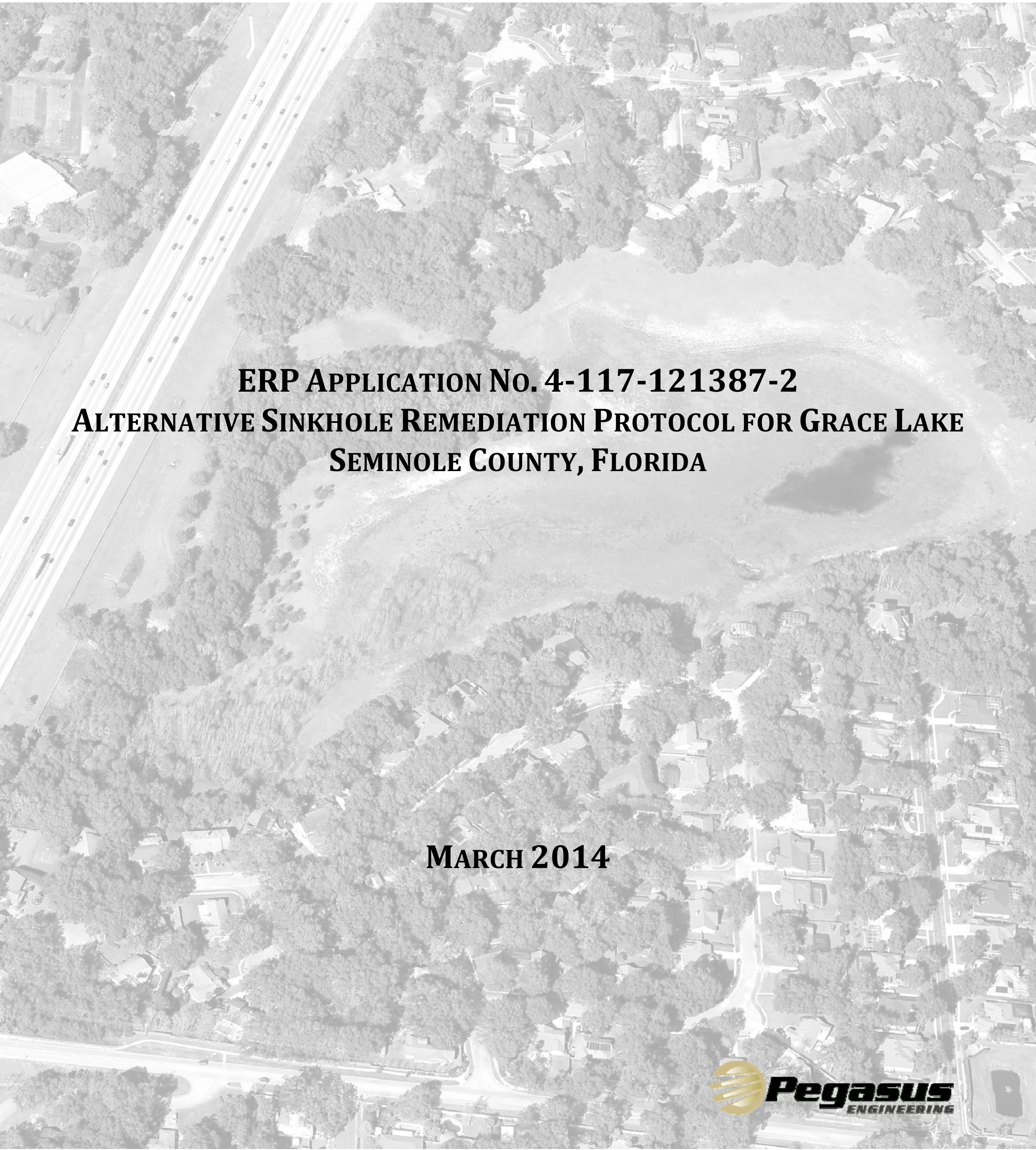
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT



ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
SEMINOLE COUNTY, FLORIDA

MARCH 2014

Pegasus
ENGINEERING

SJRWMD Joint Application for Individual Environmental Resource Permit

ERP Application No. 4-117-121387-2
Alternative Sinkhole Remediation Protocol for Grace Lake

Acknowledgements

- Bob Dallari, District 1 Commissioner
- John Horan, District 2 Commissioner
- Lee Constantine, District 3 Commissioner
- Carton Henley, District 4 Commissioner
- Brenda Carey, District 5 Commissioner

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

Antoine Khoury, P.E., Public Works Director
Brett Blackadaar, P.E., County Engineer
Mark Flomerfelt, P.E., Stormwater Capital Projects

Certification

Pegasus ENGINEERING

301 West SR 434, Suite 309
Winter Springs, Florida 32708
407-992-9160 (Phone) | 407-358-5155 (Fax)

The information contained within the following document was prepared by Pegasus Engineering, LLC under the supervision and direction of the respective undersigned, whose seal as a registered professional engineer is affixed below.

SJRWMD Permit Application Package

GREGORY ALLEN TEAGUE LICENSE NO. 47663 STATE OF FLORIDA PROFESSIONAL ENGINEER

Greg A. Teague

Greg A. Teague, P.E., CFM
Florida Registration No. 47663
March 28, 2014

ICPR Stormwater Modeling

JOHAN A. RODRIGUEZ LICENSE No 66517 STATE OF FLORIDA PROFESSIONAL ENGINEER

Johan A. Rodriguez, P.E.
Florida Registration No. 66517
March 28, 2014

FOREWORD

TAB 1: JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

TAB 2: APPLICATION OVERVIEW

TAB 3: SUPPORTING DOCUMENTATION FOR THE UPDATED SURFACE WATER ANALYSIS

TAB 4: UPDATED SURFACE WATER ANALYSIS

TAB 5: SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS

TAB 6: CONTINUOUS SIMULATION ANALYSIS
(PREPARED BY DEVO ENGINEERING)

TAB 7: CONSTRUCTION PLANS
(PREPARED BY DEVO ENGINEERING)

St. Johns River Water Management District (SJRWMD)
Joint Application for Individual Environmental Resource Permit

ERP Application No. 4-117-121387-2
Alternative Sinkhole Remediation Protocol for Grace Lake

TAB 1.1

Section A: General Information for All Activities

Section A: General Information for All Activities

PART 1: NAME, APPLICATION TYPE, LOCATION, AND DESCRIPTION OF ACTIVITY

A. Name of project, including phase if applicable:

Alternative Sinkhole Remediation Protocol for Grace Lake

B. This is for (check all that apply):

☐ Construction or operation of ***new*** works, activities and/ or a stormwater management system

☐ ***Conceptual Approval*** of proposed works, activities and/ or a stormwater management system

☒ Modification or Alteration of ***existing*** works activities and / or a stormwater management system. Provide the existing DEP or WMD permit #, if known: **4-117-121387-1** Note: Minor modifications do not require completion of this form, and may instead be requested by letter.

☐ ***Maintenance or repair*** of works, activities and/ or stormwater management system previously permitted by the DEP or WMD Provide existing permit #, if known: _____

☐ Abandonment or removal of works, activities and/ or stormwater management system Provide existing DEP or WMD permit #, if known: _____

☐ Operation of an ***existing unpermitted*** stormwater management system.

☐ Construction of additional phases of a permitted work, activity and/ or stormwater management system.

Provide the existing DEP or WMD permit #, if known: _____

C. ***List the type of activities proposed. Check all that apply, and provide the supplemental information requested in each of the referenced application sections.*** *Please also reference Applicant's Handbooks I and II for the type of information that may be needed.*

☐ Activities associated with one single-family residence, duplex, triplex, or quadruplex that do not qualify for an exemption or a General Permit: ***Provide the information requested in Section B. Do not complete Section C.***

☒ Activities within wetlands or surface waters, or within 25 feet of a wetland or surface water, (not including the activities associated with an individual residence). *Examples include dredging, filling, outfall structures, docks, piers, over-water structures, shoreline stabilization, mitigation, reclamation, restoration/enhancement.* ***Provide the information requested in Section C.***

☐ Activities within navigable or flowing surface waters such as a multi-slip dock or marina, dry storage facility, dredging, bridge, breakwaters, reefs, or other offshore structures: ***In addition to Section C, also provide the information requested in Section D.***

☐ Activities that are (or may be) located within, on or over state-owned submerged lands (*See Chapter 18-21, F.A.C. https://www.flrules.org/gateway/ChapterHome.asp?Chapter=18-21*): ***In addition to Section B or C, also provide the information requested in Section F***

☒ Construction or alteration of a stormwater management system serving residential, commercial, transportation, industrial, agricultural, or other land uses, or a solid waste facility (excluding mines that are regulated by DEP). ***Provide the information requested in Section E.***

☐ Creation or modification of Mitigation Bank (refer to Chapter 62-342, F.A.C. https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-342): ***Provide the information requested in Section G.***

☐ Mines (as defined in Section 2.0 of Applicant's Handbook Volume I) that are regulated by the DEP: ***Provide the information requested in Section H.***

☐ Other, describe: Please contact the Agency to determine which additional sections of the application are needed. See Attachment 1 for Agency contacts.

D. Describe in general terms the proposed project, system, works, or other activities. For permit modifications, please briefly describe the changes requested to the permit: **Implementation of an alternative sinkhole remediation protocol for Grace Lake which includes the placement of alternating layers of rubble riprap, articulating concrete block mats with surficial engineered soils. A vertical HDPE liner will also be installed around the perimeter of the sinkhole to mitigate the potential for seepage paths and soil loss into the restoration area.**

E. For activities in, on, or over wetlands or other surface waters, check the type of federal dredge and fill permit requested (if known): ☐Individual ☐Programmatic General permit #: SAJ
☐General ☒Nationwide permit #: NWP **27** ☐Not Applicable ☐Not sure

F. Project/Activity Street/Road Address or other location (if applicable): **Grace Lake**

City: **Longwood** County(ies): **Seminole** Zip: **32750**

Note: For utility, road, or ditch/canal activities, provide a starting and ending point using street names and nearest house numbers or provide length of project in miles along named streets or highways.

G. Project location map and Section, Township, and Range information (use additional sheets if needed): ***Please attach a location map showing the location and boundaries of the proposed activity in relation to major intersections or other landmarks. The map should also contain a north arrow and a graphic scale; show Section(s), Township(s), and Range(s); and must be of sufficient detail to allow a person unfamiliar with the site to find it.***
Section(s): **25** Township: **20 S** Range: **29 E** Land Grant name, if applicable: **Northridge Tract "F"**
Section(s): Township: Range:
Section(s): Township: Range:

H. Latitude (DMS) **28° 42' 59.9"** Longitude (DMS) **81° 22' 24.5"** (Taken from central location of the activity). Explain source for obtaining latitude and longitude (i.e. U.S.G.S. Quadrangle Map, GPS, online resource): **Online Resource**

I. Tax Parcel Identification Number(s): **25-20-29-509-0F00-0000**

[Number may be obtained from property tax bill or from the county property appraiser's office; if on multiple parcels, provide multiple Tax Parcel Identification Numbers]

J. Directions to Site (from major roads; include distances and landmarks as applicable): **East of Interstate 4, South of Northridge Drive, West of South Ridge Lake Circle.**

K. Project area or phase area: **42.50** acres **(Unchanged from Permit No. 4-117-121387-1)**

L. Name of waterbody(ies) (if known) in which activities will occur or into which the system will discharge: **Grace Lake**

The following questions (M-O) are not applicable to activities related to a single-family residence, including private single-family residential docks, piers, seawalls or boat ramps.

M. Is it part of a larger plan of development or sale? ☐ yes ☒ no

N. Impervious or semi-impervious area excluding wetlands and other surface waters (if applicable): **0.00** acres or square feet **(Unchanged from Permit No. 4-117-121387-1)**

O. Volume of water the system is capable of impounding (if applicable): **N/A** acre-feet.

PART 2: SUPPLEMENTAL INFORMATION, AND PERMIT HISTORY

A. Is this an application to modify an existing Environmental Resource Permit, or to construct or implement part of a multi-phase project, such as a project with a Conceptual Approval permit? ☒ Yes ☐ No *If you answered "yes", please provide permit numbers below:*

AGENCY	DATE	PERMIT/APPLICATION NO.	PROJECT NAME
SJRWMD	6/13/11	4-117-121387-1	Grace Lake Sinkhole Repair

B. Indicate if there have been any ***pre-application meeting(s)*** or other discussions about the proposed project, system or activity. If so, please provide the date(s), location(s) of the meeting, and the name(s) of Agency staff that attended the meeting(s):

AGENCY	DATE	LOCATION	MEETING ATTENDEES
SJRWMD	3/28/14	Devo Engineering	Margie Cook, Victoria Nations, Richard Lee, Monica Sovacool

C. ***Attach a depiction (plan and section views), which clearly shows the works or other activities proposed to be constructed.*** Use multiple sheets, if necessary, a scale sufficient to show the location and type of works, and include a north arrow and a key to any symbols used. ***Specific information to be included in the plans is based on the activities proposed and is further described in Sections B-H***. However, supplemental information may be required based on the specific circumstances or location of the proposed works or other activities.

D. Processing Fee: ***Please submit the application processing fee along with this application form and supplemental information*.** Processing fees vary based on the size of the activity, the type of permit applied for, and the reviewing Agency. Please reference Attachment 3 to determine the appropriate fee.

PART 3: APPLICANT AND ASSOCIATED PARTIES INFORMATION

Instructions: Permits are only issued to entities having sufficient real property interest as described in Section 4.2.3 (d) of Applicant's Handbook Volume I. Please attach evidence of sufficient real property interest over the land upon which the activities subject to the application will be conducted, including mitigation (if applicable). Refer to Section 4.2.3 (d) for acceptable ownership or real property interest documentation. For corporations, list a person who is a registered agent or officer of the corporation who has the legal authority to bind the corporation.

A. APPLICANT (ENTITY MUST HAVE SUFFICIENT REAL PROPERTY INTEREST) ☒ **THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION**		
Name: Last: **Flomerfelt**	First: **Mark**	Middle:
Title: **Stormwater Capital Projects**	Company: **Seminole County Public Works**	
Address: **100 East First Street**		
City: **Sanford**	State: **FL**	Zip: **32771**
Home Telephone:	Work Telephone: **407-665-5709**	
Cell Phone:	Fax: **407-665-5786**	
E-mail Address: **mflomerfelt@seminolecountyfl.gov**		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		
B. LAND OWNER(S) (IF DIFFERENT OR IN ADDITION TO APPLICANT) ☐ **CHECK HERE IF LAND OWNER IS ALSO A CO-APPLICANT**		
Name: Last:	First:	Middle:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:	Fax:	
E-mail Address:		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

C. OPERATION AND MAINTENANCE ENTITY (see Applicant's Handbook I, Section 12.3)			
Entity Name: **Seminole County**	Contact: Last: **Flomerfelt**	First: **Mark**	Middle:
Title: **Stormwater Capital Projects**	Company: **Seminole County Public Works**		
Address: **100 East First Street**			
City: **Sanford**	State: **FL**		Zip: **32771**
Home Telephone:	Work Telephone: **407-665-5709**		
Cell Phone:	Fax: **407-665-5786**		
E-mail Address: **mflomerfelt@seminolecountyfl.gov**			
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐			

D. CO-APPLICANT (IF DIFFERENT OR IN ADDITION TO APPLICANT AND OWNER)		
Name: Last:	First:	Middle:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:	Fax:	
E-mail Address:		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

E. ENGINEERING CONSULTANT ☒ THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION		
Name: Last: **Teague**	First: **Greg**	Middle:
Title: **Project Manager**	Company: **Pegasus Engineering**	
Address: **301 West SR 434, Suite 309**		
City: **Winter Springs**	State: **FL**	Zip: **32708**
Home Telephone:	Work Telephone: **407-992-9160**	
Cell Phone:	Fax: **407-358-5155**	
E-mail Address: **greg@pegasusengineering.net**		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

F. ENVIRONMENTAL CONSULTANT ☐ THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION		
Name: Last:	First:	Middle:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:	Fax:	
E-mail Address:		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

G. AGENT AUTHORIZED TO SECURE PERMIT (IF DIFFERENT FROM CONSULTANT) ☐ THIS IS A CONTACT PERSON FOR ADDITIONAL INFORMATION		
Name: Last:	First:	Middle:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:	Fax:	
E-mail Address:		
Correspondence will be sent via email. Check here to receive correspondence via US Mail: ☐		

If necessary, please add additional pages for other contacts and property owners related to this project.

PART 4: SIGNATURES AND AUTHORIZATION TO ACCESS PROPERTY

Instructions: For multiple applicants please provide a separate Part 4 for each applicant. For corporations, the application must be signed by a person authorized to bind the corporation. A person who has sufficient real property interest (see Section 4.2.3 (d) of Applicant's Handbook Volume I) is required in (B) to authorize access to the property, except when the applicant has the power of eminent domain.

A. By signing this application form, I am applying for the permit and any proprietary authorizations identified above, according to the supporting data and other incidental information filed with this application. I am familiar with the information contained in this application and represent that such information is true, complete and accurate. I understand this is an application and not a permit, and that work prior to approval is a violation. I understand that this application and any permit issued or proprietary authorization issued pursuant thereto, does not relieve of any obligation for obtaining any other required federal, state, water management district or local permit prior to commencement of construction. I agree to operate and maintain the permitted system unless the permitting agency authorizes transfer of the permit to a different responsible operation and maintenance entity. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S. and 18 U.S.C. Section 1001.

Mark Flomerfelt, P.E.		3/14/14
Typed/Printed Name of Applicant or Applicant's Authorized Agent	Signature of Applicant or Applicant's Authorized Agent	Date

Stormwater Capital Projects - Seminole County Public Works

(Corporate Title if applicable)

B. CERTIFICATION OF SUFFICIENT REAL PROPERTY INTEREST AND AUTHORIZATION FOR STAFF TO ACCESS THE PROPERTY:
I certify that:

☐ ***I possess sufficient real property interest in or control, as defined in Section 4.2.3 (d) of Applicant's Handbook Volume I,*** over the land upon which the activities described in this application are proposed and I have legal authority to grant permission to access those lands. I hereby grant permission, evidenced by my signature below, for staff of the Agency and the U.S. Army Corps of Engineers to access, inspect, and sample the lands and waters of the property as necessary for the review of the proposed works and other activities specified in this application. I authorize these agents or personnel to enter the property as many times as may be necessary to make such review, inspection, and/ or sampling. Further, I agree to provide entry to the project site for such agents or personnel to monitor and inspect permitted work if a permit is granted.

OR

☒ I represent an entity having ***the power of eminent domain and condemnation authority***, and I/we shall make appropriate arrangements to enable staff of the Agency and the U.S. Army Corps of Engineers to access, inspect, and sample the property as described above.

Mark Flomerfelt, P.E.		3/14/14
Typed/Printed Name	Signature	Date

Stormwater Capital Projects - Seminole County Public Works

(Corporate Title if applicable)

C. DESIGNATION OF AUTHORIZED AGENT (IF APPLICABLE):

I hereby designate and authorize _____ to act on my behalf, or on behalf of my corporation, as the agent in the processing of this application for the permit and/or proprietary authorization indicated above; and to furnish, on request, supplemental information in support of the application. In addition, I authorize the above-listed agent to bind me, or my corporation, to perform any requirements which may be necessary to procure the permit or authorization indicated above. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S. and 18 U.S.C. Section 1001.

Typed/Printed Name of Applicant	Signature of Applicant	Date

(Corporate Title if applicable)

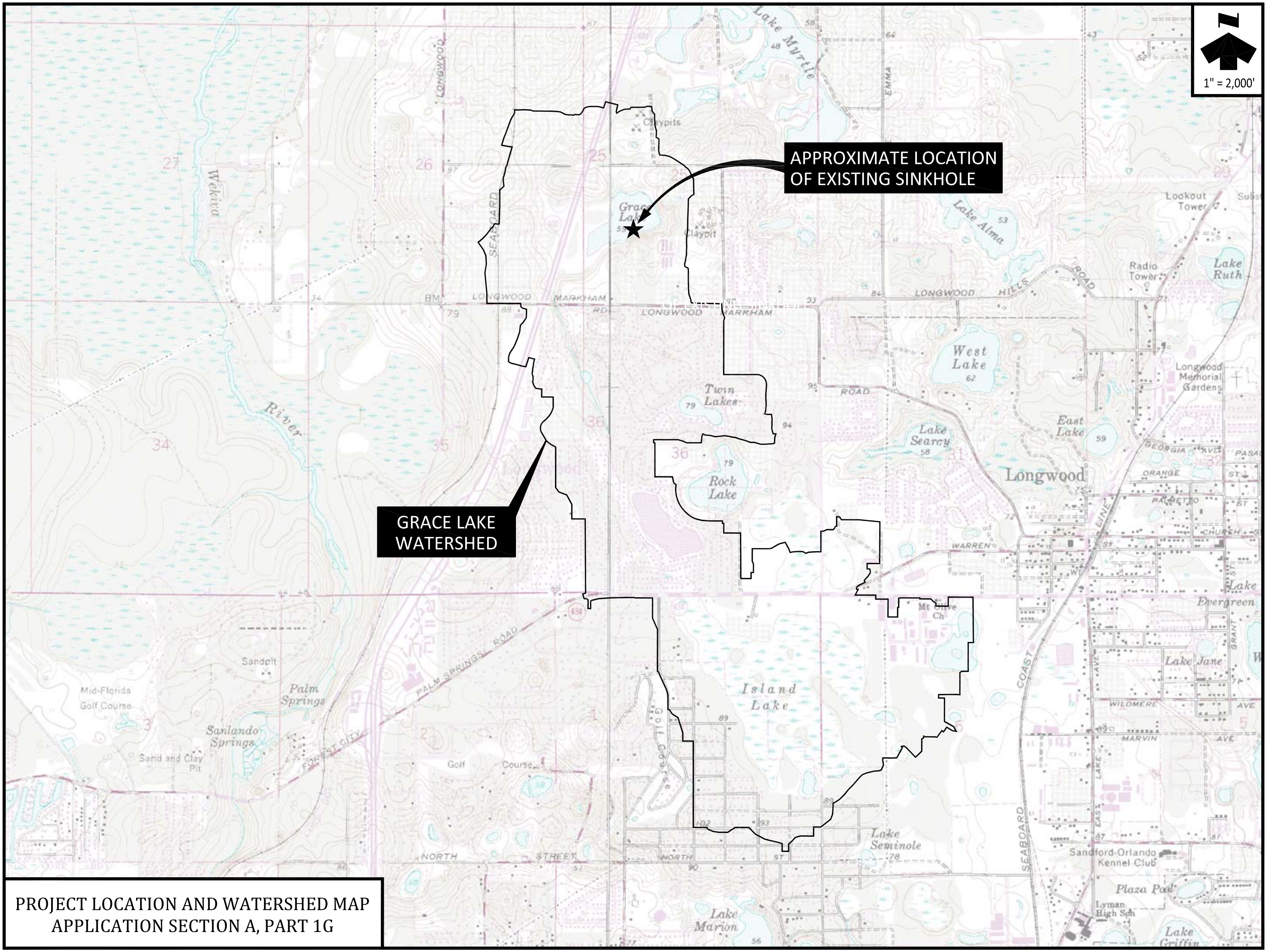
(9.25.13)

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 1.2

SECTION A: MAPS AND OTHER ATTACHMENTS



PROJECT LOCATION AND WATERSHED MAP
APPLICATION SECTION A, PART 1G

PROPOSED WORKS
SJRWMD APPLICATON SECTION A, PART 2C

INSET A
SINKHOLE REMEDIATION LAYOUT ENLARGEMENT
Scale: 1" = 40'

NOT VALID FOR CONSTRUCTION UNLESS SIGNED IN THIS BLOCK

DATE	REVISIONS	BY	CHECKED

GRACE LAKE SINKHOLE
REPAIR PROJECT
SEMINOLE COUNTY, FLORIDA

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

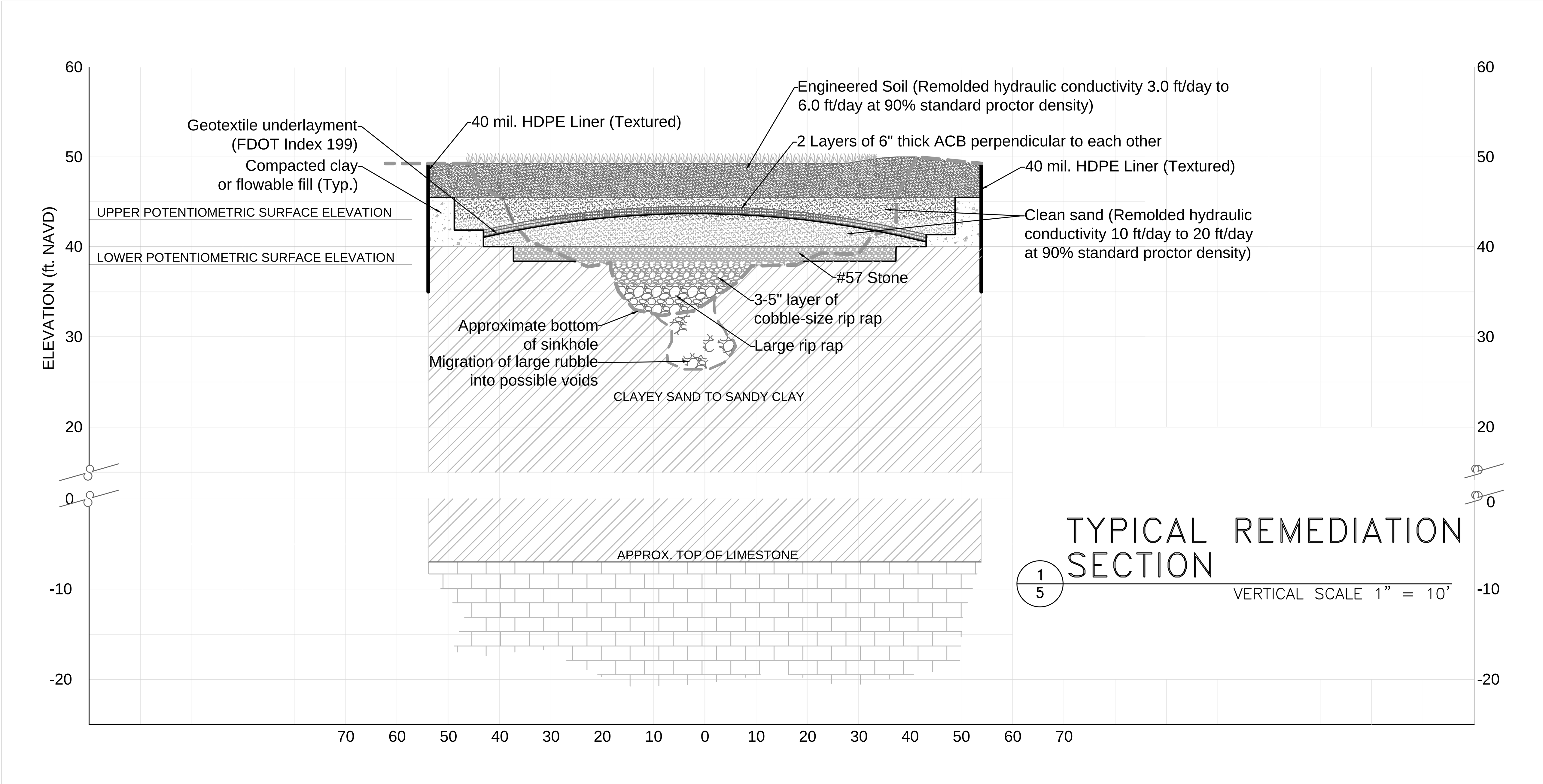
SINKHOLE REMEDIATION
LAYOUT PLAN

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
SJS	VP	SJS/DS	DS

PROJECT NO. 13-087
SCALE N.T.S
DATE FEBRUARY 04, 2014
SHEET NO. 4
SHEET 4 OF 5

DEVO SEEREERAM, Ph.D., P.E.
REGISTRATION NO. 48303

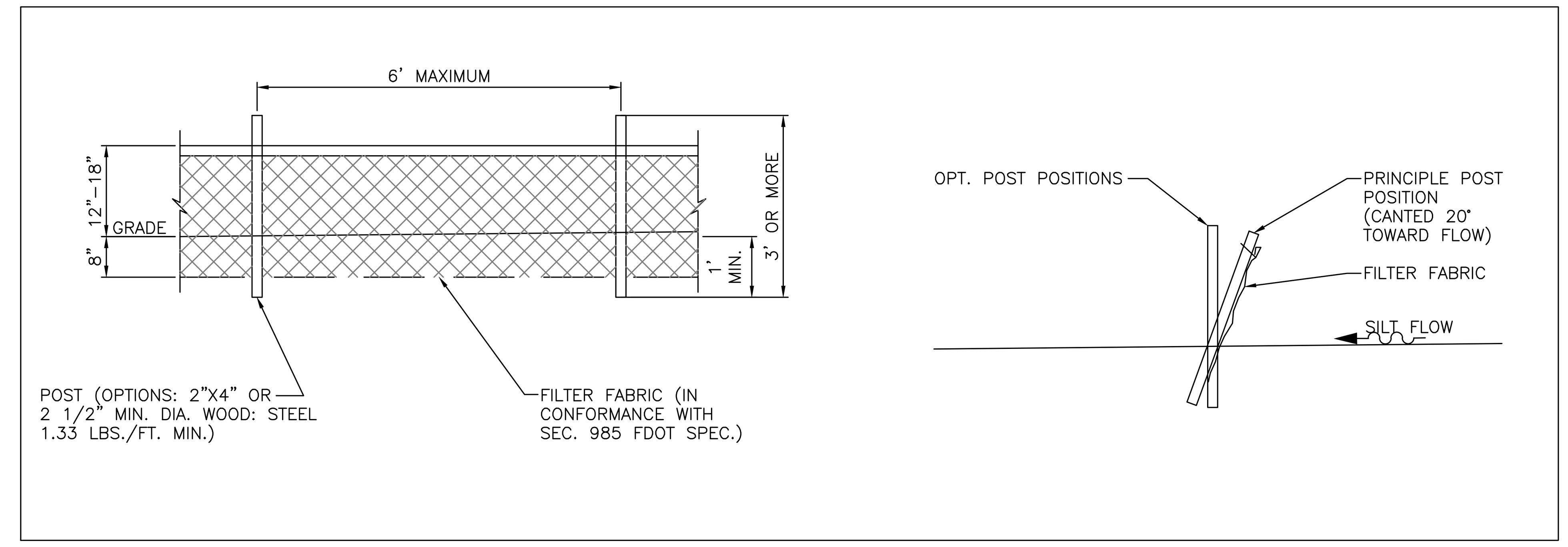
100% SUBMITTAL



TYPICAL REMEDIATION SECTION

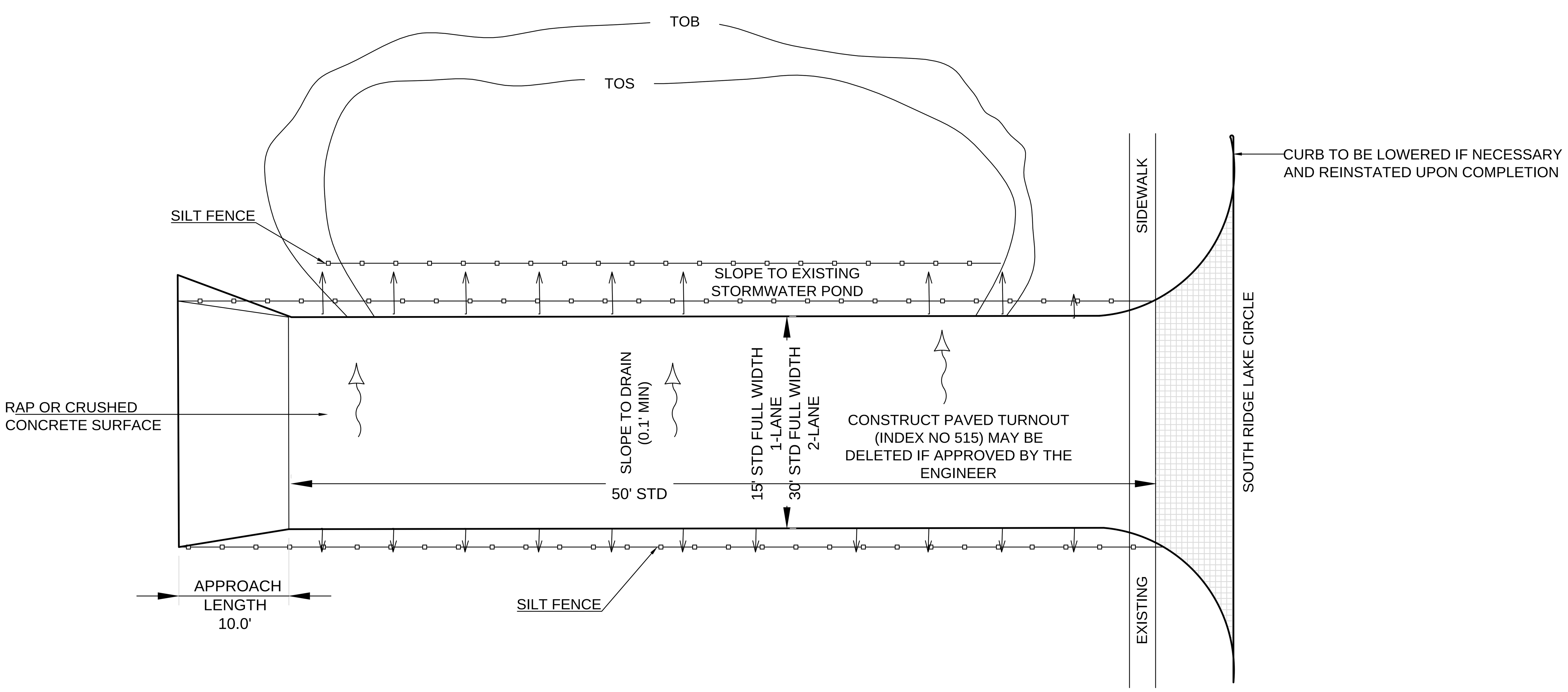
1/5

VERTICAL SCALE 1" = 10'



2/5 SILT FENCE

SCALE 1" = 2'



3/5 SOIL TRACKING PREVENTION DEVICE WITHIN TRACK "D"

Proposed Construction Sequence

- Set up approved soil and erosion control measures.
- Establish access for construction equipment.
- Clear and Grub the upper reaches of the sinkhole above elev. 38+/- ft NAVD.
- Install Large Rip Rap using an excavator with adequate reach to fill voids from the bottom of the sinkhole up to elev. 36+/- ft NAVD.
- Install 3"-5" cobble size rip rap using an excavator with adequate reach to fill voids in the underlying rubble layer up to elev. 38+/- ft NAVD.
- Install #57 stone using an excavator with adequate reach to fill voids in the underlying rubble layer up to elev. 40+/- ft NAVD (benched into natural soils).
- Install clean sand with a remolded hydraulic conductivity of 10 ft/day to 20 ft/day at 90% standard proctor density to parabolic configuration as shown on the cross-section (benched into natural soils).
- Install a layer of geotextile fabric underlayment per FDOT index 199.
- Install two layers of ACB perpendicular to each other.
- Install clean sand with a remolded hydraulic conductivity of 10 ft/day to 20 ft/day at 90% standard proctor density onto the ACB ensuring that all voids are properly filled.
- Install minimum of 3 ft. of engineered soil to 12"+/- below finish grade with remolded hydraulic conductivity of 3.0 ft/day to 6.0 ft/day at 90% standard proctor density.
- Install 40 mil Vertical HDPE liner.
- Carefully compact the clay layer between the HDPE liner and the ACB including the use of flowable fill as necessary to ensure a complete cutoff.

Note that some variation in the above limits and elevations can be expected based on location specific engineering soil properties.

NOT VALID FOR CONSTRUCTION UNLESS SIGNED IN THIS BLOCK

DATE	REVISIONS	BY	CHECKED

GRACE LAKE SINKHOLE
REPAIR PROJECT
SEMINOLE COUNTY, FLORIDA

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

SECTIONS AND DETAILS

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
SJS	VP	SJS/DS	DS

PROJECT NO. 13-087
SCALE N.T.S
DATE FEBRUARY 04, 2014
SHEET NO. 5
SHEET 5 OF 5

DEVO SEEREERAM, Ph.D., P.E.
REGISTRATION NO. 48303

100% SUBMITTAL

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 1.3

SECTION C: SUPPLEMENTAL INFORMATION FOR WORKS OR OTHER ACTIVITIES IN, ON, OR OVER WETLANDS AND/OR OTHER SURFACE WATERS

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ENGINEERING

SECTION C: SUPPLEMENTAL INFORMATION FOR WORKS OR OTHER ACTIVITIES IN, ON, OR OVER WETLANDS AND/OR OTHER SURFACE WATERS

(Note: This section is not required if all the proposed activities are covered in Section B.)

Instructions: This section is for ERP applications that do not involve activities associated with an individual single-family residence, duplex, triplex or quadruplex. For those activities, please use Section B. This form is to be completed if the proposed work or activity will occur in, on, over, or within 25 feet of a wetland or other surface water. The supplemental information required by this section is in addition to the information required by Section A of the ERP application.

PART 1: WETLAND OR OTHER SURFACE WATER IMPACT SUMMARY

B. Describe the basic purpose of the project or activity: **Implementation of an alternative sinkhole remediation protocol for Grace Lake which includes the placement of alternating layers of rubble riprap, articulating concrete block mats with surficial engineered soils. A vertical HDPE liner will also be installed around the perimeter of the sinkhole to mitigate the potential for seepage paths and soil loss into the restoration area.**

1. Total area of work (dredging, filling, construction, alteration, or removal) in, on, or over wetlands or other surface waters: **162,043** sq. ft.; **3.72** ac.

2. Total volume of material in wetlands or other surface waters:
   a. to be dredged: cubic yards,
   b. to be filled: **+/- 7,000** cubic yards.

3. Identify the seasonal high water level (SHWL) and wetland normal pool elevations for each wetland or surface water within the project site. For tidal wetlands and/or surface waters provide the elevation of mean high and mean low water. Include an aerial photograph showing the location of each sampling location, dates, datum, and methods used to determine these elevations. **Water levels within Grace Lake have been significantly altered by the sinkhole. A seasonal hydroperiod that varies from elevation 58- to 62.6-ft, NAVD is anticipated after the alternative sinkhole remediation protocol is implemented.**

4. Name of waterbody(ies) (if applicable & if known) in which work will occur? **Grace Lake**

5. Is the activity proposed in an Outstanding Florida Water or Aquatic Preserve?
   ☐ yes, name: ☒ no ☐ I don't know

6. Has there ever been a formal or informal wetland determination for the project site? If yes, provide the identifying number and/ or a copy of the jurisdictional map. **SRJWMD Permit 4-117-121387-1 for the Grace Lake Sinkhole Repair Project dated 6/13/2011.**

7. Provide a map(s) of the project area and vicinity delineating USDA/NRCS soil types. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

8. Provide recent aerials, legible for photointerpretation (no photocopies) with a scale of 1" = 400 ft, or more detailed, with project boundaries and wetland boundaries delineated on the aerial. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

9. Provide existing and proposed maps indicating vegetative community types based on Florida Land Use and Cover Classification System (FLUCCS) (FDOT 1999). For vegetated areas dominated by exotic vegetation, use the FLUCCS code representative of the native community type that was present prior to exotic infestation. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

10. Provide existing and proposed maps indicating vegetative community types based on the Florida Natural Areas Inventory Guide to the Natural Communities of Florida. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

11. Impact Summary Tables (located at the end of this section):

    a. For all projects, complete Table 1, 2 and 3 as applicable. **Table 1 has been completed.**

    b. For shoreline stabilization projects, provide the information requested in Table 4. **N/A**

12. Adjacent property owners. The following information is required only for projects proposed to occur in, on or over wetlands that need a federal dredge and fill permit and/or authorization to use state owned submerged lands and is not necessary when applying solely for an Environmental Resource Permit. If the activity is located on state owned submerged lands and requires a lease or easement, provide a list of names and addresses from the latest county tax assessment roll of all property owners located within a 500 ft. radius of the proposed lease or easement boundary in mailing label format, or you may elect to send notice to those persons by certified mail, with the return-receipt card addressed to the DEP or water management district, as applicable, in accordance with subsection 18-21.005(3), F.A.C., and Section 253.115, F.S. For projects that need a federal dredge and fill permit, please provide the names, addresses and zip codes of property owners whose property directly adjoins the project (excluding applicant). Attach additional sheets if necessary.

1. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**	2.
3.	4.
5.	6.

PART 2: ENVIRONMENTAL CONSIDERATIONS

Note: for many questions, a state rule/Applicant's Handbook Volume I (AH I) section is cited to assist the applicant in addressing these questions. However, additional Federal criteria may apply.

1. Elimination or Reduction of Impacts (Avoidance and Minimization). Describe measures taken to eliminate or reduce impacts to wetlands and other surface waters (*Refer to AH I Section 10.2.1*). **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

2. Fish, Wildlife, Listed Species and their Habitats. Provide results of any wildlife assessments that have been conducted on the project site and provide any comments pertaining to the project from the Florida Fish and Wildlife Conservation Commission and/or the U.S. Fish and Wildlife Service (*Refer to AH I Section 10.2.2*). **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

3. Water quantity impacts to wetlands and other surface waters (*Refer to AH I Section 10.2.2.4 and AH II*).

   a. Does the activity include a proposed stormwater water management system with a control elevation different than the wetland normal pool elevation(s) of existing or proposed created wetlands or other surface waters? **Yes.**

   b. If yes to (a), provide documentation (e.g. drawdown assessment or other methods) that shows the proposed surface water management system will not change the hydroperiod of the existing or created wetland or other surface water. **Refer to the continuous simulation analysis prepared by Devo Engineering.**

4. Public Interest Test. Please describe how the proposed activity will ***not be contrary*** to the public interest, OR if such an activity significantly degrades or is located within an Outstanding Florida Water (OFW), that the regulated activity will be ***clearly in*** the public interest (*Refer to AH I Section 10.2.3).*

   a. Please describe how the project will be designed to avoid adverse affects to public health, safety, or the welfare or the property of others. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

   b. Please describe how the project will be designed to avoid adverse affects to the conservation of fish and wildlife, including endangered or threatened species, or their habitats. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

   c. Please describe how the project will be designed to avoid adverse affects to navigation or the flow of water or cause harmful erosion or shoaling. **The alternative sinkhole remediation protocol proposes various improvements that will restore the historic lake bottom grade without impacting navigation. The proposed erosion control countermeasures address the potential for erosion or shoaling.**

   d. Please describe how the project will be designed to avoid adverse affects to the fishing or recreational values or marine productivity in the vicinity of the activity. **N/A.**

e. Will the project be of a temporary or permanent nature? **Most of the environmental impacts will be temporary. Permanent impacts will occur in the immediate vicinity and within the limits of the existing sinkhole.**

f. Please describe how the project will be designed to avoid adverse impacts to significant historical and archaeological resources, under the provisions of section 267.061, F.S. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

g. Please describe how the project will be designed to avoid adverse affects to the current condition and relative value of functions being performed by areas affected by the proposed regulated activity. **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

5. Water Quality. Provide a description of how water quality will be maintained in wetlands and other surface waters that will be preserved or will remain undisturbed, both on and offsite. Please address both short-term (such as during construction) and long-term water quality considerations (*Refer to AH I Section 10.2.4*). **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

6. Class II Waters; Waters approved for shellfish harvesting *(Refer to AH I Section 10.2.5)*.

   a. Will the project occur in Class II that are NOT approved for shellfish harvesting? If yes, please provide a plan or procedure detailing the measures to be taken to meet the requirements of *AH I Section 10.2.5(a)*. **No.**

   b. Is the project located adjacent to or in close proximity to Class II waters? If yes, please provide a plan or procedure detailing the measures to be taken to meet the requirements of *AH I Section 10.2.5(b)*. **No.**

   c. Is the project located in Class II or Class III waters that are classified as “approved”, “restricted”, “conditionally approved”, or “conditionally restricted”? If yes, demonstrate that the project meets the requirements of *AH I Section 10.2.5(c)*. **No.**

7. Vertical seawalls. Are vertical seawalls proposed in an estuary or lagoon as part of the project? If yes, please describe how the project meets the requirements of *AH I Section 10.2.6*. **No.**

8. Secondary Impacts (*AH I Section 10.2.7*).

   a. Will an upland buffer, with a minimum width of 15' and an average width of 25', be provided between the proposed activities and existing wetlands or wetlands to be preserved, enhanced, restored, or created? Provide the location and dimension of all buffers on the plans. **No.** If not, demonstrate that secondary impacts will not occur or how they will be offset. **N/A.**

   b. If listed species are present or may be present then coordination with wildlife agencies is needed. Have you coordinated with the FFWCC and/or USFWS? If so, please provide correspondence from the wildlife agencies indicating concurrence with the species management plan(s). **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

   c. What measures will be taken to avoid impacts to wetland-dependent wildlife and/or listed species that use uplands for nesting or denning? **Previously submitted (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

d. Describe whether there are any other relevant activities that are very closely linked and causally related to any proposed dredging or filling in wetlands or other surface waters that have the potential to cause impacts to significant historical and archaeological resources. **N/A.**

e. Are there additional future phases or extensions of the proposed activities that are not shown? If yes, please describe. **No.**

9. Cumulative Impacts. Is the proposed mitigation located within the same drainage basin (*Refer to AH I Figures 10.2.8.1 – 10.2.8.5)* as the proposed wetland impacts? **N/A.** If not, please submit a Cumulative Impact Evaluation in accordance with *AH I Section 10.2.8*.

10. Mitigation Plan (*Refer to AH I Section 10.3*).

a. If a mitigation bank is proposed to offset wetland/other surface water impacts, provide:

i. The name of the bank: **N/A**. A letter of reservation from the banker will be required once the application has been evaluated.
ii. If the mitigation bank was assessed using UMAM, provide UMAM worksheets for impact area(s). If the bank was assessed using a method other than UMAM, then prepare the impact assessment using the same method. **N/A.**

b. If mitigation is proposed to offset wetland/other surface water impacts, please provide a mitigation plan that includes, at a minimum, the following:

i. ☐ Proposed mitigation narrative:
   (1) ☐ Describe the current and proposed condition for each type of mitigation component (restoration, enhancement, creation, preservation), including:
      (a) ☐ Describe current and proposed vegetation
      (b) ☐ Describe current and proposed hydrologic conditions for the proposed mitigation.
      (c) ☐ Describe the soil types from NRCS maps and confirm if actual soil conditions appear to match.
   (2) ☐ Provide details of the proposed construction/mitigation activities including phasing and timing, as appropriate.
   (3) ☐ Identify measures that will be implemented during and after construction to avoid adverse impacts related to the proposed activities.
   (4) ☐ A mitigation implementation and monitoring schedule with dates.
   (5) ☐ Identify the success criteria.
   (6) ☐ Describe the anticipated site conditions in and around the mitigation area after the mitigation plan is successfully implemented.
   (7) ☐ Provide a comparison of current fish and wildlife habitat to expected habitat after the mitigation plan is successfully implemented.
ii. ☐ Provide a Management Plan that includes, as appropriate, aspects of operation and maintenance, including water management practices, vegetation establishment, exotic and nuisance species control, fire management, and control of access.
iii. ☐ Maps:
   (1) ☐ Soil map (include soil names/codes, hydrologic soil groups and hydric soil types).

(2) ☐ Topographic map of the mitigation area and adjacent contributing and receiving areas.
(3) ☐ Hydrologic features map of the mitigation area and adjacent contributing and receiving areas.
(4) ☐ Vegetative communities map (using FLUCCS or other appropriate classification system).
(5) ☐ For all maps, indentify source.

iv. Provide the necessary supporting information for the application of sections 62-345.400 - .600 (Uniform Mitigation Assessment Method (UMAM)). To meet this requirement, submittal of UMAM worksheets is acceptable for impact and mitigation areas.

v. If onsite and/or offsite applicant-responsible mitigation is proposed, submit a draft Conservation Easement document or other form of restrictive covenant that provides for protection of the mitigation area in perpetuity. Standard forms, as described in subsection 62-330.301(6), F.A.C., are available from the Agency or on its website.

vi. If onsite and/or offsite applicant-responsible mitigation is proposed, submit a cost estimate for completing the mitigation, including monitoring and maintenance.

vii. If onsite and/or offsite applicant-responsible mitigation is proposed and the proposed mitigation exceeds $25,000, please provide a draft financial assurance document.

viii. Identify the entity responsible for monitoring, maintenance and long-term stewardship of the mitigation area (i.e. the landowner or homeowner association, not the consultant or contractor that will do the work).

PART 3: PLANS

PLANS: The information listed in the checklist below represent the typical information required on the submitted project plans. The Plans checklists in each application section are cumulative unless otherwise noted. Separate plans for each application section are not required.

1. ☐ Include the following on the construction plans and cross sections:

   a. ☐ An Existing Conditions sheet showing the entire project and wetland/other surface water boundaries. Include the following: Acreage and type (herbaceous, forested or other surface water) of each wetland/other surface water.
   b. ☐ A Proposed Conditions sheet showing the entire project and wetland/other surface water boundaries with construction plan overlay.
   c. ☐ A Proposed Wetland Impact sheet that include the following:
      i. ☐ Acreage and type (herbaceous, forested or other surface water) of each wetland/other surface water to be impacted.
      ii. ☐ Proposed upland buffers with dimensions.
      iii. ☐ Identify the seasonal high water and wetland normal pool elevations on the plans.
      iv. ☐ Separately identify WMD/FDEP and USACE wetland/other surface water impacts if different.
   d. ☐ Include wetland boundaries on all construction plan sheets.

2. ☐ If onsite and/or offsite applicant-responsible mitigation is proposed, submit mitigation permit plans and cross sections including, at a minimum:

   a. ☐ existing conditions plan sheet identifying upland and wetland communities and acreage of each, topography, drainage patterns, and location of cross-section detail.
   b. ☐ proposed conditions plan sheet identifying proposed improvements by type (restoration, enhancement, creation, preservation), acreage of each, topography, drainage patterns, and location of cross-section detail.
   c. ☐ monitoring plan sheet including proposed improvements, monitoring transects, photostations, and mitigation signage (if applicable).
   d. ☐ cross-section and/or profile detail(s) sheet(s) including representative section of each type of mitigation component. Include existing and proposed conditions and representative elevations.
   e. ☐ planting schedule, plant species including common and scientific names divided into three sections (canopy, shrub, herbaceous) by mitigation component, quantity, spacing, size, and elevation range.

TABLE 1 - PROJECT WETLAND (WL) AND OTHER SURFACE WATER (SW) AND IMPACT SUMMARY

WL & SW ID	UMAM ASSESSMENT AREA NAME(S)	WL & SW TYPE	WL & SW SIZE (acres)	WL & SW NOT IMPACTED (acres)	TEMPORARY WL & SW IMPACTS		PERMANENT WL & SW IMPACTS		MITIGATION ID
					IMPACT SIZE (acres)	IMPACT TYPE	IMPACT SIZE (acres)	IMPACT TYPE	
Grace Lake		520	42.5	38.78	3.66	D, F	0.06	D, F	N/A
PROJECT TOTALS:			42.5	38.78	3.66		0.06		

Comments: **The table entries above were previously permitted and are unchanged from the previous application for the Grace Lake Sinkhole Repair Project (SJRWMD Permit 4-117-121387-1 dated 6/13/2011).**

Codes (multiple entries per cell not allowed):

- Wetland & Surface Water ID: Include ID on submitted wetland and surface water impact maps
- Wetland Type: from an established wetland classification system
- Impact Type: D=dredge; F=fill; H=change hydrology; S=shading; C=clearing; O=other

TABLE 2 - PROJECT ON-SITE MITIGATION SUMMARY

MITIGATION ID	UMAM ASSESSMENT AREA NAME(S)	TARGET TYPE	CREATION	RESTORATION	ENHANCEMENT	WETLAND PRESERVE	UPLAND PRESERVE	OTHER
			AREA (acres)	AREA (acres)	AREA (acres)	AREA (acres)	AREA (acres)	AREA (acres)
PROJECT TOTALS								

COMMENTS:

Codes (multiple entries per cell not allowed):

- Target Type or Type=target or existing habitat type from an established wetland classification system or land use classification for non-wetland mitigation

TABLE 3 - **PROJECT OFF-SITE MITIGATION SUMMARY**

MITIGATION ID	UMAM ASSESSMENT AREA NAME(S)	TARGET TYPE	CREATION	RESTORATION	ENHANCEMENT	WETLAND PRESERVE	UPLAND PRESERVE	OTHER
			AREA (acres)	AREA (acres)	AREA (acres)	AREA (acres)	AREA (acres)	AREA (acres)
PROJECT TOTALS								

COMMENTS:

Codes (multiple entries per cell not allowed):

- Target Type or Type=target or existing habitat type from an established wetland classification system or land use classification for non-wetland mitigation

TABLE 4 - SHORELINE STABILIZATION

Stabilization	Linear Ft. New	Linear Ft. Replaced	Linear Ft. Repaired	Linear Ft. Removed	Slope H: V:	Toe Width (Ft.)
Natural Vegetation (living shoreline)					**N/A**	**N/A**
Rip Rap + Vegetation						
Rip Rap						
Seawall + Rip Rap						
Vertical Seawall						
Other Shoreline Stabilization Type						

Size of Rip Rap ____

Type of Rip Rap ____

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 1.4

SECTION E: SUPPLEMENTAL INFORMATION REQUIRED FOR WORKS OR OTHER ACTIVITIES INVOLVING A STORMWATER MANAGEMENT SYSTEM (OTHER THAN A SINGLE-FAMILY PROJECT)

Pegasus
ENGINEERING

SECTION E: SUPPLEMENTAL INFORMATION REQUIRED FOR WORKS OR OTHER ACTIVITIES INVOLVING A STORMWATER MANAGEMENT SYSTEM
(OTHER THAN A SINGLE-FAMILY PROJECT)

Instructions: The information listed in the checklists below represents the level of information that is usually required to evaluate an application. Information can be provided within reports, plans and documents. The level of information required for a specific project will vary depending on the nature and location of the site and the activity proposed. Conceptual approvals generally do not require the same level of detail as a construction permit. However, providing a greater level of detail will reduce the need to submit additional information at a later date. If an item does not apply to your project, proceed to the next item. The supplemental information required by this section is in addition to the information required by Section A of the ERP application.

Refer to the application overview narrative for the information requested within Application Section E.

PART 1: STORMWATER MANAGEMENT SYSTEM SUMMARY

Provide drainage calculations, signed and sealed by an appropriate registered professional, and supporting documentation demonstrating that the proposed project meets the conditions for issuance under 62-330.301(1)(a),(b),(c),(e), F.A.C. The drainage calculations should include, but not necessarily be limited to, the following:

1. General Site Information:

   a. ☐ Provide pre-development and post-development drainage map(s), as appropriate, that include drainage patterns and basin boundaries with acreage served by each hydraulically separate system, showing the direction of flows, including any off-site runoff being routed through or around the system; topographic information; and connections between wetlands and other surface waters.

   b. ☐ Provide the results of any percolation tests, where appropriate, and soil borings that are representative of the actual site conditions. Identify the wet season high water table elevations, soil profiles, and hydraulic conductivity. Include dates, datum, and methods used to determine these soil parameters.

   c. ☐ Identify the onsite hydrologic soil classification (e.g. Type A, B/D, D). Reference the source, such as the USDA/NRCS Soil Survey, used in estimating the onsite hydrologic soil classification. Provide maps, as appropriate, with the project limits delineated.

   d. ☐ Identify the seasonal high water or mean high tide elevation for receiving waters/wetlands into which runoff will be discharged. Include dates, datum, and methods used to determine these elevations.

   e. ☐ Identify the name of each receiving waterbody to which the proposed stormwater management system will discharge: .

   f. ☐ Indicate the existing land use and land cover.

   g. ☐ Provide the acreage, and percentages of the total project, of the following:
      1. Impervious surfaces, excluding buildings, wetlands and other surface waters;

2. Buildings;
3. Pervious surfaces (green areas not including wetlands);
4. Lakes, canals, retention areas, other open water areas; and
5. Wetlands (Please refer to Section C to ensure consistency in wetland acreages).

h. ☐ Provide the location and description of any nearby existing offsite features (such as wetland and other surface waters, stormwater management ponds, and building or other structures) which might be affected by or affect the proposed construction or development.

2. Water Quality Analysis:

a. ☐ Provide a description of the proposed stormwater treatment methodology that addresses the type of treatment, pollution abatement volumes, and recovery analysis.

b. ☐ Is the receiving waterbody known to be impaired, and/or has an established Total Maximum Daily Load (TMDL) or Basin Management Action Plan (BMAP)? If so, please provide specific descriptions of all water quality parameters for which the waterbody is known to be impaired? For more information about water quality, impaired waters, and to determine whether a TMDL has been adopted in your project area, refer to: http://waterwebprod.dep.state.fl.us/basin411/downloads/Florida-Adopted-TMDLs.pdf. To determine whether a BMAP exists, or is being developed in your project area, refer to: *http://www.dep.state.fl.us/water/watersheds/bmap.htm#rad*.
☐ yes ☐ no ☐ don't know
If yes, provide calculations demonstrating that the proposed project will not contribute to violations of state water quality standards in accordance with the applicable Applicant's Handbook, Vol. II.

c. ☐ Does the project have a direct discharge to a Class I, Class II, Outstanding Florida Waters or Class III waters, which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting? *To determine whether your project is within, or will discharge to an OFW, or for more information about OFWs in general, refer to: http://www.dep.state.fl.us/water/wqssp/ofw.htm.*
☐ yes ☐ no ☐ don't know
If yes, additional treatment in accordance with the applicable Applicant's Handbook, Vol. II, may be required.

d. ☐ Provide construction plans and calculations that address the required treatment volume and recovery, as well as stage-storage and design elevations, which demonstrate compliance with the appropriate water quality treatment criteria in the applicable Applicant's Handbook, Vol. II.

.

Provide a description of the engineering methodology, assumptions and references for the parameters listed above, and a copy of all such computations, engineering plans, and specifications used to analyze the system. If a computer program is used for the analysis, provide the name of the program, a description of the program, input and output data, and justification for model selection.

3. Water Quantity Analysis:

Provide calculations and documentations demonstrating that the project, as proposed, meets the applicable design criteria as indicated in the applicable Applicant's Handbook, Vol. II. Typically, the information would include, at a minimum, but is not necessarily be limited to, the following:

a. ☐ For projects requiring pre-development analysis, provide an analysis of the pre-development peak rate of discharge and / or volume of runoff, for all design storm events. Account for all onsite depressional storage and offsite contributing area. Please refer to the applicable Applicant's Handbook, Vol. II for the design storm event(s) that apply to your project.

b. ☐ Provide an analysis of the post-development peak rate of discharge and / or volume of runoff for all applicable design storm events. Account for all onsite storage and offsite contributing area. Please refer to the applicable Applicant's Handbook, Vol. II for the design storm event(s) and criteria that apply to your project.

These analyses should include:

- ☐ Runoff characteristics, including area, runoff curve number or runoff coefficient, and time of concentration for each drainage basins in the pre-development and post-development condition;
- ☐ Design storms used including rainfall depth, duration, frequency, and distribution;
- ☐ Runoff hydrograph(s) for each drainage basin, for all required design storm event(s);
- ☐ Stage-storage computations for any area such as a reservoir, closed basin, detention area, or channel, used in storage routing;
- ☐ Stage-discharge computations for any storage areas at a selected control point, such as control structure or natural restriction;
- ☐ Flood routings through on-site conveyance and storage areas;
- ☐ Water surface profiles in the primary drainage system for each required design storm event(s);
- ☐ Runoff peak rates and volumes discharged from the site for each required design storm event(s);
- ☐ Design tailwater elevation(s) for each storm event at all points of discharge (include source or method of estimate); and
- ☐ Pump specifications and operating curves for range of possible operating conditions (if used in system).

Provide a description of the engineering methodology, assumptions and references for the parameters listed above, and a copy of all such computations, engineering plans, and specifications used to analyze the system. If a computer program is used for the analysis, provide the name of the program, input and output data, justification for model selection, and, if necessary, a description of the program.

4. Floodplain Analysis (where applicable).

a. ☒ If the project is in a known floodplain of a stream or other water course, identify the appropriate floodplain boundary and approximate flooding elevations of any lake, stream or other watercourse located on or adjacent to the site.

b. ☐ For traversing works, in accordance with the applicable Applicant's Handbook, Vol. II, provide:

☐ Hydraulic calculations for all proposed traversing works; and

☐ Water surface profiles showing upstream impact of traversing works.

c. ☐ For impacts to regulated floodplains, in accordance with the applicable Applicant’s Handbook, Vol. II, provide:

☐ Location and volume of encroachment within regulated floodplain(s); and

☐ Plans and calculations for compensating floodplain storage, if necessary, and calculations required for determining minimum building and road flood elevations.

PART 2: CONSTRUCTION PLANS

1. Provide clear, construction level detailed plans for the system. The plans must be signed and sealed by an appropriate registered professional as required by law. These plans should include cumulative information from all applicable sections; as well as the following:

a. ☒ Project area boundary and total area, including distances and orientation from roads or other landmark.

b. ☒ Existing topography extending at least 100 feet off the project area. All topography shall include location and description of benchmarks, reference to NGVD 1929 or NAVD 1988 along with the conversion factor.

c. ☒ Proposed site plan with acreage, including the following:
☐ plan view of proposed development, including impervious surfaces and water management areas;
☐ land cover and natural communities*;
☐ wetlands and other surface waters*;
☐ undisturbed uplands*;
☐ aquatic communities*;
☐ proposed buffers*;
☐ proposed impacts to wetlands and other surface waters, and any proposed connections/outfalls to other surface waters or wetlands, (if applicable); and
☐ onsite wetland mitigation areas*.
*Please refer to Section C.

☐ For phased projects, provide a master development plan clearing delineating the limits of each phase of construction.

d. ☒ Paving, Grading, and Drainage Information, which includes, but not necessarily limited to, the following:
☒ Existing topography;
☐ Boundaries of wetlands and other surface waters and upland buffers (see Section C);
☐ Plan view of proposed development;
☒ Proposed elevations and/or profiles, including:
☐ roadway, parking, and pavement grades;
☐ floor slabs, walkways, and other paved surfaces;
☐ earthwork grades for pervious landscaped areas; and
☐ perimeter site grading, tying back into existing grades.

- ☒ Location of all water management areas, including elevations, dimensions, side slopes, and design water depths;
- ☒ Location, size, and invert elevations of existing and proposed stormwater conveyance systems;
- ☐ Vegetative cover plan for all on-site and off-site earth surfaces disturbed by construction; and
- ☐ Rights-of-way and easements for the system, including all on-site and off-site areas to be reserved for water management purposes (including access), and rights-of-way and easements for the existing drainage system, if any.

e. ☒ Stormwater detail information, including but not necessarily limited to, the following:
- ☒ Cross section of all stormwater management areas, including elevations, dimensions, side slopes, and proposed stabilization measures (with location of the cross section(s) shown on the corresponding plan view);
- ☐ Detail of all proposed control structures, including elevations, dimensions, and skimmer, where applicable; and
- ☐ Details of proposed stormwater management systems, such as underdrains, exfiltration trenches, vaults, and other proposed Best Management Practices (BMPs).

f. ☒ Location and description of any nearby existing offsite features (such as wetland and other surface waters, stormwater management ponds, and building or other structures) which might be affected by or affect the proposed construction or development.

PART 3: CONSTRUCTION SCHEDULE AND TECHNIQUES **Contractor Responsibility**

Provide a construction schedule, and a description of construction techniques, sequencing and equipment. This information should include, as applicable, the following.

a. ☐ Access and staging of equipment;

b. ☐ Location and details of the erosion, sediment and turbidity control measures to be implemented during each phase of construction and all permanent control measures to be implemented in post-development conditions.

c. ☐ The location of disposal site(s) for any excavated material, including temporary and permanent disposal sites.

d. ☐ A demolition plan for any existing structures to be removed.

e. ☐ Dewatering plan details. If dewatering is required, detail the dewatering proposal including the methods that are proposed to contain the discharge, methods of isolating dewatering areas, and indicate the period dewatering structures will be in place; **Note: a Consumptive Use or Water Use permit may be required for dewatering.**

f. ☐ Methods for transporting equipment and materials to and from the work site. If barges are required for access, provide the low water depths and draft of the fully loaded barge;

PART 4: OPERATION AND MAINTENANCE AND LEGAL DOCUMENTATION: **Seminole County**

a. ☐ Describe the overall maintenance and operation schedule for the proposed system.

b. ☐ Identify the entity (or entities) that will be responsible for operating and maintaining the system (or parts of the system) to demonstrate that the entity (or entities) meet(s) the requirements of section 12.3 of the Applicant’s Handbook, Vol. I.

- ☐ If different from the permittee, provide a draft document enumerating the enforceable affirmative obligations on the entity to properly operate and maintain the system for its expected life, and documentation of the entity's financial responsibility for long-term maintenance.
- ☐ If the proposed operation and maintenance entity is not a property owner's association, provide proof of the existence of an entity, or the future acceptance of the system by an entity which will operate and maintain the system.

c. ☐ Provide drafts of all proposed conservation easements, stormwater management system easements, draft property owner's association documents, and plats for the property containing the proposed system.

d. ☐ Provide legal reservations for access to the treatment system for maintenance and operation by future maintenance entities for subdivided projects.

e. ☐ Provide indication of how water and wastewater service will be supplied.

f. ☐ Provide a copy of the boundary survey and/or legal description and acreage of the total land area of contiguous property owned/controlled the applicant.

PART 5: WATER USE **Contractor Responsibility**

a. ☐ Describe how irrigation will be provided to the project. Will the surface water system be used for water supply, including landscape irrigation, or recreation?

b. ☐ If a Consumptive Use or Water Use permit has been issued for the project, state the permit number:

c. ☐ If a Consumptive Use or Water Use permit has not been issued for the project, indicate if such a permit will be required. ☐ yes ☐ no ☐ don't know
If yes, please indicate when the application for a permit will be submitted:

d. ☐ Indicate how any existing wells located within the project site will be utilized or abandoned.

PART 6: SPECIAL BASIN INFORMATION

Is your project within a special basin as described in the applicable Applicant's Handbook, Vol. II?

☐ yes ☒ no ☐ don't know

If yes, please demonstrate that the project will meet the applicable special basin criteria.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

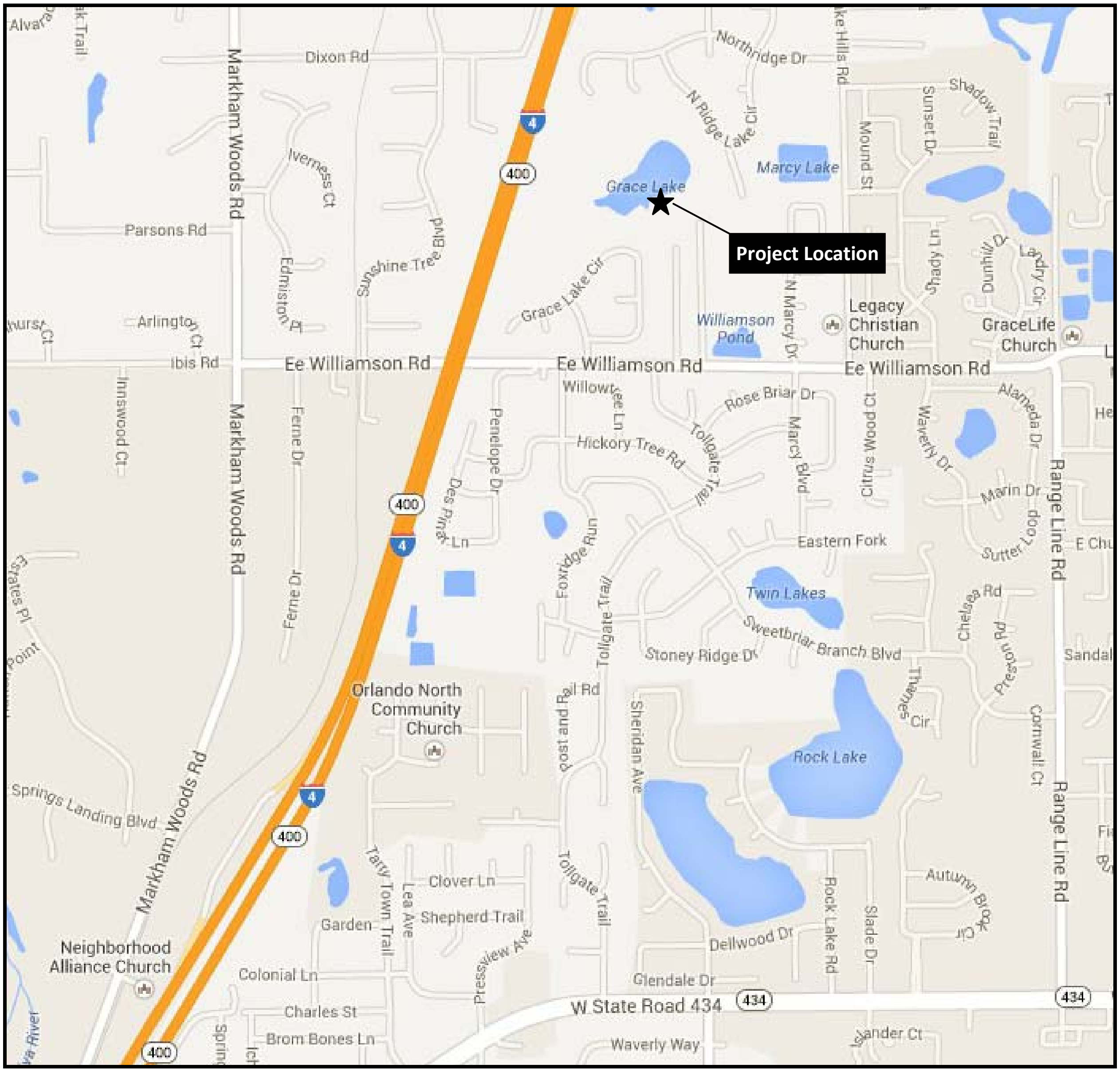
ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 2.1

APPLICATION OVERVIEW

2.1 Introduction and Project Overview

Grace Lake is located north of E.E. Williamson Road, east of Interstate 4, south of Northridge Drive and west of South Ridge Lake Circle (shown on most maps as North Ridge Lake Circle) and the Bay Lagoon Subdivision.



Beginning in April of 1986, water levels in Grace Lake have been altered by a sinkhole which formed approximately 120 feet north of the single family home located at 1526 Grace Lake Circle. Although post-sinkhole water levels have fluctuated in response to seasonal weather patterns and natural plugging of the formation, the lake is typically well below the normal water level (elevation 58-ft, NAVD). Subsequently, the lake's water area is most often well below the ±22 acres that would otherwise be occupied at the normal water level.

A remediation protocol[1] for Grace Lake was first developed in 2005, with actual design, engineering, and construction plans and permitting for a different repair approach completed a few years later[2]. The St. Johns River Water Management District (SJRWMD) issued Permit No. 4-117-121387-1 on June 13, 2011 which authorized the following construction activities for the sinkhole repair project.

- Installation of sheet pile panels to form a square-shaped coffer dam around the perimeter of the existing sinkhole formation.
- Backfilling inside and outside the sheet pile panels in alternating layers of rubble riprap and soil.
- Compaction grouting within the sinkhole and around the perimeter of the cofferdam in an effort to stabilize the subsurface soils.
- Although the repairs were focused upon stabilizing the existing sinkhole, water levels within Grace Lake would not be completely restored to pre-sinkhole (historical) conditions.

Because the bid documents[2] for the above sinkhole repairs were never finalized, Seminole County authorized additional work to investigate alternative options that could be more cost-effective and potentially more beneficial in terms of restoring water levels in Grace Lake to pre-sinkhole conditions. As part of this new authorization, the team of Devo Engineering and Pegasus Engineering has been tasked with the following scope of work.

<u>Devo Engineering</u>

- Investigate and evaluate various repair options and develop an alternative sinkhole remediation protocol.
- Develop a continuous simulation model to assess the performance characteristics of the alternative sinkhole remediation protocol in terms of both restoring the lake hydroperiod and maintaining adequate flood protection.
- Develop bid documents (construction plans and technical specifications) for the construction activities associated with the alternative sinkhole remediation protocol.

<u>Pegasus Engineering</u>

- Review and revise (if necessary) the surface water analysis developed for the original sinkhole remediation program. As part of this evaluation process, the high-level overflow path from Grace Lake to Myrtle Lake will also be confirmed, revised and/or refined.
- Utilize the updated surface water analysis to predict 100-year flood elevations, taking into account any changes to the Grace Lake hydroperiod associated with the proposed alternative sinkhole remediation protocol.

---

1 Geotechnical Engineering Report for the Grace Lake Sinkhole Restoration (Devo Engineering, April 2005).
2 Sinkhole repair improvements developed jointly by Professional Service Industries (PSI) and HDR Engineering.

- Evaluate flood protection issues and concerns relative to regulations associated with FEMA's National Flood Insurance Program (NFIP).

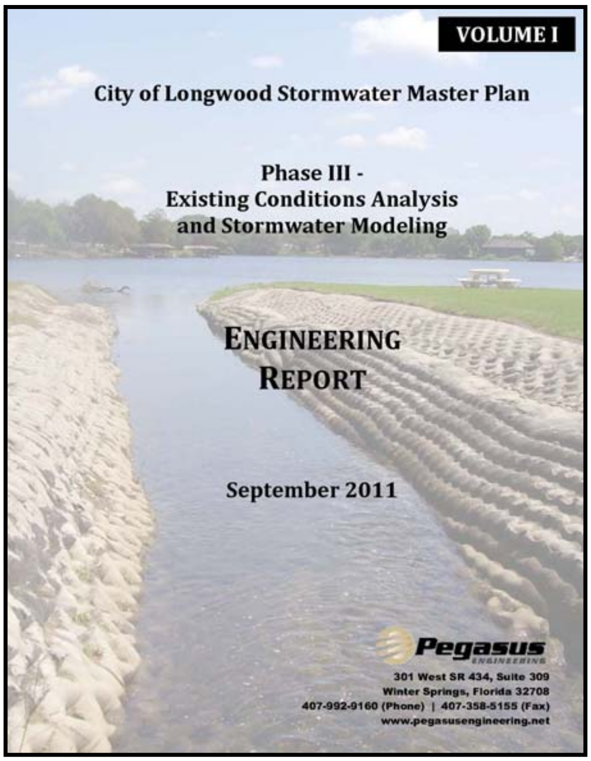
- Perform additional stormwater model simulation scenarios in support of the continuous simulation model being developed by Devo Engineering. More specifically, rating curves will be developed to quantify the discharge volume for inflows to Grace Lake that are outside the limits of the "direct rainfall" basin. Simulated rainfall will be increased (on an incremental basis) to encompass the actual rainfall for the period of record to be evaluated by the continuous simulation model.

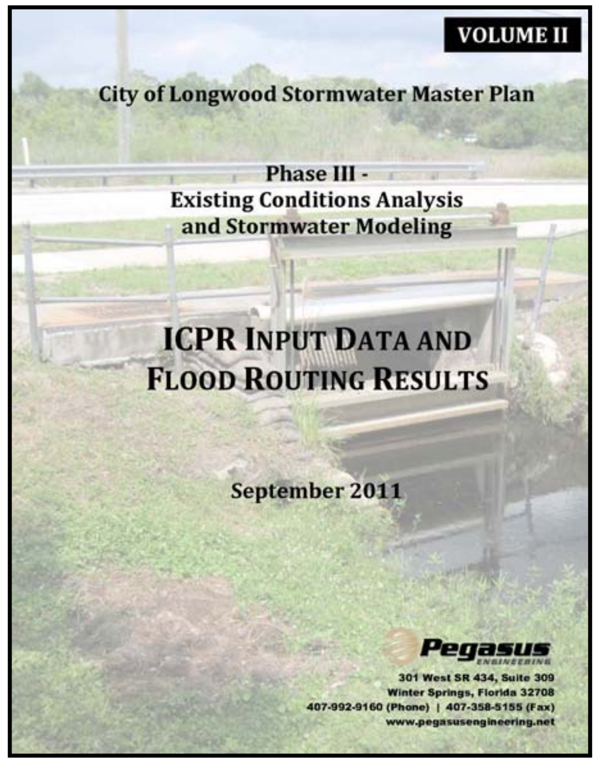
- Prepare a SJRWMD permit application package to modify the previously approved permit for the alternative sinkhole remediation protocol.

2.2 Updated Surface Water Analysis

The original sinkhole remediation program included the development of a surface water analysis for the drainage area that contributes stormwater runoff to Grace Lake. Although the surface water analysis was revised several times, research efforts[3] indicate that the final ICPR stormwater model was published within a response to the District's request for information (RAI) entitled "Grace Lake - Analysis of Sinkhole Repair, Permit Application Report RAI Update" (prepared by HDR and dated stamped received by the District on April 26, 2011).

In September 2011, final deliverables were published for the City of Longwood Stormwater Master Plan. More specifically, Phase 3 of Longwood's Stormwater Master Plan provided an existing conditions analysis and stormwater modeling for most of the drainage basins that encompass the City, including a significant portion of the Grace Lake watershed.





The original scope of work for the current project envisioned various activities related to reviewing, updating and revising the original surface water analysis for Grace Lake that was ultimately approved by the District under Permit No. 4-117-121387-1 dated June 13, 2011. However, the existing conditions analysis and stormwater modeling developed as part of Longwood's Stormwater Master Plan provides more current and comprehensive information, with several distinct benefits as summarized below.

- **Watershed Interactions**. As illustrated on the following figure, the Grace Lake watershed can potentially interact with several adjacent watersheds during large storm events that produce stages that rise above topographic ridges that define surface water basins.

[3] Seminole County and SJRWMD archives.

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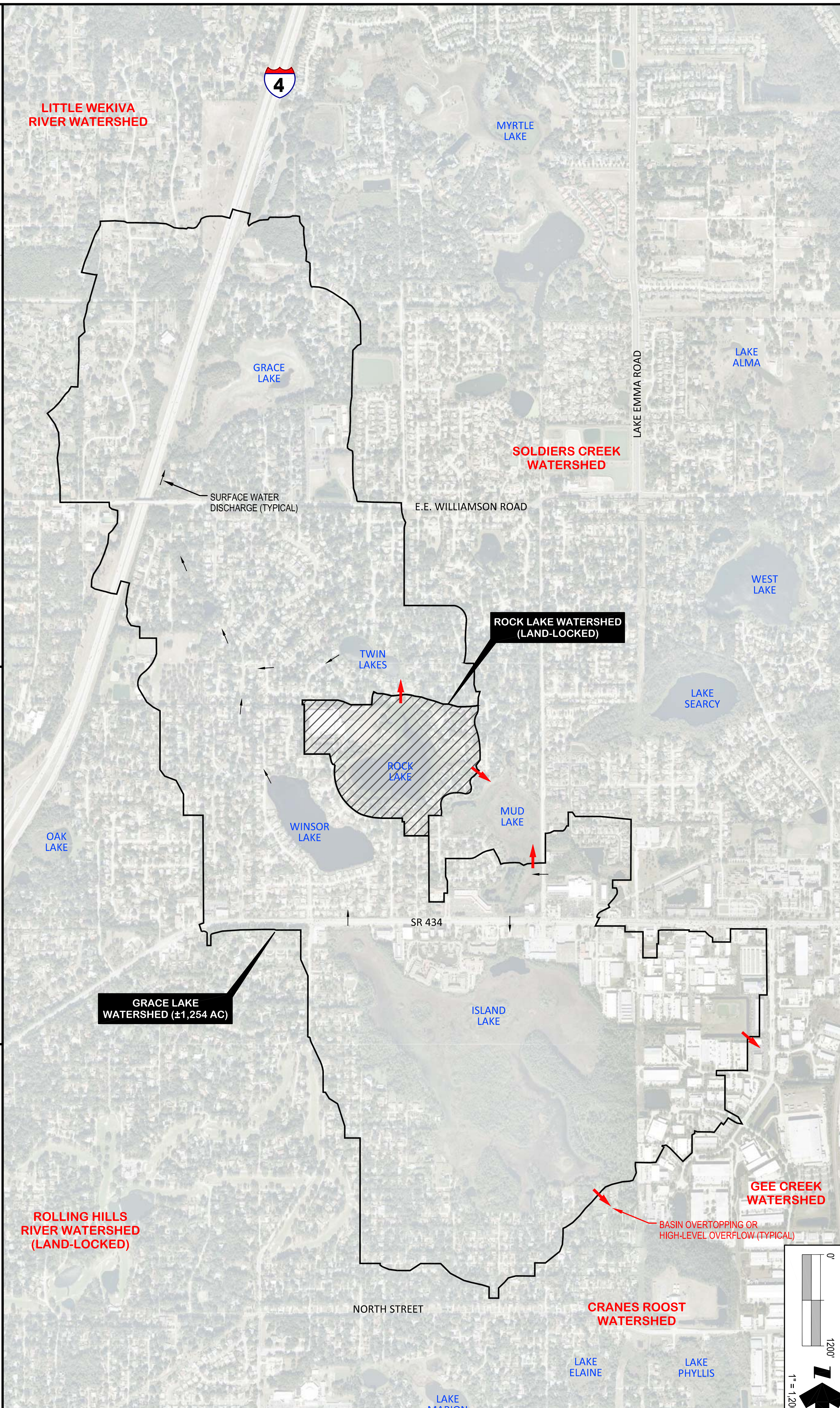
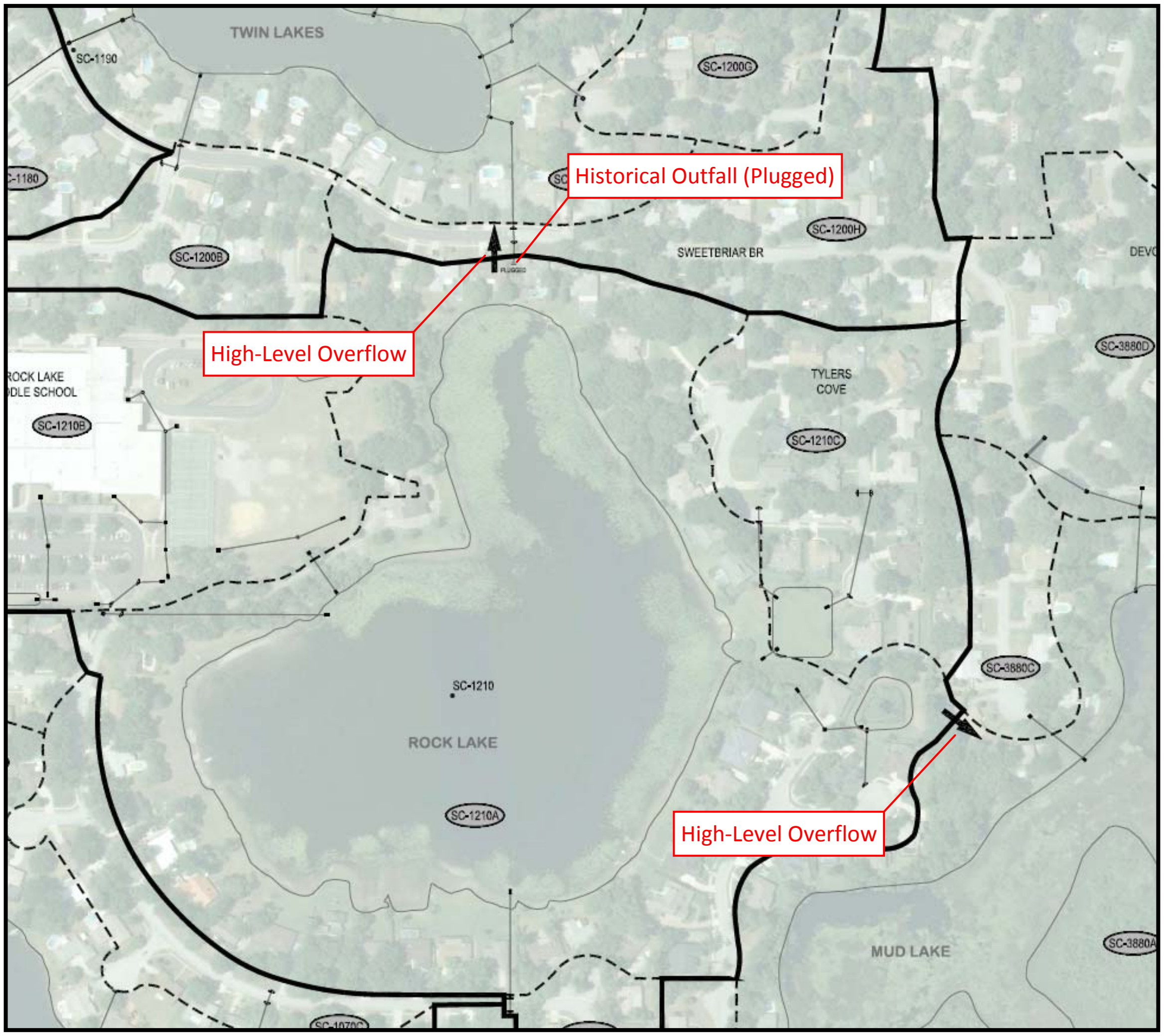
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

FIGURE NO. 2-1

GRACE LAKE WATERSHED INTERACTION



- **Rock Lake Overflow Patterns**. Although Rock Lake had a historical discharge to Twin Lakes, the pipe connection on Sweetbriar Branch Boulevard was plugged at some point in time. Existing topography indicates that overflow from Rock Lake could potentially occur to the north (across Sweetbriar Branch Boulevard to Twin Lakes) or to the southeast (to Mud Lake within the Soldiers Creek watershed). Both of these high-level overflows, which essentially occur at the same elevation, are included within Longwood's Stormwater Master Plan (as shown below), whereas, only the north overflow was included within the original surface water analysis for Grace Lake.



Excerpt from Longwood's Stormwater Master Plan (Phase 3 - Existing Conditions Analysis and Stormwater Modeling)

It should be noted that the City of Longwood has implemented emergency pumping operations at Rock Lake in the past (during periods of high water and potential flooding), with various force mains and hoses connected to existing drainage systems that eventually result in discharge from Rock Lake to Mud Lake. For this reason, Rock Lake (a ±70-acre watershed) will not be included within the contributing drainage area for the Grace Lake watershed, although overflow discharge is accounted for in the updated surface water analysis as previously discussed.

- **Information Accuracy**. Phase 2 of Longwood's Stormwater Master Plan included the development of a comprehensive drainage inventory, encompassing both primary and secondary drainage systems. To facilitate the existing conditions analysis and stormwater modeling associated with Phase 3 of Longwood's Stormwater Master Plan, topographic surveys were completed for all of the drainage systems to be included within the ICPR stormwater model. Generally speaking, relying on comprehensive survey information is typically more reliable than developing stormwater model input data from "best available information", which is often derived from approximate sources or altered by some type of datum shift to maintain elevation consistency.

- **Elevation Datum Consistency**. Longwood's Stormwater Master Plan was developed with all elevation information referenced to the NAVD vertical datum, which provides for improved accuracy and consistency with information presented within FEMA's National Flood Insurance Program (NFIP).

  Unless specified otherwise, elevations presented throughout this report are referenced to the NAVD vertical datum. In the event that elevation information referenced to the NGVD vertical datum was used, a datum shift of 1.03 feet was applied as a constant conversion to the NAVD vertical datum. In some cases, an approximate datum shift of 1 foot was used.

- **Areal Extent of the Revision Area**. Because Longwood's Stormwater Master Plan included a large portion of the Grace Lake watershed with a northern terminus located just south of E.E. Williamson Road, only the land areas located north of E.E. Williamson Road had to be appended for the purpose of developing the updated surface water analysis. Because the ICPR input data for the updated surface water analysis was obtained from a variety of different sources, substantial information was added to the ICPR comment fields to provide the necessary reference citations. Because portions of the original surface water analysis were used to incorporate the northern extent of the Grace Lake watershed, consistency with current conditions was confirmed by field reviews performed by Pegasus Engineering staff.

- **Minimizing Modeling Assumptions.** A number of modeling assumptions were presented within the engineering narrative for the original surface water analysis, some of which related to a previous drainage study[4] and to various drainage systems and their intended discharge patterns throughout the Grace Lake watershed.

- **SJRWMD Considerations**. Pursuant to previous conversations with District staff, using a stormwater model that was previously developed as part of a comprehensive and/or large scale master plan is acceptable. However, the application submittal should only include whatever portion of the stormwater model that is necessary to support the proposed improvements (i.e., the District does not want to approve the entire model as part of the County's application for this project).

[4] Engineering Study and Drainage Inventory for the Soldiers Creek Basin (Singhofen & Associates, December 1996).

2.3 Report Organization

In support of this application overview and the updated surface water analysis for Grace Lake, the following full size exhibits (24" x 36" set is to scale) are provided as an external attachment to this report. For the reader's convenience, a reduced size set of exhibits (11" x 17" is not to scale) is also provided later within this narrative. These mapping exhibits should be considered equally important companion material that provides graphical representations of the drainage basins and drainage systems that are germane to the updated surface water analysis for Grace Lake.

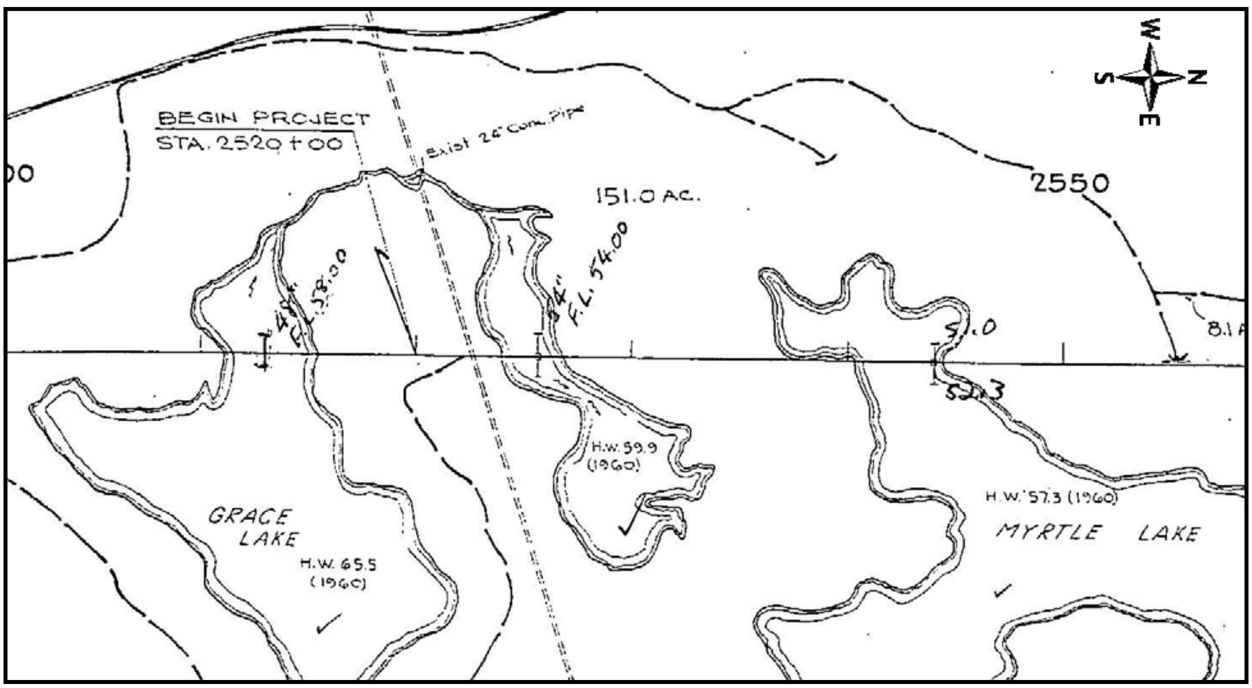
COMPANION PLANS	
Sheet	Exhibit Name
1	Cover Sheet
2	NRCS Soils and FLUCCS Land Use
3	Drainage Basins and ICPR Nodes
4	High Level Overflow Path ~ Grace Lake to Myrtle Lake
5	ICPR Nodes and Links ("Network Builder")
6	Topographic Survey Coverage
7	100-Year Floodplains (Effective and Predicted SFHA's)

In keeping with the District's directive relative to submitting information associated with a comprehensive and/or large scale master plan, mapping exhibits (companion plans) and printouts from the stormwater model will be limited to the northern extent of the Grace Lake watershed (ICPR Group "Grace Lake"). Additional information (outside of these limits) can be obtained from Longwood's Stormwater Master Plan and is available upon request.

2.4 Flood Protection and the Grace Lake Overflow

As part of the alternative sinkhole remediation protocol, County staff emphasized the significance of ensuring adequate flood protection for both existing property and developed parcels located contiguous to Grace Lake and elsewhere within upstream portions of the watershed. Therefore, and in addition to updating the surface water analysis as previously discussed herein, current work efforts focused upon "where" and at "what elevation" Grace Lake overflows.

As shown below, the original drainage basin map for Interstate 4 (circa 1962) provides a historical illustration of Grace Lake before the Interstate was constructed. A narrow waterway (creek or stream) is shown to connect the north and south portions of Grace Lake, with a substantial land area that separates Grace Lake from Myrtle Lake. High water elevations associated with Hurricane Donna (circa September 1960) are shown for Myrtle Lake as well as the north and south portions of Grace Lake at elevations 57.3', 59.9' and 65.5', respectively. Given the age of this information, the high water elevations are believed to be referenced to the NGVD vertical datum.



Because the Interstate 4 alignment bisected both the north and south portions of Grace Lake, culverts were constructed to maintain water conveyance to and from the connecting waterway as discussed above. Current aerial photography indicates that the land areas surrounding Grace Lake are almost entirely developed. Furthermore, development on the west side of Interstate 4 has impacted most of the natural waterway that connected the north and south portions of Grace Lake.

A combination of archival research and field reviews conducted by Pegasus Engineering staff resulted in developing a current illustration of the high-level overflow path(s) between Grace Lake and Myrtle Lake (refer to Sheet 4 of the companion plans), the most important aspects of which are summarized below.

- Once the water flow path(s) was accurately defined, the various conveyance elements (drainage pipes, topographic saddles associated with overland flow, etc.) were identified and surveyed.

- Although the reader is referred to the table that summarizes the conveyance elements and elevations, the critical elevation for the Grace Lake overflow occurs on the west side of Interstate 4 at approximate elevation 62.6-ft, NAVD.

- Two (2) different overflow paths were identified for Grace Lake, with the western (historical) overflow designated as "primary" and the northern overflow designated as "secondary". Although both of these high-level overflows are included within the stormwater model for the updated surface water analysis, the conveyance capacity of the northern ("secondary") overflow is very limited until stages exceed elevation 67.9-ft, NAVD. Therefore, the "primary" overflow path is also considered to be the most probable.

Flood protection for this project will be quantitatively evaluated using two (2) different analysis methodologies as discussed below.

<u>Continuous Simulation Model</u>

Although the reader is referred to the engineering narrative provided within the following **Tabbed Section 6** of this report, the following points are provided to emphasize the significance of the continuous simulation modeling for this project.

- A continuous simulation model was required to address the unique hydrogeology of Grace Lake, including infiltration aspects associated with the natural lake bottom, the existing sinkhole and the post-sinkhole condition after the repairs have been completed.

- The continuous simulation model provides an analysis of actual recorded rainfall over a sufficiently long period of time. Flood protection for proposed conditions (post-sinkhole repairs) can be evaluated and compared to what actually occurred in the past (pre-sinkhole repairs), inclusive of any tropical storms and/or hurricanes during the period of record.

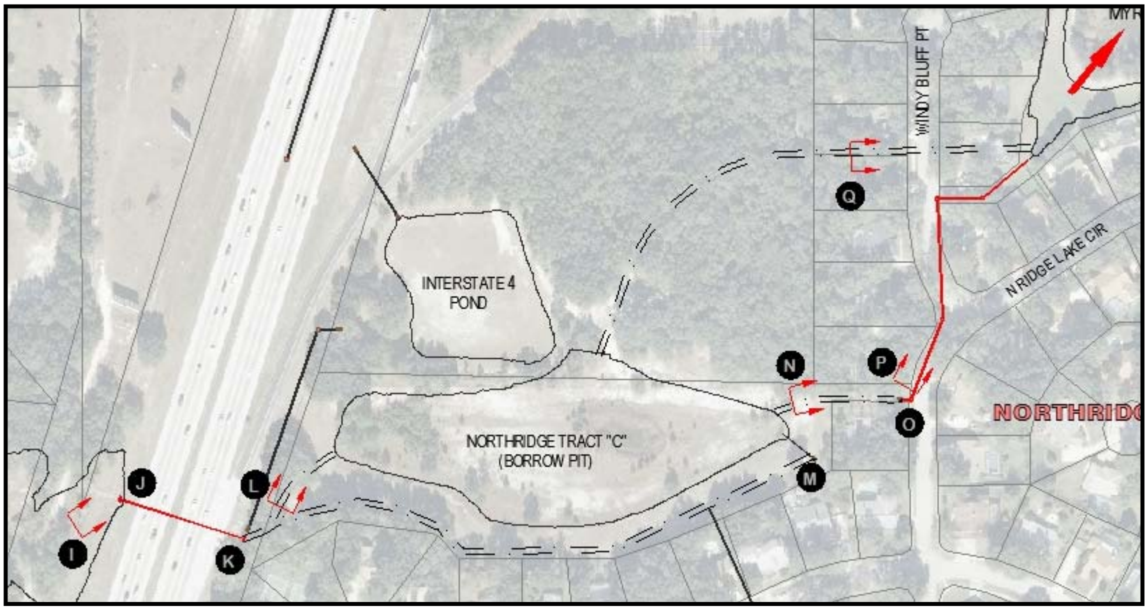
- Prior experience with similar projects indicates that continuous simulation (extended duration) modeling of Grace Lake (including discharge from the up-gradient basins) is an acceptable analysis methodology[5].

[5] In lieu of the District's presumptive criteria related to hypothetical storm events of specific frequency and duration.

ICPR Stormwater Model

The updated surface water analysis for Grace Lake was developed for several different reasons, with some of the most important considerations summarized below.

- It should be noted that most of the narrative discussions presented within the original surface water analysis for Grace Lake were correct in terms of describing the western ("primary") overflow path. However, overflow discharge between the northern culvert crossing Interstate 4 and the existing drainage systems along North Ridge Lake Circle and Windy Bluff Point was not defined and therefore not included within the stormwater model (i.e., the western overflow path was incorrectly terminated within the stormwater model). As shown on the graphic below, this portion of the outfall path that was excluded from the original surface water analysis corresponds to Locations "L" through "Q".



- The original surface water analysis included all of the drainage conveyance elements located between North Ridge Lake Circle, Windy Bluff Point and Myrtle Lake. However, the water surface elevations fall dramatically to the east of North Ridge Lake Circle and Windy Bluff Point. As such, the updated surface water analysis includes a stage versus time boundary condition at a location just east of Windy Bluff Point. Water surface elevations downstream of this location will not influence peak flood stages within Grace Lake or induce tailwater on the Grace Lake overflow (i.e., free discharge).

- Information was obtained from the updated surface water analysis (the ICPR node time series report) in support of the continuous simulation model. More specifically, and as summarized within the following **Tabbed Section 5** of this report, rating curves were developed to quantify the rainfall depth versus discharge volume for inflows to Grace Lake from the "up-gradient" basins. As shown on Sheet 3 of the companion plans, discharge volume from the "up-gradient" basins was obtained from ICPR Node SC-0930 (outfall ditch along the east side of Interstate 4) and ICPR Node SC-0990 (discharge end of the outfall system from the Woodlands Elementary School pond). Seasonal variation in surface runoff volume was encompassed by developing rating curves for both AMC I and AMC II conditions.

- Predicted flood elevations for proposed conditions (post-sinkhole repairs) were used to evaluate flood protection relative to regulations associated with FEMA's National Flood Insurance Program (NFIP). More specifically, the 100-year, 96-hour storm event, with a total rainfall depth of 15-inches, was used to define special flood hazard areas (SFHA's) and the potential for flooding.

FEMA Flood Insurance Study for Seminole County (September 28, 2007)				
Flooding Source	Summary of Stillwater Elevations (ft, NAVD)			
	10% (10-Year)	2% (50 Year)	1% (100 Year)	0.2% (500 Year)
Grace Lake	66.3	67.0	67.1	67.2

- Rating curves were used in the original surface water analysis to quantify the vertical leakage (infiltration) through the natural lake bottom and/or the sinkhole formation, whereas, vertical leakage (infiltration) will not be included in the updated surface water analysis. Although vertical leakage would have a measurable impact on reducing the duration of flooding (storage recovery), it would have little to no effect upon lowering peak stages which is the primary focus of the updated surface water analysis.

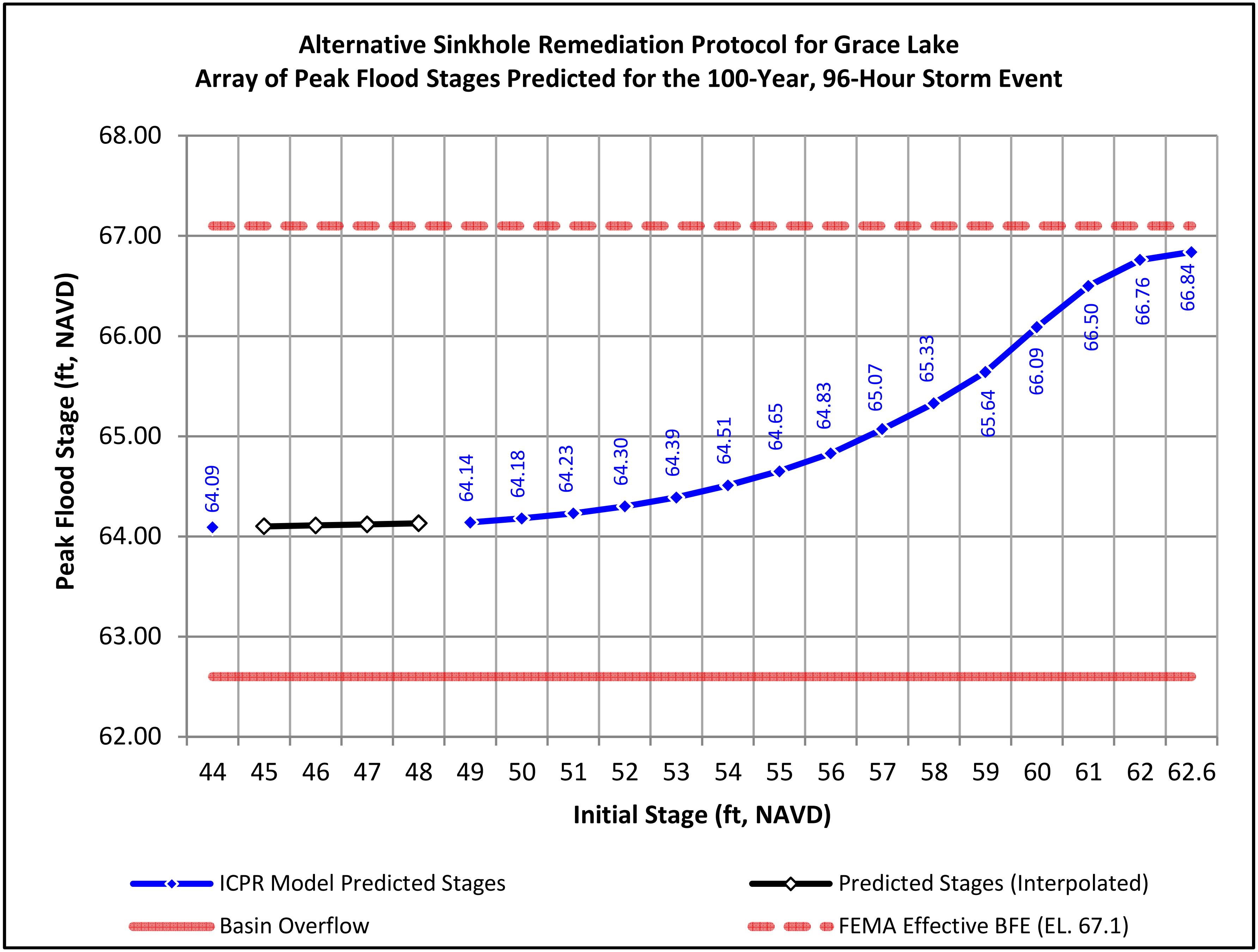
- The updated surface water analysis is defined as a "proposed conditions" evaluation, although it is important to clarify that it could also be defined as a "historic conditions" evaluation before the sinkhole formed (i.e., proposed conditions is attempting to return the lake hydroperiod to the historic condition). An analysis of "current conditions" would be significantly different and would have to include infiltration estimates for the current sinkhole in terms of both discharge volume and altering (lowering) the lake hydroperiod as reflected by the initial stage.

- Because the proposed hydroperiod is somewhat variable, the chart on the following page provides an array of peak flood elevations that were predicted for a range of initial stages that should be representative of post-sinkhole conditions within Grace Lake. It should be noted that the effective base flood elevation (BFE) was computed in accordance with FEMA's criteria[6], which assumes an initial stage in Grace Lake that corresponds to the "brim full" condition (where water is coincident with the lowest overflow elevation).

- Regarding flood protection issues and concerns, the reader is referred to Sheet 7 of the companion plans for a graphical representation of 100-year floodplains. In addition to providing an illustration of FEMA's effective SFHA's for the Grace Lake vicinity, additional floodplains are also shown based on the predicted flood elevations as previously discussed.

  Although finished floor elevations were previously surveyed for all of the residential properties contiguous to Grace Lake, the County should consider additional finished floor elevation surveys in the future to better assess flood protection issues and concerns for all of the floodplains shown on Sheet 7 of the companion plans.

[6] Managing Floodplain Development in Approximate Zone "A" Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations (FEMA 265).



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2.5 Additional Permitting Considerations

Sovereign Submerged Lands (SSL)

An excerpt from the District's Technical Staff Report (TSR) for SJRWMD Permit No. 4-117-121387-1 dated June 13, 2011 is provided below and should allay any potential SSL issues for the alternative sinkhole remediation protocol and specifically the current permit modification.

> *The proposed activity will be wholly located within Grace Lake. Per correspondence received by the District on May 18, 2004 from the Florida Department of Environmental Protection (FDEP), the proprietary requirements that would normally apply to state owned lands will not be applied to Grace Lake.*

Wetland Impact Areas

The District's Technical Staff Report (TSR) for SJRWMD Permit No. 4-117-121387-1 dated June 13, 2011 also provides the following breakdown for wetland impact areas that were anticipated for the original sinkhole repair project.

- Temporary wetland impact area .... 3.66 acres
- Permanent wetland impact area .... 0.06 acres
- Total wetland impact area .... 3.72 acres

The temporary impact area shown above included clearing and grubbing activities associated with both construction ingress/egress and staging of equipment and materials. Given that the alternative sinkhole remediation protocol for Grace Lake is not significantly different than what was authorized within the previous approval, no change in the wetland impact areas is proposed as part of the current permit modification.

2.6 References (in chronological order)

1. Original Drainage Map for Interstate 4 (Grace Lake Vicinity) 1962
   - Florida Department of Transportation (FDOT)

2. Seminole County Soil Survey .... June 1966
   - Soil Conservation Services (SCS)

3. Seminole County Soil Survey Supplement ....September 1975
   - Soil Conservation Services (SCS)

4. Stormwater Management System Design and
   Permit Calculations for Northridge Subdivision .... April 1984
   - CPH Engineers, Inc.

5. Revised Surface Water Management Calculations for Northridge Subdivision (Phase 3)..... April 1985
   - CPH Engineers, Inc.

6. As-built Plans for Northridge Subdivision .... May 1985
   - CPH Engineers, Inc.

7. Permit for the Interstate 4 Widening (SR 434 to Lake Mary Boulevard) .... January 10, 1995
   - SJRMWD Permit No. 4-117-22434-1

8. Permit for the Interstate 4 Rest Area Expansion at Lake Mary...July 8, 1998
   - SJRMWD Permit No. 4-117-22434-2

9. Permit for the Woodlands Elementary School Addition and Renovation.........................July 27, 1999
   - SJRMWD Permit No. 42-117-49356-2

10. Engineering Study and Drainage Inventory for the Soldiers Creek Basin .... December 1996
    - Singhofen & Associates (under contract with Seminole County)

11. LiDAR Topography for the Grace Lake Vicinity.. 2005
    - Watershed Concepts (under contract with Seminole County)
    - St. Johns River Water Management District (3-dimensional data set in the form of LAS files)

12. Geotechnical Engineering Report for Grace Lake Sinkhole Restoration .... April 2005
    - Devo Engineering

13. Topographic surveys for the Grace Lake Vicinity .... December 2007
    - Southeastern Surveying and Mapping Corporation (Project No. 53087001)

14. Countywide FEMA application for Letter of Map Revision (LOMR)... 2007
    - Watershed Concepts (under contract with Seminole County)

15. Flood Insurance Study (FIS) for Seminole County ....September 28, 2007
    - Federal Emergency Management Agency (FEMA)

16. Permit for the Woodlands Elementary School Pond Modification........................November 21, 2007
    - SJRMWD Permit No. 42-117-49356-3

17. Geotechnical Engineering Services Report - Grace Lake Sinkhole Repair Study................ March 2008
    - Professional Service Industries (PSI)

18. Permit for the Bella Tuscany Subdivision... October 24, 2008
    - SJRMWD Permit No. 42-117-49356-4

19. Grace Lake - Analysis of Sinkhole Repair..April 2011 (Final Version)
    - HDR Engineering, Inc.

20. Construction Plans (90%) for the Grace Lake Sinkhole Repair Project ....April 2011
    - HDR Engineering, Inc.

21. Permit for the Grace Lake Sinkhole Repair Project.. June 13, 2011
    - SJRMWD Permit No. 4-117-121387-1

22. Topographic surveys for the Grace Lake Vicinity .... August 2013
    - Southeastern Surveying and Mapping Corporation (Project No. 53087001)

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

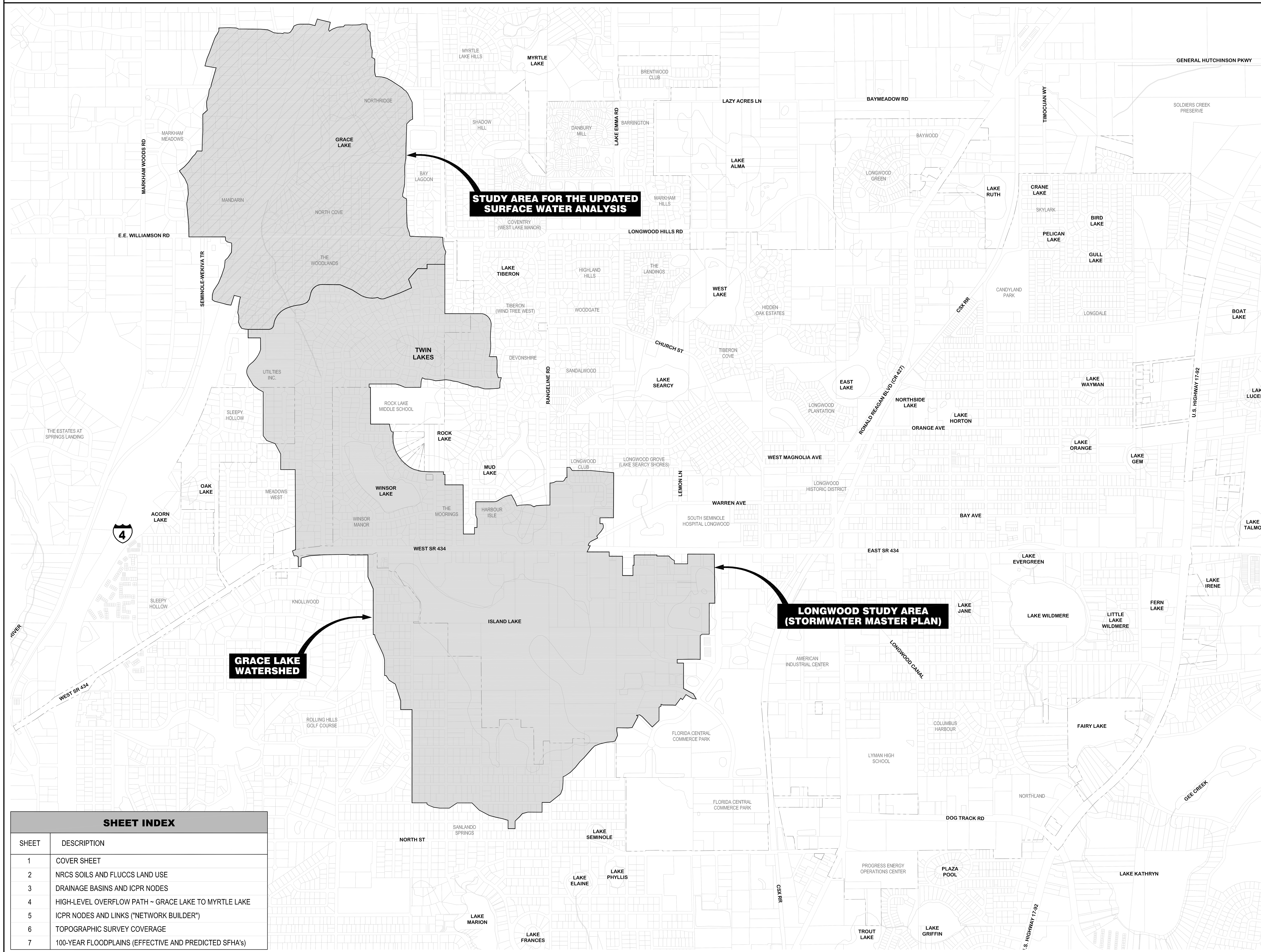
TAB 3.1

SUPPORTING DOCUMENTATION FOR THE UPDATED SURFACE WATER ANALYSIS

COMPANION PLANS
(11" X 17" NOT TO SCALE)

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

COMPANION PLANS FOR THE UPDATED SURFACE WATER ANALYSIS



SHEET INDEX

SHEET	DESCRIPTION
1	COVER SHEET
2	NRCS SOILS AND FLUCCS LAND USE
3	DRAINAGE BASINS AND ICPR NODES
4	HIGH-LEVEL OVERFLOW PATH ~ GRACE LAKE TO MYRTLE LAKE
5	ICPR NODES AND LINKS ("NETWORK BUILDER")
6	TOPOGRAPHIC SURVEY COVERAGE
7	100-YEAR FLOODPLAINS (EFFECTIVE AND PREDICTED SFHA's)

GENERAL LEGEND

LONGWOOD MUNICIPAL LIMITS

HYDROLOGY AND MODELING NOMENCLATURE

DRAINAGE BASIN BOUNDARY
CLOSED (LAND-LOCKED) BASIN OR OTHER NON-CONTRIBUTING DRAINAGE AREA
BASIN OVERTOPPING
XX-XXXX SUB-BASIN NAME
XX-XXXX ICPR NODE NAME
SC SOLDIERS CREEK WATERSHED (INCLUDES GRACE LAKE)

PRIMARY DRAINAGE SYSTEMS

CANALS AND MAJOR DITCHES
STORMWATER PUMP STATION AND FORCE MAIN
OUTFALL CONTROL STRUCTURE AND PIPE (ALSO USED TO REPRESENT SYSTEM CONTROL POINTS)
CULVERT / PIPE
DRAINAGE CURB INLETS AND PIPE
DRAINAGE FLAT INLETS AND PIPE
DRAINAGE MANHOLES AND PIPE

SECONDARY DRAINAGE SYSTEMS

OPEN CHANNELS AND DITCHES
OUTFALL CONTROL STRUCTURE AND PIPE (ALSO USED TO REPRESENT SYSTEM CONTROL POINTS)
PIPE / CULVERT
DRAINAGE CURB INLETS AND PIPE
DRAINAGE FLAT INLETS AND PIPE
DRAINAGE MANHOLES AND PIPE
STORMWATER POND

GENERAL NOTES

1. Attention is directed to the fact that these plans may may have been changed in size by reproduction. This must be considered when obtaining scaled data.
   => 11" x 17" drawings ~ Not to Scale
   => 12" x 18" drawings ~ Half Size (2 x Scale)
   => 24" x 36" drawings ~ To Scale

MAPPING NOTES

1. Unless otherwise noted, the following sheets were prepared using base mapping as described below.
   => Aerial photography obtained from the Seminole County Property Appraiser (www.scpafl.org). These images were flown in late 2011 and early 2012.
   => Aerial topography (1-foot contours) developed by Watershed Concepts (using data provided by the St. Johns River Water Management District) for the purpose of FEMA floodplain mapping circa 2005. The vertical control for the topographic contours is the North American Vertical Datum of 1988 (NAVD88).
   => Mapping exhibits developed by Pegasus Engineering for the City of Longwood Stormwater Master Plan (Phases 1, 2 and 3). The vertical control for elevation information presented within Longwood's Stormwater Master Plan is the North American Vertical Datum of 1988 (NAVD88).
2. It should be noted that alignment issues between various information referenced to the County's representation of roads and parcels may not properly align with the aerial photography and topographic contours. For the current project, graphically illustrating the drainage systems of interest was completed assuming that the aerial photography and topographic contours represent the most accurate base mapping available on a regional basis.
3. A comprehensive drainage inventory was developed for Longwood's Stormwater Master Plan (Phase 2) and includes a portion of the Grace Lake watershed. Although the drainage inventory was expanded to include various drainage systems of interest within the Grace Lake watershed, the drainage inventory for Grace Lake should not be considered complete and comprehensive.

PREPARED FOR (CLIENT)

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FLORIDA'S NATURAL CHOICE

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Phone: (407) 992-9160
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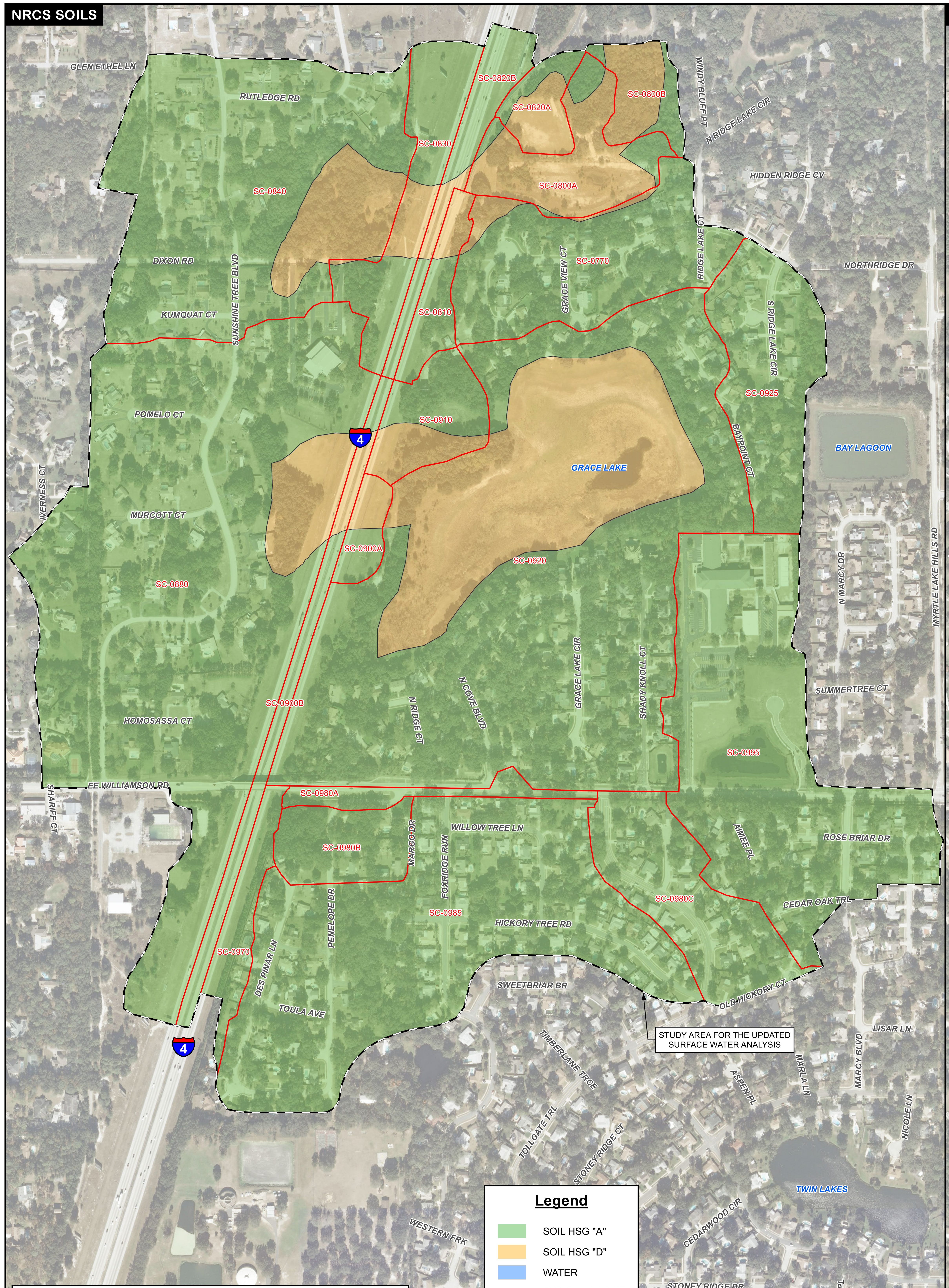
ENGINEER: Johan A. Rodriguez, P.E.

REG. NO. 66517

DATE:

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

NRCS SOILS



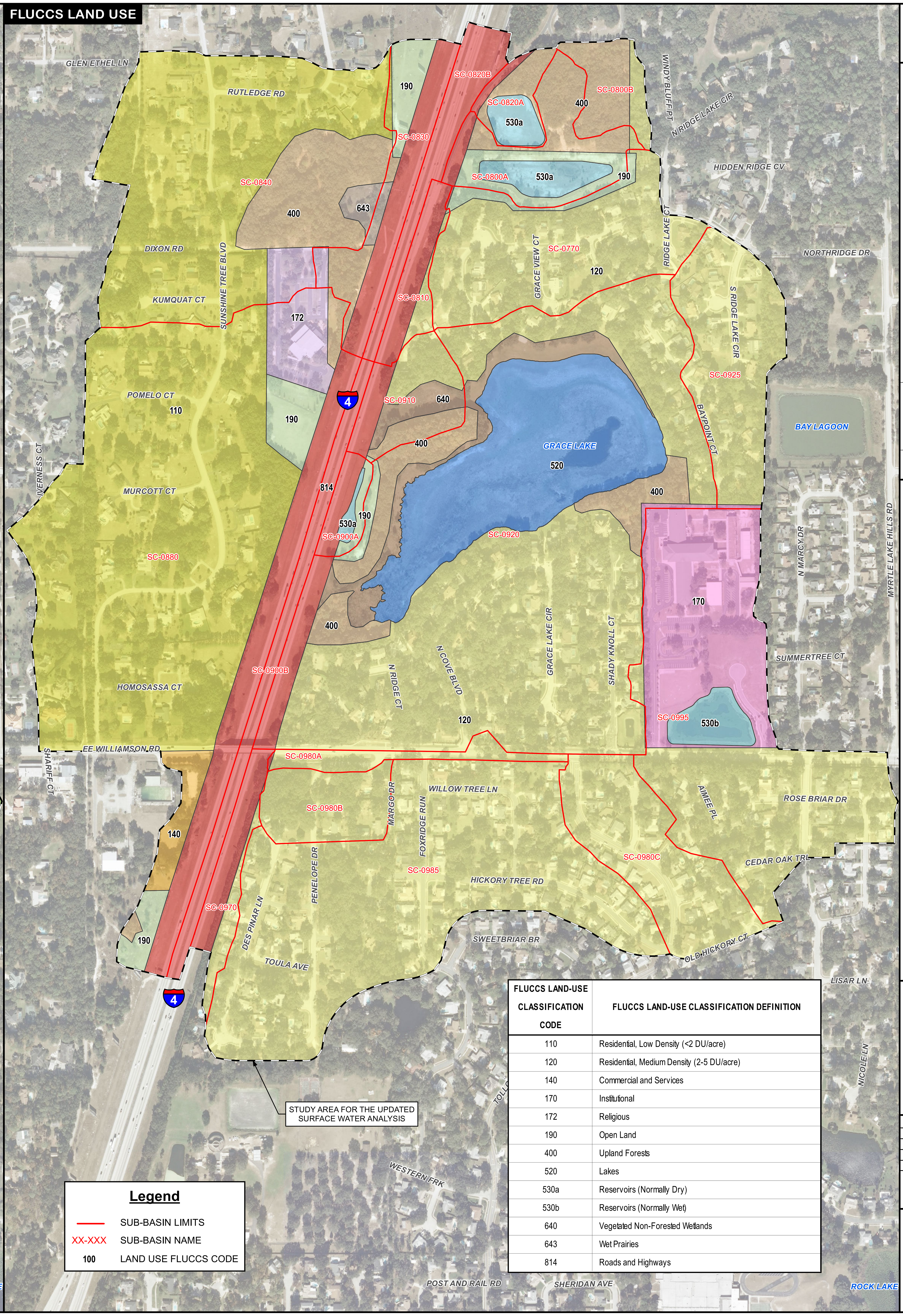
Legend

- SOIL HSG "A"
- SOIL HSG "D"
- WATER
- SUB-BASIN LIMITS
- XX-XXX SUB-BASIN NAME

NOTE:

1. HYDROLOGIC SOIL GROUPS (HSG) AS PRESENTED WITHIN THE NRCS SOIL SURVEY (LATEST INFORMATION PRESENTED WITHIN THE WEB SOIL SURVEY). HSG FOR SOILS MAPPED AS "URBAN LAND" WAS ASSIGNED BASED UPON INFORMATION PRESENTED WITHIN THE ORIGINAL NRCS SOIL SURVEY (1966) AND SUPPLEMENT (1975) THERETO.

FLUCCS LAND USE



FLUCCS LAND-USE CLASSIFICATION CODE	FLUCCS LAND-USE CLASSIFICATION DEFINITION
110	Residential, Low Density (<2 DU/acre)
120	Residential, Medium Density (2-5 DU/acre)
140	Commercial and Services
170	Institutional
172	Religious
190	Open Land
400	Upland Forests
520	Lakes
530a	Reservoirs (Normally Dry)
530b	Reservoirs (Normally Wet)
640	Vegetated Non-Forested Wetlands
643	Wet Prairies
814	Roads and Highways

Legend

- SUB-BASIN LIMITS
- XX-XXX SUB-BASIN NAME
- 100 LAND USE FLUCCS CODE

0' 300'
1" = 300'

REV. | DATE | DESCRIPTION

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

NRCS SOILS AND FLUCCS LAND USE

Pegasus Engineering
Pegasus Engineering, LLC
301 West SR 434, Suite 309
Winter Springs, Florida 32708

Office (407) 992-9160
Fax (407) 358-5155

State of Florida Board of Professional Engineers
Certificate of Authorization No. 27770

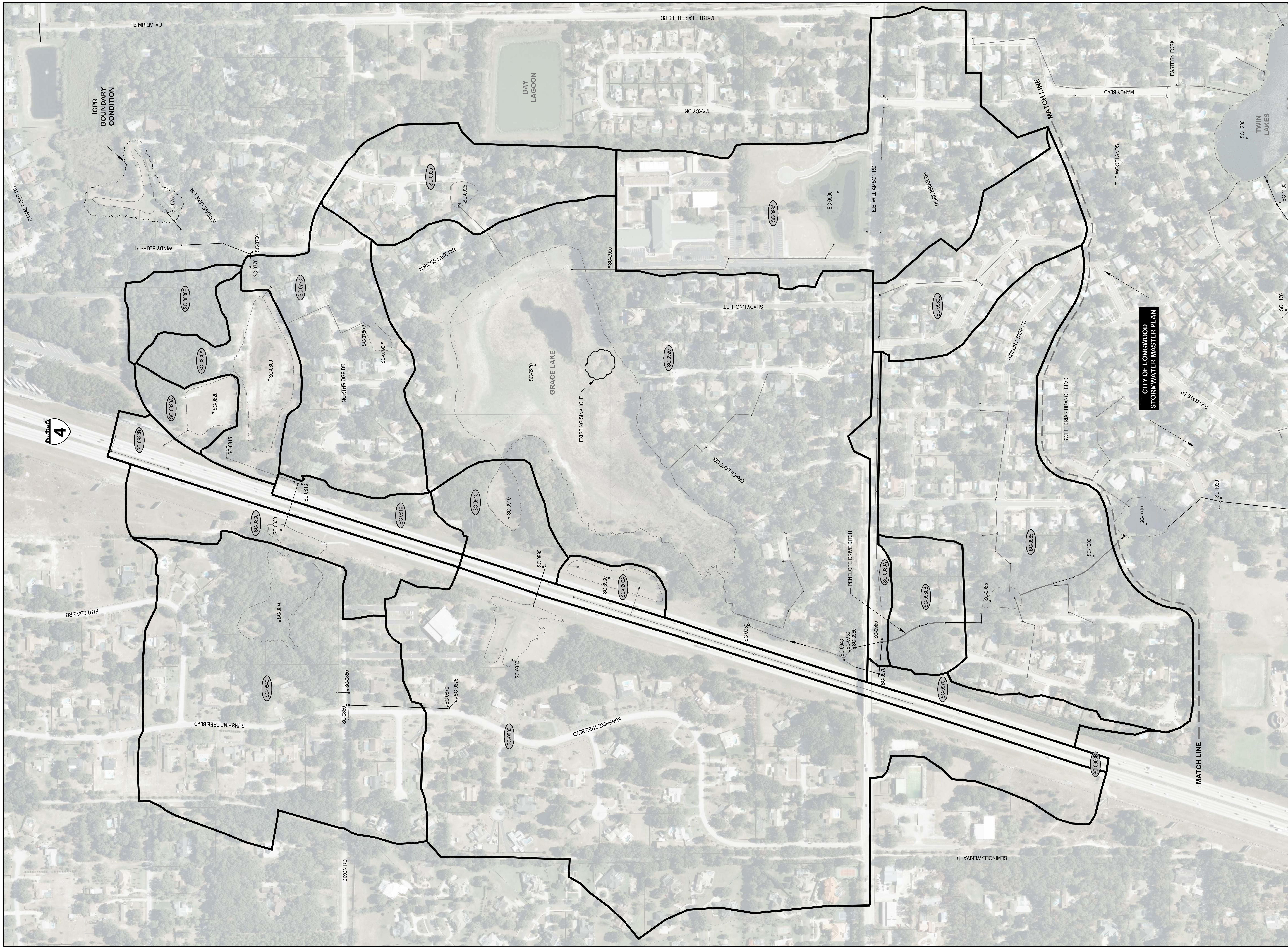
JOB NO.:	SMC-014
DESIGNED BY:	JAR
DRAWN BY:	JJB
APPROVED BY:	DWH
DATE:	SEPT 2013

SHEET 2 OF 7

NOT A FINAL PLAN UNLESS SIGNED AND SEALED

JOHAN RODRIGUEZ, P.E.
REGISTRATION No. 66517

DATE: ______________



0' 200'

1" = 200'

REV. | DATE | DESCRIPTION

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

DRAINAGE BASINS AND ICPR NODES

Pegasus ENGINEERING

Pegasus Engineering, LLC
301 West SR 434, Suite 309
Winter Springs, Florida 32708

Office (407) 992-9160
Fax. (407) 358-5155

State of Florida Board of Professional Engineers
Certificate of Authorization No. 27770

JOB No.:	SMC-014
DESIGNED BY:	JAR
DRAWN BY:	JJB
APPROVED BY:	DWH
DATE:	SEPT 2013

SHEET 3 OF 7

NOT A FINAL PLAN UNLESS SIGNED AND SEALED

JOHAN A. RODRIGUEZ, P.E.
REGISTRATION No. 66517

DATE: ____________

PHOTOGRAPH #1

PHOTOGRAPH #6

PHOTOGRAPH #2

PHOTOGRAPH #7

PHOTOGRAPH #3

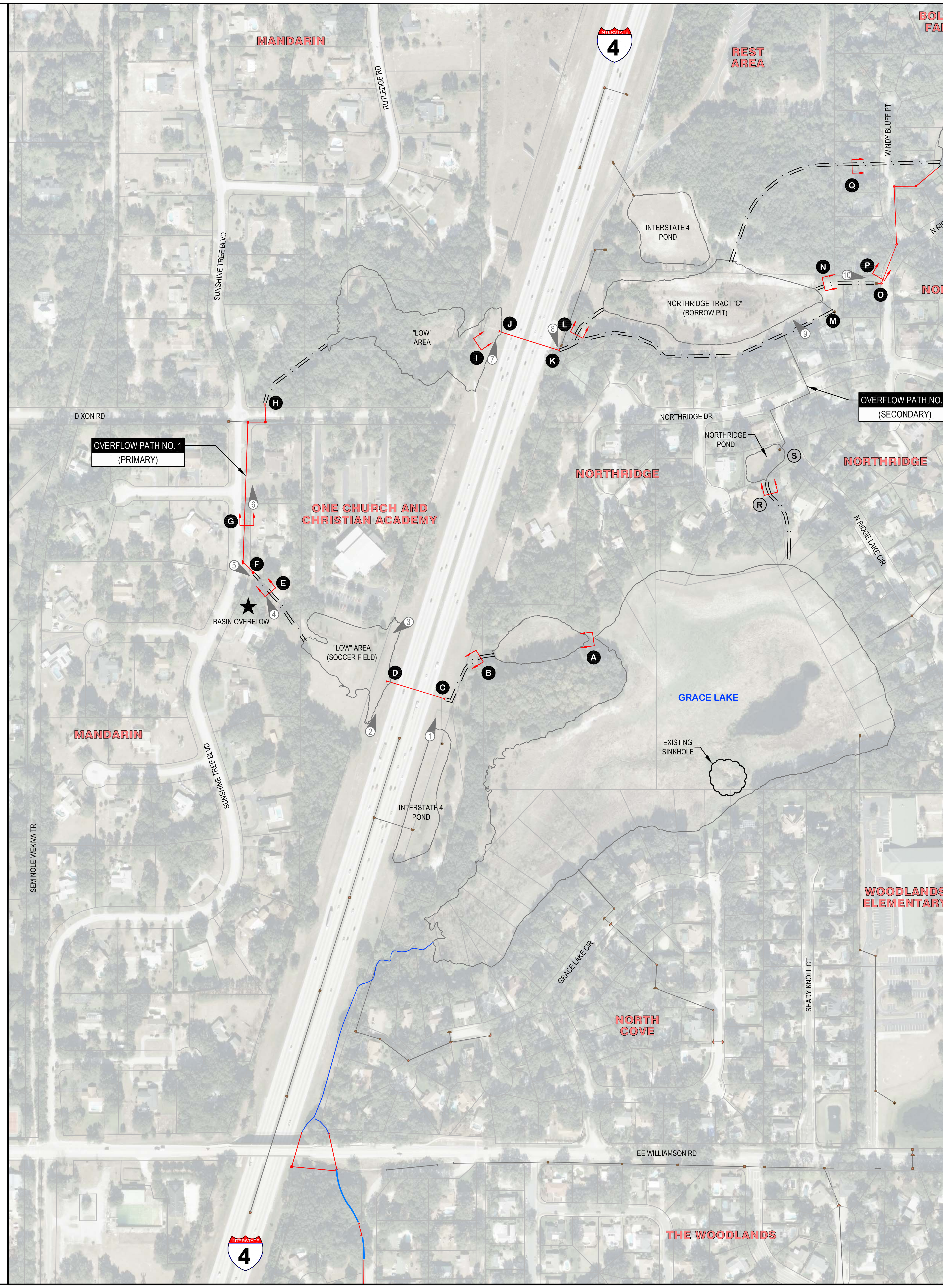
PHOTOGRAPH #8

PHOTOGRAPH #4

PHOTOGRAPH #9

PHOTOGRAPH #5

PHOTOGRAPH #10



MAPPING LEGEND

- LOCATIONS OF OVERFLOW CONVEYANCE ELEMENTS
- OVERFLOW PATH OF DISCHARGE
- OVERTOPPING DISCHARGE
- PHOTOGRAPH LOCATION

CONVEYANCE ELEMENTS AND ELEVATIONS

GRACE LAKE OVERFLOW PATH NO. 1 (PRIMARY)

LOCATION	DESCRIPTION	ELEVATION (ft, NAVD)
A	GRACE LAKE (WEST LOBE)	±59.5
B	GRACE LAKE (WEST LOBE)	±59.5
C	INTERSTATE 4 CULVERT (SOUTH LOCATION) - 48" PIPE (EAST END)	- - 58.4
D	INTERSTATE 4 CULVERT (SOUTH LOCATION) - 48" PIPE (WEST END)	- - 57.8
E	ONE CHURCH (SOCCER FIELD)	±62.6
F	SUNSHINE TREE BOULEVARD CULVERT -36" PIPE (SOUTH END)	59.7
G	TOPOGRAPHIC RIDGE (SUNSHINE TREE BOULEVARD NEAR KUMQUAT COURT)	±65.5
H	SUNSHINE TREE BOULEVARD CULVERT -36" PIPE (NORTH END)	56.3
I	CROSSING DIXON ROAD (DIRT) AT DEPRESSIONAL AREA	±54.0
J	INTERSTATE 4 CULVERT (NORTH LOCATION) - 54" PIPE (WEST END)	- - 51.5
K	INTERSTATE 4 CULVERT (NORTH LOCATION) - 54" PIPE (EAST END)	- - 52.3
L	INTERSTATE 4 RIGHT-OF-WAY (EAST SIDE)	57.2
M	NORTHRIDGE POND CONTROL STRUCTURE - 24" PIPE INVERT (WEST END) - 24" PIPE INVERT (EAST END) - OVERFLOW WEIR (VERTICAL SLOT, 30" x 15.5") - OVERFLOW WEIR (TOP OF GRATE)	- - 49.1 49.7 56.9 58.4
N	NORTHRIDGE TRACT "C" (BORROW PIT NORTHEAST BERM)	±58.0
O	NORTH RIDGE LAKE CIRCLE DRAINAGE SYSTEM - 36" PIPE INVERT (EAST END) - OVERFLOW WEIR (VERTICAL SLOTS, 3 SIDES) - OVERFLOW WEIR (TOP OF GRATE)	- - 53.3 57.2 58.2
P	NORTH RIDGE LAKE CIRCLE (ROAD OVERTOPPING)	±58.5
Q	OVERTOPPING TO WINDY BLUFF POINT	±58.5

GRACE LAKE OVERFLOW PATH NO. 2 (SECONDARY)

LOCATION	DESCRIPTION	ELEVATION (ft, NAVD)
R	BETWEEN 1334 GRACE VIEW COURT AND 1397 NORTH RIDGE LAKE CIRCLE	66.8
S	NORTH RIDGE LAKE CIRCLE POND CONTROL STRUCTURE - 18" PIPE INVERT (DIVERSION BOX OUTFALL) - OVERFLOW WEIR (WEIR WALL) - OVERFLOW WEIR (SIDEWALK)	- - 62.4 65.5 67.9

0' 200'
1" = 200'

REV.	DATE	DESCRIPTION

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

HIGH-LEVEL OVERFLOW PATH ~ GRACE LAKE TO MYRTLE LAKE

Pegasus ENGINEERING

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State of Florida Board of Professional Engineers
Certificate of Authorization No. 27770

JOB No.:	SMC-014
DESIGNED BY:	JAR
DRAWN BY:	JJB
APPROVED BY:	DWH
DATE:	SEPT 2013

SHEET 4 OF 7

NOT A FINAL PLAN UNLESS SIGNED AND SEALED

JOHAN A. RODRIGUEZ, P.E.
REGISTRATION No. 66517

DATE: ____________

ICPR BASIN AND NODE LEGEND

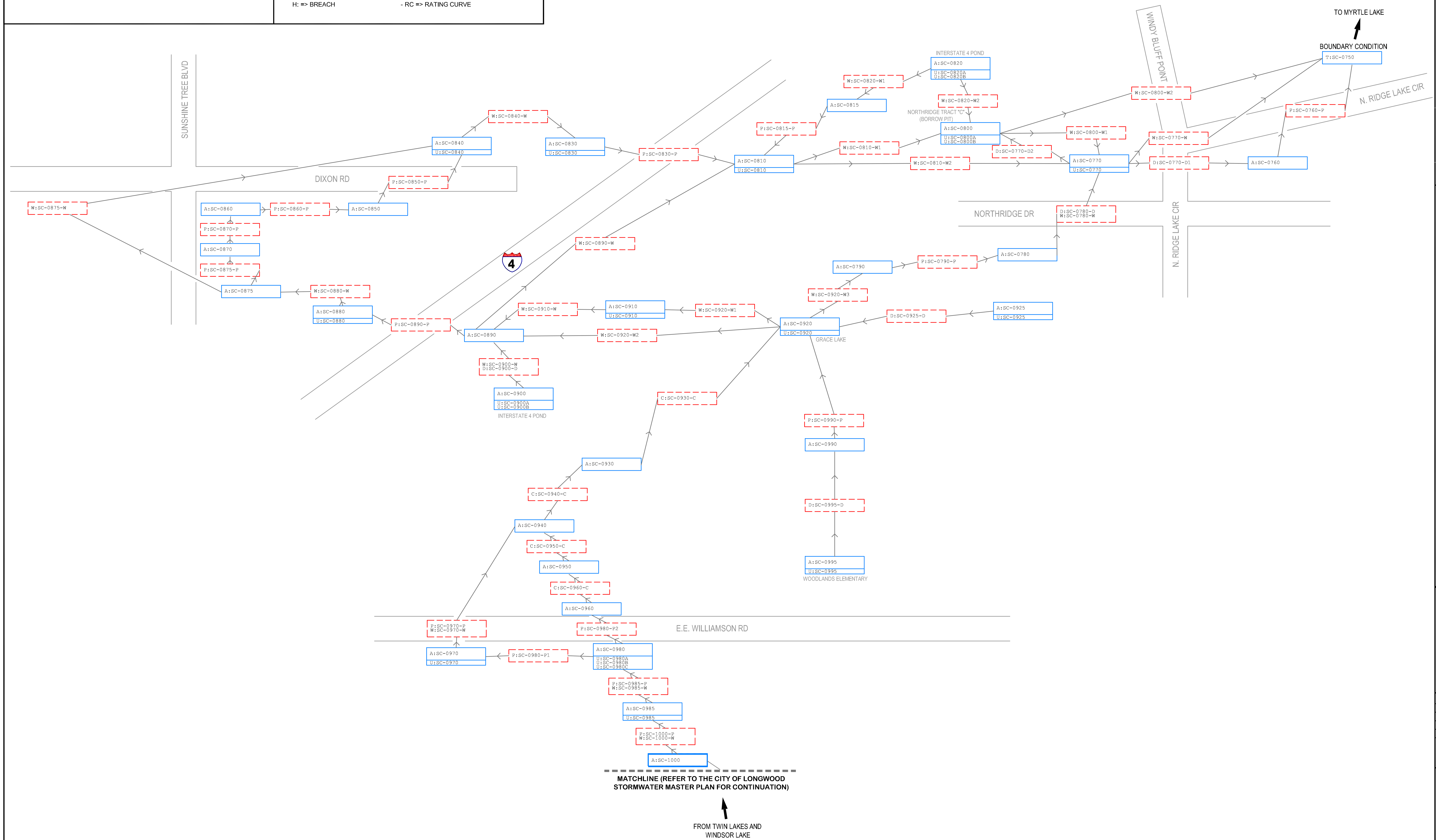
ICPR NODE TYPE
ICPR DESIGNATION (BY WATERSHED)
ICPR NODE NAME / NUMBER (BY WATERSHED TRIBUTARY)
A:SC-1000
U:SC-1000A
ICPR BASIN NAME / NUMBER
ICPR DESIGNATION (BY WATERSHED)
ICPR BASIN TYPE

ICPR NODES	ICPR BASINS
A: => STAGE / AREA	O: => OVERLAND FLOW
V: => STAGE / VOLUME	U: => SCS UNIT HYDROGRAPH
T: => STAGE / TIME	S: => SANTA BARBARA
M: => MANHOLE	

ICPR LINK LEGEND

ICPR DESIGNATION (BY WATERSHED)
ICPR "FROM" NODE (BY WATERSHED TRIBUTARY)
P:SC-1000-P
W:SC-1000-W
PEGASUS ENGINEERING LINK TYPE / DESIGNATION
ICPR LINK TYPE

ICPR LINKS	PEGASUS ENGINEERING LINKS
P: => PIPES	- P => PIPES
W: => WEIR	- W => WEIR
C: => CHANNEL	- R => WEIR (ROADWAY OVERTOPPING)
D: => DROP STRUCTURE	- C => CHANNEL
B: => BRIDGE	- D => DROP STRUCTURE
R: => RATING CURVE	- B => BRIDGE
H: => BREACH	- RC => RATING CURVE



N.T.S.

DATE
REV.

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

ICPR NODES AND LINKS ("NETWORK BUILDER")

Pegasus ENGINEERING
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301 West SR 434, Suite 309
Winter Springs, Florida 32708
Office (407) 992-9160
Fax. (407) 358-5155
State of Florida Board of Professional Engineers Certificate of Authorization No. 27770

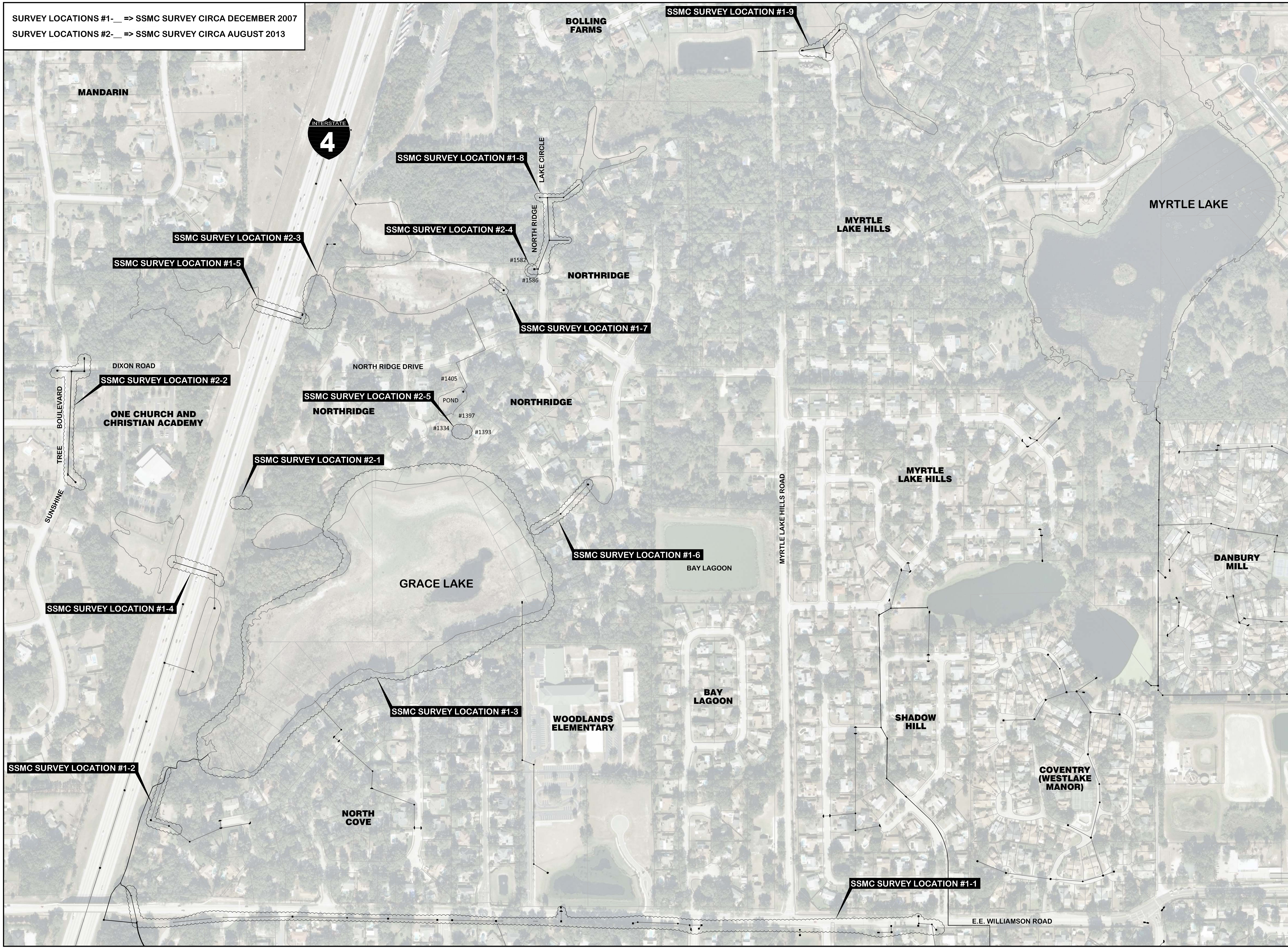
JOB No.:	SMC-014
DESIGNED BY:	JAR
DRAWN BY:	JJB
APPROVED BY:	DWH
DATE:	SEPT 2013

SHEET 5 OF 7

NOT A FINAL PLAN UNLESS SIGNED AND SEALED

JOHAN A. RODRIGUEZ, P.E.
REGISTRATION No. 66517

DATE: ___________



0' 200'
1" = 200'

REV.	DATE	DESCRIPTION

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TOPOGRAPHIC SURVEY COVERAGE

Pegasus ENGINEERING
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State of Florida Board of Professional Engineers
Certificate of Authorization No. 27770

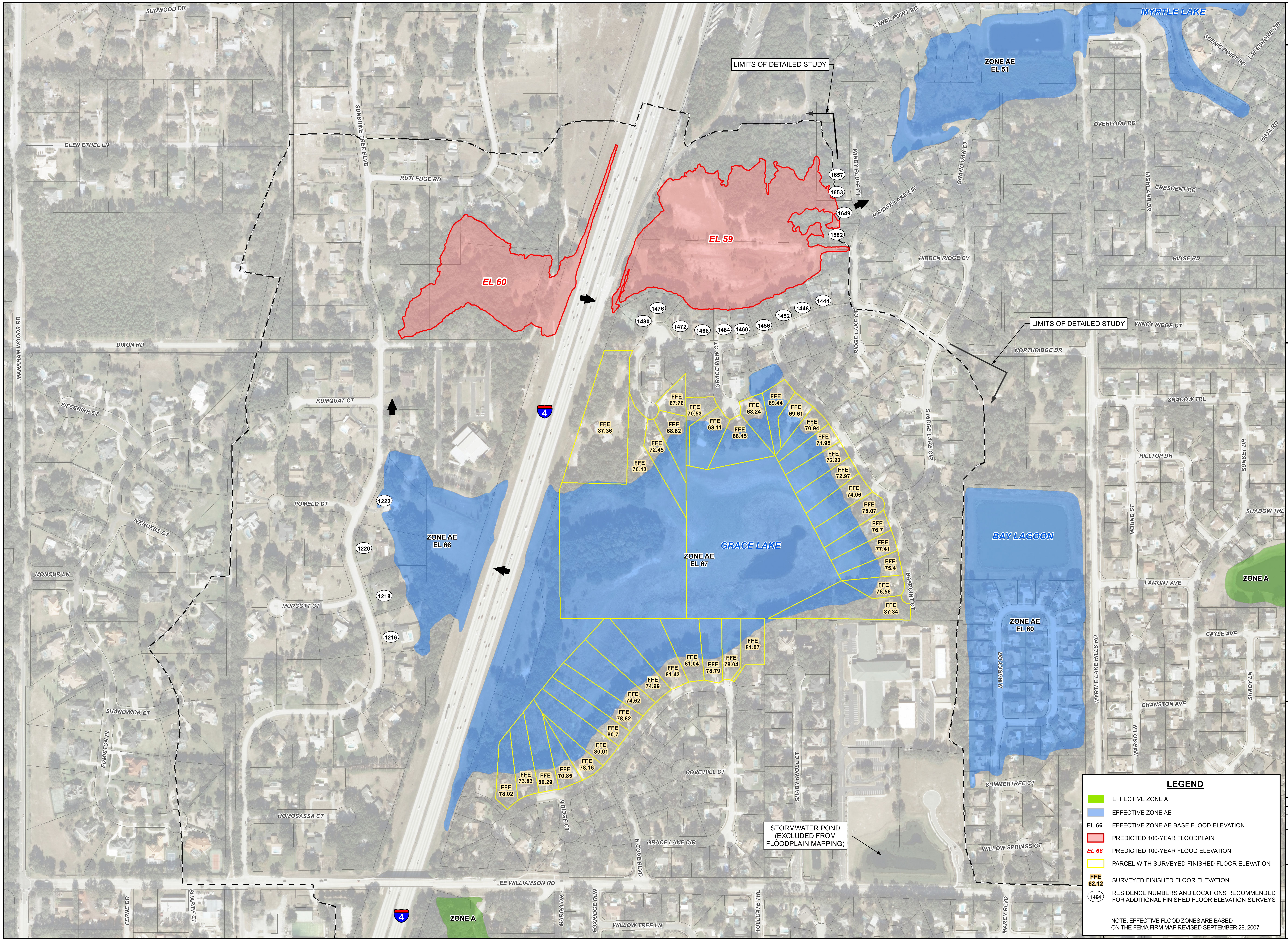
JOB No.:	SMC-014
DESIGNED BY:	GAT
DRAWN BY:	JJB
APPROVED BY:	DWH
DATE:	SEPT 2013

SHEET 6 OF 7

NOT A FINAL PLAN UNLESS SIGNED AND SEALED

JOHAN A. RODRIGUEZ P.E.
REGISTRATION No. 66517

DATE: ______________



REV.	DATE	DESCRIPTION

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

100-YEAR FLOOD PLAINS (EFFECTIVE AND PREDICTED SFHA'S)

Pegasus Engineering, LLC
301 West SR 434, Suite 309
Winter Springs, Florida 32708

Office (407) 992-9160
Fax (407) 358-5155

State of Florida Board of Professional Engineers
Certificate of Authorization No. 27770

JOB NO.:	SMC-014
DESIGNED BY:	JAR
DRAWN BY:	JJB
APPROVED BY:	DWH
DATE:	SEPT 2013

SHEET 7 OF 7

NOT A FINAL PLAN UNLESS SIGNED AND SEALED

JOHAN RODRIGUEZ, P.E.
REGISTRATION No. 66517

DATE: ______________

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 3.2

SUPPORTING DOCUMENTATION FOR THE UPDATED SURFACE WATER ANALYSIS

RUNOFF CURVE NUMBER COMPUTATIONS

Alternative Sinkhole Remediation Protocol for Grace Lake
Tabulation of Existing Soils (Organized By NRCS Soil Number)

Table No. 3.2.1

SOIL NUMBER	SOIL NAME	NRCS HSG [1]	ASSIGNED HSG [1, 2]	FLOODING			HIGH WATER TABLE	
				FREQUENCY	DURATION	MONTHS	DEPTH (ft) [3]	MONTHS
6	Astatula-Apopka fine sands, 0 to 5 percent slopes	A	A	None	- - -	- - -	> -6.0	- - -
7	Astatula-Apopka fine sands, 5 to 8 percent slopes	A	A	None	- - -	- - -	> -6.0	- - -
8	Astatula-Apopka fine sands, 8 to 12 percent slopes	A	A	None	- - -	- - -	> -6.0	- - -
10	Basinger, Samsula, and Hontoon soils, depressional	A/D	D	None	- - -	- - -	+2.0 to 0.0	Jun - Feb, Jan - Dec
20	Myakka and Eau Gallie fine sands	A/D	D	None	- - -	- - -	0.0 to -1.0	Jun - Oct
31	Tavares-Millhopper fine sands, 0 to 5 percent slopes	A	A	None	- - -	- - -	-3.5 to -6.0	Jul - Dec
34	Urban land, 0 to 12 percent slopes	-	A	None	- - -	- - -	> -2.0	- - -

SOURCE: NRCS Soil Survey of Seminole County
Issued September 2012

NOTES

[1] HSG => Hydrologic Soil Group

[2] Assigned HSG applies to any mapping units classified with either a dual hydrologic soil group or if NRCS data was unavailable.

[3] A plus sign under "Depth to high water table" indicates that the water table is above the surface of the soil.

[3] A minus sign under "Depth to high water table" indicates that the water table is below the surface of the soil.

Alternative Sinkhole Remediation Protocol for Grace Lake
Tabulation of Existing Soils (Organized By Hydrologic Soil Group)

Table No. 3.2.2

SOIL NUMBER	SOIL NAME	HYDROLOGIC SOIL GROUP		SOIL BREAKDOWN	
		NRCS	ASSIGNED	AREA (ac)	PERCENT
TYPE "A" SOILS					
6	Astatula-Apopka fine sands, 0 to 5 percent slopes	A	A		
7	Astatula-Apopka fine sands, 5 to 8 percent slopes	A	A		
8	Astatula-Apopka fine sands, 8 to 12 percent slopes	A	A		
31	Tavares-Millhopper fine sands, 0 to 5 percent slopes	A	A		
34	Urban land, 0 to 12 percent slopes	N/A	A		
		Sub-total		332.1	84.7%
TYPE "B" SOILS					
		Sub-total		0.0	0.0%
TYPE "C" SOILS					
		Sub-total		0.0	0.0%
TYPE "B/D" and "D" SOILS					
10	Basinger, Samsula, and Hontoon soils, depressional	A/D	D		
20	Myakka and Eau Gallie fine sands	A/D	D		
		Sub-total		60.0	15.3%
"OTHER" SOILS					
99	Water	N/A	W		
		Sub-total		0.0	0.0%

SOURCE	NRCS Soil Survey of Seminole County Issued September 2012	Totals	392.1	100.0%

NOTES

[1] Hydrologic soil group not identified within the NRCS soil survey, and was therefore assigned using narrative discussions provided within the NRCS map unit descriptions.

Alternative Sinkhole Remediation Protocol for Grace Lake
Tabulation of FLUCCS Land Use Classifications

Table No. 3.2.3

FLUCCS LAND-USE CLASSIFICATION CODE	FLUCCS LAND-USE CLASSIFICATION DEFINITION	LAND USE BREAKDOWN	
		AREA (ac)	PERCENT
110	Residential, Low Density (<2 DU/acre)	89.1	22.7%
120	Residential, Medium Density (2-5 DU/acre)	168.9	43.1%
140	Commercial and Services	2.4	0.6%
170	Institutional	16.5	4.2%
172	Religious	5.4	1.4%
190	Open Land	10.7	2.7%
400	Upland Forests	26.5	6.8%
520	Lakes	22.1	5.6%
530a	Reservoirs (Normally Dry)	4.1	1.0%
530b	Reservoirs (Normally Wet)	2.3	0.6%
640	Vegetated Non-Forested Wetlands	6.2	1.6%
643	Wet Prairies	1.2	0.3%
814	Roads and Highways	36.8	9.4%
	Totals	392.1	100.0%

REFERENCE Florida Land Use, Cover, and Forms Classification System (FLUCCS)
Florida Department of Transportation (FDOT)
January 1999

NOTES Land use delineations dated 2004 were obtained from the St. Johns River Water Management District (SJRWMD) Geographi Information System (GIS) and updated as necessary using aerial photography dated 2008. Land use polygons wer subsequently aggregated to combine land uses with similar FLUCCS codes into larger delineations

Alternative Sinkhole Remediation Protocol for Grace Lake
Tabulation of Runoff Curve Numbers Based On Existing Land Use

Table No. 3.2.4

FLUCCS LAND USE CLASSIFICATION [1] NUMBER	DEFINITION [2]	USDA TR-55 COVER DESCRIPTION	CURVE NUMBER FOR HYDROLOGIC SOIL GROUP [3] A	B	C	D
110	Residential, Low Density (<2 DU/acre)	1 acre avg. lot (avg. 20% imp.)	51	68	79	84
120	Residential, Medium Density (2-5 DU/acre)	1/3 acre avg. lot (avg. 30% imp.)	57	72	81	86
140	Commercial and Services	Commercial and Business (avg. 85% imp.)	89	92	94	95
170	Institutional	Average 50% imp.	69	80	86	89
172	Religious	Average 50% imp.	69	80	86	89
185	Parks	Average 20% imp.	51	68	79	84
190	Open Land	Open space (grass cover 50% to 75%)	49	69	79	84
400	Upland Forests	Woods (good cond.)	39	55	70	77
520	Lakes	Water	100	100	100	100
530a	Reservoirs (Normally Dry)	Open space (grass cover 50% to 75%)	49	69	79	84
530b	Reservoirs (Normally Wet)	Water and Open Space (grass cover >75%)	92	92	92	92
640	Vegetated Non-Forested Wetlands	SJRWMD Tech Pub. #85-5, Table 2	98	98	98	98
643	Wet Prairies	SJRWMD Tech Pub. #85-5, Table 2	98	98	98	98
814	Roads and Highways	Average 50% imp.	69	80	86	89

NOTES

1 Florida Land Use, Cover, and Forms Classification System (FLUCCS)
Florida Department of Transportation (FDOT)
January 1999

2 Land use delineations dated 2004 were obtained from the St. Johns River Water Management District (SJRWMD) Geographic Information System (GIS) and updated as necessary using aerial photography flown in 2009.
http://www.sjrwmd.com/gisdevelopment/docs/themes.html

3 Technical Release 55, Soils Conservation Service, June 1986 (second edition)

Alternative Sinkhole Remediation Protocol for Grace Lake
Partial Tabulation of Computed Runoff Curve Numbers

Table No. 3.2.5

Sub-Basin Name	FLUCCS Land Use Code	Soil HSG	Runoff CN	Acres	CN x Area	Weighted Runoff CN
SC-0770	120	A	57	16.48	939.63	
SC-0770	120	D	86	0.38	32.33	
SC-0770	190	A	49	0.49	23.88	
SC-0770	190	D	84	0.63	52.99	
SC-0770	400	A	39	0.01	0.26	
SC-0770	814	D	89	0.03	3.00	
			Totals	**18.02**	**1,052.07**	**58.39**
SC-0800A	120	A	57	0.12	6.85	
SC-0800A	190	A	49	0.25	12.44	
SC-0800A	190	D	84	2.25	188.61	
SC-0800A	400	A	39	1.18	45.95	
SC-0800A	400	D	77	2.31	177.76	
SC-0800A	814	A	69	0.24	16.54	
SC-0800A	814	D	89	0.40	35.43	
SC-0800A	530a	D	84	2.23	187.53	
			Totals	**8.98**	**671.11**	**74.76**
SC-0800B	120	A	57	0.92	52.55	
SC-0800B	120	D	86	0.05	3.91	
SC-0800B	400	A	39	0.28	11.09	
SC-0800B	400	D	77	2.78	213.86	
			Totals	**4.03**	**281.41**	**69.84**
SC-0810	120	A	57	0.69	39.36	
SC-0810	120	D	86	0.07	5.72	
SC-0810	190	D	84	0.01	0.77	
SC-0810	814	A	69	1.77	121.83	
SC-0810	814	D	89	0.94	83.31	
			Totals	**3.47**	**251.00**	**72.37**
SC-0820A	400	A	39	0.63	24.39	
SC-0820A	400	D	77	0.71	54.40	
SC-0820A	814	A	69	0.42	28.94	
SC-0820A	530a	D	84	1.47	123.61	
			Totals	**3.22**	**231.35**	**71.78**

Alternative Sinkhole Remediation Protocol for Grace Lake
Partial Tabulation of Computed Runoff Curve Numbers

Table No. 3.2.5

Sub-Basin Name	FLUCCS Land Use Code	Soil HSG	Runoff CN	Acres	CN x Area	Weighted Runoff CN
SC-0820B	814	A	69	4.20	290.11	
SC-0820B	814	D	89	0.78	69.14	
			Totals	**4.98**	**359.24**	**72.12**
SC-0830	110	A	51	0.23	11.70	
SC-0830	172	A	69	0.31	21.51	
SC-0830	172	D	89	0.04	3.87	
SC-0830	190	A	49	1.97	96.72	
SC-0830	400	A	39	1.45	56.73	
SC-0830	400	D	77	0.08	5.82	
SC-0830	643	A	98	0.01	0.79	
SC-0830	643	D	98	0.40	39.41	
SC-0830	814	A	69	3.71	255.65	
SC-0830	814	D	89	1.04	92.41	
			Totals	**9.24**	**584.62**	**63.25**
SC-0840	110	A	51	31.08	1,585.27	
SC-0840	110	D	84	0.18	15.13	
SC-0840	172	A	69	0.99	68.41	
SC-0840	172	D	89	0.51	45.16	
SC-0840	190	A	49	0.04	1.75	
SC-0840	400	A	39	3.17	123.49	
SC-0840	400	D	77	4.75	365.96	
SC-0840	643	A	98	0.00	0.04	
SC-0840	643	D	98	0.82	80.59	
			Totals	**41.54**	**2,285.79**	**55.03**
SC-0880	110	A	51	55.38	2,824.55	
SC-0880	110	D	84	2.20	184.54	
SC-0880	140	A	89	2.37	210.76	
SC-0880	172	A	69	3.54	244.30	
SC-0880	190	A	49	2.70	132.28	
SC-0880	190	D	84	1.05	88.22	
SC-0880	400	A	39	0.90	35.12	
SC-0880	814	A	69	7.99	551.29	
SC-0880	814	D	89	1.70	151.36	
			Totals	**77.83**	**4,422.43**	**56.82**

Alternative Sinkhole Remediation Protocol for Grace Lake
Partial Tabulation of Computed Runoff Curve Numbers

Table No. 3.2.5

Sub-Basin Name	FLUCCS Land Use Code	Soil HSG	Runoff CN	Acres	CN x Area	Weighted Runoff CN
SC-0900A	190	A	49	0.36	17.73	
SC-0900A	190	D	84	0.24	19.78	
SC-0900A	814	A	69	0.61	42.37	
SC-0900A	814	D	89	0.68	60.56	
SC-0900A	530a	A	49	0.30	14.88	
SC-0900A	530a	D	84	0.10	8.03	
			Totals	**2.29**	**163.35**	**71.30**
SC-0900B	814	A	69	4.62	318.70	
SC-0900B	814	D	89	0.92	81.97	
			Totals	**5.54**	**400.67**	**72.33**
SC-0910	120	A	57	1.98	112.74	
SC-0910	120	D	86	0.01	0.44	
SC-0910	190	D	84	0.02	1.79	
SC-0910	400	A	39	0.11	4.37	
SC-0910	400	D	77	1.16	89.02	
SC-0910	640	A	98	0.95	92.92	
SC-0910	640	D	98	0.58	56.37	
SC-0910	814	A	69	0.61	41.79	
SC-0910	814	D	89	0.69	61.25	
			Totals	**6.09**	**460.69**	**75.65**
SC-0920	120	A	57	50.59	2,883.68	
SC-0920	120	D	86	0.65	55.53	
SC-0920	170	A	69	0.36	24.95	
SC-0920	190	A	49	0.43	21.06	
SC-0920	190	D	84	0.24	20.06	
SC-0920	400	A	39	5.09	198.36	
SC-0920	400	D	77	1.93	148.66	
SC-0920	520	A	100	0.54	54.12	
SC-0920	520	D	100	21.51	2,151.07	
SC-0920	640	A	98	1.12	109.63	
SC-0920	640	D	98	3.54	347.37	
SC-0920	814	A	69	2.63	181.13	
			Totals	**88.62**	**6,195.63**	**69.91**

Alternative Sinkhole Remediation Protocol for Grace Lake
Partial Tabulation of Computed Runoff Curve Numbers

Table No. 3.2.5

Sub-Basin Name	FLUCCS Land Use Code	Soil HSG	Runoff CN	Acres	CN x Area	Weighted Runoff CN
SC-0925	120	A	57	13.12	747.80	
SC-0925	170	A	69	0.12	8.12	
			Totals	**13.24**	**755.92**	**57.11**
SC-0970	120	A	57	1.39	79.26	
SC-0970	814	A	69	2.83	195.22	
			Totals	**4.22**	**274.48**	**65.05**
SC-0980A	120	A	57	2.73	155.53	
SC-0980A	814	A	69	0.03	2.27	
			Totals	**2.76**	**157.80**	**57.14**
SC-0980B	120	A	57	5.83	332.19	
SC-0980B	814	A	69	0.00	0.11	
			Totals	**5.83**	**332.30**	**57.00**
SC-0980C	120	A	57	12.31	701.60	
			Totals	**12.31**	**701.60**	**57.00**
SC-0985	120	A	57	43.86	2,499.94	
			Totals	**43.86**	**2,499.94**	**57.00**
SC-0995	120	A	57	17.74	1,011.30	
SC-0995	170	A	69	16.01	1,104.93	
SC-0995	400	A	39	0.00	0.18	
SC-0995	530b	A	92	2.32	213.14	
			Totals	**36.08**	**2,329.55**	**64.57**

Total Area (acres) = 392.15

Pegasus ENGINEERING

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 3.3

SUPPORTING DOCUMENTATION FOR THE UPDATED SURFACE WATER ANALYSIS

TIME OF CONCENTRATION COMPUTATIONS

Pegasus
ENGINEERING

Alternative Sinkhole Remediation Protocol for Grace Lake
Partial Tabulation of Computed Times of Concentration

Table No. 3.3.1

SUB-BASIN I.D.	SHEET FLOW									SHALLOW CONCENTRATED FLOW							CHANNEL FLOW			ACCUMULATED TOTAL TIME OF CONC.		BASIN I.D.
	SURFACE DESC.	("n")	FLOW LENGTH (feet)	2-yr, 24-hr RAINFALL (inch)	UPPER EL. (feet)	LOWER EL. (feet)	CALC'D SLOPE (foot/foot)	TRAVEL TIME (hour)	PAVED OR UNPAVED	FLOW LENGTH (feet)	UPPER EL. (feet)	LOWER EL. (feet)	CALC'D SLOPE (foot/foot)	VEL. (fps)	TRAVEL TIME (hour)	VEL. (fps)	FLOW LENGTH (feet)	TRAVEL TIME (hour)	(hour)	(min.)	
SC-0770	Dense Grass	0.24	100	4.50	85.00	79.00	0.0600	0.13	Unpaved	96	79.00	70.00	0.0938	4.9	0.01	3.00	195	0.02	0.24	14	SC-0770
									Paved	593	70.00	65.00	0.0084	1.9	0.09						
SC-0800A	Dense Grass	0.24	100	4.50	67.50	64.00	0.0350	0.16	Unpaved	512	64.00	47.00	0.0332	2.9	0.05				0.21	13	SC-0800A
SC-0800B	Dense Grass	0.24	100	4.50	65.00	61.50	0.0350	0.16	Unpaved	423	61.50	51.00	0.0248	2.5	0.05				0.21	12	SC-0800B
SC-0810	Dense Grass	0.24	100	4.50	85.00	76.00	0.0900	0.11	Unpaved	52	76.00	70.00	0.1154	5.5	0.00	3.00	706	0.07	0.18	11	SC-0810
SC-0820A	Dense Grass	0.24	100	4.50	68.00	64.50	0.0350	0.16	Unpaved	237	64.50	52.00	0.0527	3.7	0.02				0.18	11	SC-0820A
SC-0820B	Dense Grass	0.24	100	4.50	72.00	71.00	0.0100	0.26	Unpaved	1071	71.00	64.00	0.0065	1.3	0.23				0.49	30	SC-0820B
SC-0830	Dense Grass	0.24	100	4.50	84.50	84.20	0.0030	0.43	Unpaved	491	84.20	53.00	0.0635	4.1	0.03				0.46	28	SC-0830
SC-0840	Dense Grass	0.24	100	4.50	81.00	78.00	0.0300	0.17	Unpaved	892	78.00	62.00	0.0179	2.2	0.11	3.00	623	0.06	0.34	21	SC-0840
SC-0880	Dense Grass	0.24	100	4.50	86.00	85.00	0.0100	0.26	Unpaved	294	85.00	80.00	0.0170	2.1	0.04	3.00	1557	0.14	0.45	27	SC-0880
SC-0900A	Dense Grass	0.24	100	4.50	70.50	62.00	0.0850	0.11	Unpaved	85	62.00	55.00	0.0824	4.6	0.01				0.12	7	SC-0900A
SC-0900B	Dense Grass	0.24	100	4.50	87.00	86.00	0.0100	0.26	Unpaved	962	86.00	75.00	0.0114	1.7	0.15	3.00	1626	0.15	0.57	34	SC-0900B
SC-0910	Dense Grass	0.24	100	4.50	73.00	69.00	0.0400	0.15	Unpaved	340	69.00	55.00	0.0412	3.3	0.03				0.18	11	SC-0910
SC-0920	Dense Grass	0.24	100	4.50	86.00	84.00	0.0200	0.20	Unpaved	431	84.00	78.00	0.0139	1.9	0.06	3.00	1152	0.11	0.37	22	SC-0920
SC-0925	Dense Grass	0.24	100	4.50	89.00	83.50	0.0550	0.13	Unpaved	235	83.50	79.00	0.0191	2.2	0.03				0.26	15	SC-0925
									Paved	360	79.00	78.00	0.0028	1.1	0.09						
SC-0970	Dense Grass	0.24	100	4.50	88.00	86.80	0.0120	0.25	Unpaved	302	86.80	75.00	0.0391	3.2	0.03				0.27	16	SC-0970
SC-0980A	Dense Grass	0.24	100	4.50	88.00	87.50	0.0050	0.35	Unpaved	98	87.50	87.00	0.0051	1.2	0.02	3.00	1227	0.11	0.49	29	SC-0980A
SC-0980B	Dense Grass	0.24	100	4.50	86.50	85.00	0.0150	0.23	Unpaved	347	85.00	71.00	0.0403	3.2	0.03				0.25	15	SC-0980B
SC-0980C	Dense Grass	0.24	100	4.50	96.50	95.50	0.0100	0.26	Unpaved	137	95.50	95.00	0.0036	1.0	0.04				0.34	20	SC-0980C
									Paved	180	95.00	94.00	0.0056	1.5	0.03						
SC-0985	Dense Grass	0.24	100	4.50	87.00	86.00	0.0100	0.26	Unpaved	288	86.00	72.00	0.0486	3.6	0.02				0.29	17	SC-0985
SC-0995	Dense Grass	0.24	100	4.50	94.00	93.50	0.0050	0.35	Unpaved	294	93.50	86.00	0.0255	2.6	0.03				0.38	23	SC-0995

REFERENCE
URBAN HYDROLOGY FOR SMALL WATERSHEDS
TECHNICAL RELEASE 55, SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
JUNE 1986

NOTES

1. Empty cells indicate that the time of concentration for that sub-basin was assumed.
2. In some cases, the assumed time of concentration includes a lag factor to account for stormwater management systems that provide retention storage or attenuation volume that is not otherwise accounted for in the stormwater model.
3. In some cases, and specifically when detailed topographic information is unavailable, time of concentrations for residential land uses assume sheet flow with a minimum lot grade of 1% (FHA minimum standard) and shallow concentrated flow with a minimum road grade of 0.5%.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 4.1

UPDATED SURFACE WATER ANALYSIS

ICPR INPUT DATA
(GROUP "GRACE LAKE")

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

```
==========================================================================================
==== Basins ==============================================================================
==========================================================================================

         Name: SC-0770                  Node: SC-0770               Status: Onsite
        Group: Grace Lake               Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                    Peaking Factor: 323.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 14.00
               Area(ac): 18.020                  Time Shift(hrs): 0.00
           Curve Number: 58.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0800A                 Node: SC-0800               Status: Onsite
        Group: Grace Lake               Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 13.00
               Area(ac): 8.980                   Time Shift(hrs): 0.00
           Curve Number: 75.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0800B                 Node: SC-0800               Status: Onsite
        Group: Grace Lake               Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 12.00
               Area(ac): 4.030                   Time Shift(hrs): 0.00
           Curve Number: 70.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0810                  Node: SC-0810               Status: Onsite
        Group: Grace Lake               Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                    Peaking Factor: 323.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 11.00
               Area(ac): 3.470                   Time Shift(hrs): 0.00
           Curve Number: 72.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0820A                 Node: SC-0820               Status: Onsite
        Group: Grace Lake               Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 11.00
               Area(ac): 3.220                   Time Shift(hrs): 0.00
           Curve Number: 72.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

FDOT POND F BASIN AREA

----------------------------------------------------------------------------------------------------
         Name: SC-0820B                 Node: SC-0820               Status: Onsite
        Group: Grace Lake               Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                    Peaking Factor: 323.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 30.00
               Area(ac): 4.980                   Time Shift(hrs): 0.00
           Curve Number: 72.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

I-4 BASIN AREA CONTRIBUTING RUNOFF TO POND SC-0820
```

```
----------------------------------------------------------------------------------------------------
        Name: SC-0830                  Node: SC-0830              Status: Onsite
       Group: Grace Lake               Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 28.00
              Area(ac): 9.240                  Time Shift(hrs): 0.00
          Curve Number: 63.00              Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00


----------------------------------------------------------------------------------------------------
        Name: SC-0840                  Node: SC-0840              Status: Onsite
       Group: Grace Lake               Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 21.00
              Area(ac): 41.540                 Time Shift(hrs): 0.00
          Curve Number: 55.00              Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00


----------------------------------------------------------------------------------------------------
        Name: SC-0880                  Node: SC-0880              Status: Onsite
       Group: Grace Lake               Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 27.00
              Area(ac): 77.830                 Time Shift(hrs): 0.00
          Curve Number: 57.00              Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00


----------------------------------------------------------------------------------------------------
        Name: SC-0900A                 Node: SC-0900              Status: Onsite
       Group: Grace Lake               Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 10.00
              Area(ac): 2.290                  Time Shift(hrs): 0.00
          Curve Number: 71.00              Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

FDOT POND E BASIN

----------------------------------------------------------------------------------------------------
        Name: SC-0900B                 Node: SC-0900              Status: Onsite
       Group: Grace Lake               Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh323                   Peaking Factor: 323.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 34.00
              Area(ac): 5.540                  Time Shift(hrs): 0.00
          Curve Number: 72.00              Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

I-4 BASIN CONTRIBUTING RUNOFF TO POND E

----------------------------------------------------------------------------------------------------
        Name: SC-0910                  Node: SC-0910              Status: Onsite
       Group: Grace Lake               Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 11.00
              Area(ac): 6.090                  Time Shift(hrs): 0.00
          Curve Number: 76.00              Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00


----------------------------------------------------------------------------------------------------
        Name: SC-0920                  Node: SC-0920              Status: Onsite
       Group: Grace Lake               Type: SCS Unit Hydrograph CN
```

```
      Unit Hydrograph: Uh323                Peaking Factor: 323.0
        Rainfall File:                 Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000             Time of Conc(min): 22.00
             Area(ac): 88.620              Time Shift(hrs): 0.00
         Curve Number: 70.00          Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0925               Node: SC-0925               Status: Onsite
        Group: Grace Lake            Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh323                Peaking Factor: 323.0
        Rainfall File:                 Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000             Time of Conc(min): 15.00
             Area(ac): 13.240              Time Shift(hrs): 0.00
         Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0970               Node: SC-0970               Status: Onsite
        Group: Grace Lake            Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh323                Peaking Factor: 323.0
        Rainfall File:                 Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000             Time of Conc(min): 16.00
             Area(ac): 4.220               Time Shift(hrs): 0.00
         Curve Number: 65.00          Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0980A              Node: SC-0980               Status: Onsite
        Group: Grace Lake            Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh323                Peaking Factor: 323.0
        Rainfall File:                 Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000             Time of Conc(min): 29.00
             Area(ac): 2.760               Time Shift(hrs): 0.00
         Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0980B              Node: SC-0980               Status: Onsite
        Group: Grace Lake            Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh323                Peaking Factor: 323.0
        Rainfall File:                 Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000             Time of Conc(min): 15.00
             Area(ac): 5.830               Time Shift(hrs): 0.00
         Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0980C              Node: SC-0980               Status: Onsite
        Group: Grace Lake            Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh323                Peaking Factor: 323.0
        Rainfall File:                 Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000             Time of Conc(min): 20.00
             Area(ac): 12.310              Time Shift(hrs): 0.00
         Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0985               Node: SC-0985               Status: Onsite
        Group: Grace Lake            Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh323                Peaking Factor: 323.0
        Rainfall File:                 Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000             Time of Conc(min): 17.00
             Area(ac): 43.860              Time Shift(hrs): 0.00
```

```
          Curve Number: 57.00             Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00


----------------------------------------------------------------------------------------------------
        Name: SC-0995                 Node: SC-0995               Status: Onsite
       Group: Grace Lake              Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh323                  Peaking Factor: 323.0
         Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 23.00
              Area(ac): 36.080                Time Shift(hrs): 0.00
          Curve Number: 65.00             Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00


==========================================================================================
==== Nodes ===============================================================================
==========================================================================================

     Name: SC-0750            Base Flow(cfs): 0.000          Init Stage(ft): 52.000
    Group: Grace Lake                                        Warn Stage(ft): 54.000
     Type: Time/Stage

ASSUMED TAILWATER AT THE CROWN OF THE OUTFALL PIPE THAT DISCHARGES TO THE BOLLING FARMS SUBDIVISION WETLAND AND POND.
SURVEYED PIPE INVERT ELEVATION IS 48.96 FT, NAVD (SSMC SURVEY DATED DEC. 2007).


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          52.000
         180.00          52.000

------------------------------------------------------------------------------------------
     Name: SC-0760            Base Flow(cfs): 0.000          Init Stage(ft): 53.080
    Group: Grace Lake                                        Warn Stage(ft): 58.000
     Type: Stage/Area

CURB INLET STRUCTURE LOCATED ALONG THE NORTH RIDGE LAKE CIRCLE WEST RIGHT-OF-WAY.
PARAMETERS WERE OBTAINED FROM SURVEY DATA BY SSMC (DATED DEC. 2007 AND JULY 2013).

      Stage(ft)        Area(ac)
--------------- ---------------
         53.080          0.0010
         58.780          0.0010

------------------------------------------------------------------------------------------
     Name: SC-0770            Base Flow(cfs): 0.000          Init Stage(ft): 57.000
    Group: Grace Lake                                        Warn Stage(ft): 58.000
     Type: Stage/Area

NORTHRIDGE SWALE LOCATED SOUTH OF THE NORTHRIDGE DEPRESSIONAL AREA

      Stage(ft)        Area(ac)
--------------- ---------------
         55.900          0.0100
         57.000          0.4100
         58.000          0.7700

------------------------------------------------------------------------------------------
     Name: SC-0780            Base Flow(cfs): 0.000          Init Stage(ft): 64.240
    Group: Grace Lake                                        Warn Stage(ft): 67.270
     Type: Stage/Area

DIVERSION STRUCTURE.  DATA OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS (DATED 05/19/1985).  REFER TO STRUCTURE

      Stage(ft)        Area(ac)
--------------- ---------------
         64.240          0.0010
         67.570          0.0010

------------------------------------------------------------------------------------------
     Name: SC-0790            Base Flow(cfs): 0.000          Init Stage(ft): 64.000
    Group: Grace Lake                                        Warn Stage(ft): 67.000
     Type: Stage/Area

SMALL DRY RETENTION POND LOCATED NORTH OF GRACE LAKE, SOUTH OF NORTH RIDGE DR., EAST OF GRACE VIEW CT., AND WEST OF NORTH R
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

      Stage(ft)        Area(ac)
```

64.000	0.1800
65.000	0.2300
66.000	0.2900
67.000	0.3900

Name: SC-0800 Base Flow(cfs): 0.000 Init Stage(ft): 47.000
Group: Grace Lake Warn Stage(ft): 56.000
Type: Stage/Area

NORTHRIDE DEPRESSIONAL AREA

Stage(ft)	Area(ac)
47.000	0.9700
48.000	1.9200
49.000	2.3000
50.000	2.6500
51.000	2.9900
52.000	3.3100
53.000	3.6200
54.000	4.0400
55.000	4.8500
56.000	6.2700
57.000	7.1700

Name: SC-0810 Base Flow(cfs): 0.000 Init Stage(ft): 52.330
Group: Grace Lake Warn Stage(ft): 58.000
Type: Stage/Area

STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

Stage(ft)	Area(ac)
52.330	0.0010
55.000	0.0050
56.000	0.0100
57.000	0.0200
58.000	0.0400

Name: SC-0815 Base Flow(cfs): 0.000 Init Stage(ft): 55.000
Group: Grace Lake Warn Stage(ft): 56.000
Type: Stage/Area

SHALLOW SWALE

Stage(ft)	Area(ac)
55.000	0.0200
56.000	0.0300

Name: SC-0820 Base Flow(cfs): 0.000 Init Stage(ft): 53.000
Group: Grace Lake Warn Stage(ft): 56.000
Type: Stage/Area

FDOT POND F
STAGE-AREA RELATIONSHIP OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP AND COMPARED TO THE PERMITTED PARAMETERS (SJRWMD PERMIT NO.

Stage(ft)	Area(ac)
52.000	0.9100
53.000	1.2100
54.000	1.3300
55.000	1.4800
56.000	1.6100
57.000	1.6900

Name: SC-0830 Base Flow(cfs): 0.000 Init Stage(ft): 52.890
Group: Grace Lake Warn Stage(ft): 59.000
Type: Stage/Area

DEPRESSIONAL AREA IMMEDIATELY WEST (UPSTREAM SIDE) OF THE I-4 CULVERT CROSSING (NORTH PIPE)

Stage(ft)	Area(ac)
52.000	0.0010
53.000	0.0500

54.000	0.3100
55.000	0.4800
56.000	0.5900
57.000	0.6800
58.000	0.7900
59.000	0.9200

Name: SC-0840   Base Flow(cfs): 0.000   Init Stage(ft): 50.000
Group: Grace Lake   Warn Stage(ft): 58.000
Type: Stage/Area

DEPRESSIONAL AREA NORTH OF DIXON ROAD AND EAST OF SUNSHINE TREE BOULEVARD.
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHI MAP.

Stage(ft)	Area(ac)
47.000	0.0200
48.000	0.0500
49.000	0.0900
50.000	0.1200
51.000	0.3400
52.000	0.5400
53.000	0.7700
54.000	1.1800
55.000	1.9200
56.000	2.7200
57.000	3.4100
58.000	4.1100
59.000	4.7300

Name: SC-0850   Base Flow(cfs): 0.000   Init Stage(ft): 56.690
Group: Grace Lake   Warn Stage(ft): 59.500
Type: Stage/Area

Stage(ft)	Area(ac)
56.650	0.0010
59.500	0.0010

Name: SC-0860   Base Flow(cfs): 0.000   Init Stage(ft): 56.920
Group: Grace Lake   Warn Stage(ft): 61.550
Type: Stage/Area

DITCH BOTTOM INLET LOCATED AT THE SOUTHEAST CORNER OF THE INTERSECTION OF DIXON RD. AND SUNSHINE TREE BLVD.

Stage(ft)	Area(ac)
56.920	0.0010
62.650	0.0010

Name: SC-0870   Base Flow(cfs): 0.000   Init Stage(ft): 59.620
Group: Grace Lake   Warn Stage(ft): 66.000
Type: Stage/Area

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.
CURB INLET LOCATED ALONG THE SUNSHINE TREE BLVD EAST RIGHT-OF-WAY.

Stage(ft)	Area(ac)
59.620	0.0010
67.000	0.0010

Name: SC-0875   Base Flow(cfs): 0.000   Init Stage(ft): 59.710
Group: Grace Lake   Warn Stage(ft): 64.000
Type: Stage/Area

Stage(ft)	Area(ac)
59.710	0.0100
64.000	0.0100

Name: SC-0880   Base Flow(cfs): 0.000   Init Stage(ft): 57.840

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Group: Grace Lake   Warn Stage(ft): 64.000
Type: Stage/Area

DEPRESSIONAL AREA SOUTH OF THE ONE CHURCH (SOCCER FIELDS)
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

Stage(ft)	Area(ac)
57.840	0.0010
58.000	0.0020
59.000	0.0300
60.000	0.5700
61.000	0.7700
62.000	1.6400
63.000	3.0800
64.000	3.8700
65.000	5.6500

Name: SC-0890   Base Flow(cfs): 0.000   Init Stage(ft): 58.430
Group: Grace Lake   Warn Stage(ft): 66.000
Type: Stage/Area

UPSTREAM END (EAST SIDE) OF THE SOUTHERN CULVERT CROSSING I-4

Stage(ft)	Area(ac)
58.160	0.0100
66.000	0.0100

Name: SC-0900   Base Flow(cfs): 0.000   Init Stage(ft): 60.000
Group: Grace Lake   Warn Stage(ft): 66.000
Type: Stage/Area

STAGE-AREA RELATIONSHIP OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.
FDOT POND E (REFER TO THE SJRWMD PERMIT NO. 22434-1)

Stage(ft)	Area(ac)
59.000	0.3000
60.000	0.4400
61.000	0.6200
62.000	0.7900
63.000	0.9200
64.000	1.0400
65.000	1.1900
66.000	1.3900
67.000	1.5400

Name: SC-0910   Base Flow(cfs): 0.000   Init Stage(ft): 58.000
Group: Grace Lake   Warn Stage(ft): 66.000
Type: Stage/Area

DEPRESSIONAL AREA IMMEDIATELY EAST OF THE SOUTH I-4 CROSS CULVERT, ADJACENT TO GRACE LAKE.
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

Stage(ft)	Area(ac)
55.000	0.1700
56.000	0.3000
57.000	0.4500
58.000	0.6600
59.000	0.9600
60.000	1.4200
61.000	1.8200
62.000	2.2500
63.000	2.6800
64.000	2.9600
65.000	3.2500
66.000	3.4800
67.000	3.6800

Name: SC-0920   Base Flow(cfs): 0.000   Init Stage(ft): 58.000
Group: Grace Lake   Warn Stage(ft): 66.000
Type: Stage/Area

GRACE LAKE.
STAGE-AREA RELATIONSHIP BETWEEN ELEVATIONS 33-54 FT, NAVD, WAS OBTAINED FROM THE SURVEY PREPARED BY SSMC, DATED DEC. 2007.
STAGE-AREA RELATIONSHIP BETWEEN ELEVATIONS 55-67, NAVD, IS BASED ON THE 1-FT TOPOGRAPHY.

INITIAL STAGE IS BASED ON THE GRACE LAKE "NORMAL" HYDROPERIOD ELEVATION BETWEEN ELEVATION 58-63 FT, NAVD (REFER TO ENGINEERING REPORT FROM DEVO ENGINEERING).

Stage(ft)	Area(ac)
33.000	0.0000
34.000	0.0005
35.000	0.0014
36.000	0.0028
37.000	0.0053
38.000	0.0140
39.000	0.0450
40.000	0.0980
41.000	0.1830
42.000	0.3010
43.000	0.4270
44.000	0.5320
45.000	0.6430
46.000	0.7540
47.000	0.8640
48.000	1.1900
49.000	3.6300
50.000	5.8800
51.000	8.1300
52.000	10.5200
53.000	12.8800
54.000	14.9400
55.000	16.6400
56.000	18.3800
57.000	20.0700
58.000	22.0500
59.000	24.0900
60.000	26.0500
61.000	27.8500
62.000	29.7000
63.000	31.6800
64.000	33.6800
65.000	35.3300
66.000	36.9000
67.000	38.7900

Name: SC-0925   Base Flow(cfs): 0.000   Init Stage(ft): 68.000
Group: Grace Lake   Warn Stage(ft): 76.000
Type: Stage/Area

SMALL DRY RETENTION POND LOCATED ALONG NORTH RIDGE LAKE CIRCLE, SOUTH OF NORTH RIDGE DR. STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAPS.

Stage(ft)	Area(ac)
68.000	0.0300
69.000	0.0800
70.000	0.1000
71.000	0.1300
72.000	0.1600
73.000	0.1800
74.000	0.2200
75.000	0.2500
76.000	0.2900
77.000	0.5100
78.000	0.8700
79.000	1.1900

Name: SC-0930   Base Flow(cfs): 0.000   Init Stage(ft): 62.900
Group: Grace Lake   Warn Stage(ft): 66.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 3.

Stage(ft)	Area(ac)
62.900	0.0100
66.000	0.0100

Name: SC-0940   Base Flow(cfs): 0.000   Init Stage(ft): 65.700
Group: Grace Lake   Warn Stage(ft): 69.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 2.

Stage(ft)	Area(ac)
65.700	0.0100
69.000	0.0100

Name: SC-0950 Base Flow(cfs): 0.000 Init Stage(ft): 66.200
Group: Grace Lake Warn Stage(ft): 72.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 1.

Stage(ft)	Area(ac)
66.200	0.0100
72.000	0.0100

Name: SC-0960 Base Flow(cfs): 0.000 Init Stage(ft): 68.780
Group: Grace Lake Warn Stage(ft): 73.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 0.

Stage(ft)	Area(ac)
68.780	0.0100
73.000	0.0100

Name: SC-0970 Base Flow(cfs): 0.000 Init Stage(ft): 65.780
Group: Grace Lake Warn Stage(ft): 71.000
Type: Stage/Area

STAGE AREA ESTIMATED BASED ON THE 1-FT TOPOGRAPHY.
NODE INITIAL STAGE OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE Ghost_I-4_30in.

Stage(ft)	Area(ac)
65.780	0.0100
71.000	0.0400

Name: SC-0980 Base Flow(cfs): 0.000 Init Stage(ft): 68.100
Group: Grace Lake Warn Stage(ft): 74.000
Type: Stage/Area

STAGE-AREA OBTAINED FROM THE 1-FT TOPO MAPS
INITIAL STAGE IS BASED ON THE DOWNSTREAM PIPE INVERT ELEVATION

Stage(ft)	Area(ac)
67.000	0.0100
70.000	0.0150
71.000	0.0200
72.000	0.1000
73.000	0.1800
74.000	0.3200

Name: SC-0985 Base Flow(cfs): 0.000 Init Stage(ft): 68.100
Group: Grace Lake Warn Stage(ft): 73.000
Type: Stage/Area

PENELOPE POND (POND LOCATED EAST OF PENELOPE DR AND NORTH OF HICKORY TREE RD)
STAGE-AREA RELATIONSHIP OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP
INITIAL STAGE WAS ESTIMATED BASED ON THE DOWNSTREAM PIPE INVERT JUST SOUTH OF EE WILLIAMSON RD

Stage(ft)	Area(ac)
66.000	0.1100
71.000	0.2200
72.000	0.3400
73.000	0.5900
74.000	1.2000

Name: SC-0990 Base Flow(cfs): 0.000 Init Stage(ft): 71.000
Group: Grace Lake Warn Stage(ft): 79.000
Type: Stage/Area

EMERGENCY OVERFLOW MANHOLE

Stage(ft)	Area(ac)
71.000	0.0010
79.000	0.0010

Name: SC-0995 Base Flow(cfs): 0.000 Init Stage(ft): 77.500
Group: Grace Lake Warn Stage(ft): 84.000
Type: Stage/Area

WET DETENTION POND THAT SERVES THE WOODLAND ELEMENTARY SCHOOL, THE BELLA TUSCANY SUBDIVISION AND A PORTION OF EE WILLIAMSON
POND WAS EXPANDED TO PROVIDE WATER QUALITY TREATMENT AND ATTENUATION FROM THE BELLA TUSCANY SUBDIVISION (REFER TO THE SJRMD
STAGE-AREA RELATIONSHIP AND INITIAL STAGE WAS OBTAINED FROM THE PERMITTED PARAMETERS. ELEVATIONS SHOWN HEREIN WERE CONVERT
SINCE THE ORIGINAL BELLA TUSCANY SUBDIVISION PLANS ARE REFERENCED TO THE NGVD VERTICAL DATUM (CONVERSION USED: NAVD ELEV.

Stage(ft)	Area(ac)
77.500	1.8600
78.000	1.9300
79.000	2.0000
80.000	2.0800
81.000	2.2200
82.000	2.3600
83.000	2.5000
84.000	2.6500
85.000	2.8000

==== Cross Sections ====

Name: SC-0810_W1 Group: Grace Lake
Encroachment: No

OVERLAND OVERTOPPING CROSS SECTION FROM I-4 CULVERT CROSSING (NORTH PIPE) TO THE NORTHRIDGE DEPRESSIONAL AREA

Station(ft)	Elevation(ft)	Manning's N
0.000	58.400	0.000000
11.900	57.800	0.000000
31.100	57.200	0.000000
43.400	57.800	0.000000
63.200	58.700	0.000000

Name: SC-0810_W2 Group: Grace Lake
Encroachment: No

OVERLAND OVERTOPPING CROSS SECTION FROM I-4 CULVERT CROSSING (NORTH PIPE) TO THE NORTHRIDGE SWALE

Station(ft)	Elevation(ft)	Manning's N
0.000	59.300	0.000000
30.700	59.000	0.000000
68.400	58.500	0.000000
106.100	58.700	0.000000
133.700	59.300	0.000000

Name: SC-0840_W Group: Grace Lake
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
0.000	59.000	0.000000
6.700	58.000	0.000000
13.300	57.000	0.000000
20.000	56.000	0.000000
39.900	55.000	0.000000
91.800	54.000	0.000000
116.000	54.000	0.000000
137.600	54.000	0.000000

182.000	55.000	0.000000
203.100	56.000	0.000000
218.500	57.000	0.000000
229.100	58.000	0.000000
239.500	59.000	0.000000

Name: SC-0875_W Group: Grace Lake
Encroachment: No

CROSS SECTION DATA ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

Station(ft)	Elevation(ft)	Manning's N
0.000	67.000	0.000000
36.600	66.000	0.000000
44.200	65.500	0.000000
51.800	66.000	0.000000
78.700	67.000	0.000000

Name: SC-0880_W Group: Grace Lake
Encroachment: No

CROSS SECTION DATA OBTAINED FROM SSMC SURVEY, DATED JULY 2013.

Station(ft)	Elevation(ft)	Manning's N
0.000	63.300	0.000000
9.200	62.600	0.000000
24.700	63.400	0.000000

Name: SC-0890_W Group: Grace Lake
Encroachment: No

SURVEYED CROSS SECTION (SSMC, DATED JULY 2013).

Station(ft)	Elevation(ft)	Manning's N
0.000	70.960	0.000000
4.200	70.600	0.000000
26.000	67.700	0.000000
48.500	71.100	0.000000
64.600	79.100	0.000000
78.400	83.600	0.000000
82.500	83.400	0.000000

Name: SC-0920_W1 Group: Grace Lake
Encroachment: No

CROSS SECTION DATA ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

Station(ft)	Elevation(ft)	Manning's N
0.000	67.000	0.000000
20.300	66.000	0.000000
45.300	65.000	0.000000
53.000	64.000	0.000000
63.600	63.000	0.000000
80.700	62.000	0.000000
93.800	61.000	0.000000
106.600	60.000	0.000000
139.200	59.500	0.000000
168.200	60.000	0.000000
194.200	61.000	0.000000
206.100	62.000	0.000000
224.900	63.000	0.000000
240.600	64.000	0.000000
249.600	65.000	0.000000
258.000	66.000	0.000000
277.100	67.000	0.000000

Name: SC-0920_W3 Group: Grace Lake
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

0.000	66.900	0.000000
24.000	66.800	0.000000
47.000	67.100	0.000000

Name: SC-0930_DS Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan3DS.

Station(ft)	Elevation(ft)	Manning's N
0.000	64.000	0.011000
0.320	63.600	0.011000
1.550	63.000	0.011000
2.250	62.600	0.011000
4.340	62.700	0.011000
5.150	63.000	0.011000
6.110	63.400	0.011000
8.310	64.000	0.011000

Name: SC-0940_DS Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan2DS3US.

Station(ft)	Elevation(ft)	Manning's N
0.000	65.700	0.150000
2.240	65.000	0.150000
5.290	64.000	0.150000
8.190	63.100	0.150000
9.050	63.000	0.150000
11.130	62.900	0.150000
12.170	63.000	0.150000
19.550	64.000	0.150000
26.880	65.000	0.150000

Name: SC-0950_DS Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan1DS2US.

Station(ft)	Elevation(ft)	Manning's N
0.000	67.980	0.150000
9.010	66.700	0.150000
15.920	66.000	0.150000
17.990	65.800	0.150000
20.380	65.700	0.150000
22.200	66.000	0.150000
23.200	66.300	0.150000
27.190	66.500	0.150000
30.370	67.000	0.150000
40.400	68.000	0.150000
48.060	68.700	0.150000

Name: SC-0950_US Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan1_US.

Station(ft)	Elevation(ft)	Manning's N
0.000	71.000	0.150000
1.190	70.000	0.150000
2.360	69.000	0.150000
3.560	68.000	0.150000
4.580	67.000	0.150000
5.300	66.200	0.150000
11.970	67.000	0.150000
12.060	68.000	0.150000
12.060	69.000	0.150000
12.060	69.700	0.150000

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

```
----------------------------------------------------------------------
          Name: SC-0960_DS                  Group: Grace Lake
   Encroachment: No
```

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION EEW I-4 Chan DS.

Station(ft)	Elevation(ft)	Manning's N
0.000	71.230	0.011000
0.610	71.000	0.011000
2.090	70.000	0.011000
3.570	69.000	0.011000
3.800	68.640	0.011000
8.900	68.640	0.011000
9.240	69.000	0.011000
10.080	70.000	0.011000

```
----------------------------------------------------------------------
          Name: SC-0960_US                  Group: Grace Lake
   Encroachment: No
```

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION EEW I-4 Chan US.

Station(ft)	Elevation(ft)	Manning's N
0.000	71.000	0.011000
0.960	70.000	0.011000
1.930	69.000	0.011000
7.640	68.860	0.011000
7.810	69.000	0.011000
8.830	70.000	0.011000
9.880	71.000	0.011000
10.790	72.000	0.011000

```
=====================================================================================
==== Pipes ==========================================================================
=====================================================================================

        Name: SC-0760-P          From Node: SC-0760           Length(ft): 534.00
       Group: Grace Lake           To Node: SC-0750                Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                               Flow: Both
    Span(in): 36.00          36.00                    Entrance Loss Coef: 0.00
    Rise(in): 36.00          36.00                        Exit Loss Coef: 1.00
  Invert(ft): 53.080         48.960                       Bend Loss Coef: 0.00
 Manning's N: 0.012000       0.012000                  Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY DATA BY SSMC, DATED DEC. 2007.

```
----------------------------------------------------------------------------------------------------
        Name: SC-0790-P          From Node: SC-0790           Length(ft): 30.00
       Group: Grace Lake           To Node: SC-0780                Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                               Flow: Both
    Span(in): 18.00          18.00                    Entrance Loss Coef: 0.50
    Rise(in): 18.00          18.00                        Exit Loss Coef: 0.00
  Invert(ft): 64.050         64.240                       Bend Loss Coef: 0.00
 Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

PIPE DATA OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILTS (DATED 05/19/1985).
ORIGINAL PLANS WERE REFERENCED TO THE NGVD VERTICAL DATUM AND HAD TO BE CONVERTED TO THE NAVD VERTICAL DATUM.
ELEVATIONS SHOWN CORRESPOND TO THE NAVD DATUM.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0815-P          From Node: SC-0815          Length(ft): 412.00
        Group: Grace Lake           To Node: SC-0810               Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 18.00          18.00                   Entrance Loss Coef: 0.50
     Rise(in): 18.00          18.00                       Exit Loss Coef: 0.00
   Invert(ft): 55.000         53.520                      Bend Loss Coef: 0.00
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                     Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

UPSTREAM INVERT OBTAINED FROM THE PROPOSED ICPR MODEL, PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008).
DOWNSTREAM INVERT WAS OBTAINED FROM THE SSMC SURVEY, DATED JULY 2013.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0830-P          From Node: SC-0830          Length(ft): 227.00
        Group: Grace Lake           To Node: SC-0810               Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 54.00          54.00                   Entrance Loss Coef: 0.50
     Rise(in): 54.00          54.00                       Exit Loss Coef: 0.00
   Invert(ft): 51.520         52.330                      Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                     Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CULVERT CROSSING I-4 (NORTH CROSSING)
UPSTREAM (WEST END) INVERT DATA WAS OBTAINED FROM SURVEY PERFORMED BY SSMC, DATED DEC. 2007.
DOWNSTREAM (EAST END) INVERT ELEVATION WAS REVISED BASED ON SURVEY PERFORMED BY SSMC, DATED JULY 2013.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0850-P          From Node: SC-0850          Length(ft): 66.00
        Group: Grace Lake           To Node: SC-0840               Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 36.00          36.00                   Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                       Exit Loss Coef: 0.00
   Invert(ft): 56.690         56.270                      Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                     Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0860-P          From Node: SC-0860          Length(ft): 62.00
        Group: Grace Lake           To Node: SC-0850               Count: 1
                                                       Friction Equation: Automatic
```

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

```
               UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 36.00          36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                         Exit Loss Coef: 0.00
   Invert(ft): 56.920         56.650                        Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

--------------------------------------------------------------------------------------------
         Name: SC-0870-P          From Node: SC-0870           Length(ft): 499.00
        Group: Grace Lake           To Node: SC-0860                Count: 1
                                                         Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 36.00          36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                         Exit Loss Coef: 0.00
   Invert(ft): 59.620         57.050                        Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

--------------------------------------------------------------------------------------------
         Name: SC-0875-P          From Node: SC-0875           Length(ft): 47.00
        Group: Grace Lake           To Node: SC-0870                Count: 1
                                                         Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 36.00          36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                         Exit Loss Coef: 0.00
   Invert(ft): 59.710         59.650                        Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

--------------------------------------------------------------------------------------------
         Name: SC-0890-P          From Node: SC-0890           Length(ft): 220.00
        Group: Grace Lake           To Node: SC-0880                Count: 1
                                                         Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 48.00          48.00                     Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                         Exit Loss Coef: 0.00
   Invert(ft): 58.430         57.840                        Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall
```

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CULVERT CROSSING I-4 (SOUTH CROSSING)
INVERT DATA WAS OBTAINED FROM SURVEY PERFORMED BY SSMC, DATED DEC. 2007.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0970-P          From Node: SC-0970           Length(ft): 200.00
        Group: Grace Lake           To Node: SC-0940                Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 30.00          30.00                   Entrance Loss Coef: 0.50
     Rise(in): 30.00          30.00                       Exit Loss Coef: 0.00
   Invert(ft): 65.780         65.700                      Bend Loss Coef: 0.00
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0980-P1         From Node: SC-0980           Length(ft): 165.00
        Group: Grace Lake           To Node: SC-0970                Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 30.00          30.00                   Entrance Loss Coef: 0.50
     Rise(in): 30.00          30.00                       Exit Loss Coef: 0.00
   Invert(ft): 68.100         66.070                      Bend Loss Coef: 0.00
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO HDR PIPE LINK I-4_30Inch. SURVEY DATA PROVIDED BY SSMC (DATED DEC. 2007)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0980-P2         From Node: SC-0980           Length(ft): 135.00
        Group: Grace Lake           To Node: SC-0960                Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 24.00          24.00                   Entrance Loss Coef: 0.50
     Rise(in): 24.00          24.00                       Exit Loss Coef: 0.00
   Invert(ft): 69.830         68.780                      Bend Loss Coef: 0.00
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR PIPE LINK EEWilliams_24. SURVEY DATA PROVIDED BY SSMC (DATED DEC. 2007)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0985-P          From Node: SC-0985           Length(ft): 230.00
        Group: Grace Lake           To Node: SC-0980                Count: 1
                                                       Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM              Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 42.00          42.00                   Entrance Loss Coef: 0.50
     Rise(in): 42.00          42.00                       Exit Loss Coef: 0.00
   Invert(ft): 67.000         67.000                      Bend Loss Coef: 0.00
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                    Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE SIZE AND INVERT DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR, IN
SUPPORT OF THE GRACE LAKE SINKHOLE ANALYSIS REPORT (DATED APRIL 2008).
IT APPEARS THAT THIS PIPE SEGMENT WAS NOT SURVEYED
PIPE LENGTH WAS ADJUSTED TO MATCH FIELD OBSERVATIONS

----------------------------------------------------------------------------------------------------
         Name: SC-0990-P          From Node: SC-0990           Length(ft): 219.00
        Group: Grace Lake           To Node: SC-0920                Count: 1
                                                       Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM              Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                              Flow: Both
     Span(in): 15.00          15.00                   Entrance Loss Coef: 0.50
     Rise(in): 15.00          15.00                       Exit Loss Coef: 0.00
   Invert(ft): 71.000         52.000                      Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                    Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

EMERGENCY OVERFLOW PIPE FROM THE WOODLAND ELEMENTARY POND TO GRACE LAKE (FINAL PIPE SEGMENT).
PARAMETERS WERE OBTAINED FROM PERMITTED PLANS (REFER TO THE SJRWMD PERMIT NO. 49356-3, DATED 11/21/2007).
NOTE THAT ORIGINAL PLANS WERE REFERENCED TO THE NGVD DATUM.  ELEVATIONS SHOWN HEREIN WERE CONVERTED TO THE NAVD VERTICAL DA

----------------------------------------------------------------------------------------------------
         Name: SC-1000-P          From Node: SC-1000           Length(ft): 112.00
        Group: Grace Lake           To Node: SC-0985                Count: 1
                                                       Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM              Solution Algorithm: Most Restrictive
     Geometry: Arch           Arch                                  Flow: Both
     Span(in): 95.00          95.00                   Entrance Loss Coef: 0.50
     Rise(in): 67.00          67.00                       Exit Loss Coef: 0.00
   Invert(ft): 68.620         68.070                      Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                    Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Pipe Arch 18" Corner Radius CM: 90° headwall

Downstream FHWA Inlet Edge Description:
Pipe Arch 18" Corner Radius CM: 90° headwall

CULVERT CROSSING HICKORY DITCH ROAD
INVERT DATA OBTAINED FROM THE CITY OF LONGWOOD STORMWATER MASTERPLAN
PIPE SIZE WAS ADJUSTED TO REFLECT THE NEAREST STANDARD SIZE FOR AN ARCH PIPE BASED ON SURVEYED DIMENSIONS

==========================================================================================
==== Channels ============================================================================
==========================================================================================

          Name: SC-0930-C          From Node: SC-0930           Length(ft): 106.00
```

```
        Group: Grace Lake           To Node: SC-0920              Count: 1

               UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
     Geometry: Irregular      Irregular               Solution Algorithm: Automatic
   Invert(ft): 62.900         62.600                                Flow: Both
TClpInitZ(ft): 9999.000       9999.000                  Contraction Coef: 0.100
   Manning's N:                                           Expansion Coef: 0.300
 Top Clip(ft):                                        Entrance Loss Coef: 0.000
 Bot Clip(ft):                                            Exit Loss Coef: 0.000
    Main XSec: SC-0940_DS     SC-0930_DS                Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000          0.000                      Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft): 0.000          0.000
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
 LtSdSlp(h/v):
 RtSdSlp(h/v):
```

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK I-4 Channel 3 AND CROSS SECTIONS I-4 Chan2DS3US (UPSTREAM) AND I-4 Chan3DS (DOWNSTREAM)

```
--------------------------------------------------------------------------------------------
         Name: SC-0940-C          From Node: SC-0940           Length(ft): 496.00
        Group: Grace Lake           To Node: SC-0930                Count: 1

               UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
     Geometry: Irregular      Irregular               Solution Algorithm: Automatic
   Invert(ft): 65.700         62.900                                Flow: Both
TClpInitZ(ft): 9999.000       9999.000                  Contraction Coef: 0.100
   Manning's N:                                           Expansion Coef: 0.300
 Top Clip(ft):                                        Entrance Loss Coef: 0.000
 Bot Clip(ft):                                            Exit Loss Coef: 0.000
    Main XSec: SC-0950_DS     SC-0940_DS                Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000          0.000                      Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft): 0.000          0.000
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
 LtSdSlp(h/v):
 RtSdSlp(h/v):
```

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK I-4 Channel 2 AND CROSS SECTIONS I-4 Chan1DS2US (UPSTREAM) AND I-4 Chan2DS3US (DOWNSTREAM)

```
--------------------------------------------------------------------------------------------
         Name: SC-0950-C          From Node: SC-0950           Length(ft): 66.00
        Group: Grace Lake           To Node: SC-0940                Count: 1

               UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
     Geometry: Irregular      Irregular               Solution Algorithm: Automatic
   Invert(ft): 66.200         65.700                                Flow: Both
TClpInitZ(ft): 9999.000       9999.000                  Contraction Coef: 0.100
   Manning's N:                                           Expansion Coef: 0.300
 Top Clip(ft):                                        Entrance Loss Coef: 0.000
 Bot Clip(ft):                                            Exit Loss Coef: 0.000
    Main XSec: SC-0950_US     SC-0950_DS                Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000          0.000                      Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft): 0.000          0.000
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
 LtSdSlp(h/v):
 RtSdSlp(h/v):
```

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK I-4 Channel 1 AND CROSS SECTIONS I-4 Chan 1_US (UPSTREAM) AND I-4 Chan1DS2US (DOWNSTREAM)

```
--------------------------------------------------------------------------------------------
         Name: SC-0960-C          From Node: SC-0960           Length(ft): 15.00
        Group: Grace Lake           To Node: SC-0950                Count: 1

               UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
     Geometry: Irregular      Irregular               Solution Algorithm: Automatic
```

```
    Invert(ft): 68.780        68.640                           Flow: Both
 TClpInitZ(ft): 9999.000      9999.000             Contraction Coef: 0.100
   Manning's N:                                      Expansion Coef: 0.300
  Top Clip(ft):                                  Entrance Loss Coef: 0.000
  Bot Clip(ft):                                      Exit Loss Coef: 0.000
     Main XSec: SC-0960_US    SC-0960_DS           Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000         0.000                 Inlet Ctrl Spec: Use dc
     Aux XSec1:                                   Stabilizer Option: None
  AuxElev2(ft): 0.000         0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):
```

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK 24 Splwy Chan AND CROSS SECTIONS EEW I-4 Chan US (UPSTREAM) AND EEW I-4 Chan DS (DOWNSTREAM)

```
===========================================================================================
==== Drop Structures ======================================================================
===========================================================================================

        Name: SC-0770-D1         From Node: SC-0770           Length(ft): 17.00
       Group: Grace Lake           To Node: SC-0760                Count: 1

              UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
    Geometry: Circular       Circular                Solution Algorithm: Most Restrictive
    Span(in): 36.00          36.00                                 Flow: Both
    Rise(in): 36.00          36.00                   Entrance Loss Coef: 0.500
  Invert(ft): 53.250         53.080                      Exit Loss Coef: 0.000
 Manning's N: 0.012000       0.012000                  Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                       Solution Incs: 10
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

DITCH BOTTOM STRUCTURE LOCATED ALONG THE NORTH RIDGE LAKE CIRCLE WEST RIGHT-OF-WAY, NORTH OF NORTH RIDGE DRIVE (TRACT "C" O

```
*** Weir 1 of 4 for Drop Structure SC-0770-D1 ***
                                                                                TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 10.20                     Invert(ft): 57.170
               Rise(in): 33.60               Control Elev(ft): 57.170

*** Weir 2 of 4 for Drop Structure SC-0770-D1 ***
                                                                                TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 9.60                      Invert(ft): 57.180
               Rise(in): 34.80               Control Elev(ft): 57.180

*** Weir 3 of 4 for Drop Structure SC-0770-D1 ***
                                                                                TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 9.00                      Invert(ft): 57.170
               Rise(in): 34.80               Control Elev(ft): 57.170

*** Weir 4 of 4 for Drop Structure SC-0770-D1 ***
                                                                                TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Horizontal             Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600
```

```
              Span(in): 36.00                    Invert(ft): 58.180
              Rise(in): 54.00               Control Elev(ft): 58.180


-----------------------------------------------------------------------------------------------------
         Name: SC-0770-D2         From Node: SC-0770           Length(ft): 70.00
        Group: Grace Lake           To Node: SC-0800                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Circular       Circular                Solution Algorithm: Most Restrictive
     Span(in): 18.00          18.00                                 Flow: Both
     Rise(in): 18.00          18.00                   Entrance Loss Coef: 0.500
   Invert(ft): 49.660         49.140                      Exit Loss Coef: 0.000
  Manning's N: 0.024000       0.024000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CONTROL STRUCTURE LOCATED WITHIN THE NORTHRIDGE SWALE.
REFER TO SSMC SURVEY DATED DEC. 2007 AND THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS (DATED  05/19/1985).
IT APPEARS THAT SURVEY FROM SSMC DID NOT PICK UP THE WEIR CUT-OUT (SLOT).  HOWEVER, AS BUILTS PROVIDE AN INVERT ELEVATION F

*** Weir 1 of 2 for Drop Structure SC-0770-D2 ***
                                                                                               TABLE
                 Count: 1                     Bottom Clip(in): 0.000
                  Type: Vertical: Mavis          Top Clip(in): 0.000
                  Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 30.00                    Invert(ft): 56.820
              Rise(in): 15.50               Control Elev(ft): 56.820

*** Weir 2 of 2 for Drop Structure SC-0770-D2 ***
                                                                                               TABLE
                 Count: 1                     Bottom Clip(in): 0.000
                  Type: Horizontal               Top Clip(in): 0.000
                  Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 37.00                    Invert(ft): 58.360
              Rise(in): 49.00               Control Elev(ft): 58.360


-----------------------------------------------------------------------------------------------------
         Name: SC-0780-D          From Node: SC-0780           Length(ft): 443.00
        Group: Grace Lake           To Node: SC-0770                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Circular       Circular                Solution Algorithm: Most Restrictive
     Span(in): 18.00          18.00                                 Flow: Both
     Rise(in): 18.00          18.00                   Entrance Loss Coef: 0.500
   Invert(ft): 62.370         55.900                      Exit Loss Coef: 0.000
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

DIVERSION / CONTROL STRUCTURE.  DATA OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS (DATED 05/19/1985).
ELEVATIONS SHOWN WERE CONVERTED TO THE NAVD VERTICAL DATUM.

*** Weir 1 of 1 for Drop Structure SC-0780-D ***
                                                                                               TABLE
                 Count: 1                     Bottom Clip(in): 0.000
                  Type: Vertical: Mavis          Top Clip(in): 0.000
                  Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 50.40                    Invert(ft): 65.500
              Rise(in): 24.84               Control Elev(ft): 65.500
```

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

```
----------------------------------------------------------------------------------------------------
        Name: SC-0900-D          From Node: SC-0900           Length(ft): 164.00
       Group: Grace Lake           To Node: SC-0890                Count: 1

              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
    Geometry: Circular       Circular                  Solution Algorithm: Most Restrictive
    Span(in): 24.00          24.00                                   Flow: Both
    Rise(in): 24.00          24.00                     Entrance Loss Coef: 0.500
  Invert(ft): 59.500         58.160                        Exit Loss Coef: 0.000
 Manning's N: 0.013000       0.013000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

FDOT POND E OUTFALL STRUCTURE.  STRUCTURE DATA AND UPSTREAM INVERT WAS OBTAINED FROM THE FDOT CONSTUCTION PLANS (PREPARED B
IT APPEARS THAT THE FDOT PLANS ARE REFERENCED TO THE NGVD VERTICAL DATUM.  THESE ELEVATIONS WERE CONVERTED TO THE NAVD DATU
DOWNSTREAM PIPE INVERT ELEVATION WAS OBTAINED FROM SURVEYED DATA, PREPARED BY SSMC (DATED DEC. 2007)

*** Weir 1 of 3 for Drop Structure SC-0900-D ***
                                                                                  TABLE
                  Count: 1                       Bottom Clip(in): 0.000
                   Type: Vertical: Mavis            Top Clip(in): 0.000
                   Flow: Both                      Weir Disc Coef: 3.200
               Geometry: Rectangular            Orifice Disc Coef: 0.600

               Span(in): 36.00                        Invert(ft): 63.700
               Rise(in): 15.60                  Control Elev(ft): 63.700

*** Weir 2 of 3 for Drop Structure SC-0900-D ***
                                                                                  TABLE
                  Count: 1                       Bottom Clip(in): 0.000
                   Type: Horizontal                 Top Clip(in): 0.000
                   Flow: Both                      Weir Disc Coef: 3.200
               Geometry: Rectangular            Orifice Disc Coef: 0.600

               Span(in): 37.00                        Invert(ft): 65.000
               Rise(in): 49.00                  Control Elev(ft): 65.000

*** Weir 3 of 3 for Drop Structure SC-0900-D ***
                                                                                  TABLE
                  Count: 1                       Bottom Clip(in): 0.000
                   Type: Vertical: Mavis            Top Clip(in): 0.000
                   Flow: Both                      Weir Disc Coef: 3.200
               Geometry: Circular               Orifice Disc Coef: 0.600

               Span(in): 2.00                         Invert(ft): 60.000
               Rise(in): 2.00                   Control Elev(ft): 60.000


----------------------------------------------------------------------------------------------------
        Name: SC-0925-D          From Node: SC-0925           Length(ft): 360.00
       Group: Grace Lake           To Node: SC-0920                Count: 1

              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
    Geometry: Circular       Circular                  Solution Algorithm: Most Restrictive
    Span(in): 18.00          18.00                                   Flow: Both
    Rise(in): 18.00          18.00                     Entrance Loss Coef: 0.500
  Invert(ft): 69.350         64.010                        Exit Loss Coef: 0.000
 Manning's N: 0.013000       0.013000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CONTROL STRUCTURE DATA WAS OBTAINED FROM THE AS-BUILT PLANS OF THE NORTHRIDGE SUBDIVISION, PREPARED BY CPH, DATED 05/19/198
CONSTRUCTION PLANS WERE REFERENCED TO THE NGVD VERTICAL DATUM AND CONVERTED TO THE NAVD DATUM.

*** Weir 1 of 2 for Drop Structure SC-0925-D ***
                                                                                  TABLE
                  Count: 1                       Bottom Clip(in): 0.000
                   Type: Vertical: Mavis            Top Clip(in): 0.000
                   Flow: Both                      Weir Disc Coef: 3.200
               Geometry: Rectangular            Orifice Disc Coef: 0.600
```

```
               Span(in): 12.00                    Invert(ft): 74.020
               Rise(in): 46.70              Control Elev(ft): 74.020

*** Weir 2 of 2 for Drop Structure SC-0925-D ***
                                                                               TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Horizontal             Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 36.00                    Invert(ft): 77.910
               Rise(in): 54.00              Control Elev(ft): 77.910


----------------------------------------------------------------------------------------------------
         Name: SC-0995-D          From Node: SC-0995           Length(ft): 1211.00
        Group: Grace Lake           To Node: SC-0990                Count: 1

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Circular       Circular                  Solution Algorithm: Most Restrictive
     Span(in): 15.00          15.00                                   Flow: Both
     Rise(in): 15.00          15.00                     Entrance Loss Coef: 0.500
   Invert(ft): 80.000         76.250                        Exit Loss Coef: 0.000
  Manning's N: 0.012000       0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

EMERGENCY OVERFLOW STRUCTURE AND PIPE FROM THE WOODLAND ELEMENTARY POND TO GRACE LAKE.
PARAMETERS WERE OBTAINED FROM PERMITTED PLANS (REFER TO THE SJRWMD PERMIT NO. 49356-3, DATED 11/21/2007).
NOTE THAT ORIGINAL PLANS WERE REFERENCED TO THE NGVD DATUM.  ELEVATIONS SHOWN HEREIN WERE CONVERTED TO THE NAVD VERTICAL DA

*** Weir 1 of 1 for Drop Structure SC-0995-D ***
                                                                               TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Horizontal             Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 36.00                    Invert(ft): 83.160
               Rise(in): 54.00              Control Elev(ft): 83.160


==========================================================================================
==== Weirs ===============================================================================
==========================================================================================

         Name: SC-0770-W          From Node: SC-0770
        Group: Grace Lake           To Node: SC-0750
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Rectangular

                  Span(in): 180.00
                  Rise(in): 999.00
                Invert(ft): 58.500
      Control Elevation(ft): 58.500
                                                     TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
       Weir Discharge Coef: 2.800
    Orifice Discharge Coef: 0.600

OVERTOPPING WEIR.  PARAMETERS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

----------------------------------------------------------------------------------------------------
         Name: SC-0780-W          From Node: SC-0780
        Group: Grace Lake           To Node: SC-0770
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Rectangular

                  Span(in): 2400.00
                  Rise(in): 999.00
                Invert(ft): 67.900
      Control Elevation(ft): 67.900
                                                     TABLE
            Bottom Clip(in): 0.000
```

```
          Top Clip(in): 0.000
   Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600
```

OVERLAND OVERTOPPING FROM POND TO THE NORTHRIDGE SWALE.
ELEVATION WAS OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS AND COMPARED TO THE 1-FT TOPOGRAPHIC MAP.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0800-W1          From Node: SC-0800
        Group: Grace Lake            To Node: SC-0770
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 1200.00
                    Rise(in): 999.00
                  Invert(ft): 58.000
       Control Elevation(ft): 58.000
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600
```

NORTHRIDGE DEPRESSIONAL AREA BERM OVERTOPPING
PARAMETERS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP AND SURVEYED DATA.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0800-W2          From Node: SC-0800
        Group: Grace Lake            To Node: SC-0750
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 600.00
                    Rise(in): 999.00
                  Invert(ft): 58.500
       Control Elevation(ft): 58.500
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600
```

OVERTOPPING WEIR. PARAMETERS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0810-W1          From Node: SC-0810
        Group: Grace Lake            To Node: SC-0800
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0810_W1
                  Invert(ft): 57.200
       Control Elevation(ft): 57.200
      Struct Opening Dim(ft): 9999.00
                                              TABLE
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0810-W2          From Node: SC-0810
        Group: Grace Lake            To Node: SC-0770
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0810_W2
                  Invert(ft): 58.500
       Control Elevation(ft): 58.500
      Struct Opening Dim(ft): 9999.00
                                              TABLE
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0820-W1          From Node: SC-0820
```

```
        Group: Grace Lake            To Node: SC-0815
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Trapezoidal

            Bottom Width(ft): 5.00
        Left Side Slope(h/v): 6.00
       Right Side Slope(h/v): 6.00
                  Invert(ft): 55.000
       Control Elevation(ft): 55.000
      Struct Opening Dim(ft): 9999.00
                                             TABLE
             Bottom Clip(ft): 0.000
                Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

CONCRETE WEIR (OUTFALL)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0820-W2          From Node: SC-0820
        Group: Grace Lake            To Node: SC-0800
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 600.00
                    Rise(in): 999.00
                  Invert(ft): 56.500
       Control Elevation(ft): 56.500
                                             TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

POND BERM OVERTOPPING

```
----------------------------------------------------------------------------------------------------
         Name: SC-0840-W           From Node: SC-0840
        Group: Grace Lake            To Node: SC-0830
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0840_W
                  Invert(ft): 54.000
       Control Elevation(ft): 54.000
      Struct Opening Dim(ft): 9999.00
                                             TABLE
             Bottom Clip(ft): 0.000
                Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0875-W           From Node: SC-0875
        Group: Grace Lake            To Node: SC-0840
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0875_W
                  Invert(ft): 65.500
       Control Elevation(ft): 65.500
      Struct Opening Dim(ft): 9999.00
                                             TABLE
             Bottom Clip(ft): 0.000
                Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

OVERLAND OVERTOPPING

```
----------------------------------------------------------------------------------------------------
         Name: SC-0880-W           From Node: SC-0880
        Group: Grace Lake            To Node: SC-0875
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0880_W
                  Invert(ft): 62.600
       Control Elevation(ft): 62.600
      Struct Opening Dim(ft): 9999.00
```

```
                                             TABLE
             Bottom Clip(ft): 0.000
                Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0890-W          From Node: SC-0890
        Group: Grace Lake           To Node: SC-0810
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Irregular

                        XSec: SC-0890_W
                 Invert(ft): 67.700
       Control Elevation(ft): 67.700
      Struct Opening Dim(ft): 9999.00
                                             TABLE
             Bottom Clip(ft): 0.000
                Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600

OVERTOPPING OF I-4 SWALE AT HIGH POING ALONG THE EAST RIGHT-OF-WAY.
POTENTIAL INTERCONNECTION OF THE TWO (2) CULVERTS CROSSING I-4 (NORTH AND SOUTH).
CROSS SECTION DATA WAS OBTAINED FROM SURVEY PERFORMED BY SSMC (DATED JULY 2013).

----------------------------------------------------------------------------------------------------
         Name: SC-0900-W          From Node: SC-0900
        Group: Grace Lake           To Node: SC-0890
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Rectangular

                    Span(in): 120.00
                    Rise(in): 999.00
                  Invert(ft): 68.000
       Control Elevation(ft): 68.000
                                             TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600

ELEVATIONS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

----------------------------------------------------------------------------------------------------
         Name: SC-0910-W          From Node: SC-0910
        Group: Grace Lake           To Node: SC-0890
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Rectangular

                    Span(in): 960.00
                    Rise(in): 999.00
                  Invert(ft): 59.500
       Control Elevation(ft): 59.500
                                             TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600

OVERTOPPING ELEVATION WAS ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

----------------------------------------------------------------------------------------------------
         Name: SC-0920-W1         From Node: SC-0920
        Group: Grace Lake           To Node: SC-0910
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Irregular

                        XSec: SC-0920_W1
                  Invert(ft): 59.500
       Control Elevation(ft): 59.500
      Struct Opening Dim(ft): 9999.00
                                             TABLE
             Bottom Clip(ft): 0.000
                Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

```
----------------------------------------------------------------------------------------------------
         Name: SC-0920-W2          From Node: SC-0920
        Group: Grace Lake            To Node: SC-0890
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 1160.00
                    Rise(in): 999.00
                  Invert(ft): 62.500
       Control Elevation(ft): 62.500
                                            TABLE
              Bottom Clip(in): 0.000
                 Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0920-W3          From Node: SC-0920
        Group: Grace Lake            To Node: SC-0790
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0920_W3
                  Invert(ft): 66.800
       Control Elevation(ft): 66.800
      Struct Opening Dim(ft): 9999.00
                                            TABLE
              Bottom Clip(ft): 0.000
                 Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600

PARAMETERS ARE BASED ON SURVEY DATA OBTAINED FROM SSMC, DATED JULY 2013.

----------------------------------------------------------------------------------------------------
         Name: SC-0925-W           From Node: SC-0925
        Group: Grace Lake            To Node: SC-0920
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 680.00
                    Rise(in): 999.00
                  Invert(ft): 78.700
       Control Elevation(ft): 78.700
                                            TABLE
              Bottom Clip(in): 0.000
                 Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0970-W           From Node: SC-0970
        Group: Grace Lake            To Node: SC-0940
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 120.00
                    Rise(in): 999.00
                  Invert(ft): 71.000
       Control Elevation(ft): 71.000
                                            TABLE
              Bottom Clip(in): 0.000
                 Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0985-W           From Node: SC-0985
        Group: Grace Lake            To Node: SC-0980
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 600.00
                    Rise(in): 999.00
                  Invert(ft): 73.500
       Control Elevation(ft): 73.500
```

```
                                              TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600

PENELOPE POND OVERTOPPING
PARAMETERS WERE ESTIMATED USING THE 1-FT TOPOGRAPHIC MAPS

----------------------------------------------------------------------------------------------------
         Name: SC-1000-W          From Node: SC-1000
        Group: Grace Lake           To Node: SC-0985
         Flow: Both                   Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 600.00
                    Rise(in): 999.00
                  Invert(ft): 77.500
       Control Elevation(ft): 77.500
                                              TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600

OVERTOPPING HICKORY TREE ROAD

==========================================================================================
==== Hydrology Simulations ===============================================================
==========================================================================================

         Name: 010-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\010-024.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 6.80

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 025-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\025-024.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 8.50

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 025-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\025-096.R32

      Override Defaults: Yes
    Storm Duration(hrs): 96.00
          Rainfall File: Sjrwmd96
    Rainfall Amount(in): 11.30

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 100-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\100-024.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 11.40

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00
```

```
----------------------------------------------------------------------------------------------------
         Name: 100-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\100-096.R32

      Override Defaults: Yes
    Storm Duration(hrs): 96.00
           Rainfall File: Sjrwmd96
    Rainfall Amount(in): 15.00

Time(hrs)       Print Inc(min)
--------------- ---------------
96.000          5.00

----------------------------------------------------------------------------------------------------
         Name: MA-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\MA-024.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
           Rainfall File: Flmod
    Rainfall Amount(in): 4.40

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

==========================================================================================
==== Routing Simulations =================================================================
==========================================================================================

         Name: 010-024            Hydrology Sim: 010-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\010-024.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 36.00
     Min Calc Time(sec): 0.1000               Max Calc Time(sec): 1.0000
        Boundary Stages: 010-024                  Boundary Flows:

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
10-YEAR STORM EVENT (24-HOUR DURATION)

Time(hrs)       Print Inc(min)
--------------- ---------------
999.000         15.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes


----------------------------------------------------------------------------------------------------
         Name: 025-024            Hydrology Sim: 025-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\025-024.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 36.00
     Min Calc Time(sec): 0.1000               Max Calc Time(sec): 1.0000
        Boundary Stages: 025-024                  Boundary Flows:

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
25-YEAR STORM EVENT (24-HOUR DURATION)

Time(hrs)       Print Inc(min)
--------------- ---------------
999.000         15.000

Group           Run
--------------- -----
```

```
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 025-096            Hydrology Sim: 025-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\025-096.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 120.00
     Min Calc Time(sec): 0.1000               Max Calc Time(sec): 60.0000
        Boundary Stages: 100-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
96.000          15.000
120.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 100-024            Hydrology Sim: 100-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\100-024.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 100-024                  Boundary Flows:

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
100-YEAR STORM EVENT (24-HOUR DURATION)

Time(hrs)       Print Inc(min)
--------------- ---------------
48.000          15.000
336.000         60.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 100-096            Hydrology Sim: 100-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\100-096.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 180.00
     Min Calc Time(sec): 0.1000               Max Calc Time(sec): 60.0000
        Boundary Stages: 100-024                  Boundary Flows:
```

Time(hrs)	Print Inc(min)
96.000	15.000
120.000	30.000
180.000	60.000

Group	Run
BASE	Yes
Cranes	Yes
Gee	Yes
Grace Lake	Yes
Soldier	Yes

Name: MA-024 Hydrology Sim: MA-024
Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\MA-024.I32

Execute: No Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 36.00
Min Calc Time(sec): 0.1000 Max Calc Time(sec): 1.0000
Boundary Stages: 010-024 Boundary Flows:

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
MEAN ANNUAL STORM EVENT (24-HOUR DURATION)

Time(hrs)	Print Inc(min)
999.000	15.000

Group	Run
BASE	Yes
Cranes	Yes
Gee	Yes
Grace Lake	Yes
Soldier	Yes

==== Boundary Conditions ====

Name: 010-024 Node: GC-1000 Type: Stage

Time(hrs)	Stage(ft)
0.000	50.400
0.500	50.400
1.000	50.400
1.500	50.400
2.000	50.400
2.500	50.400
3.000	50.400
3.500	50.400
4.000	50.400
4.500	50.400
5.000	50.400
5.500	50.400
6.000	50.400
6.500	50.400
7.000	50.400
7.500	50.400
8.000	50.400
8.500	50.410
8.670	50.410
8.830	50.420
9.000	50.420
9.170	50.430
9.330	50.430
9.500	50.440
9.670	50.440
9.830	50.450
10.000	50.460
10.170	50.470
10.330	50.470

10.500	50.480
10.670	50.490
10.830	50.510
11.000	50.520
11.170	50.530
11.330	50.550
11.500	50.570
11.670	50.600
11.830	50.650
12.000	50.740
12.170	50.840
12.330	50.960
12.500	51.080
12.670	51.170
12.830	51.250
13.000	51.320
13.170	51.370
13.330	51.420
13.500	51.460
13.670	51.500
13.830	51.540
14.000	51.570
14.170	51.600
14.330	51.620
14.500	51.650
14.670	51.680
14.830	51.700
15.000	51.720
15.170	51.750
15.330	51.770
15.500	51.790
15.670	51.810
15.830	51.830
16.000	51.850
16.170	51.870
16.670	51.930
17.170	51.980
17.670	52.040
18.170	52.090
18.670	52.150
19.170	52.200
19.670	52.250
20.170	52.300
20.670	52.340
21.170	52.390
21.670	52.430
22.170	52.470
22.670	52.500
23.170	52.540
23.670	52.570
24.170	52.600
24.670	52.620
25.170	52.640
25.670	52.650
26.170	52.660
26.670	52.670
27.170	52.670
27.670	52.680
28.170	52.680
28.670	52.680
29.170	52.690
29.670	52.690
30.170	52.680
30.670	52.680
31.170	52.680
31.670	52.680
32.170	52.670
32.670	52.670
33.170	52.660
33.670	52.660
34.170	52.650
34.670	52.640
35.170	52.640
35.670	52.630
36.000	52.620

Name: 010-024 Node: SC-3000 Type: Stage

Time(hrs)	Stage(ft)
0.000	42.140

0.500	42.140
1.000	42.140
1.500	42.140
2.000	42.140
2.500	42.140
3.000	42.150
3.500	42.150
4.000	42.150
4.500	42.150
5.000	42.150
5.500	42.160
6.000	42.160
6.500	42.160
7.000	42.170
7.500	42.180
8.000	42.190
8.500	42.210
8.750	42.220
9.000	42.240
9.250	42.250
9.500	42.270
9.750	42.280
10.000	42.300
10.250	42.310
10.500	42.330
10.750	42.350
11.000	42.370
11.250	42.390
11.500	42.420
11.750	42.470
12.000	42.570
12.250	42.700
12.500	42.830
12.750	42.910
13.000	42.940
13.250	42.950
13.500	42.950
13.750	42.940
14.000	42.940
14.250	42.930
14.500	42.930
14.750	42.930
15.000	42.940
15.250	42.970
15.500	43.000
15.750	43.020
16.000	43.050
16.250	43.080
16.750	43.120
17.250	43.160
17.750	43.190
18.250	43.220
18.750	43.240
19.250	43.250
19.750	43.270
20.250	43.280
20.750	43.290
21.250	43.300
21.750	43.310
22.250	43.320
22.750	43.320
23.250	43.330
23.750	43.350
24.250	43.370
24.750	43.390
25.250	43.410
25.750	43.420
26.250	43.430
26.750	43.450
27.250	43.460
27.750	43.470
28.250	43.470
28.750	43.480
29.250	43.480
29.750	43.490
30.250	43.490
30.750	43.490
31.250	43.490
31.750	43.490
32.250	43.490
32.750	43.490
33.250	43.490

33.750	43.490
34.250	43.480
34.750	43.480
35.250	43.480
35.750	43.470
36.250	43.460
36.750	43.460
37.250	43.450
37.750	43.440
38.250	43.440
38.750	43.430
39.250	43.420
39.750	43.410
40.250	43.400
40.750	43.390
41.250	43.380
41.750	43.370
42.250	43.360
42.750	43.350
43.250	43.340
43.750	43.330
44.250	43.310
44.750	43.300
45.250	43.290
45.750	43.280
46.250	43.270
46.750	43.250
47.250	43.240
47.750	43.230
48.000	43.220

Name: 010-024　　Node: SC-3010　　Type: Stage

Time(hrs)	Stage(ft)
0.000	45.860
0.500	46.020
1.000	46.080
1.500	46.090
2.000	46.100
2.500	46.110
3.000	46.110
3.500	46.120
4.000	46.120
4.500	46.120
5.000	46.130
5.500	46.130
6.000	46.130
6.500	46.130
7.000	46.130
7.500	46.130
8.000	46.130
8.500	46.130
8.750	46.140
9.000	46.140
9.250	46.140
9.500	46.140
9.750	46.150
10.000	46.150
10.250	46.160
10.500	46.160
10.750	46.170
11.000	46.180
11.250	46.200
11.500	46.220
11.750	46.260
12.000	46.330
12.250	46.430
12.500	46.530
12.750	46.600
13.000	46.650
13.250	46.690
13.500	46.720
13.750	46.740
14.000	46.770
14.250	46.800
14.500	46.820
14.750	46.850
15.000	46.870
15.250	46.900
15.500	46.920

15.750	46.950
16.000	46.980
16.250	47.000
16.750	47.060
17.250	47.120
17.750	47.180
18.250	47.240
18.750	47.300
19.250	47.350
19.750	47.410
20.250	47.460
20.750	47.490
21.250	47.520
21.750	47.550
22.250	47.580
22.750	47.730
23.250	48.070
23.750	48.530
24.250	48.700
24.750	48.810
25.250	48.880
25.750	48.920
26.250	48.950
26.750	48.970
27.250	48.980
27.750	48.980
28.250	48.980
28.750	48.970
29.250	48.960
29.750	48.950
30.250	48.940
30.750	48.920
31.250	48.910
31.750	48.890
32.250	48.870
32.750	48.850
33.250	48.830
33.750	48.810
34.250	48.790
34.750	48.770
35.250	48.750
35.750	48.720
36.250	48.700
36.750	48.680
37.250	48.660
37.750	48.640
38.250	48.620
38.750	48.600
39.250	48.580
39.750	48.560
40.250	48.540
40.750	48.520
41.250	48.510
41.750	48.490
42.250	48.470
42.750	48.290
43.250	48.270
43.750	48.240
44.250	48.220
44.750	48.200
45.250	48.170
45.750	48.150
46.250	48.130
46.750	48.110
47.250	48.090
47.750	48.060
48.000	48.050

Name: 010-024 Node: SC-5000 Type: Stage

Time(hrs)	Stage(ft)
0.000	41.060
0.500	41.060
1.000	41.060
1.500	41.060
2.000	41.060
2.500	41.060
3.000	41.060
3.500	41.060
4.000	41.060

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

4.500	41.060
5.000	41.090
5.500	41.180
6.000	41.310
6.500	41.400
7.000	41.520
7.500	41.670
8.000	41.810
8.500	41.960
8.750	42.050
9.000	42.130
9.250	42.230
9.500	42.320
9.750	42.400
10.000	42.480
10.250	42.570
10.500	42.670
10.750	42.770
11.000	42.870
11.250	42.970
11.500	43.120
11.750	43.540
12.000	43.920
12.250	44.110
12.500	44.080
12.750	43.900
13.000	43.750
13.250	43.700
13.500	43.720
13.750	43.740
14.000	43.750
14.250	43.750
14.500	43.780
14.750	43.840
15.000	43.910
15.250	43.960
15.500	44.000
15.750	44.020
16.000	44.030
16.250	44.030
16.750	44.020
17.250	44.000
17.750	43.960
18.250	43.900
18.750	43.840
19.250	43.790
19.750	43.740
20.250	43.700
20.750	43.670
21.250	43.660
21.750	43.650
22.250	43.650
22.750	43.640
23.250	43.630
23.750	43.620
24.250	43.600
24.750	43.570
25.250	43.540
25.750	43.510
26.250	43.480
26.750	43.460
27.250	43.430
27.750	43.430
28.250	43.320
28.750	42.350
29.250	42.150
29.750	42.080
30.250	42.030
30.750	42.000
31.250	41.970
31.750	41.950
32.250	41.920
32.750	41.890
33.250	41.860
33.750	41.830
34.250	41.810
34.750	41.790
35.250	41.770
35.750	41.750
36.250	41.730
36.750	41.710
37.250	41.700

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

37.750	41.680
38.250	41.670
38.750	41.660
39.250	41.650
39.750	41.640
40.250	41.630
40.750	41.620
41.250	41.610
41.750	41.600
42.250	41.590
42.750	41.580
43.250	41.570
43.750	41.560
44.250	41.550
44.750	41.550
45.250	41.540
45.750	41.530
46.250	41.520
46.750	41.520
47.250	41.510
47.750	41.510
48.000	41.510

Name: 025-024 Node: GC-1000 Type: Stage

Time(hrs)	Stage(ft)
0.000	50.400
0.500	50.400
1.000	50.400
1.500	50.400
2.000	50.400
2.500	50.400
3.000	50.400
3.500	50.400
4.000	50.400
4.500	50.400
5.000	50.400
5.500	50.400
6.000	50.400
6.500	50.400
7.000	50.410
7.500	50.420
8.000	50.430
8.500	50.450
8.670	50.450
8.830	50.460
9.000	50.470
9.170	50.480
9.330	50.480
9.500	50.490
9.670	50.500
9.830	50.510
10.000	50.520
10.170	50.530
10.330	50.550
10.500	50.560
10.670	50.570
10.830	50.590
11.000	50.610
11.170	50.630
11.330	50.650
11.500	50.680
11.670	50.710
11.830	50.780
12.000	50.880
12.170	51.020
12.330	51.170
12.500	51.310
12.670	51.440
12.830	51.530
13.000	51.610
13.170	51.680
13.330	51.740
13.500	51.800
13.670	51.840
13.830	51.890
14.000	51.920
14.170	51.960
14.330	52.000
14.500	52.030

14.670	52.060
14.830	52.090
15.000	52.120
15.170	52.140
15.330	52.170
15.500	52.200
15.670	52.220
15.830	52.250
16.000	52.280
16.170	52.300
16.670	52.380
17.170	52.450
17.670	52.520
18.170	52.590
18.670	52.650
19.170	52.720
19.670	52.770
20.170	52.830
20.670	52.890
21.170	52.940
21.670	52.980
22.170	53.030
22.670	53.070
23.170	53.110
23.670	53.140
24.170	53.170
24.670	53.190
25.170	53.200
25.670	53.210
26.170	53.220
26.670	53.230
27.170	53.230
27.670	53.230
28.170	53.240
28.670	53.230
29.170	53.230
29.670	53.230
30.170	53.220
30.670	53.220
31.170	53.210
31.670	53.210
32.170	53.200
32.670	53.190
33.170	53.180
33.670	53.170
34.170	53.160
34.670	53.150
35.170	53.140
35.670	53.130
36.000	53.120

Name: 025-024 Node: SC-3000 Type: Stage

Time(hrs)	Stage(ft)
0.000	42.140
0.500	42.140
1.000	42.140
1.500	42.140
2.000	42.140
2.500	42.140
3.000	42.150
3.500	42.150
4.000	42.150
4.500	42.150
5.000	42.160
5.500	42.160
6.000	42.170
6.500	42.180
7.000	42.190
7.500	42.210
8.000	42.240
8.500	42.270
8.750	42.280
9.000	42.300
9.250	42.320
9.500	42.330
9.750	42.350
10.000	42.370
10.250	42.380
10.500	42.400

10.750	42.420
11.000	42.450
11.250	42.470
11.500	42.500
11.750	42.560
12.000	42.670
12.250	42.820
12.500	42.950
12.750	43.030
13.000	43.070
13.250	43.080
13.500	43.080
13.750	43.080
14.000	43.090
14.250	43.110
14.500	43.150
14.750	43.200
15.000	43.250
15.250	43.300
15.500	43.340
15.750	43.370
16.000	43.410
16.250	43.440
16.750	43.490
17.250	43.540
17.750	43.570
18.250	43.600
18.750	43.620
19.250	43.640
19.750	43.650
20.250	43.670
20.750	43.690
21.250	43.720
21.750	43.750
22.250	43.780
22.750	43.810
23.250	43.830
23.750	43.860
24.250	43.880
24.750	43.900
25.250	43.910
25.750	43.920
26.250	43.930
26.750	43.940
27.250	43.940
27.750	43.950
28.250	43.950
28.750	43.950
29.250	43.950
29.750	43.950
30.250	43.950
30.750	43.940
31.250	43.940
31.750	43.930
32.250	43.930
32.750	43.920
33.250	43.910
33.750	43.910
34.250	43.900
34.750	43.890
35.250	43.880
35.750	43.870
36.250	43.850
36.750	43.840
37.250	43.830
37.750	43.820
38.250	43.800
38.750	43.790
39.250	43.780
39.750	43.760
40.250	43.750
40.750	43.730
41.250	43.720
41.750	43.700
42.250	43.690
42.750	43.670
43.250	43.660
43.750	43.640
44.250	43.630
44.750	43.610
45.250	43.600
45.750	43.580

46.250	43.570
46.750	43.550
47.250	43.530
47.750	43.520
48.000	43.510

Name: 025-024 Node: SC-3010 Type: Stage

Time(hrs)	Stage(ft)
0.000	45.860
0.500	46.020
1.000	46.080
1.500	46.090
2.000	46.100
2.500	46.110
3.000	46.110
3.500	46.120
4.000	46.120
4.500	46.120
5.000	46.130
5.500	46.130
6.000	46.130
6.500	46.130
7.000	46.130
7.500	46.130
8.000	46.140
8.500	46.150
8.750	46.150
9.000	46.150
9.250	46.160
9.500	46.160
9.750	46.170
10.000	46.180
10.250	46.190
10.500	46.200
10.750	46.220
11.000	46.240
11.250	46.260
11.500	46.290
11.750	46.330
12.000	46.400
12.250	46.570
12.500	46.710
12.750	46.800
13.000	46.860
13.250	46.910
13.500	46.940
13.750	46.980
14.000	47.010
14.250	47.040
14.500	47.070
14.750	47.100
15.000	47.130
15.250	47.160
15.500	47.190
15.750	47.220
16.000	47.260
16.250	47.290
16.750	47.350
17.250	47.410
17.750	47.460
18.250	47.500
18.750	47.530
19.250	47.570
19.750	47.720
20.250	48.190
20.750	48.710
21.250	48.950
21.750	49.120
22.250	49.240
22.750	49.310
23.250	49.370
23.750	49.410
24.250	49.430
24.750	49.430
25.250	49.430
25.750	49.440
26.250	49.430
26.750	49.430
27.250	49.420

27.750	49.410
28.250	49.400
28.750	49.380
29.250	49.360
29.750	49.340
30.250	49.320
30.750	49.300
31.250	49.280
31.750	49.250
32.250	49.230
32.750	49.190
33.250	49.160
33.750	49.130
34.250	49.100
34.750	49.080
35.250	49.050
35.750	49.020
36.250	48.990
36.750	48.960
37.250	48.930
37.750	48.900
38.250	48.870
38.750	48.840
39.250	48.820
39.750	48.790
40.250	48.770
40.750	48.740
41.250	48.720
41.750	48.700
42.250	48.670
42.750	48.650
43.250	48.630
43.750	48.610
44.250	48.590
44.750	48.570
45.250	48.550
45.750	48.530
46.250	48.510
46.750	48.500
47.250	48.480
47.750	48.460
48.000	48.290

Name: 025-024 Node: SC-5000 Type: Stage

Time(hrs)	Stage(ft)
0.000	41.060
0.500	41.060
1.000	41.060
1.500	41.060
2.000	41.060
2.500	41.060
3.000	41.060
3.500	41.060
4.000	41.060
4.500	41.140
5.000	41.280
5.500	41.390
6.000	41.510
6.500	41.670
7.000	41.830
7.500	42.000
8.000	42.170
8.500	42.340
8.750	42.420
9.000	42.500
9.250	42.580
9.500	42.650
9.750	42.730
10.000	42.800
10.250	42.870
10.500	42.960
10.750	43.070
11.000	43.160
11.250	43.240
11.500	43.430
11.750	43.690
12.000	44.060
12.250	44.120
12.500	44.140

12.750	44.090
13.000	43.950
13.250	43.930
13.500	43.870
13.750	43.960
14.000	44.130
14.250	44.240
14.500	44.340
14.750	44.420
15.000	44.490
15.250	44.540
15.500	44.570
15.750	44.580
16.000	44.580
16.250	44.570
16.750	44.520
17.250	44.470
17.750	44.410
18.250	44.350
18.750	44.290
19.250	44.240
19.750	44.180
20.250	44.130
20.750	44.070
21.250	43.990
21.750	43.910
22.250	43.840
22.750	43.770
23.250	43.720
23.750	43.690
24.250	43.660
24.750	43.630
25.250	43.600
25.750	43.570
26.250	43.550
26.750	43.530
27.250	43.510
27.750	43.480
28.250	43.460
28.750	43.440
29.250	43.410
29.750	43.400
30.250	42.620
30.750	42.160
31.250	42.050
31.750	42.010
32.250	41.980
32.750	41.960
33.250	41.930
33.750	41.910
34.250	41.900
34.750	41.890
35.250	41.880
35.750	41.860
36.250	41.850
36.750	41.840
37.250	41.830
37.750	41.820
38.250	41.830
38.750	41.810
39.250	41.800
39.750	41.790
40.250	41.770
40.750	41.760
41.250	41.750
41.750	41.730
42.250	41.720
42.750	41.710
43.250	41.700
43.750	41.680
44.250	41.670
44.750	41.660
45.250	41.650
45.750	41.640
46.250	41.630
46.750	41.620
47.250	41.610
47.750	41.600
48.000	41.600

Name: 100-024 Node: GC-1000 Type: Stage

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Time(hrs)	Stage(ft)
0.000	50.400
0.500	50.400
1.000	50.400
1.500	50.400
2.000	50.400
2.500	50.400
3.000	50.410
3.500	50.410
4.000	50.410
4.500	50.410
5.000	50.420
5.500	50.420
6.000	50.440
6.500	50.450
7.000	50.460
7.500	50.480
8.000	50.510
8.500	50.540
8.670	50.550
8.830	50.560
9.000	50.570
9.170	50.580
9.330	50.600
9.500	50.610
9.670	50.630
9.830	50.640
10.000	50.660
10.170	50.680
10.330	50.700
10.500	50.720
10.670	50.740
10.830	50.770
11.000	50.790
11.170	50.820
11.330	50.850
11.500	50.890
11.670	50.950
11.830	51.040
12.000	51.170
12.170	51.350
12.330	51.560
12.500	51.760
12.670	51.940
12.830	52.080
13.000	52.200
13.170	52.310
13.330	52.410
13.500	52.490
13.670	52.570
13.830	52.640
14.000	52.710
14.170	52.770
14.330	52.830
14.500	52.880
14.670	52.930
14.830	52.970
15.000	53.010
15.170	53.050
15.330	53.080
15.500	53.120
15.670	53.150
15.830	53.180
16.000	53.210
16.170	53.230
16.670	53.310
17.170	53.380
17.670	53.440
18.170	53.500
18.670	53.560
19.170	53.610
19.670	53.660
20.170	53.700
20.670	53.740
21.170	53.780
21.670	53.820
22.170	53.850
22.670	53.880
23.170	53.910
23.670	53.940

24.170	53.970
24.670	53.980
25.170	54.000
25.670	54.000
26.170	54.010
26.670	54.010
27.170	54.010
27.670	54.000
28.170	54.000
28.670	54.000
29.170	53.990
29.670	53.990
30.170	53.980
30.670	53.970
31.170	53.970
31.670	53.960
32.170	53.950
32.670	53.940
33.170	53.920
33.670	53.910
34.170	53.900
34.670	53.890
35.170	53.870
35.670	53.860
36.000	53.850

Name: 100-024 Node: SC-3000 Type: Stage

Time(hrs)	Stage(ft)
0.000	42.140
0.500	42.140
1.000	42.140
1.500	42.140
2.000	42.140
2.500	42.140
3.000	42.150
3.500	42.150
4.000	42.150
4.500	42.160
5.000	42.170
5.500	42.180
6.000	42.210
6.500	42.230
7.000	42.270
7.500	42.300
8.000	42.330
8.500	42.370
8.750	42.380
9.000	42.400
9.250	42.420
9.500	42.440
9.750	42.460
10.000	42.470
10.250	42.500
10.500	42.520
10.750	42.540
11.000	42.570
11.250	42.600
11.500	42.630
11.750	42.700
12.000	42.830
12.250	42.980
12.500	43.130
12.750	43.230
13.000	43.300
13.250	43.350
13.500	43.390
13.750	43.450
14.000	43.540
14.250	43.610
14.500	43.690
14.750	43.750
15.000	43.810
15.250	43.860
15.500	43.910
15.750	43.950
16.000	43.990
16.250	44.020
16.750	44.090
17.250	44.150

17.750	44.200
18.250	44.250
18.750	44.300
19.250	44.350
19.750	44.390
20.250	44.430
20.750	44.460
21.250	44.490
21.750	44.520
22.250	44.550
22.750	44.570
23.250	44.600
23.750	44.620
24.250	44.640
24.750	44.650
25.250	44.660
25.750	44.670
26.250	44.670
26.750	44.670
27.250	44.670
27.750	44.670
28.250	44.670
28.750	44.670
29.250	44.670
29.750	44.670
30.250	44.670
30.750	44.670
31.250	44.660
31.750	44.660
32.250	44.650
32.750	44.650
33.250	44.640
33.750	44.630
34.250	44.620
34.750	44.610
35.250	44.600
35.750	44.590
36.250	44.570
36.750	44.560
37.250	44.540
37.750	44.530
38.250	44.510
38.750	44.490
39.250	44.470
39.750	44.450
40.250	44.430
40.750	44.410
41.250	44.390
41.750	44.370
42.250	44.350
42.750	44.330
43.250	44.300
43.750	44.280
44.250	44.260
44.750	44.240
45.250	44.210
45.750	44.190
46.250	44.170
46.750	44.140
47.250	44.120
47.750	44.100
48.000	44.070

Name: 100-024 Node: SC-3010 Type: Stage

Time(hrs)	Stage(ft)
0.000	45.860
0.500	46.020
1.000	46.080
1.500	46.090
2.000	46.100
2.500	46.110
3.000	46.110
3.500	46.120
4.000	46.120
4.500	46.120
5.000	46.130
5.500	46.130
6.000	46.130
6.500	46.140

7.000	46.150
7.500	46.150
8.000	46.170
8.500	46.180
8.750	46.190
9.000	46.200
9.250	46.220
9.500	46.230
9.750	46.250
10.000	46.270
10.250	46.290
10.500	46.320
10.750	46.330
11.000	46.330
11.250	46.340
11.500	46.360
11.750	46.440
12.000	46.630
12.250	46.860
12.500	47.030
12.750	47.140
13.000	47.210
13.250	47.270
13.500	47.310
13.750	47.350
14.000	47.390
14.250	47.430
14.500	47.460
14.750	47.480
15.000	47.500
15.250	47.520
15.500	47.540
15.750	47.560
16.000	47.600
16.250	47.750
16.750	48.370
17.250	48.910
17.750	49.200
18.250	49.380
18.750	49.510
19.250	49.610
19.750	49.700
20.250	49.770
20.750	49.830
21.250	49.890
21.750	49.890
22.250	49.910
22.750	49.940
23.250	49.950
23.750	49.960
24.250	49.970
24.750	49.960
25.250	49.950
25.750	49.950
26.250	49.950
26.750	49.950
27.250	49.950
27.750	49.950
28.250	49.940
28.750	49.940
29.250	49.940
29.750	49.940
30.250	49.940
30.750	49.930
31.250	49.920
31.750	49.910
32.250	49.900
32.750	49.890
33.250	49.890
33.750	49.870
34.250	49.840
34.750	49.810
35.250	49.770
35.750	49.740
36.250	49.700
36.750	49.660
37.250	49.620
37.750	49.580
38.250	49.530
38.750	49.490
39.250	49.450
39.750	49.410

40.250	49.370
40.750	49.340
41.250	49.300
41.750	49.260
42.250	49.220
42.750	49.180
43.250	49.140
43.750	49.100
44.250	49.070
44.750	49.040
45.250	49.010
45.750	48.980
46.250	48.950
46.750	48.920
47.250	48.890
47.750	48.870
48.000	48.840

Name: 100-024 Node: SC-5000 Type: Stage

Time(hrs)	Stage(ft)
0.000	41.060
0.500	41.060
1.000	41.060
1.500	41.060
2.000	41.060
2.500	41.060
3.000	41.060
3.500	41.140
4.000	41.280
4.500	41.420
5.000	41.600
5.500	41.810
6.000	42.000
6.500	42.190
7.000	42.380
7.500	42.530
8.000	42.680
8.500	42.800
8.750	42.870
9.000	42.940
9.250	43.020
9.500	43.080
9.750	43.140
10.000	43.200
10.250	43.370
10.500	43.370
10.750	43.430
11.000	43.500
11.250	43.540
11.500	43.610
11.750	43.920
12.000	44.160
12.250	44.250
12.500	44.260
12.750	44.220
13.000	44.240
13.250	44.400
13.500	44.650
13.750	44.870
14.000	45.020
14.250	45.170
14.500	45.290
14.750	45.370
15.000	45.460
15.250	45.500
15.500	45.500
15.750	45.470
16.000	45.410
16.250	45.350
16.750	45.250
17.250	45.140
17.750	45.030
18.250	44.910
18.750	44.800
19.250	44.690
19.750	44.600
20.250	44.510
20.750	44.420
21.250	44.350

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

21.750	44.280
22.250	44.220
22.750	44.170
23.250	44.120
23.750	44.050
24.250	43.970
24.750	43.860
25.250	43.730
25.750	43.640
26.250	43.600
26.750	43.580
27.250	43.560
27.750	43.540
28.250	43.530
28.750	43.510
29.250	43.510
29.750	43.510
30.250	43.510
30.750	43.490
31.250	43.470
31.750	43.450
32.250	43.420
32.750	43.420
33.250	43.330
33.750	42.350
34.250	42.110
34.750	42.050
35.250	42.020
35.750	42.000
36.250	41.980
36.750	41.960
37.250	41.950
37.750	41.930
38.250	41.920
38.750	41.910
39.250	41.900
39.750	41.890
40.250	41.880
40.750	41.870
41.250	41.870
41.750	41.860
42.250	41.860
42.750	41.850
43.250	41.850
43.750	41.840
44.250	41.840
44.750	41.840
45.250	41.830
45.750	41.830
46.250	41.830
46.750	41.830
47.250	41.830
47.750	41.820
48.000	41.820

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 4.2

UPDATED SURFACE WATER ANALYSIS

ICPR FLOOD ROUTING RESULTS FOR THE
100-YEAR, 96-HOUR STORM EVENT
(GROUP "GRACE LAKE")

INITIAL STAGE => ELEVATION 58-FT, NAVD

Pegasus
ENGINEERING

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
NODE MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 58 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
SC-0750	Grace Lake	100-096	0.00	52.00	54.00	0.0000	40	96.00	48.18	0.00	0.00
SC-0760	Grace Lake	100-096	96.00	55.87	58.00	0.0001	619	96.00	31.85	95.93	31.85
SC-0770	Grace Lake	100-096	96.00	58.69	58.00	-0.0004	44368	59.72	49.94	96.00	34.71
SC-0780	Grace Lake	100-096	0.00	64.24	67.27	0.0000	114	0.00	0.00	0.00	0.00
SC-0790	Grace Lake	100-096	0.00	64.00	67.00	0.0000	7842	0.00	0.00	0.00	0.00
SC-0800	Grace Lake	100-096	96.00	58.70	56.00	0.0002	379104	61.31	96.79	96.02	39.83
SC-0810	Grace Lake	100-096	96.00	58.73	58.00	0.0049	2421	61.41	68.15	61.42	68.15
SC-0815	Grace Lake	100-096	96.00	58.70	56.00	0.0001	2500	0.00	0.00	0.00	0.00
SC-0820	Grace Lake	100-096	96.00	58.70	56.00	0.0001	79554	60.08	39.78	61.46	6.73
SC-0830	Grace Lake	100-096	96.00	59.03	59.00	-0.0010	40264	61.21	74.77	61.43	72.31
SC-0840	Grace Lake	100-096	96.00	59.03	58.00	0.0002	206982	60.31	150.90	61.28	62.39
SC-0850	Grace Lake	100-096	96.00	60.16	59.50	0.0011	145	96.00	42.89	96.00	42.89
SC-0860	Grace Lake	100-096	96.00	61.24	61.55	0.0006	155	96.00	42.89	96.00	42.89
SC-0870	Grace Lake	100-096	96.00	63.86	66.00	0.0004	154	96.00	42.89	96.00	42.89
SC-0875	Grace Lake	100-096	96.00	64.88	64.00	0.0006	439	96.00	42.89	96.00	42.89
SC-0880	Grace Lake	100-096	96.00	64.94	64.00	0.0047	241109	60.08	157.25	96.00	42.89
SC-0890	Grace Lake	100-096	96.74	65.33	66.00	0.0066	458	97.72	100.44	97.69	42.08
SC-0900	Grace Lake	100-096	96.54	65.32	66.00	0.0001	54641	60.08	34.60	61.26	9.03
SC-0910	Grace Lake	100-096	96.52	65.33	66.00	0.0001	144829	67.64	20.89	97.72	51.58
SC-0920	Grace Lake	100-096	96.52	65.33	66.00	0.0001	1562098	60.08	567.06	97.72	67.27
SC-0925	Grace Lake	100-096	60.56	78.79	76.00	0.0002	48853	60.08	63.78	60.56	23.84
SC-0930	Grace Lake	100-096	60.25	65.95	66.00	0.0001	9594	60.19	105.55	60.25	105.16
SC-0940	Grace Lake	100-096	60.19	69.07	69.00	0.0017	12328	60.17	105.66	60.19	105.55
SC-0950	Grace Lake	100-096	60.25	69.44	72.00	0.0019	1139	60.48	38.86	60.49	38.89
SC-0960	Grace Lake	100-096	60.44	70.40	73.00	0.0043	505	60.48	38.86	60.48	38.86
SC-0970	Grace Lake	100-096	60.10	72.09	71.00	0.0005	2037	60.08	69.36	60.10	69.16
SC-0980	Grace Lake	100-096	60.48	77.25	74.00	0.0008	33808	60.08	131.53	60.53	91.11
SC-0985	Grace Lake	100-096	60.48	77.27	73.00	0.0004	139136	60.08	371.60	63.31	77.79
SC-0990	Grace Lake	100-096	68.21	72.66	79.00	0.0009	151	68.20	5.76	68.21	5.76
SC-0995	Grace Lake	100-096	68.20	86.23	84.00	0.0002	129991	60.08	167.63	68.20	5.76

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
LINK MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 58 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
SC-0760-P	Grace Lake	100-096	95.93	31.85	0.003	96.00	55.87	0.00	52.00
SC-0770-D1	Grace Lake	100-096	96.00	31.85	0.001	96.00	58.69	96.00	55.87
SC-0770-D2	Grace Lake	100-096	60.06	14.66	0.611	96.00	58.69	96.00	58.70
SC-0770-W	Grace Lake	100-096	96.00	3.49	-0.000	96.00	58.69	0.00	52.00
SC-0780-D	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	96.00	58.69
SC-0780-W	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	96.00	58.69
SC-0790-P	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.00	0.00	64.24
SC-0800-W1	Grace Lake	100-096	96.04	27.03	-0.011	96.00	58.70	96.00	58.69
SC-0800-W2	Grace Lake	100-096	96.00	12.84	0.000	96.00	58.70	0.00	52.00
SC-0810-W1	Grace Lake	100-096	61.42	68.15	-0.023	96.00	58.73	96.00	58.70
SC-0810-W2	Grace Lake	100-096	96.00	7.40	-0.002	96.00	58.73	96.00	58.69
SC-0815-P	Grace Lake	100-096	0.00	0.00	-0.002	96.00	58.70	96.00	58.73
SC-0820-W1	Grace Lake	100-096	0.00	0.00	-0.002	96.00	58.70	96.00	58.70
SC-0820-W2	Grace Lake	100-096	61.46	12.64	0.830	96.00	58.70	96.00	58.70
SC-0830-P	Grace Lake	100-096	61.43	72.31	4.384	96.00	59.03	96.00	58.73
SC-0840-W	Grace Lake	100-096	61.28	62.39	5.653	96.00	59.03	96.00	59.03
SC-0850-P	Grace Lake	100-096	96.00	42.89	-1.869	96.00	60.16	61.44	59.02
SC-0860-P	Grace Lake	100-096	96.00	42.89	0.059	96.00	61.24	96.00	60.16
SC-0870-P	Grace Lake	100-096	96.00	42.89	0.009	96.00	63.86	96.00	61.24
SC-0875-P	Grace Lake	100-096	96.00	42.89	-0.017	96.00	64.88	96.00	63.86
SC-0875-W	Grace Lake	100-096	0.00	0.00	0.000	96.00	64.88	96.00	59.03
SC-0880-W	Grace Lake	100-096	96.00	42.89	-0.010	96.00	64.94	96.00	64.88
SC-0890-P	Grace Lake	100-096	97.69	42.08	-12.347	96.74	65.33	96.00	64.94
SC-0890-W	Grace Lake	100-096	0.00	0.00	0.000	96.74	65.33	96.00	58.73
SC-0900-D	Grace Lake	100-096	61.26	9.03	1.109	96.54	65.32	96.74	65.33
SC-0900-W	Grace Lake	100-096	0.00	0.00	0.000	96.54	65.32	96.74	65.33
SC-0910-W	Grace Lake	100-096	97.72	51.58	37.633	96.52	65.33	96.74	65.33
SC-0920-W1	Grace Lake	100-096	96.11	19.85	3.451	96.52	65.33	96.52	65.33
SC-0920-W2	Grace Lake	100-096	97.72	47.89	28.679	96.52	65.33	96.74	65.33
SC-0920-W3	Grace Lake	100-096	0.00	0.00	0.000	96.52	65.33	0.00	64.00
SC-0925-D	Grace Lake	100-096	60.56	19.84	0.032	60.56	78.79	96.52	65.33
SC-0925-W	Grace Lake	100-096	60.56	4.00	0.001	60.56	78.79	96.52	65.33
SC-0930-C	Grace Lake	100-096	60.25	105.16	-0.436	60.25	65.95	96.52	65.33
SC-0940-C	Grace Lake	100-096	60.19	105.55	-0.034	60.19	69.07	60.25	65.95
SC-0950-C	Grace Lake	100-096	60.49	38.89	0.721	60.25	69.44	60.19	69.07
SC-0960-C	Grace Lake	100-096	60.48	38.86	-15.425	60.44	70.40	60.25	69.44
SC-0970-P	Grace Lake	100-096	60.09	37.51	-5.134	60.10	72.09	60.19	69.07
SC-0970-W	Grace Lake	100-096	60.10	31.68	0.004	60.10	72.09	60.19	69.07
SC-0980-P1	Grace Lake	100-096	60.57	52.28	0.003	60.48	77.25	60.10	72.09
SC-0980-P2	Grace Lake	100-096	60.48	38.86	0.005	60.48	77.25	59.48	70.78
SC-0985-P	Grace Lake	100-096	71.34	47.27	-0.050	60.48	77.27	60.48	77.25
SC-0985-W	Grace Lake	100-096	63.31	69.28	-0.224	60.48	77.27	60.48	77.25
SC-0990-P	Grace Lake	100-096	68.21	5.76	0.013	68.21	72.66	116.99	64.70
SC-0995-D	Grace Lake	100-096	68.20	5.76	0.004	68.20	86.23	68.21	72.66
SC-1000-P	Grace Lake	100-096	62.34	182.85	-252.066	60.46	78.05	60.48	77.27
SC-1000-W	Grace Lake	100-096	60.46	56.63	56.633	60.46	78.05	60.48	77.27

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
BASIN MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 58 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
100-096	SC-0770	Grace Lake	60.04	92.29	8.835	577896
100-096	SC-0800A	Grace Lake	60.03	52.65	11.625	378938
100-096	SC-0800B	Grace Lake	60.03	23.17	10.850	158725
100-096	SC-0810	Grace Lake	60.01	22.88	11.173	140732
100-096	SC-0820A	Grace Lake	60.03	19.44	11.164	130493
100-096	SC-0820B	Grace Lake	60.13	22.13	11.173	201980
100-096	SC-0830	Grace Lake	60.17	32.41	9.697	325245
100-096	SC-0840	Grace Lake	60.11	148.40	8.286	1249386
100-096	SC-0880	Grace Lake	60.18	251.81	8.650	2443779
100-096	SC-0900A	Grace Lake	60.02	14.15	11.008	91507
100-096	SC-0900B	Grace Lake	60.22	22.93	11.170	224637
100-096	SC-0910	Grace Lake	60.03	38.07	11.775	260308
100-096	SC-0920	Grace Lake	60.08	448.71	10.856	3492417
100-096	SC-0925	Grace Lake	60.03	64.99	8.656	416039
100-096	SC-0970	Grace Lake	60.05	22.94	10.044	153865
100-096	SC-0980A	Grace Lake	60.13	10.05	8.654	86703
100-096	SC-0980B	Grace Lake	60.03	28.62	8.656	183195
100-096	SC-0980C	Grace Lake	60.09	54.01	8.656	386816
100-096	SC-0985	Grace Lake	60.07	205.63	8.656	1378148
100-096	SC-0995	Grace Lake	60.11	168.83	10.044	1315407

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 4.3

UPDATED SURFACE WATER ANALYSIS

ICPR FLOOD ROUTING RESULTS FOR THE
100-YEAR, 96-HOUR STORM EVENT
(GROUP "GRACE LAKE")

INITIAL STAGE => ELEVATION 59-FT, NAVD

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
NODE MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 59 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
SC-0750	Grace Lake	100-096	0.00	52.00	54.00	0.0000	40	72.20	50.14	0.00	0.00
SC-0760	Grace Lake	100-096	72.16	55.91	58.00	0.0001	588	72.18	32.54	72.16	32.54
SC-0770	Grace Lake	100-096	72.18	58.70	58.00	-0.0004	44532	59.72	49.94	72.16	35.69
SC-0780	Grace Lake	100-096	0.00	64.24	67.27	0.0000	114	0.00	0.00	0.00	0.00
SC-0790	Grace Lake	100-096	0.00	64.00	67.00	0.0000	7842	0.00	0.00	0.00	0.00
SC-0800	Grace Lake	100-096	72.21	58.71	56.00	0.0002	379504	61.36	97.41	96.02	40.45
SC-0810	Grace Lake	100-096	72.21	58.74	58.00	0.0049	2430	61.63	69.67	61.64	69.67
SC-0815	Grace Lake	100-096	72.21	58.71	56.00	0.0001	2505	0.00	0.00	0.00	0.00
SC-0820	Grace Lake	100-096	72.21	58.71	56.00	0.0001	79590	60.08	39.78	61.46	6.73
SC-0830	Grace Lake	100-096	61.64	59.06	59.00	-0.0010	40441	61.24	75.40	61.65	73.94
SC-0840	Grace Lake	100-096	61.64	59.07	58.00	0.0002	207875	60.28	155.93	61.80	65.06
SC-0850	Grace Lake	100-096	96.01	60.23	59.50	0.0009	145	96.00	43.95	95.97	43.95
SC-0860	Grace Lake	100-096	96.01	61.36	61.55	0.0007	155	96.00	43.95	96.00	43.95
SC-0870	Grace Lake	100-096	96.00	64.11	66.00	0.0004	154	96.00	43.95	96.00	43.95
SC-0875	Grace Lake	100-096	96.00	65.18	64.00	0.0007	439	96.00	43.95	96.00	43.95
SC-0880	Grace Lake	100-096	96.00	65.23	64.00	0.0047	264296	60.08	154.07	96.00	43.95
SC-0890	Grace Lake	100-096	96.60	65.65	66.00	-0.0065	458	97.63	101.15	97.90	42.92
SC-0900	Grace Lake	100-096	96.44	65.64	66.00	0.0001	57413	60.08	34.60	61.25	9.06
SC-0910	Grace Lake	100-096	96.42	65.64	66.00	0.0001	148016	66.90	21.46	97.63	51.42
SC-0920	Grace Lake	100-096	96.43	65.64	66.00	0.0001	1583859	60.08	567.06	97.63	68.38
SC-0925	Grace Lake	100-096	60.56	78.79	76.00	0.0002	48853	60.08	63.78	60.56	23.84
SC-0930	Grace Lake	100-096	60.25	65.95	66.00	0.0001	9594	60.19	105.55	60.25	105.16
SC-0940	Grace Lake	100-096	60.19	69.07	69.00	0.0017	12328	60.17	105.66	60.19	105.55
SC-0950	Grace Lake	100-096	60.25	69.44	72.00	0.0019	1139	60.48	38.86	60.49	38.89
SC-0960	Grace Lake	100-096	60.44	70.40	73.00	0.0043	505	60.48	38.86	60.48	38.86
SC-0970	Grace Lake	100-096	60.10	72.09	71.00	0.0005	2037	60.08	69.36	60.10	69.16
SC-0980	Grace Lake	100-096	60.48	77.25	74.00	0.0008	33808	60.08	131.53	60.53	91.11
SC-0985	Grace Lake	100-096	60.48	77.27	73.00	0.0004	139136	60.08	371.60	63.31	77.79
SC-0990	Grace Lake	100-096	68.21	72.66	79.00	0.0009	151	68.20	5.76	68.21	5.76
SC-0995	Grace Lake	100-096	68.20	86.23	84.00	0.0002	129991	60.08	167.63	68.20	5.76

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
LINK MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 59 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
SC-0760-P	Grace Lake	100-096	72.16	32.54	0.003	72.16	55.91	0.00	52.00
SC-0770-D1	Grace Lake	100-096	72.18	32.54	0.001	72.18	58.70	72.16	55.91
SC-0770-D2	Grace Lake	100-096	60.06	14.66	0.611	72.18	58.70	72.21	58.71
SC-0770-W	Grace Lake	100-096	72.18	3.78	-0.000	72.18	58.70	0.00	52.00
SC-0780-D	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	72.18	58.70
SC-0780-W	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	72.18	58.70
SC-0790-P	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.00	0.00	64.24
SC-0800-W1	Grace Lake	100-096	96.04	27.11	-0.011	72.21	58.71	72.18	58.70
SC-0800-W2	Grace Lake	100-096	72.21	13.82	0.000	72.21	58.71	0.00	52.00
SC-0810-W1	Grace Lake	100-096	61.64	69.67	-0.023	72.21	58.74	72.21	58.71
SC-0810-W2	Grace Lake	100-096	72.23	8.11	-0.002	72.21	58.74	72.18	58.70
SC-0815-P	Grace Lake	100-096	0.00	0.00	-0.002	72.21	58.71	72.21	58.74
SC-0820-W1	Grace Lake	100-096	0.00	0.00	-0.002	72.21	58.71	72.21	58.71
SC-0820-W2	Grace Lake	100-096	61.46	12.65	0.832	72.21	58.71	72.21	58.71
SC-0830-P	Grace Lake	100-096	61.65	73.94	4.384	61.64	59.06	72.21	58.74
SC-0840-W	Grace Lake	100-096	61.80	65.06	5.594	61.64	59.07	61.64	59.06
SC-0850-P	Grace Lake	100-096	95.97	43.95	-1.475	96.01	60.23	148.53	58.61
SC-0860-P	Grace Lake	100-096	96.00	43.95	0.039	96.01	61.36	96.01	60.23
SC-0870-P	Grace Lake	100-096	96.00	43.95	0.009	96.00	64.11	96.01	61.36
SC-0875-P	Grace Lake	100-096	96.00	43.95	-0.019	96.00	65.18	96.00	64.11
SC-0875-W	Grace Lake	100-096	0.00	0.00	0.000	96.00	65.18	61.64	59.07
SC-0880-W	Grace Lake	100-096	96.00	43.95	-0.011	96.00	65.23	96.00	65.18
SC-0890-P	Grace Lake	100-096	97.90	42.92	-12.347	96.60	65.65	96.00	65.23
SC-0890-W	Grace Lake	100-096	0.00	0.00	0.000	96.60	65.65	72.21	58.74
SC-0900-D	Grace Lake	100-096	61.25	9.06	1.106	96.44	65.64	96.60	65.65
SC-0900-W	Grace Lake	100-096	0.00	0.00	0.000	96.44	65.64	96.60	65.65
SC-0910-W	Grace Lake	100-096	97.63	51.42	37.619	96.42	65.64	96.60	65.65
SC-0920-W1	Grace Lake	100-096	66.90	20.36	4.199	96.43	65.64	96.42	65.64
SC-0920-W2	Grace Lake	100-096	97.63	48.76	29.678	96.43	65.64	96.60	65.65
SC-0920-W3	Grace Lake	100-096	0.00	0.00	0.000	96.43	65.64	0.00	64.00
SC-0925-D	Grace Lake	100-096	60.56	19.84	0.032	60.56	78.79	96.43	65.64
SC-0925-W	Grace Lake	100-096	60.56	4.00	0.001	60.56	78.79	96.43	65.64
SC-0930-C	Grace Lake	100-096	60.25	105.16	-0.436	60.25	65.95	96.43	65.64
SC-0940-C	Grace Lake	100-096	60.19	105.55	-0.039	60.19	69.07	60.25	65.95
SC-0950-C	Grace Lake	100-096	60.49	38.89	0.721	60.25	69.44	60.19	69.07
SC-0960-C	Grace Lake	100-096	60.48	38.86	-15.395	60.44	70.40	60.25	69.44
SC-0970-P	Grace Lake	100-096	60.09	37.51	-5.134	60.10	72.09	60.19	69.07
SC-0970-W	Grace Lake	100-096	60.10	31.68	0.004	60.10	72.09	60.19	69.07
SC-0980-P1	Grace Lake	100-096	60.57	52.28	0.003	60.48	77.25	60.10	72.09
SC-0980-P2	Grace Lake	100-096	60.48	38.86	0.005	60.48	77.25	59.48	70.78
SC-0985-P	Grace Lake	100-096	71.33	47.31	-0.050	60.48	77.27	60.48	77.25
SC-0985-W	Grace Lake	100-096	63.31	69.28	-0.224	60.48	77.27	60.48	77.25
SC-0990-P	Grace Lake	100-096	68.21	5.76	0.013	68.21	72.66	116.96	65.00
SC-0995-D	Grace Lake	100-096	68.20	5.76	0.004	68.20	86.23	68.21	72.66
SC-1000-P	Grace Lake	100-096	62.34	182.85	-252.066	60.46	78.05	60.48	77.27
SC-1000-W	Grace Lake	100-096	60.46	56.63	56.633	60.46	78.05	60.48	77.27

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
BASIN MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 59 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
100-096	SC-0770	Grace Lake	60.04	92.29	8.835	577896
100-096	SC-0800A	Grace Lake	60.03	52.65	11.625	378938
100-096	SC-0800B	Grace Lake	60.03	23.17	10.850	158725
100-096	SC-0810	Grace Lake	60.01	22.88	11.173	140732
100-096	SC-0820A	Grace Lake	60.03	19.44	11.164	130493
100-096	SC-0820B	Grace Lake	60.13	22.13	11.173	201980
100-096	SC-0830	Grace Lake	60.17	32.41	9.697	325245
100-096	SC-0840	Grace Lake	60.11	148.40	8.286	1249386
100-096	SC-0880	Grace Lake	60.18	251.81	8.650	2443779
100-096	SC-0900A	Grace Lake	60.02	14.15	11.008	91507
100-096	SC-0900B	Grace Lake	60.22	22.93	11.170	224637
100-096	SC-0910	Grace Lake	60.03	38.07	11.775	260308
100-096	SC-0920	Grace Lake	60.08	448.71	10.856	3492417
100-096	SC-0925	Grace Lake	60.03	64.99	8.656	416039
100-096	SC-0970	Grace Lake	60.05	22.94	10.044	153865
100-096	SC-0980A	Grace Lake	60.13	10.05	8.654	86703
100-096	SC-0980B	Grace Lake	60.03	28.62	8.656	183195
100-096	SC-0980C	Grace Lake	60.09	54.01	8.656	386816
100-096	SC-0985	Grace Lake	60.07	205.63	8.656	1378148
100-096	SC-0995	Grace Lake	60.11	168.83	10.044	1315407

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 4.4

UPDATED SURFACE WATER ANALYSIS

ICPR FLOOD ROUTING RESULTS FOR THE
100-YEAR, 96-HOUR STORM EVENT
(GROUP "GRACE LAKE")

INITIAL STAGE => ELEVATION 60-FT, NAVD

Pegasus ENGINEERING

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
NODE MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 60 FT, NAVD

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Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
SC-0750	Grace Lake	100-096	0.00	52.00	54.00	0.0000	40	72.16	52.30	0.00	0.00
SC-0760	Grace Lake	100-096	72.16	55.96	58.00	0.0001	550	72.14	33.29	72.13	33.29
SC-0770	Grace Lake	100-096	72.14	58.71	58.00	-0.0004	44708	59.72	49.94	72.13	36.76
SC-0780	Grace Lake	100-096	0.00	64.24	67.27	0.0000	114	0.00	0.00	0.00	0.00
SC-0790	Grace Lake	100-096	0.00	64.00	67.00	0.0000	7842	0.00	0.00	0.00	0.00
SC-0800	Grace Lake	100-096	72.17	58.72	56.00	0.0002	379940	61.35	99.12	96.02	41.29
SC-0810	Grace Lake	100-096	72.16	58.75	58.00	0.0049	2440	61.64	71.38	61.65	71.38
SC-0815	Grace Lake	100-096	72.17	58.73	56.00	0.0001	2509	0.00	0.00	0.00	0.00
SC-0820	Grace Lake	100-096	72.17	58.73	56.00	0.0001	79629	60.08	39.78	61.45	6.74
SC-0830	Grace Lake	100-096	61.66	59.11	59.00	-0.0010	40712	61.24	77.15	61.66	75.68
SC-0840	Grace Lake	100-096	61.66	59.11	58.00	0.0002	209170	60.18	174.93	61.80	66.88
SC-0850	Grace Lake	100-096	96.00	60.33	59.50	0.0006	145	96.00	45.35	96.00	45.35
SC-0860	Grace Lake	100-096	96.00	61.53	61.55	0.0010	155	96.00	45.35	96.00	45.35
SC-0870	Grace Lake	100-096	96.00	64.46	66.00	0.0006	154	96.00	45.35	96.00	45.35
SC-0875	Grace Lake	100-096	96.00	65.60	64.00	0.0010	439	96.00	45.46	96.00	45.46
SC-0880	Grace Lake	100-096	96.00	65.65	64.00	0.0001	296467	60.17	177.18	96.00	45.46
SC-0890	Grace Lake	100-096	96.18	66.09	66.00	-0.0062	458	97.92	103.90	98.03	44.09
SC-0900	Grace Lake	100-096	96.34	66.08	66.00	0.0001	61085	60.08	34.60	61.07	8.63
SC-0910	Grace Lake	100-096	96.32	66.09	66.00	0.0001	152332	66.78	22.46	97.92	52.30
SC-0920	Grace Lake	100-096	96.32	66.09	66.00	0.0001	1615276	60.08	567.06	97.92	70.60
SC-0925	Grace Lake	100-096	60.56	78.79	76.00	0.0002	48853	60.08	63.78	60.56	23.84
SC-0930	Grace Lake	100-096	96.02	66.13	66.00	0.0001	9113	60.19	105.54	60.25	105.14
SC-0940	Grace Lake	100-096	60.19	69.07	69.00	0.0014	12328	60.16	105.65	60.19	105.54
SC-0950	Grace Lake	100-096	60.25	69.44	72.00	0.0026	1139	60.47	38.86	60.48	38.89
SC-0960	Grace Lake	100-096	60.43	70.40	73.00	0.0050	505	60.47	38.86	60.47	38.86
SC-0970	Grace Lake	100-096	60.10	72.09	71.00	0.0005	2037	60.08	69.36	60.10	69.16
SC-0980	Grace Lake	100-096	60.47	77.25	74.00	0.0008	33810	60.08	131.62	60.54	91.11
SC-0985	Grace Lake	100-096	60.47	77.27	73.00	0.0004	139138	60.08	371.58	63.31	77.70
SC-0990	Grace Lake	100-096	68.21	72.66	79.00	0.0009	151	68.20	5.76	68.21	5.76
SC-0995	Grace Lake	100-096	68.20	86.23	84.00	0.0002	129991	60.08	167.63	68.20	5.76

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** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
SC-0760-P	Grace Lake	100-096	72.13	33.29	0.003	72.16	55.96	0.00	52.00
SC-0770-D1	Grace Lake	100-096	72.14	33.29	0.001	72.14	58.71	72.16	55.96
SC-0770-D2	Grace Lake	100-096	60.06	14.66	0.611	72.14	58.71	72.17	58.72
SC-0770-W	Grace Lake	100-096	72.14	4.10	-0.000	72.14	58.71	0.00	52.00
SC-0780-D	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	72.14	58.71
SC-0780-W	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	72.14	58.71
SC-0790-P	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.00	0.00	64.24
SC-0800-W1	Grace Lake	100-096	96.04	27.21	-0.011	72.17	58.72	72.14	58.71
SC-0800-W2	Grace Lake	100-096	72.17	14.91	0.000	72.17	58.72	0.00	52.00
SC-0810-W1	Grace Lake	100-096	61.65	71.38	-0.019	72.16	58.75	72.17	58.72
SC-0810-W2	Grace Lake	100-096	72.19	9.02	-0.002	72.16	58.75	72.14	58.71
SC-0815-P	Grace Lake	100-096	0.00	0.00	-0.002	72.17	58.73	72.16	58.75
SC-0820-W1	Grace Lake	100-096	0.00	0.00	-0.002	72.17	58.73	72.17	58.73
SC-0820-W2	Grace Lake	100-096	61.46	12.68	0.836	72.17	58.73	72.17	58.72
SC-0830-P	Grace Lake	100-096	61.66	75.68	4.384	61.66	59.11	72.16	58.75
SC-0840-W	Grace Lake	100-096	61.80	66.88	5.453	61.66	59.11	61.66	59.11
SC-0850-P	Grace Lake	100-096	96.00	45.35	-0.231	96.00	60.33	154.67	58.62
SC-0860-P	Grace Lake	100-096	96.00	45.35	0.020	96.00	61.53	96.00	60.33
SC-0870-P	Grace Lake	100-096	96.00	45.35	0.013	96.00	64.46	96.00	61.53
SC-0875-P	Grace Lake	100-096	96.00	45.35	-0.029	96.00	65.60	96.00	64.46
SC-0875-W	Grace Lake	100-096	96.00	0.11	-0.000	96.00	65.60	61.66	59.11
SC-0880-W	Grace Lake	100-096	96.00	45.46	-0.023	96.00	65.65	96.00	65.60
SC-0890-P	Grace Lake	100-096	98.03	44.09	0.397	96.18	66.09	96.00	65.65
SC-0890-W	Grace Lake	100-096	0.00	0.00	0.000	96.18	66.09	72.16	58.75
SC-0900-D	Grace Lake	100-096	61.07	8.63	1.161	96.34	66.08	96.18	66.09
SC-0900-W	Grace Lake	100-096	0.00	0.00	0.000	96.34	66.08	96.18	66.09
SC-0910-W	Grace Lake	100-096	97.92	52.30	37.547	96.32	66.09	96.18	66.09
SC-0920-W1	Grace Lake	100-096	66.78	21.35	5.685	96.32	66.09	96.32	66.09
SC-0920-W2	Grace Lake	100-096	97.92	50.61	30.204	96.32	66.09	96.18	66.09
SC-0920-W3	Grace Lake	100-096	0.00	0.00	0.000	96.32	66.09	0.00	64.00
SC-0925-D	Grace Lake	100-096	60.56	19.84	0.032	60.56	78.79	96.32	66.09
SC-0925-W	Grace Lake	100-096	60.56	4.00	0.001	60.56	78.79	96.32	66.09
SC-0930-C	Grace Lake	100-096	60.25	105.14	-0.436	96.02	66.13	96.32	66.09
SC-0940-C	Grace Lake	100-096	60.19	105.54	0.043	60.19	69.07	96.02	66.13
SC-0950-C	Grace Lake	100-096	60.48	38.89	0.721	60.25	69.44	60.19	69.07
SC-0960-C	Grace Lake	100-096	60.47	38.86	-15.759	60.43	70.40	60.25	69.44
SC-0970-P	Grace Lake	100-096	60.09	37.51	-5.134	60.10	72.09	60.19	69.07
SC-0970-W	Grace Lake	100-096	60.10	31.68	0.004	60.10	72.09	60.19	69.07
SC-0980-P1	Grace Lake	100-096	60.56	52.28	0.003	60.47	77.25	60.10	72.09
SC-0980-P2	Grace Lake	100-096	60.47	38.86	0.005	60.47	77.25	59.48	70.78
SC-0985-P	Grace Lake	100-096	71.21	47.71	0.050	60.47	77.27	60.47	77.25
SC-0985-W	Grace Lake	100-096	63.31	69.20	-0.226	60.47	77.27	60.47	77.25
SC-0990-P	Grace Lake	100-096	68.21	5.76	-0.013	68.21	72.66	116.91	65.41
SC-0995-D	Grace Lake	100-096	68.20	5.76	0.004	68.20	86.23	68.21	72.66
SC-1000-P	Grace Lake	100-096	62.35	182.87	-252.194	60.42	78.06	60.47	77.27
SC-1000-W	Grace Lake	100-096	60.42	58.05	58.049	60.42	78.06	60.47	77.27

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MARCH 2014
GRACE LAKE INITIAL STAGE = 60 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
100-096	SC-0770	Grace Lake	60.04	92.29	8.835	577896
100-096	SC-0800A	Grace Lake	60.03	52.65	11.625	378938
100-096	SC-0800B	Grace Lake	60.03	23.17	10.850	158725
100-096	SC-0810	Grace Lake	60.01	22.88	11.173	140732
100-096	SC-0820A	Grace Lake	60.03	19.44	11.164	130493
100-096	SC-0820B	Grace Lake	60.13	22.13	11.173	201980
100-096	SC-0830	Grace Lake	60.17	32.41	9.697	325245
100-096	SC-0840	Grace Lake	60.11	148.40	8.286	1249386
100-096	SC-0880	Grace Lake	60.18	251.81	8.650	2443779
100-096	SC-0900A	Grace Lake	60.02	14.15	11.008	91507
100-096	SC-0900B	Grace Lake	60.22	22.93	11.170	224637
100-096	SC-0910	Grace Lake	60.03	38.07	11.775	260308
100-096	SC-0920	Grace Lake	60.08	448.71	10.856	3492417
100-096	SC-0925	Grace Lake	60.03	64.99	8.656	416039
100-096	SC-0970	Grace Lake	60.05	22.94	10.044	153865
100-096	SC-0980A	Grace Lake	60.13	10.05	8.654	86703
100-096	SC-0980B	Grace Lake	60.03	28.62	8.656	183195
100-096	SC-0980C	Grace Lake	60.09	54.01	8.656	386816
100-096	SC-0985	Grace Lake	60.07	205.63	8.656	1378148
100-096	SC-0995	Grace Lake	60.11	168.83	10.044	1315407

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 4.5

UPDATED SURFACE WATER ANALYSIS

ICPR FLOOD ROUTING RESULTS FOR THE
100-YEAR, 96-HOUR STORM EVENT
(GROUP "GRACE LAKE")

INITIAL STAGE => ELEVATION 61-FT, NAVD

Pegasus
ENGINEERING

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
NODE MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 61 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
SC-0750	Grace Lake	100-096	0.00	52.00	54.00	0.0000	40	96.00	55.51	0.00	0.00
SC-0760	Grace Lake	100-096	96.00	56.02	58.00	0.0001	473	96.00	34.37	95.98	34.37
SC-0770	Grace Lake	100-096	96.00	58.73	58.00	0.0001	44961	59.72	49.94	96.00	38.32
SC-0780	Grace Lake	100-096	0.00	64.24	67.27	0.0000	114	0.00	0.00	0.00	0.00
SC-0790	Grace Lake	100-096	0.00	64.00	67.00	0.0000	7842	0.00	0.00	0.00	0.00
SC-0800	Grace Lake	100-096	96.00	58.74	56.00	0.0001	380578	61.31	101.66	96.02	43.94
SC-0810	Grace Lake	100-096	96.00	58.77	58.00	0.0049	2456	61.63	73.69	61.64	73.69
SC-0815	Grace Lake	100-096	96.00	58.74	56.00	0.0001	2517	0.00	0.00	0.00	0.00
SC-0820	Grace Lake	100-096	96.00	58.74	56.00	0.0001	79685	60.08	39.78	61.45	6.79
SC-0830	Grace Lake	100-096	61.65	59.17	59.00	-0.0010	41083	61.22	79.55	61.65	78.01
SC-0840	Grace Lake	100-096	61.65	59.18	58.00	0.0001	210940	60.08	186.10	61.81	69.14
SC-0850	Grace Lake	100-096	96.00	60.41	59.50	0.0006	144	96.00	46.41	96.00	46.41
SC-0860	Grace Lake	100-096	96.00	61.67	61.55	0.0010	155	96.00	46.41	96.00	46.41
SC-0870	Grace Lake	100-096	96.00	64.73	66.00	0.0006	154	96.00	46.41	96.00	46.41
SC-0875	Grace Lake	100-096	96.00	65.93	64.00	0.0010	439	96.00	50.49	96.00	50.49
SC-0880	Grace Lake	100-096	96.00	65.98	64.00	0.0001	321946	60.17	193.53	96.00	50.49
SC-0890	Grace Lake	100-096	96.36	66.50	66.00	0.0065	458	96.99	108.01	97.45	47.87
SC-0900	Grace Lake	100-096	96.00	66.50	66.00	0.0001	63812	60.08	34.60	60.83	8.52
SC-0910	Grace Lake	100-096	96.00	66.50	66.00	0.0001	155963	67.29	23.19	96.99	53.78
SC-0920	Grace Lake	100-096	96.00	66.50	66.00	0.0001	1649590	60.08	567.06	96.43	74.82
SC-0925	Grace Lake	100-096	60.56	78.79	76.00	0.0002	48853	60.08	63.78	60.56	23.84
SC-0930	Grace Lake	100-096	96.01	66.54	66.00	0.0001	9147	60.19	105.54	60.25	105.14
SC-0940	Grace Lake	100-096	60.19	69.07	69.00	0.0017	12328	60.16	105.65	60.19	105.54
SC-0950	Grace Lake	100-096	60.25	69.44	72.00	0.0026	1139	69.33	41.21	60.50	38.88
SC-0960	Grace Lake	100-096	60.44	70.40	73.00	0.0050	505	60.49	38.85	69.33	41.21
SC-0970	Grace Lake	100-096	60.10	72.09	71.00	0.0004	2037	60.08	69.36	60.10	69.16
SC-0980	Grace Lake	100-096	60.49	77.25	74.00	0.0006	33796	60.08	131.92	60.54	91.10
SC-0985	Grace Lake	100-096	60.49	77.27	73.00	0.0003	139094	60.08	371.69	63.32	77.78
SC-0990	Grace Lake	100-096	68.21	72.66	79.00	0.0009	151	68.20	5.76	68.21	5.76
SC-0995	Grace Lake	100-096	68.20	86.23	84.00	0.0002	129991	60.08	167.63	68.20	5.76

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
LINK MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 61 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
SC-0760-P	Grace Lake	100-096	95.98	34.37	0.003	96.00	56.02	0.00	52.00
SC-0770-D1	Grace Lake	100-096	96.00	34.37	0.001	96.00	58.73	96.00	56.02
SC-0770-D2	Grace Lake	100-096	60.06	14.66	0.611	96.00	58.73	96.00	58.74
SC-0770-W	Grace Lake	100-096	96.00	4.58	-0.000	96.00	58.73	0.00	52.00
SC-0780-D	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	96.00	58.73
SC-0780-W	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	96.00	58.73
SC-0790-P	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.00	0.00	64.24
SC-0800-W1	Grace Lake	100-096	96.04	27.43	-0.011	96.00	58.74	96.00	58.73
SC-0800-W2	Grace Lake	100-096	96.00	16.56	0.000	96.00	58.74	0.00	52.00
SC-0810-W1	Grace Lake	100-096	61.64	73.69	-0.012	96.00	58.77	96.00	58.74
SC-0810-W2	Grace Lake	100-096	96.00	10.63	-0.001	96.00	58.77	96.00	58.73
SC-0815-P	Grace Lake	100-096	0.00	0.00	-0.002	96.00	58.74	96.00	58.77
SC-0820-W1	Grace Lake	100-096	0.00	0.00	-0.001	96.00	58.74	96.00	58.74
SC-0820-W2	Grace Lake	100-096	61.45	12.75	0.842	96.00	58.74	96.00	58.74
SC-0830-P	Grace Lake	100-096	61.65	78.01	4.374	61.65	59.17	96.00	58.77
SC-0840-W	Grace Lake	100-096	61.81	69.14	5.478	61.65	59.18	61.65	59.17
SC-0850-P	Grace Lake	100-096	96.00	46.41	0.012	96.00	60.41	159.87	58.62
SC-0860-P	Grace Lake	100-096	96.00	46.41	0.020	96.00	61.67	96.00	60.41
SC-0870-P	Grace Lake	100-096	96.00	46.41	0.011	96.00	64.73	96.00	61.67
SC-0875-P	Grace Lake	100-096	96.00	46.41	-0.026	96.00	65.93	96.00	64.73
SC-0875-W	Grace Lake	100-096	96.00	4.09	-0.000	96.00	65.93	61.65	59.18
SC-0880-W	Grace Lake	100-096	96.00	50.49	-0.022	96.00	65.98	96.00	65.93
SC-0890-P	Grace Lake	100-096	97.45	47.87	2.362	96.36	66.50	96.00	65.98
SC-0890-W	Grace Lake	100-096	0.00	0.00	0.000	96.36	66.50	96.00	58.77
SC-0900-D	Grace Lake	100-096	60.83	8.52	1.231	96.00	66.50	96.36	66.50
SC-0900-W	Grace Lake	100-096	0.00	0.00	0.000	96.00	66.50	96.36	66.50
SC-0910-W	Grace Lake	100-096	96.99	53.78	38.229	96.00	66.50	96.36	66.50
SC-0920-W1	Grace Lake	100-096	95.73	22.13	7.399	96.00	66.50	96.00	66.50
SC-0920-W2	Grace Lake	100-096	96.99	53.22	31.700	96.00	66.50	96.36	66.50
SC-0920-W3	Grace Lake	100-096	0.00	0.00	0.000	96.00	66.50	0.00	64.00
SC-0925-D	Grace Lake	100-096	60.56	19.84	0.032	60.56	78.79	96.00	66.50
SC-0925-W	Grace Lake	100-096	60.56	4.00	0.001	60.56	78.79	96.00	66.50
SC-0930-C	Grace Lake	100-096	60.25	105.14	0.436	96.01	66.54	96.00	66.50
SC-0940-C	Grace Lake	100-096	60.19	105.54	-0.387	60.19	69.07	96.01	66.54
SC-0950-C	Grace Lake	100-096	60.50	38.88	0.721	60.25	69.44	60.19	69.07
SC-0960-C	Grace Lake	100-096	69.33	41.21	-17.119	60.44	70.40	60.25	69.44
SC-0970-P	Grace Lake	100-096	60.09	37.51	-5.134	60.10	72.09	60.19	69.07
SC-0970-W	Grace Lake	100-096	60.10	31.68	0.004	60.10	72.09	60.19	69.07
SC-0980-P1	Grace Lake	100-096	60.55	52.27	0.003	60.49	77.25	60.10	72.09
SC-0980-P2	Grace Lake	100-096	60.49	38.85	0.003	60.49	77.25	59.48	70.78
SC-0985-P	Grace Lake	100-096	70.83	48.82	-0.050	60.49	77.27	60.49	77.25
SC-0985-W	Grace Lake	100-096	63.32	69.27	-0.224	60.49	77.27	60.49	77.25
SC-0990-P	Grace Lake	100-096	68.21	5.76	0.013	68.21	72.66	116.87	65.76
SC-0995-D	Grace Lake	100-096	68.20	5.76	0.004	68.20	86.23	68.21	72.66
SC-1000-P	Grace Lake	100-096	62.26	183.09	-252.157	60.44	78.04	60.49	77.27
SC-1000-W	Grace Lake	100-096	60.44	55.80	55.797	60.44	78.04	60.49	77.27

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
BASIN MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 61 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
100-096	SC-0770	Grace Lake	60.04	92.29	8.835	577896
100-096	SC-0800A	Grace Lake	60.03	52.65	11.625	378938
100-096	SC-0800B	Grace Lake	60.03	23.17	10.850	158725
100-096	SC-0810	Grace Lake	60.01	22.88	11.173	140732
100-096	SC-0820A	Grace Lake	60.03	19.44	11.164	130493
100-096	SC-0820B	Grace Lake	60.13	22.13	11.173	201980
100-096	SC-0830	Grace Lake	60.17	32.41	9.697	325245
100-096	SC-0840	Grace Lake	60.11	148.40	8.286	1249386
100-096	SC-0880	Grace Lake	60.18	251.81	8.650	2443779
100-096	SC-0900A	Grace Lake	60.02	14.15	11.008	91507
100-096	SC-0900B	Grace Lake	60.22	22.93	11.170	224637
100-096	SC-0910	Grace Lake	60.03	38.07	11.775	260308
100-096	SC-0920	Grace Lake	60.08	448.71	10.856	3492417
100-096	SC-0925	Grace Lake	60.03	64.99	8.656	416039
100-096	SC-0970	Grace Lake	60.05	22.94	10.044	153865
100-096	SC-0980A	Grace Lake	60.13	10.05	8.654	86703
100-096	SC-0980B	Grace Lake	60.03	28.62	8.656	183195
100-096	SC-0980C	Grace Lake	60.09	54.01	8.656	386816
100-096	SC-0985	Grace Lake	60.07	205.63	8.656	1378148
100-096	SC-0995	Grace Lake	60.11	168.83	10.044	1315407

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 4.6

UPDATED SURFACE WATER ANALYSIS

ICPR FLOOD ROUTING RESULTS FOR THE
100-YEAR, 96-HOUR STORM EVENT
(GROUP "GRACE LAKE")

INITIAL STAGE => ELEVATION 62-FT, NAVD

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
NODE MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 62 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
SC-0750	Grace Lake	100-096	0.00	52.00	54.00	0.0000	40	96.00	60.87	0.00	0.00
SC-0760	Grace Lake	100-096	95.96	56.13	58.00	0.0001	343	96.00	36.16	95.95	36.17
SC-0770	Grace Lake	100-096	96.00	58.75	58.00	0.0001	45372	59.72	49.94	96.00	40.92
SC-0780	Grace Lake	100-096	0.00	64.24	67.27	0.0000	114	0.00	0.00	0.00	0.00
SC-0790	Grace Lake	100-096	0.00	64.00	67.00	0.0000	7842	0.00	0.00	0.00	0.00
SC-0800	Grace Lake	100-096	96.00	58.77	56.00	0.0001	381598	60.13	116.07	96.02	46.81
SC-0810	Grace Lake	100-096	96.00	58.80	58.00	0.0049	2480	61.45	82.28	61.45	82.28
SC-0815	Grace Lake	100-096	96.00	58.77	56.00	0.0001	2528	0.00	0.00	0.00	0.00
SC-0820	Grace Lake	100-096	96.00	58.77	56.00	0.0001	79776	60.08	39.78	61.27	8.16
SC-0830	Grace Lake	100-096	61.47	59.43	59.00	-0.0010	42515	61.09	88.52	61.48	86.60
SC-0840	Grace Lake	100-096	61.47	59.43	58.00	0.0001	217717	60.08	187.82	61.54	76.31
SC-0850	Grace Lake	100-096	96.00	60.44	59.50	0.0002	144	96.00	46.88	96.00	46.88
SC-0860	Grace Lake	100-096	96.00	61.73	61.55	0.0006	155	96.00	46.88	96.00	46.88
SC-0870	Grace Lake	100-096	96.00	64.85	66.00	0.0002	154	96.00	46.88	96.00	46.88
SC-0875	Grace Lake	100-096	96.00	66.08	64.00	0.0005	439	96.00	55.56	96.00	55.56
SC-0880	Grace Lake	100-096	96.00	66.13	64.00	0.0001	333748	60.17	204.77	96.00	55.56
SC-0890	Grace Lake	100-096	95.85	66.76	66.00	-0.0066	458	96.38	116.38	96.88	52.07
SC-0900	Grace Lake	100-096	96.00	66.76	66.00	0.0001	65501	60.08	34.60	60.82	7.05
SC-0910	Grace Lake	100-096	96.00	66.76	66.00	0.0000	158212	60.00	28.85	96.38	57.59
SC-0920	Grace Lake	100-096	96.00	66.76	66.00	0.0000	1670839	60.08	567.06	96.21	81.18
SC-0925	Grace Lake	100-096	60.56	78.79	76.00	0.0002	48853	60.08	63.78	60.56	23.84
SC-0930	Grace Lake	100-096	96.00	66.79	66.00	0.0001	9180	60.19	105.54	60.25	105.15
SC-0940	Grace Lake	100-096	60.19	69.07	69.00	0.0014	12328	60.17	105.65	60.19	105.54
SC-0950	Grace Lake	100-096	60.26	69.44	72.00	0.0018	1139	69.25	41.84	60.48	38.90
SC-0960	Grace Lake	100-096	60.41	70.40	73.00	-0.0041	505	60.48	38.87	69.25	41.84
SC-0970	Grace Lake	100-096	60.10	72.09	71.00	0.0002	2037	60.08	69.36	60.10	69.16
SC-0980	Grace Lake	100-096	60.48	77.26	74.00	0.0004	33833	60.08	131.33	60.53	91.13
SC-0985	Grace Lake	100-096	60.48	77.27	73.00	0.0002	139245	60.08	371.84	63.33	77.80
SC-0990	Grace Lake	100-096	68.21	72.66	79.00	0.0009	151	68.20	5.76	68.21	5.76
SC-0995	Grace Lake	100-096	68.20	86.23	84.00	0.0002	129991	60.08	167.63	68.20	5.76

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
LINK MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 62 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
SC-0760-P	Grace Lake	100-096	95.95	36.17	0.003	95.96	56.13	0.00	52.00
SC-0770-D1	Grace Lake	100-096	96.00	36.16	0.001	96.00	58.75	95.96	56.13
SC-0770-D2	Grace Lake	100-096	60.06	14.65	0.611	96.00	58.75	96.00	58.77
SC-0770-W	Grace Lake	100-096	96.00	5.39	-0.000	96.00	58.75	0.00	52.00
SC-0780-D	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	96.00	58.75
SC-0780-W	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.24	96.00	58.75
SC-0790-P	Grace Lake	100-096	0.00	0.00	0.000	0.00	64.00	0.00	64.24
SC-0800-W1	Grace Lake	100-096	96.04	27.55	-0.011	96.00	58.77	96.00	58.75
SC-0800-W2	Grace Lake	100-096	96.00	19.31	0.000	96.00	58.77	0.00	52.00
SC-0810-W1	Grace Lake	100-096	61.45	82.28	-0.013	96.00	58.80	96.00	58.77
SC-0810-W2	Grace Lake	100-096	96.00	13.10	-0.002	96.00	58.80	96.00	58.75
SC-0815-P	Grace Lake	100-096	0.00	0.00	-0.002	96.00	58.77	96.00	58.80
SC-0820-W1	Grace Lake	100-096	0.00	0.00	-0.001	96.00	58.77	96.00	58.77
SC-0820-W2	Grace Lake	100-096	61.27	14.20	0.850	96.00	58.77	96.00	58.77
SC-0830-P	Grace Lake	100-096	61.48	86.60	3.067	61.47	59.43	96.00	58.80
SC-0840-W	Grace Lake	100-096	61.54	76.31	5.769	61.47	59.43	61.47	59.43
SC-0850-P	Grace Lake	100-096	96.00	46.88	0.005	96.00	60.44	61.47	59.43
SC-0860-P	Grace Lake	100-096	96.00	46.88	0.131	96.00	61.73	96.00	60.44
SC-0870-P	Grace Lake	100-096	96.00	46.88	-0.005	96.00	64.85	96.00	61.73
SC-0875-P	Grace Lake	100-096	96.00	46.88	-0.009	96.00	66.08	96.00	64.85
SC-0875-W	Grace Lake	100-096	96.00	8.68	-0.000	96.00	66.08	61.47	59.43
SC-0880-W	Grace Lake	100-096	96.00	55.56	-0.006	96.00	66.13	96.00	66.08
SC-0890-P	Grace Lake	100-096	96.88	52.07	-6.642	95.85	66.76	96.00	66.13
SC-0890-W	Grace Lake	100-096	0.00	0.00	0.000	95.85	66.76	96.00	58.80
SC-0900-D	Grace Lake	100-096	60.82	7.05	1.250	96.00	66.76	95.85	66.76
SC-0900-W	Grace Lake	100-096	0.00	0.00	0.000	96.00	66.76	95.85	66.76
SC-0910-W	Grace Lake	100-096	96.38	57.59	39.200	96.00	66.76	95.85	66.76
SC-0920-W1	Grace Lake	100-096	95.72	23.76	9.153	96.00	66.76	96.00	66.76
SC-0920-W2	Grace Lake	100-096	96.38	57.77	33.009	96.00	66.76	95.85	66.76
SC-0920-W3	Grace Lake	100-096	0.00	0.00	0.000	96.00	66.76	0.00	64.00
SC-0925-D	Grace Lake	100-096	60.56	19.84	0.032	60.56	78.79	96.00	66.76
SC-0925-W	Grace Lake	100-096	60.56	4.00	0.001	60.56	78.79	96.00	66.76
SC-0930-C	Grace Lake	100-096	60.25	105.15	-0.436	96.00	66.79	96.00	66.76
SC-0940-C	Grace Lake	100-096	60.19	105.54	0.854	60.19	69.07	96.00	66.79
SC-0950-C	Grace Lake	100-096	60.48	38.90	0.721	60.26	69.44	60.19	69.07
SC-0960-C	Grace Lake	100-096	69.25	41.84	-17.343	60.41	70.40	60.26	69.44
SC-0970-P	Grace Lake	100-096	60.09	37.51	-5.134	60.10	72.09	60.19	69.07
SC-0970-W	Grace Lake	100-096	60.10	31.68	0.004	60.10	72.09	60.19	69.07
SC-0980-P1	Grace Lake	100-096	60.55	52.28	0.003	60.48	77.26	60.10	72.09
SC-0980-P2	Grace Lake	100-096	60.48	38.87	0.002	60.48	77.26	59.48	70.78
SC-0985-P	Grace Lake	100-096	70.83	48.57	-0.051	60.48	77.27	60.48	77.26
SC-0985-W	Grace Lake	100-096	63.33	69.29	-0.227	60.48	77.27	60.48	77.26
SC-0990-P	Grace Lake	100-096	68.21	5.76	0.013	68.21	72.66	116.85	65.94
SC-0995-D	Grace Lake	100-096	68.20	5.76	0.004	68.20	86.23	68.21	72.66
SC-1000-P	Grace Lake	100-096	62.24	182.67	-252.262	60.35	78.07	60.48	77.27
SC-1000-W	Grace Lake	100-096	60.35	59.99	59.988	60.35	78.07	60.48	77.27

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
BASIN MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 62 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
100-096	SC-0770	Grace Lake	60.04	92.29	8.835	577896
100-096	SC-0800A	Grace Lake	60.03	52.65	11.625	378938
100-096	SC-0800B	Grace Lake	60.03	23.17	10.850	158725
100-096	SC-0810	Grace Lake	60.01	22.88	11.173	140732
100-096	SC-0820A	Grace Lake	60.03	19.44	11.164	130493
100-096	SC-0820B	Grace Lake	60.13	22.13	11.173	201980
100-096	SC-0830	Grace Lake	60.17	32.41	9.697	325245
100-096	SC-0840	Grace Lake	60.11	148.40	8.286	1249386
100-096	SC-0880	Grace Lake	60.18	251.81	8.650	2443779
100-096	SC-0900A	Grace Lake	60.02	14.15	11.008	91507
100-096	SC-0900B	Grace Lake	60.22	22.93	11.170	224637
100-096	SC-0910	Grace Lake	60.03	38.07	11.775	260308
100-096	SC-0920	Grace Lake	60.08	448.71	10.856	3492417
100-096	SC-0925	Grace Lake	60.03	64.99	8.656	416039
100-096	SC-0970	Grace Lake	60.05	22.94	10.044	153865
100-096	SC-0980A	Grace Lake	60.13	10.05	8.654	86703
100-096	SC-0980B	Grace Lake	60.03	28.62	8.656	183195
100-096	SC-0980C	Grace Lake	60.09	54.01	8.656	386816
100-096	SC-0985	Grace Lake	60.07	205.63	8.656	1378148
100-096	SC-0995	Grace Lake	60.11	168.83	10.044	1315407

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 4.7

UPDATED SURFACE WATER ANALYSIS

ICPR FLOOD ROUTING RESULTS FOR THE
100-YEAR, 96-HOUR STORM EVENT
(GROUP "GRACE LAKE")

INITIAL STAGE => ELEVATION 62.6-FT, NAVD

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
NODE MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 62.6 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
SC-0750	Grace Lake	100-096	0.00	52.00	54.00	0.0000	40	72.14	65.02	0.00	0.00
SC-0760	Grace Lake	100-096	72.12	56.22	58.00	0.0001	342	72.12	37.54	72.12	37.54
SC-0770	Grace Lake	100-096	72.12	58.77	58.00	0.0001	45682	59.72	49.94	72.11	42.95
SC-0780	Grace Lake	100-096	97.37	64.44	67.27	0.0000	129	96.85	0.00	0.00	0.00
SC-0790	Grace Lake	100-096	97.43	64.44	67.00	0.0000	8815	95.56	0.09	96.85	0.00
SC-0800	Grace Lake	100-096	72.15	58.79	56.00	0.0002	382357	60.08	164.59	72.42	48.09
SC-0810	Grace Lake	100-096	72.15	58.82	58.00	0.0049	2497	61.08	95.99	61.09	95.99
SC-0815	Grace Lake	100-096	72.15	58.79	56.00	0.0001	2536	0.00	0.00	0.00	0.00
SC-0820	Grace Lake	100-096	72.15	58.79	56.00	0.0001	79844	60.08	39.78	60.59	19.83
SC-0830	Grace Lake	100-096	61.22	59.85	59.00	-0.0010	44942	60.67	102.70	61.23	99.91
SC-0840	Grace Lake	100-096	61.22	59.86	58.00	0.0001	229303	60.08	188.60	61.19	87.24
SC-0850	Grace Lake	100-096	61.24	60.96	59.50	0.0001	123	96.00	46.99	96.00	46.99
SC-0860	Grace Lake	100-096	61.26	62.04	61.55	0.0003	155	96.00	46.99	96.00	46.99
SC-0870	Grace Lake	100-096	96.00	64.88	66.00	0.0001	154	96.00	46.99	96.00	46.99
SC-0875	Grace Lake	100-096	96.00	66.11	64.00	0.0003	439	96.00	57.19	96.00	57.19
SC-0880	Grace Lake	100-096	96.00	66.17	64.00	0.0001	336649	60.17	208.09	96.00	57.19
SC-0890	Grace Lake	100-096	95.19	66.84	66.00	0.0066	458	93.88	119.00	96.85	53.46
SC-0900	Grace Lake	100-096	95.85	66.83	66.00	0.0001	65989	60.08	34.60	60.71	6.43
SC-0910	Grace Lake	100-096	95.67	66.83	66.00	0.0000	158860	60.00	31.68	93.88	58.72
SC-0920	Grace Lake	100-096	95.56	66.84	66.00	0.0000	1676967	60.08	567.06	93.88	83.35
SC-0925	Grace Lake	100-096	60.56	78.79	76.00	0.0002	48853	60.08	63.78	60.56	23.84
SC-0930	Grace Lake	100-096	94.94	66.87	66.00	0.0001	9192	60.19	105.55	60.25	105.15
SC-0940	Grace Lake	100-096	60.19	69.07	69.00	0.0014	12328	60.17	105.66	60.19	105.55
SC-0950	Grace Lake	100-096	60.26	69.44	72.00	0.0019	1139	69.31	41.38	60.50	38.92
SC-0960	Grace Lake	100-096	60.43	70.40	73.00	0.0047	505	60.49	38.89	69.31	41.38
SC-0970	Grace Lake	100-096	60.10	72.09	71.00	0.0003	2037	60.08	69.37	60.10	69.16
SC-0980	Grace Lake	100-096	60.49	77.26	74.00	0.0005	33859	60.08	131.88	60.52	91.18
SC-0985	Grace Lake	100-096	60.49	77.28	73.00	0.0002	139367	60.08	371.23	63.32	77.81
SC-0990	Grace Lake	100-096	68.21	72.66	79.00	0.0009	151	68.20	5.76	68.21	5.76
SC-0995	Grace Lake	100-096	68.20	86.23	84.00	0.0002	129991	60.08	167.63	68.20	5.76

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
LINK MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 62.6 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
SC-0760-P	Grace Lake	100-096	72.12	37.54	0.004	72.12	56.22	0.00	52.00
SC-0770-D1	Grace Lake	100-096	72.12	37.54	0.001	72.12	58.77	72.12	56.22
SC-0770-D2	Grace Lake	100-096	59.97	14.25	0.611	72.12	58.77	72.15	58.79
SC-0770-W	Grace Lake	100-096	72.12	6.03	-0.000	72.12	58.77	0.00	52.00
SC-0780-D	Grace Lake	100-096	0.00	0.00	0.000	97.37	64.44	72.12	58.77
SC-0780-W	Grace Lake	100-096	0.00	0.00	0.000	97.37	64.44	72.12	58.77
SC-0790-P	Grace Lake	100-096	96.85	0.00	0.003	97.43	64.44	97.37	64.44
SC-0800-W1	Grace Lake	100-096	96.04	27.57	0.012	72.15	58.79	72.12	58.77
SC-0800-W2	Grace Lake	100-096	72.15	21.45	0.000	72.15	58.79	0.00	52.00
SC-0810-W1	Grace Lake	100-096	61.09	95.99	-0.023	72.15	58.82	72.15	58.79
SC-0810-W2	Grace Lake	100-096	72.20	14.85	-0.003	72.15	58.82	72.12	58.77
SC-0815-P	Grace Lake	100-096	0.00	0.00	-0.002	72.15	58.79	72.15	58.82
SC-0820-W1	Grace Lake	100-096	0.00	0.00	-0.002	72.15	58.79	72.15	58.79
SC-0820-W2	Grace Lake	100-096	60.59	25.78	0.870	72.15	58.79	72.15	58.79
SC-0830-P	Grace Lake	100-096	61.23	99.91	2.172	61.22	59.85	72.15	58.82
SC-0840-W	Grace Lake	100-096	61.19	87.24	-0.008	61.22	59.86	61.22	59.85
SC-0850-P	Grace Lake	100-096	96.00	46.99	0.005	61.24	60.96	61.22	59.86
SC-0860-P	Grace Lake	100-096	96.00	46.99	0.138	61.26	62.04	61.24	60.96
SC-0870-P	Grace Lake	100-096	96.00	46.99	0.005	96.00	64.88	61.26	62.04
SC-0875-P	Grace Lake	100-096	96.00	46.99	-0.002	96.00	66.11	96.00	64.88
SC-0875-W	Grace Lake	100-096	96.00	10.19	-0.000	96.00	66.11	61.22	59.86
SC-0880-W	Grace Lake	100-096	96.00	57.19	-0.002	96.00	66.17	96.00	66.11
SC-0890-P	Grace Lake	100-096	96.85	53.46	5.223	95.19	66.84	96.00	66.17
SC-0890-W	Grace Lake	100-096	0.00	0.00	0.000	95.19	66.84	72.15	58.82
SC-0900-D	Grace Lake	100-096	60.71	6.43	1.261	95.85	66.83	95.19	66.84
SC-0900-W	Grace Lake	100-096	0.00	0.00	0.000	95.85	66.83	95.19	66.84
SC-0910-W	Grace Lake	100-096	93.88	58.72	39.647	95.67	66.83	95.19	66.84
SC-0920-W1	Grace Lake	100-096	91.45	24.32	9.915	95.56	66.84	95.67	66.83
SC-0920-W2	Grace Lake	100-096	93.88	59.18	33.527	95.56	66.84	95.19	66.84
SC-0920-W3	Grace Lake	100-096	95.56	0.09	-0.000	95.56	66.84	97.43	64.44
SC-0925-D	Grace Lake	100-096	60.56	19.84	0.032	60.56	78.79	95.56	66.84
SC-0925-W	Grace Lake	100-096	60.56	4.00	0.001	60.56	78.79	95.56	66.84
SC-0930-C	Grace Lake	100-096	60.25	105.15	-0.436	94.94	66.87	95.56	66.84
SC-0940-C	Grace Lake	100-096	60.19	105.55	1.012	60.19	69.07	94.94	66.87
SC-0950-C	Grace Lake	100-096	60.50	38.92	0.721	60.26	69.44	60.19	69.07
SC-0960-C	Grace Lake	100-096	69.31	41.38	-17.116	60.43	70.40	60.26	69.44
SC-0970-P	Grace Lake	100-096	60.09	37.51	-5.134	60.10	72.09	60.19	69.07
SC-0970-W	Grace Lake	100-096	60.10	31.68	0.004	60.10	72.09	60.19	69.07
SC-0980-P1	Grace Lake	100-096	60.53	52.30	0.003	60.49	77.26	60.10	72.09
SC-0980-P2	Grace Lake	100-096	60.49	38.89	0.003	60.49	77.26	59.48	70.78
SC-0985-P	Grace Lake	100-096	70.90	48.30	-0.051	60.49	77.28	60.49	77.26
SC-0985-W	Grace Lake	100-096	63.32	69.30	-0.227	60.49	77.28	60.49	77.26
SC-0990-P	Grace Lake	100-096	68.21	5.76	0.013	68.21	72.66	116.84	65.99
SC-0995-D	Grace Lake	100-096	68.20	5.76	0.004	68.20	86.23	68.21	72.66
SC-1000-P	Grace Lake	100-096	62.20	182.55	-252.336	60.41	78.07	60.49	77.28
SC-1000-W	Grace Lake	100-096	60.41	59.76	59.763	60.41	78.07	60.49	77.28

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
PROPOSED CONDITIONS ANALYSIS
BASIN MAXIMUM CONDITIONS REPORT
MARCH 2014
GRACE LAKE INITIAL STAGE = 62.6 FT, NAVD

** ALL ELEVATIONS ARE REFERENCED TO THE NAVD VERTICAL DATUM**

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
100-096	SC-0770	Grace Lake	60.04	92.29	8.835	577896
100-096	SC-0800A	Grace Lake	60.03	52.65	11.625	378938
100-096	SC-0800B	Grace Lake	60.03	23.17	10.850	158725
100-096	SC-0810	Grace Lake	60.01	22.88	11.173	140732
100-096	SC-0820A	Grace Lake	60.03	19.44	11.164	130493
100-096	SC-0820B	Grace Lake	60.13	22.13	11.173	201980
100-096	SC-0830	Grace Lake	60.17	32.41	9.697	325245
100-096	SC-0840	Grace Lake	60.11	148.40	8.286	1249386
100-096	SC-0880	Grace Lake	60.18	251.81	8.650	2443779
100-096	SC-0900A	Grace Lake	60.02	14.15	11.008	91507
100-096	SC-0900B	Grace Lake	60.22	22.93	11.170	224637
100-096	SC-0910	Grace Lake	60.03	38.07	11.775	260308
100-096	SC-0920	Grace Lake	60.08	448.71	10.856	3492417
100-096	SC-0925	Grace Lake	60.03	64.99	8.656	416039
100-096	SC-0970	Grace Lake	60.05	22.94	10.044	153865
100-096	SC-0980A	Grace Lake	60.13	10.05	8.654	86703
100-096	SC-0980B	Grace Lake	60.03	28.62	8.656	183195
100-096	SC-0980C	Grace Lake	60.09	54.01	8.656	386816
100-096	SC-0985	Grace Lake	60.07	205.63	8.656	1378148
100-096	SC-0995	Grace Lake	60.11	168.83	10.044	1315407

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

TAB 5.1

SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS

RAINFALL VS. DISCHARGE VOLUME RATING CURVE FOR THE "UP-GRADIENT" DRAINAGE BASINS

(RAINFALL EVENTS BETWEEN 0.25" AND 10.00")

AMC I CONDITION

Alternative Sinkhole Remediation Protocol for Grace Lake ~ Updated Surface Water Analysis
Rainfall vs. Discharge Volume Rating Curve for the "Up-gradient" Drainage Basins
AMC I Condition

Table No. 5.1.1

Discharge Volume (AC-FT) ~ 0.25" Rainfall			Discharge Volume (AC-FT) ~ 0.50" Rainfall			Discharge Volume (AC-FT) ~ 0.75" Rainfall			Discharge Volume (AC-FT) ~ 1.00" Rainfall			Discharge Volume (AC-FT) ~ 1.25" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table No. 5.1.2

Discharge Volume (AC-FT) ~ 1.50" Rainfall			Discharge Volume (AC-FT) ~ 1.75" Rainfall			Discharge Volume (AC-FT) ~ 2.00" Rainfall			Discharge Volume (AC-FT) ~ 2.25" Rainfall			Discharge Volume (AC-FT) ~ 2.50" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
1.6	0.0	1.6	4.2	0.0	4.2	7.5	0.0	7.5	11.2	0.0	11.2	15.6	0.0	15.6

Table No. 5.1.3

Discharge Volume (AC-FT) ~ 3.00" Rainfall			Discharge Volume (AC-FT) ~ 3.50" Rainfall			Discharge Volume (AC-FT) ~ 4.00" Rainfall			Discharge Volume (AC-FT) ~ 4.50" Rainfall			Discharge Volume (AC-FT) ~ 5.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
25.7	0.0	25.7	37.4	0.0	37.4	50.6	0.0	50.6	65.2	0.0	65.2	80.2	0.0	80.2

Table No. 5.1.4

Discharge Volume (AC-FT) ~ 6.00" Rainfall			Discharge Volume (AC-FT) ~ 7.00" Rainfall			Discharge Volume (AC-FT) ~ 8.00" Rainfall			Discharge Volume (AC-FT) ~ 9.00" Rainfall			Discharge Volume (AC-FT) ~ 10.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
98.6	0.0	98.6	113.3	0.0	113.3	129.6	0.0	129.6	146.2	0.0	146.2	163.6	0.0	163.6

NOTES

1. Cumulative discharge volume obtained from the ICPR node-time series at the end of each simulation. The duration for each of these storm event similations was set to 336 hours.

2. Refer to the charts on the following pages for a graphical illustration of the node outflow relationships for several of the storm events summarized above.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
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ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 5.2

SUPPORTING DOCUMENTATION FOR THE
CONTINUOUS SIMULATION ANALYSIS

ICPR FLOOD ROUTING RESULTS
FOR THE "UP-GRADIENT" DRAINAGE BASINS
(RAINFALL EVENTS BETWEEN 0.25" AND 10.00")

AMC I CONDITION

Pegasus
ENGINEERING

ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS
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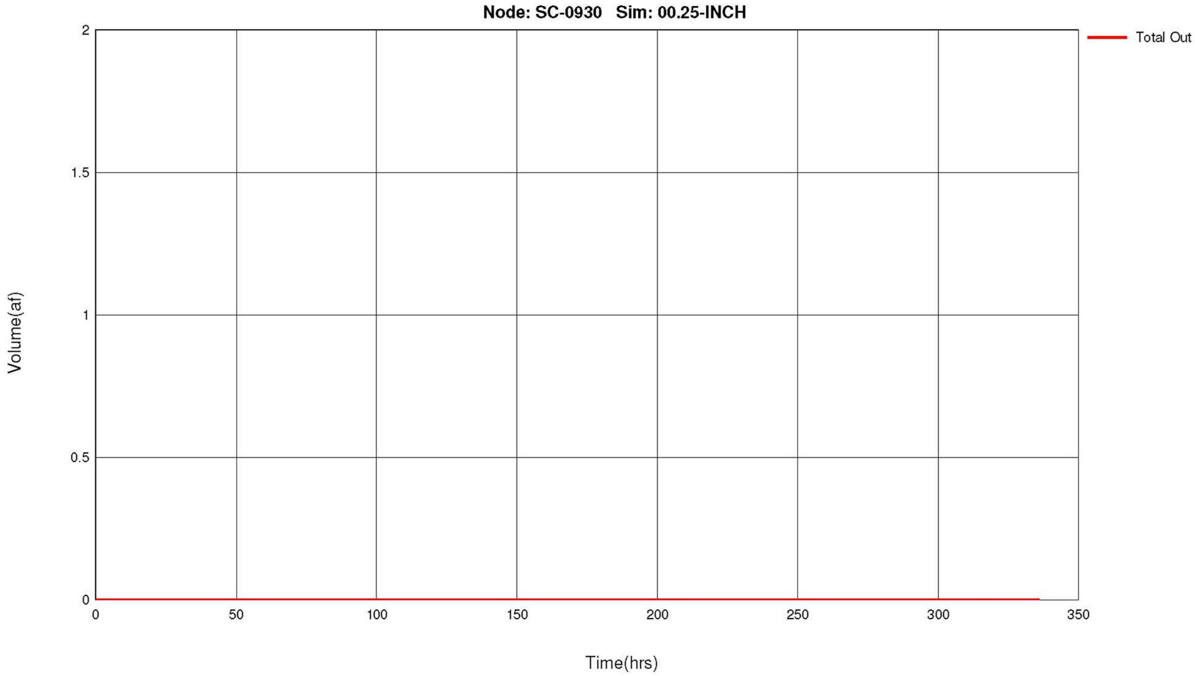

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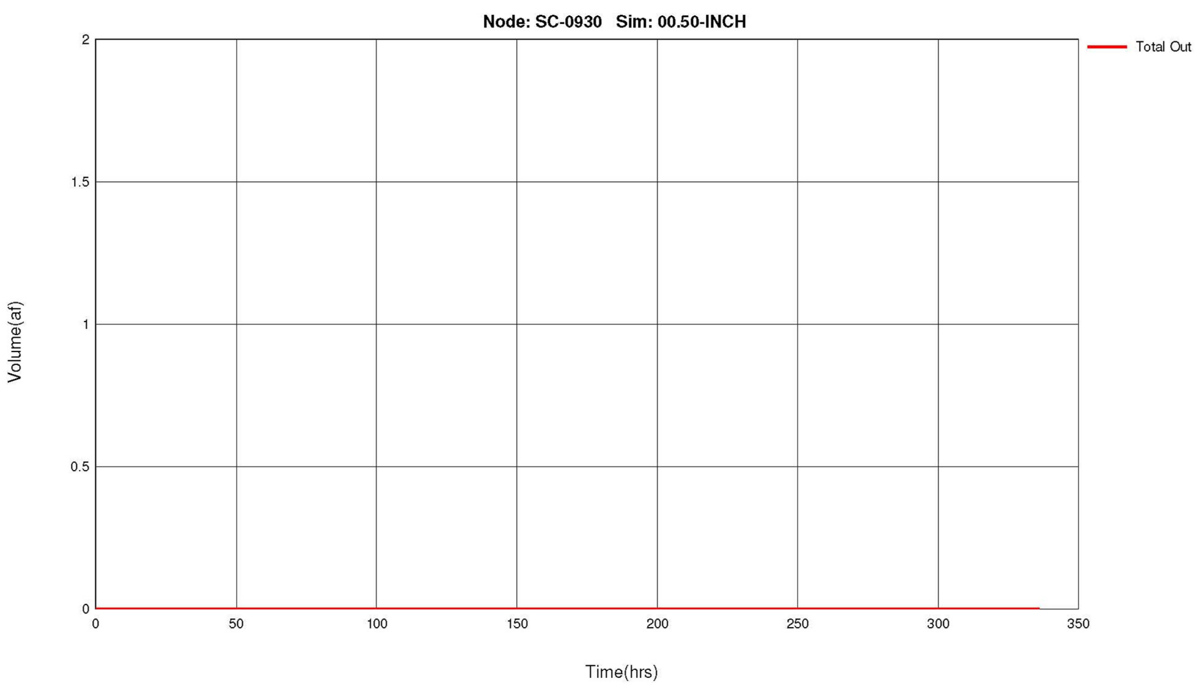

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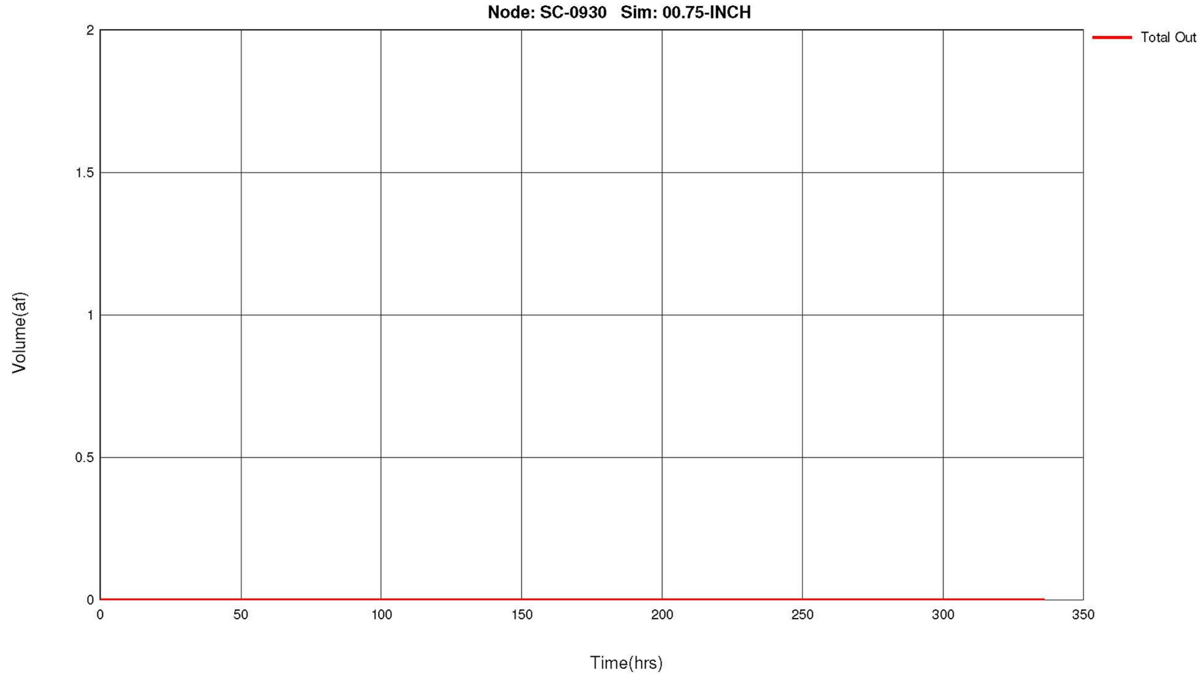

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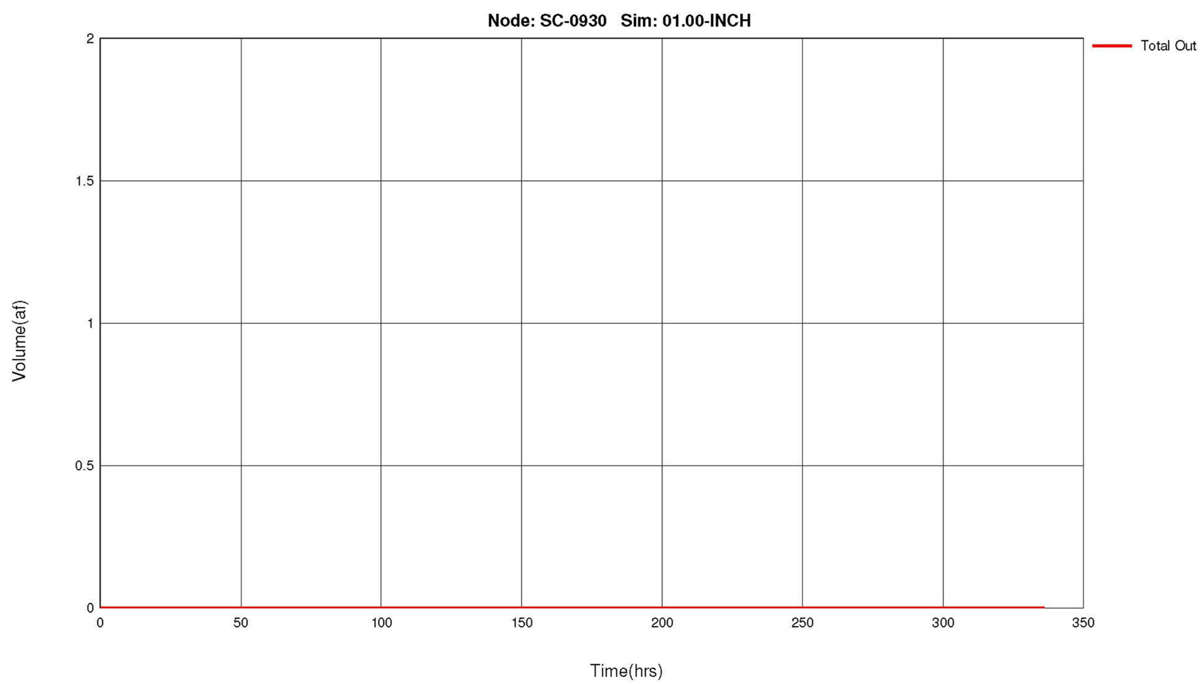

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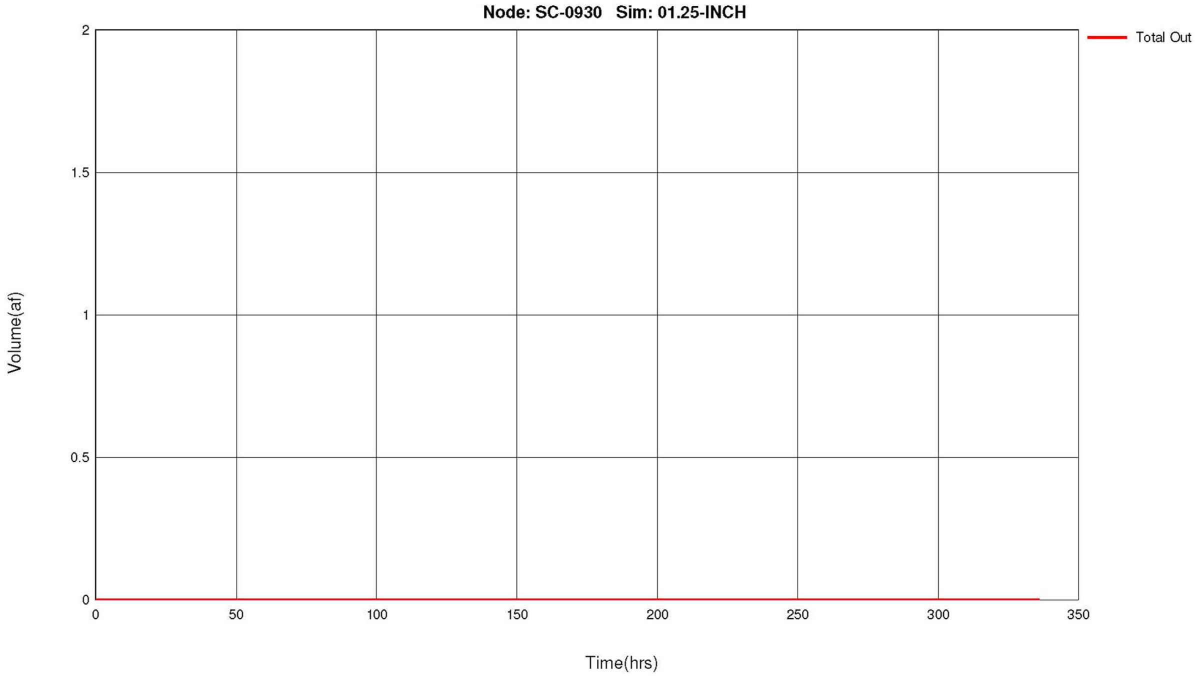

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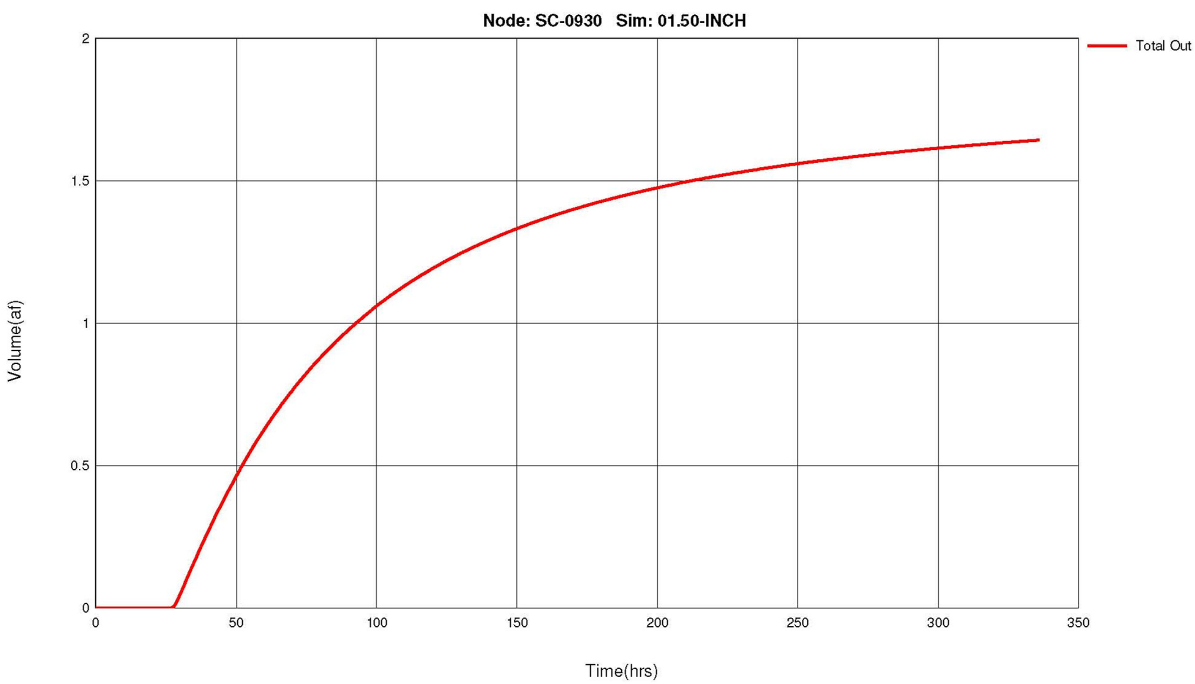

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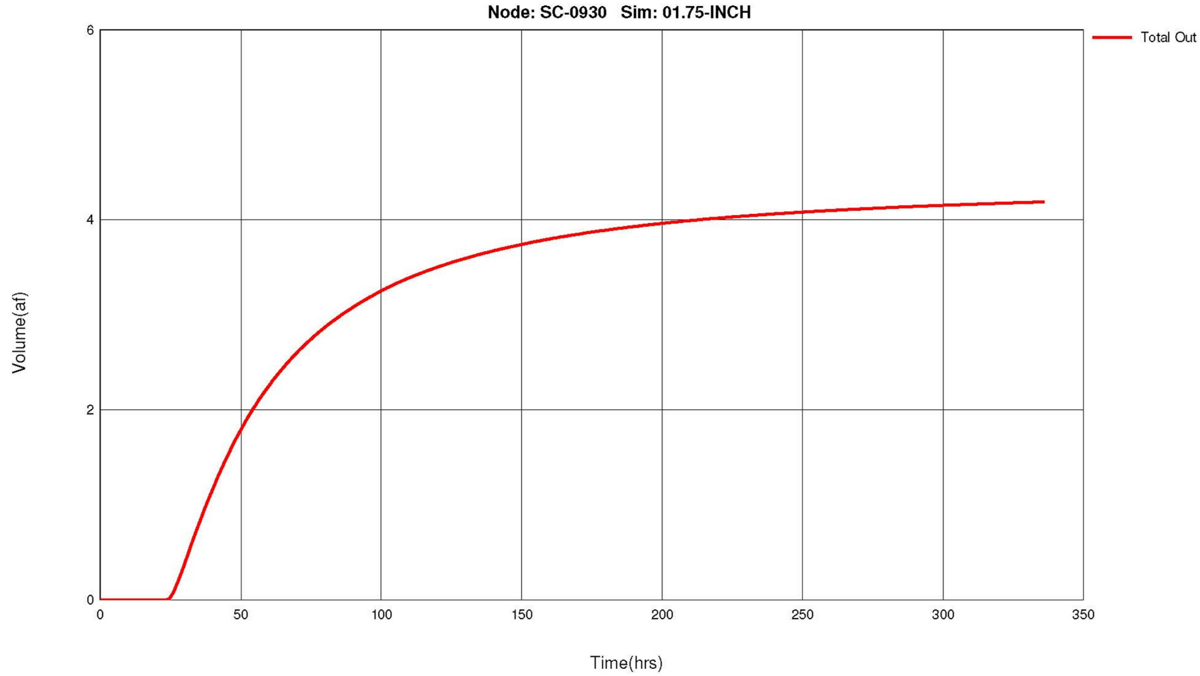

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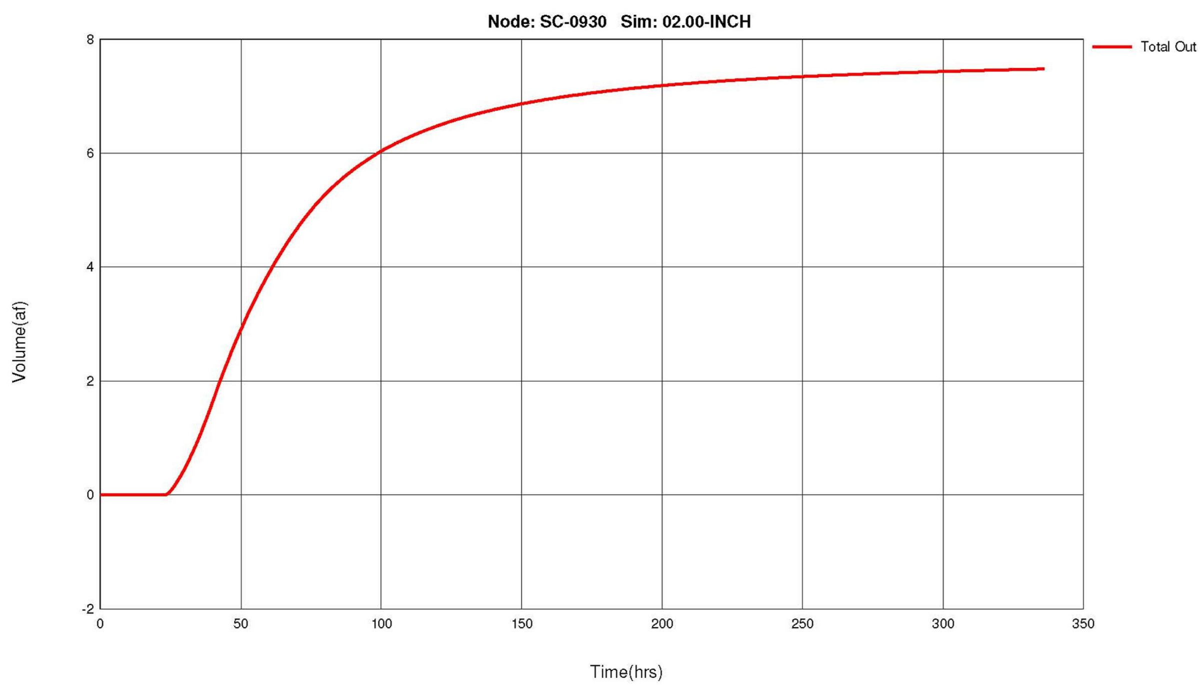

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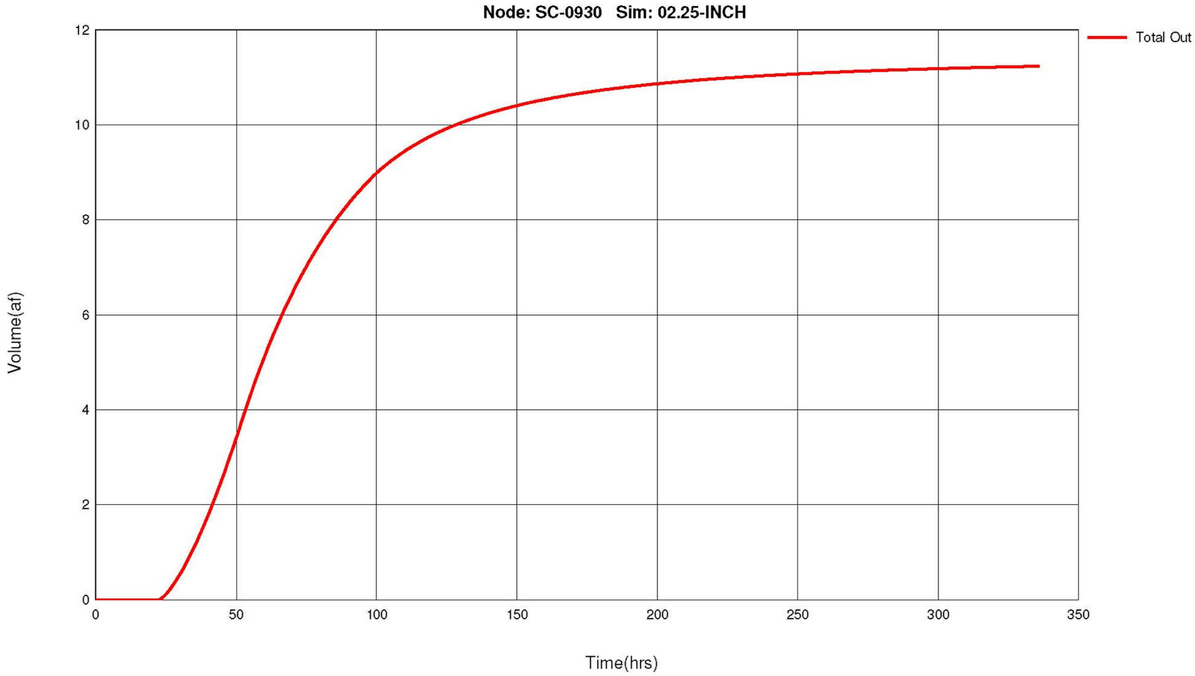

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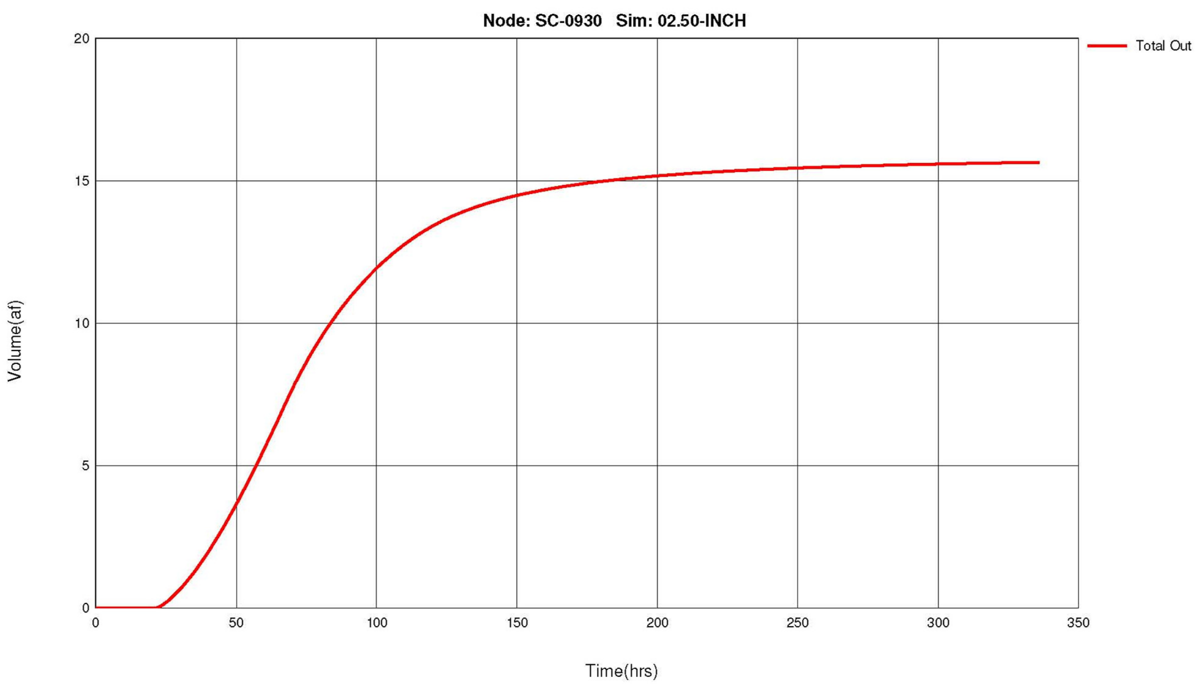

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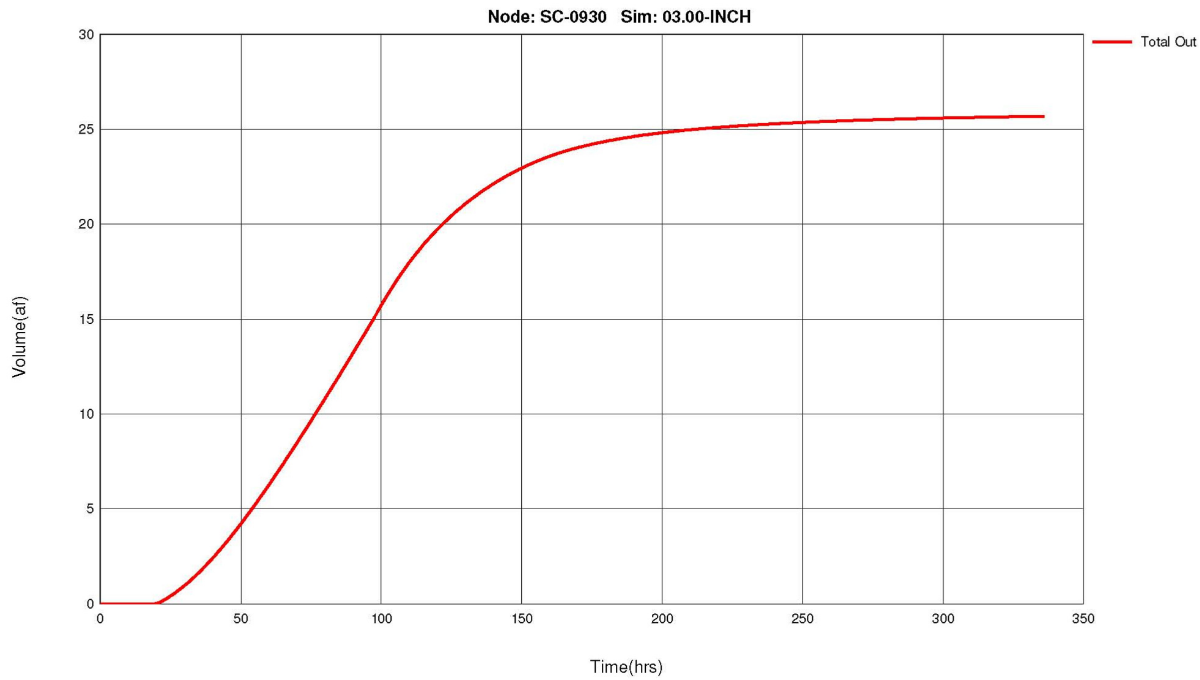

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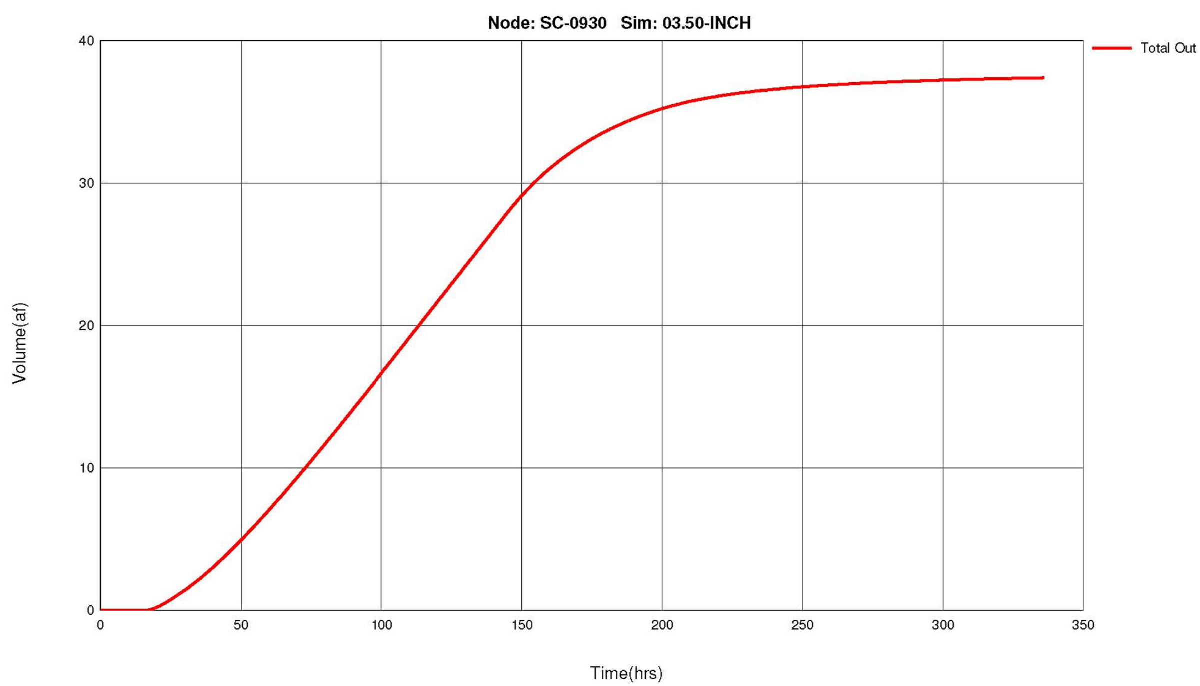

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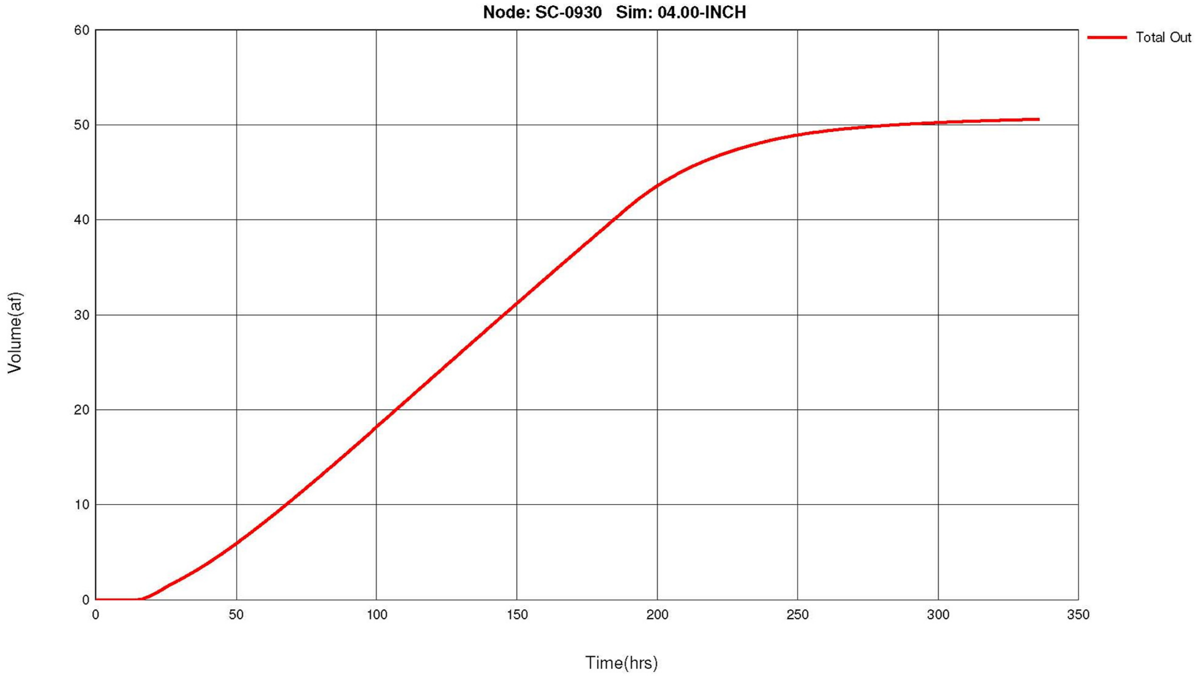

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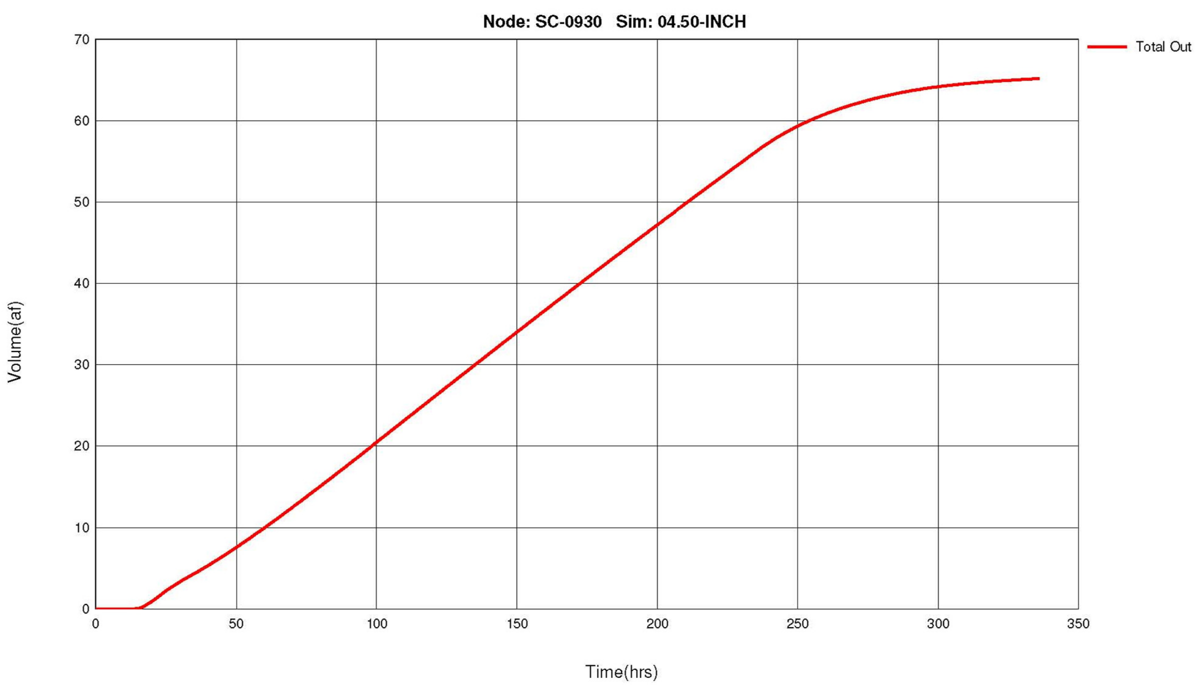

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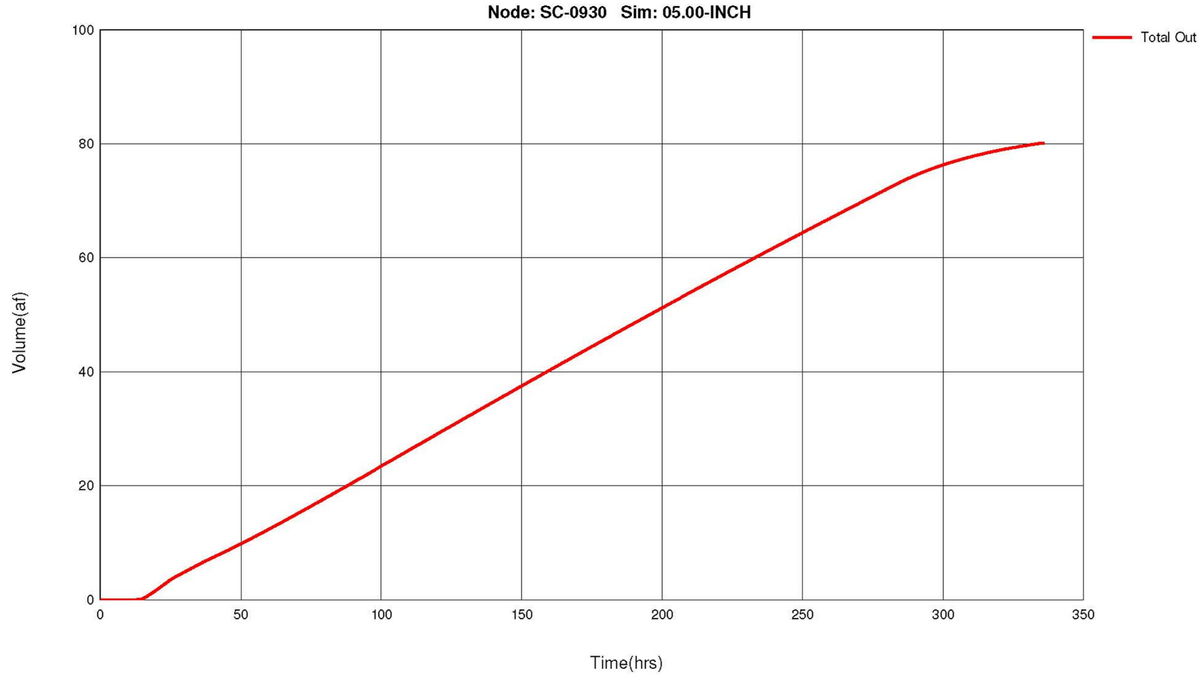

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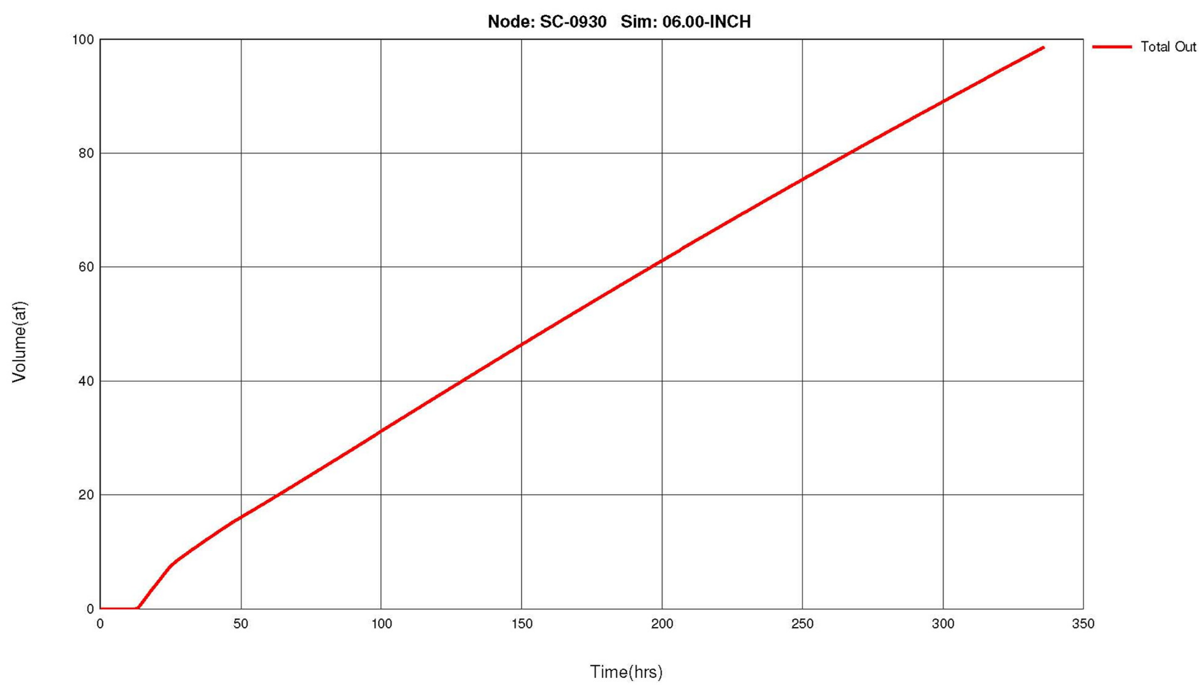

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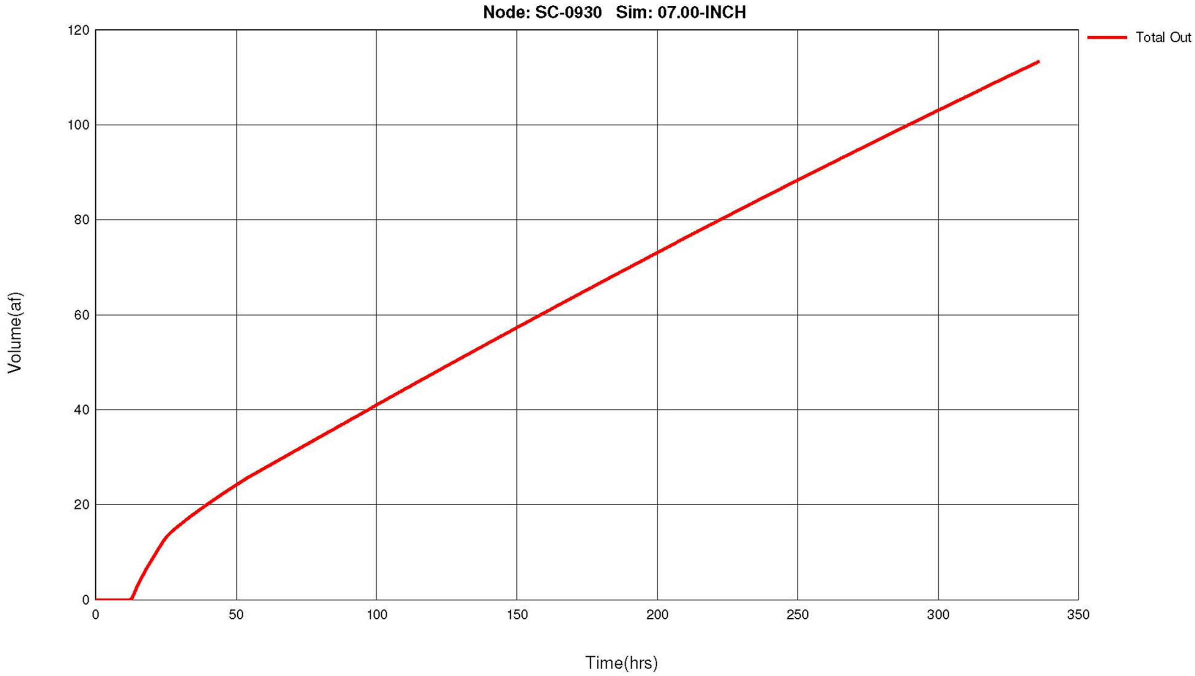

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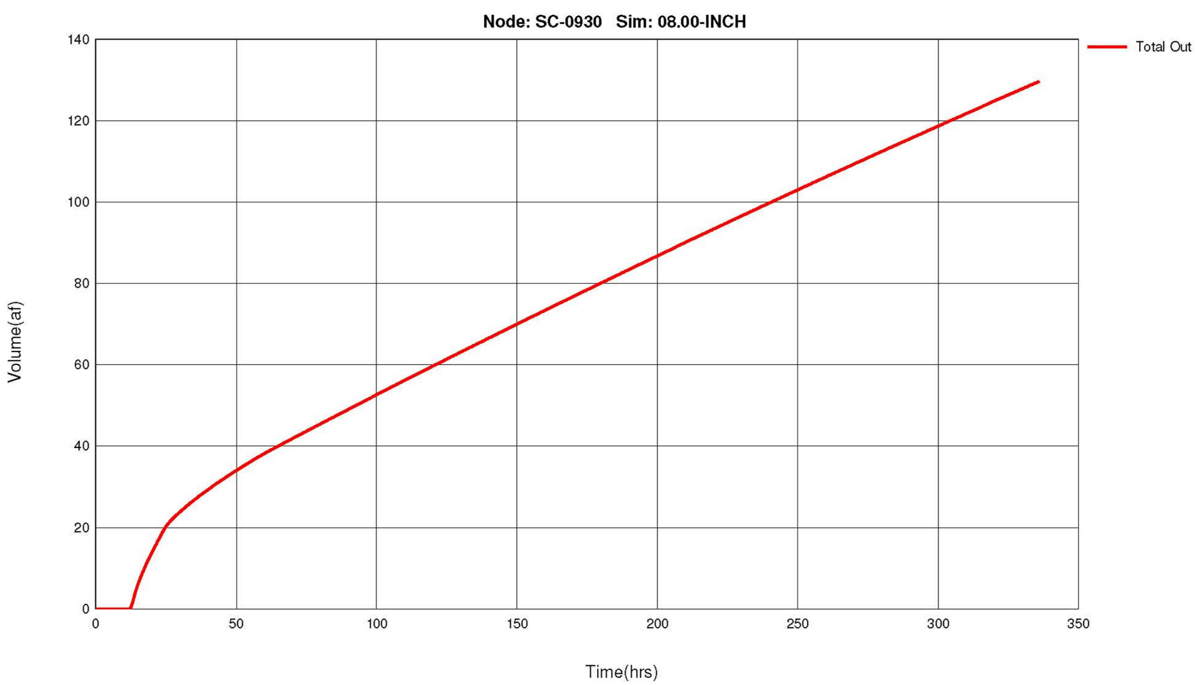

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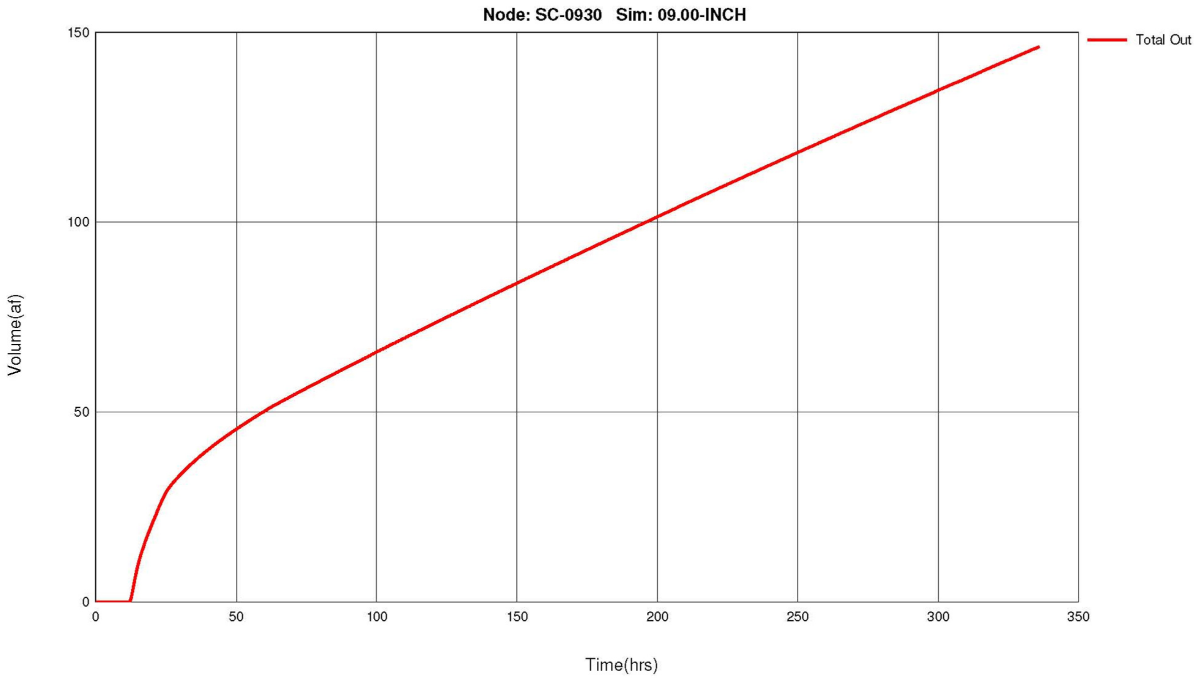

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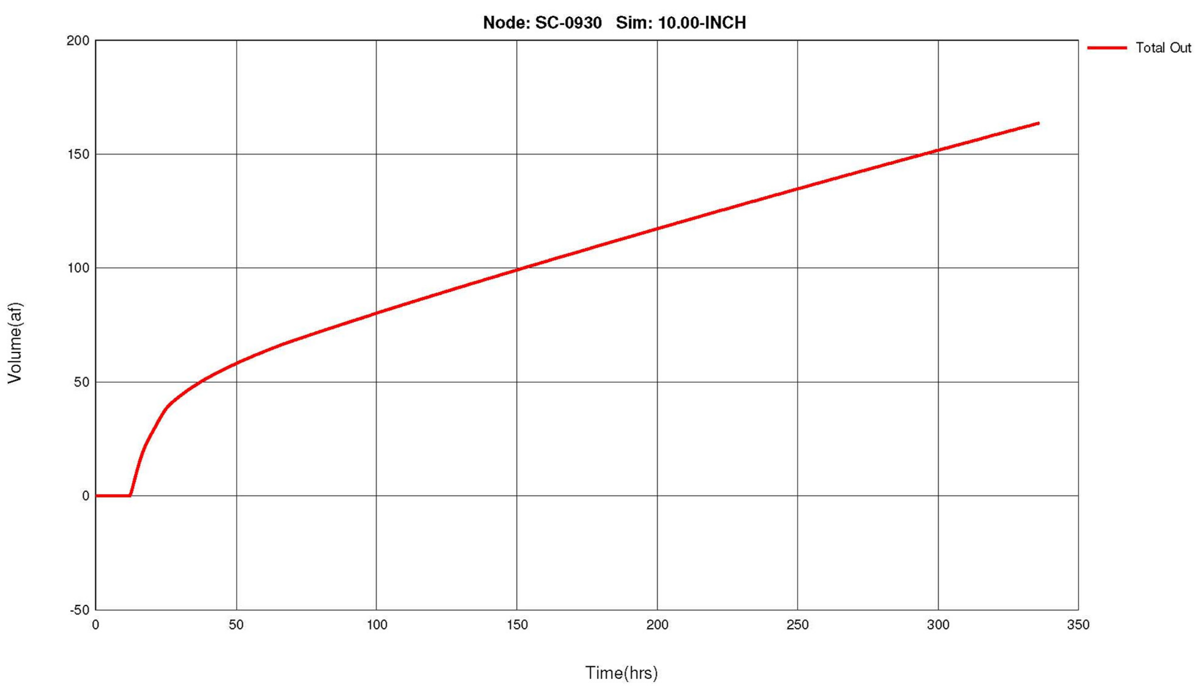

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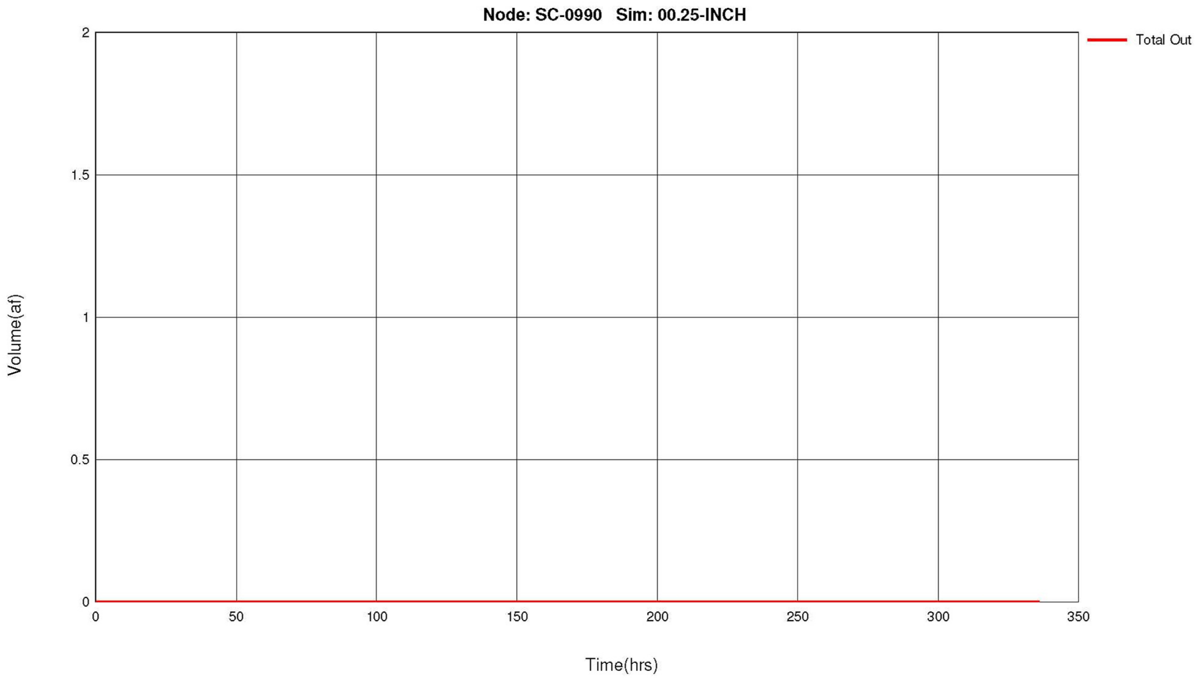

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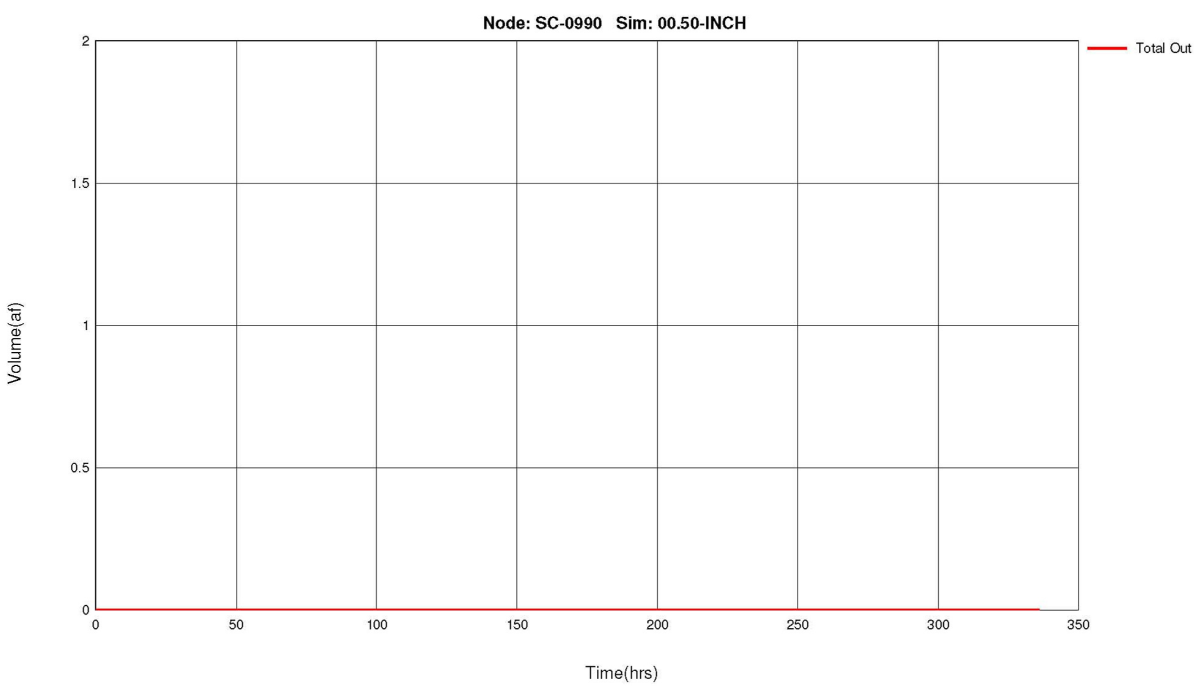

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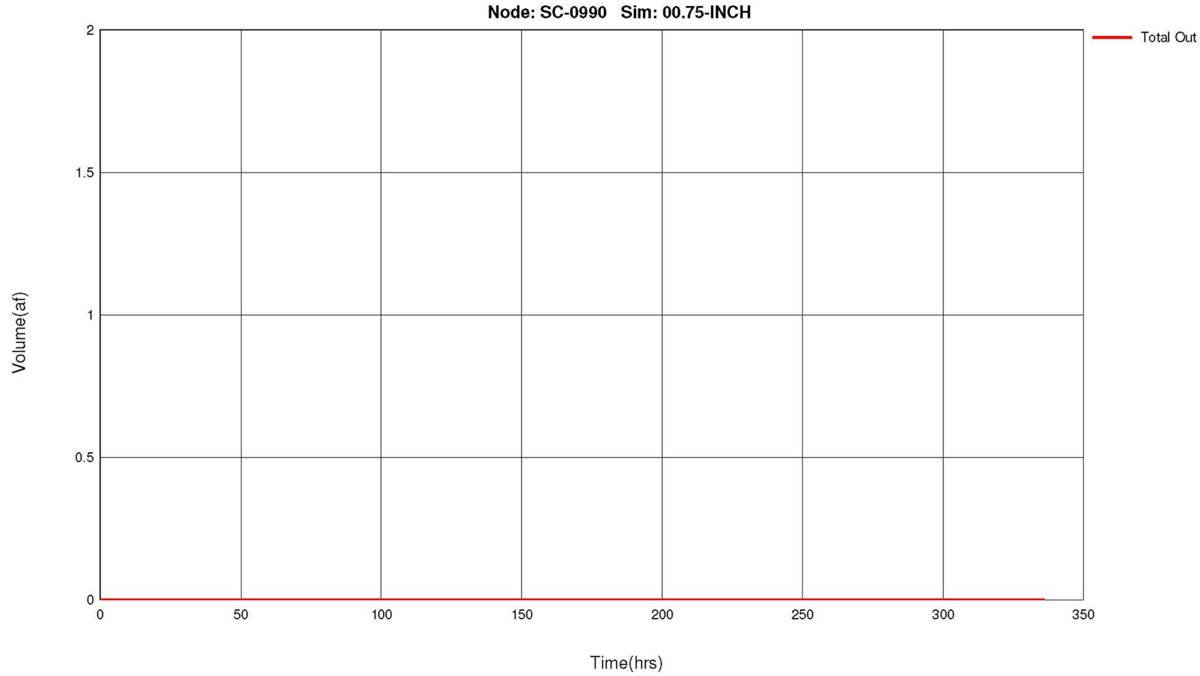

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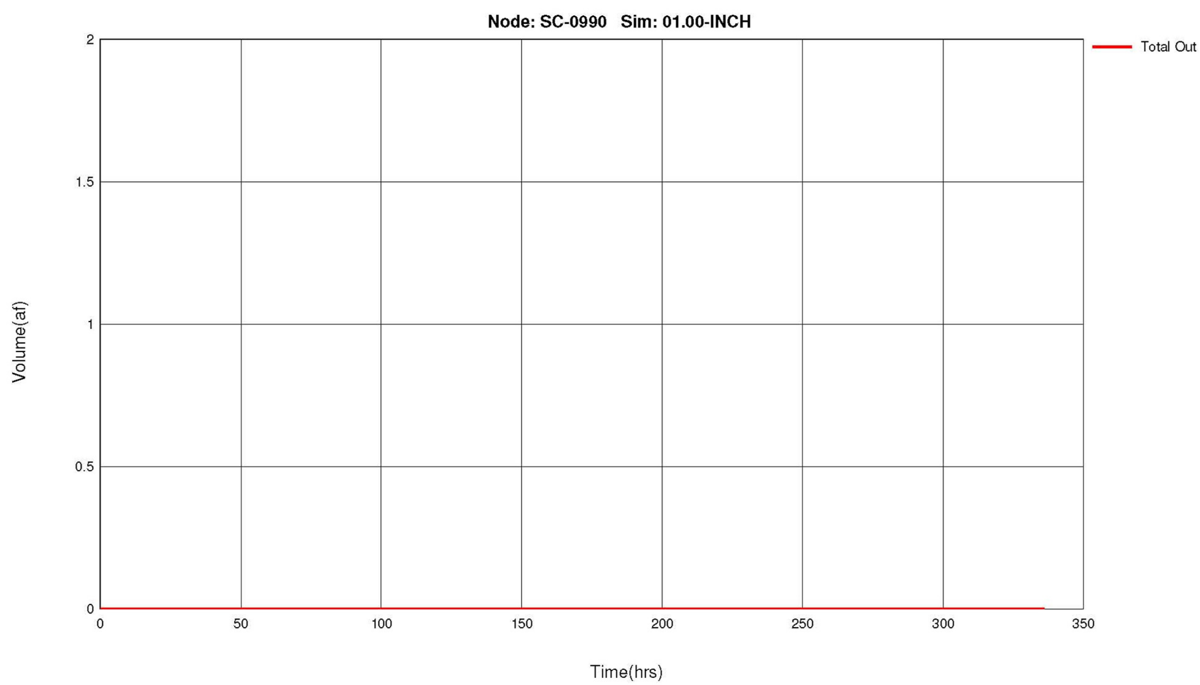

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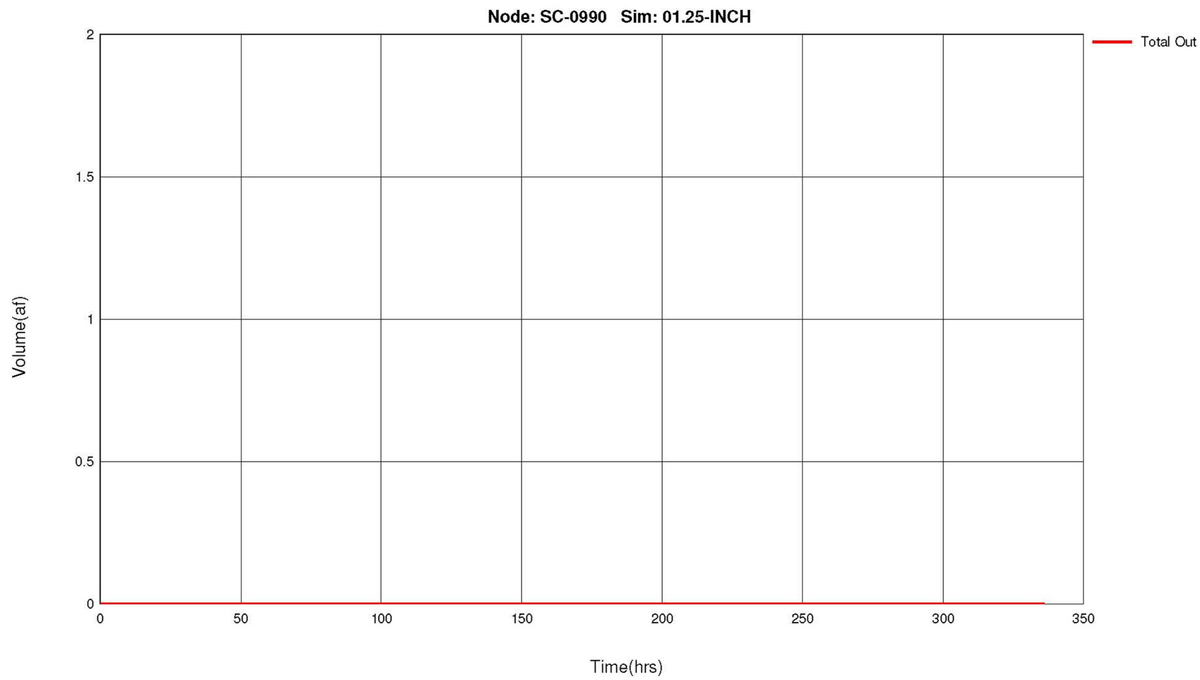

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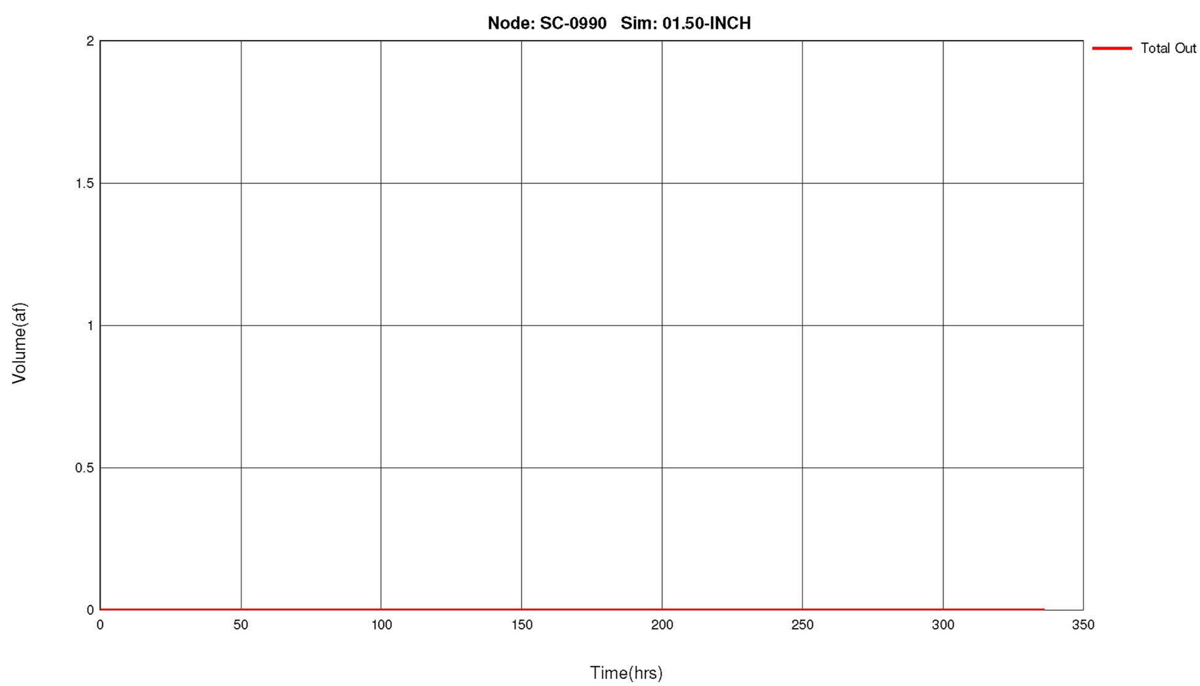

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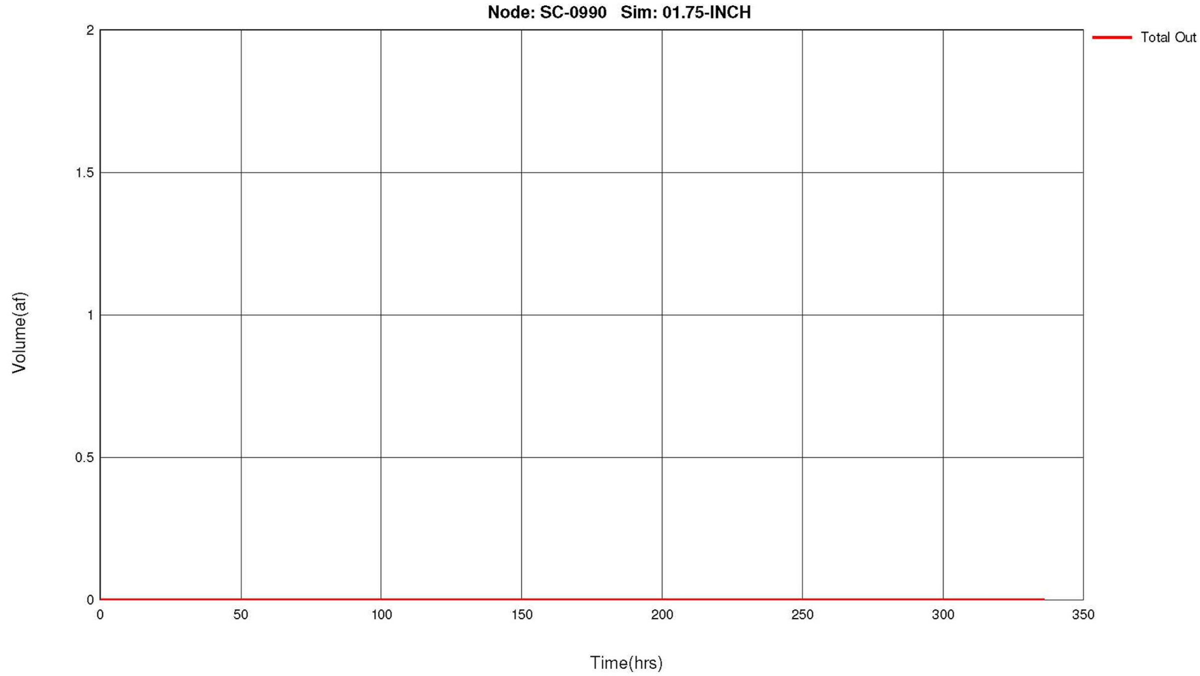

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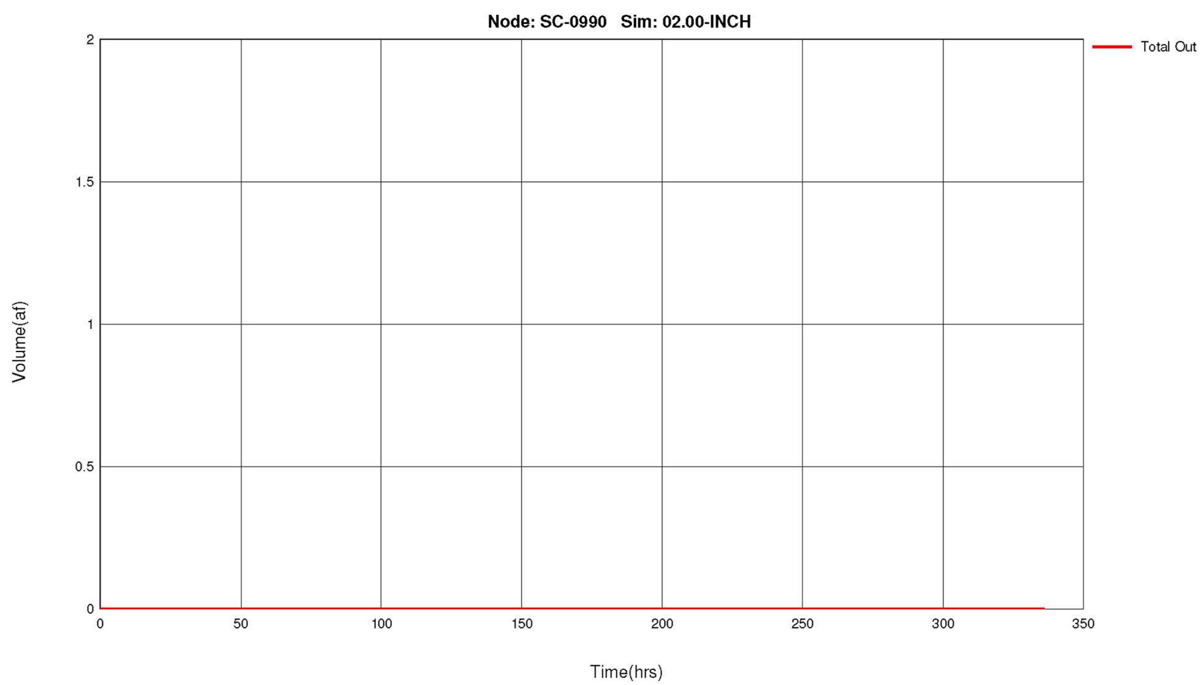

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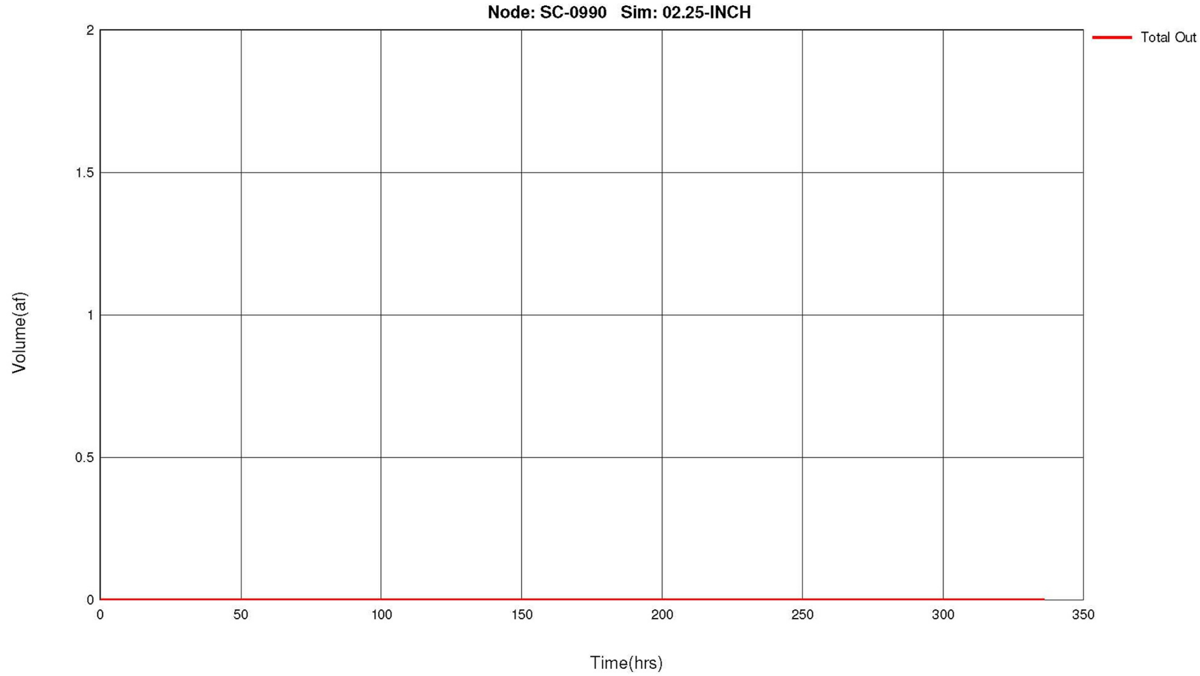

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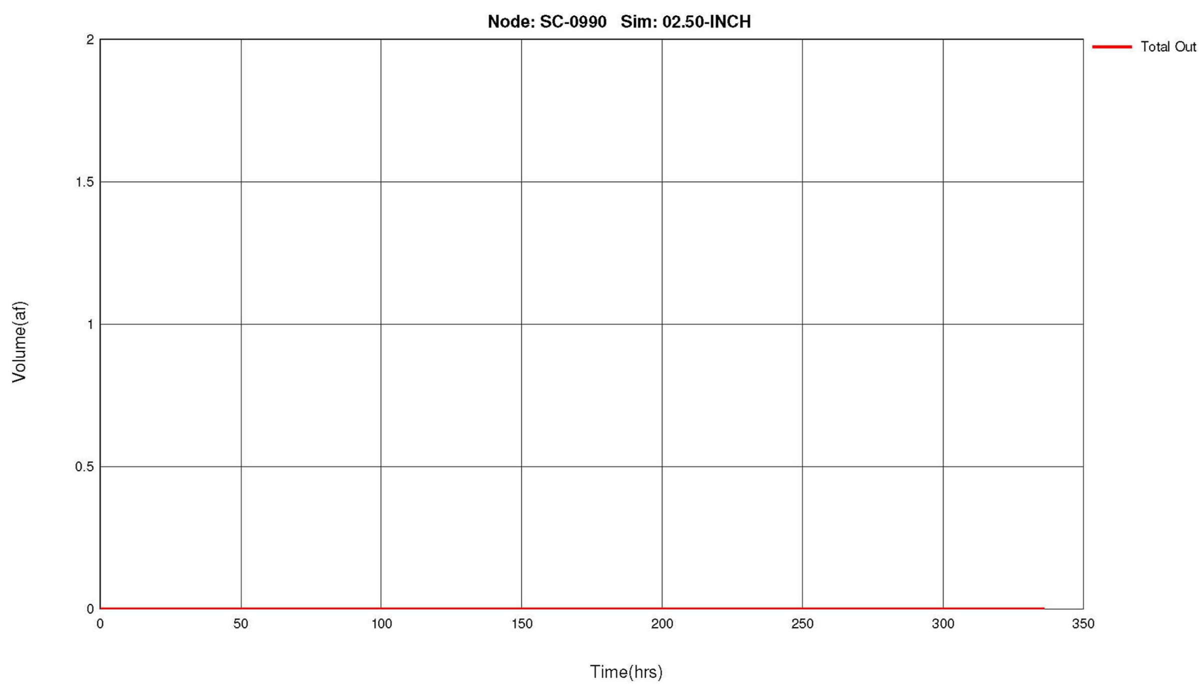

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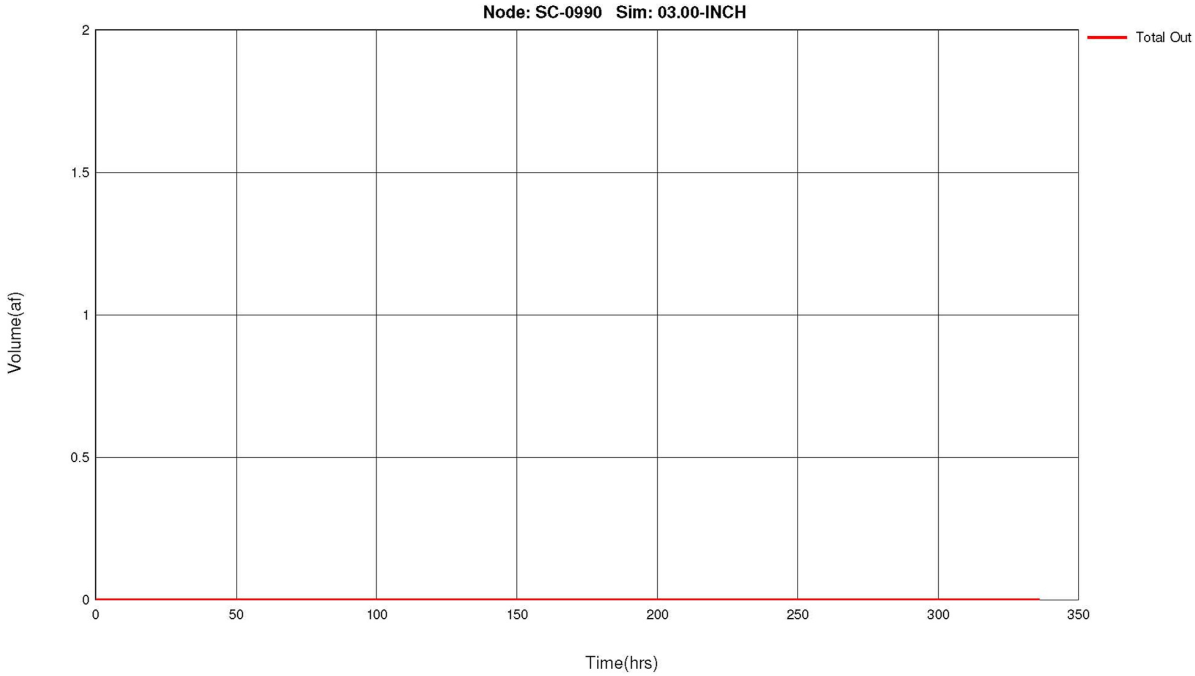

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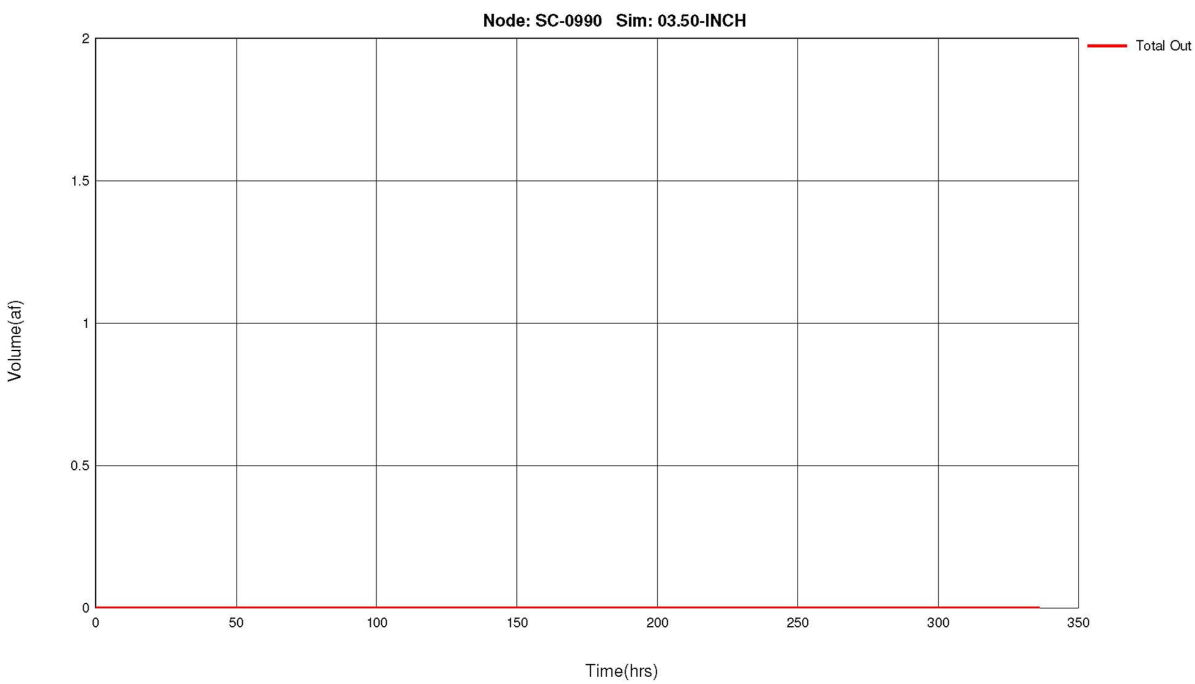

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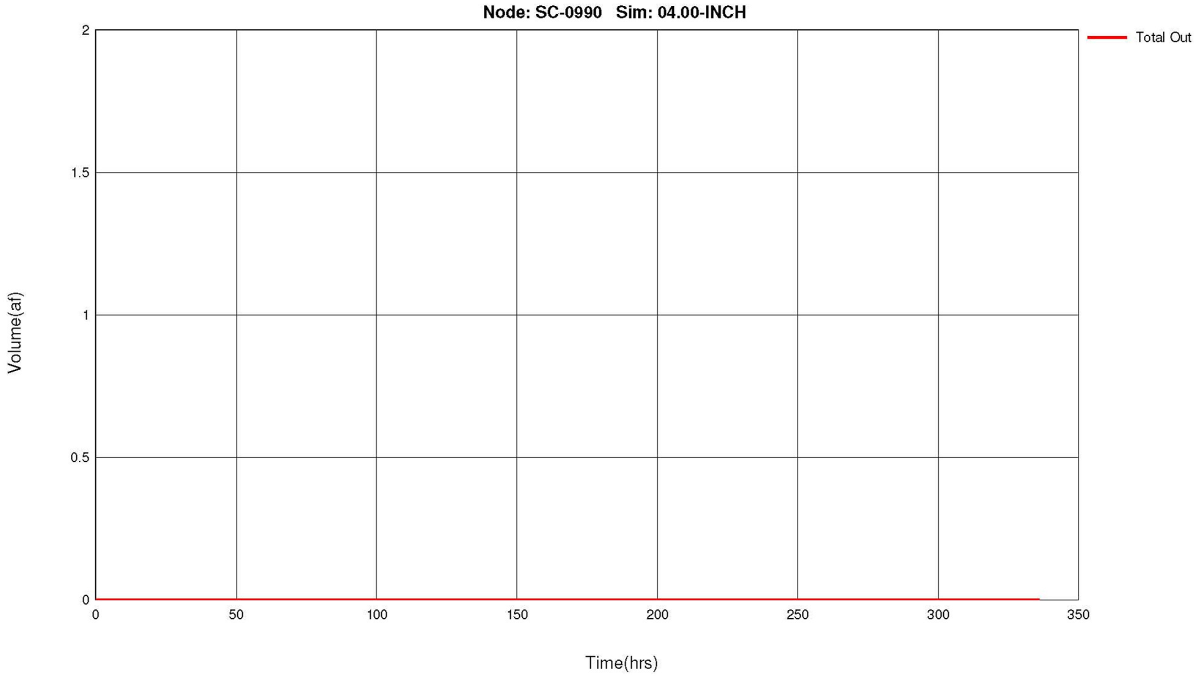

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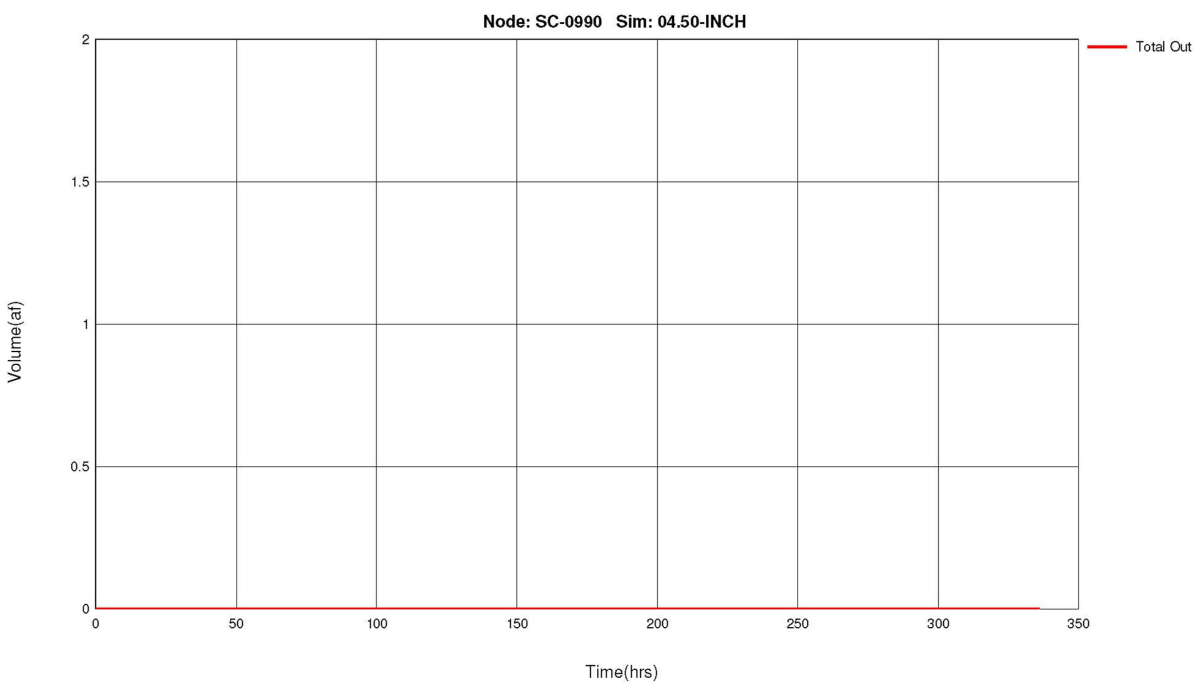

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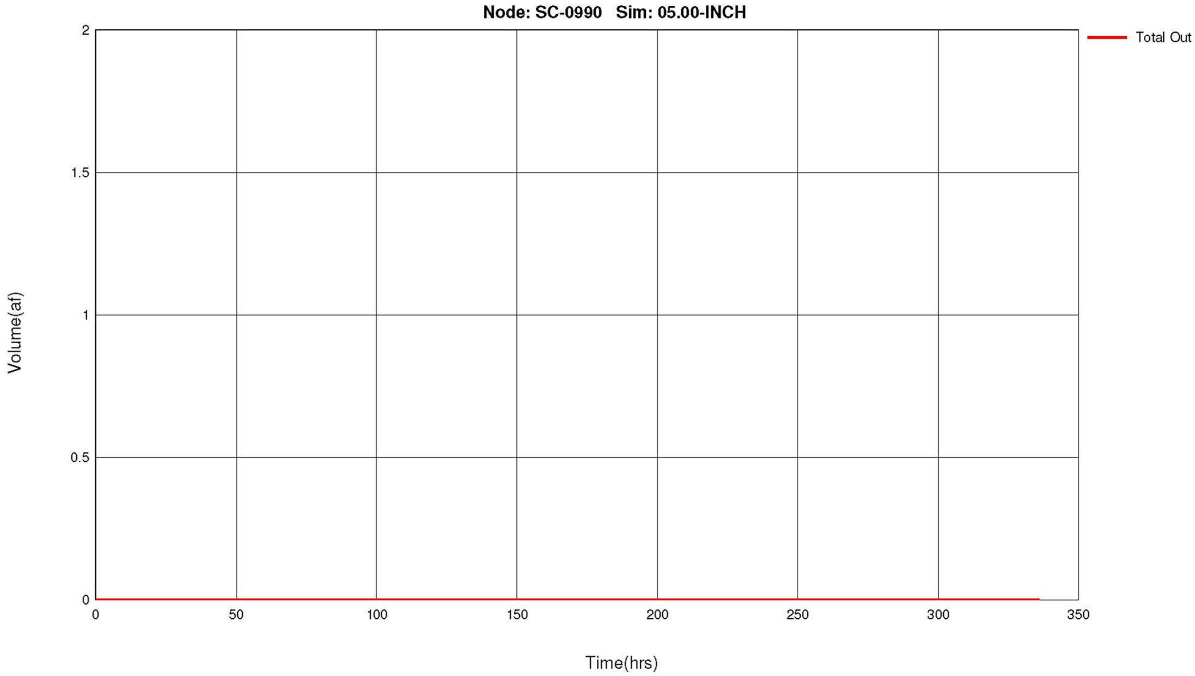

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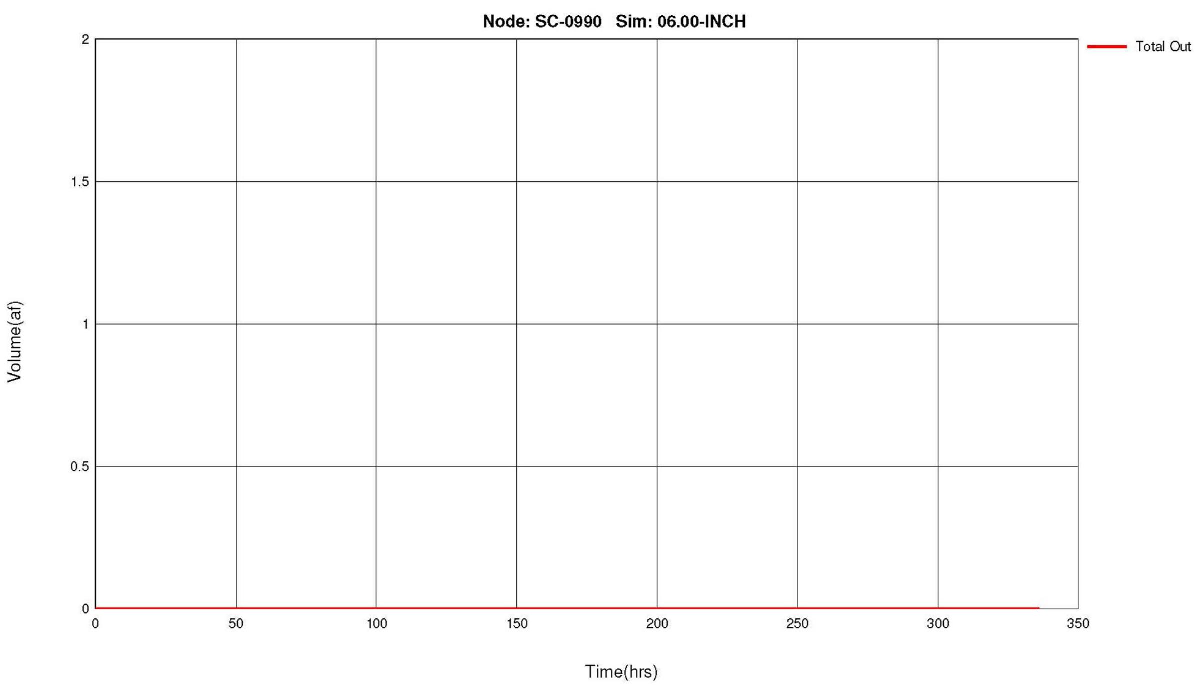

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ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS
RAINFALL VS. DISCHARGE VOLUME RATING CURVE FOR THE "UP-GRADIENT" DRAINAGE BASINS
AMC I CONDITION
MARCH 2014

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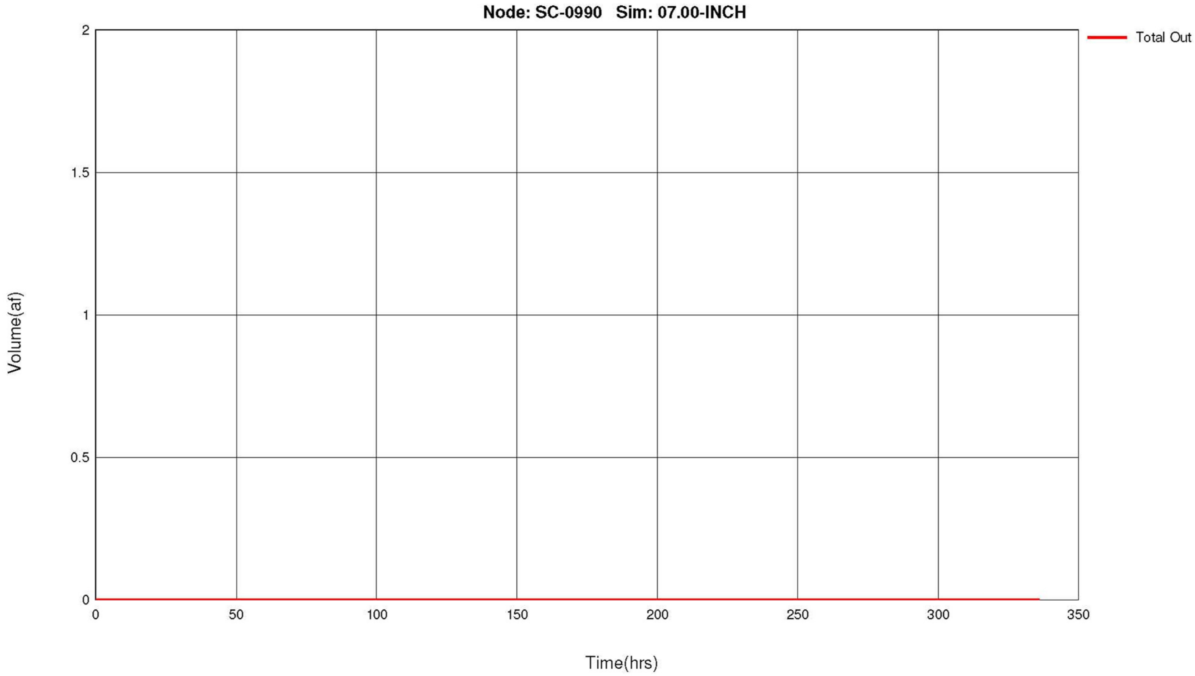

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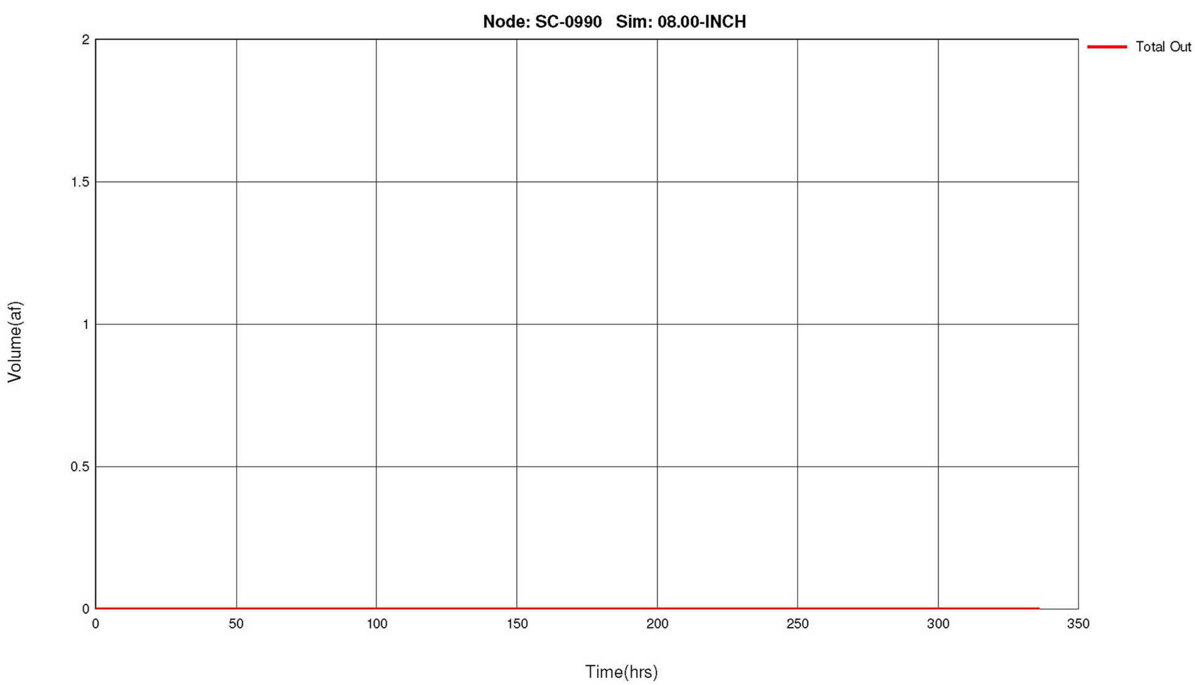

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AMC I CONDITION
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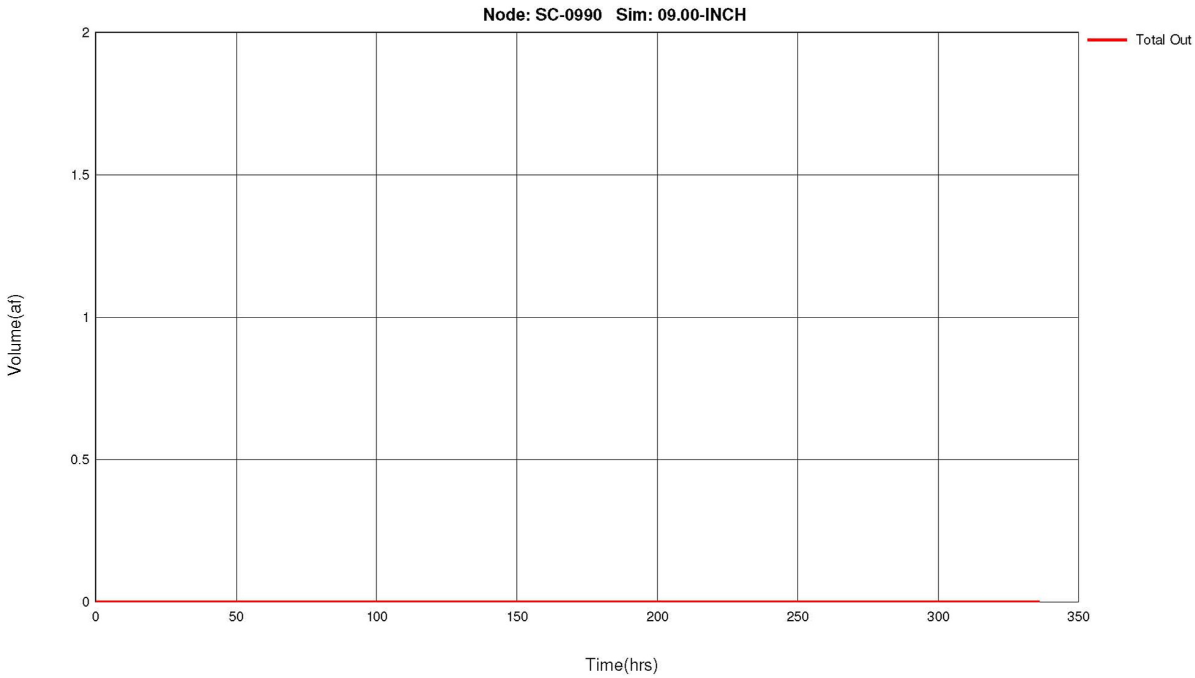

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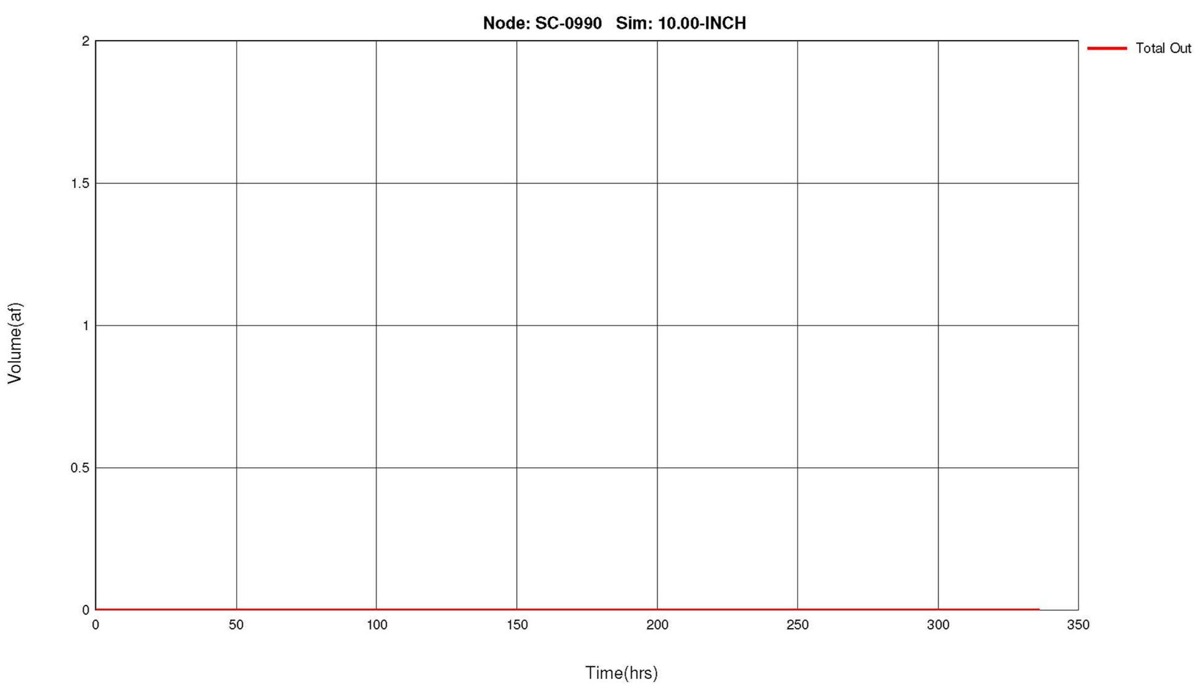

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ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 5.3

SUPPORTING DOCUMENTATION FOR THE
CONTINUOUS SIMULATION ANALYSIS

RAINFALL VS. DISCHARGE VOLUME RATING CURVE
FOR THE "UP-GRADIENT" DRAINAGE BASINS
(RAINFALL EVENTS BETWEEN 0.25" AND 10.00")

AMC II CONDITION

Pegasus
ENGINEERING

Alternative Sinkhole Remediation Protocol for Grace Lake ~ Updated Surface Water Analysis
Rainfall vs. Discharge Volume Rating Curve for the "Up-gradient" Drainage Basins
AMC II Condition

Table No. 5.1.5

Discharge Volume (AC-FT) ~ 0.25" Rainfall			Discharge Volume (AC-FT) ~ 0.50" Rainfall			Discharge Volume (AC-FT) ~ 0.75" Rainfall			Discharge Volume (AC-FT) ~ 1.00" Rainfall			ume (AC-FT) ~ 1.25" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7	4.4	0.0	4.4	9.4	0.0	9.4

Table No. 5.1.6

Discharge Volume (AC-FT) ~ 1.50" Rainfall			Discharge Volume (AC-FT) ~ 1.75" Rainfall			Discharge Volume (AC-FT) ~ 2.00" Rainfall			Discharge Volume (AC-FT) ~ 2.25" Rainfall			ume (AC-FT) ~ 2.50" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
15.3	0.0	15.3	22.2	0.0	22.2	30.0	0.0	30.0	38.7	0.0	38.7	48.0	0.0	48.0

Table No. 5.1.7

Discharge Volume (AC-FT) ~ 3.00" Rainfall			Discharge Volume (AC-FT) ~ 3.50" Rainfall			Discharge Volume (AC-FT) ~ 4.00" Rainfall			Discharge Volume (AC-FT) ~ 4.50" Rainfall			ume (AC-FT) ~ 5.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
68.3	0.0	68.3	89.2	0.0	89.2	104.1	0.0	104.1	114.9	0.0	114.9	126.3	0.0	126.3

Table No. 5.1.8

Discharge Volume (AC-FT) ~ 6.00" Rainfall			Discharge Volume (AC-FT) ~ 7.00" Rainfall			Discharge Volume (AC-FT) ~ 8.00" Rainfall			Discharge Volume (AC-FT) ~ 9.00" Rainfall			ume (AC-FT) ~ 10.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
149.4	0.0	149.4	169.1	0.0	169.1	189.3	0.0	189.3	208.8	2.0	210.8	228.8	4.5	233.3

NOTES

1. Cumulative discharge volume obtained from the ICPR node-time series at the end of each simulation. The duration for each of these storm event similations was set to 336 hours.

2. Refer to the charts on the following pages for a graphical illustration of the node outflow relationships for several of the storm events summarized above.

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ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 5.4

SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS

ICPR FLOOD ROUTING RESULTS FOR THE "UP-GRADIENT" DRAINAGE BASINS
(RAINFALL EVENTS BETWEEN 0.25" AND 10.00")

AMC II CONDITION

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ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE
SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS
RAINFALL VS. DISCHARGE VOLUME RATING CURVE FOR THE "UP-GRADIENT" DRAINAGE BASINS
AMC II CONDITION
MARCH 2014

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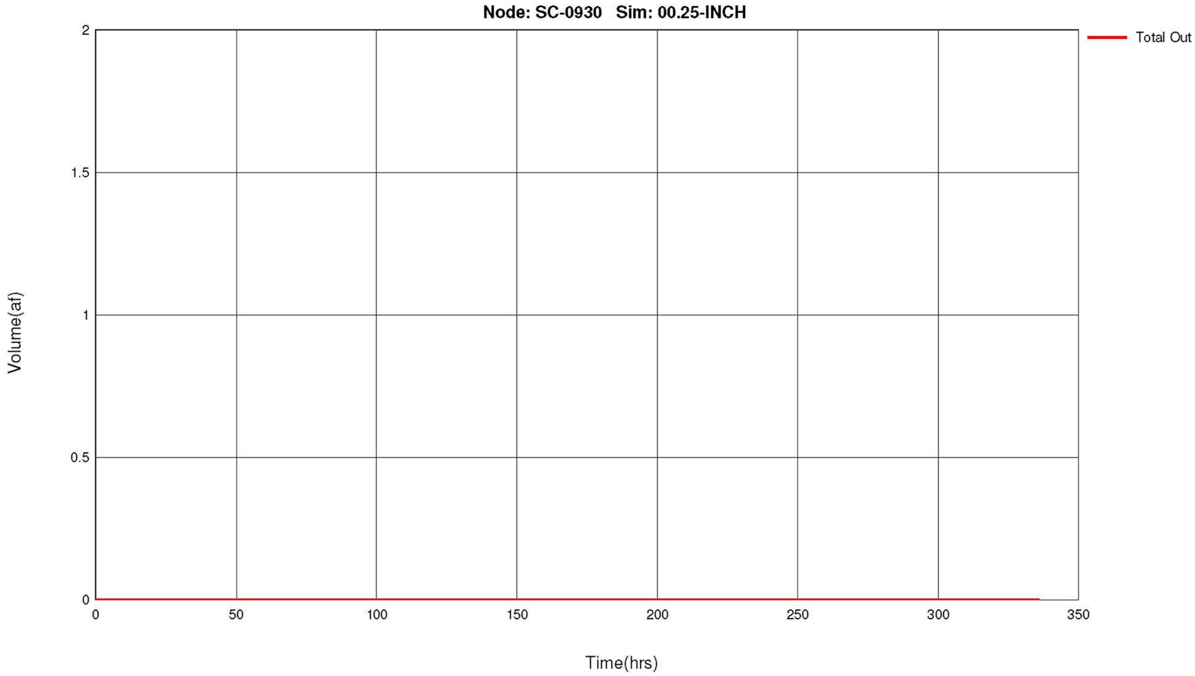

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SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS
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AMC II CONDITION
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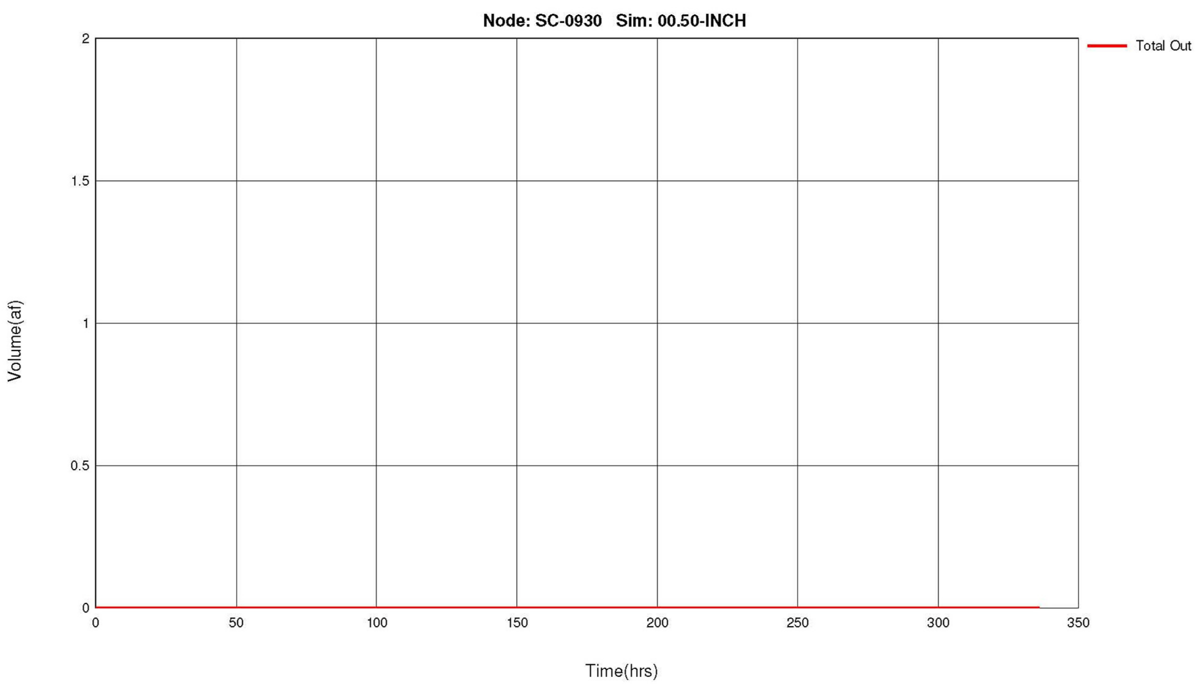

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AMC II CONDITION
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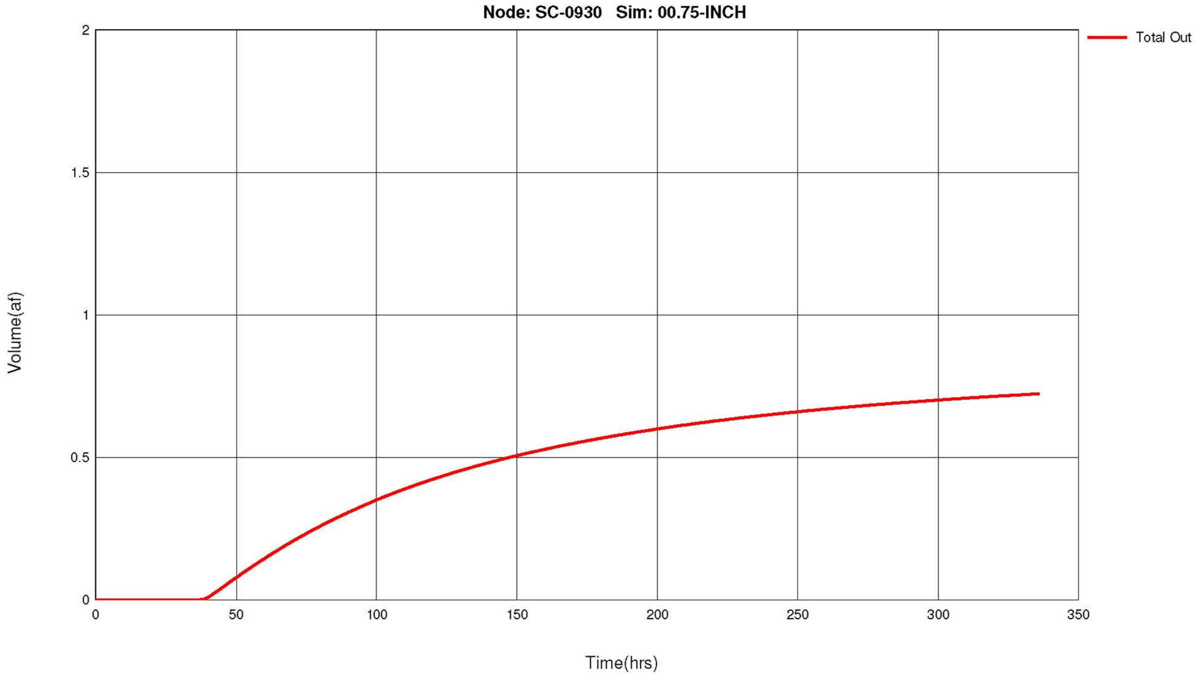

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AMC II CONDITION
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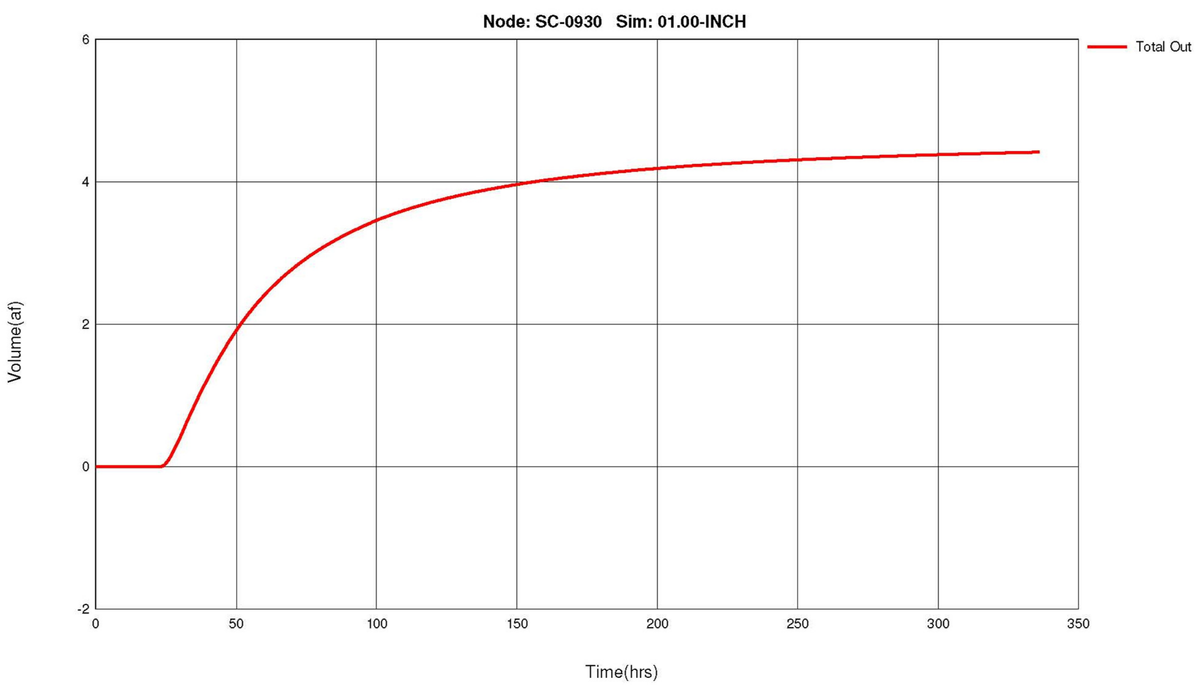

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AMC II CONDITION
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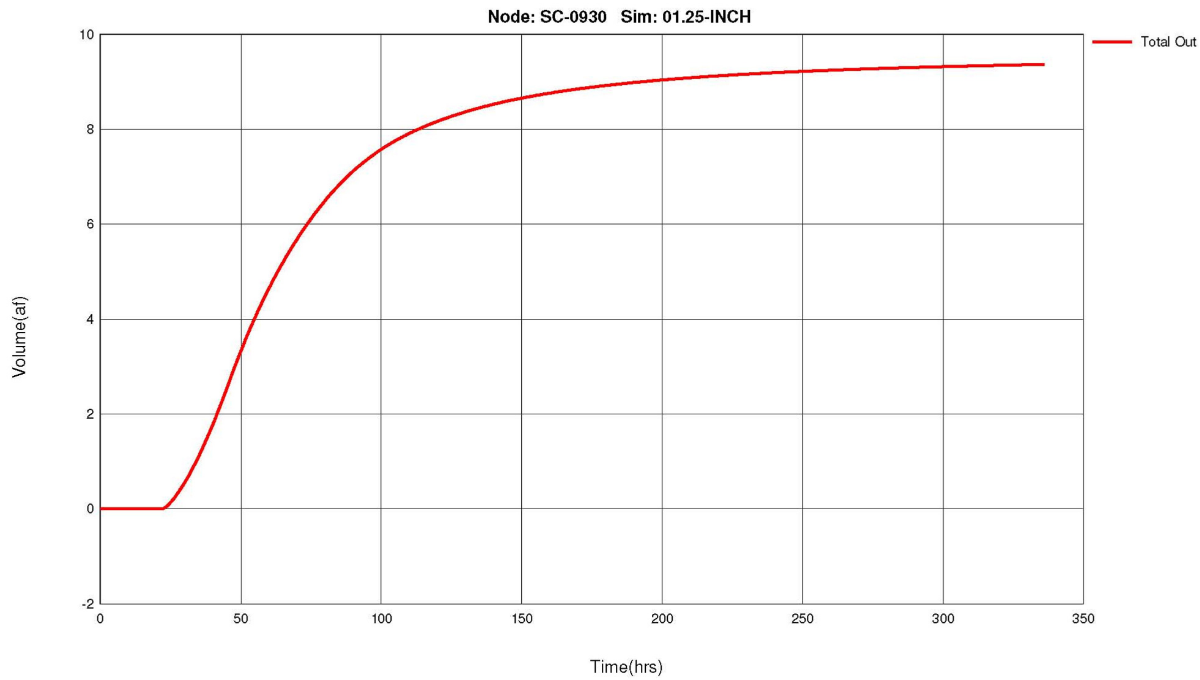

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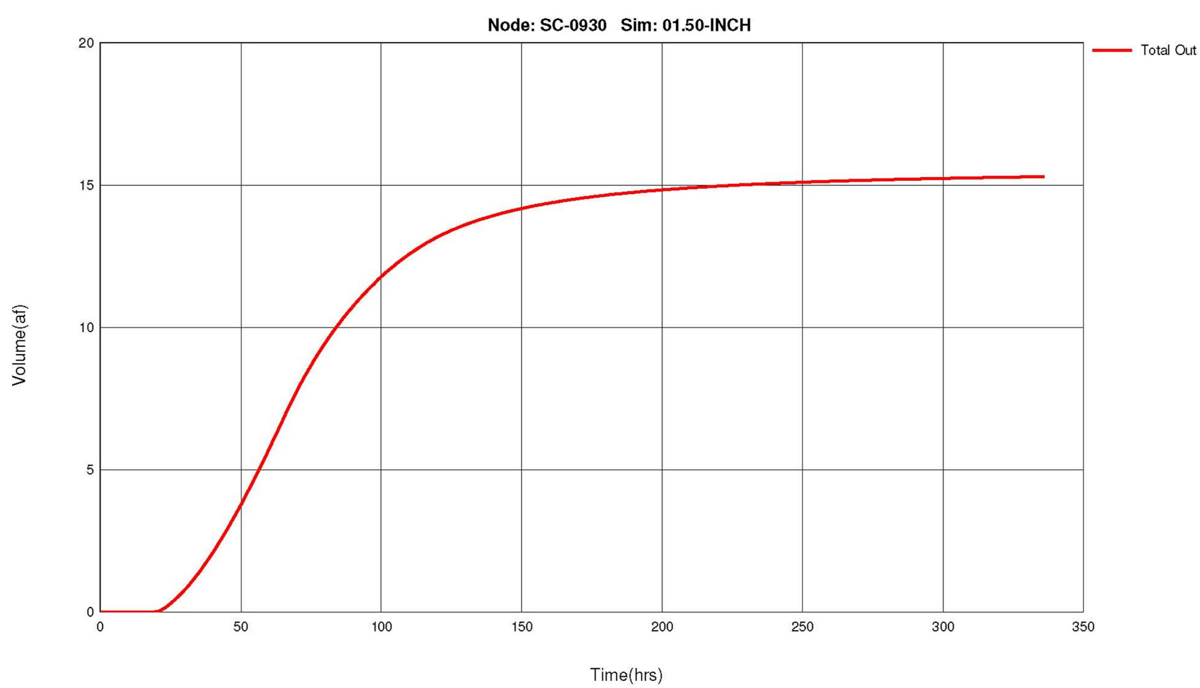

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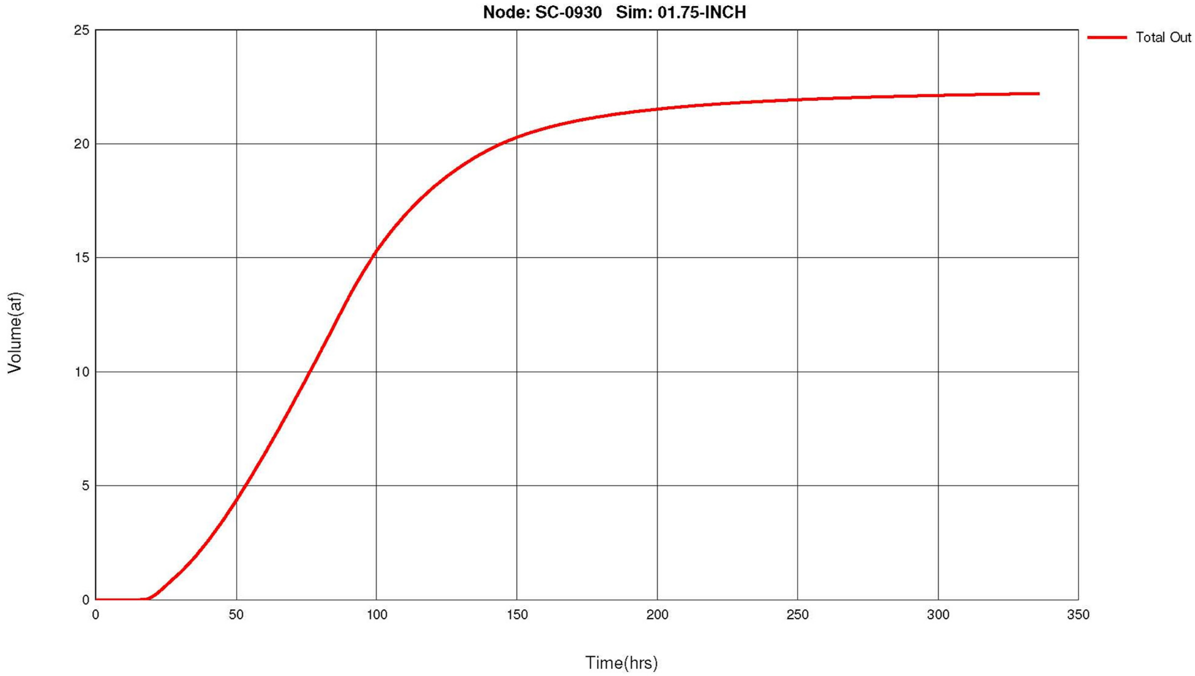

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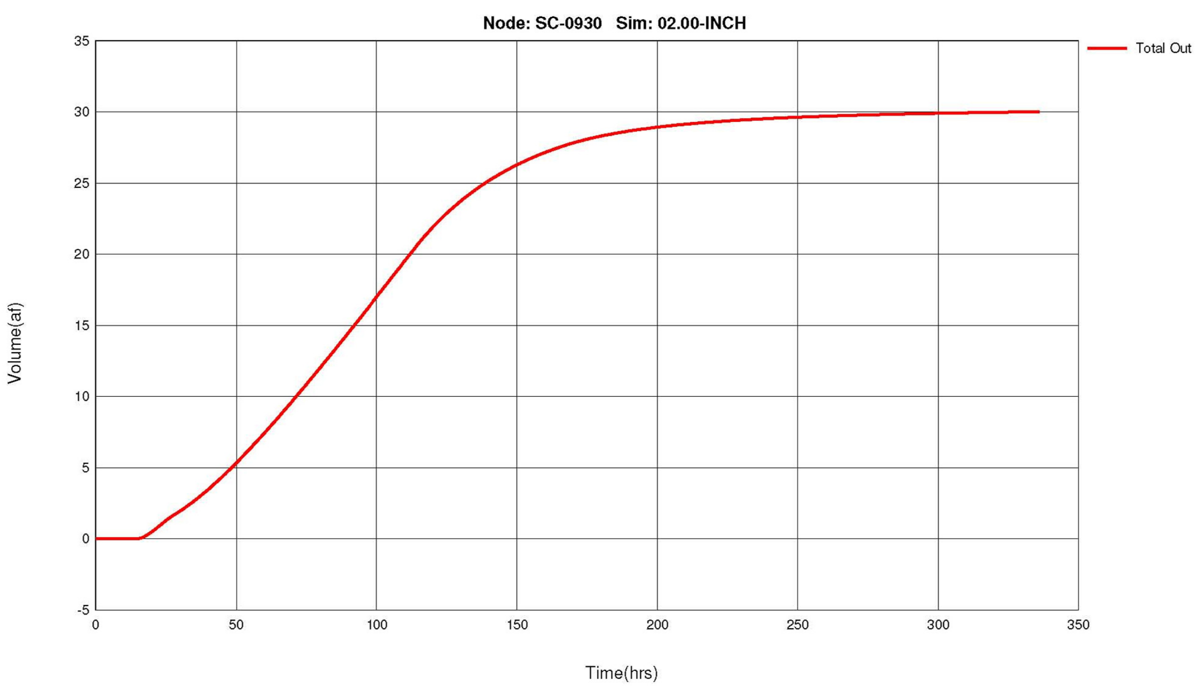

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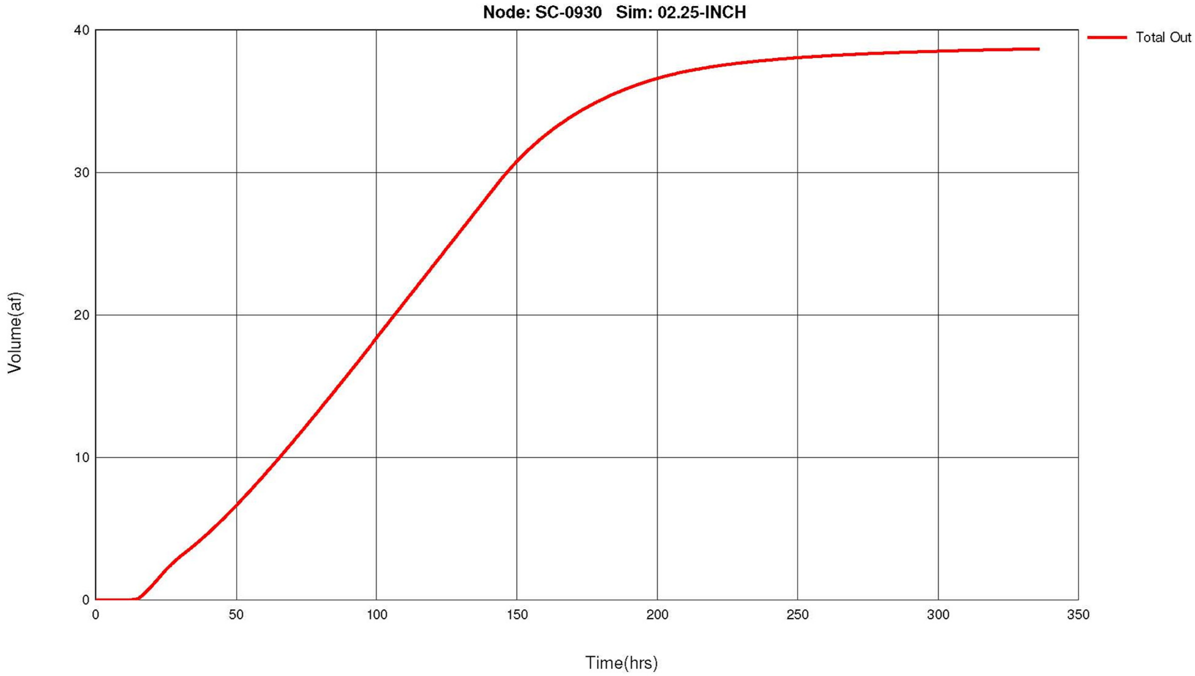

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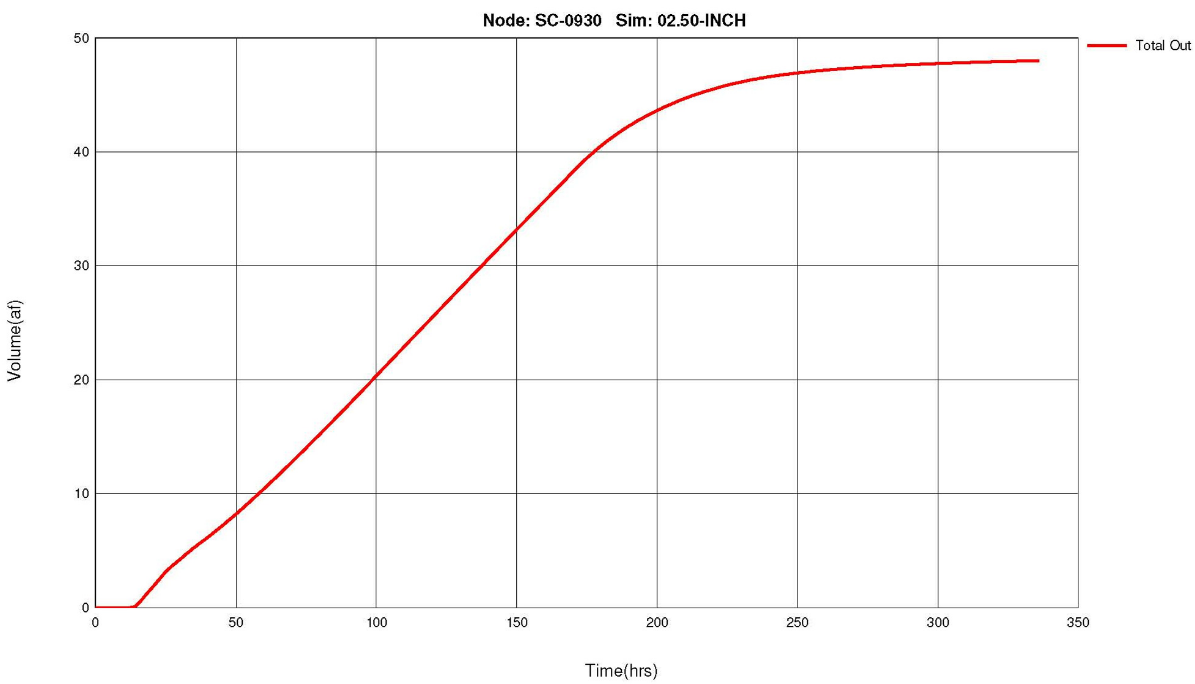

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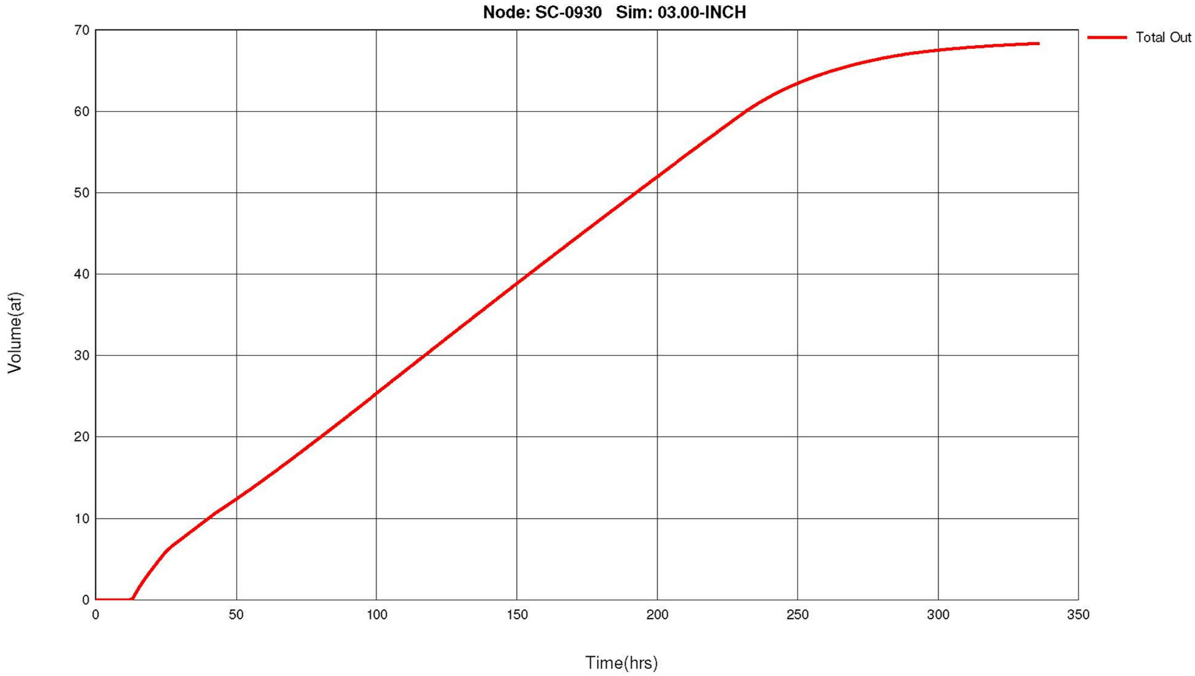

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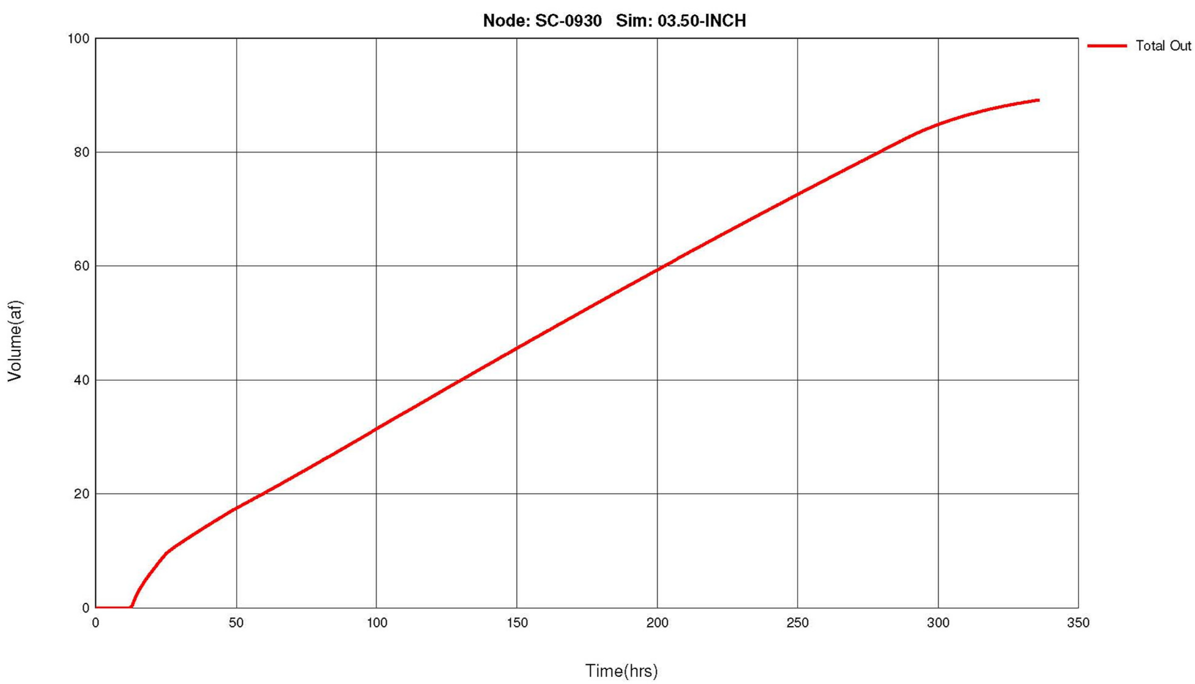

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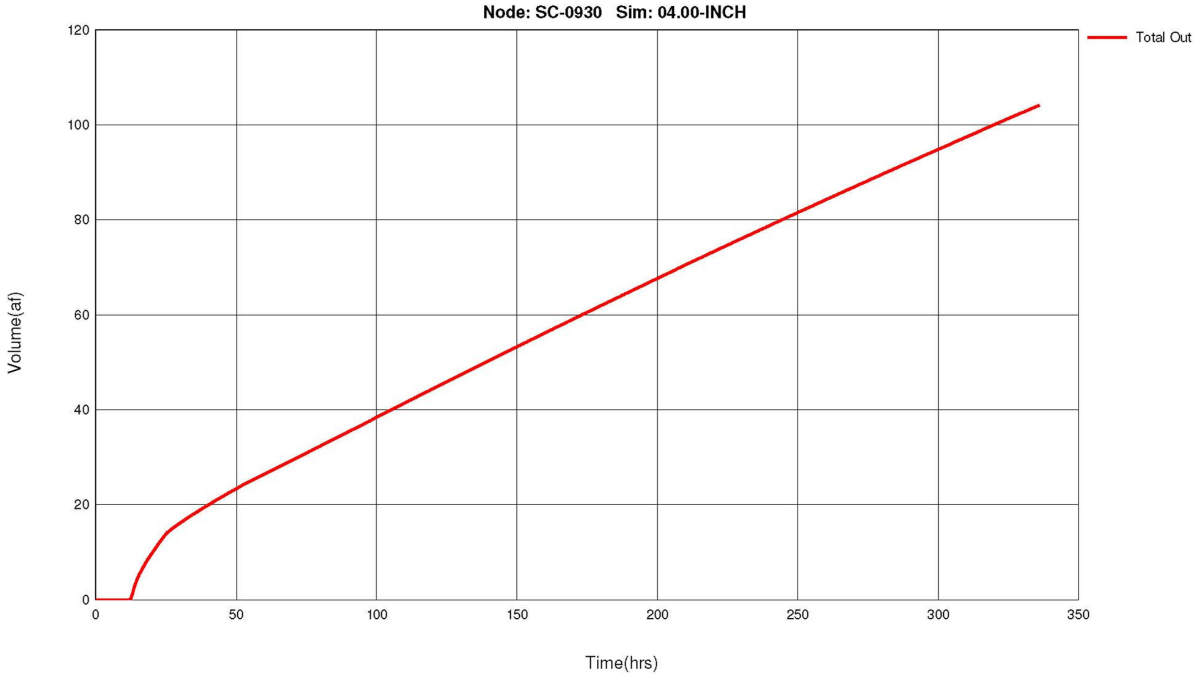

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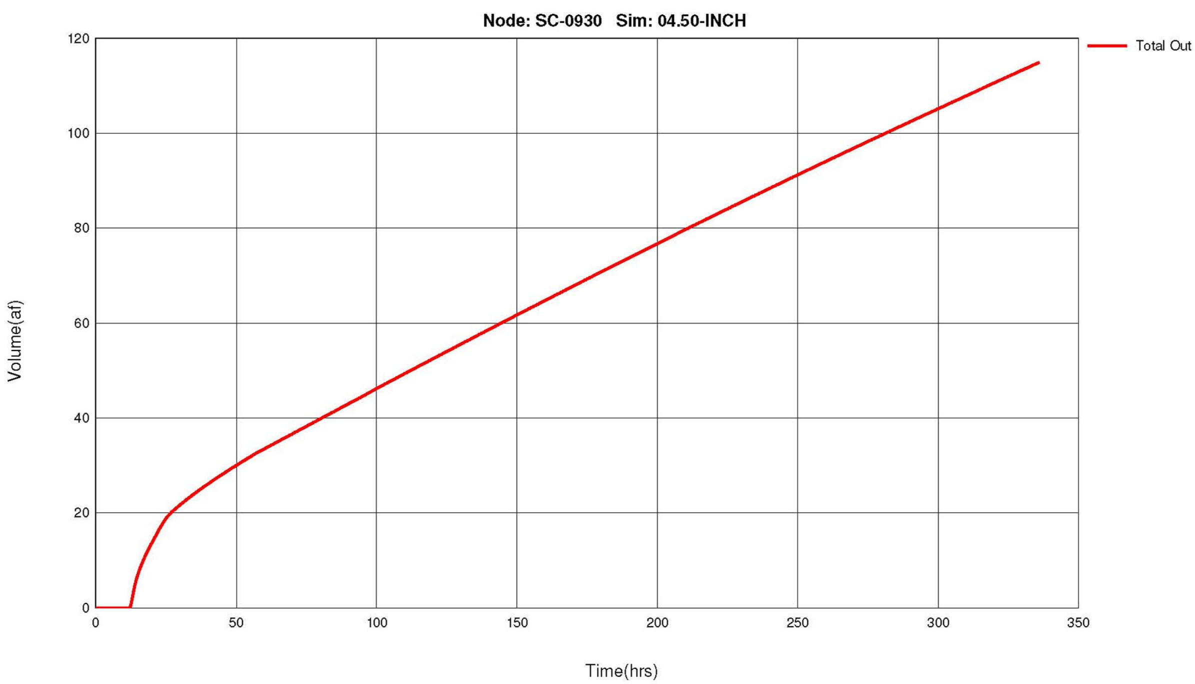

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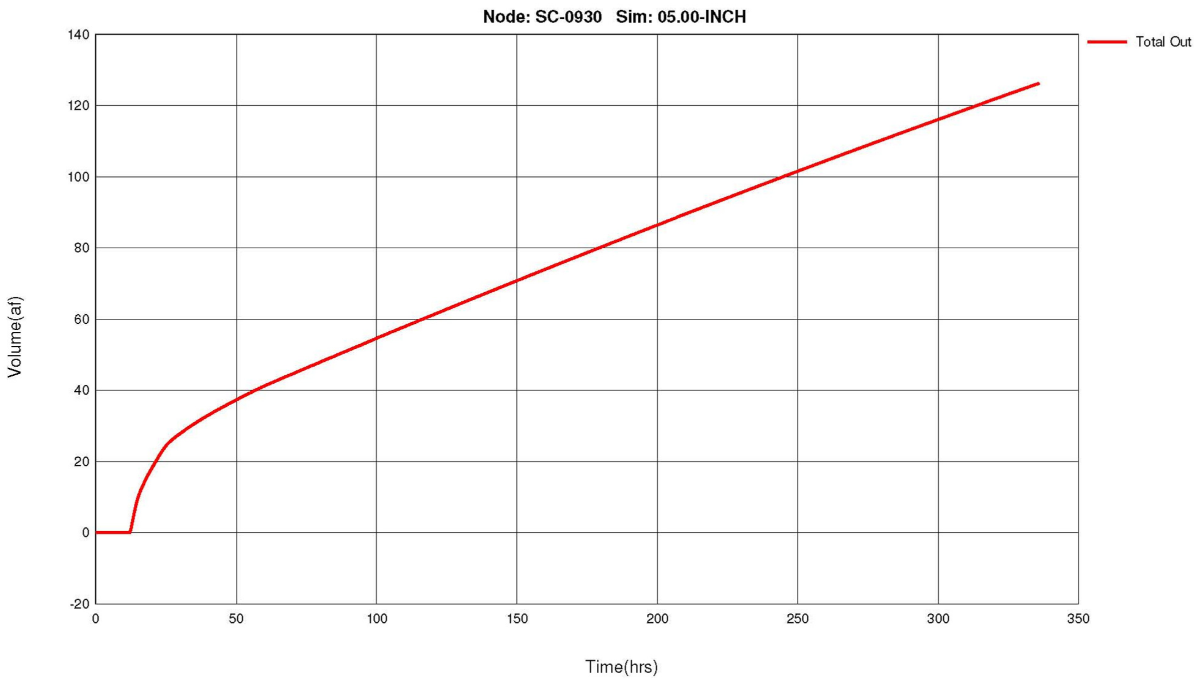

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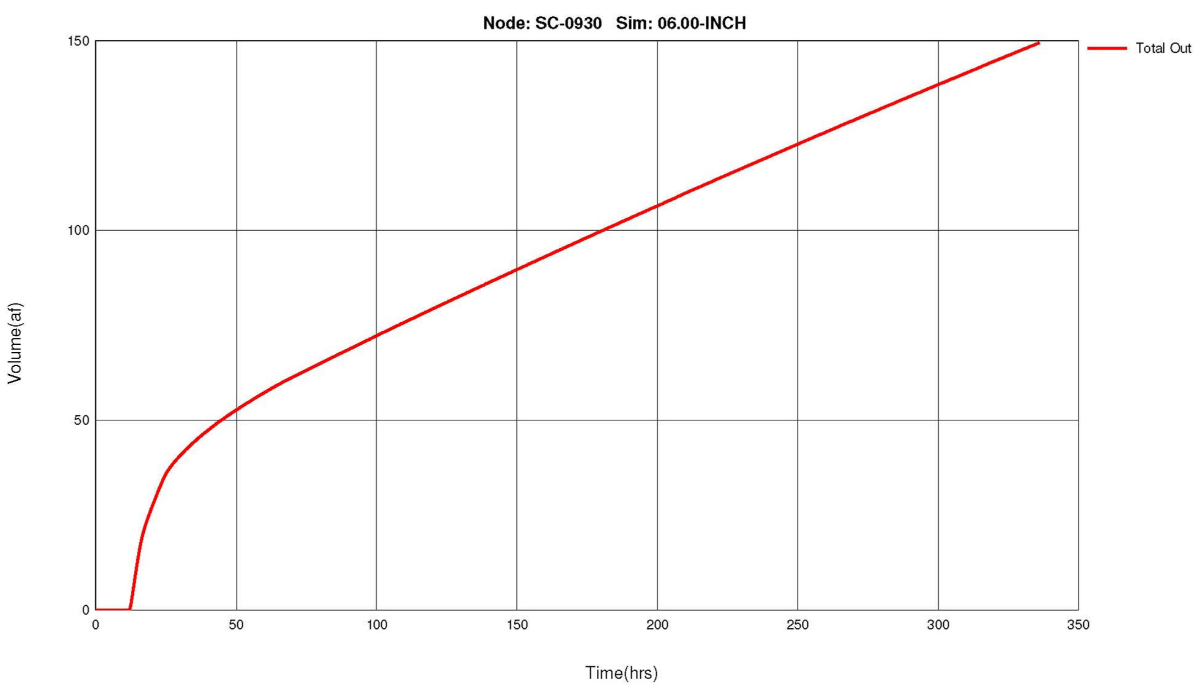

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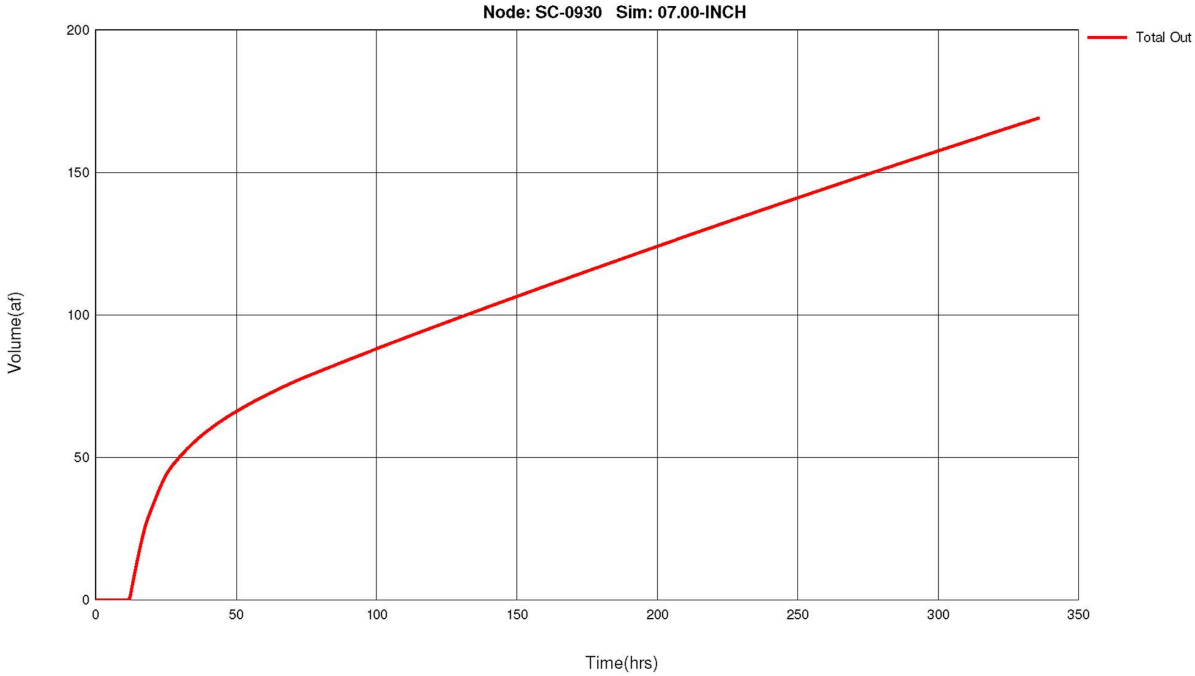

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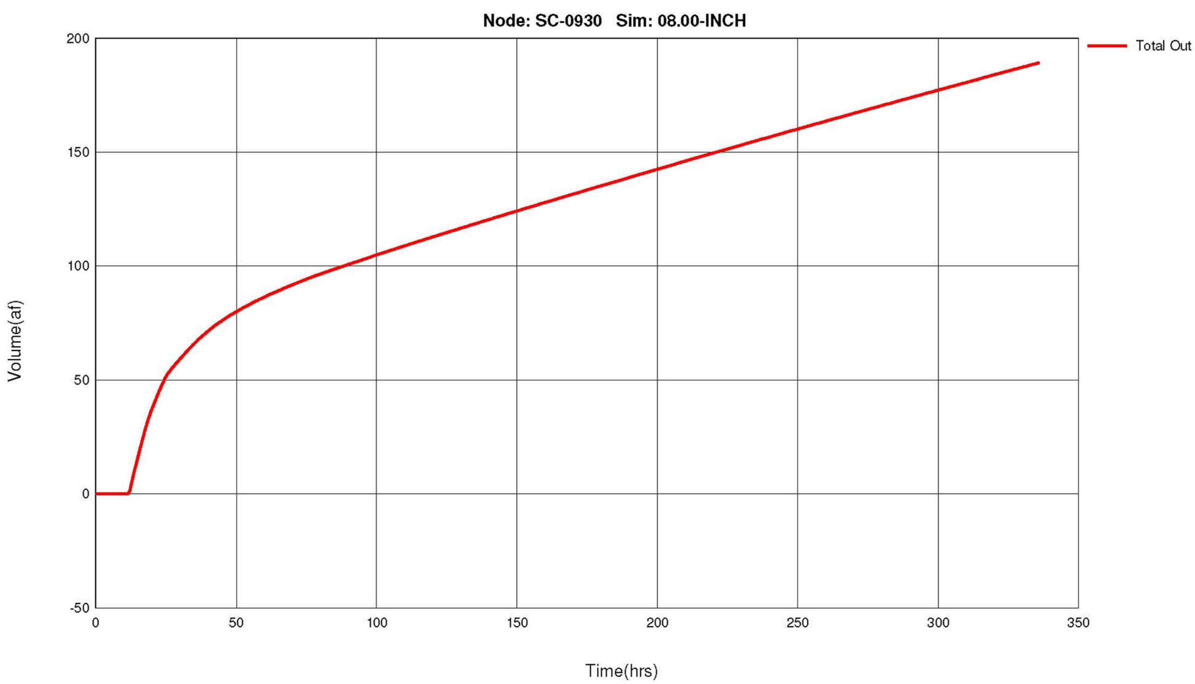

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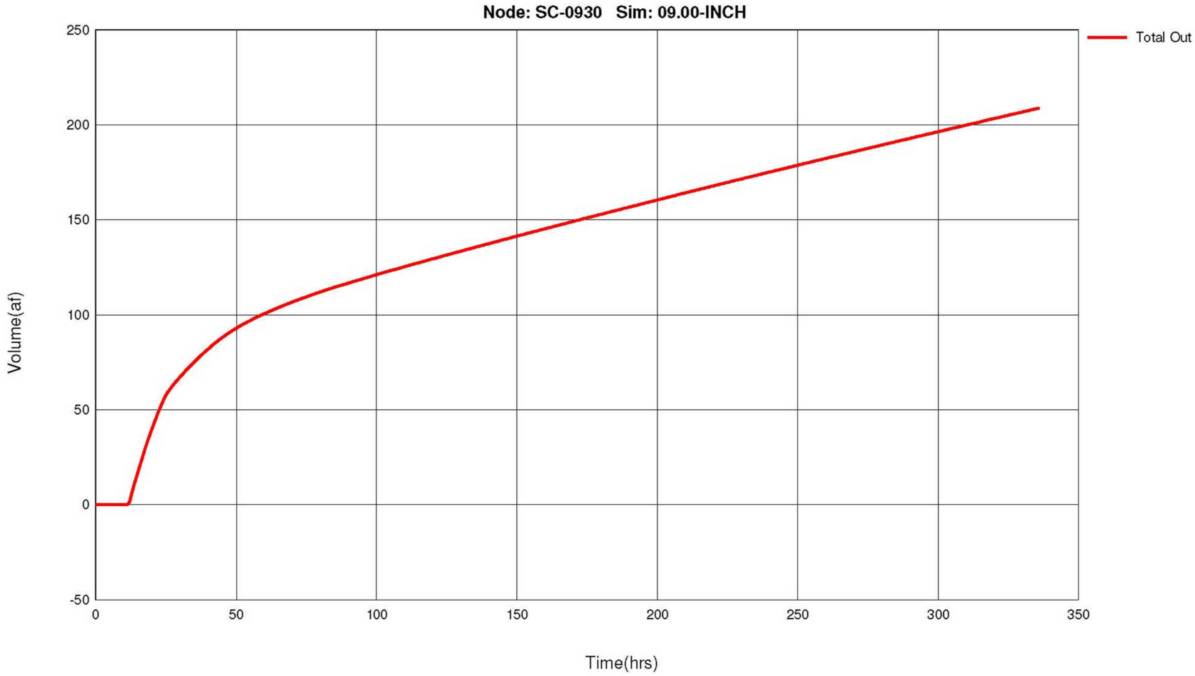

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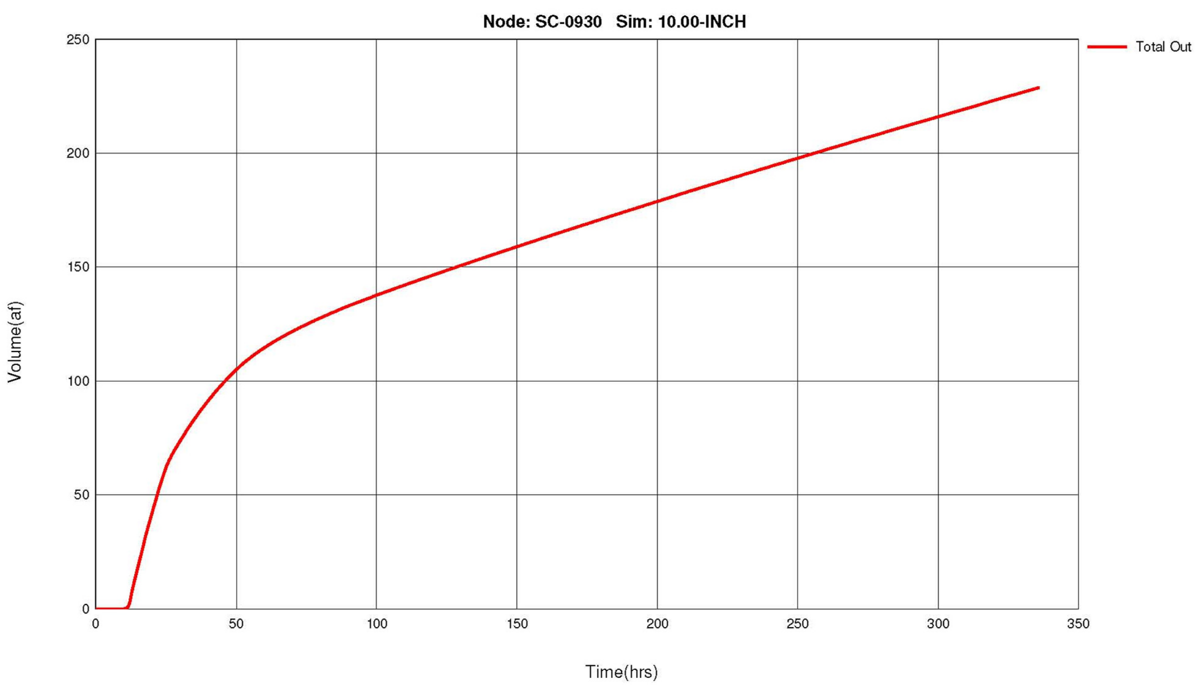

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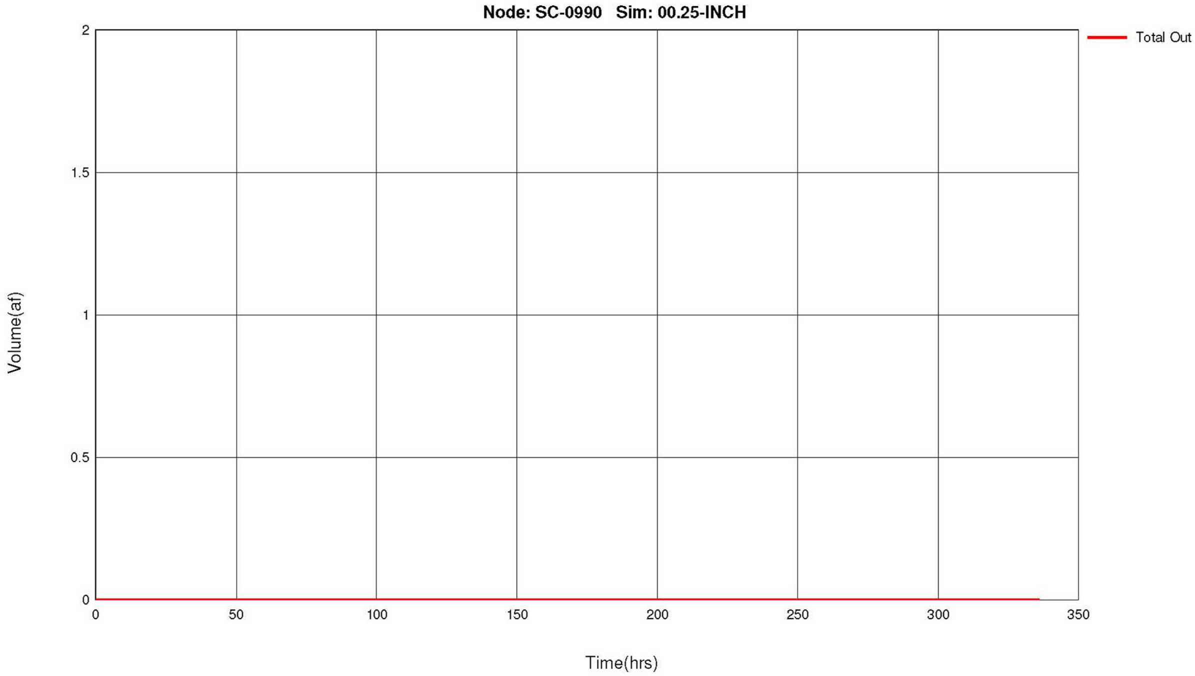

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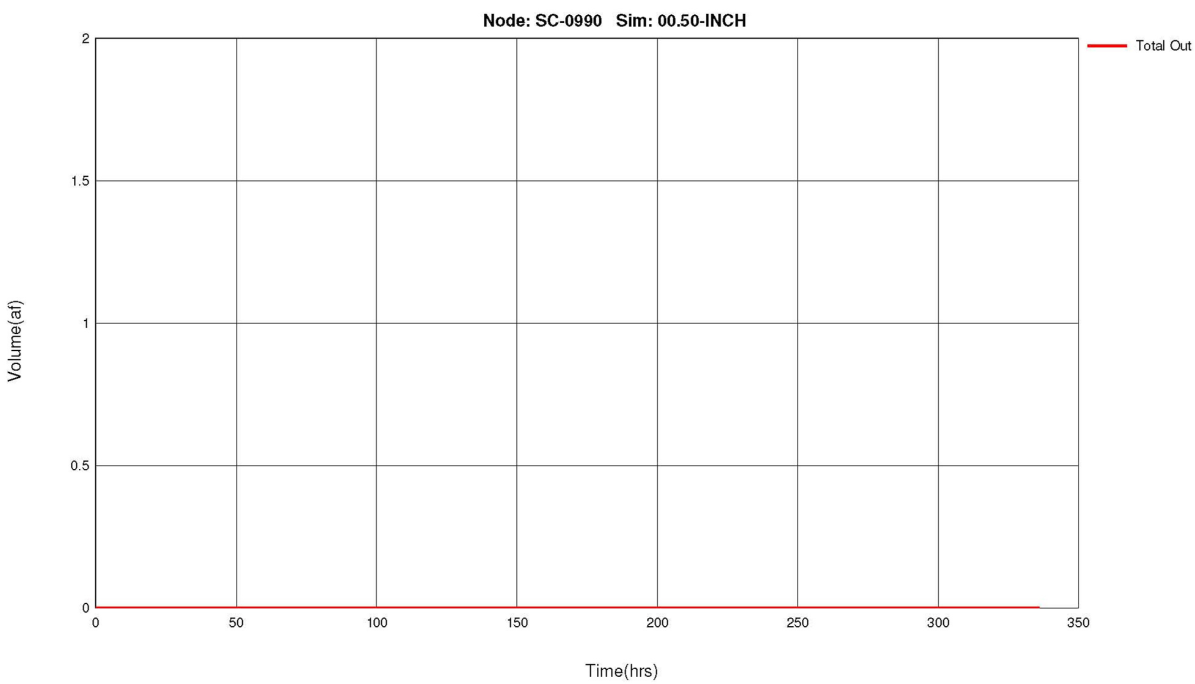

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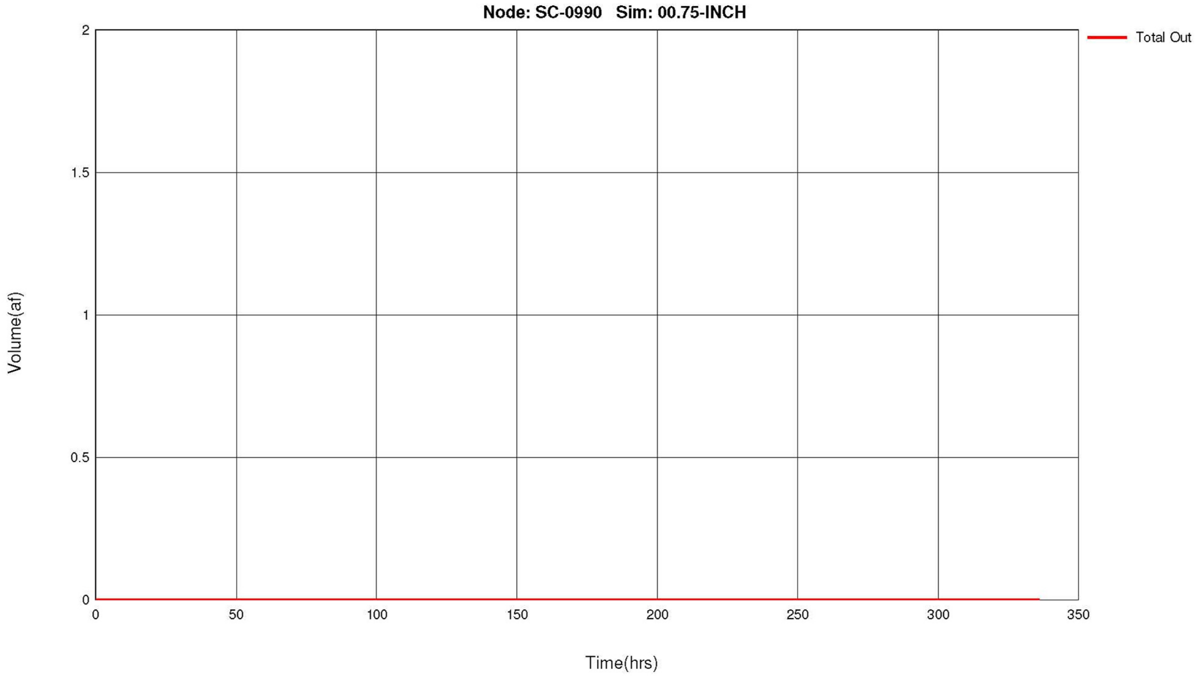

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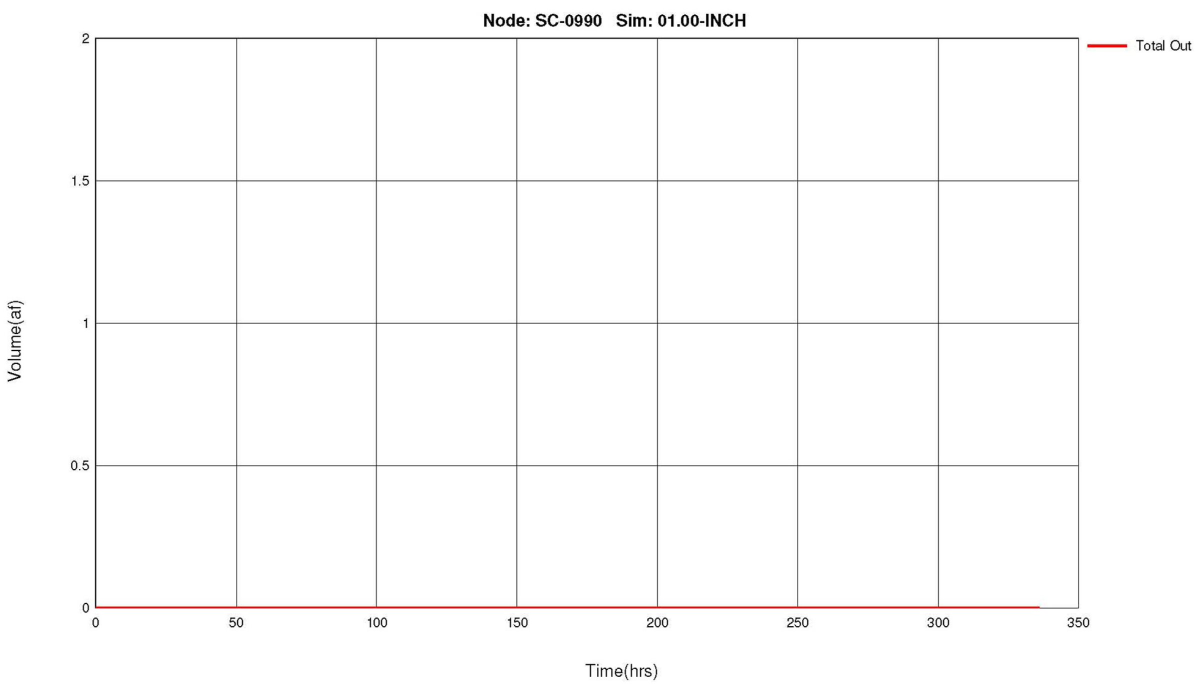

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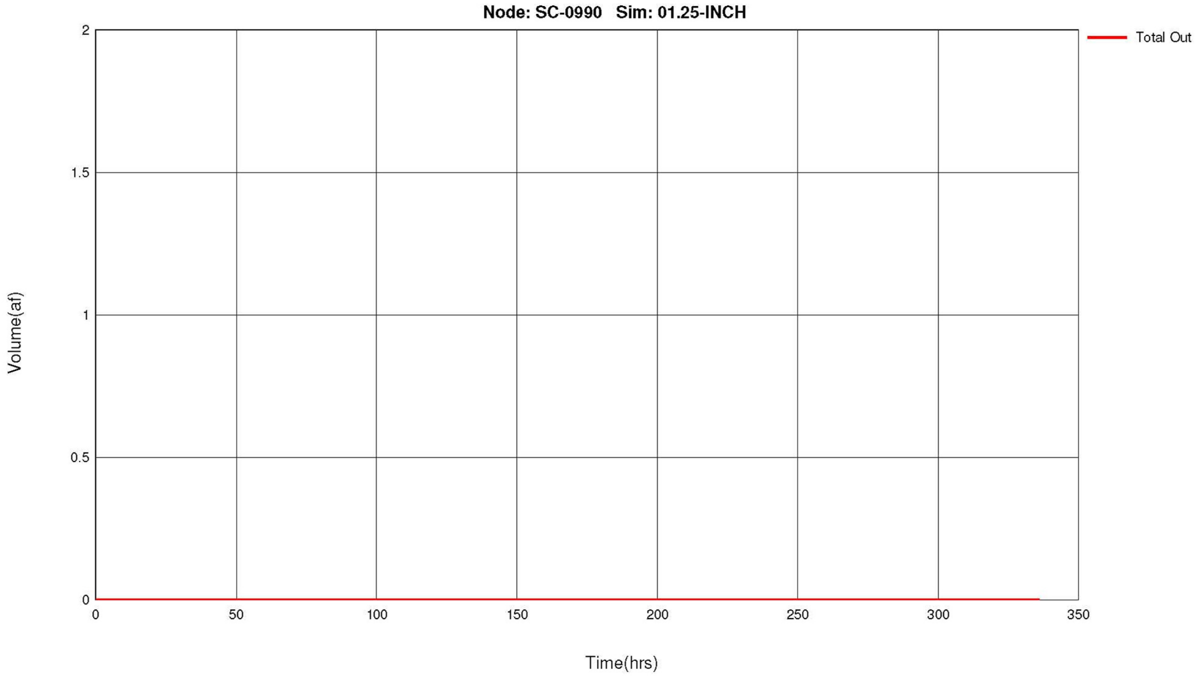

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SUPPORTING DOCUMENTATION FOR THE CONTINUOUS SIMULATION ANALYSIS
RAINFALL VS. DISCHARGE VOLUME RATING CURVE FOR THE "UP-GRADIENT" DRAINAGE BASINS
AMC II CONDITION
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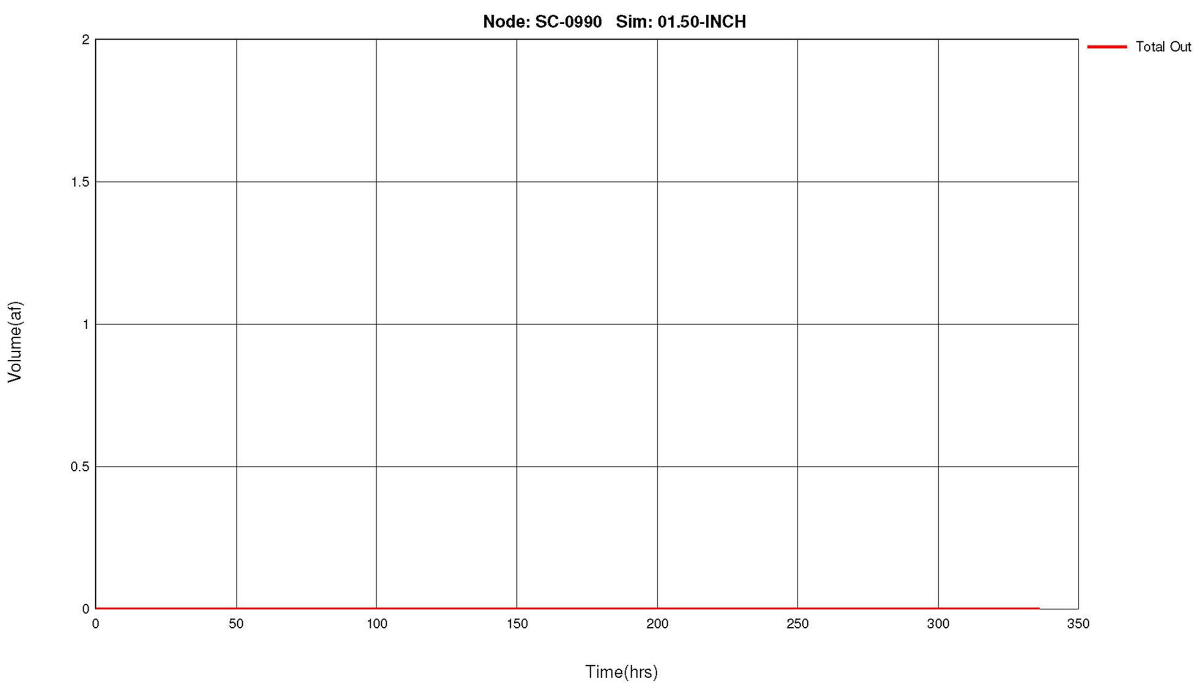

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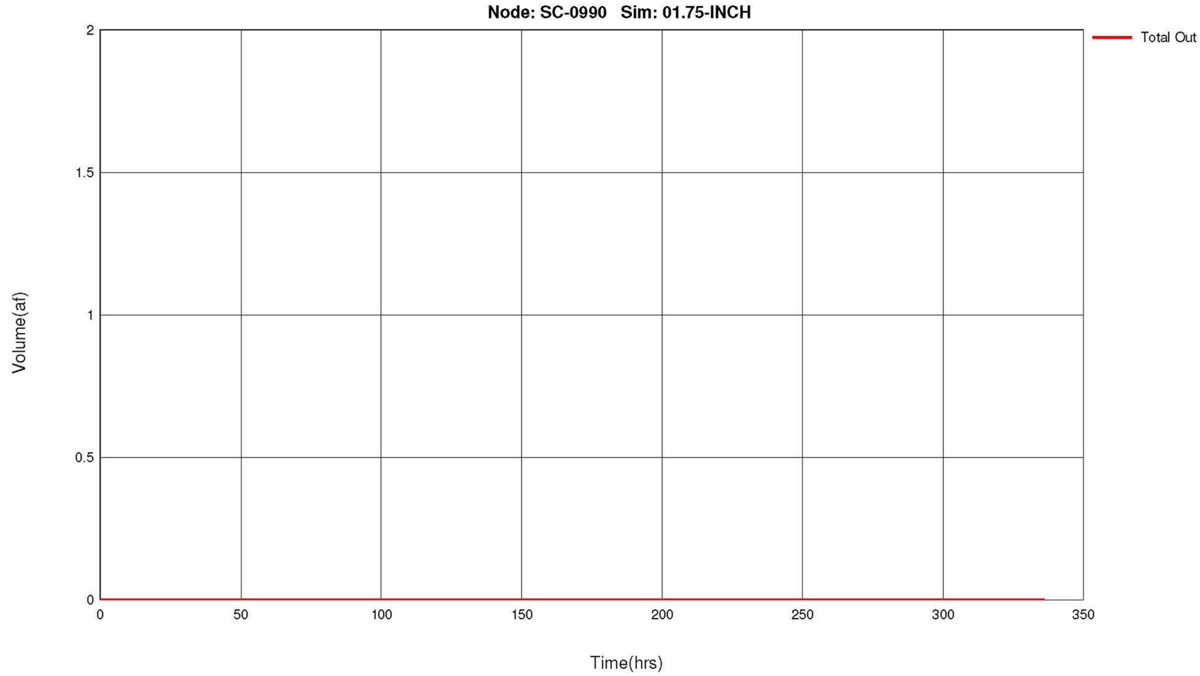

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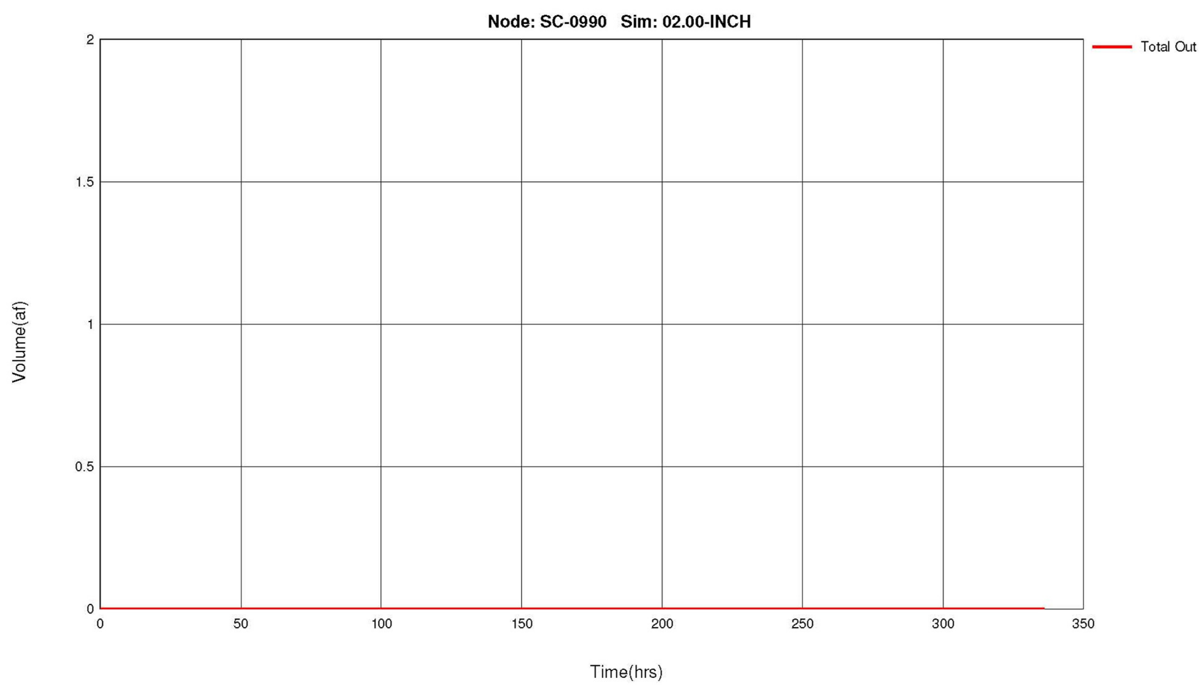

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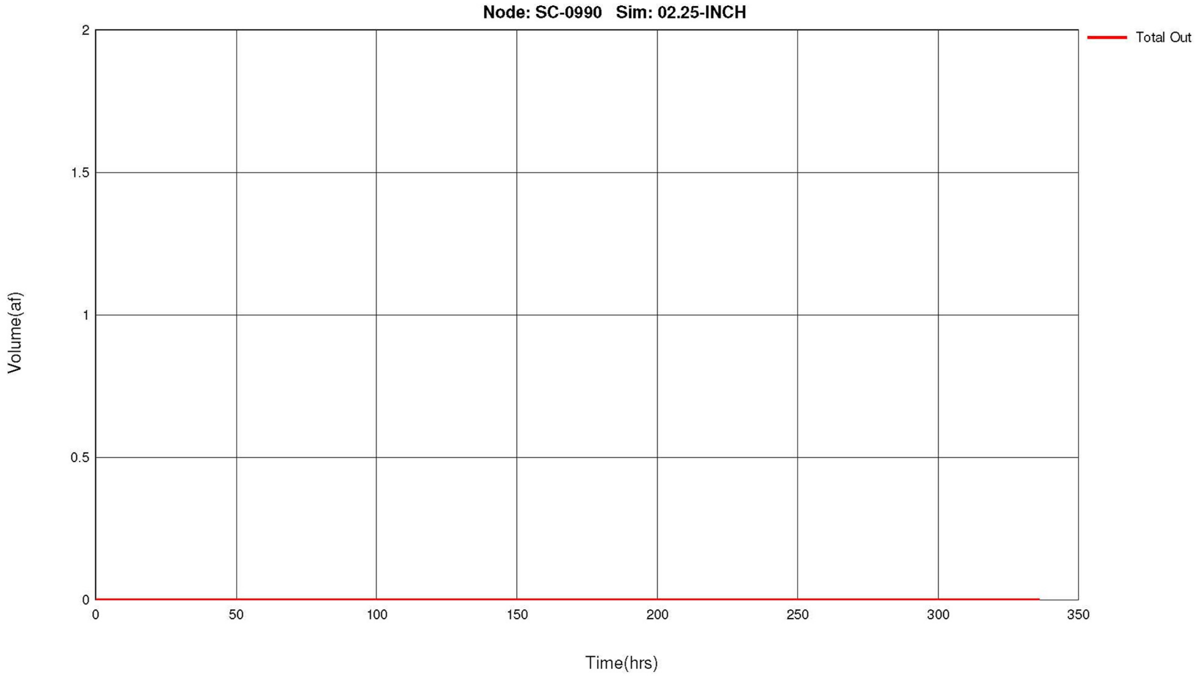

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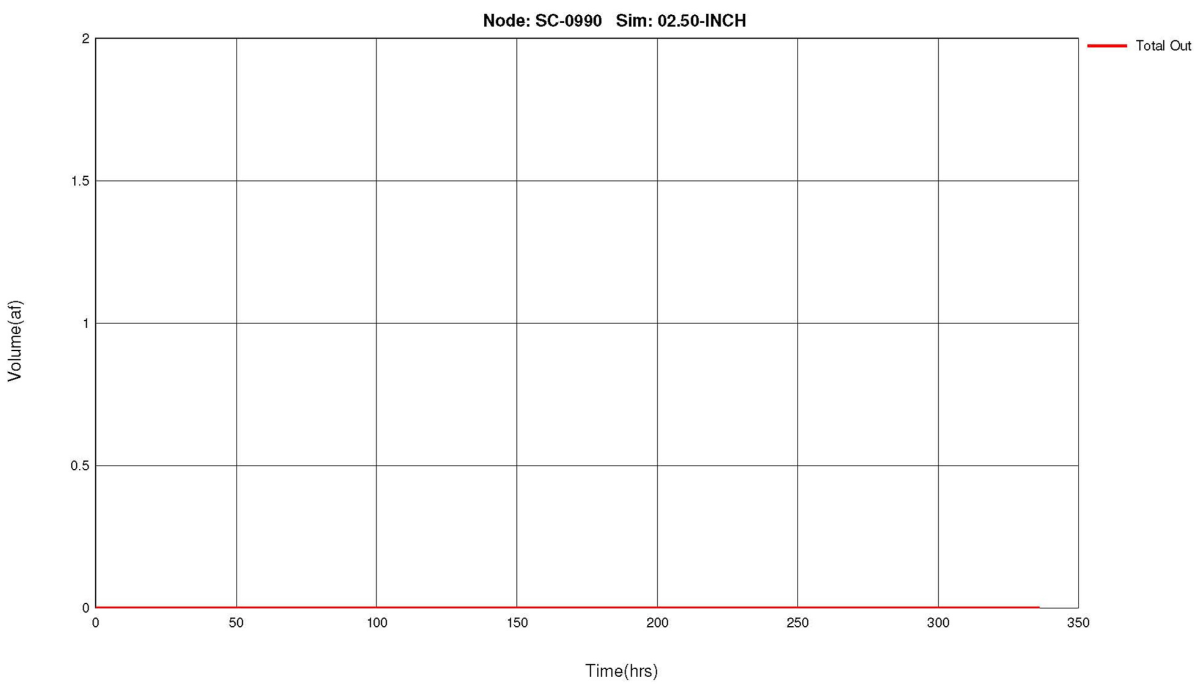

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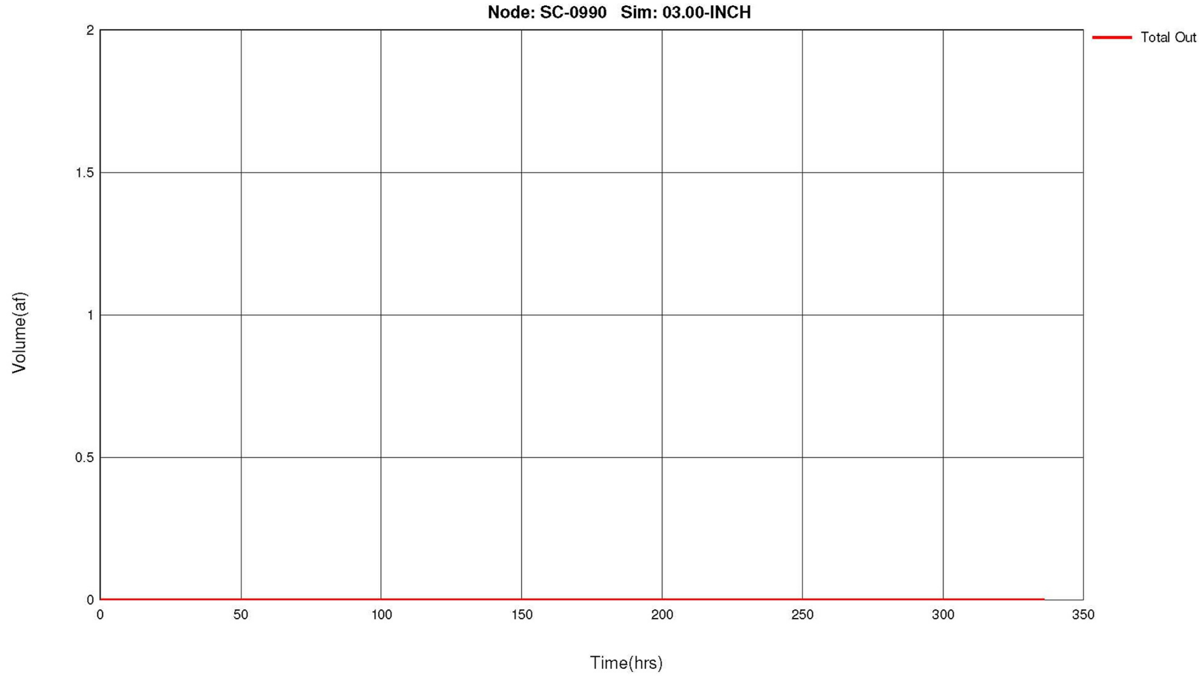

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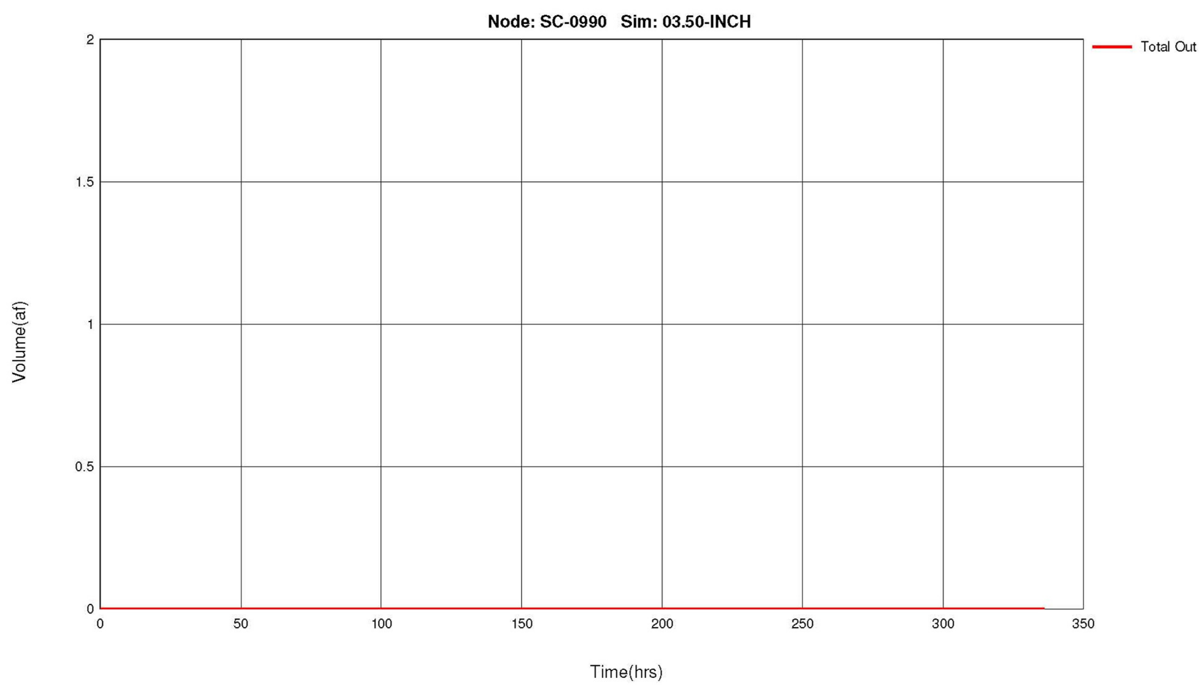

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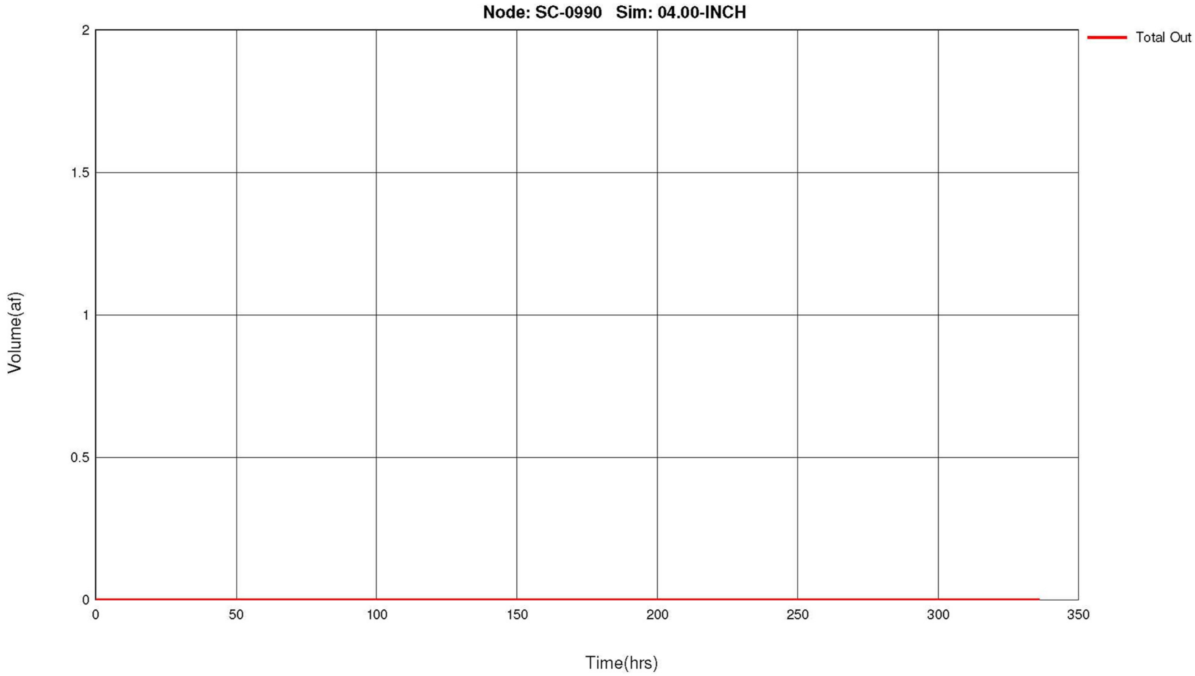

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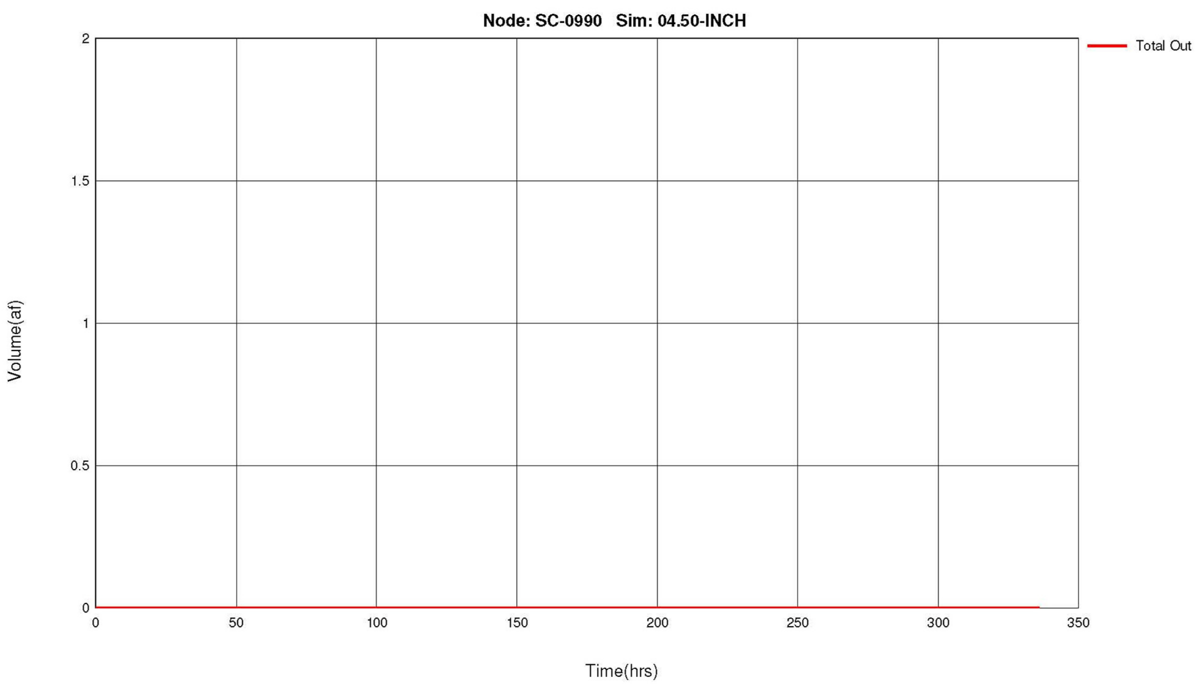

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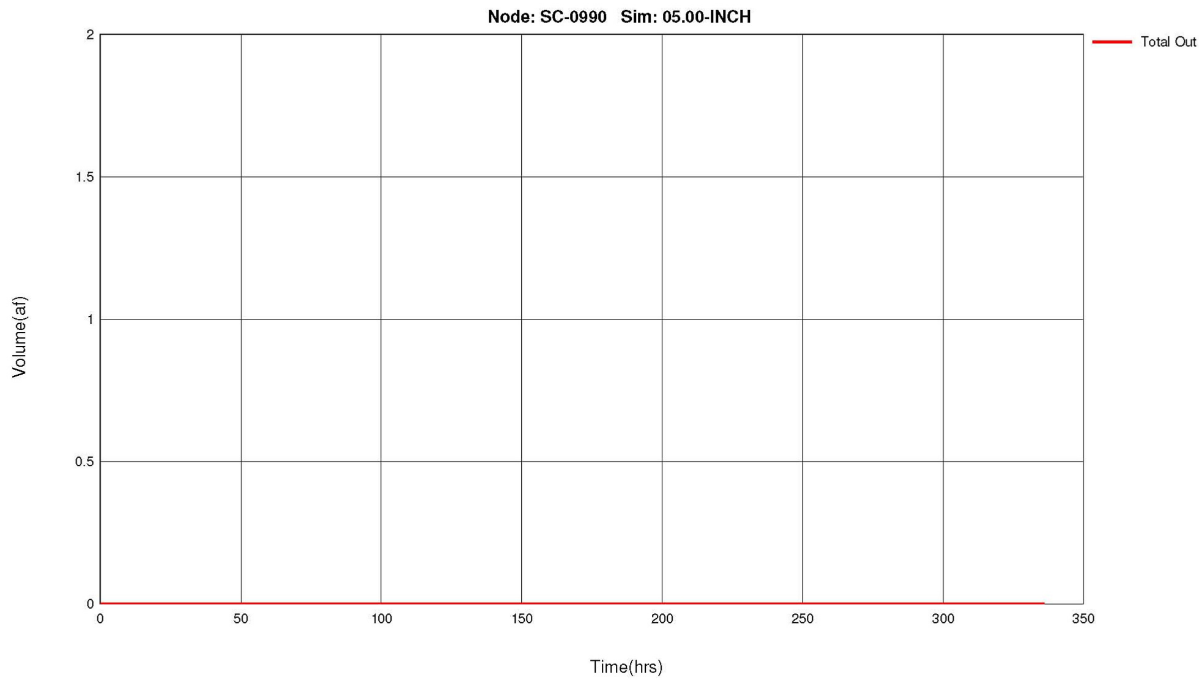

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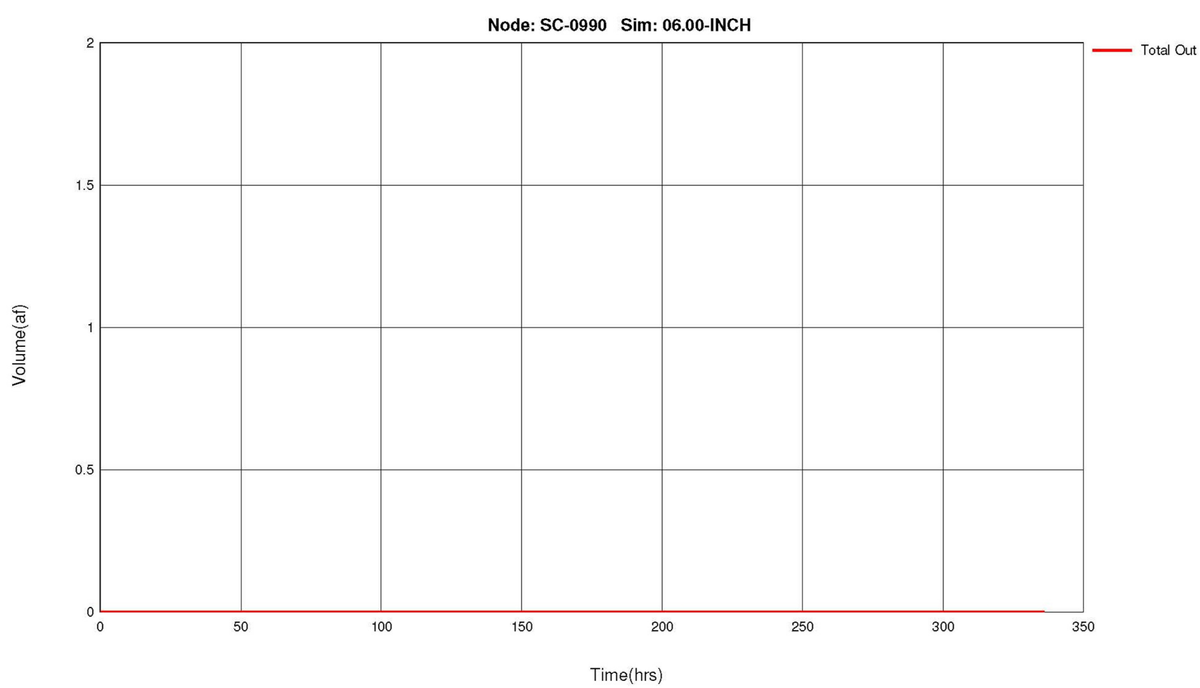

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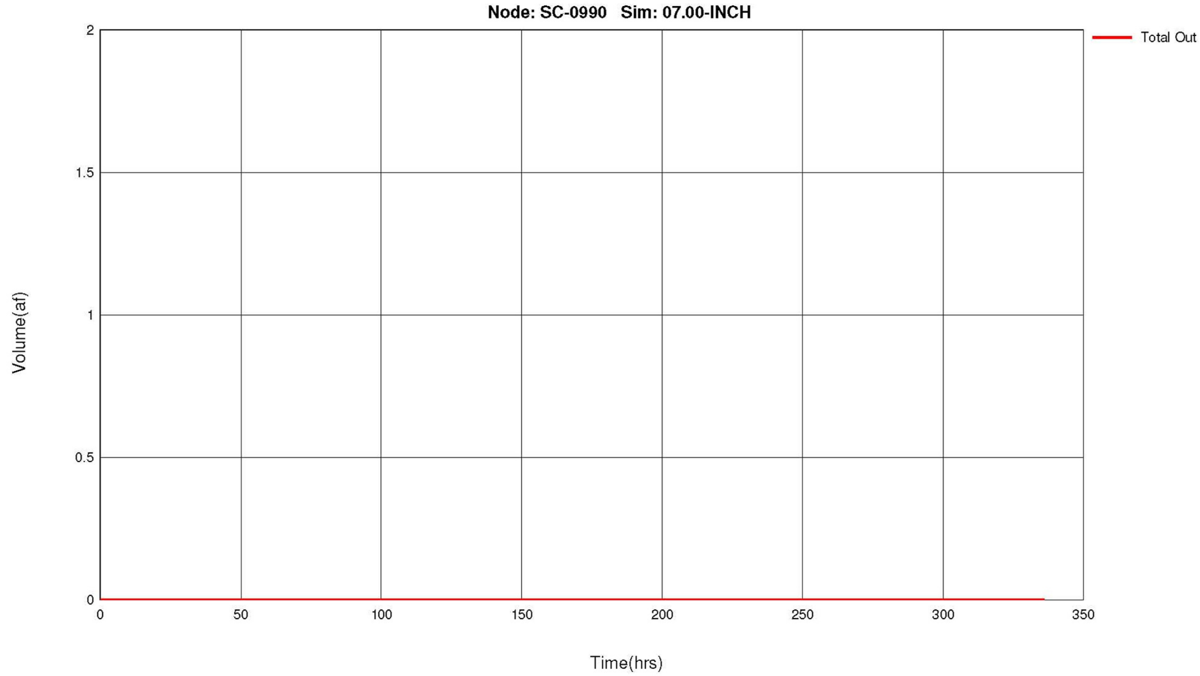

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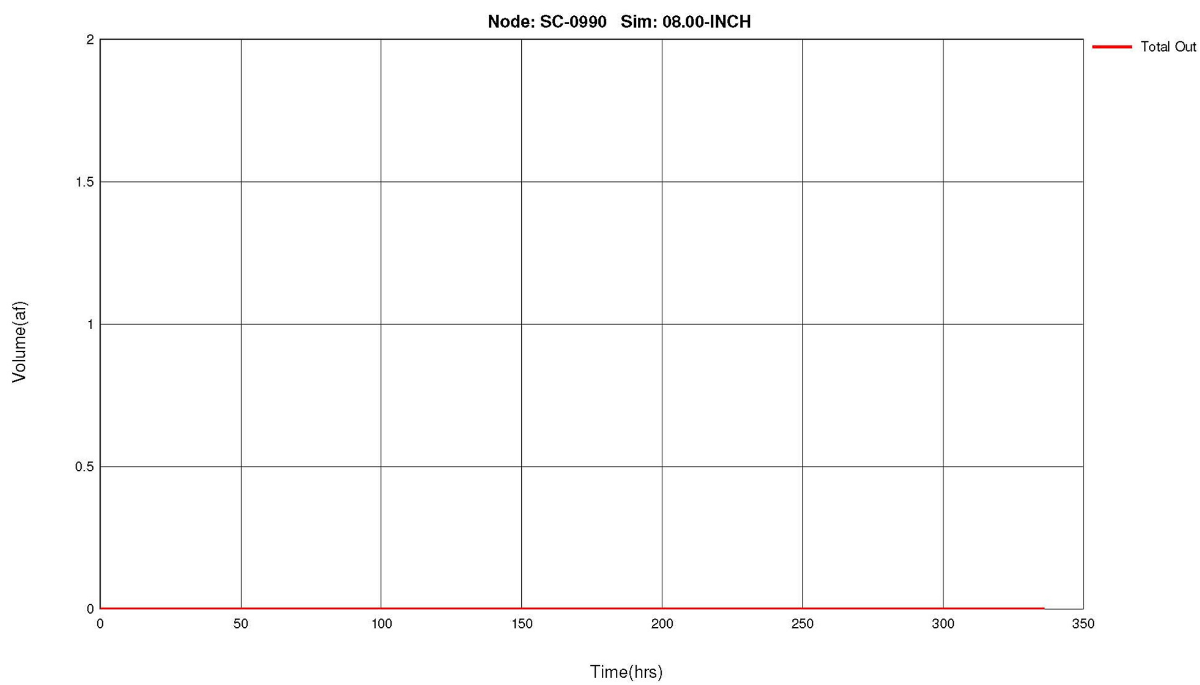

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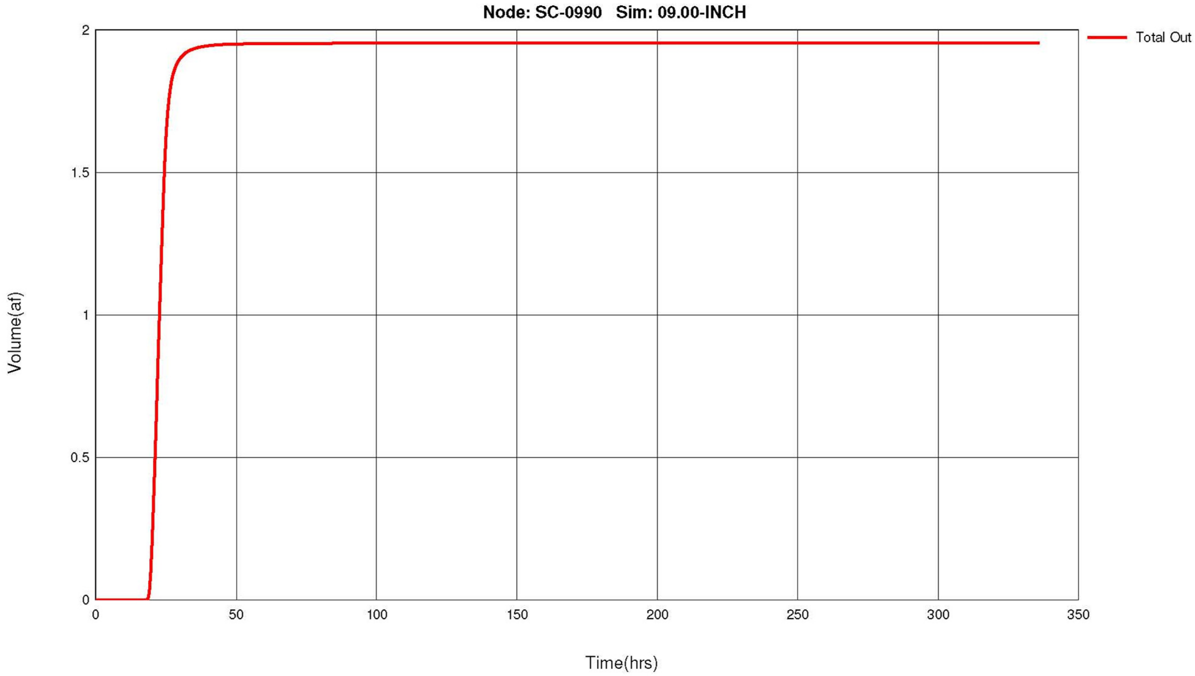

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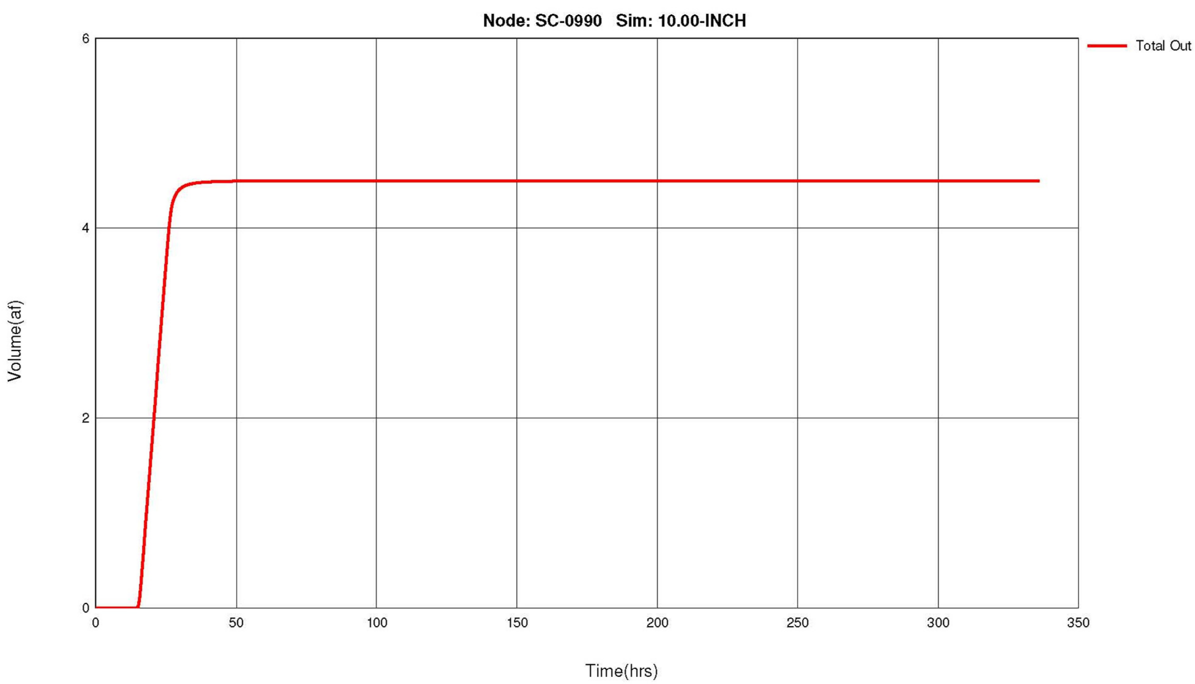

PEGASUS ENGINEERING, LLC

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)
JOINT APPLICATION FOR INDIVIDUAL ENVIRONMENTAL RESOURCE PERMIT

ERP APPLICATION NO. 4-117-121387-2
ALTERNATIVE SINKHOLE REMEDIATION PROTOCOL FOR GRACE LAKE

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

TAB 6

CONTINUOUS SIMULATION ANALYSIS

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Phone: (407) 290-2371 . Fax: (407) 298-9011
E-Mail addresss: devo@devoeng.com
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Pegasus ENGINEERING

HYDRO-GEOTECHNICAL ENGINEERING & SINKHOLE REMEDIATION SERVICES
Design-Level Engineering Support Services & Concept Retrofit

GRACE LAKE - WATER LOSS DUE TO 1986 SINKHOLE

Longwood, Seminole County, Florida

FEBRUARY 2014

Prepared by

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

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Date: January 31, 2014	***Devo's Project No:*** 12-836.12
To: **PEGASUS ENGINEERING, LLC.** 301 West State Road 434, Suite 309 Winter Springs, Fl 32708 phone: 407-992-9160 x 309 fax: 407-358-5155 e-mail: david@pegasusengineering.net	attention: **DAVID W. HAMSTRA, P.E.**

Re:
HYDRO-GEOTECHNICAL ENGINEERING & SINKHOLE REMEDIATION SERVICES
Design-Level Engineering Support Services & Concept Retrofit

GRACE LAKE - WATER LOSS DUE TO 1986 SINKHOLE

Longwood, Seminole County, Florida

Dear Mr. Hamstra,

The following report contains our analyses and recommendations for a proposed sinkhole remediation plan for the above referenced project, based on the following activities performed:

① review of additional data since our firm's last involvement with the project in 2005,
② hydro-geotechnical analyses and modeling,
③ design of a retrofit to achieve a target backfill permeability and overall stability.

We trust that the information contained herein addresses the needs of the County in moving forward with the proposed sinkhole remediation. Feel free to contact us if there are any questions.

Sincerely,

Robert Casper

Robert Casper
Lead Modeler

Devo Seereeram

Devo Seereeram, Ph.D., P.E.
Principal Engineer
Florida Registration No. 48303
Date: January 31, 2014

R Persad

Robin Persad
Project Geotechnical Engineer

TABLE OF CONTENTS

Page #

TABLE OF CONTENTS

Page #

List of Tables

List of Exhibits

TABLE OF CONTENTS (CONTINUED)

List of Attached Figures

List of Attachments

1.0 INTRODUCTION

In April 1986, a sinkhole approximately 10 ft diameter and 8 ft deep appeared on the southeastern bed of Grace Lake, resulting in a rapid fall in lake levels, which declined approximately 4 ft in 5 days, drying-up approximately 50% of the lake area, based on an eyewitness report. The sinkhole then appeared to seal itself naturally, probably due to scour and redistribution of the highly restrictive clayey soils along the bottom of the lake. The sinkhole then re-opened in just over two years (in late July 1988), and expanded to approximately 3 times its previous size (as indicated in a hand-written document by Mr. Brian Skulterty of 1554 Grace lake Circle).

In February 2007, Seminole County commissioned HDR to study and develop/permit a plan for a sinkhole retrofit. The final form of this HDR/PSI plan was submitted to SJRWMD for approval in April 2011. However, on May 12, 2012, HDR informed Seminole County via formal correspondence that they would not be able to proceed from 90% to 100% plans since they were concerned that the sinkhole was still growing. To date no retrofit has been attempted.

Devo Engineering was retained in March 2013 to review the previous retrofit plan developed by HDR and develop an alternative retrofit plan for the sinkhole. The following report contains the results of our analyses and our recommendations. This report is structured as follows:

① A general discussion of sinkhole development in man-made stormwater systems and natural lakes, and a discussion of Grace Lake specifically.

② A discussion of historic and recent water level data for Grace Lake.

③ A discussion of the previously developed retrofit design by HDR, and an alternate approach recommended by Devo Engineering.

④ Continuous simulation modeling for the existing and proposed conditions.

⑤ Conclusions and recommendations.

2.0 SINKHOLE DRAINED LAKES AND STORMWATER PONDS

2.1 Man-Made Stormwater Ponds Drained by Sinkholes

In parts of Florida with thinly mantled karst, induced sinkholes are known to occur within constructed stormwater basins and rapidly drain the stored water volumes directly into the aquifer. "Thinly mantled karst", in this context, implies generally less than 30 ft of leaky and/or fractured sand, clayey sand, sandy clay overburden soil superjacent to (i.e., directly above) the cavernous limestone of the Floridan aquifer, the primary source of potable water supply in the state of Florida.

These collapses/erosional breaches usually occur after the initial or first few stormwater filling cycles. They are caused by the first-time concentration of stormwater on the thin mantle of overburden which can result in the raveling and/or collapse of weaker/erodible bridging soil layers into the underlying cavities of the limestone formation. These breaches in stormwater ponds are usually repaired by special backfilling procedures, although they sometimes plug themselves (self-heal) by the accumulation of silt, sand, and clay which infills the breach.

2.2 Well Known Cases of Lakes Being Drained by Sinkholes in Florida

Unlike man-made ponds, it is very rare for sinkholes to develop under the submerged portions of major natural lakes in the state of Florida and drain them in the fashion of "pulling the plug on a bathtub". Perhaps the two (2) most well-known and dramatic examples of such large urban lakes in Florida being partially or completely drained by sinkholes are:

- ❶ Lake Jackson (3,950± acres) near Tallahassee (Leon County), and
- ❷ Scott Lake (285± acres) in Lakeland (Polk County).

A NWFWMD video of the December 2002 loss of water from Lake Jackson into Porter Hole Sink can be found at the YouTube link below:

http://www.youtube.com/watch?v=NpbczFIKH8I

Lake Jackson periodically undergoes such dramatic emptying episodes. There are several other informative youtube videos related to Lake Jackson's episodic dry-downs into two (2) reactivating sinkholes [Porter Hole Sink and Lime Sink]; these videos may be located and viewed by entering the following search term on youtube.com: "*Lake Jackson Tallahassee*".

The second high-profile lake is Scott Lake (285± acres) in Lakeland and the MSNBC video at the hyperlink below shows the partial drainage of this lake in mid June 2006 via multiple sinkholes:

http://www.msnbc.msn.com/id/13481962/ns/us_news-life/t/lake-goes-down-drain-sinkholes-appear/#.UK0sPIczp8F

These underwater sinkholes caused the level of the lake to decline over 10 ft and the lake has not re-established its level since these 2006 sinkholes.

2.3 Grace Lake Drained by Sinkhole in 1986

In the Orlando metropolitan area, Grace Lake in the Longwood area of Seminole County is another example of a dramatic, rapid internal drainage of a perennially wet lake due to sinkhole development. Figure 1.1 (attached) shows a 2012-dated birds' eye view of this pronounced sinkhole within Grace Lake which was first reported on Sunday April 20, 1986 (per Orlando Sentinel archive). The sinkhole is located within the southeastern bed of Grace Lake near the residence at 1526 Grace Lake Circle, Longwood, Fl (see Figure 2.18). As noted in Figure 1.1, the sinkhole is only about 120 ft from the this residence.

To distinguish it from another borehole-induced sinkhole which apparently occurred some time after January 2011, this gaping sinkhole is referred to as the "1986 sinkhole" within the narrative which follows.

As shown on the map in Figure 3.1, Grace Lake is located in an area of Seminole County with a relatively high number of reported sinkholes.

The 1986 sinkhole was reported to be approximately 10 ft in diameter and 8 ft deep. This sinkhole opened during the dry season when lake levels would have been low (approximately +54 to +55 ft NAVD). Surface water discharge into this sinkhole apparently resulted in a rapid decline of lake level. Based on eyewitness reports, the water elevation dropped approximately 4 ft in 5 days, causing the water surface area to contract approximately 50%.

Although there were unconfirmed reports by the residents that the lake had also dried up approximately 4 years prior to the 1986 episode, the aerials for April 1980 (Figure 2.9) and March 1983 (Figure 2.10) do not support this event.

There was no engineered approach to the backfilling and restoration of the 1986 sinkhole at the time it occurred. Natural scour and redistribution of the hydraulically restrictive clayey soils within the throat of the sinkhole formed a temporary and partial plug. In late July 1988, the sinkhole reopened and expanded to approximately three (3) times its previous size [source: hand-written document by Mr. Brian Skultety, a former resident at 1554 Grace Lake Circle, Longwood, Fl]. During this 1988 recurrence, the lake level is reported to have fallen 2 to 3 ft in 4 days.

The lake has re-filled and drained episodically since that time as the sinkhole plug forms and then subsequently washes out during periods when water rushed into the feature. However, from review of the historical aerials described in the next section, the lake has been mainly dry since 2000 {except for a small pool within the topographic lowest zone of the lake bed}. These observations are discussed in more detail in the next section.

Grace Lake's contributory watershed area is large and occupies an area of approximately 1,254 acres.

3.0 REVIEW OF HISTORIC AND CONTEMPORARY WATER LEVELS

3.1 Note on Elevation Datum

The numerical difference between ft NAVD and ft NGVD at Grace Lake is as follows:

ft NGVD = ft NAVD **+ 1.030 ft**

Within this narrative, we reference the **ft NAVD** datum as our primary reference to be consistent with the HDR permitted plans. This is the datum to be used for the redesign undertaking.

3.2 Review Of Historic Aerial Photographs

A series of historical aerial photos of Grace Lake were obtained dating from April 1940 through Jan 2012. Lake bed elevation contours (in ft NAVD) were overlaid on the aerial photo series, as seen in the attached Figures 2.1 to 2.18. For visual reference, the location of the 1986 sinkhole is also annotated on all historical images. The Interstate Highway 4 corridor is also outlined to show its location on the pre-1960 aerials, prior to its construction. Note that the elevation survey was developed from a combination of the August 2005 LIDAR and a site specific survey performed by Southeastern Surveying and Mapping in December 2007, both of which are post-sinkhole.

The elevation contours were used to interpret the apparent water level in Grace Lake at the time that each photo was taken. The interpreted water level in each of the aerial photos is summarized in Table 1. Table 1 also includes some historical lake levels from published data and/or construction plans.

The 1940, 1948, and 1957 aerials (Figures 2.1, 2.2 and 2.3) show three separate and distinct natural sinkhole depressions within the main body of the lake. These three isolated depressions show up very clearly on the 1948 aerial (Figure 2.2) because they each have separate pools of water. Figure 2.3 shows that 1957 was a very dry year with a large portion of the lake bed waterless. All of the years up to January 1986 show the lake to contain water, with the expected seasonal fluctuations in water level. However, this lake-like appearance changes in the years after the sinkhole opened in April 1986. The Feb 1993 and Dec 1995 aerials (Figure 2.13 and 2.14) show the lake holding water while all subsequent dates show the lake to be dry. The sinkhole was therefore partially plugged in Feb 1993 and Dec 1995.

A plot of the historic lake levels based on data listed in Table 1 is shown in Exhibit 1. Note that the lake is essentially dry at a water level elevation of 48 ft NAVD.

Table 1. Summary of Historic Lake Levels From Aerial Photos and Published Data		
Date	Water Level (ft NAVD)	Comment
Apr 1940	50.5	Aerial photo, attached Figure 2.1
Nov 1948	54.0	Aerial photo, attached Figure 2.2
Mar 1957	49.0	Aerial photo, attached Figure 2.3
Sep 1960	64.5	Hurricane Donna, from I-4 plans
Oct 1964	59.0	Aerial photo, attached Figure 2.4
Nov 1969	59.0	Aerial photo, attached Figure 2.5
Mar 1970	64.0	From USGS study of Grace Lake
Nov 1970	62.0	From USGS study of Grace Lake
Jan 1971	61.0	From USGS study of Grace Lake
Aug 1971	58.0	From USGS study of Grace Lake
Feb 1973	53.0	Aerial photo, attached Figure 2.6
Nov 1974	60.5	Aerial photo, attached Figure 2.7
Jan 1978	54.0	Aerial photo, attached Figure 2.8
Apr 1980	60.5	Aerial photo, attached Figure 2.9
Mar 1983	60.0	Aerial photo, attached Figure 2.10
Jan 1986	56.0	Aerial photo, attached Figure 2.11, sinkhole first apparent 3 months later in April 1986
Mar 1989	53.0	Aerial photo, attached Figure 2.12
Feb 1993	54.0	Aerial photo, attached Figure 2.13
Dec 1995	55.0	Aerial photo, attached Figure 2.14
Feb 2002	48.0	Aerial photo, attached Figure 2.15
Feb 2006	48.0	Aerial photo, attached Figure 2.16
Jan 2010	48.0	Aerial photo, attached Figure 2.17
Jan 2012	48.0	Aerial photo, attached Figure 2.18

Notes:
1. Oct 1964: first aerial where the completed Interstate Highway 4 is visible.
2. Jan 1986: last available aerial image before the sinkhole occurs.
3. Feb 1993 & Dec 1995: lake is holding water (after 1986 sinkhole).
4. Some elevations have been shifted to maintain consistency between the different vertical datums.

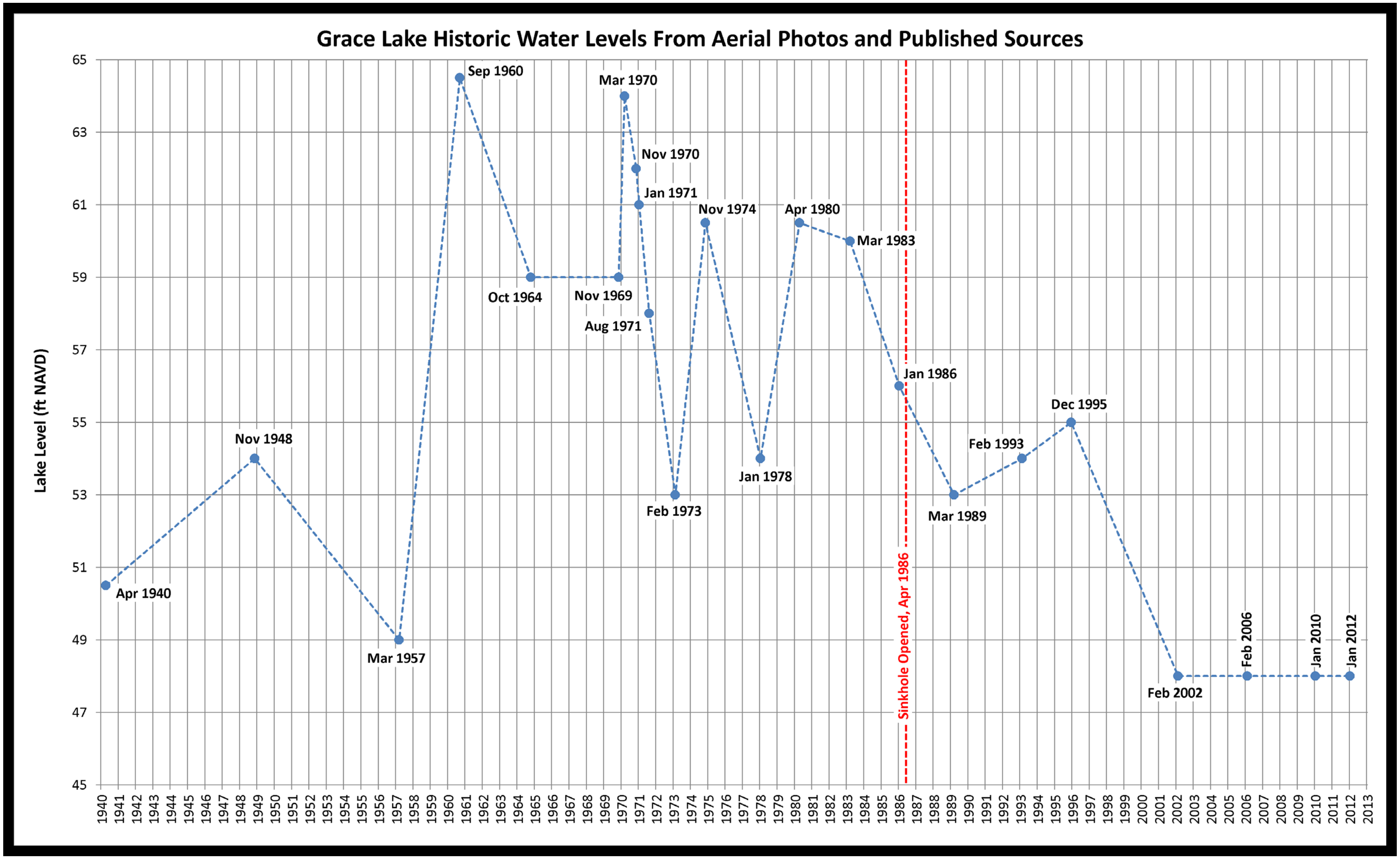

Exhibit 1. Historic Lake Levels From Aerial Photos and Published Data

3.3 Historic Water Levels From Various Sources

The following lake level (and rainfall) data were compiled from various sources, including the Seminole County Water Atlas, observations by lake residents, etc.:

- ➡ The published FEMA 100 year flood elevation of Grace Lake is +67.1 ft NAVD and its 10 year flood elevation is +66.3 ft NAVD.

- ➡ Hurricane Donna high water in 1960: +64.5 ft NAVD

- ➡ October 29, 1975 high water level: +64.7 ft NAVD (Seminole County records)

- ➡ Jan 20, 1986: +59 ft NAVD (from Northridge subdivision plans)

- ➡ When the sinkhole is unplugged, the stabilized water level in Grace Lake is generally in the range +47 ft to +48 ft NAVD, compared to historical normal estimated close to +58 ft NAVD. Note that Grace Lake is shown with a normal water level of +58 ft NAVD on the 1959 quadrangle map.

- ➡ After the three (3) hurricanes in 2004 [Charley (Aug 13), Frances (Sep 5), and Jeanne (Sep 26)], the water surface elevation in Grace Lake rose to +59.61 ft NAVD on September 29, 2004. This means that the rim of the sinkhole (approx +48 ft NAVD) was under a 11.6 ft water depth. It is not certain how long it took to recover this "hurricane volume" of water but the next lake level measurement on January 3, 2005 recorded +48 ft NAVD, indicating that the sinkhole drainage controlled.

- ➡ The month of June 2005 was the second wettest month on record at the Orlando International Airport (with approximately 17 inches of rainfall). NEXRAD data suggests about 13 inches of rainfall in the Grace Lake locale for the month of June 2005. At the end of this particular month, the lake level rose to an altitude of +56.67 ft NAVD (measured on June 30, 2005) and then declined to +49 ft NAVD by August 30, 2005. This is almost a 7 ft fall in lake level over a 2-month period (i.e., all of July & August 2005), another indication that the sinkhole continues to provide significant discharge/recovery capacity.

- ➡ The measured lake level has been consistently at or below +48 ft NAVD since the June 2005 storm event (with the exception of transient surges in lake levels which are quickly drained, and are not reflected in the lake level data) indicating the sinkhole has not sealed itself sufficiently to restrict the high leakage rate.

- ➡ Tropical Storm Fay deposited a total of 15.7 inches of rainfall between August 19 and August 24, 2008. Based on the recollections of some shoreline residents, the lake level is believed to have peaked at an elevation of about +64 ft NAVD following the storm. Figures 6.1 through 6.3 show the approximate high water mark (+64 ft NAVD) during TS Fay for three (3) lakeside residences (Jackson, Jaeger and Kamrath residences).

3.4 Water Levels Measured By Devo Engineering In May to August, 2013

During the months of May through August 2013, Devo Engineering personnel surveyed the water level in Grace Lake on approximately 14 occasions. These water level measurements are shown in Exhibit 2 below. Note that the month of June, in particular, was very wet with a total of about 18.45 inches of rainfall based on the nearby FL-SM-5 rainfall station, resulting in a measured peak stage in Grace Lake of about 59.6 ft NAVD. The location of the FL-SM-5 weather station is shown in Figure 3.2.

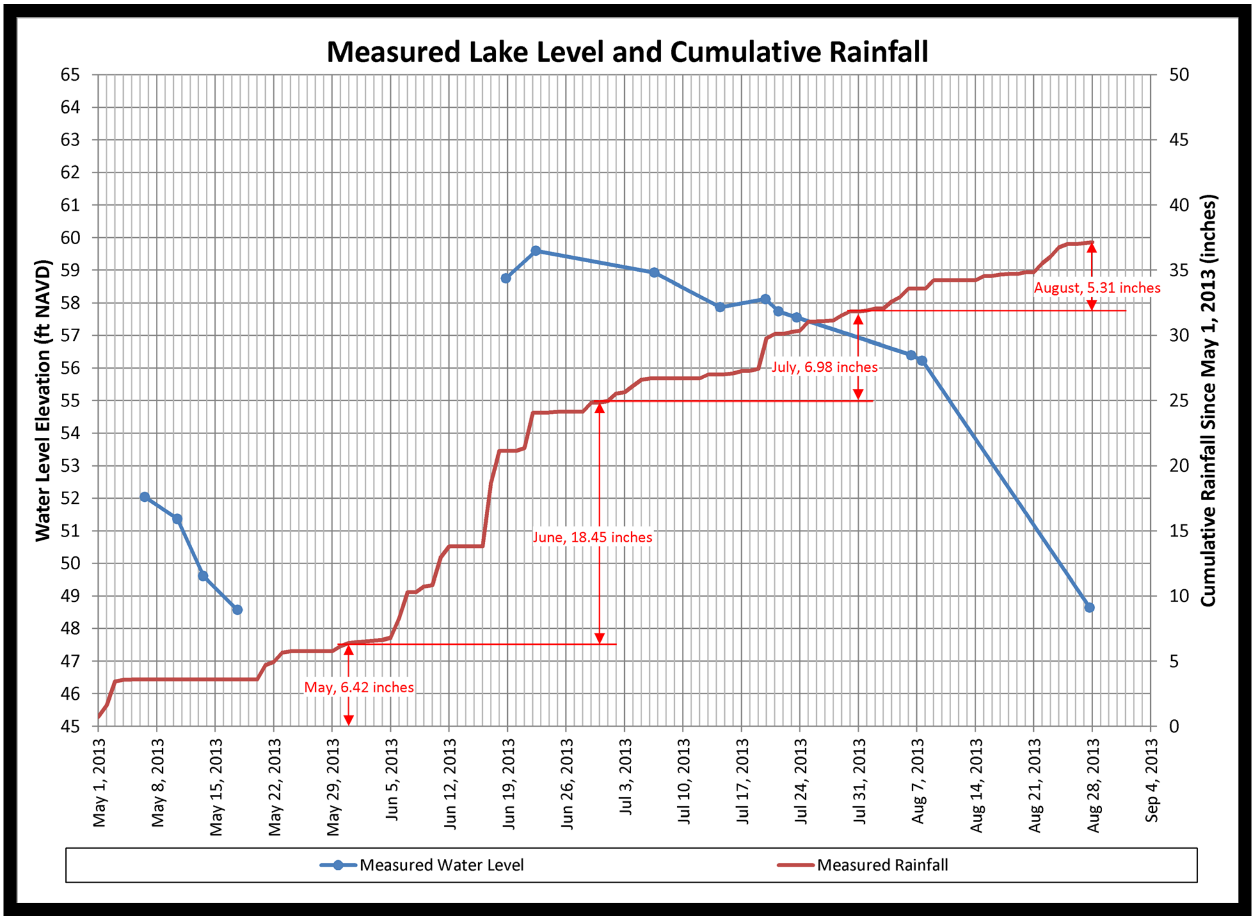

Exhibit 2. Measured Lake Level, May to August, 2013 (Devo Eng.)

Note: rainfall data for the SM-FL-5 weather station was downloaded from the Community Collaborative Rain, Hail and Snow Network (CoCoRaHaS) website, at the following web address:

http://www.cocorahs.org/

4.0 PREVIOUS STUDIES OF GRACE LAKE

4.1 Devo Engineering 2005

In April 2005, Devo Engineering issued a preliminary report to the Grace Lake Residents Association titled

Geotechnical Engineering Report For Grace Lake Sinkhole Restoration, Seminole County, Fl.

This 2005 report contained the general outline of a plan for backfilling the sinkhole to recreate or closely mimic the lake's "*pre-1986 sinkhole*" vertical leakage characteristics [i.e., lake elevation versus vertical discharge rate to the underlying aquifer]. Restoration of this component of the lake's water budget would automatically return its hydroperiod to a normal level [i.e., lake level restored to +58 ft to +59 ft NAVD during the wet season of normal rainfall years].

In the first half of 1971, the level of Grace Lake was measured in the range +58 to +62 ft NAVD. During this period, the USGS calculated a water budget for Grace Lake which is documented in the following report:

Anderson, W. and G.H. Hughes. 1975. Hydrology of Three Sinkhole Basins in Southwestern Seminole County, Florida. Report of Investigation No. 81, U.S. Geological Survey

The result of this 1971 water balance analysis indicated that the 20± acre Grace Lake **loses 0.5 foot of water per month** by seepage through the lake bottom into the underlying Floridan aquifer. For a 20± acre lake, this equates to approximately 110,000 gallons per day. However, because of the 1986 sinkhole, these vertical leakage losses are now estimated to be 7 to 10 times higher than pre-sinkhole conditions (according to the Devo 2005 report). Other reports claim it is now more than 20 times higher.

The Devo 2005 report recommended a net backfill permeability target value in the range 0.5 to 2.0 ft/day to achieve equivalency with the "*pre-1986 sinkhole*" leakage rate. Additionally, the following key elevations were cited in the Devo 2005 report:

- ➡ peak stage of Grace Lake = +65.0 ft NAVD on September 30, 1960
- ➡ second highest stage recorded in Grace Lake = +64.7 ft NAVD on Oct 29, 1975
- ➡ potentiometric surface of the underlying Floridan aquifer (Sept 1995) = +44 ft NAVD, low level of about +38 ft NAVD.
- ➡ ordinary high water level of Grace Lake = +58 ft NAVD

4.2 HDR 2011

4.2.1 Recently Completed Study & Retrofit Plan for Grace Lake

In February 2007, Seminole County commissioned HDR to study and develop/permit a plan for the sinkhole retrofit. The final form of this HDR/PSI plan was submitted to SJRWMD for approval in April 2011. Key elements of the approved plan are described below.

- ➦ On June 18, 2009, HDR submitted the first version of their plan to SJRWMD for approval. This plan included two (2) 12-inch diameter vertical pipe shafts into the Upper Floridan aquifer (i.e., drainwells) in a backfill surround (including a sandwich layer of clay). This plan was not approved by SJRWMD since the agency considered it equivalent to a new drainage well permit which is now prohibited.

- ➦ After discussions with the regulatory agency, the final form of the plan was submitted approximately two (2) years later in April 2011. The revised plan calls for the following:

  - ⇨ a 21 ft by 21 ft sheetpile cofferdam [sheetpile length of 61.5 ft with top elevation @ +51.5 ft NAVD and tip elevation of -10 ft NAVD] around the sinkhole.

  - ⇨ Note that the +48 ft NAVD elevation contour generally circumscribes the outer rim of the sinkhole and the base elevation of the sinkhole is approximately +32 ft NAVD. The water table was measured in the range +38 ft to +40 ft NAVD over the period July 2010 to January 2011, while the potentiometric surface of the underlying aquifer was approximately 2 ft lower. Dewatering was required to facilitate the construction of this project and 5 ft of soil stripping is anticipated prior to placement of backfill material.

  - ⇨ 12 inch rip-rap was recommended to infill the interior of the cofferdam and soil backfill material in the zone external to the cofferdam. In the interior backfill, 4-inch riprap was recommended between elevations +49 ft NAVD and +50 ft NAVD, and then #57 stone above that [from +50 ft NAVD to the top of the structure at +51.5 ft NAVD]. A grate was recommended to be placed on top to prevent public access into the interior of the coffer cell.

  - ⇨ The top of the soil backfill outside the cofferdam would have been graded to an elevation of +49 ft NAVD.

  - ⇨ After installation of the structure, typical sinkhole-type compaction grouting was recommended around and within the "sinkhole area" outside the limits of the sheetpile cofferdam. Twenty six (26) primary injection points was recommended for compaction grouting with the injection tubes being installed to a depth of 50 ft below the lake bottom. Note that top of rock is generally about 55 ft below the lake bottom in the area of the sinkhole.

- ➦ The drainage calculations submitted by HDR with the SJRWMD permit application show an initial stage of +49 ft NAVD in Grace Lake, with the computed 100 yr/24 hr flood stage at elevation 65.1 ft NAVD. Note that the HDR model does not predict any overflow into Lake Myrtle and also predicts that Grace Lake stays land-locked for the 100 yr/24 hr storm. Fourteen (14) day volume recovery is also output. The discharge into the sinkhole was assumed to be fixed at 400,000 cubic feet per day from the start of the simulation.

- ➦ SJRWMD issued their permit for this plan on June 13, 2011 [Permit #: 4-117-121387-1] which carries an expiration date of June 13, 2016.

The following geotechnical investigations were undertaken as part of the HDR study:

① In December 2007, PSI, Inc. performed a geotechnical investigation of the Grace Lake sinkhole and the lake bed in general. The results confirmed the soil stratigraphy, approximate water table levels within the dry lake bed, and estimated the seepage rate into the sinkhole.

② Additional geotechnical investigations were conducted in July 2008 and included additional soil borings and soil parameter determination for seasonal high water table and seepage rates.

③ The June 2010 investigation included monitor well installation for piezometric readings, sheet pile design recommendations, and a geophysical survey of the sinkhole area using Electrical Resistivity Imaging (ERI) and Multichannel Analysis of Surface Wave (MASW) methods, the latter work being performed by Subsurface Evaluations Inc. The piezometric readings and recommended sheet pile design parameters were performed by Professional Service Industries, Inc. (PSI). The geophysical survey was performed by Subsurface Evaluations Inc. (SEI) and that report is dated June 23, 2010.

④ The potentiometric surface of the Upper Floridan aquifer monitored by PSI over the period June 2010 to January 2011 was in the range +37 to +39 ft NAVD, which is generally consistent with the published data for dry season conditions.

Figures 4.1 and 4.2 shows the electrical resistivity results along two (2) selected transects with the SPT borehole data overlaid for a subsurface perspective.

4.2.2 Current Status of Sinkhole/HDR Repair Plan

On May 12, 2012, HDR informed Seminole County via formal correspondence that they will not be able to proceed from 90% to 100% plans since they were concerned that the sinkhole was still growing.

4.2.3 Devo's Comments on HDR's 2011 Sinkhole Repair Plan

These are our comments on the HDR design/analysis:

- ⇨ From our field inspection on November 23, 2012, it is apparent that there is not a "growth of the 1986 sinkhole" but a secondary induced sinkhole has developed because of the deep piezometer installed by PSI at their B-8/MW-2 or B6 location. It is apparent that the annular space around this piezometer was not grouted so it leaves an avenue for soil loss into the underlying cavity system. The County has requested that PSI remove this piezometer and grout seal this penetration through the confining layer as part of their work completion. It is apparent that this secondary sinkhole occurred some time after January 2011 since PSI has water level measurements during this month, without mention of the induced sinkhole.

- ⇨ The other physiographic changes around the primary 1986 sinkhole are due to erosion from the surface water flow into the feature and not a result of additional deep collapse.

- ⇨ The sheetpile cofferdam will likely need the press-in method instead of vibratory methods (to avoid sinkhole activation and damage to adjacent residential structures).

5.0 DEVO ENGINEERING RECOMMENDED RETROFIT

With HDR's withdrawal from the project, Seminole County contracted Pegasus Engineering to assess the retrofit and develop a plan to move forward, with the primary goals being to repair the sinkhole such that Grace Lake's hydrology is restored to near pre-sinkhole conditions. The County has also emphasized the importance of the selected retrofit plan not increasing flood elevations around the lake or in any upstream or downstream location.

It is our recommendation that the County not move forward with the previously proposed retrofit design, utilizing the sheetpile cofferdam, for reasons previously stated. As an alternative, we recommend that a series of progressively decreasing nominal size rock be installed to fill and bridge the base of the cavity to provide a stable working platform for the engineered retrofit measures. These measures consist of two layers of clean sands in which a couple layers of Articulating Concrete Block (ACB) mats are sandwiched in a parabolic configuration perpendicular to each other, overlain by a minimum 3 ft thick layer of 3 ft/day engineered soils. The retrofit measures would also consist of a vertical HDPE liner installed around the perimeter of the retrofitted sinkhole area to cutoff head driven flow paths and possible piping and erosion of soils to the potentiometric surface of the underlying Floridan aquifer. The detailed design concept, construction sequence and methodology are presented in Section 7 of this report.

6.0 CONTINUOUS SIMULATION MODELING

6.1 Modeling Strategy

A continuous simulation model was developed using the PONDS 3.3 Refined Method software module, in order to evaluate the changes to the lake's hydroperiod which could be anticipated as a result of implementing the proposed sinkhole remediation strategy. The continuous simulation modeling consisted of the following steps:

① An initial calibration was performed in order to estimate the current leakage characteristics of the sinkhole. Rainfall data for May through August, 2013 was used in conjunction with water level measurements taken by Devo Engineering personnel during this time period.

② Predictive runs, in order to evaluate the effect on the lake's hydroperiod for a range of post-construction sinkhole leakage rates, in order to develop engineering recommendations for the proposed remediation.

The continuous simulation model was partially based on data from a revised ICPR model developed by Pegasus Engineering, LLC, which builds upon earlier modeling which was performed for the City of Longwood's Stormwater Master Plan, in which the Grace Lake watershed is a subset of the larger model. The ICPR model was used to provide the following information:

❶ Contributing sub-basins and flow patterns, including determination of contiguous/direct runoff basins versus upgradient discharge basins.

❷ Curve number estimates for runoff calculations. Contiguous basins were directly modeled in PONDS using SCS Curve numbers, basin areas, etc.

❸ Upgradient discharge rating curves. Discharge from upgradient basins was modeled based on rainfall vs upgradient discharge rating curves developed using the Pegasus ICPR model (calculations performed by Pegasus Engineering).

❹ Discharge elevations.

❺ Stage vs area relationship of Grace Lake.

Attached Figure 5.1 shows the drainage basin boundaries in the Pegasus model in the vicinity of Grace Lake. A partial printout of the input data from the Pegasus model is included in Attachment B (for basins in the vicinity of Grace Lake watershed).

6.2 General Input Data Parameters

6.2.1 Aquifer Parameters

The following aquifer parameters were used to model the surficial aquifer, and the leakage between the surficial aquifer and Upper Floridan aquifer. Note that the leakages shown in Table 2 represent the pre-existing leakages before the sinkhole opened up. These leakages are assumed to still exist outside of the sinkhole area. The leakage within the sinkhole was modeled separately.

Table 2. Aquifer Parameters

Parameter	Value
Base of Aquifer Elevation (ft NAVD)	30
Saturated Horizontal Hydraulic Conductivity (ft/day)	2
Fillable Porosity (%)	20
Vertical Leakage Outside Lake (in/yr)	12
Vertical Leakage Inside Lake (in/yr) [1]	60

NOTE:
1. This does not include the leakage within the sinkhole, which is defined separately.

6.2.2 Contiguous Basin Runoff Parameters

For modeling purposes, the following runoff basins (as seen in attached Figure 5.1) are considered to produce direct stormwater runoff to Grace Lake:

- SC-0880 - 77.83 acres west of I-4
- SC-0900A - 2.29 acres east of I-4
- SC-0900B - I-4 corridor, 5.54 acres
- SC-0910 - contiguous basin to northwestern lobe of lake, 6.09 acres
- SC-0920, contiguous basin to main lake body , 88.62 acres
- SC-0925 - residential area east of basin SC-0920, 13.24 acres

A weighted average curve number was calculated for these basins based on data from the Pegasus model (Attachment B). Table 3 below details the weighted average curve number calculation.

Table 3. Weighted Average Curve Number for Direct Runoff Basins			
Description	Area (acres)	CN	Area x CN
Basin SC-0880	77.83	57	4436.3
Basin SC-0900A	2.29	71	162.6
Basin SC-0900B	5.54	72	398.9
Basin SC-0910 (less lake area) [1]	5.43	73.1	396.9
Basin SC-0920 (less lake area) [1]	66.57	60.1	4000.9
Basin SC-0925	13.24	57	754.7
Total	170.9		10150.3
Weighted Average CN		59.4	

Notes:
1. Pegasus basin area and CN adjusted to exclude lake area.
2. Total basin area (6.09 acres) minus area of lake surface at elevation 58 ft NAVD (0.66 acres).
2. Total basin area (66.57 acres) minus area of lake surface at elevation 58 ft NAVD (22.05 acres).

Note that the total lake area at the historic normal water level elevation (58 ft NAVD) is **22.71 acres** based on the stage vs area in the Pegasus model.

6.2.3 Inflow From Upgradient Basins

The inflow to Grace Lake from upgradient basins was modeled based on rating curves for rainfall depth versus upgradient discharge volume, based on model runs of the Pegasus ICPR model for various rainfall depths and antecedent moisture conditions (AMC I and AMC II). These model runs were performed by Pegasus Engineering, LLC. The tabular results of these model runs are included in Attachment A, and are plotted in Exhibit 3 below.

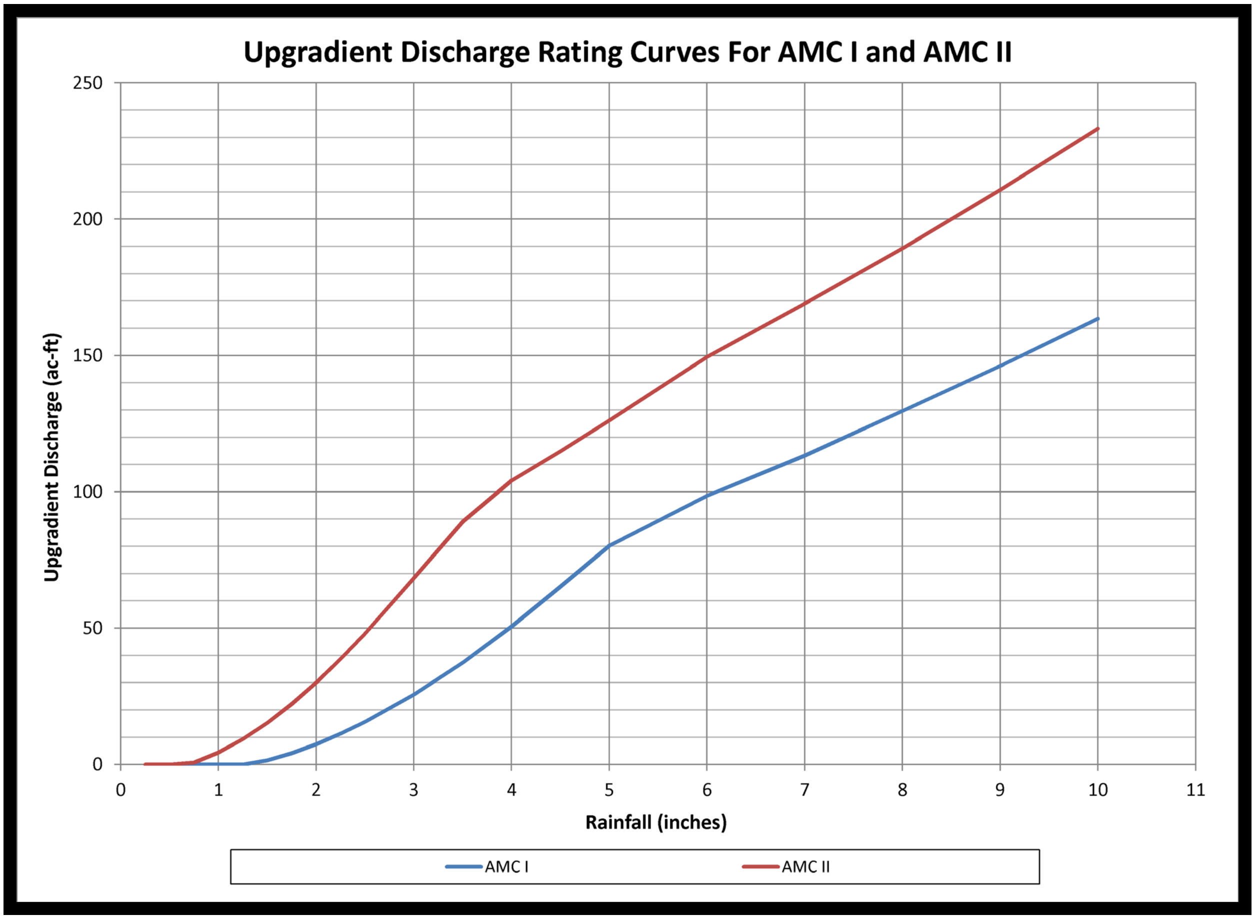

Exhibit 3. Rating Curve For Rainfall vs Upgradient Discharge

6.2.4 Discharge Control Elevation

The control elevation for discharge from Grace Lake occurs at elevation 62.6 ft NAVD, on the west side of I-4, at downstream to Node SC-0880 (see Figure 5.1). For modeling purposes, this was modeled in PONDS as a 5 ft wide weir.

At an elevation 65.5 ft NAVD, water begins to top over to Sunshine Tree Blvd. This was modeled in PONDS as a 20 ft wide weir.

6.2.5 Stage vs Area Data For Grace Lake

Stage versus area data for Grace Lake is summarized in Table 4, based on data from the Pegasus ICPR model. Note that in the Pegasus model, Grace Lake is represented by two separate nodes, Node SC-0910 which is the smaller node in the northwest of the lake, and Node SC-0920 which is the main body of the lake. These two nodes were combined for the purpose of modeling in PONDS.

Table 4. Stage vs Area Data

Stage (ft NAVD)	Area (sq-ft)		
	Node SC-0920	Node SC-0910	Total
48	51,836		51,836
49	158,123		158,123
50	256,133		256,133
51	354,143		354,143
52	458,251		458,251
53	561,053		561,053
54	650,786		650,786
55	724,838	7,405	732,244
56	800,633	13,068	813,701
57	874,249	19,602	893,851
58	960,498	28,750	989,248
59	1,049,360	41,818	1,091,178
60	1,134,738	61,855	1,196,593
61	1,213,146	79,279	1,292,425
62	1,293,732	98,010	1,391,742
63	1,379,981	116,741	1,496,722
64	1,467,101	128,938	1,596,038
65	1,538,975	141,570	1,680,545
66	1,607,364	151,589	1,758,953
67	1,689,692	160,301	1,849,993

6.3 Model Calibration

Model calibration was performed based on the measured lake levels from May 6 to August 28, 2013 (as shown in Exhibit 2 previously), along with rainfall data from the nearby FL-SM-5 Rainfall Station. The purpose of the calibration was to estimate the leakage rate through the existing sinkhole, and to refine the upgradient inflow estimates to better match the observed peak stage conditions during the model calibration period. The upgradient inflow was varied as follows:

① Calibration Scenario #1. Upgradient inflow was estimated based on the rating curves generated by the Pegasus ICPR model (shown in Exhibit 3), with consideration given to the 5-day antecedent moisture conditions. This upgradient inflow was applied at 100% of the calculated rating curve value.

② Calibration Scenario #2. A correction factor was applied to the rating curves generated by the Pegasus ICPR model. This correction factor was applied to both the AMC I and AMC II rating curves. The correction factor was iterated upon in order to produce a good match for the peak stage during the calibration period.

③ Calibration Scenario #3. Upgradient inflow was estimated using only the AMC I rating curve (in Exhibit 3), regardless of the actual 5-day antecedent moisture conditions. The AMC I curve was applied at 100% of the rating curve value.

In all three of the calibration scenarios outlined above, the leakage rate in the sinkhole was then varied in order to adjust the predicted recovery time of the lake level to match the observed recovery time from peak stage conditions.

The result of the calibration are shown in Exhibit 4 below. Based on these results, the best calibration is achieved using the second calibration series, i.e., a correction factor of 65% applied to the raw rating curve values and a sinkhole leakage of 1.27 cfs.

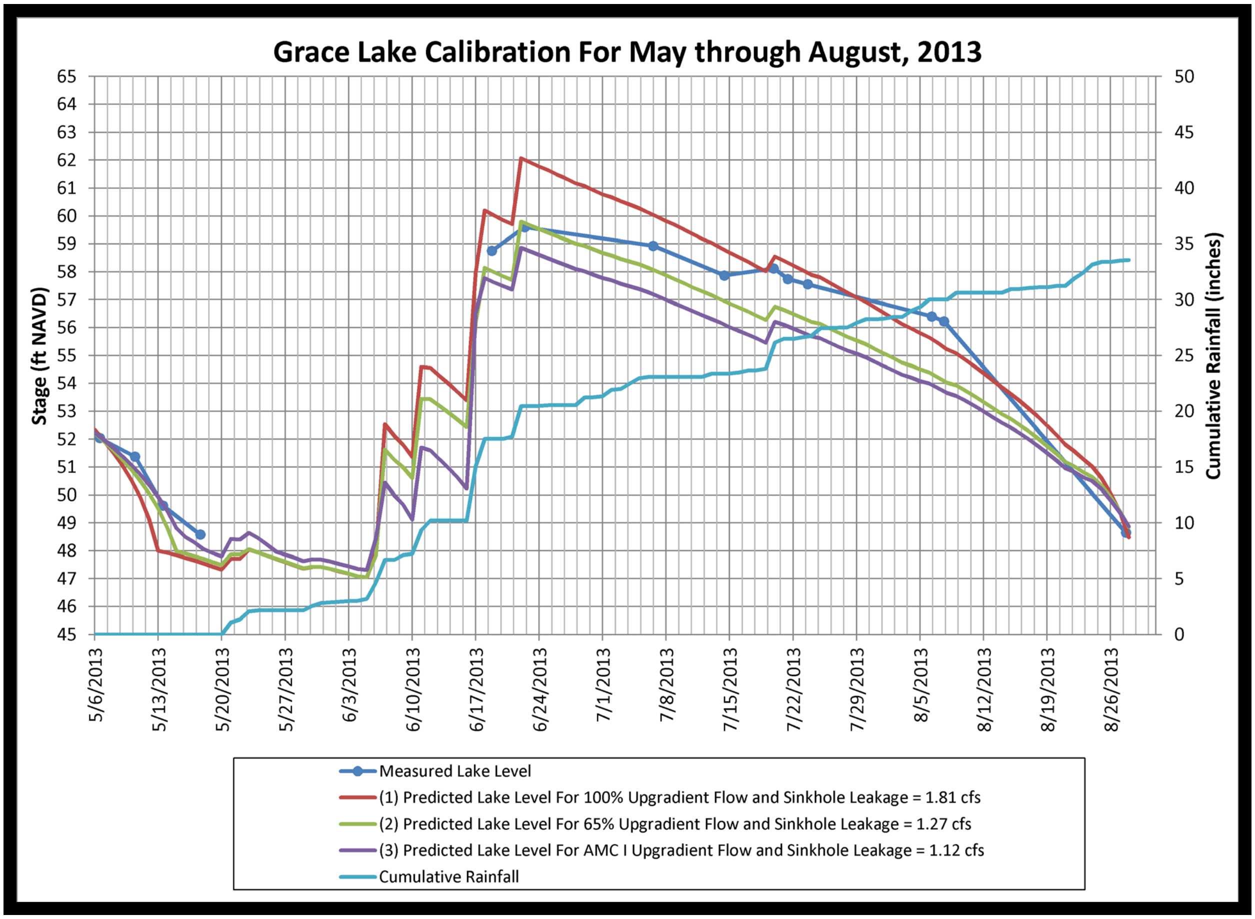

Exhibit 4. Calibration Results

6.4 Long Term Continuous Simulation

Using the calibration obtained for May through August 2013 conditions, a series of long-term predictive simulations were performed for varying rates of post-construction leakage in the sinkhole in order to evaluate the resulting impact to the hydroperiod of the lake.

These predictive model runs utilized long term rainfall data from the nearby FL-SM-5 rainfall station, for the period of 2007 through 2012. Rainfall data from the FL-SM-5 rainfall station is plotted in Exhibit 5 below, and annual rainfall totals are summarized in Table 5. As seen in Table 5, these years cover a range of dry, normal and wet rainfall years. For modeling purposes, the 6 year rainfall period between 2007 to 2012 (inclusive) was repeated for four (4) repetitions, with the results plotted for the final repetition of the 6-year rainfall data cycle.

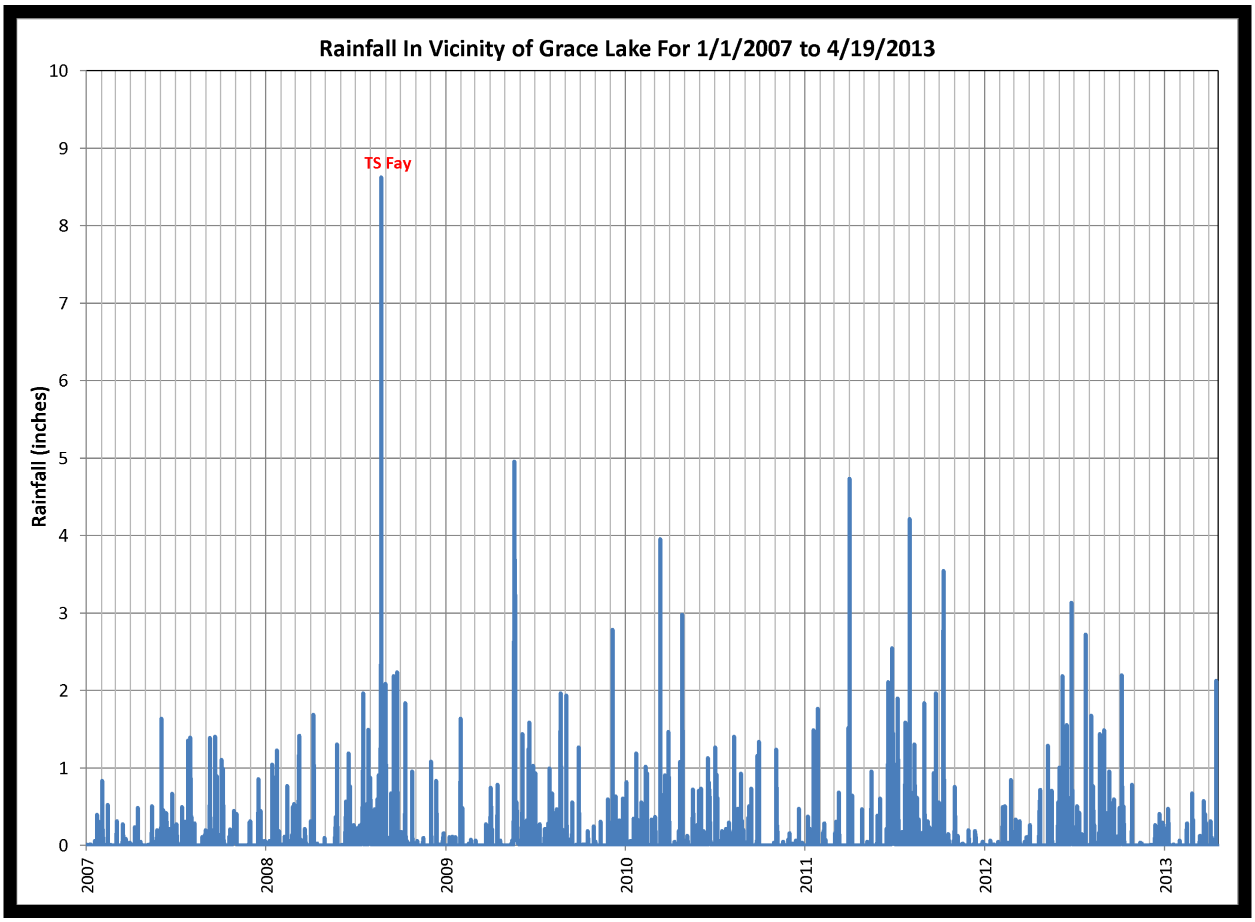

Exhibit 5. Rainfall For Period of 1/1/2007 to 4/19/2013

Table 5. Summary of Annual Rainfall For Model Period of Record		
Year	Cumulative Annual Rainfall (inches)	Comment
2007	29.5	Dry year
2008	63.4	Wet year
2009	49.4	Average rainfall year
2010	43.2	Below average rainfall
2011	60.9	Above average rainfall
2012	48.5	Average rainfall year
2013	N.A.	Partial year
Note: Long-term average rainfall in Central Florida is on the order of 50 to 51 inches per year.		

Two series of predictive model runs were performed. The first series utilizes the preferred Calibration Scenario #2 (65% correction factor to the upgradient discharge rating curves and sinkhole leakage rate of 1.27 cfs), and the second series utilizes Calibration Scenario #1 (100% of upgradient discharge rating curves and sinkhole leakage rate of 1.81 cfs) which appears to over predict upgradient inflow, and is therefore somewhat conservative.

Exhibit 6 shows the predicted lake stage using the preferred Calibration Scenario #2, for a range of post-construction sinkhole leakage rates from 0 cfs to 0.4 cfs.

Exhibit 7 shows the predicted lake stage using Calibration Scenario #1, for a range of post-construction sinkhole leakage rates from 0 cfs to 0.4 cfs.

Based on these simulations, it appears that a post-construction sinkhole leakage rate of approximately 0.2 cfs to 0.3 cfs will provide a lake hydroperiod which best meets the target objective of restoring the lakes historic normal water level. When implementing the sinkhole retrofit, we recommend using an initial leakage rate of 0.3 cfs and monitoring the resulting lake level hydroperiod for a period of time, after which the leakage rate can be further decreased if warranted.

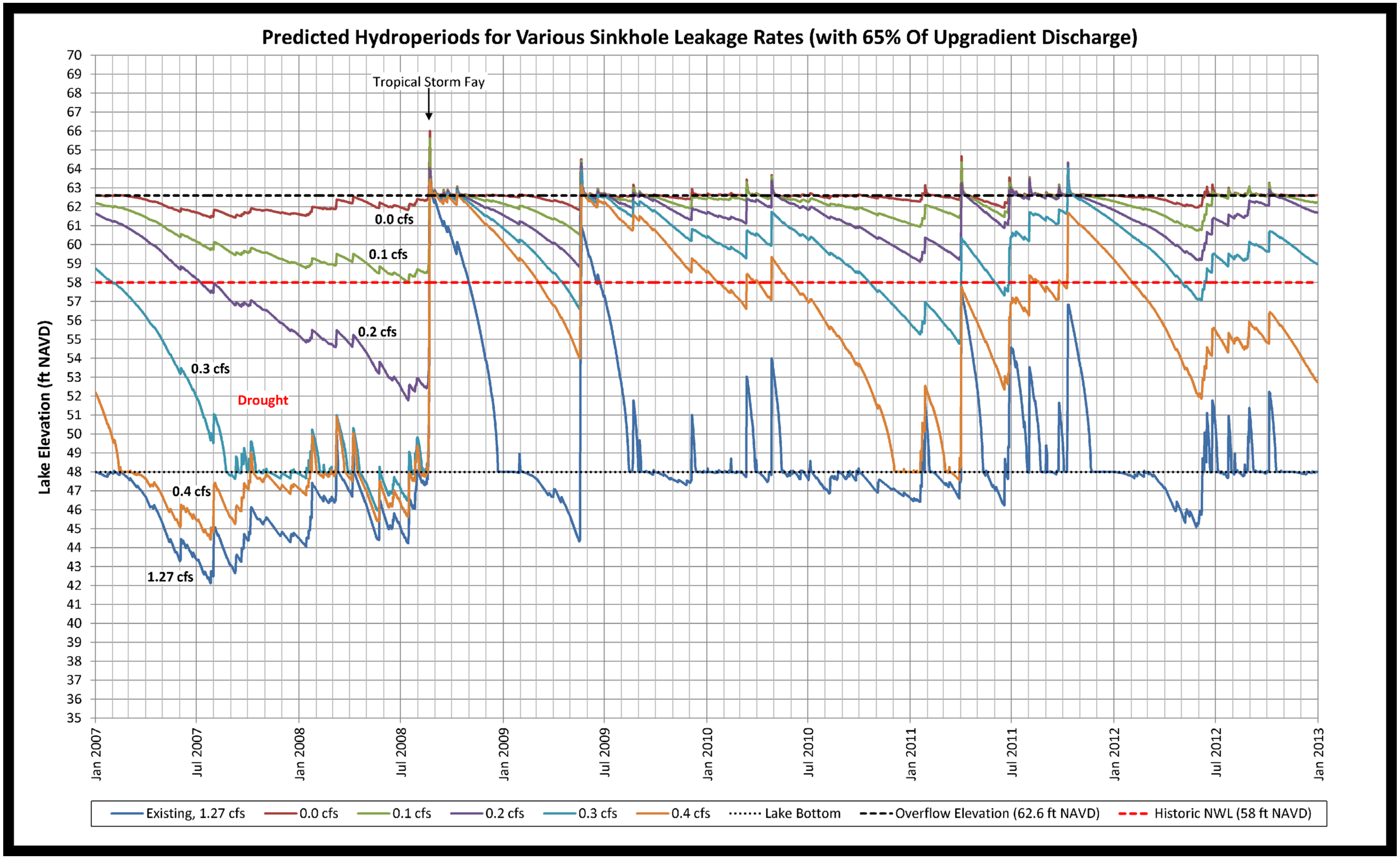

Exhibit 6. Predicted Hydroperiod For A Range Of Sinkhole Leakages For Preferred Calibration Scenario #2

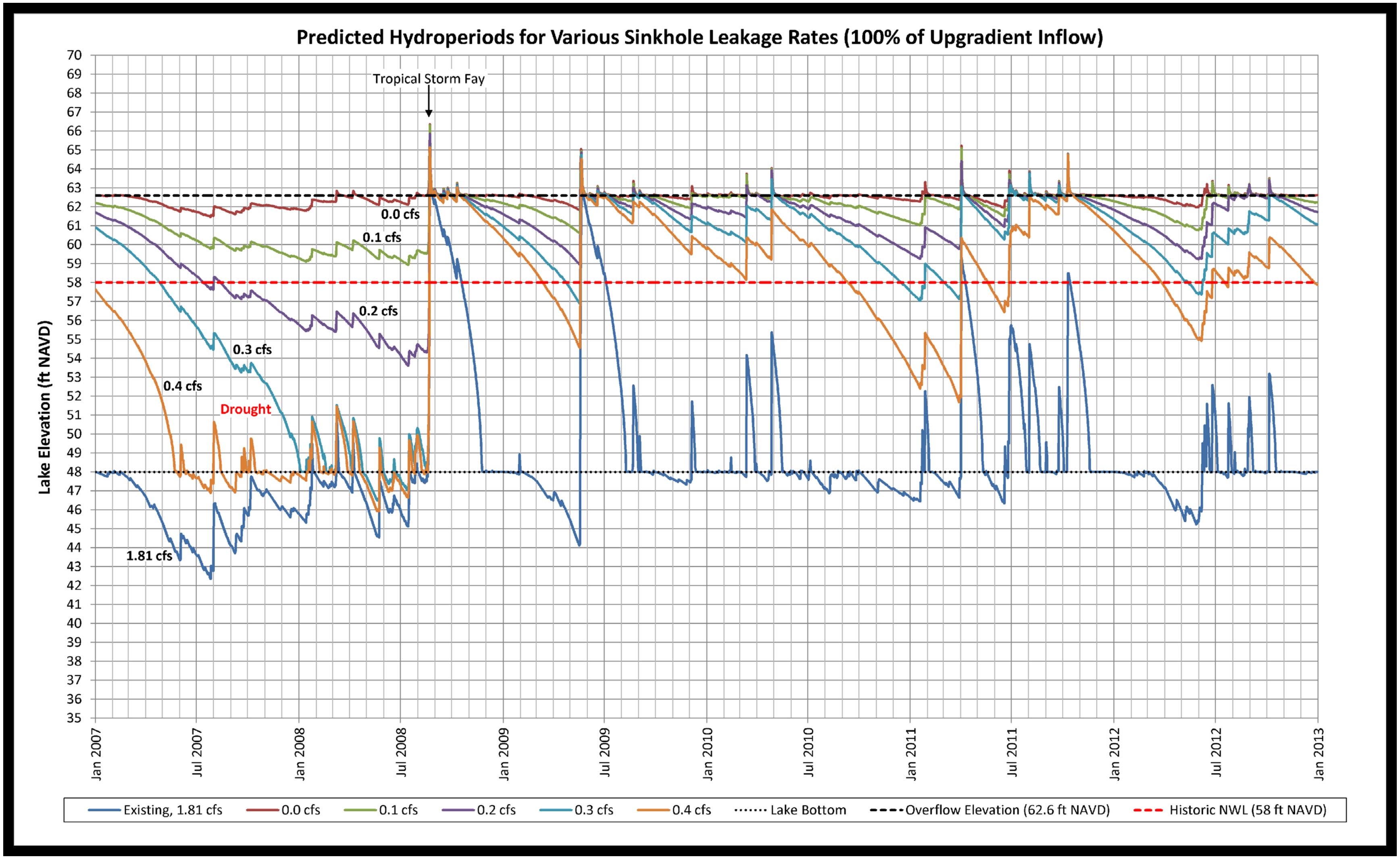

Exhibit 7. Predicted Hydroperiod For A Range Of Sinkhole Leakages For Calibration Scenario 1

7.0 DESIGN AND CONSTRUCTION RECOMMENDATIONS

7.1 Design Concept

Our design concept consists of four (4) principal components, listed below, whilst ensuring that the vertical leakage is controlled by the 3 ft thick engineered surficial soil layer which can be simply and practically decreased after monitoring the post remediated sinkhole lake performance for a couple wet seasons. Based on the layer thicknesses and the material permeabilities, as well as, the area of the sinkhole , the design configuration is expected to achieve a leakage value close to the target leakage value of 0.3 cfs, but thicknesses may be adjusted after the systems goes though a minimum period of two wet seasons.

❶ Stabilization of the base of the sinkhole by in filling with large rubble to safely facilitate the construction of the overlying engineered retrofit measures;

❷ Installation of a geotextile fabric soil cutoff layer above the open graded rock, and ACB mats configured in a parabolic (cambered) shape to enhance the stability of the overlying layers even if some nominal settlement and redistribution of soils within the sinkhole occurs;

❸ Construction of a surficial layer of engineered soils which generally conforms with the remolded hydraulic conductivity dictated by the modeling results while staying somewhat on the conservative side, i.e. allowing more leakage thus preventing any potential for flooding; and

❹ Construction of a vertical cutoff HDPE liner along the retrofitted perimeter to prevent head driven propagation of seepage paths and soil loss by approximately 10 ft of head under the ideal pre-sinkhole lake levels.

7.2 Construction methodology

Our proposed construction methodology consist of filling the base of the sinkhole, initially with large rubble size rock (up to 12-in nominal diameter) up to an approximate elevation of +36 ft NAVD followed by 3-in to 5-in nominal diameter cobble size rubble up to an approximate elevation of +38 ft NAVD and finally #57 stone up to an approximate elevation of +40 ft NAVD. It is very important to note that adequate "box cut" or migration into natural soils to at least the thickness of the soil layer being installed is required from this layer up to finish grade as shown in Figure 7.1.

The next phase of construction is comprised of the installation of a layer of clean sand, geotextile fabric, two layers of ACB in a parabolic configuration overlain by clean sand and finished with a minimum of 3-ft thick layer of engineered soils with a minimum remolded hydraulic conductivity of 3 ft/day.

Finally the vertical HDPE barrier shall be installed along the perimeter of the remediated area of the sinkhole, the clayey soils in the area between the HDPE liner and the ACB mats shall be compacted using static methods and complimented with flowable fill as necessary to provide a complete cutoff to head driven flow paths and possible piping of soils to the potentiometric surface of the underlying Floridan aquifer. The post retrofitted sinkhole shall be monitored for a minimum period of two wet seasons following which the lake performance would be evaluated and the engineered soils modified as necessary.

7.3 Construction Sequence

The proposed construction sequence for the sinkhole retrofit is as follows:

- Set up approved soil and erosion control measures.
- Establish access for construction equipment.
- Clear and Grub the upper reaches of the sinkhole above Elev. 38± ft NAVD.
- Install Large Rubble using an excavator with adequate reach to fill voids from the bottom of the sinkhole up to Elev. 38± ft NAVD.
- Install 3-in to 5-in cobble size rubble using an excavator with adequate reach to fill voids in the underlying rubble layer up to Elev. 40± ft NAVD.
- Install #57 stone using an excavator with adequate reach to fill voids in the underlying rubble layer up to Elev. 42.5± ft NAVD (benched into natural soils).
- Install clean sand with a remolded hydraulic conductivity of 15± ft/day to parabolic configuration as shown on the cross-section (benched into natural soils).
- Install a layer of geotextile fabric underlayment per FDOT Index 199.
- Install two layers of 16 ft x 8 ft x 6 Inches high closed cell mechanically interconnected ACB mats perpendicular to each other.
- Install clean sand with a remolded hydraulic conductivity of 15± ft/day onto the ACB ensuring that all voids are properly filled.
- Install engineered soil to 12± in below finish grade with remolded hydraulic conductivity of 3± ft/day.
- Install 20-mil Vertical HDPE liner
- Carefully compact the clay layer between the HDPE liner and the ACB including the use of flowable fill as necessary to ensure a complete cutoff.

Note that some variation in the above limits and elevations can be expected based on location specific engineering soil properties.

FIGURES

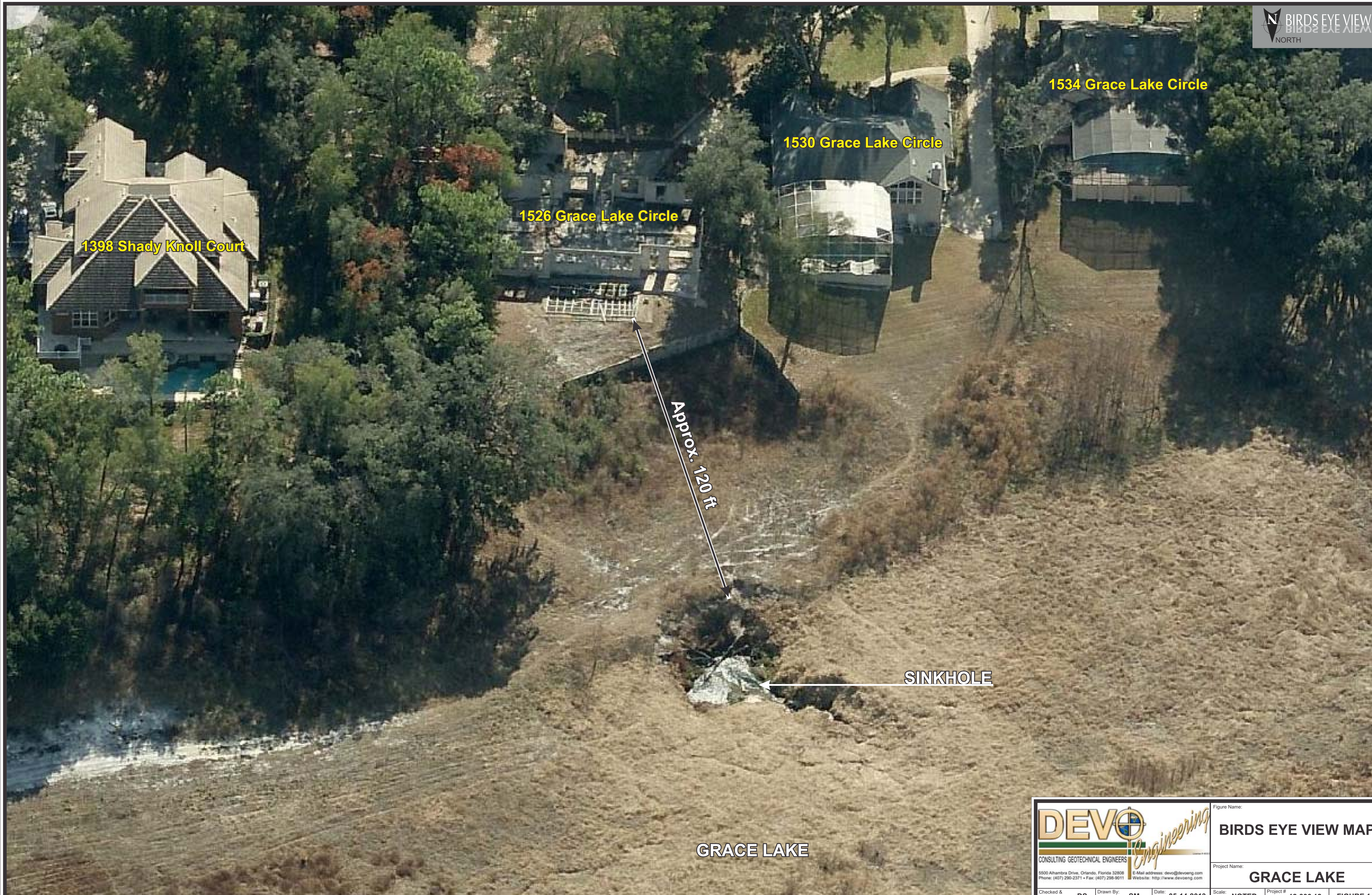

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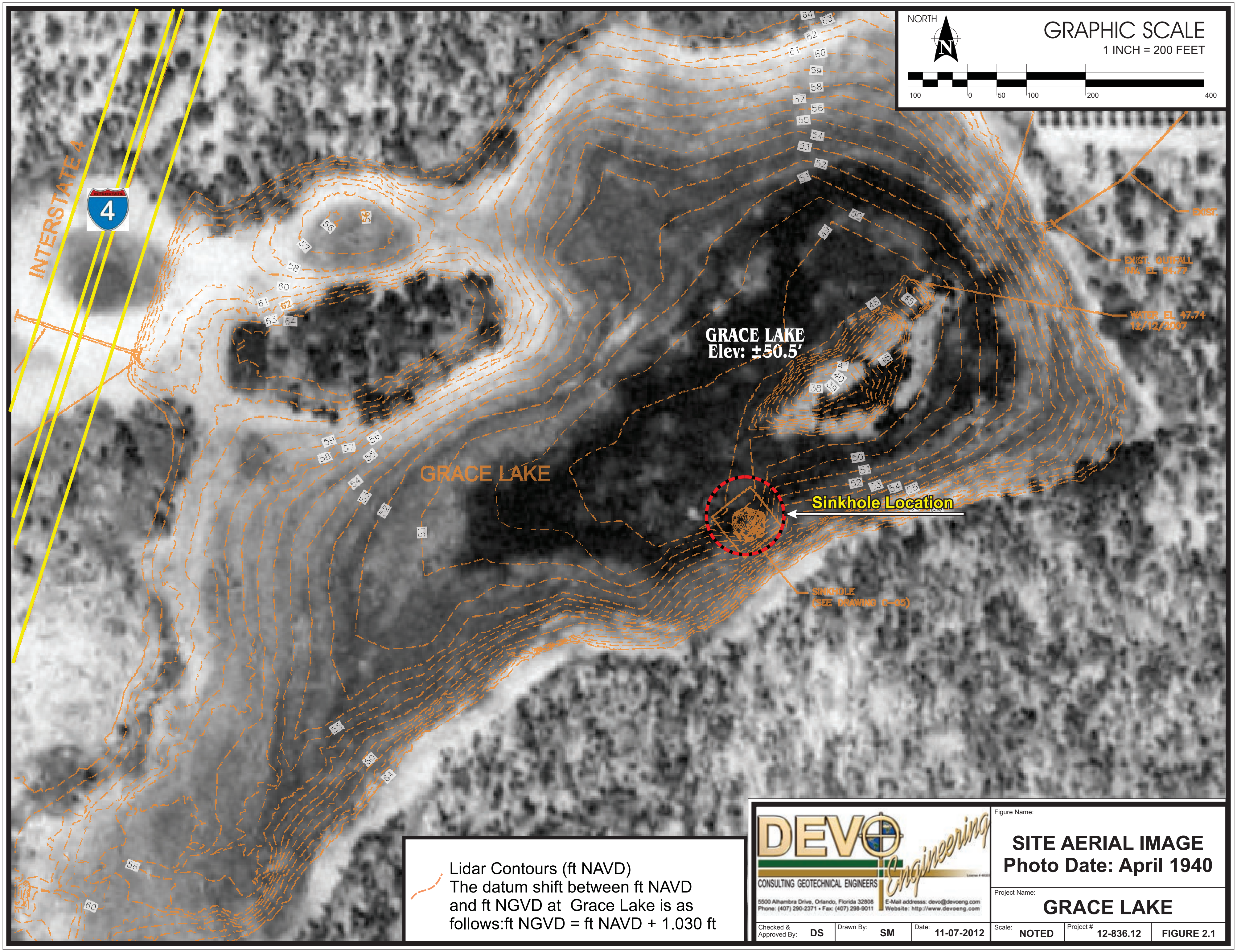
Figure Name:	BIRDS EYE VIEW MAP
Project Name:	GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	05-14-2013	NOTED	12-836.12	FIGURE 1.1



INTERSTATE 4
4
GRACE LAKE
Elev: ±50.5'
GRACE LAKE
Sinkhole Location
SINKHOLE
(SEE DRAWING C-05)
EXIST.
EXIST. OUTFALL
INV. EL. 54.77
WATER EL. 47.74
12/12/2007
NORTH
N
GRAPHIC SCALE
1 INCH = 200 FEET
100
0
50
100
200
400
Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows:ft NGVD = ft NAVD + 1.030 ft
DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS
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Phone: (407) 290-2371 • Fax: (407) 298-9011
E-Mail address: devo@devoeng.com
Website: http://www.devoeng.com
Figure Name:
SITE AERIAL IMAGE
Photo Date: April 1940
Project Name:
GRACE LAKE
Checked & Approved By: DS
Drawn By: SM
Date: 11-07-2012
Scale: NOTED
Project # 12-836.12
FIGURE 2.1

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

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

Figure Name:
SITE AERIAL IMAGE
Photo Date: Nov 1948

Project Name:
GRACE LAKE

Checked & Approved By: DS	Drawn By: SM	Date: 11-07-2012	Scale: NOTED	Project # 12-836.12	FIGURE 2.2

Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows:ft NGVD = ft NAVD + 1.030 ft

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Website: http://www.devoeng.com

Figure Name:	SITE AERIAL IMAGE Photo Date: Mar 1957
Project Name:	GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.3

Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows:ft NGVD = ft NAVD + 1.030 ft

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Website: http://www.devoeng.com

Figure Name: SITE AERIAL IMAGE Photo Date: Oct 1964					
Project Name: GRACE LAKE					
Checked & Approved By: DS	Drawn By: SM	Date: 11-07-2012	Scale: NOTED	Project # 12-836.12	FIGURE 2.4

NORTH
N
GRAPHIC SCALE
1 INCH = 200 FEET
100
0
50
100
200
400
INTERSTATE 4
4
GRACE LAKE
Elev: ±59.0'
GRACE LAKE
Sinkhole Location
SINKHOLE
(SEE DRAWING C-15)
EXIST.
EXIST. OUTFALL
INV. EL 64.77
WATER EL 47.74
12/12/2007
Lidar Contours (ft NAVD)
The datum shift between ft NAVD
and ft NGVD at Grace Lake is as
follows:ft NGVD = ft NAVD + 1.030 ft
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Website: http://www.devoeng.com
Figure Name:
SITE AERIAL IMAGE
Photo Date: Nov 1969
Project Name:
GRACE LAKE
Checked & Approved By: DS
Drawn By: SM
Date: 11-07-2012
Scale: NOTED
Project # 12-836.12
FIGURE 2.5

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Figure Name: **SITE AERIAL IMAGE Photo Date: Feb 1973**

Project Name: **GRACE LAKE**

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.6

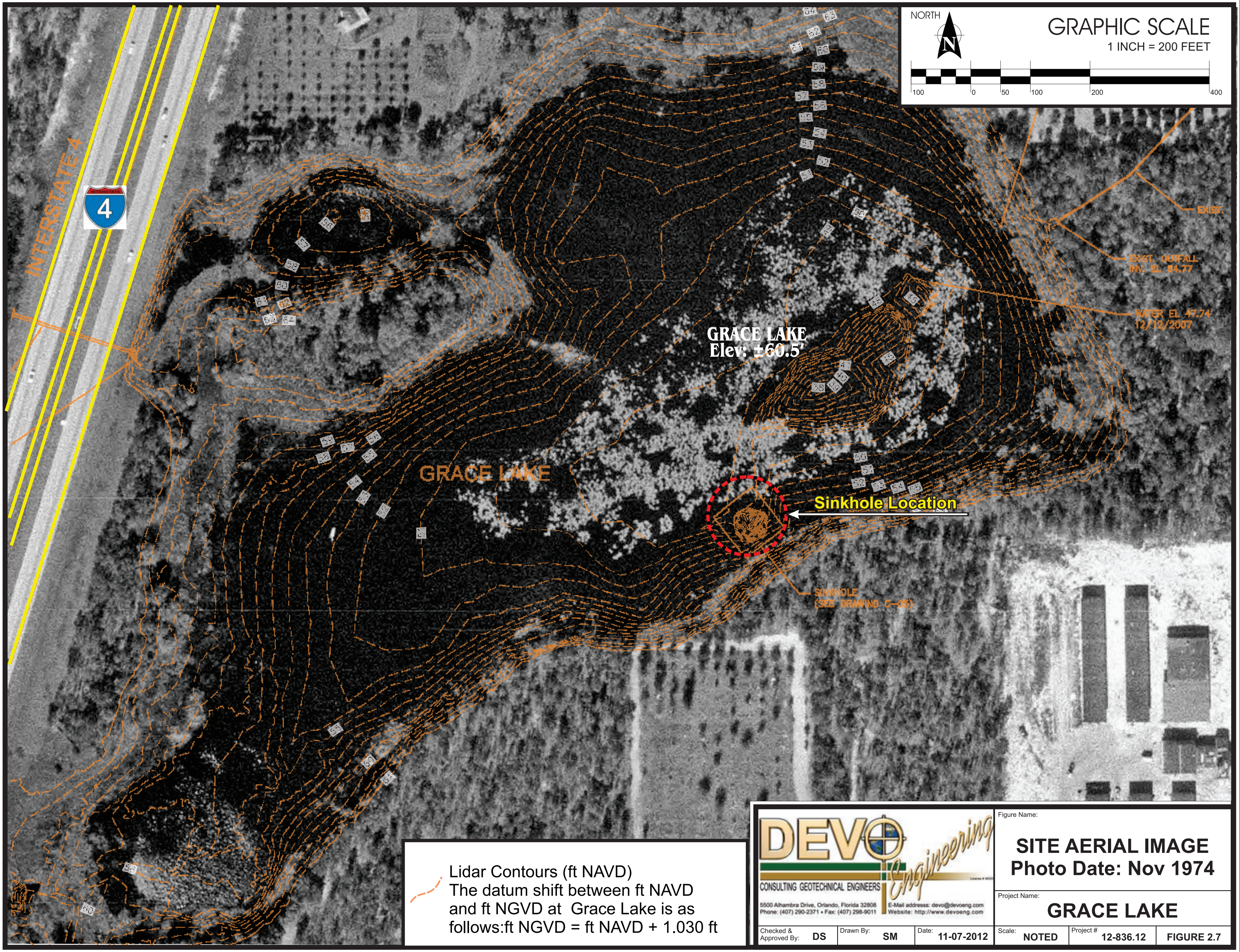

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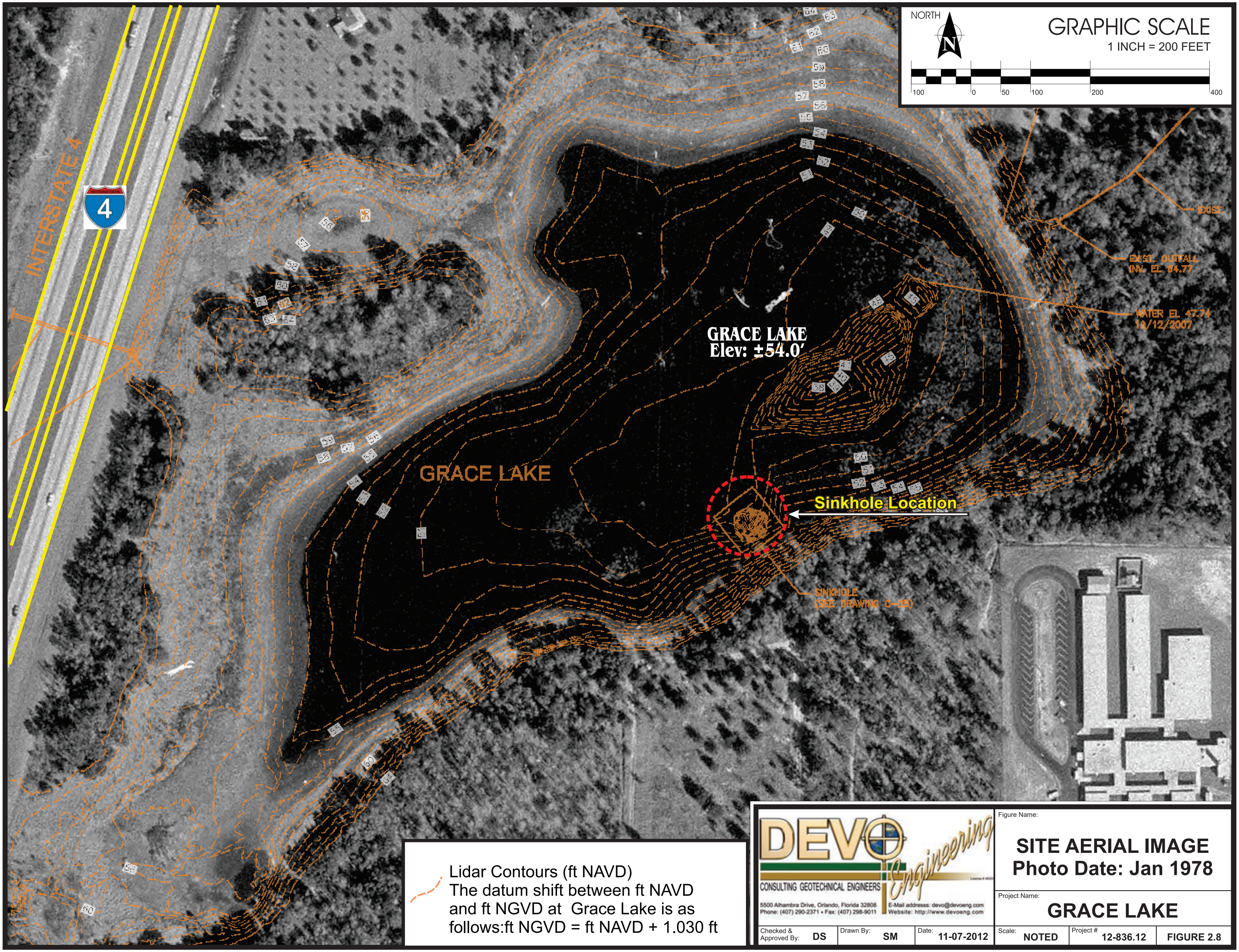
Figure Name: **SITE AERIAL IMAGE Photo Date: Nov 1974**

Project Name: **GRACE LAKE**

Checked & Approved By: DS	Drawn By: SM	Date: 11-07-2012	Scale: NOTED	Project # 12-836.12	FIGURE 2.7



Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows:ft NGVD = ft NAVD + 1.030 ft

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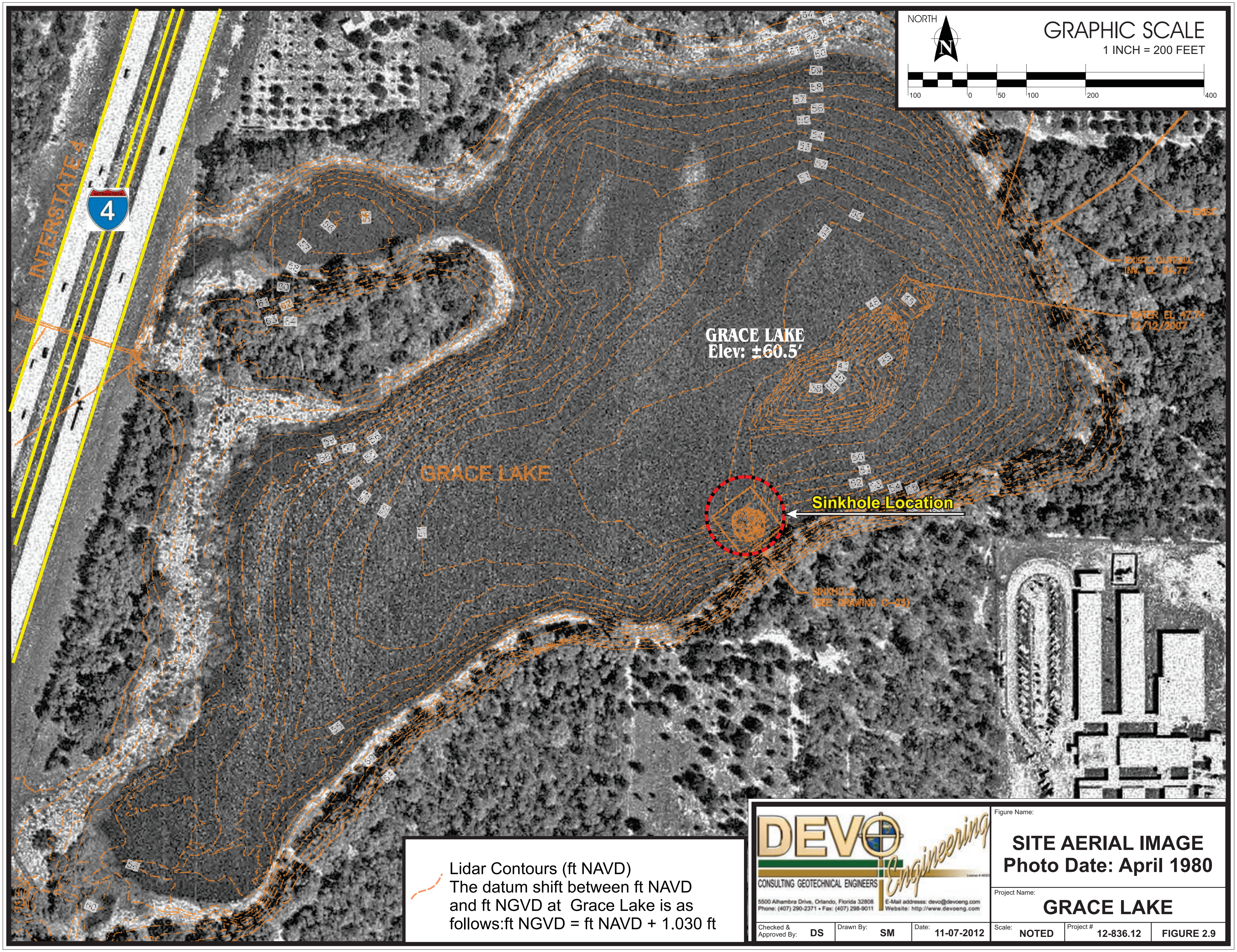
Figure Name:	SITE AERIAL IMAGE Photo Date: Jan 1978
Project Name:	GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.8



NORTH
N
GRAPHIC SCALE
1 INCH = 200 FEET
100 0 50 100 200 400
INTERSTATE 4
4
GRACE LAKE
Elev: ±60.5′
GRACE LAKE
EXIST.
EXIST. OUTFALL
INV. EL: 64.77
WATER EL: 47.74
12/12/2007
Sinkhole Location
SINKHOLE
(SEE DRAWING C-03)
Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows:ft NGVD = ft NAVD + 1.030 ft
DEVO Engineering
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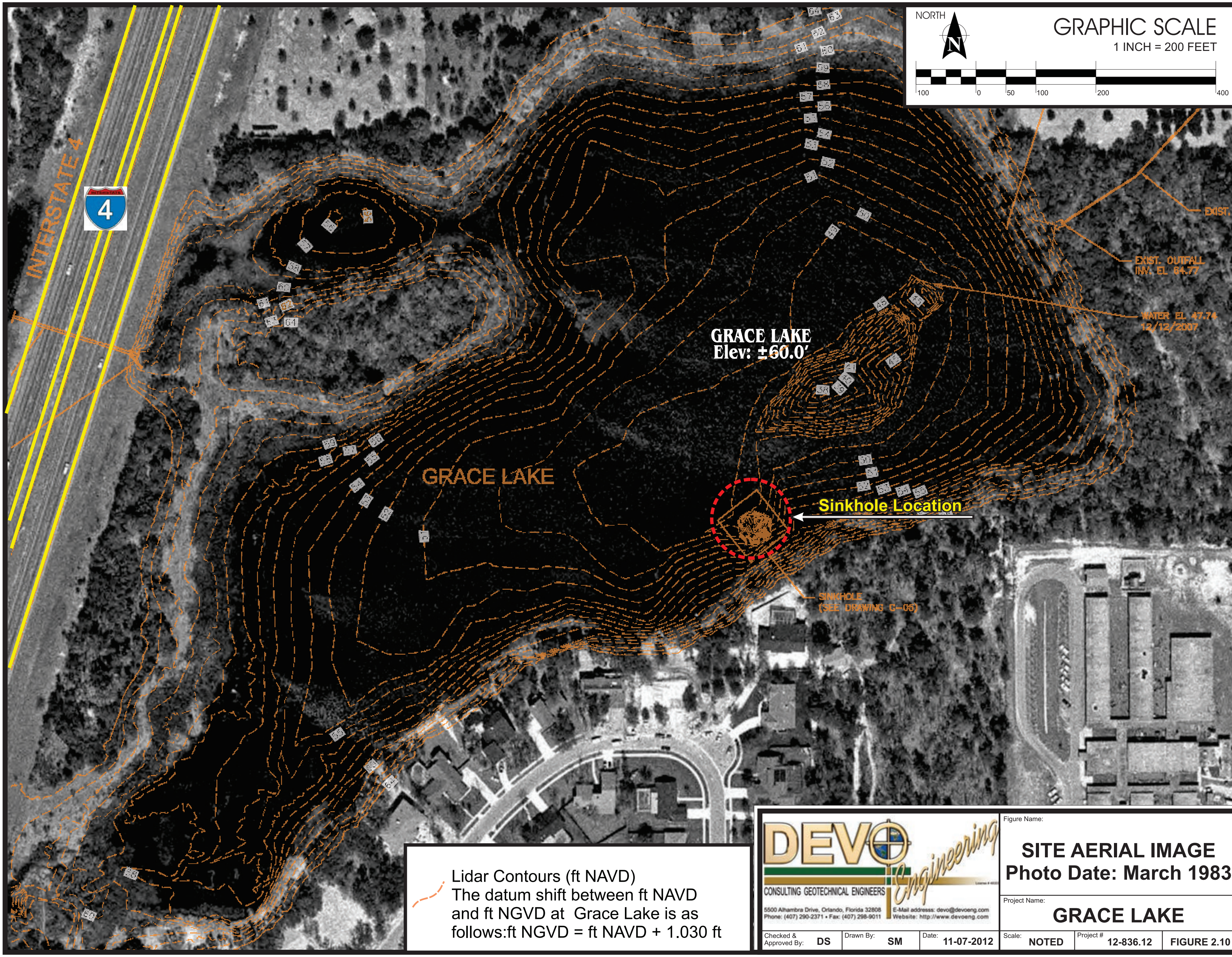
Figure Name:
SITE AERIAL IMAGE
Photo Date: April 1980
Project Name:
GRACE LAKE
Checked & Approved By: DS
Drawn By: SM
Date: 11-07-2012
Scale: NOTED
Project # 12-836.12
FIGURE 2.9



Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows:ft NGVD = ft NAVD + 1.030 ft

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Figure Name:	SITE AERIAL IMAGE Photo Date: March 1983
Project Name:	GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.10

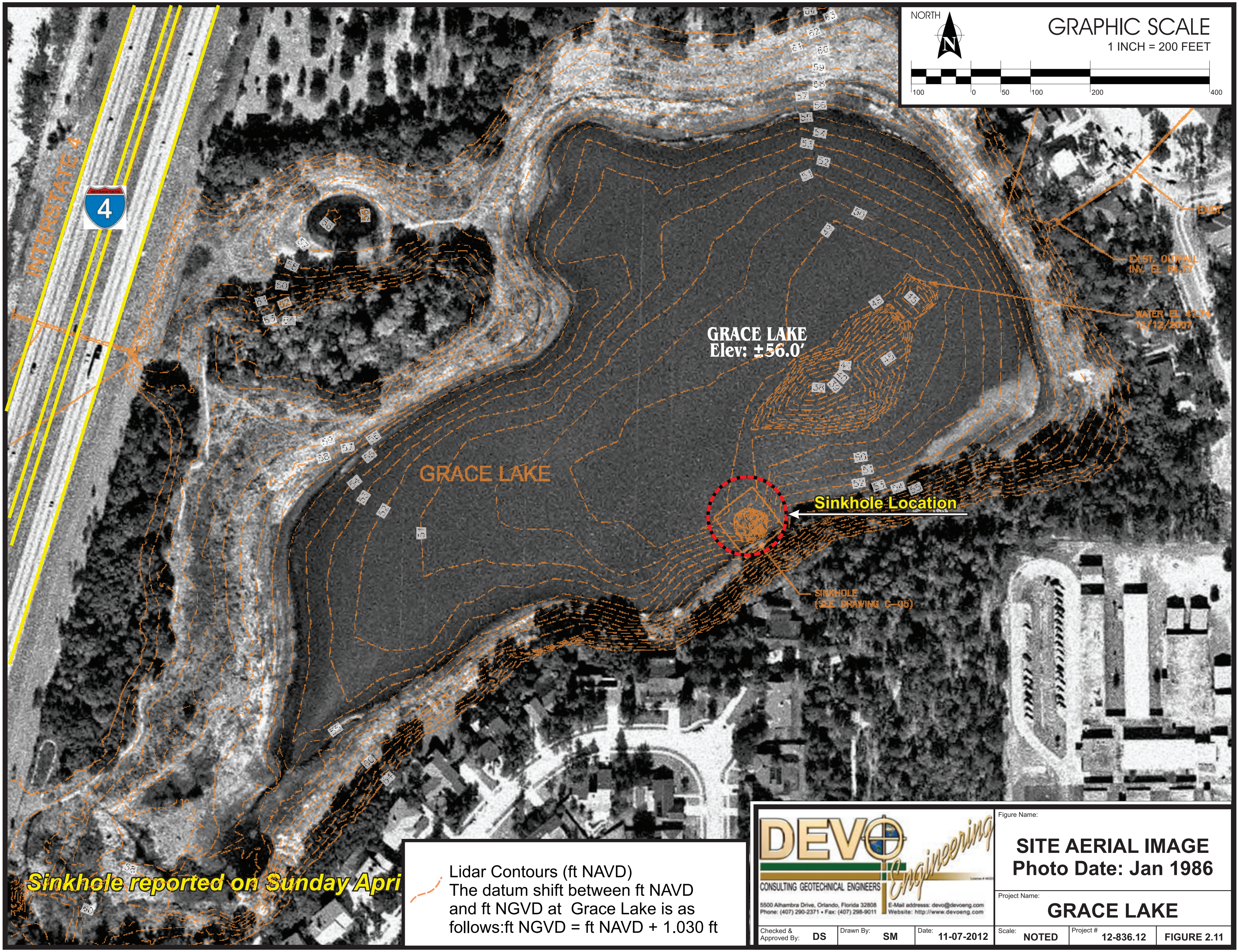

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Figure Name:
SITE AERIAL IMAGE
Photo Date: Jan 1986

Project Name:
GRACE LAKE

Checked & Approved By: DS	Drawn By: SM	Date: 11-07-2012	Scale: NOTED	Project # 12-836.12	FIGURE 2.11

NORTH
N
GRAPHIC SCALE
1 INCH = 200 FEET
100 0 50 100 200 400
INTERSTATE 4
4
GRACE LAKE
Elev: ±53.0'
GRACE LAKE
EXIST.
EXIST. OUTFALL
INV. EL 64.77
WATER EL 47.74
12/12/2007
Sinkhole Location
SINKHOLE
(SEE DRAWING C-03)
Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows:ft NGVD = ft NAVD + 1.030 ft
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Website: http://www.devoeng.com
Figure Name:
SITE AERIAL IMAGE
Photo Date: March 1989
Project Name:
GRACE LAKE
Checked & Approved By: DS
Drawn By: SM
Date: 11-07-2012
Scale: NOTED
Project # 12-836.12
FIGURE 2.12

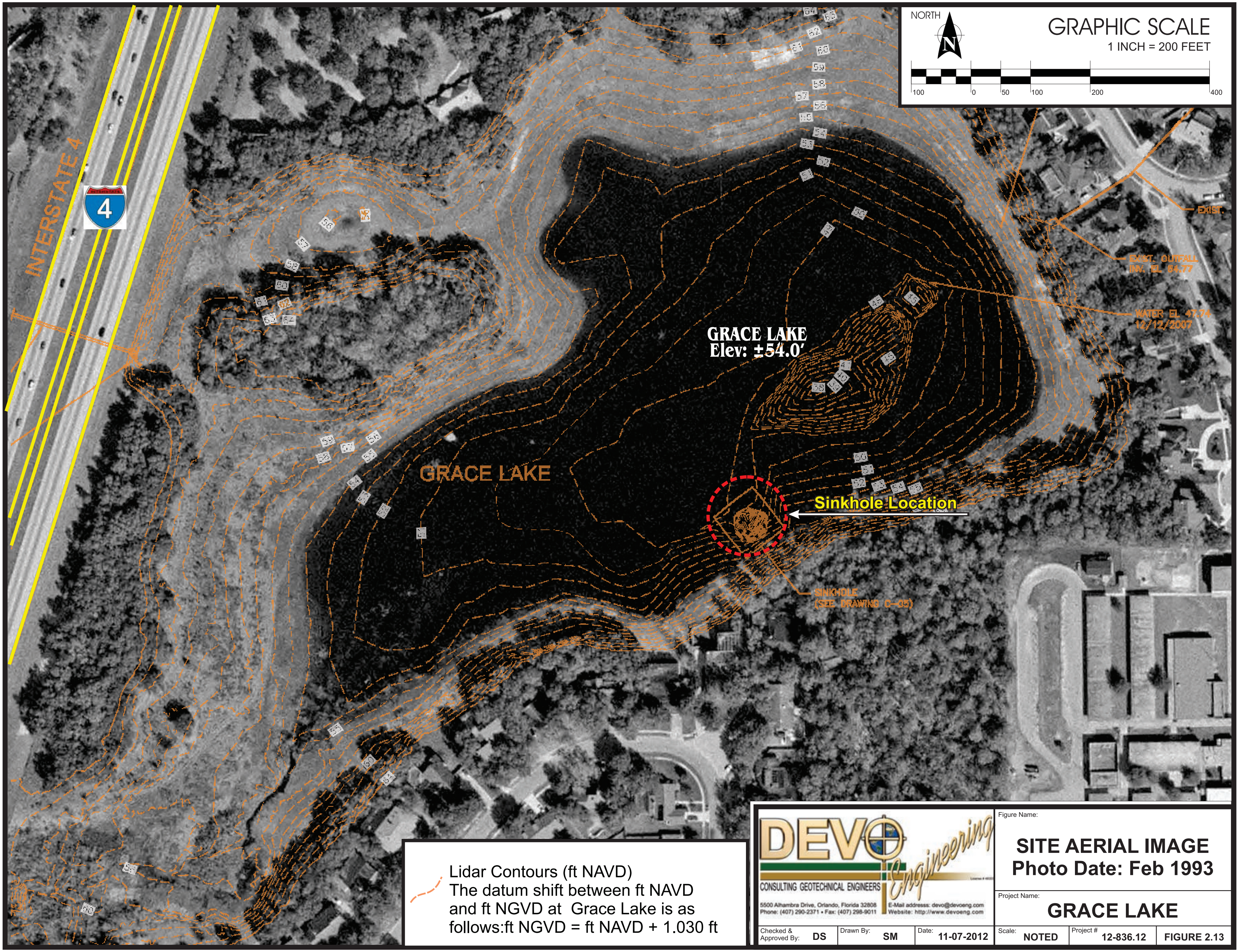

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Figure Name:
SITE AERIAL IMAGE
Photo Date: Feb 1993

Project Name:
GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.13

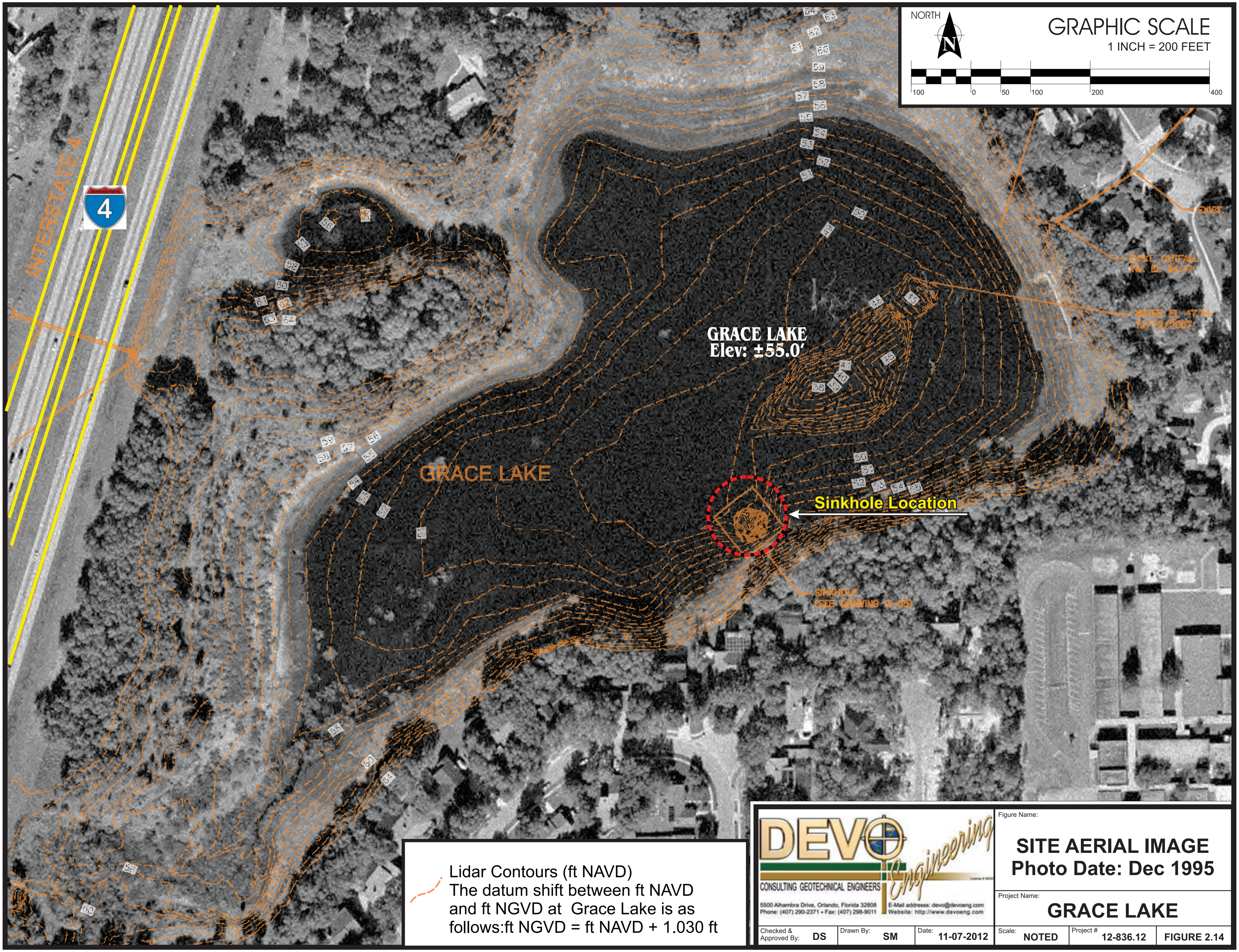

Figure Name:
SITE AERIAL IMAGE
Photo Date: Dec 1995

Project Name:
GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.14

Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows: ft NGVD = ft NAVD + 1.030 ft

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Figure Name:	SITE AERIAL IMAGE Photo Date: Feb 2002				
Project Name:	GRACE LAKE				
Checked & Approved By: DS	Drawn By: SM	Date: 11-07-2012	Scale: NOTED	Project # 12-836.12	FIGURE 2.15

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Figure Name:	SITE AERIAL IMAGE Photo Date: Feb 2006		
Project Name:	GRACE LAKE		
Checked & Approved By: DS	Drawn By: SM	Date: 11-07-2012	
Scale: NOTED	Project # 12-836.12	FIGURE 2.16	

Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows: ft NGVD = ft NAVD + 1.030 ft

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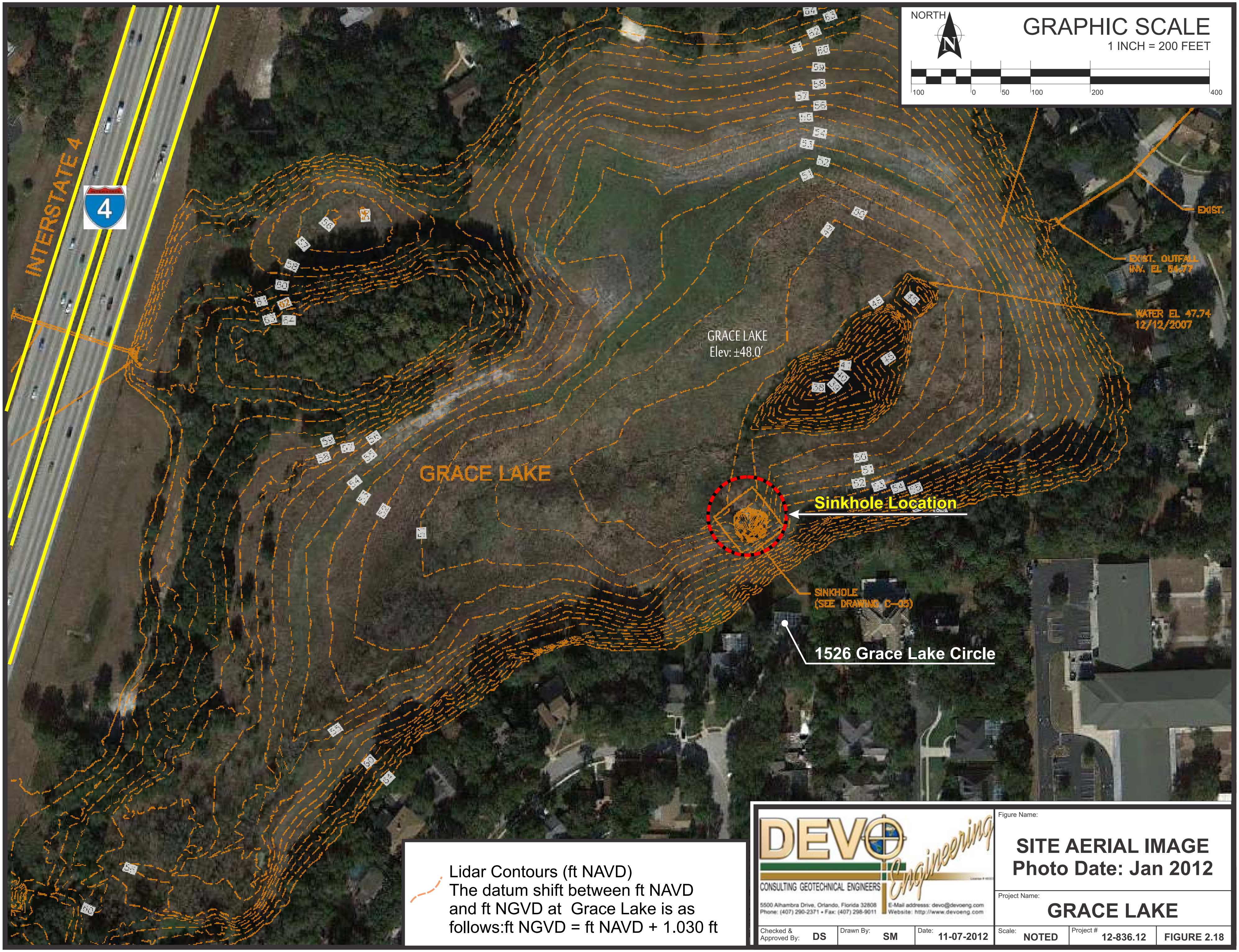
Figure Name:

SITE AERIAL IMAGE
Photo Date: Jan 2010

Project Name:

GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.17



Lidar Contours (ft NAVD)
The datum shift between ft NAVD and ft NGVD at Grace Lake is as follows: ft NGVD = ft NAVD + 1.030 ft

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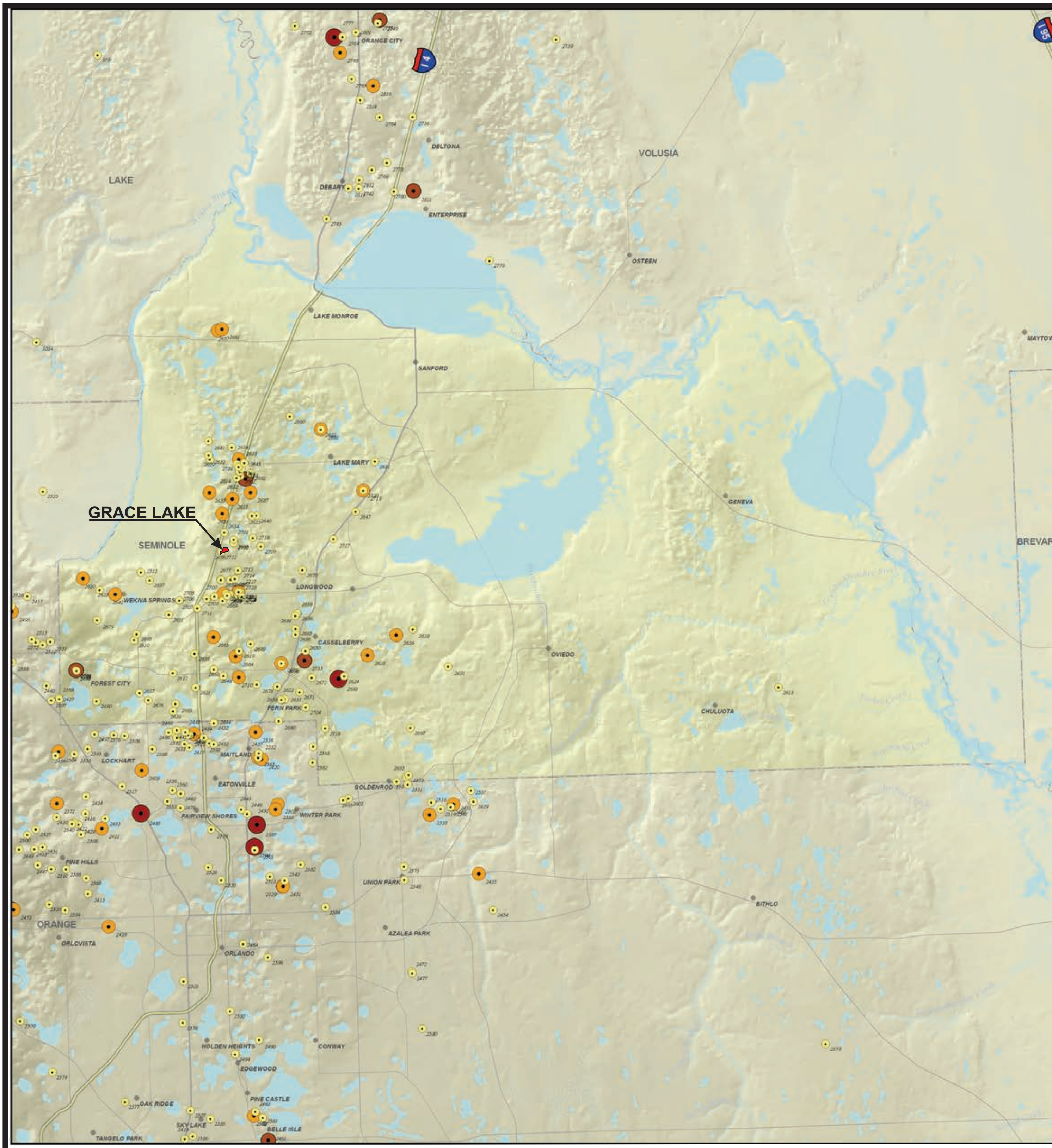
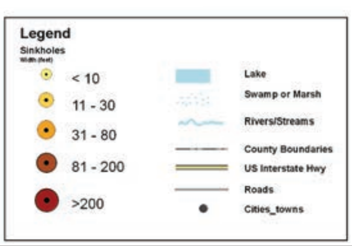
Figure Name:	SITE AERIAL IMAGE Photo Date: Jan 2012
Project Name:	GRACE LAKE

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #	
DS	SM	11-07-2012	NOTED	12-836.12	FIGURE 2.18



SEMINOLE COUNTY SINKHOLE



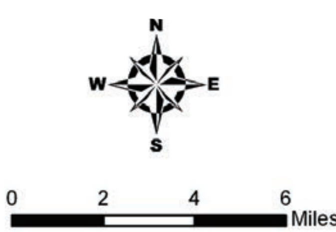


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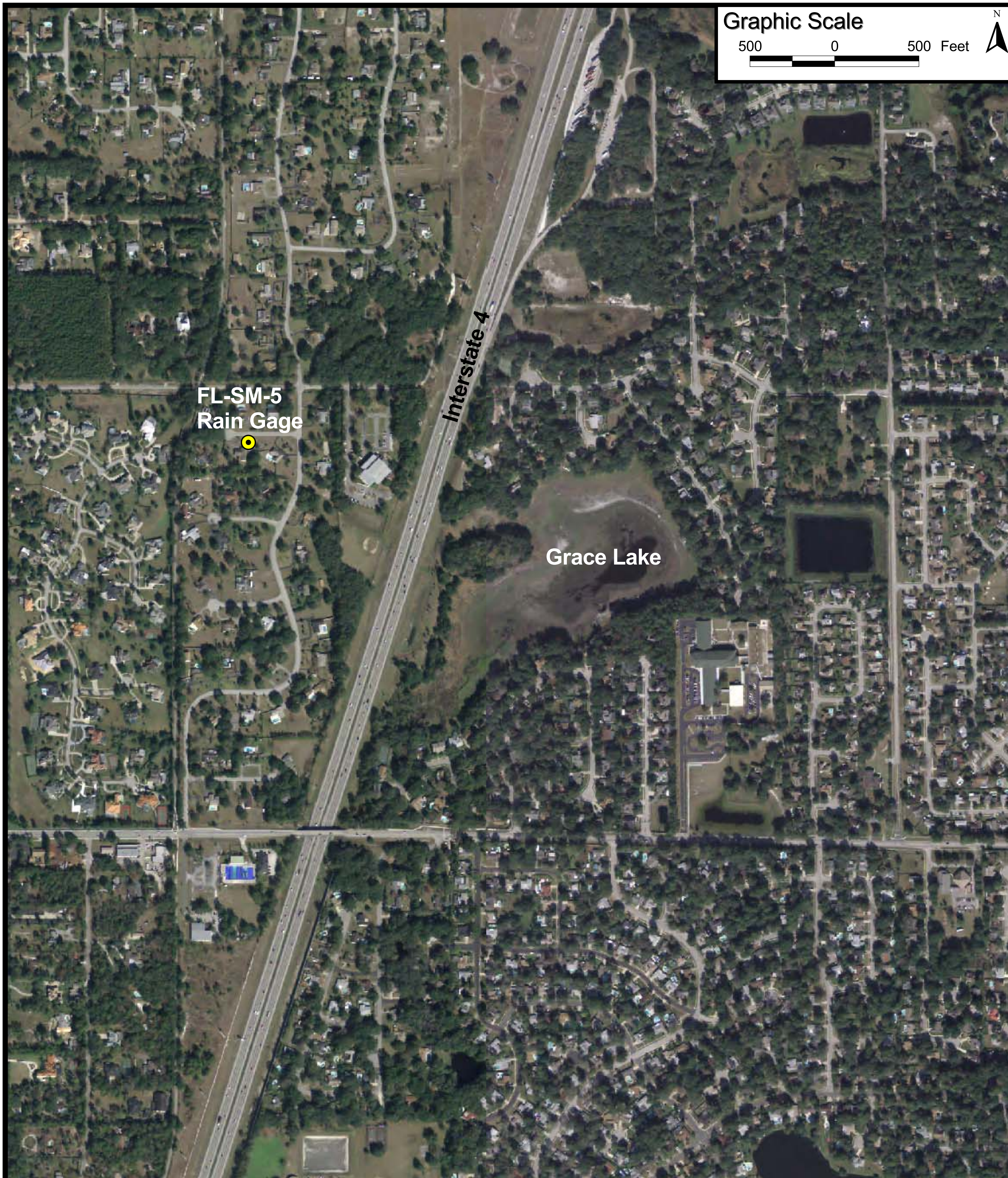
Figure Name: SEMINOLE COUNTY SINKHOLE LOCATION			
Project Name: GRACE LAKE Sinkhole			
Checked & Approved By: DS	Drawn By: SM	Date: 12-06-2012	
Scale: NOTED	Project # 03-683.01	FIGURE 3.1	



Legend:

FL-SM-5 Rain Gage

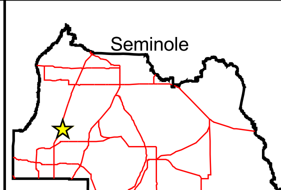


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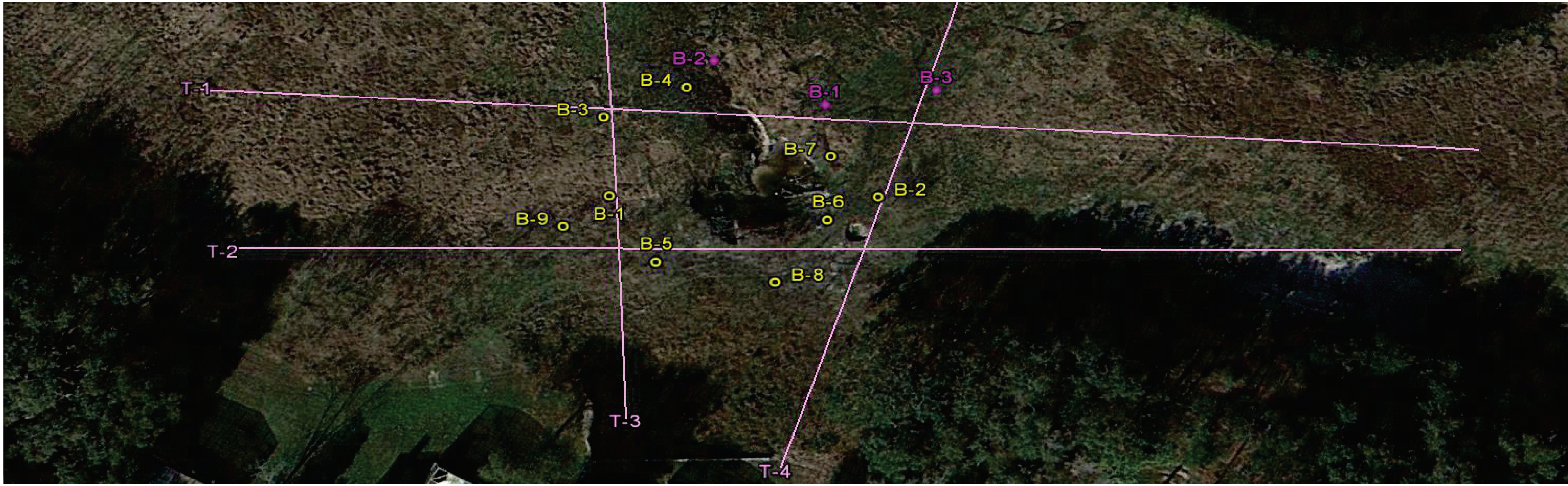
Figure Name:
Location Of
FL-SM-5 Rain Gage

Project Name:
Grace Lake

Checked & Approved By:	Drawn By:	Date:	Scale:	Project #:	
DS	RDC	05-13-2013	Noted	12-836.12	Figure 3.2



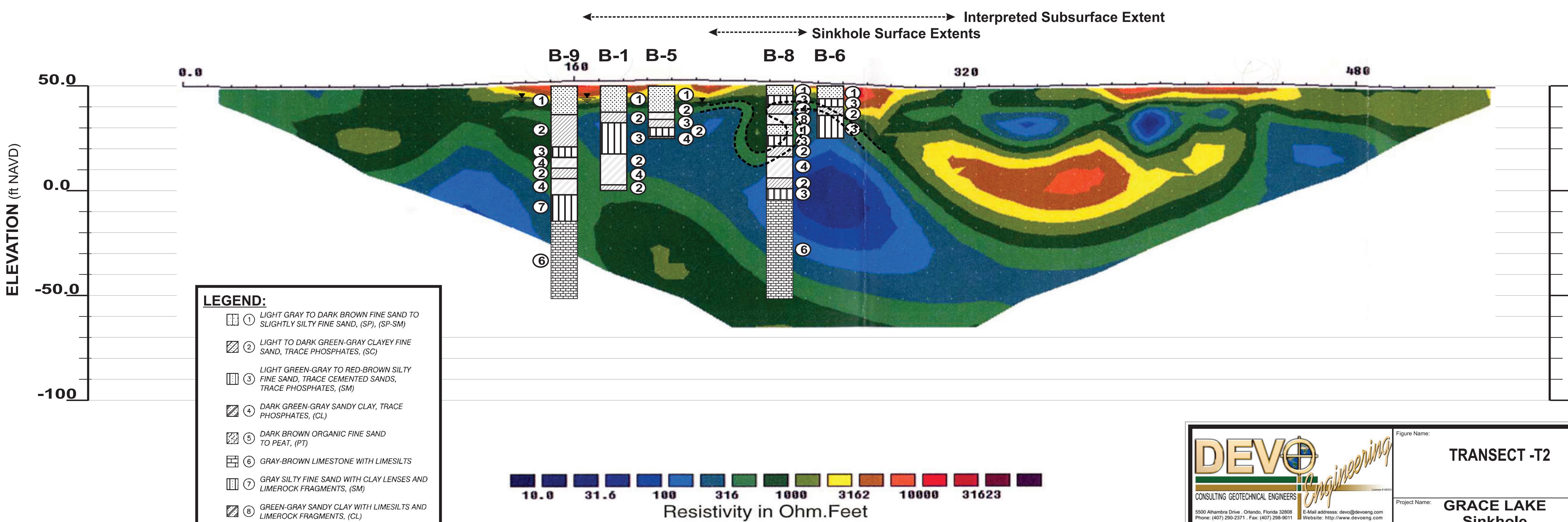


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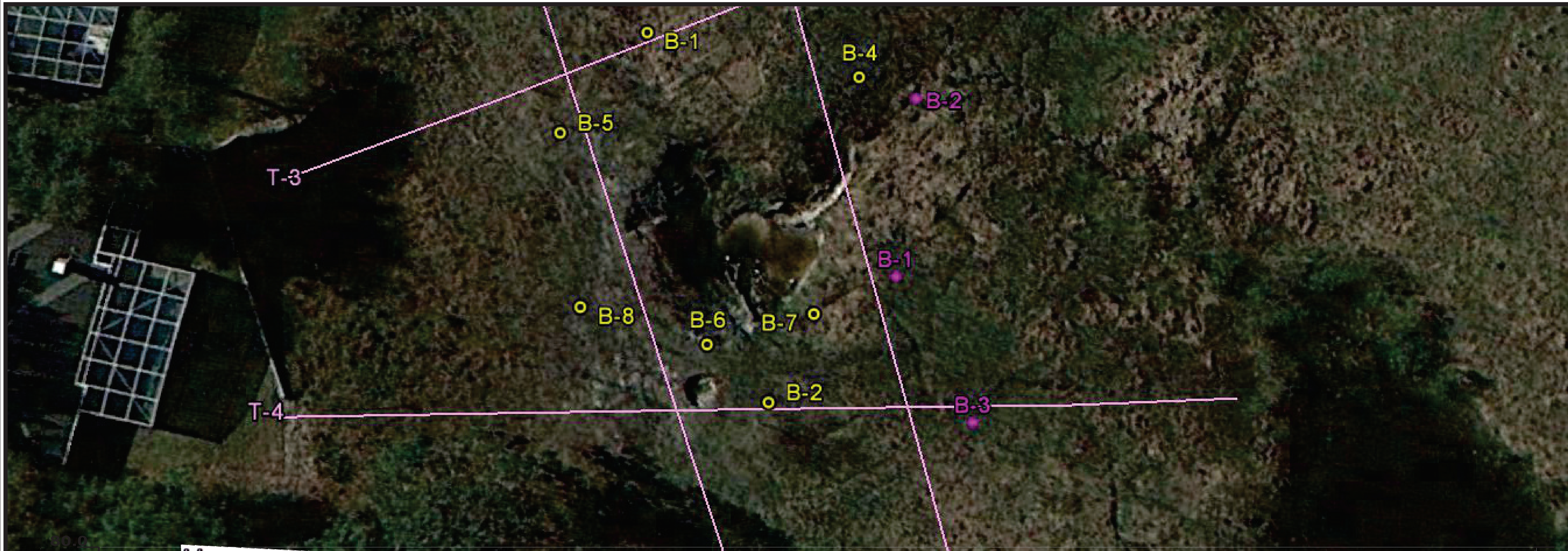
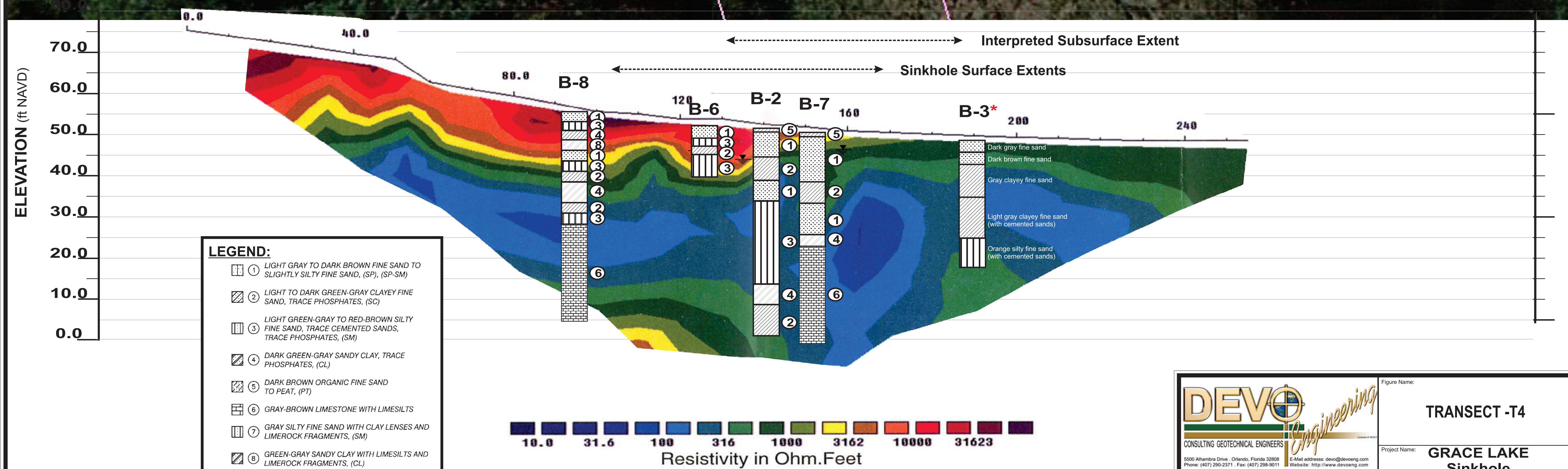
Figure Name: TRANSECT -T2					
Project Name: GRACE LAKE Sinkhole					
Checked & Approved By: DS	Drawn By: SM	Date: 11-28-2012	Scale: NOTED	Project # 03-683.01	Figure 4.1





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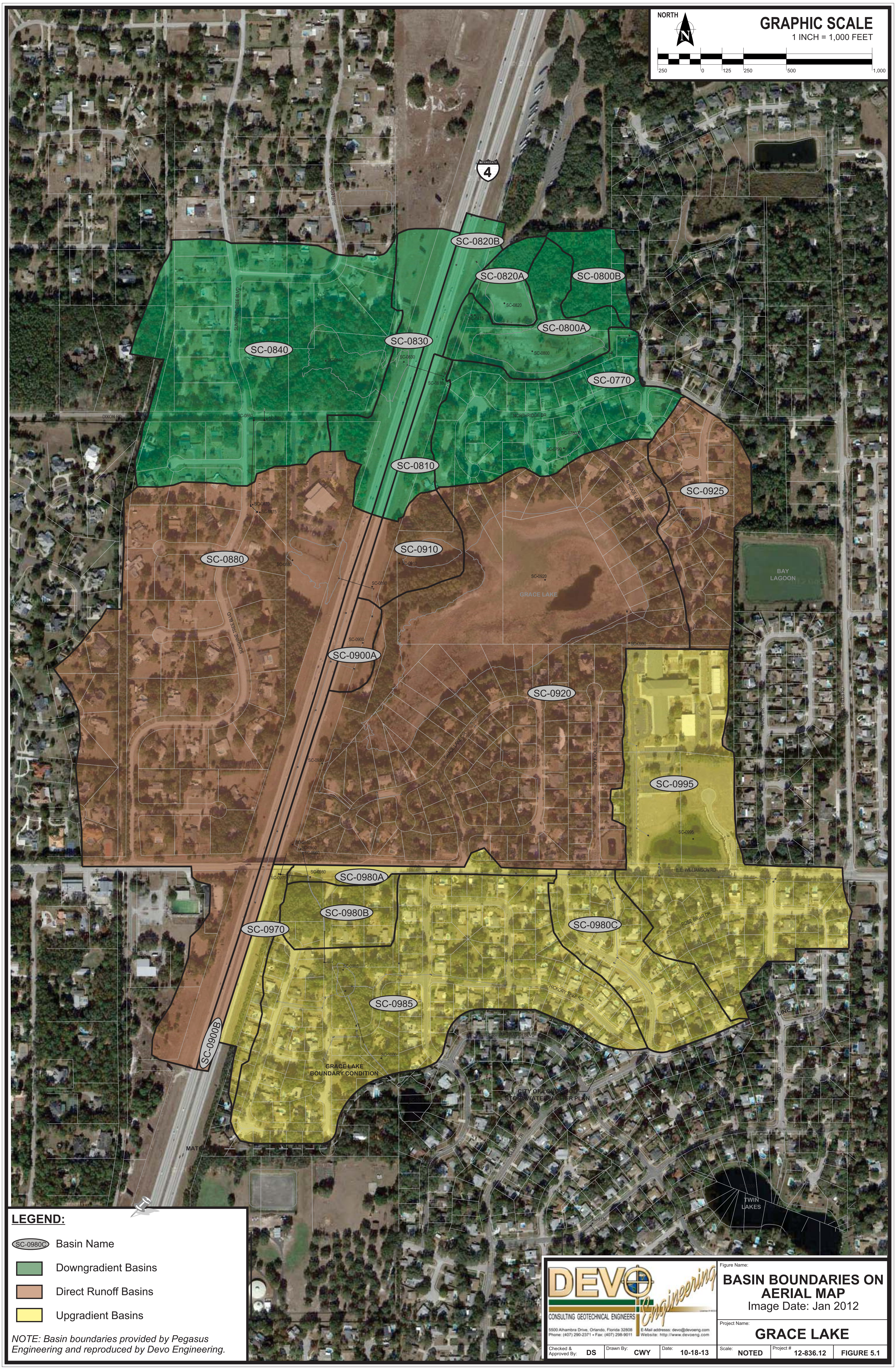
Website: http://www.devoeng.com

Figure Name:	TRANSECT -T4								
Project Name:	GRACE LAKE Sinkhole								
Checked & Approved By:	DS	Drawn By:	SM	Date:	11-28-2012	Scale:	NOTED	Project #	03-683.01

Figure 4.2


NORTH
GRAPHIC SCALE
1 INCH = 1,000 FEET
250 0 125 250 500 1,000
SC-0820B
SC-0820A
SC-0800B
SC-0800A
SC-0830
SC-0840
SC-0770
SC-0810
SC-0925
SC-0910
SC-0880
BAY LAGOON
GRACE LAKE
SC-0900A
SC-0920
SC-0995
SC-0980A
SC-0980B
SC-0970
SC-0980C
SC-0985
SC-0900B
GRACE LAKE BOUNDARY CONDITION
TWIN LAKES
LEGEND:
Basin Name
Downgradient Basins
Direct Runoff Basins
Upgradient Basins
NOTE: Basin boundaries provided by Pegasus Engineering and reproduced by Devo Engineering.
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Website: http://www.devoeng.com
Figure Name:
BASIN BOUNDARIES ON AERIAL MAP
Image Date: Jan 2012
Project Name:
GRACE LAKE
Checked & Approved By: DS
Drawn By: CWY
Date: 10-18-13
Scale: NOTED
Project #: 12-836.12
FIGURE 5.1


NORTH
N
GRAPHIC SCALE
1 INCH = 100 FEET
50 0 25 50 100 200
GRACE VIEW CT.
N. RIDGE LAKE CIR
Tim Jackson Residence
4
LEGEND:
Ground Surface Contours (ft NAVD)
Estimated High Water Elevation During Tropical Storm Fay (+64 ft NAVD)
Recovered Water Level After 30 Days (+50 ft NAVD)
64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49
56 56 57 58 60 61 62 63 64
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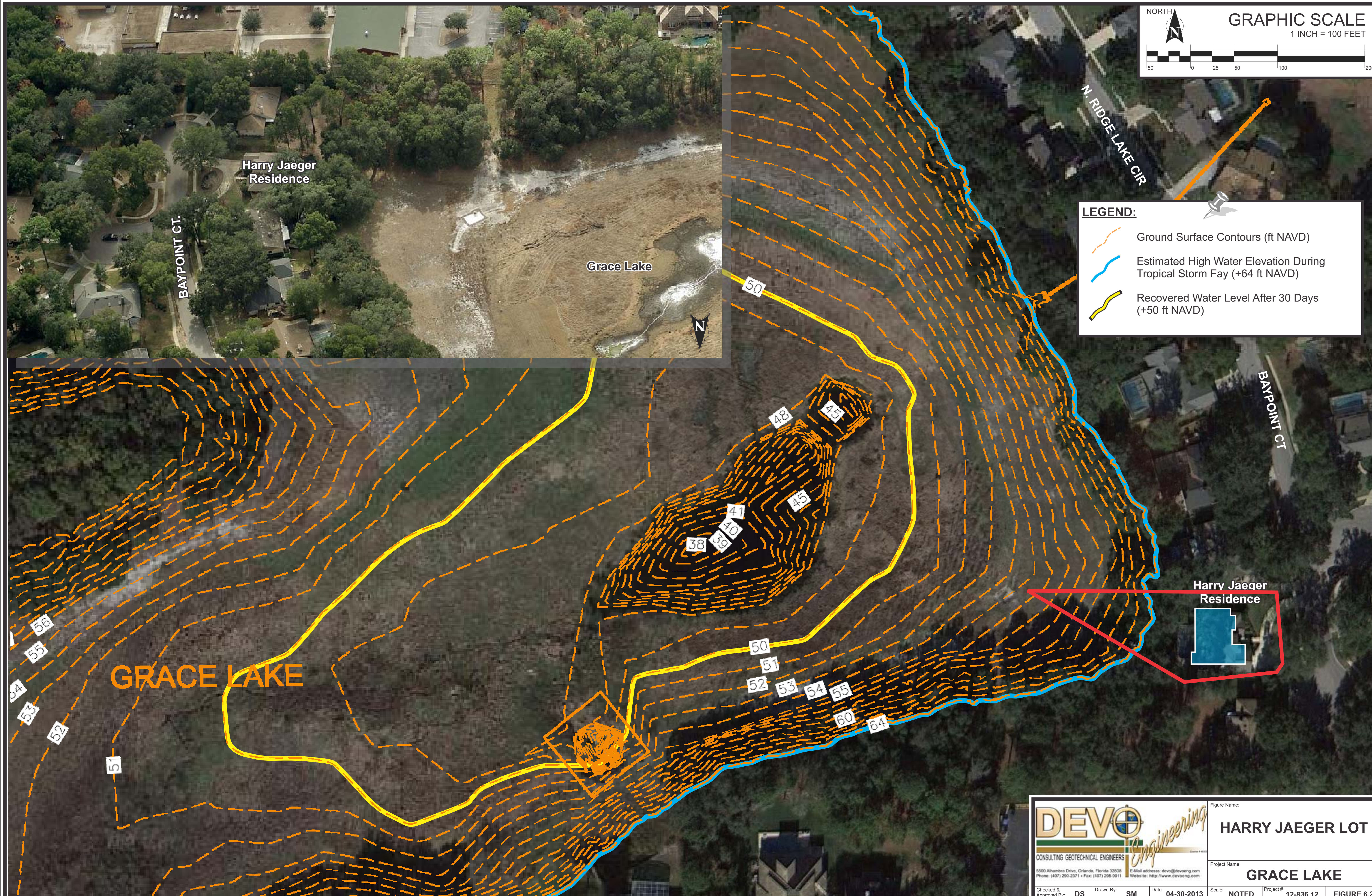
Phone: (407) 290-2371 • Fax: (407) 298-9011
E-Mail address: devo@devoeng.com
Website: http://www.devoeng.com
Figure Name:
TIM JACKSON LOT
Project Name:
GRACE LAKE
Checked & Approved By: DS
Drawn By: SM
Date: 04-30-2013
Scale: NOTED
Project # 12-836.12
FIGURE 6.1



Harry Jaeger Residence
BAYPOINT CT.
Grace Lake
N
NORTH
GRAPHIC SCALE
1 INCH = 100 FEET
50 0 25 50 100 200
N. RIDGE LAKE CIR
LEGEND:
Ground Surface Contours (ft NAVD)
Estimated High Water Elevation During Tropical Storm Fay (+64 ft NAVD)
Recovered Water Level After 30 Days (+50 ft NAVD)
BAYPOINT CT
50
48
45
45
41
40
39
38
Harry Jaeger Residence
56
55
54
53
52
51
GRACE LAKE
50
51
52
53
54
55
60
64
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Phone: (407) 290-2371 • Fax: (407) 298-9011
E-Mail address: devo@devoeng.com
Website: http://www.devoeng.com
Figure Name:
HARRY JAEGER LOT
Project Name:
GRACE LAKE
Checked & Approved By: DS
Drawn By: SM
Date: 04-30-2013
Scale: NOTED
Project # 12-836.12
FIGURE 6.2

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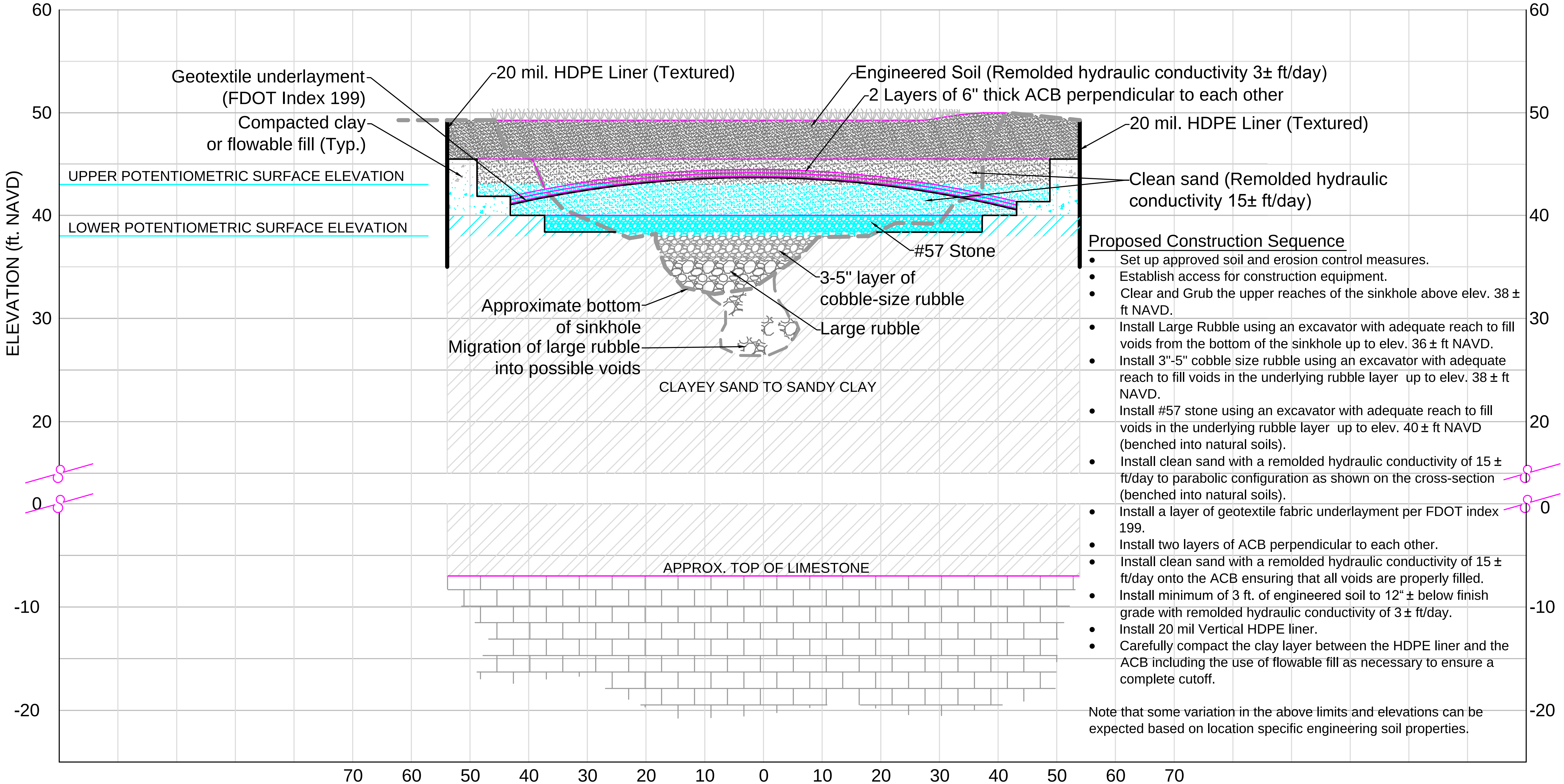
Checked & Approved By: DS	Drawn By: SM	Date: 04-30-2013	Scale: NOTED	Project # 12-836.12	FIGURE 6.3



<u>Proposed Construction Sequence</u>

- Set up approved soil and erosion control measures.
- Establish access for construction equipment.
- Clear and Grub the upper reaches of the sinkhole above elev. 38 ± ft NAVD.
- Install Large Rubble using an excavator with adequate reach to fill voids from the bottom of the sinkhole up to elev. 36 ± ft NAVD.
- Install 3"-5" cobble size rubble using an excavator with adequate reach to fill voids in the underlying rubble layer up to elev. 38 ± ft NAVD.
- Install #57 stone using an excavator with adequate reach to fill voids in the underlying rubble layer up to elev. 40 ± ft NAVD (benched into natural soils).
- Install clean sand with a remolded hydraulic conductivity of 15 ± ft/day to parabolic configuration as shown on the cross-section (benched into natural soils).
- Install a layer of geotextile fabric underlayment per FDOT index 199.
- Install two layers of ACB perpendicular to each other.
- Install clean sand with a remolded hydraulic conductivity of 15 ± ft/day onto the ACB ensuring that all voids are properly filled.
- Install minimum of 3 ft. of engineered soil to 12" ± below finish grade with remolded hydraulic conductivity of 3 ± ft/day.
- Install 20 mil Vertical HDPE liner.
- Carefully compact the clay layer between the HDPE liner and the ACB including the use of flowable fill as necessary to ensure a complete cutoff.

Note that some variation in the above limits and elevations can be expected based on location specific engineering soil properties.

SINKHOLE MITIGATION MODEL

VERTICAL SCALE: 1" = 10'-0"

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Figure Name	RECOMMENDED SINKHOLE MITIGATION MODEL		
Project Name	GRACE LAKE SINKHOLE		
Checked & Approved by: DS	Drawn By: CWY	Date: 04-18-13	Scale: Noted
Proj. #: 12-836.12	Figure 7.1		

ATTACHMENT A

Data For Upgradient Discharge Rating Curves (Pegasus)

Alternative Sinkhole Remediation Protocol for Grace Lake ~ Updated Surface Water Analysis
Rainfall vs. Discharge Volume Rating Curve for the "Up-gradient" Drainage Basins
AMC I Condition

Table No. 5.1.1

Discharge Volume (AC-FT) ~ 0.25" Rainfall			Discharge Volume (AC-FT) ~ 0.50" Rainfall			Discharge Volume (AC-FT) ~ 0.75" Rainfall			Discharge Volume (AC-FT) ~ 1.00" Rainfall			Discharge Volume (AC-FT) ~ 1.25" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
0	0	0	0	0	0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0

Table No. 5.1.2

Discharge Volume (AC-FT) ~ 1.50" Rainfall			Discharge Volume (AC-FT) ~ 1.75" Rainfall			Discharge Volume (AC-FT) ~ 2.00" Rainfall			Discharge Volume (AC-FT) ~ 2.25" Rainfall			Discharge Volume (AC-FT) ~ 2.50" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
1.6	0	1.6	4.2	0	4.2	7.5	0	7.5	11.2	0	11.2	15.6	0	15.6

Table No. 5.1.3

Discharge Volume (AC-FT) ~ 3.00" Rainfall			Discharge Volume (AC-FT) ~ 3.50" Rainfall			Discharge Volume (AC-FT) ~ 4.00" Rainfall			Discharge Volume (AC-FT) ~ 4.50" Rainfall			Discharge Volume (AC-FT) ~ 5.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
25.7	0	25.7	37.4	0	37.4	50.6	0	50.6	65.2	0	65.2	80.2	0	80.2

Table No. 5.1.4

Discharge Volume (AC-FT) ~ 6.00" Rainfall			Discharge Volume (AC-FT) ~ 7.00" Rainfall			Discharge Volume (AC-FT) ~ 8.00" Rainfall			Discharge Volume (AC-FT) ~ 9.00" Rainfall			Discharge Volume (AC-FT) ~ 10.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
98.6	0	98.6	113.3	0	113.3	129.6	0	129.6	146.2	0.0	146.2	163.6	0.0	163.6

NOTES

1. Cumulative discharge volume obtained from the ICPR node-time series at the end of each simulation. The duration for each of these storm event similations was set to 336 hours.

2. Refer to the charts on the following pages for a graphical illustration of the node outflow relationships for several of the storm events summarized above.

Alternative Sinkhole Remediation Protocol for Grace Lake ~ Updated Surface Water Analysis
Rainfall vs. Discharge Volume Rating Curve for the "Up-gradient" Drainage Basins
AMC II Condition

Table No. 5.1.1

Discharge Volume (AC-FT) ~ 0.25" Rainfall			Discharge Volume (AC-FT) ~ 0.50" Rainfall			Discharge Volume (AC-FT) ~ 0.75" Rainfall			Discharge Volume (AC-FT) ~ 1.00" Rainfall			Discharge Volume (AC-FT) ~ 1.25" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
0	0	0	0	0	0	0.7	0	0.7	4.4	0	4.4	9.4	0	9.4

Table No. 5.1.2

Discharge Volume (AC-FT) ~ 1.50" Rainfall			Discharge Volume (AC-FT) ~ 1.75" Rainfall			Discharge Volume (AC-FT) ~ 2.00" Rainfall			Discharge Volume (AC-FT) ~ 2.25" Rainfall			Discharge Volume (AC-FT) ~ 2.50" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
15.3	0	15.3	22.2	0	22.2	30	0	30	38.7	0	38.7	50.0	0	50.0

Table No. 5.1.3

Discharge Volume (AC-FT) ~ 3.00" Rainfall			Discharge Volume (AC-FT) ~ 3.50" Rainfall			Discharge Volume (AC-FT) ~ 4.00" Rainfall			Discharge Volume (AC-FT) ~ 4.50" Rainfall			Discharge Volume (AC-FT) ~ 5.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
68.3	0	68.3	89.2	0	89.2	104.1	0	104.1	114.9	0	114.9	126.3	0	126.3

Table No. 5.1.4

Discharge Volume (AC-FT) ~ 6.00" Rainfall			Discharge Volume (AC-FT) ~ 7.00" Rainfall			Discharge Volume (AC-FT) ~ 8.00" Rainfall			Discharge Volume (AC-FT) ~ 9.00" Rainfall			Discharge Volume (AC-FT) ~ 10.00" Rainfall		
ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total	ICPR Node SC-0930	ICPR Node SC-0990	Node Total
149.4	0	149.4	169.1	0	169.1	189.3	0	189.3	208.8	2	210.8	228.8	4.5	233.3

NOTES

1. Cumulative discharge volume obtained from the ICPR node-time series at the end of each simulation. The duration for each of these storm event similations was set to 336 hours.

2. Refer to the charts on the following pages for a graphical illustration of the node outflow relationships for several of the storm events summarized above.

ATTACHMENT B

Input Report for Pegasus ICPR Model

```
==========================================================================================
==== Basins ==============================================================================
==========================================================================================

         Name: SC-0770                 Node: SC-0770             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 14.00
               Area(ac): 18.020                Time Shift(hrs): 0.00
           Curve Number: 58.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0800A                Node: SC-0800             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 13.00
               Area(ac): 8.980                 Time Shift(hrs): 0.00
           Curve Number: 75.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0800B                Node: SC-0800             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 12.00
               Area(ac): 4.030                 Time Shift(hrs): 0.00
           Curve Number: 70.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0810                 Node: SC-0810             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 11.00
               Area(ac): 3.470                 Time Shift(hrs): 0.00
           Curve Number: 72.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: SC-0820A                Node: SC-0820             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 11.00
               Area(ac): 3.220                 Time Shift(hrs): 0.00
           Curve Number: 72.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

FDOT POND F BASIN AREA

----------------------------------------------------------------------------------------------------
         Name: SC-0820B                Node: SC-0820             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 30.00
               Area(ac): 4.980                 Time Shift(hrs): 0.00
           Curve Number: 72.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

I-4 BASIN AREA CONTRIBUTING RUNOFF TO POND SC-0820

----------------------------------------------------------------------------------------------------
```

```
         Name: SC-0830                Node: SC-0830             Status: Onsite
        Group: Grace Lake             Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 28.00
               Area(ac): 9.240                 Time Shift(hrs): 0.00
           Curve Number: 63.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-------------------------------------------------------------------------------------------------
         Name: SC-0840                Node: SC-0840             Status: Onsite
        Group: Grace Lake             Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 21.00
               Area(ac): 41.540                Time Shift(hrs): 0.00
           Curve Number: 55.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-------------------------------------------------------------------------------------------------
         Name: SC-0880                Node: SC-0880             Status: Onsite
        Group: Grace Lake             Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 27.00
               Area(ac): 77.830                Time Shift(hrs): 0.00
           Curve Number: 57.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-------------------------------------------------------------------------------------------------
         Name: SC-0900A               Node: SC-0900             Status: Onsite
        Group: Grace Lake             Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
               Area(ac): 2.290                 Time Shift(hrs): 0.00
           Curve Number: 71.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

FDOT POND E BASIN

-------------------------------------------------------------------------------------------------
         Name: SC-0900B               Node: SC-0900             Status: Onsite
        Group: Grace Lake             Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 34.00
               Area(ac): 5.540                 Time Shift(hrs): 0.00
           Curve Number: 72.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

I-4 BASIN CONTRIBUTING RUNOFF TO POND E

-------------------------------------------------------------------------------------------------
         Name: SC-0910                Node: SC-0910             Status: Onsite
        Group: Grace Lake             Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                  Peaking Factor: 256.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000               Time of Conc(min): 11.00
               Area(ac): 6.090                 Time Shift(hrs): 0.00
           Curve Number: 76.00            Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-------------------------------------------------------------------------------------------------
         Name: SC-0920                Node: SC-0920             Status: Onsite
        Group: Grace Lake             Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
```

```
    Rainfall Amount(in): 0.000              Time of Conc(min): 22.00
               Area(ac): 88.620              Time Shift(hrs): 0.00
          Curve Number: 70.00          Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0925                 Node: SC-0925             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000              Time of Conc(min): 15.00
               Area(ac): 13.240              Time Shift(hrs): 0.00
          Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0970                 Node: SC-0970             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000              Time of Conc(min): 16.00
               Area(ac): 4.220               Time Shift(hrs): 0.00
          Curve Number: 65.00          Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0980A                Node: SC-0980             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000              Time of Conc(min): 29.00
               Area(ac): 2.760               Time Shift(hrs): 0.00
          Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0980B                Node: SC-0980             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000              Time of Conc(min): 15.00
               Area(ac): 5.830               Time Shift(hrs): 0.00
          Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0980C                Node: SC-0980             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000              Time of Conc(min): 20.00
               Area(ac): 12.310              Time Shift(hrs): 0.00
          Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
         Name: SC-0985                 Node: SC-0985             Status: Onsite
        Group: Grace Lake              Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File:                   Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000              Time of Conc(min): 17.00
               Area(ac): 43.860              Time Shift(hrs): 0.00
          Curve Number: 57.00          Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00
```

```
----------------------------------------------------------------------------------------------------
         Name: SC-0995                    Node: SC-0995                Status: Onsite
        Group: Grace Lake                 Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                     Peaking Factor: 323.0
          Rainfall File:                       Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                   Time of Conc(min): 23.00
               Area(ac): 36.080                    Time Shift(hrs): 0.00
           Curve Number: 65.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00
```

```
==========================================================================================
==== Nodes ===============================================================================
==========================================================================================

      Name: SC-0750             Base Flow(cfs): 0.000          Init Stage(ft): 52.000
     Group: Grace Lake                                         Warn Stage(ft): 54.000
      Type: Time/Stage
```

ASSUMED TAILWATER AT THE CROWN OF THE OUTFALL PIPE THAT DISCHARGES TO THE BOLLING FARMS SUBDIVISION WETLAND AND POND.
SURVEYED PIPE INVERT ELEVATION IS 48.96 FT, NAVD (SSMC SURVEY DATED DEC. 2007).

Time(hrs)	Stage(ft)
0.00	52.000
180.00	52.000

```
------------------------------------------------------------------------------------------
      Name: SC-0760             Base Flow(cfs): 0.000          Init Stage(ft): 53.080
     Group: Grace Lake                                         Warn Stage(ft): 58.000
      Type: Stage/Area
```

CURB INLET STRUCTURE LOCATED ALONG THE NORTH RIDGE LAKE CIRCLE WEST RIGHT-OF-WAY.
PARAMETERS WERE OBTAINED FROM SURVEY DATA BY SSMC (DATED DEC. 2007 AND JULY 2013).

Stage(ft)	Area(ac)
53.080	0.0010
58.780	0.0010

```
------------------------------------------------------------------------------------------
      Name: SC-0770             Base Flow(cfs): 0.000          Init Stage(ft): 57.000
     Group: Grace Lake                                         Warn Stage(ft): 58.000
      Type: Stage/Area
```

NORTHRIDGE SWALE LOCATED SOUTH OF THE NORTHRIDGE DEPRESSIONAL AREA

Stage(ft)	Area(ac)
55.900	0.0100
57.000	0.4100
58.000	0.7700

```
------------------------------------------------------------------------------------------
      Name: SC-0780             Base Flow(cfs): 0.000          Init Stage(ft): 64.240
     Group: Grace Lake                                         Warn Stage(ft): 67.270
      Type: Stage/Area
```

DIVERSION STRUCTURE. DATA OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS (DATED 05/19/1985). REFER TO STRUCTURE

Stage(ft)	Area(ac)
64.240	0.0010
67.570	0.0010

```
------------------------------------------------------------------------------------------
      Name: SC-0790             Base Flow(cfs): 0.000          Init Stage(ft): 64.000
     Group: Grace Lake                                         Warn Stage(ft): 67.000
      Type: Stage/Area
```

SMALL DRY RETENTION POND LOCATED NORTH OF GRACE LAKE, SOUTH OF NORTH RIDGE DR., EAST OF GRACE VIEW CT., AND WEST OF NORTH R
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

Stage(ft)	Area(ac)
64.000	0.1800
65.000	0.2300
66.000	0.2900

67.000	0.3900

Name: SC-0800 Base Flow(cfs): 0.000 Init Stage(ft): 47.000
Group: Grace Lake Warn Stage(ft): 56.000
Type: Stage/Area

NORTHRIDE DEPRESSIONAL AREA

Stage(ft)	Area(ac)
47.000	0.9700
48.000	1.9200
49.000	2.3000
50.000	2.6500
51.000	2.9900
52.000	3.3100
53.000	3.6200
54.000	4.0400
55.000	4.8500
56.000	6.2700
57.000	7.1700

Name: SC-0810 Base Flow(cfs): 0.000 Init Stage(ft): 52.330
Group: Grace Lake Warn Stage(ft): 58.000
Type: Stage/Area

STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

Stage(ft)	Area(ac)
52.330	0.0010
55.000	0.0050
56.000	0.0100
57.000	0.0200
58.000	0.0400

Name: SC-0815 Base Flow(cfs): 0.000 Init Stage(ft): 55.000
Group: Grace Lake Warn Stage(ft): 56.000
Type: Stage/Area

SHALLOW SWALE

Stage(ft)	Area(ac)
55.000	0.0200
56.000	0.0300

Name: SC-0820 Base Flow(cfs): 0.000 Init Stage(ft): 53.000
Group: Grace Lake Warn Stage(ft): 56.000
Type: Stage/Area

FDOT POND F
STAGE-AREA RELATIONSHIP OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP AND COMPARED TO THE PERMITTED PARAMETERS (SJRWMD PERMIT NO.

Stage(ft)	Area(ac)
52.000	0.9100
53.000	1.2100
54.000	1.3300
55.000	1.4800
56.000	1.6100
57.000	1.6900

Name: SC-0830 Base Flow(cfs): 0.000 Init Stage(ft): 52.890
Group: Grace Lake Warn Stage(ft): 59.000
Type: Stage/Area

DEPRESSIONAL AREA IMMEDIATELY WEST (UPSTREAM SIDE) OF THE I-4 CULVERT CROSSING (NORTH PIPE)

Stage(ft)	Area(ac)
52.000	0.0010
53.000	0.0500
54.000	0.3100
55.000	0.4800
56.000	0.5900
57.000	0.6800
58.000	0.7900

59.000	0.9200

Name: SC-0840 Base Flow(cfs): 0.000 Init Stage(ft): 50.000
Group: Grace Lake Warn Stage(ft): 58.000
Type: Stage/Area

DEPRESSIONAL AREA NORTH OF DIXON ROAD AND EAST OF SUNSHINE TREE BOULEVARD.
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHI MAP.

Stage(ft)	Area(ac)
47.000	0.0200
48.000	0.0500
49.000	0.0900
50.000	0.1200
51.000	0.3400
52.000	0.5400
53.000	0.7700
54.000	1.1800
55.000	1.9200
56.000	2.7200
57.000	3.4100
58.000	4.1100
59.000	4.7300

Name: SC-0850 Base Flow(cfs): 0.000 Init Stage(ft): 56.690
Group: Grace Lake Warn Stage(ft): 59.500
Type: Stage/Area

Stage(ft)	Area(ac)
56.650	0.0010
59.500	0.0010

Name: SC-0860 Base Flow(cfs): 0.000 Init Stage(ft): 56.920
Group: Grace Lake Warn Stage(ft): 61.550
Type: Stage/Area

DITCH BOTTOM INLET LOCATED AT THE SOUTHEAST CORNER OF THE INTERSECTION OF DIXON RD. AND SUNSHINE TREE BLVD.

Stage(ft)	Area(ac)
56.920	0.0010
62.650	0.0010

Name: SC-0870 Base Flow(cfs): 0.000 Init Stage(ft): 59.620
Group: Grace Lake Warn Stage(ft): 66.000
Type: Stage/Area

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.
CURB INLET LOCATED ALONG THE SUNSHINE TREE BLVD EAST RIGHT-OF-WAY.

Stage(ft)	Area(ac)
59.620	0.0010
67.000	0.0010

Name: SC-0875 Base Flow(cfs): 0.000 Init Stage(ft): 59.710
Group: Grace Lake Warn Stage(ft): 64.000
Type: Stage/Area

Stage(ft)	Area(ac)
59.710	0.0100
64.000	0.0100

Name: SC-0880 Base Flow(cfs): 0.000 Init Stage(ft): 57.840
Group: Grace Lake Warn Stage(ft): 64.000
Type: Stage/Area

DEPRESSIONAL AREA SOUTH OF THE ONE CHURCH (SOCCER FIELDS)
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

Stage(ft)	Area(ac)
57.840	0.0010
58.000	0.0020
59.000	0.0300
60.000	0.5700
61.000	0.7700
62.000	1.6400
63.000	3.0800
64.000	3.8700
65.000	5.6500

Name: SC-0890 Base Flow(cfs): 0.000 Init Stage(ft): 58.430
Group: Grace Lake Warn Stage(ft): 66.000
Type: Stage/Area

UPSTREAM END (EAST SIDE) OF THE SOUTHERN CULVERT CROSSING I-4

Stage(ft)	Area(ac)
58.160	0.0100
66.000	0.0100

Name: SC-0900 Base Flow(cfs): 0.000 Init Stage(ft): 60.000
Group: Grace Lake Warn Stage(ft): 66.000
Type: Stage/Area

STAGE-AREA RELATIONSHIP OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.
FDOT POND E (REFER TO THE SJRWMD PERMIT NO. 22434-1)

Stage(ft)	Area(ac)
59.000	0.3000
60.000	0.4400
61.000	0.6200
62.000	0.7900
63.000	0.9200
64.000	1.0400
65.000	1.1900
66.000	1.3900
67.000	1.5400

Name: SC-0910 Base Flow(cfs): 0.000 Init Stage(ft): 55.000
Group: Grace Lake Warn Stage(ft): 66.000
Type: Stage/Area

DEPRESSIONAL AREA IMMEDIATELY EAST OF THE SOUTH I-4 CROSS CULVERT, ADJACENT TO GRACE LAKE.
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP.

Stage(ft)	Area(ac)
55.000	0.1700
56.000	0.3000
57.000	0.4500
58.000	0.6600
59.000	0.9600
60.000	1.4200
61.000	1.8200
62.000	2.2500
63.000	2.6800
64.000	2.9600
65.000	3.2500
66.000	3.4800
67.000	3.6800

Name: SC-0920 Base Flow(cfs): 0.000 Init Stage(ft): 44.000
Group: Grace Lake Warn Stage(ft): 66.000
Type: Stage/Area

GRACE LAKE.
STAGE-AREA RELATIONSHIP BETWEEN ELEVATIONS 33-54 FT, NAVD, WAS OBTAINED FROM THE SURVEY PREPARED BY SSMC, DATED DEC. 2007.
STAGE-AREA RELATIONSHIP BETWEEN ELEVATIONS 55-67, NAVD, IS BASED ON THE 1-FT TOPOGRAPHY.
INITIAL STAGE WAS SET TO ELEVATION 49 FT IN ORDER TO ENSURE THAT THERE ARE NO TAILWATER EFFECTS WHEN ESTIMATING UPGRADIENT FLOWS TO LAKE GRACE.

Stage(ft)	Area(ac)
33.000	0.0000
34.000	0.0005

35.000	0.0014
36.000	0.0028
37.000	0.0053
38.000	0.0140
39.000	0.0450
40.000	0.0980
41.000	0.1830
42.000	0.3010
43.000	0.4270
44.000	0.5320
45.000	0.6430
46.000	0.7540
47.000	0.8640
48.000	1.1900
49.000	3.6300
50.000	5.8800
51.000	8.1300
52.000	10.5200
53.000	12.8800
54.000	14.9400
55.000	16.6400
56.000	18.3800
57.000	20.0700
58.000	22.0500
59.000	24.0900
60.000	26.0500
61.000	27.8500
62.000	29.7000
63.000	31.6800
64.000	33.6800
65.000	35.3300
66.000	36.9000
67.000	38.7900

Name: SC-0925 Base Flow(cfs): 0.000 Init Stage(ft): 68.000
Group: Grace Lake Warn Stage(ft): 76.000
Type: Stage/Area

SMALL DRY RETENTION POND LOCATED ALONG NORTH RIDGE LAKE CIRCLE, SOUTH OF NORTH RIDGE DR.
STAGE-AREA RELATIONSHIP WAS OBTAINED FROM THE 1-FT TOPOGRAPHIC MAPS.

Stage(ft)	Area(ac)
68.000	0.0300
69.000	0.0800
70.000	0.1000
71.000	0.1300
72.000	0.1600
73.000	0.1800
74.000	0.2200
75.000	0.2500
76.000	0.2900
77.000	0.5100
78.000	0.8700
79.000	1.1900

Name: SC-0930 Base Flow(cfs): 0.000 Init Stage(ft): 62.900
Group: Grace Lake Warn Stage(ft): 66.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 3.

Stage(ft)	Area(ac)
62.900	0.0100
66.000	0.0100

Name: SC-0940 Base Flow(cfs): 0.000 Init Stage(ft): 65.700
Group: Grace Lake Warn Stage(ft): 69.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 2.

Stage(ft)	Area(ac)
65.700	0.0100
69.000	0.0100

Name: SC-0950 Base Flow(cfs): 0.000 Init Stage(ft): 66.200
Group: Grace Lake Warn Stage(ft): 72.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 1.

Stage(ft)	Area(ac)
66.200	0.0100
72.000	0.0100

Name: SC-0960 Base Flow(cfs): 0.000 Init Stage(ft): 68.780
Group: Grace Lake Warn Stage(ft): 73.000
Type: Stage/Area

NODE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE GHOST 0.

Stage(ft)	Area(ac)
68.780	0.0100
73.000	0.0100

Name: SC-0970 Base Flow(cfs): 0.000 Init Stage(ft): 65.780
Group: Grace Lake Warn Stage(ft): 71.000
Type: Stage/Area

STAGE AREA ESTIMATED BASED ON THE 1-FT TOPOGRAPHY.
NODE INITIAL STAGE OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO NODE Ghost_I-4_30in.

Stage(ft)	Area(ac)
65.780	0.0100
71.000	0.0400

Name: SC-0980 Base Flow(cfs): 0.000 Init Stage(ft): 68.100
Group: Grace Lake Warn Stage(ft): 74.000
Type: Stage/Area

STAGE-AREA OBTAINED FROM THE 1-FT TOPO MAPS
INITIAL STAGE IS BASED ON THE DOWNSTREAM PIPE INVERT ELEVATION

Stage(ft)	Area(ac)
67.000	0.0100
70.000	0.0150
71.000	0.0200
72.000	0.1000
73.000	0.1800
74.000	0.3200

Name: SC-0985 Base Flow(cfs): 0.000 Init Stage(ft): 68.100
Group: Grace Lake Warn Stage(ft): 73.000
Type: Stage/Area

PENELOPE POND (POND LOCATED EAST OF PENELOPE DR AND NORTH OF HICKORY TREE RD)
STAGE-AREA RELATIONSHIP OBTAINED FROM THE 1-FT TOPOGRAPHIC MAP
INITIAL STAGE WAS ESTIMATED BASED ON THE DOWNSTREAM PIPE INVERT JUST SOUTH OF EE WILLIAMSON RD

Stage(ft)	Area(ac)
66.000	0.1100
71.000	0.2200
72.000	0.3400
73.000	0.5900
74.000	1.2000

Name: SC-0990 Base Flow(cfs): 0.000 Init Stage(ft): 71.000
Group: Grace Lake Warn Stage(ft): 79.000
Type: Stage/Area

EMERGENCY OVERFLOW MANHOLE

Stage(ft)	Area(ac)

71.000	0.0010
79.000	0.0010

Name: SC-0995 Base Flow(cfs): 0.000 Init Stage(ft): 77.500
Group: Grace Lake Warn Stage(ft): 84.000
Type: Stage/Area

WET DETENTION POND THAT SERVES THE WOODLAND ELEMENTARY SCHOOL, THE BELLA TUSCANY SUBDIVISION AND A PORTION OF EE WILLIAMSON POND WAS EXPANDED TO PROVIDE WATER QUALITY TREATMENT AND ATTENUATION FROM THE BELLA TUSCANY SUBDIVISION (REFER TO THE SJRMD STAGE-AREA RELATIONSHIP AND INITIAL STAGE WAS OBTAINED FROM THE PERMITTED PARAMETERS. ELEVATIONS SHOWN HEREIN WERE CONVERT SINCE THE ORIGINAL BELLA TUSCANY SUBDIVISION PLANS ARE REFERENCED TO THE NGVD VERTICAL DATUM (CONVERSION USED: NAVD ELEV.

Stage(ft)	Area(ac)
77.500	1.8600
78.000	1.9300
79.000	2.0000
80.000	2.0800
81.000	2.2200
82.000	2.3600
83.000	2.5000
84.000	2.6500
85.000	2.8000

==== Cross Sections ====

Name: SC-0810_W1 Group: Grace Lake
Encroachment: No

OVERLAND OVERTOPPING CROSS SECTION FROM I-4 CULVERT CROSSING (NORTH PIPE) TO THE NORTHRIDGE DEPRESSIONAL AREA

Station(ft)	Elevation(ft)	Manning's N
0.000	58.400	0.000000
11.900	57.800	0.000000
31.100	57.200	0.000000
43.400	57.800	0.000000
63.200	58.700	0.000000

Name: SC-0810_W2 Group: Grace Lake
Encroachment: No

OVERLAND OVERTOPPING CROSS SECTION FROM I-4 CULVERT CROSSING (NORTH PIPE) TO THE NORTHRIDGE SWALE

Station(ft)	Elevation(ft)	Manning's N
0.000	59.300	0.000000
30.700	59.000	0.000000
68.400	58.500	0.000000
106.100	58.700	0.000000
133.700	59.300	0.000000

Name: SC-0840_W Group: Grace Lake
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
0.000	59.000	0.000000
6.700	58.000	0.000000
13.300	57.000	0.000000
20.000	56.000	0.000000
39.900	55.000	0.000000
91.800	54.000	0.000000
116.000	54.000	0.000000
137.600	54.000	0.000000
182.000	55.000	0.000000
203.100	56.000	0.000000
218.500	57.000	0.000000
229.100	58.000	0.000000
239.500	59.000	0.000000

Name: SC-0875_W Group: Grace Lake
Encroachment: No

CROSS SECTION DATA ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

Station(ft)	Elevation(ft)	Manning's N
0.000	67.000	0.000000
36.600	66.000	0.000000
44.200	65.500	0.000000
51.800	66.000	0.000000
78.700	67.000	0.000000

Name: SC-0880_W Group: Grace Lake
Encroachment: No

CROSS SECTION DATA OBTAINED FROM SSMC SURVEY, DATED JULY 2013.

Station(ft)	Elevation(ft)	Manning's N
0.000	63.300	0.000000
9.200	62.600	0.000000
24.700	63.400	0.000000

Name: SC-0890_W Group: Grace Lake
Encroachment: No

SURVEYED CROSS SECTION (SSMC, DATED JULY 2013).

Station(ft)	Elevation(ft)	Manning's N
0.000	70.960	0.000000
4.200	70.600	0.000000
26.000	67.700	0.000000
48.500	71.100	0.000000
64.600	79.100	0.000000
78.400	83.600	0.000000
82.500	83.400	0.000000

Name: SC-0920_W1 Group: Grace Lake
Encroachment: No

CROSS SECTION DATA ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

Station(ft)	Elevation(ft)	Manning's N
0.000	67.000	0.000000
20.300	66.000	0.000000
45.300	65.000	0.000000
53.000	64.000	0.000000
63.600	63.000	0.000000
80.700	62.000	0.000000
93.800	61.000	0.000000
106.600	60.000	0.000000
139.200	59.500	0.000000
168.200	60.000	0.000000
194.200	61.000	0.000000
206.100	62.000	0.000000
224.900	63.000	0.000000
240.600	64.000	0.000000
249.600	65.000	0.000000
258.000	66.000	0.000000
277.100	67.000	0.000000

Name: SC-0920_W3 Group: Grace Lake
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
0.000	66.900	0.000000
24.000	66.800	0.000000
47.000	67.100	0.000000

Name: SC-0930_DS Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan3DS.

Station(ft) Elevation(ft) Manning's N

0.000	64.000	0.011000
0.320	63.600	0.011000
1.550	63.000	0.011000
2.250	62.600	0.011000
4.340	62.700	0.011000
5.150	63.000	0.011000
6.110	63.400	0.011000
8.310	64.000	0.011000

Name: SC-0940_DS Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan2DS3US.

Station(ft)	Elevation(ft)	Manning's N
0.000	65.700	0.150000
2.240	65.000	0.150000
5.290	64.000	0.150000
8.190	63.100	0.150000
9.050	63.000	0.150000
11.130	62.900	0.150000
12.170	63.000	0.150000
19.550	64.000	0.150000
26.880	65.000	0.150000

Name: SC-0950_DS Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan1DS2US.

Station(ft)	Elevation(ft)	Manning's N
0.000	67.980	0.150000
9.010	66.700	0.150000
15.920	66.000	0.150000
17.990	65.800	0.150000
20.380	65.700	0.150000
22.200	66.000	0.150000
23.200	66.300	0.150000
27.190	66.500	0.150000
30.370	67.000	0.150000
40.400	68.000	0.150000
48.060	68.700	0.150000

Name: SC-0950_US Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION I-4 Chan1_US.

Station(ft)	Elevation(ft)	Manning's N
0.000	71.000	0.150000
1.190	70.000	0.150000
2.360	69.000	0.150000
3.560	68.000	0.150000
4.580	67.000	0.150000
5.300	66.200	0.150000
11.970	67.000	0.150000
12.060	68.000	0.150000
12.060	69.000	0.150000
12.060	69.700	0.150000

Name: SC-0960_DS Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION EEW I-4 Chan DS.

Station(ft)	Elevation(ft)	Manning's N
0.000	71.230	0.011000
0.610	71.000	0.011000
2.090	70.000	0.011000
3.570	69.000	0.011000

3.800	68.640	0.011000
8.900	68.640	0.011000
9.240	69.000	0.011000
10.080	70.000	0.011000

Name: SC-0960_US Group: Grace Lake
Encroachment: No

CHANNEL CROSS SECTION DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR CROSS SECTION EEW I-4 Chan US.

Station(ft)	Elevation(ft)	Manning's N
0.000	71.000	0.011000
0.960	70.000	0.011000
1.930	69.000	0.011000
7.640	68.860	0.011000
7.810	69.000	0.011000
8.830	70.000	0.011000
9.880	71.000	0.011000
10.790	72.000	0.011000

==== Pipes ====

Name: SC-0760-P From Node: SC-0760 Length(ft): 534.00
Group: Grace Lake To Node: SC-0750 Count: 1
Friction Equation: Automatic
Solution Algorithm: Most Restrictive
Flow: Both
Entrance Loss Coef: 0.00
Exit Loss Coef: 1.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dc
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	36.00	36.00
Rise(in):	36.00	36.00
Invert(ft):	53.080	48.960
Manning's N:	0.012000	0.012000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY DATA BY SSMC, DATED DEC. 2007.

Name: SC-0790-P From Node: SC-0790 Length(ft): 30.00
Group: Grace Lake To Node: SC-0780 Count: 1
Friction Equation: Automatic
Solution Algorithm: Most Restrictive
Flow: Both
Entrance Loss Coef: 0.50
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dc
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	18.00	18.00
Rise(in):	18.00	18.00
Invert(ft):	64.050	64.240
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE DATA OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILTS (DATED 05/19/1985).
ORIGINAL PLANS WERE REFERENCED TO THE NGVD VERTICAL DATUM AND HAD TO BE CONVERTED TO THE NAVD VERTICAL DATUM.
ELEVATIONS SHOWN CORRESPOND TO THE NAVD DATUM.

Name: SC-0815-P From Node: SC-0815 Length(ft): 412.00
Group: Grace Lake To Node: SC-0810 Count: 1
Friction Equation: Automatic
Solution Algorithm: Most Restrictive
Flow: Both
Entrance Loss Coef: 0.50
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	18.00	18.00
Rise(in):	18.00	18.00
Invert(ft):	55.000	53.520

```
 Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

UPSTREAM INVERT OBTAINED FROM THE PROPOSED ICPR MODEL, PREPARED BY HDR IN SUPPORT OF THE LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008).
DOWNSTREAM INVERT WAS OBTAINED FROM THE SSMC SURVEY, DATED JULY 2013.

```
--------------------------------------------------------------------------------------------------
        Name: SC-0830-P          From Node: SC-0830           Length(ft): 227.00
       Group: Grace Lake           To Node: SC-0810                Count: 1
                                                      Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM              Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                              Flow: Both
    Span(in): 54.00          54.00                   Entrance Loss Coef: 0.50
    Rise(in): 54.00          54.00                       Exit Loss Coef: 0.00
  Invert(ft): 51.520         52.330                      Bend Loss Coef: 0.00
 Manning's N: 0.012000       0.012000                 Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CULVERT CROSSING I-4 (NORTH CROSSING)
UPSTREAM (WEST END) INVERT DATA WAS OBTAINED FROM SURVEY PERFORMED BY SSMC, DATED DEC. 2007.
DOWNSTREAM (EAST END) INVERT ELEVATION WAS REVISED BASED ON SURVEY PERFORMED BY SSMC, DATED JULY 2013.

```
--------------------------------------------------------------------------------------------------
        Name: SC-0850-P          From Node: SC-0850           Length(ft): 66.00
       Group: Grace Lake           To Node: SC-0840                Count: 1
                                                      Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM              Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                              Flow: Both
    Span(in): 36.00          36.00                   Entrance Loss Coef: 0.50
    Rise(in): 36.00          36.00                       Exit Loss Coef: 0.00
  Invert(ft): 56.690         56.270                      Bend Loss Coef: 0.00
 Manning's N: 0.012000       0.012000                 Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

```
--------------------------------------------------------------------------------------------------
        Name: SC-0860-P          From Node: SC-0860           Length(ft): 62.00
       Group: Grace Lake           To Node: SC-0850                Count: 1
                                                      Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM              Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                              Flow: Both
    Span(in): 36.00          36.00                   Entrance Loss Coef: 0.50
    Rise(in): 36.00          36.00                       Exit Loss Coef: 0.00
  Invert(ft): 56.920         56.650                      Bend Loss Coef: 0.00
 Manning's N: 0.012000       0.012000                 Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                    Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:

Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

```
         Name: SC-0870-P          From Node: SC-0870           Length(ft): 499.00
        Group: Grace Lake           To Node: SC-0860                Count: 1
                                                        Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                Flow: Both
     Span(in): 36.00         36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00         36.00                         Exit Loss Coef: 0.00
   Invert(ft): 59.620        57.050                        Bend Loss Coef: 0.00
  Manning's N: 0.012000      0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                      Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

```
         Name: SC-0875-P          From Node: SC-0875           Length(ft): 47.00
        Group: Grace Lake           To Node: SC-0870                Count: 1
                                                        Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                Flow: Both
     Span(in): 36.00         36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00         36.00                         Exit Loss Coef: 0.00
   Invert(ft): 59.710        59.650                        Bend Loss Coef: 0.00
  Manning's N: 0.012000      0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                      Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PARAMETERS OBTAINED FROM SURVEY FROM SSMC, DATED JULY 2013.

```
         Name: SC-0890-P          From Node: SC-0890           Length(ft): 220.00
        Group: Grace Lake           To Node: SC-0880                Count: 1
                                                        Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                Flow: Both
     Span(in): 48.00         48.00                     Entrance Loss Coef: 0.50
     Rise(in): 48.00         48.00                         Exit Loss Coef: 0.00
   Invert(ft): 58.430        57.840                        Bend Loss Coef: 0.00
  Manning's N: 0.012000      0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                      Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CULVERT CROSSING I-4 (SOUTH CROSSING)
INVERT DATA WAS OBTAINED FROM SURVEY PERFORMED BY SSMC, DATED DEC. 2007.

```
         Name: SC-0970-P          From Node: SC-0970           Length(ft): 200.00
        Group: Grace Lake           To Node: SC-0940                Count: 1
                                                        Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                Flow: Both
     Span(in): 30.00         30.00                     Entrance Loss Coef: 0.50
     Rise(in): 30.00         30.00                         Exit Loss Coef: 0.00
```

```
   Invert(ft): 65.780        65.700                   Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                 Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0980-P1        From Node: SC-0980          Length(ft): 165.00
        Group: Grace Lake          To Node: SC-0970               Count: 1
                                                     Friction Equation: Automatic
               UPSTREAM      DOWNSTREAM             Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                             Flow: Both
     Span(in): 30.00         30.00                 Entrance Loss Coef: 0.50
     Rise(in): 30.00         30.00                     Exit Loss Coef: 0.00
   Invert(ft): 68.100        66.070                    Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                 Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO HDR PIPE LINK I-4_30Inch.
SURVEY DATA PROVIDED BY SSMC (DATED DEC. 2007)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0980-P2        From Node: SC-0980          Length(ft): 135.00
        Group: Grace Lake          To Node: SC-0960               Count: 1
                                                     Friction Equation: Automatic
               UPSTREAM      DOWNSTREAM             Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                             Flow: Both
     Span(in): 24.00         24.00                 Entrance Loss Coef: 0.50
     Rise(in): 24.00         24.00                     Exit Loss Coef: 0.00
   Invert(ft): 69.830        68.780                    Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                 Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER HDR PIPE LINK EEWilliams_24.
SURVEY DATA PROVIDED BY SSMC (DATED DEC. 2007)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0985-P         From Node: SC-0985          Length(ft): 230.00
        Group: Grace Lake          To Node: SC-0980               Count: 1
                                                     Friction Equation: Automatic
               UPSTREAM      DOWNSTREAM             Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                             Flow: Both
     Span(in): 42.00         42.00                 Entrance Loss Coef: 0.50
     Rise(in): 42.00         42.00                     Exit Loss Coef: 0.00
   Invert(ft): 67.000        67.000                    Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                 Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:

```
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

PIPE SIZE AND INVERT DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR, IN
SUPPORT OF THE GRACE LAKE SINKHOLE ANALYSIS REPORT (DATED APRIL 2008).
IT APPEARS THAT THIS PIPE SEGMENT WAS NOT SURVEYED
PIPE LENGTH WAS ADJUSTED TO MATCH FIELD OBSERVATIONS

-----------------------------------------------------------------------------------------------
         Name: SC-0990-P          From Node: SC-0990           Length(ft): 219.00
        Group: Grace Lake           To Node: SC-0920                Count: 1
                                                         Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 15.00          15.00                     Entrance Loss Coef: 0.50
     Rise(in): 15.00          15.00                         Exit Loss Coef: 0.00
   Invert(ft): 71.000         52.000                        Bend Loss Coef: 0.00
  Manning's N: 0.012000       0.012000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

EMERGENCY OVERFLOW PIPE FROM THE WOODLAND ELEMENTARY POND TO GRACE LAKE (FINAL PIPE SEGMENT).
PARAMETERS WERE OBTAINED FROM PERMITTED PLANS (REFER TO THE SJRWMD PERMIT NO. 49356-3, DATED 11/21/2007).
NOTE THAT ORIGINAL PLANS WERE REFERENCED TO THE NGVD DATUM.  ELEVATIONS SHOWN HEREIN WERE CONVERTED TO THE NAVD VERTICAL DA

-----------------------------------------------------------------------------------------------
         Name: SC-1000-P          From Node: SC-1000           Length(ft): 112.00
        Group: Grace Lake           To Node: SC-0985                Count: 1
                                                         Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Arch           Arch                                    Flow: Both
     Span(in): 95.00          95.00                     Entrance Loss Coef: 0.50
     Rise(in): 67.00          67.00                         Exit Loss Coef: 0.00
   Invert(ft): 68.620         68.070                        Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Pipe Arch 18" Corner Radius CM: 90° headwall

Downstream FHWA Inlet Edge Description:
Pipe Arch 18" Corner Radius CM: 90° headwall

CULVERT CROSSING HICKORY DITCH ROAD
INVERT DATA OBTAINED FROM THE CITY OF LONGWOOD STORMWATER MASTERPLAN
PIPE SIZE WAS ADJUSTED TO REFLECT THE NEAREST STANDARD SIZE FOR AN ARCH PIPE BASED ON SURVEYED DIMENSIONS

==========================================================================================
==== Channels ============================================================================
==========================================================================================

          Name: SC-0930-C          From Node: SC-0930           Length(ft): 106.00
         Group: Grace Lake           To Node: SC-0920                Count: 1

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
      Geometry: Irregular      Irregular                Solution Algorithm: Automatic
    Invert(ft): 62.900         62.600                                 Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                   Contraction Coef: 0.100
   Manning's N:                                             Expansion Coef: 0.300
  Top Clip(ft):                                         Entrance Loss Coef: 0.000
  Bot Clip(ft):                                             Exit Loss Coef: 0.000
     Main XSec: SC-0940_DS     SC-0930_DS                 Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000          0.000                       Inlet Ctrl Spec: Use dc
     Aux XSec1:                                          Stabilizer Option: None
  AuxElev2(ft): 0.000          0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
```

```
  RtSdSlp(h/v):

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK I-4 Channel 3 AND
CROSS SECTIONS I-4 Chan2DS3US (UPSTREAM) AND I-4 Chan3DS (DOWNSTREAM)

--------------------------------------------------------------------------------------------------
          Name: SC-0940-C          From Node: SC-0940           Length(ft): 496.00
         Group: Grace Lake           To Node: SC-0930                Count: 1

                UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
      Geometry: Irregular      Irregular               Solution Algorithm: Automatic
    Invert(ft): 65.700         62.900                                Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                  Contraction Coef: 0.100
   Manning's N:                                            Expansion Coef: 0.300
  Top Clip(ft):                                        Entrance Loss Coef: 0.000
  Bot Clip(ft):                                            Exit Loss Coef: 0.000
     Main XSec: SC-0950_DS     SC-0940_DS                Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000          0.000                      Inlet Ctrl Spec: Use dc
     Aux XSec1:                                          Stabilizer Option: None
  AuxElev2(ft): 0.000          0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK I-4 Channel 2 AND
CROSS SECTIONS I-4 Chan1DS2US (UPSTREAM) AND I-4 Chan2DS3US (DOWNSTREAM)

--------------------------------------------------------------------------------------------------
          Name: SC-0950-C          From Node: SC-0950           Length(ft): 66.00
         Group: Grace Lake           To Node: SC-0940                Count: 1

                UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
      Geometry: Irregular      Irregular               Solution Algorithm: Automatic
    Invert(ft): 66.200         65.700                                Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                  Contraction Coef: 0.100
   Manning's N:                                            Expansion Coef: 0.300
  Top Clip(ft):                                        Entrance Loss Coef: 0.000
  Bot Clip(ft):                                            Exit Loss Coef: 0.000
     Main XSec: SC-0950_US     SC-0950_DS                Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000          0.000                      Inlet Ctrl Spec: Use dc
     Aux XSec1:                                          Stabilizer Option: None
  AuxElev2(ft): 0.000          0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK I-4 Channel 1 AND
CROSS SECTIONS I-4 Chan 1_US (UPSTREAM) AND I-4 Chan1DS2US (DOWNSTREAM)

--------------------------------------------------------------------------------------------------
          Name: SC-0960-C          From Node: SC-0960           Length(ft): 15.00
         Group: Grace Lake           To Node: SC-0950                Count: 1

                UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
      Geometry: Irregular      Irregular               Solution Algorithm: Automatic
    Invert(ft): 68.780         68.640                                Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                  Contraction Coef: 0.100
   Manning's N:                                            Expansion Coef: 0.300
  Top Clip(ft):                                        Entrance Loss Coef: 0.000
  Bot Clip(ft):                                            Exit Loss Coef: 0.000
     Main XSec: SC-0960_US     SC-0960_DS                Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000          0.000                      Inlet Ctrl Spec: Use dc
     Aux XSec1:                                          Stabilizer Option: None
  AuxElev2(ft): 0.000          0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

CHANNEL DATA WAS OBTAINED FROM THE PROPOSED CONDITIONS ICPR MODEL PREPARED BY HDR IN SUPPORT OF THE
LAKE GRACE SINKHOLE REPAIR ANALYSIS REPORT (DATED APRIL 2008). REFER TO CHANNEL LINK 24 Splwy Chan AND
CROSS SECTIONS EEW I-4 Chan US (UPSTREAM) AND EEW I-4 Chan DS (DOWNSTREAM)
```

```
===========================================================================================
==== Drop Structures ======================================================================
===========================================================================================

        Name: SC-0770-D1         From Node: SC-0770           Length(ft): 17.00
       Group: Grace Lake           To Node: SC-0760                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
    Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
    Span(in): 36.00          36.00                                  Flow: Both
    Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.500
  Invert(ft): 53.250         53.080                       Exit Loss Coef: 0.000
 Manning's N: 0.012000       0.012000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                         Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

DITCH BOTTOM STRUCTURE LOCATED ALONG THE NORTH RIDGE LAKE CIRCLE WEST RIGHT-OF-WAY, NORTH OF NORTH RIDGE DRIVE (TRACT "C" O


*** Weir 1 of 4 for Drop Structure SC-0770-D1 ***
                                                                                     TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Vertical: Mavis           Top Clip(in): 0.000
                  Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 10.20                      Invert(ft): 57.170
              Rise(in): 33.60                Control Elev(ft): 57.170

*** Weir 2 of 4 for Drop Structure SC-0770-D1 ***
                                                                                     TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Vertical: Mavis           Top Clip(in): 0.000
                  Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 9.60                       Invert(ft): 57.180
              Rise(in): 34.80                Control Elev(ft): 57.180

*** Weir 3 of 4 for Drop Structure SC-0770-D1 ***
                                                                                     TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Vertical: Mavis           Top Clip(in): 0.000
                  Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 9.00                       Invert(ft): 57.170
              Rise(in): 34.80                Control Elev(ft): 57.170

*** Weir 4 of 4 for Drop Structure SC-0770-D1 ***
                                                                                     TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Horizontal                Top Clip(in): 0.000
                  Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 36.00                      Invert(ft): 58.180
              Rise(in): 54.00                Control Elev(ft): 58.180


----------------------------------------------------------------------------------------------------
        Name: SC-0770-D2         From Node: SC-0770           Length(ft): 70.00
       Group: Grace Lake           To Node: SC-0800                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
    Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
    Span(in): 18.00          18.00                                  Flow: Both
    Rise(in): 18.00          18.00                    Entrance Loss Coef: 0.500
  Invert(ft): 49.660         49.140                       Exit Loss Coef: 0.000
 Manning's N: 0.024000       0.024000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                         Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall
```

```
Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CONTROL STRUCTURE LOCATED WITHIN THE NORTHRIDGE SWALE.
REFER TO SSMC SURVEY DATED DEC. 2007 AND THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS (DATED  05/19/1985).
IT APPEARS THAT SURVEY FROM SSMC DID NOT PICK UP THE WEIR CUT-OUT (SLOT).  HOWEVER, AS BUILTS PROVIDE AN INVERT ELEVATION F

*** Weir 1 of 2 for Drop Structure SC-0770-D2 ***
                                                                                 TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 30.00                   Invert(ft): 56.820
               Rise(in): 15.50             Control Elev(ft): 56.820

*** Weir 2 of 2 for Drop Structure SC-0770-D2 ***
                                                                                 TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Horizontal             Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 37.00                   Invert(ft): 58.360
               Rise(in): 49.00             Control Elev(ft): 58.360


----------------------------------------------------------------------------------------------------
         Name: SC-0780-D          From Node: SC-0780           Length(ft): 443.00
        Group: Grace Lake           To Node: SC-0770                Count: 1

               UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
     Geometry: Circular       Circular                Solution Algorithm: Most Restrictive
     Span(in): 18.00          18.00                                 Flow: Both
     Rise(in): 18.00          18.00                   Entrance Loss Coef: 0.500
   Invert(ft): 62.370         55.900                      Exit Loss Coef: 0.000
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

DIVERSION / CONTROL STRUCTURE.  DATA OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS (DATED 05/19/1985).
ELEVATIONS SHOWN WERE CONVERTED TO THE NAVD VERTICAL DATUM.

*** Weir 1 of 1 for Drop Structure SC-0780-D ***
                                                                                 TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular        Orifice Disc Coef: 0.600

               Span(in): 50.40                   Invert(ft): 65.500
               Rise(in): 24.84             Control Elev(ft): 65.500


----------------------------------------------------------------------------------------------------
         Name: SC-0900-D          From Node: SC-0900           Length(ft): 164.00
        Group: Grace Lake           To Node: SC-0890                Count: 1

               UPSTREAM       DOWNSTREAM               Friction Equation: Automatic
     Geometry: Circular       Circular                Solution Algorithm: Most Restrictive
     Span(in): 24.00          24.00                                 Flow: Both
     Rise(in): 24.00          24.00                   Entrance Loss Coef: 0.500
   Invert(ft): 59.500         58.160                      Exit Loss Coef: 0.000
  Manning's N: 0.013000       0.013000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

FDOT POND E OUTFALL STRUCTURE.  STRUCTURE DATA AND UPSTREAM INVERT WAS OBTAINED FROM THE FDOT CONSTUCTION PLANS (PREPARED B
IT APPEARS THAT THE FDOT PLANS ARE REFERENCED TO THE NGVD VERTICAL DATUM.  THESE ELEVATIONS WERE CONVERTED TO THE NAVD DATU
```

```
DOWNSTREAM PIPE INVERT ELEVATION WAS OBTAINED FROM SURVEYED DATA, PREPARED BY SSMC (DATED DEC. 2007)

*** Weir 1 of 3 for Drop Structure SC-0900-D ***
                                                                           TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular       Orifice Disc Coef: 0.600

               Span(in): 36.00                   Invert(ft): 63.700
               Rise(in): 15.60             Control Elev(ft): 63.700

*** Weir 2 of 3 for Drop Structure SC-0900-D ***
                                                                           TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Horizontal             Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular       Orifice Disc Coef: 0.600

               Span(in): 37.00                   Invert(ft): 65.000
               Rise(in): 49.00             Control Elev(ft): 65.000

*** Weir 3 of 3 for Drop Structure SC-0900-D ***
                                                                           TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Circular          Orifice Disc Coef: 0.600

               Span(in): 2.00                    Invert(ft): 60.000
               Rise(in): 2.00              Control Elev(ft): 60.000


----------------------------------------------------------------------------------------------------
         Name: SC-0925-D          From Node: SC-0925           Length(ft): 360.00
        Group: Grace Lake           To Node: SC-0920                Count: 1

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
     Span(in): 18.00          18.00                                  Flow: Both
     Rise(in): 18.00          18.00                    Entrance Loss Coef: 0.500
   Invert(ft): 69.350         64.010                       Exit Loss Coef: 0.000
  Manning's N: 0.013000       0.013000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

CONTROL STRUCTURE DATA WAS OBTAINED FROM THE AS-BUILT PLANS OF THE NORTHRIDGE SUBDIVISION, PREPARED BY CPH, DATED 05/19/198
CONSTRUCTION PLANS WERE REFERENCED TO THE NGVD VERTICAL DATUM AND CONVERTED TO THE NAVD DATUM.

*** Weir 1 of 2 for Drop Structure SC-0925-D ***
                                                                           TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Vertical: Mavis        Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular       Orifice Disc Coef: 0.600

               Span(in): 12.00                   Invert(ft): 74.020
               Rise(in): 46.70             Control Elev(ft): 74.020

*** Weir 2 of 2 for Drop Structure SC-0925-D ***
                                                                           TABLE
                  Count: 1                   Bottom Clip(in): 0.000
                   Type: Horizontal             Top Clip(in): 0.000
                   Flow: Both                 Weir Disc Coef: 3.200
               Geometry: Rectangular       Orifice Disc Coef: 0.600

               Span(in): 36.00                   Invert(ft): 77.910
               Rise(in): 54.00             Control Elev(ft): 77.910


----------------------------------------------------------------------------------------------------
         Name: SC-0995-D          From Node: SC-0995           Length(ft): 1211.00
        Group: Grace Lake           To Node: SC-0990                Count: 1

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
     Span(in): 15.00          15.00                                  Flow: Both
```

```
     Rise(in): 15.00         15.00                Entrance Loss Coef: 0.500
   Invert(ft): 80.000        76.250                   Exit Loss Coef: 0.000
  Manning's N: 0.012000      0.012000              Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                  Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                    Solution Incs: 10
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

EMERGENCY OVERFLOW STRUCTURE AND PIPE FROM THE WOODLAND ELEMENTARY POND TO GRACE LAKE.
PARAMETERS WERE OBTAINED FROM PERMITTED PLANS (REFER TO THE SJRWMD PERMIT NO. 49356-3, DATED 11/21/2007).
NOTE THAT ORIGINAL PLANS WERE REFERENCED TO THE NGVD DATUM. ELEVATIONS SHOWN HEREIN WERE CONVERTED TO THE NAVD VERTICAL DA

```
*** Weir 1 of 1 for Drop Structure SC-0995-D ***
                                                                                TABLE
                  Count: 1                     Bottom Clip(in): 0.000
                   Type: Horizontal               Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
               Geometry: Rectangular          Orifice Disc Coef: 0.600

               Span(in): 36.00                      Invert(ft): 83.160
               Rise(in): 54.00                Control Elev(ft): 83.160
```

```
==========================================================================================
==== Weirs ===============================================================================
==========================================================================================

         Name: SC-0770-W          From Node: SC-0770
        Group: Grace Lake           To Node: SC-0750
         Flow: Both                   Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 180.00
                    Rise(in): 999.00
                  Invert(ft): 58.500
       Control Elevation(ft): 58.500
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

OVERTOPPING WEIR. PARAMETERS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0780-W          From Node: SC-0780
        Group: Grace Lake           To Node: SC-0770
         Flow: Both                   Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 2400.00
                    Rise(in): 999.00
                  Invert(ft): 67.900
       Control Elevation(ft): 67.900
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600
```

OVERLAND OVERTOPPING FROM POND TO THE NORTHRIDGE SWALE.
ELEVATION WAS OBTAINED FROM THE NORTHRIDGE SUBDIVISION AS-BUILT PLANS AND COMPARED TO THE 1-FT TOPOGRAPHIC MAP.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0800-W1         From Node: SC-0800
        Group: Grace Lake           To Node: SC-0770
         Flow: Both                   Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 1200.00
                    Rise(in): 999.00
                  Invert(ft): 58.000
       Control Elevation(ft): 58.000
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

NORTHRIDGE DEPRESSIONAL AREA BERM OVERTOPPING
PARAMETERS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP AND SURVEYED DATA.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0800-W2          From Node: SC-0800
        Group: Grace Lake            To Node: SC-0750
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 600.00
                    Rise(in): 999.00
                  Invert(ft): 58.500
       Control Elevation(ft): 58.500
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

OVERTOPPING WEIR. PARAMETERS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

```
----------------------------------------------------------------------------------------------------
         Name: SC-0810-W1          From Node: SC-0810
        Group: Grace Lake            To Node: SC-0800
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0810_W1
                  Invert(ft): 57.200
       Control Elevation(ft): 57.200
      Struct Opening Dim(ft): 9999.00
                                              TABLE
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0810-W2          From Node: SC-0810
        Group: Grace Lake            To Node: SC-0770
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0810_W2
                  Invert(ft): 58.500
       Control Elevation(ft): 58.500
      Struct Opening Dim(ft): 9999.00
                                              TABLE
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0820-W1          From Node: SC-0820
        Group: Grace Lake            To Node: SC-0815
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Trapezoidal

           Bottom Width(ft): 5.00
        Left Side Slope(h/v): 6.00
       Right Side Slope(h/v): 6.00
                  Invert(ft): 55.000
       Control Elevation(ft): 55.000
      Struct Opening Dim(ft): 9999.00
                                              TABLE
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

CONCRETE WEIR (OUTFALL)

```
----------------------------------------------------------------------------------------------------
         Name: SC-0820-W2          From Node: SC-0820
        Group: Grace Lake            To Node: SC-0800
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular
```

```
                 Span(in): 600.00
                 Rise(in): 999.00
               Invert(ft): 56.500
    Control Elevation(ft): 56.500
                                          TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 2.800
    Orifice Discharge Coef: 0.600
```

POND BERM OVERTOPPING

```
----------------------------------------------------------------------------------------------------
         Name: SC-0840-W          From Node: SC-0840
        Group: Grace Lake           To Node: SC-0830
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Irregular

                     XSec: SC-0840_W
               Invert(ft): 54.000
    Control Elevation(ft): 54.000
   Struct Opening Dim(ft): 9999.00
                                          TABLE
           Bottom Clip(ft): 0.000
              Top Clip(ft): 0.000
       Weir Discharge Coef: 2.800
    Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0875-W          From Node: SC-0875
        Group: Grace Lake           To Node: SC-0840
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Irregular

                     XSec: SC-0875_W
               Invert(ft): 65.500
    Control Elevation(ft): 65.500
   Struct Opening Dim(ft): 9999.00
                                          TABLE
           Bottom Clip(ft): 0.000
              Top Clip(ft): 0.000
       Weir Discharge Coef: 2.800
    Orifice Discharge Coef: 0.600
```

OVERLAND OVERTOPPING

```
----------------------------------------------------------------------------------------------------
         Name: SC-0880-W          From Node: SC-0880
        Group: Grace Lake           To Node: SC-0875
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Irregular

                     XSec: SC-0880_W
               Invert(ft): 62.600
    Control Elevation(ft): 62.600
   Struct Opening Dim(ft): 9999.00
                                          TABLE
           Bottom Clip(ft): 0.000
              Top Clip(ft): 0.000
       Weir Discharge Coef: 2.800
    Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: SC-0890-W          From Node: SC-0890
        Group: Grace Lake           To Node: SC-0810
         Flow: Both                   Count: 1
         Type: Vertical: Fread     Geometry: Irregular

                     XSec: SC-0890_W
               Invert(ft): 67.700
    Control Elevation(ft): 67.700
   Struct Opening Dim(ft): 9999.00
                                          TABLE
           Bottom Clip(ft): 0.000
              Top Clip(ft): 0.000
       Weir Discharge Coef: 2.800
    Orifice Discharge Coef: 0.600
```

OVERTOPPING OF I-4 SWALE AT HIGH POING ALONG THE EAST RIGHT-OF-WAY.

POTENTIAL INTERCONNECTION OF THE TWO (2) CULVERTS CROSSING I-4 (NORTH AND SOUTH).
CROSS SECTION DATA WAS OBTAINED FROM SURVEY PERFORMED BY SSMC (DATED JULY 2013).

```
--------------------------------------------------------------------------------------------
         Name: SC-0900-W           From Node: SC-0900
        Group: Grace Lake            To Node: SC-0890
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 120.00
                    Rise(in): 999.00
                  Invert(ft): 68.000
       Control Elevation(ft): 68.000
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

ELEVATIONS WERE ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

```
--------------------------------------------------------------------------------------------
         Name: SC-0910-W           From Node: SC-0910
        Group: Grace Lake            To Node: SC-0890
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 960.00
                    Rise(in): 999.00
                  Invert(ft): 59.500
       Control Elevation(ft): 59.500
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600
```

OVERTOPPING ELEVATION WAS ESTIMATED BASED ON THE 1-FT TOPOGRAPHIC MAP.

```
--------------------------------------------------------------------------------------------
         Name: SC-0920-W1          From Node: SC-0920
        Group: Grace Lake            To Node: SC-0910
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0920_W1
                  Invert(ft): 59.500
       Control Elevation(ft): 59.500
      Struct Opening Dim(ft): 9999.00
                                              TABLE
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



--------------------------------------------------------------------------------------------
         Name: SC-0920-W2          From Node: SC-0920
        Group: Grace Lake            To Node: SC-0890
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 1160.00
                    Rise(in): 999.00
                  Invert(ft): 62.500
       Control Elevation(ft): 62.500
                                              TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
         Weir Discharge Coef: 2.800
      Orifice Discharge Coef: 0.600



--------------------------------------------------------------------------------------------
         Name: SC-0920-W3          From Node: SC-0920
        Group: Grace Lake            To Node: SC-0790
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Irregular

                        XSec: SC-0920_W3
                  Invert(ft): 66.800
```

```
      Control Elevation(ft): 66.800
     Struct Opening Dim(ft): 9999.00
                                         TABLE
           Bottom Clip(ft): 0.000
              Top Clip(ft): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600
```

PARAMETERS ARE BASED ON SURVEY DATA OBTAINED FROM SSMC, DATED JULY 2013.

```
----------------------------------------------------------------------------------------------------
        Name: SC-0925-W           From Node: SC-0925
       Group: Grace Lake            To Node: SC-0920
        Flow: Both                    Count: 1
        Type: Vertical: Fread      Geometry: Rectangular

                  Span(in): 680.00
                  Rise(in): 999.00
                Invert(ft): 78.700
      Control Elevation(ft): 78.700
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
        Name: SC-0970-W           From Node: SC-0970
       Group: Grace Lake            To Node: SC-0940
        Flow: Both                    Count: 1
        Type: Vertical: Fread      Geometry: Rectangular

                  Span(in): 120.00
                  Rise(in): 999.00
                Invert(ft): 71.000
      Control Elevation(ft): 71.000
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
        Name: SC-0985-W           From Node: SC-0985
       Group: Grace Lake            To Node: SC-0980
        Flow: Both                    Count: 1
        Type: Vertical: Fread      Geometry: Rectangular

                  Span(in): 600.00
                  Rise(in): 999.00
                Invert(ft): 73.500
      Control Elevation(ft): 73.500
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600
```

PENELOPE POND OVERTOPPING
PARAMETERS WERE ESTIMATED USING THE 1-FT TOPOGRAPHIC MAPS

```
----------------------------------------------------------------------------------------------------
        Name: SC-1000-W           From Node: SC-1000
       Group: Grace Lake            To Node: SC-0985
        Flow: Both                    Count: 1
        Type: Vertical: Fread      Geometry: Rectangular

                  Span(in): 600.00
                  Rise(in): 999.00
                Invert(ft): 77.500
      Control Elevation(ft): 77.500
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 2.800
     Orifice Discharge Coef: 0.600
```

OVERTOPPING HICKORY TREE ROAD

```
==========================================================================================
==== Hydrology Simulations ===============================================================
==========================================================================================

         Name: 0.25-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\0.25-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 0.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 0.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\0.50-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 0.50

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 0.75-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\0.75-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 0.75

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 010-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\010-024.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 6.80

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 025-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\025-024.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 8.50

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 025-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\025-096.R32

      Override Defaults: Yes
    Storm Duration(hrs): 96.00
          Rainfall File: Sjrwmd96
    Rainfall Amount(in): 11.30

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 1.00-INCH
```

```
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 1.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 1.25-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.25-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 1.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 1.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.50-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 1.50

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 1.75-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.75-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 1.75

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 10.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\10.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 10.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 100-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\100-024.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 11.40

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 100-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\100-096.R32

      Override Defaults: Yes
    Storm Duration(hrs): 96.00
          Rainfall File: Sjrwmd96
```

```
    Rainfall Amount(in): 15.00

Time(hrs)       Print Inc(min)
--------------- ---------------
96.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 2.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\2.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 2.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 2.25-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\2.25-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 2.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 2.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\2.50-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 2.50

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 3.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\3.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 3.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 3.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\3.50-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 3.50

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 4.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\4.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 4.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00
```

```
----------------------------------------------------------------------------------------------------
         Name: 4.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\4.50-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 4.50

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 5.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\5.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 5.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 6.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\6.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 6.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 7.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\7.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 7.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 8.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\8.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 8.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 9.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\9.00-INCH.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 9.00

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: MA-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\MA-024.R32
```

```
      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 4.40

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

==========================================================================================
==== Routing Simulations =================================================================
==========================================================================================

         Name: 0.25-INCH           Hydrology Sim: 0.25-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\0.25-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 0.50-INCH           Hydrology Sim: 0.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\0.50-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 0.75-INCH           Hydrology Sim: 0.75-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\0.75-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:
```

Time(hrs)	Print Inc(min)
336.000	30.000

Group	Run
BASE	Yes
Cranes	Yes
Gee	Yes
Grace Lake	Yes
Soldier	Yes

```
         Name: 010-024            Hydrology Sim: 010-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\010-024.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 36.00
     Min Calc Time(sec): 0.1000              Max Calc Time(sec): 1.0000
        Boundary Stages: 010-024                 Boundary Flows:
```

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
10-YEAR STORM EVENT (24-HOUR DURATION)

Time(hrs)	Print Inc(min)
999.000	15.000

Group	Run
BASE	Yes
Cranes	Yes
Gee	Yes
Grace Lake	Yes
Soldier	Yes

```
         Name: 025-024            Hydrology Sim: 025-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\025-024.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 36.00
     Min Calc Time(sec): 0.1000              Max Calc Time(sec): 1.0000
        Boundary Stages: 025-024                 Boundary Flows:
```

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
25-YEAR STORM EVENT (24-HOUR DURATION)

Time(hrs)	Print Inc(min)
999.000	15.000

Group	Run
BASE	Yes
Cranes	Yes
Gee	Yes
Grace Lake	Yes
Soldier	Yes

```
         Name: 025-096            Hydrology Sim: 025-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\025-096.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 120.00
```

```
     Min Calc Time(sec): 0.1000              Max Calc Time(sec): 60.0000
        Boundary Stages: 100-024                 Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
96.000          15.000
120.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 1.00-INCH          Hydrology Sim: 1.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                 Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 1.25-INCH          Hydrology Sim: 1.25-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.25-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                 Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 1.50-INCH          Hydrology Sim: 1.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.50-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
```

```
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                   End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000             Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes


----------------------------------------------------------------------------------------------------
         Name: 1.75-INCH          Hydrology Sim: 1.75-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\1.75-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                   Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                   End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000             Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes


----------------------------------------------------------------------------------------------------
         Name: 10.00-INCH         Hydrology Sim: 10.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\10.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                   Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                   End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000             Max Calc Time(sec): 60.0000
        Boundary Stages: 025-024                Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes


----------------------------------------------------------------------------------------------------
         Name: 100-024            Hydrology Sim: 100-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\100-024.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No
```

```
        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages: 100-024                  Boundary Flows:

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
100-YEAR STORM EVENT (24-HOUR DURATION)

Time(hrs)        Print Inc(min)
---------------  ---------------
48.000           15.000
336.000          60.000

Group            Run
---------------  -----
BASE             Yes
Cranes           Yes
Gee              Yes
Grace Lake       Yes
Soldier          Yes

----------------------------------------------------------------------------------------------------
         Name: 100-096             Hydrology Sim: 100-096
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\100-096.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 180.00
     Min Calc Time(sec): 0.1000              Max Calc Time(sec): 60.0000
        Boundary Stages: 100-024                  Boundary Flows:


Time(hrs)        Print Inc(min)
---------------  ---------------
96.000           15.000
120.000          30.000
180.000          60.000

Group            Run
---------------  -----
BASE             Yes
Cranes           Yes
Gee              Yes
Grace Lake       Yes
Soldier          Yes

----------------------------------------------------------------------------------------------------
         Name: 2.00-INCH           Hydrology Sim: 2.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\2.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)        Print Inc(min)
---------------  ---------------
336.000          30.000

Group            Run
---------------  -----
BASE             Yes
Cranes           Yes
Gee              Yes
Grace Lake       Yes
Soldier          Yes

----------------------------------------------------------------------------------------------------
```

```
         Name: 2.25-INCH           Hydrology Sim: 2.25-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\2.25-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 2.50-INCH           Hydrology Sim: 2.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\2.50-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 3.00-INCH           Hydrology Sim: 3.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\3.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes
```

```
----------------------------------------------------------------------------------------------------
         Name: 3.50-INCH           Hydrology Sim: 3.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\3.50-INCH.I32

      Execute: No          Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 4.00-INCH           Hydrology Sim: 4.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\4.00-INCH.I32

      Execute: No          Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 4.50-INCH           Hydrology Sim: 4.50-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\4.50-INCH.I32

      Execute: No          Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes
```

```
----------------------------------------------------------------------------------------------------
         Name: 5.00-INCH           Hydrology Sim: 5.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\5.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 6.00-INCH           Hydrology Sim: 6.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\6.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

----------------------------------------------------------------------------------------------------
         Name: 7.00-INCH           Hydrology Sim: 7.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\7.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 010-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes
```

```
--------------------------------------------------------------------------------------------------------
         Name: 8.00-INCH          Hydrology Sim: 8.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\8.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 025-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

--------------------------------------------------------------------------------------------------------
         Name: 9.00-INCH          Hydrology Sim: 9.00-INCH
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\9.00-INCH.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 336.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages: 025-024                  Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
336.000         30.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
Gee             Yes
Grace Lake      Yes
Soldier         Yes

--------------------------------------------------------------------------------------------------------
         Name: MA-024             Hydrology Sim: MA-024
     Filename: L:\Projects_Drainage\Seminole\SMC-22014 Grace Lake\ICPR Pegasus (Sept 2013)\Devo Sims\MA-024.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                     End Time(hrs): 36.00
     Min Calc Time(sec): 0.1000               Max Calc Time(sec): 1.0000
        Boundary Stages: 010-024                  Boundary Flows:

GRACE LAKE SINKHOLE REMEDIATION
PROPOSED CONDITIONS ANALYSIS
MEAN ANNUAL STORM EVENT (24-HOUR DURATION)

Time(hrs)       Print Inc(min)
--------------- ---------------
999.000         15.000

Group           Run
--------------- -----
BASE            Yes
Cranes          Yes
```

Gee	Yes
Grace Lake	Yes
Soldier	Yes

==== Boundary Conditions ====

Name: 010-024 Node: GC-1000 Type: Stage

Time(hrs)	Stage(ft)
0.000	50.400
0.500	50.400
1.000	50.400
1.500	50.400
2.000	50.400
2.500	50.400
3.000	50.400
3.500	50.400
4.000	50.400
4.500	50.400
5.000	50.400
5.500	50.400
6.000	50.400
6.500	50.400
7.000	50.400
7.500	50.400
8.000	50.400
8.500	50.410
8.670	50.410
8.830	50.420
9.000	50.420
9.170	50.430
9.330	50.430
9.500	50.440
9.670	50.440
9.830	50.450
10.000	50.460
10.170	50.470
10.330	50.470
10.500	50.480
10.670	50.490
10.830	50.510
11.000	50.520
11.170	50.530
11.330	50.550
11.500	50.570
11.670	50.600
11.830	50.650
12.000	50.740
12.170	50.840
12.330	50.960
12.500	51.080
12.670	51.170
12.830	51.250
13.000	51.320
13.170	51.370
13.330	51.420
13.500	51.460
13.670	51.500
13.830	51.540
14.000	51.570
14.170	51.600
14.330	51.620
14.500	51.650
14.670	51.680
14.830	51.700
15.000	51.720
15.170	51.750
15.330	51.770
15.500	51.790
15.670	51.810
15.830	51.830
16.000	51.850
16.170	51.870
16.670	51.930
17.170	51.980
17.670	52.040
18.170	52.090
18.670	52.150
19.170	52.200

19.670	52.250
20.170	52.300
20.670	52.340
21.170	52.390
21.670	52.430
22.170	52.470
22.670	52.500
23.170	52.540
23.670	52.570
24.170	52.600
24.670	52.620
25.170	52.640
25.670	52.650
26.170	52.660
26.670	52.670
27.170	52.670
27.670	52.680
28.170	52.680
28.670	52.680
29.170	52.690
29.670	52.690
30.170	52.680
30.670	52.680
31.170	52.680
31.670	52.680
32.170	52.670
32.670	52.670
33.170	52.660
33.670	52.660
34.170	52.650
34.670	52.640
35.170	52.640
35.670	52.630
36.000	52.620

Name: 010-024 Node: SC-3000 Type: Stage

Time(hrs)	Stage(ft)
0.000	42.140
0.500	42.140
1.000	42.140
1.500	42.140
2.000	42.140
2.500	42.140
3.000	42.150
3.500	42.150
4.000	42.150
4.500	42.150
5.000	42.150
5.500	42.160
6.000	42.160
6.500	42.160
7.000	42.170
7.500	42.180
8.000	42.190
8.500	42.210
8.750	42.220
9.000	42.240
9.250	42.250
9.500	42.270
9.750	42.280
10.000	42.300
10.250	42.310
10.500	42.330
10.750	42.350
11.000	42.370
11.250	42.390
11.500	42.420
11.750	42.470
12.000	42.570
12.250	42.700
12.500	42.830
12.750	42.910
13.000	42.940
13.250	42.950
13.500	42.950
13.750	42.940
14.000	42.940
14.250	42.930
14.500	42.930
14.750	42.930

15.000	42.940
15.250	42.970
15.500	43.000
15.750	43.020
16.000	43.050
16.250	43.080
16.750	43.120
17.250	43.160
17.750	43.190
18.250	43.220
18.750	43.240
19.250	43.250
19.750	43.270
20.250	43.280
20.750	43.290
21.250	43.300
21.750	43.310
22.250	43.320
22.750	43.320
23.250	43.330
23.750	43.350
24.250	43.370
24.750	43.390
25.250	43.410
25.750	43.420
26.250	43.430
26.750	43.450
27.250	43.460
27.750	43.470
28.250	43.470
28.750	43.480
29.250	43.480
29.750	43.490
30.250	43.490
30.750	43.490
31.250	43.490
31.750	43.490
32.250	43.490
32.750	43.490
33.250	43.490
33.750	43.490
34.250	43.480
34.750	43.480
35.250	43.480
35.750	43.470
36.250	43.460
36.750	43.460
37.250	43.450
37.750	43.440
38.250	43.440
38.750	43.430
39.250	43.420
39.750	43.410
40.250	43.400
40.750	43.390
41.250	43.380
41.750	43.370
42.250	43.360
42.750	43.350
43.250	43.340
43.750	43.330
44.250	43.310
44.750	43.300
45.250	43.290
45.750	43.280
46.250	43.270
46.750	43.250
47.250	43.240
47.750	43.230
48.000	43.220

Name: 010-024 Node: SC-3010 Type: Stage

Time(hrs)	Stage(ft)
0.000	45.860
0.500	46.020
1.000	46.080
1.500	46.090
2.000	46.100
2.500	46.110
3.000	46.110

3.500	46.120
4.000	46.120
4.500	46.120
5.000	46.130
5.500	46.130
6.000	46.130
6.500	46.130
7.000	46.130
7.500	46.130
8.000	46.130
8.500	46.130
8.750	46.140
9.000	46.140
9.250	46.140
9.500	46.140
9.750	46.150
10.000	46.150
10.250	46.160
10.500	46.160
10.750	46.170
11.000	46.180
11.250	46.200
11.500	46.220
11.750	46.260
12.000	46.330
12.250	46.430
12.500	46.530
12.750	46.600
13.000	46.650
13.250	46.690
13.500	46.720
13.750	46.740
14.000	46.770
14.250	46.800
14.500	46.820
14.750	46.850
15.000	46.870
15.250	46.900
15.500	46.920
15.750	46.950
16.000	46.980
16.250	47.000
16.750	47.060
17.250	47.120
17.750	47.180
18.250	47.240
18.750	47.300
19.250	47.350
19.750	47.410
20.250	47.460
20.750	47.490
21.250	47.520
21.750	47.550
22.250	47.580
22.750	47.730
23.250	48.070
23.750	48.530
24.250	48.700
24.750	48.810
25.250	48.880
25.750	48.920
26.250	48.950
26.750	48.970
27.250	48.980
27.750	48.980
28.250	48.980
28.750	48.970
29.250	48.960
29.750	48.950
30.250	48.940
30.750	48.920
31.250	48.910
31.750	48.890
32.250	48.870
32.750	48.850
33.250	48.830
33.750	48.810
34.250	48.790
34.750	48.770
35.250	48.750
35.750	48.720
36.250	48.700
36.750	48.680

37.250	48.660
37.750	48.640
38.250	48.620
38.750	48.600
39.250	48.580
39.750	48.560
40.250	48.540
40.750	48.520
41.250	48.510
41.750	48.490
42.250	48.470
42.750	48.290
43.250	48.270
43.750	48.240
44.250	48.220
44.750	48.200
45.250	48.170
45.750	48.150
46.250	48.130
46.750	48.110
47.250	48.090
47.750	48.060
48.000	48.050

Name: 010-024 Node: SC-5000 Type: Stage

Time(hrs)	Stage(ft)
0.000	41.060
0.500	41.060
1.000	41.060
1.500	41.060
2.000	41.060
2.500	41.060
3.000	41.060
3.500	41.060
4.000	41.060
4.500	41.060
5.000	41.090
5.500	41.180
6.000	41.310
6.500	41.400
7.000	41.520
7.500	41.670
8.000	41.810
8.500	41.960
8.750	42.050
9.000	42.130
9.250	42.230
9.500	42.320
9.750	42.400
10.000	42.480
10.250	42.570
10.500	42.670
10.750	42.770
11.000	42.870
11.250	42.970
11.500	43.120
11.750	43.540
12.000	43.920
12.250	44.110
12.500	44.080
12.750	43.900
13.000	43.750
13.250	43.700
13.500	43.720
13.750	43.740
14.000	43.750
14.250	43.750
14.500	43.780
14.750	43.840
15.000	43.910
15.250	43.960
15.500	44.000
15.750	44.020
16.000	44.030
16.250	44.030
16.750	44.020
17.250	44.000
17.750	43.960
18.250	43.900
18.750	43.840

19.250	43.790
19.750	43.740
20.250	43.700
20.750	43.670
21.250	43.660
21.750	43.650
22.250	43.650
22.750	43.640
23.250	43.630
23.750	43.620
24.250	43.600
24.750	43.570
25.250	43.540
25.750	43.510
26.250	43.480
26.750	43.460
27.250	43.430
27.750	43.430
28.250	43.320
28.750	42.350
29.250	42.150
29.750	42.080
30.250	42.030
30.750	42.000
31.250	41.970
31.750	41.950
32.250	41.920
32.750	41.890
33.250	41.860
33.750	41.830
34.250	41.810
34.750	41.790
35.250	41.770
35.750	41.750
36.250	41.730
36.750	41.710
37.250	41.700
37.750	41.680
38.250	41.670
38.750	41.660
39.250	41.650
39.750	41.640
40.250	41.630
40.750	41.620
41.250	41.610
41.750	41.600
42.250	41.590
42.750	41.580
43.250	41.570
43.750	41.560
44.250	41.550
44.750	41.550
45.250	41.540
45.750	41.530
46.250	41.520
46.750	41.520
47.250	41.510
47.750	41.510
48.000	41.510

Name: 025-024 Node: GC-1000 Type: Stage

Time(hrs)	Stage(ft)
0.000	50.400
0.500	50.400
1.000	50.400
1.500	50.400
2.000	50.400
2.500	50.400
3.000	50.400
3.500	50.400
4.000	50.400
4.500	50.400
5.000	50.400
5.500	50.400
6.000	50.400
6.500	50.400
7.000	50.410
7.500	50.420
8.000	50.430
8.500	50.450

8.670	50.450
8.830	50.460
9.000	50.470
9.170	50.480
9.330	50.480
9.500	50.490
9.670	50.500
9.830	50.510
10.000	50.520
10.170	50.530
10.330	50.550
10.500	50.560
10.670	50.570
10.830	50.590
11.000	50.610
11.170	50.630
11.330	50.650
11.500	50.680
11.670	50.710
11.830	50.780
12.000	50.880
12.170	51.020
12.330	51.170
12.500	51.310
12.670	51.440
12.830	51.530
13.000	51.610
13.170	51.680
13.330	51.740
13.500	51.800
13.670	51.840
13.830	51.890
14.000	51.920
14.170	51.960
14.330	52.000
14.500	52.030
14.670	52.060
14.830	52.090
15.000	52.120
15.170	52.140
15.330	52.170
15.500	52.200
15.670	52.220
15.830	52.250
16.000	52.280
16.170	52.300
16.670	52.380
17.170	52.450
17.670	52.520
18.170	52.590
18.670	52.650
19.170	52.720
19.670	52.770
20.170	52.830
20.670	52.890
21.170	52.940
21.670	52.980
22.170	53.030
22.670	53.070
23.170	53.110
23.670	53.140
24.170	53.170
24.670	53.190
25.170	53.200
25.670	53.210
26.170	53.220
26.670	53.230
27.170	53.230
27.670	53.230
28.170	53.240
28.670	53.230
29.170	53.230
29.670	53.230
30.170	53.220
30.670	53.220
31.170	53.210
31.670	53.210
32.170	53.200
32.670	53.190
33.170	53.180
33.670	53.170
34.170	53.160
34.670	53.150

35.170	53.140
35.670	53.130
36.000	53.120

Name: 025-024 Node: SC-3000 Type: Stage

Time(hrs)	Stage(ft)
0.000	42.140
0.500	42.140
1.000	42.140
1.500	42.140
2.000	42.140
2.500	42.140
3.000	42.150
3.500	42.150
4.000	42.150
4.500	42.150
5.000	42.160
5.500	42.160
6.000	42.170
6.500	42.180
7.000	42.190
7.500	42.210
8.000	42.240
8.500	42.270
8.750	42.280
9.000	42.300
9.250	42.320
9.500	42.330
9.750	42.350
10.000	42.370
10.250	42.380
10.500	42.400
10.750	42.420
11.000	42.450
11.250	42.470
11.500	42.500
11.750	42.560
12.000	42.670
12.250	42.820
12.500	42.950
12.750	43.030
13.000	43.070
13.250	43.080
13.500	43.080
13.750	43.080
14.000	43.090
14.250	43.110
14.500	43.150
14.750	43.200
15.000	43.250
15.250	43.300
15.500	43.340
15.750	43.370
16.000	43.410
16.250	43.440
16.750	43.490
17.250	43.540
17.750	43.570
18.250	43.600
18.750	43.620
19.250	43.640
19.750	43.650
20.250	43.670
20.750	43.690
21.250	43.720
21.750	43.750
22.250	43.780
22.750	43.810
23.250	43.830
23.750	43.860
24.250	43.880
24.750	43.900
25.250	43.910
25.750	43.920
26.250	43.930
26.750	43.940
27.250	43.940
27.750	43.950
28.250	43.950
28.750	43.950

29.250	43.950
29.750	43.950
30.250	43.950
30.750	43.940
31.250	43.940
31.750	43.930
32.250	43.930
32.750	43.920
33.250	43.910
33.750	43.910
34.250	43.900
34.750	43.890
35.250	43.880
35.750	43.870
36.250	43.850
36.750	43.840
37.250	43.830
37.750	43.820
38.250	43.800
38.750	43.790
39.250	43.780
39.750	43.760
40.250	43.750
40.750	43.730
41.250	43.720
41.750	43.700
42.250	43.690
42.750	43.670
43.250	43.660
43.750	43.640
44.250	43.630
44.750	43.610
45.250	43.600
45.750	43.580
46.250	43.570
46.750	43.550
47.250	43.530
47.750	43.520
48.000	43.510

Name: 025-024 Node: SC-3010 Type: Stage

Time(hrs)	Stage(ft)
0.000	45.860
0.500	46.020
1.000	46.080
1.500	46.090
2.000	46.100
2.500	46.110
3.000	46.110
3.500	46.120
4.000	46.120
4.500	46.120
5.000	46.130
5.500	46.130
6.000	46.130
6.500	46.130
7.000	46.130
7.500	46.130
8.000	46.140
8.500	46.150
8.750	46.150
9.000	46.150
9.250	46.160
9.500	46.160
9.750	46.170
10.000	46.180
10.250	46.190
10.500	46.200
10.750	46.220
11.000	46.240
11.250	46.260
11.500	46.290
11.750	46.330
12.000	46.400
12.250	46.570
12.500	46.710
12.750	46.800
13.000	46.860
13.250	46.910
13.500	46.940

13.750	46.980
14.000	47.010
14.250	47.040
14.500	47.070
14.750	47.100
15.000	47.130
15.250	47.160
15.500	47.190
15.750	47.220
16.000	47.260
16.250	47.290
16.750	47.350
17.250	47.410
17.750	47.460
18.250	47.500
18.750	47.530
19.250	47.570
19.750	47.720
20.250	48.190
20.750	48.710
21.250	48.950
21.750	49.120
22.250	49.240
22.750	49.310
23.250	49.370
23.750	49.410
24.250	49.430
24.750	49.430
25.250	49.430
25.750	49.440
26.250	49.430
26.750	49.430
27.250	49.420
27.750	49.410
28.250	49.400
28.750	49.380
29.250	49.360
29.750	49.340
30.250	49.320
30.750	49.300
31.250	49.280
31.750	49.250
32.250	49.230
32.750	49.190
33.250	49.160
33.750	49.130
34.250	49.100
34.750	49.080
35.250	49.050
35.750	49.020
36.250	48.990
36.750	48.960
37.250	48.930
37.750	48.900
38.250	48.870
38.750	48.840
39.250	48.820
39.750	48.790
40.250	48.770
40.750	48.740
41.250	48.720
41.750	48.700
42.250	48.670
42.750	48.650
43.250	48.630
43.750	48.610
44.250	48.590
44.750	48.570
45.250	48.550
45.750	48.530
46.250	48.510
46.750	48.500
47.250	48.480
47.750	48.460
48.000	48.290

Name: 025-024 Node: SC-5000 Type: Stage

Time(hrs)	Stage(ft)
0.000	41.060
0.500	41.060

1.000	41.060
1.500	41.060
2.000	41.060
2.500	41.060
3.000	41.060
3.500	41.060
4.000	41.060
4.500	41.140
5.000	41.280
5.500	41.390
6.000	41.510
6.500	41.670
7.000	41.830
7.500	42.000
8.000	42.170
8.500	42.340
8.750	42.420
9.000	42.500
9.250	42.580
9.500	42.650
9.750	42.730
10.000	42.800
10.250	42.870
10.500	42.960
10.750	43.070
11.000	43.160
11.250	43.240
11.500	43.430
11.750	43.690
12.000	44.060
12.250	44.120
12.500	44.140
12.750	44.090
13.000	43.950
13.250	43.930
13.500	43.870
13.750	43.960
14.000	44.130
14.250	44.240
14.500	44.340
14.750	44.420
15.000	44.490
15.250	44.540
15.500	44.570
15.750	44.580
16.000	44.580
16.250	44.570
16.750	44.520
17.250	44.470
17.750	44.410
18.250	44.350
18.750	44.290
19.250	44.240
19.750	44.180
20.250	44.130
20.750	44.070
21.250	43.990
21.750	43.910
22.250	43.840
22.750	43.770
23.250	43.720
23.750	43.690
24.250	43.660
24.750	43.630
25.250	43.600
25.750	43.570
26.250	43.550
26.750	43.530
27.250	43.510
27.750	43.480
28.250	43.460
28.750	43.440
29.250	43.410
29.750	43.400
30.250	42.620
30.750	42.160
31.250	42.050
31.750	42.010
32.250	41.980
32.750	41.960
33.250	41.930
33.750	41.910
34.250	41.900

34.750	41.890
35.250	41.880
35.750	41.860
36.250	41.850
36.750	41.840
37.250	41.830
37.750	41.820
38.250	41.830
38.750	41.810
39.250	41.800
39.750	41.790
40.250	41.770
40.750	41.760
41.250	41.750
41.750	41.730
42.250	41.720
42.750	41.710
43.250	41.700
43.750	41.680
44.250	41.670
44.750	41.660
45.250	41.650
45.750	41.640
46.250	41.630
46.750	41.620
47.250	41.610
47.750	41.600
48.000	41.600

Name: 100-024 Node: GC-1000 Type: Stage

Time(hrs)	Stage(ft)
0.000	50.400
0.500	50.400
1.000	50.400
1.500	50.400
2.000	50.400
2.500	50.400
3.000	50.410
3.500	50.410
4.000	50.410
4.500	50.410
5.000	50.420
5.500	50.420
6.000	50.440
6.500	50.450
7.000	50.460
7.500	50.480
8.000	50.510
8.500	50.540
8.670	50.550
8.830	50.560
9.000	50.570
9.170	50.580
9.330	50.600
9.500	50.610
9.670	50.630
9.830	50.640
10.000	50.660
10.170	50.680
10.330	50.700
10.500	50.720
10.670	50.740
10.830	50.770
11.000	50.790
11.170	50.820
11.330	50.850
11.500	50.890
11.670	50.950
11.830	51.040
12.000	51.170
12.170	51.350
12.330	51.560
12.500	51.760
12.670	51.940
12.830	52.080
13.000	52.200
13.170	52.310
13.330	52.410
13.500	52.490
13.670	52.570

13.830	52.640
14.000	52.710
14.170	52.770
14.330	52.830
14.500	52.880
14.670	52.930
14.830	52.970
15.000	53.010
15.170	53.050
15.330	53.080
15.500	53.120
15.670	53.150
15.830	53.180
16.000	53.210
16.170	53.230
16.670	53.310
17.170	53.380
17.670	53.440
18.170	53.500
18.670	53.560
19.170	53.610
19.670	53.660
20.170	53.700
20.670	53.740
21.170	53.780
21.670	53.820
22.170	53.850
22.670	53.880
23.170	53.910
23.670	53.940
24.170	53.970
24.670	53.980
25.170	54.000
25.670	54.000
26.170	54.010
26.670	54.010
27.170	54.010
27.670	54.000
28.170	54.000
28.670	54.000
29.170	53.990
29.670	53.990
30.170	53.980
30.670	53.970
31.170	53.970
31.670	53.960
32.170	53.950
32.670	53.940
33.170	53.920
33.670	53.910
34.170	53.900
34.670	53.890
35.170	53.870
35.670	53.860
36.000	53.850

Name: 100-024 Node: SC-3000 Type: Stage

Time(hrs)	Stage(ft)
0.000	42.140
0.500	42.140
1.000	42.140
1.500	42.140
2.000	42.140
2.500	42.140
3.000	42.150
3.500	42.150
4.000	42.150
4.500	42.160
5.000	42.170
5.500	42.180
6.000	42.210
6.500	42.230
7.000	42.270
7.500	42.300
8.000	42.330
8.500	42.370
8.750	42.380
9.000	42.400
9.250	42.420
9.500	42.440

9.750	42.460
10.000	42.470
10.250	42.500
10.500	42.520
10.750	42.540
11.000	42.570
11.250	42.600
11.500	42.630
11.750	42.700
12.000	42.830
12.250	42.980
12.500	43.130
12.750	43.230
13.000	43.300
13.250	43.350
13.500	43.390
13.750	43.450
14.000	43.540
14.250	43.610
14.500	43.690
14.750	43.750
15.000	43.810
15.250	43.860
15.500	43.910
15.750	43.950
16.000	43.990
16.250	44.020
16.750	44.090
17.250	44.150
17.750	44.200
18.250	44.250
18.750	44.300
19.250	44.350
19.750	44.390
20.250	44.430
20.750	44.460
21.250	44.490
21.750	44.520
22.250	44.550
22.750	44.570
23.250	44.600
23.750	44.620
24.250	44.640
24.750	44.650
25.250	44.660
25.750	44.670
26.250	44.670
26.750	44.670
27.250	44.670
27.750	44.670
28.250	44.670
28.750	44.670
29.250	44.670
29.750	44.670
30.250	44.670
30.750	44.670
31.250	44.660
31.750	44.660
32.250	44.650
32.750	44.650
33.250	44.640
33.750	44.630
34.250	44.620
34.750	44.610
35.250	44.600
35.750	44.590
36.250	44.570
36.750	44.560
37.250	44.540
37.750	44.530
38.250	44.510
38.750	44.490
39.250	44.470
39.750	44.450
40.250	44.430
40.750	44.410
41.250	44.390
41.750	44.370
42.250	44.350
42.750	44.330
43.250	44.300
43.750	44.280
44.250	44.260

44.750	44.240
45.250	44.210
45.750	44.190
46.250	44.170
46.750	44.140
47.250	44.120
47.750	44.100
48.000	44.070

Name: 100-024 Node: SC-3010 Type: Stage

Time(hrs)	Stage(ft)
0.000	45.860
0.500	46.020
1.000	46.080
1.500	46.090
2.000	46.100
2.500	46.110
3.000	46.110
3.500	46.120
4.000	46.120
4.500	46.120
5.000	46.130
5.500	46.130
6.000	46.130
6.500	46.140
7.000	46.150
7.500	46.150
8.000	46.170
8.500	46.180
8.750	46.190
9.000	46.200
9.250	46.220
9.500	46.230
9.750	46.250
10.000	46.270
10.250	46.290
10.500	46.320
10.750	46.330
11.000	46.330
11.250	46.340
11.500	46.360
11.750	46.440
12.000	46.630
12.250	46.860
12.500	47.030
12.750	47.140
13.000	47.210
13.250	47.270
13.500	47.310
13.750	47.350
14.000	47.390
14.250	47.430
14.500	47.460
14.750	47.480
15.000	47.500
15.250	47.520
15.500	47.540
15.750	47.560
16.000	47.600
16.250	47.750
16.750	48.370
17.250	48.910
17.750	49.200
18.250	49.380
18.750	49.510
19.250	49.610
19.750	49.700
20.250	49.770
20.750	49.830
21.250	49.890
21.750	49.890
22.250	49.910
22.750	49.940
23.250	49.950
23.750	49.960
24.250	49.970
24.750	49.960
25.250	49.950
25.750	49.950
26.250	49.950

26.750	49.950
27.250	49.950
27.750	49.950
28.250	49.940
28.750	49.940
29.250	49.940
29.750	49.940
30.250	49.940
30.750	49.930
31.250	49.920
31.750	49.910
32.250	49.900
32.750	49.890
33.250	49.890
33.750	49.870
34.250	49.840
34.750	49.810
35.250	49.770
35.750	49.740
36.250	49.700
36.750	49.660
37.250	49.620
37.750	49.580
38.250	49.530
38.750	49.490
39.250	49.450
39.750	49.410
40.250	49.370
40.750	49.340
41.250	49.300
41.750	49.260
42.250	49.220
42.750	49.180
43.250	49.140
43.750	49.100
44.250	49.070
44.750	49.040
45.250	49.010
45.750	48.980
46.250	48.950
46.750	48.920
47.250	48.890
47.750	48.870
48.000	48.840

Name: 100-024 Node: SC-5000 Type: Stage

Time(hrs)	Stage(ft)
0.000	41.060
0.500	41.060
1.000	41.060
1.500	41.060
2.000	41.060
2.500	41.060
3.000	41.060
3.500	41.140
4.000	41.280
4.500	41.420
5.000	41.600
5.500	41.810
6.000	42.000
6.500	42.190
7.000	42.380
7.500	42.530
8.000	42.680
8.500	42.800
8.750	42.870
9.000	42.940
9.250	43.020
9.500	43.080
9.750	43.140
10.000	43.200
10.250	43.370
10.500	43.370
10.750	43.430
11.000	43.500
11.250	43.540
11.500	43.610
11.750	43.920
12.000	44.160
12.250	44.250

12.500	44.260
12.750	44.220
13.000	44.240
13.250	44.400
13.500	44.650
13.750	44.870
14.000	45.020
14.250	45.170
14.500	45.290
14.750	45.370
15.000	45.460
15.250	45.500
15.500	45.500
15.750	45.470
16.000	45.410
16.250	45.350
16.750	45.250
17.250	45.140
17.750	45.030
18.250	44.910
18.750	44.800
19.250	44.690
19.750	44.600
20.250	44.510
20.750	44.420
21.250	44.350
21.750	44.280
22.250	44.220
22.750	44.170
23.250	44.120
23.750	44.050
24.250	43.970
24.750	43.860
25.250	43.730
25.750	43.640
26.250	43.600
26.750	43.580
27.250	43.560
27.750	43.540
28.250	43.530
28.750	43.510
29.250	43.510
29.750	43.510
30.250	43.510
30.750	43.490
31.250	43.470
31.750	43.450
32.250	43.420
32.750	43.420
33.250	43.330
33.750	42.350
34.250	42.110
34.750	42.050
35.250	42.020
35.750	42.000
36.250	41.980
36.750	41.960
37.250	41.950
37.750	41.930
38.250	41.920
38.750	41.910
39.250	41.900
39.750	41.890
40.250	41.880
40.750	41.870
41.250	41.870
41.750	41.860
42.250	41.860
42.750	41.850
43.250	41.850
43.750	41.840
44.250	41.840
44.750	41.840
45.250	41.830
45.750	41.830
46.250	41.830
46.750	41.830
47.250	41.830
47.750	41.820
48.000	41.820

ATTACHMENT C

PONDS Data Printout For
Preferred Calibration Scenario #2

PONDS Version 3.3.0276
Retention Pond Recovery - Refined Method

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

Project Data

Project Name: Grace Lake

Simulation Description: Calibration to May through August, 2013 rainfall
65% rating curve factor, 1.27 cfs sinkhole leakage

Project Number: 12-836.12

Engineer : RDC

Supervising Engineer: Devo Seereeram

Date: 10-21-2013

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum): 30.00

Water Table Elevation, [WT] (ft datum): 52.50

Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day): 2.00

Fillable Porosity, [n] (%): 20.00

Vertical infiltration was not considered.

Geometry Data

Equivalent Pond Length, [L] (ft): 1500.0

Equivalent Pond Width, [W] (ft): 600.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft^2)
48.00	51836.0
49.00	158123.0
50.00	256133.0
51.00	354143.0
52.00	458251.0
53.00	561053.0
54.00	650786.0
55.00	732244.0
56.00	813701.0
57.00	893851.0
58.00	989248.0
59.00	1091178.0
60.00	1196593.0
61.00	1292425.0
62.00	1391742.0
63.00	1496722.0
64.00	1596038.0
65.00	1680545.0
66.00	1758953.0

Stage vs Area Data (cont'd.)

Stage (ft datum)	**Area (ft^2)**
67.00	1849993.0

Discharge Structures

Discharge Structure #1 is active as rating curve

Description: Rating Curve For Sinkhole Drainage

Stage (ft datum)	Discharge (ft^3/s)
48.01	0
48.1	1.27
99	1.27

Discharge Structure #2 is active as weir

Structure Parameters

Description: Overflow Elevation

Weir elevation, (ft datum):	62.6
Weir coefficient:	2.861
Weir length, (ft):	100
Weir exponent:	1.5

Tailwater - disabled, free discharge

Discharge Structure #3 is active as weir

Structure Parameters

Description: High Level Outfall

Weir elevation, (ft datum):	65.5
Weir coefficient:	2.861
Weir length, (ft):	20
Weir exponent:	1.5

Tailwater - disabled, free discharge

Scenario Input Data

Scenario 1 :: May Through August, 2013

Hydrograph Type:	Continuous Simulation
Modflow Routing:	Routed with infiltration
Number of Sub-Increments Per Stress Period:	48

Rainfall Data

Data Format:	Date range, daily (monthly summary below)
Starting Date:	May 6, 2013
Ending Date:	Aug 28, 2013

Summary of monthly rainfall

Month	Rainfall (inches)
5/2013	2.81
6/2013	18.45
7/2013	6.98
8/2013	5.31

Runoff - Basin Parameters

Lake area (acres): 22.71

Surface water basin data:

Total area of drainage basin, including lake (acres):	193.61
Directly Connected Impervious Area (acres):	0
Impervious area within basin where there are no E.T. losses (acres):	61
Curve Number for non-DCIA Area (AMC I):	39.4
Curve Number for non-DCIA Area (AMC II):	59.4
Curve Number for non-DCIA Area (AMC III):	77.4
Curve Number for DCIA	98

Ground water basin data:

Uses surface water basin data

Season Definitions

Data Format:	Calendar year, monthly
Starting Date:	Jan
Ending Date:	Dec

Date	Season	Date	Season
Jan	dormant	Jul	growing
Feb	dormant	Aug	growing
Mar	dormant	Sep	growing
Apr	dormant	Oct	dormant
May	dormant	Nov	dormant
Jun	growing	Dec	dormant

Scenario 1 (cont'd.) :: May Through August, 2013

Evaporation and Evapotranspiration

Evapotranspiration ratio: ET (impervious) / ET (pervious)

ET Ratio (%) 0

Evaporation and Evapotranspiration Rates

Data Format:	Calendar year, monthly
Starting Date:	Jan
Ending Date:	Dec

Date	Monthly Evaporation (inches)	Monthly E.T. (inches)
Jan	2.20	1.97
Feb	2.50	1.85
Mar	3.90	2.68
Apr	5.50	3.31
May	6.70	3.07
Jun	5.80	4.88
Jul	6.20	4.76
Aug	5.50	4.45
Sep	4.40	4.09
Oct	3.60	4.06
Nov	2.40	2.32
Dec	2.20	1.97

Diffuse Vertical Leakage

Leakage model: Constant rate

Leakage Inside Pond (inch/yr)	60
Leakage Outside Pond (inch/yr)	12

Artificial Recharge

Number of septic tanks within influence of pond	0
Average daily flow per septic tank (gpd)	0
Other baseflows (gpd)	0

Upgradient Flows

Number of contributing upgradient nodes:	1
Data Format:	Date range, daily
Starting Date:	May 6, 2013
Ending Date:	Aug 28, 2013

Scenario Input Data (cont'd.)

Scenario 1 (cont'd.) :: May Through August, 2013

Upgradient Flows (cont'd.)

Summary of monthly upgradient discharge from Node 1

Month	Upgradient Discharge (cu-ft)
5/2013	17,190
6/2013	7,019,343
7/2013	362,569
8/2013	9,004

Direct Lake Pumping

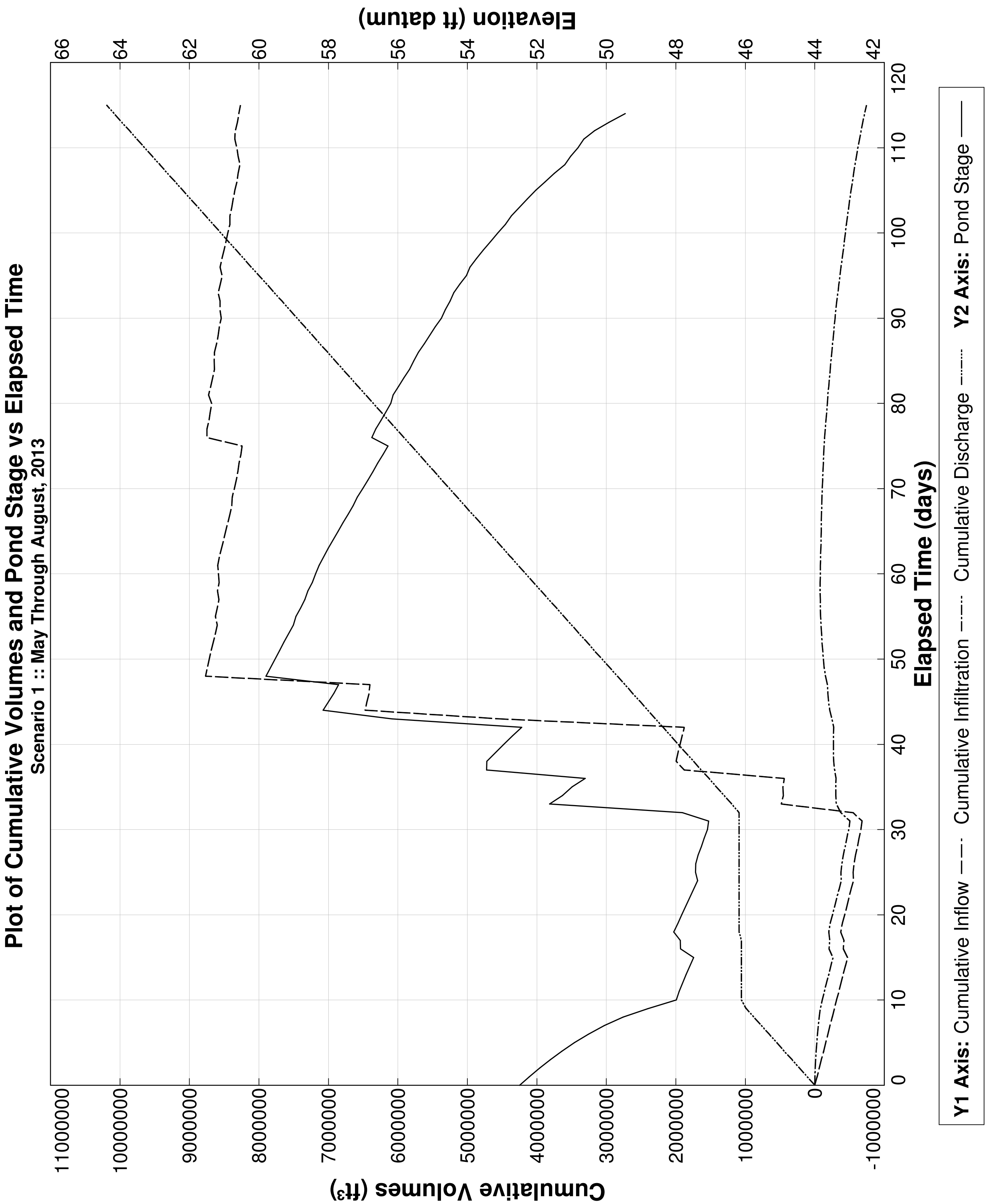
Number of contributing pump nodes: none

Summary

Not available

Summary of Results *:: Scenario 1 :: May Through August, 2013*

	Time (hours)	Stage (ft datum)	Rate (ft^3/s)	Volume (ft^3)
Stage				
Minimum	744.000	47.06		
Maximum	1152.000	59.80		
Inflow				
Rate - Maximum - Positive	1032.000		111.2672	
Rate - Maximum - Negative	1056.000		-66.2283	
Cumulative Volume - Maximum Positive	1152.000			8769971.0
Cumulative Volume - Maximum Negative	744.000			-678801.4
Cumulative Volume - End of Simulation	2760.000			8266872.0
Infiltration				
Rate - Maximum - Positive	768.000		1.1212	
Rate - Maximum - Negative	264.000		-0.3631	
Cumulative Volume - Maximum Positive	None			None
Cumulative Volume - Maximum Negative	2760.000			-745172.1
Cumulative Volume - End of Simulation	2760.000			-745172.1
Combined Discharge				
Rate - Maximum - Positive	24.000		1.2700	
Rate - Maximum - Negative	None		None	
Cumulative Volume - Maximum Positive	2760.000			10194560.0
Cumulative Volume - Maximum Negative	None			None
Cumulative Volume - End of Simulation	2760.000			10194560.0
Discharge Structure 1 - simple rating curve				
Rate - Maximum - Positive	24.000		1.2700	
Rate - Maximum - Negative	None		None	
Cumulative Volume - Maximum Positive	2760.000			10194560.0
Cumulative Volume - Maximum Negative	None			None
Cumulative Volume - End of Simulation	2760.000			10194560.0
Discharge Structure 2 - simple weir				
Rate - Maximum - Positive	None		None	
Rate - Maximum - Negative	None		None	
Cumulative Volume - Maximum Positive	None			None
Cumulative Volume - Maximum Negative	None			None
Cumulative Volume - End of Simulation	2760.000			0.0
Discharge Structure 3 - simple weir				
Rate - Maximum - Positive	None		None	
Rate - Maximum - Negative	None		None	
Cumulative Volume - Maximum Positive	None			None
Cumulative Volume - Maximum Negative	None			None
Cumulative Volume - End of Simulation	2760.000			0.0
Pollution Abatement:				
36 Hour Stage and Infiltration Volume	N.A.	N.A.		N.A.
72 Hour Stage and Infiltration Volume	N.A.	N.A.		N.A.


Plot of Cumulative Volumes and Pond Stage vs Elapsed Time
Scenario 1 :: May Through August, 2013
Elevation (ft datum)
66 64 62 60 58 56 54 52 50 48 46 44 42
Cumulative Volumes (ft³)
11000000 10000000 9000000 8000000 7000000 6000000 5000000 4000000 3000000 2000000 1000000 0 -1000000
Elapsed Time (days)
0 10 20 30 40 50 60 70 80 90 100 110 120
Y1 Axis: Cumulative Inflow Cumulative Infiltration Cumulative Discharge
Y2 Axis: Pond Stage

St. Johns River Water Management District (SJRWMD)
Joint Application for Individual Environmental Resource Permit

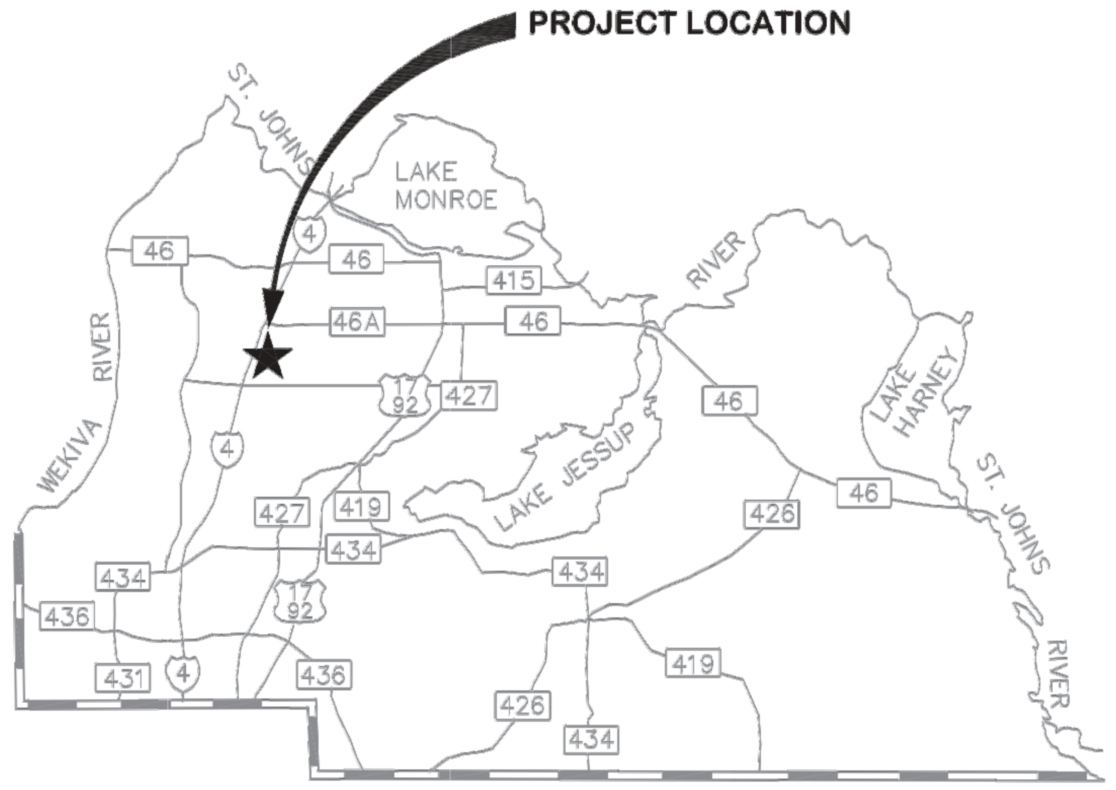
ERP Application No. 4-117-121387-2
Alternative Sinkhole Remediation Protocol for Grace Lake

TAB 7

Construction Plans
(11" x 17" Not to Scale)

DEVO's JOB FILE #	SHEET
13-087	1

PROJECT LOCATION



VICINITY MAP

SEMINOLE COUNTY
PUBLIC WORKS DEPARTMENT

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

CONSTRUCTION PLANS

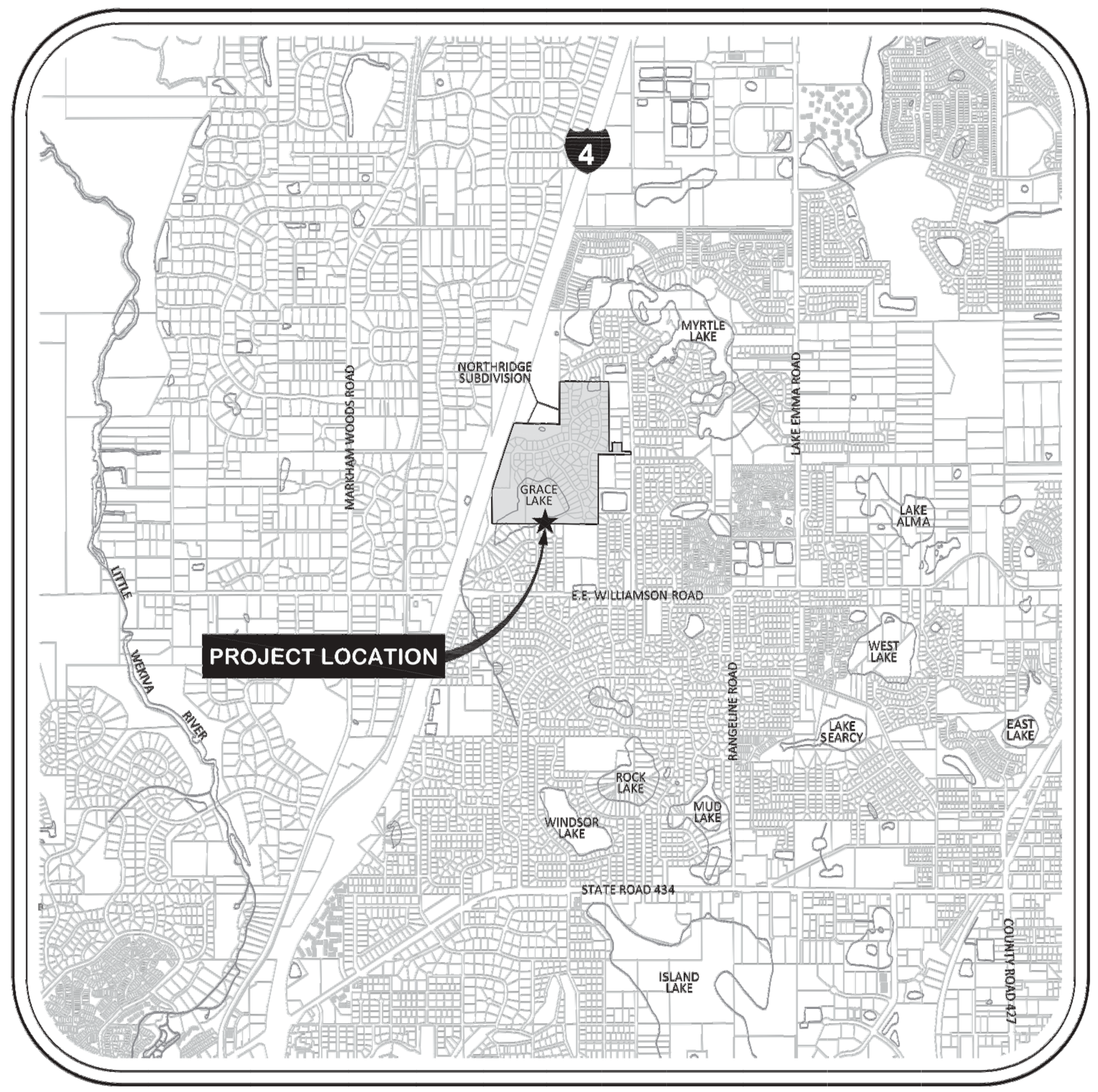
WORK ORDER #47
GRACE LAKE SINKHOLE REPAIR PROJECT

INDEX OF PLANS

NOTES

1. GOVERNING SPECIFICATIONS: STATE OF FLORIDA, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATIONS (LATEST EDITION) AND SUPPLEMENTS THERETO IF NOTED IN THE TECHNICAL PROVISIONS FOR THIS PROJECT.
2. ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN CHANGED IN SIZE BY REPRODUCTION. THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA.
   - 11" X 17" DRAWINGS ~ NOT TO SCALE
   - 12" X 18" DRAWINGS ~ HALF SCALE
   - 24" X 36" DRAWINGS ~ TO SCALE
3. INFORMATION SHOWN WITHIN THESE PLANS IS REFERENCED TO THE NAVD88 VERTICAL DATUM.
4. DATUM SHIFT FOR THIS PROJECT (SEE PROJECT LOCATION SUMMARY THIS SHEET) WILL BE APPLIED AS A CONSTANT VALUE FOR CONVERTING ELEVATIONS BETWEEN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).

COMPUTED DATUM SHIFTS
- NAVD88 + 1.030' = NGVD29
- NGVD29 - 1.030' = NAVD88



Section 25, Township 20S, Range 29E
Latitude 28° 42m 59.9s
Longitude 81° 22m 24.5s

APPROXIMATE LOCATION OF THE EXISTING SINKHOLE ON THE SOUTH SIDE OF GRACE LAKE

LOCATION MAP
ROADS AND PACELS PROVIDED BY SEMINOLE COUNTY

N.T.S

LENGTH OF PROJECT						
			SIDE STREETS		TOTAL	
	LIN.FT.	MILES	LIN.FT.	MILES	LIN.FT.	MILES
DRAINAGE IMPROVEMENTS	—	—	—	—	—	—
	—	—	—	—	—	—
NET LENGTH OF PROJECT	—	—	—	—	—	—
EXCEPTIONS	—	—	—	—	—	—
GROSS LENGTH OF PROJECT	—	—	—	—	—	—

PREPARED FOR:

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

Mark Flomerfelt, P.E.
100 East First Street
Sanford, Florida 32771
Phone: 407-665-5709 | Fax: 407-665-5786
E-mail: mflomerfelt@seminolecountyfl.gov

PREPARED BY:

State of Florida Board of Professional Engineers Certificate of Authorization No. 28221

DEVO Engineering

5500 Alhambra Drive
Orlando, Florida 32808
Phone: 407-290-2371 | Fax: 407-298-9011
E-mail: devo@devoeng.com

PLANS APPROVED BY: ______________________

DEVO SEEREERAM, Ph.D., P.E. # 48303 DATE

CONSTRUCTION COMPLETION DATE ______________________

FIELD VERIFIED BY ______________________

REVISIONS / SUBMITTAL SUMMARY		
BY	DATE	DESCRIPTION
VP	10 / 23 / 2013	60% PLANS SUBMITTAL
RP	02/05/2014	100% PLANS SUBMITTAL

CONSTRUCTION PLANS ~ GRACE LAKE SINKHOLE REPAIR PROJECT

GENERAL NOTES:

1. THESE GENERAL NOTES APPLY TO ALL WORK IN THIS SET OF DRAWINGS.
2. CONTRACTOR SHALL OBTAIN A SEMINOLE COUNTY CONSTRUCTION PERMIT AT LEAST ONE (1) WEEK PRIOR TO COMMENCEMENT OF CONSTRUCTION FROM KEITH DENTON, PERMIT COORDINATOR AT 100 E. FIRST STREET, SANFORD, FLORIDA 32771, TELEPHONE (407) 665-5663.
3. CONTRACTOR SHALL OBTAIN DEWATERING PERMITS (LATEST EDITION), AS REQUIRED, FROM ST. JOHNS RIVER WATER MANAGEMENT DISTRICT.
4. ALL CONSTRUCTION, MATERIALS, INSPECTION AND TESTING SHALL, AS A MINIMUM, CONFORM TO FDOT STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION DATED 2013 AND FDOT DESIGN STANDARDS DATED 2013.
5. UNSUITABLE MATERIALS SHALL BE REMOVED FROM CONSTRUCTION AREAS AND REPLACED WITH SUITABLE FDOT APPROVED MATERIALS. UNSUITABLE MATERIALS SHALL BE DISPOSED OF OFF-SITE BY THE CONTRACTOR AS DIRECTED BY THE ENGINEER.
6. ALL PERSONAL PROPERTY WITHIN THE RIGHT-OF-WAY SHALL BE RELOCATED BY THE PROPERTY OWNER OR IT SHALL BE REMOVED BY THE CONTRACTOR AS NECESSARY TO CONSTRUCT THE PROJECT IN ACCORDANCE WITH THE PLANS.
7. ALL PRIVATE AND PUBLIC PROPERTY AFFECTED BY THE CONSTRUCTION WORK SHALL BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN THE EXISTING PRE-CONSTRUCTION CONDITION, UNLESS OTHERWISE NOTED.
8. ANY DRAINAGE PROBLEMS EXISTING BEFORE AND DURING CONSTRUCTION SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
9. TEMPORARY DRAINAGE SHALL BE PROVIDED DURING CONSTRUCTION AS NECESSARY TO ELIMINATE ANY FLOODING OF PRIVATE PROPERTY.
10. THE EROSION CONTROL MEASURES PER "FDOT EROSION AND SEDIMENT CONTROL - DESIGNER AND REVIEWER MANUAL" (LATEST EDITION DATED JULY 2013) ARE THE MINIMUM REQUIRED. ADDITIONAL EROSION CONTROL MEASURES REQUIRED DUE TO CONDITIONS AS DETERMINED BY THE REGULATORY AGENCIES.
11. CAUTION SHALL BE EXERCISED WHILE RELOCATING SIGNS TO PREVENT UNNECESSARY DAMAGE. IF THE SIGNS ARE DAMAGED BEYOND USE, AS DETERMINED BY THE COUNTY, SIGNS SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
12. DURING CONSTRUCTION, TRAFFIC SHALL BE MAINTAINED IN ACCORDANCE WITH THE FDOT STANDARD INDEX 600 SERIES AND THE FDOT "MANUAL ON TRAFFIC CONTROLS AND SAFE PRACTICES FOR STREET AND HIGHWAY CONSTRUCTION MAINTENANCE AND UTILITY OPERATION." THE CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN TO, AND SHALL BE APPROVED BY, THE COUNTY ENGINEER PRIOR TO THE PRE-CONSTRUCTION MEETING.
13. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLY WITH THE CURRENT STATE OF FLORIDA UNDERGROUND FACILITY DAMAGE PREVENTION AND SAFETY ACT AND/OR RELATED STATE LAW. THE UTILITY INFORMATION SHOWN IN THESE PLANS IS PROVIDED BY SEMINOLE COUNTY IN AN EFFORT TO ASSIST THE CONTRACTOR BY LISTING UTILITIES THAT MAY PROVIDE SERVICE IN THE APPROXIMATE AREA OF THE PROPOSED CONSTRUCTION.
14. THE PROJECT AREA SHALL BE CLEARED OF ALL OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO SHRUBS, WEEDS, TREES AND OTHER FORMS OF TRASH OR DEBRIS. THESE OBSTRUCTIONS SHALL BE SATISFACTORILY DISPOSED OF OFF-SITE, IN AREAS PROVIDED BY THE CONTRACTOR.
15. IT IS CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND SUNSHINE STATE UTILITY LOCATES AT 1(800)432-4770 AT LEAST ONE (1) WEEK PRIOR TO COMMENCEMENT OF CONSTRUCTION AND HAVE OWNERS OF SAID UTILITIES ADJUST UTILITIES AS NECESSARY.
16. ANY PUBLIC LAND CORNER OR COUNTY MONUMENT WITHIN THE LIMITS OF CONSTRUCTION ARE TO BE PROTECTED. IF A CORNER MONUMENT IS IN DANGER OF BEING DESTROYED AND HAS NOT BEEN PROPERLY REFERENCED, THE CONSTRUCTION MANAGER SHOULD NOTIFY SEMINOLE COUNTY SURVEYOR WITHOUT DELAY BY TELEPHONE AT SEMINOLE COUNTY ENGINEERING, 100 E. FIRST STREET, SANFORD, FLORIDA 32771, TELEPHONE (407)665-5656.
17. IN THE EVENT THERE IS A CONFLICT BETWEEN THE PLANS AND TECHNICAL PROVISIONS, THE TECHNICAL PROVISIONS SHALL SUPERSEDE, UNLESS OTHERWISE DETERMINED BY THE ENGINEER.
18. CONTRACTOR SHALL PREPARE AS-BUILT DRAWINGS DURING AND AFTER CONSTRUCTION AND PROVIDE TO THE COUNTY WITHIN FOURTEEN (14) DAYS OF FINAL COMPLETION.
19. CONTRACTOR SHALL COORDINATE ACCESS TO THE SITE THROUGH EASEMENTS WITH THE COUNTY.
20. THE CONTRACTOR SHALL COMPLY WITH ALL RULES, REGULATIONS, AND SPECIFICATIONS OF SEMINOLE COUNTY AND THE FLORIDA DEPARTMENT OF TRANSPORTATION FOR SITE IMPROVEMENT IN THE ABSENCE OF A PARTICULAR REQUIREMENT.
21. AFTER COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL PERFORM SITE CLEAN-UP OPERATION FOR REMOVAL OF ALL TRASH, DEBRIS, EXCESS MATERIAL AND EQUIPMENT. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PRESENT THE PROJECT SITE CLEAN AND IN GOOD ORDER AT THE TIME OF FINAL ACCEPTANCE.

GEOMETRY & SURVEY NOTES:

1. THE PROPOSED DESIGN PLANS ARE BASED ON A SURVEY PREPARED FOR THE OWNER BY SSMC, SOUTHEASTERN SURVEYING & MAPPING COMPANY DATED 12/17/2007 AND REVISITED ON 04/19/2011.
2. CONTRACTOR SHALL STAKE ALL IMPROVEMENTS USING THE GEOMETRIC DATA PROVIDED. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO COMPLETELY STAKE AND CHECK ALL IMPROVEMENTS TO ENSURE ADEQUATE POSITIONING, BOTH HORIZONTAL AND VERTICAL, PRIOR TO THE INSTALLATION OF ANY IMPROVEMENTS. THE CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER IF ANY APPARENT DISCREPANCIES ARE FOUND.
3. ALL (P.R.M.'s) IRONS AND MONUMENTS SHOWN ON PLANS, OR FOUND, SHALL BE PRESERVED. PUBLIC LAND CORNERS WITHIN THE LIMITS OF CONSTRUCTION SHALL BE PROTECTED.
4. IF A CORNER MONUMENT IS IN DANGER OF BEING DESTROYED OR DISTURBED, THE CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE COUNTY SURVEYOR, WITHOUT DELAY, BY TELEPHONE. THE CONTRACTOR SHALL PROVIDE WRITTEN FOLLOW-UP CONFIRMATION WITHIN 48 HOURS OF TELEPHONE NOTIFICATION.
5. VERTICAL INFORMATION SHOWN HEREON REFERS TO SEMINOLE COUNTY BENCHMARK STAMPED "SEM. CO. 4086001 GPS MIKE GARCIA 0120", BEING A 4" X 4" CONCRETE MONUMENT WITH BRASS DISK IN POURED-IN-PLACE CONCRETE COLLAR, SET AT THE NORTHEAST CORNER OF INTERSECTION OF E.E. WILLIAMSON ROAD & WOODLANDS ELEMENTARY SCHOOL DRIVE AT THE EDGE OF WALK. ELEVATION 86.537' (NAVD88). ELECTRONIC SURVEY FILES WITH THIS BENCHMARK ARE AVAILABLE UPON REQUEST FROM THE COUNTY.

EARTHWORK ACTIVITIES:

1. THE DISPOSAL OF EXCESS EARTHWORK MATERIALS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. APPROVALS OF DISPOSAL SITES SHALL BE OBTAINED FROM THE SEMINOLE COUNTY AND JURISDICTIONAL REGULATORY AGENCIES PRIOR TO DISPOSAL. ALL EXCESS MATERIAL IS THE PROPERTY AND RESPONSIBILITY OF THE CONTRACTOR.
2. THE CONTRACTOR SHALL MAKE NECESSARY ARRANGEMENTS WITH UTILITY SUPPLIERS FOR LOCATING, PROTECTING, AND/OR REMOVING THEIR FACILITIES, LINES AND EQUIPMENT. ANY DAMAGE TO KNOWN UTILITY LINES DURING CONSTRUCTION SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE BY CONTRACTOR'S FORCES IN A MANNER ACCEPTABLE TO THE OWNER AND UTILITY COMPANY AT NO COST TO THE OWNER. SHOULD UNCHARTED OR INCORRECTLY CHARTED PIPING OR OTHER UTILITIES BE ENCOUNTERED DURING EXCAVATION, THE CONTRACTOR SHALL CONSULT WITH UTILITY OWNER AND PROJECT ENGINEER IMMEDIATELY FOR DIRECTIONS. THE CONTRACTOR SHALL COOPERATE WITH OWNER AND UTILITY COMPANIES IN KEEPING RESPECTIVE SERVICES AND FACILITIES IN OPERATION.
3. CONTRACTOR SHALL MAINTAIN ADEQUATE SUPERVISION AND CONTROL TO ENSURE THAT STABILITY OF EXCAVATED AND CONSTRUCTED SLOPES ARE NOT ADVERSELY AFFECTED BY RAIN WATER.
4. CONTRACTOR SHALL MAINTAIN ADEQUATE SUPERVISION AND CONTROL TO ENSURE THAT EROSION IS CONTROLLED AND FLOODING OF EXCAVATION OR DAMAGE TO STRUCTURES DOES NOT OCCUR.
5. CONTRACTOR SHALL PROTECT STRUCTURES, UTILITIES, SIDEWALKS, PAVEMENTS, AND OTHER FACILITIES FROM DAMAGE CAUSED BY SETTLEMENT, LATERAL MOVEMENT, UNDERMINING, WASHOUT AND OTHER HAZARDS CREATED BY EARTHWORK OPERATIONS.
6. THE CONTRACTOR SHALL SLOPE SIDE SLOPES TO COMPLY WITH ALL FEDERAL, STATE AND LOCAL CODES AND REGULATIONS HAVING JURISDICTION. THE CONTRACTOR SHALL SLOPE AND BRACE WHERE SLOPING IS NOT POSSIBLE BECAUSE OF SPACE RESTRICTIONS OR STABILITY OF MATERIAL EXCAVATED. THE CONTRACTOR SHALL MAINTAIN STABILITY OF MATERIAL EXCAVATED IN A SAFE CONDITION UNTIL COMPLETION OF BACK FILLING.
7. ALL FILL MATERIAL IN IMPROVEMENT AREAS SHALL BE COMPACTED IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS AND REQUIREMENTS AND AS SHOWN ON THESE PLANS.
8. UNLESS OTHERWISE DIRECTED BY THE GEOTECHNICAL ENGINEER AND PRIOR TO THE PLACEMENT OF FILL, THE AREA TO BE FILLED WILL BE PROOF ROLLED UNDER THE SUPERVISION OF THE GEOTECHNICAL ENGINEER. ANY AREA SHOWING SIGNS OF PUMPING, WEAVING OR OTHER FORMS OF INSTABILITY SHALL BE SELECTIVELY REMOVED AND REPLACED WITH COMPACTED SELECT FILL.
9. ALL DISTURBED AREAS MUST BE SODDED UNLESS OTHERWISE NOTED ON THE PLANS. ALL SODDING MUST BE DONE IN ACCORDANCE WITH SECTION 570 OF THE FLORIDA DEPARTMENT OF TRANSPORTATION'S STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION.
10. ALL SOD ON SLOPES EXCEEDING 3:1 MUST BE PINNED.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF ALL NEWLY PLANTED GRASSES AND VEGETATION UNTIL THE WORK HAS BEEN ACCEPTED BY THE OWNER.

ABBREVIATIONS

CONT	CONTINUOUS
EA	EACH
EL	ELEVATION
ERCP	ELLIPTICAL REINFORCED CONCRETE PIPE
EXIST.	EXISTING
GRTG.	GRATING
INV.	INVERT
IR	IRON ROD
N.T.S.	NOT TO SCALE
OC	ON CENTER
PERM.	PERMANENT
PROP.	PROPOSED
RCP	REINFORCED CONCRETE PIPE
SEC	SECTION
TRM	TURF REINFORCEMENT MAT
TYP	TYPICAL
VERT.	VERTICAL

UTILITY OWNERS

PROGRESS ENERGY FLORIDA, INC.
(DISTRIBUTION)
CUSTOMER SERVICE CENTER
PHONE: (800)700-8744
CONTACT: TAMRA VANDERHORST
PHONE: (407)359-4431

EMBARQ
CONTACT: DOUG WHITAKER
PHONE: (407)830-3458

ATT / DISTRIBUTION
CONTACT: PAM COTE
PHONE: (407)539-0644

TECO PEOPLES GAS - ORLANDO
CONTACT: DEBORAH FRAZIER
PHONE: (407)420-6609

SANLANDO UTILITY CORP
WEKIVA SANLANDO UTILITY CORP
DES PINAR
CONTACT: NATE CARVER
PHONE: (407)869-1919 EXT. 250

BRIGHTHOUSE NETWORKS, LLC
CONTACT: MARVIN USRY
PHONE: (407)532-8509

DRAINAGE NOTES:

1. ALL DRAINAGE WORKS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SEMINOLE COUNTY CONSTRUCTION SPECIFICATIONS AND OTHER COUNTY GENERAL AND SPECIAL SPECIFICATIONS AND THE LATEST EDITION OF THE FLORIDA DEPARTMENT OF TRANSPORTATION'S STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, UNLESS STATED OTHERWISE IN THE SPECIFICATIONS OR ON THE PLANS.
2. THE LOCATIONS OF EXISTING UTILITIES AND STORM DRAINAGE SHOWN ON THE PLANS HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR INACCURACY. PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAKE ARRANGEMENTS FOR FIELD LOCATIONS AND FOR ANY RELOCATIONS OF THE VARIOUS EXISTING UTILITIES WITH THE UTILITY OWNERS, WHICH SHALL BE DONE IN A TIMELY FASHION TO MINIMIZE IMPACT ON THE CONSTRUCTION SCHEDULE. ANY DELAY OR INCONVENIENCE CAUSED THE CONTRACTOR BY THE RELOCATION OF THE VARIOUS UTILITIES SHALL BE INCIDENTAL TO THE CONTRACT AND NO EXTRA COMPENSATION WILL BE ALLOWED.
3. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE PROJECT ENGINEER OF ANY PROBLEMS REQUIRING DEVIATION FROM THESE PLANS AND SPECIFICATIONS.
4. THE CONTRACTOR SHALL SUBMIT DETAILED SHOP DRAWINGS OF ALL MAJOR ITEMS PROPOSED FOR THIS PROJECT TO THE ENGINEER PRIOR TO ORDERING ANY OF THE ITEMS. UPON THE CONTRACTOR'S RECEIPT OF APPROVED SHOP DRAWINGS FROM THE PROJECT ENGINEER, THE CONTRACTOR MAY PROCEED WITH THE WORK.
5. THE PROJECT ENGINEER SHALL BE CONSULTED FOR ANY AND ALL REQUIRED INTERPRETATIONS OF THE PLANS AND TO GIVE SUPPLEMENTARY INSTRUCTIONS TO ACCOMPLISH THE INTENT OF THE PLANS.

Summary of Quantities - Grace Lake Sinkhole Remediation Works

Item No.	Pay Item No.	Item Description	Unit	Estimated Quantity
1.0	101-1	Mobilization	LS	1.0
2.0	104-0-1	Set up approved soil and erosion control measures	LS	1.0
3.0	110-2	Clear and Grub the upper reaches of the sinkhole above Elev. 38± ft NAVD	LS	1.0
4.0	120-1	Establish access for construction equipment	LS	1.0
5.0	121-70	Supply and Install Flowable Fill Including compaction the clay layer between the HDPE liner and the ACB as shown on the plans	Cubic Yard	100.0
6.0	162-1-12	Supply and Install engineered soil to 12± in below finish grade with remolded hydraulic conductivity of 3.0 ft/day to 6.0 ft/day @ 90% Standard Proctor Density	Cubic Yard	2,218
7.0	514-71-1	Supply and Install a layer of geotextile fabric underlayment per FDOT Index 199	Square Yard	834
8.0	530-3-4	Supply and Install 3-in to 5-in Cobble Sized Rip Rap to fill voids in the underlying rubble layer up to Elev. 38± ft NAVD.	Tons	104
9.0	530-76-2	Supply and Install Large Rip Rap to fill voids from the bottom of the sinkhole up to Elev. 36± ft NAVD.	Tons	104
10.0	530-78	Supply and Install two layers of 16 ft x 8 ft x 6 Inches high closed cell mechanically interconnected ACB mats perpendicular to each other	Square Yard	841
11.0	570-1	Sodding (Non pinned)	Square Yard	18,000
12.0	570-2	Sodding (Pinned)	Square Yard	2,000
13.0	901.0	Supply and Install #57 stone to fill voids in the underlying rubble layer up to Elev. 40± ft NAVD (benched into natural soils).	Cubic Yard	453
14.0	902.0	Supply and Install clean sand with a remolded hydraulic conductivity of 10.0 ft/day to 20.0 ft/day @ 90% Standard Proctor Density	Cubic Yard	2,177
15.0	985.0	Supply and Install 40-mil Vertical HDPE liner as shown on plans	Square Yard	734

SOIL TRACKING PREVENTION

1. A SOIL TRACKING PREVENTION DEVICE (STPD) SHALL BE CONSTRUCTED AT THE LOCATION SHOWN ON THE PLANS. TRAFFIC FROM UNSTABILIZED AREAS OF CONSTRUCTION SHALL BE DIRECTED THRU THE STPD BARRIER. FLAGGING OR OTHER POSITIVE MEANS SHALL BE USED AS REQUIRED TO LIMIT & DIRECT VEHICULAR EGRESS ACROSS THE STPD.
2. THE CONTRACTOR MAY PROPOSE AN ALTERNATIVE TECHNIQUE TO MINIMIZE OFFSITE TRACKING OF SEDIMENT. THE ALTERNATIVE MUST BE REVIEWED & APPROVED BY THE ENGINEER &/OR SEMINOLE COUNTY PRIOR TO ITS USE.
3. ALL MATERIALS SPILLED, DROPPED, OR TRACKED ONTO PUBLIC ROADS (INCLUDING THE STPD AGGREGATE & CONSTRUCTION MUD) SHALL BE REMOVED DAILY, OR MORE FREQUENTLY IF SO DIRECTED BY THE ENGINEER &/OR SEMINOLE COUNTY.
4. AGGREGATES SHALL BE AS DESCRIBED IN FDOT STANDARD SPECIFICATION SECTION 901 EXCLUDING 901-2.3. AGGREGATES SHALL BE FDOT SIZE #1. IF THIS SIZE IS NOT AVAILABLE, THE NEXT AVAILABLE SMALLER SIZE AGGREGATE MAY BE SUBSTITUTED WITH THE APPROVAL OF THE ENGINEER. SIZES CONTAINING EXCESSIVE SMALL AGGREGATE WILL TRACK OFF THE PROJECT & ARE UNACCEPTABLE.
5. THE STPD SHALL BE MAINTAINED IN A CONDITION THAT WILL ALLOW IT TO PERFORM ITS FUNCTION. TO PREVENT OFFSITE TRACKING, THE STPD SHALL BE RINSED (DAILY WHEN IN USE) TO MOVE ACCUMULATED MUD DOWNWARD THRU THE STONE. ADDITIONAL STABILIZATION OF THE VEHICULAR ROUTE LEADING TO THE STPD MAY BE REQUIRED TO LIMIT THE MUD TRACKED.

EROSION CONTROLS FOR NON STORMWATER DISCHARGES:

A) WASTE DISPOSAL:

WASTE MATERIAL:

ALL WASTE MATERIAL WILL BE HAULED TO AN APPROVED SEMINOLE COUNTY LANDFILL. NO CONSTRUCTION WASTE WILL BE BURIED ONSITE.

HAZARDOUS WASTE:

ALL HAZARDOUS WASTE MATERIALS WILL BE DISPOSED OF IN ACCORDANCE WITH THE APPLICABLE LOCAL, STATE & FEDERAL REGULATIONS.

SANITARY WASTE:

ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS A MINIMUM OF THREE TIMES PER WEEK BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR AS REQUIRED BY LOCAL REGULATION.

B) OFFSITE VEHICLE TRACKING:

A GRAVEL CONSTRUCTION ENTRANCE HAS BEEN PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS. THE PAVED STREET ADJACENT TO THE SITE ENTRANCE WILL BE SWEPT DAILY TO REMOVE ANY EXCESS MUD, DIRT OR ROCK TRACKED FROM THE SITE. DUMP TRUCKS HAULING MATERIAL FROM THE CONSTRUCTION SITE WILL BE COVERED WITH A TARPAULIN.

SITE KEYNOTES

1. SILT FENCE, TYPICAL.
2. WORK AREA WITHIN SILT FENCE TO BE RESTORED TO ORIGINAL CONDITION. ALL GRADED AREAS SHALL BE SODDED AND WILL BE PAID FOR UNDER THE CONTRACT. ANY AREA(S) DISTURBED OUTSIDE OF THE SILT FENCE SHALL BE REINSTATED TO THE ORIGINAL OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.
3. SOIL TRACKING PREVENTION DEVICE PER THE DETAIL SHOWN ON SHEET 5 OF THESE PLANS.

EROSION AND SEDIMENT CONTROL NOTES:

1. THE CONTRACTOR SHALL PERFORM EROSION CONTROL MEASURES IN ACCORDANCE WITH FDOT EROSION AND SEDIMENT CONTROL – DESIGNER AND REVIEWER MANUAL, LATEST EDITION, DETAILS CONTAINED IN THE PLANS, AS DIRECTED BY THE ENGINEER AND BY SEMINOLE COUNTY.
2. THE CONTRACTOR SHALL SUBMIT AN EROSION CONTROL PLAN FOR APPROVAL BY THE COUNTY ENGINEER PRIOR TO SCHEDULING THE PRE-CONSTRUCTION MEETING.
3. ALL DISTURBED AREAS SHALL BE SODDED OR SEEDED AND MULCHED WITHIN SEVEN (7) DAYS AFTER GRADING IS COMPLETED TO PREVENT EROSION.
4. DURING CONSTRUCTION, THE CONTRACTOR SHALL TAKE ALL REASONABLE MEASURES TO INSURE AGAINST POLLUTING, SILTING OR DISTURBING TO SUCH AN EXTENT AS TO CAUSE AN INCREASE IN TURBIDITY BEYOND THOSE ALLOWED BY THE STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION TO THE EXISTING WATER BODIES. SUCH MEASURES SHALL INCLUDE, BUT NOT LIMITED TO, CONSTRUCTION OF TEMPORARY EROSION CONTROL STRUCTURES SUCH AS SEDIMENT BASINS, SEDIMENT CHECKS OR SILT BARRIERS. THE MEASURES DELINEATED ABOVE ARE THE MINIMUM REQUIRED, WITH ADDITIONAL CONTROLS TO BE UTILIZED AS NEEDED, DEPENDENT UPON ACTUAL SITE CONDITIONS AND CONSTRUCTION OPERATIONS.
5. IF THE EROSION PREVENTION AND CONTROL DEVICES SHOWN IN THE EROSION CONTROL PLAN PROVIDED BY THE CONTRACTOR PROVE TO BE INEFFECTIVE, ALTERNATE METHODS FOR MAINTAINING STATE WATER QUALITY STANDARDS FOR DISCHARGE FROM THE CONSTRUCTION SITE WILL BE REQUIRED. ALL ALTERNATE EROSION PREVENTION AND CONTROL DEVICES MUST BE APPROVED BY THE COUNTY ENGINEER PRIOR TO PLACEMENT.
6. ALL SURFACE WATER DISCHARGE FROM THE CONSTRUCTION SITE, INCLUDING DEWATERING DISCHARGE, SHALL MEET STATE WATER QUALITY STANDARDS PRIOR TO REACHING ANY WATERS OF THE STATE INCLUDING WETLANDS.
7. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN CONSTRUCTION. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE APPLIED AS A PERIMETER DEFENSE AGAINST THE TRANSPORTATION OF SILT AND SEDIMENTS OFF THE PROJECT SITE OR INTO ADJACENT WATER BODIES OR WETLANDS.
8. THE CONTRACTOR SHALL PREPARE AND IMPLEMENT AN EROSION CONTROL PLAN AS PART OF THE SCOPE OF WORK COVERED BY THESE PLANS. THE CONTRACTOR SHALL USE BEST MANAGEMENT PRACTICES IN CONTROLLING EROSION AND SEDIMENT TRANSPORT DURING CONSTRUCTION. THE FLORIDA DEVELOPMENT MANUAL "A GUIDE TO SOUND LAND & WATER MANAGEMENT" MAY BE USED AS REFERENCE FOR RECOMMENDED BEST MANAGEMENT PRACTICES RELATED TO EROSION AND SEDIMENT CONTROL.
9. ALL EROSION AND SEDIMENT CONTROL MEASURES WHICH ARE NECESSARY TO LIMIT THE TRANSPORT OF SILTS AND SEDIMENTS TO OUTSIDE THE LIMITS OF THE WORK AREA OR TO WATER BODIES OR WETLANDS ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE BEST MANAGEMENT PRACTICES AND IMPLEMENT STRUCTURAL MEASURES AS NEEDED TO PREVENT EROSION AND SEDIMENT TRANSPORT FROM THE WORK AREAS. THE FOLLOWING ARE MINIMUM RECOMMENDED GUIDELINES TO BE IMPLEMENTED DURING CONSTRUCTION AS PART OF THE EROSION AND SEDIMENT CONTROL PLAN:

A. STOCKPILING OF MATERIAL

NO EXCAVATED MATERIAL SHALL BE STOCKPILED IN SUCH A MANNER AS TO DIRECT RUNOFF DIRECTLY OFF THE PROJECT SITE OR INTO ANY ADJACENT WATER BODY OR STORMWATER COLLECTION FACILITY.

B. EXPOSED AREA LIMITATION & PROTECTION

THE SURFACE AREA OF OPEN, RAW ERODIBLE SOIL EXPOSED BY CLEARING AND GRUBBING OPERATIONS OR EXCAVATION AND FILLING OPERATIONS SHALL BE LIMITED AS NEEDED TO MINIMIZE THE POTENTIAL OF OFF-SITE SEDIMENT TRANSPORT. ALL EXPOSED AREAS SHALL BE PROTECTED BY INSTALLING EFFECTIVE EROSION AND SEDIMENT CONTROL MEASURES SUCH AS SILT SCREENS, SYNTHETIC HAY BALES, TURBIDITY BARRIERS, SWALES, OR A COMBINATION OF THESE AND OTHER MEASURES AS WARRANTED.

C. INLET PROTECTION

INLETS AND CATCH BASINS SHALL BE PROTECTED DURING CONSTRUCTION FROM SEDIMENT LADEN FABRIC COVERS OR OTHER MEASURES AS NECESSARY TO CONTROL THE TRANSPORT OF SEDIMENT.

D. TEMPORARY GRASSING

AREAS OPENED BY CONSTRUCTION OPERATIONS THAT ARE NOT ANTICIPATED TO BE DRESSED OR RECEIVE FINAL GRASSING TREATMENT WITHIN THIRTY DAYS SHALL BE SEEDED WITH A QUICK GROWING GRASS SPECIES WHICH WILL PROVIDE AN EARLY COVER DURING THE SEASON IN WHICH IT IS PLANTED. TEMPORARY SEEDING SHALL BE CONTROLLED AS TO NOT ALTER OR COMPETE WITH PERMANENT GRASSING. SLOPES STEEPER THAN 6:1 SHALL ADDITIONALLY RECEIVE MULCHING OF APPROXIMATELY 2 INCHES OF LOOSE MEASURE OF MULCH MATERIAL CUT INTO THE SOIL OF THE SEEDED AREA TO A DEPTH OF 4 INCHES. THE SEEDED OR SEEDED AND MULCHED AREAS SHALL BE ROLLED AND WATERED AS NEEDED TO ENSURE OPTIMUM GROWING CONDITIONS FOR THE ESTABLISHMENT OF A GOOD GRASS COVER. IF AFTER 14 DAYS, THE TEMPORARY GRASSED AREAS HAVE NOT ATTAINED A MINIMUM OF 75% OF GOOD GRASS COVER, THE AREAS WILL BE REWORKED AND ADDITIONAL SEED APPLIED TO ESTABLISH THE DESIRED VEGETATION COVER.

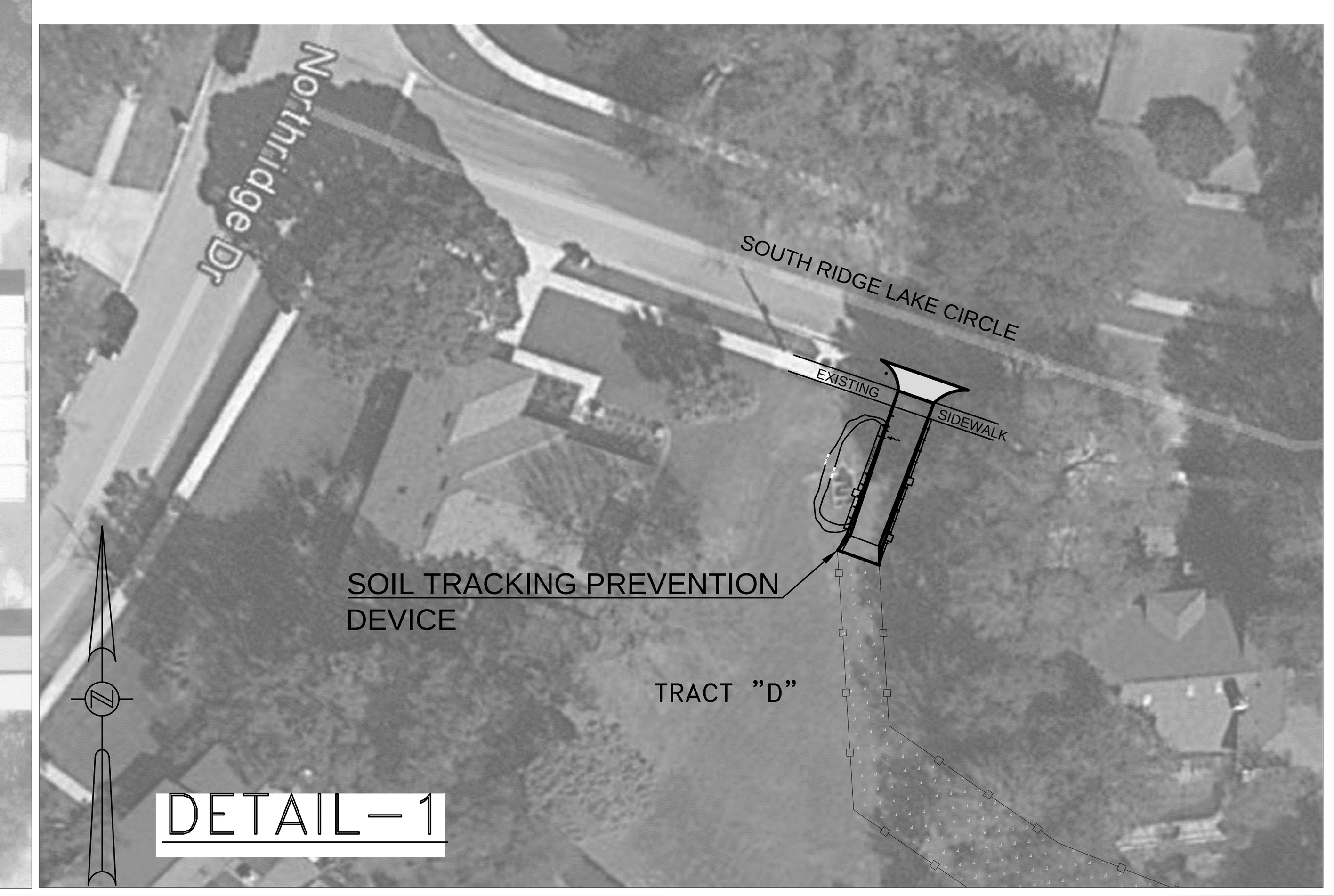
E. MAINTENANCE

EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED DURING THE ENTIRE DURATION OF CONSTRUCTION. THE CONTRACTOR SHALL INSPECT THE EROSION AND CONTROL MEASURES ON A ROUTINE BASIS AND FOLLOWING RAINFALL EVENTS AND IMMEDIATELY REPAIR ANY OBSERVED DAMAGED CONTROLS. ALL EROSION AND SEDIMENT CONTROLS SHALL BE MAINTAINED AS TO FUNCTION PROPERLY WITHOUT THE TRANSPORT OF SEDIMENTS OUTSIDE THE LIMITS OF THE PROJECT.

LEGEND

SILT FENCE

WORK AREA



NOT VALID FOR CONSTRUCTION UNLESS SIGNED IN THIS BLOCK	DATE	REVISIONS	BY	CHECKED

GRACE LAKE SINKHOLE
REPAIR PROJECT
SEMINOLE COUNTY, FLORIDA

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

SOIL AND EROSION CONTROL PLAN

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
SJS	VP	SJS/DS	DS

PROJECT NO. 13-087
SCALE N.T.S
DATE FEBRUARY 04, 2014
SHEET NO. 3
SHEET 3 OF 5

DEVO SEEREERAM, Ph.D., P.E.
REGISTRATION NO. 48303

100% SUBMITTAL

NOT VALID FOR CONSTRUCTION UNLESS SIGNED IN THIS BLOCK	DATE	REVISIONS	BY	CHECKED

GRACE LAKE SINKHOLE
REPAIR PROJECT
SEMINOLE COUNTY, FLORIDA

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

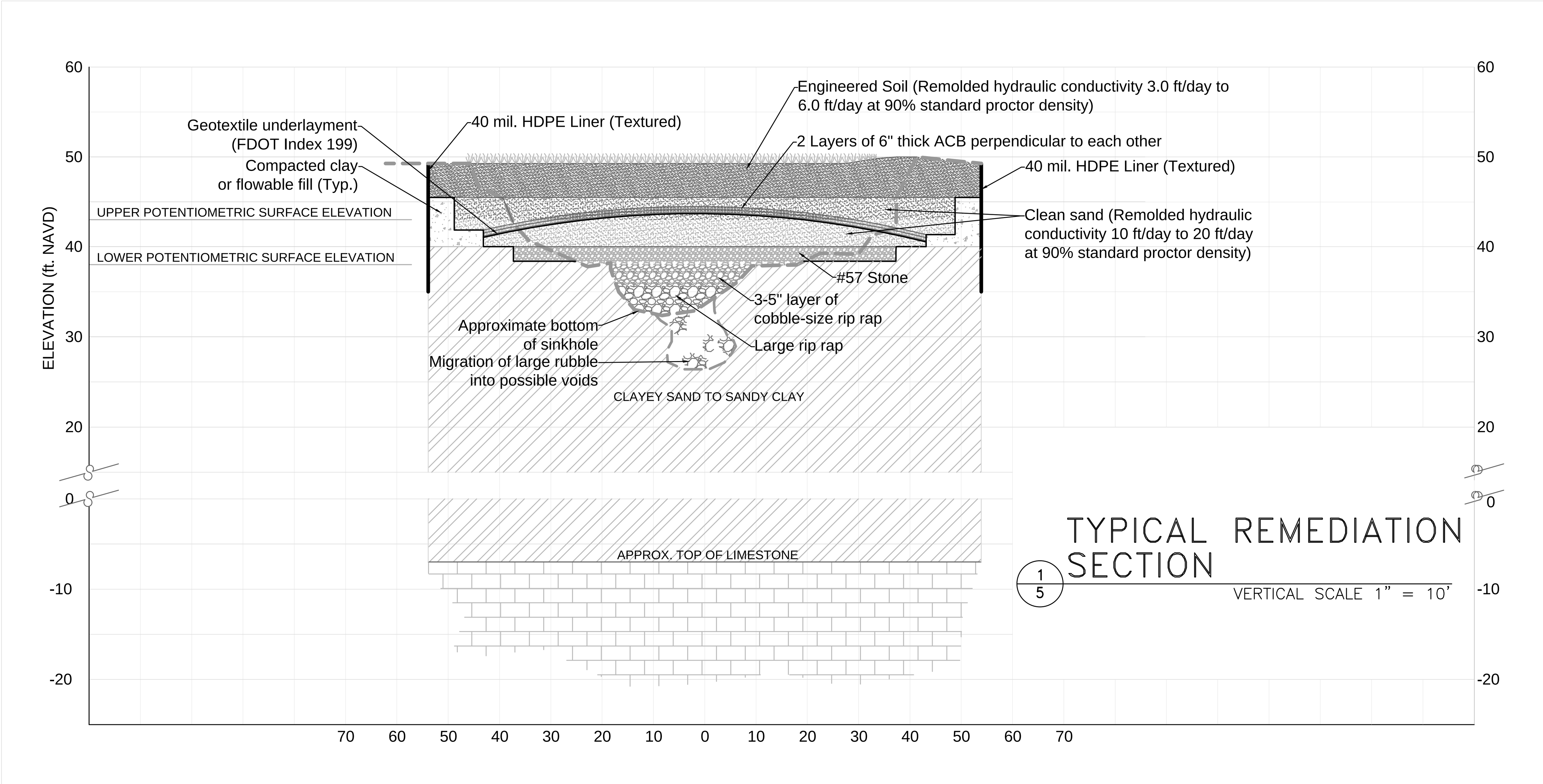
SINKHOLE REMEDIATION
LAYOUT PLAN

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
SJS	VP	SJS/DS	DS

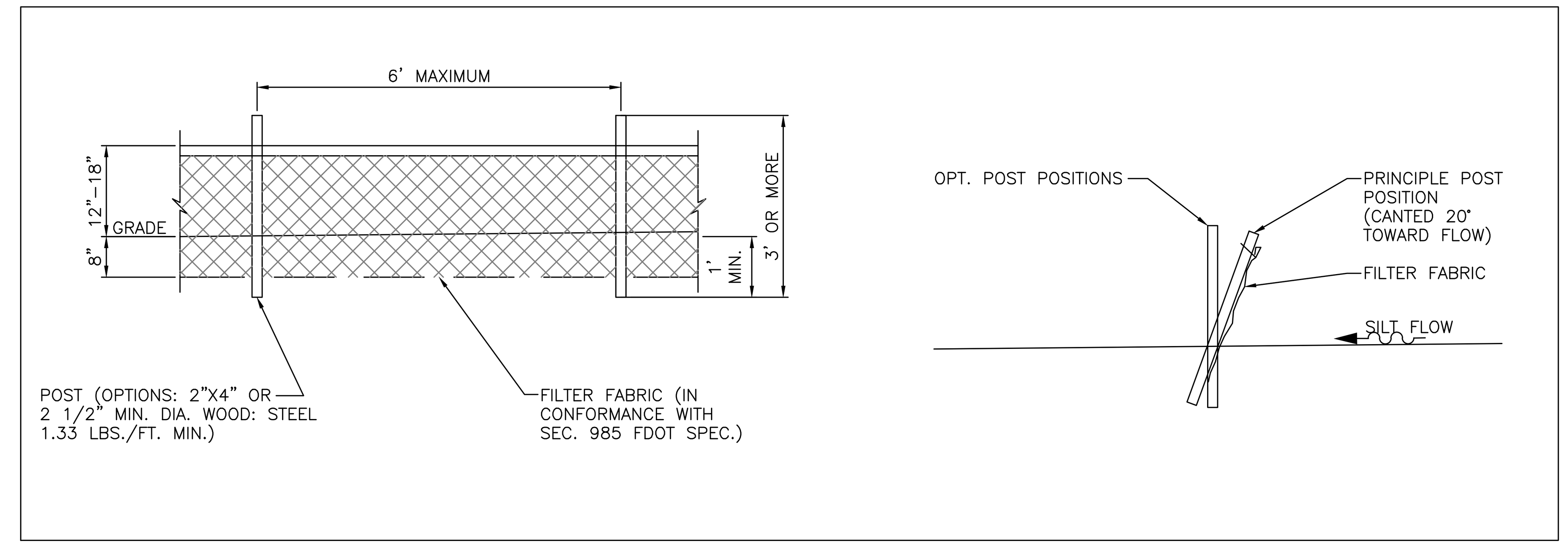
PROJECT NO. 13-087
SCALE N.T.S
DATE FEBRUARY 04, 2014
SHEET NO. 4
SHEET 4 OF 5

DEVO SEEREERAM, Ph.D., P.E.
REGISTRATION NO. 48303

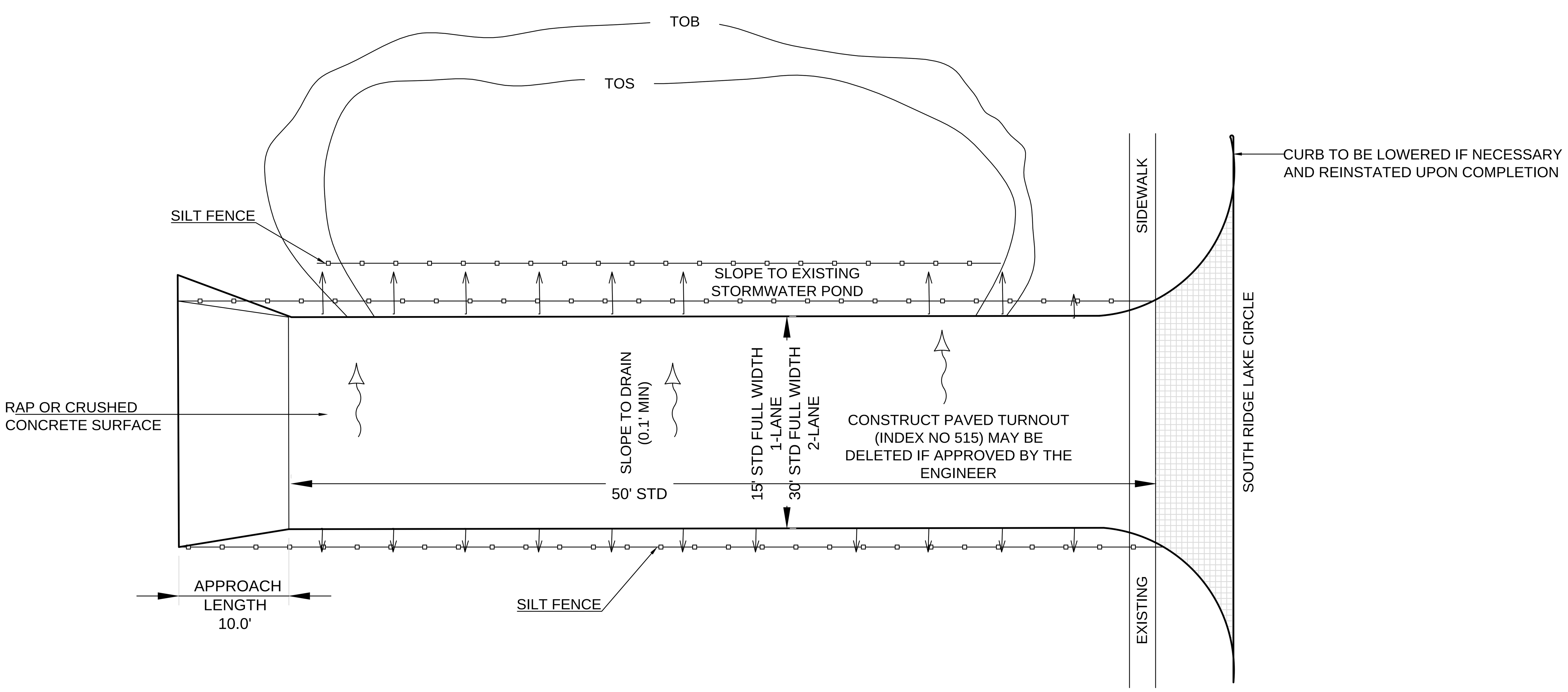
100% SUBMITTAL



1/5 TYPICAL REMEDIATION SECTION
VERTICAL SCALE 1" = 10'



2/5 SILT FENCE
SCALE 1" = 2'



3/5 SOIL TRACKING PREVENTION DEVICE WITHIN TRACK "D"

Proposed Construction Sequence

- Set up approved soil and erosion control measures.
- Establish access for construction equipment.
- Clear and Grub the upper reaches of the sinkhole above elev. 38+/- ft NAVD.
- Install Large Rip Rap using an excavator with adequate reach to fill voids from the bottom of the sinkhole up to elev. 36+/- ft NAVD.
- Install 3"-5" cobble size rip rap using an excavator with adequate reach to fill voids in the underlying rubble layer up to elev. 38+/- ft NAVD.
- Install #57 stone using an excavator with adequate reach to fill voids in the underlying rubble layer up to elev. 40+/- ft NAVD (benched into natural soils).
- Install clean sand with a remolded hydraulic conductivity of 10 ft/day to 20 ft/day at 90% standard proctor density to parabolic configuration as shown on the cross-section (benched into natural soils).
- Install a layer of geotextile fabric underlayment per FDOT index 199.
- Install two layers of ACB perpendicular to each other.
- Install clean sand with a remolded hydraulic conductivity of 10 ft/day to 20 ft/day at 90% standard proctor density onto the ACB ensuring that all voids are properly filled.
- Install minimum of 3 ft. of engineered soil to 12"+/- below finish grade with remolded hydraulic conductivity of 3.0 ft/day to 6.0 ft/day at 90% standard proctor density.
- Install 40 mil Vertical HDPE liner.
- Carefully compact the clay layer between the HDPE liner and the ACB including the use of flowable fill as necessary to ensure a complete cutoff.

Note that some variation in the above limits and elevations can be expected based on location specific engineering soil properties.

NOT VALID FOR CONSTRUCTION UNLESS SIGNED IN THIS BLOCK

DATE	REVISIONS	BY	CHECKED

GRACE LAKE SINKHOLE
REPAIR PROJECT
SEMINOLE COUNTY, FLORIDA

DEVO Engineering
CONSULTING GEOTECHNICAL ENGINEERS

SECTIONS AND DETAILS

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
SJS	VP	SJS/DS	DS

PROJECT NO. 13-087
SCALE N.T.S
DATE FEBRUARY 04, 2014
SHEET NO. 5
SHEET 5 OF 5

DEVO SEEREERAM, Ph.D., P.E.
REGISTRATION NO. 48303

100% SUBMITTAL