September 17, 2014

BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY, FLORIDA
ADDENDUM NO. 4 / IFB Y14-7035-PH

ALLISON OAKS 3893A, GREENVIEW PINES 3887, BRADFORD COVE 3290, ROUSE AND UNIVERSITY 3365 AND LENA STREET 3309 PUMP STATIONS IMPROVEMENTS
BID OPENING DATE: September 25, 2014

This Addendum is hereby incorporated into the bid documents of the project referenced above. The following items are clarifications, corrections, additions, deletions and/or revisions to and shall take precedence over the original documents. Additions are indicated by underlining, deletions are indicated by ~~strikethrough~~.

The bid opening remains September 25, 2014 at 2:00 P.M.

A. CLARIFICATIONS

1. Q: Appendix A of the Specifications contains a geotechnical report for Rouse and University PS 3365, and Lena Street PS 3309. Are there any geotechnical reports available for the other pump stations?

A: There is additional information available for only Allison Oaks PS 3893A and Greenview Pines PS 3887. These documents, which are attached and dated this addendum are named as follows:

- Geotechnical Engineering Report for Allison Oaks Pump Station, prepared by Nodarse and Associates, Inc.
- NPDES Groundwater Testing and Database Search for Allison Oaks Pump Station, prepared by Nodarse and Associates, Inc.,
- Geotechnical Engineering Report for Greenview Pines Pump Station, prepared by Nodarse and Associates, Inc.
- NPDES Groundwater Testing and Database Search for Greenview Pines Pump Station, prepared by Nodarse and Associates, Inc.

2. Q: Plan Sheet C-101 shows we are to install 6” x 8” curbing with a 4” reveal, should that be 6” x 18”?

A: Yes, the call out on Sheet C-101 should read 6” x 18”, not 6” x 8”. This Plan Sheet has been corrected in this Addendum

3. Q: What type of wet well liner is existing in the Rouse and University PS 3365?

A: The existing wet well liner is HDPE. This liner is damaged and is scheduled to be removed in this project.

4. Q: It appears that the Rouse and University PS 3365 is the only pump station that has an existing wet well liner, is this correct?

A: Yes, the Rouse and University PS 3365 is the only wet well that has an existing wet well liner.

B. PROJECT MANUAL

TABLE OF CONTENTS

Page iv, APPENDICES

Add: Under the heading "APPENDIX A - GEOTECHNICAL REPORT", add the following text:

Geotechnical Engineering Report for Allison Oaks Pump Station, prepared by Nodarse and Associates, Inc.

NPDES Groundwater Testing and Database Search for Allison Oaks Pump Station, prepared by Nodarse and Associates, Inc.,

Geotechnical Engineering Report for Greenview Pines Pump Station, prepared by Nodarse and Associates, Inc.

NPDES Groundwater Testing and Database Search for Greenview Pines Pump Station, prepared by Nodarse and Associates, Inc.

APPENDIX A

Add: Add the above referenced documents to Appendix A of the Specifications, which are attached and dated this Addendum.

C. PROJECT DRAWINGS

SHEET C-101

Delete: Delete the text that points to the concrete curb that reads "~~CONST 6" X 8" CONC CURB W/ 4" REVEAL AND WEEP HOLES WHERE APPLICABLE~~"

Add: Add in its place the following note: "CONST 6" X 18" CONC CURB W/ 4" REVEAL AND WEEP HOLES WHERE APPLICABLE"

D. ACKNOWLEDGEMENT OF ADDENDA

a. The Proposer shall acknowledge receipt of this addendum by completing the applicable section in the solicitation or by completion of the acknowledgement information on the addendum. Either form of acknowledgement must be completed and returned not later than the date and time for receipt of proposal.

b. All other terms, conditions and specifications remain the same.

c. Receipt acknowledged by:

_____ _____ _____

Authorized Signature Date Signed

_____

Title

_____

Name of Firm

Geotechnical Engineering Report

Allison Oaks Pump Station No. F3215
Winter Park, Florida
September 21, 2012
Terracon Project No. AK127001

Prepared for:
Orange County Public Utilities-Engineering Division
Orlando, Florida

Prepared by:
Nodarse & Associates
A Terracon Company
Winter Park, Florida

September 21, 2012

Orange County Public Utilities – Engineering Division
9150 Curry Ford Road
Orlando, Florida 32815

Attn: Mr. Jeff Nazario

Re: Geotechnical Engineering Report
Allison Oaks Pump Station No. F3215
Winter Park, Florida
Terracon Project Number: AK127001

Dear Mr. Nazario:

Nodarse & Associates, a Terracon Company (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number PH1120210 dated May 2, 2012.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of the proposed wet well pump station.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Nodarse & Associates, a Terracon Company
Certificate of Authorization Number 8820

AMR M. SALLAM, PhD
LICENSE
No. 67578
STATE OF
FLORIDA
PROFESSIONAL ENGINEER
09/21/12

Amr M. Sallam, Ph.D., P.E.
Principal
Florida PE- 67578

Jay W. Casper, P.E.
Senior Associate
Florida PE - 36330

Enclosures
cc: 1 – Client (PDF)
1 – File

TABLE OF CONTENTS

EXECUTIVE SUMMARY

A geotechnical investigation has been performed for the proposed Allison Oaks Pump Station planned at 3120 Patel Drive in Winter Park, Orange County, Florida. Three (3) borings, designated PB-1, PB-2, and TB-1 have been performed to depths of between 15 and 50 feet below the existing ground surface within the pump station areas. This report specifically addresses the recommendations for the proposed pump station wet well, manhole, and pipelines.

Based on the information obtained from our geotechnical exploration, it appears that the subsoil and groundwater conditions at the site are suitable for the proposed developed and construction. The following geotechnical considerations were identified:

- Temporary dewatering will be required for construction of the pump station. Dewatering the pump station area will require the use of a properly designed well point system. The dewatering system should not be turned off until the pump station has enough dead weight to counteract an uplift force calculated based on a head of water measured from the base of the pump station to the estimated Seasonal High Water Level (SHWL).

- Our borings did not encounter unsuitable soils such as muck, clay, high silts, and debris, which might cause problems during construction. However, if encountered, unsuitable soils should be completely removed to a minimum depth of 18 inches below the pump station pipelines bottom, replaced with well-draining granular sands with a fines content of less than 5 percent or less passing the No. 200 U.S. Standard sieve by weight, and compacted to a firm and unyielding state.

- The proposed structure may be supported on shallow footings bearing on the existing site soil only if the proper site preparations are following according to the appropriate sections of this report.

- On-site native soils typically appear suitable for use as general engineered fill.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
ALLISON OAKS PUMP STATION NO. F3125
WINTER PARK, FLORIDA

Terracon Project No. AK127001
September 21, 2012

1.0 INTRODUCTION

A geotechnical engineering report has been prepared for the proposed Allison Oaks Pump Station which will be located at 3120 Patel Drive in Winter Park, Orange County, Florida as shown on the Topographic Vicinity Map included as Exhibit A-1 in Appendix A. Three (3) borings, designated PB-1, PB-2, and TB-1 have been performed to depths of between 15 and 50 feet below the existing ground surface in the proposed pump station and manhole area. Logs of the borings along with a site location plan, geologic map and boring location plans are included in Appendix A of this report.

The purpose of the geotechnical services was to provide information and geotechnical engineering recommendations relative to the proposed pump station wet well, gravity pipeline, and a concrete drive way. The followings will be provided:

- Field exploration method
- Subsurface soil and groundwater conditions
- Presentation of field and laboratory information in graphical format
- Recommendations for general earthwork
- Recommendations for pump station design and construction
- Recommendations for gravity pipe line earthwork

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Exhibit A-4: Boring Location Plan
Construction	One wet well to a depth of about 14 feet below existing grade and 6 feet in diameter with associated pipelines and man holes.
Grading	Fill – fine grading, estimated at up to approximately 1 foot.
Cut and fill slopes	Excavation per OSHA requirements or a license professional engineer for braced excavations.

2.2 Site Location and Description

Item	Description
Location	The project will be located at 3120 Patel Drive in Winter Park, Orange County, Florida
Existing improvements	No existing structures on site. A previous structure on site has been removed.
Current ground cover	Grass covered with limited trees.
Existing topography	The USGS topographic quadrangle map "Orlando East, Florida" depicts the developed topography as nearly level, with original ground surface elevations ranging from about elevation +65 feet to +70 feet referencing the National Geodetic Vertical Datum of 1929 (NGVD29).

3.0 SUBSURFACE CONDITIONS

3.1 USDA Soil Survey

The Soil Survey of Orange County, Florida, as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS; later renamed the Natural Resource Conservation Service - NRCS), dated October 1981, identifies the soil types at the project site as Zofl-Urban land complex (55). It should be noted that the Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be encountered. A copy of the pertinent section of the Soil Survey map is included as Exhibit A-2 in Appendix A. Descriptions of soil map units are included in Appendix A as Exhibit A-3.

3.2 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
1	8	Fine sand to fine sand with silt (SP/SP-SM)	Very loose to loose

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
2	8 to 38	Fine sand with silt to silty fine sand (SP/SP-SM)	Loose to medium dense
3	38 to 50	Fine sand (SP)	Medium dense to dense

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A of this report. Descriptions of our field exploration are included as Exhibit A-5 in Appendix A. Descriptions of our laboratory testing procedures are included as Exhibit B-1 in Appendix B.

3.3 Groundwater

The boreholes were observed during drilling for the presence and level of groundwater. Groundwater was observed in the borings at a depth of 10 feet below existing grade. It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the boring was performed. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the boring logs. The estimated seasonal high groundwater tables are included in the following table and on the boring logs.

Boring #	Approximate depth to encountered water table (feet)	Approximate depth to estimated seasonal high groundwater table (feet)
PB-1	10	8
PB-2	10	8
TB-1	10	8

Estimates of the seasonal high water table presented in this report are based on and limited by the data collected during our geotechnical exploration, and the referenced published documents. Estimates of the seasonal high assume normal precipitation volumes and distribution. These seasonal water table estimates do not represent the temporary rise in water table that occurs immediately following a storm event, including adjacent to other stormwater management facilities. This is different from static groundwater levels in wet ponds and/or drainage canals which can affect the design water levels of new, nearby ponds. The seasonal high water table may be affected by extreme weather changes, localized or regional flooding,

karst activity, future grading, drainage improvements, or other construction that may occur on our around the site following the date of this report.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The following conclusions and recommendations are based on the project characteristics previously described, the data obtained in our field exploration and our experience with similar subsurface conditions and construction types. If the proposed pump station location is significantly different from that previously described, or if subsurface conditions different from those disclosed by the borings are encountered during construction, we should be notified immediately so that we might review and modify, if necessary, the following recommendations in regards to such changes. The general guidelines included in this report are not intended to supersede more stringent requirements which may be mandated by County specifications.

4.1.1 Pump Station: Boring TB-1 was performed near the approximate location of the proposed pump station wet well as indicated by provided site plans. Groundwater was encountered in the boring at a depth of about 10 feet below existing grade. Based on the provided plans, the anticipated depth of the proposed pump station wet well is to be about 14 feet below existing grade.

- Dewatering will be required for construction of the pump station. Dewatering the pump station area will require the use of a properly designed well point system. Other dewatering systems utilizing sumps within shored or braced excavations may also be feasible. However, design of shoring/sump systems should be carefully evaluated with regard to blow outs of the excavation bottom due to unbalanced hydrostatic conditions. The Contractor should be allowed to review the soil stratification to determine the most feasible dewatering system for the pump station area. Dewatering should be performed gradually and slowly in order to reduce the effect of the sudden additional effective stress increase on the subsoil below close-by housed or roadways.

- All excavation should be performed in accordance with appropriate Occupational Safety and Health Administration (OSHA) standards. These standards typically include side slopes for temporary excavation no steeper than 1.5 horizontal to 1 vertical (1.5H: 1V) to provide adequate worker safety.

- If these side slopes cannot be maintained or are not desired due to other considerations, a properly designed and braced excavation or sheet piling would be required. All shoring

and bracing systems or sheet piling should be designed and reviewed by an experienced professional engineer registered in the State of Florida.

- Although not encountered, it is important to note that soils with high fines content (clay, silts, ect.) or unsuitable material (organics, muck, debris, ect.) should be removed to a minimum depth of 12 inches below the pump station bottom, to provide a stable construction platform, and replaced with well-draining granular sands with fines contents of 5 percent of less passing the No. 200 U.S. Standard sieve by weight. The soils below the base of the pump station should be compacted to a firm and unyielding state.

After the subgrade soils have been prepared as recommended above, the pump station may be supported on a monolithic slab or spread footing. The foundations can utilize a maximum net soil bearing pressure of 2,000 pounds per square foot.

- Compaction of backfilled soils around the pump station should be accomplished in lift thicknesses no greater than 8 inches. The fill material should consist of relatively clean granular sands with no more than 5 percent passing the No. 200 U.S. standard sieve by weight.

- Compaction can likely be accomplished in these areas with a small plate or hand guided drum type vibratory compactor and loose lift thicknesses should be limited to 8 inches. At least one (1) density test should be performed on each lift to verify that the soil has been compacted to at least 95 percent of its modified Proctor maximum dry density (ASTM D-1557).

- If compaction difficulties arise during construction, the geotechnical engineer should be consulted to provide further recommendations.

- The construction should also be sequenced so that a dewatering system, if necessary, is not turned off until the pump station has enough weight to counteract an uplift force equivalent to the amount of water displaced. It may also be prudent to place additional concrete in the structure foundation to provide ballast against such an uplift force. This uplift force should account for the head difference from the bottom elevation of the foundation to the seasonal high groundwater level or the groundwater level at the time of construction, whichever is shallower, plus any possible flooding conditions that may occur at the project site.

- For calculations of resistance to the uplift force, 50 pounds per cubic foot may be used for the buoyant unit weight of the soil. The buoyant weight of the concrete and overlying soils should be used in calculating the necessary amount of ballast required.

4.1.2 Pipelines: Regarding the pipe subgrade soils and backfill soils we offer the following recommendations:

- The bedding soil beneath the pipe should be properly shaped to completely support the pipe section and areas should be excavated to accommodate any bells or other raised portions of the pipe to help avoid point loading conditions.

- Once the pipe has been laid in the excavation trench and approved, backfill should be carefully deposited and compacted to the centerline of the pipe on both sides. All fill should be inorganic, non-plastic, granular soils (clean sands). The near surficial native site soils appear to meet backfill requirements.

- Compaction of backfilled soils above the centerline of the pipe to the proposed final grade should be accomplished in lift thicknesses no thicker than 12 inches.

- At least one (1) density per lift should be performed to verify that the soil has been compacted to 95 percent of the material's maximum modified Proctor dry density (ASTM D 1557).

- If compaction difficulties arise during construction, the Geotechnical Engineer should be consulted to provide further recommendations.

4.1.4 General Site Preparation: The following general procedures are recommended for site preparation:

- All excavations required should be performed in accordance with appropriate Occupational Safety and Health Administration (OSHA) standards. These standards typically include side slopes for temporary excavations not steeper than 1.5 Horizontal to 1 Vertical (1.5H:1V) to provide for adequate worker safety.

- If these side slopes cannot be maintained or are not desired due to other considerations, a properly designed braced excavation, trench shield, or sheet piling would be required for stable excavations. All shields, shoring and bracing systems, or sheet piling should be designed and reviewed by an experienced Professional Engineer registered in the State of Florida. Adjacent traffic loads and induced vibrations, among other factors, should be included in the design of these stabilization systems.

4.1.5 Temporary Dewatering: Groundwater was observed at a depth of about 10 feet at our boring locations at the time of our exploration. The seasonal high groundwater level is anticipated to be at a depth of about 8 feet below existing grades. Based on this information and the proposed embedment depths of the pump station, dewatering will be required to facilitate construction, backfill and compaction in the dry. Regarding dewatering, we offer the following recommendations:

- Dewatering operations at this site for the proposed pump station should be accomplished with a properly designed well point system dewatering system operating outside the excavation limits.

- The dewatering system should be adequate to lower groundwater levels to at least 2 feet below the lowest compaction surface.

- Other dewatering systems utilizing sumps within shored or braced excavations may also be feasible. However, design of shoring/sump systems should be carefully evaluated with regard to blow outs of the excavation bottom due to unbalanced hydrostatic conditions. The Contractor should be allowed to review the soil stratification to determine the most feasible dewatering system for the pump station area.

The construction should be sequenced so that the dewatering system is not turned off until the pump station has enough weight placed over it to counteract an uplift force equivalent to the height of standing water above the base of the pump station. The resisting weight of soil over the pump station should be calculated using the buoyant unit weight of the soil.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

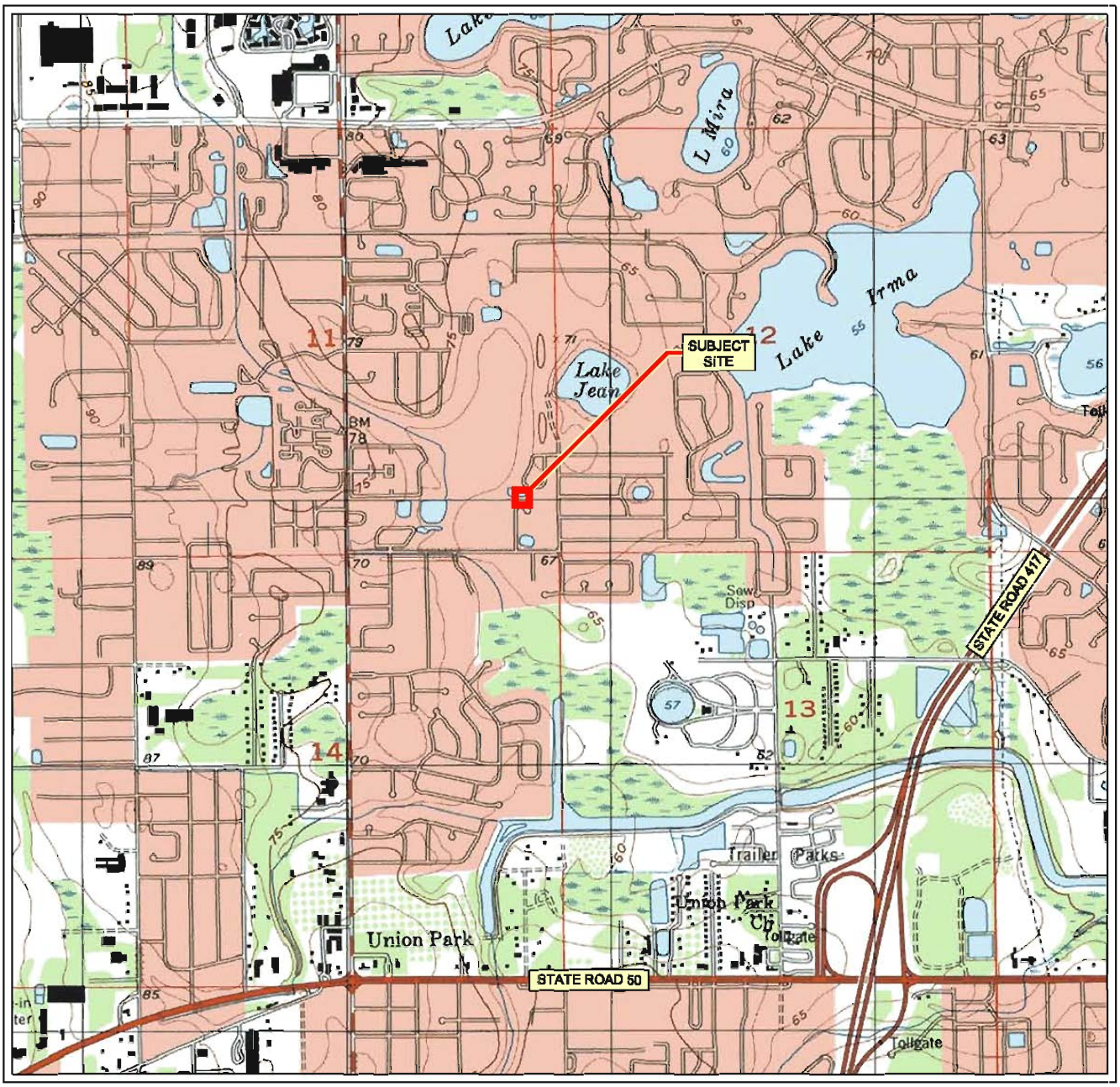
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY



SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 MILES 1000 2000

1 .5 0 1

FEET

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

SECTION: 11
TOWNSHIP: 22 SOUTH
RANGE: 30 EAST

ORLANDO EAST, FLORIDA
1994
7.5 MINUTE SERIES (QUADRANGLE)

Project Mngr:	KCM
Drawn By:	MG
Checked By:	KCM
Approved By:	BHW

Project No.	AK127001
Scale:	AS SHOWN
File No.	AK127001
Date:	8-16-12

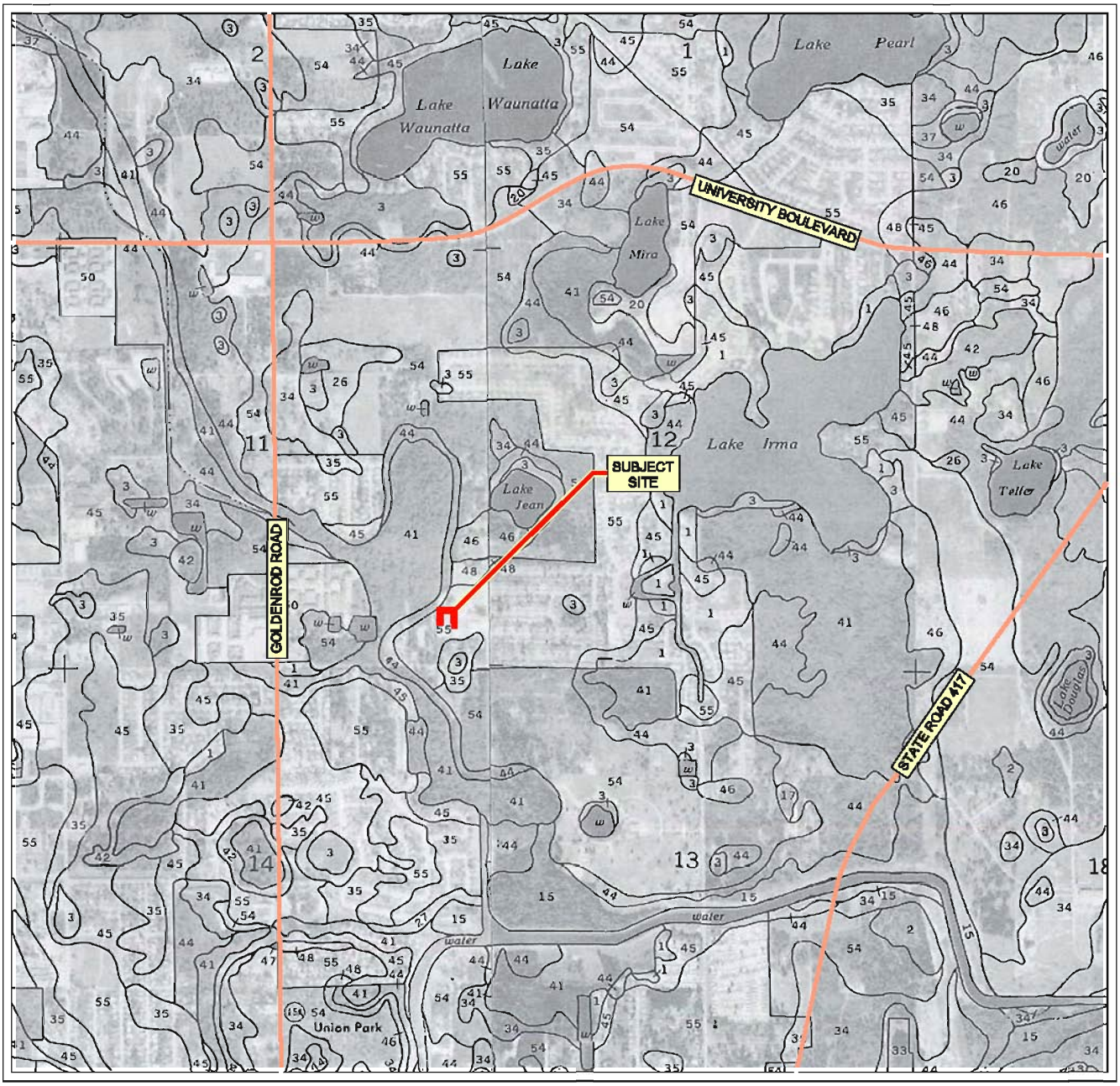
Terracon
Consulting Engineers and Scientists
1675 LEE ROAD WINTER PARK, FLORIDA 32789
PH. (407) 740-8110 FAX. (407) 740-8112

TOPOGRAPHIC VICINITY MAP

GEOTECHNICAL ENGINEERING REPORT
ALLISON OAKS PUMP STATION
3120 PATEL DRIVE
ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT
A-1

M:\Projects\2012\AK127001\PROJECT DOCUMENTS (Reports-Letters-Drafts to Client)\Cad\AK127001-Exhibit-A-1.dwg



SCALE 1" = 2000'

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

U.S.D.A. SOIL SURVEY FOR ORANGE COUNTY, FLORIDA
ISSUED: AUGUST 1989

N

SECTION: 11
TOWNSHIP: 22 SOUTH
RANGE: 30 EAST

SOIL LEGEND

55 ZOLFO-URBAN LAND COMPLEX

Project Mngr:	KCM
Drawn By:	MG
Checked By:	KCM
Approved By:	BHW
Project No.	AK127001
Scale:	AS SHOWN
File No.	AK127001
Date:	8-16-12

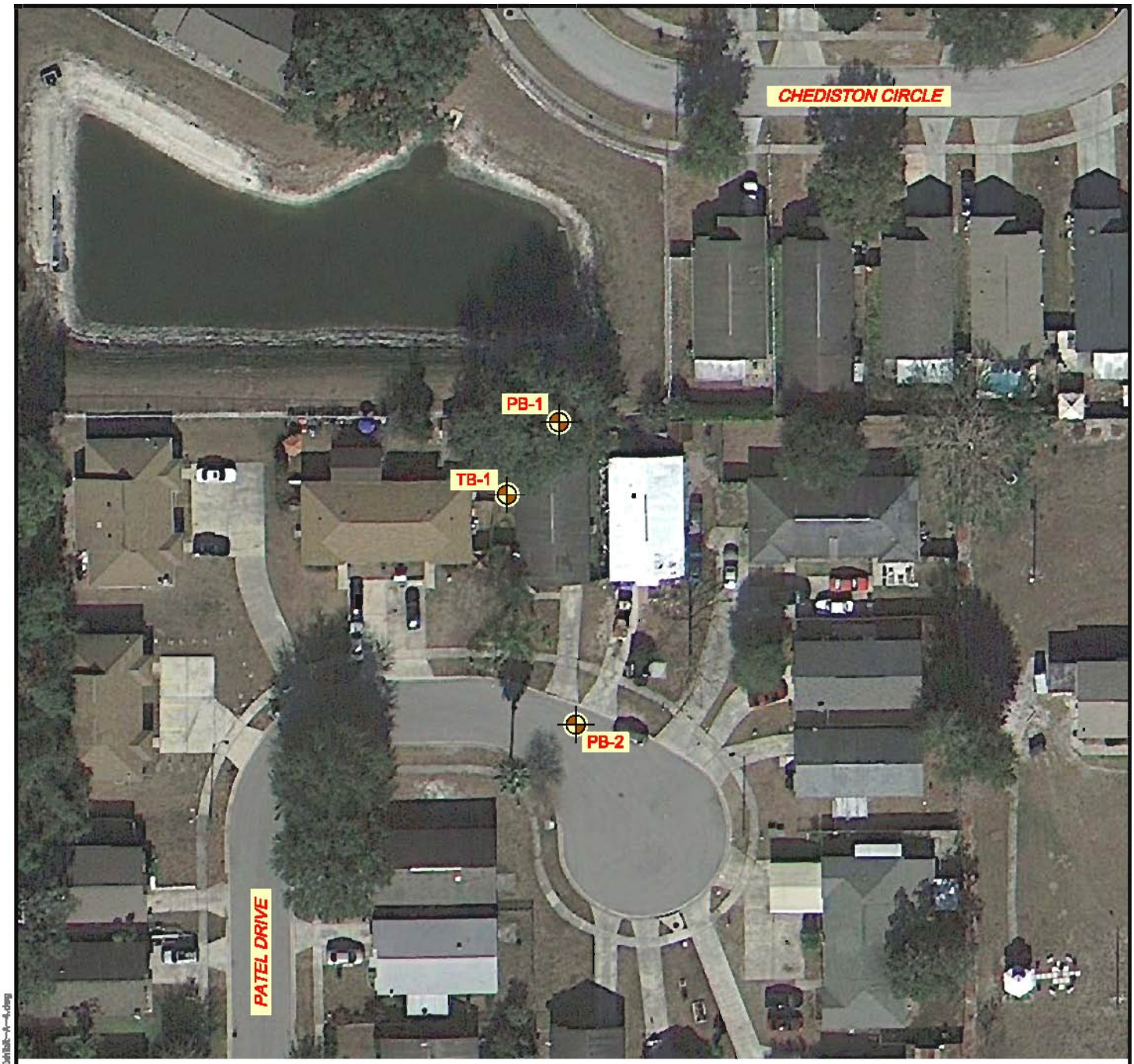
Terracon
Consulting Engineers and Scientists
1675 LEE ROAD WINTER PARK, FLORIDA 32789
PH. (407) 740-8110 FAX. (407) 740-8112

SOILS MAP
GEOTECHNICAL ENGINEERING REPORT
ALLISON OAKS PUMP STATION
3120 PATEL DRIVE
ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT
A-2

Soil Survey Descriptions

55 – Zolfo-Urban land complex. This complex consists of areas of Zolfo soil that is nearly level and somewhat poorly drained and areas of Urban land. It is typically found in broad, slightly higher positions adjacent to the flatwoods. Drainage systems have been established in most areas. The depth to the seasonal high water table is dependent upon the functioning of the drainage system. In undrained areas, this soil map unit has an apparent seasonal high water table between depths of 24 and 40 inches (2.0 and 3.3 feet) for 2 to 6 months and at a depth of 10 to 24 inches (0.8 to 2.0 feet) during periods of high rainfall. It recedes to a depth of more than 60 inches (5.0 feet) during extended dry periods. Zolfo soil is predominantly sandy throughout the defined profile of 80 inches (6.7 feet). The areas of Urban land have been covered or altered such that the natural soil profile is no longer observable.



LEGEND

⊕ APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

N

SCALE IN FEET

0 30 60

Project Mngr:	KCM
Drawn By:	MG
Checked By:	KCM
Approved By:	BHW

Project No.	AK127001
Scale:	AS SHOWN
File No.	AK127001
Date:	8-16-12

Terracon
Consulting Engineers and Scientists
1675 LEE ROAD WINTER PARK, FLORIDA 32789
PH. (407) 740-8110 FAX. (407) 740-8112

BORING LOCATION PLAN

GEOTECHNICAL ENGINEERING REPORT
ALLISON OAKS PUMP STATION

3120 PATEL DRIVE
ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT

A-4

Field Exploration Description

The boring locations were laid out at the project site by Terracon personnel. The locations indicated on the attached diagram are approximate and were measured by pacing distances and estimating right angles, across vegetated/wooded terrain. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The SPT soil borings were drilled with an truck-mounted, rotary drilling rig equipped with a rope an automatic hammer. The boreholes were advanced with a cutting head and stabilized with the use of bentonite (drillers' mud). Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure. In the split spoon sampling procedure, the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch penetration or the middle 12 inches of a 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs.

Portions of the samples from the borings were sealed in glass jars to reduce moisture loss, and then the jars were taken to our laboratory for further observation and classification. Upon completion, the boreholes were backfilled with the site soil.

Field logs of each boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation of the samples.

A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

BORING LOG NO. PB-1

PROJECT: Allison Oaks Pump Station
No. F3215 - Wet Well

CLIENT: Orange County Public Utilities
Orlando, Florida

SITE: 3120 Patel Drive
Winter Park, Orange County, Florida

SPT Borings

GRAPHIC LOG	LOCATION Exhibit A-4 / DEPTH	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
	FINE SAND WITH SILT (SP-SM), gray						
	4.0						
	FINE SAND (SP), light brown to brown, loose	5			2-2-3-2 N=5		
					2-2-3-3 N=5		
	8.0						
	SILTY FINE SAND (SM), tan, loose				3-3-2-2 N=5	21	16
		10	▽				
	15.0				5-4-5 N=9		
	Boring Terminated at 15 Feet	15					
		20					
		25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Rotary Drilling Cutting Head

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water Initially Encountered*

Estimated Seasonal High Water Level @ 8'

NODARSE
A Terracon COMPANY
1675 Lee Road
Winter Park, Florida

Boring Started: 8/8/2012 | Boring Completed: 8/8/2012

Drill Rig: Truck | Driller: Travis

Project No.: AK127001 | Exhibit A-6

BORING LOG NO. PB-2

PROJECT: Allison Oaks Pump Station
No. F3215 - Wet Well

CLIENT: Orange County Public Utilities
Orlando, Florida

SITE: 3120 Patel Drive
Winter Park, Orange County, Florida

SPT Borings

GRAPHIC LOG	LOCATION Exhibit A-4 DEPTH	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
	FINE SAND (SP), light brown to grayish-brown, very loose to medium dense						
						5	5
		5			2-1-1-2 N=2		
					1-1-2-4 N=3		
					6-5-6-4 N=11		
		10	▽				
	13.5						
	SILTY FINE SAND (SM), brown, loose 15.0				2-2-5 N=7		
	Boring Terminated at 15 Feet	15					
		20					
		25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Rotary Drilling Cutting Head

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water Initially Encountered*

Estimated Seasonal High Water Level @ 8'

NODARSE
A Terracon COMPANY
1675 Lee Road
Winter Park, Florida

Boring Started: 8/8/2012 | Boring Completed: 8/8/2012

Drill Rig: Truck | Driller: Travis

Project No.: AK127001 | Exhibit A-7

BORING LOG NO. TB-1

PROJECT: Allison Oaks Pump Station
No. F3215 - Wet Well

CLIENT: Orange County Public Utilities
Orlando, Florida

SITE: 3120 Patel Drive
Winter Park, Orange County, Florida

SPT Borings

GRAPHIC LOG	LOCATION Exhibit A-4 DEPTH	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
	FINE SAND WITH SILT (SP-SM), grayish-brown						
	4.0						
	FINE SAND (SP), light brown, loose	5			2-2-2-2 N=4		
					2-2-3-3 N=5		
	8.0						
	FINE SAND WITH SILT (SP-SM), tan to light brown, loose to medium dense				3-2-2-2 N=4		
		10	▽				
					1-2-2 N=4	27	9
		15					
					3-4-3 N=7		
		20					
					5-5-5 N=10		
		25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Rotary Drilling Cutting Head

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water Initially Encountered*

Estimated Seasonal High Water Level @ 8'

NODARSE
A Terracon COMPANY
1675 Lee Road
Winter Park, Florida

Boring Started: 8/8/2012 | Boring Completed: 8/8/2012

Drill Rig: Truck | Driller: Travis

Project No.: AK127001 | Exhibit A-8

BORING LOG NO. TB-1

PROJECT: Allison Oaks Pump Station
No. F3215 - Wet Well

CLIENT: Orange County Public Utilities
Orlando, Florida

SITE: 3120 Patel Drive
Winter Park, Orange County, Florida

SPT Borings

GRAPHIC LOG	LOCATION Exhibit A-4 DEPTH	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
	FINE SAND WITH SILT (SP-SM), tan to light brown, loose to medium dense *(continued)*						
					5-4-5 N=9	27	9
		30					
					7-7-8 N=15		
		35					
	38.5						
	FINE SAND (SP), light brown, medium dense to dense				6-8-9 N=17		
		40					
					13-17-21 N=38		
		45					
					10-14-19 N=33		
	50.0						
	Boring Terminated at 50 Feet	50					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Rotary Drilling Cutting Head

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water Initially Encountered

Estimated Seasonal High Water Level @ 8'

NODARSE
A Terracon Company
1675 Lee Road
Winter Park, Florida

Boring Started: 8/8/2012 | Boring Completed: 8/8/2012

Drill Rig: Truck | Driller: Travis

Project No.: AK127001 | Exhibit A-9

APPENDIX B – LABORATORY TESTING

Laboratory Testing

During the field exploration, a portion of each recovered sample was sealed in a glass jar and transported to our laboratory for further visual observation and laboratory testing. Selected samples retrieved from the borings were tested for moisture (water) content, fines content (soil passing a US standard #200 sieve). Those results are included in this report and on the respective boring logs, except for permeability. The visual-manual classifications were modified as appropriate based upon the laboratory testing results.

The soil samples were classified in general accordance with the appended General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of the Unified Soil Classification System is included in Appendix B. The results of our laboratory testing are presented in the Laboratory Test Results section of this report and on the corresponding borings logs.

APPENDIX C
SUPPORTING DOCUMENTS

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K,L,M,N] / Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K,L,M,P] / Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

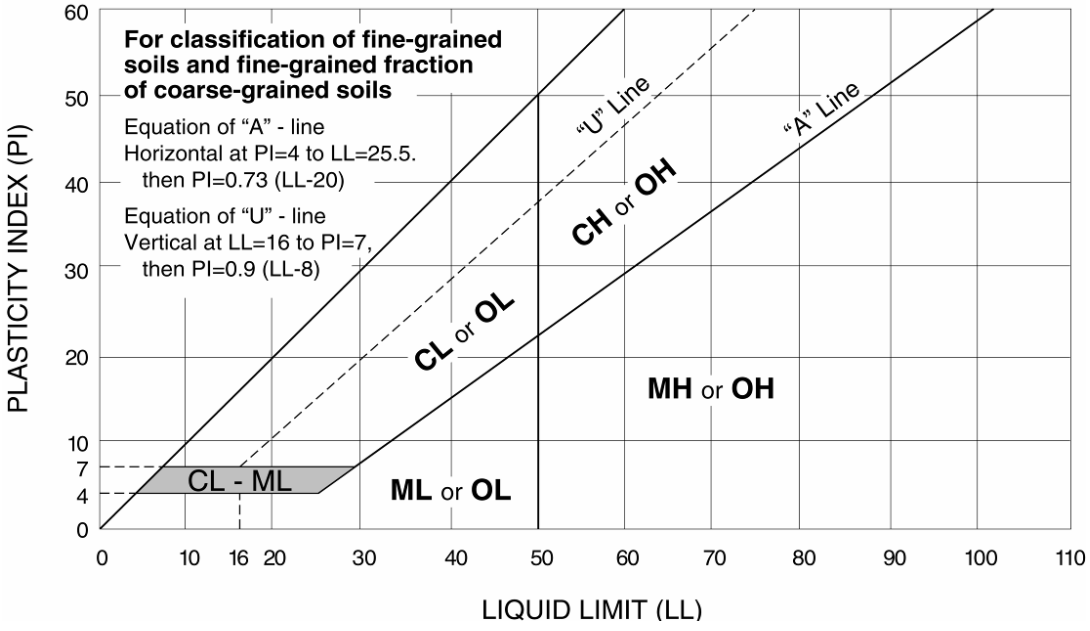
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



APPENDIX D
SUSTAINABILITY CONSIDERATIONS

SUSTAINABILITY CONSIDERATIONS

LEED Sustainable Sites (SS)

SS Prerequisite 1 – Construction Activity Pollution Prevention

The intent is to reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation. Terracon can assist in developing site specific Storm Water Management Plans (SWMP's) in addition to providing observation services for the duration of the project for conformance to the SWMP's.

SS Credit 5.1 - Site Development – Protect or Restore Habitat

The intent is to conserve existing natural areas and restoring damaged areas to provide habitat and promote biodiversity. Terracon can provide restoration recommendations such as design of mechanically stabilized earth vegetative faced retained slopes, stream mitigation, etc.

SS Credit 6.1 and Credit 6.1 – Storm Water Design – Quantity Control and Quality Control

Sustainable storm water design limits disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, and managing storm water runoff. Terracon can provide design recommendations for porous pavement systems and infiltration basins to assist in maintaining pre-development peak discharge rates of design storms without compromising the structural capacity of the pavement or surrounding improvements. A pervious pavement system is a pavement that is sufficiently porous to allow the infiltration of water into a sub-drainage system or open-graded aggregate base reservoir below paved areas. The collected water is allowed to infiltrate through a filter fabric into the underlying subgrade soils or the water is collected and discharged to a suitable outlet.

LEED Energy and Atmosphere (EA)

EA Credit 2 – On-site Renewable Energy

The intent is to provide on-site renewable energy. Self supply renewable energy potentials Include horizontal and vertical loop fields. Terracon can provide thermal resistivity testing for horizontal loop fields or trial testing for vertical geothermal wells.

LEED Materials and Resources (MR)

MR Credit 2 – Construction Waste Management

The intent is to divert construction and demolition debris from disposal in landfills and incineration facilities.

Reuse of On-Site Building Materials or Construction Debris: Reusing inorganic building materials derived from foundation demolition or construction debris as processed fill material is acceptable provided the materials are crushed to a well-graded homogenous mixture and free of wood and other deleterious debris. Crushed concrete foundations, flatwork and brick may be incorporated into structural compacted fill in approved areas.

Maximum size of crushed material should be no greater than 3 inches. Use of fill materials will depend upon the source of the recycled material and the intended use. Materials such as wood and metal should be properly disposed off-site. *Caution should be used when specifying painted recycled materials. In some states, the paint would need to be analyzed to evaluate if it is lead-based. The text above may need to be edited to say "uncoated" building materials*

Use of On-site Crushed Asphaltic Cement Concrete (ACC) Pavement for Engineered Fill: ACC pavement, and the underlying base rock can be used as engineered fill as long as it is properly processed. It is important that the recycled ACC pavement be blended with another material, such as soil, sand, and/or gravel, to fill voids. This material should be well graded and have a maximum size, in any dimension, of 6-inches. This may necessitate the use of on-site screening of the materials and processing the oversized portion through a crusher such that the maximum size of the well graded blend would be 6-inches.

Recycled ACC pavement should be limited to a maximum of 50% of the fill material being placed in any lift. This material should be used deep within the fill or in non-structural areas such that it does not underlie future excavations being made for footings, utilities, etc.

MR Credit 4 – Recycled Content

Flowable Fill: Consider using flowable fill for trench backfill. The flowable fill should be comprised of waste materials such as waste limestone screenings as the bulk-filler and fly-ash for the cementitious component.

ACC Pavement: ACC Pavement produced in the Central Florida area typically includes 20 percent recycled asphalt pavement (RAP) and 4 percent recycled asphalt shingles resulting in a product that contains 24% recycled material.

Limestone Screenings (Waste Lime): Limestone screenings are a waste product produced by many Central Florida Quarries. This material is usually wasted in the quarries if it does not possess enough calcium content to be suitable for ag-lime applications and also because there is more product produced than demand can satisfy. As a result, this material is abandoned on-site as a waste product. This material typically is well graded crushed aggregate material with an approximate top size of ¼-inch. This material can be used as engineered fill material in structural and non-structural areas of the project. The limestone screenings can be used for the low volume change zones as a suitable replacement for shrink/swell prone soils.

Supplementary Cementitious Materials (SCM's): Consider using SCM's that are recycled from other operations, such as fly ash, in concrete mixes.

Soil Subgrade Stabilization: Consider using Fly-Ash or Code-L (a waste by-product produced when making cement) to stabilize or otherwise improve the soil subgrade.

MR Credit 5: Regional Materials

Using regional materials is intended to increase demand for building materials and products that are extracted and manufactured within the region. Regional materials also reduce environmental impacts caused by transportation.

Asphaltic Cement Pavement (ACC): ACC pavement is typically produced locally. Asphalt and aggregates are typically derived locally. Oils may or may not be derived locally.

Portland Cement Concrete (PCC): PCC is typically derived locally including sand, gravel, water, and cement. Additives may or may not be locally derived.

Aggregates for Base and Backfill: Coarse and fine aggregates are typically derived locally from quarrying operations or from dredging operations.

National Pollutant Discharge Elimination System Groundwater Testing and Database Search

Allison Oaks Pump Station No. F3215
3120 Patel Drive, Winter Park
Orange County, Florida

October 4, 2012
Nodarse/Terracon Project No. AK127001

Prepared for:
Orange County Public Utilities-Engineering Division
Orlando, Florida

Prepared by:
Nodarse & Associates, Inc.
A Terracon Company
Winter Park, Florida 32789

October 4, 2012

Orange County Utilities Department
Engineering Division
9150 Curry Ford Road
Orlando, Florida 32825

Attn: Mr. Heriberto Collado-Lopez, P.E.
Phone: 407-254-9900
Fax: 407-254-9999

Re: Groundwater Sampling/Testing
National Pollutant Discharge Elimination System (NPDES) Parameters
Allison Oaks Pump Station No. F3215
3120 Patel Drive, Winter Park, Orange County, Florida
Nodarse/Terracon Project No. AK127001

Dear Mr. Collado:

In accordance with your request and authorization, Nodarse & Associates, Inc., a Terracon Company (Nodarse/Terracon), has completed National Pollutant Discharge Elimination System (NPDES) groundwater quality sampling and testing services at the above referenced location in accordance with our proposal number PH1120210 dated May 2, 2012, and Orange County Purchase Order #C11903A012, dated July 10, 2012.

A review of the Florida Department of Environmental Protection's (FDEP's) Contamination Locator Database website did not reveal the presence of any identified contaminated site within 1,000 feet of the project site.

On September 19, 2012, a temporary monitor well (TMW-3) was installed by direct-push Geoprobe drilling method to a depth of 13 feet below land surface (BLS). The depth to the shallow water table was measured at 6.7 feet BLS. On September 20, 2012, after well purging and stabilization of groundwater field parameters, Nodarse/Terracon collected one representative groundwater sample (PS# FS3215) for laboratory testing. The groundwater sample was delivered to Southern Research Laboratories, Inc. (SRL) of Orlando, Florida (Florida Department of Health #E83484) for analysis of NPDES parameters.

As shown in Table 1, the reported concentration of one parameter, total copper (detected at 4.58 micrograms per liter [µg/l]), exceeded the Chapter 62-621.300 (2), Florida Administrative Code, listed screening value (LSV) of 2.9 µg/l. If the dewatering effluent will be discharged onto the project site or sanitary sewer, then re-sampling of the temporary monitoring well for total copper may not to be warranted. Otherwise, re-sampling is recommended for total copper only. The remaining parameters analyzed did not report exceedances above their respective LSVs.

A copy of the laboratory analytical report, the groundwater sampling log, instrument calibration sheet, the monitoring well details and a site photograph are included in Appendix A.

Nodarse/Terracon appreciates the opportunity to have assisted with these services. If you should have any questions or comments, please feel free to contact us.

Sincerely,
Nodarse & Associates, Inc., a Terracon Company

Eduardo Sainten
Project Environmental Scientist

John Malkowski, P.E.
Florida License No. 59404
Senior Engineer

JOHN C MALKOWSKI LICENSE No. 59404 STATE OF FLORIDA PROFESSIONAL ENGINEER 10/4/12

N:\Projects\2012\AK127001\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\NPDES Allison Oaks\AK127001 Final NPDES Report.doc

TABLE

TABLE 1
GROUNDWATER ANALYTICAL SUMMARY
FINAL RESULTS OF NPDES CONCENTRATIONS
ALLISON OAKS PUMP STATION #F3215
WINTER PARK, ORANGE COUNTY, FLORIDA
NODARSE/TERRACON PROJECT NO. AK127001
SAMPLING DATE: SEPTEMBER 20, 2012

	Sample ID		
PARAMETER	**PS #FS3215**	**Limits***	**Units**
DATE SAMPLED	**9/20/12**		
Benzene	0.50 U	**1.0**	µg/L
Naphthalene	0.10 U	**100**	µg/L
Cadmium, Total	0.306 U	**9.3**	µg/L
Copper, Total	4.58 i	**2.9**	µg/L
Lead, Total	1.60 U	**30.0**	µg/L
Mercury, Total	0.00195	**0.012**	µg/L
Zinc, Total	10.3 v	**86.0**	µg/L
Chromium, Hexavalent	4.2 U	**11.0**	µg/L
Total Organic Carbon (TOC)	6.9	**10.0**	mg/L
TRPH	200 U	**5000.0**	µg/L
pH - Field	6.44	**6.0 - 8.5**	µg/L
Turbidity	2.41	**NA**	NTU

NOTES:

Bold values represent a concentration exceeding the respective NPDES criteria

mg/L - milligrams per liter

µg/L - micrograms per liter

i - indicates value < method detection limit but > than practical quantitation limit

I - The reported concentration is between the MDL and PQL

U - not detected above method detection limit

v - Analyte was detected in both the sample and associated Lab Method Blank; laboratory contamination

* Based on the Florida Department of Environmental Protection' s Effluent Discharge

Generic Dewatering Permit Table 4 Screening Values (Doc # 62-621.300(1), eff. 2-14-2000

NS - No applicable limitation or standard referenced

NA - Not applicable

APPENDIX A

LABORATORY ANALYTICAL REPORT, GROUNDWATER SAMPLING LOGS, INSTRUMENT CALIBRATION SHEET, MONITORING WELL DETAILS AND PHOTOGRAPH

Southern Research Laboratories, Inc.

2251 Lynx Lane, Suite I
Orlando, Florida 32804
(407) 522-7100 Fax (407) 522-7043
Toll Free 1 (888) 420-Test

Thank you **Mr. Ed Sainten** for the opportunity to be of service to you and your company; we **S**incerely **A**ppreciate **Y**our **B**usiness. SRL certifies these **Laboratory Results** were produced in accordance with NELAC Standards. Hold times and preservation requirements were met for all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: **Terracon**	Date(s) Collected: 09/20/12
Contact Name: **Ed Sainten**	Date Received: 09/20/12
Project Name: Allison Oak's PS #F3215	Time Received: 13:08
Project Number: AK-12-7001	Date Reported : 10/01/12
Phone Number: (407) 740-6110	Date Emailed : 10/01/12
Fax Number: (407) 740-6112	SRL Work Order # 12-09024

SRL WO #	Clients #	Matrix	Analysis Requested
12-09024-001	PS #FS3215	Liquid	EPA8260(Benz)/TOC/Cd/Cu/Pb/Zn/ 8270-SIM(PAH)Naph/FLPRO/ LL Hg/Hexavalent Chromium
12-09024-002	Trip Blank	Liquid	EPA 8260 (Benz)

Sherri Payne Digitally signed by Sherri Payne DN: cn=Sherri Payne, o=SRL, ou=SRLAB.com, email=sherri.payne@srlab.com, c=US Date: 2012.10.01 18:19:38 -04'00'

Sherri Payne
Vice President & Quality Assurance Officer
Southern Research Laboratories, Inc.

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09024
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-7001
Allison Oak's PS #F3215
Orlando, FL

EPA Method 5030/8260B VOA {602} Compounds in Water by GC-MS

Client ID #	**PS #FS3215**	**Trip Blank**	**Method Blank**			
SRL (Lab) ID#	12-09024-001	12-09024-002	MB092512			
Date Collected	09/20/12	09/18/12	NA			
Lab FDOH Certification #	E83484	E83484	E83484			
Date Prepared	09/25/12	09/25/12	09/25/12			
Date Analyzed	09/25/12	09/25/12	09/25/12	**MDL**	**PQL**	**CAS Number**
Benzene	0.5 U	0.5 U	0.5 U	0.5	1.0	71-43-2
Units	**ug/L**	**ug/L**	**ug/L**	ug/L	ug/L	
Dilution Factor (MEDF)	1	1	1	1	1	
Surrogate (% Rec)				(Surrogate Control Limits)		
4-Bromofluorobenzene	92.5%	97.4%	95.0%	70-130		

	% Recovery LCS/MS/MSD	**LCS Acceptable Limits**	**MS/MSD Acceptable Limits**	**%RPD MS/MSD**	**Acceptable Limits**
Benzene	109/81/81	70-130	70-130	0.5	0-30

EPA Method 3510/8270C-SIM Polynuclear Aromatic Hydrocarbon Compounds +Naph in Water by GC-MS

Client ID #	**PS #FS3215**	**Method Blank**			
SRL (Lab) ID#	12-09024-001	MB092512			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E83484	E83484			
Date Extracted	09/25/12	09/25/12			
Date Analyzed	09/26/12	09/26/12	**MDL**	**PQL**	**CAS Number**
Naphthalene	0.10 U	0.10 U	0.10	0.50	91-20-3
Units	ug/L	ug/L	ug/L	ug/L	
Dilution Factor (MEDF)	1	1	1	1	
Surrogate (% Rec)			(Surrogate Control Limits)		
Nitrobenzene-D5	89.2%	87.3%	60-140		
2-Fluorobiphenyl	79.2%	74.6%	60-140		
p-Terphenyl-D14	99.3%	105.2%	60-140		

	% Recovery LCS/MS/MSD	**Acceptable Limits**	**%RPD MS/MSD**	**Acceptable Limits**
Naphthalene	83/76/82	60-140	7.6	30

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09024
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-7001
Allison Oak's PS #F3215
Orlando, FL

FL-PRO (Petroleum Range Organics)~{Water}

Client ID #	**PS #FS3215**	**Method Blank**			
SRL (Lab) ID#	12-09024-001	MB092612			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E83484	E83484			
Date Prepared	09/26/12	09/26/12			
Date Analyzed	09/27/12	09/27/12	**MDL**	**PQL**	**CAS Number**
TOTAL PRO (C8-C40)	0.2 U	0.2 U	0.2	0.5	NA
Units	mg/L	mg/L	mg/L	mg/L	
Dilution Factor (MEDF)	1	1	1	1	
Surrogate (% Rec)			(Surrogate Control Limits)		
Orthoterphenyl (OTP)	86.2%	115.7%	82-142		

	% Recovery LCS/LCSD	**Acceptable Limits**	**%RPD LCS/LCSD**	**Acceptable Limits**
TOTAL PRO (C8-C40)	84/85	55-118	1.7	0-20

Hexavalent Chromium by SM18 3500-Cr D in Water

Client ID #	**PS #FS3215**	**Method Blank1**	**Method Blank2**			
SRL (Lab) ID#	12-09024-001	MB092012	MB092112			
Date Collected	09/20/12	NA	NA			
Lab FDOH Certification #	E82277	E83182	E83182			
Date Prepared	09/21/12	09/20/12	09/21/12			
Date Analyzed	09/21/12	09/20/12	09/21/12			
Time Analyzed	10:00	22:09	9:51			
Units	**mg/L**	**mg/L**	**mg/L**	**MDL**	**PQL**	**CAS Number**
Hexavalent Chromium	0.0042 U	0.0042 U	0.0042 U	0.0042	0.030	1854-02-99

	% Recovery LCS/MS/MSD	**LCS Acceptable Limits**	**MS/MSD Acceptable Limits**	**%RPD MS/MSD**	**Acceptable Limits**
Hexavalent Chromium	106/92/93	85-115	85-115	2	0-13

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09024
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-7001
Allison Oak's PS #F3215
Orlando, FL

Total Organic Carbon by SM18 5310B in Water

Client ID #	**PS #FS3215**	**Method Blank**			
SRL (Lab) ID#	12-09024-001	MB092612			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E82277	E83182			
Date Prepared	09/26/12	09/26/12			
Date Analyzed	09/26/12	09/26/12			
Dilution Factor (MEDF)	1	1			
Units	**mg/L**	**mg/L**	**MDL**	**PQL**	**CAS Number**
Total Organic Carbon (TOC)	**6.9**	0.22	0.22	1.0	ECL-0165

	% Recovery LCS/MS/MSD	Acceptable Limits	%RPD MS/MSD	Acceptable Limits
Total Organic Carbon (TOC)	100/103/104	85-115	0.7	0-21

EPA Method 1631 Low Level Mercury (Hg) in Water

Client ID #	**PS #FS3215**	**Method Blank**			
SRL (Lab) ID#	12-09024-001	MB092412			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E87688	E87688			
Date Prepared	09/24/12	09/24/12			
Date Analyzed	09/25/12	09/25/12			
Units	**ng/L**	**ng/L**	**MDL**	**PQL**	**CAS Number**
Low Level Mercury (Hg)	**1.95**	0.183 U	0.183	0.5	7439-97-6

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	%RPD MS/MSD	Acceptable Limits
Low Level Mercury (Hg)	107/100/91	77-123	71-125	8.7	0-24

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09024
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-7001
Allison Oak's PS #F3215
Orlando, FL

Metals (total recoverable) by EPA 200 Series Methods

Client ID #	: **PS #FS3215**	**Method Blank**				
SRL (Lab) ID#	: 12-09024-001	MB092412				
Date Collected	: 09/20/12	NA				
Lab FDOH Certification #	: E82277	E82277				
Date Prepared	: 09/24/12	09/24/12				
Date Analyzed	: 09/25/12	09/25/12				
Units	: **ug/L**	**ug/L**		**MDL**	**PQL**	**CAS Number**
Cadmium	0.306 U	0.306 U		0.306	1.00	7440-43-9
Copper	**4.58 I**	1.40 U		1.40	10.0	7440-50-8
Lead	1.60 U	1.60 U		1.60	10.0	7439-92-1
Zinc	**10.3 V**	* **7.86 I**		3.00	10.0	7440-66-6

Prep. Method EPA 3005A		**LCS**	**MS/MSD**		
EPA 200.7	**% Recovery**	**Acceptable**	**Acceptable**	**%RPD**	**Acceptable**
	LCS/MS/MSD	**Limits**	**Limits**	**MS/MSD**	**Limits**
Cadmium	104/102/102	85-115	70-130	0.1	0-25
Copper	101/101/101	85-115	70-130	0.2	0-25
Lead	102/100/100	85-115	70-130	0.7	0-25
Zinc	99/98/97	85-115	70-130	0.7	0-25

* This compound is a common laboratory contaminant

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09024
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-7001
Allison Oak's PS #F3215
Orlando, FL

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

LCS Obs. Value is the observed quantity, as calculated from the calibration curve, of the analyte in the Laboratory Control Sample (LCS). The LCS is a standard from a source different than the source of the standards used for calibration. The LCS is also known as the QC sample. It is used to check the accuracy of the calibration curve.

Chain of Custody

Page 1 of 1

Project Manager:	ED Swinton
Company:	Terracon
Address:	1675 Lee Road
City, State, Zip:	Winter Park, Florida 32789
Phone:	+1 (407) 740-6110
Fax:	+1 (407) 740-6112

Southern Research Laboratories, Inc.
2251 Lynx Lane, Suite #1
Orlando, Florida 32804
(407) 522-7100
Toll Free 1 (888) 420-TEST
Fax: (407) 522-7043

Project Name:	Allison Oaks PS # FS3215
Project Location:	Orlando, FL.
Sampled by (Print Name(s)) / Affiliation:	Mike Burns / Terracon
Sampler(s) Signature(s):	Mike Burns
Project Number:	AK 12-7001
REQUESTED DUE DATE:	Standard
Sampling QAP No.:	
Approval Date:	

	Sample Identification	Sampled Date:	Sampled Time:	Grab or Composite	Matrix (see codes)	Total Number of Containers	Preservatives (see codes)	Analyses Requested: Benzene	Naphthalene	TRPH	TOC	metals Cd, Cu, Pb, Zn	Lt Mercury	Hex Chromium	Comments
							H I H I N H I								
1	PS # FS3215	9/20/12	1017	Grab	GW	10		X	X	X	X	X	X	X	1209024-001
2	Trip Blank	9-18-12	21:10	—	W	2		X							-002

Shipment Method:		Relinquished by: / Affiliation:	Date:	Time:	Accepted by: / Affiliation:	Date:	Time:
Out: / /	Via:	[illegible]	9-18-12	21:20	Mike Burns	9/20/12	0700
Returned: / /	Via:	Mike Burns	9/20/12	1308	[illegible]	9-20-12	1307

Additional Comments:

Cooler No.(s) / Temperature(s) (°C): 399 / 0.7°

Sampling Kit No.: 5927

Equipment ID No.:

Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water(Blanks) HW = Potential Haz Waste O = Other(Specify:)

Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other(Specify)

Form FD 9000-24

GROUNDWATER SAMPLING LOG

Riser: 2.0

SITE NAME: Allison Oaks PS# F3215	SITE LOCATION: Orlando, FL.	
WELL NO: PS# F3215	SAMPLE ID: PS# F3215	DATE: 9/20/12

PURGING DATA

WELL DIAMETER (inches): 1"	TUBING DIAMETER (inches): 1/8"	WELL SCREEN INTERVAL DEPTH: 3.0 feet to 13.0 feet	STATIC DEPTH TO WATER (feet): 8.74	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable)

= (15.0 feet - 8.74 feet) X .04 gallons/foot = 0.25 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable)

= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 11.5'	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 14.5	PURGING INITIATED AT: 0957	PURGING ENDED AT: 1012	TOTAL VOLUME PURGED (gallons): 0.97

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) mhos/cm or S/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
0957	0.25	0.25	.06	13.05	6.44	25.16	583	60.8%/5.01	7.02	clear	none
1000	0.18	0.43	.06	13.84	6.14	25.13	573	58.8%/4.89	5.23	CL	"
1003	0.18	0.61	.06	13.85	5.89	25.07	384	60.7%/5.0	5.57	CL	"
1006	0.12	0.73	.04	14.23	5.71	25.05	359	59.8%/4.92	3.92	CL	"
1009	0.12	0.85	.04	14.35	5.62	25.05	258	59.9%/4.96	3.33	CL	"
1012	0.12	0.97	.04	14.48	5.57	25.06	262	60%/4.95	2.41	CL	"

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Mike Burns / Terracon	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1017	SAMPLING ENDED AT: 1041
PUMP OR TUBING DEPTH IN WELL (feet): 14.5	TUBING MATERIAL CODE: PE/S	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ m
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y (N) (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
PS#F3215	2	CG	40mL	HCl	—	—	VOA	RFPP	<100 mL
|	2	AG	40mL	None	—	—	TOC	|	<100mL
|	2	CG	40mL	HCl	—	—	LL Mercury	|	<100mL
|	1	AG	1Ltr.	H2SO4	—	—	FL-PRO	PP	.046gpm
|	1	AG	1Ltr.	None	—	—	8270-SIMPAH	|	|
|	1	PE	250mL	None	—	—	Hex Cr	|	|
REMARKS: Very Slow Recharge	1	PE	125mL	HNO3	—	—	4 metals	↓	↓

Slow Pump down due to dropping water level / Allow recharge for 5min prior to Collecting Samples

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

NA-038

Form FD 9000-8: FIELD INSTRUMENT CALIBRATION RECORDS

INSTRUMENT (MAKE/MODEL#) YSI 556MPS **INSTRUMENT #** 06H2510AF

PARAMETER: *[check only one]*

☐ TEMPERATURE ☒ CONDUCTIVITY ☐ SALINITY ☒ pH ☐ ORP
☐ TURBIDITY ☐ RESIDUAL Cl ☒ DO ☐ OTHER _____

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A DO 100%
Standard B PH 4, 7, 10
Standard C Conductivity 1413

DATE (yy/mm/dd)	TIME (hr:min)	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS
9/20/12	0925	A	100%	92.0/100.3	8%/<1	Yes	Init	MB
	0934	B	4.0	4.03	<1			
	0943	B	7.0	6.97	<1			
	0949	B	10.0	10.10	1%			
	0951	C	1413	1400	<1			
9/20/12	1157	A	100%	100.4%	<1	Yes	cont	MB
	1200	B	4	4.01	<1			
	1203	B	7	7.0	<1			
	1208	B	10	10.03	<1			
	1211	C	1413	1413	<1			

Form FD 9000-8: FIELD INSTRUMENT CALIBRATION RECORDS

INSTRUMENT (MAKE/MODEL#) HACH 2100P **INSTRUMENT #** 08080C017245

PARAMETER: *[check only one]*

☐ TEMPERATURE ☐ CONDUCTIVITY ☐ SALINITY ☐ pH ☐ ORP

☒ TURBIDITY ☐ RESIDUAL Cl ☐ DO ☐ OTHER _____

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A <0.1

Standard B 20.0

Standard C 100

DATE (yy/mm/dd)	TIME (hr:min)	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS
9/20/12	0921	A	0.1	0.16/0.11	60/10%	Yes	Init	MB.
↓	0923	B	20.0	20.2	1%	↓	↓	↓
↓	0925	C	100	99.3	<1	↓	↓	↓
9/20/12	1213	A	0.1	0.11	10%	Yes	cont	MB
↓	1214	B	20.0	20.1	<1	↓	↓	↓
↓	1215	C	100	99.7	<1	↓	↓	↓

DATE: 9/19/19

SITE: Pump Station #3215

LOCATION: Orlando, FL

WELL LOCATION STRATEGY: TMW-3

DRILLING COMPANY: Groundwater Protection

DRILLING METHOD / BORING DIAMETER: Geo Probe / 4"

WELL DEPTH / SCREEN INTERVAL: 13' bls / 3-13'

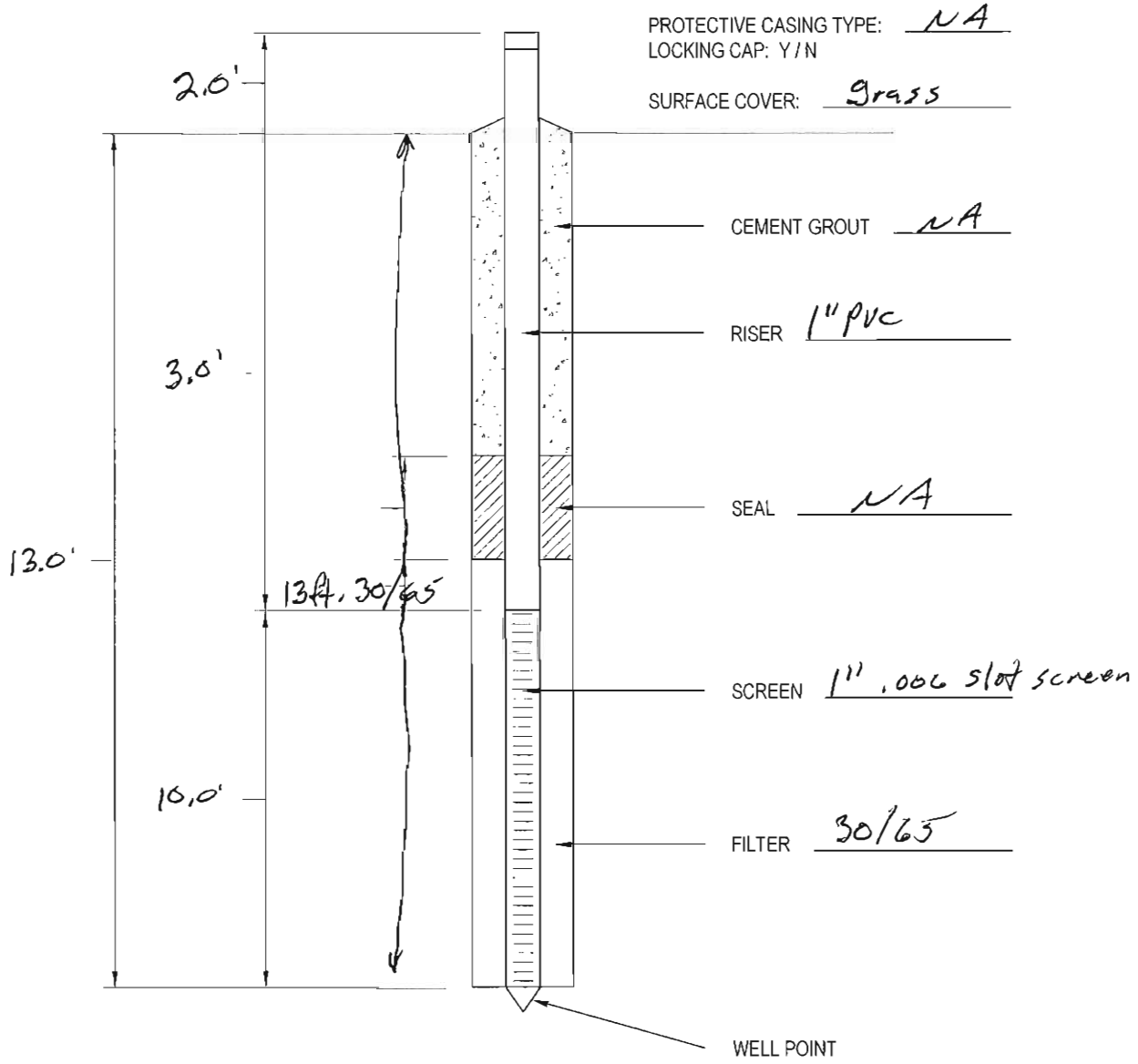
GROUNDWATER LEVEL: 9.87' TOC

TOP OF CASING ELEVATION:

DEVELOPMENT PROCEDURE: Peristaltic Pump

DISPOSITION OF INVESTIGATIVE DERIVED WASTES: Spread

REMARKS:



Terracon

Nodarse/Page One Joint Venture

Geotechnical Engineering Report

Greenview Pines Pump Station No. 3887
Orlando, Florida

October 16, 2012
Project No. AK125005

Prepared for:
Orange County Public Utilities-Engineering Division
Orlando, Florida

Prepared by:
Nodarse & Associates
A Terracon Company
Winter Park, Florida

October 16, 2012

Orange County Public Utilities – Engineering Division
9150 Curry Ford Road
Orlando, Florida 32815

Attn: Mr. Jeff Nazario

Re: Geotechnical Engineering Report
Greenview Pines Pump Station No. 3887
Orlando, Florida
Project Number: AK125005

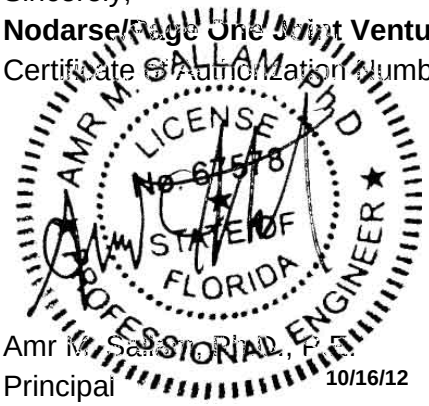
Dear Mr. Nazario:

Nodarse/Page One Joint Venture has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number PH1120208 dated May 2, 2012.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of the proposed wet well pump station.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Nodarse/Page One Joint Venture, LLC
Certificate of Authorization Number 8830



10/16/12

Amr M. Sallam, PhD, P.E.
Principal
Florida PE- 67578

Jay W. Casper, P.E.
Senior Associate
Florida PE - 36330

Enclosures
cc: 1 – Client (PDF)
1 – File

TABLE OF CONTENTS

EXECUTIVE SUMMARY

A geotechnical investigation has been performed for the proposed Greenview Pines Pump Station planned at 3955 Greenview Pines Court in Orlando, Orange County, Florida. Three (3) borings, designated AB-01, AB-02, and TB-01 have been performed to depths of between 10 and 50 feet below the existing ground surface within the pump station areas. This report specifically addresses the recommendations for the proposed pump station wet well, manhole, and pipelines.

Based on the information obtained from our geotechnical exploration, it appears that the subsoil and groundwater conditions at the site are suitable for the proposed developed and construction. The following geotechnical considerations were identified:

- Temporary dewatering will be required for construction of the pump station. Dewatering the pump station area will require the use of a properly designed well point system. The dewatering system should not be turned off until the pump station has enough dead weight to counteract an uplift force calculated based on a head of water measured from the base of the pump station to the estimated Seasonal High Water Level (SHWL).

- Our borings did not encounter unsuitable soils such as muck, clay, high silts, and debris, which might cause problems during construction. However, if encountered, unsuitable soils should be completely removed to a minimum depth of 18 inches below the pump station pipelines bottom, replaced with well-draining granular sands with a fines content of 5 percent or less passing the No. 200 U.S. Standard sieve by weight, and compacted to a firm and unyielding state.

- The proposed structure may be supported on shallow footings bearing on the existing site soil only if the proper site preparations are following according to the appropriate sections of this report.

- On-site native soils typically appear suitable for use as general engineered fill.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
GREENVIEW PINES PUMP STATION NO. 3887
ORLANDO, FLORIDA

Project No. AK125005
October 16, 2012

1.0 INTRODUCTION

A geotechnical engineering report has been prepared for the proposed Greenview Pines Pump Station which will be located at 3955 Greenview Pines Court in Orlando, Orange County, Florida as shown on the Topographic Vicinity Map included as Exhibit A-1 in Appendix A. Three (3) borings, designated AB-01, AB-02, and TB-01 have been performed to depths of between 10 and 50 feet below the existing ground surface in the proposed pump station and manhole area. Logs of the borings along with a site location plan, geologic map and boring location plans are included in Appendix A of this report.

The purpose of the geotechnical services was to provide information and geotechnical engineering recommendations relative to the proposed pump station wet well, gravity pipeline, and a concrete drive way. The followings will be provided:

- Field exploration method
- Subsurface soil and groundwater conditions
- Presentation of field and laboratory information in graphical format
- Recommendations for general earthwork
- Recommendations for pump station design and construction
- Recommendations for gravity pipe line earthwork

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Exhibit A-4: Boring Location Plan
Construction	One wet well to a depth of about 20 feet below existing grade and 6 feet in diameter with associated pipelines and man holes.
Grading	Fill – fine grading, estimated at up to approximately 1 foot.
Cut and fill slopes	Excavation per OSHA requirements or a license professional engineer for braced excavations.

2.2 Site Location and Description

Item	Description
Location	The project will be located at 3955 Greenview Pines Court in Orlando, Orange County, Florida
Existing improvements	No existing structures on site. A residential structure exists just south of the site.
Current ground cover	Grass covered with limited trees.
Existing topography	The USGS topographic quadrangle map "Orlando East, Florida" and "Oviedo SW, Florida" depict the developed topography as nearly level, with original ground surface elevations ranging from about elevation +60 feet to +65 feet referencing the National Geodetic Vertical Datum of 1929 (NGVD29).

3.0 SUBSURFACE CONDITIONS

3.1 USDA Soil Survey

The Soil Survey of Orange County, Florida, as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS; later renamed the Natural Resource Conservation Service - NRCS), dated October 1981, identifies the soil types at the project site as Pomello fine sand, 0 to 5 percent slopes (34). It should be noted that the Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be encountered. A copy of the pertinent section of the Soil Survey map is included as Exhibit A-2 in Appendix A. Descriptions of soil map units are included in Appendix A as Exhibit A-3.

3.2 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
1	8	Fine sand to fine sand with silt (SP/SP-SM)	Loose to medium dense
2	10 to 13.5	Silty fine sand (SM)	Loose

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
3	15 to 50	Fine sand to fine sand with silt (SP/SP-SM)	Loose to dense

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A of this report. Descriptions of our field exploration are included as Exhibit A-5 in Appendix A. Descriptions of our laboratory testing procedures are included as Exhibit B-1 in Appendix B.

3.3 Groundwater

The boreholes were observed during drilling for the presence and level of groundwater. Groundwater was observed in the borings at a depth of 4.5 feet below existing grade. It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the boring was performed. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the boring logs. The estimated seasonal high groundwater tables are included in the following table and on the boring logs.

Boring #	Approximate depth to encountered water table (feet)	Approximate depth to estimated normal seasonal high groundwater table (feet)
AB-01	4.5	3
AB-02	4.5	3
TB-01	4.5	3

Estimates of the normal seasonal high water table presented in this report are based on and limited by the data collected during our geotechnical exploration, and the referenced published documents. Estimates of the normal seasonal high assume normal precipitation volumes and distribution. These seasonal water table estimates do not represent the temporary rise in water table that occurs immediately following a storm event, including adjacent to other stormwater management facilities. This is different from static groundwater levels in wet ponds and/or drainage canals which can affect the design water levels of new, nearby ponds. The seasonal high water table may be affected by extreme weather changes, localized or regional flooding, karst activity, future grading, drainage improvements, or other construction that may occur on our around the site following the date of this report.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The following conclusions and recommendations are based on the project characteristics previously described, the data obtained in our field exploration and our experience with similar subsurface conditions and construction types. If the proposed pump station location is significantly different from that previously described, or if subsurface conditions different from those disclosed by the borings are encountered during construction, we should be notified immediately so that we might review and modify, if necessary, the following recommendations in regards to such changes. The general guidelines included in this report are not intended to supersede more stringent requirements which may be mandated by County specifications.

4.1.1 Pump Station: Boring TB-01 was performed near the approximate location of the proposed pump station wet well as indicated by provided site plans. Groundwater was encountered in the boring at a depth of about 4.5 feet below existing grade. Based on the provided plans, the anticipated depth of the proposed pump station wet well is to be about 20 feet below existing grade.

- Dewatering will be required for construction of the pump station. Dewatering the pump station area will require the use of a properly designed well point system. Other dewatering systems utilizing sumps within shored or braced excavations may also be feasible. However, design of shoring/sump systems should be carefully evaluated with regard to blow outs of the excavation bottom due to unbalanced hydrostatic conditions. The Contractor should be allowed to review the soil stratification to determine the most feasible dewatering system for the pump station area. Dewatering should be performed gradually and slowly in order to reduce the effect of the sudden additional effective stress increase on the subsoil below close-by housed or roadways.

- All excavation should be performed in accordance with appropriate Occupational Safety and Health Administration (OSHA) standards. These standards typically include side slopes for temporary excavation no steeper than 1.5 horizontal to 1 vertical (1.5H: 1V) to provide adequate worker safety.

- If these side slopes cannot be maintained or are not desired due to other considerations, a properly designed and braced excavation or sheet piling would be required. All shoring and bracing systems or sheet piling should be designed and reviewed by an experienced professional engineer registered in the State of Florida.

- Although not encountered, it is important to note that soils with high fines content (clay, silts, ect.) or unsuitable material (organics, muck, debris, ect.) should be removed to a minimum depth of 12 inches below the pump station bottom, to provide a stable construction platform, and replaced with well-draining granular sands with fines contents of 5 percent of less passing the No. 200 U.S. Standard sieve by weight. The soils below the base of the pump station should be compacted to a firm and unyielding state.

After the subgrade soils have been prepared as recommended above, the pump station may be supported on a monolithic slab or spread footing. The foundations can utilize a maximum net soil bearing pressure of 2,000 pounds per square foot.

- Compaction of backfilled soils around the pump station should be accomplished in lift thicknesses no greater than 8 inches. The fill material should consist of relatively clean granular sands with no more than 5 percent passing the No. 200 U.S. standard sieve by weight.

- Compaction can likely be accomplished in these areas with a small plate or hand guided drum type vibratory compactor and loose lift thicknesses should be limited to 8 inches. At least one (1) density test should be performed on each lift to verify that the soil has been compacted to at least 95 percent of its modified Proctor maximum dry density (ASTM D-1557).

- If compaction difficulties arise during construction, the geotechnical engineer should be consulted to provide further recommendations.

- The construction should also be sequenced so that a dewatering system, if necessary, is not turned off until the pump station has enough weight to counteract an uplift force equivalent to the amount of water displaced. It may also be prudent to place additional concrete in the structure foundation to provide ballast against such an uplift force. This uplift force should account for the head difference from the bottom elevation of the foundation to the seasonal high groundwater level or the groundwater level at the time of construction, whichever is shallower, plus any possible flooding conditions that may occur at the project site.

- For calculations of resistance to the uplift force, 50 pounds per cubic foot may be used for the buoyant unit weight of the soil. The buoyant weight of the concrete and overlying soils should be used in calculating the necessary amount of ballast required.

4.1.2 Pipelines: Regarding the pipe subgrade soils and backfill soils we offer the following recommendations:

- The bedding soil beneath the pipe should be properly shaped to completely support the pipe section and areas should be excavated to accommodate any bells or other raised portions of the pipe to help avoid point loading conditions.

- Once the pipe has been laid in the excavation trench and approved, backfill should be carefully deposited and compacted to the centerline of the pipe on both sides. All fill should be inorganic, non-plastic, granular soils (clean sands). The near surficial native site soils appear to meet backfill requirements.

- Compaction of backfilled soils above the centerline of the pipe to the proposed final grade should be accomplished in lift thicknesses no thicker than 12 inches.

- At least one (1) density per lift should be performed to verify that the soil has been compacted to 95 percent of the material's maximum modified Proctor dry density (ASTM D 1557).

- If compaction difficulties arise during construction, the Geotechnical Engineer should be consulted to provide further recommendations.

4.1.4 General Site Preparation: The following general procedures are recommended for site preparation:

- All excavations required should be performed in accordance with appropriate Occupational Safety and Health Administration (OSHA) standards. These standards typically include side slopes for temporary excavations not steeper than 1.5 Horizontal to 1 Vertical (1.5H:1V) to provide for adequate worker safety.

- If these side slopes cannot be maintained or are not desired due to other considerations, a properly designed braced excavation, trench shield, or sheet piling would be required for stable excavations. All shields, shoring and bracing systems, or sheet piling should be designed and reviewed by an experienced Professional Engineer registered in the State of Florida. Adjacent traffic loads and induced vibrations, among other factors, should be included in the design of these stabilization systems.

4.1.5 Temporary Dewatering: Groundwater was observed at a depth of about 4.5 feet at our boring locations at the time of our exploration. The normal seasonal high groundwater level is anticipated to be at a depth of about 3 feet below existing grades. Based on this information and the proposed embedment depths of the pump station, dewatering will be required to

facilitate construction, backfill and compaction in the dry. Regarding dewatering, we offer the following recommendations:

- Dewatering operations at this site for the proposed pump station should be accomplished with a properly designed well point system dewatering system operating outside the excavation limits.

- The dewatering system should be adequate to lower groundwater levels to at least 2 feet below the lowest compaction surface.

- Other dewatering systems utilizing sumps within shored or braced excavations may also be feasible. However, design of shoring/sump systems should be carefully evaluated with regard to blow outs of the excavation bottom due to unbalanced hydrostatic conditions. The Contractor should be allowed to review the soil stratification to determine the most feasible dewatering system for the pump station area.

The construction should be sequenced so that the dewatering system is not turned off until the pump station has enough weight placed over it to counteract an uplift force equivalent to the height of standing water above the base of the pump station. The resisting weight of soil over the pump station should be calculated using the buoyant unit weight of the soil.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

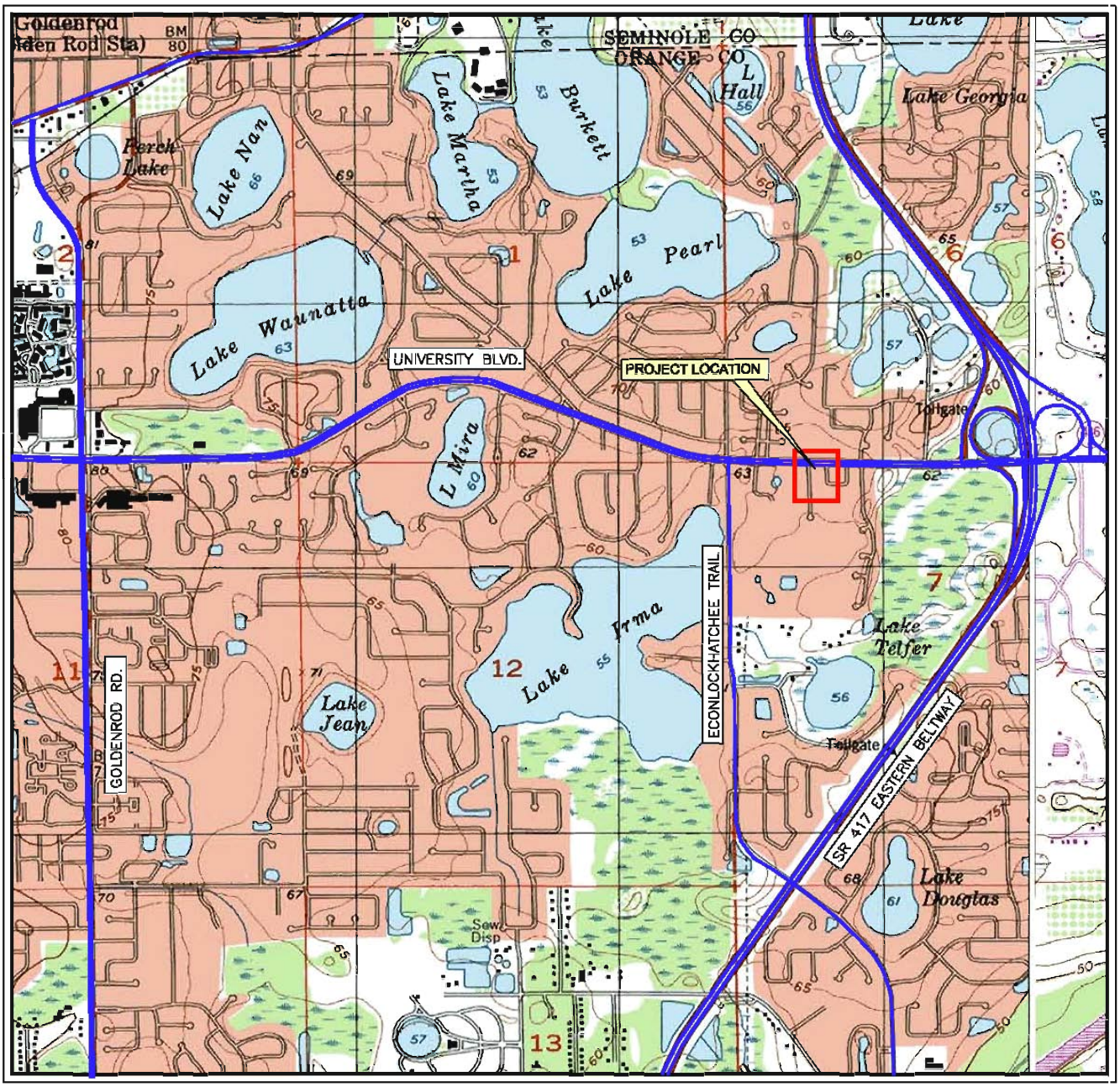
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or

prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY



SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 MILES 1000 2000

1 .5 0 1

FEET

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SECTION: 7
TOWNSHIP: 22 SOUTH
RANGE: 31 EAST

ORLANDO EAST, FLORIDA
ISSUED: 1994

OVIEDO SW, FLORIDA
ISSUED: 1953 REVISED: 1980

7.5 MINUTE SERIES (QUADRANGLE)

N

N:\Projects\2012\AK125005\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\Lead\5005-usgs.dwg

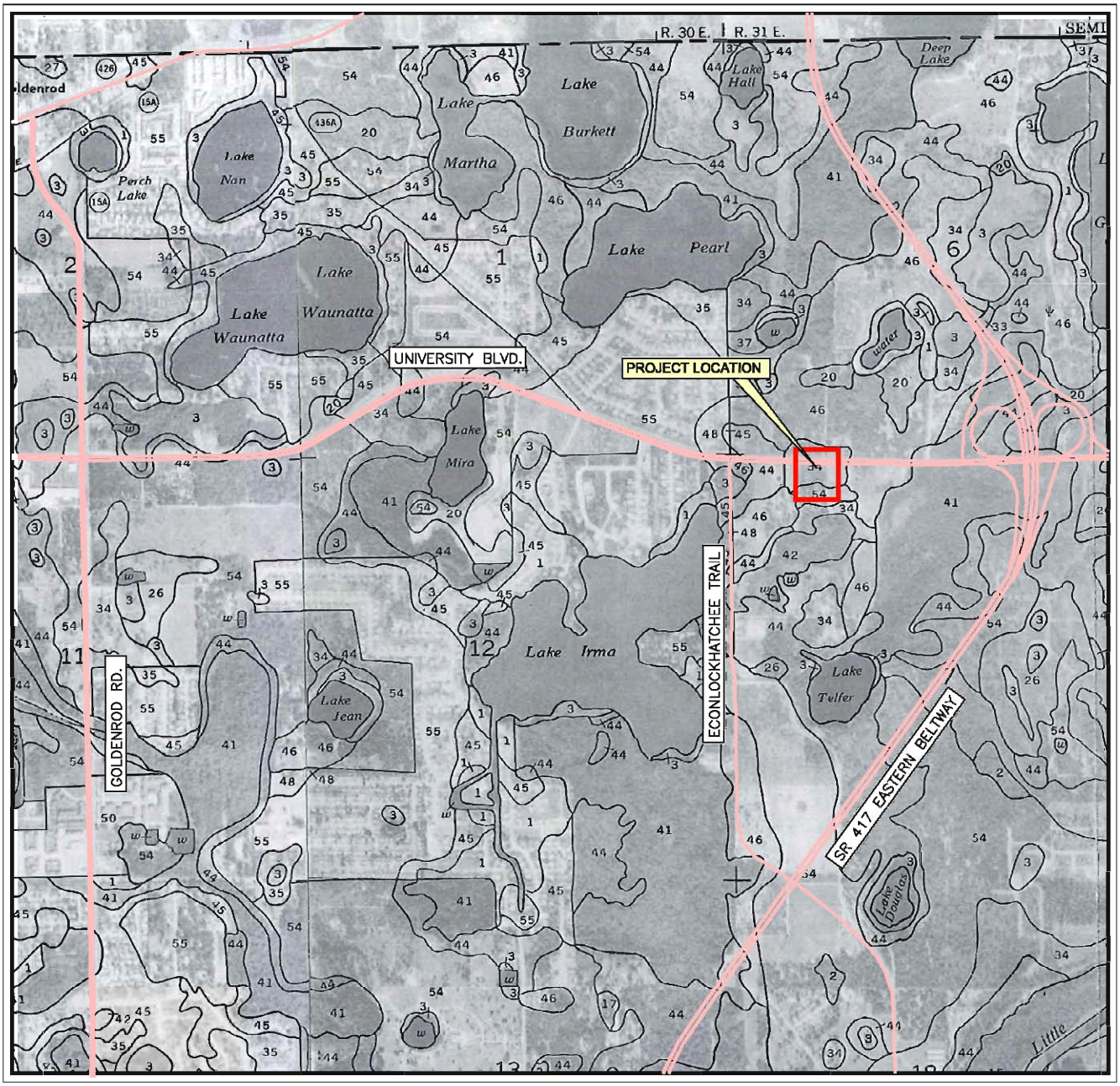
Project Mngr:	MER
Drawn By:	SW
Checked By:	MER
Approved By:	AMS

Project No.	AK125005
Scale:	AS SHOWN
File No.	AK125005-1
Date:	9-26-12

NODARSE
A Terracon COMPANY

TOPOGRAPHIC VICINITY MAP
GEOTECHNICAL ENGINEERING REPORT
GREENVIEW PINES PUMP STATION
ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT
A-1



SCALE 1" = 2000'

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

U.S.D.A. SOIL SURVEY FOR ORANGE COUNTY, FLORIDA
ISSUED: 1989

SECTION: 7
TOWNSHIP: 22 SOUTH
RANGE: 31 EAST

SOILS MAP INDEX	
34	POMELLO FINE SAND, 0 TO 5 PERCENT SLOPES

N

N:\Projects\2012\AK125005\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\cad\5005-usda.dwg

Project Mngr:	MER
Drawn By:	SW
Checked By:	MER
Approved By:	AMS

Project No.	AK125005
Scale:	AS SHOWN
File No.	AK125005-2
Date:	9-26-12

NODARSE
A Terracon COMPANY

U.S.D.A. SOILS MAP
GEOTECHNICAL ENGINEERING REPORT
GREENVIEW PINES PUMP STATION
ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT
A-2

Soil Survey Descriptions

34 – Pomello fine sand, 0 to 5 percent slopes. This soil type is nearly level to gently sloping and moderately well drained. It is typically found on low ridges and knolls on the flatwoods. In its natural state and during years of normal rainfall, this soil type has a seasonal high water table at a depth of between 20 and 40 inches (1.7 and 3.3 feet) for 1 to 4 months, receding to a depth of 40 to 60 inches (3.3 to 5.0 feet) during dry periods.

Project Mngr:	MER
Drawn By:	SW
Checked By:	MER
Approved By:	AMS

Project No.	AK125005
Scale:	AS SHOWN
File No.	AK125005-1
Date:	9-26-12

NODARSE
A Terracon COMPANY

BORING LOCATION PLAN

GEOTECHNICAL ENGINEERING REPORT

GREENVIEW PINES PUMP STATION

ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT

A-4

Field Exploration Description

The boring locations were laid out at the project site by Terracon personnel. The locations indicated on the attached diagram are approximate and were measured by pacing distances and estimating right angles. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The SPT soil borings were drilled with a mini-rig mounted, rotary drilling rig equipped with a rope an automatic hammer. The boreholes were advanced with a cutting head and stabilized with the use of bentonite (drillers' mud). Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure. In the split spoon sampling procedure, the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch penetration or the middle 12 inches of a 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs.

Portions of the samples from the borings were sealed in glass jars to reduce moisture loss, and then the jars were taken to our laboratory for further observation and classification. Upon completion, the boreholes were backfilled with the site soil.

Field logs of each boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation of the samples.

BORING LOG NO. AB-01

PROJECT: Greenview Pines Pump Station No. 3887

CLIENT: O.C. Public Utilities - Engineering Division Orlando, Florida

SITE: 3955 Greenview Pines Court Orlando, Florida

LOCATION See Exhibit A-3

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	Percent Fines
		FINE SAND (SP), brown to gray						
4.0								
		FINE SAND WITH SILT (SP-SM), reddish-brown	5	▽				
6.5								
		FINE SAND (SP), light brown						
8.0								
		SILTY FINE SAND (SM), brown					31	23
10.0			10					
		Boring Terminated at 10 Feet	15					
			20					
			25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Continuous Auger

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

See Exhibit A-4 for description of field procedures
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *GWT Encountered During Drilling*

NODARSE A Terracon COMPANY
1675 Lee Road
Winter Park, Florida

Boring Started: 9/17/2012 | Boring Completed: 9/17/2012

Drill Rig: Mini Rig | Driller: Mark C.

Project No.: AK125005 | Exhibit A-6

BORING LOG NO. AB-02

PROJECT: Greenview Pines Pump Station No. 3887

CLIENT: O.C. Public Utilities - Engineering Division Orlando, Florida

SITE: 3955 Greenview Pines Court Orlando, Florida

GRAPHIC LOG	LOCATION See Exhibit A-3 DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	Percent Fines
	FINE SAND (SP), brown 1.5						
	SILTY FINE SAND (SM), grayish-brown 6.5	5	▽			11	18
	FINE SAND WITH SILT (SP-SM), grayish-brown 10.0	10					
	Boring Terminated at 10 Feet	15 20 25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Continuous Auger

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

WATER LEVEL OBSERVATIONS

▽ *GWT Encountered During Drilling*

See Exhibit A-4 for description of field procedures
See Appendix B for description of laboratory procedures and additional data, (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

NODARSE A Terracon COMPANY
1675 Lee Road
Winter Park, Florida

Boring Started: 9/17/2012 | Boring Completed: 9/17/2012

Drill Rig: Mini Rig | Driller: Mark C.

Project No.: AK125005 | Exhibit A-7

BORING LOG NO. TB-01

PROJECT: Greenview Pines Pump Station No. 3887

CLIENT: O.C. Public Utilities - Engineering Division Orlando, Florida

SITE: 3955 Greenview Pines Court Orlando, Florida

GRAPHIC LOG	LOCATION See Exhibit A-3 DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	Percent Fines
	FINE SAND (SP), brown to grayish-brown, loose to medium dense				3-3-3-3 N=6		
					3-4-5-6 N=9		
		5	▽		5-4-7-6 N=11		
					7-7-6-5 N=13		
	8.0						
	SILTY FINE SAND (SM), light grayish-brown, loose				5-4-5-5 N=9	16	16
		10					
	13.5						
	FINE SAND WITH SILT (SP-SM), light brown, medium dense				6-6-8 N=14		
		15					
					6-7-7 N=14		
		20					
					10-10-11 N=21		
		25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Rotary Drilling Cutting Head

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

WATER LEVEL OBSERVATIONS

▽ *GWT Encountered During Drilling*

See Exhibit A-4 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

NODARSE A Terracon COMPANY
1675 Lee Road
Winter Park, Florida

Boring Started: 9/17/2012 | Boring Completed: 9/17/2012

Drill Rig: Mini Rig | Driller: Mark C.

Project No.: AK125005 | Exhibit A-8

BORING LOG NO. TB-01

PROJECT: Greenview Pines Pump Station No. 3887

CLIENT: O.C. Public Utilities - Engineering Division Orlando, Florida

SITE: 3955 Greenview Pines Court Orlando, Florida

GRAPHIC LOG	LOCATION See Exhibit A-3 DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	Percent Fines
	FINE SAND WITH SILT (SP-SM), light brown, medium dense *(continued)*						
	28.5						
	FINE SAND (SP), light gray to light brown, medium dense to dense			X	12-16-14 N=30		
		30					
				X	10-10-12 N=22		
		35					
	38.5						
	FINE SAND WITH SILT (SP-SM), dark gray to dark greenish-gray, loose to medium dense			X	12-8-11 N=19		
		40					
				X	4-5-4 N=9		
		45					
				X	5-5-5 N=10		
	50.0						
	Boring Terminated at 50 Feet	50					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Rotary Drilling Cutting Head

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

WATER LEVEL OBSERVATIONS

▽ *GWT Encountered During Drilling*

See Exhibit A-4 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

NODARSE A Terracon COMPANY
1675 Lee Road
Winter Park, Florida

Boring Started: 9/17/2012 | Boring Completed: 9/17/2012

Drill Rig: Mini Rig | Driller: Mark C.

Project No.: AK125005 | Exhibit A-9

APPENDIX B – LABORATORY TESTING

Laboratory Testing

During the field exploration, a portion of each recovered sample was sealed in a glass jar and transported to our laboratory for further visual observation and laboratory testing. Selected samples retrieved from the borings were tested for moisture (water) content and fines content (soil passing a US standard #200 sieve). Those results are included in this report and on the respective boring logs, except for permeability. The visual-manual classifications were modified as appropriate based upon the laboratory testing results.

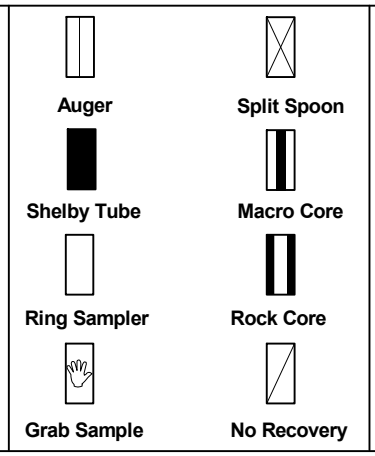
The soil samples were classified in general accordance with the appended General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of the Unified Soil Classification System is included in Appendix B. The results of our laboratory testing are presented in the Laboratory Test Results section of this report and on the corresponding borings logs.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

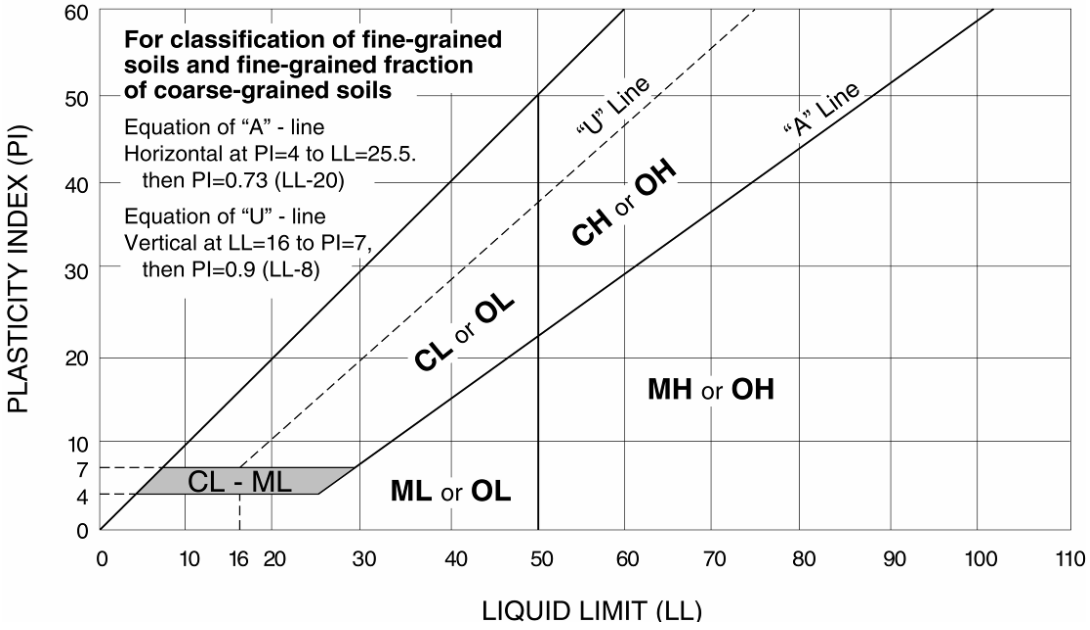
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



APPENDIX D
SUSTAINABILITY CONSIDERATIONS

SUSTAINABILITY CONSIDERATIONS

LEED Sustainable Sites (SS)

SS Prerequisite 1 – Construction Activity Pollution Prevention

The intent is to reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation. Terracon can assist in developing site specific Storm Water Management Plans (SWMP's) in addition to providing observation services for the duration of the project for conformance to the SWMP's.

SS Credit 5.1 - Site Development – Protect or Restore Habitat

The intent is to conserve existing natural areas and restoring damaged areas to provide habitat and promote biodiversity. Terracon can provide restoration recommendations such as design of mechanically stabilized earth vegetative faced retained slopes, stream mitigation, etc.

SS Credit 6.1 and Credit 6.1 – Storm Water Design – Quantity Control and Quality Control

Sustainable storm water design limits disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, and managing storm water runoff. Terracon can provide design recommendations for porous pavement systems and infiltration basins to assist in maintaining pre-development peak discharge rates of design storms without compromising the structural capacity of the pavement or surrounding improvements. A pervious pavement system is a pavement that is sufficiently porous to allow the infiltration of water into a sub-drainage system or open-graded aggregate base reservoir below paved areas. The collected water is allowed to infiltrate through a filter fabric into the underlying subgrade soils or the water is collected and discharged to a suitable outlet.

LEED Energy and Atmosphere (EA)

EA Credit 2 – On-site Renewable Energy

The intent is to provide on-site renewable energy. Self supply renewable energy potentials Include horizontal and vertical loop fields. Terracon can provide thermal resistivity testing for horizontal loop fields or trial testing for vertical geothermal wells.

LEED Materials and Resources (MR)

MR Credit 2 – Construction Waste Management

The intent is to divert construction and demolition debris from disposal in landfills and incineration facilities.

Reuse of On-Site Building Materials or Construction Debris: Reusing inorganic building materials derived from foundation demolition or construction debris as processed fill material is acceptable provided the materials are crushed to a well-graded homogenous mixture and free of wood and other deleterious debris. Crushed concrete foundations, flatwork and brick may be incorporated into structural compacted fill in approved areas.

Maximum size of crushed material should be no greater than 3 inches. Use of fill materials will depend upon the source of the recycled material and the intended use. Materials such as wood and metal should be properly disposed off-site. *Caution should be used when specifying painted recycled materials. In some states, the paint would need to be analyzed to evaluate if it is lead-based. The text above may need to be edited to say "uncoated" building materials*

Use of On-site Crushed Asphaltic Cement Concrete (ACC) Pavement for Engineered Fill: ACC pavement, and the underlying base rock can be used as engineered fill as long as it is properly processed. It is important that the recycled ACC pavement be blended with another material, such as soil, sand, and/or gravel, to fill voids. This material should be well graded and have a maximum size, in any dimension, of 6-inches. This may necessitate the use of on-site screening of the materials and processing the oversized portion through a crusher such that the maximum size of the well graded blend would be 6-inches.

Recycled ACC pavement should be limited to a maximum of 50% of the fill material being placed in any lift. This material should be used deep within the fill or in non-structural areas such that it does not underlie future excavations being made for footings, utilities, etc.

MR Credit 4 – Recycled Content

Flowable Fill: Consider using flowable fill for trench backfill. The flowable fill should be comprised of waste materials such as waste limestone screenings as the bulk-filler and fly-ash for the cementitious component.

ACC Pavement: ACC Pavement produced in the Central Florida area typically includes 20 percent recycled asphalt pavement (RAP) and 4 percent recycled asphalt shingles resulting in a product that contains 24% recycled material.

Limestone Screenings (Waste Lime): Limestone screenings are a waste product produced by many Central Florida Quarries. This material is usually wasted in the quarries if it does not possess enough calcium content to be suitable for ag-lime applications and also because there is more product produced than demand can satisfy. As a result, this material is abandoned on-site as a waste product. This material typically is well graded crushed aggregate material with an approximate top size of ¼-inch. This material can be used as engineered fill material in structural and non-structural areas of the project. The limestone screenings can be used for the low volume change zones as a suitable replacement for shrink/swell prone soils.

Supplementary Cementitious Materials (SCM's): Consider using SCM's that are recycled from other operations, such as fly ash, in concrete mixes.

Soil Subgrade Stabilization: Consider using Fly-Ash or Code-L (a waste by-product produced when making cement) to stabilize or otherwise improve the soil subgrade.

MR Credit 5: Regional Materials

Using regional materials is intended to increase demand for building materials and products that are extracted and manufactured within the region. Regional materials also reduce environmental impacts caused by transportation.

Asphaltic Cement Pavement (ACC): ACC pavement is typically produced locally. Asphalt and aggregates are typically derived locally. Oils may or may not be derived locally.

Portland Cement Concrete (PCC): PCC is typically derived locally including sand, gravel, water, and cement. Additives may or may not be locally derived.

Aggregates for Base and Backfill: Coarse and fine aggregates are typically derived locally from quarrying operations or from dredging operations.

National Pollutant Discharge Elimination System Groundwater Testing and Database Search

Greenview Pines Pump Station No. 3887
3955 Greenview Pines Court, Orlando
Orange County, Florida

October 4, 2012
Nodarse/Terracon Project No. AK125005

Prepared for:
Orange County Public Utilities-Engineering Division
Orlando, Florida

Prepared by:
Nodarse & Associates, Inc.
A Terracon Company
Winter Park, Florida 32789

October 4, 2012

Orange County Utilities Department
Engineering Division
9150 Curry Ford Road
Orlando, Florida 32825

Attn: Mr. Heriberto Collado-Lopez, P.E.
Phone: 407-254-9900
Fax: 407-254-9999

Re: Groundwater Sampling/Testing
National Pollutant Discharge Elimination System (NPDES) Parameters
Greenview Pines Pump Station No. 3887
3955 Greenview Pines Court, Orlando, Orange County, Florida
Nodarse/Terracon Project No. AK125005

Dear Mr. Collado:

In accordance with your request and authorization, Nodarse & Associates, Inc., a Terracon Company (Nodarse/Terracon), has completed National Pollutant Discharge Elimination System (NPDES) groundwater quality sampling and testing services at the above referenced location in accordance with our proposal number PH1120208 dated May 2, 2012, and Orange County Purchase Order #C11903A011, dated July 11, 2012.

A review of the Florida Department of Environmental Protection's (FDEP's) Contamination Locator Database website did not reveal the presence of any identified contaminated site within 1,000 feet of the project site.

On September 19, 2012, a temporary monitor well (TMW-4) was installed by direct-push Geoprobe drilling method to a depth of 15 feet below land surface (BLS). The depth to the shallow water table was measured at 4.1 feet BLS. On September 20, 2012, after well purging and stabilization of groundwater field parameters, Nodarse/Terracon collected one representative groundwater sample (PS #F3887) for laboratory testing. The groundwater sample was delivered to Southern Research Laboratories, Inc. (SRL) of Orlando, Florida (Florida Department of Health #E83484) for analysis of NPDES parameters.

As shown in Table 1, the reported concentration of one parameter, total organic carbon (TOC), detected at 16 milligrams per liter (mg/l), exceeded the Chapter 62-621.300 (2), Florida Administrative Code, listed screening value (LSV) of 10 mg/l. The elevated TOC value is likely attributable to naturally-occurring, high molecular weight organic compounds in the groundwater at this location. This is confirmed by the reported non-detection of total recoverable petroleum

hydrocarbons (TRPH) above the laboratory method detection limit in the groundwater sample. Field pH was measured at 5.01 standard units (SU), which is below the LSV range of 6.5 – 8.0 SU. The measured field pH is representative of background pH levels below 6.0 (acidic) in east Orange County. The remaining parameters analyzed did not report exceedances above their respective LSVs.

A copy of the laboratory analytical report, the groundwater sampling log, instrument calibration sheet, the monitoring well details and a site photograph are included in Appendix A.

Nodarse/Terracon appreciates the opportunity to have assisted with these services. If you should have any questions or comments, please feel free to contact us.

Sincerely,
Nodarse & Associates, Inc., a Terracon Company

Eduardo Sainten
Project Environmental Scientist

John Malkowski, P.E.
Florida License No. 59404
Senior Engineer

JOHN C MALKOWSKI LICENSE No. 59404 STATE OF FLORIDA PROFESSIONAL ENGINEER

N:\Projects\2012\AK125005\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\NPDES Greenview Pines\AK125005 Final NPDES Report.doc

TABLE

TABLE 1
GROUNDWATER ANALYTICAL SUMMARY
FINAL RESULTS OF NPDES CONCENTRATIONS
GREENVIEW PINES PUMP STATION #3887
ORLANDO, ORANGE COUNTY, FLORIDA
NODARSE/TERRACON PROJECT NO. AK125005
SAMPLING DATE: SEPTEMBER 20, 2012

	Sample ID		
PARAMETER	**PS #F3887**	**Limits***	**Units**
DATE SAMPLED	**09/20/12**		
Benzene	0.5 U	**1.0**	µg/L
Naphthalene	0.10 i	**100**	µg/L
Cadmium, Total	0.306 U	**9.3**	µg/L
Copper, Total	1.40 U	**2.9**	µg/L
Lead, Total	1.60 U	**30.0**	µg/L
Mercury, Total	0.00288	**0.012**	µg/L
Zinc, Total	47.2 v	**86.0**	µg/L
Chromium, Hexavalent	4.2 U	**11.0**	µg/L
Total Organic Carbon (TOC)	16	**10.0**	mg/L
TRPH	200 U	**5000.0**	µg/L
pH - Field	5.01	**6.0 - 8.5**	µg/L
Turbidity	1.38	**NA**	NTU

NOTES:

Bold values represent a concentration exceeding the respective NPDES criteria
mg/L - milligrams per liter
µg/L - micrograms per liter
i - indicates value < method detection limit but > than practical quantitation limit
I - The reported concentration is between the MDL and PQL
U - not detected above method detection limit
v - Analyte was detected in both the sample and associated Lab Method Blank; laboratory contamination
* Based on the Florida Department of Environmental Protection' s Effluent Discharge
Generic Dewatering Permit Table 4 Screening Values (Doc # 62-621.300(1), eff. 2-14-2000
NS - No applicable limitation or standard referenced
NA - Not applicable

APPENDIX A

LABORATORY ANALYTICAL REPORT, GROUNDWATER SAMPLING LOGS, INSTRUMENT CALIBRATION SHEET, MONITORING WELL DETAILS AND PHOTOGRAPH

Southern Research Laboratories, Inc.

2251 Lynx Lane, Suite 1
Orlando, Florida 32804
(407) 522-7100 Fax (407) 522-7043
Toll Free 1 (888) 420-Test

Thank you **Mr. Ed Sainten** for the opportunity to be of service to you and your company; we **S**incerely **A**ppreciate **Y**our **B**usiness. SRL certifies these **Laboratory Results** were produced in accordance with NELAC Standards. Hold times and preservation requirements were met for all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: **Terracon**	Date(s) Collected: 09/20/12
Contact Name: **Ed Sainten**	Date Received: 09/20/12
Project Name: Greenview Pines PS #3387	Time Received: 13:08
Project Number: AK-12-5005	Date Reported : 09/28/12
Phone Number: (407) 740-6110	Date Emailed : 09/28/12
Fax Number: (407) 740-6112	SRL Work Order # 12-09025

SRL WO #	Clients #	Matrix	Analysis Requested
12-09025-001	PS #F3887	Liquid	EPA8260(Benz)/TOC/Cd/Cu/Pb/Zn/ 8270-SIM(PAH)Naph/FLPRO/ LL Hg/Hexavalent Chromium
12-09025-002	Trip Blank	Liquid	EPA 8260 (Benz)

Sherri Payne Digitally signed by Sherri Payne DN: cn=Sherri Payne, o=SRL, ou=SRLAB.com, email=sherri.payne@srlab.com, c=US Date: 2012.09.28 19:54:44 -04'00'

Sherri Payne
Vice President & Quality Assurance Officer
Southern Research Laboratories, Inc.

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09025
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-5005
Greenview Pines PS #3387
Orlando, FL

EPA Method 5030/8260B VOA {602} Compounds in Water by GC-MS

Client ID #	**PS #F3887**	**Trip Blank**	**Method Blank**			
SRL (Lab) ID#	12-09025-001	12-09025-002	MB092512			
Date Collected	09/20/12	09/18/12	NA			
Lab FDOH Certification #	E83484	E83484	E83484			
Date Prepared	09/25/12	09/25/12	09/25/12			
Date Analyzed	09/25/12	09/25/12	09/25/12	**MDL**	**PQL**	**CAS Number**
Benzene	0.5 U	0.5 U	0.5 U	0.5	1.0	71-43-2
Units	**ug/L**	**ug/L**	**ug/L**	ug/L	ug/L	
Dilution Factor (MEDF)	1	1	1	1	1	
Surrogate (% Rec)				(Surrogate Control Limits)		
4-Bromofluorobenzene	92.2%	97.7%	95.0%	70-130		

	% Recovery LCS/MS/MSD	**LCS Acceptable Limits**	**MS/MSD Acceptable Limits**	**%RPD MS/MSD**	**Acceptable Limits**
Benzene	109/81/81	70-130	70-130	0.5	0-30

EPA Method 3510/8270C-SIM Polynuclear Aromatic Hydrocarbon Compounds +Naph in Water by GC-MS

Client ID #	**PS #F3887**	**Method Blank**			
SRL (Lab) ID#	12-09025-001	MB092512			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E83484	E83484			
Date Extracted	09/25/12	09/25/12			
Date Analyzed	09/26/12	09/26/12	**MDL**	**PQL**	**CAS Number**
Naphthalene	**0.10 I**	0.10 U	0.10	0.50	91-20-3
Units	ug/L	ug/L	ug/L	ug/L	
Dilution Factor (MEDF)	1	1	1	1	
Surrogate (% Rec)			(Surrogate Control Limits)		
Nitrobenzene-D5	79.9%	87.3%	60-140		
2-Fluorobiphenyl	85.2%	74.6%	60-140		
p-Terphenyl-D14	98.9%	105.2%	60-140		

	% Recovery LCS/MS/MSD	**Acceptable Limits**	**%RPD MS/MSD**	**Acceptable Limits**
Naphthalene	83/76/82	60-140	7.6	30

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite I
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09025
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-5005
Greenview Pines PS #3387
Orlando, FL

FL-PRO (Petroleum Range Organics)~{Water}

Client ID #	**PS #F3887**	**Method Blank**			
SRL (Lab) ID#	12-09025-001	MB092612			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E83484	E83484			
Date Prepared	09/26/12	09/26/12			
Date Analyzed	09/27/12	09/27/12	**MDL**	**PQL**	**CAS Number**
TOTAL PRO (C8-C40)	0.2 U	0.2 U	0.2	0.5	NA
Units	mg/L	mg/L	mg/L	mg/L	
Dilution Factor (MEDF)	1	1	1	1	
Surrogate (% Rec)			(Surrogate Control Limits)		
Orthoterphenyl (OTP)	102.5%	115.7%	82-142		

	% Recovery LCS/LCSD	Acceptable Limits	%RPD LCS/LCSD	Acceptable Limits
TOTAL PRO (C8-C40)	84/85	55-118	1.7	0-20

Hexavalent Chromium by SM18 3500-Cr D in Water

Client ID #	**PS #F3887**	**Method Blank**			
SRL (Lab) ID#	12-09025-001	MB092012			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E83182	E83182			
Date Prepared	09/20/12	09/20/12			
Date Analyzed	09/20/12	09/20/12			
Time Analyzed	22:21	22:09			
Units	**mg/L**	**mg/L**	**MDL**	**PQL**	**CAS Number**
Hexavalent Chromium	0.0042 U	0.0042 U	0.0042	0.030	1854-02-99

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	%RPD MS/MSD	Acceptable Limits
Hexavalent Chromium	106/92/93	85-115	85-115	2	0-13

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09025
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-5005
Greenview Pines PS #3387
Orlando, FL

Total Organic Carbon by SM18 5310B in Water

Client ID #	**PS #F3887**	**Method Blank**			
SRL (Lab) ID#	12-09025-001	MB092612			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E83182	E83182			
Date Prepared	09/26/12	09/26/12			
Date Analyzed	09/26/12	09/26/12			
Dilution Factor (MEDF)	1	1			
Units	**mg/L**	**mg/L**	**MDL**	**PQL**	**CAS Number**
Total Organic Carbon (TOC)	**16**	0.22	0.22	1.0	ECL-0165

	% Recovery LCS/MS/MSD	Acceptable Limits	%RPD MS/MSD	Acceptable Limits
Total Organic Carbon (TOC)	100/103/104	85-115	0.7	0-21

EPA Method 1631 Low Level Mercury (Hg) in Water

Client ID #	**PS #F3887**	**Method Blank**			
SRL (Lab) ID#	12-09025-001	MB092412			
Date Collected	09/20/12	NA			
Lab FDOH Certification #	E87688	E87688			
Date Prepared	09/24/12	09/24/12			
Date Analyzed	09/25/12	09/25/12			
Units	**ng/L**	**ng/L**	**MDL**	**PQL**	**CAS Number**
Low Level Mercury (Hg)	**2.88**	0.183 U	0.183	0.5	7439-97-6

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	%RPD MS/MSD	Acceptable Limits
Low Level Mercury (Hg)	107/100/91	77-123	71-125	8.7	0-24

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09025
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-5005
Greenview Pines PS #3387
Orlando, FL

Metals (total recoverable) by EPA 200 Series Methods

Client ID #	: **PS #F3887**	**Method Blank**			
SRL (Lab) ID#	: 12-09025-001	MB092412			
Date Collected	: 09/20/12	NA			
Lab FDOH Certification #	: E82277	E82277			
Date Prepared	: 09/24/12	09/24/12			
Date Analyzed	: 09/25/12	09/25/12			
Units	: **ug/L**	**ug/L**	**MDL**	**PQL**	**CAS Number**
Cadmium	0.306 U	0.306 U	0.306	1.00	7440-43-9
Copper	1.40 U	1.40 U	1.40	10.0	7440-50-8
Lead	1.60 U	1.60 U	1.60	10.0	7439-92-1
Zinc	**47.2 V**	* **7.86 I**	3.00	10.0	7440-66-6

Prep. Method EPA 3005A		**LCS**	**MS/MSD**		
EPA 200.7	**% Recovery**	**Acceptable**	**Acceptable**	**%RPD**	**Acceptable**
	LCS/MS/MSD	**Limits**	**Limits**	**MS/MSD**	**Limits**
Cadmium	104/102/102	85-115	70-130	0.1	0-25
Copper	101/101/101	85-115	70-130	0.2	0-25
Lead	102/100/100	85-115	70-130	0.7	0-25
Zinc	99/98/97	85-115	70-130	0.7	0-25

* This compound is a common laboratory contaminant

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 12-09025
Received Date : 09/20/12

Ed Sainten
Terracon
1675 Lee Rd.
Winter Park, FL 32789 (407) 740-6110

Project Number/Project Name
AK-12-5005
Greenview Pines PS #3387
Orlando, FL

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

LCS Obs. Value is the observed quantity, as calculated from the calibration curve, of the analyte in the Laboratory Control Sample (LCS). The LCS is a standard from a source different than the source of the standards used for calibration. The LCS is also known as the QC sample. It is used to check the accuracy of the calibration curve.

Chain of Custody

Project Manager: Ed Saunders	Southern Research Laboratories, Inc. 2251 Lynx Lane, Suite #1, Orlando, Florida 32804
Company: Terracon	(407) 522-7100
Address: 1675 Lee Road	Toll Free 1 (888) 420-TEST Fax: (407) 522-7043
City, State, Zip: Winter Park, Florida, 32789	
Phone: +1 (407) 740-6110 Fax: +1 (407) 740-6112	

Page 1 of 1

Project Name: Greenview Pines PS # 3887

Project Location: Orlando, FL

Sampled by (Print Name(s)) / Affiliation: Mike Burns / Terracon

Sampler(s) Signature(s): Mike Burns

Preservatives (see codes): NaO | I | H | I | N | H | I

Project Number: AK 12-5005

Analyses Requested

REQUESTED DUE DATE: Standard

Sampling QAP No.:

Approval Date:

Comments:

Sample Identification	Sampled Date	Sampled Time	Grab or Composite	Matrix (see codes)	Total Number of Containers	Benzene	Naphthalene	TRPH	TOC	metals Cd, Cu, Pb, Zn	Lt. Mercury	Hex Chromium	
1 PS#3887	9/20/12	1132	Grab	GW	10	X	X	X	X	X	X	X	1209025-001
2 FB,D Blank	9-15-12	21:12	-	W	2	X							-002

Shipment Method:	Relinquished by: / Affiliation:	Date:	Time:	Accepted by: / Affiliation:	Date:	Time:
Out: Via:		9-15-12	21:12		9/20/12	0200
Returned: Via:		9/20/12	1308		9-20-12	1308

Additional Comments:

Cooler No.(s) / Temperature(s) (°C): 399 / 0.7°C

Sampling Kit No.: 5523

Equipment ID No.:

Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water(Blanks) HW = Potential Haz Waste O = Other(Specify):

Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other(Specify)

Form FD 9000-24

GROUNDWATER SAMPLING LOG

Riser 2.9'

SITE NAME: Greenview Pines Ct. PS#F3887	SITE LOCATION: Orlando, FL.	
WELL NO: PS #F3887	SAMPLE ID: PS # F3887	DATE: 9/20/12

PURGING DATA

WELL DIAMETER (inches): 1"	TUBING DIAMETER (inches): 1/8"	WELL SCREEN INTERVAL DEPTH: 5.0 feet to 15.0 feet	STATIC DEPTH TO WATER (feet): 7.03	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (17.9 feet – 7.03 feet) X .04 gallons/foot = 0.43 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 13.0	FINAL PUMP OR TUBING DEPTH IN WELL (feet): ~~14.50~~ 15.0	PURGING INITIATED AT: 1110	PURGING ENDED AT: 1132	TOTAL VOLUME PURGED (gallons): 1.33

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) mhos/cm or S/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1117	0.43	0.43	.04	13.87	5.01	26.85	93	58.6%/4.66	11.2	clear	none
1120	0.18	0.61		14.03	4.81	26.92	76	51.2%/4.08	4.66	cl	"
1123	0.18	0.79		14.37	4.71	26.82	80	49.4%/3.94	2.81	cl	"
1126	0.18	0.97		14.84	4.65	26.82	74	46.7%/3.73	2.32	cl	"
1129	0.18	1.15		14.89	4.60	26.88	75	45.1%/3.57	1.50	cl	"
1132	0.18	1.33		14.94	4.57	26.82	76	44.4%/3.55	1.38	cl	"

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Mike Burns / Terracon	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1132	SAMPLING ENDED AT: 1154
PUMP OR TUBING DEPTH IN WELL (feet): 15.0	TUBING MATERIAL CODE: PE/S	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ m
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y (N) (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
PS#F3887	2	CG	40mL	HCL	—	—	VOA	RFPP	<100 mL
	2	AG	40mL	None	—	—	TOC	↓	<100 mL
	2	CG	40mL	HCL	—	—	LL Merc.	↓	<100 mL
	1	AG	1Ltr.	None	—	—	8270 SIMPAH	PP	100-500 mL
	1	AG	1Ltr.	HCL	—	—	FL PRO	↓	↓
	1	PE	250mL	HNO3	—	—	MET Cr	↓	↓
REMARKS:	1	PE	125mL	HNO3	—	—	4 metals	↓	↓

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

NA-038

Form FD 9000-8: FIELD INSTRUMENT CALIBRATION RECORDS

INSTRUMENT (MAKE/MODEL#) YSI 556MPS **INSTRUMENT #** 06H2510AF

PARAMETER: *[check only one]*

☐ TEMPERATURE ☒ CONDUCTIVITY ☐ SALINITY ☒ pH ☐ ORP
☐ TURBIDITY ☐ RESIDUAL Cl ☒ DO ☐ OTHER _____

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A DO 100%
Standard B pH 4, 7, 10
Standard C Conductivity 1413

DATE (yy/mm/dd)	TIME (hr:min)	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS
9/20/12	0925	A	100%	92.0/100.3	8%/<1	Yes	Init	MB
	0934	B	4.0	4.03	<1			
	0943	B	7.0	6.97	<1			
	0949	B	10.0	10.10	1%			
	0951	C	1413	1400	<1			
9/20/12	1157	A	100%	100.4%	<1	Yes	Cont	MB
	1200	B	4	4.01	<1			
	1203	B	7	7.0	<1			
	1208	B	10	10.03	<1			
	1211	C	1413	1413	<1			

Form FD 9000-8: FIELD INSTRUMENT CALIBRATION RECORDS

INSTRUMENT (MAKE/MODEL#) HACH 2100P **INSTRUMENT #** 08080C017245

PARAMETER: *[check only one]*

☐ TEMPERATURE ☐ CONDUCTIVITY ☐ SALINITY ☐ pH ☐ ORP

☒ TURBIDITY ☐ RESIDUAL Cl ☐ DO ☐ OTHER _____

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A <0.1

Standard B 20.0

Standard C 100

DATE (yy/mm/dd)	TIME (hr:min)	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS
9/20/12	0921	A	0.1	0.16/0.11	60/10%	Yes	Init	MB.
↓	0923	B	20.0	20.2	1%	↓	↓	↓
↓	0925	C	100	99.3	<1	↓	↓	↓
9/20/12	1213	A	0.1	0.11	10%	Yes	cont	MB
↓	1214	B	20.0	20.1	<1	↓	↓	↓
↓	1215	C	100	99.7	<1	↓	↓	↓

DATE: 9/19/19

SITE: Pump Sta. # 3887

LOCATION: Orlando, FL.

WELL LOCATION STRATEGY: TMW-4

DRILLING COMPANY: Groundwater Protection

DRILLING METHOD / BORING DIAMETER: GeoProbe / 4"

WELL DEPTH / SCREEN INTERVAL: 15' bls / 5-15'

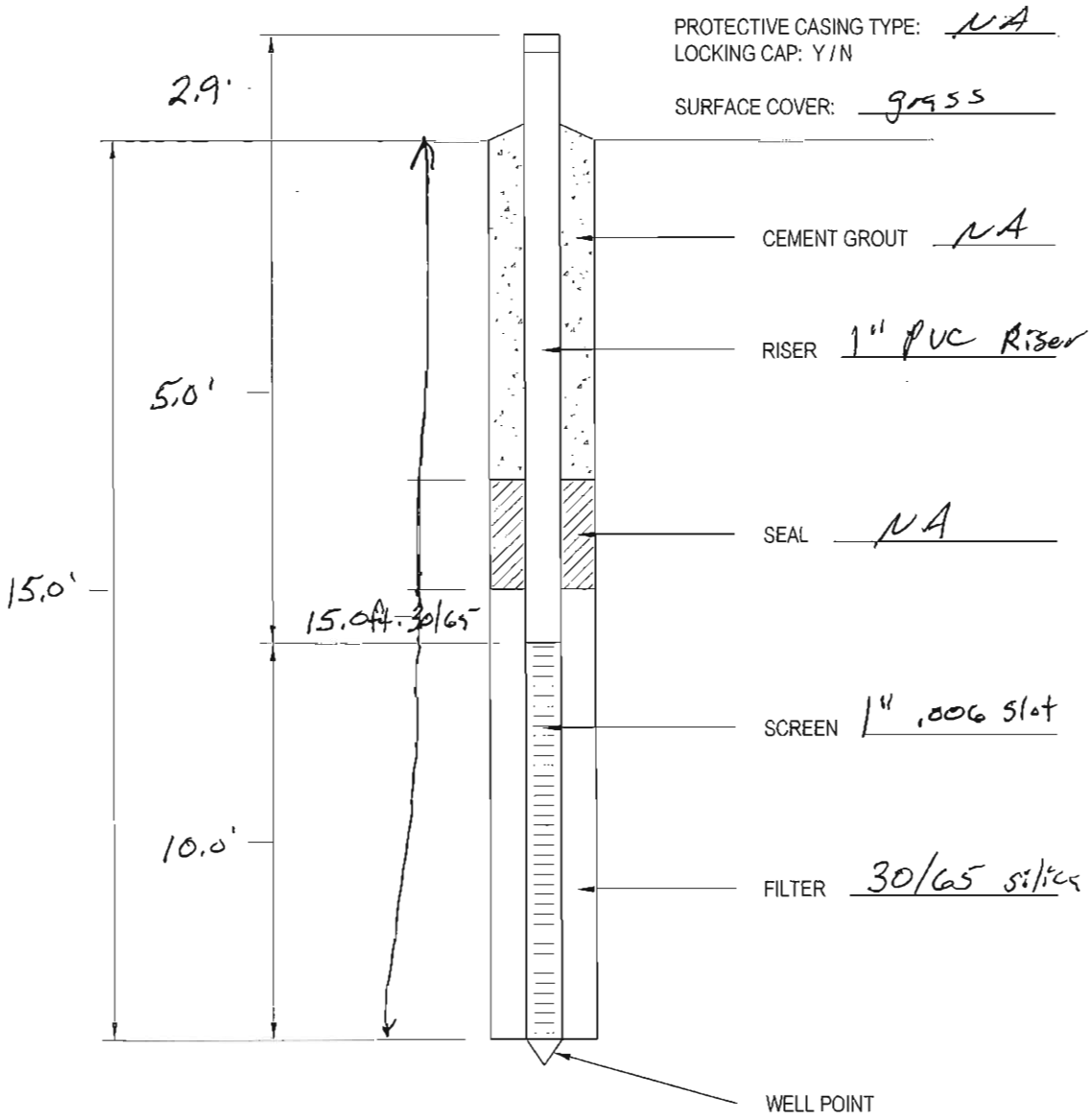
GROUNDWATER LEVEL: 7.74' BTOC

TOP OF CASING ELEVATION:

DEVELOPMENT PROCEDURE: Peristaltic Pump

DISPOSITION OF INVESTIGATIVE DERIVED WASTES: Spread.

REMARKS:



Terracon