



UNIVERSAL ENGINEERING SCIENCES

Consultants In: Geotechnical Engineering • Environmental Sciences
Geophysical Services • Construction Materials Testing • Threshold Inspection
Building Inspection • Plan Review • Building Code Administration

February 16, 2023

Ray Knight
Index Companies
211 Commerce Way Suite A
Jupiter, FL 33458

Subject: Report of Exfiltration Testing
US-441 S New Construction
4993 US-441, Okeechobee, Florida 34974
UES Project No. 3330.2200178.0000

Dear Ray Knight:

As per your recent request, Universal Engineering Sciences (UES) is pleased to submit this report on exfiltration testing for the above referenced project. UES services were performed in substantial accordance with Change Order No. 1 dated January 30th, 2023, planned in conjunction with and authorized by you.

Field Exploration

Two (2) exfiltration test (EX-1 and EX-2) conducted at a depth of approximately 6 feet below the existing ground surface, were performed at the referenced property. The approximate locations of the auger borings and exfiltration tests are illustrated on the attached Test Location Plan.

The auger borings were performed in substantial accordance with ASTM D 1452, "Practice for Soil Investigation and Sampling by Auger Borings." Hand Cone Penetrometer (HCP) tests were conducted at one-foot depth intervals in the auger boring. The HCP test, in conjunction with information about the soil type, is empirically correlated to the relative density of subsurface soils.

Subsurface Soil Conditions

The soil samples recovered from the auger borings were visually classified using the Unified Soil Classification System (ASTM D 2488). The soil stratification at the test site is illustrated on the attached Exfiltration Test Reports for EX-1 and EX-2. Note that the soil boring data reflect information from a specific test location only and soil conditions may vary between the strata interfaces indicated on the logs.

The subsurface soil conditions encountered at the auger boring locations generally consisted of very loose to medium dense fine sand (SP), fine sand with little silt (SP-SM), silty fine sand (SM), fine sand and organics (SP-OL) and silty fine sand and organics (SM-OL) to the boring termination depths of approximately 6 feet below the existing ground surface.

Hydrogeological Conditions

On the date of the field exploration (February 2023), the groundwater table was encountered at a depth of approximately 5' below the existing ground surface at the exfiltration test location sites. Note that the groundwater table will fluctuate seasonally depending upon local rainfall and other site specific and/or local influences.

The exfiltration tests were performed in accordance with the South Florida Water Management District method for open-hole constant head field testing. The results are presented on the attached Exfiltration Test Reports. The hydraulic conductivity (K) values determined at the test sites are presented in the table below.

Test Location	K (cfs/ft ² -ft)*
EX-1	4.16 X 10 ⁻⁰⁴
EX-2	5.75 X 10 ⁻⁰⁵

The soil samples recovered from the field exploration were returned to the laboratory where they were visually classified by a geotechnical engineer in general accordance with the Unified Soil Classification System (ASTM D 2488). The soil samples will be held in the laboratory for 30 days and then discarded unless UES is notified otherwise in writing.

Laboratory falling head permeability tests were performed upon the Shelby tube soil samples obtained during the field exploration. This testing was performed to obtain horizontal (k_h) and vertical (k_v) permeability values for the in-situ soils. The permeability test results are summarized in the table below.

Falling Head Permeability Test Results				
Test Location	Sample Depth (feet)	Sample Description	Coefficient of Permeability, k (ft/day)	
			k_h	k_v
ST-1	0 - 2	Dark brown organically stained fine sand with silt, trace fine roots (SP-SM)	10.74	5.37
ST-2	0 - 2	Light brown fine sand with silt, trace fine roots (SP-SM)	7.61	7.61

The recovered samples were not evaluated, either visually or analytically, for chemical composition or environmental hazards. UES will be pleased to perform these services for an additional fee, if required.

Historical Rainfall Information

UES reviewed available monthly precipitation data from several stations in the Stuart area from July 2022 through January 2023 utilizing the Community Collaborative Rain, Hail & Snow Network website, which corresponds to the six (6) months prior to the time of the field exploration. The data indicated that the recorded rainfall during this period was slightly lower compared to the 30-year recorded average rainfall.

Seasonal High Groundwater Table

The normal seasonal high groundwater level each year is the level that typically occurs in the July to September period at the end of the rainy season during a year of normal or average rainfall.

Note that UES's estimate of seasonal high groundwater level is based on limited data and does not provide any assurance that groundwater levels will not exceed the estimated level during any given year in the future. If the rainfall intensity and duration or total rainfall quantities exceed those normally anticipated, then groundwater levels will likely exceed the seasonal high estimate.

The estimate of seasonal high groundwater level is made for the site at the present time. Future development of adjoining or nearby properties and development on a regional scale may affect the local seasonal high groundwater table. Universal makes no warranty on the estimate of the seasonal high groundwater table.

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

UES reviewed the U. S. Geological Survey (USGS) water database for existing monitoring wells in the adjacent areas of the site. There were no active monitoring wells at the proximity of the subject property, hence, UES recommends a site-specific investigation. To better interpret the groundwater data, UES suggests the following measures, but not limited to:

1. On-site installation of monitoring wells or piezometers for a certain period of time, preferably wet season since the groundwater table fluctuates throughout the year in response to seasonal rainfall.
2. Performing a comprehensive study to determine an accurate seasonal high-water data by a hydrogeologist.

UES recommends that all foundation design incorporate assumption of the seasonal high groundwater condition. UES recommends that positive drainage be established and maintained on the site during construction. UES further recommends that permanent measures be implemented to maintain positive drainage throughout the life of the project.

Limitations

This consulting report has been prepared for the exclusive use of Think Green, LLC, and other members of the design team for the proposed building located at 325 & 333 Datura Street in West Palm Beach, Florida. This report has been prepared in accordance with generally accepted local geotechnical engineering practices. No other warranty, express or implied, is made.

The evaluation submitted in this report is based in part upon the data collected during a field exploration. However, the nature and extent of variations throughout the subsurface profile may not become evident until construction. If variations then appear evident, it may be necessary to reevaluate information and professional opinions as provided in this report.

Closure

UES appreciates the opportunity to be of service during this phase of the project and looks forward to a continued association. Please do not hesitate to contact UES if you have any questions or comments, or if UES may further assist you as your plans proceed.

Respectfully Submitted,
Universal Engineering Sciences
Florida Registry No. 4930

This item has been digitally signed and sealed by Estela G. León Aguilar., P.E. on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Estela G. León Aguilar, P.E.
Senior Geotechnical Engineer
Florida Registration No. 83307

Dhanuhasini Subramaniam, E.I.
Project Engineer

Attachments:

Test Location Plan
Exfiltration Test Report

Test Location Plan

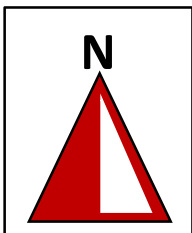
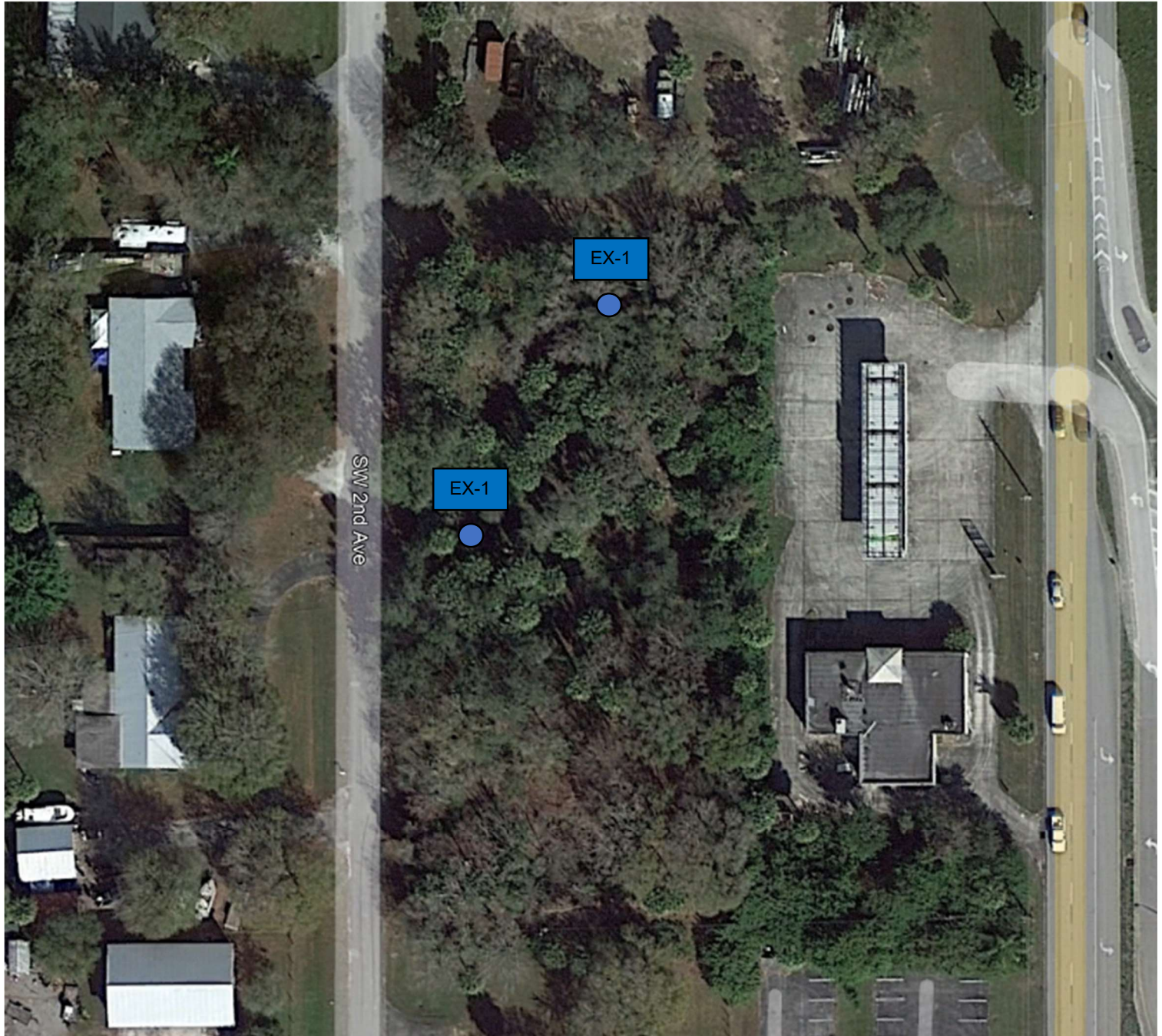
US-441 S New Construction
4993 US-441, Okeechobee

Project No. 3330.2200178.0000

Drafted by: DS

Reviewed By: ELA

Date: 2/17/2023



Legend

- Approximate Exfiltration Test Locations

NOTE: BORING LOCATIONS WERE LOCATED USING A MEASURING TAPE AND EXISTING LANDMARKS AS REFERENCE POINTS. IN ADDITION, THE LATITUDE, LONGITUDE, AND ELEVATION NOTED ON THE BORING LOGS WERE TAKEN FROM GOOGLE EARTH. THEREFORE, LOCATIONS SHOWN ON THE PLAN ARE APPROXIMATE.



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EXFILTRATION TEST REPORT

SOUTH FLORIDA WATER MANAGEMENT DISTRICT - USUAL OPEN HOLE TEST

Client: Ray Knight
Index Companies

Project No: 3330.2200178.0000

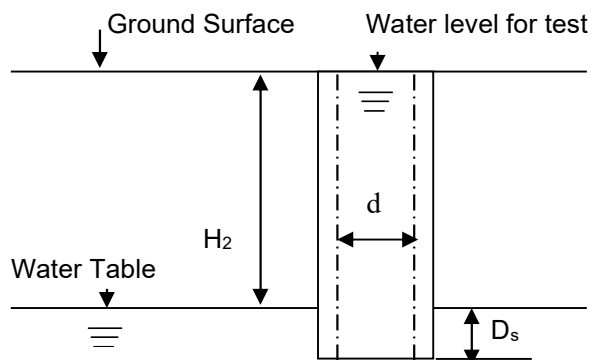
Project: US-441 S New Construction
4993 US – 441, Okeechobee, FL 34974

Test Date: 02/08/23
Technician: PS/LO/KB

SOIL PROFILE

Test Location:	Depth (feet)	Soil Description	HCP
EX-1	0.0 – 4.0	Brown fine sand (SP)	50
	4.0 – 5.0	Dark gray fine sand and organics (SP-OL)	50
	5.0 – 6.0	Gray fine sand with silt (SP-SM)	30
			30
			60
			60
	Depth to Water Table from Ground Surface (feet)		5

CALCULATION OF HYDRAULIC CONDUCTIVITY



$$K = \frac{4Q}{\pi d(2H_2^2 + 4H_2D_s + H_2d)}$$

K	Hydraulic Conductivity (cfs/ ft ² – ft head)	4.16 x 10⁻⁰⁴
Q	Stabilized Flow Rate (cubic ft per second)	7.80 x 10⁻⁰³
d	Diameter of Test Hole (feet)	0.33
H₂	Depth to Water Table (feet)	5.0
D_s	Saturated Hole Depth (feet)	1.0

Water table, ft	5
Water table, in	0
Depth of screen	6
ID of screen, in	4
Gallons of water	35
Time, minutes	10
Time, seconds	0

K=	4.16E-04 CFS/Ft ² -Ft. of head
Q=	7.80E-03 CFS
d=	0.33 Feet
H ₂ =	5.0 Feet
D _s =	1.0 Feet



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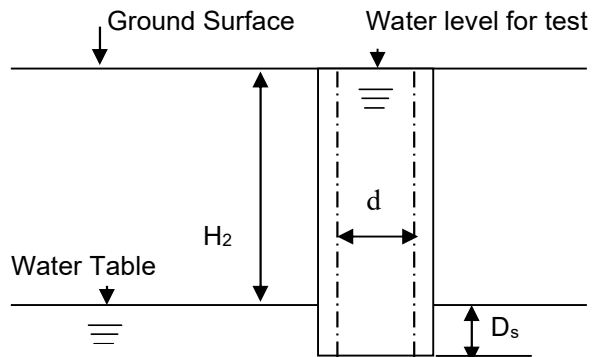
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4993 US – 441, Okeechobee, FL 34974

Test Date: 02/08/23
Technician: PS/LO/KB

SOIL PROFILE

Test Location:	Depth (feet)	Soil Description	HCP
EX-2	0.0 – 1.0	Light brown fine sand (SP)	80+
	1.0 – 2.0	Gray fine sand with silt, trace large roots (SP-SM)	80+
	2.0 – 3.5	Light brown – gray fine sand, trace clay (SP)	80+
	3.5 – 5.5	Black silty fine sand and organics (SM-OL)	20
	5.5 – 6.0	Gray silty fine sand (SM)	20
			20
Depth to Water Table from Ground Surface (feet)			N/A

CALCULATION OF HYDRAULIC CONDUCTIVITY



$$K = \frac{4Q}{\pi d(2H_2^2 + 4H_2D_s + H_2d)}$$

K	Hydraulic Conductivity (cfs/ ft ² – ft head)	5.75 x 10⁻⁰⁵
Q	Stabilized Flow Rate (cubic ft per second)	1.11 x 10⁻⁰³
d	Diameter of Test Hole (feet)	0.33
H₂	Depth to Water Table (feet)	6.0
D_s	Saturated Hole Depth (feet)	0.0

Water table, ft	6
Water table, in	0
Depth of screen	6
ID of screen, in	4
Gallons of water	5
Time, minutes	10
Time, seconds	0

K=	5.75E-05 CFS/Ft ² -Ft. of head
Q=	1.11E-03 CFS
d=	0.33 Feet
H ₂ =	6.0 Feet
D _s =	0.0 Feet