

DRAINAGE STATEMENT

for

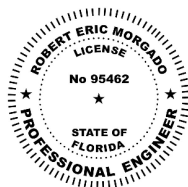
United Management Corp.

Project Location:
32 S L Street,
Lake Worth, FL 33460

Prepared by

BOHLER //

1900 NW Corporate Boulevard, Suite 101E
Boca Raton, FL 33431



Digitally signed by Robert Morgado
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Date: 2025.03.14 15:43:41-04'00'

This item has been digitally signed and sealed by Robert Eric Morgado, PE, 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.

Robert Morgado, P.E.
Florida Professional Engineer License No. 95462

February 28, 2025

Drainage Statement

February 27, 2025

Subject: WMODA – United Management Corp.
32 S L Street
Lake Worth, FL 33460

I. Site Description

The proposed project is located at 32 S L Street, Lake Worth, FL 33460, bounded by Lake Avenue, 1st St Avenue South, S L Street and S M Street and consists of a 1.60-acre site (Parcel ID: 38-43-44-21-15-023-0010; 38-43-44-21-15-023-0020; 38-43-44-21-15-023-0030; 38-43-44-21-15-023-0050; 38-43-44-21-15-023-0060; 38-43-44-21-15-023-0090; 38-43-44-21-15-023-0170; 38-43-44-21-15-023-0191; 38-43-44-21-15-023-0220; 38-43-44-21-15-023-0230; 38-43-44-21-15-023-0250). The site is in FEMA flood zone X per FEMA map number 12099C0781G. The site is falls within the South Florida Water Management District, and qualifies for a General Permit (10-2) under subsection 403.814(12), F.S.

II. Existing Conditions & Hydrology

The existing site currently consists of existing buildings and parking lot area with storm sewer mains running along the East and South sides of the property. All existing runoff discharges off-site without a known control structure.

III. Proposed Conditions & Hydrology

The proposed development will consist of a residential building, a museum, an art walk, and associated parking. The development will also include a proposed drainage system that will improve the site conditions and provide water quality and water attenuation using Contech underground storm chambers. The proposed system is designed to store the 3-year 1-hour storm event on-site prior to any discharge. The system will connect into the existing drainage with the alley way, and we then be controlled with a control structure. See the construction plans for details.

IV. Site Area Summary

Site Area	Post-Development
Pervious Area	± 0.14 Acres
Impervious Area (Excluding Building Area)	± 0.51 Acres
Building Area	± 0.95 Acres

V. Offsite Area

The drainage system capacity and ICPR model routing has included the offsite alley way runoff. See ICPR4 routing for model results.

Offsite Area	Contributory
Impervious Area (Alley)	± 0.12 Acres

VI. Water Quality

A water quality treatment volume equal to 2.5" times the percent impervious will be provided within the proposed onsite treatment areas. The site will be treated and retained using underground chambers up to the 3-year 1-hour storm event. The total water quality volume needed for the site was calculated to be 0.26 ac-ft. As shown in the table below, the proposed underground treatment meets the water quality standards.

	Treatment Method	Volume Required (ac-ft)	Weir Elevation (ft NAVD)	Volume Provided
Site Area	Contech Chambers	0.260	9.30	0.262

VII. Discharge

The site is designed to have zero discharge up the 3-year 1-hour storm event. Please see the ICPR4 modeling results summarized as shown.

	Area (acres)	Allowable Discharge (cfs)	Post Development Discharge (cfs)	Peak Stage (ft NAVD)
3-year 1-hour	1.72	0.00	0.00	9.02

VIII. Outfall Structures

Weir:

Structure	Count	Type	Depth (ft)	Width (ft)	Elevation (ft NAVD)
Control Structure	1	Sharp Crested, Vertical	2.20	4.50	9.30

VIII. Water Quantity

The proposed minimum finished floors will be maintained above the 100-year 3-day storm per SFWMD Applicant's Handbook Volume II Part III Section 3.4. To protect the road subgrade, the minimum roadway crown elevation shall be at least 2 feet higher than the control elevation (SFWMD Applicant's Handbook Volume II Part III Section 3.5). Perimeter grading and/or berms will be utilized to contain runoff from the 25-year 3-day design storm event. Proposed minimum roadway elevations will be held above design standards of a 5-year 1-day storm. The underground storage chambers have been designed to fully retain all runoff from the 3-year 1-hour storm event.

Design Storms:

Building Storm Frequency: 100-year 72-hour

Design Rainfall: 16 inches

	Peak Stage (ft NAVD)	Min. Finished Floor (ft NAVD)	FEMA Elevation (ft NAVD)
Site Area	10.90	12.70	N/A

Berm Storm Frequency: 25-year 72-hour

Design Rainfall: 13 inches

	Peak Stage (ft NAVD)	Min. Perimeter Berm (ft NAVD)
Site Area	10.53	11.50

Vehicular Use Storm Frequency: 5-year 1-hour

Design Rainfall: 3.2 inches

	Peak Stage (ft NAVD)	Min. Road Grade (ft NAVD)
Site Area	10.06	11.00

Retention Storm Frequency: 3-year 1-hour

Design Rainfall: 3.6 inches

	Peak Stage (ft NAVD)	Weir Elevation (ft NAVD)
Site Area	9.02	9.30

X. Conclusion

Please see the attached drainage calculations and construction plans. As described above, the proposed design meets South Florida Water Management District and Lake Worth Drainage District.



Date: 2/27/2025
Project: WMODA
Project No.: FLB230233
Calculated By: Zach Hayes
Checked By: Robert Morgado

WMODA - Stormwater Management

SITE DATA		
Total Site Area (A_T)=	1.60 Acres	100.0%
Total Building (A_B)=	0.95 Acres	59.4%
Total Canopy (A_C)=	0.05 Acres	3.1%
Total Pavement/Sidewalk (A_I)=	0.46 Acres	28.8%
Total Green (A_P)=	0.14 Acres	8.8%
Total Lakes Normal Water Level (A_L)=	0.00 Acres	0.0%
OFFSITE DATA		
Offsite Contributory Area (Alley) =	0.12 Acres	100.0%
SOIL STORAGE CALCULATIONS		
Average Pervious Elevation =	12.0 Ft. +/- NAVD	
Seasonal High Water Table	6.00 Ft. NAVD (avg)	
Depth to water table=	6.00 Ft.	
Soil Storage Type	Flatwoods	
From SFWMD Manual for to W.T. (Comp S) =	6.75 In.	
Compute overall soil storage for site.=	0.59 In.	
$S = (\text{Comp S}) \times (A_P / A_T);$		
Compute CN value for site=	94	
$CN = 1000 / (S + 10)$		
COMPUTE 100-Year, 72-Hour Runoff Volume for Proposed Site		
Rainfall (P_{100-72}),	16.00 In.	
$Q_{100-72} = (P_{100-72} - 0.2S^2) / (P_{100-72} + 0.8S) =$	15.31 In.	
Compute volume generated by storm		
$V = (P_{100-72} / 12) \times A_T =$	2.04 Ac.-Ft.	
COMPUTE 25-Year, 72-hour Runoff Volume for Proposed Site		
Rainfall (P_{5-1}),	13.00 In.	
$Q_{5-1} = (P_{5-1} - 0.2S^2) / (P_{5-1} + 0.8S) =$	12.32 In.	
Compute volume generated by storm		
$V = (P_{5-24} / 12) \times A_T =$	1.64 Ac.-Ft.	
COMPUTE 5-Year, 1-hour Runoff Volume for Proposed Site		
Rainfall (P_{5-1}),	3.20 In.	
$Q_{5-1} = (P_{5-1} - 0.2S^2) / (P_{5-1} + 0.8S) =$	2.59 In.	
Compute volume generated by storm		
$V = (P_{5-24} / 12) \times A_T =$	0.34 Ac.-Ft.	
COMPUTE 3-Year, 1-hour Runoff Volume for Proposed Site		
Rainfall (P_{5-24}),	2.60 In.	
$Q_{5-24} = (P_{5-24} - 0.2S^2) / (P_{5-24} + 0.8S) =$	2.00 In.	
Compute volume generated by storm		
$V = (P_{5-24} / 12) \times A_T =$	0.27 Ac.-Ft.	



Date: 2/27/2025

Project: WMODA

Project No.: FLB230233

Calculated By: Zach Hayes

Checked By: Robert Morgado

WMODA - Water Quality

SITE DATA

Total Site Area (A_T)=	1.60 Acres	(100.0%)
Total Building/Canopy (A_B)=	1.00 Acres	(62.5%)
Total Pavement/Sidewalk (A_I)=	0.46 Acres	(28.8%)
Total Green (A_P)=	0.14 Acres	(8.8%)
Total Pond/Lake (A_L)	0.00 Acres	(0.0%)

Compute Water Quality Requirements

-Compute first inch of runoff over entire site

$$\begin{aligned}WQ_1 &= 1 \text{ Inch} \times A_T \times (1 \text{ Ft./12 In.}) \\&= 1/12 \times 1.6 \text{ Acres} \\&= 0.13 \text{ Ac.-Ft.} \quad \text{or} = 1.6 \text{ Ac.-In.}\end{aligned}$$

-Compute 2.5" x % of Imperviousness

A) Calculate site area for W.Q. Imperviousness

$$\begin{aligned}A_S &= A_T - (A_B + A_L) \\&= 1.6 - (1 + 0) \\&= 0.60 \text{ Acres}\end{aligned}$$

B) Calculate Imperviousness Area for W.Q.

$$\begin{aligned}A_{IMP} &= A_S - A_P \\&= 0.6 - 0.14 \\&= 0.46 \text{ Acres}\end{aligned}$$

C) Calculate percent imperviousness

$$\begin{aligned}\%_{IMP} &= (A_{IMP} / A_S) \times 100 \\&= (0.46 / 0.6) \times 100 \\&= 76.7\%\end{aligned}$$

D) Calculate 2.5 inches times the percent imperviousness

$$\begin{aligned}V_{2.5} &= 2.5 \text{ in.} \times \%_{IMP} \\&= 2.5 \text{ in.} \times 0.767 \\&= 1.92 \text{ In.}\end{aligned}$$

E) Calculate W.Q. volume required

$$\begin{aligned}WQ_{2.5} &= V_{2.5} \times (A_T - A_L) \\&= 1.92 \times (1.6 - 0) \\&= 0.26 \text{ Ac.-Ft.} \quad \text{or} = 3.12 \text{ Ac.-In.}\end{aligned}$$

-Determine W.Q. required for site

$$WQ = 0.26 \text{ Ac.-Ft.} \quad \text{or} = 3.12 \text{ Ac.-In.}$$

WQ

at Elev. 9.25

(See stage storage)

< Weir at elev. = 9.30

Since the 3.12 ac-in is greater than the 1.6 ac-in computed for the first inch of runoff the volume of 3.12 ac-in controls.



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Project: WMODA
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WMODA - Stage Storage										
Basin	Remaining Green	Pavement/Sidewalk	Offsite Contributory Area (Alley)	Chamber 1	Chamber 2	Chamber 3	Canopy	Building (res)	Building (museum)	Total Area (Ac.)
Land Type	Pervious	Impervious	Impervious	N/A	N/A	N/A	Impervious	Impervious	Impervious	
Area (Acres)	0.14	0.46	0.12	N/A	N/A	N/A	0.05	0.76	0.19	1.72
Storage Type	Sloped	Sloped	Sloped	Flat	Flat	Flat	Sloped	Flat	Flat	
Start (Ft.)	11.00	11.50	11.50	N/A	N/A	N/A	12.00	13.83	12.70	
End (Ft.)	12.50	12.50	12.50	N/A	N/A	N/A	15.00	13.83	12.70	
Stage (Ft.)	Storage (Ac-Ft)	Storage (Ac-Ft)	Storage (Ac-Ft)	Storage (Ac-Ft)	Storage (Ac-Ft)	Storage (Ac-Ft)	Storage (Ac-Ft)	Storage (Ac-Ft)	Storage (Ac-Ft)	Total Storage (Ac-Ft)
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.50	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02
6.00	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.05
6.50	0.00	0.00	0.00	0.00	0.01	0.07	0.00	0.00	0.00	0.08
7.00	0.00	0.00	0.00	0.00	0.02	0.10	0.00	0.00	0.00	0.12
7.50	0.00	0.00	0.00	0.00	0.02	0.13	0.00	0.00	0.00	0.15
8.00	0.00	0.00	0.00	0.01	0.03	0.15	0.00	0.00	0.00	0.19
8.50	0.00	0.00	0.00	0.01	0.03	0.18	0.00	0.00	0.00	0.22
9.00	0.00	0.00	0.00	0.01	0.04	0.19	0.00	0.00	0.00	0.25
9.50	0.00	0.00	0.00	0.02	0.04	0.21	0.00	0.00	0.00	0.27
10.00	0.00	0.00	0.00	0.02	0.04	0.21	0.00	0.00	0.00	0.27
10.50	0.00	0.00	0.00	0.02	0.04	0.21	0.00	0.00	0.00	0.27
11.00	0.00	0.00	0.00	0.02	0.04	0.21	0.00	0.00	0.00	0.27
11.50	0.01	0.00	0.00	0.02	0.04	0.21	0.00	0.00	0.00	0.28
12.00	0.05	0.06	0.02	0.02	0.04	0.21	0.00	0.00	0.00	0.39
12.50	0.11	0.23	0.06	0.02	0.04	0.21	0.00	0.00	0.00	0.67
12.70	0.13	0.32	0.08	0.02	0.04	0.21	0.00	0.00	0.00	0.81

Appendix C: Isohyetal Maps
from SFWMD Technical Memorandum, *Frequency Analysis of One and Three Day
Rainfall Maxima for central and southern Florida*, Paul Trimble, October 1990.

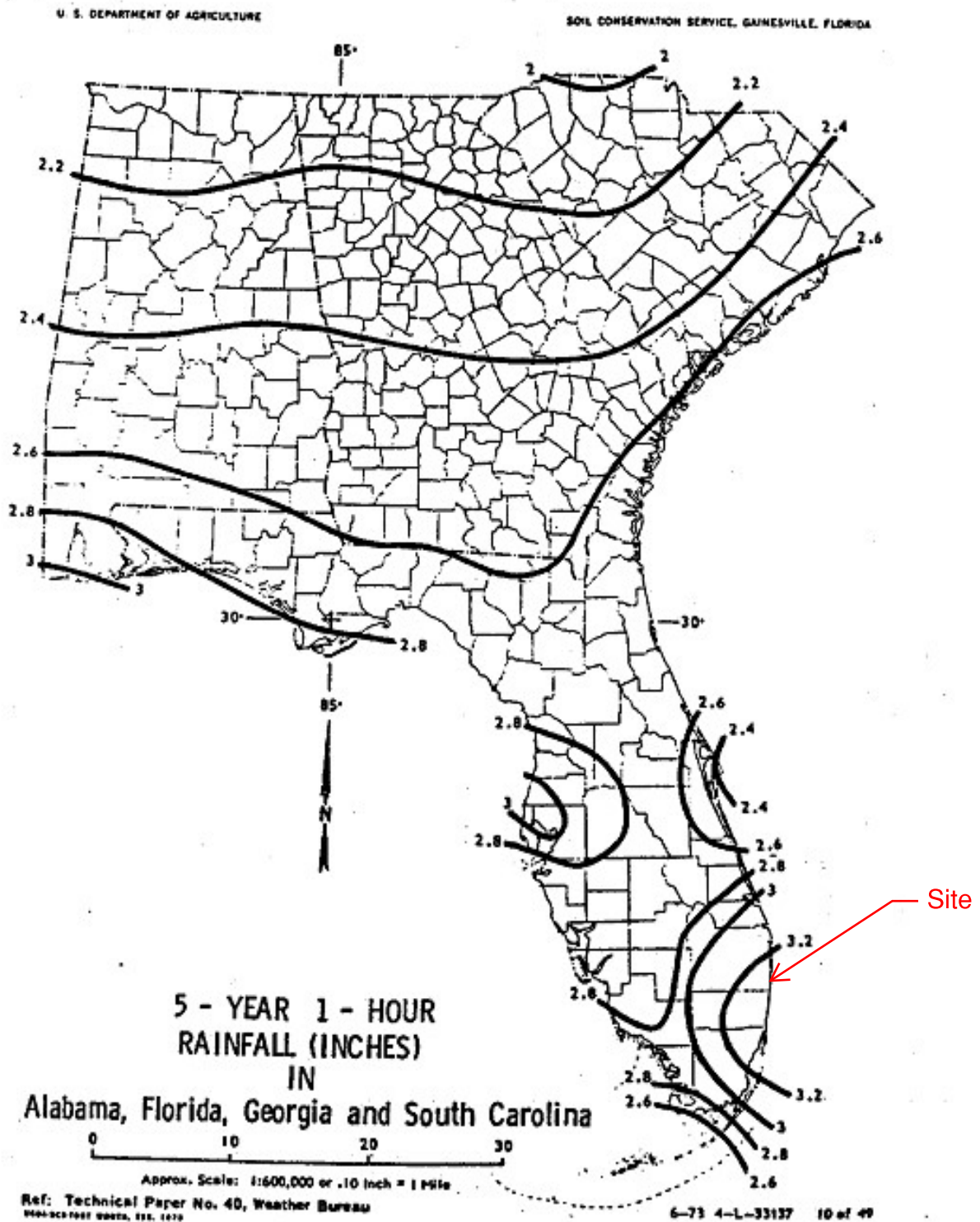


Figure C-1

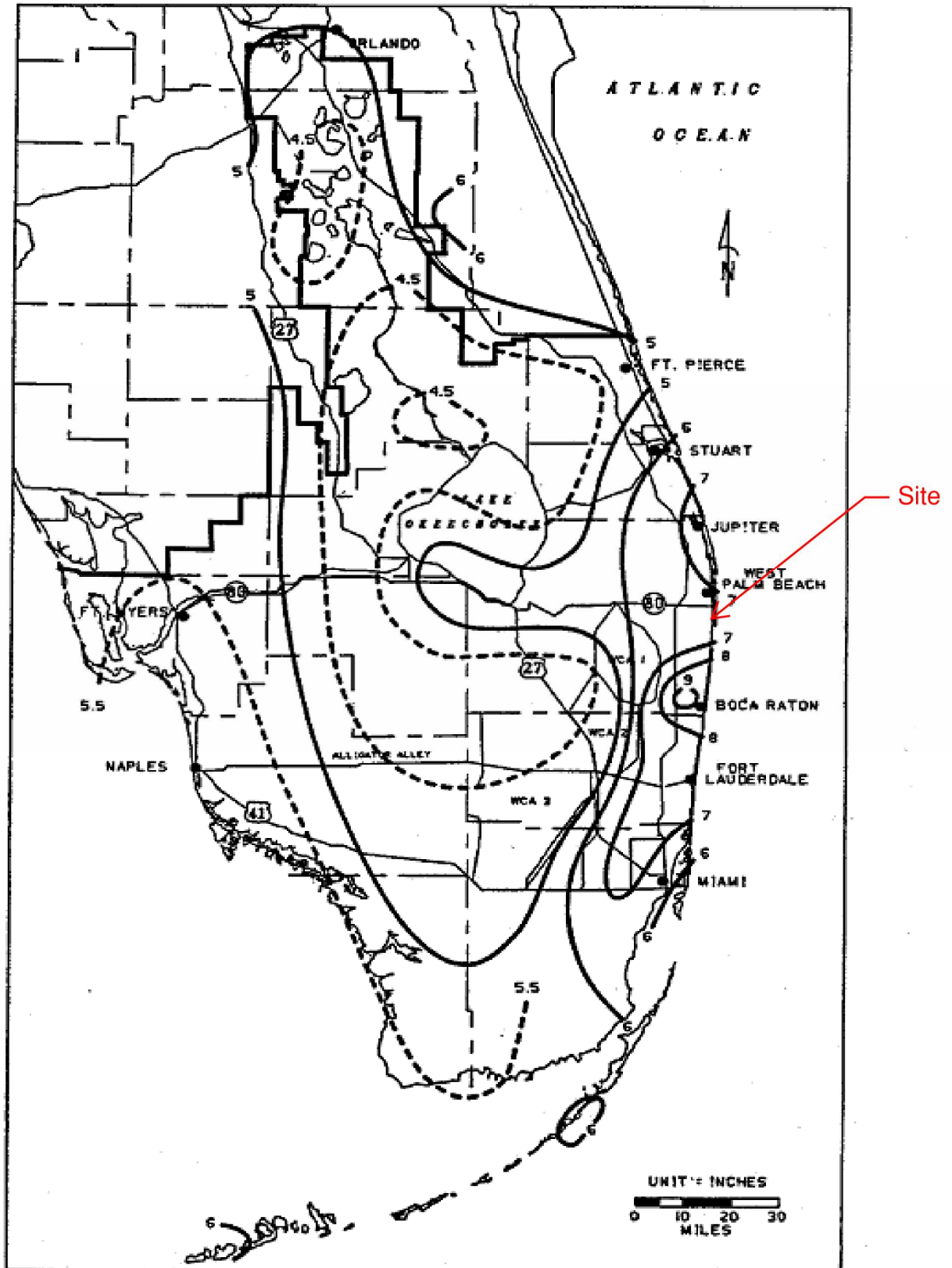


FIGURE C-3. 1-DAY RAINFALL: 5-YEAR RETURN PERIOD

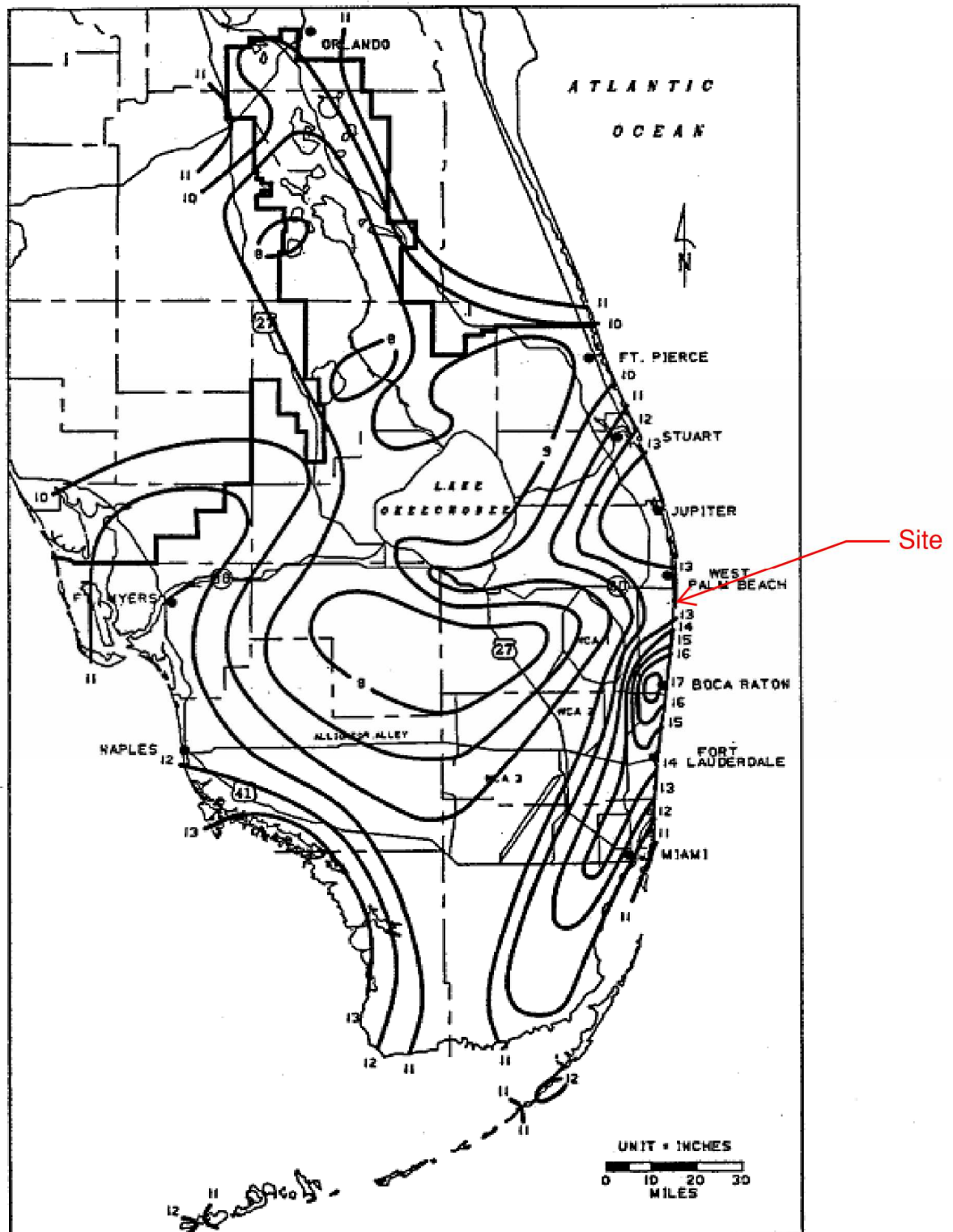


FIGURE C-8. 3-DAY RAINFALL: 25-YEAR RETURN PERIOD

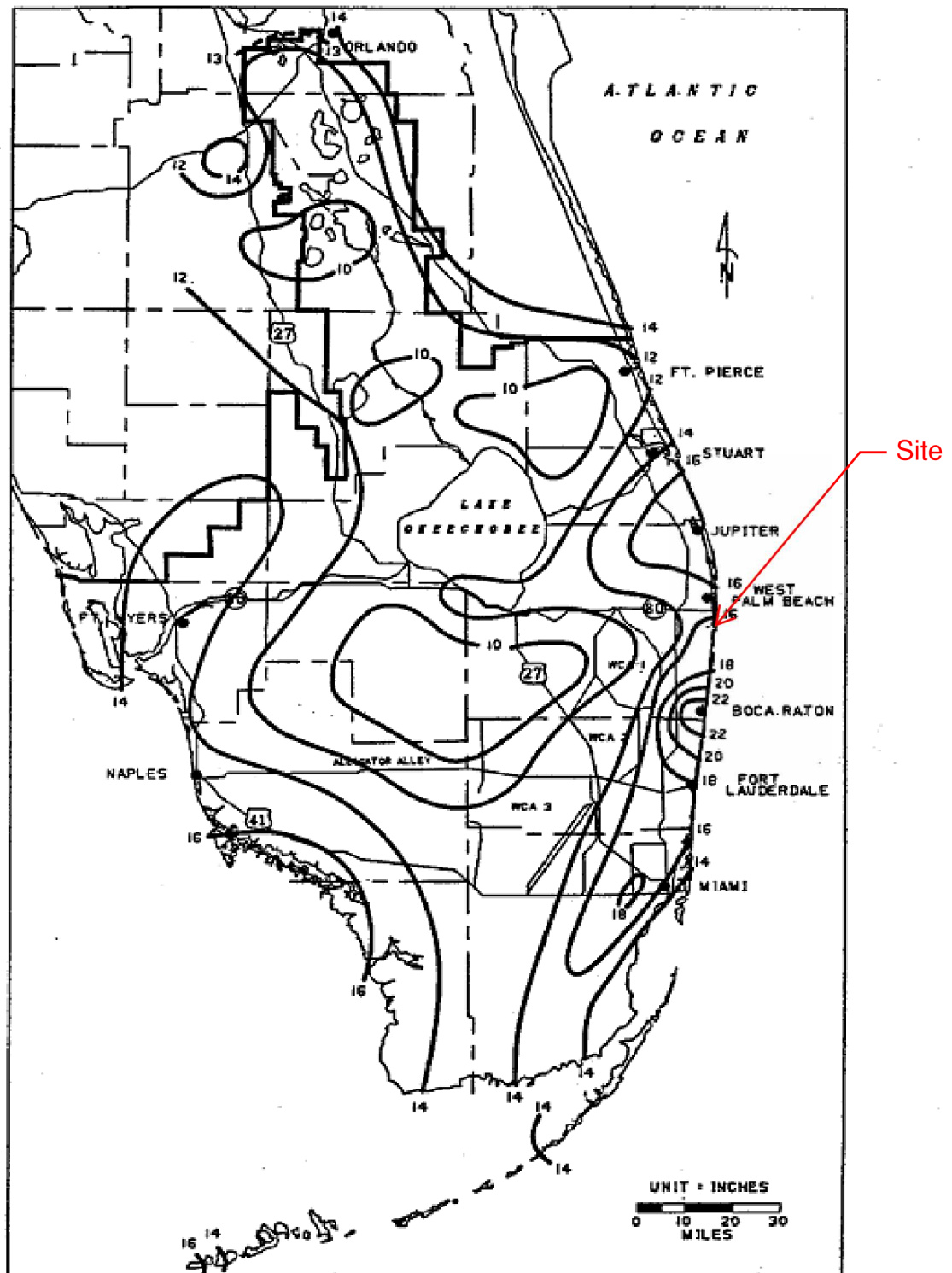
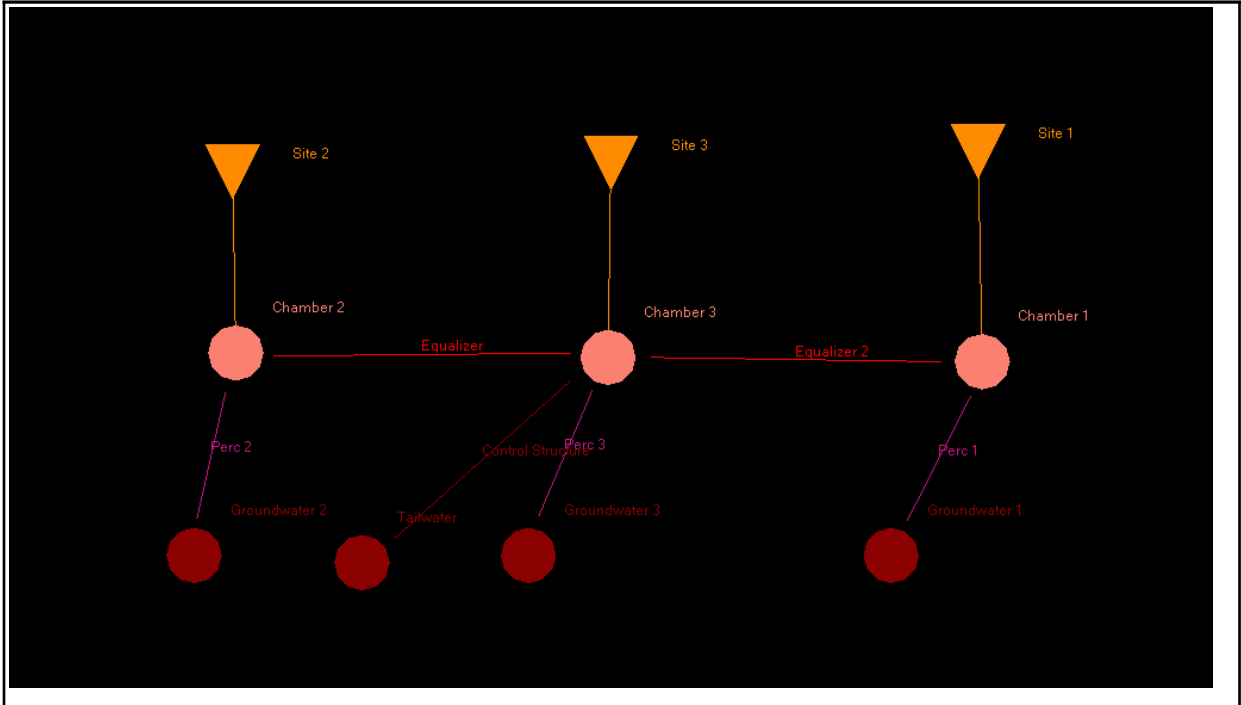


FIGURE C-9. 3-DAY RAINFALL: 100-YEAR RETURN PERIOD

Background Image: background image



Simple Basin: Site 1

Scenario: Scenario1
 Node: Chamber 1
 Hydrograph Method: NRCS Unit Hydrograph
 Infiltration Method: Curve Number
 Time of Concentration: 10.0000 min
 Max Allowable Q: 0.00 cfs
 Time Shift: 0.0000 hr
 Unit Hydrograph: UH484
 Peaking Factor: 484.0
 Area: 0.4700 ac
 Curve Number: 94.0
 Ia/S: 0.00
 % Impervious: 0.00
 % DCIA: 0.00
 % Direct: 0.00
 Rainfall Name:

Comment:

Simple Basin: Site 2

Scenario: Scenario1
Node: Chamber 2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 0.4300 ac
Curve Number: 94.0
Ia/S: 0.00
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment:

Simple Basin: Site 3

Scenario: Scenario1
Node: Chamber 3
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 0.8200 ac
Curve Number: 94.0
Ia/S: 0.00
% Impervious: 0.00
% DCIA: 0.00
% Direct: 0.00
Rainfall Name:

Comment:

Node: Chamber 1

Scenario: Scenario1
Type: Stage/Volume
Base Flow: 0.00 cfs
Initial Stage: 7.00 ft

Warning Stage: 12.70 ft
Alert Stage: 0.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
7.00	0.00	0
7.17	0.00	44
7.33	0.00	87
7.50	0.00	131
7.58	0.00	174
7.75	0.01	218
7.92	0.01	261
8.00	0.01	305
8.17	0.01	348
8.25	0.01	392
8.42	0.01	436
8.50	0.01	479
8.67	0.01	523
8.75	0.01	566
8.92	0.01	610
9.00	0.02	653
9.17	0.02	697
9.25	0.02	741
9.42	0.02	784
9.58	0.02	828
9.83	0.02	871
10.00	0.02	915
10.25	0.02	958
13.83	0.02	958

Comment:

Node: Chamber 2

Scenario: Scenario1
Type: Stage/Volume
Base Flow: 0.00 cfs
Initial Stage: 5.00 ft
Warning Stage: 12.70 ft
Alert Stage: 0.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
5.00	0.00	0
5.17	0.00	44
5.25	0.00	87
5.42	0.00	131
5.50	0.00	174
5.67	0.01	218
5.75	0.01	261

Stage [ft]	Volume [ac-ft]	Volume [ft3]
5.83	0.01	305
6.00	0.01	348
6.08	0.01	392
6.17	0.01	436
6.25	0.01	479
6.33	0.01	523
6.50	0.01	566
6.58	0.01	610
6.67	0.02	653
6.75	0.02	697
6.83	0.02	741
7.00	0.02	784
7.08	0.02	828
7.17	0.02	871
7.25	0.02	915
7.33	0.02	958
7.42	0.02	1002
7.50	0.02	1045
7.67	0.03	1089
7.75	0.03	1133
7.83	0.03	1176
7.92	0.03	1220
8.00	0.03	1263
8.08	0.03	1307
8.25	0.03	1350
8.33	0.03	1394
8.42	0.03	1437
8.50	0.03	1481
8.67	0.04	1525
8.75	0.04	1568
8.83	0.04	1612
9.00	0.04	1655
9.08	0.04	1699
9.25	0.04	1742
9.33	0.04	1786
12.70	0.04	1786

Comment:

Node: Chamber 3

Scenario: Scenario1
 Type: Stage/Volume
 Base Flow: 0.00 cfs
 Initial Stage: 5.00 ft
 Warning Stage: 12.70 ft
 Alert Stage: 0.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
5.00	0.00	0
5.08	0.00	131
5.17	0.01	261
5.25	0.01	392
5.33	0.01	566
5.42	0.02	697
5.50	0.02	871
5.58	0.02	1045
5.67	0.03	1220
5.75	0.03	1394
5.83	0.04	1568
5.92	0.04	1742
6.00	0.04	1917
6.08	0.05	2134
6.17	0.05	2309
6.25	0.06	2483
6.33	0.06	2701
6.42	0.07	2875
6.50	0.07	3093
6.58	0.08	3267
6.67	0.08	3485
6.75	0.08	3659
6.83	0.09	3877
6.92	0.09	4051
7.00	0.10	4269
7.08	0.10	4487
7.17	0.11	4661
7.25	0.11	4879
7.33	0.12	5053
7.42	0.12	5271
7.50	0.13	5489
7.58	0.13	5663
7.67	0.14	5881
7.75	0.14	6055
7.83	0.14	6273
7.92	0.15	6447
8.00	0.15	6621
8.08	0.16	6839
8.17	0.16	7013
8.25	0.17	7187
8.33	0.17	7362
8.42	0.17	7536
8.50	0.18	7710
8.58	0.18	7841
8.67	0.18	7971
8.75	0.19	8102
8.83	0.19	8233
8.92	0.19	8364

Stage [ft]	Volume [ac-ft]	Volume [ft3]
9.00	0.20	8494
9.08	0.20	8625
9.17	0.20	8712
9.25	0.20	8843
9.33	0.21	8930
9.42	0.21	9017
12.70	0.21	9017

Comment:

Node: Groundwater 1

Scenario: Scenario1
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 7.00 ft
Warning Stage: 13.83 ft
Alert Stage: 0.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
9999	0	0	0.0000	13.83

Comment:

Node: Groundwater 2

Scenario: Scenario1
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 5.00 ft
Warning Stage: 11.83 ft
Alert Stage: 0.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
9999	0	0	0.0000	11.83

Comment:

Node: Groundwater 3

Scenario: Scenario1
Type: Time/Stage

Base Flow: 0.00 cfs
 Initial Stage: 5.00 ft
 Warning Stage: 11.83 ft
 Alert Stage: 0.00 ft
 Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
9999	0	0	0.0000	11.83

Comment:

Node: Tailwater

Scenario: Scenario1
 Type: Time/Stage
 Base Flow: 0.00 cfs
 Initial Stage: 5.00 ft
 Warning Stage: 5.00 ft
 Alert Stage: 0.00 ft
 Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
9999	0	0	0.0000	5.00

Comment:

Drop Structure Link: Control Structure

Scenario: Scenario1
 From Node: Chamber 3
 To Node: Tailwater
 Link Count: 1
 Pipe Flow Direction: Both
 Solution: Combine
 Increments: 0
 Pipe Count: 1
 Damping: 0.0000 ft
 Length: 21.32 ft
 FHWA Code: 0
 Entr Loss Coef: 0
 Exit Loss Coef: 0
 Bend Loss Coef: 0
 Bend Location: 0.00 dec
 Energy Switch: Energy

Upstream Pipe

Invert: 9.00 ft
 Manning's N: 0.0120
 Geometry: Circular
 Max Depth: 1.50 ft
 Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0000

Downstream Pipe

Invert: 8.75 ft
 Manning's N: 0.0120
 Geometry: Circular
 Max Depth: 1.50 ft
 Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0000

Bottom Clip

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0000

Top Clip

Default: 0.00 ft
 Op Table:
 Ref Node:
 Manning's N: 0.0000

Pipe Comment:

Weir Component

Weir: 1
 Weir Count: 1
 Weir Flow Direction: Both
 Damping: 0.0000 ft
 Weir Type: Sharp Crested Vertical
 Geometry Type: Rectangular
 Invert: 9.30 ft
 Control Elevation: 9.30 ft
 Max Depth: 2.20 ft
 Max Width: 4.50 ft
 Fillet: 0.00 ft

Bottom Clip

Default: 0.00 ft

Op Table:

Ref Node:

Top Clip

Default: 0.00 ft

Op Table:

Ref Node:

Discharge Coefficients

Weir Default: 3.200

Weir Table:

Orifice Default: 0.600

Orifice Table:

Weir Comment:

Drop Structure Comment:

Pipe Link: Equalizer

Upstream

Downstream

Scenario: Scenario1
 From Node: Chamber 2
 To Node: Chamber 3
 Link Count: 1
 Flow Direction: Both
 Damping: 0.0000 ft
 Length: 100.00 ft
 FHWA Code: 0
 Entr Loss Coef: 0
 Exit Loss Coef: 0
 Bend Loss Coef: 0
 Bend Location: 0.00 dec
 Energy Switch: Energy

Invert: 5.00 ft

Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.50 ft

Default: 0.00 ft

Op Table:

Ref Node:

Manning's N: 0.0000

Geometry: Circular

Max Depth: 1.50 ft

Default: 0.00 ft

Op Table:

Ref Node:

Manning's N: 0.0000

Invert: 5.00 ft

Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.50 ft

Default: 0.00 ft

Op Table:

Ref Node:

Manning's N: 0.0000

Geometry: Circular

Max Depth: 1.50 ft

Default: 0.00 ft

Op Table:

Ref Node:

Manning's N: 0.0000

Comment:

Pipe Link: Equalizer 2

Upstream

Downstream

Scenario: Scenario1
 From Node: Chamber 1
 To Node: Chamber 3
 Link Count: 1
 Flow Direction: Both
 Damping: 0.0000 ft
 Length: 300.00 ft
 FHWA Code: 0
 Entr Loss Coef: 0

Invert: 7.00 ft

Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.00 ft

Default: 0.00 ft

Op Table:

Ref Node:

Manning's N: 0.0000

Invert: 5.00 ft

Manning's N: 0.0120

Geometry: Circular

Max Depth: 1.00 ft

Default: 0.00 ft

Op Table:

Ref Node:

Manning's N: 0.0000

Exit Loss Coef: 0	Top Clip	
Bend Loss Coef: 0	Default: 0.00 ft	Default: 0.00 ft
Bend Location: 0.00 dec	Op Table:	Op Table:
Energy Switch: Energy	Ref Node:	Ref Node:
	Manning's N: 0.0000	Manning's N: 0.0000

Comment:

Percolation Link: Perc 1

Scenario: Scenario1	Surface Area Option: Vary Based on Stage/Area
From Node: Chamber 1	Table
To Node: Groundwater 1	Vertical Flow Termination: Horizontal Flow Algorithm
Link Count: 1	Perimeter 1: 107.00 ft
Flow Direction: Both	Perimeter 2: 107.01 ft
Aquifer Base Elevation: -10.00 ft	Perimeter 3: 107.10 ft
Water Table Elevation: 7.00 ft	Distance P1 to P2: 5.00 ft
Annual Recharge Rate: 0 ipy	Distance P2 to P3: 10.00 ft
Horizontal Conductivity: 3.160 fpd	# of Cells P1 to P2: 2
Vertical Conductivity: 2.120 fpd	# of Cells P2 to P3: 4
Fillable Porosity: 0.250	
Layer Thickness: 0.00 ft	

Comment:

Percolation Link: Perc 2

Scenario: Scenario1	Surface Area Option: Vary Based on Stage/Area
From Node: Chamber 2	Table
To Node: Groundwater 2	Vertical Flow Termination: Horizontal Flow Algorithm
Link Count: 1	Perimeter 1: 134.00 ft
Flow Direction: Both	Perimeter 2: 134.01 ft
Aquifer Base Elevation: -10.00 ft	Perimeter 3: 134.10 ft
Water Table Elevation: 5.00 ft	Distance P1 to P2: 5.00 ft
Annual Recharge Rate: 0 ipy	Distance P2 to P3: 10.00 ft
Horizontal Conductivity: 3.500 fpd	# of Cells P1 to P2: 2
Vertical Conductivity: 2.350 fpd	# of Cells P2 to P3: 4
Fillable Porosity: 0.250	
Layer Thickness: 0.00 ft	

Comment:

Percolation Link: Perc 3

Scenario: Scenario1	Surface Area Option: Vary Based on Stage/Area
From Node: Chamber 3	Table
To Node: Groundwater 3	Vertical Flow Termination: Horizontal Flow Algorithm
Link Count: 1	Perimeter 1: 409.00 ft

Flow Direction: Both
 Aquifer Base Elevation: -10.00 ft
 Water Table Elevation: 5.00 ft
 Annual Recharge Rate: 0 ipy
 Horizontal Conductivity: 3.500 fpd
 Vertical Conductivity: 2.350 fpd
 Fillable Porosity: 0.250
 Layer Thickness: 0.00 ft

Perimeter 2: 409.01 ft
 Perimeter 3: 409.10 ft
 Distance P1 to P2: 5.00 ft
 Distance P2 to P3: 10.00 ft
 # of Cells P1 to P2: 2
 # of Cells P2 to P3: 4

Comment:

Simulation: 100 YR- 72 HR

Scenario: Scenario1
 Run Date/Time: 2/27/2025 9:27:51 AM
 Program Version: StormWise 4.08.01

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	72.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	60.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000
0	0	0	24.0000	6.0000
0	0	0	72.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000
0	0	0	24.0000	5.0000
0	0	0	72.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources	Lookup Tables
Rainfall Folder:	Boundary Stage Set:
Unit Hydrograph Folder:	Extern Hydrograph Set:
	Curve Number Set:
	Green-Ampt Set:
	Vertical Layers Set:
	Impervious Set:

Tolerances & Options			
Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6		
Over-Relax Weight	0.5 dec	Ia/S:	0.20 dec
Fact:			
dZ Tolerance:	0.0010 ft		
Max dZ:	1.0000 ft	Smp/Man Basin Rain	Global
		Opt:	
Link Optimizer Tol:	0.0001 ft		
		Rainfall Name:	~FLMOD
		Rainfall Amount:	16.00 in
		Storm Duration:	72.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area	100 ft2
		(1D):	
		Energy Switch (1D):	Energy

Comment:

Simulation: 25 YR - 72 HR

Scenario: Scenario1
Run Date/Time: 2/27/2025 9:28:14 AM
Program Version: StormWise 4.08.01

General				
Run Mode:	Normal			
	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	72.0000
	Hydrology [sec]	Surface Hydraulics [sec]		
Min Calculation Time:	60.0000	0.1000		
Max Calculation Time:		30.0000		

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000
0	0	0	24.0000	5.0000
0	0	0	72.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000
0	0	0	24.0000	5.0000
0	0	0	72.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph
Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set:Green-Ampt Set:
Vertical Layers Set:
Impervious Set:

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight 0.5 dec
Fact:
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft

IA Recovery Time: 24.0000 hr

Ia/S: 0.20 dec

Smp/Man Basin Rain Global
Opt:Rainfall Name: ~FLMOD
Rainfall Amount: 13.00 in
Storm Duration: 72.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area 100 ft2
(1D):
Energy Switch (1D): Energy

Comment:

Simulation: 3-YR-1 HR

Scenario: Scenario1
 Run Date/Time: 2/27/2025 9:28:41 AM
 Program Version: StormWise 4.08.01

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	1.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	60.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	1.0000
0	0	0	1.0000	5.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000
0	0	0	1.0000	5.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph
Folder:

Lookup Tables

Boundary Stage Set:
 Extern Hydrograph Set:
 Curve Number Set:

Green-Ampt Set:
 Vertical Layers Set:
 Impervious Set:

Tolerances & Options

Time Marching: SAOR
 Max Iterations: 6
 Over-Relax Weight 0.5 dec

IA Recovery Time: 24.0000 hr
 Ia/S: 0.20 dec

Fact:
 dZ Tolerance: 0.0010 ft
 Max dZ: 1.0000 ft
 Link Optimizer Tol: 0.0001 ft

Smp/Man Basin Rain Global
 Opt:
 Rainfall Name: ~FLMOD
 Rainfall Amount: 2.60 in
 Storm Duration: 1.0000 hr
 Dflt Damping (1D): 0.0050 ft
 Min Node Srf Area 100 ft2
 (1D):
 Energy Switch (1D): Energy

Comment:

Simulation: 5 YR - 1 HR

Scenario: Scenario1
 Run Date/Time: 2/27/2025 9:28:43 AM
 Program Version: StormWise 4.08.01

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	1.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	60.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	1.0000
0	0	0	1.0000	5.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000
0	0	0	1.0000	5.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph
Folder:

Lookup Tables

Boundary Stage Set:

Extern Hydrograph Set:

Curve Number Set:

Green-Ampt Set:

Vertical Layers Set:

Impervious Set:

Tolerances & Options

Time Marching: SAOR

Max Iterations: 6

Over-Relax Weight 0.5 dec

Fact:

dZ Tolerance: 0.0010 ft

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft

IA Recovery Time: 24.0000 hr

Ia/S: 0.20 dec

Smp/Man Basin Rain Global
Opt:

Rainfall Name: ~FLMOD

Rainfall Amount: 3.20 in

Storm Duration: 1.0000 hr

Dflt Damping (1D): 0.0050 ft

Min Node Srf Area 100 ft2

(1D):

Energy Switch (1D): Energy

Comment:

Sim	Node Name	Maximum Stage [ft]
100 YR- 72 HR	Chamber 1	10.90
100 YR- 72 HR	Chamber 2	10.20
100 YR- 72 HR	Chamber 3	10.18
25 YR - 72 HR	Chamber 1	10.53
25 YR - 72 HR	Chamber 2	10.07
25 YR - 72 HR	Chamber 3	10.06
3-YR-1 HR	Chamber 1	9.02
3-YR-1 HR	Chamber 2	9.01
3-YR-1 HR	Chamber 3	9.01
5 YR - 1 HR	Chamber 1	10.06
5 YR - 1 HR	Chamber 2	9.87
5 YR - 1 HR	Chamber 3	9.86



ECS Florida, LLC

Subsurface Exploration and Geotechnical Engineering Report

WMODA Lake Worth Development

32 S L Street
Lake Worth, Palm Beach County, Florida 33304

ECS Project Number 25:4174

May 8, 2024





ECS FLORIDA, LLC

Geotechnical • Construction Materials • Environmental • Facilities

"One Firm. One Mission."

May 8, 2024

Mr. Nicholas Tangredi
Sunshine Lake Worth Development LLC
C/O HE2PD
10 Grand Avenue
Rockville Centre, New York 11570

ECS Project No. 25:4174

Reference: Subsurface Exploration and Geotechnical Engineering Report
WMODA Lake Worth Development
32 S L Street
Lake Worth, Palm Beach County, Florida 33304

Dear Mr. Tangredi:

ECS Florida, LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project, the results of the field exploration conducted, and our geotechnical design and construction recommendations for the project.

It has been our pleasure to be of service to you during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify subsurface conditions estimated for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Florida, LLC

Ernesto J Masis, E.I.
Geotechnical Project Manager
EMasis@ecslimited.com

David W. Spangler, State of Florida
Professional Engineer, License No. 58770

This item has been digitally signed and sealed by
David W. Spangler on the date indicated here.

Printed Copies of this document are not
considered signed and sealed and the signature
must be verified on any electronic copies.

2024.05.0
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-04'00'

David W. Spangler, P.E.
Principal Engineer
Florida Registration No. 58770
DSpangler@ecslimited.com

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APPENDICES

Appendix A – Diagrams

- Site Location Diagram
- Boring Location Diagram
- Generalized Subsurface Profile A-A'
- Flood Map
- Soil Survey Map

Appendix B – Field Operations

- Reference Notes for Boring Logs
- Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
- Boring Logs
- Exfiltration Test Result

Appendix C – Laboratory Summary

- Laboratory Data Summary

Appendix D – Project Details and Supporting Documents

- Laboratory Capacity Results

EXECUTIVE SUMMARY

This executive summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect foundation design and earthwork construction. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The purpose of this geotechnical exploration was to provide subsurface information for the foundation design and earthwork construction of the proposed Residential and Museum Development. ECS understands that the proposed development is to include the removal of the existing 1-story to 2-story buildings and construction of a new 3-story museum and a series of connected residential condominium buildings ranging from 2-story to 5-story with an underground basement. The condominium buildings will have 1-level of underground parking. Based on our field observations and aerial images, the site is currently occupied by an existing 1-story to 2-story residential buildings.
- The geotechnical exploration performed for the planned development included 8 Standard Penetration Test (SPT) borings drilled to depth a depth in the range of 30 feet to 75 feet below the existing ground surface. Subsurface conditions within the borings generally consisted of FILL material of fine to medium SAND (SP) followed by a layer of fine to medium SAND (SP) and then terminating with a soft to hard LIMESTONE material to maximum termination depth of the borings (75 feet below existing grade).
- Loading information was not provided at the time of this proposal. Based on similar projects and our experience, ECS presumes the proposed 5-story multi-family building with 1-level underground parking garage likely consist of maximum column loads of 725 kips. Based on the maximum column load of 725 kips for the proposed 5-story multi-family building with 1-level underground parking garage, it is our opinion that the proposed residential buildings can be supported on a mat foundation **if the site can be dewatered** with a maximum allowable bearing pressure of 1,500 psf.
- Based on similar projects and our experience, ECS estimates the proposed 3-story Museum building will likely consist of maximum column loads of 600 kips and wall loads of 10 kips/ft or less. Based on the presumed loading information given above, it is recommended that a ground improvement method in the form of vibratory stone columns can be used to improve bearing capacities. With ground improvements, it is our opinion that allowable bearing capacities in the range of 6,000 psf can be achieved allowing shallow foundations to be constructed at manageable sizes. We recommend engaging with a design-build contractor experienced with South Florida soils be retained to further evaluate this option, if deemed to be a desirable alternative.
- Based on the presumed finished basement and pile cap depths, dewatering will likely be required during installation. The dewatering system should be determined by the contractor.

- ECS should be retained to review the design documents for conformance with our recommendations and be retained for construction materials testing and special inspections to facilitate proper implementation of our recommendations.

1.0 INTRODUCTION

The purpose of this geotechnical exploration was to provide subsurface information for the foundation design and earthwork construction of the proposed residential development. ECS understands that the proposed development is to include the removal of the existing building and construction of a condominium buildings ranging from 2-story to 5-story. The residential buildings will have 1-level of underground parking. ECS presumes the FFE of the ground floor of the condominium will be el +15 NAVD88 and the FFE of the basement will be el +7 NAVD88.

In addition, a new 3-story Museum building will be constructed on the northeastern portion of the site. ECS presumes the FFE of the ground floor of the condominium will be el +15 NAVD88.

ECS should be provided with the actual FFE and basement elevation when they are established during design. The recommendations developed for this report are based on project information provided by HE2PD in the following documents:

- Site plan, prepared by United Management, and
- Map of Boundary Survey, prepared by Principal Meridian Survey, Inc., dated 11/5/2019.

Our services were provided in accordance with our Proposal No. 25:8634-GP, dated April 5, 2024, as authorized by Nicholas Tangredi with HE2PD on April 9, 2024, which includes our Terms and Conditions of Service.

This report contains the procedures and results of our subsurface exploration program, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items.

- A brief review and description of our field and laboratory test procedures and the results of testing conducted,
- A review of area and site geologic conditions,
- A review of subsurface soil stratigraphy with pertinent available physical properties,
- Final copies of our soil exploration/test boring logs,
- Recommended and foundation type and estimated axial and lateral pile capacities.
- Pile Construction Guidelines,
- Recommendation for standard and heavy-duty pavement,
- Evaluation and recommendations relative to groundwater control, and
- Earthwork construction recommendations including site preparation and placement of engineered fill.

Our assessment was confined to the zone of soil likely to be stressed by the proposed construction. Our work did not address the potential for subsurface expression of deep geological conditions, such as sinkhole development related to karst activity. This evaluation requires a more extensive range of field services than performed in this study. We will be pleased to conduct an exploration to evaluate the probable effect of the regional geology upon the proposed construction if you desire.

2.0 PROJECT INFORMATION

2.1 SITE INFORMATION

The site is located at 32 S L Street in Lake Worth, Palm Beach County, Florida, at the approximate location shown in the following figure below.

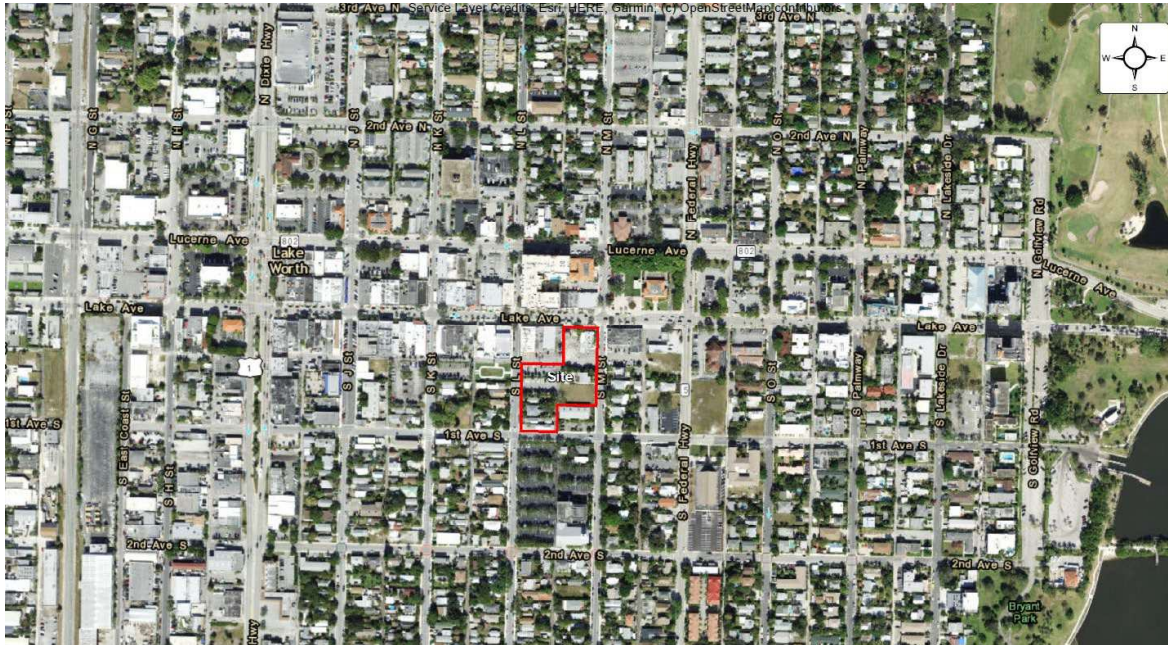


Figure 2.1.1. Site Location

ECS reviewed aerial photographs of the subject property and immediate surrounding properties on Historic Aerials and Google Earth® Historical Imagery databases dating to 1958. Based on review of an aerial photographs dating back to 1958, the site appears to be occupied by multiple residential structures ranging from one to two story. In the 2019 aerial photograph the site appears similar to the 1958 aerial, however, a building at the southeastern portion of the site has been removed. The site has remained unchanged throughout the present day. Upon researching the subject area with USDA, it is noted that the site generally consists of St. Lucie-Paula-Urban land complex (41) and Urban Land (48).

Current grade appears to be at elevation of 13 NAVD88. Please note that the ground surface elevations were not surveyed by a licensed surveyor; these elevations are approximate based on Google-Earth®; therefore, elevation ranges are approximate +/- several feet and should not be used for design .

2.2 PROPOSED CONSTRUCTION

Based on the information provided to us, we understand that the project is likely to consist of the removal of the existing buildings and construction of a series of new connected condominium buildings ranging from 2-story to 5-stories in height. In addition, a new 3-story Museum building will be constructed. The residential buildings will have 1-level of underground parking. Please note that details of the construction of the 2-story to 5-story structures and loads were not available at

the time of this report was prepared, therefore we have made some estimates based on similar projects and experience. The following information included in Table 2.2.1 explains our understanding of the structure:

Table 2.2.1 Museum Building Design Values

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
# of Stories	3-story above grade
Usage	Museum
Framing	We anticipate that the building will be principally cast-in-place concrete with minor reinforced masonry or steel frame.
Column Loads	600 kips (Full Dead and Factored Live) Presumed (Maximum)
Wall Loads	10 kips per linear foot (klf) maximum – Estimated Presumed (Maximum)
Ground Finish Floor Elevation	Presumed at +/- 15 feet above existing grades

- (1) If actual structural loads differ from these loads ECS must be contacted immediately to revise building foundation recommendations and settlement calculations as needed.
- (2) Please note that the ground surface elevations were not surveyed by a licensed surveyor; these elevations are approximate based on Google-Earth®; therefore, elevation ranges are approximate +/- several feet.

Table 2.2.2 Condominium Building Design Values

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
# of Stories	2-story to 5-story above grade + basement
Usage	Mixed-Use Residential
Framing	We anticipate that the building will be principally cast-in-place concrete with minor reinforced masonry or steel frame.
Column Loads	725 kips (Full Dead and Factored Live) Presumed (Maximum)
Ground Finish Floor Elevation	Presumed at +/- 2 feet above existing grades
Basement Finish Floor Elevation	Presumed at +/- 6 feet below existing grades

- (1) If actual structural loads differ from these loads ECS must be contacted immediately to revise building foundation recommendations and settlement calculations as needed.
- (2) Please note that the ground surface elevations were not surveyed by a licensed surveyor; these elevations are approximate based on Google-Earth®; therefore, elevation ranges are approximate +/- several feet and should not be used for design.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling 8 SPT borings. Borings were performed for the proposed structures (A-01 and A-02, B-01 through B-04 and C-01 and C-02). Additionally, we performed 2 exfiltration tests (EXF-01 and EXF-02) within the site.

Boring locations were identified in the field by ECS personnel using GPS techniques prior to mobilization of our drilling equipment and their approximate locations are shown on the Boring Location Diagram in Appendix A. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations noted on our boring logs were interpolated from the provided site survey and should be considered approximate. Standard Penetration Tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained to provide a general indication of soil density and correlate to shear strength parameters.

3.1 USUAL OPEN HOLE TESTING

Usual open hole testing was performed in accordance with procedures of South Florida Water Management District (SFWMD) Usual Condition Test procedure found in the SFWMD Environmental Resource Permit Information Manual Volume IV (September 2010 edition) at the location denoted as exfiltration test EXF-01 on the attached Exfiltration Log found in Appendix B which includes the hydraulic conductivity (K_{IV} values). The measured K_{IV} -values is provided below.

Tests	K_{IV} -Value (cfs/ft ² -ft head)
EXF-01	8.11×10^{-5}
EXF-02	7.31×10^{-5}

Note: Refer to the attached Usual Open Hole Test summary sheet for detailed information

3.2 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil strata. Please refer to the boring logs in Appendix B for more detailed boring information.

The South Florida region is located on the southern flank of Florida Plateau, a stable, carbonate platform on which thick deposits of limestones, dolomites, and evaporates have accumulated. The general geology of the upper 200 feet of this platform within the area of South Florida where the proposed project is to be located is composed predominantly of limestone and quartz sand. The two geological formations that usually are encountered from west to east within Palm Beach County are: Shelly Sediments of Plio-Pleistocene age and Miami Limestone.

Generalized Subsurface Stratigraphy

Approximate Depth (ft)	Elevation ⁽¹⁾ (ft)	Stratum	Description	Ranges of SPT ⁽²⁾ N-values (bpf)
0 to 0.16 – ¼	EL.+13 to EL.+12.84 – EL.+12.75	N/A	Surficial Cover: Asphalt Thickness [2 to 3 Inches] ⁽³⁾ Topsoil [4 to 6 Inches]	N/A
0.16 – ¼ to 2	EL. +12.84 – EL. +12.75 to EL. +11	I	FILL: Fine to Medium SAND (SP, FILL), contains rock fragments, loose to medium dense to dense, brown ⁽⁴⁾	6 – 38
½ – 2 to 38	EL. +12½ – EL. +11 to EL. -10 – EL. -25	II	Fine to Medium SAND (SP), gray, wet, very loose to medium dense, contains trace limestone and shell fragments	4 – 25
38 to 75	EL. -10 – EL. -25 to EL. -62	III	(WR) Highly Weathered to Hard Limestone, gray, wet	7 – 50/1"

Notes:

- (1) Please note that the ground surface elevations were interpolated from the survey plan provided; therefore, elevation ranges are approximate.
- (2) SPT refers to Standard Penetration Test.
- (3) Asphalt Pavement was encountered as surficial cover for Boring B-02, B-03 and C-01.
- (4) Fill Material was encountered in borings B-02 to B-04, and C-02.

A graphical presentation of the subsurface conditions is shown on the Generalized Subsurface Profile Diagrams included in Appendix A.

3.3 GROUNDWATER OBSERVATIONS

Groundwater levels were measured at our boring locations as shown on the boring logs in Appendix B. Groundwater depths measured at the time of drilling ranged from 8 feet to 10 feet below the ground surface. Variations in the long-term water table may occur because of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors. Based upon our interpretation of the subsurface data, it appears that the normal seasonal high groundwater level (SHGWL) is at depths ranging from approximately 4.5 feet to 8 feet below existing grades. We note for refined SHGWL estimates for the proposed basement uplift resistance design, a groundwater monitoring program consisting of surveyed piezometers is recommended.

Based on the Flood Insurance Rate Map (FIRM) Map Number 12099C0781F of Palm Beach County, effective date October 5, 2017, indicates that the site is located within Flood Zone X, which is designated as an area with minimal flood hazard.

3.4 LABORATORY TESTING

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) including USCS classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

The laboratory testing consisted of classification and index property tests performed on samples obtained during our field exploration operations. Laboratory tests performed included moisture content (ASTM D2216) test. The test results are shown on the boring logs in Appendix B and are tabulated in Appendix C.

4.0 DESIGN RECOMMENDATIONS

4.1 BASEMENT CONSIDERATIONS

We estimate that the season high water table is approximately 6 feet below current grade level within this site. The presumed finished floor elevation of the basement appears to be below the groundwater table. Waterproofing will be needed for construction and permanent water proofing will be needed for the basement. Dewatering in order to cast concrete for the basement may not be viably without the first creating a membrane in the form of a bottom plug. This bottom plug will need to be able to resist the large hydrostatic pressure due to its elevation being below the water table. Methods such as Deep Soil-Cement Mixing Plug and Tremie Plug/Seal can be utilized as a waterproofing barrier for the basement. Descriptions of each method can be found in section 4.6 and 4.7.

The proposed 2-story to 5-story condominium building with 1-level subgrade parking garage, may be supported on augercast piles to optimize the load carrying capacity of the LIMESTONE stratum. Augercast piles are commonly used in South Florida because of their ability to develop high compression and tension capacities when embedded in the Fort Thompson Limestone that was

encountered in the borings. Other benefits to augercast piles are that they will also reduce the impact of vibrations to adjacent structures during construction. The following sections provide recommendations for deep foundation design and support for the proposed structures.

4.2 MAT FOUNDATION

A mat foundation can be explored as a value engineering alternative **if the site can be dewatered** with a maximum allowable bearing pressure of 1,500 psf. The mat foundation can be designed with a downward pressure or thickness sufficient to counteract the hydrostatic pressure without the use of tiedowns. This would require a thicker mat. In addition to that, you have the option in tying down the mat which would result in a thinner mat with either Auger cast piles or helical anchors. Auger cast piles would be the desirable alternative if higher uplifts were necessitated. However, if a very low uplift capacity is needed, helical piles could be used to compliment the weight of the mat itself and provide the required additional anchoring of the mat.

4.3 SHALLOW FOUNDATION – MUSEUM BUILDING

Provided subgrades and engineered fills are prepared as recommended in this report, It is in our opinion that the proposed 3-story Museum structure can be supported on a shallow foundation system supported on ground improved soils. Based upon the presumed loads to be placed over existing loose SAND (SP), it is recommended that a ground improvement system such as a stone column be installed for the project as discussed in the following Section 4.4. We recommend the foundation design use the following parameters:

Summary of Shallow Foundation Design Parameters

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure ⁽¹⁾	6,000 psf (Estimated, but to be determined by the stone column design)	
Acceptable Bearing Soil Material	Compacted Stratum I and/or engineered fill with stone column ground improvements	Compacted Stratum I and/or engineered fill with stone column ground improvements
Minimum Width	24 inches	18 inches
Minimum Footing Embedment Depth (below slab or finished grade)	24 inches	24 inches
Estimated Total Settlement ⁽²⁾	1-inch or less	1-inch or less
Estimated Differential Settlement ⁽³⁾	Approximately ½ inches between columns	Approximately ½ inches over 30 feet

Notes:

- (1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.
- (2) Based on estimated structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
- (3) Based on maximum column/wall loads and variability in borings. Differential settlement can be re-evaluated once the foundation plans are more complete.

Potential Undercuts: If soft or unsuitable soils are observed at the footing bearing elevations to include any presence of organics, the unsuitable soils should be undercut and replaced with approved engineered fill or with lean concrete ($f'c \geq 1,000$ psi at 28 days) or compacted No. 57 stone, as applicable, up to the original design bottom of footing elevation.

4.4 GROUND IMPROVEMENTS (STONE COLUMNS)

Ground improvement methods in the form of vibratory stone columns (VSC) can be used to improve bearing capacities of the upper loose sands encountered within our borings. It is our opinion that the proposed Museum can be supported with shallow foundations bearing on or above deep ground improvement elements consisting of stone columns extending 23 feet below existing grade surface. The stone columns will increase the allowable bearing pressure to reduce footing sizes, reduce settlements to tolerable levels, infill or bypass anomalous miscellaneous zones to significantly reduce the risk associated with differential settlement. We expect settlements to be less than 1-inch, and occur primarily during construction. Bearing capacity in the range of 6,000 psf appears to be feasible at this site with stone column soil improvements. Stone columns are of a design-build nature and will need to be procured this way. Drawings and specifications should be prepared by the engineering consultants sufficient to adequately bid the work. The proposals prepared by any specialty foundation contractor should be provided to ECS so that we may review the proposed construction techniques to assure compliance with the intention of our geotechnical recommendations.

The stone column vibrator is penetrated to design depth and stone is placed in the resulting cavity as the vibrator is withdrawn. Raising and lowering the vibrator in two-to-three-foot increments provides densification effort to the stone fill and surrounding granular soils. A dense column is formed with the stone laterally compacted against the surrounding soil.

Stone column and the in-situ soil form an integrated system having low compressibility and high shear strength. The excess pore pressure can more readily dissipate through the stone columns which also act as drains. This reduces the amount of time for settlement to occur, as well as reduces liquefaction potential by dissipating seismically generated excess pore pressure.

The VR vibrator can either be mounted to specially fabricated equipment such as a Vibrocat or free hung from a lattice boom crawler crane. Regardless of how the VR vibrator is mounted, the work is generally performed using either the wet top feed or the dry bottom feed method. In the wet top feed method, water jets in the tip of the vibrator, assisting in penetration and stabilization of the hole. Stone backfill is delivered at the ground surface and falls to the tip of the vibrator through the annulus between the vibrator and the surrounding soil. In the dry bottom feed method, the vibrator penetrates the soil by means of its weight and vibrations. The stone is fed through a hopper and supply tube directly to the bottom of the vibrator for injection into the ground.

4.5 DEEP FOUNDATION – AUGER CAST PILES

The condominium building structure may be supported on augercast piles embedded into the LIMESTONE Stratum. For this design, we anticipate that a 2 to 5-story residential building with basement could be supported on either 14-inch diameter or 16-inch diameter ACIP piles. The anticipated settlement is estimated to be less than 1 inch, with differential settlement to be less than $\frac{3}{4}$ inches for the structures. We recommend appropriately sized augercast piles embedded into the LIMESTONE, Stratum 3, should be considered, such that pile cap sizes are manageable and the bottom of the pile caps be kept as shallow as possible so that dewatering efforts are minimized during construction of foundations.

Table 4.5.1.1 Summary of Residential Buildings Pile Allowable Capacity Estimates

Design Parameters	14-inch Diameter Pile	16-inch Diameter Pile
Allowable Compressive Capacity (Factor of Safety = 2.0)	120 tons	140 tons
Allowable Uplift Capacity	60 tons	70 tons
Spring Constant	240 kips/in	280 kips/in
Allowable Lateral Capacity (Fixed Head Condition)	13 tons	17 tons
Embedment Depth	Minimum 18 feet into Stratum 3	Minimum 18 feet into Stratum 3
Estimated Pile Length and Elevation (Pile lengths were referenced to existing land surface at the time the borings were drilled)	68 feet below existing grades Approximately EL-43 feet	68 feet below existing grades Approximately EL-43 feet
Minimum Center to Center Spacing	3½ feet	4 feet
Minimum Recommended Compression Steel Reinforcement	Full Length Steel Cages to be determined by the Project Structural Engineer	Full Length Steel Cages to be determined by the Project Structural Engineer
Minimum Recommended Grout Compressive Strength	5,000 lbs/in ²	5,000 lbs/in ²

Notes:

1. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
2. Based on maximum column/wall loads and variability in borings. Differential settlement can be re-evaluated once the foundation plans are more complete.

The allowable tension capacities provided above are one-half of the individual pile compressive capacities. The reinforcing steel cages presented in Tables 4.1.1.1 is the recommended minimum. The grout strength is a minimum required value. **The project structural engineer should design the pile reinforcement and grout strength to resist all axial, bending, tensile and shear stresses in the pile.** If the full recommended pile uplift capacity is not required, the pile uplift capacity may be reduced to minimize the quantity of steel reinforcement required for tension piles. Additional lateral load can be achieved by using battered piles installed at a 1 horizontal (H) to 6 vertical (V) batter. The lateral capacities provided are for a fixed-head condition with a top of pile deflection of approximately 0.375 inches (refer to appendix D for the lateral load analysis).

The estimated pile tip elevations presented in Table 4.1.1.1 are based on where the top of the Limestone stratum were encountered in the borings, and the required embedment presumes the Limestone and Cemented Sand material to be confirmed during pile installation activities. Deeper piles may be required if the bearing stratum is encountered deeper than anticipated or if weaker conditions are encountered during drilling of the required embedment into the bearing stratum. Piles should not be installed shallower than the estimated pile lengths. The estimated pile capacity is based upon a single, free-standing pile statically analyzed. Piles may have significantly different capacities in groups; similarly, pile groups may settle significantly more than single piles. To help mitigate group action effects, piles should normally be spaced a minimum of at least three pile diameters.

To help to assure the pile foundation systems will perform as required, we recommend that we review the final design of the proposed building foundation system before the project moves into the final design and construction phase. The recommendations provided in this report should be

confirmed after the project structural engineer has generated a foundation layout and provided refined building loads.

Auger cast-in-place piling operations are highly dependent on the workmanship of the operator and therefore require strict, full-time quality control and inspection. For this reason, we strongly recommend that ECS provide the inspection service during the auger pile installation. Full-time observation and inspection will allow us to evaluate if piles are being installed properly by the contractor, provided an accurate record of the installation, and provide an opportunity to correct anomalous or unforeseen conditions during the pile placement work.

4.5.1 Test Pile Program: Bi-Directional (O-Cell) Load Test

ECS recommends that at least one (1) bi-directional axial load test be performed for each pile size prior to the installation of production piles to verify the design parameters and confirm the adequacy of the augercast piles contractor's construction methods. These test pile results will be utilized to confirm lateral/uplift capacity of the soils and rock as well, and to optimize the design length of the augercast piles. Due to the high variability of the limestone (Stratum 3) strength at this site, we recommend an SPT boring be performed at the proposed test pile location prior to the load test to confirm the condition of the limestone at the load test location.

The load test should be performed by means of a "Bi-Directional Static Load Tests" per ASTM D8169 "Standard Test Method for Deep Foundations Under Bi-Directional Static Axial Compressive Load". Additionally, we recommend the load test be performed **near a planned interior column with high loading conditions within an area of the weaker limestone as encountered at Boring A-1**. The test pile shall be instrumented with a minimum of seven vertical levels of embedded strain gages placed at various soil layer interfaces. The contractor performing the load test should submit the proposed test pile location, installation details, and proposed load test procedure and configuration to ECS for review and approval prior to the installation of the test drilled pile. In addition, the construction of the test drilled piles should be performed under the observation of an ECS Geotechnical Engineer, or his/her field representative. Typically, additional pile length is considered for load test piles than what is recommended in the report. The additional pile length will be instrumented to extend the usefulness of the information gathered during the load test program. The intent of the instrumentation is to measure the load distribution between side friction and end bearing. It should be noted that the production drilled pile lengths may be updated based on the results of the load test.

The bi-directional static axial compressive load test method loads the pile in two directions by hydraulically pressurizing an embedded jack within the pile. Pressurizing the jack simultaneously loads the pile below the embedded jack that resists downward movement and loads the pile above, which resists upward movement. The load is determined by relating the applied hydraulic pressure to the jack calibration. Both a calibrated Bourdon gage and electronic pressure transducer monitor the applied pressure during testing. A variety of supplementary instrumentation should be installed in the test pile to obtain detailed data on load transfer. These instruments include: multiple levels of strain gages, embedded displacement transducers (LVWDTs), sister bars, and telltales. The pile must be designed and constructed properly to structurally support the applied test load. Loads of the tests should be performed at least two times the design load indicated in the project plans or to failure of the pile, whichever comes first, to determine the ultimate capacity of the pile.

Load testing of augercast piles shall not begin until the concrete has attained a minimum compressive strength as directed by the Structural Engineer. High early strength concrete may be used to obtain this strength at an earlier time to prevent testing delays, upon the approval of the Engineer.

Upon completion of the Bi-Directional Static Load Test, a report should be submitted by a Registered Professional Engineer in the State of Florida containing the load deflection of the pile top, side shear resistance of the limestone at various depth intervals based on the strain gage data, end bearing resistance and any other pertinent data obtained during testing. Due to the complex nature of the local geology, it is imperative that the load test is performed by a contractor experienced performing load tests in local projects.

4.5.2 Augercast Pile Construction Guidelines

Presented below are general guidelines regarding augured cast-in-place pile construction that we recommend during the installation of the piles.

1. The pile contractor's equipment should be inspected when delivered to the site to confirm that the auger length is sufficient to drill to the specified depth/tip elevation. Pile leads should be clearly and accurately marked at one-foot intervals. Equipment must be capable of achieving the minimum plan tip elevations stated herein plus an additional 10 feet.
2. The auger and bit diameter should be measured for compliance with the project specifications. Auger flighting should be continuous with no gaps and should be in good condition with uniform diameter throughout the entire length. Auger and bit diameter should be within $\frac{1}{4}$ -inch ($\pm$) of the specified diameter.
3. Grout pumping equipment (pump, hoses, swivels, connections, etc.) should be checked to confirm that the pump and appurtenances are appropriately sized to develop and maintain the specified grout pressure and delivery volume. The grout pump should be calibrated to determine the volume per pump stroke so that grout volumes placed in the piles can be properly evaluated. If the grout pump includes a stroke counter, the counter should be inspected to assure that it operates correctly.
4. Pressure gauges should be inspected to confirm proper operation and placement. As a minimum, pressure gauges should be located at the pump discharge port, the crane leads and at the inlet point to the auger column. All gauge faces should be clearly readable and properly calibrated.
5. At the start of pile construction operations, the location and orientation of the auger column and leads should be checked to confirm that the pile is being constructed at the proper location and that the auger and leads are plumb and true to the specified pile orientation.
6. During drilling, the auger should be advanced at a rate consistent with the material being penetrated. Care should be taken during auger advancement to prevent prolonged drilling or excessive rotation which could result in ground subsidence or settlement due to the removal of excessive volumes of soil.

7. Once the design depth of the pile has been achieved, the auger should be raised off the bottom of the drill hole 12 inches to allow the plug to be pumped out. The auger should be maintained in the position of 12 inches off the bottom of the hole until the grout has reached the bit.
8. Prior to the beginning of any further auger withdrawal, a grout volume sufficient to achieve a grout head of seven feet on the auger flights should be pumped through the bit into the borehole. A minimum grout head of seven feet should be maintained during the construction of the entire length of pile.
9. Withdrawal of the auger column should be performed at a slow, continuous rate, with the grout pressure and pumping volume maintained at a constant rate during auger withdrawal. Grout volume and pressure should be monitored by the ECS inspector during auger withdrawal and the volume pumped and pressures recorded at each five-foot interval (as a minimum). Slow, positive rotation of the auger should be maintained during pumping; however, at no time should the auger be allowed to rotate in the reverse direction.
10. Piles should be drilled and grouted in one continuous operation. The pile contractor should confirm that sufficient grout is available on site prior to beginning construction of each pile. During grouting and pile topping operations, representative samples of the grout mix should be obtained from the pump hopper for evaluation of initial set time and for later compliance testing for compressive strength. Grout which has achieved initial set or has otherwise become unworkable should not be used for pile construction and should be discarded. Piles constructed with grout that has achieved its initial set should be re-drilled and re-grouted.

Additionally, grout fluidity should be checked using an appropriate flow cone upon introduction of grout into the pump hopper and at suitable intervals during pile construction operations. If noticeable changes in grout consistency become apparent (grout is too fluid or excessively thick), more frequent fluidity tests should be performed.

11. Sufficient grout should be placed in each pile to achieve a minimum grout factor of 1.05 (placed volume divided by theoretical hole volume). The amount of grout pumped per foot of pile during auger retrieval should also be at least 105% of the theoretical volume per foot of pile. Grouting and auger withdrawal operations should be performed to assure a uniform pile diameter free of any necking. Any pile that fails to achieve at least a 1.05 grout factor shall be re-drilled and re-grouted.
12. Following the completion of grouting and removal of the augers from the pile bore, the top of the pile should be screened to remove any foreign matter. The top pile form ("pile can") can then be placed and the form topped off with fresh grout to the pile cutoff elevation.
13. Placement of reinforcing steel, if included in the project specifications, should be performed as recommended by the structural engineer, generally after grouting. All reinforcing steel, cages, etc. should easily penetrate the grout column. Reinforcing steel which cannot be inserted the full length can be an indication of pile "necking" or other non-uniform pile conditions. If the reinforcing steel cannot be installed under its own weight or by manual insertion, the steel should be removed and the pile re-drilled and re-grouted.
14. Following completion of grouting and pile topping operation, the grout level of the pile should be recorded and measured following grout set to determine grout subsidence. Excessive grout subsidence should be reported to the project geotechnical engineer immediately upon

discovery. Grout subsidence greater than that measured during test pile construction should be considered excessive. At no time during pile construction should the grout be allowed to subside below the lower end of the "pile can."

15. A minimum grout set time of 12 hours shall be allowed before any adjacent piles are installed unless otherwise directed by the Geotechnical Engineer. No piles closer than 9 feet center to center shall be installed the same day. If grout loss is experienced in a completed pile while drilling an adjacent pile, the construction of the adjacent pile shall be ceased, and the completed pile shall be redrilled and regouted. The adjacent pile shall not be installed until the next day.
16. The ECS pile inspector should record all applicable pile installation data. Specific attention should be given to conditions or practices which may result in inadequate pile construction. Further, the inspector should require that any pile not installed according to the project specifications be replaced or re-drilled.

4.6 TREMIE PLUG/SEAL

Tremie Plug/Seal is a method used to cutoff the vertical flow of groundwater for deeper and large below ground construction. This method involves excavating to design depths after shoring has been placed. Concrete is then tremie poured into the water filled excavation forming an unreinforced slab. Once dry, the water can then be pumped out. Piles will be needed in order for the plug to resist the hydrostatic pressure experienced.

4.7 SOIL-CEMENT MIXING

Soil-Cement Mixing is an in-situ method used to cutoff the vertical flow of groundwater for deeper and large below ground construction. This method involves the mixing of the heterogeneous subsurface soils with an introduced engineered soil/cement material. This method negates the need to pour concrete in the wet as in the tremie method due to performing the soil mixing at above ground level. Piles will be needed in order for the plug to resist the hydrostatic pressure experienced.

4.8 LIGHTLY LOADED STRUCTURES

For lightly loaded structures such as on grade landscape areas, lighting, etc., provided that subgrades and structural fill are prepared in accordance to the procedures described in Section 5.1 and Section 5.2 of this report, a net allowable bearing pressure of 3,000 psf can be used for design.

4.9 FLOOR SLABS

Provided subgrades and structural fills are prepared as discussed herein, the proposed floor slabs can be constructed as Ground Supported Slabs (or Slab-On-Grade). Based on a lowest finished floor elevation, it appears that the slabs will bear on compacted structural fill and/or Stratum I and II - SAND (SP). However, there may be areas of loose or yielding soils that should be removed from below the structure foundation and the slab footprints, plus and extended horizontal distance of 5

feet and replaced with compacted structural fill in accordance with the recommendations included in this report.

Note that basement slabs and walls will require waterproofing and drainage considerations considering the seasonal high ground water level. See Sections 4.4 and 4.5 of this report for below grade wall and slab recommendations.

Soft or yielding soils may be encountered in some areas. Those soils should be removed and replaced with compacted Structural Fill in accordance with the recommendations included in this report.

Vapor Barrier: Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the structural engineer and/or the architect may choose to eliminate the vapor barrier.

Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab such as in a drop-down footing/monolithic slab configuration, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab.

4.10 SEISMIC DESIGN

The requires site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the unconfined compressive strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The N-value method was used for this project.

The seismic site class definitions for the weighted average of shear wave velocity or SPT N-value in the upper 100 feet of the soil profile are shown in the following table:

Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, V_s , (ft./s)	N value (bpf)
A	Hard Rock	$V_s > 5,000$ fps	N/A
B	Rock	$2,500 < V_s \leq 5,000$ fps	N/A
C	Very dense soil and soft rock	$1,200 < V_s \leq 2,500$ fps	>50
D	Stiff Soil Profile	$600 \leq V_s \leq 1,200$ fps	15 to 50
E	Soft Soil Profile	$V_s < 600$ fps	<15

The 2021 Florida Building requires that a Site Class be assigned for the seismic design of new structures. The Site Class for the site was determined by calculating a weighted average SPT N-value for the top 100 feet of the subsurface profile. Based on the conditions encountered in the borings, we recommend that a Site Class "D" be used for design of the proposed building.

4.11 SITE DESIGN CONSIDERATIONS

4.11.1 Pavements

Subgrade Characteristics: Based on the results of our soil test borings, it appears that the soils that will be exposed as pavement subgrade will consist mainly of structural fill material and/or sandy soils. The pavement design assumes subgrades consist of suitable materials evaluated by ECS and placed and compacted to at least 98 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557).

Pavement Considerations: Pavement subgrades should be prepared in accordance with the recommendations in Section 5.2 Structural Fill. We are providing recommendations for both standard duty and heavy duty flexible and rigid pavements sections. For the design and construction of exterior pavements, the subgrade should be prepared in strict accordance with the recommendations in the geotechnical report. An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, softening of the subgrade and other problems related to the premature deterioration of the pavement can be expected.

Pavement recommendations are based upon local experience with similar pavement conditions, Florida Department of Transportation (FDOT), and AASHTO Guide for Design of Pavement Structures.

A minimum separation of 18 inches should be maintained between the pavement aggregate base (limerock) or base course in asphalt pavement areas and the seasonal high groundwater levels. In most cases, this separation is available. Recommended pavement sections are described below in Table 4.2.1.

Table 4.2.1: Pavement Structures Sections

	Flexible (Hot Mix Asphalt)		Rigid (Concrete)	
Component	Standard	Heavy	Standard	Heavy
Surface Course	1.5 inches	2.0 inches	5 inches	6 inches
Base Course (Limerock)	6 inches	8 inches	-	-
Stabilized Subgrade	12 inches	12 inches	12 inches	12 inches

Hot Mix Asphalt Surface Course (flexible): Prime and tack coats should be applied during the construction of the pavement sections in accordance with Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (current edition). Before applying any bituminous material, all loose dust, dirt, and other foreign material which might prevent proper bond with the existing surface should be removed. Care should be taken in cleaning the outer edges, to ensure that the prime or tack coat will adhere. Prior to applying prime coat, the moisture content of the base should be checked to make sure that it does not exceed the optimum moisture. The hot mix asphalt concrete pavement should consist of a Superpave mix Type SP as per FDOT Standard Specifications for Road and Bridge Construction (current edition), Section 334 Superpave Asphalt Concrete. Recycled Asphalt Pavement (RAP) and other recycled materials may be used as indicated in Section 334, previously mentioned. If this is to be a LEED certified project, credits may be awarded for using such materials.

Base Course: Typically, the most prevalent flexible or rigid pavement base material in South Florida is limerock. Limerock is readily available from FDOT approved mines in South Florida. As an alternative base course, crushed concrete could be used. Limerock should have a minimum LBR value of 100 and should be mined from an FDOT approved source. Limerock should be placed in maximum six-inch lifts and compacted to 98 percent of the Modified Proctor (ASTM D1557) maximum dry density. Limerock pavement base shall be in accordance with Section 911 and 200 of the FDOT Specifications for Road and Bridge Construction (Current Edition).

Stabilized Subgrade: Stabilized subgrade soil material should be stabilized with rock to a minimum Limerock Bearing Ratio (LBR) value of 40, as specified by FDOT requirements for Type B or Type C Stabilized Subgrade. All stabilized subgrade materials should be compacted to 98 percent of the Modified Proctor (ASTM D1557) maximum dry density. Furthermore, the stabilized subgrade may be imported material or a blend of on-site soils and imported materials. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions. It should be noted that a minimum of 97 percent of the stabilized material should pass a 3½ inch sieve.

Perform compliance testing for base course to a depth of one foot at a frequency of one test per 5,000 square feet, or at a minimum of two test locations, whichever is greater.

Concrete surface course (rigid): Our recommendations for heavy-duty Portland cement concrete (pcc) pavement section is using unreinforced Portland cement concrete surface course (Type 1) providing a minimum 28-day compressive strength of 4,000 pounds per square inch (psi). This section would be placed atop a layer of fine (SP). Appropriate steel reinforcing and jointing should also be incorporated into the design of all PCC. In addition, the concrete should provide a minimum 28-day flexural strength (modulus of rupture) of 600 psi, based on the third point loading of concrete beam samples.

Rigid pavement notes recommendations:

- The surface of the subgrade soils should be free of all soft, unstable, or unsatisfactory soil and smooth and uniform. Any disturbances or wheel rutting corrected prior to placement of concrete.
- The subgrade soils should be moistened not more than 24 hours prior to placement of concrete but there should be no standing water present during concrete placement.
- Concrete pavement thickness should be uniform throughout, with the exception to thickened edges (curbs or footings).
- The bottom of the pavement base course should be separated from the estimated typical wet season groundwater level by at least one foot.
- Maximum Control Joint Spacing should be 12 feet by 12 feet
- Minimum Sawcut depth should be at least 1/4 of concrete thickness
- Isolation joints are recommended at the interface between concrete pavement and fixed objects such as drainage inlets, light poles, etc.

- Control joints should be sawed as soon as the concrete can withstand traffic and concrete surface and aggregate raveling can be prevented.

It is recommended that dowels be used for all construction joints for new pavements, the interface between new pavement and existing pavements, and interface at existing curb and gutter. It is recommended that 3/4-inch diameter smooth dowels 18 inches long spaced 12 inches on center be used. The full length of the dowels should be lightly oiled.

4.12 BELOW GRADE WALLS

We recommend that below grade walls be designed to withstand at-rest lateral earth pressures and surcharge loads from adjacent building foundations, and/or streets. These recommendations apply to a “drained” condition which is where there is drainage material behind below grade walls that prevents hydrostatic water pressures on the back of the below grade wall.

To accomplish a drained condition, drainage materials such as a free draining gravel, geocomposite drainage panels, weep holes, and an underslab drainage system should be used.

We recommend that walls that are restrained from movement at the top be designed for a linearly increasing lateral earth pressure. The following Figure depicts our recommended at-rest lateral earth pressure condition for a “drained below-grade wall” with restrained wall top:

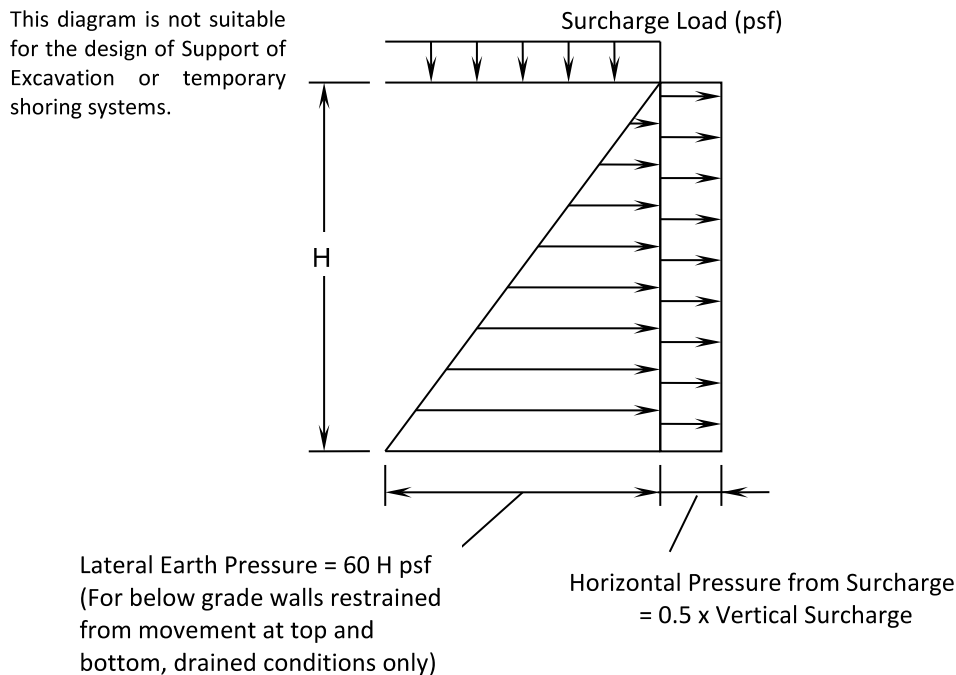


Figure 4.12.1

Surcharge loads imposed within a 45-degree slope from the base of the restrained wall should be considered in the below grade wall design. These surcharge loads should be based on an at-rest pressure coefficient, k_0 , of 0.5. Care should be used to avoid the operation of heavy equipment to

compact the wall backfill since it may overload and damage the wall; in addition, such loads are not typically considered in the design of below grade walls.

4.13 UNDERSLAB SUBDRAINAGE

We recommend that the below grade areas be provided with a designed perimeter and underslab subdrainage system. If requested, ECS can assist with the underslab/basement drainage design.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 Subgrade Preparation

5.1.1 Previous Site Development

When reviewing our recommendations, please note that there are existing structures on this site, and that previous grading activities have likely occurred on this site. Our experience with previously graded sites indicates that unexpected conditions can exist that were not encountered by the soil test borings. Unexpected conditions could include areas of soft or loose fill, debris-laden fill, and other obstructions or conditions. There is a possibility that existing underground utilities may be present and should be removed or abandoned in place. It should be noted that if existing or former underground utilities are abandoned and not removed or grouted full, soil may migrate into open voids (e.g., open pipes from utilities), causing subsidence of the overlaying construction. These conditions should be addressed by an on-site engineering evaluation by ECS during construction utilizing a test pit exploration. In addition, existing utility lines, if located within proposed construction areas, may cause the new construction to behave unexpectedly due to the variable support conditions caused by old backfill. Furthermore, old backfill along utility lines also may provide inadequate support due to poor compaction. The poor support conditions may result in settlement or distress of the overlying new construction. Based on our experience, existing utility backfill rarely is suitable for support of new foundations. In slab areas, the load support characteristics of the backfill along utility lines typically can be assessed with careful proofrolling and subgrade evaluation during construction. Some undercutting and/or bridging of these backfill areas should be anticipated if utilities are present.

5.1.2 Demolition

Site demolition should include the removal of existing structure, concrete curb and gutter, underground utilities and pipes from the proposed construction areas. Any underground utilities that may exist within the proposed building areas should be relocated, and any within proposed pavement areas should be evaluated by the design team and relocated or filled with grout, if necessary. The crushed stone on the ground surface in the existing pavement areas should be left in place in areas to be filled or can be excavated and re-used as compacted engineered fill but not as the new pavement base course. Excavations or cavities resulting from demolition should be backfilled with compacted structural backfill.

5.1.3 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, existing fill, existing pavements and aggregate base, and any soft or unsuitable materials. The existing fill

material should be evaluated by ECS engineers before reuse. ECS should be retained to verify that topsoil and unsuitable surficial materials have been removed prior to the placement of structural fill or construction of structures.

5.1.4 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by an ECS field technician. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 20 tons [e.g. fully loaded tandem-axle dump truck]. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of an ECS technician. This procedure is intended to assist in identifying any localized yielding materials.

Where proofrolling identifies areas that are unstable or “pumping” subgrade those areas should be repaired prior to the placement of any subsequent Structural Fill or other construction materials. Methods of stabilization include undercutting or moisture conditioning. The situation should be discussed with ECS to determine the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of the observed unstable materials, and to assist in the evaluation of appropriate remedial actions to stabilize the subgrade.

5.1.5 Site Temporary Dewatering

Based on the presumed finished basement and pile cap depths, dewatering will likely be required during installation. The dewatering system should be determined by the contractor.

Note that discharge of produced groundwater to surface waters of the state from dewatering operations or other site activities is regulated and would require temporary dewatering permits from Palm Beach County and the State of Florida Department of Environmental Protection (FDEP). This permit is termed a Generic Permit for the Discharge of Produced Groundwater from Any Non-Contaminated Site Activity. If discharge of produced groundwater is anticipated, we recommend sampling and testing of the groundwater early in the site design phase to prevent project delays during construction. ECS can provide the sampling, testing, and professional consulting required to evaluate compliance with the regulations.

5.1.6 Compaction

Subgrade Compaction: Upon completion of subgrade documentation, the exposed subgrade within the five-foot expanded building limit below shallow foundations, grade supported floor slabs, or mat foundations. should be moisture conditioned to within +/- two percent of the soil's optimum moisture content and be compacted with suitable equipment (minimum ten-ton roller) to a depth of twelve inches. Subgrade compaction within the expanded building and pavement limits should be to a dry density of at least 98 percent of the Modified Proctor maximum dry density (ASTM D1557).

Subgrade Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits for buildings, fills, and slopes, etc. Field density testing of subgrades will be performed at frequencies in Table 5.1.6.1.

Table 5.1.6.1 Frequency of Subgrade Compaction Testing

Location	Frequency of Tests
Expanded Building Limits	One test per 2,000 sq. ft.
Pavement Areas	One test per 5,000 sq. ft.
Utility Trenches	One test per 200 linear ft.
All Other Non-Critical Areas	One test per 5,000 sq. ft.

5.2 STRUCTURAL FILL

Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of on-site and/or off-site borrow should be submitted to ECS for laboratory testing, which will typically include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are within the last 90 days.

Satisfactory Structural Fill Materials: Materials satisfactory for use as Structural Fill should consist of inorganic soils with the following engineering properties and compaction requirements.

STRUCTURAL FILL INDEX PROPERTIES	
Subject	Property
Building and Pavement Areas	LL < 40, PI < 6
Max. Particle Size	4 inches
Fines Content	Max. 25 % > #200 sieve
Max. organic content	5% by dry weight

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	Requirement
Compaction Standard	Modified Proctor, ASTM D1557
Required Compaction	95% of Max. Dry Density
Recommended Moisture Content	-2 to +3 % points of the soil's optimum value
Loose Thickness	8 inches prior to compaction

Fill Placement: Asphalt and Concrete should not be reused as Structural Fill. Fill materials should not be placed on excessively wet soils. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned. **The Stratum I FINE SAND (SP) material is suitable to be reused as structural fill material.**

At the end of each workday, all fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of four inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Drying and compaction of wet soils is typically difficult during the rainy season. Accordingly, earthwork should be performed during the drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which tends to degrade subgrade soils.

Fill material should be placed in horizontal lifts in confined areas such as utility trenches, portable compaction equipment and thin lifts of three inches to four inches may be required to achieve specified degrees of compaction.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during extended periods of rain.

5.3 FOUNDATIONS AND FLOOR SLABS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a one to three-inch thick “mud mat” of “lean” concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations (Lightly loaded shallow foundations): After over-excavation of the deleterious organic soils, most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. It is important to have ECS observe the foundation subgrade prior to placing foundation concrete; to confirm the bearing soils are what was anticipated.

Slab Subgrade Verification: Prior to placement of a drainage layer, the subgrade should be prepared in accordance with the recommendations found in Section 5.1.4 Proofrolling.

5.4 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Any loose or unsuitable materials encountered should be removed and replaced with suitable compacted structural fill, or pipe stone bedding material.

Utility Backfilling: The granular bedding material should be at least 4 inches thick, but not less than that specified by the civil engineer’s project drawings and specifications. We recommend that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Section 5.1 Subgrade Preparation and Section 5.2 Structural Fill.

Temporary Dewatering: Based on the assumed design grades, we anticipate localized dewatering for the construction of the footings and utilities that extend 4 feet below existing grade surface. Minor localized dewatering for deeper utility structures can be achieved using sump pumps.

Excavation Safety: All excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing, constructing, and maintaining stable temporary excavations and slopes. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.0 RECOMMENDED ADDITIONAL TESTING

ECS recommends that additional SPT borings be performed at the location of the 2-story building in the east portion of the site once area is accessible. Piezometers could also be placed at the proposed basement area to provide refined groundwater measurements and estimated Seasonal High Groundwater levels. Additional field testing, if any, which we feel is necessary to formulate detailed foundation design and site preparation and earthwork construction recommendations, should be conducted prior to final design.

7.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by HE2PD. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

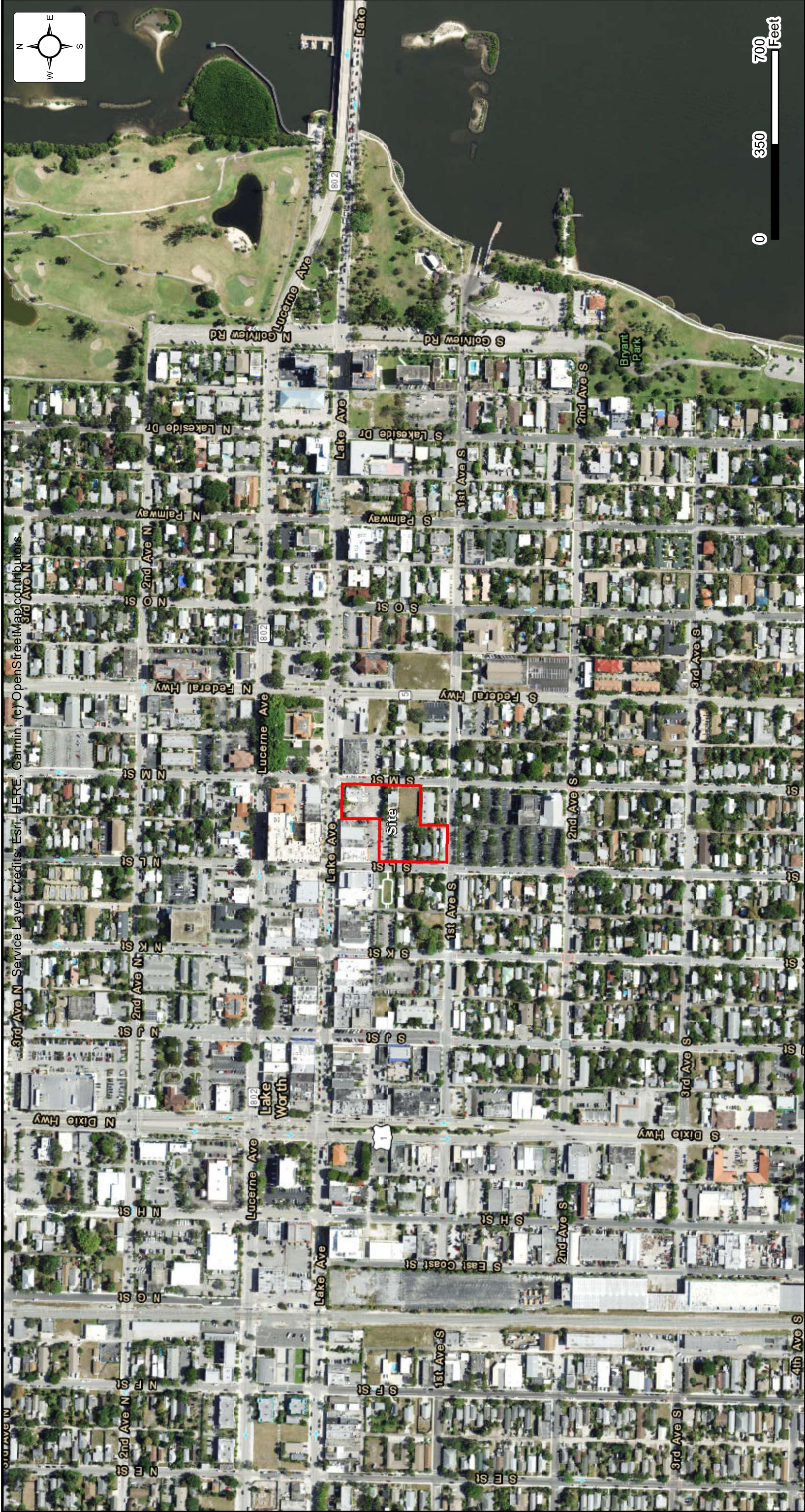
We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Diagrams

Site Location Diagram
Boring Location Diagram
Generalized Subsurface Profile A-A'
Flood Map
Soil Survey Map

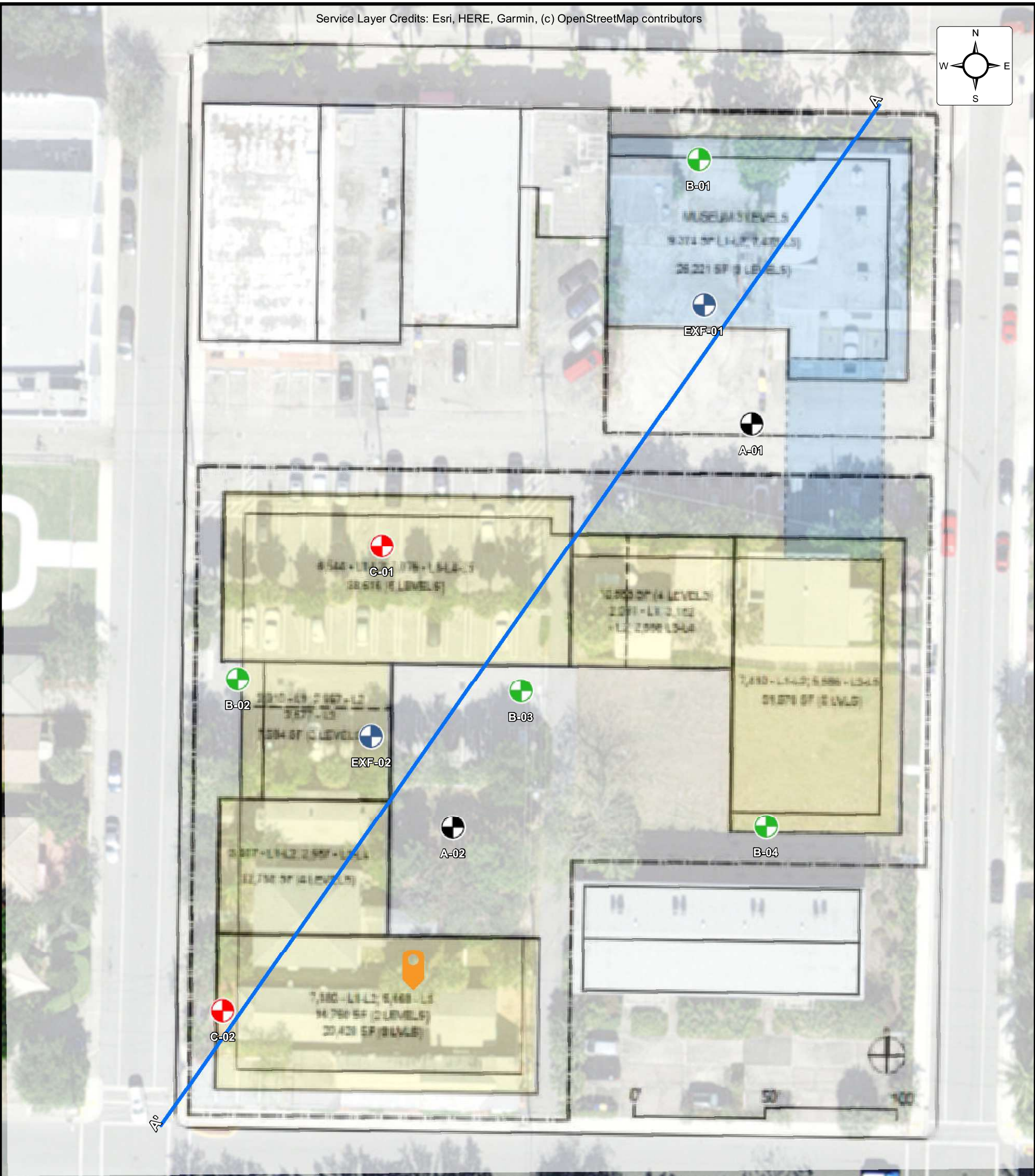
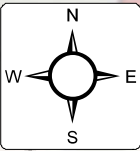


SITE LOCATION DIAGRAM

WMODA LAKE WORTH DEVELOPMENT

32 S L ST, LAKE WORTH, FLORIDA
C/O UNITED MANAGEMENT

ENGINEER	JPH
SCALE	AS NOTED
PROJECT NO.	25.4174
FIGURE	1 OF 2
DATE	4/30/2024



Legend



Approx. Building Boring Locations (75')



Approx. Building Boring Locations (60')



Approx. Building Boring Locations (30')



Approx. Exfiltration Locations



Approximate Cross-Section Locations A-A'

0 40 80 Feet

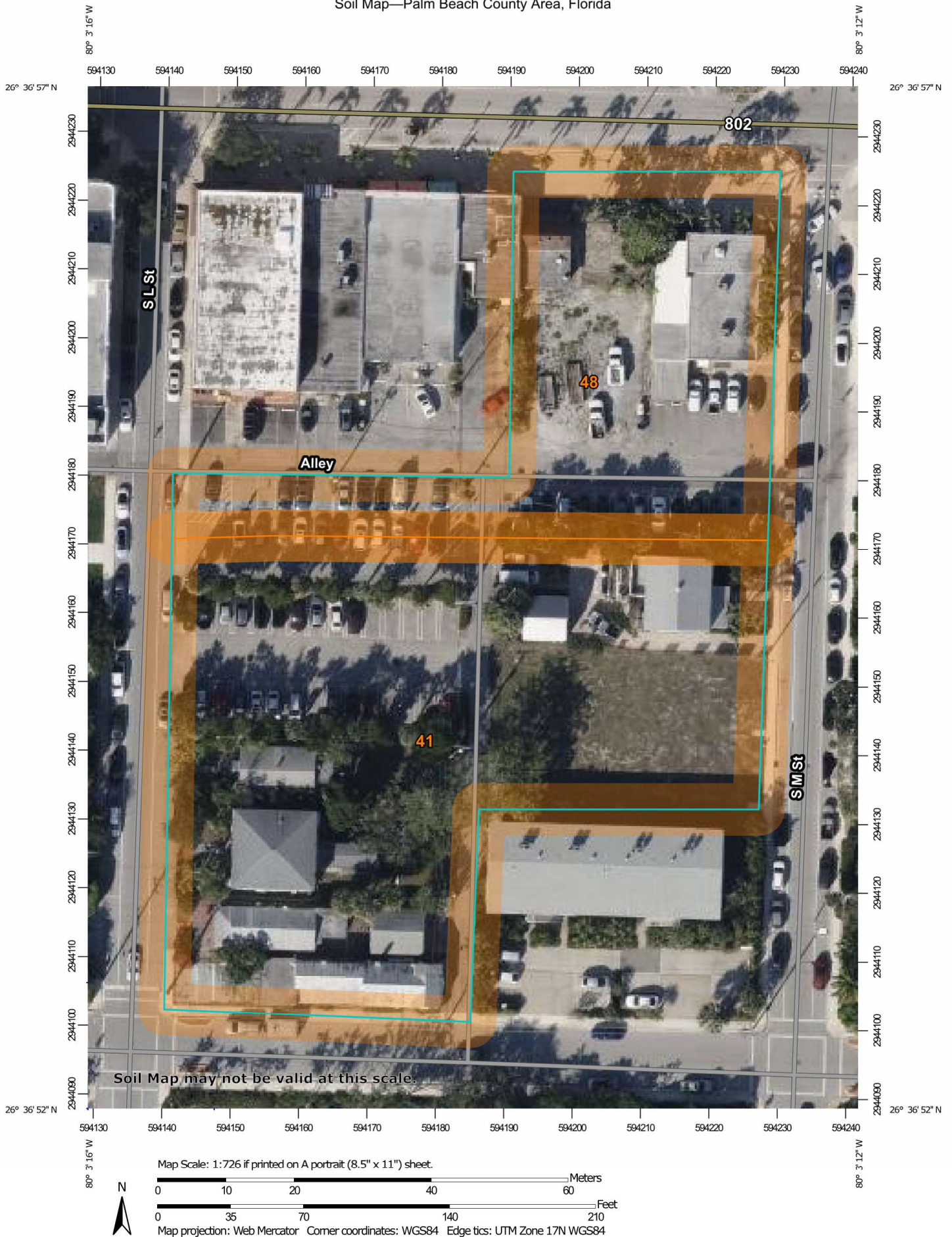


**BORING LOCATION DIAGRAM
WMODA LAKE WORTH DEVELOPMENT**

**32 S L ST, LAKE WORTH, FLORIDA
C/O UNITED MANAGEMENT**

ENGINEER JPH
SCALE AS NOTED
PROJECT NO. 25:4174
FIGURE 1 OF 1
DATE 5/6/2024

Soil Map—Palm Beach County Area, Florida



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

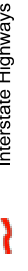
Sodic Spot

Water Features

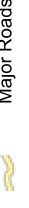
Streams and Canals

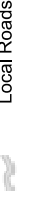
Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

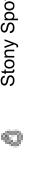
Background

Aerial Photography

Spoil Area

Spoil Area

Stony Spot

Stony Spot

Very Stony Spot

Very Stony Spot

Wet Spot

Wet Spot

Other

Other

Special Line Features

Special Line Features

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Palm Beach County Area, Florida
Survey Area Data: Version 20, Aug 28, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 10, 2022—May 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
41	St. Lucie-Paola-Urban land complex, 0 to 8 percent slopes	1.2	65.7%
48	Urban land, 0 to 2 percent slopes	0.6	34.3%
Totals for Area of Interest		1.8	100.0%

APPENDIX B – Field Operations

Reference Notes for Boring Logs

Subsurface Exploration Procedure: Standard Penetration Testing (SPT)

Boring Logs

Exfiltration Test Results



REFERENCE NOTES FOR BORING LOGS

MATERIAL^{1,2}

	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	GW WELL-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GP POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GM SILTY GRAVEL gravel-sand-silt mixtures
	GC CLAYEY GRAVEL gravel-sand-clay mixtures
	SW WELL-GRADED SAND gravelly sand, little or no fines
	SP POORLY-GRADED SAND gravelly sand, little or no fines
	SM SILTY SAND sand-silt mixtures
	SC CLAYEY SAND sand-clay mixtures
	ML SILT non-plastic to medium plasticity
	MH ELASTIC SILT high plasticity
	CL LEAN CLAY low to medium plasticity
	CH FAT CLAY high plasticity
	OL ORGANIC SILT or CLAY non-plastic to low plasticity
	OH ORGANIC SILT or CLAY high plasticity
	PT PEAT highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION	PARTICLE SIZES
Boulders	12 inches (300 mm) or larger
Cobbles	3 inches to 12 inches (75 mm to 300 mm)
Gravel: Coarse	¾ inch to 3 inches (19 mm to 75 mm)
Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand: Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")	<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSION STRENGTH, QP ⁴	SPT ⁵ (BPF)	CONSISTENCY ⁷ (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT ⁷	COARSE GRAINED (%) ⁸	FINE GRAINED (%) ⁸
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective (ex: "Silty")	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT ⁵	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS⁶

	WL (First Encountered)
	WL (Completion)
	WL (Seasonal High Water)
	WL (Stabilized)

FILL AND ROCK

FILL	POSSIBLE FILL	PROBABLE FILL	ROCK

¹Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

²To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

³Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

⁴Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

⁵Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

⁶The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

⁷Minor deviation from ASTM D 2488-17 Note 14.

⁸Percentages are estimated to the nearest 5% per ASTM D 2488-17.



SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 18-24 inches (in 3 or 4 Increments of 6 inches each)
- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet. An approximate 1.5 inch diameter soil sample is recovered.



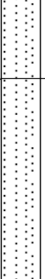
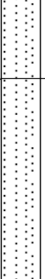
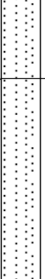
**Drilling Methods May Vary—* The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: A-01		SHEET: 1 of 3						
PROJECT NAME: WMODA Lake Worth Development				DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.										
SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 						
LATITUDE: 26.615376		LONGITUDE: -80.053691		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 						
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)*	STANDARD PENETRATION BLOWS/FT		LIQUID LIMIT X PLASTIC LIMIT			
									ROCK QUALITY DESIGNATION & RECOVERY		CALIBRATED PENETROMETER TSF			
									10 20 30 40 50		1 2 3 4 5			
									20 40 60 80 100		● WATER CONTENT % [FINES CONTENT] %			
									10 20 30 40 50		10 20 30 40 50			
									RQD					
									REC					
									MODIFIED CALIFORNIA SAMPLER BLOWS/FT					
									10 20 30 40 50					
					Topsoil Thickness[6.00"]			5-7-11-10 (18)		18				
					(SP) FINE TO MEDIUM SAND, white to brown, moist to wet, loose to medium dense			9-8-8-9 (16)		16				
5					S-3	SS	24	9	7-7-7-6 (14)		14			
					S-4	SS	24	11	6-7-5-6 (12)		12			
					S-5	SS	24	13	6-5-6-7 (11)		11			
10														
					S-6	SS	24	11	1-2-3-2 (5)		5			
15														
					S-7	SS	24	14	5-7-5-6 (12)		12			
20														
					S-8	SS	24	11	4-3-4-5 (7)		7			
25														
					S-9	SS	24	13	4-5-5-5 (10)		10			
30														
					(SP) SAND, gray, wet, loose to medium dense, contains limestone fragments									
					CONTINUED ON NEXT PAGE									
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL														
WL (First Encountered)				9.75		BORING STARTED: Apr 15 2024				CAVE IN DEPTH:				
WL (Completion)						BORING COMPLETED: Apr 15 2024				HAMMER TYPE: Auto				
WL (Seasonal High Water)				7.75		EQUIPMENT: Truck				LOGGED BY:				
WL (Stabilized)										DRILLING METHOD: Mud rotary				
GEOTECHNICAL BOREHOLE LOG														

CLIENT: c/o United Management				PROJECT NO.: 25:4174		BORING NO.: A-01		SHEET: 2 of 3																																																																																																																																																																																																																																																																																	
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CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: A-01		SHEET: 3 of 3				
PROJECT NAME: WMODA Lake Worth Development				DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.								
SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 				
LATITUDE: 26.615376		LONGITUDE: -80.053691		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 				
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	STANDARD PENETRATION BLOWS/FT		LIQUID LIMIT X PLASTIC LIMIT	
									ROCK QUALITY DESIGNATION & RECOVERY		CALIBRATED PENETROMETER TSF	
									10 20 30 40 50		1 2 3 4 5	
									20 40 60 80 100			
										WATER CONTENT % [FINES CONTENT] %		
										10 20 30 40 50		
65	S-16	SS	24	6	(WR) Highly Weathered Soft Limestone, wet, gray		-52	4-3-4-37 (7)				
70	S-17	SS	24	9			-57	8-11-10-14 (21)		21		
75	S-18	SS	24	9			-62	10-13-14-14 (27)		27		
					END OF BORING AT 75 FT							
80							-67					
85							-72					
90							-77					
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL												
 WL (First Encountered)		9.75		BORING STARTED: Apr 15 2024		CAVE IN DEPTH:						
 WL (Completion)				BORING COMPLETED: Apr 15 2024		HAMMER TYPE: Auto						
 WL (Seasonal High Water)		7.75		EQUIPMENT: Truck		LOGGED BY:		DRILLING METHOD: Mud rotary				
 WL (Stabilized)												
GEOTECHNICAL BOREHOLE LOG												

CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: A-02		SHEET: 1 of 3							
PROJECT NAME: WMODA Lake Worth Development				DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.											
SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 							
LATITUDE: 26.614949		LONGITUDE: -80.054048		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 							
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)*	STANDARD PENETRATION BLOWS/FT		LIQUID LIMIT X PLASTIC LIMIT				
									ROCK QUALITY DESIGNATION & RECOVERY		CALIBRATED PENETROMETER TSF				
									10 20 30 40 50		1 2 3 4 5				
									20 40 60 80 100		WATER CONTENT % [FINES CONTENT] %				
									10 20 30 40 50		10 20 30 40 50				
									RQD						
									REC						
									MODIFIED CALIFORNIA SAMPLER BLOWS/FT						
									10 20 30 40 50						
					Topsoil Thickness[6.00"]			2-2-3-3 (5)		5					
					(SP) FINE TO MEDIUM SAND, white to brown, moist to wet, loose to medium dense			5-4-6-5 (10)		10					
5					S-3	SS	24	10	5-5-6-6 (11)		11				
					S-4	SS	24	10	6-7-7-8 (14)		14				
10					S-5	SS	24	9	6-6-5-7 (11)		11				
15					S-6	SS	24	10	2-2-3-4 (5)		5				
20					S-7	SS	24	9	4-4-5-6 (9)		9				
25					S-8	SS	24	9	1-1-16-12 (17)		17				
30					S-9	SS	24	9	11-10-8-7 (18)		18				
CONTINUED ON NEXT PAGE															
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WL (Completion)						BORING COMPLETED:				Apr 15 2024				HAMMER TYPE: Auto	
WL (Seasonal High Water)				7.00		EQUIPMENT:				LOGGED BY:				DRILLING METHOD: Mud rotary	
WL (Stabilized)						Truck									
GEOTECHNICAL BOREHOLE LOG															

CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: A-02		SHEET: 2 of 3																																																																																																																																																																																																																																																																																																																																																																																												
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40	S-11	SS	24	5	(WR) Highly Weathered Soft Limestone, wet, gray		-27	11-7-7-7 (14)	14																																																																																																																																																																																																																																																																																																																																																																																											
45	S-12	SS	24	10			-32	15-5-2-2 (7)	15																																																																																																																																																																																																																																																																																																																																																																																											
50	S-13	SS	3	2	Hard Limestone, wet, gray		-37	50/3" (50/3")	50/3"																																																																																																																																																																																																																																																																																																																																																																																											
55	S-14	SS	2	2			-42	50/2" (50/2")	50/2"																																																																																																																																																																																																																																																																																																																																																																																											
60	S-15	SS	9	6			-47	18-50/3" (50/3")	50/3"																																																																																																																																																																																																																																																																																																																																																																																											
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CLIENT: HE2PD						PROJECT NO.: 25:4174		BORING NO.: A-02		SHEET: 3 of 3																																																																																																																																																											
PROJECT NAME: WMODA Lake Worth Development						DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.																																																																																																																																																															
SITE LOCATION: 32 S I St, Lake Worth, Florida, 33460									LOSS OF CIRCULATION 																																																																																																																																																												
LATITUDE: 26.614949			LONGITUDE: -80.054048			STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 																																																																																																																																																											
<table border="1"><thead><tr><th rowspan="2">DEPTH (FT)</th><th rowspan="2">SAMPLE NUMBER</th><th rowspan="2">SAMPLE TYPE</th><th rowspan="2">SAMPLE DIST. (IN)</th><th rowspan="2">RECOVERY (IN)</th><th rowspan="2">DESCRIPTION OF MATERIAL</th><th rowspan="2">WATER LEVELS</th><th rowspan="2">ELEVATION (FT)</th><th rowspan="2">BLOWS/6" (N - Value) *</th><th colspan="5">ROCK QUALITY DESIGNATION & RECOVERY</th><th colspan="2">LIMBS</th><th colspan="5">PENETROMETER</th></tr><tr><th>STANDARD PENETRATION BLOWS/FT</th><th>REC</th><th>MODIFIED CALIFORNIA SAMPLER BLOWS/FT</th><th>RQD</th><th>PLASTIC LIMIT</th><th>CALIBRATED PENETROMETER TSF</th><th>WATER CONTENT % [FINES CONTENT] %</th></tr></thead><tbody><tr><td>65</td><td>S-16</td><td>SS</td><td>14</td><td>8</td><td rowspan="3">Hard Limestone, wet, gray</td><td rowspan="3"></td><td>-52</td><td>10-40-50/2" (90/8")</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>70</td><td>S-17</td><td>SS</td><td>17</td><td>7</td><td>-57</td><td>11-20-50/5" (70/11")</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>75</td><td>S-18</td><td>SS</td><td>24</td><td>13</td><td>-62</td><td>34-19-20-29 (39)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td colspan="5"></td><td>END OF BORING AT 75 FT</td><td></td><td>-67</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td colspan="5"></td><td></td><td></td><td>-72</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td colspan="5"></td><td></td><td></td><td>-77</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>														DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	ROCK QUALITY DESIGNATION & RECOVERY					LIMBS		PENETROMETER					STANDARD PENETRATION BLOWS/FT	REC	MODIFIED CALIFORNIA SAMPLER BLOWS/FT	RQD	PLASTIC LIMIT	CALIBRATED PENETROMETER TSF	WATER CONTENT % [FINES CONTENT] %	65	S-16	SS	14	8	Hard Limestone, wet, gray		-52	10-40-50/2" (90/8")													70	S-17	SS	17	7	-57	11-20-50/5" (70/11")														75	S-18	SS	24	13	-62	34-19-20-29 (39)																			END OF BORING AT 75 FT		-67																					-72																					-77													
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CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: B-01		SHEET: 1 of 2																																																																																																																																																																																					
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SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 																																																																																																																																																																																					
LATITUDE: 26.615659		LONGITUDE: -80.053751		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 																																																																																																																																																																																					
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DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	STANDARD PENETRATION BLOWS/FT												LIQUID LIMIT X PLASTIC LIMIT																																																																																																																																																																								
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CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: B-01		SHEET: 2 of 2				
PROJECT NAME: WMODA Lake Worth Development				DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.								
SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 				
LATITUDE: 26.615659		LONGITUDE: -80.053751		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 				
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	STANDARD PENETRATION BLOWS/FT		LIQUID LIMIT X PLASTIC LIMIT	
									ROCK QUALITY DESIGNATION & RECOVERY		CALIBRATED PENETROMETER TSF	
									10 20 30 40 50		1 2 3 4 5	
									20 40 60 80 100			
										WATER CONTENT % [FINES CONTENT] %		
										10 20 30 40 50		
35	S-10	SS	9	3	(SP) FINE TO MEDIUM SAND, gray, wet, medium dense, contains limestone fragments Hard Limestone, wet, gray		-22	14-50/3" (50/3")				
40	S-11	SS	24	9	(SP) FINE TO MEDIUM SAND, gray, wet, loose		-27	6-4-5-5 (9)				
45	S-12	SS	1	1	Hard Limestone, wet, gray		-32	50/1" (50/1")				
50	S-13	SS	14	9			-37	16-21-50/2" (71/8")				
55	S-14	SS	1	1			-42	50/1" (50/1")				
60	S-15	SS	1	1			-47	50/1" (50/1")				
					END OF BORING AT 60 FT							
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL												
WL (First Encountered) 8.25				BORING STARTED: Apr 18 2024				CAVE IN DEPTH:				
WL (Completion)				BORING COMPLETED: Apr 18 2024				HAMMER TYPE: Auto				
WL (Seasonal High Water) 6.25				EQUIPMENT: Truck		LOGGED BY:		DRILLING METHOD: Mud rotary				
GEOTECHNICAL BOREHOLE LOG												

CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: B-02		SHEET: 1 of 2				
PROJECT NAME: WMODA Lake Worth Development				DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.								
SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 				
LATITUDE: 26.615109		LONGITUDE: -80.054302		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 				
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	STANDARD PENETRATION BLOWS/FT		LIQUID LIMIT X PLASTIC LIMIT	
									ROCK QUALITY DESIGNATION & RECOVERY		CALIBRATED PENETROMETER TSF	
								10 20 30 40 50		1 2 3 4 5		
								20 40 60 80 100		● WATER CONTENT % [FINES CONTENT] %		
								10 20 30 40 50		10 20 30 40 50		
								RQD				
								REC				
								MODIFIED CALIFORNIA SAMPLER BLOWS/FT				
								10 20 30 40 50				
								48-20-18-18 (38)		38		
								13-10-8-7 (18)		18		
								7-8-8-8 (16)		16		
								3-5-5-5 (10)		10		
								5-4-5-6 (9)		9		
								4-3-2-2 (5)		5		
								2-3-2-2 (5)		5		
								2-5-4-7 (9)		9		
								13-16-5-4 (21)		21		
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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL												
WL (First Encountered) 6.75				BORING STARTED: Apr 16 2024				CAVE IN DEPTH:				
WL (Completion)				BORING COMPLETED: Apr 16 2024				HAMMER TYPE: Auto				
WL (Seasonal High Water) 4.75				EQUIPMENT: Truck		LOGGED BY:		DRILLING METHOD: Mud rotary				
WL (Stabilized)												
GEOTECHNICAL BOREHOLE LOG												

CLIENT: c/o United Management				PROJECT NO.: 25:4174		BORING NO.: B-02		SHEET: 2 of 2																																																																																																																																															
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SITE LOCATION: 32 S I St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 																																																																																																																																															
LATITUDE: 26.615109		LONGITUDE: -80.054302		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 																																																																																																																																															
<table><thead><tr><th rowspan="4">DEPTH (FT)</th><th rowspan="4">SAMPLE NUMBER</th><th rowspan="4">SAMPLE TYPE</th><th rowspan="4">SAMPLE DIST. (IN)</th><th rowspan="4">RECOVERY (IN)</th><th rowspan="4">DESCRIPTION OF MATERIAL</th><th rowspan="4">WATER LEVELS</th><th rowspan="4">ELEVATION (FT)</th><th rowspan="4">BLOWS/6" (N - Value)*</th><th colspan="5">STANDARD PENETRATION BLOWS/FT</th><th colspan="2">LIQUID LIMIT X PLASTIC LIMIT</th></tr><tr><th colspan="5">ROCK QUALITY DESIGNATION & RECOVERY</th><th colspan="5">CALIBRATED PENETROMETER TSF</th></tr><tr><th colspan="5">MODIFIED CALIFORNIA SAMPLER BLOWS/FT</th><th colspan="5">WATER CONTENT % [FINES CONTENT] %</th></tr><tr><th colspan="5"></th><th colspan="5"></th></tr></thead><tbody><tr><td>35</td><td>S-10</td><td>SS</td><td>24</td><td>10</td><td rowspan="6">(SP) FINE TO MEDIUM SAND, brown, wet, loose to medium dense, contains limestone fragments (WR) Soft to Hard Limestone, wet, gray</td><td rowspan="6"></td><td>-22</td><td>5-5-22-11 (27)</td><td></td><td>27</td><td></td><td></td><td></td><td></td></tr><tr><td>40</td><td>S-11</td><td>SS</td><td>23</td><td>11</td><td>-27</td><td>7-5-5-50/5" (10)</td><td></td><td>10</td><td></td><td></td><td></td><td></td></tr><tr><td>45</td><td>S-12</td><td>SS</td><td>1</td><td>1</td><td>-32</td><td>50/1" (50/1")</td><td></td><td></td><td></td><td>50/1"</td><td></td><td></td></tr><tr><td>50</td><td>S-13</td><td>SS</td><td>7</td><td>3</td><td>-37</td><td>37-50/1" (50/1")</td><td></td><td></td><td></td><td>50/1"</td><td></td><td></td></tr><tr><td>55</td><td>S-14</td><td>SS</td><td>8</td><td>2</td><td>-42</td><td>24-50/2" (50/2")</td><td></td><td></td><td></td><td>50/2"</td><td></td><td></td></tr><tr><td>60</td><td>S-15</td><td>SS</td><td>2</td><td>2</td><td>-47</td><td>50/2" (50/2")</td><td></td><td></td><td></td><td>50/2"</td><td></td><td></td></tr><tr><td colspan="5"></td><td colspan="2">END OF BORING AT 60 FT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>												DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value)*	STANDARD PENETRATION BLOWS/FT					LIQUID LIMIT X PLASTIC LIMIT		ROCK QUALITY DESIGNATION & RECOVERY					CALIBRATED PENETROMETER TSF					MODIFIED CALIFORNIA SAMPLER BLOWS/FT					WATER CONTENT % [FINES CONTENT] %															35	S-10	SS	24	10	(SP) FINE TO MEDIUM SAND, brown, wet, loose to medium dense, contains limestone fragments (WR) Soft to Hard Limestone, wet, gray		-22	5-5-22-11 (27)		27					40	S-11	SS	23	11	-27	7-5-5-50/5" (10)		10					45	S-12	SS	1	1	-32	50/1" (50/1")				50/1"			50	S-13	SS	7	3	-37	37-50/1" (50/1")				50/1"			55	S-14	SS	8	2	-42	24-50/2" (50/2")				50/2"			60	S-15	SS	2	2	-47	50/2" (50/2")				50/2"								END OF BORING AT 60 FT								
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 WL (Seasonal High Water) 4.75				EQUIPMENT: Truck				LOGGED BY:		DRILLING METHOD: Mud rotary																																																																																																																																													
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CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: B-03		SHEET: 1 of 2																																																																																																																																																																									
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15	S-6	SS	24	12	(WR) Highly Weathered Soft Limestone, gray, wet		-2	3-5-6-6 (11)	 11																																																																																																																																																																								
	S-7	SS	24	11					3-2-2-3 (4)	 4																																																																																																																																																																							
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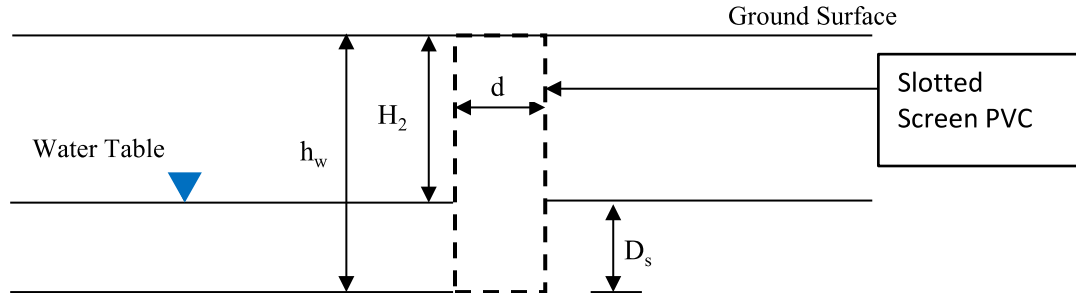
CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: B-03		SHEET: 2 of 2				
PROJECT NAME: WMODA Lake Worth Development				DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.								
SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 				
LATITUDE: 26.615094		LONGITUDE: -80.053966		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 				
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	⊗ STANDARD PENETRATION BLOWS/FT		△ LIQUID LIMIT × PLASTIC LIMIT	
									ROCK QUALITY DESIGNATION & RECOVERY		○ CALIBRATED PENETROMETER TSF	
									10 20 30 40 50		1 2 3 4 5	
									20 40 60 80 100			
										● WATER CONTENT % [FINES CONTENT] %		
										10 20 30 40 50		
									10 20 30 40 50			
					(WR) Highly Weathered Soft Limestone, gray, wet							
35	S-10	SS	24	2			-22	12-5-6-9 (11)		⊗ 11		
40	S-11	SS	24	9			-27	10-16-4-7 (20)		⊗ 20		
45	S-12	SS	24	9			-32	9-7-4-3 (11)		⊗ 11		
50	S-13	SS	1	1	Hard Limestone, gray, wet		-37	50/1" (50/1")		⊗ 50/1"		
55	S-14	SS	7	1			-42	50/2" (50/2")				
60	S-15	SS	1	1			-47	50/1" (50/1")		⊗ 50/1"		
					END OF BORING AT 60 FT							
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL												
☒ WL (First Encountered)		6.50		BORING STARTED:		Apr 16 2024		CAVE IN DEPTH:				
▼ WL (Completion)				BORING COMPLETED:		Apr 16 2024		HAMMER TYPE: Auto				
☒ WL (Seasonal High Water)		4.50		EQUIPMENT:		LOGGED BY:		DRILLING METHOD: Mud rotary				
☒ WL (Stabilized)				Truck								
GEOTECHNICAL BOREHOLE LOG												

CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: B-04		SHEET: 1 of 2				
PROJECT NAME: WMODA Lake Worth Development				DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.								
SITE LOCATION: 32 S L St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION 				
LATITUDE: 26.614948		LONGITUDE: -80.053677		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING 				
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	STANDARD PENETRATION BLOWS/FT		LIQUID LIMIT X PLASTIC LIMIT	
									ROCK QUALITY DESIGNATION & RECOVERY		CALIBRATED PENETROMETER TSF	
									10 20 30 40 50	1 2 3 4 5	WATER CONTENT % [FINES CONTENT] % 10 20 30 40 50	
	S-1	SS	24	11	Topsoil Thickness[6.00"] (SP FILL) FILL, FINE TO MEDIUM SAND, brown, moist, medium dense			2-4-7-6 (11)				
	S-2	SS	24	14	(SP) FINE TO MEDIUM SAND, white to brown, moist to wet, loose to medium dense			6-7-7-7 (14)				
5	S-3	SS	24	10			8	5-5-7-6 (12)				
	S-4	SS	24	13				7-10-9-8 (19)				
	S-5	SS	24	10				4-6-8-10 (14)				
10												
	S-6	SS	24	9				3-4-4-5 (8)				
15												
	S-7	SS	24	11	(SP) FINE TO MEDIUM SAND, gray, wet, loose, contains limestone fragments			1-2-3-16 (5)				
20												
	S-8	SS	24	10	(WR) Highly Weathered to Soft Limestone, gray, wet			10-11-13-15 (24)				
25												
	S-9	SS	24	14				12-10-11-36 (21)				
30												
CONTINUED ON NEXT PAGE												
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 WL (First Encountered)				BORING STARTED: Apr 17 2024				CAVE IN DEPTH:				
 WL (Completion) 8.50				BORING COMPLETED: Apr 17 2024				HAMMER TYPE: Auto				
 WL (Seasonal High Water) 6.50				EQUIPMENT: Truck				LOGGED BY:		DRILLING METHOD: Mud rotary		
 WL (Stabilized)												
GEOTECHNICAL BOREHOLE LOG												

CLIENT: HE2PD				PROJECT NO.: 25:4174		BORING NO.: B-04		SHEET: 2 of 2																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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rowspan="5">30</td><td rowspan="5">40</td><td rowspan="5">50</td><td rowspan="5"></td><td rowspan="5">10</td><td rowspan="5">20</td><td rowspan="5">30</td><td rowspan="5">40</td><td rowspan="5">50</td><td rowspan="5"></td><td rowspan="5"></td><td rowspan="5"></td><td 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PROJECT NAME: WMODA Lake Worth Development						DRILLER/CONTRACTOR: J & R Precision Drilling, Inc.																																																																																																																																																																																																																																																																							
SITE LOCATION: 32 S I St, Lake Worth, Florida, 33460								LOSS OF CIRCULATION >100		>																																																																																																																																																																																																																																																																			
LATITUDE: 26.614756				LONGITUDE: -80.054323		STATION:		SURFACE ELEVATION: 13.0		BOTTOM OF CASING >																																																																																																																																																																																																																																																																			
<table><thead><tr><th rowspan="2">DEPTH (FT)</th><th rowspan="2">SAMPLE NUMBER</th><th rowspan="2">SAMPLE TYPE</th><th rowspan="2">SAMPLE DIST. (IN)</th><th rowspan="2">RECOVERY (IN)</th><th rowspan="2">DESCRIPTION OF MATERIAL</th><th rowspan="2">WATER LEVELS</th><th rowspan="2">ELEVATION (FT)</th><th rowspan="2">BLOWS/6" (N - Value) *</th><th colspan="5">ROCK QUALITY DESIGNATION & RECOVERY</th><th colspan="2">LIMBS LIMIT</th><th rowspan="2">CALIBRATED PENETROMETER TSF</th><th rowspan="2">WATER CONTENT % [FINES CONTENT] %</th></tr><tr><th>RQD</th><th>REC</th><th>MCS</th><th>SPT</th><th>Liquid Limit</th><th>Plastic Limit</th></tr></thead><tbody><tr><td></td><td>S-1</td><td>SS</td><td>24</td><td>16</td><td>Topsoil Thickness [6.00"] (SP FILL) FILL, FINE TO MEDIUM SAND, brown, moist, medium dense</td><td> </td><td></td><td>3-3-3-5 (6)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>S-2</td><td>SS</td><td>24</td><td>11</td><td>(SP) FINE TO MEDIUM SAND, white to brown, moist to wet, loose to medium dense</td><td> </td><td></td><td>4-5-5-5 (10)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td>S-3</td><td>SS</td><td>24</td><td>9</td><td></td><td> </td><td>8</td><td>4-4-4-5 (8)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>S-4</td><td>SS</td><td>24</td><td>10</td><td></td><td> </td><td></td><td>4-5-5-6 (10)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td>S-5</td><td>SS</td><td>24</td><td>11</td><td></td><td> </td><td>3</td><td>6-7-7-6 (14)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>S-6</td><td>SS</td><td>24</td><td>12</td><td></td><td> </td><td>-2</td><td>2-4-6-7 (10)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td> </td><td></td><td></td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>S-7</td><td>SS</td><td>24</td><td>10</td><td></td><td> </td><td>-7</td><td>8-11-14-16 (25)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>20</td><td></td><td></td><td></td><td></td><td></td><td> </td><td></td><td></td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>S-8</td><td>SS</td><td>24</td><td>12</td><td></td><td> </td><td>-12</td><td>10-11-10-6 (21)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>25</td><td></td><td></td><td></td><td></td><td></td><td> </td><td></td><td></td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>S-9</td><td>SS</td><td>24</td><td>11</td><td></td><td> </td><td>-17</td><td>7-10-13-15 (23)</td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>30</td><td></td><td></td><td></td><td></td><td>END OF BORING AT 30 FT</td><td> </td><td></td><td></td><td> </td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>												DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (N - Value) *	ROCK QUALITY DESIGNATION & RECOVERY					LIMBS LIMIT		CALIBRATED PENETROMETER TSF	WATER CONTENT % [FINES CONTENT] %	RQD	REC	MCS	SPT	Liquid Limit	Plastic Limit		S-1	SS	24	16	Topsoil Thickness [6.00"] (SP FILL) FILL, FINE TO MEDIUM SAND, brown, moist, medium dense			3-3-3-5 (6)											S-2	SS	24	11	(SP) FINE TO MEDIUM SAND, white to brown, moist to wet, loose to medium dense			4-5-5-5 (10)										5	S-3	SS	24	9			8	4-4-4-5 (8)											S-4	SS	24	10				4-5-5-6 (10)										10	S-5	SS	24	11			3	6-7-7-6 (14)											S-6	SS	24	12			-2	2-4-6-7 (10)										15																			S-7	SS	24	10			-7	8-11-14-16 (25)										20																			S-8	SS	24	12			-12	10-11-10-6 (21)										25																			S-9	SS	24	11			-17	7-10-13-15 (23)										30					END OF BORING AT 30 FT												
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WL (First Encountered)						BORING STARTED: Apr 17 2024				CAVE IN DEPTH:																																																																																																																																																																																																																																																																			
WL (Completion) 9.50						BORING COMPLETED: Apr 17 2024				HAMMER TYPE: Auto																																																																																																																																																																																																																																																																			
WL (Seasonal High Water) 7.50						EQUIPMENT: Truck				LOGGED BY:																																																																																																																																																																																																																																																																			
WL (Stabilized)										DRILLING METHOD: Mud rotary																																																																																																																																																																																																																																																																			
GEOTECHNICAL BOREHOLE LOG																																																																																																																																																																																																																																																																													

**SOUTH FLORIDA WATER MANAGEMENT DISTRICT
" USUAL OPEN - HOLE TEST "**



$$K_{IV} = 4Q / [\pi d (2H_2^2 + 4H_2 D_s + H_2 d)]$$

8.11E-05 CFS/FT²-FT HEAD

Q = Average Flow Rate = 0.009046 CFS

d = Diameter of Test Hole = 0.40 feet

H₂ = Head on Water Table = 8.0 feet

h_w = Total Hole Depth = 15.0 feet

D_s = Saturated Hole Depth = 7.0 feet

TEST LOCATION : EXF-01
 DEPTH TO WATER TABLE : 8 ft Below Existing Grade
 DEPTH OF TEST HOLE : 15 ft Below Existing Grade
 AVERAGE FLOW RATE: 4.1 GPM

SOIL PROFILE :

0.0' - 15.0' SAND with Limerock (SP)

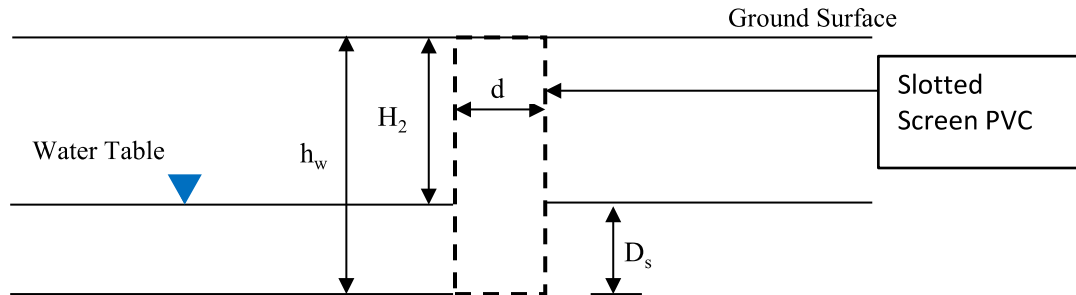
NOTES: The soil profile is determined by drilled cuttings & should not be relied upon as an accurate record of soil type or for transition zones.

USUAL OPEN HOLE TEST SUMMARY	Test Date	Project No.	Test No.	Tested By	Checked by:
	04/18/24	4174	EXF-01	JP	EJM



**Job No.: 25:4174
 WMODA Lake Worth
 32 S L St
 Lake Worth, Palm Beach County, Florida
 33460**

**SOUTH FLORIDA WATER MANAGEMENT DISTRICT
" USUAL OPEN - HOLE TEST "**



$$K_{IV} = 4Q / [\pi d (2H_2^2 + 4H_2 D_s + H_2 d)]$$

7.31E-05 CFS/FT²-FT HEAD

Q = Average Flow Rate = 0.008155 CFS

d = Diameter of Test Hole = 0.40 feet

H₂ = Head on Water Table = 8.0 feet

h_w = Total Hole Depth = 15.0 feet

D_s = Saturated Hole Depth = 7.0 feet

TEST LOCATION : EXF-02
 DEPTH TO WATER TABLE : 8 ft Below Existing Grade
 DEPTH OF TEST HOLE : 15 ft Below Existing Grade
 AVERAGE FLOW RATE: 3.7 GPM

SOIL PROFILE :

0.0' - 15.0' SAND with Limerock (SP)

NOTES: The soil profile is determined by drilled cuttings & should not be relied upon as an accurate record of soil type or for transition zones.

USUAL OPEN HOLE TEST SUMMARY		Test Date	Project No.	Test No.	Tested By	Checked by:
		04/18/24	4174	EXF-02	JP	EJM
					Job No.: 25:4174	
					WMODA Lake Worth 32 S L St Lake Worth, Palm Beach County, Florida 33460	

APPENDIX C – Laboratory Summary

Laboratory Data Summary

Laboratory Testing Summary

[illegible]

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, @FM 5-515, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: WMODA Lake Worth Development
Client: HE2PD

Project No.: 25:4174
Date Reported: 4/29/2024



Office / Lab

Address

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Tested by	Checked by	Approved by	Date Received
DHansen	DHansen	DHansen	4/26/2024

APPENDIX D – Project Details and Supporting Documents

Lateral Capacity Results



WMODA Lake Worth Development
Ernesto J Masis, EIT
ECS Florida, LLC
Report Created Date: 2024/05/01, 16:27:12
Software Version: 3.024

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RSPile Analysis Information

WMODA Lake Worth Development

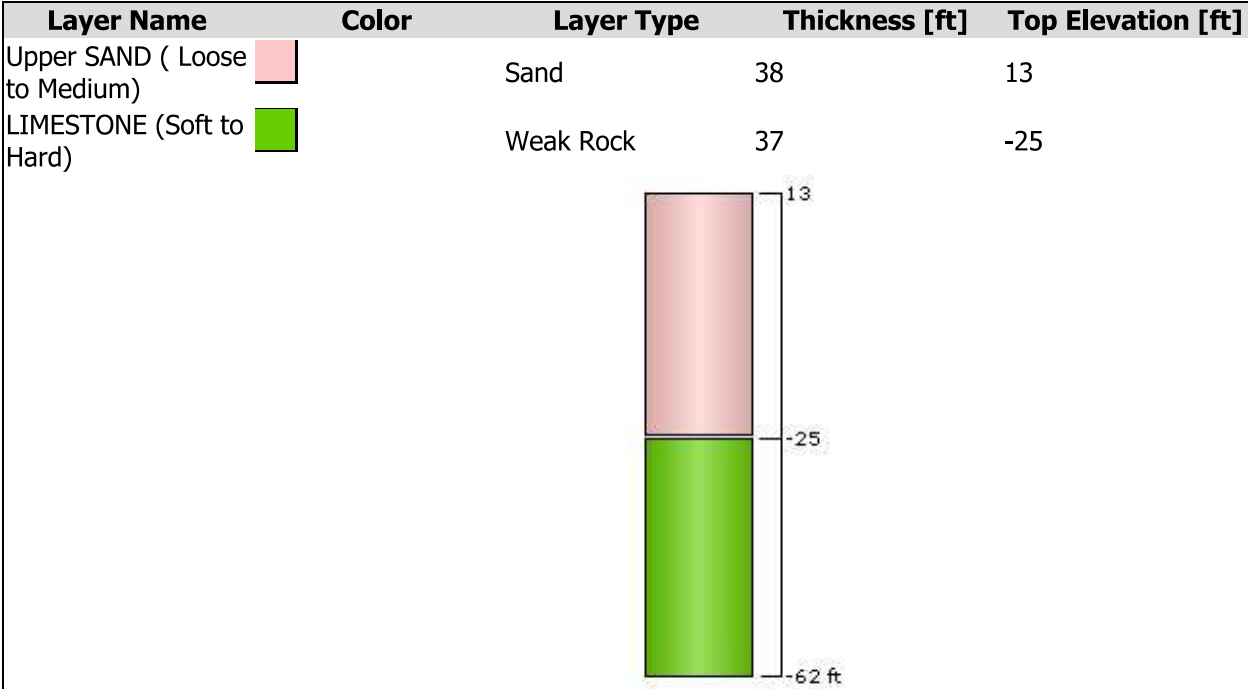
Project Summary

Document Name	25.4174 WMODA Lake Worth- 14 Inch Pile
Project Title	WMODA Lake Worth Development
Analysis	Lateral
Author	Ernesto J Masis, EIT
Company	ECS Florida, LLC
Date Created	3/9/2023, 9:35:20 AM
Last saved with RSPile version	3.024

Groundwater

Water Unit Weight	62.4 lbs/ft3
Water Table Elevation	7 ft

Soil Layers



Soil Properties

Upper SAND (Loose to Medium)

Property	Value
Name	Upper SAND (Loose to Medium)
Color	
Soil Type	Sand
Unit Weight (lbs/ft3)	110
Sat. Unit Weight (lbs/ft3)	115
Friction Angle (degrees)	30
Kpy (lbs/ft3)	25920
Kpy Saturated (lbs/ft3)	25920

LIMESTONE (Soft to Hard)

Property	Value
Name	LIMESTONE (Soft to Hard)
Color	
Soil Type	Weak Rock
Unit Weight (lbs/ft3)	125
Sat. Unit Weight (lbs/ft3)	130
Uniaxial Compressive Strength (psf)	30000
Reaction Modulus of Rock (psf)	1.44e+08
Rock Quality Designation (%)	25
Constant Krm	5e-05

Pile Section Properties

14 inch (120 Tons)

Property		Value
Name	14 inch (120 Tons)	
Color		
Pile Type	Reinforced Concrete	
Pile Cross Section	Circular	
Diameter (ft)	1.166	
Compressive Strength (psf)	720000	
14.0in Pattern 1 US Std. #5		
Reinforcement Pattern 1		
Rebar Size	US Std. #5	
Yield Stress (psf)	8640000	
Elastic Modulus (psf)	4176000000	
Pattern 1 Bar Locations		
#	X (ft)	Y (ft)
1	2.683	0.000
2	0.829	2.552
3	-2.171	1.577
4	-2.171	-1.577
5	0.829	-2.552

Pile Settings

Pile 1

Geometry

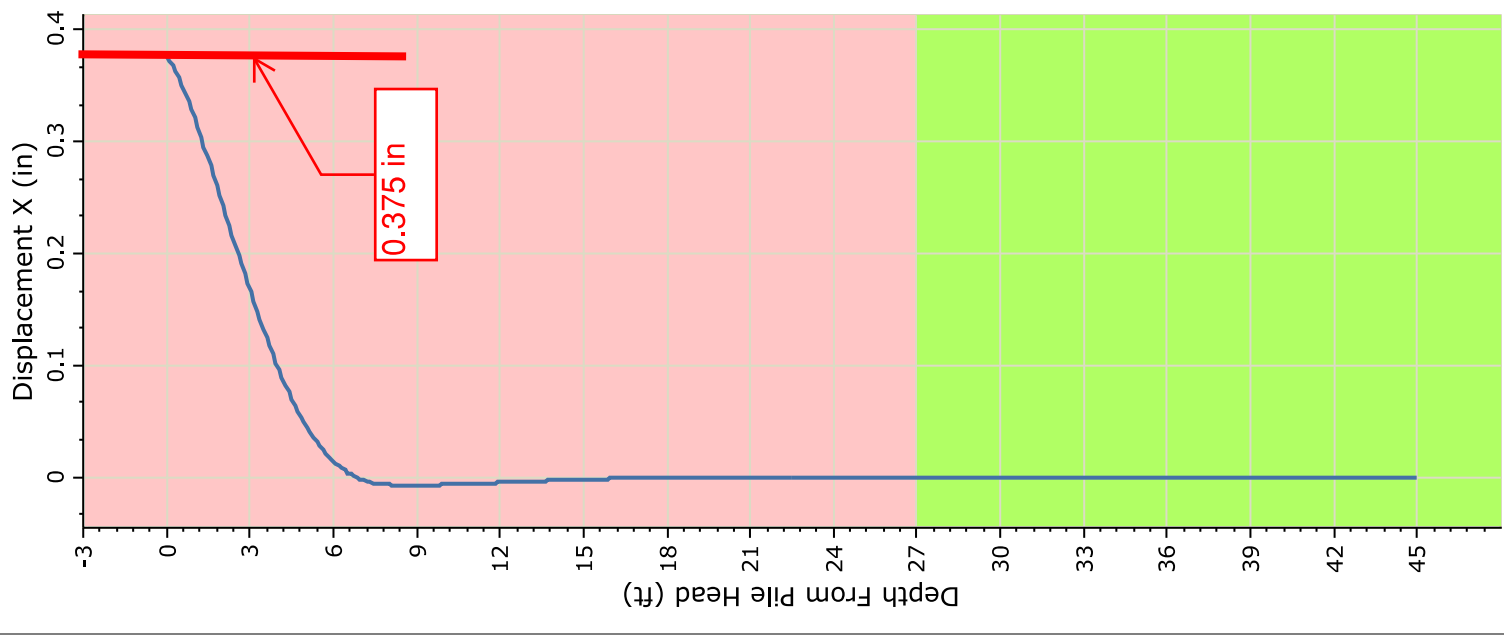
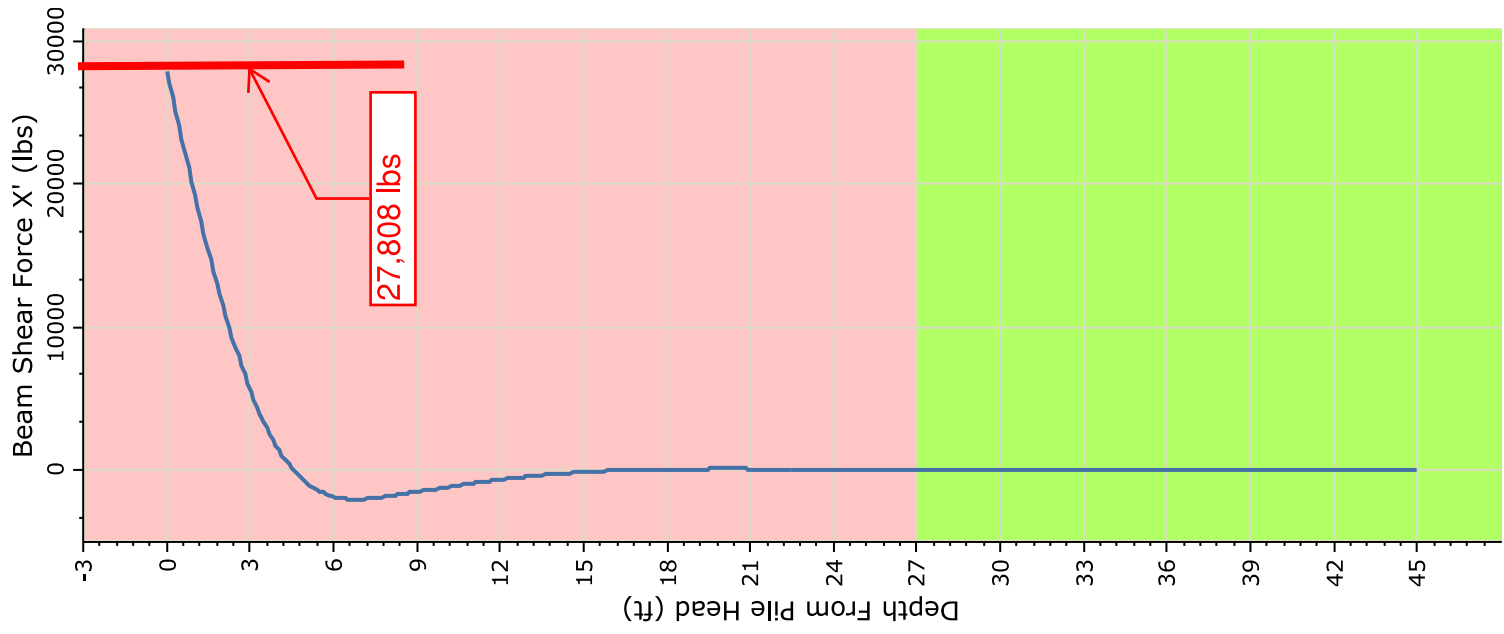
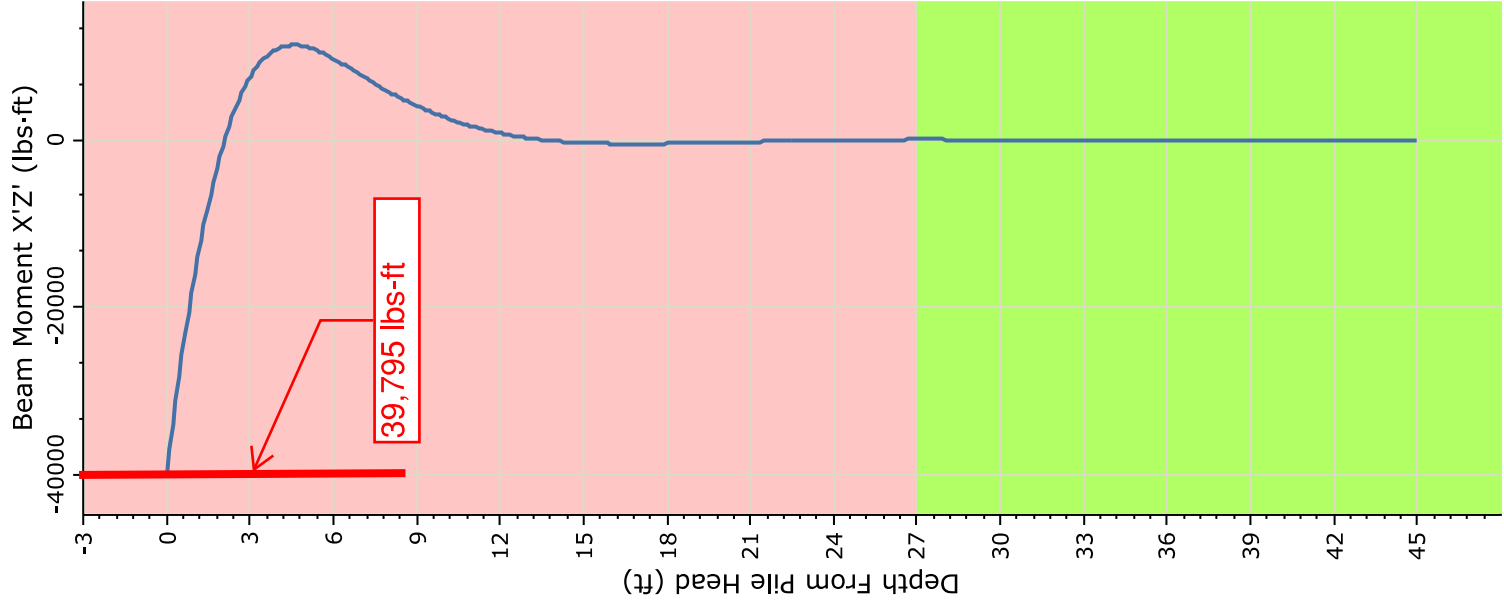
Type	14 inch (180 Tons)
Location	0, 0
Elevation (ft)	2
Length (ft)	45
Ground Slope	
Ground Slope Angle (°)	0
Ground Slope Direction (°)	0

Loading

Loading Type		Static
Load Factor Profile		None
Type	Value	Depth
Slope Y, (deg)	0	0
Deflection X, (ft)	0.03125	0

Advanced Analysis

Pushover Analysis	
Maximum Deflection X (in)	5
Maximum Deflection Y (in)	5
Number of Steps	10



Max shear at 3/8"
Displacement

Max moment at 3/8"
Displacement

Project Title: WMODA Lake Worth Development
Filename: 25.4174 WMODA Lake Worth- 14 Inch Pile

Depth From Pile Head (ft)	Displacement X (in)	Beam Shear Force X' (lbs)	Beam Moment X'Z' (lbs-ft)
0	0.375	27808.33654	-39795.02788
0.112499982	0.372066348	27054.80801	-36981.55138
0.224999964	0.367761576	26050.20394	-34062.27099
0.337499946	0.362694277	25049.70797	-31138.67237
0.449999929	0.356944554	24051.77107	-28317.34135
0.562499911	0.350651036	23064.33975	-25718.95661
0.674999893	0.343847923	22081.35342	-23124.41459
0.787499875	0.336629569	21114.11014	-20749.32342
0.899999857	0.329016022	20152.91962	-18374.30359
1.012499839	0.321093464	19211.93804	-16213.29345
1.124999821	0.312876462	18278.37633	-14052.36402
1.237499803	0.304444715	17368.77922	-12098.81271
1.349999785	0.29580857	16467.73815	-10145.27712
1.462499768	0.287041133	15593.74153	-8392.968031
1.57499975	0.278150838	14729.21859	-6641.495497
1.687499732	0.269208029	13894.16061	-5076.797626
1.799999714	0.260250108	13069.26577	-3511.985841
1.912499696	0.25135778	12275.33876	-2132.207276
2.024999678	0.242501585	11491.89969	-751.8308205
2.13749966	0.233711575	10740.40385	455.8654848
2.249999642	0.22496275	9999.713384	1663.544597
2.362499625	0.216283102	9291.883121	2708.265153
2.474999607	0.207648671	8595.153376	3752.969624
2.587499589	0.199085383	7932.141757	4644.703215
2.699999571	0.190570393	7280.50739	5536.376489
2.812499553	0.182127556	6663.397695	6285.324499
2.924999535	0.173735251	6057.926131	7034.303215
3.037499517	0.165415277	5487.741796	7651.016415
3.149999499	0.157147262	4929.443013	8267.71612
3.262499481	0.148950908	4407.157674	8762.848044
3.374999464	0.140807154	3896.991556	9257.980624
3.487499446	0.132726834	3423.554702	9642.390214
3.599999428	0.124786572	2962.488842	10026.86204
3.71249941	0.117098539	2537.885327	10311.49264
3.824999392	0.109645772	2125.21817	10596.13752
3.937499374	0.1024472	1747.635451	10792.15746
4.049999356	0.095492437	1381.501702	10988.27264
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4.499999285	0.070226484	157.605156	11320.38235
4.612499267	0.064548574	-92.10473248	11309.45448
4.724999249	0.059119078	-332.1603213	11298.56345
4.837499231	0.053944626	-544.2557387	11236.80439
4.949999213	0.049015043	-747.3664861	11175.08358
5.062499195	0.044334686	-924.5572541	11070.57791
5.174999178	0.039893794	-1093.453811	10966.04187
5.28749916	0.035694689	-1238.521425	10826.20576
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5.512499124	0.027993652	-1491.763401	10518.26895
5.624999106	0.024482981	-1600.645569	10350.13989
5.737499088	0.021194672	-1689.935982	10159.68733
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5.962499052	0.015258271	-1838.679164	9762.045231
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6.749998927	0.000661595	-2051.605265	8204.392014
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6.974998891	-0.001932176	-2045.396979	7742.685104
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7.874998748	-0.00664959	-1865.682081	5997.101692
7.98749873	-0.006748691	-1834.669898	5740.138617
8.099998713	-0.006833183	-1803.380613	5525.467583
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9.337498516	-0.006999808	-1433.162331	3552.425773
9.449998498	-0.00695906	-1398.567627	3391.195839
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14.39999771	-0.002506234	-225.4712721	-255.1361628
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17.21249726	-0.000735102	19.45731539	-482.9599713
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17.77499717	-0.000519414	41.10976787	-465.8314726
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17.99999714	-0.000444412	47.86485725	-455.7936961
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18.2249971	-0.000375463	53.65463577	-444.3465789
18.33749709	-0.000343199	56.15513889	-438.0228223
18.44999707	-0.000312306	58.54781643	-431.699536
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18.899997	-0.000202297	65.90981341	-403.567485
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19.46249691	-9.26088E-05	71.18101259	-364.7638236
19.57499689	-0.00007404	71.83181983	-356.7522489
19.68749687	-5.65308E-05	72.28464596	-348.6165153
19.79999685	-4.00308E-05	72.67489151	-340.4811562
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20.1374968	0.000003672	73.04043256	-315.8552095
20.24999678	1.64136E-05	72.98770163	-307.6355204

20.36249676	2.82948E-05	72.79407843	-299.4435461
20.47499675	3.93408E-05	72.55643419	-291.2518935
20.58749673	4.95876E-05	72.19505091	-283.1276315
20.69999671	5.90544E-05	71.79520733	-275.0036735
20.81249669	0.000067782	71.28784356	-266.9817764
20.92499667	7.57824E-05	70.74726999	-258.960166
21.03749666	8.31012E-05	70.11446992	-251.0705602
21.14999664	8.97444E-05	69.45340406	-243.181224
21.26249662	9.57612E-05	68.71449327	-235.4493851
21.3749966	0.000101152	67.95195921	-227.7177991
21.48749658	0.000105968	67.12506622	-220.1650236
21.59999657	0.000110206	66.27889695	-212.6124846
21.71249655	0.00011392	65.38097858	-205.2561554
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22.16249648	0.0001238	61.55650403	-176.682293
22.27499646	0.000125135	60.55493013	-169.7568321
22.38749644	0.00012608	59.53440807	-163.058857
22.49999642	0.000126618	58.50919161	-156.361057
22.61249641	0.000126804	57.47436906	-149.8950114
22.72499639	0.000126622	56.43783828	-143.4291269
22.83749637	0.000126125	55.40029279	-137.1965759
22.94999635	0.000125296	54.36377967	-130.9641725
23.06249633	0.000124188	53.33412047	-124.9642134
23.17499632	0.000122782	52.30799802	-118.9643888
23.2874963	0.000121128	51.29590338	-113.1938636
23.39999628	0.000119209	50.28962299	-107.4234604
23.51249626	0.000117074	49.30387731	-101.8771601
23.62499624	0.000114703	48.32600565	-96.33096984
23.73749623	0.000112145	47.37453583	-91.00183044
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23.96249619	0.000106456	45.52270175	-80.55207996
24.07499617	0.000103351	44.62398833	-75.43145784
24.18749616	0.000100111	43.7615957	-70.50896012
24.29999614	9.67176E-05	42.91203781	-65.58653929
24.41249612	9.32124E-05	42.10290143	-60.85072153
24.5249961	8.95776E-05	41.30787428	-56.11497049
24.63749608	8.58528E-05	40.55682679	-51.55315282
24.74999607	8.20212E-05	39.82098573	-46.99139207
24.86249605	0.00007812	39.13216003	-42.58990631
24.97499603	7.41348E-05	38.459467	-38.188468
25.08749601	7.01004E-05	37.83632054	-33.93281161
25.19999599	6.60012E-05	37.23006767	-29.67719352
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25.76249591	4.50816E-05	34.7763208	-9.495690786
25.87499589	4.08636E-05	34.38272746	-5.584384667
25.98749587	3.66624E-05	34.04403279	-1.755460937
26.09999585	3.24744E-05	33.72370397	2.073459259
26.21249583	2.83188E-05	33.4584623	5.836502785
26.32499582	2.41932E-05	33.21157383	9.599551273
26.4374958	2.01132E-05	33.01950795	13.3132174
26.54999578	1.60812E-05	32.8456315	17.02689703
26.66249576	1.21116E-05	32.72585759	20.70754101
26.77499574	8.2056E-06	32.62395685	24.38820713
26.88749573	4.3752E-06	32.57497724	28.05189921
26.99999571	6.264E-07	12.40437924	31.82872391
27.11249574	5.28E-08	-13.74703512	30.39432242
27.22499576	-7.2E-09	-18.35128538	28.7161611
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