2518 HAAS ROAD

DRAINAGE REPORT

February 2025

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SUITE 500

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Reason: I am the author of this document
Date: 2025.02.24 14:34:51-05'00'

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LICENSE
No. 89115
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

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Prepared For:

City of Apopka

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Report and Appendices A – I
Performed Under the Supervision of

Leonardo V. Quiterio, P.E.
Florida P.E. No.: 89115

1. PROJECT DESCRIPTION

Sovereign Engineering Inc. is proposing grading/draining a residential set of lots in Orange County, Florida. The project is located at 2518 Haas Road in the city of Apopka. The proposed site is located on Parcel No. 07-20-28-0000-00-002. To the south of the property, there is the Arab George Trail, while to the North it is directly connected Haas Road. Moreover, towards the East there is McGuire Road directly to the East Line of the lot, while to the West, the Henry William R Jr sits adjacent to the lot.

The scope of work for this project is grading the lot, designing the drainage proposal that can handle the existing and post conditions of the lot, and lastly, developing homes to be placed in each parcel of the overall lot. Additionally, the scope of work includes the design of stormwater management plan for the development in accordance with the St. Johns River Water Management District (SJRWMD) and the City of Apopka. The stormwater management plan includes the construction of a pond that will sit at the center of the lot, to serve as a point of collection and also discharge of rain water.

The project vertical datum is NAVD88 and all elevations contained in this document and in the plans reference this datum unless otherwise noted. The NAVD88 vertical datum is generally 1 ft lower than the NGVD29 vertical datum in this area. Included for reference in **Appendix A** for the project vicinity is the Location Map as **Figure A-1** and the Aerial Map as **Figure A-2**.

2. PERMIT HISTORY

No existing stormwater Environmental Resource Permits (ERPs) exist for this site.

3. EXISTING SITE CONDITIONS

3.1 Land Cover

The project area is 4.17 acres and is Parcel 07-20-28-0000-00-002. The existing land cover is grass with 50%-75% ground cover. Refer to **Figure A-2** located in **Appendix A** for the Aerial Map.

3.2 Floodplains

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Orange County, Florida was used to determine the flood zones for the project. The site is located entirely within Zone X, areas determined to be outside of the 0.2% annual chance floodplain. Refer to **Figure A-** located in **Appendix A** for the FEMA Floodplain Map.

3.3 Soils and Groundwater Conditions

The Natural Resources Conservation Service (NRCS) Web Soil Survey identified two soil types within the project limits, Candler Fine Sand, 0 to 5 percent slopes, and Candler Fine Sand, with 5 to 12 percent slopes. Refer to **Appendix A**, **Figure A-**, for the NRCS Web Soil Survey for this project.

A geotechnical investigation was also completed by Ardaman & Associates, Inc. The geotechnical investigation took eight borings within the lot. Refer to **Appendix I** for geotechnical report.

Based on the geotechnical report, the normal water level (NWL) was not found, during any of the 20' deep borings.

3.4 Wetlands and Surface Waters

Based on the environmental assessment report, no wetlands areas are incapsulated in the project area.

3.5 Drainage Patterns

Refer to **Appendix B** for the Pre-Development Basin Map. The runoff from the site sheet flows to the existing swale within the right of way.

3.6 Existing Drains and Structures

Within the right of way surrounding the perimeter of the site, there are no major hydraulic structures used to direct flow, with only swales around the perimeter of the lot, to direct water flow to the outside of the lot.

4. PROPOSED DEVELOPMENT CONDITIONS

4.1 Land Cover

Most of the site will be cleared and grubbed in the proposed condition and the single-family units shall be constructed.

4.2 Drainage Patterns

Stormwater runoff will be treated using a proposed perimeter swale. The proposed dry swale will be constructed to provide the treatment and attenuation volume required by the proposed improvements. Runoff from the on-site post-development basin will sheet flow into the proposed inlets, which will route the runoff into the dry swale. Please see the stage/storage for the pond system within Appendix B.

Refer to **Appendix C** for the Proposed Drainage Map for a summary of the proposed drainage basin area.

5. DRAINAGE CALCULATIONS

5.1 Stormwater Management

5.1.1 Design Criteria

The storm water management system design for the project will need to comply with the requirements of the St. Johns River Water Management District (SJRWMD) and the City of Apopka. Treatment volume was provided for 1 inch over the entire site or 2.5 inches over the impervious area, whichever is greater.

5.1.2 Tailwater Conditions

Due to the design of the project, a full retention pond, there is no outfall structure, which in turn makes it so there is no need to account for tailwater, as the water from the rain will be concentrated over the proposed pond.

5.1.3 Treatment and Recovery

SJRWMD requires that retention systems recover within 14 days.

5.1.4 Peak Discharge Rate and Volume

SJRWMD states that the post-development peak rate of discharge must not exceed the pre-development peak rate discharge for the 25-year 24-hour and mean annual storm duration. ICPR 4.0 was utilized to determine the pre-development discharge. Pre-development discharge may be found in **Appendix E**.

5.1.5 Drainage Analysis

The pond is a retention structure that has been designed to treat, store, and attenuate the runoff from the proposed development. The control structure is a 109.4'-foot-wide trapezoidal grass pond set at elevation 81' – 84' . Please refer to **Appendix F** for the proposed ICPR analysis.

The hydrologic rainfall amounts used in the ICPR analyses are shown in **Table 1.**

Table 1 – Rainfall Amount

Frequency (Years)	Duration (Hours)	Rainfall (Inches)
10	24	7.2
25	24	8.4
100	24	10.6
Mean Annual	24	5

The results of the ICPR analyses are shown on the following pages.

5.1.6 Pond Maintenance

The owner shall be responsible for maintaining the vegetation and control structure within the pond.

Table 2 – Peak Discharge Rate

Storm Event			Peak Discharge	
Frequency	Duration	Rainfall	Pre Condition	Proposed Condition
(Years)	(Hours)	(Inches)	(cfs)	(cfs)
Mean Annual	24	5.0	2.02	0.1
25	24	8.4	4.89	0.54
100	24	10.6	6.85	2.12

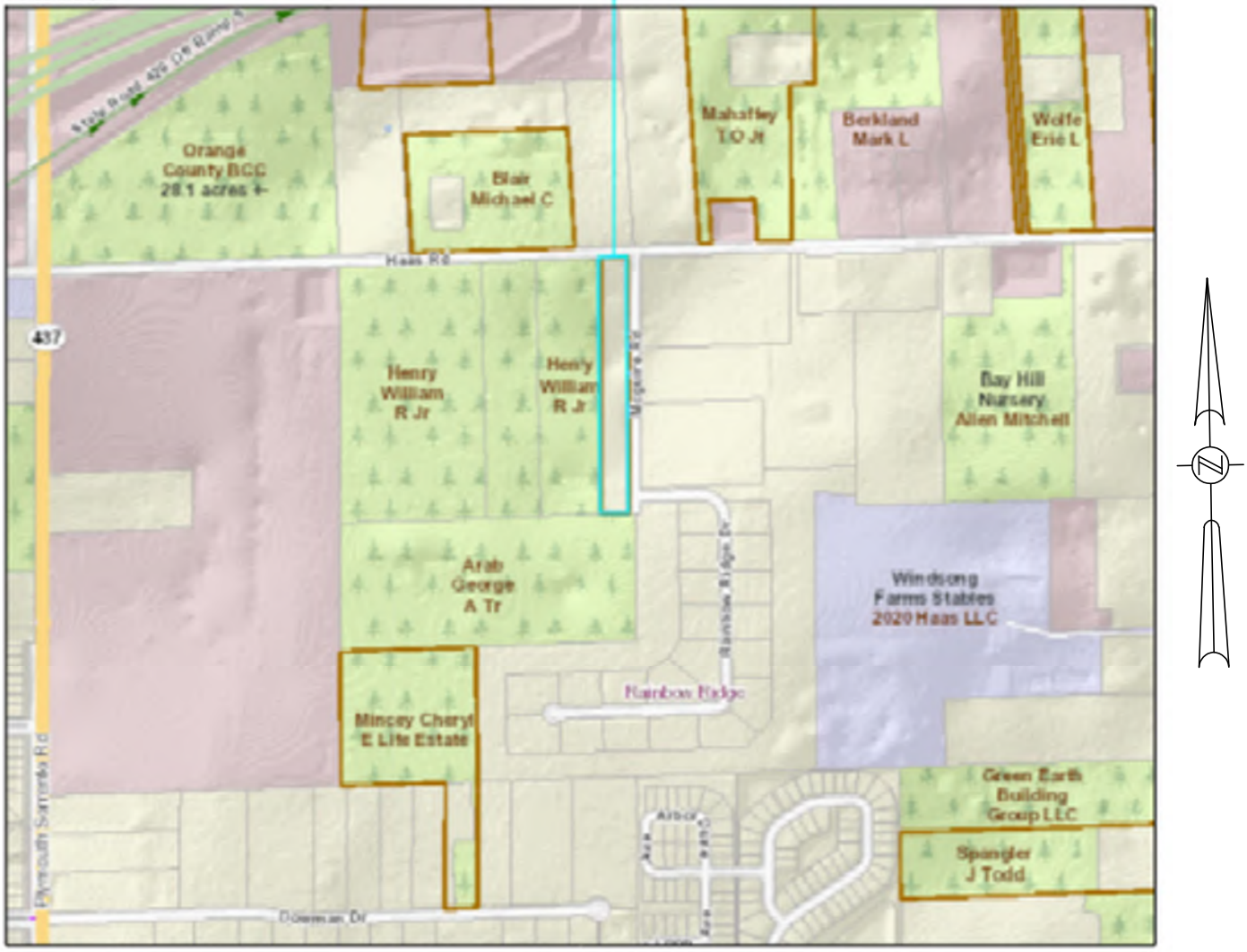
Table 3 – Pond 1 Peak Stage Results

Storm Event				Warning Stage	Proposed Condition
Frequency	Duration	Rainfall	Type		Peak Stage
(Years)	(Hours)	(Inches)		(FT NAVD88)	(FT NAVD88)
10	24	7.2	ORANGE	-	-
25	24	8.4	ORANGE	87.0	82.45
100	24	10.6	ORANGE	87.0	81.61
Mean Annual	24	5.0	ORANGE	87.0	81.27

APPENDIX A – REPORT FIGURES

VICINITY MAP:

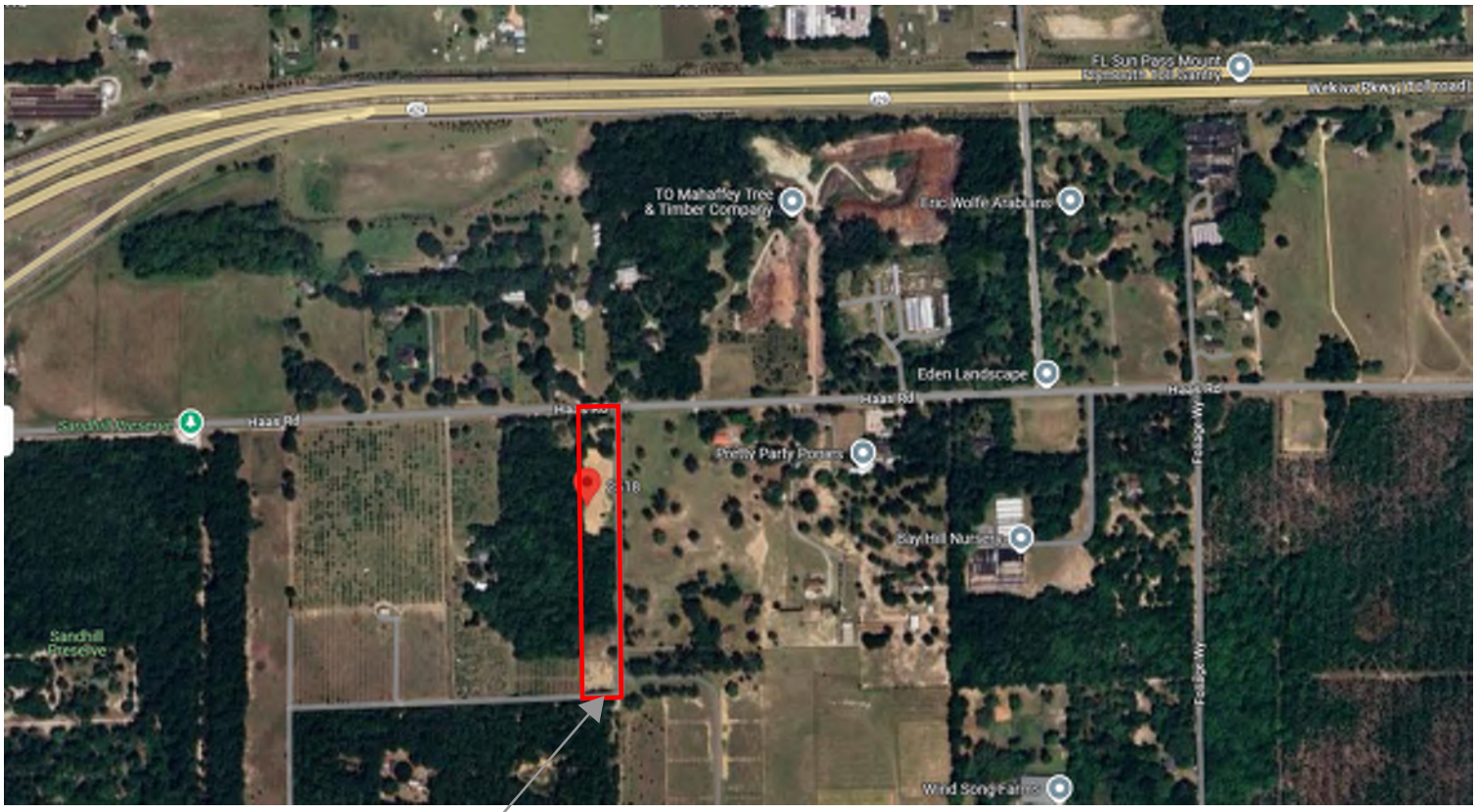
N.T.S.



PERMITTING AGENCY

CITY OF APOPKA

Figure A-1 Location Map



PARCEL:
- 07-20-28-0000-00-002

TOTAL PARCEL AREA:
- 4.17 ac

Figure A-2 Aerial Map

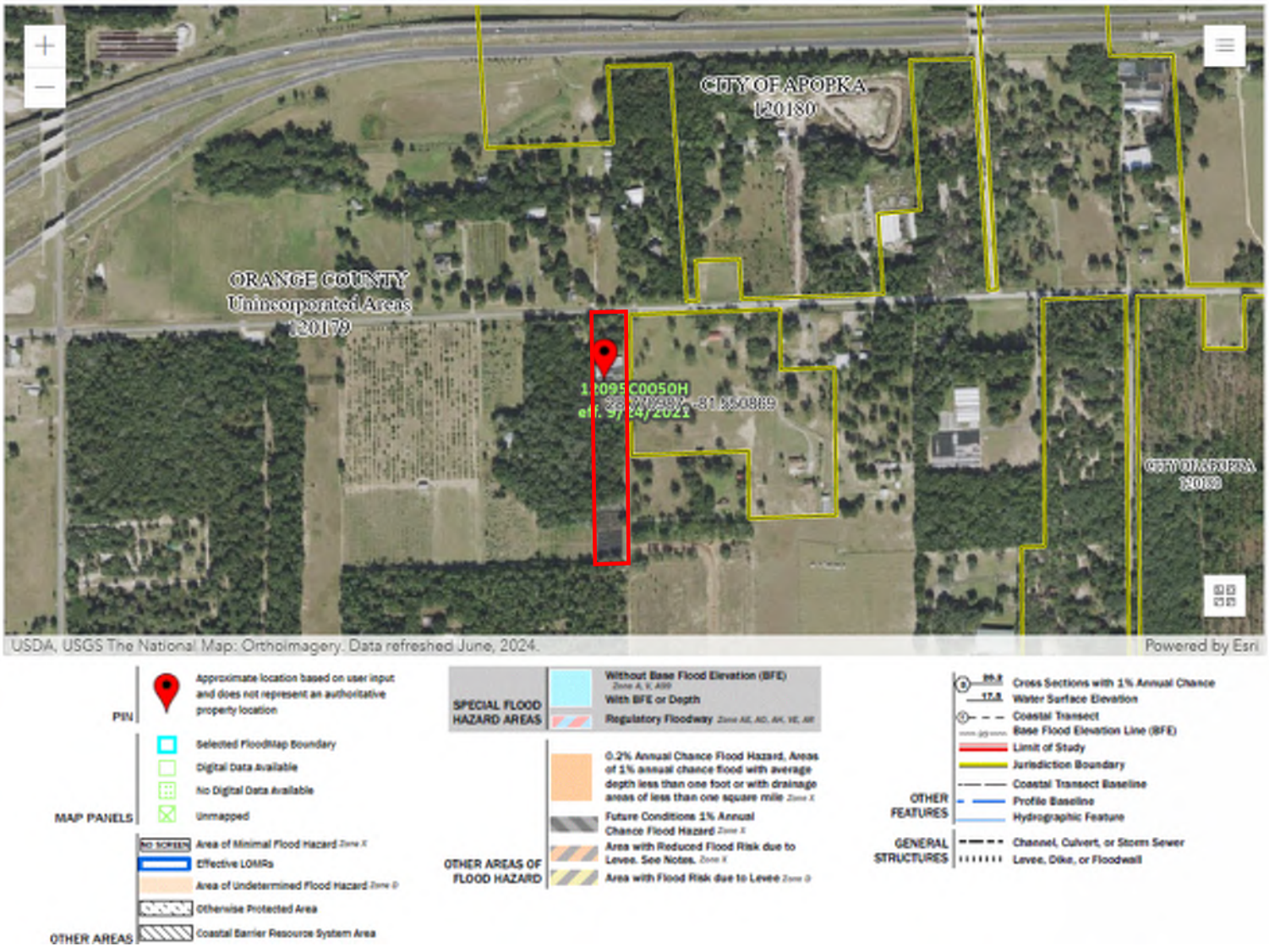


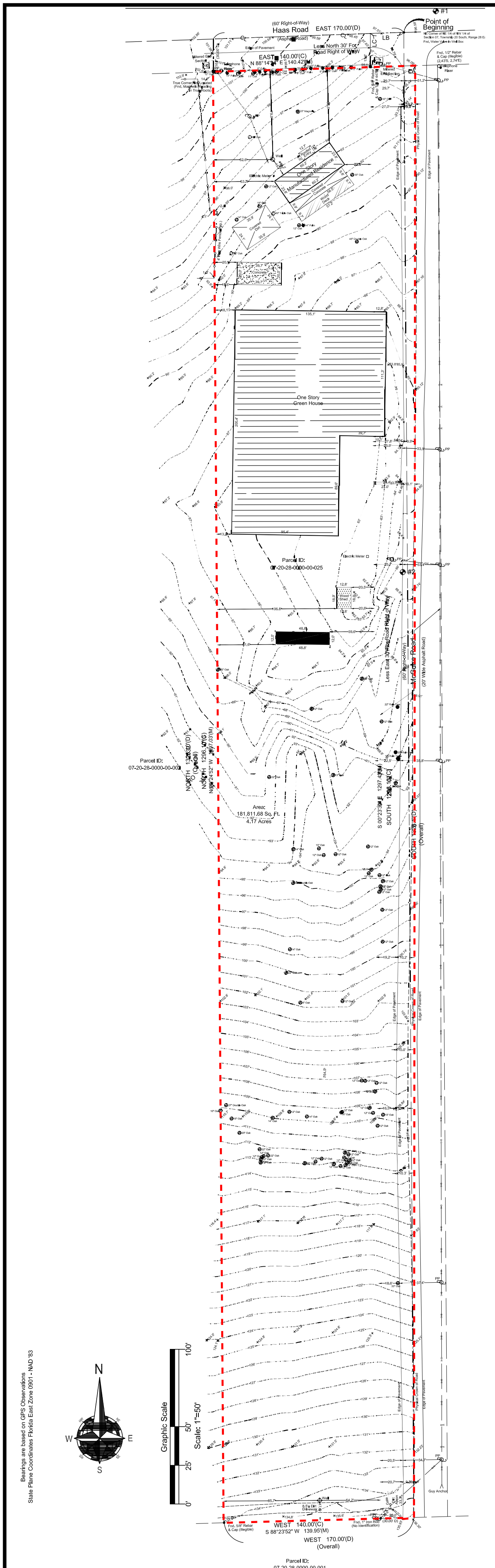
Figure A-3 FEMA Floodplain Map

HYDROLOGIC SOIL GROUP		
MAP UNIT SYMBOL	MAP UNIT NAME	RATING
4	CANDLER FINE SAND, 0-5% SLOPES	A
5	CANDLER FINE SAND, 5-12% SLOPES	A

SOURCE: NATURAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY
SURVEY AREA DATE: FEBRUARY, 2025

Figure A-4 Soils Map

APPENDIX B – PRE-DEVELOPMENT BASIN MAP

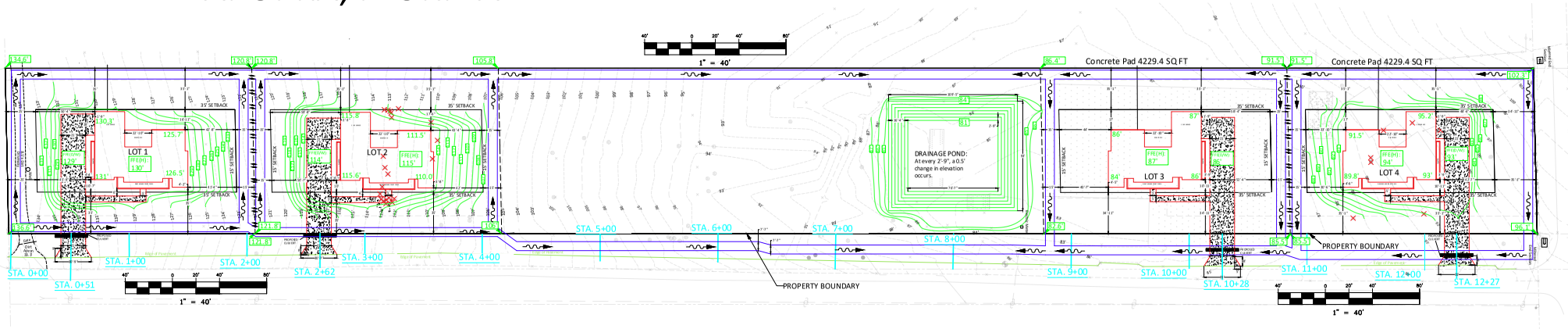

(60' Right-of-Way)
Haas Road
(Asphalt Road)
EAST 170.00'(D)
Point of Beginning
Less North 30' For Road Right of Way
EAST 140.00'(C)
N 88°14'34" E 140.42'(M)
Edge of Pavement
One Story Manufactured Residence
One Story Green House
Parcel ID:
07-20-28-0000-00-025
Parcel ID:
07-20-28-0000-00-002
Area:
181,811.68 Sq. Ft.
4.17 Acres
(60' Right-of-Way)
McGregor Road
(20' Wide Asphalt Road)
(Overall)
Less East 30' For Road Right of Way
SOUTH
Edge of Pavement
Guy Anchor
WEST 140.00'(C)
S 88°23'52" W 139.95'(M)
WEST 170.00'(D)
(Overall)
Parcel ID:
07-20-28-0000-00-001
Graphic Scale
Scale: 1"=50'
0'
25'
50'
100'
N
S
W
E
Bearings are based on GPS Observations
State Plane Coordinates Florida East Zone 0901 - NAD '83

APPENDIX C – POST-DEVELOPMENT BASIN MAP

LEGEND:	
120.8'	PROPOSED ELEVATION
115.8'	EXISTING ELEVATION
	CONCRETE PAD
	FLOW ARROW
	PROPOSED SWALES
	TREE REMOVAL
STA. 0+00	STATION POINTS FOR DRAINAGE ANALYSIS

HAVEN PEACE PD 2518 HAAS ROAD

APOPKA, FLORIDA



SCALE: 1" = 40'

APPENDIX D – STORMWATER MANAGEMENT CALCULATIONS

PRE-DEVELOPMENT

Runoff Curve Number (CN)- Development Area

For ICPR Model

Soil Hydrologic Group	Cover Description	Curve Number	Area (SF)	Area Total (AC)	Area x CN
	Impervious				
	Pavement	98	-	0.00	0.0
	Buildings	98	28,693.9	0.66	64.68
	Pervious and Ponds				
A	Open Space (CN Per Prev. Permit)	49	153,287.2	3.51	171.99
				0.00	0.0
		Total	181,981.1	4.17	236.67
Weighted CN (Post-development)					**64.68**

CN= **$(\Sigma area*CN)/Area_{total}$**

PRE- DEVELOPMENT CONDITIONS:

TIME OF CONCENTRATION (TC):

Manning's Coefficient, n 0.02

Use TR-55 V. 2.10 2 year rain = 4.5 in

overland runoff up to 100 ft. in distance and Shallow Concentrated flow f

Total TC = Tc Sheet flow + Tc Concentrated flow

Total TC = **16 min**

POST-DEVELOPMENT

Runoff Curve Number (CN)- Development Area

For ICPR Model

Soil Hydrologic Group	Cover Description	Curve Number	Area (SF)	Area Total (AC)	Area x CN
	Impervious				
	Pavement	98	12,090.4	0.28	27.44
	Buildings	98	16,917.6	0.39	38.22
	Pervious and Ponds				
A	Open Space (CN Per Prev. Permit)	49	142,803.3	3.21	157.29
A	Pond O.W.	100	10,169.8	0.23	23.00
		Total	181,981.1	4.17	245.95
Weighted CN (Post-development)					**58.98**

CN= **(Σarea*CN)/Area$_{total}$**

PRE- DEVELOPMENT CONDITIONS:

TIME OF CONCENTRATION (TC):

Manning's Coefficient, n 0.02

Use TR-55 V. 2.10 2 year rain = 4.5 in

overland runoff up to 100 ft. in distance and Shallow Concentrated flow f

Total TC = Tc Sheet flow + Tc Concentrated flow

Total TC = **15 min**

APPENDIX E – POST ICPR

Simple Basin: POST

Scenario:	001
Node:	POND
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	15.0000 min
Max Allowable Q:	999999999999999.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH484
Peaking Factor:	484.0
Area:	4.1700 ac
Curve Number:	59.0
Ia/S:	0.20
% Impervious:	15.90
% DCIA:	0.00
% Direct:	5.60
Rainfall Name:	~ORANGE

Comment:

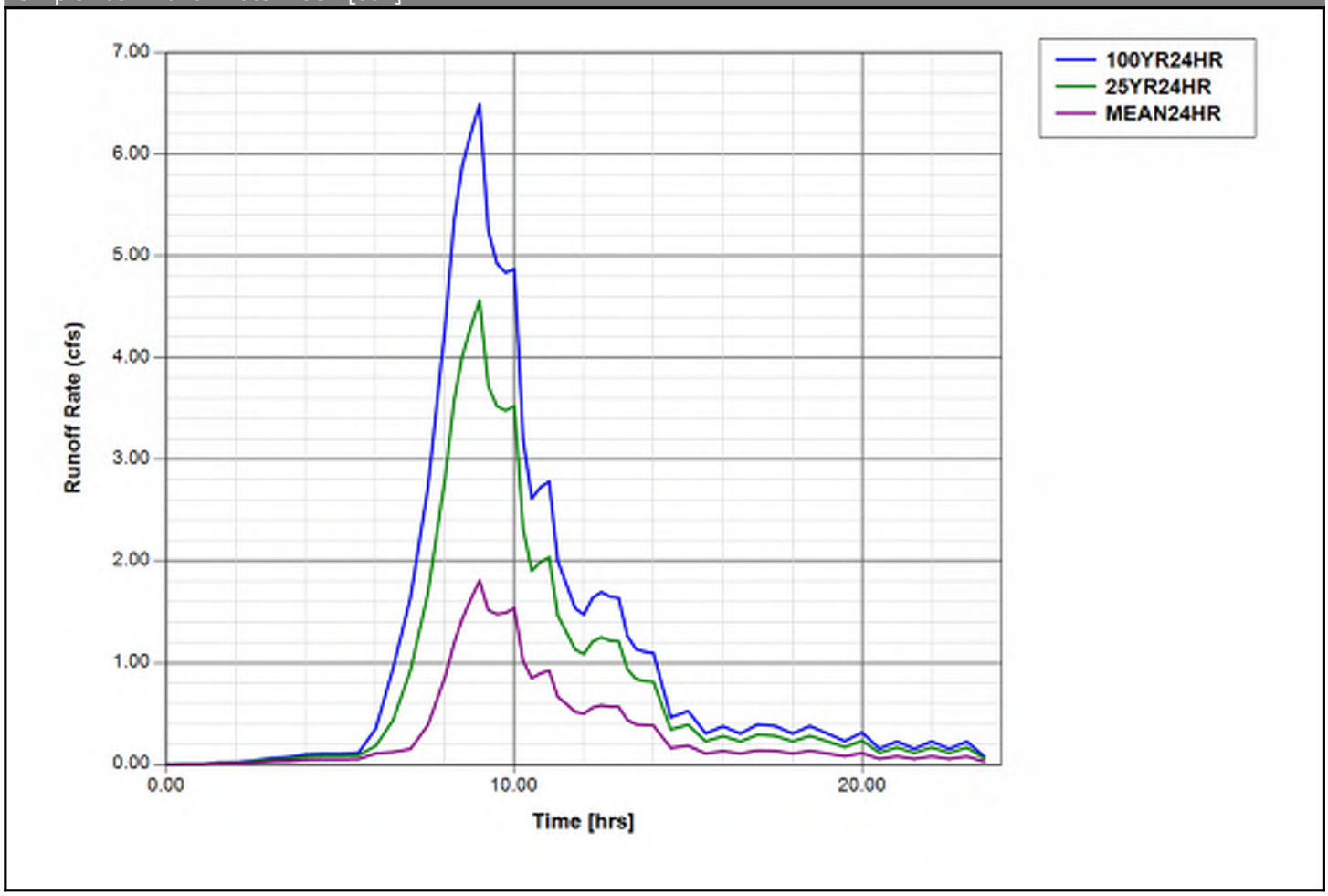
Simple Basin Runoff Summary [001]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]
POST	100YR24HR	6.49	9.0000	10.60	6.13	4.1700
POST	25YR24HR	4.56	9.0000	8.40	4.28	4.1700
POST	MEAN24HR	1.81	9.0000	5.00	1.73	4.1700

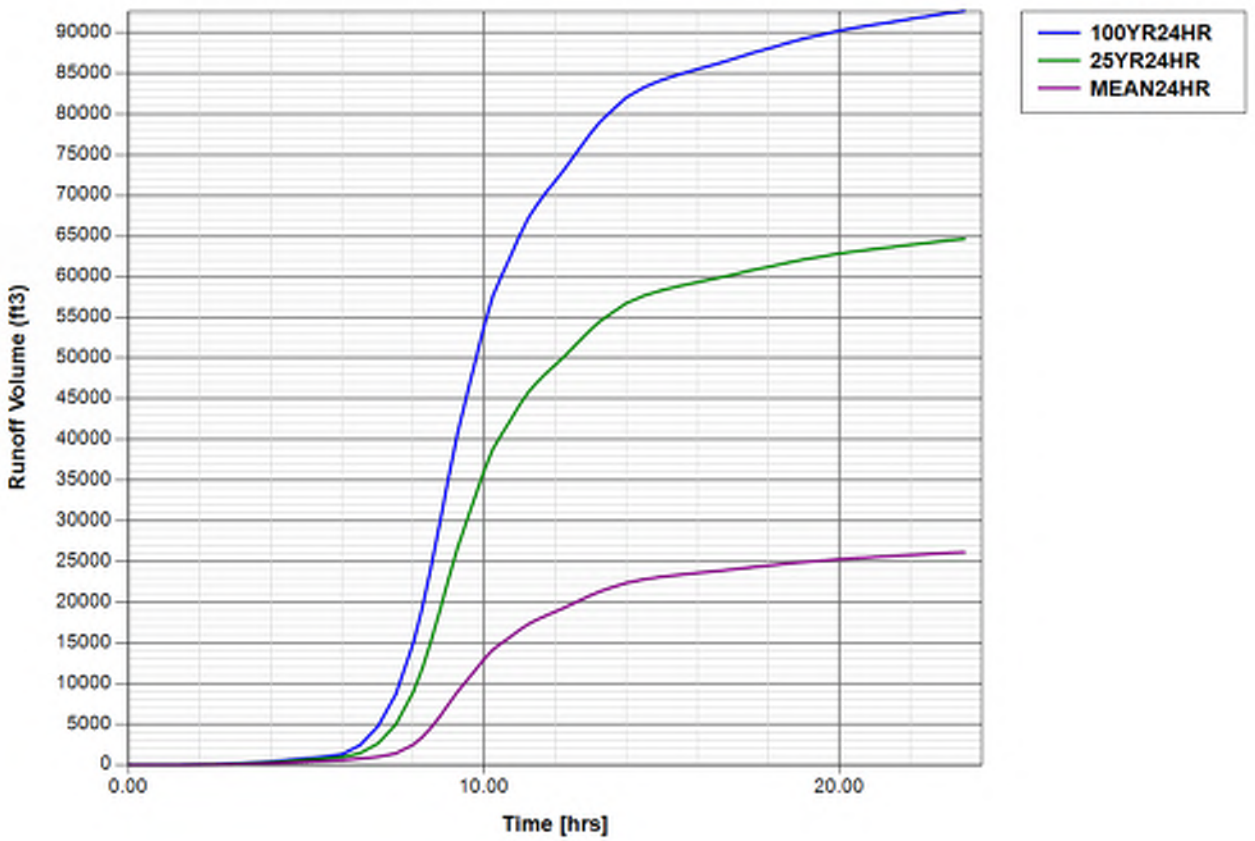
Simple Basin Mass Balance Summary [001]

Basin Name	Sim Name	Total Rainfall	Total Runoff	Change Soil Storage
POST [in]	100YR24HR	10.60	6.13	4.47
POST [ft3]	100YR24HR	160453	92787	67666
POST [ac-ft]	100YR24HR	3.68	2.13	1.55
POST [in]	25YR24HR	8.40	4.28	4.12
POST [ft3]	25YR24HR	127152	64748	62404
POST [ac-ft]	25YR24HR	2.92	1.49	1.43
POST [in]	MEAN24HR	5.00	1.73	3.27
POST [ft3]	MEAN24HR	75686	26189	49496
POST [ac-ft]	MEAN24HR	1.74	0.60	1.14

Simple Basin Runoff Rate: POST [001]



Simple Basin Runoff Volume: POST



Simple Basin: PRE

Scenario:	001
Node:	PRE
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	16.0000 min
Max Allowable Q:	999999999.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH323
Peaking Factor:	323.0
Area:	4.1700 ac
Curve Number:	64.7
Ia/S:	0.20
% Impervious:	15.77
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	~ORANGE

Comment:

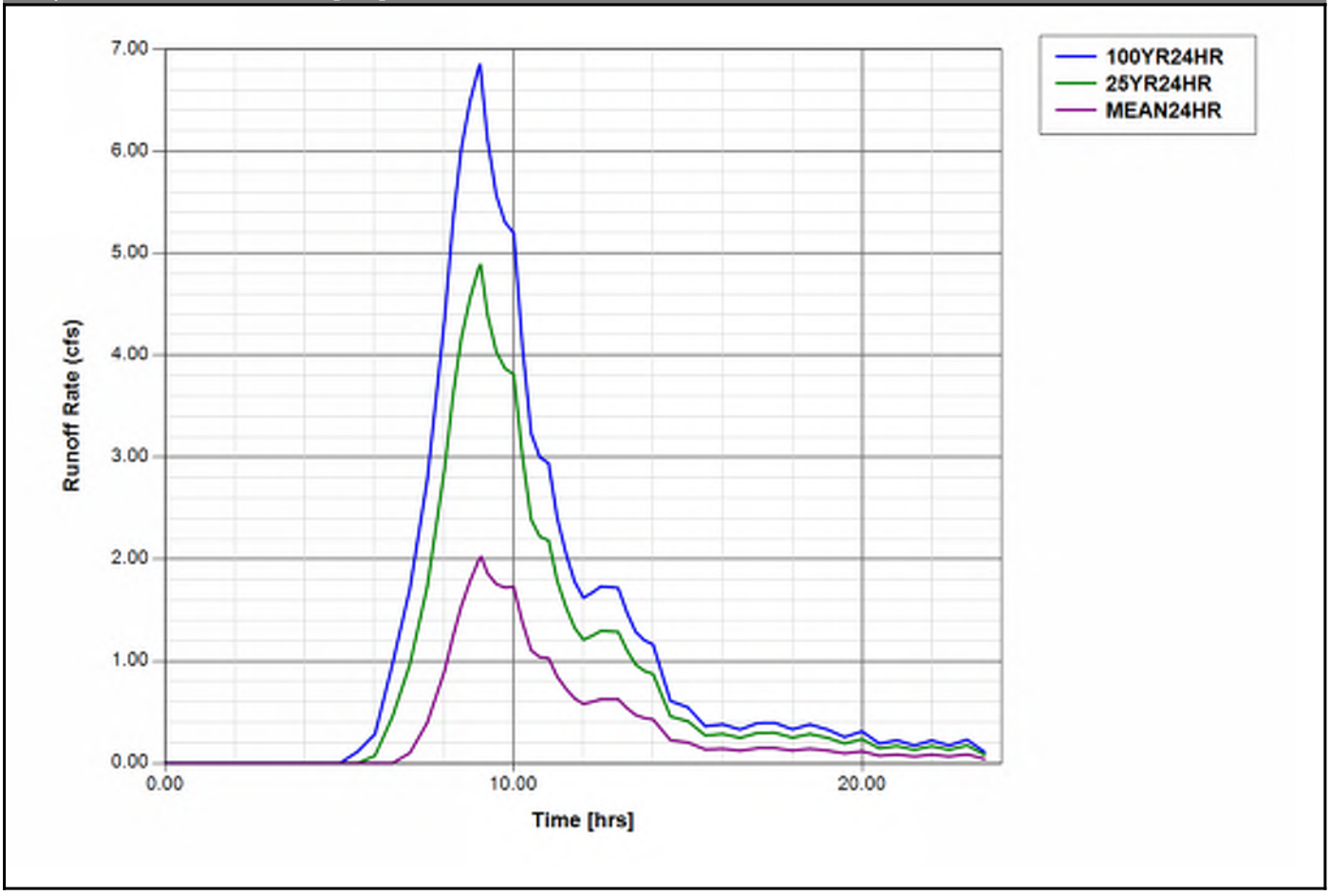
Simple Basin Runoff Summary [001]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]
PRE	100YR24HR	6.85	9.0333	10.60	6.57	4.1700
PRE	25YR24HR	4.89	9.0500	8.40	4.64	4.1700
PRE	MEAN24HR	2.02	9.0667	5.00	1.92	4.1700

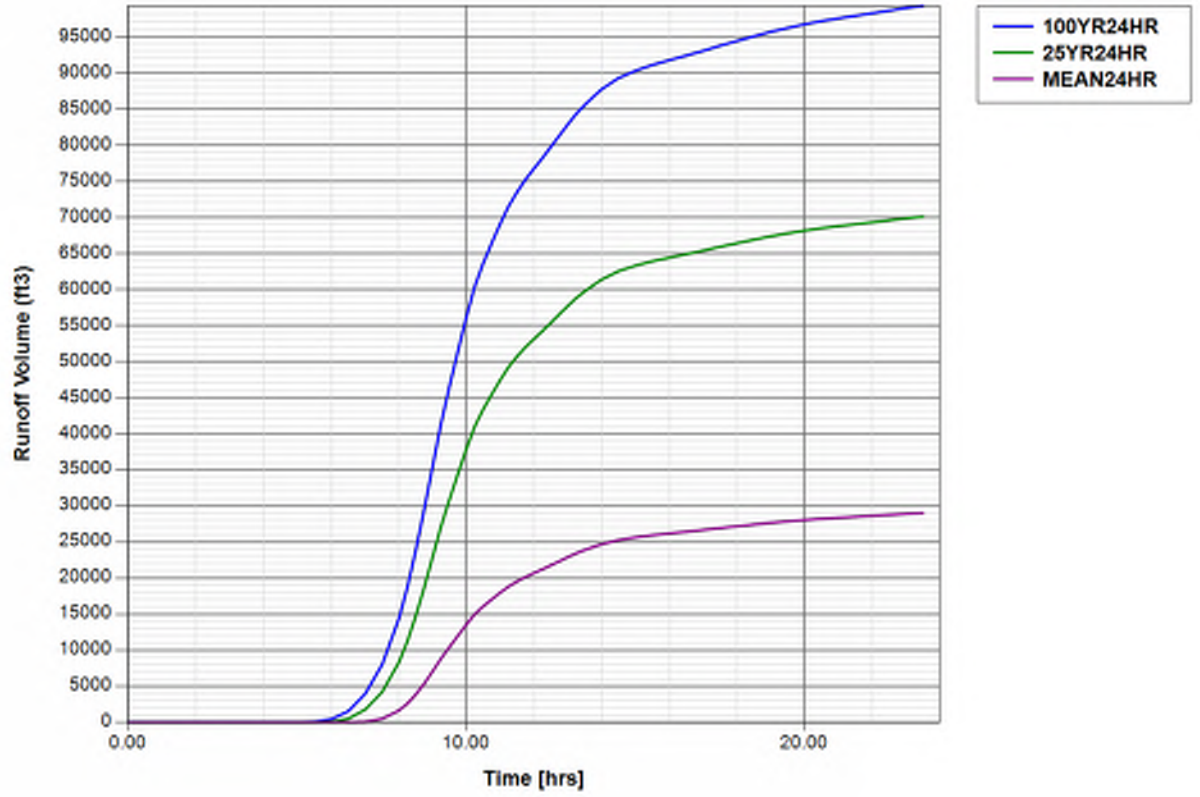
Simple Basin Mass Balance Summary [001]

Basin Name	Sim Name	Total Rainfall	Total Runoff	Change Soil Storage
PRE [in]	100YR24HR	10.60	6.57	4.03
PRE [ft3]	100YR24HR	160453	99442	61011
PRE [ac-ft]	100YR24HR	3.68	2.28	1.40
PRE [in]	25YR24HR	8.40	4.64	3.76
PRE [ft3]	25YR24HR	127152	70188	56964
PRE [ac-ft]	25YR24HR	2.92	1.61	1.31
PRE [in]	MEAN24HR	5.00	1.92	3.08
PRE [ft3]	MEAN24HR	75686	29057	46628
PRE [ac-ft]	MEAN24HR	1.74	0.67	1.07

Simple Basin Runoff Rate: PRE [001]



Simple Basin Runoff Volume: PRE

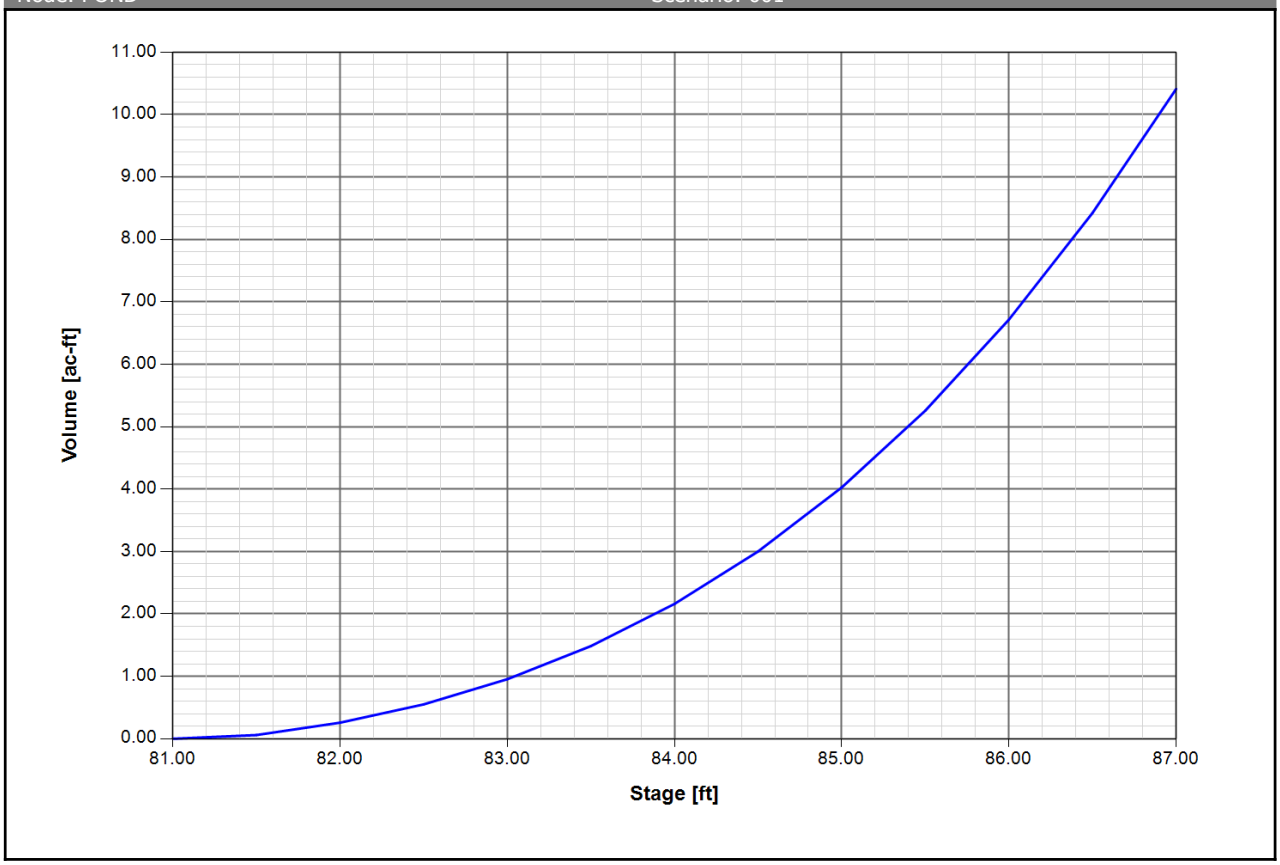


Node: POND

Scenario: 001
Type: Stage/Volume
Base Flow: 0.00 cfs
Initial Stage: 81.00 ft
Warning Stage: 87.00 ft
Alert Stage: 88.00 ft

Stage [ft]	Volume [ac-ft]	Volume [ft3]
81.00	0.00	0
81.50	0.06	2586
82.00	0.26	11225
82.50	0.55	23982
83.00	0.95	41550
83.50	1.48	64668
84.00	2.16	94122
84.50	3.00	130741
85.00	4.03	175401
85.50	5.26	229021
86.00	6.72	292568
86.50	8.43	367053
87.00	10.41	453531

Node: POND Scenario: 001



Node Max Conditions [001]

Node Name	Sim Name	Warning Stage [ft]	Alert Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
POND	100YR24HR	87.00	88.00	82.45	0.0010	6.49	8.61	29443
POND	25YR24HR	87.00	88.00	81.61	-0.0010	4.56	4.02	13376
POND	MEAN24HR	87.00	88.00	81.27	0.0010	1.80	1.70	5663

Node Max Conditions w/ Times [001]

Node Name	Sim Name	Warning Stage [ft]	Alert Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]	Time to Max Stage [hr]	Time to Min/Max Delta Stage [hr]	Time to Max Total Inflow [hr]	Time to Max Total Outflow [hr]
POND	100YR24HR	87.00	88.00	82.45	0.0010	6.49	8.61	29443	10.1714	8.1761	8.9988	10.5802
POND	25YR24HR	87.00	88.00	81.61	-0.0010	4.56	4.02	13376	9.1759	10.1908	8.9982	9.1759
POND	MEAN24HR	87.00	88.00	81.27	0.0010	1.80	1.70	5663	9.1237	7.5201	8.9924	9.1344

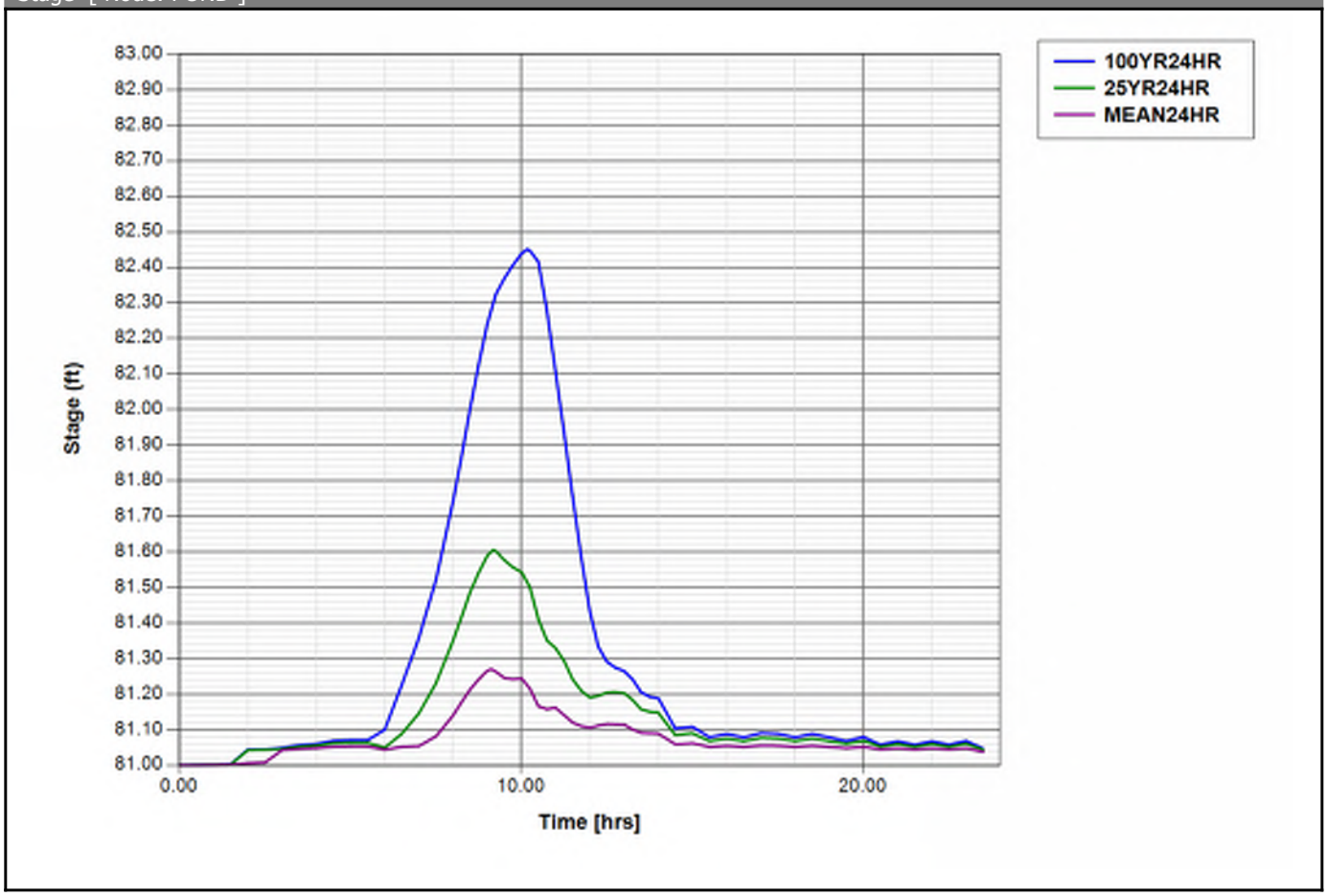
Node Mass Balance Condensed [001]

Node Name	Sim Name	Total Inflow [ft3]	Total Outflow [ft3]	Stored Volume (Flow Based) [ft3]
POND	100YR24HR	92785	92788	-3
POND	25YR24HR	64747	64746	1
POND	MEAN24HR	26189	26189	0

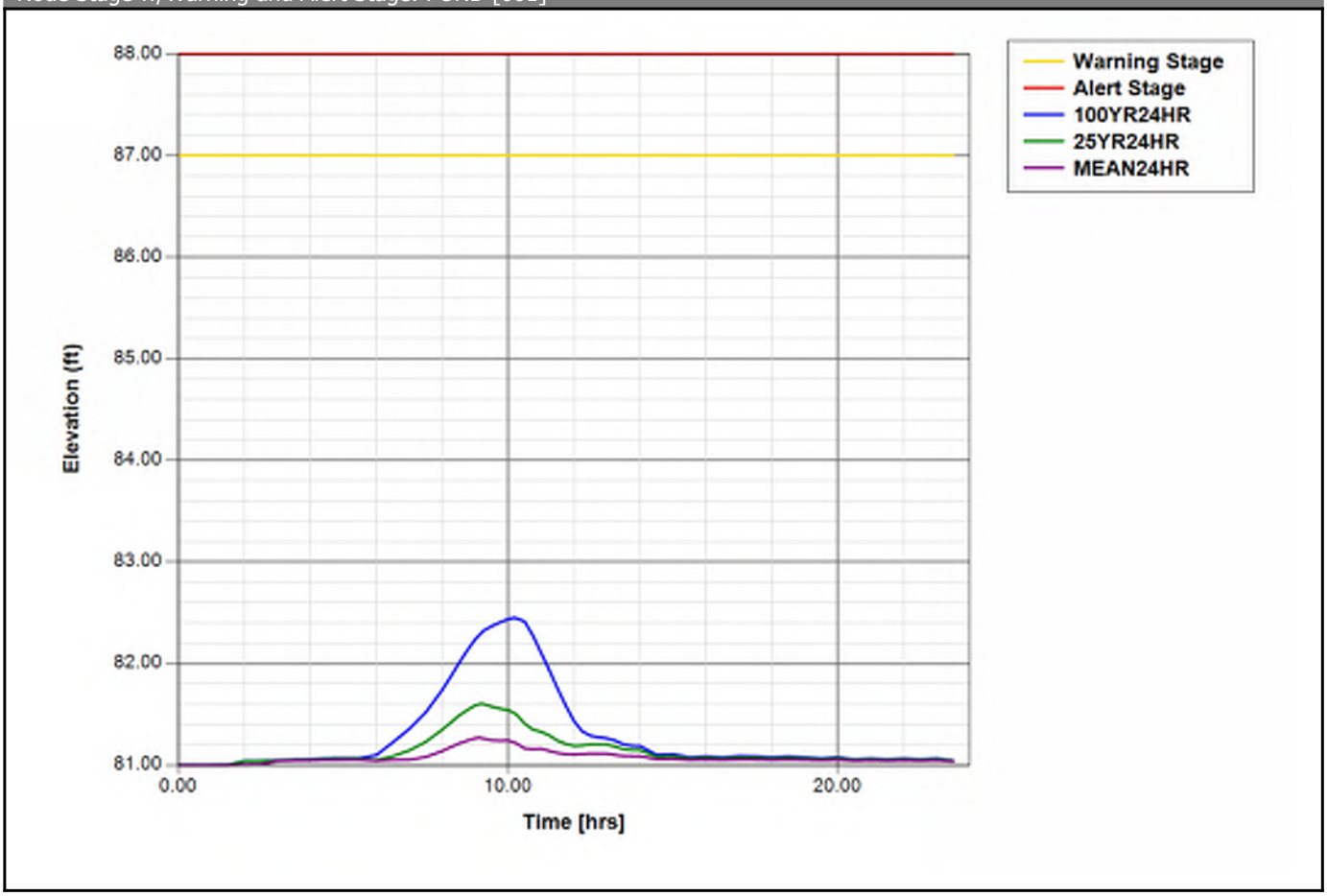
Node Mass Balance Detailed [001]

Node Name	Sim Name	Total Base [ft3]	Total Basin [ft3]	Total External [ft3]	Total Seepage [ft3]	Total Irrigation [ft3]	Total Link [ft3]	Stored (Flow Based) [ft3]	Stored (Geo Based) [ft3]	% Error Inflow
POND : In	100YR24HR	0	92785	0	0	0	0	-3	5	-0.01
POND : Out		0	0	0	0	0	92788			
POND : In	25YR24HR	0	64747	0	0	0	0	1	5	-0.01
POND : Out		0	0	0	0	0	64746			
POND : In	MEAN24HR	0	26189	0	0	0	0	0	1	-0.01
POND : Out		0	0	0	0	0	26189			

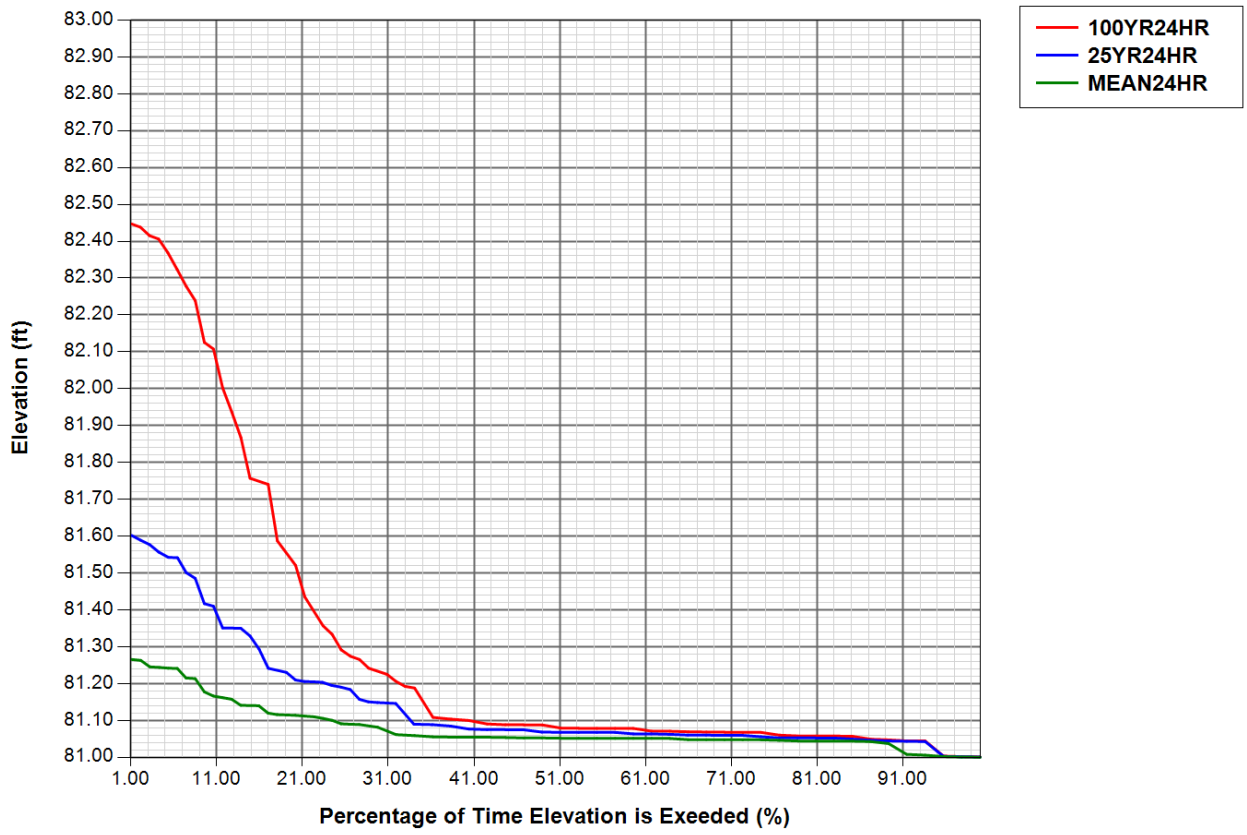
Stage [Node: POND]



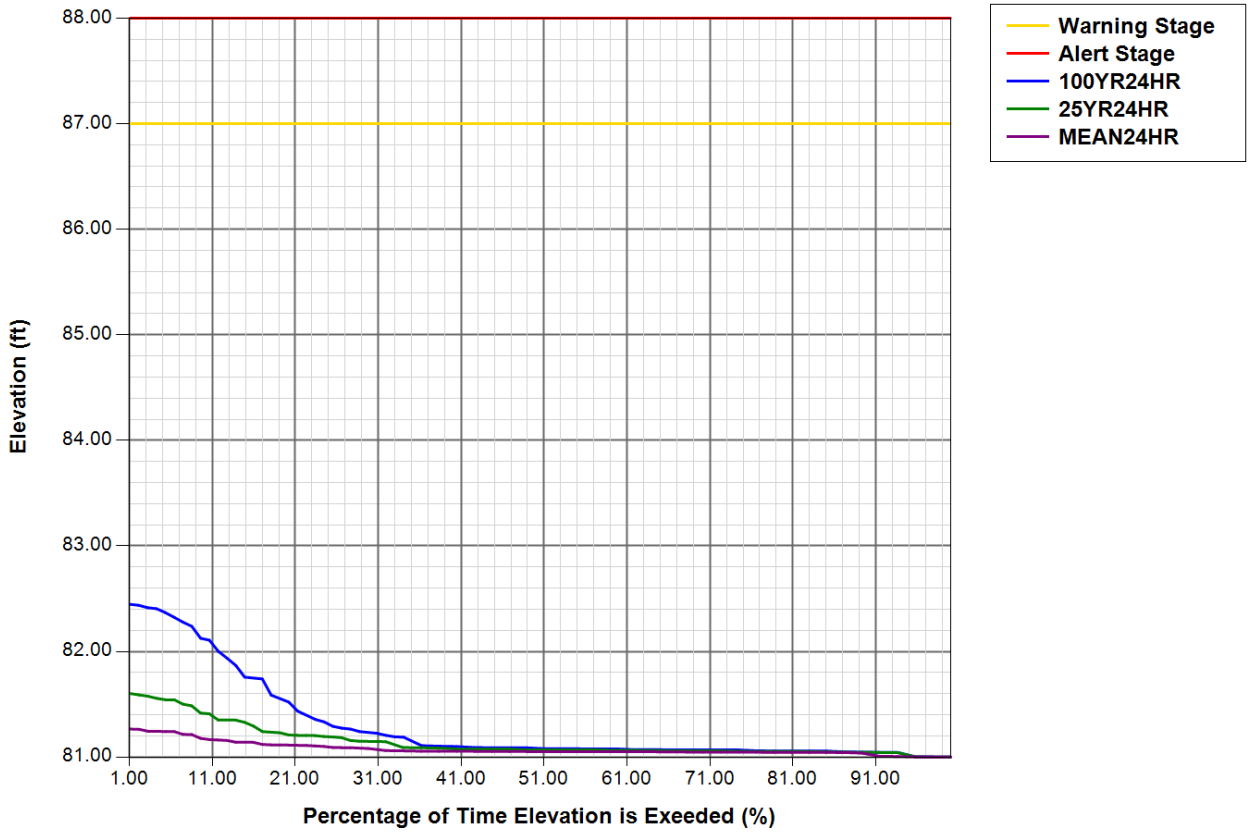
Node Stage w/Warning and Alert Stage: POND [001]



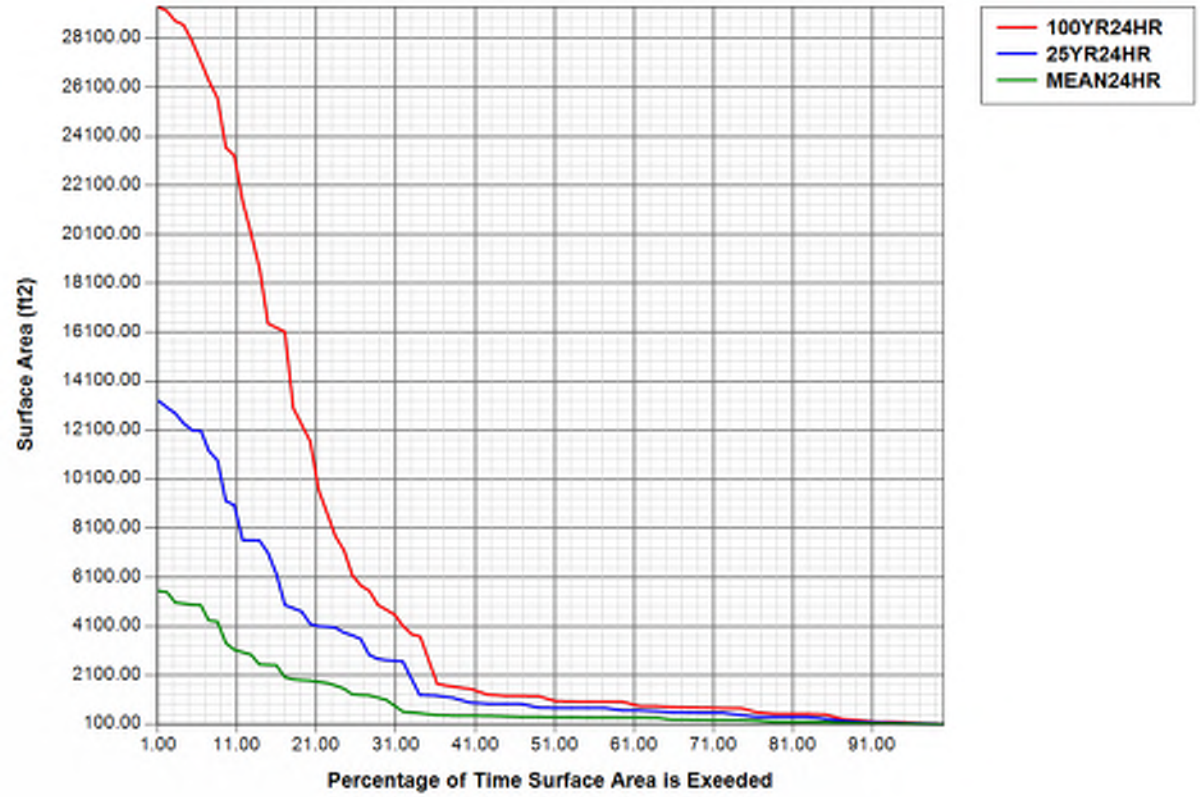
Node - Stage % Exceedance: POND [001]



Node - Stage % Exceedance With Warning and Alert Stage: POND [001]



Node - Surface Area % Exceedance: POND [001]



Percolation Link: PERC

Scenario:	001	Surface Area Option:	Vary Based on Stage/Area Table
From Node:	POND		
To Node:	PERC	Vertical Flow Termination:	Constant Rate
Link Count:	1	Constant Rate:	26.0 fpd
Flow Direction:	Both		
Aquifer Base Elevation:	50.00 ft		
Water Table Elevation:	63.00 ft		
Annual Recharge Rate:	0 ipy		
Horizontal Conductivity:	11.350 fpd		
Vertical Conductivity:	11.350 fpd		
Fillable Porosity:	0.300		
Layer Thickness:	4.00 ft		

Comment:

Link: PERC

Scenario:	001
Type:	Percolation
From Node:	POND
To Node:	PERC
Link Count:	1
Flow Direction:	Both

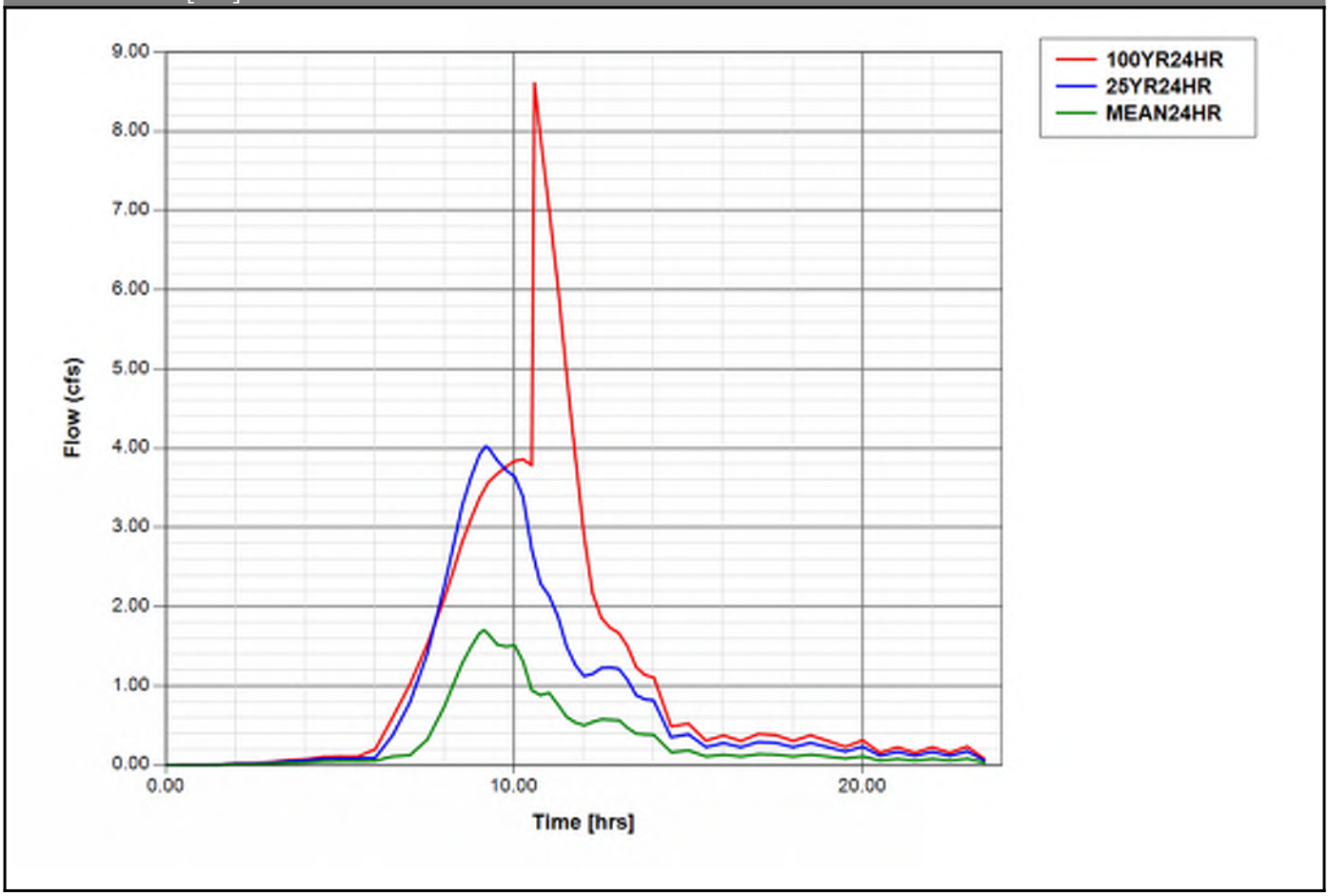
Link Min/Max Conditions [001]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
PERC	100YR24HR	8.61	0.00	4.85	0.00	0.00	0.00
PERC	25YR24HR	4.02	0.00	0.11	0.00	0.00	0.00
PERC	MEAN24HR	1.70	0.00	0.07	0.00	0.00	0.00

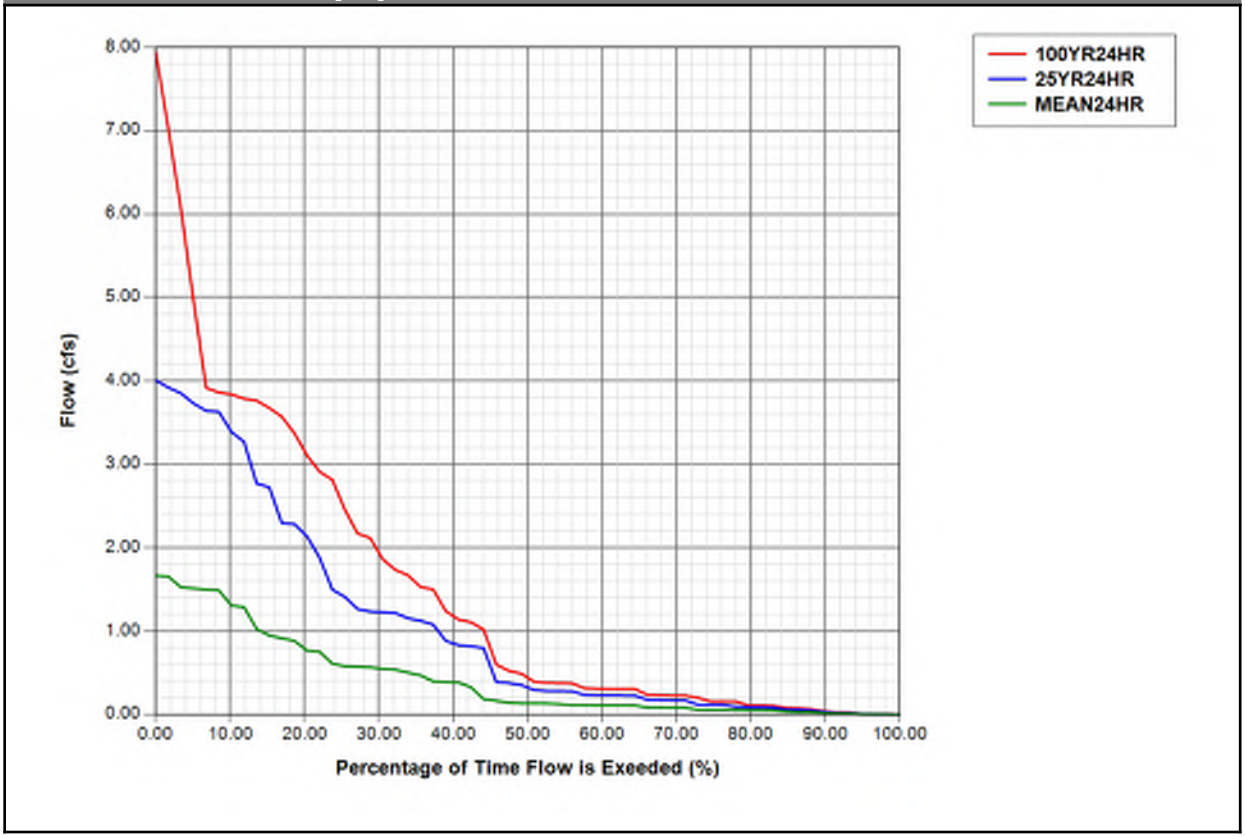
Link Min/Max Conditions with Times [001]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Time to Max Flow [hrs]	Time to Min Flow [hrs]	Time to Min/Max Delta Flow [hrs]	Time to Max Us Velocity [hrs]	Time to Max Ds Velocity [hrs]
PERC	100YR24HR	8.61	0.00	4.85	0.00	0.00	10.5802	0.0000	10.5802	0.0000	0.0000
PERC	25YR24HR	4.02	0.00	0.11	0.00	0.00	9.1759	0.0000	5.6238	0.0000	0.0000
PERC	MEAN24HR	1.70	0.00	0.07	0.00	0.00	9.1344	0.0000	5.6210	0.0000	0.0000

Link Flow: PERC [001]



Link - Flow % Exceedance: PERC [001]



Simulation: 100YR24HR

Scenario:	001
Run Date/Time:	2/14/2025 3:57:37 PM
Program Version:	StormWise 4.08.03

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

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

APPENDIX F – PRE ICPR

Node: PRE

Scenario: 001
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 81.00 ft
Warning Stage: 87.00 ft
Alert Stage: 88.00 ft
Boundary Stage:

Node Max Conditions [001]

Node Name	Sim Name	Warning Stage [ft]	Alert Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
PRE	100YR24HR	87.00	88.00	81.00	0.0000	6.85	0.00	0
PRE	25YR24HR	87.00	88.00	81.00	0.0000	4.89	0.00	0
PRE	MEAN24HR	87.00	88.00	81.00	0.0000	2.02	0.00	0

Node Max Conditions w/ Times [001]

Node Name	Sim Name	Warning Stage [ft]	Alert Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]	Time to Max Stage [hr]	Time to Min/Max Delta Stage [hr]	Time to Max Total Inflow [hr]	Time to Max Total Outflow [hr]
PRE	100YR24HR	87.00	88.00	81.00	0.0000	6.85	0.00	0	0.0000	0.0000	9.0333	0.0000
PRE	25YR24HR	87.00	88.00	81.00	0.0000	4.89	0.00	0	0.0000	0.0000	9.0487	0.0000
PRE	MEAN24HR	87.00	88.00	81.00	0.0000	2.02	0.00	0	0.0000	0.0000	9.0700	0.0000

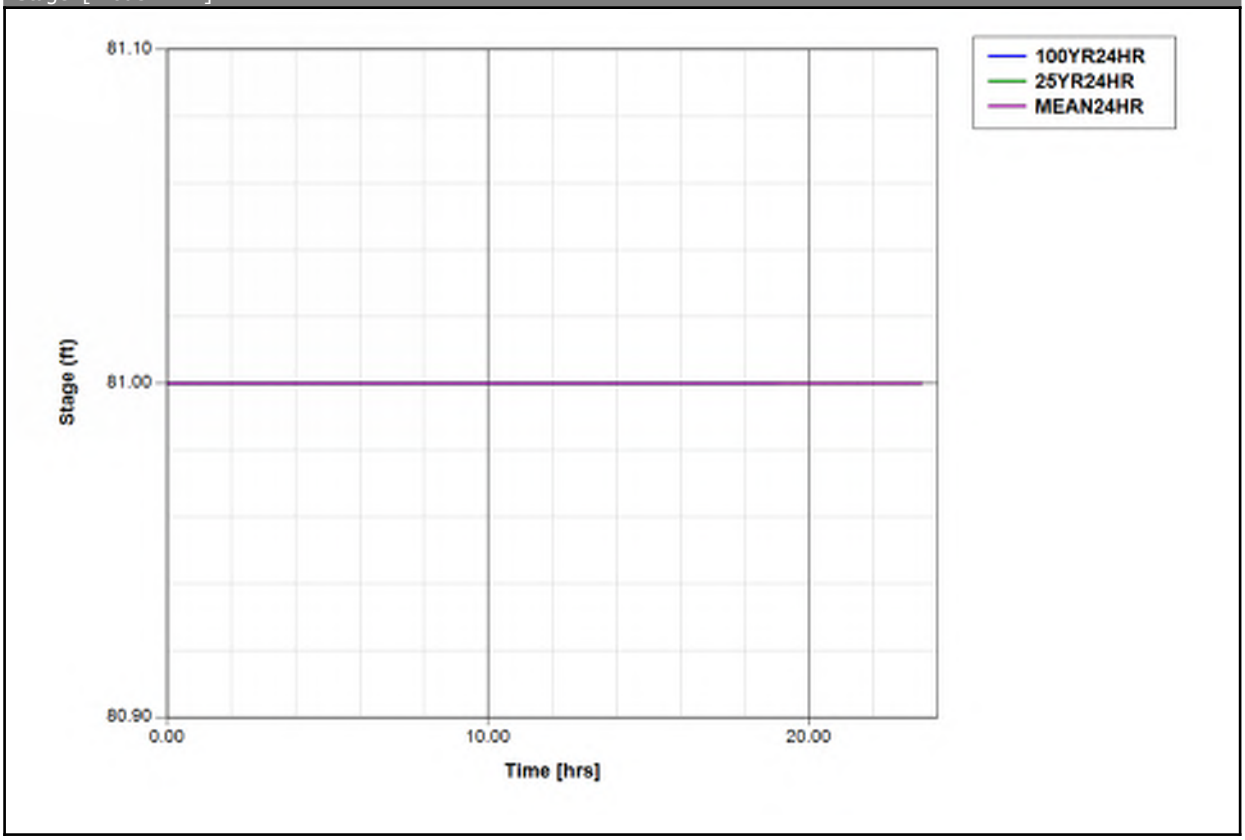
Node Mass Balance Condensed [001]

Node Name	Sim Name	Total Inflow [ft3]	Total Outflow [ft3]	Stored Volume (Flow Based) [ft3]
PRE	100YR24HR	99439	0	99439
PRE	25YR24HR	70186	0	70186
PRE	MEAN24HR	29056	0	29056

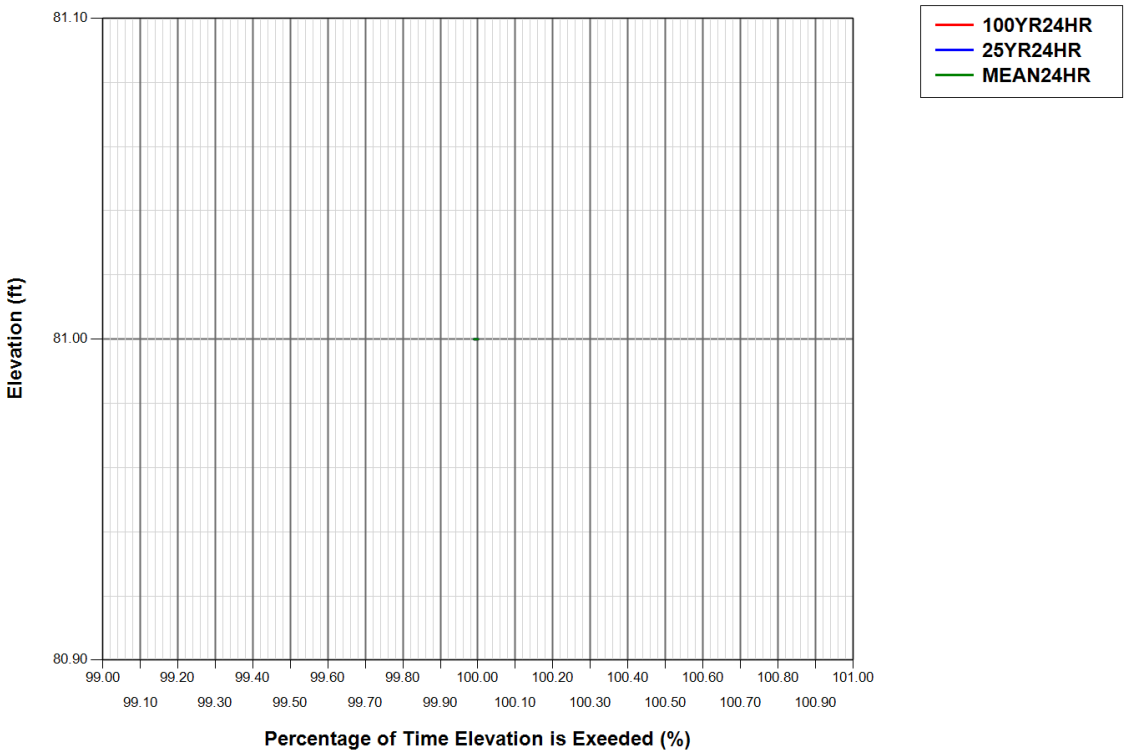
Node Mass Balance Detailed [001]

Node Name	Sim Name	Total Base [ft3]	Total Basin [ft3]	Total External [ft3]	Total Seepage [ft3]	Total Irrigation [ft3]	Total Link [ft3]	Stored (Flow Based) [ft3]	Stored (Geo Based) [ft3]	% Error Inflow
PRE : In	100YR24HR	0	99439	0	0	0	0	99439	0	N/A
PRE : Out		0	0	0	0	0	0			
PRE : In	25YR24HR	0	70186	0	0	0	0	70186	0	N/A
PRE : Out		0	0	0	0	0	0			
PRE : In	MEAN24HR	0	29056	0	0	0	0	29056	0	N/A
PRE : Out		0	0	0	0	0	0			

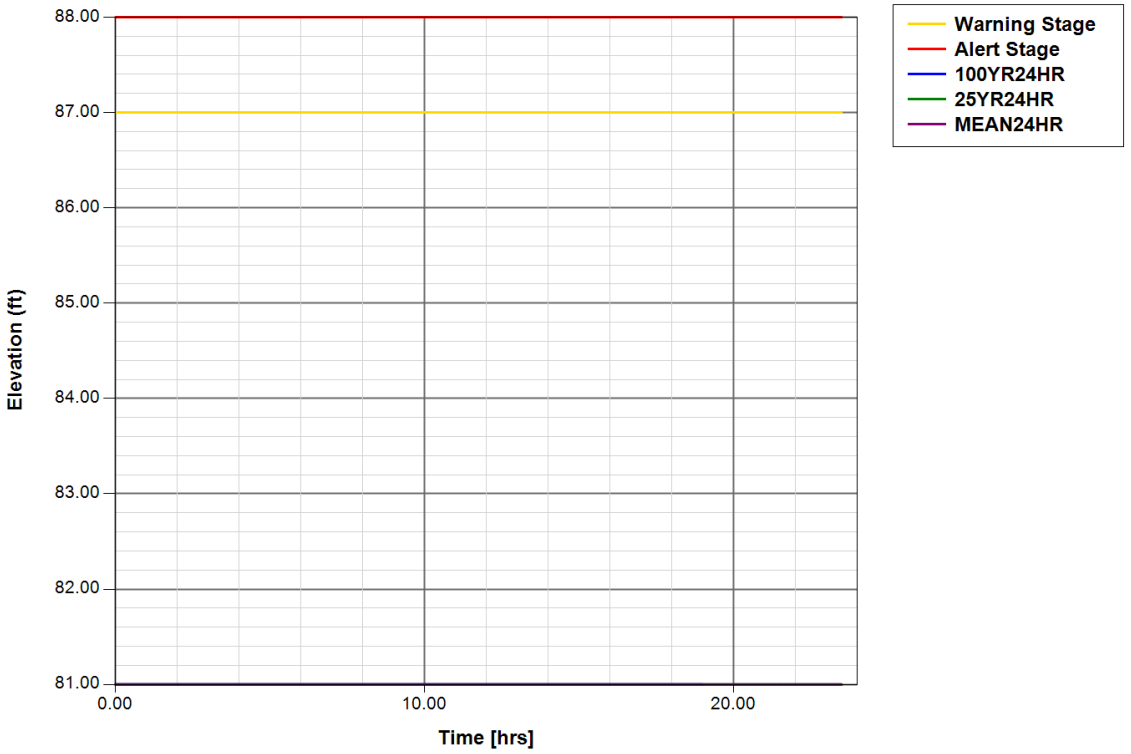
Stage [Node: PRE]



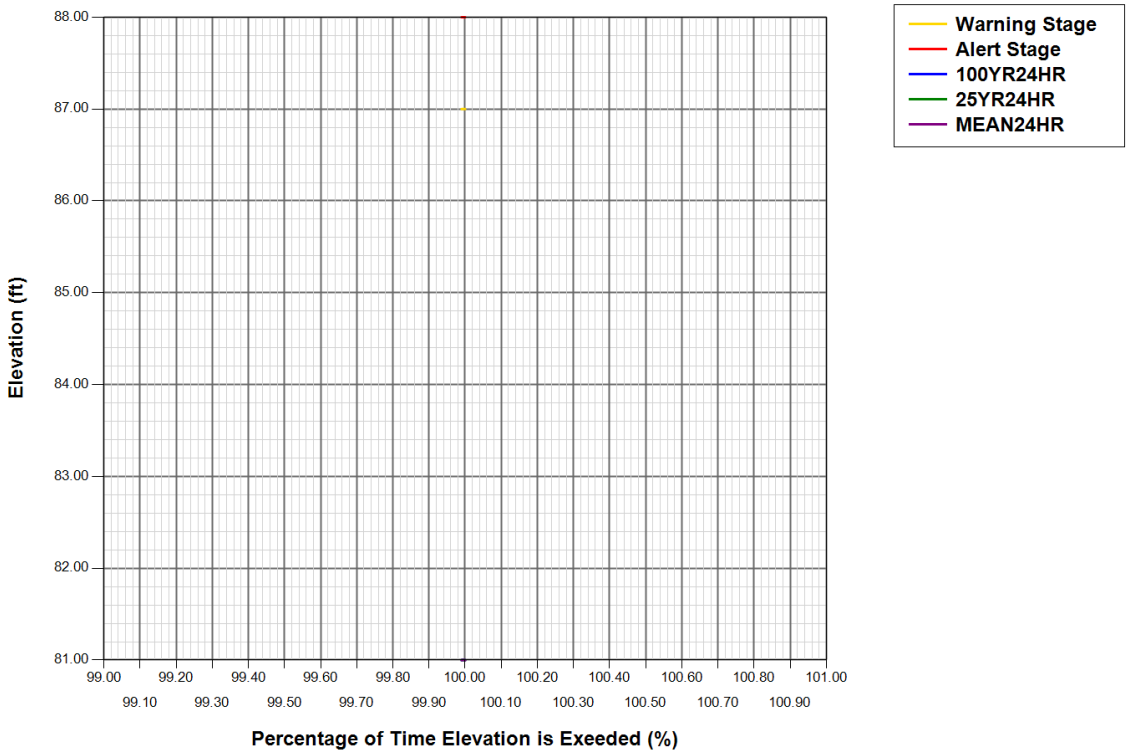
Node - Stage % Exceedance: PRE [001]



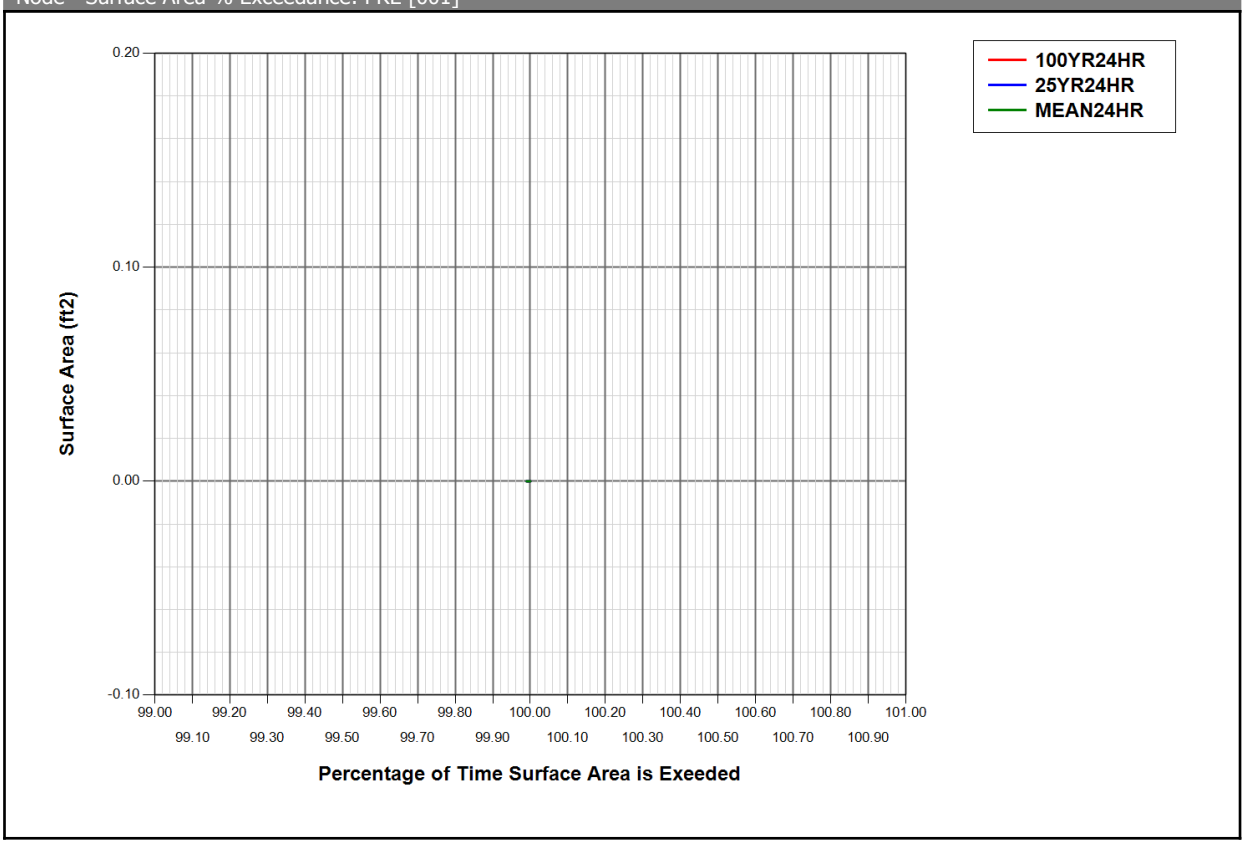
Node Stage w/Warning and Alert Stage: PRE [001]



Node - Stage % Exceedance With Warning and Alert Stage: PRE [001]



Node - Surface Area % Exceedance: PRE [001]



Simulation: 25YR24HR

Scenario:	001
Run Date/Time:	2/6/2025 4:48:41 PM
Program Version:	StormWise 4.08.03

General

Run Mode:	Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

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

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

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 Fact: 0.5 dec
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 Opt: Global

Rainfall Name: ~ORANGE
Rainfall Amount: 8.40 in
Storm Duration: 24.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: 100YR24HR

Scenario: 001
Run Date/Time: 2/10/2025 3:45:09 PM
Program Version: StormWise 4.08.03

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

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

Output Time Increments

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

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 Fact: 0.5 dec
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 Opt: Global
Rainfall Name: ~ORANGE
Rainfall Amount: 10.60 in
Storm Duration: 24.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Simulation: 25YR24HR

Scenario: 001
Run Date/Time: 2/10/2025 3:45:13 PM
Program Version: StormWise 4.08.03

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

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

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

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
IA Recovery Time: 24.0000 hr

Max Iterations:	6		
Over-Relax Weight Fact:	0.5 dec	Ia/S:	0.20 dec
dZ Tolerance:	0.0010 ft		
Max dZ:	1.0000 ft	Smp/Man Basin Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft		
		Rainfall Name:	~ORANGE
		Rainfall Amount:	8.40 in
		Storm Duration:	24.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

Simulation: MEAN24HR

Scenario: 001
Run Date/Time: 2/10/2025 3:45:15 PM
Program Version: StormWise 4.08.03

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	24.0000

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

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	30.0000
0	0	0	8.0000	15.0000
0	0	0	14.0000	30.0000

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	IA Recovery Time:	24.0000 hr
Max Iterations:	6		
Over-Relax Weight Fact:	0.5 dec	Ia/S:	0.20 dec
dZ Tolerance:	0.0010 ft		
Max dZ:	1.0000 ft	Smp/Man Basin Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft		
		Rainfall Name:	~ORANGE
		Rainfall Amount:	5.00 in
		Storm Duration:	24.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

APPENDIX I – GEOTECHNICAL REPORT

Subsurface Soil Exploration
Proposed Residence Lots and Retention Pond
2518 Haas Road
Orange County, Florida

Ardaman & Associates, Inc.

CORPORATE HEADQUARTERS

8008 S. Orange Avenue, Orlando, Florida 32809 - Phone: (407) 855-3860 Fax: (407) 859-8121

Branch Office Locations

Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach
Louisiana: Baton Rouge, New Orleans, Shreveport
Texas: Houston

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

January 10, 2025
Ardaman File No. 24-6447

FLT Contractors, Inc.
7512 Dr. Phillips Boulevard, Suite 50748
Orlando, Florida 32819

Attention: Mr. Rommel Fontana

Subject: Subsurface Soil Exploration
Proposed Residence Lots and Retention Pond
2518 Haas Road
Orange County, Florida

Dear Mr. Fontana:

As requested and authorized, we have completed a shallow subsurface soil exploration for the subject project. The purposes of performing this exploration were to evaluate the general subsurface conditions within the residence lot and stormwater retention area, and to provide earthwork recommendations for mass grading of the residence lots. In addition, we have estimated the normal seasonal high groundwater level at the boring locations. This report documents our findings and presents our engineering recommendations.

SITE LOCATION AND SITE DESCRIPTION

The site for the proposed development is located on the west side of McGuire Road at the southwest corner of the intersection of McGuire Road and Haas Road, Orange County, Florida (Section 7, Township 20 South, Range 28 East). The general site location is shown superimposed on the Sorrento, Florida U.S.G.S. quadrangle map presented on Figure 1.

Portions of the site are covered with sparse to heavy grass and weeds, and portions of the site are covered with trees and brush. The site slopes downward from relatively higher elevations on the north and south ends to lower elevations in the approximate middle ⅓ of the site.

PROPOSED CONSTRUCTION AND GRADING

It is our understanding that the proposed development includes 2 single-family residence lots on the north portion of the site, and 2 single-family residence lots on the south portion of the property. Grading plans are not complete at this time, therefore we have assumed that 0 to 5 feet of cut and/or fill are required to grade the residence lots to final elevations. If actual building loads or fill height exceed our assumptions, then the recommendations in this report may not be valid.

We understand that the stormwater run-off is to be retained by means of a retention pond in the relatively low elevation portion of the site near the middle of the site.

REVIEW OF SOIL SURVEY MAPS

Based on information obtained online from the Web Soil Survey as operated by the U.S. Department of Agriculture Natural Resources Conservation Services, the site is located in an area mapped as the “Candler fine sand, 5 to 12 percent slopes” soil series.

The “Candler fine sand, 5 to 12 percent slopes”, soil series consists of strongly sloping upland soil. The internal drainage of the “Candler fine sand, 5 to 12 percent slopes” is excessive and the soil permeability is rapid in the surface and subsurface layers, and rapid to moderately rapid in the subsoil. According to the Soil Survey, the seasonal high water table for the “Candler fine sand, 5 to 12 percent slopes” soil series is typically at a depth of more than 80 inches below the natural ground surface.

FIELD EXPLORATION PROGRAM

SPT and Auger Borings

The field exploration program included performing 4 Standard Penetration Test (SPT) borings and 4 auger borings. The SPT borings were advanced to a depth of 10.5 feet below the existing ground surface generally using the methodology outlined in ASTM D-1586. A summary of this field procedure is included in the Appendix.

The auger borings were drilled using a truck-mounted, 4-inch diameter, continuous flight auger to depths of 10 and 20 feet below the existing ground surface. A summary of this field procedure is included in the Appendix.

Soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory in sealed sample jars.

The groundwater level at each of the boring locations was measured during drilling. The borings were backfilled with soil cuttings.

Field Permeability Test

A field permeability test was performed adjacent to Borings AB-3 and AB-4, generally following the procedures shown in the Florida Department of Transportation (FDOT) Soils and Foundations Handbook (2022 version). The field permeability test was performed by installing a solid-walled PVC casing snugly fit into a 4-inch diameter auger borehole. The bottom of the pipe was open and raised 1 foot above the bottom of the borehole. The bottom 1 foot of the borehole was gravel-packed. The pipe was then filled to the top with water. The test was performed as a "falling head" test in which the rate of water drop within the pipe was measured. The results of the permeability tests are presented in the Retention Pond section of this report.

Test Locations

The approximate locations of the borings are schematically illustrated on a site plan shown on Figure 2. These locations were determined in the field by Global Positioning System (GPS) utilizing hand-held GPS equipment and coordinates obtained from Google Earth Pro. Boring locations should be considered accurate only to the degree implied by the method of locating used. The permeability tests were conducted adjacent to Borings AB-3 and AB-4.

LABORATORY PROGRAM

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual examination and classification. The soil samples were classified using visual-manual procedures in general accordance with the Unified Soil Classification System (ASTM D-2488). The resulting soil descriptions are shown on the soil boring profiles presented on Figure 3.

In addition, we conducted 7 percent fines analyses (ASTM D-1140) on selected soil samples obtained from the borings. The results of these tests are presented adjacent to the sample depth on the boring profiles on Figure 3.

GENERAL SUBSURFACE CONDITIONS

General Soil Profile

The results of the field exploration and laboratory programs are graphically summarized on the soil boring profiles presented on Figure 3. The stratification of the boring profiles represents our interpretation of the field boring logs and the results of laboratory examinations of the recovered samples. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

The results of the borings indicate a general soil profile consisting of very loose to loose fine sand (SP) and fine sand with silt (SP-SM).

The above soil profile is outlined in general terms only. Please refer to Figure 3 for soil profile details.

Groundwater Level

We attempted to measure the groundwater level in the boreholes during drilling. As shown on Figure 3, groundwater was not encountered within the vertical reaches of the borings on the date indicated. However, this does not necessarily mean that groundwater would not be encountered within the vertical reach of the borings at some other time. Fluctuation in groundwater levels

should be anticipated throughout the year primarily due to seasonal variations in rainfall and other factors that may vary from the time the borings were conducted.

NORMAL SEASONAL HIGH GROUNDWATER LEVEL

The groundwater level is affected by a number of factors. The amount of rainfall and the drainage characteristics of the soils, the land surface elevation, relief points such as drainage ditches, lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the groundwater level.

The normal seasonal high groundwater level each year is the level in the August-September period at the end of the rainy season during a year of normal (average) rainfall. The water table elevations associated with a higher than normal rainfall and in the extreme case, flood, would be higher to much higher than the normal seasonal high groundwater level, and could occur at times outside of the August-September period. The normal high water levels would more approximate the normal seasonal high groundwater levels.

Based on our interpretation of the site conditions using our boring logs, we estimate the normal seasonal high groundwater level at the locations of Borings AB-3 and AB-4 to be deeper than 15 feet below ground surface, at the locations of the other six boring locations to be deeper than 8 feet below ground surface.

ENGINEERING EVALUATION AND RECOMMENDATIONS

General

Based on the results of the soil borings, the soils encountered in the borings are compatible with the proposed development. Deleterious soils such as organic muck and expansive clay were not encountered in the borings.

The following are our earthwork recommendations for mass grading in the residence lots. The recommendations are made as a guide for the design engineer, parts of which should be incorporated into the project's specifications. Additional exploration and evaluation should be performed in the footprints of the houses after site elevations and foundation loads are available.

Stripping and Grubbing/Root-Raking

The proposed structure areas (i.e., buildings and hardscape) of the residence lots plus a minimum margin of five feet, and any other areas of the residence lots where existing vegetation will not be preserved, should be stripped of all surface vegetation, stumps, debris, organic topsoil or other deleterious materials, as encountered.

After stripping, the site should be grubbed/root-raked such that roots with a diameter greater than ½ inch, stumps, or small roots in a dense state, are completely removed. The actual depth(s) of stripping and grubbing/root-raking must be determined by visual observation and judgment during the earthwork operation. Grubbing/root-raking should continue until determined to be adequate by Ardaman's representative who is monitoring the root-raking.

All existing foundations, slabs, asphalt, and any other underground structures should be removed from the proposed construction area. If pipes or any collapsible or leak prone utilities are not removed or completely filled (with grout or concrete), they might serve as conduits for subsurface erosion resulting in excessive settlements. Over-excavated areas resulting from the removal of underground structures and unsuitable materials should be backfilled in accordance with the fill soils section of this report.

Proof-rolling

We recommend proof-rolling the cleared surface to locate any unforeseen soft areas or unsuitable surface or near-surface soils, to increase the density of the upper soils, and to prepare the existing surface for the addition of the fill soils (as required). Proof-rolling of the structure areas, and any other areas in the residence lots where existing vegetation is not preserved, should consist of at least 10 passes of a compactor capable of achieving the density requirements described in the next paragraph. Each pass should overlap the preceding pass by 30 percent to achieve complete coverage. If deemed necessary, in areas that continue to "yield", remove all deleterious material and replace with clean, compacted sand backfill. The proof-rolling should occur after cutting and before filling. Proof-rolling should be monitored in the field by an Ardaman representative.

A density equivalent to or greater than 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value for a depth of 2 feet should be achieved beneath the stripped and grubbed ground surface. Additional passes and/or overexcavation and recompaction may be required if these minimum density requirements are not achieved. The soil moisture should be adjusted as necessary during compaction. Significant quantities of water may need to be added to the soil and to compaction.

Care should be exercised to avoid damaging any neighboring structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing condition (i.e., cracks) of the structures documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures, and Ardaman & Associates should be notified immediately. Heavy vibratory compaction should not be used within 200 feet of existing structures.

Suitable Fill Material and Compaction of Fill Soils

All fill materials should be free of organic materials, such as roots and vegetation. We recommend using fill with less than 10 percent by dry weight of material passing the U.S. Standard No. 200 sieve size. The fine sand and fine sand with silt (Strata No. 1 and 2 without roots, as shown on Figure 3) are suitable for use as fill materials and, with proper moisture control, should densify using conventional compaction methods. Soils with more than 10 percent passing the No. 200 sieve can be used in some applications, but will be more difficult to compact due to their inherent nature to retain soil moisture.

All structural fill should be placed in level lifts not to exceed 12 inches in uncompacted thickness. Each lift should be compacted to at least 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value. The filling and compaction operations should continue in lifts until the desired elevation(s) is achieved. If hand-held compaction equipment is used, the lift thickness should be reduced to no more than 6 inches.

The use of soils with relatively high fines content (i.e., silty and clayey soils) as fill should be avoided near the ground surface in green-space areas since these relatively low permeability soils promote ponding of water during and following rainfall.

Our fill soil recommendations do not apply to the stormwater pond vicinity as the pond designer should recommend types of fill, if any, in the stormwater pond vicinity to be compatible with the pond design.

Dewatering

If the control of the groundwater is required to achieve the necessary stripping and subsequent construction, backfilling, and compaction requirements presented in the preceding sections, the actual method(s) of dewatering should be determined by the contractor. However, regardless of the method(s) used, we suggest drawing down the water table sufficiently, say 2 to 3 feet, below the bottom of any excavation or compaction surface to preclude "pumping" and/or compaction-related problems with the foundation soils. The dewatering should be performed in advance of any excavation to minimize soil disturbance caused by water seeping into the excavation.

Retention Pond

We understand that a dry bottom retention pond is planned. For this study, soil conditions were explored in the proposed pond areas with 2 auger borings to a depth of 20 feet below the existing ground surface.

Soil Permeability

The fine sand and fine sand with silt (Strata 1 and 2 on Figure 3) are generally considered to be relatively permeable. No underlying soil was encountered within the vertical reaches of the borings that would be considered an aquitard for retention pond drawdown evaluation.

The results of the falling head field permeability tests are presented in the following table:

Test Location	Test Depth (feet)	Measured Permeability (feet/day)
AB-3	4 to 5	8.6
AB-4	3 to 4	14.1

It is noted that a suitable factor of safety should be used with these values. In addition, for the type of soils tested, a transformation ratio of 1 horizontal to 1 vertical is appropriate (i.e., the estimated ratio of horizontal to vertical permeability).

We recommend using a soil porosity of 30 percent for pond recovery calculations.

QUALITY ASSURANCE

We recommend establishing a comprehensive quality assurance program to verify that all site preparation and foundation and pavement construction is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by Ardaman & Associates.

As a minimum, an on-site engineering technician should monitor all stripping and grubbing to verify that deleterious materials have been removed and should observe the proof-rolling operation to verify that the appropriate number of passes are applied to the subgrade. In-situ density tests should be conducted during earthwork activities. In-situ density values should be compared to laboratory Proctor moisture-density results for each of the different natural and fill soils encountered.

IN-PLACE DENSITY TESTING FREQUENCY

In Central Florida, earthwork testing is typically performed on an on-call basis when the contractor has completed a portion of the work. The test result from a specific location is only representative of a larger area if the contractor has used consistent means and methods and the soils are practically uniform throughout. The frequency of testing can be increased and full-time

construction inspection can be provided to account for variations. We recommend that the following minimum testing frequencies be utilized.

For mass grading areas, a minimum frequency of one in-place density test for each 5,000 square feet of area should be used. In-place density testing should be performed at this minimum frequency for a depth of 2 feet below natural ground and for every 1-foot lift of fill placed in the structural area.

Representative samples of the various natural ground and fill soils should be obtained and transported to our laboratory for Proctor compaction tests. These tests will determine the maximum dry density and optimum moisture content for the materials tested and will be used in conjunction with the results of the in-place density tests to determine the degree of compaction achieved.

CLOSURE

The analyses and recommendations submitted herein are based on the data obtained from the soil borings presented on Figure 3. This report does not reflect any variations which may occur adjacent to or between the borings. The nature and extent of the variations between the borings may not become evident until during construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented in this report after performing on-site observations during the construction period and noting the characteristics of the variations.

In the event any changes occur in the design, nature, or location of the proposed development, we should review the applicability of conclusions and recommendations in this report. We recommend a general review of final design and specifications by our office to verify that earthwork recommendations are properly interpreted and implemented in the design specifications. Ardaman & Associates should attend the pre-bid and preconstruction meetings to verify that the bidders/contractor understand the recommendations contained in this report.

Because of Ardaman & Associates' familiarity with this site and the proposed development gained through performing the subsurface soil exploration and geotechnical engineering evaluation as presented in this report, Ardaman & Associates is best suited to provide monitoring and testing services during earthwork, and to provide continued evaluation and guidance during construction should variations in the soil conditions be encountered.

This study is based on a relatively shallow exploration and is not intended to be an evaluation for sinkhole potential. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface.

This report has been prepared for the exclusive use of FLT Contractors, Inc. in accordance with generally accepted geotechnical engineering practices for the purpose of providing subsurface

soil and groundwater level information for mass grading and stormwater retention pond design for the proposed single-family residential development. No other warranty, expressed or implied, is made.

We are pleased to be of assistance to you on this phase of the project. When we may be of further service to you or should you have any questions, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Florida Registry 5950

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Vice President
Florida License No. 38189

Chase L. Moscovitz, E.I.
Engineering Intern

CHARLES H. CUNNINGHAM LICENSE No. 38189 STATE OF FLORIDA PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY:

ON THE DATE ADJACENT TO THIS SEAL.

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THIS SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

ARDAMAN & ASSOCIATES, INC.
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CHARLES H. CUNNINGHAM, P.E. NO 38189

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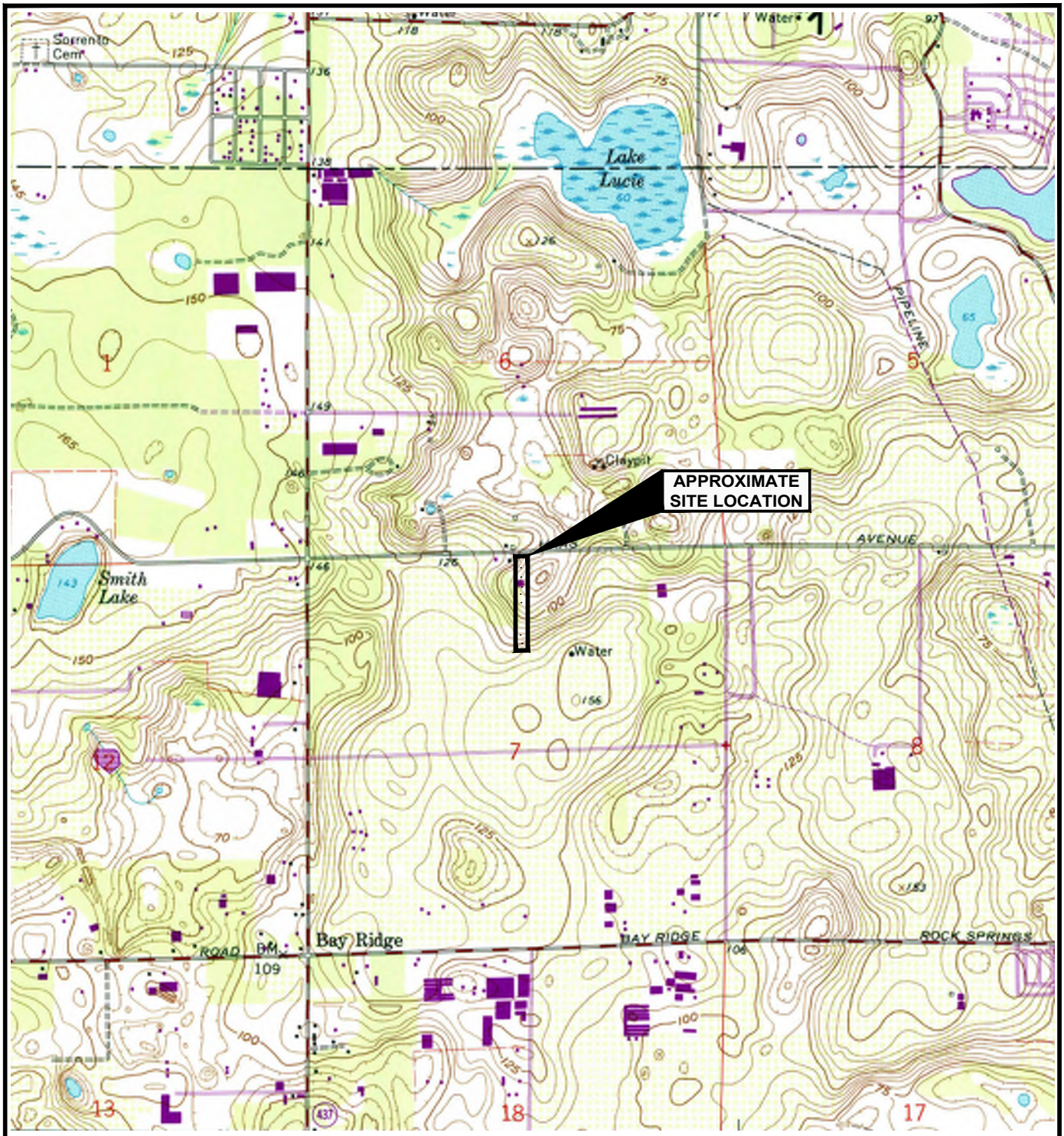
24-60-6447 FLT Contractors - Proposed Residence Lots and Retention Pond, 2518 Haas Road, Apopka.docx (Geo 2024)



SECTION 7
TOWNSHIP 20 SOUTH
RANGE 28 EAST

OBTAINED FROM U.S.G.S. QUAD MAP: SORRENTO, FLORIDA 1960
(PHOTOREVISED 1980)

N

0 1000 2000
SCALE: (FEET)

QUADRANGLE LOCATION

SITE LOCATION MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
PROPOSED RESIDENCE LOTS
2518 HAAS ROAD
ORANGE COUNTY, FLORIDA

DRAWN BY: BLS		DATE: 01/08/25
FILE NO. 24-6447	APPROVED BY: Charles H. Cunningham, P.E.	FIGURE: 1

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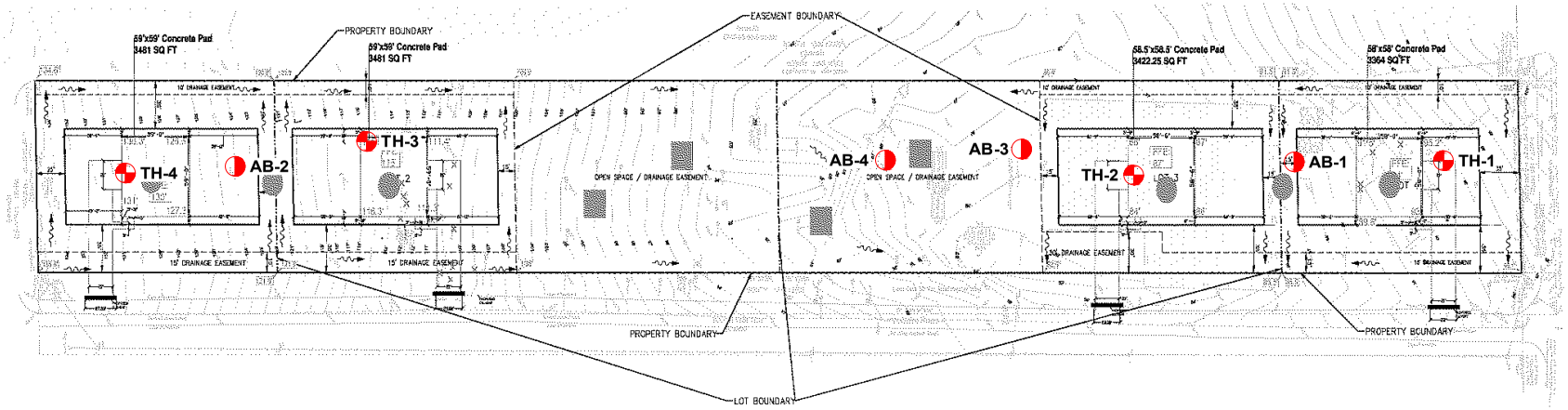

LEGEND

TH STANDARD PENETRATION TEST (SPT) BORING LOCATION

AB AUGER BORING LOCATION

NOTE: THE BASE MAP FOR THE BORING LOCATION PLAN IS A SITE PLAN BY LEONARDO QUITERIO, P.E.

N

0 50 100
SCALE: (FEET)

BORING LOCATION PLAN

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
PROPOSED RESIDENCE LOTS
2518 HAAS ROAD
ORANGE COUNTY, FLORIDA

DRAWN BY: BLS	DATE: 01/08/25
FILE NO. 24-6447	APPROVED BY: Charles H. Cunningham, P.E.
	FIGURE: 2

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LEGEND

SOIL DESCRIPTIONS		COLORS	
1	FINE SAND (SP)	A	BROWN
2	FINE SAND WITH SILT (SP-SM)	B	ORANGE-BROWN
3	ORGANIC TOPSOIL	C	ORANGE

TH STANDARD PENETRATION TEST (SPT) BORING

AB AUGER BORING

N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT

-200 PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)

GNE GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED

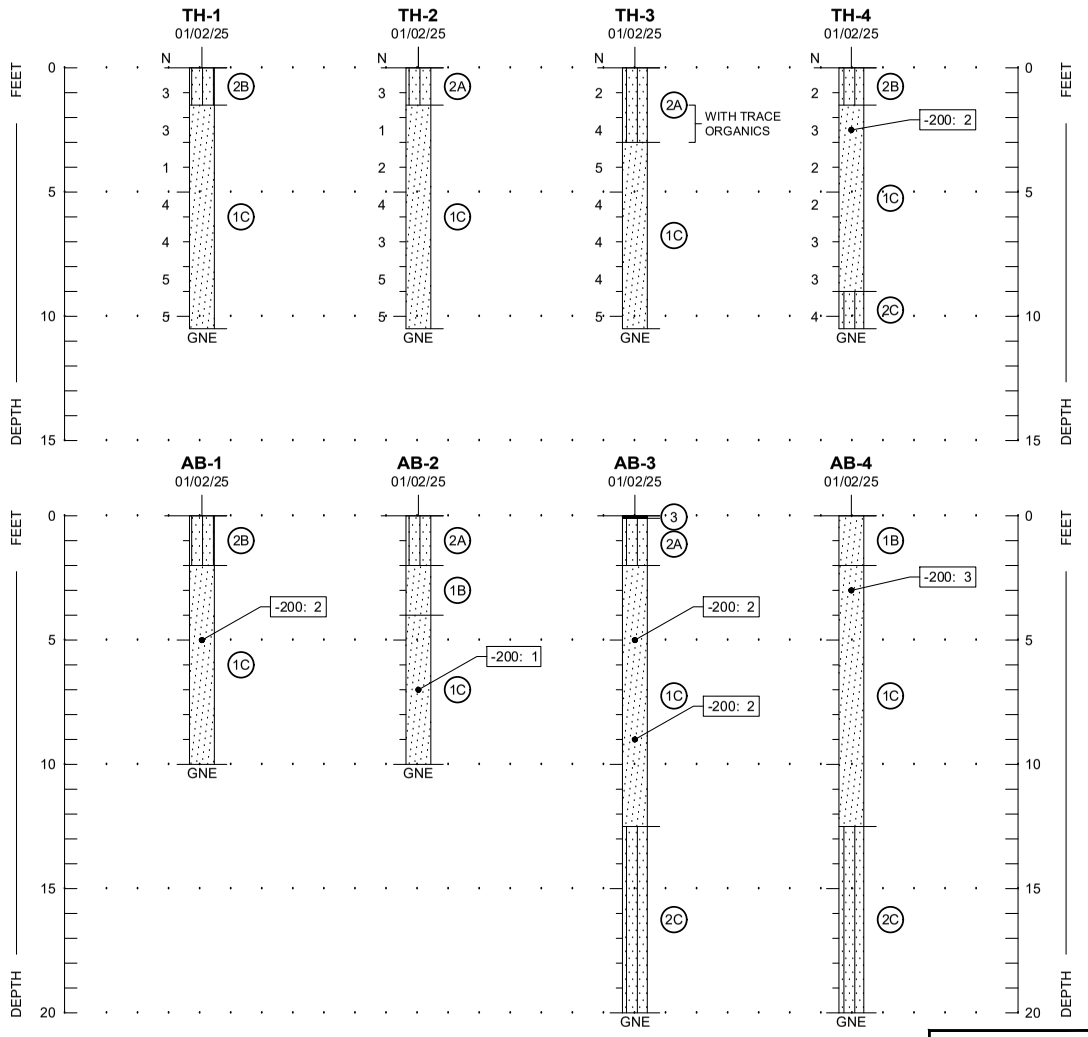
SP,SP-SM
SM,SC,CH UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

NOTE: UPON COMPLETION OF EACH SPT BORING, THE BOREHOLE WAS BACKFILLED WITH SOIL CUTTINGS.

GRANULAR MATERIALS-RELATIVE DENSITY	AUTOMATIC HAMMER SPT N-VALUE (BLOWS/FOOT)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM DENSE	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	**AUTOMATIC HAMMER SPT N-VALUE (BLOWS/FOOT)**
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR. ABSENCE OF WATER SURFACE DATA IN THE BORING IMPLIES THAT NO GROUNDWATER DATA IS AVAILABLE, BUT DOES NOT NECESSARILY MEAN THAT GROUNDWATER WILL NOT BE ENCOUNTERED AT THIS LOCATION OR WITHIN THE VERTICAL REACHES OF THIS BORING IN THE FUTURE.



SOIL BORING PROFILES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
PROPOSED RESIDENCE LOTS
2518 HAAS ROAD
ORANGE COUNTY, FLORIDA

DRAWN BY: CD	DATE: 01/08/25
FILE NO. 24-6447	APPROVED BY: Charles H. Cunningham, P.E.
	FIGURE: 3

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APPENDIX

Standard Penetration Test and Auger Boring Procedures

STANDARD PENETRATION TEST

The standard penetration test is a widely accepted test method of *in situ* testing of soils (ASTM D-1586), and Ardaman & Associates generally follows this test method. A 2-foot long, 2-inch O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 or 24 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties.

The tests are usually performed at 5-foot intervals. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is a bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid.

Representative split-spoon samples from the soils are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary.

AUGER BORINGS

Auger borings are used when continuous sampling of soil strata close to ground surface is desired. A 4-inch diameter, continuous flight, helical auger with a cutting head at its end is screwed into the ground in 5-foot sections. It is powered by the rotating action of the Kelly bar of a rotary drill rig. The sample is recovered by withdrawing the auger out of the ground without rotating it. The soil sample so obtained, is classified and representative samples put in bags or jars and brought back to the laboratory for further evaluation and testing, if necessary.