Stormwater Management System Report

CRS Marvin Burnett

Prepared For: Concept Development, Inc.

Submitted To: City of Lake City and Suwannee River Water Management District

Date: 03/20/2024
PN# 23-0653
PM: Randall S. Olney, P.E.

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CHW Professional Consultants

Engineer's Certification Statement

I hereby certify that the design of the stormwater management systems for the project known as CRS Marvin Burnett has been designed substantially in accordance with the City of Lake City, the Suwannee River Water Management District, and the Florida Department of Transportation applicable rules and regulations.

Randall Scott Olney, State of Florida, Professional Engineer, License No. 68382

This item has been electronically signed and sealed by Randall Scott Olney, PE. On 03/21/2024 using a Digital Signature.

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

Randall Scott Olney

Digitally signed by Randall Scott Olney
DN: E=randyo@chw-inc.com, CN=Randall Scott Olney, O=Randall Scott Olney, L=Alachua, S=Florida, C=US
Date: 2024.03.21 13:52:58-04'00'

Randall S. Olney, FL PE No. 68382

03/21/2024

Date

Causseaux, Hewett, & Walpole, Inc – Certificate of Authorization No. 0005075
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Introduction

The CRS Marvin Burnett project proposes the development of a ±10,640 sf commercial retail store with associated parking, stormwater, and utility infrastructure. The total proposed site area is ± 2.70 acres, located along the northwest corner of the intersection of State Road 47 and SW Marvin Burnett Road in Lake City, Florida.

The project site is located on a portion of tax parcel #07-4S-17-08127-005 according to the Columbia County Property Appraiser's website. Figure 1 provides a Location Map and Figure 2 depicts the site on a portion of the Lake City West USGS Quadrangle Map. The site is located in Section 7, Township 4 South, Range 17 East in Columbia County, Florida.

Refer to the accompanying engineering plans for details about the proposed construction and demolition regarding this project.

Design Criteria

The design criteria for the proposed stormwater management facility (SMF) is based upon the criteria set forth by the City of Lake City (CLC), the Suwannee River Water Management District (SRWMD), and the Florida Department of Transportation (FDOT) for a dry retention system design in a closed watershed. The criteria are as follows:

1. Provide Peak Discharge Rate Attenuation: Attenuate the post-development peak discharge rates to be less than the pre-development peak discharge rates for:
    a. The 100 year – 1 hour, 100 year – 2 hour, 100 year – 4 hour, 100 year – 8 hour, 100 year – 24 hour storm events (SRWMD).
    b. The 3, 5, 10, 25, 50, and 100-year frequency analysis of the 1, 2, 4, 8, 24, 72, 168, and 240-hr storm events (FDOT).

2. Provide Peak Discharge Volume Attenuation: Attenuate the post-development peak discharge volumes to be less than the pre-development peak discharge volume for:
    a. The 100 year – 1 hour, 100 year – 2 hour, 100 year – 4 hour, 100 year – 8 hour, 100 year – 24 hour storm events (SRWMD).
    b. The 3, 5, 10, 25, 50, and 100-year frequency analysis of the 1, 2, 4, 8, 24, 72, 168, and 240-hr storm events (FDOT).

3. Provide Water Quality Treatment Volume (WQTV): The minimum stormwater treatment volume shall be the runoff from the first 2.0 inch of runoff from the design storm. WQTV must be recovered within 72 hours (SRWMD).

4. Freeboard: Retention ponds shall have a freeboard of 1 foot above the maximum stage in order to function properly during storms greater than the design storm (SRWMD).

5. Provide Volume Recovery: Retention systems must have one-half of the total volume available within 7 days following the end of the design storm event, and the total volume must be recovered within 30 days following the end of the storm event (SRWMD and FDOT).

Alternatively, if recovery requirements cannot be met, back-to-back storms can be routed through the system (SRWMD).

6. Fencing: Any water retention areas that have a potential of holding water in excess of one (1) foot depth to be fenced with a four (4) foot high fence and screened by trees or shrubbery (CLC).

City of Lake City, SRWMD, and FDOT also require that best management practices be employed to control erosion, sedimentation, and that an operation and maintenance entity be established.

Site Characteristics

Physical characteristics of the site are described in the following sections. Additional details are provided in the accompanying Engineering plans.

Site Topography

The existing site is undeveloped and heavily wooded with existing pavement and structures that are to be removed. The project site is bordered by a single-family residence to the west, a church to the north, State Road 47 to the east, and Marvin Burnett Road to the south. The site is sloped from the northeast to the southwest. Site topography ranges from EL. ± 167.00' (NAVD 88) in the northeast corner of the site to EL. ± 152.60' (NAVD 88) in the southwest corner.

Please refer to the accompanying engineering plans for details.

Pre-Development Drainage

Pre-development drainage consists of two watersheds: Pre-Development Watershed #1 (Pre DA-1) and Pre-Development Watershed #2 (Pre DA-2). Pre DA-1 is ±2.03 acres in size and includes a portion of offsite area to the north of the site as well as most of the western portion of the project site. Stormwater runoff from Pre DA-1 flows via sheet flow and shallow concentrated flow to a natural low area along the western boundary of the site. Pre DA-2 is ±1.79 acres in size and includes offsite area to the north as well as the eastern portion of the project site. Stormwater runoff from Pre DA-2 flows via sheet flow and shallow concentrated flow into the SR-47 (FDOT) storm sewer system.

Refer to Figure 4 for a NRCS Soils Map. Refer to Figure 6 for more information on the pre-development watershed.

Post-Development Drainage

Post-Development drainage consists of two watersheds: Post-Development Watershed #1 (Post DA-1) and Post-Development Watershed #2 (Post DA-2). Post DA-1 comprises ±3.29 acres including ±0.93 acres of impervious area as well as a portion of offsite area. Stormwater runoff from Post DA-1 will be routed via sheet flow and shallow concentrated flow to a stormwater pipe conveyance system and into the proposed stormwater management facility (SMF-1). Post DA-2 comprises

±0.53 acres including ±0.02 acres of impervious area from a small portion of sidewalk. Stormwater runoff from Post DA-2 will be routed via sheet flow and shallow concentrated flow to the SR-47 (FDOT) storm sewer system as in the pre-development condition. The drainage area discharging to the FDOT system is greatly reduced in comparison to pre-development. Additionally, the CN of this area did not increase. Therefore, it is assumed that runoff rates and volumes have been reduced for each design storm event and these watersheds were not included in the drainage model.

SMF-1 is designed as a dry retention facility that will retain and infiltrate the difference between pre-development and post-development runoff volume. The top of bank for SMF-1 is set at EL. 160.00' while the bottom of pond is at EL. 157.00' with 4:1 side slope. The resulting total storage volume is ±49,744 cf. An underdrain system is proposed to lower the seasonal high-water table and meet recovery requirements. An outfall structure has been provided, which enables discharge to the existing depression beyond the western border of the site, mimicking the pre-development drainage patterns.

Refer to Figure 7 for more information on the post-development watershed.

Soils Information

The National Resource Conservation Service (NRCS) Soil Survey for Columbia County describes the near surface soil profile for the project area as *Blanton fine sand* (0 – 5% slopes) of hydrologic soil group rating of 'A', *Ichetucknee fine sand* (5 – 8% slopes) of hydrologic soil group rating of 'D', *Mascotte fine sand* of hydrologic soil group rating of 'B/D', *Pelham fine sand* (0 – 2% slopes) of hydrologic soil group rating of 'B/D'. Refer to Figure 4 for the NRCS Soils Map.

A site-specific soils investigation was conducted by GSE Engineering & Consulting, Inc. on October 11th, 2023 and the report was later revised on December 7th, 2023. Based on the Summary Report of Geotechnical Site Exploration, the following design parameters were recommended for the stormwater management facility calculations. Refer to Appendix C for further details.

SMF-1

- Average ground elevation of borings within proposed SMF-1 area: 156.70' (NAVD 88)
- Base elevation of effective or mobilized aquifer: 148.70' (NAVD 88)
- Average seasonal high groundwater table elevation: *152.99' (NAVD 88)
- Horizontal hydraulic conductivity: 10 feet per day (5 feet per day used in calculations)
- Unsaturated vertical infiltration rate: 10 feet per day (5 feet per day used in calculations)
- Specific yield (fillable porosity): 20%

*Seasonal high-water table established based on highest invert of the underdrain system.

Drainage Analysis

The proposed stormwater management system (SMF-1) has been designed to provide attenuation of the discharge rates and volumes for the 100 year – 1 hour, 100 year – 2 hour, 100 year – 4 hour, 100 year – 8 hour, and 100 year – 24 hour storm events. Since the portion of the site draining towards the FDOT ROW (Post DA-2) is minimal and has been reduced from its pre- development

condition (Pre DA-2), the FDOT storms were not modeled. SMF-1 should recover one-half of the total volume available within 7 days following the end of the design storm event, and the total volume must be recovered within 30 days. Additionally, the stormwater management system is designed to retain the water quality treatment volume and recover this volume within 72 hours.

Appendix A contains details and calculations as well as a section for routing results, recovery analysis, hydraulic calculations, and general drainage calculations.

Analysis Methodology

The drainage analysis was conducted using the computer program PONDS (v3.3) to generate runoff hydrographs and route the runoff hydrographs through the proposed stormwater system. The required storm events were analyzed using SRWMD rainfall amounts for the pre-development and post-development watersheds.

Unit Hydrograph Parameters

Unit hydrograph parameters required for the drainage analysis include run-off curve number (CN), time of concentration (Tc), and drainage area. Values used in the analysis are summarized as follows:

<u>Pre-Development Watershed #1 (Pre DA-1):</u>

Watershed Area =	2.03 ac.
Impervious Area (Existing) =	0.02 ac.
Woods (Good, Type 'A' Soil) =	0.47 ac.
Woods (Good, Type 'D' Soil) =	1.55 ac.

CN = 66
Tc = 29 min.

<u>Post-Development Watershed #1 (Post DA-1):</u>

Watershed Area =	3.29 ac.
Impervious Area =	0.93 ac.
Stormwater Management Facility =	0.45 ac.
Open Space (Good, Type 'A' Soil) =	1.29 ac.
Open Space (Good, Type 'D' Soil) =	0.62 ac.

CN = 72
Tc = 10 min.*

*Time of Concentration is assumed to be 10 minutes.

Pond Storage

Stage-storage values for the proposed stormwater management facilities are provided in Appendix A.

Water Quality Treatment Volume (WQTV)

Per SRWMD, the required water quality treatment volume (WQTV) required for a dry retention system is 2.0 inch of runoff over the drainage area, that must draw down within 72 hours. The WQTV calculations and modeling results are summarized in Table 1, additional details can be found in appendix A.

Table 1: Post Development Watershed Water Quality Treatment

Stormwater Management Facility	Required WQTV (cf)	Peak Elevation at WQTV (ft)	Time to Recover WQTV (hours)
SMF-1	12,483	157.87	< 6

Run-off and Facility Routing Results

The routing results for Pre DA-1 and Post DA-1 (SMF-1) are summarized in Tables 2 and 3. Table 2 displays the peak stage, freeboard, and recovery time for the analyzed storm events, while Table 3 displays the discharge rates and volumes for pre and post-development. Detailed results and calculations are provided in Appendix A.

Table 2: Pre DA-1 vs. Post DA-1 Routing Results

Storm Event	Peak Stage (ft.)	Freeboard (ft)	Full Volume Recovery (days after storm)
SRWMD 100YR-1HR	158.14	1.86	< 1
SRWMD 100YR-2HR	158.35	1.65	< 1
SRWMD 100YR-4HR	158.46	1.54	< 1
SRWMD 100YR-8HR	158.61	1.39	< 4
SRWMD 100YR-24HR	158.78	1.22	< 7

Table 3: Pre DA-1 vs. Post DA-1 Attenuation Results

Storm Event	Discharge Rates (cfs)			Discharge Volumes (cf)		
	Pre	Post	Change	Pre	Post	Change
SRWMD 100YR-1HR	4.27	0.31	-3.96	8,901	463	-8439
SRWMD 100YR-2HR	5.47	1.28	-4.19	13,242	4,512	-8730
SRWMD 100YR-4HR	6.46	1.93	-4.53	18,428	10,552	-7876
SRWMD 100YR-8HR	7.25	3.00	-4.25	25,727	17,171	-8556
SRWMD 100YR-24HR	6.67	4.28	-2.39	40,983	37,974	-3009

Summary and Conclusions

The proposed drainage system meets CLC, SRWMD, and FDOT criteria for dry retention system designs in a closed watershed. The criteria are as follows:

1. Provide Peak Discharge Rate Attenuation: SMF-1 attenuates the post-development peak discharge rates to be less than the pre-development peak discharge rates for:
    a. The 100 year – 1 hour, 100 year – 2 hour, 100 year – 4 hour, 100 year – 8 hour, 100 year – 24 hour storm events (SRWMD).
    b. The 3, 5, 10, 25, 50, and 100-year frequency analysis of the 1, 2, 4, 8, 24, 72, 168, and 240-hr storm events (FDOT).

2. Provide Peak Discharge Volume Attenuation: SMF-1 attenuates the post-development peak discharge volumes to be less than the pre-development peak discharge volume for:
    a. The 100 year – 1 hour, 100 year – 2 hour, 100 year – 4 hour, 100 year – 8 hour, 100 year – 24 hour storm events (SRWMD).
    b. The 3, 5, 10, 25, 50, and 100-year frequency analysis of the 1, 2, 4, 8, 24, 72, 168, and 240-hr storm events (FDOT).

3. Provide Water Quality Treatment Volume (WQTV): SMF-1 has been designed to retain the runoff from the first 2.0 inch of runoff from the design storm. WQTV is recovered within 72 hours. (SRWMD).

4. Freeboard: SMF-1 provides 1 foot of freeboard above the maximum stage in order to function properly during storms greater than the design storm (SRWMD).

5. Provide Volume Recovery: SMF-1 provides half of the total available volume within 7 days after the end of all storm events, and provides the total available volume within 30 days after the end of all storm events (SRWMD and FDOT).

6. Fencing: SMF-1 has the potential to hold water in excess of one (1) foot depth, therefore a (4) foot high fence and sufficient screening by trees and shrubbery is proposed. (CLC).

Based on the information provided, the project is eligible for approval by City of Lake City, SRWMD, and FDOT.

Figure 1

Project Location Map

Project Location Map
CRS Marvin Burnett

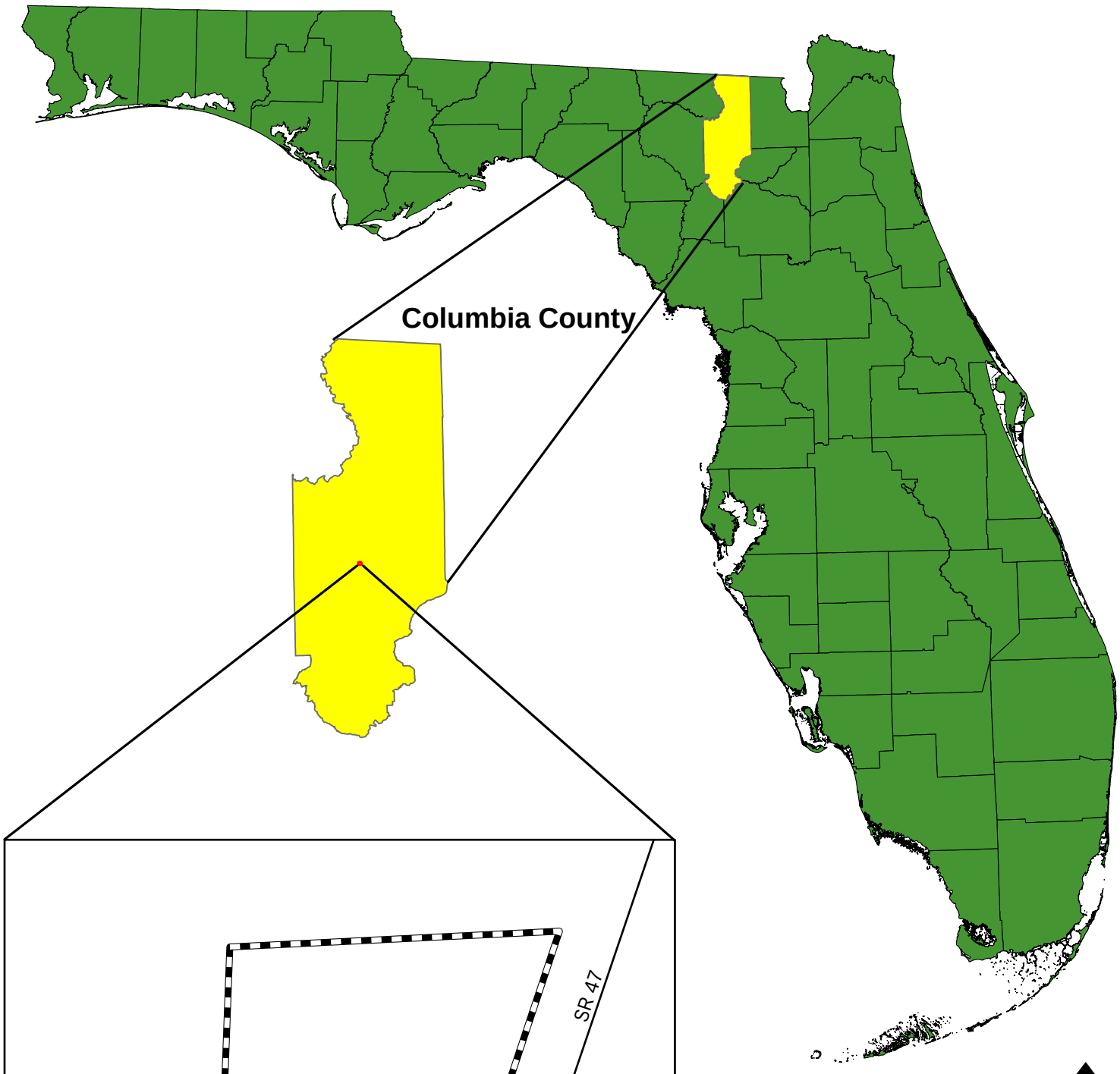

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Figure 2

USGS Quadrangle Map

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CRS Marvin Burnett Quad Map

0 600 1,200
Feet

NORTH

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Figure 3

Aerial Map

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CRS Marvin Burnett Aerial Map

0 60 120
Feet

NORTH

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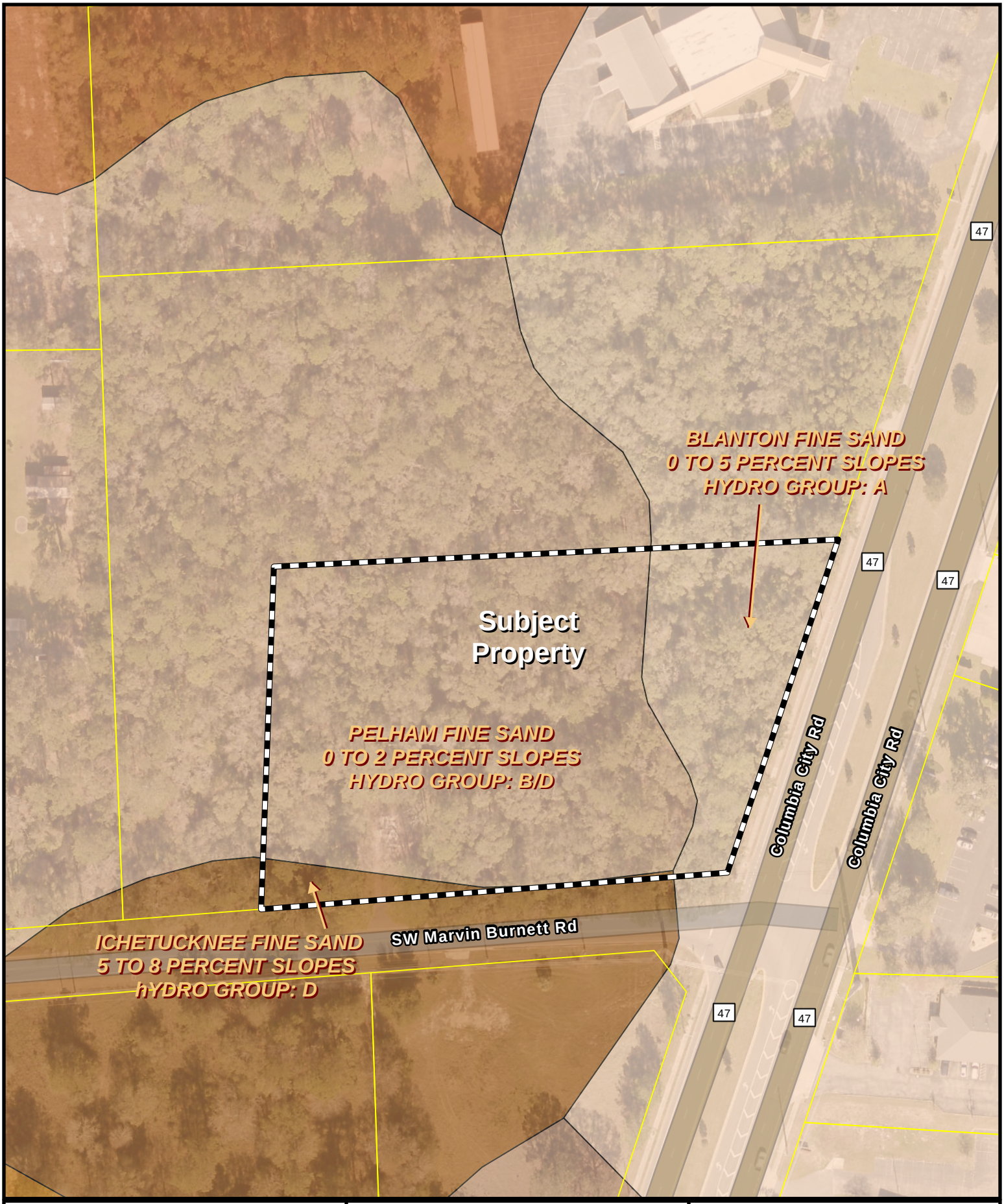
Figure 4

NRCS Soils Map



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CRS Marvin Burnett
NRCS Soils Map

0 60 120
Feet

NORTH

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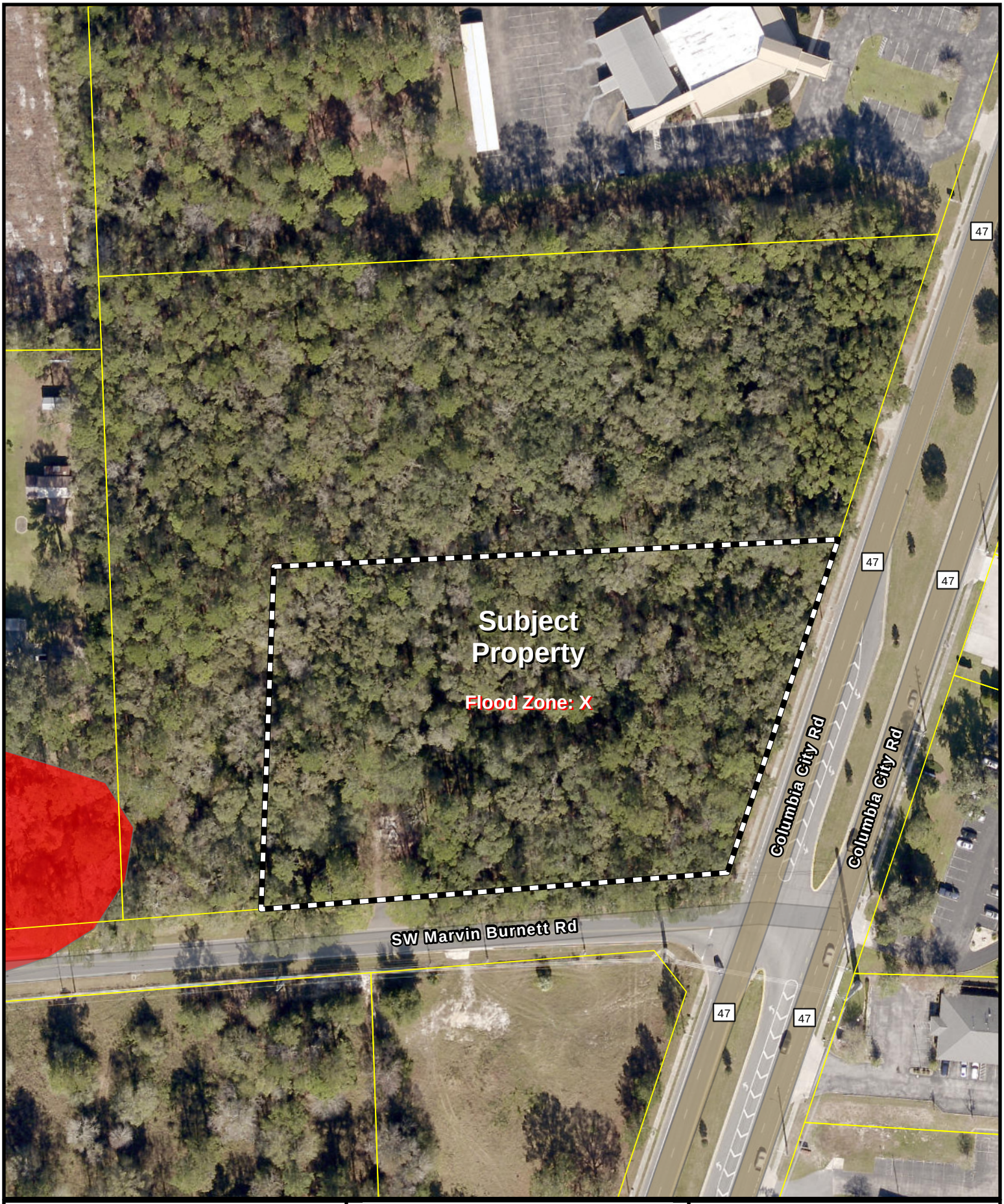
Figure 5

FEMA Flood Map



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CRS Marvin Burnett
FEMA Flood Map

0 60 120
Feet

NORTH

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Figure 6

Pre-Development Drainage Map

LEGEND

PRE-DEVELOPMENT WATERSHED 1 (PRE DA-1) BOUNDARY:

PRE-DEVELOPMENT WATERSHED 2 (PRE DA-2) BOUNDARY:

EXISTING IMPERVIOUS AREA TO BE REMOVED:

PRE-DEVELOPMENT DRAINAGE FLOW PATTERNS:

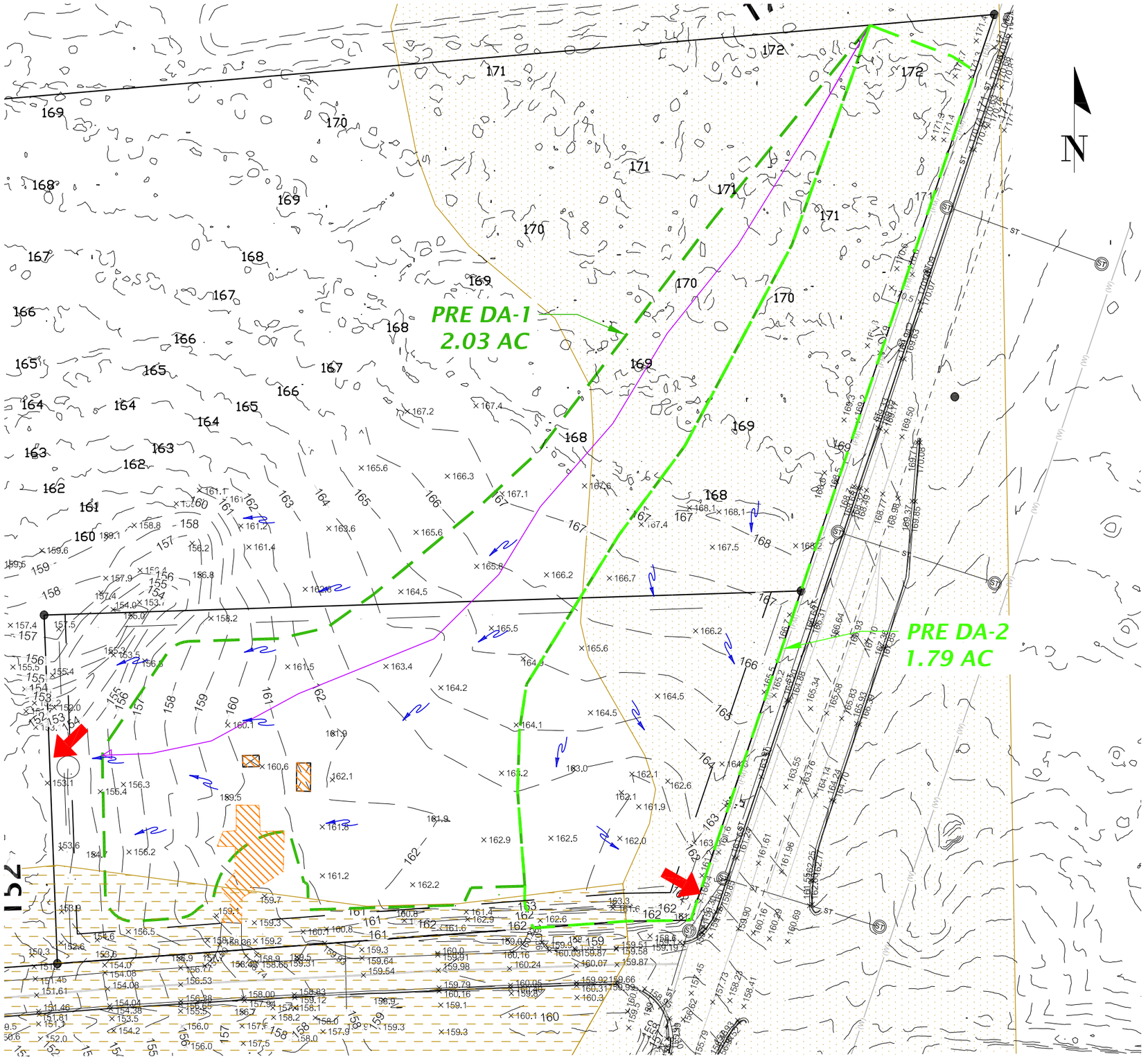
PRE-DEVELOPMENT TIME OF CONCENTRATION

PRE-DEVELOPMENT DISCHARGE POINT:

TYPE 'A' SOILS

TYPE 'D' SOILS

NOTE: ALL SOILS ARE TYPE 'B/D' UNLESS OTHERWISE NOTED



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SCALE: 1"=75'

VERIFY SCALE BAR IS CORRECT FOR ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY.

SUBMITTALS:

CLIENT: CONCEPT COMPANIES, LLC.

PROJECT: CRS MARVIN BURNETT

SHEET TITLE: PRE-DEVELOPMENT DRAINAGE MAP

TECHNICIAN: CCM

DESIGNER: CCM

QUALITY CONTROL: RSO

PROJECT NUMBER: 23-0653

SHEET NO.: FIGURE 1

Figure 7

Post-Development Drainage Map

LEGEND

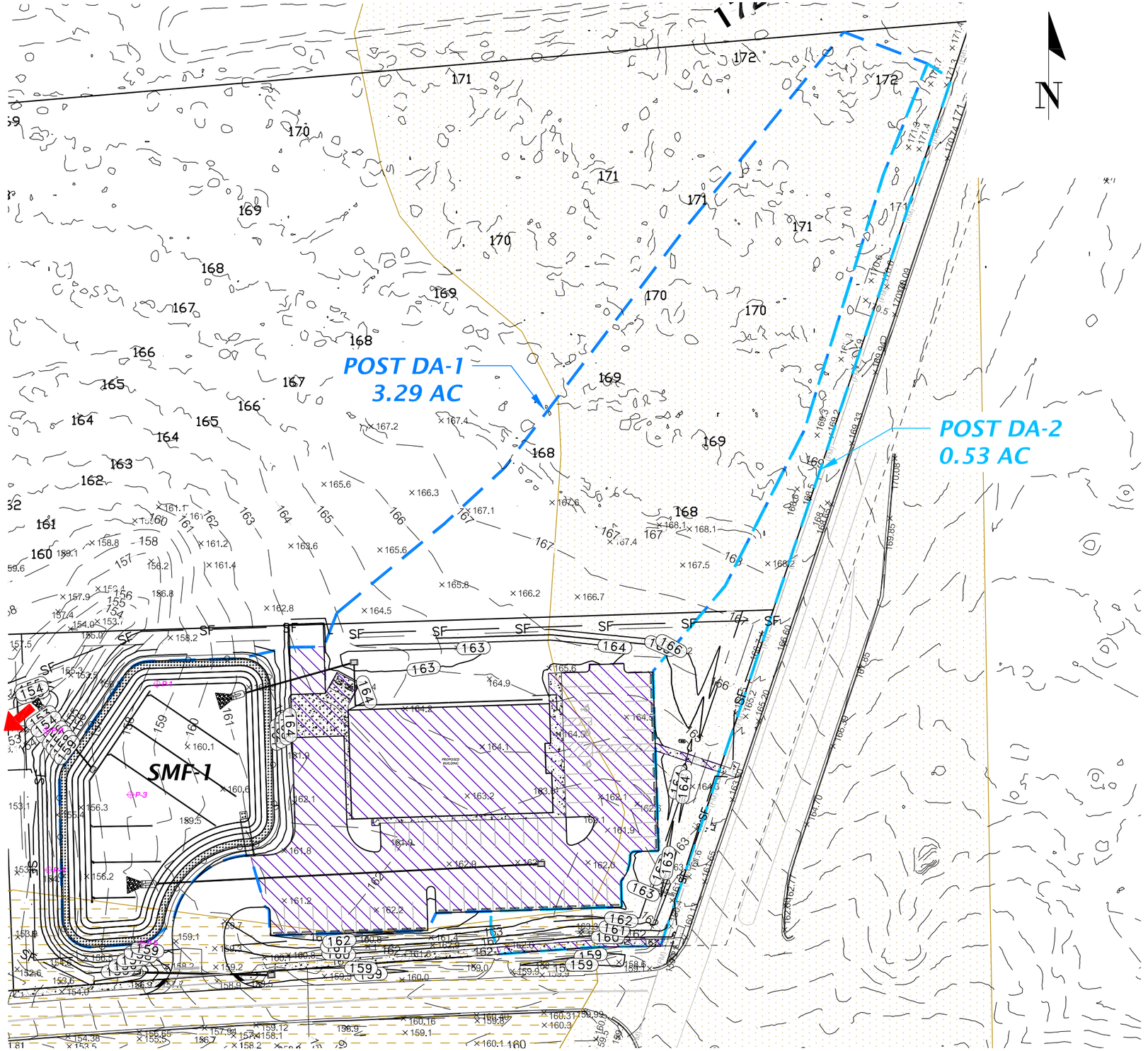
POST-DEVELOPMENT WATERSHED 1 (POST DA-1) BOUNDARY:

POST-DEVELOPMENT WATERSHED 2 (POST DA-2) BOUNDARY:

POST-DEVELOPMENT DISCHARGE POINT:

PROPOSED ONSITE IMPERVIOUS AREA:

SOIL BORING LOCATION: P-4



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SCALE: 1"=75'

VERIFY SCALE BAR IS CORRECT FOR ORIGINAL DRAWING.

IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY.

CONSTRUCTION RECORDS

SUBMITTALS

CLIENT: CONCEPT COMPANIES, LLC.

PROJECT: CRS MARVIN BURNETT

SHEET TITLE: POST-DEVELOPMENT DRAINAGE EXHIBIT

TECHNICIAN: CCM

DESIGNER: CCM

QUALITY CONTROL: RSO

PROJECT NUMBER: 23-0653

SHEET NO: FIGURE 2

Appendix A

Drainage Calculations and
Computer Model Output

Project Number: 23-0653
Project Name: CRS Marvin Burnett
Calculated by: JHP
Checked by: CCM
Date: 1/4/2024

CURVE NUMBER CALCULATIONS:

Pre DA-1								
Total Area:	88,582	s.f.	2.03	ac.	CN	CN * Area	C	C * Area
Woods (Good, Group "A" Soil)	20,340	s.f.	0.47	ac.	30	610200	0.2	4068
Woods (Good, Group "D" Soil)	67,311	s.f.	1.55	ac.	77	5182947	0.2	13462.2
Exisitng Impervious Area	931	s.f.	0.02	ac.	98	91238	0.95	884.45

Weighted C: **0.21**
Weighted CN: **66**
Time of Concentration: **29** minutes

Post DA-1								
Total Area:	143,411	s.f.	3.29	ac.	CN	CN * Area	C	C * Area
Open Space (Good, Group "A" Soil)	56,007	s.f.	1.29	ac.	39	2184273	0.2	11201.4
Open Space (Good, Group "D" Soil)	27,102	s.f.	0.62	ac.	80	2168160	0.2	5420.4
Impervious Area	40,483	s.f.	0.93	ac.	98	3967334	0.95	38458.85
Stormwater Management Facility	19,819	s.f.	0.45	ac.	100	1981900	1	19819

Weighted C: **0.52**
Weighted CN: **72**
Time of Concentration: **10** minutes

WQTV CALCULATIONS: SMF-1 (Dry Retention)

SRWMD WQTV Calculation:		
Runoff from the first 2.0" of rainfall		
2" x Drainage Area:	23901.83	c.f.
C =	**0.52**	
SRWMD WQTV:	**12,483**	**c.f.**

Pre DA-2						
Total Area:	77,911	s.f.	1.79	ac.	CN	CN * Area
Woods (Good, Group "A" Soil)	62,699	s.f.	1.44	ac.	30	1880970
Woods (Good, Group "D" Soil)	15,212	s.f.	0.35	ac.	77	1171324

Weighted CN: **39**

Post DA-2						
Total Area:	23,090	s.f.	0.53	ac.	CN	CN * Area
Woods (Good, Group "A" Soil)	9,873	s.f.	0.23	ac.	30	296190
Open Space (Good, Group "A" Soil)	11,246	s.f.	0.26	ac.	39	438594
Open Space (Good, Group "D" Soil)	1,162	s.f.	0.03	ac.	80	92960
Impervious Area	809	s.f.	0.02	ac.	98	79282

Weighted CN: **39**

Project Number: 23-0653
Project Name: CRS Marvin Burnett
Calculated by: JHP
Checked by: CCM
Date: 1/4/2024

Tc CALCULATIONS:

	SHEET FLOW					SHALLOW CONCENTRATED FLOW					CHANNEL / PIPE FLOW										
BASIN	Manning's n (--)	Flow Length L (ft)	2-Year 24-Hour Rain, P2 (in)	Land Slope s (ft/ft)	Tt1 (hr)	Paved or Unpvd. (P or U)	Flow Length L (ft)	Water-course Slope, s (ft/ft)	Avg. Velocity V (ft/s)	Tt2 (hr)	Cross-Section Area, a (ft^2)	Wetted Perim. Pw (ft)	Hydraulic Radius r (ft)	Pipe Slope s (ft/ft)	Manning n (--)	Avg. Velocity V (ft/s)	Flow Length L (ft)	Tt3 (hr)	ID #	Tc (hr)	Tc (min)
Pre DA-1	0.4	100	4.2	0.011	**0.40**	U	694	0.023	2.44	**0.08**	-	-	-	-	-	-	-	**-**	PRE DA-1	0.48	**29**

If Tc less than 10 minutes, 10 minutes was assumed per FDOT standards

TIME OF CONCENTRATION VALUES DETERMINED USING TR-55 METHODOLOGY.

SHEET FLOW:

$$Tt = \frac{0.007\,(nL)^{0.8}}{(P2)^{0.5}s^{0.4}}$$

SHALLOW CONCENTRATED FLOW:

1. For slopes < 0.005 ft/ft
   Unpaved $V=16.1345\,s^{0.5}$
   Paved $V=20.3282\,s^{0.5}$

2. For slopes > 0.005 ft/ft
Velocity per Figure 3-1, TR-55

CHANNEL/PIPE FLOW:

$$V = \frac{1.49r^{2/3}s^{1/2}}{n}$$

$$Tt = \frac{L}{3600\,V}$$

Project Number: 23-0653
Project Name: CRS Marvin Burnett
Calculated by: JHP
Checked by: CCM
Date: 1/4/2024

STAGE-STORAGE CALCULATIONS:

Post-Development: SMF-1 Stage-Storage Relationship				
ELEV.	**AREA (SF)**	**AREA (AC.)**	**STORAGE (CF)**	**STORAGE VOLUME (AC-FT)**
157.00	13,469	0.3092	0	0.00
158.00	15,494	0.3557	14,482	0.33
159.00	17,606	0.4042	31,032	0.71
160.00	19,819	0.4550	49,744	1.14

Geotech Borings	
Boring #	Ex. Grade EL.
P-1	158.50
P-2	154.00
P-3	158.00
P-4	154.75
P-5	158.25
Avg.	**156.70**

WQTV =	12,483	cf	SHWT =	*152.99	ft
WQTV EL. =	157.86	ft	Confining Layer =	148.70	ft
			Kv =	5.00	ft/day
Weir Elevation =	158.00	ft	Kh =	5.00	ft/day
			Porosity =	20	%
Eq. Length =	200	ft			
Eq. Width =	83	ft	Depth =	3.00	ft
			Perimeter =	566	ft

*Established based on Invert of Underdrain System

Project Number: 23-0653
Project Name: CRS Marvin Burnett
Calculated by: JHP
Checked by: CCM
Date: 1/4/2024

PIPE CALCS: CRS Marvin Burnett (23-0653)

Structure No.		Invert Elev.		Length	Slope	Dia.	C	Tc	i	A	A	Q (cfs) Actual		Q Allowed	Pipe A	V - Full Flow	Pipe R	Minor Loss	Minor Loss	Loss	HGL		ToG/ EoP	F.B.
From	To	U.S.	D.S.	(ft)	(ft/foot)	(in)		(min)	(in/hr)	(sf)	(ac)	Inc	Cumul	(cfs)	(sq-ft)	(fps)	(ft)	Coeff.	(ft)	(ft)	U.S.	D.S.		(in)
S-2	S-1	158.38	157.00	277	0.0050	15	0.95	10	6.2	18163	0.42	2.5	2.5	4.94	1.2	4.0	0.31	0.5	0.03	0.3	158.51	158.14	162.23	45
C/O-1	C/O-2	160.61	159.96	65	0.0100	12	0.95	10	6.2	3547	0.08	0.5	0.5	3.86	0.8	4.9	0.25	0.5	0.00	0.0	160.93	160.91	163.72	34
C/O-2	C/O-3	159.96	159.30	65	0.0102	12	0.95	10	6.2	3547	0.08	0.5	1.0	3.89	0.8	5.0	0.25	0.5	0.01	0.0	160.91	160.86	163.85	35
C/O-3	S-4	159.30	159.00	30	0.0100	12	0.95	10	6.2	3547	0.08	0.5	1.4	3.86	0.8	4.9	0.25	0.8	0.04	0.0	160.86	160.78	164.03	38
S-4	S-3	159.00	157.00	86	0.0233	15	0.80	10	6.2	76339	1.75	8.7	10.1	10.67	1.2	8.7	0.31	0.8	0.85	1.8	160.78	158.14	162.12	16

1. ToG = Top of Grate/EoP = Edge of Pavement
2. FB = Free Board
3. Rainfall intensity is based on the FDOT Zone 3 Rainfall Intensity-Duration-Frequency curve for the 3 year - 10 min storm event (6.2 inches/hr)
4. The tailwater condition was set at the peak stage for the 100 year - 1 hour storm event of the receiving SMF.

Pre-Development Model

PONDS Version 3.3.0241
Retention Pond Recovery - Refined Method
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Project Data

Project Name:	CRS Marvin Burnett
Simulation Description:	Pre-Development
Project Number:	23-0653
Engineer :	Jarrett Pearson
Supervising Engineer:	Cole Menhennett
Date:	12-28-2023

Scenario Input Data

Scenario 1 :: SRWMD 100YR-1HR

Hydrograph Type: Inline SCS
• **Modflow Routing: Not routed**
Repetitions: 1

Basin Area (acres)	2.030
Time Of Concentration (minutes)	29.0
DCIA (%)	0.0
Curve Number	66
Design Rainfall Depth (inches)	4.2
Design Rainfall Duration (hours)	1.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 154.70 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 2 :: SRWMD 100YR-2HR

Hydrograph Type: Inline SCS
• **Modflow Routing: Not routed**
Repetitions: 1

Basin Area (acres)	2.030
Time Of Concentration (minutes)	29.0
DCIA (%)	0.0
Curve Number	66
Design Rainfall Depth (inches)	5.1
Design Rainfall Duration (hours)	2.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 154.70 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 3 :: SRWMD 100YR-4HR

Hydrograph Type: Inline SCS
• **Modflow Routing: Not routed**
Repetitions: 1

Basin Area (acres)	2.030
Time Of Concentration (minutes)	29.0
DCIA (%)	0.0
Curve Number	66
Design Rainfall Depth (inches)	6.1
Design Rainfall Duration (hours)	4.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 154.70 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 4 :: SRWMD 100YR-8HR

Hydrograph Type: Inline SCS
• **Modflow Routing: Not routed**
Repetitions: 1

Basin Area (acres)	2.030
Time Of Concentration (minutes)	29.0
DCIA (%)	0.0
Curve Number	66
Design Rainfall Depth (inches)	7.4
Design Rainfall Duration (hours)	8.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 154.70 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 5 :: SRWMD 100YR-24HR

Hydrograph Type: Inline SCS
• **Modflow Routing: Not routed**
Repetitions: 1

Basin Area (acres)	2.030
Time Of Concentration (minutes)	29.0
DCIA (%)	0.0
Curve Number	66
Design Rainfall Depth (inches)	9.8
Design Rainfall Duration (hours)	24.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 154.70 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Sort-By-Category Report

Scenarios Considered: 1 to 5

Discharge - Rate - Maximum Positive

Rank	Scenario Number	Maximum Positive Discharge Rate (ft^3/s)	Time (hours)	Description
1	4	7.25	4.25	SRWMD 100YR-8HR
2	5	6.67	12.12	SRWMD 100YR-24HR
3	3	6.46	2.32	SRWMD 100YR-4HR
4	2	5.47	1.35	SRWMD 100YR-2HR
5	1	4.27	0.84	SRWMD 100YR-1HR

Discharge - Cumulative Volume - Maximum Positive

Rank	Scenario Number	Maximum Positive Cumulative Discharge Volume (ft^3)	Time (hours)	Description
1	5	40983.17	25.58	SRWMD 100YR-24HR
2	4	25726.74	9.60	SRWMD 100YR-8HR
3	3	18428.31	5.54	SRWMD 100YR-4HR
4	2	13241.67	3.61	SRWMD 100YR-2HR
5	1	8901.35	2.58	SRWMD 100YR-1HR

Post-Development Model

PONDS Version 3.3.0241
Retention Pond Recovery - Refined Method
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Project Data

Project Name:	CRS Marvin Burnett
Simulation Description:	Post-Development DA-1
Project Number:	23-0653
Engineer :	Jarrett Pearson
Supervising Engineer:	Cole Menhennett
Date:	01-04-2024

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	148.70
Water Table Elevation, [WT] (ft datum):	152.99
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	5.00
Fillable Porosity, [n] (%):	20.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day):	5.0
Maximum Area For Unsaturated Infiltration, [Av] (ft²):	19819.0

Geometry Data

Equivalent Pond Length, [L] (ft):	200.0
Equivalent Pond Width, [W] (ft):	83.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
157.00	13469.0
158.00	15494.0
159.00	17606.0
160.00	19819.0

Discharge Structures

Discharge Structure #1 is active as weir

Structure Parameters

Description: WQTV

Weir elevation, (ft datum):	158.00
Weir coefficient:	3.13
Weir length, (ft):	2
Weir exponent:	1.5

Tailwater - disabled, free discharge

Discharge Structure #2 is inactive

Discharge Structure #3 is inactive

Scenario Input Data

Scenario 1 :: SRWMD 100YR-1HR

Hydrograph Type:	Inline SCS
Modflow Routing:	Routed with infiltration
Repetitions:	1

Basin Area (acres)	3.290
Time Of Concentration (minutes)	10.0
DCIA (%)	0.0
Curve Number	72
Design Rainfall Depth (inches)	4.2
Design Rainfall Duration (hours)	1.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 152.99 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 2 :: SRWMD 100YR-2HR

Hydrograph Type:	Inline SCS
Modflow Routing:	Routed with infiltration
Repetitions:	1

Basin Area (acres)	3.290
Time Of Concentration (minutes)	10.0
DCIA (%)	0.0
Curve Number	72
Design Rainfall Depth (inches)	5.1
Design Rainfall Duration (hours)	2.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 152.99 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 3 :: SRWMD 100YR-4HR

Hydrograph Type:	Inline SCS
Modflow Routing:	Routed with infiltration
Repetitions:	1

Basin Area (acres)	3.290
Time Of Concentration (minutes)	10.0
DCIA (%)	0.0
Curve Number	72
Design Rainfall Depth (inches)	6.1
Design Rainfall Duration (hours)	4.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 152.99 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 4 :: SRWMD 100YR-8HR

Hydrograph Type:	Inline SCS
Modflow Routing:	Routed with infiltration
Repetitions:	1

Basin Area (acres)	3.290
Time Of Concentration (minutes)	10.0
DCIA (%)	0.0
Curve Number	72
Design Rainfall Depth (inches)	7.4
Design Rainfall Duration (hours)	8.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 152.99 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario Input Data (cont'd.)

Scenario 5 :: SRWMD 100YR-24HR

Hydrograph Type: Inline SCS
Modflow Routing: Routed with infiltration
Repetitions: 1

Basin Area (acres)	3.290
Time Of Concentration (minutes)	10.0
DCIA (%)	0.0
Curve Number	72
Design Rainfall Depth (inches)	9.8
Design Rainfall Duration (hours)	24.0
Shape Factor	UHG 484
Rainfall Distribution	SCS Type II Florida Modified

Initial ground water level (ft datum) 152.99 (default)

Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)	Time After Storm Event (days)
0.250	6.250	12.250	18.250	24.250
0.500	6.500	12.500	18.500	24.500
0.750	6.750	12.750	18.750	24.750
1.000	7.000	13.000	19.000	25.000
1.250	7.250	13.250	19.250	25.250
1.500	7.500	13.500	19.500	25.500
1.750	7.750	13.750	19.750	25.750
2.000	8.000	14.000	20.000	26.000
2.250	8.250	14.250	20.250	26.250
2.500	8.500	14.500	20.500	26.500
2.750	8.750	14.750	20.750	26.750
3.000	9.000	15.000	21.000	27.000
3.250	9.250	15.250	21.250	27.250
3.500	9.500	15.500	21.500	27.500
3.750	9.750	15.750	21.750	27.750
4.000	10.000	16.000	22.000	28.000
4.250	10.250	16.250	22.250	28.250
4.500	10.500	16.500	22.500	28.500
4.750	10.750	16.750	22.750	28.750
5.000	11.000	17.000	23.000	29.000
5.250	11.250	17.250	23.250	29.250
5.500	11.500	17.500	23.500	29.500
5.750	11.750	17.750	23.750	29.750
6.000	12.000	18.000	24.000	30.000

Scenario 6 :: WQTV

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft^3) 12483

Initial ground water level (ft datum) 152.99 (default)

Scenario Input Data (cont'd.)

Scenario 6 (cont'd.) :: Slug Load :: WQTV

Time After Storm Event (days)	Time After Storm Event (days)
0.100	2.000
0.250	2.500
0.500	3.000
1.000	3.500
1.500	4.000

Sort-By-Category Report

Scenarios Considered: 1 to 6

Stage - Maximum

Rank	Scenario Number	Maximum Stage (ft datum)	Time (hours)	Description
1	5	158.78	12.58	SRWMD 100YR-24HR
2	4	158.61	4.47	SRWMD 100YR-8HR
3	3	158.46	2.64	SRWMD 100YR-4HR
4	2	158.35	1.89	SRWMD 100YR-2HR
5	1	158.14	1.13	SRWMD 100YR-1HR
6	6	157.87	0.00	WQTV

Discharge - Rate - Maximum Positive

Rank	Scenario Number	Maximum Positive Discharge Rate (ft^3/s)	Time (hours)	Description
1	5	4.28	12.58	SRWMD 100YR-24HR
2	4	3.00	4.47	SRWMD 100YR-8HR
3	3	1.93	2.64	SRWMD 100YR-4HR
4	2	1.28	1.89	SRWMD 100YR-2HR
5	1	0.31	1.13	SRWMD 100YR-1HR
6	6	None	N.A.	WQTV

Discharge - Cumulative Volume - Maximum Positive

Rank	Scenario Number	Maximum Positive Cumulative Discharge Volume (ft^3)	Time (hours)	Description
1	5	37974.45	30.58	SRWMD 100YR-24HR
2	4	17170.97	8.47	SRWMD 100YR-8HR
3	3	10552.48	4.58	SRWMD 100YR-4HR
4	2	4512.00	2.58	SRWMD 100YR-2HR
5	1	462.72	1.58	SRWMD 100YR-1HR
6	6	None	N.A.	WQTV

Detailed Results :: *Scenario 1 :: SRWMD 100YR-1HR*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
0.000	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.022	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.044	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.067	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.089	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.111	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.133	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.156	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.178	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.200	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.222	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.244	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.267	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.289	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.311	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.333	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.356	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.378	0.0000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	U
0.400	0.0000	0.0000	152.990	0.00120	0.00000	0.0	0.0	0.0	U
0.422	0.0048	0.0000	152.990	0.01123	0.00000	0.2	0.2	0.0	U
0.444	0.0353	0.0000	152.990	0.05641	0.00000	1.8	1.8	0.0	U
0.467	0.1503	0.0000	152.992	0.28887	0.00000	9.2	9.2	0.0	U
0.489	0.8197	0.0000	153.002	0.63289	0.00000	48.0	48.0	0.0	U
0.511	3.0541	0.0000	157.007	0.78234	0.00000	203.0	110.5	0.0	U/P
0.533	7.3661	0.0000	157.033	0.78715	0.00000	619.8	173.2	0.0	U/P
0.556	13.2100	0.0000	157.089	0.79551	0.00000	1442.8	236.4	0.0	U/P
0.578	18.1747	0.0000	157.176	0.80685	0.00000	2698.2	300.5	0.0	U/P
0.600	20.6736	0.0000	157.283	0.81971	0.00000	4252.1	365.5	0.0	U/P
0.622	20.8533	0.0000	157.395	0.83258	0.00000	5913.2	431.6	0.0	U/P
0.644	19.2460	0.0000	157.502	0.84432	0.00000	7517.2	498.7	0.0	U/P
0.667	16.5416	0.0000	157.596	0.85437	0.00000	8948.7	566.7	0.0	U/P
0.689	13.9483	0.0000	157.674	0.86274	0.00000	10168.3	635.4	0.0	U/P
0.711	11.8984	0.0000	157.738	0.86972	0.00000	11202.2	704.8	0.0	U/P
0.733	10.2784	0.0000	157.793	0.87561	0.00000	12089.2	774.6	0.0	U/P
0.756	8.9361	0.0000	157.839	0.88063	0.00000	12857.8	844.9	0.0	U/P
0.778	7.8660	0.0000	157.879	0.88496	0.00000	13529.9	915.5	0.0	U/P
0.800	6.9880	0.0000	157.913	0.88872	0.00000	14124.1	986.4	0.0	U/P
0.822	6.2744	0.0000	157.943	0.89202	0.00000	14654.6	1057.7	0.0	U/P
0.844	5.6997	0.0000	157.969	0.89496	0.00000	15133.5	1129.2	0.0	U/P
0.867	5.2272	0.0000	157.993	0.89764	0.00000	15570.6	1200.9	0.0	U/P
0.889	4.8274	0.0000	158.014	0.90011	0.01044	15972.8	1272.8	0.4	U/P
0.911	4.4846	0.0000	158.033	0.90236	0.03797	16345.3	1344.9	2.4	U/P
0.933	4.1987	0.0000	158.051	0.90441	0.07132	16692.6	1417.2	6.7	U/P
0.956	3.9662	0.0000	158.067	0.90628	0.10723	17019.2	1489.6	13.9	U/P
0.978	3.7655	0.0000	158.081	0.90800	0.14413	17328.5	1562.2	23.9	U/P
1.000	3.5795	0.0000	158.094	0.90957	0.18099	17622.2	1634.9	36.9	U/P
1.022	3.3573	0.0000	158.106	0.91097	0.21671	17899.7	1707.7	52.8	U/P
1.044	3.0563	0.0000	158.117	0.91215	0.24959	18156.3	1780.6	71.5	U/P
1.067	2.6439	0.0000	158.125	0.91306	0.27735	18384.3	1853.6	92.6	U/P
1.089	2.1539	0.0000	158.131	0.91365	0.29779	18576.2	1926.7	115.6	U/P
1.111	1.6654	0.0000	158.135	0.91394	0.30981	18729.0	1999.8	139.9	U/P
1.133	1.2315	0.0000	158.136	0.91396	0.31371	18844.8	2073.0	164.8	U/P
1.156	0.8803	0.0000	158.135	0.91376	0.31073	18929.3	2146.1	189.8	U/P
1.178	0.6289	0.0000	158.133	0.91341	0.30262	18989.7	2219.2	214.3	U/P
1.200	0.4528	0.0000	158.129	0.91294	0.29108	19032.9	2292.2	238.1	U/P
1.222	0.3260	0.0000	158.125	0.91240	0.27735	19064.1	2365.2	260.8	U/P
1.244	0.2330	0.0000	158.121	0.91182	0.26226	19086.5	2438.2	282.4	U/P
1.267	0.1669	0.0000	158.116	0.91119	0.24642	19102.5	2511.1	302.7	U/P
1.289	0.1190	0.0000	158.111	0.91055	0.23026	19113.9	2584.0	321.8	U/P
1.311	0.0845	0.0000	158.105	0.90990	0.21408	19122.0	2656.8	339.6	U/P
1.333	0.0599	0.0000	158.100	0.90923	0.19809	19127.8	2729.6	356.1	U/P
1.356	0.0421	0.0000	158.095	0.90857	0.18244	19131.9	2802.3	371.3	U/P
1.378	0.0293	0.0000	158.089	0.90791	0.16723	19134.7	2874.9	385.3	U/P
1.400	0.0201	0.0000	158.084	0.90725	0.15251	19136.7	2947.5	398.1	U/P
1.422	0.0134	0.0000	158.079	0.90660	0.13835	19138.0	3020.1	409.7	U/P
1.444	0.0086	0.0000	158.074	0.90595	0.12475	19138.9	3092.6	420.2	U/P
1.467	0.0049	0.0000	158.068	0.90531	0.11175	19139.5	3165.1	429.7	U/P
1.489	0.0023	0.0000	158.063	0.90468	0.09934	19139.8	3237.5	438.1	U/P
1.511	0.0007	0.0000	158.058	0.90405	0.08755	19139.9	3309.8	445.6	U/P
1.533	0.0000	0.0000	158.053	0.90343	0.07638	19139.9	3382.1	452.2	U/P
1.556	0.0000	0.0000	158.048	0.90282	0.06584	19139.9	3454.4	457.9	U/P
1.578	0.0000	0.0000	158.043	0.90177	0.05593	19139.9	3526.6	462.7	U/P
7.578	0.0000	0.0000	156.339	0.35071	0.00000	19139.9	18677.2	462.7	U/S
13.578	0.0000	0.0000	156.032	0.00000	0.00000	19139.9	18677.2	462.7	S

Detailed Results (cont,d.) :: *Scenario 2 :: SRWMD 100YR-2HR*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
1.644	2.8768	0.0000	158.329	0.93836	1.18168	23236.3	2444.0	1097.9	U/P
1.667	2.8113	0.0000	158.333	0.93878	1.20074	23463.9	2519.1	1193.2	U/P
1.689	2.7507	0.0000	158.336	0.93914	1.21770	23686.3	2594.2	1289.9	U/P
1.711	2.6872	0.0000	158.339	0.93946	1.23263	23903.9	2669.4	1387.9	U/P
1.733	2.6123	0.0000	158.341	0.93973	1.24535	24115.8	2744.5	1487.1	U/P
1.756	2.5262	0.0000	158.343	0.93993	1.25561	24321.4	2819.7	1587.1	U/P
1.778	2.4400	0.0000	158.344	0.94008	1.26331	24520.0	2894.9	1687.9	U/P
1.800	2.3649	0.0000	158.345	0.94018	1.26864	24712.2	2970.1	1789.1	U/P
1.822	2.3054	0.0000	158.346	0.94024	1.27203	24899.0	3045.4	1890.8	U/P
1.844	2.2636	0.0000	158.346	0.94027	1.27397	25081.8	3120.6	1992.6	U/P
1.867	2.2352	0.0000	158.346	0.94029	1.27492	25261.7	3195.8	2094.6	U/P
1.889	2.2139	0.0000	158.346	0.94029	1.27517	25439.7	3271.0	2196.6	U/P
1.911	2.1931	0.0000	158.346	0.94027	1.27485	25616.0	3346.2	2298.6	U/P
1.933	2.1665	0.0000	158.346	0.94024	1.27390	25790.4	3421.5	2400.5	U/P
1.956	2.1306	0.0000	158.346	0.94019	1.27214	25962.3	3496.7	2502.4	U/P
1.978	2.0834	0.0000	158.345	0.94011	1.26931	26130.8	3571.9	2604.0	U/P
2.000	2.0249	0.0000	158.344	0.94000	1.26515	26295.1	3647.1	2705.4	U/P
2.022	1.9305	0.0000	158.343	0.93982	1.25906	26453.4	3722.3	2806.4	U/P
2.044	1.7813	0.0000	158.342	0.93956	1.24989	26601.8	3797.5	2906.7	U/P
2.067	1.5542	0.0000	158.339	0.93917	1.23598	26735.3	3872.6	3006.2	U/P
2.089	1.2738	0.0000	158.335	0.93863	1.21577	26848.4	3947.7	3104.2	U/P
2.111	0.9890	0.0000	158.330	0.93793	1.18876	26938.9	4022.8	3200.4	U/P
2.133	0.7342	0.0000	158.324	0.93710	1.15562	27007.8	4097.8	3294.2	U/P
2.156	0.5253	0.0000	158.317	0.93616	1.11765	27058.2	4172.7	3385.1	U/P
2.178	0.3755	0.0000	158.309	0.93515	1.07648	27094.2	4247.6	3472.9	U/P
2.200	0.2706	0.0000	158.301	0.93410	1.03363	27120.1	4322.4	3557.3	U/P
2.222	0.1954	0.0000	158.293	0.93303	0.99016	27138.7	4397.0	3638.2	U/P
2.244	0.1399	0.0000	158.284	0.93195	0.94675	27152.1	4471.6	3715.7	U/P
2.267	0.1004	0.0000	158.275	0.93087	0.90387	27161.7	4546.2	3789.7	U/P
2.289	0.0717	0.0000	158.267	0.92980	0.86184	27168.6	4620.6	3860.4	U/P
2.311	0.0511	0.0000	158.258	0.92874	0.82086	27173.5	4694.9	3927.7	U/P
2.333	0.0363	0.0000	158.250	0.92770	0.78106	27177.0	4769.2	3991.7	U/P
2.356	0.0255	0.0000	158.241	0.92667	0.74251	27179.5	4843.4	4052.7	U/P
2.378	0.0177	0.0000	158.233	0.92566	0.70526	27181.2	4917.5	4110.6	U/P
2.400	0.0121	0.0000	158.225	0.92467	0.66930	27182.4	4991.5	4165.6	U/P
2.422	0.0081	0.0000	158.217	0.92370	0.63462	27183.2	5065.4	4217.7	U/P
2.444	0.0052	0.0000	158.210	0.92275	0.60121	27183.8	5139.3	4267.2	U/P
2.467	0.0030	0.0000	158.202	0.92182	0.56904	27184.1	5213.0	4314.0	U/P
2.489	0.0014	0.0000	158.195	0.92090	0.53807	27184.3	5286.8	4358.3	U/P
2.511	0.0005	0.0000	158.188	0.92000	0.50827	27184.3	5360.4	4400.1	U/P
2.533	0.0000	0.0000	158.180	0.91913	0.47960	27184.3	5434.0	4439.6	U/P
2.556	0.0000	0.0000	158.173	0.91826	0.45203	27184.3	5507.4	4476.9	U/P
2.578	0.0000	0.0000	158.167	0.91737	0.42553	27184.3	5580.9	4512.0	U/P
8.578	0.0000	0.0000	156.340	0.39564	0.00000	27184.3	22672.3	4512.0	U/S
14.578	0.0000	0.0000	156.033	0.00000	0.00000	27184.3	22672.3	4512.0	S
20.578	0.0000	0.0000	155.832	0.00000	0.00000	27184.3	22672.3	4512.0	S
26.578	0.0000	0.0000	155.680	0.00000	0.00000	27184.3	22672.3	4512.0	S
32.578	0.0000	0.0000	155.558	0.00000	0.00000	27184.3	22672.3	4512.0	S
38.578	0.0000	0.0000	155.455	0.00000	0.00000	27184.3	22672.3	4512.0	S
44.578	0.0000	0.0000	155.366	0.00000	0.00000	27184.3	22672.3	4512.0	S
50.578	0.0000	0.0000	155.288	0.00000	0.00000	27184.3	22672.3	4512.0	S
56.578	0.0000	0.0000	155.219	0.00000	0.00000	27184.3	22672.3	4512.0	S
62.578	0.0000	0.0000	155.156	0.00000	0.00000	27184.3	22672.3	4512.0	S
68.578	0.0000	0.0000	155.099	0.00000	0.00000	27184.3	22672.3	4512.0	S
74.578	0.0000	0.0000	155.047	0.00000	0.00000	27184.3	22672.3	4512.0	S
80.578	0.0000	0.0000	154.998	0.00000	0.00000	27184.3	22672.3	4512.0	S
86.578	0.0000	0.0000	154.954	0.00000	0.00000	27184.3	22672.3	4512.0	S
92.578	0.0000	0.0000	154.912	0.00000	0.00000	27184.3	22672.3	4512.0	S
98.578	0.0000	0.0000	154.873	0.00000	0.00000	27184.3	22672.3	4512.0	S
104.578	0.0000	0.0000	154.836	0.00000	0.00000	27184.3	22672.3	4512.0	S
110.578	0.0000	0.0000	154.801	0.00000	0.00000	27184.3	22672.3	4512.0	S
116.578	0.0000	0.0000	154.768	0.00000	0.00000	27184.3	22672.3	4512.0	S
122.578	0.0000	0.0000	154.737	0.00000	0.00000	27184.3	22672.3	4512.0	S
128.578	0.0000	0.0000	154.708	0.00000	0.00000	27184.3	22672.3	4512.0	S
134.578	0.0000	0.0000	154.680	0.00000	0.00000	27184.3	22672.3	4512.0	S
140.578	0.0000	0.0000	154.653	0.00000	0.00000	27184.3	22672.3	4512.0	S
146.578	0.0000	0.0000	154.628	0.00000	0.00000	27184.3	22672.3	4512.0	S
152.578	0.0000	0.0000	154.603	0.00000	0.00000	27184.3	22672.3	4512.0	S
158.578	0.0000	0.0000	154.580	0.00000	0.00000	27184.3	22672.3	4512.0	S
164.578	0.0000	0.0000	154.557	0.00000	0.00000	27184.3	22672.3	4512.0	S
170.578	0.0000	0.0000	154.536	0.00000	0.00000	27184.3	22672.3	4512.0	S
176.578	0.0000	0.0000	154.515	0.00000	0.00000	27184.3	22672.3	4512.0	S
182.578	0.0000	0.0000	154.495	0.00000	0.00000	27184.3	22672.3	4512.0	S
188.578	0.0000	0.0000	154.476	0.00000	0.00000	27184.3	22672.3	4512.0	S

Detailed Results (cont,d.) :: *Scenario 3 :: SRWMD 100YR-4HR*

Elapsed Time (hours)	Inflow Rate (ft^3/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft^3/s)	Overflow Discharge (ft^3/s)	Cumulative Inflow Volume (ft^3)	Cumulative Infiltration Volume (ft^3)	Cumulative Discharge Volume (ft^3)	Flow Type
3.289	1.6884	0.0000	158.378	0.94412	1.45726	32414.7	5467.0	6451.7	U/P
3.311	1.6908	0.0000	158.375	0.94370	1.43741	32549.9	5542.5	6567.5	U/P
3.333	1.6865	0.0000	158.372	0.94328	1.41816	32685.0	5618.0	6681.7	U/P
3.356	1.6727	0.0000	158.368	0.94286	1.39929	32819.4	5693.5	6794.4	U/P
3.378	1.6482	0.0000	158.365	0.94245	1.38050	32952.2	5768.9	6905.6	U/P
3.400	1.6107	0.0000	158.362	0.94202	1.36146	33082.5	5844.2	7015.3	U/P
3.422	1.5651	0.0000	158.358	0.94157	1.34190	33209.6	5919.6	7123.4	U/P
3.444	1.5196	0.0000	158.355	0.94112	1.32172	33333.0	5994.9	7230.0	U/P
3.467	1.4789	0.0000	158.351	0.94065	1.30104	33452.9	6070.2	7334.9	U/P
3.489	1.4456	0.0000	158.347	0.94017	1.28002	33569.9	6145.4	7438.1	U/P
3.511	1.4219	0.0000	158.343	0.93969	1.25892	33684.6	6220.6	7539.7	U/P
3.533	1.4055	0.0000	158.339	0.93921	1.23796	33797.7	6295.8	7639.6	U/P
3.556	1.3939	0.0000	158.336	0.93874	1.21731	33909.6	6370.9	7737.8	U/P
3.578	1.3855	0.0000	158.332	0.93828	1.19706	34020.8	6445.9	7834.3	U/P
3.600	1.3799	0.0000	158.328	0.93782	1.17726	34131.4	6521.0	7929.3	U/P
3.622	1.3760	0.0000	158.325	0.93737	1.15798	34241.7	6596.0	8022.7	U/P
3.644	1.3736	0.0000	158.321	0.93694	1.13922	34351.7	6671.0	8114.6	U/P
3.667	1.3720	0.0000	158.318	0.93651	1.12099	34461.5	6745.9	8205.0	U/P
3.689	1.3711	0.0000	158.314	0.93610	1.10330	34571.2	6820.8	8294.0	U/P
3.711	1.3706	0.0000	158.311	0.93569	1.08615	34680.9	6895.7	8381.6	U/P
3.733	1.3704	0.0000	158.308	0.93530	1.06951	34790.5	6970.5	8467.8	U/P
3.756	1.3702	0.0000	158.305	0.93492	1.05338	34900.1	7045.3	8552.7	U/P
3.778	1.3677	0.0000	158.302	0.93454	1.03771	35009.7	7120.1	8636.4	U/P
3.800	1.3606	0.0000	158.299	0.93417	1.02239	35118.8	7194.9	8718.8	U/P
3.822	1.3466	0.0000	158.296	0.93380	1.00726	35227.1	7269.6	8799.9	U/P
3.844	1.3273	0.0000	158.293	0.93342	0.99218	35334.0	7344.3	8879.9	U/P
3.867	1.3057	0.0000	158.290	0.93305	0.97704	35439.4	7418.9	8958.7	U/P
3.889	1.2832	0.0000	158.287	0.93267	0.96182	35542.9	7493.6	9036.3	U/P
3.911	1.2614	0.0000	158.284	0.93228	0.94650	35644.7	7568.2	9112.6	U/P
3.933	1.2401	0.0000	158.281	0.93190	0.93112	35744.8	7642.7	9187.7	U/P
3.956	1.2168	0.0000	158.278	0.93150	0.91566	35843.0	7717.3	9261.6	U/P
3.978	1.1871	0.0000	158.274	0.93110	0.90001	35939.2	7791.8	9334.2	U/P
4.000	1.1521	0.0000	158.271	0.93069	0.88406	36032.8	7866.2	9405.5	U/P
4.022	1.1018	0.0000	158.268	0.93025	0.86757	36122.9	7940.7	9475.6	U/P
4.044	1.0235	0.0000	158.264	0.92977	0.85005	36207.9	8015.1	9544.3	U/P
4.067	0.8987	0.0000	158.260	0.92923	0.83066	36284.8	8089.4	9611.5	U/P
4.089	0.7409	0.0000	158.256	0.92861	0.80857	36350.4	8163.8	9677.1	U/P
4.111	0.5789	0.0000	158.250	0.92790	0.78349	36403.2	8238.0	9740.8	U/P
4.133	0.4312	0.0000	158.244	0.92713	0.75569	36443.6	8312.2	9802.4	U/P
4.156	0.3085	0.0000	158.238	0.92629	0.72579	36473.2	8386.4	9861.6	U/P
4.178	0.2204	0.0000	158.231	0.92542	0.69459	36494.3	8460.4	9918.4	U/P
4.200	0.1588	0.0000	158.224	0.92453	0.66288	36509.5	8534.4	9972.7	U/P
4.222	0.1147	0.0000	158.217	0.92363	0.63120	36520.4	8608.3	10024.5	U/P
4.244	0.0820	0.0000	158.209	0.92273	0.59988	36528.3	8682.2	10073.7	U/P
4.267	0.0589	0.0000	158.202	0.92183	0.56915	36533.9	8756.0	10120.5	U/P
4.289	0.0420	0.0000	158.195	0.92094	0.53917	36538.0	8829.7	10164.8	U/P
4.311	0.0299	0.0000	158.188	0.92007	0.51003	36540.9	8903.3	10206.8	U/P
4.333	0.0213	0.0000	158.181	0.91920	0.48180	36542.9	8976.9	10246.5	U/P
4.356	0.0150	0.0000	158.174	0.91835	0.45450	36544.4	9050.4	10283.9	U/P
4.378	0.0104	0.0000	158.167	0.91751	0.42815	36545.4	9123.8	10319.2	U/P
4.400	0.0071	0.0000	158.161	0.91668	0.40273	36546.1	9197.2	10352.5	U/P
4.422	0.0048	0.0000	158.154	0.91587	0.37825	36546.6	9270.5	10383.7	U/P
4.444	0.0031	0.0000	158.148	0.91507	0.35468	36546.9	9343.7	10413.0	U/P
4.467	0.0018	0.0000	158.141	0.91429	0.33200	36547.1	9416.9	10440.5	U/P
4.489	0.0009	0.0000	158.135	0.91351	0.31019	36547.2	9490.0	10466.2	U/P
4.511	0.0003	0.0000	158.129	0.91276	0.28922	36547.2	9563.1	10490.2	U/P
4.533	0.0000	0.0000	158.123	0.91201	0.26909	36547.2	9636.1	10512.5	U/P
4.556	0.0000	0.0000	158.117	0.91128	0.24976	36547.2	9709.0	10533.3	U/P
4.578	0.0000	0.0000	158.111	0.90990	0.23121	36547.2	9781.9	10552.5	U/P
10.578	0.0000	0.0000	157.182	0.35377	0.00000	36547.2	23509.0	10552.5	U/S
16.578	0.0000	0.0000	157.069	0.05754	0.00000	36547.2	25065.0	10552.5	S
22.578	0.0000	0.0000	156.950	0.02152	0.00000	36547.2	25994.7	10552.5	S
28.578	0.0000	0.0000	156.719	0.00000	0.00000	36547.2	25994.7	10552.5	S
34.578	0.0000	0.0000	156.537	0.00000	0.00000	36547.2	25994.7	10552.5	S
40.578	0.0000	0.0000	156.387	0.00000	0.00000	36547.2	25994.7	10552.5	S
46.578	0.0000	0.0000	156.259	0.00000	0.00000	36547.2	25994.7	10552.5	S
52.578	0.0000	0.0000	156.147	0.00000	0.00000	36547.2	25994.7	10552.5	S
58.578	0.0000	0.0000	156.048	0.00000	0.00000	36547.2	25994.7	10552.5	S
64.578	0.0000	0.0000	155.958	0.00000	0.00000	36547.2	25994.7	10552.5	S
70.578	0.0000	0.0000	155.878	0.00000	0.00000	36547.2	25994.7	10552.5	S
76.578	0.0000	0.0000	155.804	0.00000	0.00000	36547.2	25994.7	10552.5	S
82.578	0.0000	0.0000	155.736	0.00000	0.00000	36547.2	25994.7	10552.5	S
88.578	0.0000	0.0000	155.673	0.00000	0.00000	36547.2	25994.7	10552.5	S
94.578	0.0000	0.0000	155.614	0.00000	0.00000	36547.2	25994.7	10552.5	S

Detailed Results (cont,d.) :: *Scenario 4 :: SRWMD 100YR-8HR*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
8.222	0.0696	0.0000	158.052	0.90330	0.07386	49421.5	16989.3	17144.9	U/P
8.244	0.0498	0.0000	158.047	0.90272	0.06409	49426.3	17061.5	17150.4	U/P
8.267	0.0358	0.0000	158.042	0.90214	0.05471	49429.7	17133.7	17155.2	U/P
8.289	0.0255	0.0000	158.038	0.90156	0.04582	49432.1	17205.8	17159.2	U/P
8.311	0.0182	0.0000	158.033	0.90097	0.03747	49433.9	17277.9	17162.5	U/P
8.333	0.0129	0.0000	158.028	0.90039	0.02971	49435.1	17350.0	17165.2	U/P
8.356	0.0091	0.0000	158.024	0.89981	0.02260	49436.0	17422.0	17167.3	U/P
8.378	0.0064	0.0000	158.019	0.89924	0.01619	49436.6	17494.0	17168.8	U/P
8.400	0.0044	0.0000	158.014	0.89866	0.01056	49437.1	17565.9	17169.9	U/P
8.422	0.0030	0.0000	158.010	0.89809	0.00581	49437.4	17637.8	17170.6	U/P
8.444	0.0020	0.0000	158.005	0.89752	0.00213	49437.5	17709.6	17170.9	U/P
8.467	0.0011	0.0000	158.000	1.15253	0.00002	49437.7	17781.4	17171.0	U/P
8.489	0.0006	0.0000	157.993	1.05693	0.00000	49437.7	17894.0	17171.0	U/S
8.511	0.0002	0.0000	157.989	0.70395	0.00000	49437.8	17950.5	17171.0	S
8.533	0.0000	0.0000	157.986	0.69816	0.00000	49437.8	18006.6	17171.0	S
8.556	0.0000	0.0000	157.982	0.68940	0.00000	49437.8	18062.2	17171.0	S
8.578	0.0000	0.0000	157.979	0.68240	0.00000	49437.8	18116.9	17171.0	S
14.578	0.0000	0.0000	157.750	0.12199	0.00000	49437.8	21590.3	17171.0	S
20.578	0.0000	0.0000	157.630	0.07204	0.00000	49437.8	23387.1	17171.0	S
26.578	0.0000	0.0000	157.540	0.05534	0.00000	49437.8	24702.6	17171.0	S
32.578	0.0000	0.0000	157.466	0.04630	0.00000	49437.8	25777.7	17171.0	S
38.578	0.0000	0.0000	157.401	0.04039	0.00000	49437.8	26702.7	17171.0	S
44.578	0.0000	0.0000	157.343	0.03613	0.00000	49437.8	27522.5	17171.0	S
50.578	0.0000	0.0000	157.291	0.03286	0.00000	49437.8	28263.3	17171.0	S
56.578	0.0000	0.0000	157.242	0.03026	0.00000	49437.8	28942.2	17171.0	S
62.578	0.0000	0.0000	157.197	0.02812	0.00000	49437.8	29570.6	17171.0	S
68.578	0.0000	0.0000	157.155	0.02632	0.00000	49437.8	30157.0	17171.0	S
74.578	0.0000	0.0000	157.115	0.02478	0.00000	49437.8	30707.7	17171.0	S
80.578	0.0000	0.0000	157.077	0.02345	0.00000	49437.8	31227.6	17171.0	S
86.578	0.0000	0.0000	157.040	0.02227	0.00000	49437.8	31720.5	17171.0	S
92.578	0.0000	0.0000	157.006	0.01265	0.00000	49437.8	32189.6	17171.0	S
98.578	0.0000	0.0000	156.905	0.00179	0.00000	49437.8	32266.8	17171.0	S
104.578	0.0000	0.0000	156.803	0.00000	0.00000	49437.8	32266.8	17171.0	S
110.578	0.0000	0.0000	156.711	0.00000	0.00000	49437.8	32266.8	17171.0	S
116.578	0.0000	0.0000	156.626	0.00000	0.00000	49437.8	32266.8	17171.0	S
122.578	0.0000	0.0000	156.548	0.00000	0.00000	49437.8	32266.8	17171.0	S
128.578	0.0000	0.0000	156.475	0.00000	0.00000	49437.8	32266.8	17171.0	S
134.578	0.0000	0.0000	156.407	0.00000	0.00000	49437.8	32266.8	17171.0	S
140.578	0.0000	0.0000	156.343	0.00000	0.00000	49437.8	32266.8	17171.0	S
146.578	0.0000	0.0000	156.283	0.00000	0.00000	49437.8	32266.8	17171.0	S
152.578	0.0000	0.0000	156.226	0.00000	0.00000	49437.8	32266.8	17171.0	S
158.578	0.0000	0.0000	156.172	0.00000	0.00000	49437.8	32266.8	17171.0	S
164.578	0.0000	0.0000	156.121	0.00000	0.00000	49437.8	32266.8	17171.0	S
170.578	0.0000	0.0000	156.072	0.00000	0.00000	49437.8	32266.8	17171.0	S
176.578	0.0000	0.0000	156.026	0.00000	0.00000	49437.8	32266.8	17171.0	S
182.578	0.0000	0.0000	155.981	0.00000	0.00000	49437.8	32266.8	17171.0	S
188.578	0.0000	0.0000	155.938	0.00000	0.00000	49437.8	32266.8	17171.0	S
194.578	0.0000	0.0000	155.897	0.00000	0.00000	49437.8	32266.8	17171.0	S
200.578	0.0000	0.0000	155.858	0.00000	0.00000	49437.8	32266.8	17171.0	S
206.578	0.0000	0.0000	155.820	0.00000	0.00000	49437.8	32266.8	17171.0	S
212.578	0.0000	0.0000	155.783	0.00000	0.00000	49437.8	32266.8	17171.0	S
218.578	0.0000	0.0000	155.748	0.00000	0.00000	49437.8	32266.8	17171.0	S
224.578	0.0000	0.0000	155.714	0.00000	0.00000	49437.8	32266.8	17171.0	S
230.578	0.0000	0.0000	155.681	0.00000	0.00000	49437.8	32266.8	17171.0	S
236.578	0.0000	0.0000	155.650	0.00000	0.00000	49437.8	32266.8	17171.0	S
242.578	0.0000	0.0000	155.619	0.00000	0.00000	49437.8	32266.8	17171.0	S
248.578	0.0000	0.0000	155.589	0.00000	0.00000	49437.8	32266.8	17171.0	S
254.578	0.0000	0.0000	155.560	0.00000	0.00000	49437.8	32266.8	17171.0	S
260.578	0.0000	0.0000	155.532	0.00000	0.00000	49437.8	32266.8	17171.0	S
266.578	0.0000	0.0000	155.505	0.00000	0.00000	49437.8	32266.8	17171.0	S
272.578	0.0000	0.0000	155.479	0.00000	0.00000	49437.8	32266.8	17171.0	S
278.578	0.0000	0.0000	155.453	0.00000	0.00000	49437.8	32266.8	17171.0	S
284.578	0.0000	0.0000	155.428	0.00000	0.00000	49437.8	32266.8	17171.0	S
290.578	0.0000	0.0000	155.404	0.00000	0.00000	49437.8	32266.8	17171.0	S
296.578	0.0000	0.0000	155.380	0.00000	0.00000	49437.8	32266.8	17171.0	S
302.578	0.0000	0.0000	155.357	0.00000	0.00000	49437.8	32266.8	17171.0	S
308.578	0.0000	0.0000	155.335	0.00000	0.00000	49437.8	32266.8	17171.0	S
314.578	0.0000	0.0000	155.313	0.00000	0.00000	49437.8	32266.8	17171.0	S
320.578	0.0000	0.0000	155.292	0.00000	0.00000	49437.8	32266.8	17171.0	S
326.578	0.0000	0.0000	155.271	0.00000	0.00000	49437.8	32266.8	17171.0	S
332.578	0.0000	0.0000	155.251	0.00000	0.00000	49437.8	32266.8	17171.0	S
338.578	0.0000	0.0000	155.231	0.00000	0.00000	49437.8	32266.8	17171.0	S
344.578	0.0000	0.0000	155.211	0.00000	0.00000	49437.8	32266.8	17171.0	S
350.578	0.0000	0.0000	155.192	0.00000	0.00000	49437.8	32266.8	17171.0	S

Detailed Results (cont,d.) :: *Scenario 5 :: SRWMD 100YR-24HR*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
48.578	0.0000	0.0000	157.790	0.04142	0.00000	75765.1	26523.4	37974.5	S
54.578	0.0000	0.0000	157.733	0.03772	0.00000	75765.1	27373.4	37974.5	S
60.578	0.0000	0.0000	157.681	0.03474	0.00000	75765.1	28152.7	37974.5	S
66.578	0.0000	0.0000	157.632	0.03228	0.00000	75765.1	28874.2	37974.5	S
72.578	0.0000	0.0000	157.586	0.03021	0.00000	75765.1	29547.2	37974.5	S
78.578	0.0000	0.0000	157.543	0.02843	0.00000	75765.1	30179.2	37974.5	S
84.578	0.0000	0.0000	157.502	0.02689	0.00000	75765.1	30775.5	37974.5	S
90.578	0.0000	0.0000	157.463	0.02554	0.00000	75765.1	31340.8	37974.5	S
96.578	0.0000	0.0000	157.425	0.02433	0.00000	75765.1	31878.7	37974.5	S
102.578	0.0000	0.0000	157.389	0.02325	0.00000	75765.1	32392.0	37974.5	S
108.578	0.0000	0.0000	157.355	0.02228	0.00000	75765.1	32883.3	37974.5	S
114.578	0.0000	0.0000	157.322	0.02140	0.00000	75765.1	33354.6	37974.5	S
120.578	0.0000	0.0000	157.289	0.02059	0.00000	75765.1	33807.7	37974.5	S
126.578	0.0000	0.0000	157.258	0.01985	0.00000	75765.1	34244.2	37974.5	S
132.578	0.0000	0.0000	157.228	0.01917	0.00000	75765.1	34665.4	37974.5	S
138.578	0.0000	0.0000	157.199	0.01854	0.00000	75765.1	35072.5	37974.5	S
144.578	0.0000	0.0000	157.170	0.01795	0.00000	75765.1	35466.4	37974.5	S
150.578	0.0000	0.0000	157.143	0.01741	0.00000	75765.1	35848.2	37974.5	S
156.578	0.0000	0.0000	157.116	0.01690	0.00000	75765.1	36218.5	37974.5	S
162.578	0.0000	0.0000	157.089	0.01642	0.00000	75765.1	36578.1	37974.5	S
168.578	0.0000	0.0000	157.064	0.01597	0.00000	75765.1	36927.7	37974.5	S
174.578	0.0000	0.0000	157.039	0.01554	0.00000	75765.1	37267.9	37974.5	S
180.578	0.0000	0.0000	157.014	0.01210	0.00000	75765.1	37599.1	37974.5	S
186.578	0.0000	0.0000	156.967	0.00443	0.00000	75765.1	37790.6	37974.5	S
192.578	0.0000	0.0000	156.889	0.00000	0.00000	75765.1	37790.6	37974.5	S
198.578	0.0000	0.0000	156.818	0.00000	0.00000	75765.1	37790.6	37974.5	S
204.578	0.0000	0.0000	156.752	0.00000	0.00000	75765.1	37790.6	37974.5	S
210.578	0.0000	0.0000	156.690	0.00000	0.00000	75765.1	37790.6	37974.5	S
216.578	0.0000	0.0000	156.632	0.00000	0.00000	75765.1	37790.6	37974.5	S
222.578	0.0000	0.0000	156.577	0.00000	0.00000	75765.1	37790.6	37974.5	S
228.578	0.0000	0.0000	156.525	0.00000	0.00000	75765.1	37790.6	37974.5	S
234.578	0.0000	0.0000	156.475	0.00000	0.00000	75765.1	37790.6	37974.5	S
240.578	0.0000	0.0000	156.428	0.00000	0.00000	75765.1	37790.6	37974.5	S
246.578	0.0000	0.0000	156.382	0.00000	0.00000	75765.1	37790.6	37974.5	S
252.578	0.0000	0.0000	156.338	0.00000	0.00000	75765.1	37790.6	37974.5	S
258.578	0.0000	0.0000	156.296	0.00000	0.00000	75765.1	37790.6	37974.5	S
264.578	0.0000	0.0000	156.256	0.00000	0.00000	75765.1	37790.6	37974.5	S
270.578	0.0000	0.0000	156.216	0.00000	0.00000	75765.1	37790.6	37974.5	S
276.578	0.0000	0.0000	156.179	0.00000	0.00000	75765.1	37790.6	37974.5	S
282.578	0.0000	0.0000	156.142	0.00000	0.00000	75765.1	37790.6	37974.5	S
288.578	0.0000	0.0000	156.107	0.00000	0.00000	75765.1	37790.6	37974.5	S
294.578	0.0000	0.0000	156.073	0.00000	0.00000	75765.1	37790.6	37974.5	S
300.578	0.0000	0.0000	156.040	0.00000	0.00000	75765.1	37790.6	37974.5	S
306.578	0.0000	0.0000	156.008	0.00000	0.00000	75765.1	37790.6	37974.5	S
312.578	0.0000	0.0000	155.976	0.00000	0.00000	75765.1	37790.6	37974.5	S
318.578	0.0000	0.0000	155.946	0.00000	0.00000	75765.1	37790.6	37974.5	S
324.578	0.0000	0.0000	155.917	0.00000	0.00000	75765.1	37790.6	37974.5	S
330.578	0.0000	0.0000	155.888	0.00000	0.00000	75765.1	37790.6	37974.5	S
336.578	0.0000	0.0000	155.860	0.00000	0.00000	75765.1	37790.6	37974.5	S
342.578	0.0000	0.0000	155.833	0.00000	0.00000	75765.1	37790.6	37974.5	S
348.578	0.0000	0.0000	155.807	0.00000	0.00000	75765.1	37790.6	37974.5	S
354.578	0.0000	0.0000	155.781	0.00000	0.00000	75765.1	37790.6	37974.5	S
360.578	0.0000	0.0000	155.756	0.00000	0.00000	75765.1	37790.6	37974.5	S
366.578	0.0000	0.0000	155.731	0.00000	0.00000	75765.1	37790.6	37974.5	S
372.578	0.0000	0.0000	155.707	0.00000	0.00000	75765.1	37790.6	37974.5	S
378.578	0.0000	0.0000	155.684	0.00000	0.00000	75765.1	37790.6	37974.5	S
384.578	0.0000	0.0000	155.661	0.00000	0.00000	75765.1	37790.6	37974.5	S
390.578	0.0000	0.0000	155.638	0.00000	0.00000	75765.1	37790.6	37974.5	S
396.578	0.0000	0.0000	155.616	0.00000	0.00000	75765.1	37790.6	37974.5	S
402.578	0.0000	0.0000	155.595	0.00000	0.00000	75765.1	37790.6	37974.5	S
408.578	0.0000	0.0000	155.574	0.00000	0.00000	75765.1	37790.6	37974.5	S
414.578	0.0000	0.0000	155.554	0.00000	0.00000	75765.1	37790.6	37974.5	S
420.578	0.0000	0.0000	155.534	0.00000	0.00000	75765.1	37790.6	37974.5	S
426.578	0.0000	0.0000	155.514	0.00000	0.00000	75765.1	37790.6	37974.5	S
432.578	0.0000	0.0000	155.495	0.00000	0.00000	75765.1	37790.6	37974.5	S
438.578	0.0000	0.0000	155.476	0.00000	0.00000	75765.1	37790.6	37974.5	S
444.578	0.0000	0.0000	155.457	0.00000	0.00000	75765.1	37790.6	37974.5	S
450.578	0.0000	0.0000	155.439	0.00000	0.00000	75765.1	37790.6	37974.5	S
456.578	0.0000	0.0000	155.421	0.00000	0.00000	75765.1	37790.6	37974.5	S
462.578	0.0000	0.0000	155.404	0.00000	0.00000	75765.1	37790.6	37974.5	S
468.578	0.0000	0.0000	155.386	0.00000	0.00000	75765.1	37790.6	37974.5	S
474.578	0.0000	0.0000	155.370	0.00000	0.00000	75765.1	37790.6	37974.5	S
480.578	0.0000	0.0000	155.353	0.00000	0.00000	75765.1	37790.6	37974.5	S
486.578	0.0000	0.0000	155.337	0.00000	0.00000	75765.1	37790.6	37974.5	S

Detailed Results :: *Scenario 6 :: WQTV*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
0.000	2080.5000	0.0000	152.990	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	2080.5000	0.0000	157.870	0.88138	0.00000	12483.0	5.3	0.0	U/P
2.400	0.0000	0.0000	157.369	0.51210	0.00000	12483.0	7372.3	0.0	U/P
6.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
12.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
24.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
36.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
48.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
60.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
72.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
84.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry
96.000	0.0000	0.0000	----	----	----	12483.0	12483.0	0.0	dry

Underdrain Analysis

Project Number: 23-0653
Project Name: CRS Marvin Burnett
Calculated by: JHP
Checked by: CCM
Date: 1/16/2024

BACKGROUND SEEPAGE PONDS INPUTS

Aquifer Data

Base of Aquifer:	148.7	ft
Seasonal High Water Table:	154.7	ft
Hydraulic Conductivity	5	ft/day
Fillable Porosity	20	%

Geometry: Underdrain Stage Storage

Based on the theoretical volume of water the underdrains could draw down.

ELEV.	AREA (SF)	STORAGE (CF)	STORAGE VOLUME (AC-FT)	
152.00	13,469	0	0.000	*Based on minimum Underdrain Orifice EL. 152.28'
153.00	15,494	14,482	0.332	
154.00	17,606	31,032	0.712	
155.00	19,819	49,744	1.142	**Set above the measured SHWT EL. 154.7'

Volume:	49,744	cf
Area:	19819	sf
Depth:	3.00	ft
Perimeter:	566	ft
Eq. Length:	200	ft
Eq: Width:	83	ft

PONDS Version 3.3.0241
Retention Pond Recovery - Refined Method
Copyright 2011
Devo Seereeram, Ph.D., P.E.

Project Data

Project Name:	CRS Marvin Burnett
Simulation Description:	Background Seepage
Project Number:	23-0653
Engineer :	JHP
Supervising Engineer:	CCM
Date:	01-18-2024

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	148.70
Water Table Elevation, [WT] (ft datum):	154.70
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	5.00
Fillable Porosity, [n] (%):	20.00

Vertical infiltration was not considered.

Geometry Data

Equivalent Pond Length, [L] (ft):	200.0
Equivalent Pond Width, [W] (ft):	83.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
152.00	13469.0
153.00	15494.0
154.00	17606.0
155.00	19819.0

Discharge Structures

Discharge Structure #1 is active as orifice

Structure Parameters

Description: 12" Underdrain

Orifice elevation, (ft datum):	152.27
Orifice coefficient:	4.9
Orifice area, (ft²):	0.785
Orifice exponent:	0.5

Tailwater - disabled, free discharge

Scenario Input Data

Scenario 1 :: 12" Underdrain

Hydrograph Type:	Baseflow
Modflow Routing:	Routed with infiltration

Seasonal Water Table Fluctuation (ft)	0.01
Duration of Wet Season (days)	120.0
Number of Increments	240
Initial (seasonal low) ground water level (ft datum)	154.69
Recharge is applied inside pond (in addition to outside pond)?	No

Note: when this option is selected, water will be added to the pond to synchronize the rise in the pond level with the rise in the groundwater. Otherwise, no water will be added directly to the pond, and the pond water level will rise as a result of infiltration only.

Detailed Results (cont,d.) *:: Scenario 1 :: 12" Underdrain*

Elapsed Time (hours)	Inflow Rate (ft^3/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft^3/s)	Overflow Discharge (ft^3/s)	Cumulative Inflow Volume (ft^3)	Cumulative Infiltration Volume (ft^3)	Cumulative Discharge Volume (ft^3)	Flow Type
2664.000	0.0000	0.0000	152.270	-0.00331	0.00331	0.0	-178509.4	218681.4	S
2676.000	0.0000	0.0000	152.270	-0.00331	0.00331	0.0	-178652.3	218824.3	S
2688.000	0.0000	0.0000	152.270	-0.00330	0.00330	0.0	-178795.1	218967.1	S
2700.000	0.0000	0.0000	152.270	-0.00330	0.00330	0.0	-178937.7	219109.7	S
2712.000	0.0000	0.0000	152.270	-0.00329	0.00329	0.0	-179080.1	219252.1	S
2724.000	0.0000	0.0000	152.270	-0.00329	0.00329	0.0	-179222.4	219394.4	S
2736.000	0.0000	0.0000	152.270	-0.00329	0.00329	0.0	-179364.5	219536.4	S
2748.000	0.0000	0.0000	152.270	-0.00328	0.00328	0.0	-179506.3	219678.3	S
2760.000	0.0000	0.0000	152.270	-0.00328	0.00328	0.0	-179648.1	219820.1	S
2772.000	0.0000	0.0000	152.270	-0.00327	0.00327	0.0	-179789.6	219961.6	S
2784.000	0.0000	0.0000	152.270	-0.00327	0.00327	0.0	-179931.0	220103.0	S
2796.000	0.0000	0.0000	152.270	-0.00327	0.00327	0.0	-180072.2	220244.2	S
2808.000	0.0000	0.0000	152.270	-0.00326	0.00326	0.0	-180213.2	220385.2	S
2820.000	0.0000	0.0000	152.270	-0.00326	0.00326	0.0	-180354.1	220526.1	S
2832.000	0.0000	0.0000	152.270	-0.00325	0.00325	0.0	-180494.8	220666.8	S
2844.000	0.0000	0.0000	152.270	-0.00325	0.00325	0.0	-180635.3	220807.3	S
2856.000	0.0000	0.0000	152.270	-0.00325	0.00325	0.0	-180775.7	220947.7	S
2868.000	0.0000	0.0000	152.270	-0.00324	0.00324	0.0	-180915.9	221087.9	S
2880.000	0.0000	0.0000	152.270	----	---	0.0	-181055.9	221227.9	N.A.

FLOW RATE WHEN SYSTEM ACHIEVES STEADY STATE (120 DAYS) WITH SEASONAL HIGH WATER TABLE ELEVATION

PONDS Underdrain Analysis
Version 3.3.0051

Devo Seereeram, Ph.D., P.E.

Job Information

Job Name:	23-0653 CRS Marvin Burnett
Engineer:	JHP
Date:	01-18-2024

Input Data

Area at top of pond, [ATOP]:	19819	ft²
Depth of basin, [d]:	3	ft
Aquifer depth below pond bottom, [B]:	8	ft
Desired depth to water table below pond bottom, [R]:	0.5	ft
Hydraulic conductivity of soil, [K]:	10	ft/day
Drain diameter, [D]:	12	in
Thickness of gravel envelope, [t]:	9	in
Thickness of soil cover, [H]:	2	ft
Treatment volume, [PAV]:	31032	ft³
Recovery time, [T]:	30	days
Factor of safety, [FS]:	2	
Background seepage, [qb]:	1.45	gpm
Free discharge / no tailwater		

0.00324 ft^3/s converted to gallons per minute

Results

Computed underdrain spacing, [S]:	106.6505	ft
Computed total length of laterals, [L]:	185.8312	ft
Computed flow rate through outfall, [Q]:	2.717507E-02	ft³/sec
Computed flow rate per lineal foot of lateral, [ql]:	1.462352E-04	ft³/sec/ft

Notes

1. Laterals should be no farther than S/2 from the top of the basin.
2. A gravel envelope at least 3 inches thick is recommended around the underdrain pipes. If a gravel envelope is used, a filter fabric will be required around this envelope.
3. The underdrain pipe should have a filter fabric sock to prevent fines from moving into and clogging the perforated pipe.
4. Ensure outfall elevation for system will allow gravity flow without tailwater backpressure to the underdrains.
5. Theory is applicable where ground water flow is largely in a horizontal direction (i.e., natural gradients less than 1%).
6. Capped and sealed inspection and cleanout ports which extend to the ground surface are recommended at the following locations for each drain pipe:
    a. the terminus
    b. at every 400 feet or every bend of 45 or more degrees, whichever is shortest
7. Underdrain basin should be stabilized with permanent vegetative cover.

Warnings

None.

PONDS Underdrain Analysis
Version 3.3.0051

Devo Seereeram, Ph.D., P.E.

Job Information

Job Name:	23-0653 CRS Marvin Burnett
Engineer:	JHP
Date:	01-18-2024

Input Data

Area at top of pond, [ATOP]:	19819	ft²
Depth of basin, [d]:	3	ft
Aquifer depth below pond bottom, [B]:	8	ft
Desired depth to water table below pond bottom, [R]:	0.5	ft
Hydraulic conductivity of soil, [K]:	10	ft/day
Drain diameter, [D]:	12	in
Thickness of gravel envelope, [t]:	9	in
Thickness of soil cover, [H]:	2	ft
Treatment volume, [PAV]:	12483	ft³
Recovery time, [T]:	3	days
Factor of safety, [FS]:	2	
Background seepage, [qb]:	1.45	gpm
Free discharge / no tailwater		

0.00324 ft^3/s converted to gallons per minute

Results

Computed underdrain spacing, [S]:	55.72212	ft
Computed total length of laterals, [L]:	355.6756	ft
Computed flow rate through outfall, [Q]:	9.955007E-02	ft³/sec
Computed flow rate per lineal foot of lateral, [ql]:	2.798901E-04	ft³/sec/ft

Note

Maximum Underdrain Spacing:	55.7	ft
Provided Underdrain Spacing:	25.0	ft
Minimum Lateral Length:	355	ft
Provided Lateral Length:	375	ft

Notes

1. Laterals should be no farther than S/2 from the top of the basin.
2. A gravel envelope at least 3 inches thick is recommended around the underdrain pipes. If a gravel envelope is used, a filter fabric will be required around this envelope.
3. The underdrain pipe should have a filter fabric sock to prevent fines from moving into and clogging the perforated pipe.
4. Ensure outfall elevation for system will allow gravity flow without tailwater backpressure to the underdrains.
5. Theory is applicable where ground water flow is largely in a horizontal direction (i.e., natural gradients less than 1%).
6. Capped and sealed inspection and cleanout ports which extend to the ground surface are recommended at the following locations for each drain pipe:
    a. the terminus
    b. at every 400 feet or every bend of 45 or more degrees, whichever is shortest
7. Underdrain basin should be stabilized with permanent vegetative cover.

Warnings

None.

Appendix B

Operation and Maintenance Requirements and
Erosion and Sedimentation Control Requirements

Proposed operation and maintenance and soil erosion and sediment control practices are outlined in the following paragraphs.

Surface water Management Facilities

The man-made surface water facility shall be maintained free of sediments and debris. Areas shall be inspected on a routine basis and nuisance plants shall be removed a minimum of twice annually. Grassed areas shall be mowed a minimum of 6 times per year. The natural systems shall be least disturbed as possible. Minimal maintenance is required for the natural and undisturbed areas. All ponds shall be inspected monthly. Monthly documentation shall be noted based upon the inspection findings.

Erosion Control

All erosion damage at spillways, outfall structures, and along pond side slopes shall be repaired (grading and grassing) as conditions occur. All side slopes and other areas disturbed by construction shall be stabilized by sodding, hydro-mulching or other appropriate vegetative or non-vegetative erosion control measures.

Swale/Ditch

All swales, if any, shall be maintained free of debris and sediment. Sediments shall be removed when the depth has been reduced by 20 percent. Sediments removed from swales/ditches should be evenly spread over grassed areas away from the stormwater management facilities.

Culverts, Pipes and Structures

All pipes, if any, shall be inspected bi-annually. Culverts and pipes shall be maintained free of debris and sediment. Sediments removed from culverts and pipes should be evenly spread over grassed areas away from the stormwater management facilities.

The structures and paved flow lines, if any, shall be maintained clear of debris. Remove any debris and silt collected in inlets and pipes as routine inspections dictates.

Inspection Reporting

Annual inspection reports, prepared by a properly licensed professional engineer, should be submitted to the water management district as appropriate. The engineer shall inspect the site and report on the status and function of the system. Noted deficiencies and/or maintenance requirements shall be reported to the owner with recommendations for repairs. Repairs shall be executed.

Limerock/Sinkhole

If continuous limerock is encountered during excavation of the swales/pond or if a sinkhole forms in the area of a drainage swale/pond the engineer of record shall be notified by either the contractor or the established operation and maintenance entity. The engineer of record shall inspect the repaired area upon completion of the repair.

Where continuous limerock is encountered during excavation of the swales/ponds, the limerock shall be over excavated by 2 feet and replaced with clayey soils that extend 2 feet beyond the perimeter of the limerock outcropping. The clayey soil shall have at least 20% passing the no. 200 sieve, compacted to 95% of standard proctor, and compacted in a wet condition with moisture 2% - 4% above optimum.

All swales/ponds shall be inspected monthly for sinkhole occurrence. Should a sinkhole occur, the area shall be repaired as soon as possible. Repair shall include filling (limerock such as road base material, clay/sand mixture, or concrete if necessary). A 2-foot deep cap that extends 2 feet beyond the perimeter of the sinkhole shall be constructed with clayey soils. The clayey soil shall have at least 20% passing the no. 200 sieve, compacted to 95% of standard proctor, and compacted in a wet condition with moisture 2% - 4% above optimum. The clay soil cap shall be re-graded to prevent concentration of waters (ponding) and re-vegetated.

Outfall Structures

All outfall and drawdown orifices are to be inspected bi-annually for sediment or debris in the flow line of weirs or orifices. All sediment and debris should be removed and disposed of in an approved manner.

Operation & Maintenance Entity:

Concept Development, Inc.
1449 SW 74th Drive. Suite 200
Gainesville, FL 32607

Appendix C

Geotechnical Report

GSE Engineering & Consulting, Inc.

SUMMARY REPORT OF A GEOTECHNICAL SITE EXPLORATION – REVISION 1

DOLLAR GENERAL – LAKE CITY SW MARVIN BURNETT
LAKE CITY, COLUMBIA COUNTY, FLORIDA

GSE PROJECT NO. 16251

Prepared For:

CONCEPT DEVELOPMENT, INC.

DECEMBER 2023

GSE Engineering & Consulting, Inc.

December 7, 2023

Andrea Barnett
Concept Development, Inc.
1449 SW 74th Drive, Suite 200
Gainesville, Florida 32607

Subject: Summary Report of a Geotechnical Site Exploration – Revision 1
Dollar General – Lake City SW Marvin Burnett
Lake City, Columbia County, Florida
GSE Project No. 16251

GSE Engineering & Consulting, Inc. (GSE) is pleased to submit this geotechnical site exploration report for the above referenced project.

Presented herein are the findings and conclusions of our exploration, including the geotechnical parameters and recommendations to assist with building foundation, pavement, and stormwater management designs. This revision includes recommended soil parameters for stormwater management design with underdrains.

GSE appreciates this opportunity to have assisted you on this project. If you have any questions or comments concerning this report, please contact us.

Sincerely,

GSE Engineering & Consulting, Inc.

This item has been digitally signed and sealed by Jason E Gowland
Digitally signed by Jason E Gowland
Date: 2023.12.07 15:39:40 -05'00'
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.

Angelina X. Liu, E.I.
Staff Engineer

Jason E. Gowland, P.E.
Principal Engineer
Florida Registration No. 66467

AXL / JEG: tlf
Q:\Projects\16251 Dollar General – Lake City SW Marvin Burnett\16251 Rev.1.docx

Distribution: Addressee (1 - Electronic)
File (1)

GSE Engineering & Consulting, Inc.
5590 SW 64th Street, Suite B
Gainesville, Florida 32608
(352) 377-3233 Phone ◆ (352) 377-0335 Fax
www.gseengineering.com

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LIST OF FIGURES

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1.0 INTRODUCTION

1.1 General

GSE Engineering & Consulting, Inc. (GSE) has completed this geotechnical exploration for the proposed commercial retail store located on SW Marvin Burnett Road in Lake City, Columbia County, Florida. This exploration was performed in accordance with GSE Proposal No. 2023-589 dated September 12, 2023. Ms. Andrea Barnett authorized our services on September 15, 2023.

1.2 Project Description

We understand that you are coordinating due diligence related work related to the development of this site into a commercial retail store. The site is located on the northwest corner of the State Road 47 and SW Marvin Burnett Road intersection in Lake City, Columbia County, Florida. The site is approximately +/-2.72 acres.

You provided GSE with information about the project. We understand the project will consist of an approximate 10,640 square foot building, a parking lot, and a stormwater management facility.

The structure is expected to be a single-story, high wall concrete masonry unit (CMU) and steel frame construction. Structural loads have not been provided but are expected to be on the order of 1 to 2 kips per foot for non-load bearing CMU walls, and less than 50 kips for columns. The finished floor of the structure is anticipated to be constructed within 1 to 2 feet of the existing site grades.

The building will be located in the northern portion of the site. The parking lot will be located west, south, and east of the structure. The stormwater management facility will be located on the western portion of the site.

A recent aerial photograph of the site was obtained and reviewed. The site plan and aerial photograph were used in preparation of this exploration and report.

1.3 Purpose

The purpose of this geotechnical exploration was to determine the general subsurface conditions, evaluate these conditions with respect to the proposed construction, and prepare geotechnical parameters and recommendations to assist with building foundation, stormwater management, and pavement designs.

2.0 FIELD AND LABORATORY TESTS

2.1 General Description

The procedures used for field sampling and testing are in general accordance with industry standards of care and established geotechnical engineering practices for this geographic region. This exploration consisted of performing five (5) Standard Penetration Test (SPT) borings to a depth of 20 feet below land surface (bls) within the proposed building area, five (5) auger borings to a depth of 5 feet bls in the area of the parking lot and driveways, and five (5) auger borings to depths of 15 feet bls in the area of the stormwater management facility.

The soil borings were performed at the approximate locations as shown on Figure 2. The borings were located at the site using the provided site plan, Global Positioning System (GPS) coordinates, and obvious site features as reference. The boring locations should be considered approximate. The soil borings were performed on September 20, 2023.

2.2 Auger Borings

The auger borings were performed in accordance with ASTM D1452. The borings were performed with flight auger equipment that was rotated into the ground in a manner that reduces soil disturbance. After penetrating to the required depth, the auger was retracted and the soils collected on the auger flights were field classified and placed in sealed containers. Representative samples of each stratum were retained from the auger boring. Results from the auger borings are provided in Section 5.1.

2.3 Standard Penetration Test Borings

The soil borings were performed with a drill rig employing mud rotary drilling techniques and Standard Penetration Testing (SPT) in accordance with ASTM D1586. The SPTs were performed continuously to 10 feet and at 5-foot intervals thereafter. Soil samples were obtained at the depths where the SPTs were performed. The soil samples were classified in the field, placed in sealed containers, and returned to our laboratory for further evaluation.

After drilling to the sampling depth, the standard two-inch O.D. split-barrel sampler was seated by driving it 6 inches into the undisturbed soil. The sampler was then driven an additional 12 inches by blows of a 140-pound hammer falling 30 inches. The number of blows required to produce the next 12 inches of penetration were recorded as the penetration resistance (N-value). These values and the complete SPT boring logs are provided in Section 5.2.

Upon completion of the sampling, the boreholes were abandoned in accordance with Water Management District guidelines.

2.4 Soil Laboratory Tests

The soil samples recovered from the soil borings were returned to our laboratory, and examined to confirm the field descriptions. Representative samples were then selected for laboratory testing. The laboratory tests consisted of nine (9) percent soil fines passing the No. 200 sieve, nine (9) natural moisture content determinations, two (2) Atterberg Limits tests, and three (3) constant head hydraulic conductivity tests. These tests were performed in order to aid in classifying the soils and to further evaluate their engineering properties. The laboratory tests are provided in Section 5.3.

3.0 FINDINGS

3.1 Surface Conditions

Karen Roylos with GSE visited the site on September 18, 2023 to observe the site conditions and mark the boring locations. Mr. Jason Kite with Jason Kite, LLC was retained by GSE to clear lanes to allow access to the boring locations for drilling equipment.

The majority of the site is densely vegetated with trees, scattered saw palmettos, shrubs, vines and weedy groundcover. Portions of the site were densely vegetated and more difficult to traverse. To the south of the site is SW Marvin Burnett Road. State Road 47 is located east of the site. Undeveloped wooded land borders the site to the north and west.

The topography at the site is moderately sloping from northeast towards southwest. Regional topography can be characterized as gently to moderately sloping. The Lake City West USGS Topographic Map indicates the ground surface elevations at the site are near 155 to 165 feet[1] NAVD 88.

3.2 Subsurface Conditions

The locations of the auger and SPT borings are provided on Figure 2. Complete logs for the borings are provided in Sections 5.1 and 5.2. Descriptions for the soils encountered are accompanied by the Unified Soil Classification System symbol (SM, SP-SM, etc.) and are based on visual examination of the recovered soil samples and the laboratory tests performed. Stratification boundaries between the soil types should be considered approximate, as the actual transition between soil types may be gradual.

The auger borings located within the proposed parking lot and driveways encountered relatively similar soil conditions. Auger borings A-1 to A-3 encountered poorly graded sand, and sand with silt (SP, SP-SM) to the explored depths of 5 feet bls. Auger borings A-4 and A-5 initially encountered sand with silt (SP-SM) to depths of 1.5 to 3.5 feet bls. This was underlain by clayey to very clayey sand (SC, SC/CL) to the explored depths of 5 feet bls.

The auger borings located within the stormwater management facility encountered relatively consistent soil conditions. Auger boring P-1 encountered 6 feet of silty sand, and poorly graded sand (SM, SP) overlying clayey to very clayey sand, and clay with sand (SC, SC/CL, CL/CH) to the explored depth of 15 feet bls. Auger borings P-2 to P-4 initially encountered poorly graded sand, sand with silt, and silty sand (SP, SP-SM, SM) to depths of 2 to 5 feet bls, overlying silty clayey sand, and clayey to very clayey sand (SM-SC, SC, SC/CL) to depths of 7 to 10.5 feet bls. This was underlain by sand with silt (SP-SM) to depths of 12 to 13.5 feet bls, followed by clay-rich soils (CL/CH) to the explored depth of 15 feet bls. Auger boring P-5 initially encountered 5.5 feet of clayey sand (SC) and 5 feet of sand with silt (SP-SM) overlying clay with sand (CL/CH) to a depth of 12.5 feet bls. This was underlain by sand with silt (SP-SM) to the explored depth of 15 feet bls.

[1] United States Geological Survey, Lake City West Quadrangle, 2021.

The SPT borings located within the proposed building footprint indicate the soils across these areas are relatively consistent. SPT boring B-1 initially encountered 3 feet of sand with silt (SP-SM), and 4.5 feet of sandy clay (CL) overlying sand with clay, and poorly graded sand (SP-SC, SP) to a depth of 12 feet bls. This was underlain by clay (CL/CH) to the explored depth of 20 feet bls. SPT borings B-2 to B-5 encountered poorly graded sand, sand with silt, sand with clay, silty sand, and silty clayey sand (SP, SP-SM, SP-SC, SM-SC) with some interbedded layers of clayey to very clayey sand (SC, SC/CL) to depths of 13.5 to 17.5 feet bls. This was underlain by clay-rich (CL, CL/CH) soils to the explored depths of 20 feet bls.

The sandy soils (SP, SP-SM, SP-SC) encountered are generally in a very loose to dense condition with N-values ranging from 2 to 45 blows per foot. The silty sand, silty clayey sand, and clayey to very clayey sands (SM, SM-SC, SC, SC/CL) encountered are generally in a very loose to dense condition with N-values ranging from 4 to 38 blows per foot. The sandy clay, clay with sand, and clay (CL/CH, CL) encountered are generally in a very soft to hard condition with N-values ranging from 3 to 33 blows per foot.

Weight-of-rod strength material was encountered in SPT boring B-2 at depth range from 13.5 to 14.5 feet bls. This isolated occurrence is likely related to depositional characteristics of the soil materials and transitions between material types.

The groundwater table was encountered in the auger and SPT borings at depths of 6.1 to 8.8 feet bls at the time of our investigation.

3.3 Review of Published Data

The majority of the site is mapped as three soil series by the Soil Conservation Service (SCS) Soil Survey for Columbia County[2]. The following soil descriptions are from the Soil Survey.

Blanton fine sand, 0 to 5 percent slopes

Map Unit Setting

- *National map unit symbol:* 2w0q2
- *Elevation:* 30 to 200 feet
- *Mean annual precipitation:* 51 to 59 inches
- *Mean annual air temperature:* 64 to 72 degrees F
- *Frost-free period:* 258 to 310 days
- *Farmland classification:* Not prime farmland

Map Unit Composition

- *Blanton and similar soils:* 85 percent
- *Minor components:* 15 percent
- *Estimates are based on observations, descriptions, and transects of the map unit.*

[2] Soil Survey of Hamilton County, Florida. Soil Conservation Service, U.S. Department of Agriculture.

Description of Blanton

Setting

- *Landform:* Knolls on marine terraces, ridges on marine terraces
- *Landform position (two-dimensional):* Backslope
- *Landform position (three-dimensional):* Side slope, interfluve, riser
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Parent material:* Sandy and loamy marine deposits

Typical profile

- *A - 0 to 7 inches:* fine sand
- *E - 7 to 52 inches:* fine sand
- *Bt - 52 to 80 inches:* fine sandy loam

Properties and qualities

- *Slope:* 0 to 5 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Moderately well drained
- *Runoff class:* Negligible
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.20 to 6.00 in/hr)
- *Depth to water table:* About 42 to 72 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- *Sodium adsorption ratio, maximum:* 4.0
- *Available water supply, 0 to 60 inches:* Low (about 3.6 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 3s
- *Hydrologic Soil Group:* A
- *Forage suitability group:* Sandy soils on rises, knolls, and ridges of mesic uplands (G138XA121FL)
- *Other vegetative classification:* Sandy soils on rises, knolls, and ridges of mesic uplands (G138XA121FL)
- *Hydric soil rating:* No

Minor Components

Albany

- *Percent of map unit:* 6 percent
- *Landform:* Ridges on marine terraces
- *Landform position (two-dimensional):* Shoulder
- *Landform position (three-dimensional):* Interfluve, talf
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Other vegetative classification:* Sandy soils on rises and knolls of mesic uplands (G138XA131FL), North Florida Flatwoods (R138XY004FL)
- *Hydric soil rating:* No

Troup

- *Percent of map unit:* 4 percent
- *Landform:* Ridges, knolls
- *Landform position (two-dimensional):* Summit
- *Landform position (three-dimensional):* Interfluve
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Other vegetative classification:* Sandy soils on ridges and dunes of xeric uplands (G133AA111FL), Longleaf Pine-Turkey Oak Hills (R133AY002FL)
- *Hydric soil rating:* No

Chipley

- *Percent of map unit:* 3 percent
- *Landform:* Knolls on marine terraces, rises on marine terraces, flats on marine terraces
- *Landform position (two-dimensional):* Shoulder, footslope
- *Landform position (three-dimensional):* Interfluve
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Other vegetative classification:* Sandy soils on rises and knolls of mesic uplands (G138XA131FL)
- *Hydric soil rating:* No

Alpin

- *Percent of map unit:* 2 percent
- *Landform:* Flatwoods on marine terraces, knolls on marine terraces, ridges on marine terraces
- *Landform position (two-dimensional):* Shoulder, backslope
- *Landform position (three-dimensional):* Interfluve
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Other vegetative classification:* Sandy soils on ridges and dunes of xeric uplands (G138XA111FL), Sand Pine Scrub (R153AY001FL)
- *Hydric soil rating:* No

Ichetucknee fine sand, 5 to 8 percent slopes

Map Unit Setting

- *National map unit symbol:* vrt4
- *Elevation:* 330 to 660 feet
- *Mean annual precipitation:* 50 to 58 inches
- *Mean annual air temperature:* 64 to 72 degrees F
- *Frost-free period:* 258 to 288 days
- *Farmland classification:* Not prime farmland

Map Unit Composition

- *Ichetucknee and similar soils:* 80 percent
- *Minor components:* 20 percent
- *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Ichetucknee

Setting

- *Landform:* Hills on marine terraces, ridges on marine terraces
- *Landform position (three-dimensional):* Interfluve, side slope
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Parent material:* Sandy and clayey marine deposits over limestone

Typical profile

- *A - 0 to 4 inches:* fine sand
- *E - 4 to 7 inches:* fine sand
- *Bg - 7 to 75 inches:* clay
- *2R - 75 to 79 inches:* weathered bedrock

Properties and qualities

- *Slope:* 5 to 8 percent
- *Depth to restrictive feature:* 50 to 75 inches to lithic bedrock
- *Drainage class:* Somewhat poorly drained
- *Runoff class:* Negligible
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
- *Depth to water table:* About 18 to 36 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- *Sodium adsorption ratio, maximum:* 4.0
- *Available water supply, 0 to 60 inches:* Moderate (about 8.4 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 6e
- *Hydrologic Soil Group:* D
- *Forage suitability group:* Loamy and clayey soils on rises, knolls, and ridges of mesic uplands (G138XA322FL)
- *Other vegetative classification:* Loamy and clayey soils on rises, knolls, and ridges of mesic uplands (G138XA322FL)
- *Hydric soil rating:* No

Minor Components

Goldsboro

- *Percent of map unit:* 10 percent
- *Landform:* Knolls on marine terraces, ridges on marine terraces
- *Landform position (three-dimensional):* Interfluve
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Other vegetative classification:* Loamy and clayey soils on flats and rises of mesic lowlands (G138XA331FL)
- *Hydric soil rating:* No

Ocilla

- *Percent of map unit:* 10 percent
- *Landform:* Rises on marine terraces
- *Landform position (three-dimensional):* Interfluve
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Other vegetative classification:* Sandy over loamy soils on rises and knolls of mesic uplands (G138XA231FL)
- *Hydric soil rating:* No

Pelham fine sand, 0 to 2 percent slopes

Map Unit Setting

- *National map unit symbol:* 2tg56
- *Elevation:* 0 to 190 feet
- *Mean annual precipitation:* 48 to 63 inches
- *Mean annual air temperature:* 57 to 79 degrees F
- *Frost-free period:* 251 to 293 days
- *Farmland classification:* Not prime farmland

Map Unit Composition

- *Pelham and similar soils:* 75 percent
- *Minor components:* 25 percent
- *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Pelham

Setting

- *Landform:* Flatwoods
- *Landform position (three-dimensional):* Talf
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Sandy and loamy marine deposits

Typical profile

- *A - 0 to 6 inches:* fine sand
- *Eg - 6 to 26 inches:* fine sand
- *Btg1 - 26 to 42 inches:* sandy clay loam
- *Btg2 - 42 to 83 inches:* sandy clay loam

Properties and qualities

- *Slope:* 0 to 2 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Poorly drained
- *Runoff class:* High
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.20 to 5.95 in/hr)
- *Depth to water table:* About 6 to 12 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- *Sodium adsorption ratio, maximum:* 4.0
- *Available water supply, 0 to 60 inches:* Moderate (about 7.0 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 3w
- *Hydrologic Soil Group:* B/D
- *Ecological site:* F153AY060NC - Wet Loamy Flats and Depressions
- *Forage suitability group:* Sandy over loamy soils on flats of hydric or mesic lowlands (G153AA241FL)
- *Other vegetative classification:* Sandy over loamy soils on flats of hydric or mesic lowlands (G153AA241FL)
- *Hydric soil rating:* No

Minor Components

Unnamed

- *Percent of map unit:* 13 percent
- *Landform:* Flatwoods
- *Landform position (three-dimensional):* Talf
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Other vegetative classification:* Sandy over loamy soils on flats of hydric or mesic lowlands (G153AA241FL)
- *Hydric soil rating:* Yes

Albany

- *Percent of map unit:* 6 percent
- *Landform:* Flatwoods
- *Landform position (three-dimensional):* Talf
- *Microfeatures of landform position:* Rises
- *Down-slope shape:* Convex
- *Across-slope shape:* Convex
- *Ecological site:* F153AY040NC - Moist Loamy Rises and Flats
- *Other vegetative classification:* Sandy soils on rises and knolls of mesic uplands (G153AA131FL)
- *Hydric soil rating:* No

Meggett

- *Percent of map unit:* 3 percent
- *Landform:* Flatwoods
- *Landform position (three-dimensional):* Talf
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Ecological site:* F153AY090NC - Flooded Mineral Soil Floodplains and Terraces
- *Other vegetative classification:* Loamy and clayey soils on flats of hydric or mesic lowlands (G153AA341FL)
- *Hydric soil rating:* Yes

Surrency

- *Percent of map unit:* 3 percent
- *Landform:* Drainageways, depressions
- *Landform position (three-dimensional):* Dip
- *Down-slope shape:* Linear, concave
- *Across-slope shape:* Convex, concave
- *Ecological site:* F153AY060NC - Wet Loamy Flats and Depressions
- *Other vegetative classification:* Sandy over loamy soils on stream terraces, flood plains, or in depressions (G153AA245FL)
- *Hydric soil rating:* Yes

3.4 Laboratory Soil Analysis

Selected soil samples recovered from the soil borings were analyzed for the percent soil fines passing the No. 200 sieve, natural moisture content, Atterberg Limits, and hydraulic conductivity. Samples selected for laboratory testing were collected at depths ranging from near-surface to 15 feet bls. These tests were performed to confirm visual soil classification and evaluate their engineering properties. The complete laboratory report is provided in Section 5.3.

The laboratory tests indicate the tested soils consist sand with silt, silty sand, silty sand with clay, sand with clay, clayey sand, very clayey sand, and sandy clay. The tested sand with silt (SP-SM) contains approximately 11 percent soil fines passing the No. 200 sieve with a natural moisture content of about 8.7 percent. The tested silty sand, and silty sand with clay (SM, SM-SC) contains approximately 14 to 27 percent soil fines passing the No. 200 sieve with natural moisture contents of about 7.8 to 18 percent. The tested sand with clay (SP-SC) contains approximately 11 percent soil fines passing the No. 200 sieve with a natural moisture content of about 17 percent. The tested clayey sand (SC) contains approximately 30 percent soil fines passing the No. 200 sieve with a natural moisture content of about 13 percent. The tested very clayey sand (SC/CL) contains approximately 34 percent soil fines passing the No. 200 sieve with a natural moisture content of about 18 percent. The tested sandy clay (CL) contains approximately 56 to 62 percent soil fines passing the No. 200 sieve with natural moisture contents of about 17 to 23 percent.

Atterberg Limits tests indicate the tested sandy clay (CL) has Liquid Limit (LL) values of 35 and 41, Plastic Limit (PL) values of 15 to 18, and Plasticity Index (PI) values of 17 and 26. These values correspond to materials with low potential (LL < 50) to marginal potential (PI ≤ 35) for expansive behavior[3].

The constant head hydraulic conductivity test results indicate the near-surface silty sand (SM) has hydraulic conductivity values of 0.8 to 1.1 feet per day. The tested clayey sand (SC) has no flow. Tests were not conducted on the deeper very clayey sand due to the limitations of the test method on soils having moderate to high fines content, but these soils are expected to have permeability values at least one order of magnitude lower than the sandy soils.

[3] U.S. Department of the Army USA, 1983, Foundations in Expansive Soils, TM 5-818-7, p. 4-1.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General

The following recommendations are made based upon our understanding of the proposed construction, a review of the attached soil borings and laboratory test data, and experience with similar projects and subsurface conditions. If plans or the location of proposed construction changes from those discussed previously, GSE requests the opportunity to review and possibly amend our recommendations with respect to those changes.

The final design of a foundation system is dependent upon adequate integration of geotechnical and structural engineering considerations. Consequently, GSE must review the final foundation design in order to evaluate the effectiveness and applicability of our initial analyses, and to determine if additional recommendations may be warranted. Without such a review, the recommendations presented herein could be misinterpreted or misapplied resulting in potentially unacceptable performance of the foundation system.

The performance of site improvements may be sensitive to their post-construction relationship to site groundwater levels, seepage zones, or soil/rock characteristics exposed at final site grades. GSE recommends that use of boring information for final design of all site improvements be predicated on proper horizontal and vertical control of borings.

In this section of the report, we present our geotechnical parameters and recommendations to assist with building foundation, stormwater management, and pavement designs as well as our general site preparation guidelines.

4.2 Groundwater

The groundwater table was encountered in the borings at depths of 6.1 to 8.8 feet bls at the time of our exploration. The Soil Survey indicates the groundwater table is typically at a depth of near-surface to 6 feet bls. We anticipate the seasonal high groundwater table will be near depths of 1 to 3.5 feet bls. Estimates for the seasonal high groundwater table are shown on the individual boring logs.

4.3 Building Foundations

The SPT borings located within the proposed building footprint indicate the soils across these areas are relatively consistent. SPT boring B-1 initially encountered 3 feet of sand with silt (SP-SM), and 4.5 feet of sandy clay (CL) overlying sand with clay, and poorly graded sand (SP-SC, SP) to a depth of 12 feet bls. This was underlain by clay (CL/CH) to the explored depth of 20 feet bls. SPT borings B-2 to B-5 encountered poorly graded sand, sand with silt, sand with clay, silty sand, and silty clayey sand (SP, SP-SM, SP-SC, SM-SC) with some interbedded layers of clayey to very clayey sand (SC, SC/CL) to depths of 13.5 to 17.5 feet bls. This was underlain by clay-rich (CL, CL/CH) soils to the explored depths of 20 feet bls.

Based upon the soil conditions encountered and our limited understanding of the structural loads and site grading, we recommend the building be supported by conventional, shallow strip and/or spread foundations. We recommend the shallow foundations be designed for a maximum allowable gross bearing pressure of 2,500 psf. The gross bearing pressure is defined as the soil contact pressure that can be imposed from the maximum structural loads, weight of the concrete foundations, and weight of the soil above the foundations. The foundations should be designed based upon the maximum load that could be imposed by all loading conditions.

The foundations should be embedded a minimum of 18 inches below the lowest adjacent grade. Interior foundations or thickened sections should be embedded a minimum of 12 inches. The foundations should have minimum widths of 18 inches for strip footings, and 24 inches for columns, even though the maximum soil bearing pressure may not be fully developed.

Due to the mostly sandy nature of the majority of the near-surface soils, we expect settlement to be mostly elastic in nature. The majority of the settlement will occur on application of the loads, during and immediately following construction. Using the recommended maximum bearing pressure, the assumed maximum structural loads, and the field and laboratory test data which we have correlated into the strength and compressibility characteristics of the subsurface soils, we estimate the total settlements of the structure to be 1 inch or less, with approximately half of it occurring upon load application (during construction).

Differential settlement results from differences in applied bearing pressures and the variations in the compressibility characteristics of the subsurface soils. For the building pad prepared as recommended, we anticipate differential settlement of less than 1/2 inch.

Post-construction settlement of the structures will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics of the bearing soils; (2) footing size, bearing level, applied loads, and resulting bearing pressures beneath the foundation; (3) site preparation and earthwork construction techniques used by the contractor, and (4) external factors, including but not limited to vibration from off-site sources and groundwater fluctuations beyond those normally anticipated for the naturally-occurring site and soil conditions which are present.

Our settlement estimates for the structure are based upon our limited understanding of the structural loads and site grading and the use of successful adherence to the site preparation recommendations presented later in this report. Any deviation from our project understanding and/or our site preparation recommendations could result in an increase in the estimated post-construction settlement of the structure.

4.4 Flexible Pavement

Overall soil conditions encountered by our borings at this site are suitable for supporting conventional limerock base and asphalt wearing surface pavements. We have not been provided the anticipated traffic loading conditions; therefore, the following pavement component recommendations should be used only as guidelines. The below recommendations are intended to be minimums. Increasing base course and asphalt thicknesses would increase the design life of the pavement.

The seasonal high groundwater table is estimated to be approximately 12 inches to about 3.5 feet beneath existing grade across the site. We recommend a minimum of either 12 to 24 inches of separation (depending upon the pavement section design) be present between the bottom of the base course and the estimated seasonal high groundwater table. If this separation cannot be achieved by site grading, GSE recommends underdrains be used beneath the base course.

4.4.1 Stabilized Subgrade

If a crushed limerock or recycled concrete base is used, we recommend a stabilized subgrade be located beneath the base. The stabilized subgrade should have a minimum Limerock Bearing Ratio (LBR) of 40, with minimum thicknesses of 6 inches for automobile parking areas and 12 inches for driveways.

The stabilized subgrade can be imported material or a mixture of imported and on-site material. If a mix is proposed, a mix design should be performed to determine the optimum mix proportions. The stabilized subgrade should be compacted to a minimum of 98 percent of the Modified Proctor maximum dry density (ASTM D1557) for soils with less than 15 percent fines content. Soils with 15 percent or greater fines content should be compacted to 100 percent of the Standard Proctor maximum dry density (ASTM D698).

4.4.2 Base Course

The base course can consist of either crushed limerock, soil cement, or recycled concrete. If you should use a soil cement base course, a stabilized subgrade is not required.

Limerock should have an LBR of at least 100, be obtained from a FDOT approved source and meet FDOT gradation requirements. The base course thickness should be a minimum of 6 inches in automobile parking areas, and 8 inches in driveway areas. The base course should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D1557). We recommend a minimum 24 inches separation between the bottom of the limerock base course and the estimated seasonal high-water table. If site grading does not allow for this separation, we recommend underdrains be considered.

Soil cement can consist of an imported material or a blend of the on-site soils and cement. A mix design should be performed to determine the optimum cement content. We recommend the soil cement have a minimum 28-day compressive strength of 500 psi. Soil cement can be blended off-site (in a pug mill) or on site. Soil cement pills should be cast from each day's production to verify the recommended compressive strength has been achieved at 28 days. We recommend the soil cement base course be a minimum of 8 inches thick throughout the project. We recommend a minimum 18 inches separation between the bottom of the soil cement base course and the estimated seasonal high-water table. If site grading does not allow for this separation, we recommend underdrains be considered.

Recycled concrete should have an LBR of at least 150, be obtained from a FDOT approved source and meet FDOT gradation requirements. The base course thickness should be a minimum of 8 inches. The base course should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D1557). We recommend a minimum 12 inches separation between the bottom of the recycled concrete base course and the estimated seasonal high-water table. If site grading does not allow for this separation, we recommend underdrains be considered.

4.4.3 Wearing Surface

The asphalt-wearing surface should consist of an FDOT Type SP Hot Mix Asphalt mixture. For automobile parking areas, the thickness should be a minimum of 1.5 inches. For driveway areas, the thickness should be a minimum of 2 inches. The asphalt-wearing surface should consist of an SP-12.5 mix. The asphalt should be compacted to at least 95 percent of the mix design density.

The constructability of differing asphalt thicknesses may be difficult, and having a uniform 2-inch thick asphalt wearing surface may be more practical.

4.5 Rigid Pavement

Concrete pavement is a rigid pavement that results in smaller load transfers to the subgrade soils than flexible pavement. For concrete pavement subgrade, we recommend using the existing surficial sands or recommended clean sand (SP) fill, compacted to at least 98 percent of the Modified Proctor maximum dry density without additional stabilization with the following stipulations:

1. Subgrade soils must be compacted to at least 98 percent of Modified Proctor maximum dry density to a depth of at least 2 feet prior to placement of concrete.
2. The surface of the subgrade soils must be smooth and any disturbances or wheel rutting corrected prior to placement of the concrete.
3. The subgrade soils must be moistened prior to placement of concrete.
4. Concrete pavement thickness should be uniform throughout, with the exception of thickened edges (curb or footing).
5. The bottom of the pavement should be separated from the estimated seasonal high groundwater level by at least 18 inches.
6. Limerock or any other impermeable base is not suitable unless it meets the minimum recommended permeability of 10 ft/day.
7. The upper 12 inches of subgrade underlying the base course must also be "free-draining" and water that enters the base and subgrade must be allowed to seep out by gravity or if this is not possible, underdrains must be incorporated into the subgrade. A "bathtub" condition within the base/subgrade must be avoided.

Our recommendations for slab thickness for both light-duty and heavy-duty concrete pavements is based on a.) subgrade soils are compacted to 98 percent of the Modified Proctor maximum dry density, b.) modulus of subgrade reaction (k) of 200 pounds per cubic inch, c.) a 20-year design life, and d.) previously stated design parameters. For an anticipated light-duty traffic group, a minimum pavement thickness of 5.5 inches is recommended, using Table 2.4 from the ACI 330 Guide for Design and Construction of Concrete Parking Lots, ACI 330R-01. For an anticipated heavy-duty traffic group, a minimum pavement thickness of 8 inches is recommended, using Table 3.4 from the FDOT *Rigid Pavement Design Manual*, January 2019.

We recommend using concrete with a minimum 28-day compressive strength of 4,000 pounds per square inch and a minimum 28-day flexural strength (modulus of rupture) of at least 600 pounds per square inch based on the third point loading of concrete beam test samples. Maximum control joint spacing of 12.5 by 12.5 feet is suggested for light-duty concrete pavements. Maximum control joint spacing of 15 by 15 feet is suggested for heavy-duty concrete pavements. Layout of sawcut control joints should form square panels, and the depth of sawcut joint should be at least 1/4 of the concrete slab thickness. The joints should be sawed within six hours of concrete placement or as soon as the concrete has developed sufficient strength to support workers and equipment.

For further details on concrete pavement construction, refer to "Guide to Jointing Non-reinforced Concrete Pavements" published by the Florida Concrete and Products Associates, Inc. and "Building Quality Concrete Parking Areas", published by the Portland Cement Association.

4.6 Site Preparation

The soils at this site should be suitable for supporting the proposed construction using normal, good practice site preparation procedures. The following recommendations are our general guidelines for site preparation.

4.6.1 Stripping

Strip the construction limits and 10 feet beyond the perimeter of all grass, roots, topsoil, and other deleterious materials. You should expect to strip to depths of 12 or more inches. Deeper stripping will likely be necessary due to major root systems present at the site.

4.6.2 Dewatering

Temporary dewatering may be necessary for this project. If needed, we anticipate dewatering can be accomplished with sumps placed near the construction area, or with underdrains connected to a vacuum pump.

In any case, the site should always be graded to promote runoff and limit the amount of ponding. Localized ponding of stormwater is expected without proper grading during construction, and could render previously acceptable surfaces unacceptable.

4.6.3 Proof-Rolling

Proof-roll the subgrade with heavy rubber-tired equipment, such as a loaded front-end loader or dump truck, to identify any loose or soft zones not found by the soil borings. The proof-rolling should be monitored by a geotechnical engineer or qualified technician. Undercut or otherwise treat these zones as recommended by the geotechnical engineer in this report.

4.6.4 Proof Compaction

Compact the subgrade to a density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557). The specified compaction should be obtained to a depth of 1 foot below the foundation bottoms and the existing grade prior to placing fill. Vibratory roller equipment should not be used within approximately 100 feet of existing structures. Lighter "walk-behind" compaction equipment may be used to achieve the degree of compaction.

Should clayey sand be encountered at the bearing surface, this material should be probed and visually confirmed to be unyielding in the upper 12 inches in lieu of density testing. If the foundation excavations penetrate the clayey sand, the excavation should be performed in a manner that reduces soil disturbance. Clayey sand soils (with fines content in excess of 15 percent) that are removed and replaced or appreciably disturbed need to be re-compacted to 98 percent of the Standard Proctor maximum dry density (ASTM D698).

4.6.5 Fill Placement

Imported fill placed to raise the site grades should consist of clean sand having less than 10 percent passing the No. 200 sieve. On-site soils meeting the requirements of Section 4.9 may also be used as structural fill. The fill should be placed in maximum 12-inch loose lifts that are compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557). If lighter "walk-behind" compaction equipment is used, this may require lifts of 4 inches or less to achieve the required degree of compaction.

4.7 Quality Control and Construction Materials Testing

It should be noted that the geotechnical engineering design does not end with the advertisement of the construction documents. As the geotechnical engineer of record, GSE is the most qualified to perform the construction materials testing that will be required for this project. The benefits of having the geotechnical engineer of record also perform the construction materials testing are numerous. If GSE continues to be involved with the project through construction, we will be able to constantly re-evaluate and possibly alter our geotechnical recommendations in a timely and cost effective manner once final design and construction techniques are developed. This often results in cost savings for the project.

We recommend performing compaction testing beneath the concrete floor slab and the building foundations. We recommend one test be performed every 50 linear feet of continuous footing and every other column footing, per foot depth of fill or native material. We recommend a compaction test be performed for each 2,500 square feet of floor area or 10,000 square feet of pavement area per foot of fill or native material, or a minimum of three tests each, whichever is greater. Test all footing excavations to a depth of 12 inches at the frequencies stated above.

4.8 Stormwater Management

The auger borings located within the stormwater management facility encountered relatively consistent soil conditions. Auger boring P-1 encountered 6 feet of silty sand, and poorly graded sand (SM, SP) overlying clayey to very clayey sand, and clay with sand (SC, SC/CL, CL/CH) to the explored depth of 15 feet bls. Auger borings P-2 to P-4 initially encountered poorly graded sand, sand with silt, and silty sand (SP, SP-SM, SM) to depths of 2 to 5 feet bls, overlying silty clayey sand, and clayey to very clayey sand (SM-SC, SC, SC/CL) to depths of 7 to 10.5 feet bls. This was underlain by sand with silt (SP-SM) to depths of 12 to 13.5 feet bls, followed by clay-rich soils (CL/CH) to the explored depth of 15 feet bls. Auger boring P-5 initially encountered 5.5 feet of clayey sand (SC) and 5 feet of sand with silt (SP-SM) overlying clay with sand (CL/CH) to a depth of 12.5 feet bls. This was underlain by sand with silt (SP-SM) to the explored depth of 15 feet bls.

The water table was encountered in the auger borings at depths of 7.5 to 8.8 feet bls at the time of our exploration. We anticipate the seasonal high groundwater table to be at depths of 1 to 2.5 feet bls.

The laboratory permeability tests indicate the surficial layers of silty sand (SM) has hydraulic conductivity values of 0.8 to 1.1 feet per day, and clayey sand (SC) has no flow. The deeper very clayey sand encountered below the surficial sandy soils is friable and will have permeability values at least one order of magnitude lower than the sandy soils. The underlying dense soils and clay-rich soils are expected to be confining soils.

Mr. Cole Menhennett with CHW confirmed the proposed stormwater management facility as a dry pond via email. We understand that the current design will consider underdrains. We understand that imported clean sand will be used for the backfill for the underdrains. This revision includes soil parameters considering and underdrain design with clean sand backfill.

Based upon our findings and test results, our recommended soil parameters for the stormwater management design in the explored areas are presented below. The recommended parameters consider the results of the permeability tests, wash 200 determinations, and our experience with these types of soils. The parameters below do not consider a factor of safety.

Proposed Stormwater Management Facility

1. Base elevation of effective or mobilized aquifer (average depth of confining layer) equal to 8 feet bls.
2. Unsaturated vertical infiltration rate of 10 foot per day.
3. Horizontal hydraulic conductivity equal to 10 feet per day.
4. Specific yield (fillable porosity) of 20 percent.
5. Average seasonal high groundwater table depth equal to 2 feet bls.
6. Average seasonal low groundwater table depth equal to 6 feet bls.

In areas where clay-rich soils are present at the basin bottom, we recommend these soils be undercut a minimum of 2 feet and backfilled with the on-site sands and sands with silt (SP, SP-SM) having a maximum of 12 percent soil fines passing the No. 200 sieve. This fill should also be used above the bottom of the underdrains. The intent of this undercutting and replacement is to provide a more uniform sand "blanket" at the basin bottom that allows the migration of water to the underdrains. This sand blanket will also reduce the potential for clay-fines leaching out of the soils when water is present in the basin that can result in a thin layer of confining type material on the basin bottom that can reduce the effectiveness of the basin.

4.9 Fill Suitability

The soils encountered at this site within the explored depths range from sands (SP) to clays (CL/CH). A discussion of the suitability for reuse as structural fill for each soil classification according to the Unified Soil Classification System (USCS) designation is provided below.

SP, SP/SM – Sands (SP) and sand with silt (SP/SM) have less than 5 percent and 12 percent soil fines passing the No. 200 sieve, respectively, and are typically well draining soils that are suitable for reuse as structural fill. The sands with silt may require moisture conditioning (drying) to make the material more workable. These soils will require stockpiling and drying before they are reused if they are excavated from below the water table.

SM – Silty sands (SM) can have between 12 percent and 50 percent soil fines passing the No. 200 sieve. Silty sands are typically non-plastic or have low plasticity, and can be reused as structural fill with precautions. Silty sands can be moisture sensitive and difficult to work and compact and can rut if the moisture content is near or above the optimum moisture content. We recommend these soils be moisture conditioned (dried) so that the moisture content during use is at or below the optimum moisture content. Aerating and exposure to the sun is typically the most effective methods of drying these soils. It may not be practical to reuse these materials during the wet season, as frequent rain showers may not allow these soils to dry to a workable moisture content. Suitable silty sands are limited to soil having less than 30 percent soil fines passing the No. 200 sieve. Silty sands with more than 30 percent soil fines are especially moisture sensitive, and are not recommended for reuse as structural fill. These soils will behave more as sandy silt, and for this reason, very silty sands having more than 30 percent soil fines passing the No. 200 sieve have been assigned a dual classification of SM/ML. Silty sand soils that are excavated from below the water table are not recommended for reuse as structural fill due to the amount of time that will be required to dry these soils to a workable condition.

SC – Clayey sand (SC) soils can have between 12 percent and 50 percent soil fines passing the No. 200 sieve. Clayey sands can have a high range of plasticity, varying from a PI of 7 or greater and plotting above the A-line to highly plastic. Friable clayey sands are typically suitable for use as structural fill with precautions. Clayey sands will be moisture sensitive and difficult to work and compact and can rut during placement if the moisture content is near or above the natural moisture content. We recommend these soils be moisture conditioned (dried) so that the moisture content during use is at or below the optimum moisture content. Aerating and exposure to the sun is typically the most effective methods of drying these soils. It may not be practical to reuse these materials during the wet season, as frequent rain showers may not allow these soils to dry to a workable moisture content. Suitable clayey sands are limited to soil having less than 30 percent soil fines passing the No. 200 sieve. Clayey sands with more than 30 percent soil fines passing the No. 200 sieve are especially moisture sensitive and are typically highly plastic, and are not recommended for reuse as structural fill. These soils will behave more as sandy clay, and for this reason, very clayey sands having more than 30 percent soil fines passing the No. 200 sieve have been assigned a dual classification of SC/CH or SC/CL. Clayey sand soils that are excavated from below the water table are not recommended for reuse as structural fill due to the amount of time that will be required to dry these soils to a workable condition.

ML, MH, CL, CH – Silts and clays are not suitable materials for reuse as structural fill.

When using on-site soils as fill materials, we recommend the silty and clayey sand soils (SM, SC) be used in the lower depths of the fill. Sand and sand with silt (SP, SP-SM) should be used in the upper portions of the fill. We recommend a minimum of 2 feet of sand (SP, SP-SM) cover the silty and clayey sand fill materials to reduce the potential for soggy surface conditions due to the low permeability characteristics of the silty and clayey sand materials.

4.10 Surface Water Control and Landscaping

Roof gutters should be considered to divert runoff away from the building. The gutter downspouts should discharge a minimum of 10 feet from the structure to reduce the amount of water collecting around the foundations. Where possible, the gutter downspouts should discharge directly into the storm sewer system or onto the asphalt paved areas in order to reduce the amount of water collecting around the foundations. Grading of the site should be such that water is diverted away from the building on all sides to reduce the potential for erosion and water infiltration along the foundation.

With respect to landscaping, it is recommended that any trees and large "tree-like" shrubbery with potential for developing large root systems be planted a minimum distance of half their mature height, and preferably their expected final height, away from the structure. The purpose of this is to reduce the potential for foundation or slab movements from the growth of root systems as the landscaping matures.

5.0 FIELD DATA

5.1 Auger Boring Logs

GSE Engineering & Consulting, Inc.
GSE Engineering
5590 SW 64th St
Gainesville, FL 32608
Telephone: 3523773233

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida

DATE PERFORMED 9/20/2023 **BORING NUMBER A-1**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING NE CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 3.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0				(SP) Brown and gray SAND
1		AU 1		
2				2.0
		AU 2		(SP) Pale gray and brown SAND
3				▽
4				
5				5.0
				Bottom of borehole at 5.0 feet.

DATE PERFORMED 9/20/2023 **BORING NUMBER A-2**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING NE CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 3.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0				(SP-SM) Dark brown and gray SAND with silt
1		AU 1		*%PASS-200 = 11* *MC = 8.7*
2				2.5
		AU 2		(SP) Pale brown SAND
3				▽
4				
5				5.0
				Bottom of borehole at 5.0 feet.

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GSE Engineering
5590 SW 64th St
Gainesville, FL 32608
Telephone: 3523773233

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida

DATE PERFORMED 9/20/2023 **BORING NUMBER A-3**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
AT TIME OF DRILLING NE CHECKED BY AXL
ESTIMATED SEASONAL HIGH 3.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0				(SP-SM) Brown and gray SAND with silt
		AU 1		
2.0				(SP) Pale gray and brown SAND
		AU 2		
5.0				Bottom of borehole at 5.0 feet.

DATE PERFORMED 9/20/2023 **BORING NUMBER A-4**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
AT TIME OF DRILLING NE CHECKED BY AXL
ESTIMATED SEASONAL HIGH 3.0 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0				(SP-SM) Brown and gray SAND with silt
		AU 1		
1.5				(SC/CL) Brown, gray, and orange very clayey SAND
		AU 2		*%PASS-200 = 34* *MC = 18*
5.0				Bottom of borehole at 5.0 feet.

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Gainesville, FL 32608
Telephone: 3523773233

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida

DATE PERFORMED 9/20/2023 **BORING NUMBER A-5**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING NE CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 3.0 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm^2)	MATERIAL DESCRIPTION
0		AU 1		(SP-SM) Brown and gray SAND with silt
1				
2				
3				▽
				3.5
4		AU 2		(SC) Brown and gray clayey SAND
5				5.0
				Bottom of borehole at 5.0 feet.

GSE Engineering & Consulting, Inc.
GSE Engineering
5590 SW 64th St
Gainesville, FL 32608
Telephone: 3523773233

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida

DATE PERFORMED 9/20/2023 **BORING NUMBER P-1**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING 7.5 ft CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 2.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0.0				(SM) Gray and brown silty SAND
				%PASS-200 = 14
2.5		AP 1		▽ *MC = 7.8*
				k_h = 1.1 ft/day
				4.0
		AU 2		(SP) Brown and gray SAND with trace of clay
5.0				
				6.0
				(SC/CL) Pale gray and brown very clayey SAND
7.5				▼
		AU 3		
10.0				
				12.0
12.5		AU 4		(CL/CH) Gray CLAY with sand
				13.5
		AU 5		(SC) Brown and orange clayey SAND
15.0				15.0
				Bottom of borehole at 15.0 feet.

DATE PERFORMED 9/20/2023 **BORING NUMBER P-2**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING 7.8 ft CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 2.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0.0		AU 1		(SP) Brown and gray SAND
2.5				▽
				3.5
		AU 2		(SC) Brown and orange clayey SAND
5.0				
				6.5
				(SM-SC) Gray, brown, and orange silty clayey SAND
7.5		AU 3		▼
10.0				10.5
		AU 4		(SP-SM) Pale gray and brown SAND with silt
12.5				13.5
		AU 5		(CL/CH) Pale gray and brown CLAY with sand
15.0				15.0
				Bottom of borehole at 15.0 feet.

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GSE Engineering & Consulting, Inc.
GSE Engineering
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Gainesville, FL 32608
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CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida

DATE PERFORMED 9/20/2023 **BORING NUMBER P-3**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING 7.5 ft CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 1.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0.0		AP 1		(SM) Brown silty SAND
				%PASS-200 = 15
				▽ *MC = 9.7*
				k_h = 0.8 ft/day
2.5		AU 2		2.0 (SC) Brown, gray, and orange clayey SAND
5.0				
7.5		AU 3		7.0 ▼ (SP-SM) Pale gray and pale brown SAND with silt
10.0				
12.5		AU 4		12.0 (CL/CH) Green CLAY with sand
15.0				15.0 Bottom of borehole at 15.0 feet.

DATE PERFORMED 9/20/2023 **BORING NUMBER P-4**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING 8.8 ft CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 2.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0.0		AU 1		(SP-SM) Brown and gray SAND with silt
2.5				▽
5.0		AU 2		5.0 (SC) Brown, gray, and orange clayey SAND
7.5		AU 3		7.5 (SC/CL) Brown, gray, and orange very clayey SAND
				▼
10.0		AU 4		10.0 (SP-SM) Pale brown and pale gray SAND with silt
12.5		AU 5		12.5 (CL/CH) Brown and gray CLAY with sand
15.0				15.0 Bottom of borehole at 15.0 feet.

(Continued Next Page)

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CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida

DATE PERFORMED 9/20/2023 **BORING NUMBER P-5**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS: LOGGED BY WDI
▼ AT TIME OF DRILLING 8.8 ft CHECKED BY AXL
▽ ESTIMATED SEASONAL HIGH 1.0 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE NUMBER	CPT (kg/cm²)	MATERIAL DESCRIPTION
0.0				(SC) Brown and gray clayey SAND
2.5		AP 1		*%PASS-200 = 30* *MC = 13* *k_h = NF*
5.0				
5.5		AU 2		(SP-SM) Brown, gray, and orange SAND with silt
7.5				
10.0				
10.5		AU 3		(CL/CH) Gray and brown CLAY with sand
12.5				
12.5		AU 4		(SP-SM) Brown and orange SAND with silt
15.0				
15.0				Bottom of borehole at 15.0 feet.

5.2 Standard Penetration Test Soil Boring Logs

GSE Engineering & Consulting, Inc.
GSE Engineering
5590 SW 64th St
Gainesville, FL 32608
Telephone: 3523773233

BORING NUMBER B-1

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida
DATE STARTED 9/20/23 **COMPLETED** 9/20/23
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Flight Auger
▼ **AT TIME OF DRILLING** 6.5 ft
LOGGED BY WDI **CHECKED BY** AXL
▽ **ESTIMATED SEASONAL HIGH** 3.5 ft
NOTES

DEPTH (ft)	MATERIAL DESCRIPTION	CONTACT DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	PERCENT PASS NO. 200 SIEVE	MOISTURE CONTENT, %
0	(SP-SM) Very loose brown SAND with silt		SPT 1	1-1-1 (2)					
		3	SPT 2	1-2-3 (5)					
5	(CL) Firm to very stiff brown, gray, and orange sandy CLAY		SPT 3	4-6-9 (15)	35	18	17	56	17
			SPT 4	7-10-11 (21)					
		7.5	SPT 5	8-11-12 (23)					
10	(SP-SC) Medium dense brown, gray, and orange SAND with clay	9.5	SPT 6	9-10-14 (24)					
	(SP) Medium dense pale gray and brown SAND								
		12							
15	(CL/CH) Firm to stiff green and orange CLAY		SPT 7	3-4-5 (9)					
20		20	SPT 8	2-3-4 (7)					
	Bottom of borehole at 20.0 feet.								

▲ SPT N VALUE ▲
20 40 60 80

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GSE Engineering & Consulting, Inc.
GSE Engineering
5590 SW 64th St
Gainesville, FL 32608
Telephone: 3523773233

BORING NUMBER B-2

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida
DATE STARTED 9/20/23 **COMPLETED** 9/20/23
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Flight Auger
▼ **AT TIME OF DRILLING** 6.1 ft
LOGGED BY WDI **CHECKED BY** AXL
▽ **ESTIMATED SEASONAL HIGH** 3.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CONTACT DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	PERCENT PASS NO. 200 SIEVE	MOISTURE CONTENT, %	▲ SPT N VALUE ▲
0		(SP-SM) Very loose gray and brown SAND with silt		SPT 1	1-2-2 (4)						20 40 60 80
			3	SPT 2	1-2-2 (4)						
5		(SM-SC) Very loose to medium dense gray, brown, and orange silty clayey SAND ▽ ▼		SPT 3	2-4-6 (10)						
				SPT 4	7-9-8 (17)						
				SPT 5	7-8-10 (18)						
			8.5								
10		(SP-SC) Very loose to medium dense pale gray and brown SAND with clay		SPT 6	7-9-10 (19)						
		Weight-of-Rod from 13.5 to 14.5 ft bls.	14.5	SPT 7	0-0-3 (3)						
15		(CL/CH) Soft gray sandy CLAY									
			16.5								
		(CL/CH) Firm green and orange CLAY									
				SPT 8	3-3-4 (7)						
20			20								
		Bottom of borehole at 20.0 feet.									

SPT BORINGS - GINT STD US.GDT - 10/11/23 09:54 - P:\GENERAL\PROJECTS\16251 DOLLAR GENERAL – LAKE CITY SW MARVIN BURNETT\16251 BORINGS\16251 BORINGS.GPJ

GSE Engineering & Consulting, Inc.
GSE Engineering
5590 SW 64th St
Gainesville, FL 32608
Telephone: 3523773233

BORING NUMBER B-3

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida
DATE STARTED 9/20/23 **COMPLETED** 9/20/23
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Flight Auger
▼ **AT TIME OF DRILLING** 6.1 ft
LOGGED BY WDI **CHECKED BY** AXL
▽ **ESTIMATED SEASONAL HIGH** 3.5 ft
NOTES

DEPTH (ft)	MATERIAL DESCRIPTION	CONTACT DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	PERCENT PASS NO. 200 SIEVE	MOISTURE CONTENT, %	▲ SPT N VALUE ▲
0	(SP-SM) Very loose gray and brown SAND with silt		SPT 1	1-1-1 (2)						
		2.5								
	(SP) Loose pale gray SAND ▽		SPT 2	1-2-4 (6)						
		4.5	SPT 3	2-4-5 (9)						
5	(SP-SC) Loose to gray and brown SAND with clay									
		6	SPT 4	6-2-9 (11)						
	(SC/CL) Medium dense to dense gray, brown, and orange very clayey SAND		SPT 5	7-9-11 (20)						
			SPT 6	14-16-22 (38)						
10										
		13.5								
	(CL) Firm gray sandy CLAY		SPT 7	2-3-3 (6)	41	15	26	62	23	
15										
		16								
	(CL/CH) Green and orange CLAY									
20		20								
	Bottom of borehole at 20.0 feet.									

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Gainesville, FL 32608
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BORING NUMBER B-4

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida
DATE STARTED 9/20/23 **COMPLETED** 9/20/23
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Flight Auger
▼ **AT TIME OF DRILLING** 6.5 ft
LOGGED BY WDI **CHECKED BY** AXL
▽ **ESTIMATED SEASONAL HIGH** 3.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CONTACT DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	PERCENT PASS NO. 200 SIEVE	MOISTURE CONTENT, %	▲ SPT N VALUE ▲
0		(SP-SM) Very loose gray and brown SAND with silt		SPT 1	1-1-2 (3)						
			3	SPT 2	4-7-11 (18)						
5		▽ (SP) Medium dense pale gray and brown SAND		SPT 3	7-5-6 (11)						
			6	SPT 4	3-4-5 (9)						
		▼ (SM-SC) Loose to medium dense gray, brown, and orange silty SAND with clay		SPT 5	5-7-14 (21)				27	18	
			9	SPT 6	12-10-9 (19)						
10		(SC) gray and brown clayey SAND									
			13								
		(SP-SC) Medium dense gray, brown, and orange SAND with clay		SPT 7	4-9-12 (21)						
15											
			17								
		(CL/CH) Firm green and gray sandy CLAY									
20				SPT 8	3-3-4 (7)						
			20								
		Bottom of borehole at 20.0 feet.									

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BORING NUMBER B-5

CLIENT Concept Development, Inc.
PROJECT NAME Dollar General - Lake City SW Marvin Burnett
PROJECT NUMBER 16251
PROJECT LOCATION Lake City, Columbia County, Florida
DATE STARTED 9/20/23 **COMPLETED** 9/20/23
GROUND ELEVATION **HOLE SIZE**
DRILLING CONTRACTOR Whitaker Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Flight Auger
AT TIME OF DRILLING 6.5 ft
LOGGED BY WDI **CHECKED BY** AXL
ESTIMATED SEASONAL HIGH 3.5 ft
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CONTACT DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	PERCENT PASS NO. 200 SIEVE	MOISTURE CONTENT, %	▲ SPT N VALUE ▲
0		(SP-SM) Very loose brown and gray SAND with silt		SPT 1	1-1-2 (3)						20 40 60 80
			3	SPT 2	4-7-8 (15)						
5		(SP) Medium dense pale brown and pale gray SAND		SPT 3	10-11-13 (24)						
				SPT 4	10-8-9 (17)						
			8	SPT 5	7-8-11 (19)						
10		(SP-SC) Medium dense to dense brown and orange SAND with clay	10	SPT 6	17-21-24 (45)				11	17	
		(SP) Medium dense pale brown and gray SAND									
15				SPT 7	5-7-9 (16)						
			17.5								
		(CL/CH) Hard pale gray sandy CLAY		SPT 8	8-14-19 (33)						
20			20								
		Bottom of borehole at 20.0 feet.									

5.3 Laboratory Results

GSE Engineering & Consulting, Inc.

SUMMARY REPORT OF LABORATORY TEST RESULTS

Project Number: 16251

Project Name: Dollar General - Lake City SW Marvin Burnett

Boring Number	Depth (ft)	Soil Description	Natural Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Organic Content (%)	Hydraulic Conductivity (ft/day)	Unified Soil Classification
A-2	1-1.5	Dark brown and gray SAND with silt	8.7				11			SP-SM
A-4	3-3.5	Brown, gray, and orange very clayey SAND	18				34			SC/CL
B-1	4-5.5	Brown, gray, and orange sandy CLAY	17	35	18	17	56			CL
B-3	13.5-15	Gray sandy CLAY	23	41	15	26	62			CL
B-4	7-8.5	Gray, brown, and orange silty SAND with clay	18				27			SM-SC
B-5	8.5-10	Pale brown and gray SAND with clay	17				11			SP-SC
P-1	2-4	Gray and brown silty SAND	7.8				14		1.1	SM
P-3	0-2	Brown silty SAND	9.7				15		0.8	SM
P-5	3-5	Brown and gray clayey SAND	13				30		NF	SC

5.4 Key to Soil Classification

KEY TO SOIL CLASSIFICATION CHART

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests				SYMBOLS		GROUP NAME
				GRAPHIC	LETTER	
COARSE-GRAINED SOILS	Gravels	Clean Gravels	Cu ≥ 4 and 1 ≤ Cc ≤ 3		**GW**	Well graded GRAVEL
More than 50% retained on No. 200 sieve	More than 50% of coarse fraction retained on No. 4 sieve	Less than 5% fines	Cu < 4 and/or 1 > Cc > 3		**GP**	Poorly graded GRAVEL
		Gravels with fines	Fines classify as ML or MH		**GM**	Silty GRAVEL
		More than 12% fines	Fines classify as CL or CH		**GC**	Clayey GRAVEL
	Sands	Clean Sands	Cu ≥ 6 and 1 ≤ Cc ≤ 3		**SW**	Well graded SAND
	50% or more of coarse fraction passes No. 4 sieve	Less than 5% fines	Cu < 6 and/or 1 > Cc > 3		**SP**	Poorly graded SAND
		Sand with fines	Fines classify as ML or MH		**SP-SM**	SAND with silt
		5% ≤ fines < 12%	Fines classify as CL or CH		**SP-SC**	SAND with clay
		Sand with fines	Fines classify as ML or MH		**SM**	Silty SAND
		12% ≤ fines < 30%	Fines classify as CL or CH		**SC**	Clayey SAND
		Sand with fines	Fines classify as ML or MH		**SM**	Very silty SAND
		30% fines or more	Fines classify as CL or CH		**SC**	Very clayey SAND
FINE-GRAINED SOILS	Clays	inorganic	50% ≤ fines < 70%		**CL/CH**	Sandy CLAY
50% or more passes the No. 200 sieve			70% ≤ fines < 85%		**CL/CH**	CLAY with sand
			fines ≥ 85%		**CL/CH**	CLAY
	Silts and Clays	inorganic	PI > 7 and plots on/above "A" line		**CL**	Lean CLAY
	Liquid Limit less than 50		PI < 4 or plots below "A" line		**ML**	SILT
		organic	Liquid Limit - oven dried / Liquid Limit - not dried < 0.75		**OL**	Organic clay / Organic silt
	Silts and Clays	inorganic	PI plots on or above "A" line		**CH**	Fat CLAY
	Liquid Limit 50 or more		PI plots below "A" line		**MH**	Elastic SILT
		organic	Liquid Limit - oven dried / Liquid Limit - not dried < 0.75		**OH**	Organic clay / Organic silt
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor				**PT**	PEAT

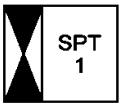
CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

	No. OF BLOWS, N	RELATIVE DENSITY
	0 - 4	Very Loose
	5 - 10	Loose
SANDS:	11 - 30	Medium dense
	31 - 50	Dense
	OVER 50	Very Dense

	No. OF BLOWS, N	CONSISTENCY
	0 - 2	Very Soft
SILTS	3 - 4	Soft
&	5 - 8	Firm
CLAYS:	9 - 15	Stiff
	16 - 30	Very Stiff
	31 - 50	Hard
	OVER 50	Very Hard

	No. OF BLOWS, N	RELATIVE DENSITY
	0 - 8	Very Soft
	9 - 18	Soft
LIMESTONE:	19 - 32	Moderately Hard
	33 - 50	Hard
	OVER 50	Very Hard

SAMPLE GRAPHIC TYPE LEGEND



Location of SPT Sample

Location of Auger Sample

PARTICLE SIZE IDENTIFICATION

BOULDERS:		Greater than 300 mm
COBBLES:		75 mm to 300 mm
GRAVEL:	Coarse -	19.0 mm to 75 mm
	Fine -	4.75 mm to 19.0 mm
SANDS:	Coarse -	2.00 mm to 4.75 mm
	Medium -	0.425 mm to 2.00 mm
	Fine -	0.075 mm to 0.425 mm
SILTS & CLAYS:		Less than 0.075 mm

LABORATORY TEST LEGEND

LL	=	Liquid Limit, %
PL	=	Plastic Limit, %
PI	=	Plasticity Index, %
% PASS - 200	=	Percent Passing the No. 200 Sieve
MC	=	Moisture Content, %
ORG	=	Organic Content, %
k_h	=	Horizontal Hydraulic Conductivity, ft/day

6.0 LIMITATIONS

6.1 Warranty

This report has been prepared for our client for their exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

6.2 Auger and SPT Borings

The determination of soil type and conditions was performed from the ground surface to the maximum depth of the borings, only. Any changes in subsurface conditions that occur between or below the borings would not have been detected or reflected in this report.

Soil classifications that were made in the field are based upon identifiable textural changes, color changes, changes in composition or changes in resistance to penetration in the intervals from which the samples were collected. Abrupt changes in soil type, as reflected in boring logs and/or cross sections may not actually occur, but instead, be transitional.

Depth to the water table is based upon observations made during the performance of the auger and SPT borings. This depth is an estimate and does not reflect the annual variations that would be expected in this area due to fluctuations in rainfall and rates of evapotranspiration.

6.3 Site Figures

The measurements used for the preparation of the figures in this report were made using the provided site plan and by estimating distances from existing structures and site features. Figures in this report were not prepared by a licensed land surveyor and should not be interpreted as such.

6.4 Unanticipated Soil Conditions

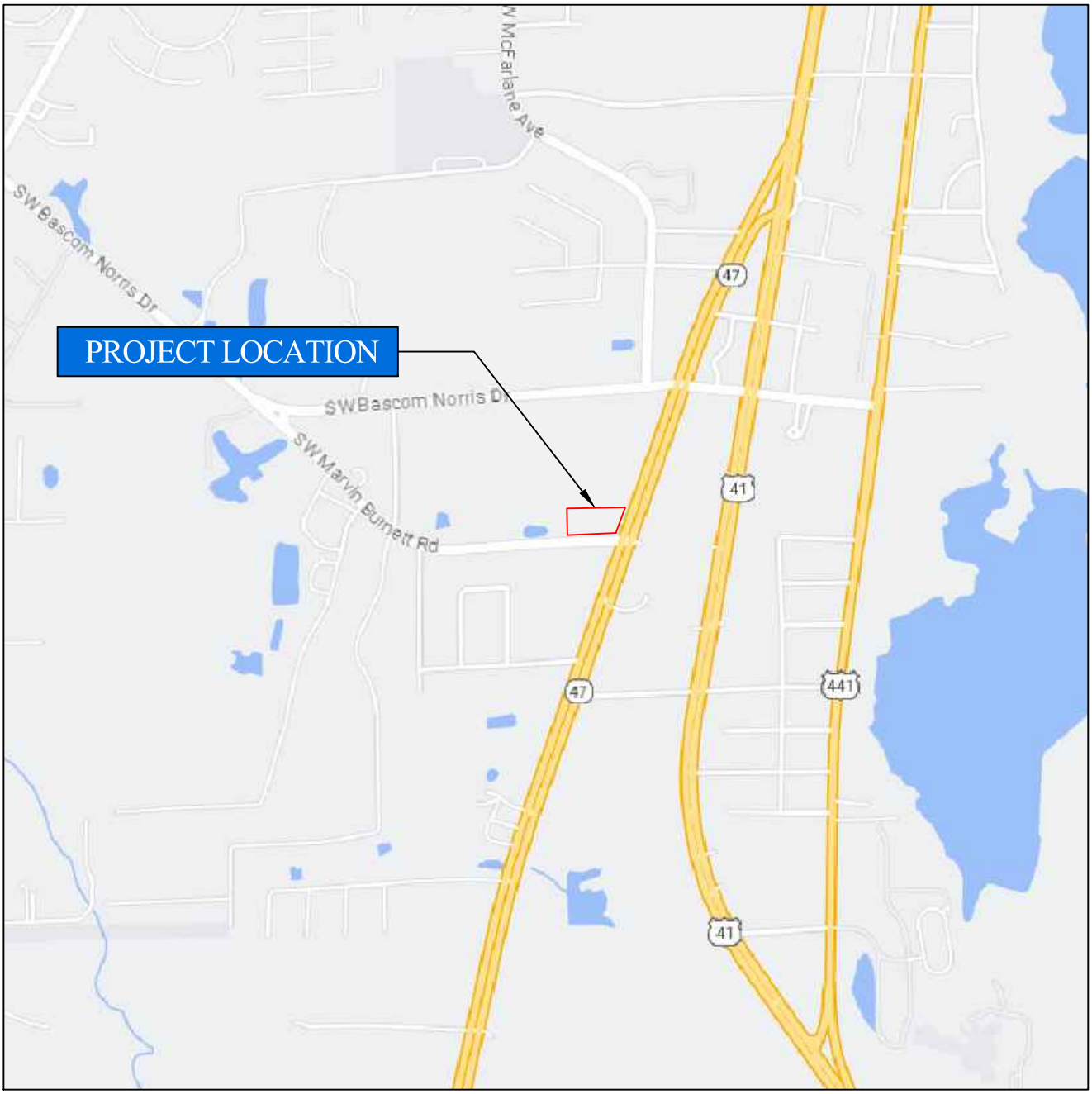
The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on Figure 2. This report does not reflect any variations that may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

6.5 Misinterpretation of Soil Engineering Report

GSE Engineering & Consulting, Inc. is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If others make the conclusions or recommendations based upon the data presented, those conclusions or recommendations are not the responsibility of GSE.

FIGURES



NORTH

NOT TO SCALE

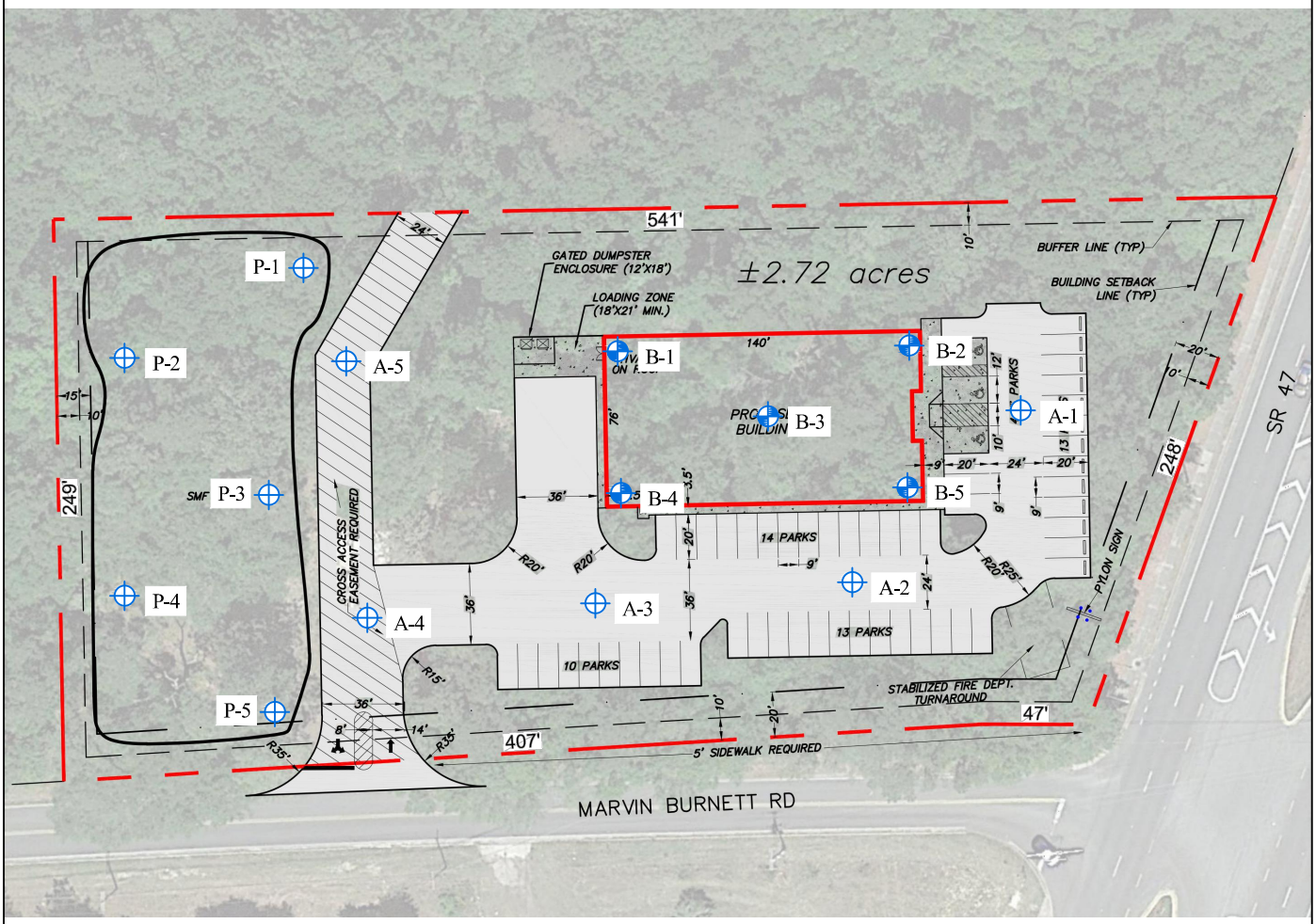
DOLLAR GENERAL - LAKE CITY
SW MARVIN BURNETT
LAKE CITY, COLUMBIA COUNTY, FLORIDA
GSE PROJECT NO. 16251

PROJECT SITE LOCATION MAP

DESIGNED BY: AXL
CHECKED BY : JEG
DRAWN BY : EEW

GSE Engineering & Consulting, Inc.

FIGURE 1



LEGEND:

- SPT BORING
- AUGER BORING

NORTH

0 80'

SCALE: 1" = 80' APPROX.

DOLLAR GENERAL - LAKE CITY
SW MARVIN BURNETT
LAKE CITY, COLUMBIA COUNTY, FLORIDA
GSE PROJECT NO. 15396

SITE PLAN SHOWING APPROXIMATE LOCATIONS OF FIELD TESTS

DESIGNED BY: AXL
CHECKED BY : JEG
DRAWN BY : AXL

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FIGURE 2