Stormwater Impact Analysis

For

1915 & 1917 Old Bunn Road

Zebulon, North Carolina 27597

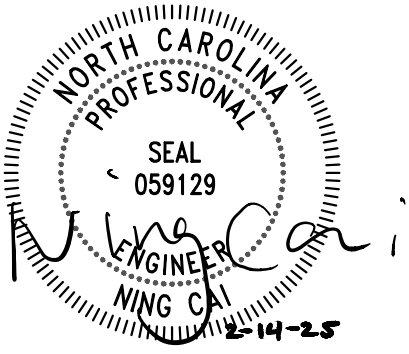
Submitted to:
Wake County Environmental Services Department
Water Quality Division, Watershed Management Section
336 Fayetteville St.
Raleigh, North Carolina 27602

Prepared for:
Eastwood Homes
7101 Creedmoor Road, Suite 115
Raleigh, North Carolina 27610

Prepared by:

PABST DESIGN GROUP, PA
Engineering | Consulting

Date: February 14th, 2025
PDG Project No: 673-23



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I. Introduction

Pabst Design Group, PA (PDG) of Raleigh, NC has been contracted by Eastwood Homes (the Client) to provide this analysis, along with supporting calculations, to Wake County for their review. The information contained within will assist Wake County with their evaluation of site development for the subject property as it relates to specific Town of Zebulon and State regulations.

II. Project Data

Project Data Table	
Project Name:	Bennett Bunn Plantation Subdivision
Parcel Identification Number(s):	2715-29-0916 (1915 Old Bunn Road) 2716-21-5371 (1917 Old Bunn Road)
Parcel Address(es):	1915 & 1917 Old Bunn Road, Zebulon, NC 27597
Previous Rezoning or Site Plan Case Number(s):	1555968
Drainage Basin:	Upper Moccasin Creek
River Basin:	Neuse
Pre-Developed Impervious Area:	112,840 Square Feet
Post-Developed Impervious Area:	2,606,694 Square Feet
Total Maximum Daily Discharge Limit (TMDLs):	None
Watershed Protection Overlay:	None

III. Site History and Site Description

Based on Wake County GIS Aerials from 1999, the primary land cover is impervious and open space.

Applicable baseline dates that must be considered for peak runoff, water quality, and watershed protection overlay as they relate to historical development on the site are as follows:

1. Watershed protection overlay requirements, **not applicable**,
2. 2- and 10-year peak flow requirements, **not applicable**,
3. 1-year peak flow requirements, **not applicable**,
4. Nitrogen requirements, **not applicable**.

The subject property, which is located at 1915 & 1917 Old Bunn Road in Zebulon, North Carolina, and is zoned Residential-30 (R-30) and will be rezoned to Planned Development (PD) District. The property on the existing parcels are listed as two Heated SF Conventional Frame with several existing buildings. Six discharge points are used as the points of analysis.

For the purpose of this report, these site conditions are herein referred to as **pre-developed site conditions**.

IV. Project Description

The proposed development includes the construction of 622 residential lots, as well as associated driveways and parking lots. Infrastructure improvements include, but are not limited to, the construction of sanitary sewer services, water services, stormwater conveyance, and stormwater control measure(s). Approximately **2,493,854.26 SF** of impervious is being added to the site for a final built upon area of **37.5%**. The project will disturb approximately **159.72-acres**.

The site will be graded to the maximum extent possible to maintain the existing drainage patterns of the site. Most of the runoff will be treated by the six proposed wet ponds. The controlled runoff will discharged into the perennial stream which flows through the site from south to north.

Refer to plan sheet C-4.0 within the submitted administrative site review plans and the drainage area maps included within this report.

For the purpose of this report, these site conditions are herein referred to as **post-developed site conditions**.

V. Quantifying Land Disturbance and Changes in Impervious Surface

As noted within Section III above, the property is currently open space and impervious. Land disturbance associated with building and site improvements will total **159.72-acres**. There is **112,840 SF** of existing impervious on site, and the proposed impervious surface totals **2,606,694.26 SF** onsite, with a final built upon area of **37.5%.** Refer to plan sheets C-1.0 and C-4.0 within the submitted administrative site review plans for reference. The proposed development does not meet any exemption thresholds based on land disturbance or impervious surface.

VI. Watershed Protection Overlay

The subject site is **not** located within a watershed protection overlay district per the ToZ's Official Zoning Map.

VII. Streams

There are two streams on or within 150 feet of the property boundary, per wake county soil survey map and USGS Quad map.

VIII. Floodplains and Flood Hazard Soils

According to FEMA's Flood Insurance Rate Map, identified by Map Number 3720271600L, the subject site is located within a Flood Zone. There are flood hazard soils located on site per Wake County Soil Survey and are located within the stream buffered area. However, no grading or development is planned within those areas.

IX. Applicable Requirements

Peak Runoff Requirements

Per the Town of Zebulon's Unified Development Ordinance (UDO) Section 151.35.D.(4), "Structural and non-structural BMPs shall be used to ensure there is no net increase in peak flow leaving the site from the pre-development conditions for the one-year, 24-hour storm. Runoff volume drawdown time shall be a minimum of 48

hours, but not more than 120 hours." There's no increase in peak flow for DA-2 through DA-6, and therefore detention is not required. 6 wet ponds were provided to provide TSS removal only. DA-1 has a large watershed of 2,568 ac and therefore was assumed to have no increase between pre and post conditions. Refer to plan sheet(s) C-4.0 within the submitted plans, as well as the pre- and post-development drainage area maps within this report for reference.

Downstream Impact Analysis (DIA)

The Town of Zebulon requires a DIA to be performed with the 10% rule.

(A) Downstream impact analysis.

(1) The downstream impact analysis must be performed in accordance with the "10% rule," and a copy of the analysis must be provided with the permit application. The purpose of the downstream impact analysis is to determine if the project will cause any impacts on flooding or channel degradation downstream of the project site. The analysis must include the assumptions, results and supporting calculations to show safe passage of post-development design flows downstream. This analysis shall be performed at the outlet(s) of the site, and downstream at each tributary junction to the point(s) in the conveyance system where the area of the portion of the site draining into the system is less than or equal to 10% of the total drainage area above that point.

(2) The typical steps in the application of the 10% rule are:

(a) Using a topographic map, determine the point downstream where the proposed site equals 10% of the total drainage area, called the 10% point. Identify all tributary junctions between the downstream site boundary and the 10% point. All points identified, as well as the outlet of the site, are known as 10% rule comparison points.

The entire drainage area to the POI is 2,568 acres and the area in review is approximately 1,620 acres and the project site encompasses 162.32 acres. Therefore, the DIA is not required for this project given the size of the watershed.

Water Quality (nitrogen, phosphorous, and TSS) Requirements

Nitrogen

Subject site is not subject to nitrogen removal.

Phosphorous

Subject site is not subject to phosphorous removal.

TSS

Subject site is required to have a minimum of 85% average removal for TSS per Town of Zebulon's UDO Section 151.35.

On-site Percentage Removal for Nitrogen and Phosphorous

Subject site is located within the Upper Neuse River Basin and is not subject to on-site percentage removal for nitrogen and phosphorous.

TMDLs

Subject site is located within the Upper Neuse River Basin and is not subject to TMDLs.

X. Methodology

- Runoff Rates for pre-development and post-development for DA-2 to DA-6 were calculated using Wake County's Stormwater Design Tool.

- Drainage area has runoff curve number calculated for it based on cover type within the drainage area, as per Wake County's Stormwater Design Tool. Land cover for areas not surveyed is approximated based on Wake County GIS and aerial imagery. The residential lots were assumed to have 40% of impervious and 60% pervious.

- A time of concentration of 5 minutes was assumed for DA-2 through DA-6. The time of concentration for DA-1 was not calculated, as it was assumed that there would be no increase in runoff between pre- and post-development conditions due to the size of the watershed.

- Hydrologic Soil Groups are classified based on and USDA Web Soil Survey, provided in Section XIV of this report. Soil Group delineation provided by Wake County GIS and USDA Web Soil Survey.

- Boundary and topographic survey information was provided by Newcomb Land Surveyors, LLC.

XI. Conclusion

PDG's peak runoff analyses compared the pre-, post-development conditions at each point of analysis for stormwater runoff leaving the site for the 1-yr storm. There's no increase in peak flow for DA-2 through DA-6. Analysis for DA-1 will not be provided given the size of the drainage area and will be assumed to have no increase between pre and post-development condition.

Summary results are below.

Peak Flow Summary Table for the 1-year Storm Event

1-year	**Pre-Development (cfs)**	**Post w/out Detention (cfs)**	**% Increase**
DA-1	-	-	-
DA-2	3.01	0	Decrease
DA-3	8.54	0.20	Decrease
DA-4	4.27	0.18	Decrease
DA-5	6.18	5.10	Decrease
DA-6	3.60	0.76	Decrease

XII. Wake County Stormwater Tool

SITE DATA

Project Information	
Project Name:	**Bennett Bunn Plantation Subdivision**
Permit No (if known):	
Applicant:	Eastwood Homes, Inc
Applicant Contact Name:	Billy Guillet
Applicant Contact Number:	919-675-8769
Contact Email:	bguillet@eastwoodhomes.com
Last Modified Date:	Friday, February 14, 2025
Site Data:	
River Basin:	Neuse
Regulatory Watershed:	N/A
Physiographic/Geologic Region:	Piedmont
Type of Development (Select from Dropdown menu):	Residential
Zoning:	R-30
Total Site Area (Ac):	4.28
Existing Lake/Pond Area (Ac):	3.07
Proposed Disturbed Area (Ac):	159.72
Proposed Impervious Surface Area from DA Sheets (acre):	0.89
Percent Built Upon Area (BUA):	21%
Is the proposed project a site expansion?	No
Number of Drainage Areas on Site (Points of Analysis):	6
Annual Rainfall (in):	45.41
One-year, 24-hour rainfall (in):	3.00
Two-year, 24-hour rainfall (in):	3.60
Proposed Residential Stormwater Details (if applicable):	
Site Square Footage:	186,437
Total Acreage in Lots:	126.06
Lot Square Footage:	5,491,174
Number of Lots:	622
Average Lot Size (SF):	8,828
Proposed Impervious Surface Area from DA sheets (SF):	38,768
Proposed Impervious Surface Area Devoted to Lots (SF):	
Total Impervious Surface Area Devoted to Roads (SF):	
Other Impervious Surface Area (SF):	

Stormwater Narrative (limit to 1,200 characters - attach additional pages with submittal if necessary):

Please note that, per our meeting with Carrie Mitchell on 1/17/2025, DA-1 will not be analyzed. It is assumed that there will be no increase in runoff between pre- and post-development conditions due to the size of the watershed (2,568 acres). As a result, no data will be entered in the DA-1 tab, and the calculations in this sheet will not reflect DA-1.

WAKE COUNTY
NORTH CAROLINA

Project Name: Bennett Bunn Plantation Subdivision

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT	POST-DEVELOPMENT
Drainage Area (Acres)=	0.00	0.00
Site Acreage within Drainage=	0.00	0.00
One-year, 24-hour rainfall (in)=	3.00	

Land Use (acres) by Soil Group:	A Soils		B Soils		C Soils		D Soils		A Soils		B Soils		C Soils		D Soils	
Commercial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Industrial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Transportation	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
High Density (interstate, main)																
High Density (Grassed Right-of-ways)																
Low Density (secondary, feeder)																
Low Density (Grassed Right-of-ways)																
Rural																
Rural (Grassed Right-of-ways)																
Sidewalk																
Misc. Pervious	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Managed pervious (Open Space)																
Unmanaged (pasture)																
Woods (not on lots)																
Residential	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Roadway																
Grassed Right-of-ways																
Driveway																
Parking lot																
Roof																
Sidewalk (Includes Patios)																
Lawn																
Managed pervious (Open Space)																
Woods (on lots)																
Land Taken up by BMP																
JURISDICTIONAL LANDS	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland																
Riparian buffer (Zone 1 only)																
Open water																
Totals (Ac)=	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
n-value=		
T_t (hrs)=	0.00	0.00
Shallow Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Channel Flow 1		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=	0.00	0.00
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Tc (hrs)=		

RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Site Impervious Surface Area (Ac) =	0.00	0.00
Lot Impervious Surface Area (Ac) =	0.00	0.00
1-year, 24-hour storm (Peak Flow)		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Runoff (inches) = Q*=		
Peak Discharge (cfs)= Q=		
Composite Curve Number (DA)=		
Composite Curve Number (Site only)=		

DISCONNECTED IMPERVIOUS - Credit given only to residential development with drainage area with less than 30% impervious	
Percent Disconnected Impervious Credit (Residential Only) =	
Disconnected impervious area (Ac) =	0.00
Drainage Area $CN_{adjusted}$=	
Site Only $CN_{adjusted}$=	

Project Name: Bennett Bunn Plantation Subdivision

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT	POST-DEVELOPMENT
Drainage Area (Acres)=	2.07	0.00
Site Acreage within Drainage=	2.07	0.00
One-year, 24-hour rainfall (in)=	3.00	

Land Use (acres) by Soil Group:	A Soils		B Soils		C Soils		D Soils		A Soils		B Soils		C Soils		D Soils	
Commercial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Industrial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Transportation	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
High Density (interstate, main)																
High Density (Grassed Right-of-ways)																
Low Density (secondary, feeder)																
Low Density (Grassed Right-of-ways)																
Rural																
Rural (Grassed Right-of-ways)																
Sidewalk																
Misc. Pervious	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Managed pervious (Open Space)					2.07				0.00							
Unmanaged (pasture)																
Woods (not on lots)																
Residential	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Roadway																
Grassed Right-of-ways																
Driveway																
Parking lot																
Roof																
Sidewalk (Includes Patios)																
Lawn																
Managed pervious (Open Space)																
Woods (on lots)																
Land Taken up by BMP																
JURISDICTIONAL LANDS	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland																
Riparian buffer (Zone 1 only)																
Open water																
Totals (Ac)=	0.00	0.00	0.00	0.00	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
n-value=		
T_t (hrs)=	0.00	0.00
Shallow Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Channel Flow 1		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=	0.00	0.00
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Tc (hrs)=	0.08	0.08

RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Site Impervious Surface Area (Ac) =	0.00	0.00
Lot Impervious Surface Area (Ac) =	0.00	0.00
1-year, 24-hour storm (Peak Flow)		
Volume of runoff (ft^3) =	6,825	
Volume change (ft^3) =		
Runoff (inches) = Q*=	0.9082	
Peak Discharge (cfs)= Q=	3.0145	
Composite Curve Number (DA)=	74	
Composite Curve Number (Site only)=	74	

DISCONNECTED IMPERVIOUS - Credit given only to residential development with drainage area with less than 30% impervious

Percent Disconnected Impervious Credit (Residential Only) =	
Disconnected impervious area (Ac) =	0.00
Drainage Area $CN_{adjusted}$=	
Site Only $CN_{adjusted}$=	

WAKE COUNTY
NORTH CAROLINA

Project Name: Bennett Bunn Plantation Subdivision

DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT								POST-DEVELOPMENT							
Drainage Area (Acres)=	11.21								0.41							
Site Acreage within Drainage=	11.21								0.41							
One-year, 24-hour rainfall (in)=	3.00															
Land Use (acres) by Soil Group:	**A Soils**		**B Soils**		**C Soils**		**D Soils**		**A Soils**		**B Soils**		**C Soils**		**D Soils**	
Commercial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Industrial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Transportation	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
High Density (interstate, main)																
High Density (Grassed Right-of-ways)																
Low Density (secondary, feeder)																
Low Density (Grassed Right-of-ways)																
Rural																
Rural (Grassed Right-of-ways)																
Sidewalk																
Misc. Pervious	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Managed pervious (Open Space)			7.54		3.56						0.41		0.00			
Unmanaged (pasture)																
Woods (not on lots)																
Residential	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Roadway																
Grassed Right-of-ways																
Driveway																
Parking lot																
Roof																
Sidewalk (Includes Patios)																
Lawn																
Managed pervious (Open Space)																
Woods (on lots)																
Land Taken up by BMP																
JURISDICTIONAL LANDS	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland			0.11								0.00					
Riparian buffer (Zone 1 only)																
Open water																
Totals (Ac)=	0.00	0.00	7.65	0.00	3.56	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
n-value=		
T_t (hrs)=	0.00	0.00
Shallow Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Channel Flow 1		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=	0.00	0.00
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Tc (hrs)=	0.08	0.08

RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Site Impervious Surface Area (Ac) =	0.00	0.00
Lot Impervious Surface Area (Ac) =	0.00	0.00
1-year, 24-hour storm (Peak Flow)		
Volume of runoff (ft^3) =	20,701	543
Volume change (ft^3) =	-20,158	
Runoff (inches) = Q*=	0.5087	0.3651
Peak Discharge (cfs)= Q=	8.5427	0.1953
Composite Curve Number (DA)=	65	61
Composite Curve Number (Site only)=	65	61

DISCONNECTED IMPERVIOUS - Credit given only to residential development with drainage area with less than 30% impervious

Percent Disconnected Impervious Credit (Residential Only) =	
Disconnected impervious area (Ac) =	0.00
Drainage Area $CN_{adjusted}$=	61
Site Only $CN_{adjusted}$=	61

WAKE COUNTY
NORTH CAROLINA

Project Name: Bennett Bunn Plantation Subdivision

DRAINAGE AREA 4
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT								POST-DEVELOPMENT							
Drainage Area (Acres)=	7.38								0.37							
Site Acreage within Drainage=	7.38								0.37							
One-year, 24-hour rainfall (in)=	3.00															
Land Use (acres) by Soil Group:	**A Soils**		**B Soils**		**C Soils**		**D Soils**		**A Soils**		**B Soils**		**C Soils**		**D Soils**	
Commercial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof	0.17								0.00							
Open/Landscaped																
Industrial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Transportation	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
High Density (interstate, main)																
High Density (Grassed Right-of-ways)																
Low Density (secondary, feeder)																
Low Density (Grassed Right-of-ways)																
Rural																
Rural (Grassed Right-of-ways)																
Sidewalk																
Misc. Pervious	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Managed pervious (Open Space)			7.21								0.37					
Unmanaged (pasture)																
Woods (not on lots)																
Residential	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Roadway																
Grassed Right-of-ways																
Driveway																
Parking lot																
Roof																
Sidewalk (Includes Patios)																
Lawn																
Managed pervious (Open Space)																
Woods (on lots)																
Land Taken up by BMP																
JURISDICTIONAL LANDS	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland																
Riparian buffer (Zone 1 only)																
Open water																
Totals (Ac)=	0.17	0.00	7.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
n-value=		
T_t (hrs)=	0.00	0.00
Shallow Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Channel Flow 1		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=	0.00	0.00
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Tc (hrs)=	0.08	0.08

RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Site Impervious Surface Area (Ac) =	0.17	0.00
Lot Impervious Surface Area (Ac) =	0.00	0.00
1-year, 24-hour storm (Peak Flow)		
Volume of runoff (ft^3) =	11,265	490
Volume change (ft^3) =	-10,774	
Runoff (inches) = Q*=	0.4205	0.3651
Peak Discharge (cfs)= Q=	4.2761	0.1762
Composite Curve Number (DA)=	62	61
Composite Curve Number (Site only)=	62	61

DISCONNECTED IMPERVIOUS - Credit given only to residential development with drainage area with less than 30% impervious

Percent Disconnected Impervious Credit (Residential Only) =	
Disconnected impervious area (Ac) =	0.00
Drainage Area $CN_{adjusted}$=	61
Site Only $CN_{adjusted}$=	61

Project Name: Bennett Bunn Plantation Subdivision

DRAINAGE AREA 5
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT								POST-DEVELOPMENT							
Drainage Area (Acres)=	4.72								2.92							
Site Acreage within Drainage=	4.72								2.92							
One-year, 24-hour rainfall (in)=	3.00															
Land Use (acres) by Soil Group:	**A Soils**		**B Soils**		**C Soils**		**D Soils**		**A Soils**		**B Soils**		**C Soils**		**D Soils**	
Commercial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot			0.54								0.82					
Roof																
Open/Landscaped																
Industrial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Transportation	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
High Density (interstate, main)																
High Density (Grassed Right-of-ways)																
Low Density (secondary, feeder)																
Low Density (Grassed Right-of-ways)																
Rural																
Rural (Grassed Right-of-ways)																
Sidewalk																
Misc. Pervious	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Managed pervious (Open Space)			2.97				1.21				1.90				0.20	
Unmanaged (pasture)																
Woods (not on lots)																
Residential	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Roadway																
Grassed Right-of-ways																
Driveway																
Parking lot																
Roof																
Sidewalk (Includes Patios)																
Lawn																
Managed pervious (Open Space)																
Woods (on lots)																
Land Taken up by BMP																
JURISDICTIONAL LANDS	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland																
Riparian buffer (Zone 1 only)																
Open water																
Totals (Ac)=	0.00	0.00	3.51	0.00	0.00	0.00	1.21	0.00	0.00	0.00	2.72	0.00	0.00	0.00	0.20	0.00

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
n-value=		
T_t (hrs)=	0.00	0.00
Shallow Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Channel Flow 1		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=	0.00	0.00
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Tc (hrs)=	0.08	0.08

RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Site Impervious Surface Area (Ac) =	0.54	0.82
Lot Impervious Surface Area (Ac) =	0.00	0.00
1-year, 24-hour storm (Peak Flow)		
Volume of runoff (ft^3) =	13,995	11,489
Volume change (ft^3) =	-2,506	
Runoff (inches) = Q*=	0.8168	1.0839
Peak Discharge (cfs)= Q=	6.1756	5.1027
Composite Curve Number (DA)=	70	73
Composite Curve Number (Site only)=	70	73

DISCONNECTED IMPERVIOUS - Credit given only to residential development with drainage area with less than 30% impervious

Percent Disconnected Impervious Credit (Residential Only) =	
Disconnected impervious area (Ac) =	0.00
Drainage Area $CN_{adjusted}$=	73
Site Only $CN_{adjusted}$=	73

Project Name: Bennett Bunn Plantation Subdivision

DRAINAGE AREA 6
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT								POST-DEVELOPMENT							
Drainage Area (Acres)=	3.91								0.58							
Site Acreage within Drainage=	3.91								0.58							
One-year, 24-hour rainfall (in)=	3.00															
Land Use (acres) by Soil Group:	**A Soils**		**B Soils**		**C Soils**		**D Soils**		**A Soils**		**B Soils**		**C Soils**		**D Soils**	
Commercial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot			0.07								0.07					
Roof																
Open/Landscaped																
Industrial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Transportation	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
High Density (interstate, main)																
High Density (Grassed Right-of-ways)																
Low Density (secondary, feeder)																
Low Density (Grassed Right-of-ways)																
Rural																
Rural (Grassed Right-of-ways)																
Sidewalk																
Misc. Pervious	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Managed pervious (Open Space)			2.79				1.05				0.37				0.14	
Unmanaged (pasture)																
Woods (not on lots)																
Residential	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Roadway																
Grassed Right-of-ways																
Driveway																
Parking lot																
Roof																
Sidewalk (Includes Patios)																
Lawn																
Managed pervious (Open Space)																
Woods (on lots)																
Land Taken up by BMP																
JURISDICTIONAL LANDS	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland																
Riparian buffer (Zone 1 only)																
Open water																
Totals (Ac)=	0.00	0.00	2.86	0.00	0.00	0.00	1.05	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.14	0.00

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
n-value=		
T_t (hrs)=	0.00	0.00
Shallow Flow		
Length (ft)=		
Slope (ft/ft)=		
Surface Cover:		
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Channel Flow 1		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=	0.00	0.00
Average Velocity (ft/sec)=	0.00	0.00
T_t (hrs)=	0.00	0.00
Tc (hrs)=	0.08	0.08

RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Site Impervious Surface Area (Ac) =	0.07	0.07
Lot Impervious Surface Area (Ac) =	0.00	0.00
1-year, 24-hour storm (Peak Flow)		
Volume of runoff (ft^3) =	8,405	1,728
Volume change (ft^3) =	-6,678	
Runoff (inches) = Q*=	0.5922	0.8207
Peak Discharge (cfs)= Q=	3.6032	0.7624
Composite Curve Number (DA)=	67	70
Composite Curve Number (Site only)=	67	70

DISCONNECTED IMPERVIOUS - Credit given only to residential development with drainage area with less than 30% impervious

Percent Disconnected Impervious Credit (Residential Only) =	
Disconnected impervious area (Ac) =	0.00
Drainage Area $CN_{adjusted}$=	70
Site Only $CN_{adjusted}$=	70

Project Name: hett Bunn Plantation Subdivi

DA SITE SUMMARY
STORMWATER PRE-POST CALCULATIONS

SITE SUMMARY						
DRAINAGE AREA SUMMARIES						
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6
Pre-Development (1-year, 24-hour storm)						
Runoff (in)=Q* =		0.908	0.509	0.420	0.817	0.592
Peak Flow (cfs)=Q_{post} =		3.014	8.543	4.276	6.176	3.603
Post-Development (1-year, 24-hour storm)						
Proposed Impervious Surface (acre) =					0.82	0.07
Runoff (in)=Q* =			0.365	0.365	1.084	0.821
Peak Flow (cfs)=Q_{post} =			0.195	0.176	5.103	0.762

TARGET CURVE NUMBER (TCN) - Residential Only			
SITE \SOIL COMPOSITION			
HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	43
B	3.94	92%	63
C	0.00	0%	76
D	0.34	8%	81
Total Site Area (acres) =	4.28		
Zoning =	R-30		
Target Curve Number (TCN) =	64		
% Impervious =	21%		
Post Development $CN_{adjusted}$ =	70		
Required Volume to be Managed (TCN)= ft^3 =	3,712		

SITE NITROGEN AND PHOSPHORUS LOADING	
Nitrogen and Phosphorus Targets (Based on Regulatory Watershed)	
Target Nitrogen Load (lb/ac/yr)=	**3.6**
Target Phosphorus Load (Falls and Jordan Lakes Only) (lb/ac/yr)=	**N/A**
% N Loading Reduction Option for Expansions (Falls and Jordan Lakes Only) =	N/A
% Loading Reduction Nitrogen Target (Falls and Jordan Lakes Only) (lb/ac/yr)=	N/A
% P Loading Reduction Option for Expansions (Falls and Jordan Lakes Only) =	N/A
% Loading Reduction Phosphorus Target (Falls and Jordan Lakes Only) (lb/ac/yr)=	N/A
Pre Development Nitrogen and Phosphorus Load	
Total Nitrogen (lb/ac/yr)=	**1.88**
Total Phosphorus (lb/ac/yr)=	**N/A**
Post Development Nitrogen and Phosphorus Load	
Total Nitrogen (lb/ac/yr)=	**4.18**
Total Phosphorus (lb/ac/yr)=	**N/A**

XIII. NOAA Precipitation Frequency & Intensity Charts

NOAA Atlas 14, Volume 2, Version 3
Location name: Zebulon, North Carolina, USA*
Latitude: 35.833°, Longitude: -78.2821°
Elevation: 325 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.85 (4.43-5.33)	5.60 (5.12-6.13)	6.34 (5.80-6.94)	7.20 (6.56-7.88)	8.04 (7.30-8.78)	8.75 (7.91-9.56)	9.37 (8.42-10.2)	9.95 (8.89-10.9)	10.6 (9.40-11.6)	11.2 (9.86-12.3)
10-min	3.88 (3.53-4.26)	4.48 (4.10-4.91)	5.08 (4.64-5.56)	5.76 (5.24-6.30)	6.40 (5.81-7.00)	6.96 (6.29-7.61)	7.45 (6.69-8.14)	7.89 (7.04-8.63)	8.39 (7.43-9.19)	8.85 (7.77-9.71)
15-min	3.23 (2.95-3.55)	3.75 (3.43-4.11)	4.28 (3.92-4.69)	4.86 (4.42-5.31)	5.41 (4.91-5.92)	5.88 (5.31-6.43)	6.28 (5.64-6.86)	6.64 (5.93-7.26)	7.04 (6.24-7.71)	7.40 (6.50-8.13)
30-min	2.21 (2.02-2.43)	2.59 (2.37-2.84)	3.04 (2.78-3.33)	3.52 (3.21-3.85)	4.01 (3.64-4.38)	4.43 (4.00-4.84)	4.81 (4.32-5.25)	5.16 (4.61-5.65)	5.60 (4.96-6.14)	6.00 (5.26-6.58)
60-min	1.38 (1.26-1.52)	1.63 (1.49-1.78)	1.95 (1.78-2.13)	2.29 (2.09-2.51)	2.67 (2.42-2.92)	3.00 (2.71-3.28)	3.31 (2.97-3.62)	3.62 (3.24-3.96)	4.02 (3.56-4.40)	4.38 (3.84-4.80)
2-hr	0.806 (0.730-0.893)	0.954 (0.868-1.05)	1.16 (1.05-1.27)	1.38 (1.25-1.51)	1.64 (1.47-1.80)	1.87 (1.68-2.05)	2.10 (1.87-2.30)	2.35 (2.07-2.57)	2.66 (2.33-2.92)	2.96 (2.57-3.25)
3-hr	0.569 (0.515-0.633)	0.673 (0.613-0.745)	0.820 (0.745-0.908)	0.984 (0.890-1.08)	1.18 (1.06-1.30)	1.36 (1.22-1.50)	1.54 (1.37-1.70)	1.74 (1.53-1.91)	2.00 (1.74-2.20)	2.26 (1.94-2.49)
6-hr	0.341 (0.311-0.378)	0.405 (0.369-0.447)	0.493 (0.449-0.544)	0.592 (0.537-0.652)	0.713 (0.642-0.782)	0.827 (0.740-0.906)	0.942 (0.836-1.03)	1.06 (0.936-1.16)	1.23 (1.07-1.35)	1.40 (1.20-1.53)
12-hr	0.200 (0.182-0.220)	0.237 (0.217-0.260)	0.290 (0.265-0.319)	0.350 (0.318-0.384)	0.424 (0.383-0.464)	0.495 (0.444-0.540)	0.568 (0.503-0.619)	0.647 (0.567-0.704)	0.757 (0.653-0.824)	0.864 (0.734-0.942)
24-hr	0.118 (0.110-0.128)	0.143 (0.133-0.155)	0.182 (0.169-0.197)	0.214 (0.198-0.231)	0.259 (0.238-0.280)	0.296 (0.271-0.320)	0.336 (0.305-0.363)	0.378 (0.342-0.409)	0.440 (0.393-0.477)	0.490 (0.435-0.534)
2-day	0.068 (0.063-0.074)	0.082 (0.077-0.089)	0.104 (0.097-0.112)	0.122 (0.113-0.131)	0.146 (0.135-0.158)	0.167 (0.153-0.180)	0.188 (0.172-0.204)	0.211 (0.191-0.229)	0.244 (0.219-0.266)	0.272 (0.241-0.297)
3-day	0.048 (0.045-0.052)	0.058 (0.054-0.063)	0.073 (0.068-0.079)	0.085 (0.079-0.091)	0.102 (0.094-0.110)	0.116 (0.107-0.125)	0.130 (0.119-0.141)	0.146 (0.133-0.158)	0.168 (0.151-0.182)	0.186 (0.166-0.203)
4-day	0.038 (0.036-0.041)	0.046 (0.043-0.049)	0.057 (0.054-0.062)	0.067 (0.062-0.071)	0.080 (0.074-0.085)	0.090 (0.083-0.097)	0.102 (0.093-0.109)	0.113 (0.103-0.122)	0.130 (0.117-0.140)	0.144 (0.129-0.156)
7-day	0.025 (0.023-0.027)	0.030 (0.028-0.032)	0.037 (0.035-0.040)	0.043 (0.040-0.046)	0.051 (0.047-0.055)	0.058 (0.053-0.062)	0.064 (0.059-0.069)	0.072 (0.065-0.077)	0.081 (0.074-0.088)	0.090 (0.081-0.097)
10-day	0.020 (0.019-0.021)	0.024 (0.022-0.026)	0.029 (0.027-0.031)	0.033 (0.031-0.036)	0.039 (0.036-0.042)	0.044 (0.041-0.047)	0.048 (0.045-0.052)	0.053 (0.049-0.057)	0.060 (0.055-0.065)	0.066 (0.060-0.071)
20-day	0.013 (0.012-0.014)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.022 (0.020-0.023)	0.025 (0.023-0.027)	0.028 (0.026-0.030)	0.031 (0.028-0.033)	0.033 (0.031-0.036)	0.037 (0.034-0.040)	0.041 (0.037-0.044)
30-day	0.011 (0.010-0.012)	0.013 (0.012-0.014)	0.015 (0.014-0.016)	0.017 (0.016-0.018)	0.020 (0.018-0.021)	0.022 (0.020-0.023)	0.023 (0.022-0.025)	0.025 (0.024-0.027)	0.028 (0.026-0.030)	0.030 (0.028-0.032)
45-day	0.009 (0.009-0.010)	0.011 (0.010-0.011)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.019 (0.017-0.020)	0.020 (0.019-0.021)	0.022 (0.020-0.023)	0.023 (0.022-0.025)
60-day	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.012 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.020)	0.020 (0.018-0.021)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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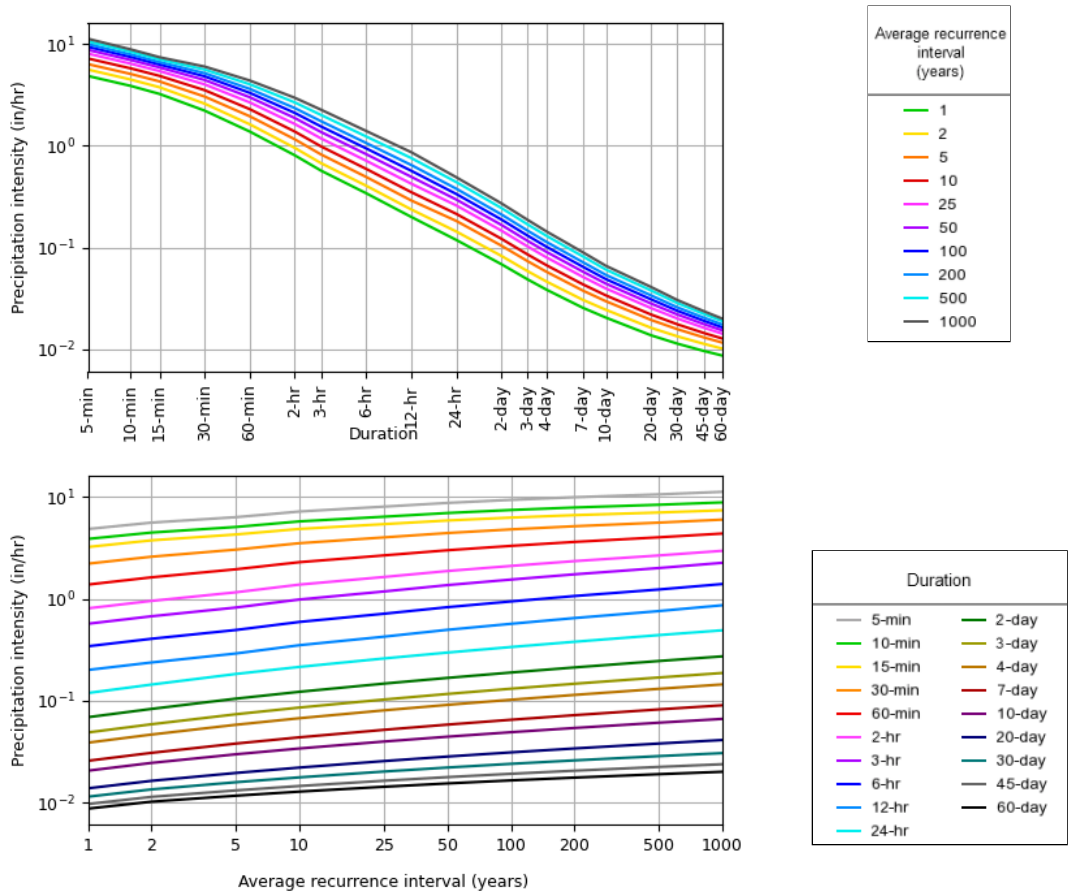
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 35.8330°, Longitude: -78.2821°



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Fri Feb 14 16:16:02 2025

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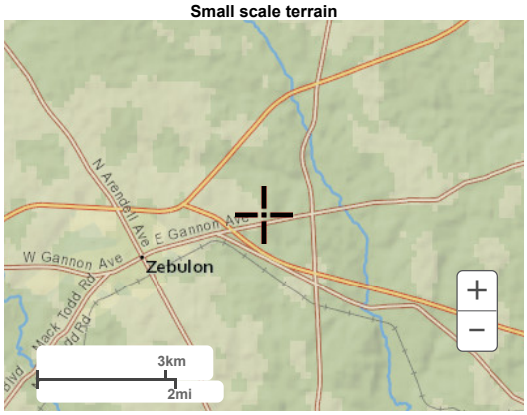
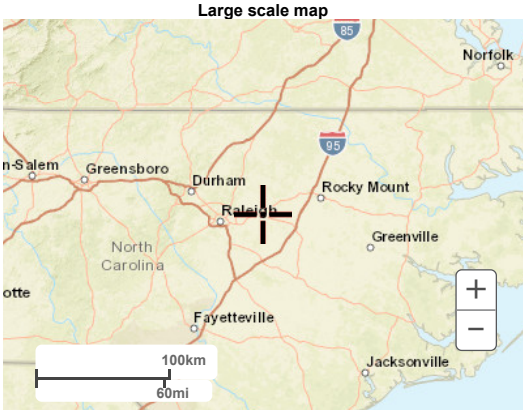
Maps & aerials

Small scale terrain

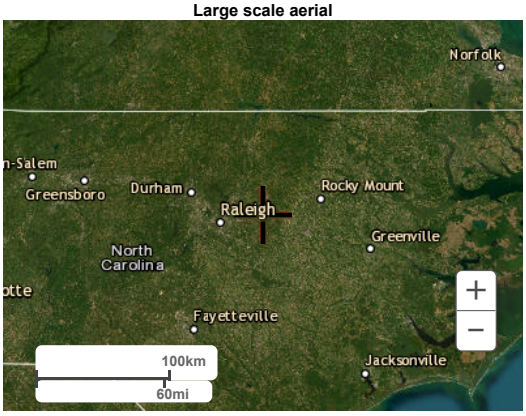


Large scale terrain

Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 2, Version 3
Location name: Zebulon, North Carolina, USA*
Latitude: 35.833°, Longitude: -78.2821°
Elevation: 325 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.404 (0.369-0.444)	0.467 (0.427-0.511)	0.528 (0.483-0.578)	0.600 (0.547-0.657)	0.670 (0.608-0.732)	0.729 (0.659-0.797)	0.781 (0.702-0.853)	0.829 (0.741-0.908)	0.884 (0.783-0.968)	0.937 (0.822-1.03)
10-min	0.646 (0.589-0.710)	0.746 (0.683-0.818)	0.846 (0.774-0.926)	0.960 (0.874-1.05)	1.07 (0.969-1.17)	1.16 (1.05-1.27)	1.24 (1.12-1.36)	1.32 (1.17-1.44)	1.40 (1.24-1.53)	1.48 (1.30-1.62)
15-min	0.807 (0.737-0.887)	0.938 (0.858-1.03)	1.07 (0.979-1.17)	1.21 (1.11-1.33)	1.35 (1.23-1.48)	1.47 (1.33-1.61)	1.57 (1.41-1.71)	1.66 (1.48-1.82)	1.76 (1.56-1.93)	1.85 (1.63-2.03)
30-min	1.11 (1.01-1.22)	1.30 (1.18-1.42)	1.52 (1.39-1.66)	1.76 (1.60-1.92)	2.00 (1.82-2.19)	2.21 (2.00-2.42)	2.40 (2.16-2.62)	2.58 (2.31-2.83)	2.80 (2.48-3.07)	3.00 (2.63-3.29)
60-min	1.38 (1.26-1.52)	1.63 (1.49-1.78)	1.95 (1.78-2.13)	2.29 (2.09-2.51)	2.67 (2.42-2.92)	3.00 (2.71-3.28)	3.31 (2.97-3.62)	3.62 (3.24-3.96)	4.02 (3.56-4.40)	4.38 (3.84-4.80)
2-hr	1.61 (1.46-1.79)	1.91 (1.74-2.10)	2.32 (2.10-2.55)	2.76 (2.50-3.03)	3.27 (2.94-3.59)	3.75 (3.36-4.11)	4.21 (3.74-4.61)	4.69 (4.15-5.14)	5.33 (4.67-5.84)	5.92 (5.14-6.51)
3-hr	1.71 (1.55-1.90)	2.02 (1.84-2.24)	2.46 (2.24-2.73)	2.96 (2.68-3.26)	3.54 (3.18-3.90)	4.09 (3.66-4.50)	4.64 (4.12-5.10)	5.23 (4.60-5.74)	6.02 (5.24-6.62)	6.78 (5.83-7.48)
6-hr	2.05 (1.86-2.27)	2.43 (2.21-2.68)	2.96 (2.69-3.26)	3.55 (3.22-3.90)	4.27 (3.85-4.69)	4.95 (4.44-5.43)	5.64 (5.01-6.17)	6.38 (5.61-6.97)	7.39 (6.42-8.08)	8.37 (7.16-9.17)
12-hr	2.41 (2.20-2.66)	2.86 (2.62-3.14)	3.50 (3.19-3.84)	4.22 (3.84-4.64)	5.11 (4.62-5.60)	5.97 (5.35-6.52)	6.84 (6.07-7.46)	7.80 (6.84-8.49)	9.13 (7.88-9.94)	10.4 (8.85-11.4)
24-hr	2.85 (2.65-3.08)	3.45 (3.21-3.73)	4.38 (4.07-4.74)	5.14 (4.76-5.56)	6.22 (5.73-6.72)	7.11 (6.52-7.68)	8.07 (7.34-8.72)	9.09 (8.22-9.83)	10.6 (9.45-11.5)	11.8 (10.4-12.8)
2-day	3.30 (3.07-3.56)	3.98 (3.71-4.30)	5.02 (4.66-5.42)	5.86 (5.43-6.32)	7.05 (6.50-7.61)	8.02 (7.37-8.66)	9.06 (8.27-9.79)	10.2 (9.22-11.0)	11.8 (10.5-12.8)	13.1 (11.6-14.3)
3-day	3.50 (3.26-3.77)	4.22 (3.93-4.54)	5.29 (4.92-5.69)	6.16 (5.72-6.62)	7.38 (6.82-7.93)	8.37 (7.70-9.01)	9.43 (8.62-10.2)	10.6 (9.59-11.4)	12.1 (10.9-13.2)	13.5 (12.0-14.6)
4-day	3.71 (3.46-3.98)	4.46 (4.16-4.78)	5.56 (5.19-5.96)	6.45 (6.00-6.91)	7.70 (7.13-8.25)	8.72 (8.04-9.35)	9.79 (8.98-10.5)	10.9 (9.96-11.8)	12.5 (11.3-13.5)	13.8 (12.4-15.0)
7-day	4.31 (4.03-4.61)	5.16 (4.82-5.52)	6.36 (5.94-6.81)	7.33 (6.83-7.84)	8.68 (8.06-9.28)	9.76 (9.03-10.5)	10.9 (10.0-11.7)	12.1 (11.1-13.0)	13.8 (12.5-14.9)	15.1 (13.6-16.4)
10-day	4.92 (4.61-5.25)	5.87 (5.50-6.26)	7.13 (6.68-7.60)	8.13 (7.61-8.66)	9.51 (8.87-10.1)	10.6 (9.86-11.3)	11.8 (10.9-12.6)	12.9 (11.9-13.8)	14.6 (13.3-15.7)	15.9 (14.4-17.1)
20-day	6.61 (6.22-7.03)	7.83 (7.36-8.33)	9.35 (8.79-9.94)	10.6 (9.91-11.2)	12.2 (11.4-13.0)	13.5 (12.6-14.4)	14.9 (13.8-15.9)	16.3 (15.1-17.4)	18.2 (16.7-19.5)	19.7 (18.0-21.1)
30-day	8.20 (7.74-8.70)	9.68 (9.14-10.3)	11.4 (10.7-12.1)	12.7 (12.0-13.5)	14.5 (13.6-15.4)	15.9 (14.8-16.8)	17.3 (16.1-18.3)	18.7 (17.3-19.9)	20.5 (19.0-21.9)	22.0 (20.3-23.6)
45-day	10.4 (9.90-11.0)	12.3 (11.6-12.9)	14.2 (13.4-15.0)	15.7 (14.8-16.5)	17.6 (16.7-18.6)	19.1 (18.0-20.2)	20.6 (19.4-21.8)	22.1 (20.7-23.5)	24.1 (22.5-25.6)	25.6 (23.8-27.3)
60-day	12.5 (11.9-13.2)	14.7 (13.9-15.4)	16.8 (15.9-17.6)	18.4 (17.4-19.4)	20.5 (19.4-21.6)	22.1 (20.9-23.3)	23.7 (22.3-25.0)	25.3 (23.7-26.7)	27.3 (25.6-28.9)	28.8 (26.9-30.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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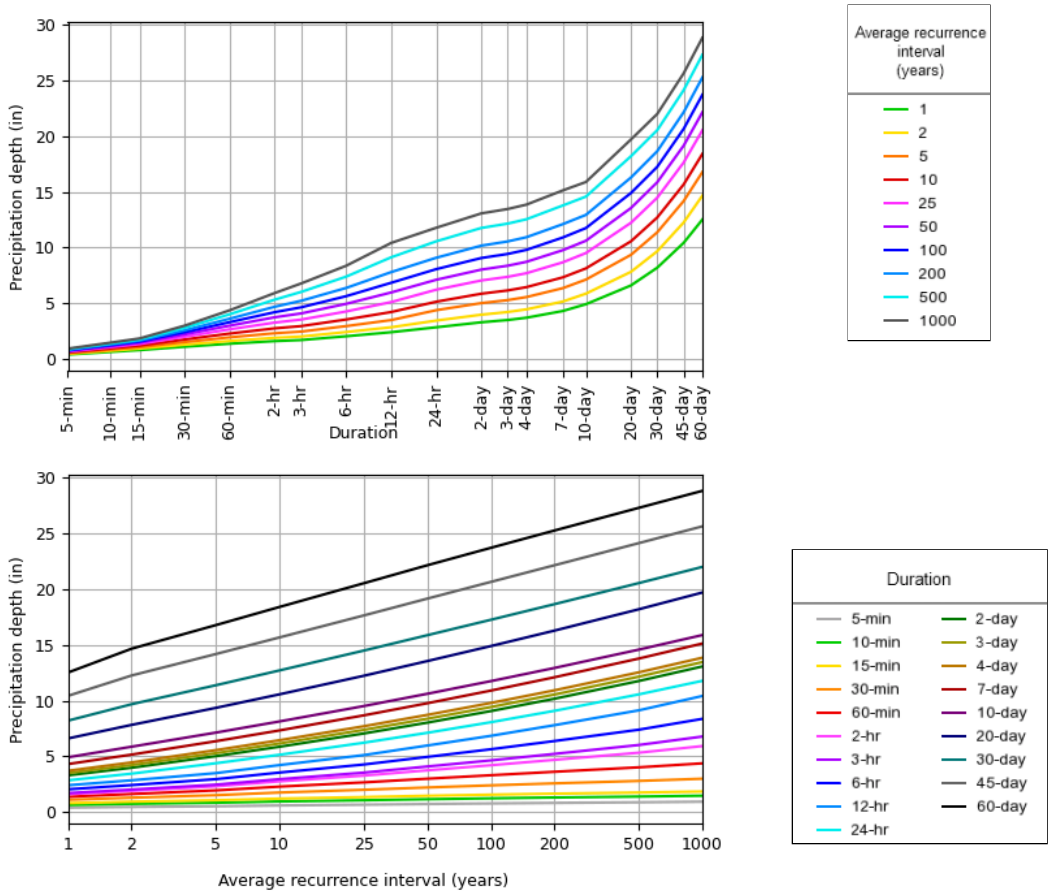
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 35.8330°, Longitude: -78.2821°



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Created (GMT): Fri Feb 14 16:15:29 2025

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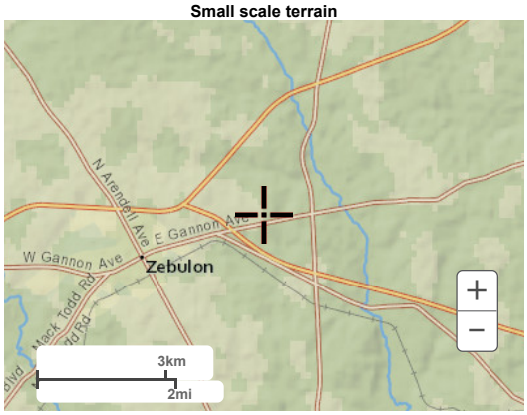
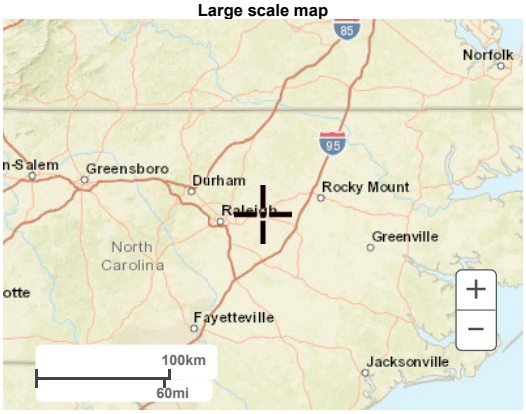
Maps & aerials

Small scale terrain

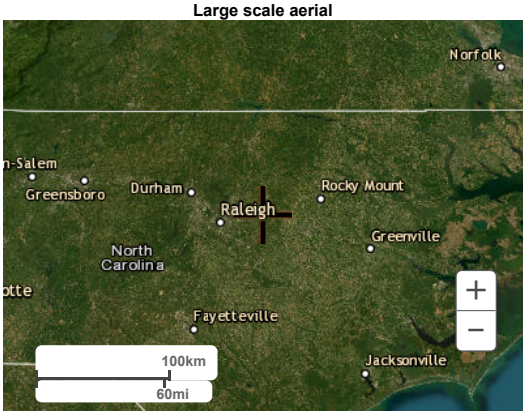


Large scale terrain

Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

XIV. Web Soil Survey and HSG Classifications

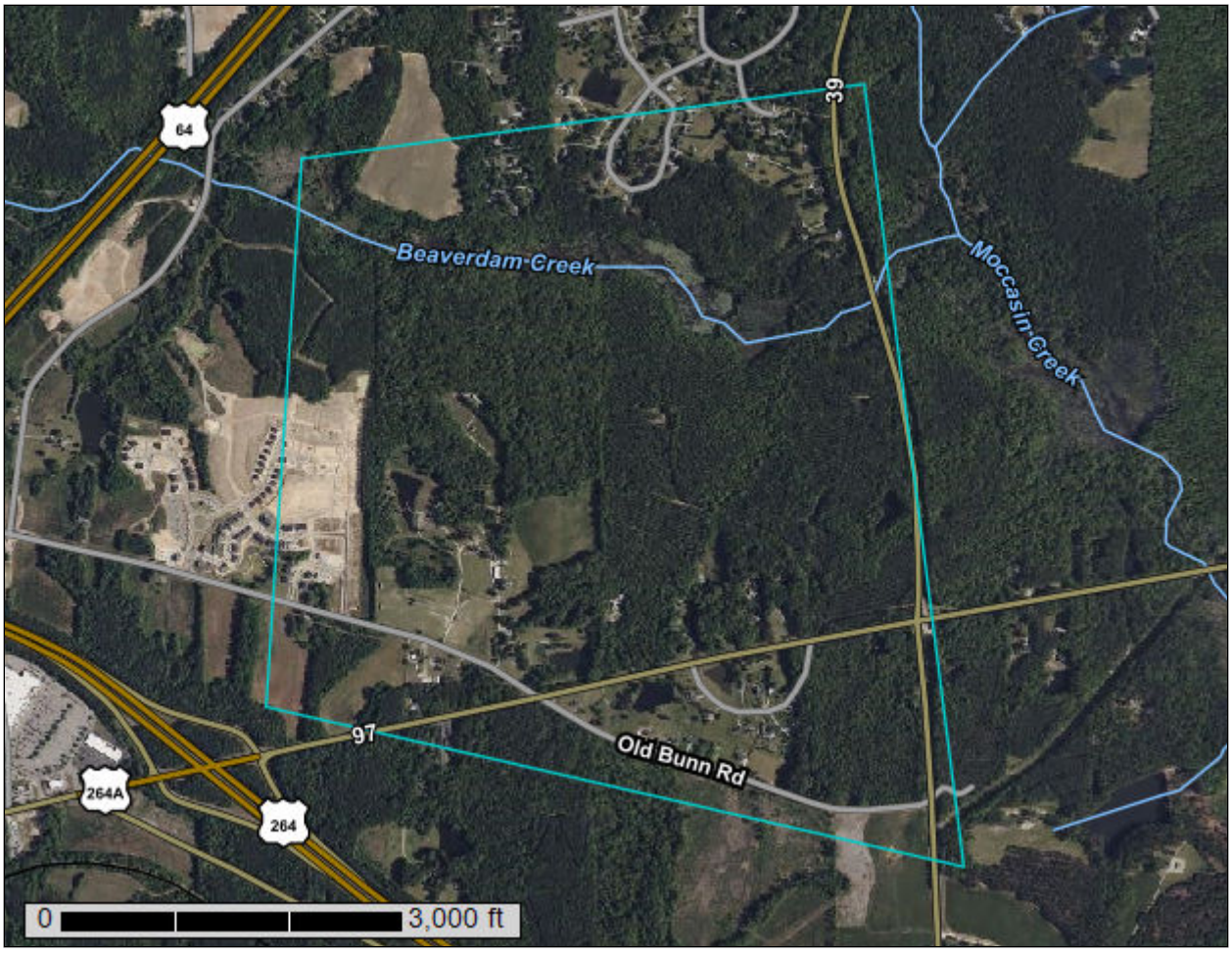
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Wake County, North Carolina



February 13, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

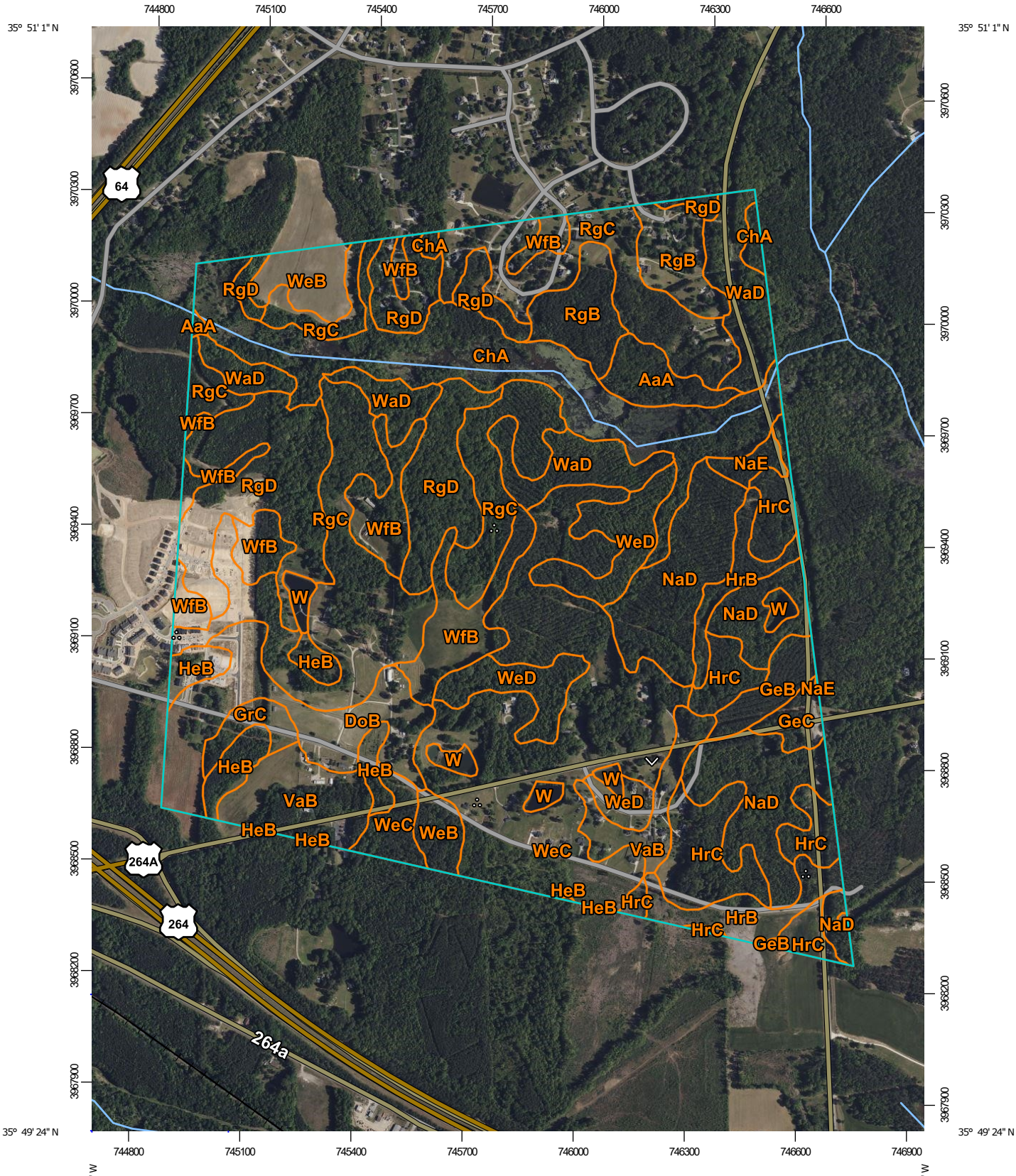
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

Soil Survey Area: Wake County, North Carolina
Survey Area Data: Version 26, Sep 9, 2024

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

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AaA	Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded	9.8	1.3%
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	67.8	9.2%
DoB	Dothan loamy sand, 2 to 6 percent slopes	33.1	4.5%
GeB	Georgeville silt loam, 2 to 6 percent slopes	8.2	1.1%
GeC	Georgeville silt loam, 6 to 10 percent slopes	5.1	0.7%
GrC	Gritney sandy loam, 6 to 10 percent slopes	5.4	0.7%
HeB	Helena sandy loam, 2 to 6 percent slopes	14.9	2.0%
HrB	Herndon silt loam, 2 to 6 percent slopes	18.9	2.5%
HrC	Herndon silt loam, 6 to 10 percent slopes	39.7	5.4%
NaD	Nanford silt loam, 10 to 15 percent slopes	62.3	8.4%
NaE	Nanford silt loam, 15 to 25 percent slopes	3.4	0.5%
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	25.3	3.4%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	112.2	15.2%
RgD	Rawlings-Rion complex, 10 to 15 percent slopes	72.8	9.8%
VaB	Vance sandy loam, 2 to 6 percent slopes	29.6	4.0%
W	Water	8.0	1.1%
WaD	Wake-Rolesville complex, 10 to 15 percent slopes, very rocky	39.0	5.3%
WeB	Wedowee sandy loam, 2 to 6 percent slopes	15.3	2.1%
WeC	Wedowee sandy loam, 6 to 10 percent slopes	100.0	13.5%
WeD	Wedowee sandy loam, 10 to 15 percent slopes	28.8	3.9%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	40.8	5.5%
Totals for Area of Interest		**740.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wake County, North Carolina

AaA—Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 2xh95
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Altavista, rarely flooded, and similar soils: 95 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altavista, Rarely Flooded

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old loamy alluvium derived from igneous and metamorphic rock

Typical profile

Ap - 0 to 8 inches: fine sandy loam
E - 8 to 12 inches: fine sandy loam
BE - 12 to 15 inches: sandy clay loam
Bt - 15 to 35 inches: clay loam
BC - 35 to 42 inches: sandy loam
C - 42 to 80 inches: coarse sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY660NC - High terraces, very rare inundation
Hydric soil rating: No

Minor Components

Roanoke, occasionally flooded, undrained

Percent of map unit: 2 percent
Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

ChA—Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2qwpj
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Chewacla, frequently flooded, and similar soils: 50 percent
Wehadkee, frequently flooded, and similar soils: 45 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chewacla, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 4 inches: loam
Bw1 - 4 to 26 inches: silty clay loam
Bw2 - 26 to 38 inches: loam
Bw3 - 38 to 60 inches: clay loam
C - 60 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F136XY610GA - Flood plain forest, wet
Hydric soil rating: No

Description of Wehadkee, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 7 inches: silt loam
Bg - 7 to 49 inches: clay loam
Cg - 49 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F136XY600NC - Flood plain forest, very wet
Hydric soil rating: Yes

DoB—Dothan loamy sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2spp1

Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Dothan and similar soils: 92 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dothan

Setting
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy marine deposits

Typical profile
Ap - 0 to 12 inches: loamy sand
Bt - 12 to 40 inches: sandy clay loam
Btv - 40 to 80 inches: sandy clay loam

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: 35 to 43 inches to plinthite
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 34 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

GeB—Georgeville silt loam, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: 2qqgb
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Georgeville and similar soils: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Georgeville

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from argillite and/or saprolite residuum weathered from metavolcanics

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 50 inches: clay
BC - 50 to 62 inches: clay loam
C - 62 to 80 inches: silt loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

GeC—Georgeville silt loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2qqgd
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Georgeville and similar soils: 95 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Georgeville

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from argillite and/or saprolite residuum weathered from metavolcanics

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 50 inches: clay
BC - 50 to 62 inches: clay loam
C - 62 to 80 inches: silt loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

GrC—Gritney sandy loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2xh9x
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Gritney and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gritney

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy marine deposits

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt - 5 to 43 inches: clay
BC - 43 to 50 inches: sandy clay loam
C - 50 to 80 inches: sandy loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
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
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

HeB—Helena sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqgq
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Helena and similar soils: 92 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helena

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 12 inches: sandy loam
BE - 12 to 19 inches: sandy clay loam
Bt1 - 19 to 39 inches: clay
Bt2 - 39 to 43 inches: clay loam
BCg - 43 to 46 inches: clay loam
C - 46 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F136XY810SC - Acidic upland forest, seasonally wet
Hydric soil rating: No

HrB—Herndon silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqgx
Elevation: 70 to 980 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Herndon and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Herndon

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Residuum weathered from phyllite

Typical profile

Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 12 inches: silty clay loam
Bt2 - 12 to 44 inches: clay
C - 44 to 80 inches: silt loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

HrC—Herndon silt loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2qqgz
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Herndon and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Herndon

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from phyllite

Typical profile

Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 12 inches: silty clay loam
Bt2 - 12 to 44 inches: clay
C - 44 to 80 inches: silt loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

NaD—Nanford silt loam, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2spp5
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Nanford and similar soils: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nanford

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from metavolcanics and/or argillite

Typical profile

A - 0 to 7 inches: silt loam
Bt - 7 to 27 inches: silty clay

BC - 27 to 38 inches: silty clay loam
C - 38 to 57 inches: loam
Cr - 57 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

NaE—Nanford silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2qqlt
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Nanford and similar soils: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nanford

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from metavolcanics and/or argillite

Typical profile

A - 0 to 7 inches: silt loam
Bt - 7 to 27 inches: silty clay
BC - 27 to 38 inches: silty clay loam
C - 38 to 57 inches: loam
Cr - 57 to 80 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgB—Rawlings-Rion complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xhb9
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgC—Rawlings-Rion complex, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2xhbb
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

RgD—Rawlings-Rion complex, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2xhb8
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent
Rion and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: sandy clay loam
C - 20 to 40 inches: gravelly sandy loam
R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt1 - 8 to 17 inches: sandy clay loam
Bt2 - 17 to 38 inches: sandy loam
C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

VaB—Vance sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqjj
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Vance and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vance

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt1 - 5 to 23 inches: clay
Bt2 - 23 to 29 inches: clay loam
C - 29 to 80 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 2qqjv
Elevation: 70 to 450 feet
Mean annual precipitation: 39 to 51 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

WaD—Wake-Rolesville complex, 10 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2xhbf
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Wake, very rocky, and similar soils: 50 percent
Rolesville, very rocky, and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wake, Very Rocky

Setting

Landform: Interfluves

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 7 inches: gravelly loamy coarse sand
C - 7 to 11 inches: gravelly loamy sand
R - 11 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: F136XY870GA - Lower piedmont acidic upland woodland, depth restriction, dry
Hydric soil rating: No

Description of Rolesville, Very Rocky

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 12 inches: loamy sand
Bw - 12 to 26 inches: loamy sand
C - 26 to 32 inches: loamy coarse sand
Cr - 32 to 38 inches: bedrock
R - 38 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock; 20 to 80 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F136XY870GA - Lower piedmont acidic upland woodland, depth restriction, dry
Hydric soil rating: No

WeB—Wedowee sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn40
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Wedowee and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

WeC—Wedowee sandy loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2xn41
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

WeD—Wedowee sandy loam, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2xn3y
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

WfB—Wedowee-Saw complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn42
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 60 percent
Saw and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Description of Saw

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam
Bt - 8 to 20 inches: clay
BC - 20 to 26 inches: sandy clay loam
C - 26 to 29 inches: sandy loam
R - 29 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist
Hydric soil rating: No

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XV. Wake County Soil Survey Map

(44)

N

Scale 1:15840

1 Mile 5000 Feet

0 0 1000 2000 3000 4000 5000

(Joins sheet 34)

(Joins sheet 43)

(Joins sheet 54)

SITE

Beaverdam Creek

Beaver Chapel

Wakefield Ch

Shepard School

ZEBULON

SOUTHERN RAILWAY

NORFOLK

Maccasin Creek

FRANKLIN COUNTY

XVI. USGS Map

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

ZEBULON QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, July 2020 - July 2020
Roads.....U.S. Census Bureau, 2016
Names.....GNIS, 1980 - 2022
Hydrography.....National Hydrography Dataset, 2001 - 2021
Contours.....National Elevation Dataset, 2008
Boundaries.....Multiple sources; see metadata file 2019 - 2021

Wetlands.....FWS National Wetlands Inventory Not Available

MN
GN
9°26'
168 MILS
1°34'
28 MILS
UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
QV
Grid Zone Designation
17S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

NORTH CAROLINA
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

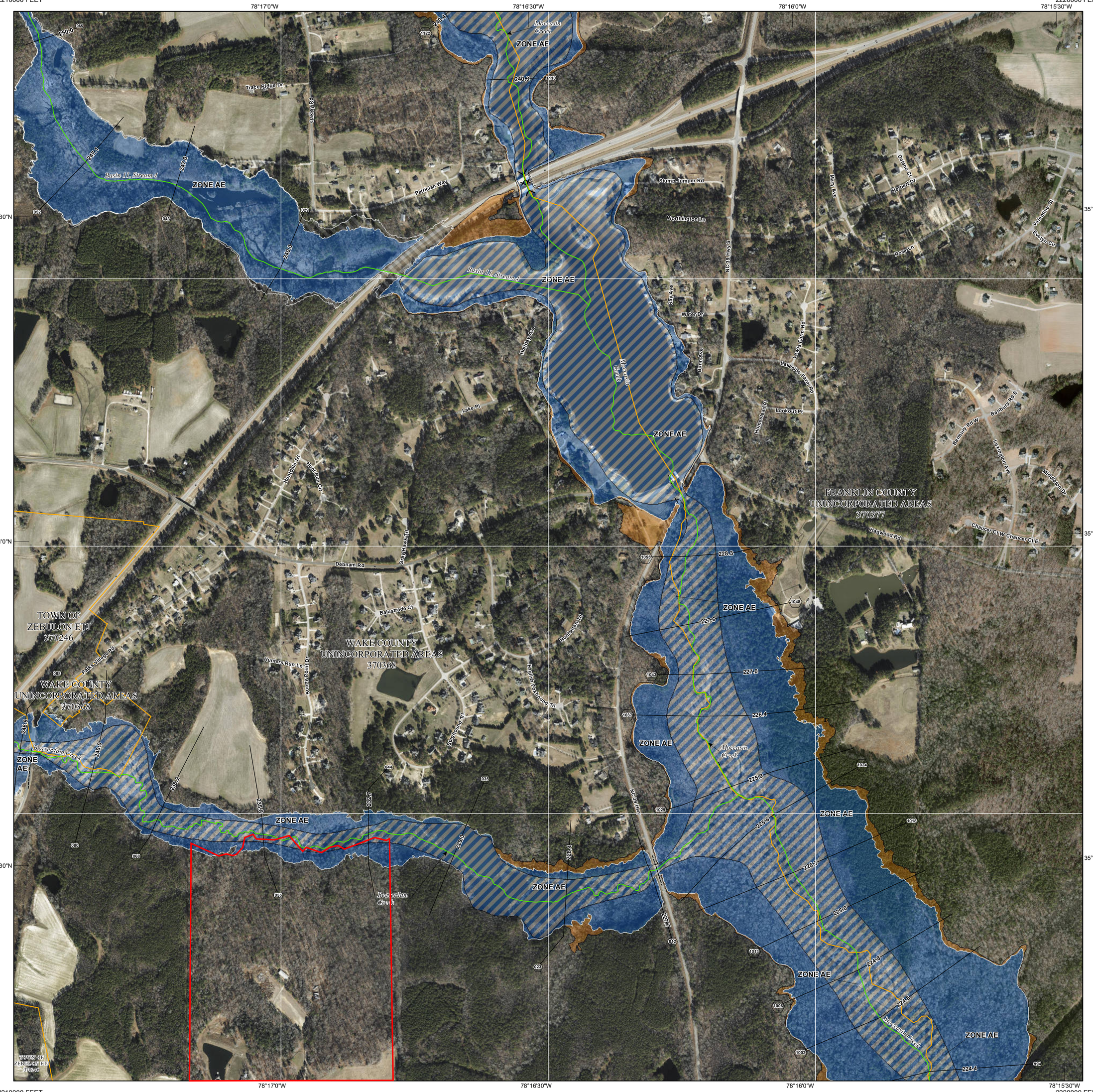
1 Rolesville
2 Bunn West
3 Bunn East
4 Knightdale
5 Middlesex
6 Clayton
7 Flowers
8 Stancils Chapel
ADJOINING QUADRANGLES

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

ZEBULON, NC
2022

NSN 7643016379377
NGA REF NO. USGSX24K72128

XVII. FEMA FIRM Map



This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long term approach to floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map flood hazard areas at the local level. As a part of this effort, the State of North Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://FRIS.NC.GOV/FRIS

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with Average Depth Less Than One Foot or With Drainage Areas of Less Than One Square Mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS

- Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall
- 012 — 18.2 — Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- 8 — Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

OTHER FEATURES

- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at https://flood.nc.gov/ncflood, or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations, flood hazard risk zones, and other flood data in a community issued by the North Carolina Floodplain Mapping Program (NCFMP). The Flood Insurance Study (FIS) is comprised of the following products used together: the Digital Flood Hazard Database, the Water Surface Elevation Rasters, the digitally derived, autogenerated Flood Insurance Rate Map and the Flood Insurance Survey Report. A Flood Insurance Survey is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. This report contains detailed flood elevation data, data tables and FIRM indices. When a flood study is completed for the NFIP, the digital information, reports and maps are assembled into an FIS. Information shown on this FIRM is provided in digital format by the NCFMP. Base map information shown on this FIRM was provided in digital format by the NCFMP. The source of this information can be determined from the metadata available in the digital FLOOD database and in the Technical Support Data Notebook (TSDN).

ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

- Limit of Moderate Wave Action (LiMWA)

SCALE

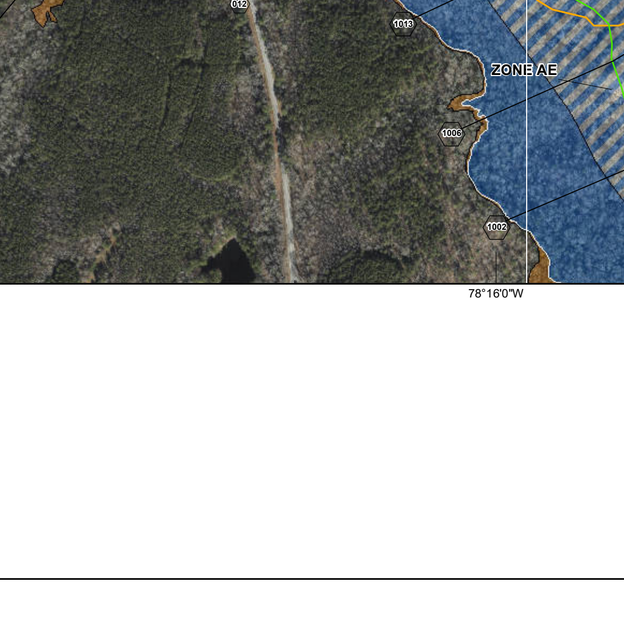
Map Projection:
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet

0 75 150 300 Meters

PANEL LOCATOR



FEMA
National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 2716

FEMA

Panel Contains:

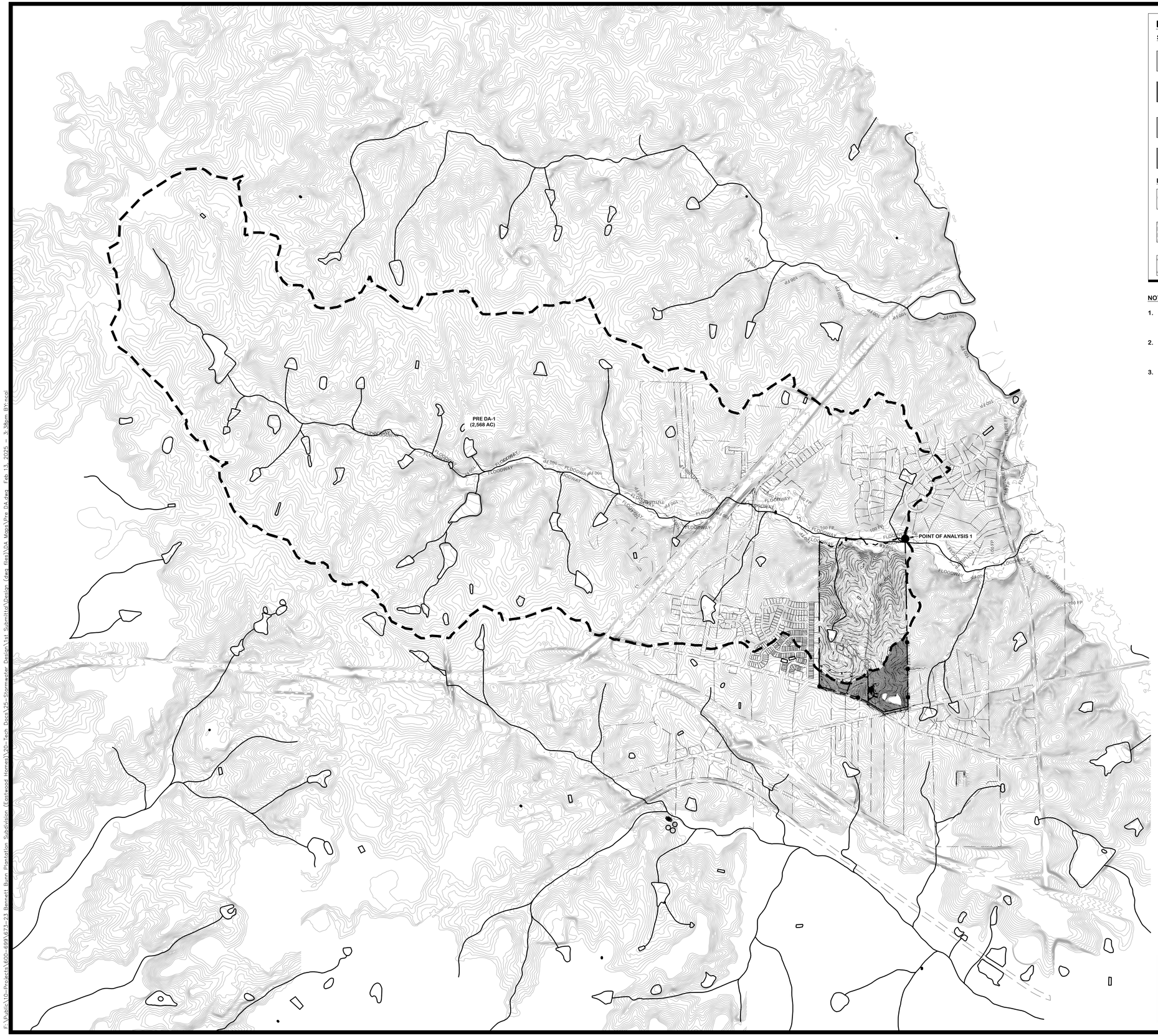
COMMUNITY	CID	PANEL	SUFFIX
FRANKLIN COUNTY	370377	2716	L
WAKE COUNTY	370368	2716	L
ZEBULON, TOWN OF	370246	2716	L

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720271600L

MAP REVISED
July 19, 2022

XVIII. Drainage Area Maps



LEGEND:

SOIL GROUPS

- SOIL GROUP A
- SOIL GROUP B
- SOIL GROUP C
- SOIL GROUP D

LAND COVER TYPE

- IMPERVIOUS SURFACE AREA (SIDEWALK, BUILDINGS, ROADS, ETC.)
- RESIDENTIAL DISTRICT (ASSUME 40% IMPERVIOUS AND 60% PERVIOUS)
- OPEN SPACE, ASSUMED GOOD CONDITION (LAWNS, PARKS, GOLF COURSES, CEMETERIES, ETC.)

NOTES

1. SOIL SURVEY INFORMATION AND OFF-SITE TOPOGRAPHY ARE FROM WAKE COUNTY GIS. HYDROLOGIC SOIL GROUP CLASSIFICATIONS ARE FROM WAKE COUNTY STORM WATER MANUAL.
2. THE LIMITS OF DRAINAGE AREA WERE DETERMINED USING SURVEY INFORMATION, WAKE COUNTY GIS AND WAKE COUNTY iMAPS FOR EXISTING TOPOGRAPHY AND CITY OF RALEIGH STORM WATER CONVEYANCE SYSTEMS.
3. DA MAP FOR DA-1 IS FOR INFORMATION ONLY AND WILL NOT BE ANALYZED PER MEETING WITH CARRIE MITCHELL ON 1/17/25.

NAD83

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

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Phone: 919 848 4395 | Fax: 919 848 4395 | NC LICENSE NUMBER: C-3211

PREPARED FOR :
BENNETT BUNN PLANTATION, INC.
7101 CREEDMOOR ROAD, SUITE 115
RALEIGH, NORTH CAROLINA 27613

DATE : 8.7.2023
PROJECT ENGINEER: PJP
PROJECT CADD DESIGNER: PJP
PROJECT SURVEYOR: ALBRECHT LAND SURVEYORS, LLC

OLD BUNN ROAD SUBDIVISION

ZEBULON, WAKE COUNTY, NORTH CAROLINA

STORMWATER IMPACT ANALYSIS

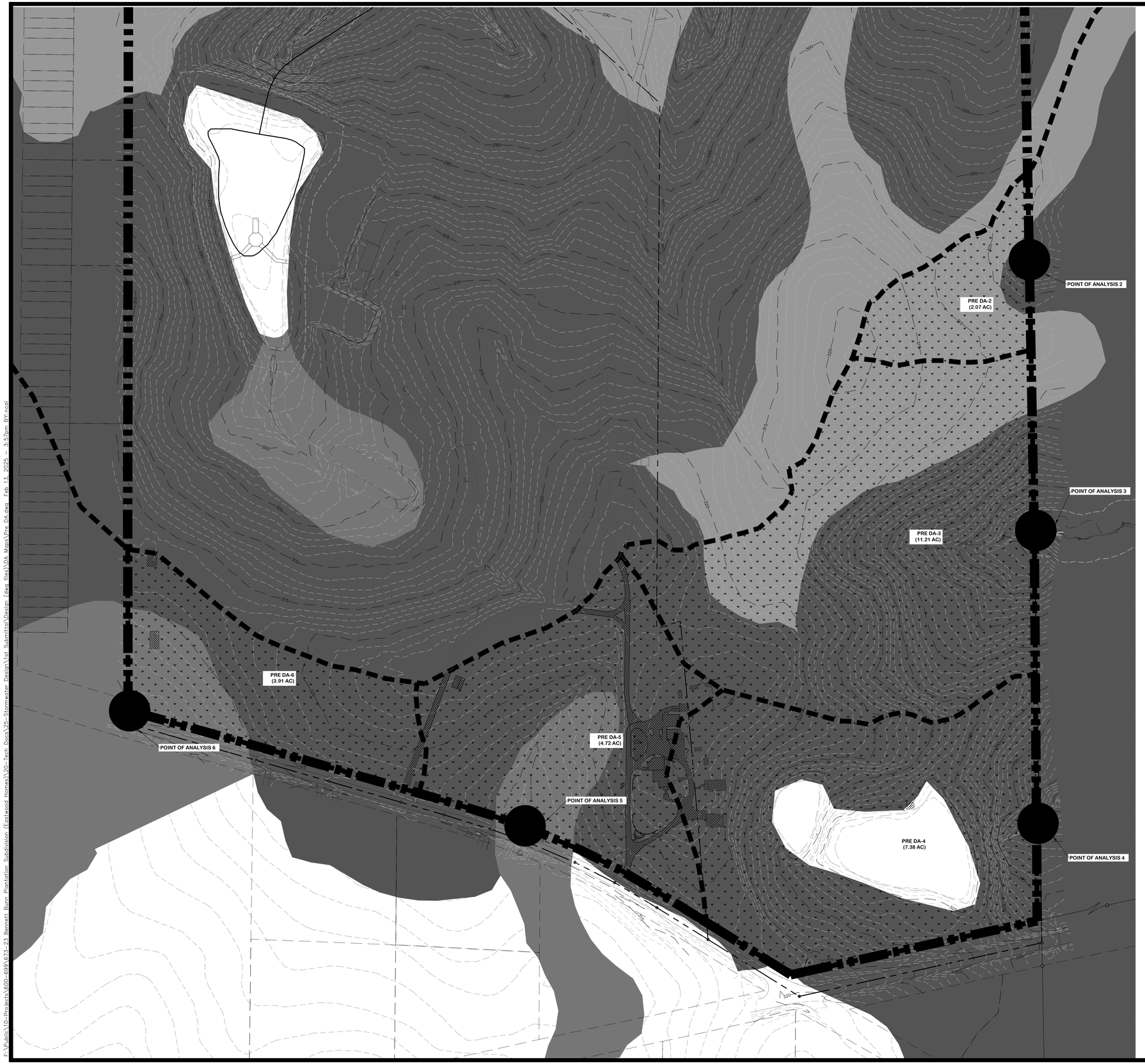
PRE-DEVELOPMENT DRIANAGE AREA MAP (DA-1)

SEAL:
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032573 PHILIP J. PAST
2-14-25

NO.	REVISION	DATE

DRAWING SHEET
PRE DA

PROJECT NUMBER
673-23



LEGEND:

SOIL GROUPS

- SOIL GROUP A
- SOIL GROUP B
- SOIL GROUP C
- SOIL GROUP D

LAND COVER TYPE

- IMPERVIOUS SURFACE AREA (SIDEWALK, BUILDINGS, ROADS, ETC.)
- RESIDENTIAL DISTRICT (ASSUME 40% IMPERVIOUS AND 60% PERVIOUS)
- OPEN SPACE, ASSUMED GOOD CONDITION (LAWNS, PARKS, GOLF COURSES, CEMETERIES, ETC.)

NOTES

1. SOIL SURVEY INFORMATION AND OFF-SITE TOPOGRAPHY ARE FROM WAKE COUNTY GIS. HYDROLOGIC SOIL GROUP CLASSIFICATIONS ARE FROM WAKE COUNTY STORM WATER MANUAL.
2. THE LIMITS OF DRAINAGE AREA WERE DETERMINED USING SURVEY INFORMATION, WAKE COUNTY GIS AND WAKE COUNTY iMAPS FOR EXISTING TOPOGRAPHY AND CITY OF RALEIGH STORM WATER CONVEYANCE SYSTEMS.
3. TR-55 MANUAL LAND COVER CLASSIFICATIONS WERE USED IN THIS ANALYSIS.

NAD83

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

PAST DESIGN GROUP, PA
Engineering | Consulting
107 Fayetteville Street, Suite 200, Raleigh, North Carolina 27601
Phone: 919 848 4395 | Fax: 919 848 4395 | NC LICENSE NUMBER: C-3211

PREPARED FOR :
BENNETT BUNN, LLC
7101 CREEDMOOR ROAD, SUITE 115
RALEIGH, NORTH CAROLINA 27613

DATE : 8.7.2023

PROJECT ENGINEER:
PDP

PROJECT CADD DESIGNER:
PDP

PROJECT SURVEYOR:
ULDRICKS LAND SURVEYORS, LLC

OLD BUNN ROAD SUBDIVISION

ZEBULON, WAKE COUNTY, NORTH CAROLINA

STORMWATER IMPACT ANALYSIS

PRE-DEVELOPMENT DRIANAGE AREA MAP (DA-2 TO 6)

SEAL:
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032573 Phillip D. Past III
2-14-25

DATE
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PROJECT NUMBER
673-23

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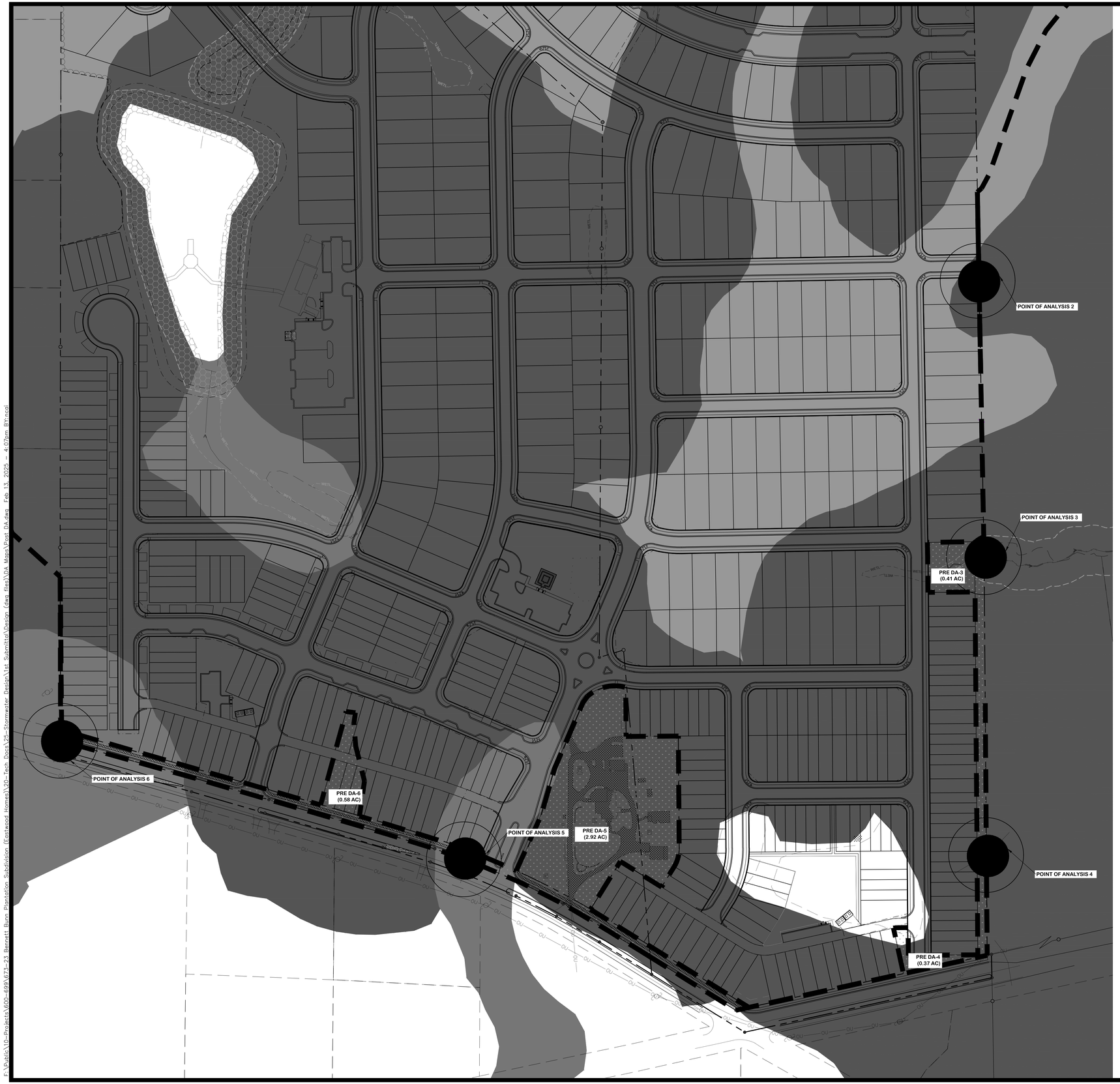

LEGEND:

SOIL GROUPS

- SOIL GROUP A
- SOIL GROUP B
- SOIL GROUP C
- SOIL GROUP D

LAND COVER TYPE

- IMPERVIOUS SURFACE AREA (SIDEWALK, BUILDINGS, ROADS, ETC.)
- RESIDENTIAL DISTRICT (ASSUME 40% IMPERVIOUS AND 60% PERVIOUS)
- OPEN SPACE, ASSUMED GOOD CONDITION (LAWNS, PARKS, GOLF COURSES, CEMETERIES, ETC.)

NOTES

1. SOIL SURVEY INFORMATION AND OFF-SITE TOPOGRAPHY ARE FROM WAKE COUNTY GIS. HYDROLOGIC SOIL GROUP CLASSIFICATIONS ARE FROM WAKE COUNTY STORM WATER MANUAL.
2. THE LIMITS OF DRAINAGE AREA WERE DETERMINED USING SURVEY INFORMATION, WAKE COUNTY GIS AND WAKE COUNTY iMAPS FOR EXISTING TOPOGRAPHY AND CITY OF RALEIGH STORM WATER CONVEYANCE SYSTEMS.
3. TR-55 MANUAL LAND COVER CLASSIFICATIONS WERE USED IN THIS ANALYSIS.

NAD83

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

PAST DESIGN GROUP, PA
Engineering | Consulting
107 Fayetteville Street, Suite 200, Raleigh, North Carolina 27601
Phone: 919 848 4395 | Fax: 919 848 4395 | NC LICENSE NUMBER: C-3211

PREPARED FOR :
BENNETT BUNN, INC
7101 CREEDMOOR ROAD, SUITE 115
RALEIGH, NORTH CAROLINA 27613

DATE : 8.7.2023

PROJECT ENGINEER:
PDP

PROJECT CADD DESIGNER:
PDP

PROJECT SURVEYOR:
ALBRECHT LAND SURVEYORS, LLC

OLD BUNN ROAD SUBDIVISION

ZEBULON, WAKE COUNTY, NORTH CAROLINA

STORMWATER IMPACT ANALYSIS
POST DA MAP

SEAL:
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032573 PHILIP D. PAST III
2-14-25

DATE
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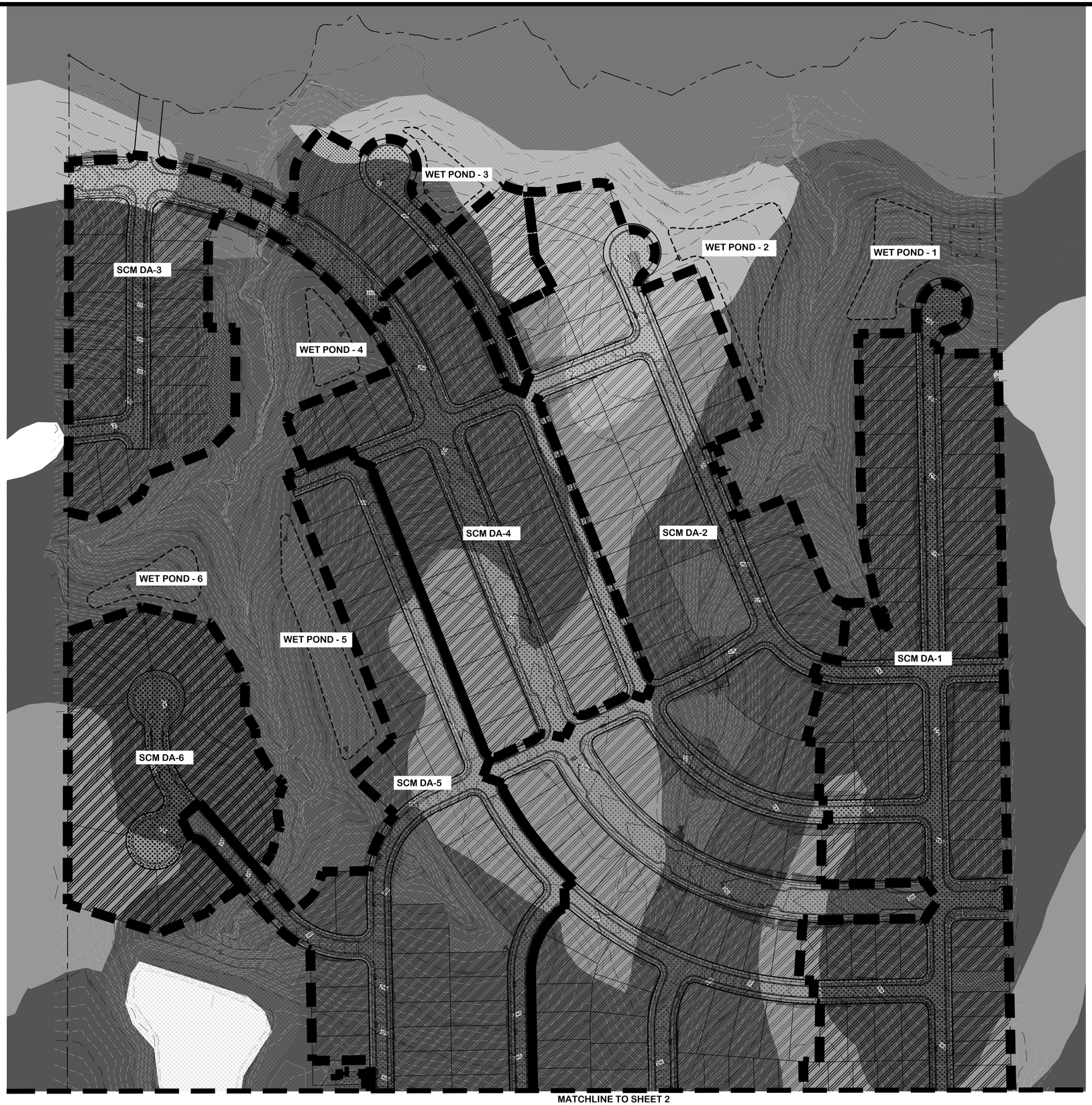

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SOIL GROUPS

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PREPARED FOR:
BENNETT BUNN, LLC
7101 CREEDMOOR ROAD, SUITE 115
RALEIGH, NORTH CAROLINA 27613

DATE : 8.7.2023

PROJECT ENGINEER:
PDP

PROJECT CADD DESIGNER:
PDP

PROJECT SURVEYOR:
TURCOMB LAND SURVEYORS, LLC

OLD BUNN ROAD SUBDIVISION

ZEBULON, WAKE COUNTY, NORTH CAROLINA

STORMWATER IMPACT ANALYSIS
SCM DRAINAGE AREA MAP SHEET 1

SEAL:
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032573 PHILIP D. PAST III
2-14-25

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SCM DA

PROJECT NUMBER
673-23

LEGEND:

SOIL GROUPS

- SOIL GROUP A
- SOIL GROUP B
- SOIL GROUP C
- SOIL GROUP D

LAND COVER TYPE

- IMPERVIOUS SURFACE AREA (SIDEWALK, BUILDINGS, ROADS, ETC.)
- RESIDENTIAL DISTRICT (ASSUME 40% IMPERVIOUS AND 60% PERVIOUS)
- OPEN SPACE, ASSUMED GOOD CONDITION (LAWNS, PARKS, GOLF COURSES, CEMETERIES, ETC.)

NOTES

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2. THE LIMITS OF DRAINAGE AREA WERE DETERMINED USING SURVEY INFORMATION, WAKE COUNTY GIS AND WAKE COUNTY iMAPS FOR EXISTING TOPOGRAPHY AND CITY OF RALEIGH STORM WATER CONVEYANCE SYSTEMS.
3. TR-55 MANUAL LAND COVER CLASSIFICATIONS WERE USED IN THIS ANALYSIS.

NAD83

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

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Engineering | Consulting
107 Fayetteville Street, Suite 200, Raleigh, North Carolina 27601
Phone: 919 848 4395 | Fax: 919 848 4395 | NC LICENSE NUMBER: C-3211

PREPARED FOR :
EASTWOOD HOMES, INC.
7101 CREEDMOOR ROAD, SUITE 115
RALEIGH, NORTH CAROLINA 27613

DATE : 8.7.2023

PROJECT ENGINEER:
PDP

PROJECT CADD DESIGNER:
PDP

PROJECT SURVEYOR:
HERCOMB LAND SURVEYORS, LLC

OLD BUNN ROAD SUBDIVISION

ZEBULON, WAKE COUNTY, NORTH CAROLINA

STORMWATER IMPACT ANALYSIS
SCM DRAINAGE AREA MAP SHEET 2

SEAL:
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032573 PHILIP D. PAST III
2-14-25

DATE
REVISION
NO.

DRAWING SHEET
SCM DA

PROJECT NUMBER
673-23

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XIX. SCM Design Calculations

DESIGN CALCULATIONS

WET POND-1

Project Name

Bennett Bunn Plantation Subdivision

Project Number

673-23

Date

14-Feb-25

Wet Pond Drainage Area Data

Wet Pond Drainage Area: 1427946.449 square feet = 32.781 acres

Impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site buildings	0	410,611	410,611
On-site streets	0	199,559	199,559
On-site parking	0	0	0
On-site sidewalks	0	63,782	63,782
Other on-site	0	0	0
Total off-site impervious	0	0	0
Total Impervious	0	673,951.58	673,952
Non-impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site grass/landscape	0	753,995	753,995
On-site woods	0	0	0
Other undeveloped	0	0	0
Other on-site non-impervious	0	0	0
Total off-site non-impervious	0	0	0
Total non-impervious	0	753,994.87	753,995
Total Drainage Area	0	1,427,946	1,427,946
Percent Impervious	n/a	47.2	n/a

Wet Pond Surface Area Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Total on-site drainage area to pond	1,427,946	square feet
Total impervious area in drainage area	673,952	square feet
Average water depth of basin at normal pool	3.01	feet
Location of site	Zebulon	
Site region	Piedmont	
% Impervious cover	47.2	percent
Will a vegetative filter be used?	No	

Surface Area/Drainage Area Ratios:

For a site in the Piedmont w/out Vegetative Filter	1.5	percent
For a site in a Coastal County w/ Vegetative Filter		percent

Required surface area of pond:

For a site in the Piedmont w/out Vegetative Filter	22,020.0	square feet
For a site in a Coastal County w/out Vegetative Filter	0.0	square feet

Wet Pond Design Volume Caclutaion

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Total on-site drainage area to pond	32.781	acres
Total impervious area in drainage area	15.472	acres
% Impervious cover (impervious fraction), I_A	0.472	
Runoff coefficient, R_v	0.475	

$R_V = 0.05 + 0.9 * I_A$

Where:

R_V	=	Runoff coefficient (unitless)
I_A	=	Impervious fraction (unitless)

Design storm depth, R_D	1.0	inches
Design Volume, DV	56,496	cubic feet

$DV = 3630 * R_D * R_V * A$

Where:

DV	=	Design volume (cu ft)
R_D	=	Design storm depth (in)
A	=	Drainage area (ac)

WET POND STAGE-STORAGE DATA

MAIN POOL

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
253.0	0.0	18,899	0.434	0.00	0.434	0.00	0.000	0.00	0.000
254.0	1.0	20,018	0.460	20,018.46	0.03	19,458.55	0.03	19,458.55	0.03
255.0	2.0	21,158	0.486	1,139.92	0.026	20,588.42	0.473	40,046.97	0.498
256.0	3.0	22,318	0.512	1,160.02	0.027	21,738.39	0.499	61,785.37	0.972
256.5	3.5	23,499	0.539	1,180.13	0.027	11,454.24	0.263	73,239.60	0.762
257.0	4.0	25,306	0.581	1,807.90	0.069	12,201.24	0.547	85,440.85	1.046

WET POND STAGE-STORAGE DATA
FOREBAY VOLUME

Project: Bennett Bunn Plantation Subd
Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
253.0	0.0	3,780	0.087	3,779.73	0.087	0.00	0.000	0.00	0.000
254.0	1.0	4,004	0.092	223.96	0.01	223.96	0.01	223.96	0.01
255.0	2.0	4,232	0.097	227.98	0.005	4,117.68	0.095	4,341.65	0.100
256.0	3.0	4,464	0.102	232.00	0.005	4,347.68	0.100	8,689.33	0.194
256.5	3.5	4,700	0.108	236.03	0.005	2,290.85	0.053	10,980.17	0.152
257.0	4.0	5,061	0.116	361.58	0.008	2,440.25	0.056	13,420.42	0.109

Required Forebay Volume =	12,816	(Max 20%)
Provided Forebay Volume =	13,420	15.7%

WET POND STAGE-STORAGE DATA
PERMANENT POOL

Project: Bennett Bunn Plantation Subd
Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
253.0	0.0	22,678	0.521	0.00	0.521	0.00	0.000	0.00	0.000
254.0	1.0	24,022	0.551	24,022.15	0.03	23,350.27	0.03	23,350.27	0.03
255.0	2.0	25,390	0.583	1,367.90	0.031	24,706.10	0.567	48,056.37	0.598
256.0	3.0	26,782	0.615	1,392.03	0.032	26,086.07	0.599	74,142.44	1.166
256.5	3.5	28,198	0.647	1,416.16	0.033	13,745.08	0.316	87,887.52	0.914
257.0	4.0	30,368	0.697	2,169.48	0.082	14,641.49	0.656	102,529.01	1.255

WET POND STAGE-STORAGE DATA

TEMPORARY POOL

Project Bennett Bunn Plantation Subdivision

Project No. 673-23

Date 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
257.0	0.0	30,368	0.697	0.00	0.70	0.00	0.00	0.00	0.00
258.0	1.0	33,209	0.762	2,841.28	0.07	31,788.36	0.73	31,788.36	0.73
259.0	2.0	35,131	0.806	1,922.00	0.04	34,170.00	0.78	65,958.36	1.51

Design Volume =	56,496
Provided Volume =	65,958

Average Depth Calculation

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:

D_{avg}	=	Average depth (feet)
V_{PP}	=	Main pool volume at permanent pool elevation (feet^3)
V_{shelf}	=	Volume over the shelf only (feet^3) – see below
$A_{bottom\ of\ shelf}$	=	Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:

$Depth_{max\ over\ shelf}$	=	Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
$Perimeter_{perm\ pool}$	=	Perimeter of main pool at the bottom of the shelf (feet)
$Width_{submerged\ part\ of\ shelf}$	=	Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

$Depth_{max\ over\ shelf}$ 0.50 feet

$Perimeter_{perm\ pool}$ 762.72 feet

$Width_{submerged\ part\ of\ shelf}$ 3.00 feet

V_{shelf} 572.04 cubic feet

D_{avg} 3.61 feet

Provided Depth = 3.61 feet

Wet Pond Drawdown Time Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Surface area at normal pool (A_0) =	30,368	square feet
Surface area at beginning of drawdown (A_1) =	35,131	square feet
Maximum head of water above dewatering hole (H_1) =	1.00	feet
Orifice coefficient (C_d) =	0.6	
Diameter of each hole =	1.25	inches
Number of holes =	2	
Acceleration of Gravity (g) =	32.2	feet / second^2
Cross sectional area of each hole (a) =	0.009	square feet
Cross sectional area of each hole =	1.2	square inches
Cross sectional area of dewatering hole(s) =	0.017	square feet
Cross sectional area of dewatering hole(s) =	2.5	square inches
Dewatering time for basin (T) =	395,979.8	seconds
Dewatering time for basin (T) =	4.58	days

Calculations based on Greensboro Stormwater Manual,
Chapter 3, Section 3.5.2

For the specific case where $A_2 = A_0$ and $H_2 = 0$

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(2 * A_0 * H_1^{1/2} + \frac{2}{3} \left(\frac{A_1 - A_0}{H_1} \right) * H_1^{3/2} \right) \right]$$

Equation 2

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(\frac{2}{3} A_0 + \frac{1}{3} A_1 \right) * H_1^{1/2} \right]$$

Notes:

Bouyancy Calculations for Riser

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Structure Data

Riser Inner Width =	4.00	ft
Riser Inner Length =	4.00	ft
Wall Thickness =	0.50	ft
Base Width =	5.00	ft
Base Length =	5.00	ft
Top of Riser Elevation =	258.00	ft
Structure Invert Elevation =	253.00	ft
Bottom of Base Elevation =	250.00	ft
Depth of Concrete Base =	3.00	ft

Bouyant Force Calcluation

Riser Inner Volume =	80.00	ft			
Riser Concrete Volume =	45.00	ft	Unit Weight =	62.50	pcf
Base Concrete Volume =	75.00	ft	Total Bouyant Force =	12,500.00	
Total Displaced Volume =	200.00	ft			

Required Resisting Force Calcluation

Desired Factor of Safety =	1.15		Factored Resistent Force =	14,375.00	lb

Provided Resisting Force Calculation

Unit Weight of Concrete =	150.00	pcf			
Weight of Concrete Riser =	6,750.00	lb			
Weight of Concrete Base Unit =	11,250.00	lb	Total Resisting Force =	18,000.00	lb

Compliance Check

Provided Resisting Force > Factored Resisting Force =	YES
Provided Factor of Safety =	1.44

Wet Pond Summary Information

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

Drainage area to pond	1,427,946	square feet =	32.78	acres
Impervious area in drainage area	673,952	square feet =	15.47	acres

Bottom of pond elevation	253.00	feet	
Normal pool elevation	257.00	feet	

Required volume for design rainfall	56,496	cubic feet	
Provided volume for design rainfall	65,958	cubic feet at elevation	259

SA/DA Ratio for Permanent Pool Sizing for 85% Removal in the Piedmont

Pool depth to lookup	3.61							
Impervious cover to lookup	47.2							
Pool depth between	3	and	4	which is between columns	1	and	2	
Impervious cover between	40.0	and	50.0	which is between rows	4	and	5	

SA/DA ratios

Impevious cover [percent]	Pool depth [feet]		
	3.0	**3.6**	4.0
40	1.51	**1.34**	1.24
47.2	**1.71**	1.54	**1.43**
50	1.79	**1.62**	1.51

Piedmont and Mountain SA/DA Table

% Impervious Cover	Permanent Pool Depth					
	3.0	4.0	5.0	6.0	7.0	8.0
10	0.51	0.43	0.37	0.30	0.27	0.25
20	0.84	0.69	0.61	0.51	0.44	0.40
30	1.17	0.97	0.84	0.72	0.61	0.56
40	1.51	1.24	1.09	0.91	0.78	0.71
50	1.79	1.51	1.31	1.13	0.95	0.87
60	2.09	1.77	1.49	1.31	1.12	1.03
70	2.51	2.09	1.80	1.56	1.34	1.17
80	2.92	2.41	2.07	1.82	1.62	1.40
90	3.25	2.64	2.31	2.04	1.84	1.59
100	3.55	2.79	2.52	2.34	2.04	1.75

DESIGN CALCULATIONS

WET POND-2

Project Name

Bennett Bunn Plantation Subdivision

Project Number

673-23

Date

14-Feb-25

Wet Pond Drainage Area Data

Wet Pond Drainage Area: 1619635.296 square feet = 37.182 acres

Impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site buildings	0	416,797	416,797
On-site streets	0	291,248	291,248
On-site parking	0	0	0
On-site sidewalks	0	61,146	61,146
Other on-site	0	0	0
Total off-site impervious	0	0	0
Total Impervious	0	769,190.64	769,191
Non-impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site grass/landscape	0	850,445	850,445
On-site woods	0	0	0
Other undeveloped	0	0	0
Other on-site non-impervious	0	0	0
Total off-site non-impervious	0	0	0
Total non-impervious	0	850,444.66	850,445
Total Drainage Area	0	1,619,635	1,619,635
Percent Impervious	n/a	47.5	n/a

Wet Pond Surface Area Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Total on-site drainage area to pond	1,619,635	square feet
Total impervious area in drainage area	769,191	square feet
Average water depth of basin at normal pool	3.04	feet
Location of site	Garner	
Site region	Piedmont	
% Impervious cover	47.5	percent
Will a vegetative filter be used?	No	

Surface Area/Drainage Area Ratios:

For a site in the Piedmont w/out Vegetative Filter	1.6	percent
For a site in a Coastal County w/ Vegetative Filter		percent

Required surface area of pond:

For a site in the Piedmont w/out Vegetative Filter	25,430.0	square feet
For a site in a Coastal County w/out Vegetative Filter	0.0	square feet

Wet Pond Design Volume Caclutaion

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Total on-site drainage area to pond	37.182	acres
Total impervious area in drainage area	17.658	acres
% Impervious cover (impervious fraction), I_A	0.475	
Runoff coefficient, R_v	0.477	

$R_V = 0.05 + 0.9 * I_A$

Where:

R_V	=	Runoff coefficient (unitless)
I_A	=	Impervious fraction (unitless)

Design storm depth, R_D	1.0	inches
Design Volume, DV	64,438	cubic feet

$DV = 3630 * R_D * R_V * A$

Where:

DV	=	Design volume (cu ft)
R_D	=	Design storm depth (in)
A	=	Drainage area (ac)

WET POND STAGE-STORAGE DATA

MAIN POOL

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
239.0	0.0	20,073	0.461	0.00	0.461	0.00	0.000	0.00	0.000
240.0	1.0	21,554	0.495	21,554.25	0.03	20,813.45	0.03	20,813.45	0.03
241.0	2.0	23,062	0.529	1,507.83	0.035	22,308.17	0.512	43,121.61	0.546
242.0	3.0	24,590	0.565	1,527.94	0.035	23,826.05	0.547	66,947.67	1.059
242.5	3.5	26,138	0.600	1,548.04	0.036	12,682.02	0.291	79,629.69	0.838
243.0	4.0	28,498	0.654	2,359.77	0.090	13,658.97	0.609	93,288.66	1.156

WET POND STAGE-STORAGE DATA
FOREBAY VOLUME

Project: Bennett Bunn Plantation Subd
Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
239.0	0.0	4,015	0.092	4,014.53	0.092	0.00	0.000	0.00	0.000
240.0	1.0	4,311	0.099	296.32	0.01	296.32	0.01	296.32	0.01
241.0	2.0	4,612	0.106	301.57	0.007	4,461.63	0.102	4,757.96	0.109
242.0	3.0	4,918	0.113	305.59	0.007	4,765.21	0.109	9,523.17	0.212
242.5	3.5	5,228	0.120	309.61	0.007	2,536.40	0.058	12,059.57	0.168
243.0	4.0	5,700	0.131	471.95	0.011	2,731.79	0.063	14,791.37	0.121

Required Forebay Volume =	13,993	(Max 20%)
Provided Forebay Volume =	14,791	15.9%

WET POND STAGE-STORAGE DATA
PERMANENT POOL

Project Bennett Bunn Plantation Subd
Project No. 673-23

Date 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
239.0	0.0	24,087	0.553	0.00	0.553	0.00	0.000	0.00	0.000
240.0	1.0	25,865	0.594	25,865.10	0.04	24,976.13	0.04	24,976.13	0.04
241.0	2.0	27,674	0.635	1,809.40	0.042	26,769.80	0.615	51,745.94	0.655
242.0	3.0	29,508	0.677	1,833.53	0.042	28,591.26	0.656	80,337.20	1.271
242.5	3.5	31,366	0.720	1,857.65	0.043	15,218.43	0.349	95,555.62	1.006
243.0	4.0	34,197	0.785	2,831.72	0.108	16,390.77	0.731	111,946.39	1.388

WET POND STAGE-STORAGE DATA

TEMPORARY POOL

Project Bennett Bunn Plantation Subdivision

Project No. 673-23

Date 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
243.0	0.0	34,197	0.785	0.00	0.79	0.00	0.00	0.00	0.00
244.0	1.0	37,101	0.852	2,903.60	0.07	35,649.20	0.82	35,649.20	0.82
245.0	2.0	39,288	0.902	2,187.00	0.05	38,194.50	0.88	73,843.70	1.70

Design Volume =	64,438
Provided Volume =	73,844

Average Depth Calculation

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:

D_{avg}	=	Average depth (feet)
V_{PP}	=	Main pool volume at permanent pool elevation (feet^3)
V_{shelf}	=	Volume over the shelf only (feet^3) – see below
$A_{bottom\ of\ shelf}$	=	Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:

$Depth_{max\ over\ shelf}$	=	Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
$Perimeter_{perm\ pool}$	=	Perimeter of main pool at the bottom of the shelf (feet)
$Width_{submerged\ part\ of\ shelf}$	=	Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

$Depth_{max\ over\ shelf}$ 0.50 feet

$Perimeter_{perm\ pool}$ 992.66 feet

$Width_{submerged\ part\ of\ shelf}$ 3.00 feet

V_{shelf} 744.50 cubic feet

D_{avg} 3.54 feet

Provided Depth = 3.54 feet

Wet Pond Drawdown Time Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Surface area at normal pool (A_0) =	28,498	square feet
Surface area at beginning of drawdown (A_1) =	39,288	square feet
Maximum head of water above dewatering hole (H_1) =	1.00	feet
Orifice coefficient (C_d) =	0.6	
Diameter of each hole =	1.50	inches
Number of holes =	2	
Acceleration of Gravity (g) =	32.2	feet / second^2
Cross sectional area of each hole (a) =	0.012	square feet
Cross sectional area of each hole =	1.8	square inches
Cross sectional area of dewatering hole(s) =	0.025	square feet
Cross sectional area of dewatering hole(s) =	3.5	square inches
Dewatering time for basin (T) =	276,182.7	seconds
Dewatering time for basin (T) =	3.20	days

Calculations based on Greensboro Stormwater Manual,
Chapter 3, Section 3.5.2

For the specific case where $A_2 = A_0$ and $H_2 = 0$

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(2 * A_0 * H_1^{1/2} + \frac{2}{3} \left(\frac{A_1 - A_0}{H_1} \right) * H_1^{3/2} \right) \right]$$

Equation 2

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(\frac{2}{3} A_0 + \frac{1}{3} A_1 \right) * H_1^{1/2} \right]$$

Notes:

Bouyancy Calculations for Riser

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Structure Data

Riser Inner Width =	4.00	ft
Riser Inner Length =	4.00	ft
Wall Thickness =	0.50	ft
Base Width =	5.00	ft
Base Length =	5.00	ft
Top of Riser Elevation =	244.00	ft
Structure Invert Elevation =	239.00	ft
Bottom of Base Elevation =	236.00	ft
Depth of Concrete Base =	3.00	ft

Bouyant Force Calcluation

Riser Inner Volume =	80.00	ft			
Riser Concrete Volume =	45.00	ft	Unit Weight =	62.50	pcf
Base Concrete Volume =	75.00	ft	Total Bouyant Force =	12,500.00	
Total Displaced Volume =	200.00	ft			

Required Resisting Force Calcluation

Desired Factor of Safety =	1.15		Factored Resistent Force =	14,375.00	lb

Provided Resisting Force Calculation

Unit Weight of Concrete =	150.00	pcf			
Weight of Concrete Riser =	6,750.00	lb			
Weight of Concrete Base Unit =	11,250.00	lb	Total Resisting Force =	18,000.00	lb

Compliance Check

Provided Resisting Force > Factored Resisting Force =	YES
Provided Factor of Safety =	1.44

Wet Pond Summary Information

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Drainage area to pond	1,619,635	square feet =	37.18	acres
Impervious area in drainage area	769,191	square feet =	17.66	acres
Bottom of pond elevation	239.00	feet		
Normal pool elevation	243.00	feet		
Required volume for design rainfall	64,438	cubic feet		
Provided volume for design rainfall	73,844	cubic feet at elevation	245	

SA/DA Ratio for Permanent Pool Sizing for 85% Removal in the Piedmont

Pool depth to lookup	3.54							
Impervious cover to lookup	47.5							
Pool depth between	3	and	4	which is between columns	1	and	2	
Impervious cover between	40.0	and	50.0	which is between rows	4	and	5	

SA/DA ratios

Impevious cover [percent]	Pool depth [feet]		
	3.0	**3.5**	4.0
40	1.51	**1.36**	1.24
47.5	**1.72**	1.57	**1.44**
50	1.79	**1.64**	1.51

Piedmont and Mountain SA/DA Table

% Impervious Cover	Permanent Pool Depth					
	3.0	4.0	5.0	6.0	7.0	8.0
10	0.51	0.43	0.37	0.30	0.27	0.25
20	0.84	0.69	0.61	0.51	0.44	0.40
30	1.17	0.97	0.84	0.72	0.61	0.56
40	1.51	1.24	1.09	0.91	0.78	0.71
50	1.79	1.51	1.31	1.13	0.95	0.87
60	2.09	1.77	1.49	1.31	1.12	1.03
70	2.51	2.09	1.80	1.56	1.34	1.17
80	2.92	2.41	2.07	1.82	1.62	1.40
90	3.25	2.64	2.31	2.04	1.84	1.59
100	3.55	2.79	2.52	2.34	2.04	1.75

DESIGN CALCULATIONS

WET POND-3

Project Name

Bennett Bunn Plantation Subdivision

Project Number

673-23

Date

14-Feb-25

Wet Pond Drainage Area Data

Wet Pond Drainage Area: 354833.870 square feet = 8.146 acres

Impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site buildings	0	74,988	74,988
On-site streets	0	66,987	66,987
On-site parking	0	0	0
On-site sidewalks	0	18,510	18,510
Other on-site	0	0	0
Total off-site impervious	0	0	0
Total Impervious	0	160,485.64	160,486
Non-impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site grass/landscape	0	194,348	194,348
On-site woods	0	0	0
Other undeveloped	0	0	0
Other on-site non-impervious	0	0	0
Total off-site non-impervious	0	0	0
Total non-impervious	0	194,348.23	194,348
Total Drainage Area	0	354,834	354,834
Percent Impervious	n/a	45.2	n/a

Wet Pond Surface Area Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Total on-site drainage area to pond	354,834	square feet
Total impervious area in drainage area	160,486	square feet
Average water depth of basin at normal pool	2.99	feet
Location of site	Garner	
Site region	Piedmont	
% Impervious cover	45.2	percent
Will a vegetative filter be used?	No	

Surface Area/Drainage Area Ratios:

For a site in the Piedmont w/out Vegetative Filter	1.5	percent
For a site in a Coastal County w/ Vegetative Filter		percent

Required surface area of pond:

For a site in the Piedmont w/out Vegetative Filter	5,460.0	square feet
For a site in a Coastal County w/out Vegetative Filter	0.0	square feet

Wet Pond Design Volume Caclutaion

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Total on-site drainage area to pond	8.146	acres
Total impervious area in drainage area	3.684	acres
% Impervious cover (impervious fraction), I_A	0.452	
Runoff coefficient, R_v	0.457	

$R_V = 0.05 + 0.9 * I_A$

Where:

R_V	=	Runoff coefficient (unitless)
I_A	=	Impervious fraction (unitless)

Design storm depth, R_D	1.0	inches
Design Volume, DV	13,515	cubic feet

$DV = 3630 * R_D * R_V * A$

Where:

DV	=	Design volume (cu ft)
R_D	=	Design storm depth (in)
A	=	Drainage area (ac)

WET POND STAGE-STORAGE DATA

MAIN POOL

Project: Bennett Bunn Plantation Subc

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
251.0	0.0	5,841	0.134	0.00	0.134	0.00	0.000	0.00	0.000
252.0	1.0	6,564	0.151	6,564.45	0.02	6,202.75	0.02	6,202.75	0.02
253.0	2.0	7,323	0.168	758.68	0.017	6,943.78	0.159	13,146.53	0.176
254.0	3.0	8,113	0.186	789.94	0.018	7,718.09	0.177	20,864.62	0.337
254.5	3.5	8,516	0.196	403.37	0.009	4,157.37	0.095	25,022.00	0.273
255.0	4.0	9,757	0.224	1,240.26	0.038	4,568.28	0.205	29,590.28	0.382

WET POND STAGE-STORAGE DATA
FOREBAY VOLUME

Project: Bennett Bunn Plantation Subd
Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
251.0	0.0	1,168	0.027	1,168.21	0.027	0.00	0.000	0.00	0.000
252.0	1.0	1,313	0.030	144.68	0.00	144.68	0.00	144.68	0.00
253.0	2.0	1,465	0.034	151.74	0.003	1,388.76	0.032	1,533.44	0.035
254.0	3.0	1,623	0.037	157.99	0.004	1,543.62	0.035	3,077.06	0.067
254.5	3.5	1,703	0.039	80.67	0.002	831.47	0.019	3,908.53	0.055
255.0	4.0	1,951	0.045	248.05	0.006	913.66	0.021	4,822.19	0.040

Required Forebay Volume =	4,439	(Max 20%)
Provided Forebay Volume =	4,822	16.3%

WET POND STAGE-STORAGE DATA

PERMANENT POOL

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
251.0	0.0	7,009	0.161	0.00	0.161	0.00	0.000	0.00	0.000
252.0	1.0	7,877	0.181	7,877.33	0.02	7,443.29	0.02	7,443.29	0.02
253.0	2.0	8,788	0.202	910.41	0.021	8,332.54	0.191	15,775.84	0.211
254.0	3.0	9,736	0.224	947.93	0.022	9,261.71	0.213	25,037.55	0.404
254.5	3.5	10,220	0.235	484.04	0.011	4,988.85	0.115	30,026.40	0.327
255.0	4.0	11,708	0.269	1,488.31	0.045	5,481.94	0.246	35,508.33	0.459

WET POND STAGE-STORAGE DATA

TEMPORARY POOL

Project Bennett Bunn Plantation Subdivision

Project No. 673-23

Date 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
255.0	0.0	11,708	0.269	0.00	0.27	0.00	0.00	0.00	0.00
256.0	1.0	12,718	0.292	1,009.97	0.02	12,213.02	0.28	12,213.02	0.28
257.0	2.0	13,988	0.321	1,270.00	0.03	13,353.00	0.31	25,566.02	0.59

Design Volume =	13,515
Provided Volume =	25,566

Average Depth Calculation

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:

D_{avg}	=	Average depth (feet)
V_{PP}	=	Main pool volume at permanent pool elevation (feet^3)
V_{shelf}	=	Volume over the shelf only (feet^3) – see below
$A_{bottom\ of\ shelf}$	=	Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:

$Depth_{max\ over\ shelf}$	=	Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
$Perimeter_{perm\ pool}$	=	Perimeter of main pool at the bottom of the shelf (feet)
$Width_{submerged\ part\ of\ shelf}$	=	Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

$Depth_{max\ over\ shelf}$ 0.50 feet

$Perimeter_{perm\ pool}$ 526.20 feet

$Width_{submerged\ part\ of\ shelf}$ 3.00 feet

V_{shelf} 394.65 cubic feet

D_{avg} 3.43 feet

Provided Depth = 3.43 feet

Wet Pond Drawdown Time Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Surface area at normal pool (A_0) =	9,757	square feet
Surface area at beginning of drawdown (A_1) =	13,988	square feet
Maximum head of water above dewatering hole (H_1) =	1.00	feet
Orifice coefficient (C_d) =	0.6	
Diameter of each hole =	1.25	inches
Number of holes =	1	
Acceleration of Gravity (g) =	32.2	feet / second^2
Cross sectional area of each hole (a) =	0.009	square feet
Cross sectional area of each hole =	1.2	square inches
Cross sectional area of dewatering hole(s) =	0.009	square feet
Cross sectional area of dewatering hole(s) =	1.2	square inches
Dewatering time for basin (T) =	276,757.4	seconds
Dewatering time for basin (T) =	3.20	days

Calculations based on Greensboro Stormwater Manual,
Chapter 3, Section 3.5.2

For the specific case where $A_2 = A_0$ and $H_2 = 0$

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(2 * A_0 * H_1^{1/2} + \frac{2}{3} \left(\frac{A_1 - A_0}{H_1} \right) * H_1^{3/2} \right) \right]$$

Equation 2

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(\frac{2}{3} A_0 + \frac{1}{3} A_1 \right) * H_1^{1/2} \right]$$

Notes:

Bouyancy Calculations for Riser

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Structure Data

Riser Inner Width =	4.00	ft
Riser Inner Length =	4.00	ft
Wall Thickness =	0.50	ft
Base Width =	5.00	ft
Base Length =	5.00	ft
Top of Riser Elevation =	256.00	ft
Structure Invert Elevation =	251.00	ft
Bottom of Base Elevation =	248.00	ft
Depth of Concrete Base =	3.00	ft

Bouyant Force Calcluation

Riser Inner Volume =	80.00	ft			
Riser Concrete Volume =	45.00	ft	Unit Weight =	62.50	pcf
Base Concrete Volume =	75.00	ft	Total Bouyant Force =	12,500.00	
Total Displaced Volume =	200.00	ft			

Required Resisting Force Calcluation

Desired Factor of Safety =	1.15		Factored Resistent Force =	14,375.00	lb

Provided Resisting Force Calculation

Unit Weight of Concrete =	150.00	pcf			
Weight of Concrete Riser =	6,750.00	lb			
Weight of Concrete Base Unit =	11,250.00	lb	Total Resisting Force =	18,000.00	lb

Compliance Check

Provided Resisting Force > Factored Resisting Force =	YES
Provided Factor of Safety =	1.44

Wet Pond Summary Information

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Drainage area to pond	354,834	square feet =	8.15	acres
Impervious area in drainage area	160,486	square feet =	3.68	acres

Bottom of pond elevation	251.00	feet
Normal pool elevation	255.00	feet

Required volume for design rainfall	13,515	cubic feet	
Provided volume for design rainfall	25,566	cubic feet at elevation	257

SA/DA Ratio for Permanent Pool Sizing for 85% Removal in the Piedmont

Pool depth to lookup	3.43							
Impervious cover to lookup	45.2							
Pool depth between	3	and	4	which is between columns	1	and	2	
Impervious cover between	40.0	and	50.0	which is between rows	4	and	5	

SA/DA ratios

Impevious cover [percent]	Pool depth [feet]		
	3.0	**3.4**	4.0
40	1.51	**1.39**	1.24
45.2	**1.66**	1.54	**1.38**
50	1.79	**1.67**	1.51

Piedmont and Mountain SA/DA Table

% Impervious Cover	Permanent Pool Depth					
	3.0	4.0	5.0	6.0	7.0	8.0
10	0.51	0.43	0.37	0.30	0.27	0.25
20	0.84	0.69	0.61	0.51	0.44	0.40
30	1.17	0.97	0.84	0.72	0.61	0.56
40	1.51	1.24	1.09	0.91	0.78	0.71
50	1.79	1.51	1.31	1.13	0.95	0.87
60	2.09	1.77	1.49	1.31	1.12	1.03
70	2.51	2.09	1.80	1.56	1.34	1.17
80	2.92	2.41	2.07	1.82	1.62	1.40
90	3.25	2.64	2.31	2.04	1.84	1.59
100	3.55	2.79	2.52	2.34	2.04	1.75

DESIGN CALCULATIONS

WET POND-4

Project Name

Bennett Bunn Plantation Subdivision

Project Number

673-23

Date

14-Feb-25

Wet Pond Drainage Area Data

Wet Pond Drainage Area: 349308.530 square feet = 8.019 acres

Impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site buildings	0	88,087	88,087
On-site streets	0	72,996	72,996
On-site parking	0	0	0
On-site sidewalks	0	17,973	17,973
Other on-site	0	0	0
Total off-site impervious	0	0	0
Total Impervious	0	179,055.82	179,056
Non-impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site grass/landscape	0	170,253	170,253
On-site woods	0	0	0
Other undeveloped	0	0	0
Other on-site non-impervious	0	0	0
Total off-site non-impervious	0	0	0
Total non-impervious	0	170,252.71	170,253
Total Drainage Area	0	349,309	349,309
Percent Impervious	n/a	51.3	n/a

Wet Pond Surface Area Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Total on-site drainage area to pond	349,309	square feet
Total impervious area in drainage area	179,056	square feet
Average water depth of basin at normal pool	2.95	feet
Location of site	Garner	
Site region	Piedmont	
% Impervious cover	51.3	percent
Will a vegetative filter be used?	No	

Surface Area/Drainage Area Ratios:

For a site in the Piedmont w/out Vegetative Filter	1.7	percent
For a site in a Coastal County w/ Vegetative Filter		percent

Required surface area of pond:

For a site in the Piedmont w/out Vegetative Filter	5,840.0	square feet
For a site in a Coastal County w/out Vegetative Filter	0.0	square feet

Wet Pond Design Volume Caclutaion

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Total on-site drainage area to pond	8.019	acres
Total impervious area in drainage area	4.111	acres
% Impervious cover (impervious fraction), I_A	0.513	
Runoff coefficient, R_v	0.511	

$R_V = 0.05 + 0.9 * I_A$

Where:

R_V	=	Runoff coefficient (unitless)
I_A	=	Impervious fraction (unitless)

Design storm depth, R_D	1.0	inches
Design Volume, DV	14,885	cubic feet

$DV = 3630 * R_D * R_V * A$

Where:

DV	=	Design volume (cu ft)
R_D	=	Design storm depth (in)
A	=	Drainage area (ac)

WET POND STAGE-STORAGE DATA

MAIN POOL

Project: Bennett Bunn Plantation Subc

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
246.0	0.0	7,056	0.162	0.00	0.162	0.00	0.000	0.00	0.000
247.0	1.0	7,702	0.177	7,702.16	0.01	7,379.27	0.01	7,379.27	0.01
248.0	2.0	8,368	0.192	665.89	0.015	8,035.10	0.184	15,414.37	0.199
249.0	3.0	9,054	0.208	686.00	0.016	8,711.05	0.200	24,125.42	0.384
249.5	3.5	9,405	0.216	350.54	0.008	4,614.66	0.106	28,740.07	0.306
250.0	4.0	10,486	0.241	1,081.77	0.033	4,972.73	0.224	33,712.81	0.424

WET POND STAGE-STORAGE DATA
FOREBAY VOLUME

Project: Bennett Bunn Plantation Subd
Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
246.0	0.0	1,411	0.032	1,411.28	0.032	0.00	0.000	0.00	0.000
247.0	1.0	1,540	0.035	129.16	0.00	129.16	0.00	129.16	0.00
248.0	2.0	1,674	0.038	133.18	0.003	1,607.02	0.037	1,736.18	0.040
249.0	3.0	1,811	0.042	137.20	0.003	1,742.21	0.040	3,478.39	0.077
249.5	3.5	1,881	0.043	70.11	0.002	922.93	0.021	4,401.32	0.061
250.0	4.0	2,097	0.048	216.35	0.005	994.55	0.023	5,395.86	0.044

Required Forebay Volume =	5,057	(Max 20%)
Provided Forebay Volume =	5,396	16.0%

WET POND STAGE-STORAGE DATA
PERMANENT POOL

Project: Bennett Bunn Plantation Subd
Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
246.0	0.0	8,468	0.194	0.00	0.194	0.00	0.000	0.00	0.000
247.0	1.0	9,243	0.212	9,242.59	0.02	8,855.12	0.02	8,855.12	0.02
248.0	2.0	10,042	0.231	799.07	0.018	9,642.12	0.221	18,497.25	0.239
249.0	3.0	10,865	0.249	823.19	0.019	10,453.25	0.240	28,950.50	0.461
249.5	3.5	11,285	0.259	420.64	0.010	5,537.59	0.127	34,488.09	0.367
250.0	4.0	12,584	0.289	1,298.13	0.039	5,967.28	0.269	40,455.37	0.509

WET POND STAGE-STORAGE DATA

TEMPORARY POOL

Project Bennett Bunn Plantation Subdivision

Project No. 673-23

Date 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
250.0	0.0	12,584	0.289	0.00	0.29	0.00	0.00	0.00	0.00
251.0	1.0	13,610	0.312	1,026.38	0.02	13,096.81	0.30	13,096.81	0.30
252.0	2.0	14,556	0.334	946.00	0.02	14,083.00	0.32	27,179.81	0.62

Design Volume =	14,885
Provided Volume =	27,180

Average Depth Calculation

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:

D_{avg}	=	Average depth (feet)
V_{PP}	=	Main pool volume at permanent pool elevation (feet^3)
V_{shelf}	=	Volume over the shelf only (feet^3) – see below
$A_{bottom\ of\ shelf}$	=	Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:

$Depth_{max\ over\ shelf}$	=	Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
$Perimeter_{perm\ pool}$	=	Perimeter of main pool at the bottom of the shelf (feet)
$Width_{submerged\ part\ of\ shelf}$	=	Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

$Depth_{max\ over\ shelf}$ 0.50 feet

$Perimeter_{perm\ pool}$ 460.16 feet

$Width_{submerged\ part\ of\ shelf}$ 3.00 feet

V_{shelf} 345.12 cubic feet

D_{avg} 3.55 feet

Provided Depth = 3.55 feet

Wet Pond Drawdown Time Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Surface area at normal pool (A_0) =	10,486	square feet
Surface area at beginning of drawdown (A_1) =	14,556	square feet
Maximum head of water above dewatering hole (H_1) =	1.00	feet
Orifice coefficient (C_d) =	0.6	
Diameter of each hole =	1.25	inches
Number of holes =	1	
Acceleration of Gravity (g) =	32.2	feet / second^2
Cross sectional area of each hole (a) =	0.009	square feet
Cross sectional area of each hole =	1.2	square inches
Cross sectional area of dewatering hole(s) =	0.009	square feet
Cross sectional area of dewatering hole(s) =	1.2	square inches
Dewatering time for basin (T) =	293,505.2	seconds
Dewatering time for basin (T) =	3.40	days

Calculations based on Greensboro Stormwater Manual,
Chapter 3, Section 3.5.2

For the specific case where $A_2 = A_0$ and $H_2 = 0$

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(2 * A_0 * H_1^{1/2} + \frac{2}{3} \left(\frac{A_1 - A_0}{H_1} \right) * H_1^{3/2} \right) \right]$$

Equation 2

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(\frac{2}{3} A_0 + \frac{1}{3} A_1 \right) * H_1^{1/2} \right]$$

Notes:

Bouyancy Calculations for Riser

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Structure Data

Riser Inner Width =	4.00	ft
Riser Inner Length =	4.00	ft
Wall Thickness =	0.50	ft
Base Width =	5.00	ft
Base Length =	5.00	ft
Top of Riser Elevation =	251.00	ft
Structure Invert Elevation =	246.00	ft
Bottom of Base Elevation =	243.00	ft
Depth of Concrete Base =	3.00	ft

Bouyant Force Calcluation

Riser Inner Volume =	80.00	ft			
Riser Concrete Volume =	45.00	ft	Unit Weight =	62.50	pcf
Base Concrete Volume =	75.00	ft	Total Bouyant Force =	12,500.00	
Total Displaced Volume =	200.00	ft			

Required Resisting Force Calcluation

Desired Factor of Safety =	1.15		Factored Resistent Force =	14,375.00	lb

Provided Resisting Force Calculation

Unit Weight of Concrete =	150.00	pcf			
Weight of Concrete Riser =	6,750.00	lb			
Weight of Concrete Base Unit =	11,250.00	lb	Total Resisting Force =	18,000.00	lb

Compliance Check

Provided Resisting Force > Factored Resisting Force =	YES
Provided Factor of Safety =	1.44

Wet Pond Summary Information

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Drainage area to pond	349,309	square feet =	8.02	acres
Impervious area in drainage area	179,056	square feet =	4.11	acres

Bottom of pond elevation	246.00	feet	
Normal pool elevation	250.00	feet	

Required volume for design rainfall	14,885	cubic feet	
Provided volume for design rainfall	27,180	cubic feet at elevation	252

SA/DA Ratio for Permanent Pool Sizing for 85% Removal in the Piedmont

Pool depth to lookup	3.55							
Impervious cover to lookup	51.3							
Pool depth between	3	and	4	which is between columns	1	and	2	
Impervious cover between	50.0	and	60.0	which is between rows	5	and	6	

SA/DA ratios

Impevious cover [percent]	Pool depth [feet]		
	3.0	**3.5**	4.0
50	1.79	**1.64**	1.51
51.3	**1.83**	1.67	**1.54**
60	2.09	**1.91**	1.77

Piedmont and Mountain SA/DA Table

% Impervious Cover	Permanent Pool Depth					
	3.0	4.0	5.0	6.0	7.0	8.0
10	0.51	0.43	0.37	0.30	0.27	0.25
20	0.84	0.69	0.61	0.51	0.44	0.40
30	1.17	0.97	0.84	0.72	0.61	0.56
40	1.51	1.24	1.09	0.91	0.78	0.71
50	1.79	1.51	1.31	1.13	0.95	0.87
60	2.09	1.77	1.49	1.31	1.12	1.03
70	2.51	2.09	1.80	1.56	1.34	1.17
80	2.92	2.41	2.07	1.82	1.62	1.40
90	3.25	2.64	2.31	2.04	1.84	1.59
100	3.55	2.79	2.52	2.34	2.04	1.75

DESIGN CALCULATIONS

WET POND-5

Project Name

Bennett Bunn Plantation Subdivision

Project Number

673-23

Date

14-Feb-25

Wet Pond Drainage Area Data

Wet Pond Drainage Area: 1203919.524 square feet = 27.638 acres

Impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site buildings	0	274,813	274,813
On-site streets	0	213,644	213,644
On-site parking	0	35,739	35,739
On-site sidewalks	0	82,629	82,629
Other on-site	0	0	0
Total off-site impervious	0	0	0
Total Impervious	0	606,825.73	606,826
Non-impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site grass/landscape	0	597,094	597,094
On-site woods	0	0	0
Other undeveloped	0	0	0
Other on-site non-impervious	0	0	0
Total off-site non-impervious	0	0	0
Total non-impervious	0	597,093.79	597,094
Total Drainage Area	0	1,203,920	1,203,920
Percent Impervious	n/a	50.4	n/a

Wet Pond Surface Area Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Total on-site drainage area to pond	1,203,920	square feet
Total impervious area in drainage area	606,826	square feet
Average water depth of basin at normal pool	2.92	feet
Location of site	Garner	
Site region	Piedmont	
% Impervious cover	50.4	percent
Will a vegetative filter be used?	No	

Surface Area/Drainage Area Ratios:

For a site in the Piedmont w/out Vegetative Filter	1.7	percent
For a site in a Coastal County w/ Vegetative Filter		percent

Required surface area of pond:

For a site in the Piedmont w/out Vegetative Filter	20,140.0	square feet
For a site in a Coastal County w/out Vegetative Filter	0.0	square feet

Wet Pond Design Volume Caclutaion

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Total on-site drainage area to pond	27.638	acres
Total impervious area in drainage area	13.931	acres
% Impervious cover (impervious fraction), I_A	0.504	
Runoff coefficient, R_v	0.504	

$R_V = 0.05 + 0.9 * I_A$

Where:

R_V	=	Runoff coefficient (unitless)
I_A	=	Impervious fraction (unitless)

Design storm depth, R_D	1.0	inches
Design Volume, DV	50,528	cubic feet

$DV = 3630 * R_D * R_V * A$

Where:

DV	=	Design volume (cu ft)
R_D	=	Design storm depth (in)
A	=	Drainage area (ac)

WET POND STAGE-STORAGE DATA

MAIN POOL

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
246.0	0.0	16,798	0.386	0.00	0.386	0.00	0.000	0.00	0.000
247.0	1.0	18,347	0.421	18,346.64	0.04	17,572.32	0.04	17,572.32	0.04
248.0	2.0	19,915	0.457	1,568.73	0.036	19,131.00	0.439	36,703.33	0.475
249.0	3.0	21,504	0.494	1,588.84	0.036	20,709.79	0.475	57,413.11	0.915
249.5	3.5	23,113	0.531	1,608.94	0.037	11,154.34	0.256	68,567.45	0.731
250.0	4.0	25,564	0.587	2,451.12	0.093	12,169.35	0.540	80,736.81	1.016

WET POND STAGE-STORAGE DATA

FOREBAY VOLUME

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
246.0	0.0	3,360	0.077	3,359.60	0.077	0.00	0.000	0.00	0.000
247.0	1.0	3,669	0.084	309.73	0.01	309.73	0.01	309.73	0.01
248.0	2.0	3,983	0.091	313.75	0.007	3,826.20	0.088	4,135.93	0.095
249.0	3.0	4,301	0.099	317.77	0.007	4,141.96	0.095	8,277.88	0.183
249.5	3.5	4,623	0.106	321.79	0.007	2,230.87	0.051	10,508.75	0.146
250.0	4.0	5,113	0.117	490.22	0.011	2,433.87	0.056	12,942.62	0.107

Required Forebay Volume =	12,111	(Max 20%)
Provided Forebay Volume =	12,943	16.0%

WET POND STAGE-STORAGE DATA

PERMANENT POOL

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
246.0	0.0	20,158	0.463	0.00	0.463	0.00	0.000	0.00	0.000
247.0	1.0	22,016	0.505	22,015.96	0.04	21,086.79	0.04	21,086.79	0.04
248.0	2.0	23,898	0.549	1,882.48	0.043	22,957.20	0.527	44,043.99	0.570
249.0	3.0	25,805	0.592	1,906.61	0.044	24,851.75	0.571	68,895.74	1.098
249.5	3.5	27,736	0.637	1,930.73	0.044	13,385.21	0.307	82,280.95	0.878
250.0	4.0	30,677	0.704	2,941.34	0.112	14,603.23	0.648	96,884.17	1.219

WET POND STAGE-STORAGE DATA

TEMPORARY POOL

Project Bennett Bunn Plantation Subdivision

Project No. 673-23

Date 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
250.0	0.0	30,677	0.704	0.00	0.70	0.00	0.00	0.00	0.00
251.0	1.0	32,611	0.749	1,933.88	0.04	31,644.06	0.73	31,644.06	0.73
252.0	2.0	34,013	0.781	1,402.00	0.03	33,312.00	0.76	64,956.06	1.49

Design Volume =	50,528
Provided Volume =	64,956

Average Depth Calculation

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:

D_{avg}	=	Average depth (feet)
V_{PP}	=	Main pool volume at permanent pool elevation (feet^3)
V_{shelf}	=	Volume over the shelf only (feet^3) – see below
$A_{bottom\ of\ shelf}$	=	Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:

$Depth_{max\ over\ shelf}$	=	Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
$Perimeter_{perm\ pool}$	=	Perimeter of main pool at the bottom of the shelf (feet)
$Width_{submerged\ part\ of\ shelf}$	=	Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

$Depth_{max\ over\ shelf}$ 0.50 feet

$Perimeter_{perm\ pool}$ 1020.72 feet

$Width_{submerged\ part\ of\ shelf}$ 3.00 feet

V_{shelf} 765.54 cubic feet

D_{avg} 3.46 feet

Provided Depth = 3.46 feet

Wet Pond Drawdown Time Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Surface area at normal pool (A_0) =	25,564	square feet
Surface area at beginning of drawdown (A_1) =	34,013	square feet
Maximum head of water above dewatering hole (H_1) =	1.00	feet
Orifice coefficient (C_d) =	0.6	
Diameter of each hole =	1.25	inches
Number of holes =	2	
Acceleration of Gravity (g) =	32.2	feet / second^2
Cross sectional area of each hole (a) =	0.009	square feet
Cross sectional area of each hole =	1.2	square inches
Cross sectional area of dewatering hole(s) =	0.017	square feet
Cross sectional area of dewatering hole(s) =	2.5	square inches
Dewatering time for basin (T) =	351,680.1	seconds
Dewatering time for basin (T) =	4.07	days

Calculations based on Greensboro Stormwater Manual,
Chapter 3, Section 3.5.2

For the specific case where $A_2 = A_0$ and $H_2 = 0$

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(2 * A_0 * H_1^{1/2} + \frac{2}{3} \left(\frac{A_1 - A_0}{H_1} \right) * H_1^{3/2} \right) \right]$$

Equation 2

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(\frac{2}{3} A_0 + \frac{1}{3} A_1 \right) * H_1^{1/2} \right]$$

Notes:

Bouyancy Calculations for Riser

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Structure Data

Riser Inner Width =	4.00	ft
Riser Inner Length =	4.00	ft
Wall Thickness =	0.50	ft
Base Width =	5.00	ft
Base Length =	5.00	ft
Top of Riser Elevation =	251.00	ft
Structure Invert Elevation =	246.00	ft
Bottom of Base Elevation =	243.00	ft
Depth of Concrete Base =	3.00	ft

Bouyant Force Calcluation

Riser Inner Volume =	80.00	ft			
Riser Concrete Volume =	45.00	ft	Unit Weight =	62.50	pcf
Base Concrete Volume =	75.00	ft	Total Bouyant Force =	12,500.00	
Total Displaced Volume =	200.00	ft			

Required Resisting Force Calcluation

Desired Factor of Safety =	1.15		Factored Resistent Force =	14,375.00	lb

Provided Resisting Force Calculation

Unit Weight of Concrete =	150.00	pcf			
Weight of Concrete Riser =	6,750.00	lb			
Weight of Concrete Base Unit =	11,250.00	lb	Total Resisting Force =	18,000.00	lb

Compliance Check

Provided Resisting Force > Factored Resisting Force =	YES
Provided Factor of Safety =	1.44

Wet Pond Summary Information

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

Drainage area to pond	1,203,920	square feet =	27.64	acres
Impervious area in drainage area	606,826	square feet =	13.93	acres

Bottom of pond elevation	246.00	feet
Normal pool elevation	250.00	feet

Required volume for design rainfall	50,528	cubic feet	
Provided volume for design rainfall	64,956	cubic feet at elevation	252

SA/DA Ratio for Permanent Pool Sizing for 85% Removal in the Piedmont

Pool depth to lookup	3.46							
Impervious cover to lookup	50.4							
Pool depth between	3	and	4	which is between columns	1	and	2	
Impervious cover between	50.0	and	60.0	which is between rows	5	and	6	

SA/DA ratios

Impevious cover [percent]	Pool depth [feet]		
	3.0	**3.5**	4.0
50	1.79	**1.66**	1.51
50.4	**1.80**	1.67	**1.52**
60	2.09	**1.94**	1.77

Piedmont and Mountain SA/DA Table

% Impervious Cover	Permanent Pool Depth					
	3.0	4.0	5.0	6.0	7.0	8.0
10	0.51	0.43	0.37	0.30	0.27	0.25
20	0.84	0.69	0.61	0.51	0.44	0.40
30	1.17	0.97	0.84	0.72	0.61	0.56
40	1.51	1.24	1.09	0.91	0.78	0.71
50	1.79	1.51	1.31	1.13	0.95	0.87
60	2.09	1.77	1.49	1.31	1.12	1.03
70	2.51	2.09	1.80	1.56	1.34	1.17
80	2.92	2.41	2.07	1.82	1.62	1.40
90	3.25	2.64	2.31	2.04	1.84	1.59
100	3.55	2.79	2.52	2.34	2.04	1.75

DESIGN CALCULATIONS

WET POND-6

Project Name

Bennett Bunn Plantation Subdivision

Project Number

673-23

Date

14-Feb-25

Wet Pond Drainage Area Data

Wet Pond Drainage Area: 231196.563 square feet = 5.308 acres

Impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site buildings	0	78,803	78,803
On-site streets	0	22,304	22,304
On-site parking	0	0	0
On-site sidewalks	0	3,238	3,238
Other on-site	0	0	0
Total off-site impervious	0	0	0
Total Impervious	0	104,344.85	104,345
Non-impervious areas	Drainage Area to Wet Pond		
	Pre [sf]	Post [sf]	Change [sf]
On-site grass/landscape	0	126,852	126,852
On-site woods	0	0	0
Other undeveloped	0	0	0
Other on-site non-impervious	0	0	0
Total off-site non-impervious	0	0	0
Total non-impervious	0	126,851.71	126,852
Total Drainage Area	0	231,197	231,197
Percent Impervious	n/a	45.1	n/a

Wet Pond Surface Area Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Total on-site drainage area to pond	231,197	square feet
Total impervious area in drainage area	104,345	square feet
Average water depth of basin at normal pool	2.86	feet
Location of site	Garner	
Site region	Piedmont	
% Impervious cover	45.1	percent
Will a vegetative filter be used?	No	

Surface Area/Drainage Area Ratios:

For a site in the Piedmont w/out Vegetative Filter	1.5	percent
For a site in a Coastal County w/ Vegetative Filter		percent

Required surface area of pond:

For a site in the Piedmont w/out Vegetative Filter	3,520.0	square feet
For a site in a Coastal County w/out Vegetative Filter	0.0	square feet

Wet Pond Design Volume Caclutaion

Project	Bennett Bunn Plantation Subdivision
Project No.	673-23
Date	14-Feb-25

Total on-site drainage area to pond	5.308	acres
Total impervious area in drainage area	2.395	acres
% Impervious cover (impervious fraction), I_A	0.451	
Runoff coefficient, R_v	0.456	

$R_V = 0.05 + 0.9 * I_A$

Where:

R_V	=	Runoff coefficient (unitless)
I_A	=	Impervious fraction (unitless)

Design storm depth, R_D	1.0	inches
Design Volume, DV	8,789	cubic feet

$DV = 3630 * R_D * R_V * A$

Where:

DV	=	Design volume (cu ft)
R_D	=	Design storm depth (in)
A	=	Drainage area (ac)

WET POND STAGE-STORAGE DATA

MAIN POOL

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
276.0	0.0	7,934	0.182	0.00	0.182	0.00	0.000	0.00	0.000
277.0	1.0	8,811	0.202	8,811.04	0.02	8,372.52	0.02	8,372.52	0.02
278.0	2.0	9,708	0.223	897.14	0.021	9,259.61	0.213	17,632.14	0.233
279.0	3.0	10,625	0.244	917.24	0.021	10,166.80	0.233	27,798.94	0.446
279.5	3.5	11,092	0.255	466.16	0.011	5,429.25	0.125	33,228.19	0.358
280.0	4.0	12,520	0.287	1,428.64	0.043	5,902.95	0.266	39,131.15	0.499

WET POND STAGE-STORAGE DATA

FOREBAY VOLUME

Project: Bennett Bunn Plantation Subd

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
276.0	0.0	1,587	0.036	1,586.80	0.036	0.00	0.000	0.00	0.000
277.0	1.0	1,762	0.040	175.41	0.00	175.41	0.00	175.41	0.00
278.0	2.0	1,942	0.045	179.43	0.004	1,851.92	0.043	2,027.33	0.047
279.0	3.0	2,125	0.049	183.45	0.004	2,033.36	0.047	4,060.69	0.089
279.5	3.5	2,218	0.051	93.23	0.002	1,085.85	0.025	5,146.54	0.072
280.0	4.0	2,504	0.057	285.73	0.007	1,180.59	0.027	6,327.13	0.052

Required Forebay Volume =	5,870	(Max 20%)
Provided Forebay Volume =	6,327	16.2%

WET POND STAGE-STORAGE DATA

PERMANENT POOL

Project: Bennett Bunn Plantation Subc

Project No.: 673-23

Date: 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
276.0	0.0	9,521	0.219	0.00	0.219	0.00	0.000	0.00	0.000
277.0	1.0	10,573	0.243	10,573.25	0.02	10,047.03	0.02	10,047.03	0.02
278.0	2.0	11,650	0.267	1,076.57	0.025	11,111.53	0.255	21,158.56	0.279
279.0	3.0	12,751	0.293	1,100.69	0.025	12,200.16	0.280	33,358.73	0.535
279.5	3.5	13,310	0.306	559.39	0.013	6,515.10	0.150	39,873.83	0.430
280.0	4.0	15,024	0.345	1,714.37	0.052	7,083.55	0.319	46,957.38	0.599

WET POND STAGE-STORAGE DATA

TEMPORARY POOL

Project Bennett Bunn Plantation Subdivision

Project No. 673-23

Date 14-Feb-25

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
280.0	0.0	15,024	0.345	0.00	0.34	0.00	0.00	0.00	0.00
281.0	1.0	16,724	0.384	1,699.72	0.04	15,874.14	0.36	15,874.14	0.36
282.0	2.0	18,339	0.421	1,615.00	0.04	17,531.50	0.40	33,405.64	0.77

Design Volume =	8,789
Provided Volume =	15,874

Average Depth Calculation

Project Bennett Bunn Plantation Subdivision
Project No. 673-23

Date 14-Feb-25

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:

D_{avg}	=	Average depth (feet)
V_{PP}	=	Main pool volume at permanent pool elevation (feet^3)
V_{shelf}	=	Volume over the shelf only (feet^3) – see below
$A_{bottom\ of\ shelf}$	=	Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:

$Depth_{max\ over\ shelf}$	=	Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
$Perimeter_{perm\ pool}$	=	Perimeter of main pool at the bottom of the shelf (feet)
$Width_{submerged\ part\ of\ shelf}$	=	Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

$Depth_{max\ over\ shelf}$ 0.50 feet

$Perimeter_{perm\ pool}$ 604.69 feet

$Width_{submerged\ part\ of\ shelf}$ 3.00 feet

V_{shelf} 453.52 cubic feet

D_{avg} 3.49 feet

Provided Depth = 3.49 feet

Wet Pond Drawdown Time Calculations

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Surface area at normal pool (A_0) =	12,520	square feet
Surface area at beginning of drawdown (A_1) =	16,724	square feet
Maximum head of water above dewatering hole (H_1) =	1.00	feet
Orifice coefficient (C_d) =	0.6	
Diameter of each hole =	1.25	inches
Number of holes =	1	
Acceleration of Gravity (g) =	32.2	feet / second^2
Cross sectional area of each hole (a) =	0.009	square feet
Cross sectional area of each hole =	1.2	square inches
Cross sectional area of dewatering hole(s) =	0.009	square feet
Cross sectional area of dewatering hole(s) =	1.2	square inches
Dewatering time for basin (T) =	345,019.2	seconds
Dewatering time for basin (T) =	3.99	days

Calculations based on Greensboro Stormwater Manual,
Chapter 3, Section 3.5.2

For the specific case where $A_2 = A_0$ and $H_2 = 0$

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(2 * A_0 * H_1^{1/2} + \frac{2}{3} \left(\frac{A_1 - A_0}{H_1} \right) * H_1^{3/2} \right) \right]$$

Equation 2

$$T = \frac{1}{Cd * a * \sqrt{2 * g}} * \left[\left(\frac{2}{3} A_0 + \frac{1}{3} A_1 \right) * H_1^{1/2} \right]$$

Notes:

Bouyancy Calculations for Riser

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Structure Data

Riser Inner Width =	4.00	ft
Riser Inner Length =	4.00	ft
Wall Thickness =	0.50	ft
Base Width =	5.00	ft
Base Length =	5.00	ft
Top of Riser Elevation =	244.00	ft
Structure Invert Elevation =	239.00	ft
Bottom of Base Elevation =	236.00	ft
Depth of Concrete Base =	3.00	ft

Bouyant Force Calcluation

Riser Inner Volume =	80.00	ft			
Riser Concrete Volume =	45.00	ft	Unit Weight =	62.50	pcf
Base Concrete Volume =	75.00	ft	Total Bouyant Force =	12,500.00	
Total Displaced Volume =	200.00	ft			

Required Resisting Force Calcluation

Desired Factor of Safety =	1.15		Factored Resistent Force =	14,375.00	lb

Provided Resisting Force Calculation

Unit Weight of Concrete =	150.00	pcf			
Weight of Concrete Riser =	6,750.00	lb			
Weight of Concrete Base Unit =	11,250.00	lb	Total Resisting Force =	18,000.00	lb

Compliance Check

Provided Resisting Force > Factored Resisting Force =	YES
Provided Factor of Safety =	1.44

Wet Pond Summary Information

Project: Bennett Bunn Plantation Subdivision
Project No.: 673-23

Date: 14-Feb-25

Drainage area to pond	231,197	square feet =	5.31	acres
Impervious area in drainage area	104,345	square feet =	2.40	acres

Bottom of pond elevation	276.00	feet	
Normal pool elevation	280.00	feet	

Required volume for design rainfall	8,789	cubic feet	
Provided volume for design rainfall	15,874	cubic feet at elevation	281

SA/DA Ratio for Permanent Pool Sizing for 85% Removal in the Piedmont

Pool depth to lookup	3.49							
Impervious cover to lookup	45.1							
Pool depth between	3	and	4	which is between columns	1	and	2	
Impervious cover between	40.0	and	50.0	which is between rows	4	and	5	

SA/DA ratios

Impevious cover [percent]	Pool depth [feet]		
	3.0	**3.5**	4.0
40	1.51	**1.38**	1.24
45.1	**1.65**	1.52	**1.38**
50	1.79	**1.65**	1.51

Piedmont and Mountain SA/DA Table

% Impervious Cover	Permanent Pool Depth					
	3.0	4.0	5.0	6.0	7.0	8.0
10	0.51	0.43	0.37	0.30	0.27	0.25
20	0.84	0.69	0.61	0.51	0.44	0.40
30	1.17	0.97	0.84	0.72	0.61	0.56
40	1.51	1.24	1.09	0.91	0.78	0.71
50	1.79	1.51	1.31	1.13	0.95	0.87
60	2.09	1.77	1.49	1.31	1.12	1.03
70	2.51	2.09	1.80	1.56	1.34	1.17
80	2.92	2.41	2.07	1.82	1.62	1.40
90	3.25	2.64	2.31	2.04	1.84	1.59
100	3.55	2.79	2.52	2.34	2.04	1.75