



WithersRavenel
Our People. Your Success.



Stormwater Management Plan

Broadmoor

Wake County

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PRELIMINARY

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Introduction/Project Data

The Broadmoor consists of 105.56 acres of land located at 1321 Rolesville Road in Rolesville, NC. See Table 1 for detailed site information. The site will be developed in three phases. This report serves as the stormwater impact analysis for all phases of Broadmoor.

Table 1 – Project Information Summary

Project Name	Broadmoor
Case Number (Case History)	REZ-23-02
Project Address	1321 Rolesville Rd, Rolesville, NC 27587
PIN(s)	1768511519
Zoning	RH, RM
River Basin	Neuse River Basin
Stormwater Regulatory Basin	Neuse River outside Falls Lake
Hydrologic Unit	Upper Buffalo Creek, HEC 12 030202011502
Watershed Protection Overlay	N/A
Total Site Area	105.5 AC
Total Project Area	105.56 AC
Land Disturbance Area	TBD
Existing Impervious %	0%
Proposed Impervious %	23.6%

Site History

The property is in the Piedmont of North Carolina. The existing property is undeveloped, with wooded acreage in Hydrologic Soil Group (HSG) “B”, “C”, and “D” soils.

Broadmoor crosses a high divide in site overall topography resulting in four points of analysis (POAs) for peak runoff assessment. The majority of the site drains to Buffalo Creek on the east side of the property, denoted as the confluence point POA 1. Four SCM’s lead to this POA 1. There is an existing pond on the site that will remain in place; this is denoted as POA 2 and also leads to POA 1. There is an area offsite that will be bypassed through the site, leading to POA 1.

There are two areas on the west side of the site that drain towards the right-of-way and are split at the high point in Rolesville Road; each going towards POA 3 and POA 4.

Proposed Development

The Broadmoor property is zoned Residential-30 (R30). The site is being rezoned through Wake County to RH & RM. The site will consist of two single-family lot styles and townhomes. Their associated infrastructure can be found in Table 2. The development will also include a private parking lot and an amenity center for the entire buildout.

Table 2 – Phase Lot Counts, Types, and Impervious Area

Lot	Type	Impervious Area per Lot (sf)	Count
1 - SF	41' Single-family	2,540	77
2 - SF	51' Single-family	3,156	80
Townhome	Multi-family	1,978	98

Quantifying Land Disturbance and Changes in Impervious Surface

The proposed development will increase the impervious area of the project area (Figure 1) from 0% to 23.6%. For the purposes of nutrient compliance and peak flow calculations, impervious area assumptions per lot type are detailed in Table 2.

Watershed Protection Overlay

The project lies within the Neuse River Basin, outside of Falls Lake and is not part of a water supply watershed.

Streams

The entirety of the site lies within the Upper Buffalo Creek sub-watershed of the Neuse River watershed. Buffalo Creek (classification C; NSW), flows from north to south along the eastern portion of the property.

Floodplains

There is a Special Flood Hazard Areas (SFHAs) located on the subject site per the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) 3720176800K dated July 19, 2022, and 3720176600K dated July 19, 2022. Copies of the previously mentioned FIRMs are included in the **Appendix**.

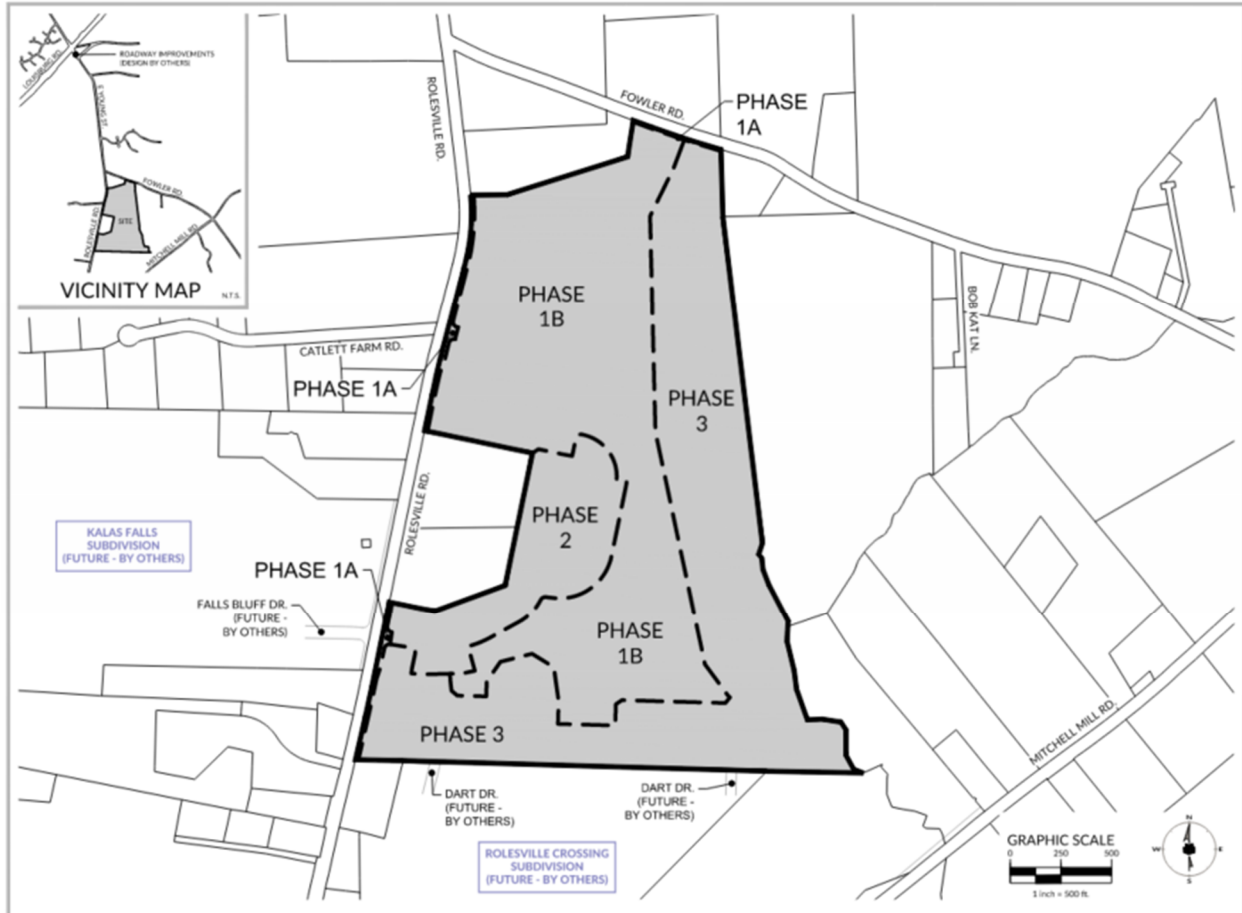


Figure 1 - Site Map

Applicable Requirements

The development shall comply with the requirements outlined in Article 9, “Stormwater Management” of the Wake County UDO.

The following requirements apply to the subject site:

- Maximum Curve Number after Development.

- Peak discharge attenuation for the 10-year design storm such that the post-development peak discharge rate is no greater than the pre-development peak runoff rate (cubic feet per second).

Proposed nitrogen loading rates shall not exceed 3.6 lbs./ac./yr. Nitrogen reduction requirements may be met, in part, through offsite management measures or the purchase of nutrient credits.

All engineered SCMs shall be designed as a primary SCM per the *North Carolina Stormwater Control Measure Credit Document* and sized to capture runoff from the first 1-inch of rainfall from the corresponding drainage areas.

The Wake County Tool shall also be used for determining the Target Curve Number.

Water quality and peak runoff for Broadmoor is accomplished via four (4) wet detention basins designed per the Minimum Design Criteria (MDC) of the North Carolina Department of Environmental Quality (NCDEQ) Stormwater Design Manual and the Wake County Stormwater Design Tool V2.2 Addendum.

Methodology

The stormwater study was conducted using the natural drainage features as depicted by Light Detection and Ranging (LIDAR) topography and existing field surveys. Proposed drainage areas were based on field survey data and proposed development within the drainage areas.

The scope of work included the following analyses:

Hydrology

- Simulation of the 1-year, 2-year, 10-year, and 100-year rainfall events for the Wake Forest, NC area.
- Formulation of the 1-year, 2-year, 10-year, and 100-year flood hydrographs for the existing development and proposed development drainage areas.

Hydraulic

- Routing the 1-year, 2-year, 10-year, and 100-year flood hydrographs for existing development runoff from the site.
- Routing the 1-year, 2-year, 10-year, and 100-year flood hydrographs for proposed development runoff through the SCM.
- Analyzing results at the analysis points.

The results of the hydrology calculations were used for the hydraulic analyses. The hydraulic design requires the development of stage-storage and stage-discharge functions for the SCMs. The rainfall/runoff hydrographs, stage-storage, and stage-discharge functions have been compiled to create a computer routing simulation model using Bentley Systems PondPack v8i software. This PondPack model was then used to assess the peak water surface elevations in the SCM for the design rainfall events. The routing results, along with the hydrologic and hydraulic calculations, are provided as in the **PondPack Routing Calculations** sections of this report.

Hydrology Calculations

The Soil Conservation Service (SCS) Method, in conjunction with National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation data for Wake Forest, NC was used to develop runoff hydrographs for the storm events. This method requires three basic parameters, including a curve number (CN), time of concentration (T_c), and drainage area (DA).

Composite CNs were calculated according to soil type, land cover, and area. Soil types were delineated using the National Research Conservation Service (NRCS) Web Soil Survey database. Directly connected impervious areas within SCM drainage basins were given a CN of 98, and remaining areas were calculated per land cover impervious assumptions to determine a composite CN for each DA. **Error! Reference source not found.** describes the impervious percentage assumption calculations per lot type.

$\frac{(\text{Impervious SF per Lot})}{\text{Total SF of Lot Type in Phase I}} = \% \text{ Impervious}$		
Single Family Lots – Small	Single Family Lots - Large	Townhome Lots
$\frac{(77 * 2,540 \frac{SF}{Lot})}{426,734 SF} = 46\%$	$\frac{(80 * 3,156 \frac{SF}{Lot})}{570,240 SF} = 44\%$	$\frac{(98 * 1,978 \frac{SF}{Lot})}{297,706 SF} = 66\%$

Figure 2 – Impervious Calculations per Lot

Tc’s for existing and proposed drainage areas were developed using the Technical Release 55 (TR-55) method. This method models the flow path in segments; each segment is considered as either sheet flow, shallow concentrated flow, or channel flow. A minimum Tc of 5-minutes was used for the proposed piped drainage systems within the SCM drainage basins.

Drainage area maps showing Tc flow paths and land cover maps are presented in the **Drainage Area Maps** section of this report.

Hydraulic Calculations

Computer simulated reservoir routing of the 1-year, 2-year, 10-year, and 100-year design storms utilized stage-storage and stage-discharge functions. A stage-storage function was derived from the proposed geometry of the SCM. A non-linear regression relation for surface area versus elevation was derived for the SCM. This relation estimates the incremental volume of the basin to the stage or elevation of the basin. Stage-discharge functions were developed to size the proposed outlet structures for the SCM.

Nutrient Calculations

Nutrient export rates for the Phase I project area were calculated using the Stormwater Nitrogen and Phosphorus (SNAP) Tool (v4.1). Land cover and respective areas were entered according to proposed conditions. Of the onsite impervious area associated with each lot type, 80% was attributed to the ‘Roof’ land use in the SNAP tool and the remaining 20% was attributed to the Parking/Driveway/Sidewalk land use. (See Table 2 for lot impervious assumptions).

Conclusions

Water Quality

The routing analysis indicates that the proposed stormwater management plan has sufficient mitigation measures to comply with nutrient export and watershed protection overlay standards in accordance with local and state regulations.

The proposed SCMs have been designed per NCDEQ and Wake County MDCs to meet 85% TSS removal requirements (see **SCM Sizing Calculations** section of this report).

Per MDC and the SNAP Tool (v4.1), appropriate nutrient reduction credits for Total Nitrogen (TN) was applied to areas draining through the onsite SCMs (Table 3).

Per the Wake County Stormwater Design Tool, we are meeting the target curve number requirements through the four proposed wetpond SCM's on the site.

Table 3 - Nutrient Loading Summary per SNAP Tool

Nutrient	Proposed Dev Untreated (lbs/ac/yr)	Proposed Dev w/ SCMs (lbs/ac/yr)	Loading Rate Target (lbs/ac/yr)
TN	3.99	2.59	3.60

Peak Flows

One-Year Flow Attenuation at SCM Outfalls

Proposed peak flows from SCM outfalls associated with the 1-year (24-hour) design storms have been attenuated as to not exceed existing conditions at discharge locations where SCM outfalls enter a buffered stream (Table 4).

Table 4 - Peak Discharge Summary at SCM Outfall

Outfall Location	Existing Dev Peak Flow (cfs)	Proposed Dev Peak Flow (cfs)	Net Change (cfs)	Net Change (%)
POA #1	64.18	49.58	-14.6	-22.75%
POA #3*	2.17	2.83	+0.62	+1.28%
POA #4*	0.57	1.49	+0.93	+2.66%

*The drainage areas to POA 3 and POA 4 drain towards existing infrastructure along the right-of-way adjacent Rolesville Road. The right-of-way trapezoidal ditch conveyance was analyzed using Bentley FlowMaster, solving for the normal depths within the channels. It was determined there is no adverse impact on the right-of-way conveyance along Rolesville Road, despite the increase in bypass flow. Output calculations for the 10- and 25-year storms can be found in the Appendix.

Two-Year and Ten-Year Attenuation at Property Boundary POAs

Proposed peak flows associated with the 2-year and 10-year (24-hour) design storms have been attenuated at the property boundary POAs so as not exceed existing conditions (Tables 5-7).

Table 5 - Peak Summary at POA #1

Storm Event	Existing Dev Peak Flow (cfs)	Proposed Dev Peak Flow (cfs)	Net Change (cfs)	Net Change (%)
2-yr, 24-hr	98.88	69.68	-29.20	-29.53%
10-yr, 24-hr	203.60	131.73	-71.87	-35.30%
100-yr, 24-hr	392.60	256.16	-142.44	-36.28%

Table 6 - Peak Summary at POA #3

Storm Event	Existing Dev Peak Flow (cfs)	Proposed Dev Peak Flow (cfs)	Net Change (cfs)	Net Change (%)
2-yr, 24-hr	3.54	4.36	+0.82	+23.16%
10-yr, 24-hr	7.82	8.95	+1.13	+14.45%
100-yr, 24-hr	15.60	17.05	+1.45	+9.29%

Table 7 - Peak Summary at POA #4

Storm Event	Existing Dev Peak Flow (cfs)	Proposed Dev Peak Flow (cfs)	Net Change (cfs)	Net Change (%)
2-yr, 24-hr	1.05	2.26	+1.21	+115.24%
10-yr, 24-hr	2.65	4.57	+1.92	+72.45%
100-yr, 24-hr	5.77	8.60	+2.83	+49.05%

SCM Design Summary

The proposed SCMs have been designed to safely pass the 100-year design storm event via the primary and emergency spillways. In addition, the SCMs maintain a freeboard during a 100-year design storm event that maintaining a freeboard of at least 1-ft.

Table 8 - SCM Freeboard Summary

SCM	Total Dam Height (ft)	Dam Elevation (ft)	Required Freeboard (ft)	100-yr Max Water Surface Elevation (ft)	Provided Freeboard
1	7.5	365.00	1.0	363.07	1.93
2	7.5	365.00	1.0	360.32	1.69
3	6.5	363.00	1.0	361.11	1.90
4	7.5	370.00	1.0	366.04	3.96

Table 9 - SCM #1 (Wet Pond)

Drainage Area =	9.39 ac
Impervious Area =	5.61 ac
% Impervious =	59.74%
Top of Dam =	365.0
Emergency Spillway Crest =	364.0
Bottom Width =	10 ft
Side Slopes =	3:1 ft/ft
4 x 4 Riser Crest =	362.5
Water Quality Overflow Elev. =	361.0
Rectangular Orifice L x H =	1.0 ft x 0.5 ft
Storage Volume =	57,888 cf
Normal Pool Orifice Elev. =	357.5
Normal Pool Surface Area =	10,695 sf
Drawdown Orifice Diameter =	2.75 in
Outlet Barrel Diameter =	24 in RCP

Table 10 - SCM #1 Routing Summary

Storm Event	Peak Discharge (cfs)	Peak WSEL (ft)	Freeboard (ft)
1-yr, 24-hr	0.32	360.16	4.84
2-yr, 24-hr	0.37	361.00	4.00
10-yr, 24-hr	2.43	361.95	3.05
100-yr, 24-hr	24.23	363.07	1.93

Table 11 - SCM #2 (Wet Pond)

Drainage Area =	20.12 ac
Impervious Area =	8.73 ac
% Impervious =	43.39%
Top of Dam =	365.0
Emergency Spillway Crest =	364.0
Bottom Width =	10 ft
Side Slopes =	3:1 ft/ft
4 x 4 Riser Crest =	360.0
Water Quality Overflow Elev. =	358.00
Rectangular Orifice L x H =	1.0 ft x 1.0 ft
Storage Volume =	34,092 cf
Normal Pool Orifice Elev. =	357.50
Normal Pool Surface Area =	53,242 sf
Drawdown Orifice Diameter =	4.25 in
Outlet Barrel Diameter =	24 in RCP

Table 12 - SCM #2 Routing Summary

Storm Event	Peak Discharge (cfs)	Peak WSEL (ft)	Freeboard (ft)
1-yr, 24-hr	1.03	358.20	6.78
2-yr, 24-hr	1.83	358.42	6.58
10-yr, 24-hr	4.32	359.12	5.88
100-yr, 24-hr	13.14	360.28	4.72

Table 13 - SCM #3 (Wet Pond)

Drainage Area =	20.94 ac
Impervious Area =	5.92 ac
% Impervious =	28.27%
Top of Dam =	363.0
Emergency Spillway Crest =	362.0
Bottom Width =	10 ft
Side Slopes =	3:1 ft/ft
4 x 4 Riser Crest =	361.0
Water Quality Overflow Elev. =	358.00
Rectangular Orifice L x H =	1.0 ft x 1.0 ft
Storage Volume =	54,001 cf
Normal Pool Orifice Elev. =	356.50
Normal Pool Surface Area =	26,620 sf
Drawdown Orifice Diameter =	3.25 in
Outlet Barrel Diameter =	24 in RCP

Table 14 - SCM #3 Routing Summary

Storm Event	Peak Discharge (cfs)	Peak WSEL (ft)	Freeboard (ft)
1-yr, 24-hr	0.29	357.72	5.28
2-yr, 24-hr	0.84	358.15	4.85
10-yr, 24-hr	3.80	359.00	4.00
100-yr, 24-hr	8.61	361.03	1.97

Table 15 - SCM #4 (Wet Pond)

Drainage Area =	6.54 ac
Impervious Area =	2.91 ac
% Impervious =	44.50%
Top of Dam =	370.0
Emergency Spillway Crest =	369.0
Bottom Width =	10 ft
Side Slopes =	3:1 ft/ft
4 x 4 Riser Crest =	368.0
Water Quality Overflow Elev. =	363.50
Rectangular Orifice L x H =	1.0 ft x 1.0 ft
Storage Volume =	14,448 cf
Normal Pool Orifice Elev. =	362.50
Normal Pool Surface Area =	10,486 sf
Drawdown Orifice Diameter =	2.25 in
Outlet Barrel Diameter =	24 in RCP

Table 16 - SCM #4 Routing Summary

Storm Event	Peak Discharge (cfs)	Peak WSEL (ft)	Freeboard (ft)
1-yr, 24-hr	0.41	363.58	6.42
2-yr, 24-hr	0.98	363.75	6.27
10-yr, 24-hr	3.67	364.52	5.48
100-yr, 24-hr	6.98	365.96	3.98

Appendix 1: Municipal Submittal Checklist



PPR – PRELIMINARY PLAN REVIEW CHECKLIST

Project Name	<u>Broadmoor</u>	Applicant	<u>WithersRavenel</u>	Zoning	<u>RH/RM</u>
Applicant Contact Info	<u>Brandon Miller</u>	Watershed	<u>Upper Little River</u>	New or Expansion (N/E)?	<u>N</u>
Project Acreage	<u>105.56 ac</u>	Existing Impervious SF	<u>3,060</u>	Proposed Impervious	<u>1,085,102</u>
				Disturbed Acreage	<u>TBD</u>

Preliminary S/D	<input checked="" type="checkbox"/>	Special Use	<input type="checkbox"/>	Variance	<input type="checkbox"/>	Planned Compliance Permit	<input type="checkbox"/>	General Use	<input type="checkbox"/>	Rezoning Request	<input type="checkbox"/>
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Regular Subdivision	<input checked="" type="checkbox"/>	Cluster Lot By Lot Open	<input type="checkbox"/>	Minor Subdivision	<input type="checkbox"/>	Nonresidential	<input type="checkbox"/>
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Submittal Package Requirements

Applicant shall select all applicable items below and provide with the submittal.

<input checked="" type="checkbox"/>	1.	Cover letter stating the purpose of the submission
<input checked="" type="checkbox"/>	2.	One (1) electronic copy of the Hybrid Stormwater Tool (click here); submit Excel workbook (Site Data Sheet, Drainage Area Sheets, Site Summary Sheet, BMP Sheets, and BMP Summary sheet) See the Wake County Stormwater Manual for guidance
<input checked="" type="checkbox"/>	3.	Drainage Area Maps with stormwater discharge points (existing/post construction/post BMP)
<input type="checkbox"/>	a.	For Water Supply Watersheds: Provide drainage map showing drainage acres to the drainage features for properties in the water supply watershed zoning districts
<input checked="" type="checkbox"/>	4.	Copy of the USGS Quad Map with delineated project limits in color
<input type="checkbox"/>	5.	Copy of the Wake County Soil Survey map from 1970 manuscript with delineated project limits
<input checked="" type="checkbox"/>	6.	Proposed Site Plan:
<input checked="" type="checkbox"/>	a.	North arrow, graphic scale, signed/dated engineer’s seal, drafting version date, and legend
<input checked="" type="checkbox"/>	b.	Show all Riparian Buffers [Article 9-21]; (Neuse: [15A NCAC 02B.0233 & 0242]; Falls [15A NCAC 02B.0277(4)(h)]; Jordan: [15A NCAC 02B.0277(4)(h)]
<input checked="" type="checkbox"/>	c.	Delineation of all existing and proposed impervious surfaces: roads, well lots, recreation sites, single family residences, etc. (consistent with SW Hybrid Tool Inputs)
<input checked="" type="checkbox"/>	d.	Delineation of current FEMA boundaries (floodway, flood fringe & future/0.2%)
<input type="checkbox"/>	e.	Delineation of flood prone soil areas



PPR – PRELIMINARY PLAN REVIEW CHECKLIST

<input checked="" type="checkbox"/>	f.	Proposed drainage easements and widths (<i>in Feet</i>)
<input checked="" type="checkbox"/>	g.	Location and type of all proposed stormwater management structures (<i>grass swale, wet/dry detention basin, filtering/infiltration basin, bioretention, etc.</i>). Must be located in a common area of development.
<input checked="" type="checkbox"/>	h.	Proposed stormwater easements, access lanes and backwater easements. Provide and label minimum 20 ft. Access easement and 10 ft. Maintenance easement from toe of stormwater pond embankment. Provide and label 20 ft. Drainage easement between every 4 residential lots or 4 acres of drainage area.
<input checked="" type="checkbox"/>	i.	Location of stormwater management structures should meet setback requirements from all wastewater system components in accordance with <i>Regulations Governing Wastewater Treatment and Dispersal Systems in Wake County</i> .
<input checked="" type="checkbox"/>	j.	A note should be added to the recorded plat distinguishing areas of disconnected impervious
<input type="checkbox"/>	7.	Provide documentation of soil re-delineations (as needed)

Standards and Requirements

By marking items with an “X”, applicant acknowledges potential standards to be applied to the proposed development.

Wake County UDO Article 8 – Subdivision Design and Improvements

<input checked="" type="checkbox"/>	8.	Streams or Drainageways [Article 8-37-2] – Easements for streams or drainageways must be provided and must follow the existing course of such streams or drainageways. Easements for drainage of surface waters from 4 lots or less may cross lots only if the Planning Board or Planning Director determines that such location will not pose a hazard to persons or property.
<input type="checkbox"/>	9.	Standards [Article 8-43] – All subdivisions within the zoning districts R-40W, R-80W and overlay districts WSO-2NC, WSO-3CA, WSO-3NC and WSO-4P must be designed and constructed so that all development directly associated with the subdivision (e.g., roads, utilities, grading, drainage facilities) and all subsequent development (e.g., buildings, driveways, yards, on-site utilities, grading, drainage facilities) on the subdivision’s lots and other parcels: <ul style="list-style-type: none"> • minimizes impervious or partially pervious surface coverage. • diffuses the flow of stormwater runoff, encourages sheet flow and avoids concentrated discharge of stormwater into surface waters. • incorporates Best Management Practices (BMPs) to minimize adverse water quality impacts. • transports stormwater runoff from the development by vegetated conveyances; and • avoids disturbance of vegetation within water supply watershed buffers.

Wake County UDO Article 9 - Stormwater Management Requirements

See [Wake County’s Stormwater Manual: Submittal and Design Guidance](#)



PPR – PRELIMINARY PLAN REVIEW CHECKLIST

<input checked="" type="checkbox"/>	10.	Stormwater Review Required - All residential subdivision development must submit a plan to comply with Article 9. Minor subdivisions have the option of limiting impervious to 15%. Office, institutional, commercial or industrial development that disturbs greater than ½ acre is required to comply with the stormwater management regulations of Article 9.
<input checked="" type="checkbox"/>	11.	Stormwater Permit – is required for all development and redevelopment unless exempt pursuant to the UDO. A permit may only be issued subsequent to a properly submitted, reviewed and approved stormwater management plan and permit application. [Article 9] Note: A permit may not be required if there are no post-construction requirements (i.e., SCMs).
<input type="checkbox"/>	12.	Volume Management – is required for RESIDENTIAL regular subdivisions when the post development curve number exceeds the pre-development curve number using the Wake County Hybrid Stormwater Tool. Minor subdivisions have the option of limiting impervious to 15%.
<input checked="" type="checkbox"/>	13.	SCMs - For projects requiring stormwater treatment for quality and/or quantity control, the applicant must comply with the NC BMP Manual, as well as <i>Article 9 Stormwater Management, Part 3 Completion and Maintenance of Improvements</i> prior to approval of the record plat.
<input type="checkbox"/>	14.	Downstream Impact Analysis – Required analysis using the “10% rule” drainage area evaluation of the 10-year, 24-hour peak flow of the pre/post development to determine if the project will have any impacts on flooding or channel degradation downstream of the project site in accordance with Article 9-22.
Nutrient Management Strategies – Neuse Rules [15A NCAC 02B.0235]; Neuse Rules apply County-wide [Article 9-21] See Wake County’s Stormwater Manual: Submittal and Design Guidance Select all that apply.		
<input checked="" type="checkbox"/>	15.	Peak Flow – new development shall not result in a net increase in peak flow leaving the site from the pre-development conditions for the 1 yr-24 hr. storm.
<input checked="" type="checkbox"/>	16.	Nitrogen Load - contributed by the proposed new development activity shall not exceed the unit area mass loading rate for nitrogen of 3.6 of pounds per acre per year: nitrogen loading shall be calculated using the Wake County Hybrid Stormwater Tool.
<input type="checkbox"/>	a.	Replacement or Expansion w/No Net Increase in BUA – proposed development that would replace or expand structures or improvements that existed as of July 2001, <i>and that would not result in a net increase in built-upon area</i> shall not be required to meet nitrogen loading targets except to the extent that the developer shall provide stormwater control at least equal to the previous development.
<input type="checkbox"/>	b.	Replacement or Expansion with Net Increase in BUA proposed development that would replace or expand structures or improvements and <i>that would result in a net increase in built-upon area</i> shall meet the target of 3.6 lbs./ac/yr. for the entire site OR achieve a 30% reduction in nitrogen loading and no increase in phosphorus loading.



PPR – PRELIMINARY PLAN REVIEW CHECKLIST

	<input type="checkbox"/>	c.	<p>LID option - Developments that show volume matching using Storm-EZ shall be considered as meeting nutrient export requirements without making offset payments provided the following:</p> <ul style="list-style-type: none"> • When analyzing a development site, the pre-development land cover shall be entered into Storm-EZ as “Woods” for the entire project area. • The Wake County Hybrid Tool must be run to estimate the pre-development, and post-development, pre-BMP nutrient export rates for the site. <p>See NCDENR Memo on Coordination between LID & NSW Programs</p>
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Wake County UDO Article 10 - Erosion and Sedimentation Control Requirements

<input checked="" type="checkbox"/>	17.	<p>Erosion Control: This project will require an Approved Erosion and Sediment Control Plan and Land Disturbance Permit if it involves <u>greater than one acre of disturbance</u> [10-13-1(A)]. Note: If the land disturbance is part of a common plan of development that is greater than one acre of disturbance, an Approved Erosion and Sediment Control Plan and Land Disturbance Permit are required for each individual tract or parcel disturbance within the common plan of development, regardless of land disturbance acreage in each tract/parcel.</p>
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Wake County UDO Article 11 - Environmental Standard Requirements

<input type="checkbox"/>	18.	<p>Water Supply Watershed Buffers (WSWB) Article 11, Part 2 Select all that apply.</p>
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	<input type="checkbox"/>	a.	<p>Water Supply Impoundments with a drainage area of 25 acres or more [Article 11-21-2]:</p> <ul style="list-style-type: none"> • WSWB required with a minimum width of 100 feet around all water supply impoundments • Buildings must be setback at least 20 feet from the outer boundary of the required buffer area.
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	<input type="checkbox"/>	b.	<p>Water Supply Impoundments with a drainage area of 5 to 25 Acres [Article 11-21-3]:</p> <ul style="list-style-type: none"> • WSWB required with a minimum width of 30 feet provided around all water impoundments • Buildings must be setback at least 20 feet from the outer boundary of the required buffer area.
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	<input type="checkbox"/>	c.	<p>Non-Water Supply Impoundments with a drainage area of 25 Acres or more [Article 11-21-4]:</p> <ul style="list-style-type: none"> • WSWB required with minimum width of 50 feet around all non-water supply impoundments. • Buildings must be setback at least 20 feet from the outer boundary of the required buffer area.
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	<input type="checkbox"/>	d.	<p>Perennial Streams [Article 11-21-5]:</p> <ul style="list-style-type: none"> • WSWB required with a minimum width of 100 feet along each side of a stream shown as a perennial stream on the most recent edition of U.S.G.S. 1:24,000 (7.5 minute) scale topographic maps. • The area of the required buffer that begins at the stream bank and extends landward 50 feet is subject to the Zone 1 standards of Sec. Section 11-22-1(A). • The area of the required buffer that begins at the outer edge of Zone 1 and extends landward 50 feet is subject to the Zone 2 standards of Sec. Section 11-22-1(B). • No minimum building setback from the required buffer.
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PPR – PRELIMINARY PLAN REVIEW CHECKLIST

<input type="checkbox"/>	<input type="checkbox"/>	e.	<p>Non-Perennial Watercourses [Article 11-21-6]</p> <ul style="list-style-type: none"> WSWB required with a minimum width of 50 feet along each side of non-perennial watercourses, channels, ditches or similar physiographic features with a drainage area of 25 acres or more Buildings must be setback at least 20 feet from the outer boundary of the required buffer area.
<input type="checkbox"/>	<input type="checkbox"/>	f.	<p>Watercourses and Channels, 5 to 25 Acres [Article 11-21-7]</p> <ul style="list-style-type: none"> WSWB required with a minimum width of 30 feet along each side of a watercourse, channel, ditch, or similar physiographic feature with a drainage area of at least 5 acres, but less than 25 acres Buildings must be setback at least 20 feet from the outer boundary of the required buffer area.
<input type="checkbox"/>	<input type="checkbox"/>	g.	<p>Activities Allowed within Buffers [Article 11-22-2]: Driveway crossings that access single-family dwellings, provided:</p> <ul style="list-style-type: none"> no alternative to their location in the buffer (including opportunity for shared driveways) exists. buffer disturbance is no more than 60 feet wide. buffer disturbance is no more than 6,000 SF. the driveway crosses the buffer at an angle close to 90 degrees and not less than 60 degrees. side slopes do not exceed a 2:1 (horizontal to vertical) ratio (bridging and/or retaining walls may be used to meet this and the disturbance width standard); and all culverts are designed and constructed for the 25-year storm event
<input type="checkbox"/>	<input type="checkbox"/>	h.	<p>Activities Allowed within Buffers [Article 11-22-2]: Road crossings (public or private roads), provided:</p> <ul style="list-style-type: none"> no alternative location in the buffer exists. buffer disturbance does not extend beyond the required right-of-way or easement width, or in no case is more than 90 feet wide. buffer disturbance is no more than 9,000 SF in area. the road crosses the buffer at an angle close to 90 degrees and not less than 60 degrees. side slopes do not exceed a 2:1 horizontal: vertical ratio (bridging and/or retaining walls may be used to meet this and the disturbance width standard); and all culverts are designed and constructed for the 25-year storm
<input type="checkbox"/>	19.	<p>Special Watershed Areas - Swift Creek Water Supply Watershed Development in the Swift Creek Water Supply Watershed is subject to the requirements of the <i>Swift Creek Land Management Plan</i> in addition to other applicable standards.</p>	
<input type="checkbox"/>	<input type="checkbox"/>	a.	<p>An as-built plan prepared by a licensed professional land surveyor is required for all lots before a Certificate of Occupancy may be issued. [11-30-3]</p>
<input type="checkbox"/>	<input type="checkbox"/>	b.	<p>In addition to the standards of the underlying zoning district, additional standards apply to all land within the Swift Creek Water Supply Watershed. (See [11-30-4])</p>
<input type="checkbox"/>	20.	<p>Special Watershed Areas - Little River Water Supply Watershed</p>	
<input type="checkbox"/>	<input type="checkbox"/>	a.	<p>An as-built plan prepared by a licensed professional land surveyor is required for all lots before a Certificate of Occupancy may be issued. [11-31-1]</p>



PPR – PRELIMINARY PLAN REVIEW CHECKLIST

<input type="checkbox"/>	<input type="checkbox"/>	b.	The following maximum impervious surface ratios apply to all nonresidential development in the Little River Water Supply Watershed: R-80W = 6% of lot/site R-40W = 12% of lot/site
<input type="checkbox"/>	21.	Special Watershed Areas - Smith Creek Water Supply Watershed	
<input type="checkbox"/>	<input type="checkbox"/>	a.	All residential and commercial properties require a preliminary site plan prepared by a licensed professional land surveyor, landscape architect, architect, or engineer. [11-32-1]
<input type="checkbox"/>	<input type="checkbox"/>	b.	All residential and commercial properties require a preliminary site plan prepared by a licensed professional land surveyor, landscape architect, architect, or engineer. [11-20-1]
<input type="checkbox"/>	<input type="checkbox"/>	c.	The following maximum impervious surface ratios apply to all nonresidential development in the Smith Creek Water Supply Watershed: R-80W = 6% of lot/site R-40W = 12% of lot/site
Wake County UDO Article 14 - Flood Hazard Area Requirements			
<input type="checkbox"/>	22.	Flood Study Required [Article 14] A study of the potential changes in the base flood elevation caused by the obstruction (fill), encroachment, alteration or relocation (including driveway or road crossings) of the following areas:	
<input type="checkbox"/>	<input type="checkbox"/>	a.	a FEMA mapped floodway (Note: No new structures may be constructed or placed within a floodway or non-encroachment area except as otherwise provided by subsection 14-19-2; AND No fill may be placed in a floodway or non-encroachment area except as otherwise provided by subsection 14-19-2; [Article 14-19-3(A-B)])
<input type="checkbox"/>	<input type="checkbox"/>	b.	a non-encroachment area [Article 14-19-3(A-B)], see note above
<input type="checkbox"/>	<input type="checkbox"/>	c.	a FEMA mapped area of special flood hazard that has not previously been studied in detail
<input type="checkbox"/>	<input type="checkbox"/>	d.	flood hazard soils areas with a total drainage area of more than 5 ac but no more than 25 ac [Article 14-15-3] – or -
<input type="checkbox"/>	<input type="checkbox"/>	e.	flood hazard soils areas with a total drainage area of more than 25 ac, but less than 100 ac [Article 14-15-4] – or -
<input type="checkbox"/>	<input type="checkbox"/>	f.	flood hazard soils area with a total drainage area of 100 ac or more [Article 14-15-5]
<input type="checkbox"/>	23.	Impoundments and Dams [14-23]	



PPR – PRELIMINARY PLAN REVIEW CHECKLIST

<input type="checkbox"/>	a.	Any construction, repair, alteration, or removal of a jurisdictional dam shall obtain State Agency Approval in accordance with Article 21, Chapter 143 of the North Carolina General Statutes. [Article 14-23-1]
<input type="checkbox"/>	b.	<p>If an impoundment is proposed to be constructed or retained within any proposed subdivision, the following standards shall apply. These County standards are separate from and do not supersede any State Agency requirements.</p> <ul style="list-style-type: none"> • The impoundment and its dam shall be constructed or structurally upgraded to accommodate the runoff from a 24-hour, 100-year frequency storm. • Runoff computations must use SCS methods or other acceptable engineering standards. [Article 14-23-2]

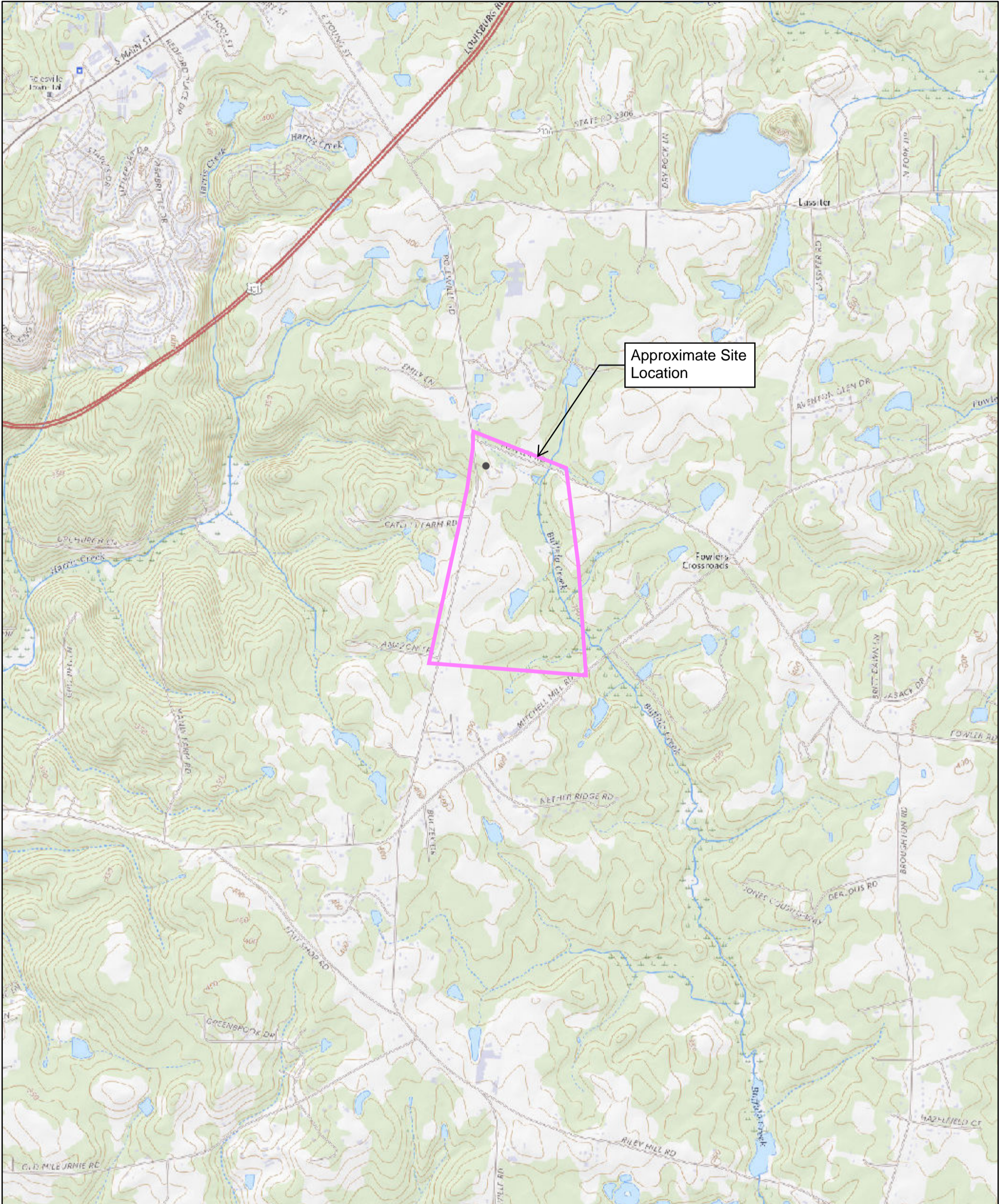
Applicant Signature: *Brandon Hall*

Date: 5/1/2024

Appendix 2: Reference Materials

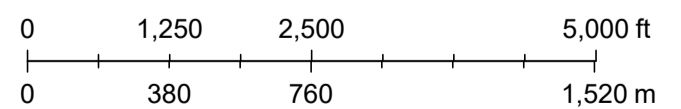
- ◆ USGS 7.5-Minute Quadrangle Map
- ◆ Web Soil Survey Map
- ◆ FEMA Flood Insurance Rate Map
- ◆ NOAA Atlas 14 Precipitation Frequency Estimates
- ◆ Pondpack Input Storm Data Pre- and Post-Development

The National Map Advanced Viewer



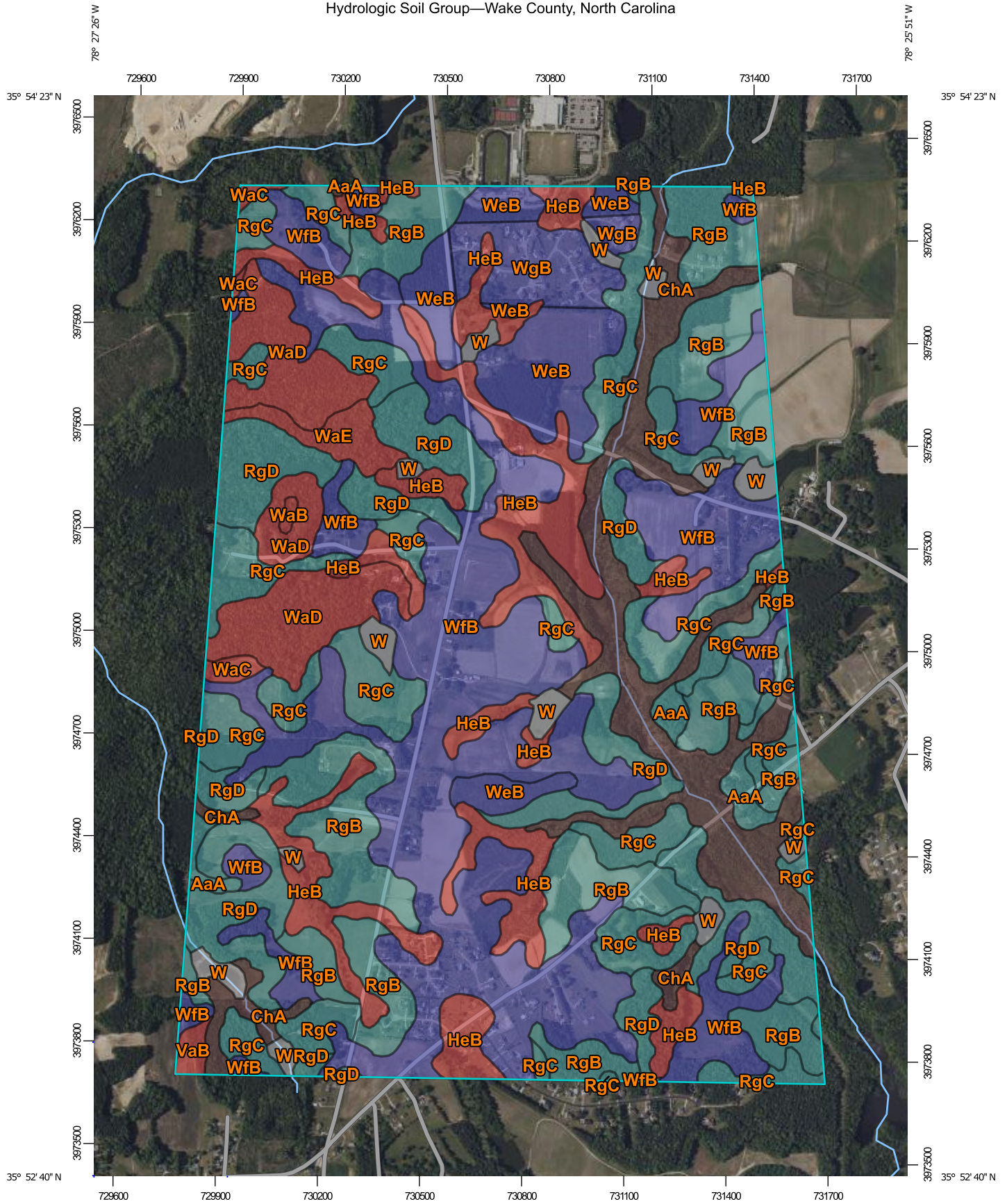
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1:25,000



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S.

Hydrologic Soil Group—Wake County, North Carolina



Map Scale: 1:15,400 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84




Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

6/30/2023
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

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 23, Sep 12, 2022

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AaA	Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded	C	10.0	0.9%
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	B/D	98.4	8.9%
HeB	Helena sandy loam, 2 to 6 percent slopes	D	120.1	10.9%
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	C	148.7	13.5%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	C	140.8	12.7%
RgD	Rawlings-Rion complex, 10 to 15 percent slopes	C	109.7	9.9%
VaB	Vance sandy loam, 2 to 6 percent slopes	D	2.9	0.3%
W	Water		24.1	2.2%
WaB	Wake-Rolesville complex, 2 to 6 percent slopes, very rocky	D	0.9	0.1%
WaC	Wake-Rolesville complex, 6 to 10 percent slopes, very rocky	D	4.1	0.4%
WaD	Wake-Rolesville complex, 10 to 15 percent slopes, very rocky	D	60.8	5.5%
WaE	Wake-Rolesville complex, 15 to 25 percent slopes, very rocky	D	10.5	1.0%
WeB	Wedowee sandy loam, 2 to 6 percent slopes	B	53.9	4.9%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	B	292.0	26.4%
WgB	Wedowee-Urban land complex, 2 to 6 percent slopes	B	27.1	2.5%
Totals for Area of Interest			1,104.1	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



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://fris.nc.gov/fris) [HTTPS://MSC.FEMA.GOV](https://msc.fema.gov)

	Without Base Flood Elevation (BFE) Zone A.V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
	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
	Areas Determined to be Outside the 0.2% Annual Chance Floodplain Zone X
	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	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/flood/>, or contact the FEMA Map Service Center.

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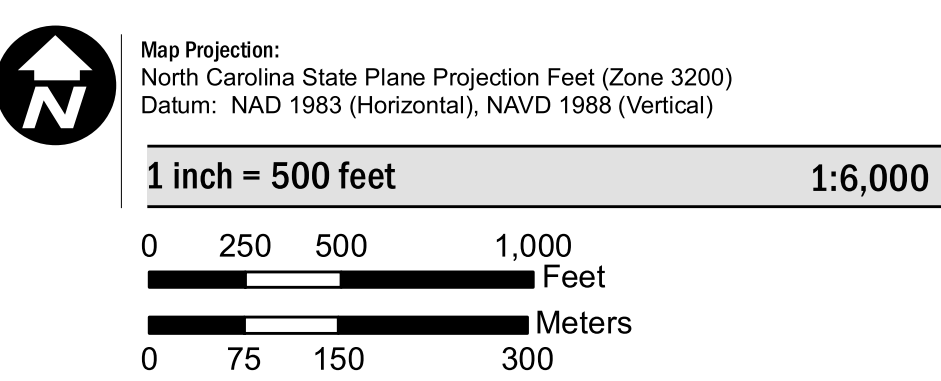
ACCREDITED LEEVE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To 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 indicates 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>.

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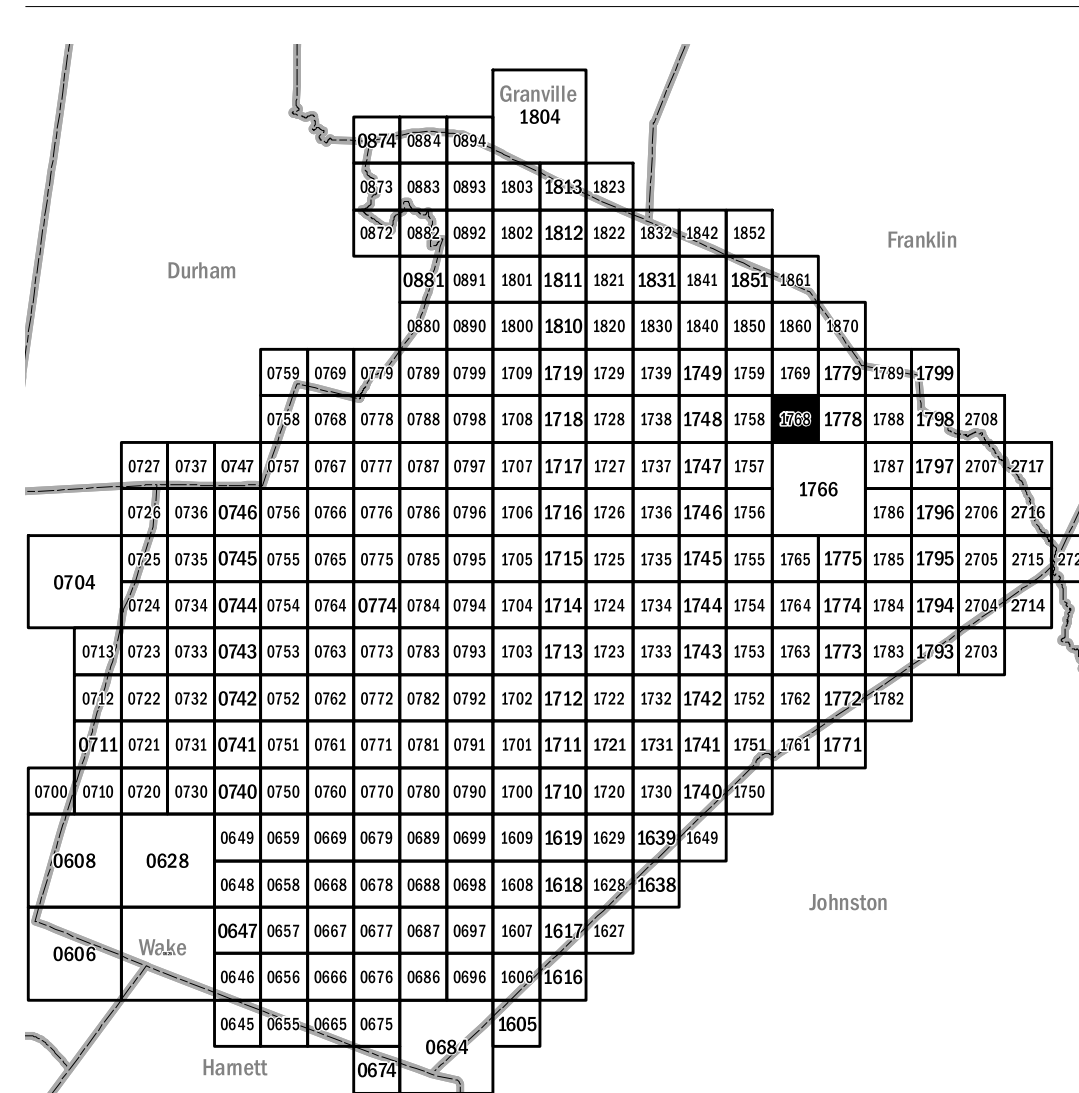
LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LIMWA). The LIMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LIMWA (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



PANEL LOCATOR



National Flood Insurance Program

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

NORTH CAROLINA

PANEL 1768

Panel Contains:

COMMUNITY
ROLESVILLE, TOWN OF
WAKE COUNTY

CID
370468
370368

PANEL
1768
1768

SUFFIX
K
K

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720176800K

MAP REVISED
July 19, 2022

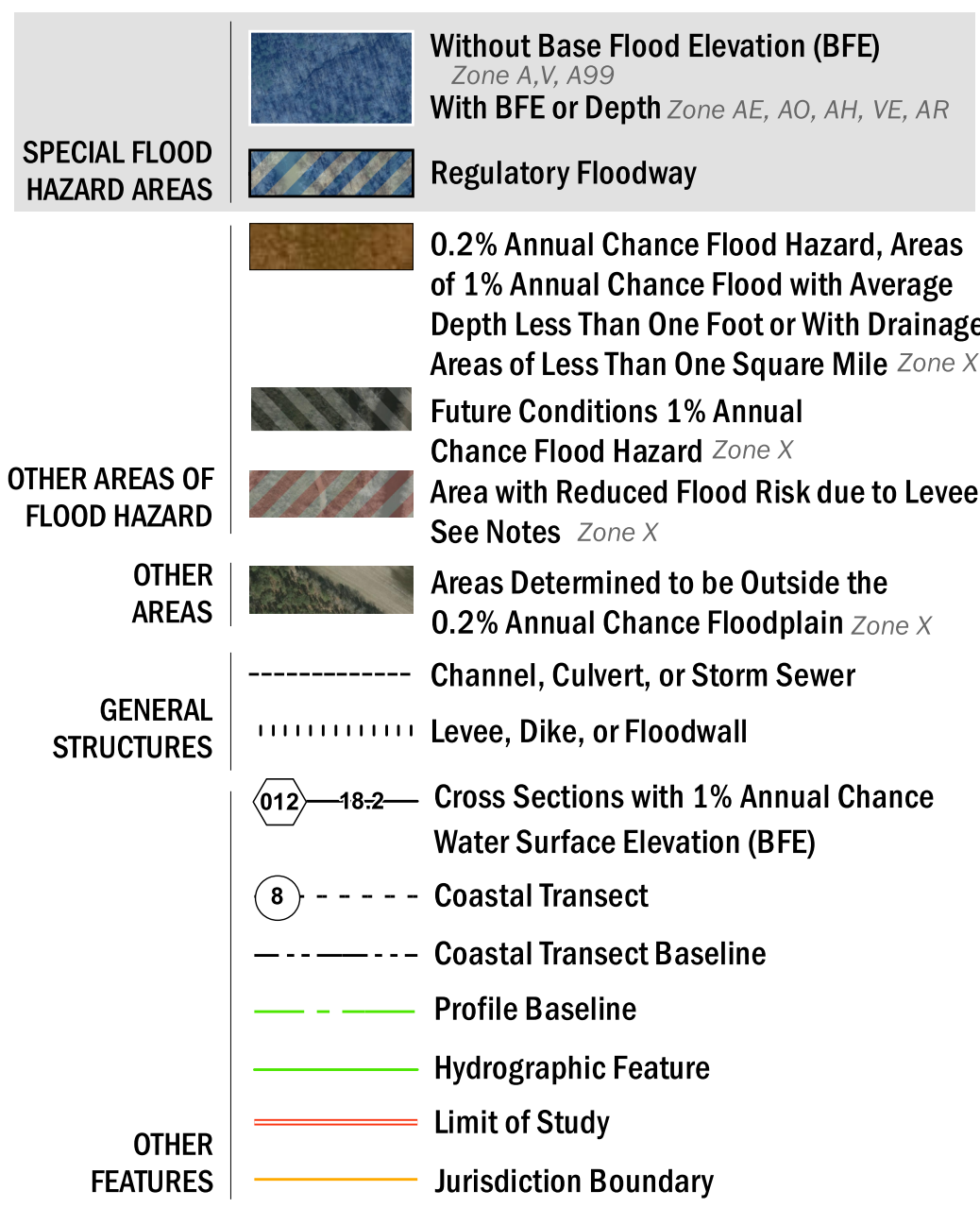


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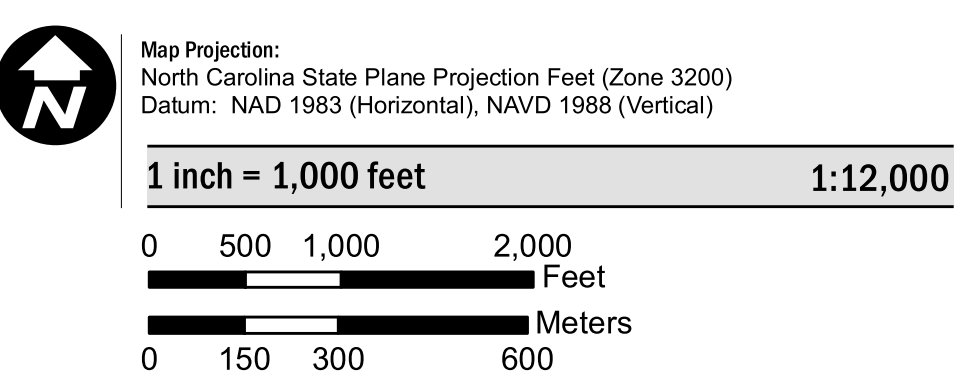
ACCREDITED LEEVE NOTES TO USERS: If an Accredited Levee Note (ALN) appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) 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 indicates 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>.

PROVISIONALLY ACCREDITED LEEVE 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 indicates 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>.

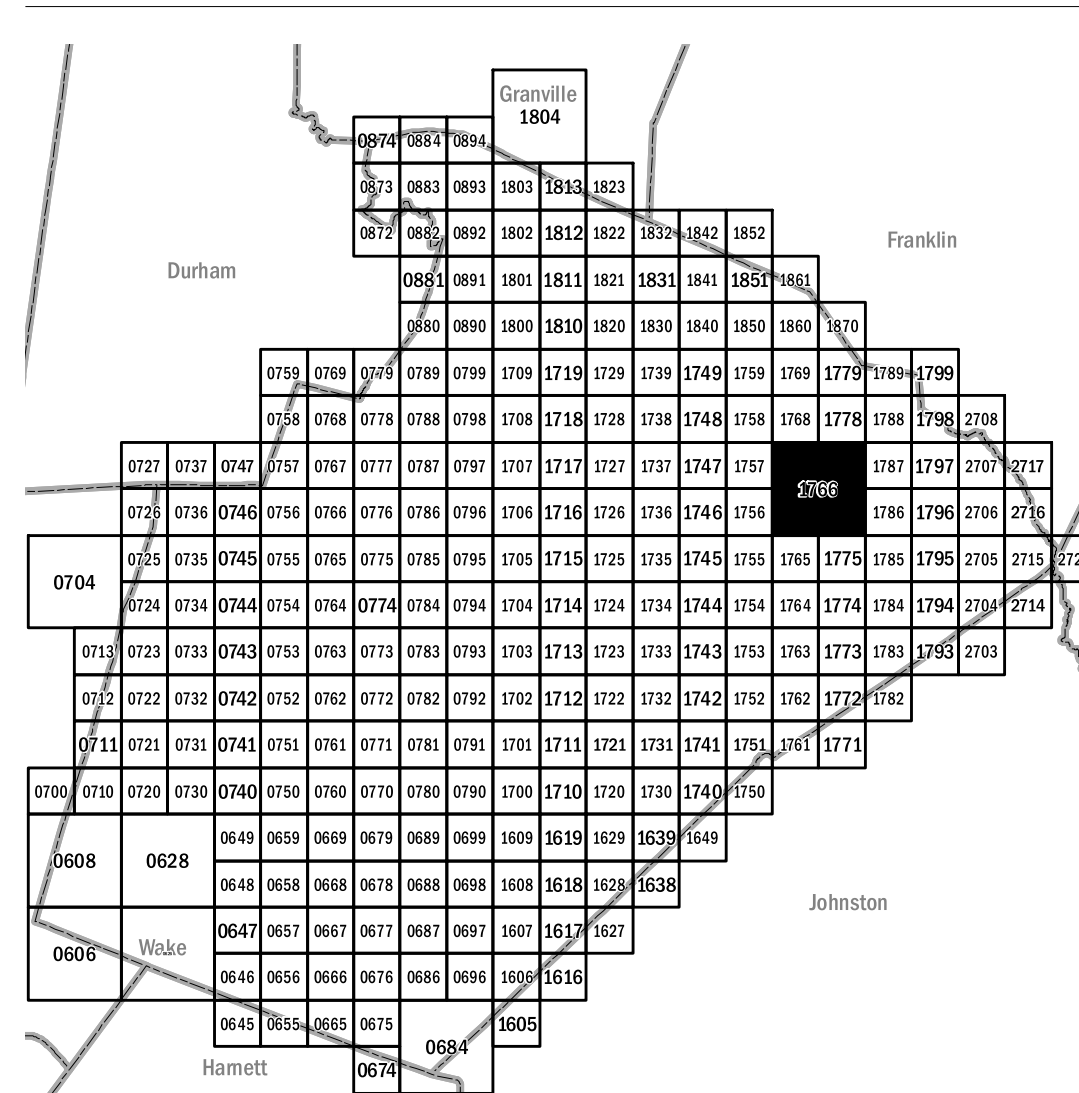
LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LIMWA). The LIMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LIMWA (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



PANEL LOCATOR



National Flood Insurance Program

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

NORTH CAROLINA

PANEL 1766

Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
ROLESVILLE, TOWN OF	370468	1766	K
WAKE COUNTY	370368	1766	K

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720176600K

MAP REVISED
July 19, 2022



NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.8971°, Longitude: -78.4444°
Elevation: 383 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

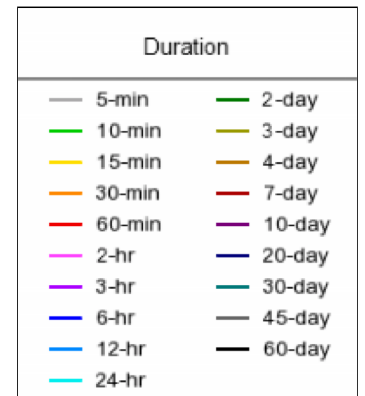
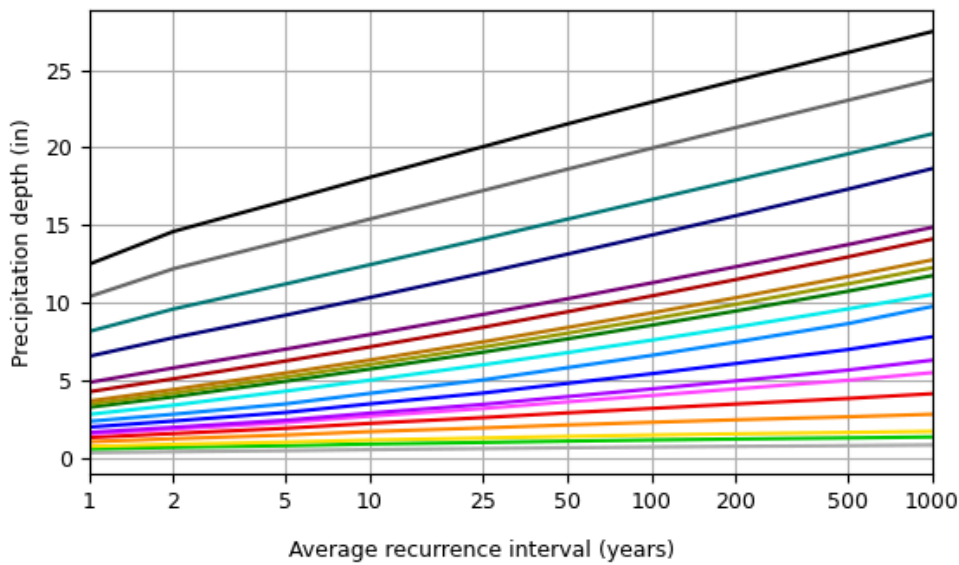
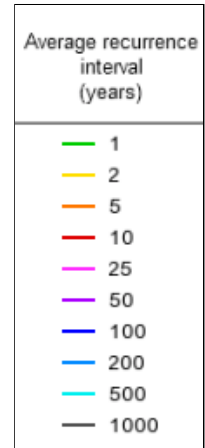
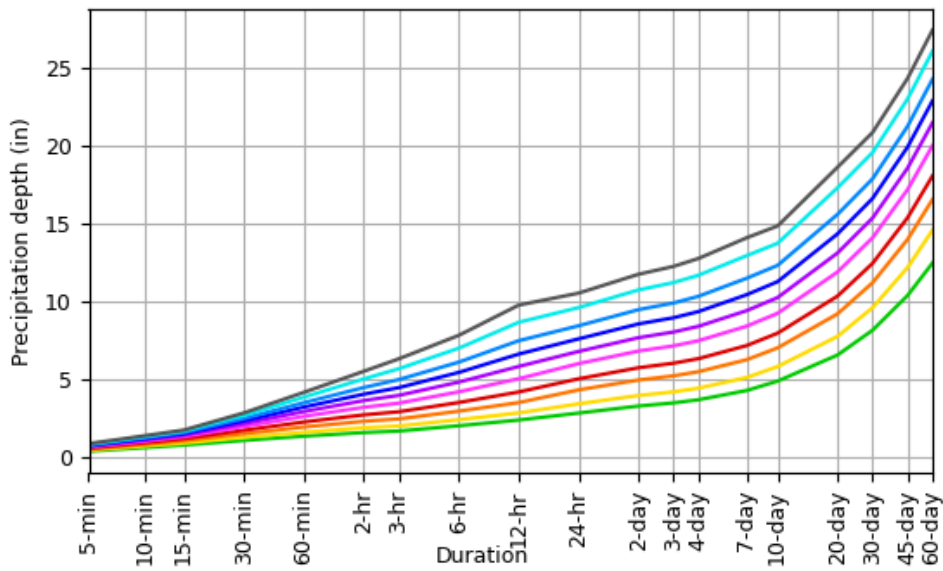
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.403 (0.369-0.442)	0.468 (0.430-0.512)	0.534 (0.489-0.582)	0.600 (0.549-0.654)	0.666 (0.606-0.726)	0.719 (0.652-0.784)	0.766 (0.691-0.835)	0.808 (0.724-0.882)	0.855 (0.791-0.934)	0.898 (0.791-0.982)
10-min	0.644 (0.590-0.706)	0.749 (0.687-0.819)	0.855 (0.783-0.933)	0.960 (0.877-1.05)	1.06 (0.966-1.16)	1.15 (1.04-1.25)	1.22 (1.10-1.33)	1.28 (1.15-1.40)	1.35 (1.20-1.48)	1.41 (1.24-1.55)
15-min	0.806 (0.738-0.882)	0.942 (0.864-1.03)	1.08 (0.990-1.18)	1.21 (1.11-1.32)	1.35 (1.22-1.47)	1.45 (1.32-1.58)	1.54 (1.39-1.68)	1.62 (1.45-1.76)	1.70 (1.51-1.86)	1.77 (1.56-1.94)
30-min	1.10 (1.01-1.21)	1.30 (1.19-1.42)	1.54 (1.41-1.68)	1.76 (1.61-1.92)	1.99 (1.81-2.17)	2.18 (1.98-2.38)	2.36 (2.12-2.57)	2.52 (2.26-2.75)	2.71 (2.41-2.96)	2.87 (2.53-3.14)
60-min	1.38 (1.26-1.51)	1.63 (1.50-1.78)	1.97 (1.80-2.15)	2.29 (2.09-2.50)	2.65 (2.42-2.89)	2.96 (2.68-3.23)	3.25 (2.93-3.54)	3.53 (3.16-3.85)	3.89 (3.45-4.24)	4.19 (3.70-4.59)
2-hr	1.61 (1.46-1.78)	1.92 (1.75-2.10)	2.34 (2.13-2.56)	2.75 (2.49-3.01)	3.23 (2.92-3.54)	3.66 (3.29-4.01)	4.08 (3.63-4.46)	4.50 (3.99-4.92)	5.06 (4.43-5.53)	5.55 (4.82-6.08)
3-hr	1.71 (1.55-1.89)	2.03 (1.85-2.24)	2.49 (2.26-2.74)	2.95 (2.67-3.24)	3.50 (3.16-3.84)	4.00 (3.58-4.39)	4.50 (3.99-4.93)	5.02 (4.42-5.50)	5.71 (4.98-6.26)	6.35 (5.47-6.98)
6-hr	2.05 (1.87-2.26)	2.44 (2.23-2.68)	2.99 (2.72-3.28)	3.54 (3.22-3.89)	4.23 (3.82-4.63)	4.85 (4.35-5.30)	5.47 (4.87-5.98)	6.13 (5.40-6.69)	7.03 (6.12-7.66)	7.85 (6.74-8.58)
12-hr	2.41 (2.21-2.66)	2.87 (2.64-3.15)	3.54 (3.24-3.88)	4.22 (3.84-4.62)	5.07 (4.59-5.54)	5.86 (5.26-6.37)	6.65 (5.92-7.23)	7.51 (6.60-8.16)	8.69 (7.52-9.44)	9.80 (8.35-10.7)
24-hr	2.86 (2.66-3.08)	3.46 (3.22-3.73)	4.35 (4.04-4.69)	5.06 (4.69-5.45)	6.04 (5.58-6.50)	6.82 (6.28-7.35)	7.63 (7.00-8.22)	8.47 (7.74-9.13)	9.64 (8.76-10.4)	10.6 (9.55-11.4)
2-day	3.31 (3.08-3.57)	3.99 (3.72-4.30)	4.99 (4.64-5.37)	5.77 (5.36-6.22)	6.85 (6.33-7.38)	7.70 (7.10-8.30)	8.59 (7.89-9.26)	9.51 (8.70-10.3)	10.8 (9.79-11.7)	11.8 (10.6-12.8)
3-day	3.52 (3.28-3.77)	4.23 (3.94-4.54)	5.25 (4.90-5.64)	6.06 (5.64-6.50)	7.18 (6.65-7.70)	8.07 (7.45-8.66)	8.98 (8.27-9.65)	9.93 (9.10-10.7)	11.2 (10.2-12.1)	12.3 (11.1-13.3)
4-day	3.72 (3.47-3.98)	4.46 (4.17-4.77)	5.52 (5.15-5.90)	6.36 (5.92-6.79)	7.51 (6.97-8.03)	8.44 (7.81-9.02)	9.38 (8.65-10.0)	10.4 (9.51-11.1)	11.7 (10.7-12.6)	12.8 (11.6-13.8)
7-day	4.31 (4.04-4.61)	5.15 (4.82-5.50)	6.29 (5.89-6.72)	7.20 (6.72-7.69)	8.45 (7.87-9.02)	9.44 (8.77-10.1)	10.5 (9.68-11.2)	11.5 (10.6-12.3)	13.0 (11.9-13.9)	14.1 (12.9-15.2)
10-day	4.91 (4.61-5.24)	5.85 (5.48-6.23)	7.05 (6.61-7.51)	8.00 (7.48-8.51)	9.27 (8.65-9.88)	10.3 (9.57-11.0)	11.3 (10.5-12.1)	12.4 (11.4-13.2)	13.8 (12.7-14.8)	14.9 (13.7-16.0)
20-day	6.59 (6.20-7.02)	7.79 (7.33-8.29)	9.24 (8.68-9.82)	10.4 (9.74-11.0)	11.9 (11.2-12.7)	13.1 (12.3-14.0)	14.4 (13.4-15.3)	15.6 (14.5-16.7)	17.3 (16.0-18.5)	18.7 (17.2-20.0)
30-day	8.19 (7.72-8.69)	9.63 (9.08-10.2)	11.2 (10.6-11.9)	12.5 (11.7-13.3)	14.1 (13.2-15.0)	15.4 (14.4-16.4)	16.7 (15.6-17.7)	17.9 (16.7-19.1)	19.6 (18.2-20.9)	20.9 (19.3-22.3)
45-day	10.4 (9.89-11.0)	12.2 (11.6-12.9)	14.0 (13.3-14.8)	15.4 (14.6-16.3)	17.2 (16.3-18.2)	18.6 (17.6-19.6)	20.0 (18.8-21.1)	21.3 (20.0-22.5)	23.0 (21.6-24.4)	24.4 (22.7-25.9)
60-day	12.5 (11.9-13.2)	14.6 (13.9-15.4)	16.6 (15.7-17.4)	18.1 (17.2-19.0)	20.0 (19.0-21.1)	21.5 (20.3-22.7)	22.9 (21.6-24.2)	24.3 (22.9-25.7)	26.1 (24.5-27.6)	27.5 (25.7-29.1)

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

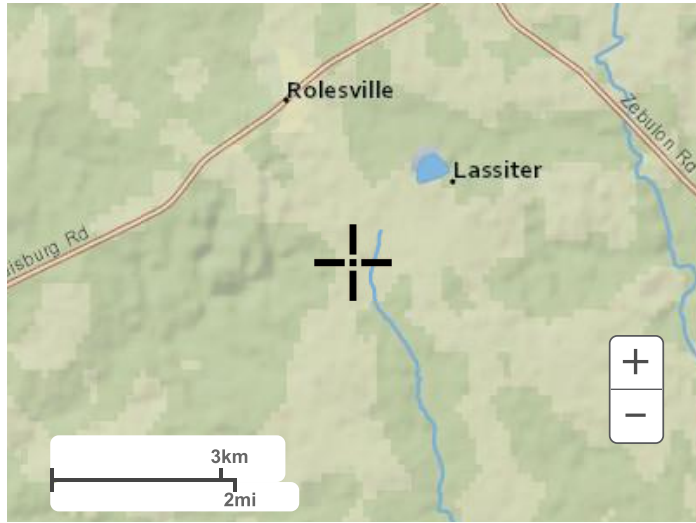
PDS-based depth-duration-frequency (DDF) curves
 Latitude: 35.8971°, Longitude: -78.4444°



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Maps & aerials

Small scale terrain



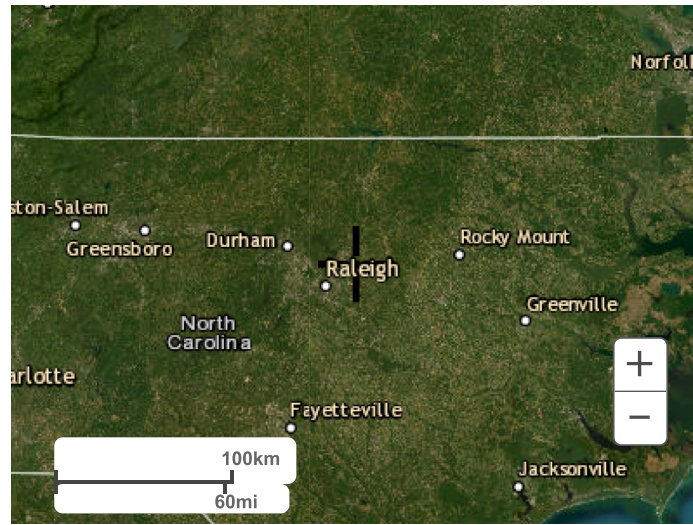
Large scale terrain



Large scale map



Large scale aerial



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Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Time-Depth Curve: 1 year	
Label	1 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.5	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.6	0.6	0.6	0.6
10.500	0.6	0.6	0.7	0.7	0.7
11.000	0.7	0.7	0.8	0.8	0.8
11.500	0.9	0.9	1.0	1.1	1.2
12.000	1.4	1.7	1.8	1.9	2.0
12.500	2.0	2.0	2.1	2.1	2.1
13.000	2.1	2.2	2.2	2.2	2.2
13.500	2.2	2.3	2.3	2.3	2.3
14.000	2.3	2.3	2.3	2.4	2.4
14.500	2.4	2.4	2.4	2.4	2.4
15.000	2.4	2.5	2.5	2.5	2.5
15.500	2.5	2.5	2.5	2.5	2.5
16.000	2.5	2.5	2.5	2.6	2.6
16.500	2.6	2.6	2.6	2.6	2.6
17.000	2.6	2.6	2.6	2.6	2.6

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.6	2.6	2.6	2.6	2.6
18.000	2.7	2.7	2.7	2.7	2.7
18.500	2.7	2.7	2.7	2.7	2.7
19.000	2.7	2.7	2.7	2.7	2.7
19.500	2.7	2.7	2.7	2.7	2.7
20.000	2.7	2.7	2.7	2.7	2.8
20.500	2.8	2.8	2.8	2.8	2.8
21.000	2.8	2.8	2.8	2.8	2.8
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.8	2.8	2.8	2.8	2.8
22.500	2.8	2.8	2.8	2.8	2.8
23.000	2.8	2.8	2.8	2.8	2.8
23.500	2.8	2.9	2.9	2.9	2.9
24.000	2.9	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 10 year

Return Event: 10 years
 Storm Event: 10 year

Time-Depth Curve: 10 year	
Label	10 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.6	0.6
8.000	0.6	0.6	0.6	0.6	0.6
8.500	0.6	0.7	0.7	0.7	0.7
9.000	0.7	0.8	0.8	0.8	0.8
9.500	0.8	0.9	0.9	0.9	0.9
10.000	1.0	1.0	1.0	1.0	1.1
10.500	1.1	1.1	1.2	1.2	1.2
11.000	1.3	1.3	1.3	1.4	1.4
11.500	1.5	1.6	1.7	1.9	2.1
12.000	2.5	3.0	3.2	3.3	3.5
12.500	3.6	3.6	3.7	3.7	3.8
13.000	3.8	3.8	3.9	3.9	3.9
13.500	4.0	4.0	4.0	4.1	4.1
14.000	4.1	4.1	4.2	4.2	4.2
14.500	4.2	4.2	4.3	4.3	4.3
15.000	4.3	4.3	4.4	4.4	4.4
15.500	4.4	4.4	4.4	4.5	4.5
16.000	4.5	4.5	4.5	4.5	4.5
16.500	4.5	4.6	4.6	4.6	4.6
17.000	4.6	4.6	4.6	4.6	4.6

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 10 year

Return Event: 10 years
 Storm Event: 10 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	4.7	4.7	4.7	4.7	4.7
18.000	4.7	4.7	4.7	4.7	4.7
18.500	4.7	4.7	4.8	4.8	4.8
19.000	4.8	4.8	4.8	4.8	4.8
19.500	4.8	4.8	4.8	4.8	4.8
20.000	4.8	4.8	4.9	4.9	4.9
20.500	4.9	4.9	4.9	4.9	4.9
21.000	4.9	4.9	4.9	4.9	4.9
21.500	4.9	4.9	4.9	5.0	5.0
22.000	5.0	5.0	5.0	5.0	5.0
22.500	5.0	5.0	5.0	5.0	5.0
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.1	5.1
24.000	5.1	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 100 year

Return Event: 100 years
 Storm Event: 100 year

Time-Depth Curve: 100 year	
Label	100 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.2	0.2	0.2	0.2	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.3	0.3	0.3
3.500	0.3	0.3	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.4	0.4
4.500	0.4	0.4	0.4	0.4	0.4
5.000	0.4	0.4	0.5	0.5	0.5
5.500	0.5	0.5	0.5	0.5	0.5
6.000	0.5	0.6	0.6	0.6	0.6
6.500	0.6	0.6	0.6	0.7	0.7
7.000	0.7	0.7	0.7	0.7	0.8
7.500	0.8	0.8	0.8	0.8	0.9
8.000	0.9	0.9	0.9	0.9	1.0
8.500	1.0	1.0	1.0	1.1	1.1
9.000	1.1	1.1	1.2	1.2	1.2
9.500	1.3	1.3	1.3	1.4	1.4
10.000	1.4	1.5	1.5	1.6	1.6
10.500	1.7	1.7	1.7	1.8	1.9
11.000	1.9	2.0	2.0	2.1	2.2
11.500	2.3	2.4	2.6	2.8	3.2
12.000	3.8	4.5	4.8	5.0	5.2
12.500	5.4	5.4	5.5	5.6	5.7
13.000	5.7	5.8	5.8	5.9	5.9
13.500	6.0	6.0	6.1	6.1	6.1
14.000	6.2	6.2	6.3	6.3	6.3
14.500	6.4	6.4	6.4	6.5	6.5
15.000	6.5	6.5	6.6	6.6	6.6
15.500	6.7	6.7	6.7	6.7	6.7
16.000	6.8	6.8	6.8	6.8	6.8
16.500	6.9	6.9	6.9	6.9	6.9
17.000	6.9	7.0	7.0	7.0	7.0

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 100 year

Return Event: 100 years
 Storm Event: 100 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	7.0	7.0	7.0	7.1	7.1
18.000	7.1	7.1	7.1	7.1	7.1
18.500	7.1	7.2	7.2	7.2	7.2
19.000	7.2	7.2	7.2	7.2	7.2
19.500	7.3	7.3	7.3	7.3	7.3
20.000	7.3	7.3	7.3	7.3	7.3
20.500	7.4	7.4	7.4	7.4	7.4
21.000	7.4	7.4	7.4	7.4	7.4
21.500	7.4	7.4	7.5	7.5	7.5
22.000	7.5	7.5	7.5	7.5	7.5
22.500	7.5	7.5	7.5	7.5	7.6
23.000	7.6	7.6	7.6	7.6	7.6
23.500	7.6	7.6	7.6	7.6	7.6
24.000	7.6	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 2 year

Return Event: 2 years
 Storm Event: 2 year

Time-Depth Curve: 2 year	
Label	2 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.5	0.5	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.6
9.500	0.6	0.6	0.6	0.6	0.6
10.000	0.7	0.7	0.7	0.7	0.7
10.500	0.7	0.8	0.8	0.8	0.8
11.000	0.9	0.9	0.9	1.0	1.0
11.500	1.0	1.1	1.2	1.3	1.4
12.000	1.7	2.0	2.2	2.3	2.4
12.500	2.4	2.5	2.5	2.5	2.6
13.000	2.6	2.6	2.6	2.7	2.7
13.500	2.7	2.7	2.8	2.8	2.8
14.000	2.8	2.8	2.8	2.9	2.9
14.500	2.9	2.9	2.9	2.9	2.9
15.000	3.0	3.0	3.0	3.0	3.0
15.500	3.0	3.0	3.0	3.0	3.1
16.000	3.1	3.1	3.1	3.1	3.1
16.500	3.1	3.1	3.1	3.1	3.1
17.000	3.1	3.2	3.2	3.2	3.2

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Pre-Development 2 year

Return Event: 2 years
 Storm Event: 2 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	3.2	3.2	3.2	3.2	3.2
18.000	3.2	3.2	3.2	3.2	3.2
18.500	3.2	3.2	3.2	3.3	3.3
19.000	3.3	3.3	3.3	3.3	3.3
19.500	3.3	3.3	3.3	3.3	3.3
20.000	3.3	3.3	3.3	3.3	3.3
20.500	3.3	3.3	3.3	3.3	3.4
21.000	3.4	3.4	3.4	3.4	3.4
21.500	3.4	3.4	3.4	3.4	3.4
22.000	3.4	3.4	3.4	3.4	3.4
22.500	3.4	3.4	3.4	3.4	3.4
23.000	3.4	3.4	3.4	3.4	3.4
23.500	3.4	3.4	3.5	3.5	3.5
24.000	3.5	(N/A)	(N/A)	(N/A)	(N/A)

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Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Time-Depth Curve: 1 year	
Label	1 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.5	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.6	0.6	0.6	0.6
10.500	0.6	0.6	0.7	0.7	0.7
11.000	0.7	0.7	0.8	0.8	0.8
11.500	0.9	0.9	1.0	1.1	1.2
12.000	1.4	1.7	1.8	1.9	2.0
12.500	2.0	2.0	2.1	2.1	2.1
13.000	2.1	2.2	2.2	2.2	2.2
13.500	2.2	2.3	2.3	2.3	2.3
14.000	2.3	2.3	2.3	2.4	2.4
14.500	2.4	2.4	2.4	2.4	2.4
15.000	2.4	2.5	2.5	2.5	2.5
15.500	2.5	2.5	2.5	2.5	2.5
16.000	2.5	2.5	2.5	2.6	2.6
16.500	2.6	2.6	2.6	2.6	2.6
17.000	2.6	2.6	2.6	2.6	2.6

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.6	2.6	2.6	2.6	2.6
18.000	2.7	2.7	2.7	2.7	2.7
18.500	2.7	2.7	2.7	2.7	2.7
19.000	2.7	2.7	2.7	2.7	2.7
19.500	2.7	2.7	2.7	2.7	2.7
20.000	2.7	2.7	2.7	2.7	2.8
20.500	2.8	2.8	2.8	2.8	2.8
21.000	2.8	2.8	2.8	2.8	2.8
21.500	2.8	2.8	2.8	2.8	2.8
22.000	2.8	2.8	2.8	2.8	2.8
22.500	2.8	2.8	2.8	2.8	2.8
23.000	2.8	2.8	2.8	2.8	2.8
23.500	2.8	2.9	2.9	2.9	2.9
24.000	2.9	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 10 year

Return Event: 10 years
 Storm Event: 10 year

Time-Depth Curve: 10 year	
Label	10 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.6	0.6
8.000	0.6	0.6	0.6	0.6	0.6
8.500	0.6	0.7	0.7	0.7	0.7
9.000	0.7	0.8	0.8	0.8	0.8
9.500	0.8	0.9	0.9	0.9	0.9
10.000	1.0	1.0	1.0	1.0	1.1
10.500	1.1	1.1	1.2	1.2	1.2
11.000	1.3	1.3	1.3	1.4	1.4
11.500	1.5	1.6	1.7	1.9	2.1
12.000	2.5	3.0	3.2	3.3	3.5
12.500	3.6	3.6	3.7	3.7	3.8
13.000	3.8	3.8	3.9	3.9	3.9
13.500	4.0	4.0	4.0	4.1	4.1
14.000	4.1	4.1	4.2	4.2	4.2
14.500	4.2	4.2	4.3	4.3	4.3
15.000	4.3	4.3	4.4	4.4	4.4
15.500	4.4	4.4	4.4	4.5	4.5
16.000	4.5	4.5	4.5	4.5	4.5
16.500	4.5	4.6	4.6	4.6	4.6
17.000	4.6	4.6	4.6	4.6	4.6

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 10 year

Return Event: 10 years
 Storm Event: 10 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	4.7	4.7	4.7	4.7	4.7
18.000	4.7	4.7	4.7	4.7	4.7
18.500	4.7	4.7	4.8	4.8	4.8
19.000	4.8	4.8	4.8	4.8	4.8
19.500	4.8	4.8	4.8	4.8	4.8
20.000	4.8	4.8	4.9	4.9	4.9
20.500	4.9	4.9	4.9	4.9	4.9
21.000	4.9	4.9	4.9	4.9	4.9
21.500	4.9	4.9	4.9	5.0	5.0
22.000	5.0	5.0	5.0	5.0	5.0
22.500	5.0	5.0	5.0	5.0	5.0
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.1	5.1
24.000	5.1	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 100 year

Return Event: 100 years
 Storm Event: 100 year

Time-Depth Curve: 100 year	
Label	100 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.2	0.2	0.2	0.2	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.3	0.3	0.3
3.500	0.3	0.3	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.4	0.4
4.500	0.4	0.4	0.4	0.4	0.4
5.000	0.4	0.4	0.5	0.5	0.5
5.500	0.5	0.5	0.5	0.5	0.5
6.000	0.5	0.6	0.6	0.6	0.6
6.500	0.6	0.6	0.6	0.7	0.7
7.000	0.7	0.7	0.7	0.7	0.8
7.500	0.8	0.8	0.8	0.8	0.9
8.000	0.9	0.9	0.9	0.9	1.0
8.500	1.0	1.0	1.0	1.1	1.1
9.000	1.1	1.1	1.2	1.2	1.2
9.500	1.3	1.3	1.3	1.4	1.4
10.000	1.4	1.5	1.5	1.6	1.6
10.500	1.7	1.7	1.7	1.8	1.9
11.000	1.9	2.0	2.0	2.1	2.2
11.500	2.3	2.4	2.6	2.8	3.2
12.000	3.8	4.5	4.8	5.0	5.2
12.500	5.4	5.4	5.5	5.6	5.7
13.000	5.7	5.8	5.8	5.9	5.9
13.500	6.0	6.0	6.1	6.1	6.1
14.000	6.2	6.2	6.3	6.3	6.3
14.500	6.4	6.4	6.4	6.5	6.5
15.000	6.5	6.5	6.6	6.6	6.6
15.500	6.7	6.7	6.7	6.7	6.7
16.000	6.8	6.8	6.8	6.8	6.8
16.500	6.9	6.9	6.9	6.9	6.9
17.000	6.9	7.0	7.0	7.0	7.0

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 100 year

Return Event: 100 years
 Storm Event: 100 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	7.0	7.0	7.0	7.1	7.1
18.000	7.1	7.1	7.1	7.1	7.1
18.500	7.1	7.2	7.2	7.2	7.2
19.000	7.2	7.2	7.2	7.2	7.2
19.500	7.3	7.3	7.3	7.3	7.3
20.000	7.3	7.3	7.3	7.3	7.3
20.500	7.4	7.4	7.4	7.4	7.4
21.000	7.4	7.4	7.4	7.4	7.4
21.500	7.4	7.4	7.5	7.5	7.5
22.000	7.5	7.5	7.5	7.5	7.5
22.500	7.5	7.5	7.5	7.5	7.6
23.000	7.6	7.6	7.6	7.6	7.6
23.500	7.6	7.6	7.6	7.6	7.6
24.000	7.6	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 2 year

Return Event: 2 years
 Storm Event: 2 year

Time-Depth Curve: 2 year	
Label	2 year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.5	0.5	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.6
9.500	0.6	0.6	0.6	0.6	0.6
10.000	0.7	0.7	0.7	0.7	0.7
10.500	0.7	0.8	0.8	0.8	0.8
11.000	0.9	0.9	0.9	1.0	1.0
11.500	1.0	1.1	1.2	1.3	1.4
12.000	1.7	2.0	2.2	2.3	2.4
12.500	2.4	2.5	2.5	2.5	2.6
13.000	2.6	2.6	2.6	2.7	2.7
13.500	2.7	2.7	2.8	2.8	2.8
14.000	2.8	2.8	2.8	2.9	2.9
14.500	2.9	2.9	2.9	2.9	2.9
15.000	3.0	3.0	3.0	3.0	3.0
15.500	3.0	3.0	3.0	3.0	3.1
16.000	3.1	3.1	3.1	3.1	3.1
16.500	3.1	3.1	3.1	3.1	3.1
17.000	3.1	3.2	3.2	3.2	3.2

Subsection: Time-Depth Curve
 Label: MyStorms
 Scenario: Post-Development 2 year

Return Event: 2 years
 Storm Event: 2 year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	3.2	3.2	3.2	3.2	3.2
18.000	3.2	3.2	3.2	3.2	3.2
18.500	3.2	3.2	3.2	3.3	3.3
19.000	3.3	3.3	3.3	3.3	3.3
19.500	3.3	3.3	3.3	3.3	3.3
20.000	3.3	3.3	3.3	3.3	3.3
20.500	3.3	3.3	3.3	3.3	3.4
21.000	3.4	3.4	3.4	3.4	3.4
21.500	3.4	3.4	3.4	3.4	3.4
22.000	3.4	3.4	3.4	3.4	3.4
22.500	3.4	3.4	3.4	3.4	3.4
23.000	3.4	3.4	3.4	3.4	3.4
23.500	3.4	3.4	3.5	3.5	3.5
24.000	3.5	(N/A)	(N/A)	(N/A)	(N/A)

Appendix 3: Peak Flow Analysis

- ◆ Existing Drainage Area Map
- ◆ Existing Cn Calculations
- ◆ Existing Tc Calculations
- ◆ PONDPACK Existing Routing Schematic
- ◆ Existing PONDPACK Input Data
- ◆ Existing Peak Flow PONDPACK Results
- ◆ Proposed Drainage Area Map
- ◆ Proposed Cn Calculations
- ◆ Proposed Tc Calculations
- ◆ PONDPACK Proposed Routing Schematic
- ◆ Proposed PONDPACK Input Data
- ◆ Proposed Peak Flow PONDPACK Results
- ◆ BentleyFlowMaster Outputs for POA 3 and POA 4 – Normal Depths

LEGEND

- DRAINAGE AREA - EXISTING
- SHEET FLOW
- SHALLOW FLOW
- CHANNEL FLOW

DA POA #3
4.00 ACRES
CN: 71
TC: 0.19 HR

DA POA #1
90.39 ACRES
CN: 76
Tc: 0.44 hr

POA 3

POA 4

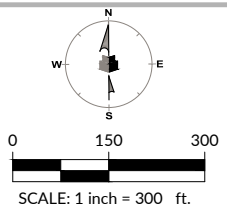
DA POA #4
2.51 ACRES
CN: 66
TC: 0.55 HR

POA 1

POA 2

DA POA #2
35.52 ACRES
CN: 67
Tc: 0.44 hr

INITIAL PLAN DATE: 05/01/2024
REVISIONS:



Preliminary
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1321 Rolesville Road Rolesville, NC 27587



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WR Job No. 23-0045 DATE 05/01/2024
DRN: EMM DGN: BJM CKD: WR

EXISTING DRAINAGE MAP

1

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Broadmoor - Rolesville, NC

Summary of Hydrology Inputs Per Sub-Drainage Area Area

Existing Conditions

ONSITE / OFFSITE	LAND USE	HSG	CN	% Total Imp	Total Imp Area	AREA (SF)	AREA (ACRE)
Drainage Area to POA #1							
Offsite	Building	B	98	100%	9,634	9,634	0.22
Onsite	Building	B	98	100%	3,060	3,060	0.07
Offsite	Building	D	98	100%	6,435	6,435	0.15
Offsite	Open Space	B	61	---	---	441,877	10.14
Onsite	Open Space	B	61	---	---	1,054,512	24.21
Offsite	Open Space	C	74	---	---	1,854	0.04
Onsite	Open Space	C	74	---	---	364,888	8.38
Offsite	Open Space	D	80	---	---	112,500	2.58
Onsite	Open Space	D	80	---	---	501,569	11.51
Onsite	Water	B	98	---	---	6	0.00
Onsite	Water	D	98	---	---	16,047	0.37
Onsite	Wetlands	B	98	-	---	52	0.00
Onsite	Wetlands	C	98	-	---	40,311	0.93
Onsite	Wetlands	D	98	-	---	862,326	19.80
Offsite	Woods	B	55	---	---	8,710	0.20
Onsite	Woods	B	55	---	---	48,419	1.11
Onsite	Woods	C	70	---	---	77,685	1.78
Offsite	Woods	D	77	---	---	56,878	1.31
Onsite	Woods	D	77	---	---	330,750	7.59
Total Onsite Impervious Area:						3,060	0.07
Total Onsite Area:						3,299,625	75.75
Total Sub-Drainage Area Basin Area:						3,937,513	90.39
Total Impervious Area:						19,129	0.44
Cumulative Curve Number (CN):						76	
Drainage Area to POA #2							
Offsite	Building	B	98	100%	3,510	3,510	0.08
Offsite	Open Space	B	61	---	---	319,000	7.32
Onsite	Open Space	B	61	---	---	802,250	18.42
Onsite	Open Space	D	80	---	---	189,586	4.35
Offsite	Roadway	B	98	100%	7,859	7,859	0.18
Onsite	Water	B	98	---	---	668	0.02
Onsite	Water	D	98	---	---	107,060	2.46
Onsite	Wetlands	D	98	-	---	36,932	0.85
Offsite	Woods	B	55	---	---	1,122	0.03
Onsite	Woods	B	55	---	---	61,297	1.41
Onsite	Woods	D	77	---	---	18,062	0.41
Total Onsite Impervious Area:						---	---
Total Onsite Area:						1,215,855	27.91
Total Sub-Drainage Area Basin Area:						1,547,346	35.52
Total Impervious Area:						11,369	0.26
Cumulative Curve Number (CN):						67	

Broadmoor - Rolesville, NC

Summary of Hydrology Inputs Per Sub-Drainage Area Area

Existing Conditions

ONSITE / OFFSITE	LAND USE	HSG	CN	% Total Imp	Total Imp Area	AREA (SF)	AREA (ACRE)
Drainage Area to POA #3							
Offsite	Building	B	98	100%	3,486	3,486	0.08
Onsite	Building	B	98	100%	47	47	0.00
Offsite	Building	C	98	100%	907	907	0.02
Offsite	Open Space	B	61	---	---	37,787	0.87
Onsite	Open Space	B	61	---	---	30,082	0.69
Offsite	Open Space	C	74	---	---	60,425	1.39
Onsite	Open Space	C	74	---	---	28,980	0.67
Offsite	Roadway	B	98	100%	5,622	5,622	0.13
Offsite	Roadway	C	98	100%	6,996	6,996	0.16
Total Onsite Impervious Area:						47	0.00
Total Onsite Area:						59,109	1.36
Total Sub-Drainage Area Basin Area:						174,332	4.00
Total Impervious Area:						17,058	0.39
Cumulative Curve Number (CN):						71	
Drainage Area to POA #4							
Offsite	Building	B	98	100%	2,313	2,313	0.05
Offsite	Open Space	B	61	---	---	69,614	1.60
Onsite	Open Space	B	61	---	---	23,363	0.54
Offsite	Roadway	B	98	100%	13,883	13,883	0.32
Total Onsite Impervious Area:						---	---
Total Onsite Area:						23,363	0.54
Total Sub-Drainage Area Basin Area:						109,173	2.51
Total Impervious Area:						16,196	0.37
Cumulative Curve Number (CN):						66	
Total Site Information							
Total Onsite Impervious Area:						3,060	0.07
Total Onsite Area:						4,597,952	105.55
Total Watershed Area:						5,768,364	132.42

Broadmoor - Rolesville, NC

Summary of Time of Concentration (T_c) Calculations Per Sub-Drainage Area

Existing Conditions

Sub-Drainage To POA1	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	100
Slope (ft/ft):	0.0313
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.189
Shallow Flow	
Length (ft):	860
Slope (ft/ft):	0.0235
Surface Cover:	Unpaved
T _t (hrs):	0.097
Channel Flow Sec 1	
Length (ft):	1445
Slope (ft/ft):	0.009
Manning's n-value:	0.035
Flow Area (ft ²):	15
Wetted Perimeter (ft):	30
T _t (hrs):	0.155
Total T_c = 0.441 hr	

Sub-Drainage To POA2	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	100
Slope (ft/ft):	0.015
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.254
Shallow Flow	
Length (ft):	769
Slope (ft/ft):	0.025
Surface Cover:	Unpaved
T _t (hrs):	0.084
Channel Flow Sec 1	
Length (ft):	888
Slope (ft/ft):	0.012
Manning's n-value:	0.035
Flow Area (ft ²):	8
Wetted Perimeter (ft):	21.5
T _t (hrs):	0.102
Total T_c = 0.440 hr	

Sub-Drainage To POA3	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	97
Slope (ft/ft):	0.038
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.171
Shallow Flow	
Length (ft):	200
Slope (ft/ft):	0.065
Surface Cover:	Unpaved
T _t (hrs):	0.013
Channel Flow Sec 1	
Length (ft):	64.5
Slope (ft/ft):	0.022
Manning's n-value:	0.035
Flow Area (ft ²):	1.6
Wetted Perimeter (ft):	7.6
T _t (hrs):	0.008
Total T_c = 0.192 hr	

Sub-Drainage To POA4	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	100
Slope (ft/ft):	0.013
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.272
Shallow Flow	
Length (ft):	250
Slope (ft/ft):	0.010
Surface Cover:	Unpaved
T _t (hrs):	0.043
Channel Flow Sec 1	
Length (ft):	624
Slope (ft/ft):	0.002
Manning's n-value:	0.035
Flow Area (ft ²):	1.2
Wetted Perimeter (ft):	4.3
T _t (hrs):	0.238
Total T_c = 0.553 hr	

Scenario: Pre-Development 1 year

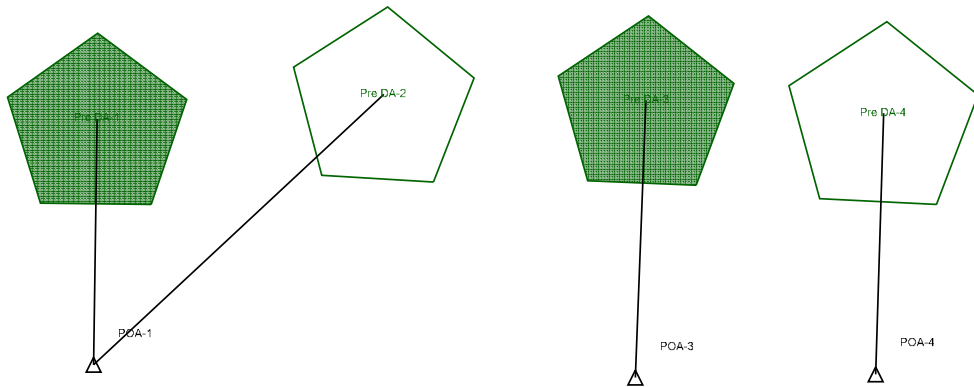


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Pre DA-1	Unit Hydrograph Summary, 1 years (Pre-Development 1 year)	1
Pre DA-2	Unit Hydrograph Summary, 1 years (Pre-Development 1 year)	3
Pre DA-3	Unit Hydrograph Summary, 1 years (Pre-Development 1 year)	5
Pre DA-4	Unit Hydrograph Summary, 1 years (Pre-Development 1 year)	7

Subsection: Unit Hydrograph Summary
 Label: Pre DA-1
 Scenario: Pre-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.441 hours
Area (User Defined)	3,937,513.000 ft ²
Computational Time Increment	0.059 hours
Time to Peak (Computed)	12.348 hours
Flow (Peak, Computed)	54.53 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.350 hours
Flow (Peak Interpolated Output)	54.49 ft ³ /s
Drainage Area	
SCS CN (Composite)	76.000
Area (User Defined)	3,937,513.000 ft ²
Maximum Retention (Pervious)	3.2 in
Maximum Retention (Pervious, 20 percent)	0.6 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.9 in
Runoff Volume (Pervious)	6.945 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	6.901 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.441 hours
Computational Time Increment	0.059 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	232.24 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Pre DA-1
Scenario: Pre-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.294 hours
Unit receding limb, T_r	1.176 hours
Total unit time, T_b	1.470 hours

Subsection: Unit Hydrograph Summary
 Label: Pre DA-2
 Scenario: Pre-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.440 hours
Area (User Defined)	1,547,346.000 ft ²
Computational Time Increment	0.059 hours
Time to Peak (Computed)	12.437 hours
Flow (Peak, Computed)	9.96 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.400 hours
Flow (Peak Interpolated Output)	9.95 ft ³ /s
Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	1,547,346.000 ft ²
Maximum Retention (Pervious)	4.9 in
Maximum Retention (Pervious, 20 percent)	1.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.5 in
Runoff Volume (Pervious)	1.530 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.518 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.440 hours
Computational Time Increment	0.059 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	91.47 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Pre DA-2
Scenario: Pre-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.293 hours
Unit receding limb, T_r	1.173 hours
Total unit time, T_b	1.467 hours

Subsection: Unit Hydrograph Summary
 Label: Pre DA-3
 Scenario: Pre-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.192 hours
Area (User Defined)	174,332.000 ft ²
<hr/>	
Computational Time Increment	0.026 hours
Time to Peak (Computed)	12.186 hours
Flow (Peak, Computed)	2.21 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	2.17 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	71.000
Area (User Defined)	174,332.000 ft ²
Maximum Retention (Pervious)	4.1 in
Maximum Retention (Pervious, 20 percent)	0.8 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.7 in
Runoff Volume (Pervious)	0.227 ac-ft
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.226 ac-ft
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.192 hours
Computational Time Increment	0.026 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	23.62 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Pre DA-3
Scenario: Pre-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.128 hours
Unit receding limb, T_r	0.512 hours
Total unit time, T_b	0.640 hours

Subsection: Unit Hydrograph Summary
 Label: Pre DA-4
 Scenario: Pre-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.553 hours
Area (User Defined)	109,173.000 ft ²
Computational Time Increment	0.074 hours
Time to Peak (Computed)	12.535 hours
Flow (Peak, Computed)	0.57 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.500 hours
Flow (Peak Interpolated Output)	0.57 ft ³ /s
Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	109,173.000 ft ²
Maximum Retention (Pervious)	5.2 in
Maximum Retention (Pervious, 20 percent)	1.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.5 in
Runoff Volume (Pervious)	0.100 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.099 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.553 hours
Computational Time Increment	0.074 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	5.14 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Pre DA-4
Scenario: Pre-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.369 hours
Unit receding limb, T_r	1.475 hours
Total unit time, T_b	1.843 hours

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
Pre DA-1	Pre-Development 1 year	1	6.901	12.350	54.49
Pre DA-1	Pre-Development 2 year	2	10.008	12.350	81.20
Pre DA-1	Pre-Development 10 year	10	19.375	12.300	160.38
Pre DA-2	Pre-Development 1 year	1	1.518	12.400	9.95
Pre DA-2	Pre-Development 2 year	2	2.433	12.400	17.69
Pre DA-2	Pre-Development 10 year	10	5.430	12.350	43.57
Pre DA-3	Pre-Development 1 year	1	0.226	12.200	2.17
Pre DA-3	Pre-Development 2 year	2	0.345	12.150	3.54
Pre DA-3	Pre-Development 10 year	10	0.719	12.150	7.82
Pre DA-4	Pre-Development 1 year	1	0.099	12.500	0.57
Pre DA-4	Pre-Development 2 year	2	0.161	12.450	1.05
Pre DA-4	Pre-Development 10 year	10	0.367	12.450	2.65

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
POA-1	Pre-Development 1 year	1	8.419	12.350	64.18
POA-1	Pre-Development 2 year	2	12.441	12.350	98.88
POA-1	Pre-Development 10 year	10	24.804	12.350	203.60
POA-3	Pre-Development 1 year	1	0.226	12.200	2.17
POA-3	Pre-Development 2 year	2	0.345	12.150	3.54
POA-3	Pre-Development 10 year	10	0.719	12.150	7.82
POA-4	Pre-Development 1 year	1	0.099	12.500	0.57
POA-4	Pre-Development 2 year	2	0.161	12.450	1.05

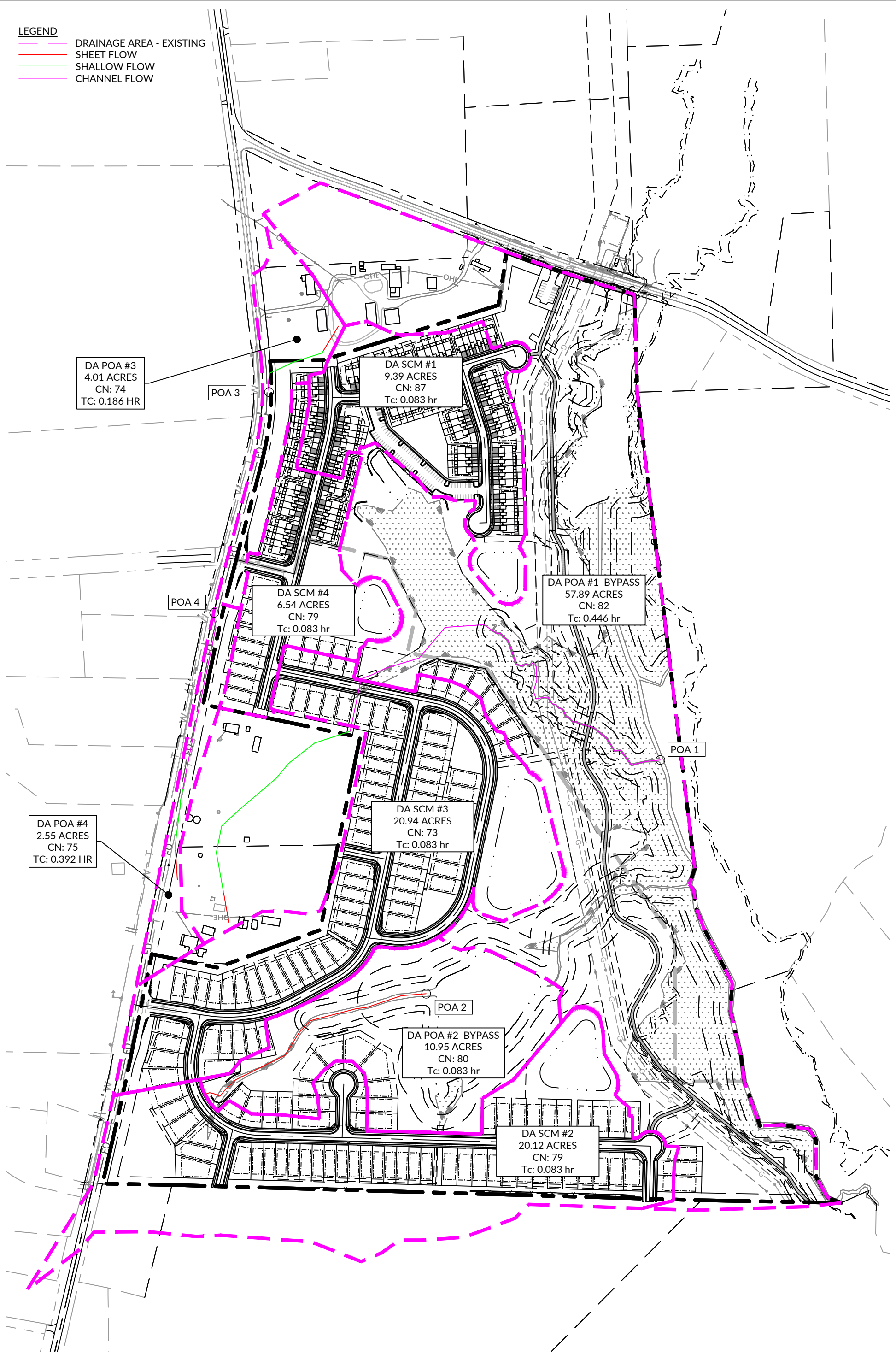
Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
POA-4	Pre-Development 10 year	10	0.367	12.450	2.65

LEGEND

- DRAINAGE AREA - EXISTING
- SHEET FLOW
- SHALLOW FLOW
- CHANNEL FLOW



DA POA #3
4.01 ACRES
CN: 74
Tc: 0.186 HR

POA 3

DA SCM #1
9.39 ACRES
CN: 87
Tc: 0.083 hr

DA SCM #4
6.54 ACRES
CN: 79
Tc: 0.083 hr

POA 4

DA POA #1 BYPASS
57.89 ACRES
CN: 82
Tc: 0.446 hr

POA 1

DA POA #4
2.55 ACRES
CN: 75
Tc: 0.392 HR

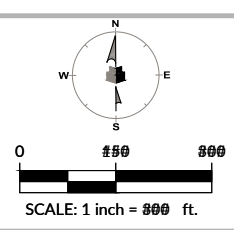
DA SCM #3
20.94 ACRES
CN: 73
Tc: 0.083 hr

POA 2

DA POA #2 BYPASS
10.95 ACRES
CN: 80
Tc: 0.083 hr

DA SCM #2
20.12 ACRES
CN: 79
Tc: 0.083 hr

INITIAL PLAN DATE: 05/01/2024
REVISIONS:



Preliminary
Broadmoor

1321 Rolesville Road Rolesville, NC 27587



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WR Job No. 23-0045 DATE 05/01/2024
DRN: EMM DGN: BJM CKD: WR

PROPOSED DRAINAGE MAP

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Broadmoor - Rolesville, NC

Summary of Hydrology Inputs Per Sub-Drainage Area Area

Proposed Conditions

AREA OF INTEREST	LAND USE	HSG	CN	% Total Imp	Total Imp Area	Disconnected Imp Area	AREA (SF)	AREA (OnsiteE)
Drainage Area to POA 1								
Bypass 1								
Offsite	Building	B	98	100%	9,446		9,446	0.22
Offsite	Building	D	98	100%	6,435		6,435	0.15
Offsite	Open Space	B	61	---	---		424,099	9.74
Offsite	Open Space	C	74	---	---		1,447	0.03
Offsite	Open Space	D	80	---	---		169,332	3.89
Offsite	Roadway	B	98	100%	26		26	0.00
Offsite	Sidewalk	B	98	100%	74		74	0.00
Offsite	Sidewalk	C	98	100%	18		18	0.00
Offsite	Sidewalk	D	98	100%	41		41	0.00
Onsite	Open Space	B	61	---	---		135,234	3.10
Onsite	Open Space	C	74	---	---		208,298	4.78
Onsite	Open Space	D	80	---	---		302,176	6.94
Onsite	Parking Lot	B	98	100%	5,745		5,745	0.13
Onsite	Parking Lot	D	98	100%	57		57	0.00
Onsite	Roadway	B	98	100%	229		229	0.01
Onsite	SF-LARGE	B	78	44%	5,314		12,077	0.28
Onsite	SF-LARGE	C	85	44%	1,958		4,451	0.10
Onsite	SF-SMALL	B	79	46%	671		1,458	0.03
Onsite	SF-SMALL	C	86	46%	3,112		6,766	0.16
Onsite	SF-SMALL	D	89	46%	15,149		32,933	0.76
Onsite	Sidewalk	B	98	100%	1,572		1,572	0.04
Onsite	Sidewalk	C	98	100%	920		920	0.02
Onsite	Sidewalk	D	98	100%	642		642	0.01
Onsite	Townhomes	B	86	66%	3,947		5,980	0.14
Onsite	Townhomes	D	92	66%	620		940	0.02
Onsite	Water	B	98	---	---		6	0.00
Onsite	Water	D	98	---	---		16,047	0.37
Onsite	Wetlands	B	98	-	---		52	0.00
Onsite	Wetlands	C	98	-	---		39,784	0.91
Onsite	Wetlands	D	98	-	---		860,911	19.76
Onsite	Woods	B	55	---	---		15,618	0.36
Onsite	Woods	C	70	---	---		65,320	1.50
Onsite	Woods	D	77	---	---		193,379	4.44
Total Onsite Impervious Area:							39,937	0.92
Total Onsite Area:							1,910,595	43.86
Total Sub-Drainage Area Basin Area:							2,521,513	57.89
Total Impervious Area:							55,977	1.29
Cumulative Curve Number (CN):							82	
CNp:							82	
Disconnected Impervious Area:							0	0.00
Disconnected Impervious Area % of Total Area:							0%	
Adjusted Cumulative Curve Number (CN):							82	

Broadmoor - Rolesville, NC

Summary of Hydrology Inputs Per Sub-Drainage Area Area

Proposed Conditions

AREA OF INTEREST	LAND USE	HSG	CN	% Total Imp	Total Imp Area	Disconnected Imp Area	AREA (SF)	AREA (OnsiteE)
SCM 1								
Offsite	Building	B	98	100%	164		164	0.00
Offsite	Open Space	B	61	---	---		13,759	0.32
Onsite	Open Space	B	61	---	---		22,104	0.51
Onsite	Open Space	D	80	---	---		35,394	0.81
Onsite	Parking Lot	B	98	100%	1,451		1,451	0.03
Onsite	Parking Lot	D	98	100%	28,784		28,784	0.66
Onsite	Roadway	B	98	100%	32,462		32,462	0.75
Onsite	Roadway	D	98	100%	18,368		18,368	0.42
Onsite	Sidewalk	B	98	100%	9,972		9,972	0.23
Onsite	Sidewalk	D	98	100%	5,832		5,832	0.13
Onsite	Townhomes	B	86	66%	79,875		121,023	2.78
Onsite	Townhomes	C	90	66%	145		219	0.01
Onsite	Townhomes	D	92	66%	57,068		86,467	1.99
Onsite	Woods	D	77	---	---		33,202	0.76
Total Onsite Impervious Area:							233,957	5.37
Total Onsite Area:							395,278	9.07
Total Sub-Drainage Area Basin Area:							409,201	9.39
Total Impervious Area:							234,121	5.37
Cumulative Curve Number (CN):							87	
CNp:							72	
Disconnected Impervious Area:							0	0.00
Disconnected Impervious Area % of Total Area:							0%	
Adjusted Cumulative Curve Number (CN):							87	
SCM 2								
Offsite	Building	B	98	100%	3,510		3,510	0.08
Offsite	Open Space	B	61	---	---		43,653	1.00
Offsite	Roadway	B	98	100%	9,673		9,673	0.22
Onsite	Open Space	B	61	---	---		162,635	3.73
Onsite	Open Space	C	74	---	---		60,346	1.39
Onsite	Open Space	D	80	---	---		6,070	0.14
Onsite	Roadway	B	98	100%	83,753		83,753	1.92
Onsite	Roadway	C	98	100%	12,442		12,442	0.29
Onsite	Roadway	D	98	100%	7,520		7,520	0.17
Onsite	SF-LARGE	B	78	44%	52,462		119,232	2.74
Onsite	SF-LARGE	D	88	44%	7,053		16,029	0.37
Onsite	SF-SMALL	B	79	46%	123,151		267,720	6.15
Onsite	SF-SMALL	C	86	46%	7,343		15,963	0.37
Onsite	SF-SMALL	D	89	46%	14,569		31,671	0.73
Onsite	Sidewalk	B	98	100%	28,964		28,964	0.66
Onsite	Sidewalk	C	98	100%	4,334		4,334	0.10
Onsite	Sidewalk	D	98	100%	2,932		2,932	0.07
Onsite	Wetlands	D	98	-	---		14	0.00
Total Onsite Impervious Area:							344,523	7.91
Total Onsite Area:							819,625	18.82
Total Sub-Drainage Area Basin Area:							876,461	20.12
Total Impervious Area:							357,706	8.21
Cumulative Curve Number (CN):							78	
CNp:							64	

Broadmoor - Rolesville, NC

Summary of Hydrology Inputs Per Sub-Drainage Area Area

Proposed Conditions

AREA OF INTEREST	LAND USE	HSG	CN	% Total Imp	Total Imp Area	Disconnected Imp Area	AREA (SF)	AREA (OnsiteE)
SCM 3								
Offsite	Open Space	B	61	---	---		278,518	6.39
Offsite	Roadway	B	98	100%	7,540		7,540	0.17
Offsite	Woods	B	55	---	---		1,122	0.03
Onsite	Open Space	B	61	---	---		132,863	3.05
Onsite	Open Space	C	74	---	---		15,397	0.35
Onsite	Open Space	D	80	---	---		6,936	0.16
Onsite	Roadway	B	98	100%	45,180		45,180	1.04
Onsite	Roadway	C	98	100%	9,426		9,426	0.22
Onsite	Roadway	D	98	100%	9,777		9,777	0.22
Onsite	SF-LARGE	B	78	44%	120,348		273,518	6.28
Onsite	SF-LARGE	C	85	44%	10,765		24,465	0.56
Onsite	SF-LARGE	D	88	44%	15,405		35,011	0.80
Onsite	Sidewalk	B	98	100%	16,654		16,654	0.38
Onsite	Sidewalk	C	98	100%	2,564		2,564	0.06
Onsite	Sidewalk	D	98	100%	3,691		3,691	0.08
Onsite	Wetlands	D	98	-	---		15	0.00
Onsite	Woods	B	55	---	---		37,229	0.85
Onsite	Woods	C	70	---	---		12,365	0.28
Total Onsite Impervious Area:							233,809	5.37
Total Onsite Area:							625,091	14.35
Total Sub-Drainage Area Basin Area:							912,271	20.94
Total Impervious Area:							241,349	5.54
Cumulative Curve Number (CN):							72	
CNp:							63	
Disconnected Impervious Area:							0	0.00
Disconnected Impervious Area % of Total Area:							0%	
Adjusted Cumulative Curve Number (CN):							72	
SCM 4								
Onsite	Open Space	B	61	---	---		96,961	2.23
Onsite	Open Space	C	74	---	---		115	0.00
Onsite	Open Space	D	80	---	---		6,112	0.14
Onsite	Roadway	B	98	100%	23,989		23,989	0.55
Onsite	Roadway	D	98	100%	5,143		5,143	0.12
Onsite	SF-SMALL	B	79	46%	30,734		66,812	1.53
Onsite	Sidewalk	B	98	100%	7,139		7,139	0.16
Onsite	Sidewalk	D	98	100%	1,900		1,900	0.04
Onsite	Townhomes	B	86	66%	25,908		39,254	0.90
Onsite	Townhomes	C	90	66%	1,508		2,285	0.05
Onsite	Townhomes	D	92	66%	23,221		35,183	0.81
Onsite	Wetlands	D	98	-	---		5	0.00
Onsite	Woods	D	77	---	---		15	0.00
Total Onsite Impervious Area:							119,541	2.74
Total Onsite Area:							284,913	6.54
Total Sub-Drainage Area Basin Area:							284,913	6.54
Total Impervious Area:							119,541	2.74
Cumulative Curve Number (CN):							78	

Broadmoor - Rolesville, NC

Summary of Hydrology Inputs Per Sub-Drainage Area Area

Proposed Conditions

AREA OF INTEREST	LAND USE	HSG	CN	% Total Imp	Total Imp Area	Disconnected Imp Area	AREA (SF)	AREA (OnsiteE)
Drainage Area to POA 2								
Bypass 2								
Onsite	Open Space	B	61	---	---		88,467	2.03
Onsite	Open Space	D	80	---	---		99,920	2.29
Onsite	SF-LARGE	B	78	44%	29,637		67,357	1.55
Onsite	SF-LARGE	D	88	44%	7,965		18,103	0.42
Onsite	Sidewalk	B	98	100%	157		157	0.00
Onsite	Sidewalk	D	98	100%	1		1	0.00
Onsite	Water	B	98	---	---		668	0.02
Onsite	Water	D	98	---	---		107,060	2.46
Onsite	Wetlands	D	98	-	---		36,025	0.83
Onsite	Woods	B	55	---	---		41,173	0.95
Onsite	Woods	D	77	---	---		18,062	0.41
Total Onsite Impervious Area:							37,760	0.87
Total Onsite Area:							476,993	10.95
Total Sub-Drainage Area Basin Area:							476,993	10.95
Total Impervious Area:							37,760	0.87
Cumulative Curve Number (CN):							80	
CNp:							78	
Disconnected Impervious Area:							0	0.00
Disconnected Impervious Area % of Total Area:							0%	
Adjusted Cumulative Curve Number (CN):							80	
Drainage Area to POA 3								
Bypass 3								
Offsite	Building	B	98	100%	3,486		3,486	0.08
Offsite	Building	C	98	100%	907		907	0.02
Offsite	Open Space	B	61	---	---		30,029	0.69
Offsite	Open Space	C	74	---	---		56,734	1.30
Offsite	Roadway	B	98	100%	13,169		13,169	0.30
Offsite	Roadway	C	98	100%	10,180		10,180	0.23
Onsite	Open Space	B	61	---	---		29,672	0.68
Onsite	Open Space	C	74	---	---		22,541	0.52
Onsite	Roadway	B	98	100%	1,535		1,535	0.04
Onsite	SF-SMALL	B	79	46%	29	29	64	0.00
Onsite	Sidewalk	B	98	100%	2,660		2,660	0.06
Onsite	Sidewalk	C	98	100%	1,575		1,575	0.04
Onsite	Townhomes	B	86	66%	55	55	83	0.00
Onsite	Townhomes	C	90	66%	1,482	1,482	2,245	0.05
Total Onsite Impervious Area:							7,336	0.17
Total Onsite Area:							60,375	1.39
Total Sub-Drainage Area Basin Area:							174,880	4.01
Total Impervious Area:							35,078	0.81
Cumulative Curve Number (CN):							74	
CNp:							68	
Disconnected Impervious Area:							1,566	0.04
Disconnected Impervious Area % of Total Area:							1%	
Adjusted Cumulative Curve Number (CN):							74	
Drainage Area to POA 4								
Bypass 4								
Offsite	Building	B	98	100%	2,313		2,313	0.05
Offsite	Open Space	B	61	---	---		47,258	1.08
Offsite	Roadway	B	98	100%	31,919		31,919	0.73
Offsite	Sidewalk	B	98	100%	4,321		4,321	0.10
Onsite	Open Space	B	61	---	---		19,588	0.45
Onsite	SF-SMALL	B	79	46%	1,547		3,364	0.08
Onsite	Sidewalk	B	98	100%	2,158		2,158	0.05
Total Onsite Impervious Area:							3,705	0.09
Total Onsite Area:							25,110	0.58
Total Sub-Drainage Area Basin Area:							110,921	2.55
Total Impervious Area:							42,258	0.97
Cumulative Curve Number (CN):							75	
CNp:							61	
Disconnected Impervious Area:							0	0.00
Disconnected Impervious Area % of Total Area:							0%	
Adjusted Cumulative Curve Number (CN):							75	
Total Site Information								
Total Onsite Impervious Area:							1,020,569	23.43
Total Onsite Area:							4,597,980	105.56
Total Watershed Area:							5,767,153	132.40

Broadmoor - Rolesville, NC

Summary of Time of Concentration (T_c) Calculations Per Sub-Drainage Area

Proposed Conditions

Sub-Drainage SCM #1 to POA 1	
User Defined T _c (hours)	0.0833

Sub-Drainage SCM #2 to POA 1	
User Defined T _c (hours)	0.0833

Sub-Drainage SCM #3 to POA 1	
User Defined T _c (hours)	0.0833

Sub-Drainage SCM #4 to POA 1	
User Defined T _c (hours)	0.0833

Sub-Drainage From Bypass To POA 1	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	100
Slope (ft/ft):	0.0313
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.189
Shallow Flow	
Length (ft):	783
Slope (ft/ft):	0.0249
Surface Cover:	Unpaved
T _t (hrs):	0.085
Channel Flow	
Length (ft):	1571
Slope (ft/ft):	0.009
Manning's n-value:	0.035
Flow Area (ft ²):	15
Wetted Perimeter (ft):	30
T _t (hrs):	0.171
Total T_c =	0.446 hr

Sub-Drainage Lake to POA 2	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	16.55
Slope (ft/ft):	0.298489426
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.018
Shallow Flow	
Length (ft):	37
Slope (ft/ft):	0.067
Surface Cover:	Unpaved
T _t (hrs):	0.002
Channel Flow	
Length (ft):	315
Slope (ft/ft):	0.029
Manning's n-value:	0.035
Flow Area (ft ²):	8
Wetted Perimeter (ft):	21.5
T _t (hrs):	0.024
Total T_c =	0.083 hr

Sub-Drainage to POA 3	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	97
Slope (ft/ft):	0.038
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.171
Shallow Flow	
Length (ft):	200
Slope (ft/ft):	0.051
Surface Cover:	Unpaved
T _t (hrs):	0.015
Channel Flow	
Length (ft):	64.5
Slope (ft/ft):	51.171
Manning's n-value:	0.013
Flow Area (ft ²):	1.6
Wetted Perimeter (ft):	7.6
T _t (hrs):	0.000
Total T_c =	0.186 hr

Sub-Drainage to POA 4	
User Defined T _c (hours)	
AND/OR	
Sheet Flow	
Length (ft):	100
Slope (ft/ft):	0.0095
Surface Cover:	Grass - Dense
Manning's n-value:	0.24
T _t (hrs):	0.304993258
Shallow Flow	
Length (ft):	209
Slope (ft/ft):	0.004
Surface Cover:	Paved
T _t (hrs):	0.043
Channel Flow	
Length (ft):	610
Slope (ft/ft):	0.004786885
Manning's n-value:	0.012
Flow Area (ft ²):	4.5
Wetted Perimeter (ft):	15
T _t (hrs):	0.044
Total T_c =	0.392 hr

Scenario: Post-Development 10 year

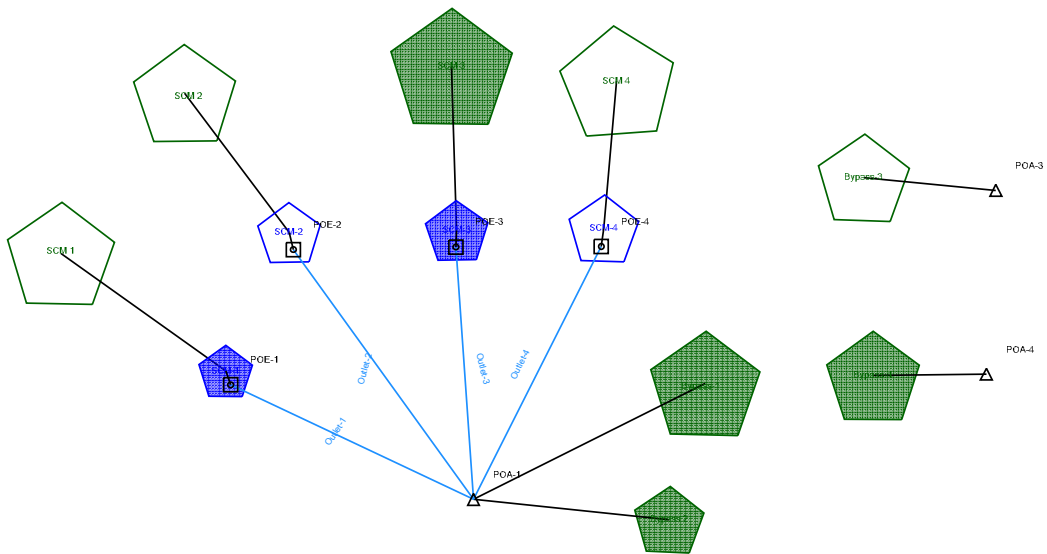


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Subsection: Unit Hydrograph Summary
 Label: Bypass 2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	476,993.000 ft ²

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.111 hours
Flow (Peak, Computed)	13.13 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	13.02 ft ³ /s

Drainage Area	
SCS CN (Composite)	80.000
Area (User Defined)	476,993.000 ft ²
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.1 in
Runoff Volume (Pervious)	1.046 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.045 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	148.89 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Bypass 2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.056 hours
Unit receding limb, T_r	0.222 hours
Total unit time, T_b	0.278 hours

Subsection: Unit Hydrograph Summary
 Label: Bypass-1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.446 hours
Area (User Defined)	2,157,439.000 ft ²
Computational Time Increment	0.059 hours
Time to Peak (Computed)	12.310 hours
Flow (Peak, Computed)	42.76 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.350 hours
Flow (Peak Interpolated Output)	42.51 ft ³ /s
Drainage Area	
SCS CN (Composite)	82.000
Area (User Defined)	2,157,439.000 ft ²
Maximum Retention (Pervious)	2.2 in
Maximum Retention (Pervious, 20 percent)	0.4 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.3 in
Runoff Volume (Pervious)	5.241 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	5.213 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.446 hours
Computational Time Increment	0.059 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	125.82 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Bypass-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.297 hours
Unit receding limb, T_r	1.189 hours
Total unit time, T_b	1.487 hours

Subsection: Unit Hydrograph Summary
 Label: Bypass-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.186 hours
Area (User Defined)	174,880.000 ft ²
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Computational Time Increment	0.025 hours
Time to Peak (Computed)	12.152 hours
Flow (Peak, Computed)	2.84 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.150 hours
Flow (Peak Interpolated Output)	2.83 ft ³ /s
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Drainage Area	
SCS CN (Composite)	74.000
Area (User Defined)	174,880.000 ft ²
Maximum Retention (Pervious)	3.5 in
Maximum Retention (Pervious, 20 percent)	0.7 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	0.275 ac-ft
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.274 ac-ft
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SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.186 hours
Computational Time Increment	0.025 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	24.46 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Bypass-3
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.124 hours
Unit receding limb, T_r	0.496 hours
Total unit time, T_b	0.620 hours

Subsection: Unit Hydrograph Summary
 Label: Bypass-4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.392 hours
Area (User Defined)	110,921.000 ft ²

Computational Time Increment	0.052 hours
Time to Peak (Computed)	12.335 hours
Flow (Peak, Computed)	1.50 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.300 hours
Flow (Peak Interpolated Output)	1.49 ft ³ /s

Drainage Area	
SCS CN (Composite)	75.000
Area (User Defined)	110,921.000 ft ²
Maximum Retention (Pervious)	3.3 in
Maximum Retention (Pervious, 20 percent)	0.7 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.9 in
Runoff Volume (Pervious)	0.185 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.184 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.392 hours
Computational Time Increment	0.052 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	7.36 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: Bypass-4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.261 hours
Unit receding limb, T_r	1.045 hours
Total unit time, T_b	1.307 hours

Subsection: Unit Hydrograph Summary
 Label: SCM 1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	409,201.000 ft ²

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.111 hours
Flow (Peak, Computed)	15.78 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	15.75 ft ³ /s

Drainage Area	
SCS CN (Composite)	87.000
Area (User Defined)	409,201.000 ft ²
Maximum Retention (Pervious)	1.5 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.6 in
Runoff Volume (Pervious)	1.266 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.265 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	127.73 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: SCM 1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.056 hours
Unit receding limb, T_r	0.222 hours
Total unit time, T_b	0.278 hours

Subsection: Unit Hydrograph Summary
 Label: SCM 2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	876,461.000 ft ²

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.111 hours
Flow (Peak, Computed)	21.55 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	21.33 ft ³ /s

Drainage Area	
SCS CN (Composite)	78.000
Area (User Defined)	876,461.000 ft ²
Maximum Retention (Pervious)	2.8 in
Maximum Retention (Pervious, 20 percent)	0.6 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	1.727 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.725 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	273.57 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: SCM 2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.056 hours
Unit receding limb, T_r	0.222 hours
Total unit time, T_b	0.278 hours

Subsection: Unit Hydrograph Summary
 Label: SCM 3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	912,271.000 ft ²
<hr/>	
Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.122 hours
Flow (Peak, Computed)	15.06 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	14.76 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	72.000
Area (User Defined)	912,271.000 ft ²
Maximum Retention (Pervious)	3.9 in
Maximum Retention (Pervious, 20 percent)	0.8 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.7 in
Runoff Volume (Pervious)	1.267 ac-ft
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.265 ac-ft
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	284.75 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: SCM 3
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.056 hours
Unit receding limb, T_r	0.222 hours
Total unit time, T_b	0.278 hours

Subsection: Unit Hydrograph Summary
 Label: SCM 4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Storm Event	1 year
Return Event	1 years
Duration	24.000 hours
Depth	2.9 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	284,913.000 ft ²
<hr/>	
Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.111 hours
Flow (Peak, Computed)	7.01 ft ³ /s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	6.93 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	78.000
Area (User Defined)	284,913.000 ft ²
Maximum Retention (Pervious)	2.8 in
Maximum Retention (Pervious, 20 percent)	0.6 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	0.562 ac-ft
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.561 ac-ft
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	88.93 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: SCM 4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

SCS Unit Hydrograph Parameters	
Unit peak time, T_p	0.056 hours
Unit receding limb, T_r	0.222 hours
Total unit time, T_b	0.278 hours

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
SCM 3	Post-Development 1 year	1	1.265	12.100	14.76
SCM 3	Post-Development 2 year	2	1.908	12.100	23.23
SCM 3	Post-Development 10 year	10	3.912	12.100	48.98
SCM 3	Post-Development 100 year	100	7.622	12.100	94.82
SCM 2	Post-Development 1 year	1	1.725	12.100	21.33
SCM 2	Post-Development 2 year	2	2.457	12.100	30.71
SCM 2	Post-Development 10 year	10	4.628	12.100	57.76
SCM 2	Post-Development 100 year	100	8.460	12.100	103.44
Bypass 2	Post-Development 1 year	1	1.045	12.100	13.02
Bypass 2	Post-Development 2 year	2	1.463	12.100	18.32
Bypass 2	Post-Development 10 year	10	2.685	12.100	33.36
Bypass 2	Post-Development 100 year	100	4.813	12.100	58.37
SCM 1	Post-Development 1 year	1	1.265	12.100	15.75
SCM 1	Post-Development 2 year	2	1.679	12.100	20.72
SCM 1	Post-Development 10 year	10	2.835	12.100	34.12
SCM 1	Post-Development 100 year	100	4.764	12.100	55.54
Bypass-1	Post-Development 1 year	1	5.213	12.350	42.51
Bypass-1	Post-Development 2 year	2	7.186	12.300	59.12
Bypass-1	Post-Development 10 year	10	12.873	12.300	106.28
Bypass-1	Post-Development 100 year	100	22.648	12.300	184.43
Bypass-3	Post-Development 1 year	1	0.274	12.150	2.83
Bypass-3	Post-Development 2 year	2	0.405	12.150	4.36
Bypass-3	Post-Development 10 year	10	0.805	12.150	8.95
Bypass-3	Post-Development 100 year	100	1.535	12.150	17.05

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
Bypass-4	Post-Development 1 year	1	0.184	12.300	1.49
Bypass-4	Post-Development 2 year	2	0.269	12.300	2.26
Bypass-4	Post-Development 10 year	10	0.528	12.300	4.57
Bypass-4	Post-Development 100 year	100	0.995	12.300	8.60
SCM 4	Post-Development 1 year	1	0.561	12.100	6.93
SCM 4	Post-Development 2 year	2	0.799	12.100	9.98
SCM 4	Post-Development 10 year	10	1.504	12.100	18.78
SCM 4	Post-Development 100 year	100	2.750	12.100	33.63

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
POA-1	Post-Development 1 year	1	7.868	12.300	49.55
POA-1	Post-Development 2 year	2	11.498	12.300	69.31
POA-1	Post-Development 10 year	10	23.851	12.300	130.94
POA-1	Post-Development 100 year	100	45.346	12.300	254.76
POA-3	Post-Development 1 year	1	0.274	12.150	2.83
POA-3	Post-Development 2 year	2	0.405	12.150	4.36
POA-3	Post-Development 10 year	10	0.805	12.150	8.95
POA-3	Post-Development 100 year	100	1.535	12.150	17.05
POA-4	Post-Development 1 year	1	0.184	12.300	1.49
POA-4	Post-Development 2 year	2	0.269	12.300	2.26
POA-4	Post-Development 10 year	10	0.528	12.300	4.57
POA-4	Post-Development 100 year	100	0.995	12.300	8.60

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
SCM-3 (IN)	Post-Development 1 year	1	1.265	12.100	14.76	(N/A)	(N/A)
SCM-3 (OUT)	Post-Development 1 year	1	0.264	24.000	0.29	357.72	1.001
SCM-3 (IN)	Post-Development 2 year	2	1.908	12.100	23.23	(N/A)	(N/A)
SCM-3 (OUT)	Post-Development 2 year	2	0.611	17.550	0.84	358.15	1.369
SCM-3 (IN)	Post-Development 10 year	10	3.912	12.100	48.98	(N/A)	(N/A)
SCM-3 (OUT)	Post-Development 10 year	10	2.467	14.000	3.80	359.00	2.147
SCM-3 (IN)	Post-Development 100 year	100	7.622	12.100	94.82	(N/A)	(N/A)
SCM-3 (OUT)	Post-Development 100 year	100	5.829	13.350	8.61	361.03	4.165
SCM-2 (IN)	Post-Development 1 year	1	1.725	12.100	21.33	(N/A)	(N/A)
SCM-2 (OUT)	Post-Development 1 year	1	0.798	15.950	1.03	358.20	1.105
SCM-2 (IN)	Post-Development 2 year	2	2.457	12.100	30.71	(N/A)	(N/A)
SCM-2 (OUT)	Post-Development 2 year	2	1.403	15.100	1.83	358.42	1.458
SCM-2 (IN)	Post-Development 10 year	10	4.628	12.100	57.76	(N/A)	(N/A)
SCM-2 (OUT)	Post-Development 10 year	10	3.188	13.900	4.32	359.12	2.631
SCM-2 (IN)	Post-Development 100 year	100	8.460	12.100	103.44	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
SCM-2 (OUT)	Post-Development 100 year	100	6.324	12.800	13.14	360.28	4.628
SCM-1 (IN)	Post-Development 1 year	1	1.265	12.100	15.75	(N/A)	(N/A)
SCM-1 (OUT)	Post-Development 1 year	1	0.316	19.600	0.32	360.16	0.971
SCM-1 (IN)	Post-Development 2 year	2	1.679	12.100	20.72	(N/A)	(N/A)
SCM-1 (OUT)	Post-Development 2 year	2	0.370	20.450	0.37	361.00	1.325
SCM-1 (IN)	Post-Development 10 year	10	2.835	12.100	34.12	(N/A)	(N/A)
SCM-1 (OUT)	Post-Development 10 year	10	1.476	13.800	2.43	361.95	1.761
SCM-1 (IN)	Post-Development 100 year	100	4.764	12.100	55.54	(N/A)	(N/A)
SCM-1 (OUT)	Post-Development 100 year	100	3.343	12.300	24.19	363.07	2.317
SCM-4 (IN)	Post-Development 1 year	1	0.561	12.100	6.93	(N/A)	(N/A)
SCM-4 (OUT)	Post-Development 1 year	1	0.233	15.350	0.41	363.58	0.356
SCM-4 (IN)	Post-Development 2 year	2	0.799	12.100	9.98	(N/A)	(N/A)
SCM-4 (OUT)	Post-Development 2 year	2	0.467	13.450	0.98	363.75	0.414
SCM-4 (IN)	Post-Development 10 year	10	1.504	12.100	18.78	(N/A)	(N/A)
SCM-4 (OUT)	Post-Development 10 year	10	1.161	12.550	3.67	364.52	0.700

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
SCM-4 (IN)	Post-Development 100 year	100	2.750	12.100	33.63	(N/A)	(N/A)
SCM-4 (OUT)	Post-Development 100 year	100	2.389	12.550	6.98	365.96	1.279

Flow Master Outputs for POA 3 - Normal Depths

POA 3 - 10 Year - Pre

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.018
Channel Slope	0.033 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	7.000 H:V
Bottom Width	5.00 ft
Discharge	7.35 cfs

Results	
Normal Depth	2.8 in
Flow Area	1.5 ft ²
Wetted Perimeter	7.4 ft
Hydraulic Radius	2.4 in
Top Width	7.35 ft
Critical Depth	4.3 in
Critical Slope	0.007 ft/ft
Velocity	5.06 ft/s
Velocity Head	0.40 ft
Specific Energy	0.63 ft
Froude Number	2.008
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.8 in
Critical Depth	4.3 in
Channel Slope	0.033 ft/ft
Critical Slope	0.007 ft/ft

POA 3 - 10 Year - Post

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.018
Channel Slope	0.033 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	7.000 H:V
Bottom Width	5.00 ft
Discharge	8.28 cfs
Results	
Normal Depth	3.0 in
Flow Area	1.6 ft ²
Wetted Perimeter	7.6 ft
Hydraulic Radius	2.5 in
Top Width	7.51 ft
Critical Depth	4.6 in
Critical Slope	0.007 ft/ft
Velocity	5.26 ft/s
Velocity Head	0.43 ft
Specific Energy	0.68 ft
Froude Number	2.028
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.0 in
Critical Depth	4.6 in
Channel Slope	0.033 ft/ft
Critical Slope	0.007 ft/ft

POA 3 - 25 Year - Pre

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.018
Channel Slope	0.033 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	7.000 H:V
Bottom Width	5.00 ft
Discharge	10.03 cfs
Results	
Normal Depth	3.4 in
Flow Area	1.8 ft ²
Wetted Perimeter	7.9 ft
Hydraulic Radius	2.7 in
Top Width	7.80 ft
Critical Depth	5.2 in
Critical Slope	0.007 ft/ft
Velocity	5.60 ft/s
Velocity Head	0.49 ft
Specific Energy	0.77 ft
Froude Number	2.058
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.4 in
Critical Depth	5.2 in
Channel Slope	0.033 ft/ft
Critical Slope	0.007 ft/ft

POA 3 - 25 Year - Post

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.018
Channel Slope	0.033 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	7.000 H:V
Bottom Width	5.00 ft
Discharge	10.03 cfs

Results	
Normal Depth	3.4 in
Flow Area	1.8 ft ²
Wetted Perimeter	7.9 ft
Hydraulic Radius	2.7 in
Top Width	7.80 ft
Critical Depth	5.2 in
Critical Slope	0.007 ft/ft
Velocity	5.60 ft/s
Velocity Head	0.49 ft
Specific Energy	0.77 ft
Froude Number	2.058
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.4 in
Critical Depth	5.2 in
Channel Slope	0.033 ft/ft
Critical Slope	0.007 ft/ft

Flow Master Outputs for POA 4 - Normal Depths

POA 4 - 10 Year - Pre

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.018
Channel Slope	0.022 ft/ft
Left Side Slope	2.100 H:V
Right Side Slope	2.100 H:V
Bottom Width	2.70 ft
Discharge	3.91 cfs

Results	
Normal Depth	3.2 in
Flow Area	0.9 ft ²
Wetted Perimeter	3.9 ft
Hydraulic Radius	2.7 in
Top Width	3.82 ft
Critical Depth	4.4 in
Critical Slope	0.007 ft/ft
Velocity	4.48 ft/s
Velocity Head	0.31 ft
Specific Energy	0.58 ft
Froude Number	1.653
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.2 in
Critical Depth	4.4 in
Channel Slope	0.022 ft/ft
Critical Slope	0.007 ft/ft

POA 4 - 10 Year - Post

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.018
Channel Slope	0.022 ft/ft
Left Side Slope	2.100 H:V
Right Side Slope	2.100 H:V
Bottom Width	2.70 ft
Discharge	6.42 cfs

Results	
Normal Depth	4.3 in
Flow Area	1.2 ft ²
Wetted Perimeter	4.3 ft
Hydraulic Radius	3.4 in
Top Width	4.19 ft
Critical Depth	5.9 in
Critical Slope	0.007 ft/ft
Velocity	5.26 ft/s
Velocity Head	0.43 ft
Specific Energy	0.78 ft
Froude Number	1.716
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.3 in
Critical Depth	5.9 in
Channel Slope	0.022 ft/ft
Critical Slope	0.007 ft/ft

POA 4 - 25 Year - Pre

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.018
Channel Slope	0.022 ft/ft
Left Side Slope	2.100 H:V
Right Side Slope	2.100 H:V
Bottom Width	2.70 ft
Discharge	5.58 cfs

Results	
Normal Depth	3.9 in
Flow Area	1.1 ft ²
Wetted Perimeter	4.2 ft
Hydraulic Radius	3.2 in
Top Width	4.08 ft
Critical Depth	5.4 in
Critical Slope	0.007 ft/ft
Velocity	5.02 ft/s
Velocity Head	0.39 ft
Specific Energy	0.72 ft
Froude Number	1.697
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.9 in
Critical Depth	5.4 in
Channel Slope	0.022 ft/ft
Critical Slope	0.007 ft/ft

POA 4 - 25 Year - Post

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.018
Channel Slope	0.022 ft/ft
Left Side Slope	2.100 H:V
Right Side Slope	2.100 H:V
Bottom Width	2.70 ft
Discharge	8.52 cfs
Results	
Normal Depth	5.0 in
Flow Area	1.5 ft ²
Wetted Perimeter	4.6 ft
Hydraulic Radius	3.8 in
Top Width	4.45 ft
Critical Depth	6.9 in
Critical Slope	0.007 ft/ft
Velocity	5.74 ft/s
Velocity Head	0.51 ft
Specific Energy	0.93 ft
Froude Number	1.749
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.0 in
Critical Depth	6.9 in
Channel Slope	0.022 ft/ft
Critical Slope	0.007 ft/ft

Appendix 4: Water Quality Calculations

- ◆ Nutrient Reporting Form

Project Information

SNAP v4.2.0

*Complete this sheet if required by your reviewing authority.
Contact them for any questions. Grey boxes/text are optional.*

LOCATION

Project Name (optional):	Broadmoor		Parcel ID (optional):		
Submission Date (optional):		date	Nutrient Management Watershed:	Neuse	menu
Local Jurisdiction / Reviewing Agency:	Rolesville	menu	Subwatershed:	Neuse-Upper	menu
Project Latitude Coordinates (optional):		N	Phosphorus Delivery Zone:	Neuse - Upper 03020201	menu
Project Longitude Coordinates (optional):		W	Nitrogen Delivery Zone:	Neuse - Upper 03020201	menu

PROJECT DETAILS

Development Land Use Type:	Multi-Family Residential	menu	Disturbed Area:		ft ²
Part of Common Development Plan?	no	y/n	Project Activity:	New Development	menu
Designated Downtown Area?	no	y/n	Project Drains to SA Waters?	no	y/n
Public Linear Road/Sidewalk Project?	no	y/n	Pre-Project Land Use:	fallow/open	menu
Project Owner Type:	Private	menu	Project Description (optional):		

STORMWATER DETAILS

(Falls ONLY) Onsite Reduction % Req.		%	Project Uses LID/Runoff Volume Match?	no	y/n
Existing BUA/Development Onsite?	no	y/n	Local Gov't nutrient req's same as State?	yes	y/n
Local Gov't cutoff date for Existing BUA:		date	Project Drains to Regional SCM?	no	y/n
Nitrogen Export Rate Target:	3.60	lb/ac/yr	Total Nitrogen Offset Credits Needed:	0.0	lb/yr
Phosphorus Export Rate Target:		lb/ac/yr	Total Phosphorus Offset Credits Needed:	0.0	lb/yr

Project Area and Offsite Land Cover Characteristics

<u>Precipitation Station:</u>	Neuse
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[Click here to scroll down to error messages on this sheet.](#)

Copy & Paste VALUES ONLY for Best Results

PROJECT AREA LAND COVERS	TN EMC (mg/L)	TP EMC (mg/L)	Pre-Project Area (ft ²)	Post-Project Area (ft ²)	Change pre-to-post (ft ²)
Roof	1.18	0.11	3,107	495,787	492,680
Roadway	1.64	0.34		249,824	249,824
Parking/Driveway/Sidewalk	1.42	0.18		274,957	274,957
Protected Forest	0.97	0.03			0
Managed Pervious/Landscaping	2.48	1.07	4,594,845	3,383,151	-1,211,694
Offsite or Existing Roof	1.18	0.11	3,674	3,674	0
Offsite or Existing Roadway	1.64	0.34	17,213	17,213	0
Offsite or Existing Parking/Driveway/Sidewalk	1.42	0.18			0
Offsite Protected Forest	0.97	0.03			0
Offsite Managed Pervious	2.48	1.07	337,052	337,052	0
CUSTOM LAND COVER 1					0
CUSTOM LAND COVER 2					0
CUSTOM LAND COVER 3					0
LAND TAKEN UP BY SCM	1.18	0.11		194,232	194,232
	Total (Regulated & UnReg) Area		4,955,891.00	4,955,891.00	
	Project (Regulated) Area		4,597,952.00	4,597,952.00	

Stormwater Control Measure (SCM) Characteristics

SWMP v4.2.0

Copy & Paste VALUES ONLY
[Click here to go to the SCM's Land Cover page](#) [Click here to review Errors](#) [Click here to go to the Settings page](#) [Click here to go back to the SCM](#)

SCM ID	101	102	103	201	202	203	301	302	303	401	402	403	501	502	503	601	602	603			
Type of SCM	Wet Pond			Wet Pond			Wet Pond			Wet Pond											
Hydrologic soil group at SCM location	D			B			C														
SCM Description	low			low			low			low											
Design Storm Size (Inches/24hrs)	200%			200%			200%			200%											
Percent of Full Size	200%			200%			200%			200%											
% Annual Effluent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%			
% Annual Overflow	2%	0%	0%	13%	0%	0%	2%	0%	0%	7%	0%	0%	0%	0%	0%	0%	0%	0%			
% Annual ET/Infiltrated	10%	0%	0%	17%	0%	0%	15%	0%	0%	14%	0%	0%	0%	0%	0%	0%	0%	0%			
Custom % Annual Effluent																					
Custom % Annual Overflow																					
Custom % Annual ET/Infiltrated																					
SCM Effluent TN EMC (mg/L)	0.13	0.00	0.00	0.13	0.00	0.00	0.13	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
SCM Effluent TN EMC (mg/L)	0.86	0.00	0.00	0.86	0.00	0.00	0.86	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Custom Effluent TP EMC																					
Custom Effluent TN EMC																					
SCM Land Cover TP EMC (mg/L)	0.11	0.00	0.00	0.11	0.00	0.00	0.11	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
SCM Land Cover TN EMC (mg/L)	1.18	0.00	0.00	1.18	0.00	0.00	1.18	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
This SCM Drains to Nearest SCM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Catchment Routing	Catchments Draining to SCM 101	Catchments Draining to SCM 102	Catchments Draining to SCM 103	Catchments Draining to SCM 201	Catchments Draining to SCM 202	Catchments Draining to SCM 203	Catchments Draining to SCM 301	Catchments Draining to SCM 302	Catchments Draining to SCM 303	Catchments Draining to SCM 401	Catchments Draining to SCM 402	Catchments Draining to SCM 403	Catchments Draining to SCM 501	Catchments Draining to SCM 502	Catchments Draining to SCM 503	Catchments Draining to SCM 601	Catchments Draining to SCM 602	Catchments Draining to SCM 603			
Catchment 1																					
Catchment 2																					
Catchment 3																					
Catchment 4																					
Catchment 5																					
Catchment 6																					
Error Check - Missing SCM Area																					
Error Check - Min/Max Size																					
Error Check - Hydrology																					
Error Check - Missing SCM Info																					
Error Check - Drainage Data w/o SCM																					
Error Check - SCM Types																					
SCM ID	101	102	103	201	202	203	301	302	303	401	402	403	501	502	503	601	602	603			
SCM Drainage Area Land Covers	Area Draining Directly to SCM 101 (ft ²)	Area Draining Directly to SCM 102 (ft ²)	Area Draining Directly to SCM 103 (ft ²)	Area Draining Directly to SCM 201 (ft ²)	Area Draining Directly to SCM 202 (ft ²)	Area Draining Directly to SCM 203 (ft ²)	Area Draining Directly to SCM 301 (ft ²)	Area Draining Directly to SCM 302 (ft ²)	Area Draining Directly to SCM 303 (ft ²)	Area Draining Directly to SCM 401 (ft ²)	Area Draining Directly to SCM 402 (ft ²)	Area Draining Directly to SCM 403 (ft ²)	Area Draining Directly to SCM 501 (ft ²)	Area Draining Directly to SCM 502 (ft ²)	Area Draining Directly to SCM 503 (ft ²)	Area Draining Directly to SCM 601 (ft ²)	Area Draining Directly to SCM 602 (ft ²)	Area Draining Directly to SCM 603 (ft ²)	Total Land Use Area Treated by All SCMs (ft ²)	Allowable Total Land Use Area to be Treated Based on Post-Project Areas (ft ²)	Post-Project Untreated Land Area (ft ²)
Roof	103,855			157,745			216,548			61,745									439,863	495,787	55,925
Roadway	50,800			101,740			64,390			29,192									246,080	246,024	1,354
Parking/Driveway/Sidewalk	79,272			89,092			12,870			29,664									243,907	274,977	31,070
Protected Forest																			0	0	0
Managed Pervious/Landscaping	135,286			380,945			342,584			140,030									998,845	3,383,151	2,384,307
Office or Existing Roof	164			3,520															3,684	3,674	0
Office or Existing Roadway				9,673			7,540												17,213	17,213	0
Office or Existing Parking/Driveway/Sidewalk																			0	0	0
Office Protected Forest																			0	0	0
Office Managed Pervious	13,759			43,653			279,640												337,052	337,052	0
CUSTOM LAND COVER 1																			0	0	0
CUSTOM LAND COVER 2																			0	0	0
CUSTOM LAND COVER 3																			0	0	0
LAND TAKEN UP BY SCM	26,035			94,157			48,698			25,342									194,232	194,232	0
TOTAL AREA DRAINING TO SCM (ft ²)	409,201	0	0	876,461	0	0	912,271	0	0	284,913	0	0	0	0	0	0	0	0	2,482,846	4,955,891	2,473,045
CATCHMENT AREA (ft ²)	409,201			876,461			912,271			284,913			0			0					

Nutrient Export Summary

Landcover & SCM Data Review

Errors / Advisories

Avg Annual precip (in) =	45.76	
Total (Regulated + Unregulated) Area (ft ²) =	4,955,891	
Project (Regulated) Area (ft ²) =	4,597,952	
Net BUA (Project Area BUA only ft ²) =	1,017,462	Net BUA indicates new development or expansion.
Custom Landcovers are present:	no	
Total Nitrogen Export Target Scaled to Project Area (lb/yr):	380.00	

Errors / Advisories

SCM Area (ft ²) =	194,232	
SCM Treated Area (ft ²) =	2,482,846	
Catchment Routing:	No errors	
Treating Runoff from Existing BUA or Offsite:	yes	Offsite Area or Existing BUA drains to an SCM. See Users' Manual for instructions to determine nutrient reduction needs and reduction provided by SCMs.
Disturbed Area (ft ²) =	missing or not matching	If using tool for Stormwater Compliance, check Project Info for missing Disturbed Area.
Total Phosphorus Export Target Scaled to Project Area (lb/yr):	0.00	

Nutrient Export Summary	Total Area (Onsite + Offsite) Pre-Project		Project Area (Onsite Only) Pre-Project		Total Area Post-Project before Treatment		Project Area Post-Project before Treatment		Total Area Post-Project after Treatment		Project Area Post-Project after Treatment		Total Area Post-Project SCM-Treated Area Only		Project Area Post-Project SCM-Treated Area Only		Total Area Post-Project Untreated Areas		Project Area Post-Project Untreated Areas		
	Area (All Landcover Types) (acres)	113.7716	105.5545	113.7716	105.5545	113.7716	105.5545	113.7716	105.5545	56.9983	48.7812	56.7733	56.7733	56.7733	48.7812	56.7733	48.7812	56.7733	56.7733	56.7733	56.7733
Percent Built-Up Area (BUA) (%)	0%	0%	21%	21%	21%	21%	21%	21%	38%	44%	38%	44%	38%	44%	38%	44%	4%	4%	4%	4%	
Built-Up Area (BUA) (sqft)	23,994	3,107	1,041,456	946,858	1,041,456	946,858	1,041,456	946,858	952,717	931,830	88,739	88,739	88,739	931,830	88,739	931,830	88,739	88,739	88,739	88,739	
Annual Runoff Volume (ft ³ /yr)	924,544	798,605	4,700,553	4,574,615	4,118,712	4,012,442	4,118,712	4,012,442	3,420,242	3,313,972	698,470	698,470	698,470	3,313,972	698,470	3,313,972	698,470	698,470	698,470	698,470	
Annual Runoff % Change			408%	473%	345%	402%	345%	402%													
Total Runoff Change (cuft/yr)			3,776,009	3,776,009	3,194,169	3,213,837	3,194,169	3,213,837													
Total Nitrogen EMC (mg/L)	2.40	2.29	1.49	1.47	1.09	1.09	1.09	1.09	0.90	0.90	1.98	1.98	1.98	0.90	0.90	1.98	0.90	1.98	1.98	1.98	
Total Nitrogen Load Leaving Site (lb/yr)	138.43	122.85	436.61	421.03	279.14	272.98	279.14	272.98	192.78	186.62	86.36	86.36	86.36	192.78	186.62	86.36	192.78	186.62	86.36	86.36	
Total Nitrogen Loading Rate (lb/ac/yr)	1.22	1.16	3.84	3.99	2.45	2.59	2.45	2.59	3.38	3.83	1.52	1.52	1.52	3.38	3.83	1.52	3.38	3.83	1.52	1.52	
Total Nitrogen % Change Pre-to-Post			215%	243%	102%	122%	102%	122%													
Total Nitrogen Change (lb/yr) Pre-to-Post			298.18	298.18	140.71	150.13	140.71	150.13													
Total Phosphorus EMC (mg/L)	1.00	0.98	0.30	0.29	0.23	0.23	0.23	0.23	0.14	0.14	0.68	0.68	0.68	0.14	0.14	0.68	0.14	0.14	0.68	0.68	
Total Phosphorus Load Leaving Site (lb/yr)	57.89	52.75	86.98	81.84	59.21	58.17	59.21	58.17	29.36	28.32	29.85	29.85	29.85	29.36	28.32	29.85	29.36	28.32	29.85	29.85	
Total Phosphorus Loading Rate (lb/ac/yr)	0.51	0.50	0.76	0.78	0.52	0.55	0.52	0.55	0.52	0.58	0.53	0.53	0.53	0.52	0.58	0.53	0.52	0.58	0.53	0.53	
Total Phosphorus % Change Pre-to-Post			50%	55%	2%	10%	2%	10%													
Total Phosphorus Change (lb/yr)Pre-to-Post			29.09	29.09	1.32	5.42	1.32	5.42													

SCM/Catchment Summary

SCM ID and Type	Volume Reduction (%)	TN Reduction (%)	TP Reduction (%)	TN Out (lbs/ac/yr)	TP Out (lbs/ac/yr)
Catchment 1	9.78%	42.90%	41.29%	4.58	0.69
101: Wet Pond	9.78%	42.90%	41.29%	4.58	0.69
102: NA	0.00%	0.00%	0.00%	0.00	0.00
103: NA	0.00%	0.00%	0.00%	0.00	0.00
Catchment 2	17.31%	43.88%	46.01%	3.79	0.58
201: Wet Pond	17.31%	43.88%	46.01%	3.79	0.58
202: NA	0.00%	0.00%	0.00%	0.00	0.00
203: NA	0.00%	0.00%	0.00%	0.00	0.00
Catchment 3	14.67%	48.68%	57.71%	2.36	0.36
301: Wet Pond	14.67%	48.68%	57.71%	2.36	0.36
302: NA	0.00%	0.00%	0.00%	0.00	0.00
303: NA	0.00%	0.00%	0.00%	0.00	0.00
Catchment 4	13.95%	43.66%	44.82%	3.70	0.56
401: NA	13.95%	43.66%	44.82%	3.70	0.56
402: NA	0.00%	0.00%	0.00%	0.00	0.00
403: NA	0.00%	0.00%	0.00%	0.00	0.00
Catchment 5	0.00%	0.00%	0.00%	0.00	0.00
501: NA	0.00%	0.00%	0.00%	0.00	0.00
502: NA	0.00%	0.00%	0.00%	0.00	0.00
503: NA	0.00%	0.00%	0.00%	0.00	0.00
Catchment 6	0.00%	0.00%	0.00%	0.00	0.00
601: NA	0.00%	0.00%	0.00%	0.00	0.00
602: NA	0.00%	0.00%	0.00%	0.00	0.00
603: NA	0.00%	0.00%	0.00%	0.00	0.00

Falls Lake ONLY: Onsite Reduction Compliance Check

	Nitrogen	Phosphorus
Onsite % Reduction Requirement		
Export Target Scaled to Area (lb/yr)	380.00	
Export Load Post-Project Before Treatment	421.03	81.84
Total Reduction Need (lb/yr)		
Onsite Reduction Need (lb/yr)		
Onsite Export Target (lb/yr)		
Project Area Post-Project After Treatment	272.98	58.17

Nutrient Management Strategy Watershed - Nutrient Offset Credit Reporting Form

SNAP v4.2.0

Please complete and submit the following information to the local government permitting your development project to characterize it and assess the need to purchase nutrient offset credits. Contact and rule implementation information can be found online at:

<http://deq.nc.gov/about/divisions/water-resources/planning/nonpoint-source-management/nutrient-offset-information>

PROJECT INFORMATION

Applicant Name:			
Project Name: Broadmoor			
Project Address:			
Date: (mm/dd/yyyy)	Development Land Use Type:	Multi-Family Residential	
County:	Project Activity Type:	New Development	
Project Area (sqft):	4,597,952	Project Latitude:	0.000000
Post-Project Built-Up Area %:	20.59%	Project Longitude:	0.000000

WATERSHED INFORMATION

Nutrient Management Watershed:	Neuse	N Target Export Rate (lb/ac/yr):	3.60
Subwatershed:	Neuse-Upper	P Target Export Rate (lb/ac/yr):	0.00
Nitrogen Delivery Zone:	Neuse - Upper 03020201	Nitrogen Delivery Factor:	100%
Phosphorus Delivery Zone:	Neuse - Upper 03020201	Phosphorus Delivery Factor:	100%

PERMANENT NUTRIENT OFFSET REQUEST

Post-Project Nitrogen Calculations - Projects with No Offsite or Built-Up Area

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(Where Applicable)	Total TN Permanent Offsets to Buy (lb/yr)
TN Untreated Load (lb/yr)	TN Export Target Load (lb/yr)	TN Treated Load (lb/yr)	TN Remaining Reduction Need (lb/yr)		TN Delivery Factor (%)	TN Permanent Offsets Required (lb/yr)	Additional Local Gov't Offsets (lb/yr)	
421.0	380.0	273.0	0.0		100.0%	0.0		0.0

Post-Project Phosphorus Calculations - Projects with No Offsite or Built-Up Area

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(Where Applicable)	Total TP Permanent Offsets to Buy (lb/yr)
TP Untreated Load (lb/yr)	TP Export Target Load (lb/yr)	TP Treated Load (lb/yr)	TP Remaining Reduction Need (lb/yr)		TP Delivery Factor (%)	TP Permanent Offsets Required (lb/yr)	Additional Local Gov't Offsets (lb/yr)	
								0.0

LOCAL GOVERNMENT AUTHORIZATION

Local Government Name:	
Staff Name:	Phone:
Staff Email:	Date:

Local Government Authorizing Signature:

Appendix 5: SCM Design Calculations

- ◆ SCM 1 – Wet Pond MDC Requirements
- ◆ SCM 2 – Wet Pond MDC Requirements
- ◆ SCM 3 – Wet Pond MDC Requirements
- ◆ SCM 4 – Wet Pond MDC Requirements

Project Name: **Broadmoor**
 City/State: **Rolesville, NC**

 Project #: **23-0045**
 Date: **5/1/24**

SCM #1 - Stormwater Wet Pond Design

Table 1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing (Adapted from Driscoll, 1986)
Piedmont and Mountain SA/DA Table (Adapted from Driscoll, 1986)

% Impervious	Permanent Pool Depth (feet)					
	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	0.94	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

Source: NCDEQ Stormwater Design Manual Minimum Design Criteria C-3 Wet Pond (4.18.2017)

SCM #1 Drainage Area Information

Total Drainage Area = **9.39 acres** → See Summary of Hydrology Inputs per Sub-Drainage Area
 Total Impervious Area = **5.61 acres**
 % Impervious Surface Area = **59.74 %**

SCM #1 Normal Pool Information

Minimum Required Permanent Pool Surface Area	Provided Permanent Pool Surface Area
Avg Depth = 3.00 ft SA/DA ratio = 2.08 <i>From Table 1</i> $\text{Minimum pond surface area (SA)} = \frac{DA \times SA \div DA \text{ ratio}}{100}$ SA = 8,517 sq. ft. 0.196 acres	Normal Pool Elevation = 357.5 Main Pool SA Provided = 10695 sq. ft. 0.246 acres

SCM #1 Water Quality Information

1-Inch Runoff Volume Calculation (Water Quality Volume)	Provided Water Quality Volume
Using "Simple Method" Runoff Volume Calculations <i>As described by Schueler (1987)</i> $Rv = 0.05 + 0.9 \times I$ Where: Rv = Runoff coefficient (in./in.) I = Percent impervious Rv = 0.59 in/in Total runoff volume from 1-inch precipitation: $\text{Runoff Volume (S)} = \text{Design Rainfall} \times Rv \times \text{Drainage Area}$ S = 20,032 cu. ft. 0.460 acre-ft	Water Quality Pool Elev = 358.84 ft Overflow Elev = 361.00 ft Storage Volume Provided = 57,888 cu. ft. 1.329 acre-ft

Project Name: **Broadmoor**
 City/State: Rolesville, NC

Project #: 23-0045
 Date: 5/1/24

SCM #1 Water Quality Drawdown Information

ORIFICE CALCULATOR

Per NCDEQ "Stormwater Design Manual" Minimum Design Criteria:

The design volume shall draw down to the permanent pool level in 2-5 days.

$$Q = C_d A \sqrt{2gh}$$

1" WATER QUALITY STORM VOLUME

Variables
 WQ Volume: 0.460 acre-ft 20032 cf
 Head / Driving Head: 1.34 ft 0.45 ft
 Draw down time: **50 hours** 180000 sec

Constants
 g = 32.2 ft/s
 C_d = 0.6

Orifice Area = 0.035 sq. ft. 4.978 sq. in.

Orifice Diameter = 2.52 in

USE 2.75 INCH DIAMETER ORIFICE

Project Name: **Broadmoor**
 City/State: **Rolesville, NC**

 Project #: **23-0045**
 Date: **5/1/24**

SCM #2 - Stormwater Wet Pond Design

Table 1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing (Adapted from Driscoll, 1986)
Piedmont and Mountain SA/DA Table (Adapted from Driscoll, 1986)

% Impervious	Permanent Pool Depth (feet)					
	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	0.94	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

Source: NCDEQ Stormwater Design Manual Minimum Design Criteria C-3 Wet Pond (4.18.2017)

SCM #2 Drainage Area Information

Total Drainage Area = **20.12 acres** → See Summary of Hydrology Inputs per Sub-Drainage Area
 Total Impervious Area = **8.73 acres**
 % Impervious Surface Area = **43.39 %**

SCM #2 Normal Pool Information

Minimum Required Permanent Pool Surface Area	Provided Permanent Pool Surface Area
Avg Depth = 3.00 ft SA/DA ratio = 1.60 <i>From Table 1</i> $\text{Minimum pond surface area (SA)} = \frac{DA \times SA \div DA \text{ ratio}}{100}$ SA = 14,066 sq. ft. 0.323 acres	Normal Pool Elevation = 357.5 Main Pool SA Provided = 53242 sq. ft. 1.222 acres

SCM #2 Water Quality Information

1-Inch Runoff Volume Calculation (Water Quality Volume)	Provided Water Quality Volume
Using "Simple Method" Runoff Volume Calculations <i>As described by Schueler (1987)</i> $Rv = 0.05 + 0.9 \times I$ Where: Rv = Runoff coefficient (in./in.) I = Percent impervious Rv = 0.44 in/in Total runoff volume from 1-inch precipitation: $\text{Runoff Volume (S)} = \text{Design Rainfall} \times Rv \times \text{Drainage Area}$ S = 32,173 cu. ft. 0.739 acre-ft	Water Quality Pool Elev = 357.97 ft Overflow Elev = 358.00 ft Storage Volume Provided = 34,092 cu. ft. 0.783 acre-ft

Project Name: **Broadmoor**
 City/State: Rolesville, NC

Project #: 23-0045
 Date: 5/1/24

SCM #2 Water Quality Drawdown Information

ORIFICE CALCULATOR

Per NCDEQ "Stormwater Design Manual" Minimum Design Criteria:

The design volume shall draw down to the permanent pool level in 2-5 days.

$$Q = C_d A \sqrt{2gh}$$

1" WATER QUALITY STORM VOLUME

Variables
 WQ Volume: 0.739 acre-ft 32173 cf
 Head / Driving Head: 0.47 ft 0.16 ft
 Draw down time: **50 hours** 180000 sec

Orifice Area = 0.094 sq. ft. 13.478 sq. in.

Orifice Diameter = 4.14 in

Constants
 g = 32.2 ft/s
 C_d = 0.6

USE 4.25 INCH DIAMETER ORIFICE

Project Name: **Broadmoor**
 City/State: **Rolesville, NC**

 Project #: **23-0045**
 Date: **5/1/24**

SCM #3 - Stormwater Wet Pond Design

Table 1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing (Adapted from Driscoll, 1986)
Piedmont and Mountain SA/DA Table (Adapted from Driscoll, 1986)

% Impervious	Permanent Pool Depth (feet)					
	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	0.94	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

Source: NCDEQ Stormwater Design Manual Minimum Design Criteria C-3 Wet Pond (4.18.2017)

SCM #3 Drainage Area Information

Total Drainage Area = **20.94 acres** → See Summary of Hydrology Inputs per Sub-Drainage Area
 Total Impervious Area = **5.92 acres**
 % Impervious Surface Area = **28.27 %**

SCM #3 Normal Pool Information

Minimum Required Permanent Pool Surface Area	Provided Permanent Pool Surface Area
Avg Depth = 3.00 ft SA/DA ratio = 1.11 <i>From Table 1</i> $\text{Minimum pond surface area (SA)} = \frac{DA \times SA \div DA \text{ ratio}}{100}$ SA = 10,152 sq. ft. 0.233 acres	Normal Pool Elevation = 356.5 Main Pool SA Provided = 26620 sq. ft. 0.611 acres

SCM #3 Water Quality Information

1-Inch Runoff Volume Calculation (Water Quality Volume)	Provided Water Quality Volume
Using "Simple Method" Runoff Volume Calculations <i>As described by Schueler (1987)</i> $Rv = 0.05 + 0.9 \times I$ Where: Rv = Runoff coefficient (in./in.) I = Percent impervious Rv = 0.30 in/in Total runoff volume from 1-inch precipitation: $\text{Runoff Volume (S)} = \text{Design Rainfall} \times Rv \times \text{Drainage Area}$ S = 23,141 cu. ft. 0.531 acre-ft	Water Quality Pool Elev = 357.16 ft Overflow Elev = 358.00 ft Storage Volume Provided = 54,001 cu. ft. 1.240 acre-ft

Project Name: **Broadmoor**
 City/State: Rolesville, NC

Project #: 23-0045
 Date: 5/1/24

SCM #3 Water Quality Drawdown Information

ORIFICE CALCULATOR

Per NCDEQ "Stormwater Design Manual" Minimum Design Criteria:

The design volume shall draw down to the permanent pool level in 2-5 days.

$$Q = C_d A \sqrt{2gh}$$

1" WATER QUALITY STORM VOLUME

Variables
 WQ Volume: 0.531 acre-ft 23141 cf
 Head / Driving Head: 0.66 ft 0.22 ft
 Draw down time: **50 hours** 180000 sec

 Orifice Area = 0.057 sq. ft. 8.189 sq. in.

 Orifice Diameter = 3.23 in

Constants
 g = 32.2 ft/s
 C_d = 0.6

USE 3.25 INCH DIAMETER ORIFICE

Project Name: Broadmoor
 City/State: Rolesville, NC

 Project #: 23-0045
 Date: 5/1/24

SCM #4 - Stormwater Wet Pond Design

Table 1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing (Adapted from Driscoll, 1986)
Piedmont and Mountain SA/DA Table (Adapted from Driscoll, 1986)

% Impervious	Permanent Pool Depth (feet)					
	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	0.94	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

Source: NCDEQ Stormwater Design Manual Minimum Design Criteria C-3 Wet Pond (4.18.2017)

SCM #4 Drainage Area Information

Total Drainage Area = **6.54 acres** → See Summary of Hydrology Inputs per Sub-Drainage Area
 Total Impervious Area = **2.91 acres**
 % Impervious Surface Area = **44.50 %**

SCM #4 Normal Pool Information

Minimum Required Permanent Pool Surface Area	Provided Permanent Pool Surface Area
Avg Depth = 3.00 ft SA/DA ratio = 1.64 From Table 1 $\text{Minimum pond surface area (SA)} = \frac{DA \times SA \div DA \text{ ratio}}{100}$ SA = 4,660 sq. ft. 0.107 acres	Normal Pool Elevation = 362.5 Main Pool SA Provided = 10486 sq. ft. 0.241 acres

SCM #4 Water Quality Information

1-Inch Runoff Volume Calculation (Water Quality Volume)	Provided Water Quality Volume
Using "Simple Method" Runoff Volume Calculations As described by Schueler (1987) $Rv = 0.05 + 0.9 \times I$ Where: Rv = Runoff coefficient (in./in.) I = Percent impervious Rv = 0.45 in/in Total runoff volume from 1-inch precipitation: $\text{Runoff Volume (S)} = \text{Design Rainfall} \times Rv \times \text{Drainage Area}$ S = 10,694 cu. ft. 0.246 acre-ft	Water Quality Pool Elev = 363.25 ft Overflow Elev = 363.50 ft Storage Volume Provided = 14,448 cu. ft. 0.332 acre-ft

Project Name: **Broadmoor**
 City/State: Rolesville, NC

Project #: 23-0045
 Date: 5/1/24

SCM #4 Water Quality Drawdown Information

ORIFICE CALCULATOR

Per NCDEQ "Stormwater Design Manual" Minimum Design Criteria:

The design volume shall draw down to the permanent pool level in 2-5 days.

$$Q = C_d A \sqrt{2gh}$$

1" WATER QUALITY STORM VOLUME

Variables
 WQ Volume: 0.246 acre-ft 10694 cf
 Head / Driving Head: 0.75 ft 0.25 ft
 Draw down time: **50 hours** 180000 sec

Constants
 g = 32.2 ft/s
 C_d = 0.6

Orifice Area = 0.025 sq. ft. 3.549 sq. in.

Orifice Diameter = 2.13 in

USE 2.25 INCH DIAMETER ORIFICE

Appendix 6: SCM Design Summaries

- ◆ SCM 1 Outlet Structure Design
- ◆ SCM 1 Elevation-Volume Table
- ◆ SCM 2 Outlet Structure Design
- ◆ SCM 2 Elevation-Volume Table
- ◆ SCM 3 Outlet Structure Design
- ◆ SCM 3 Elevation-Volume Table
- ◆ SCM 4 Outlet Structure Design
- ◆ SCM 4 Elevation-Volume Table

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SCM-1	Elevation-Area Volume Curve, 1 years (Post-Development 1 year)	1
OCS-1		
	Outlet Input Data, 1 years (Post-Development 1 year)	2
	Composite Rating Curve, 1 years (Post-Development 1 year)	6

Subsection: Elevation-Area Volume Curve
 Label: SCM-1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Elevation (ft)	Planimeter (ft ²)	Area (ft ²)	A1+A2+sqr (A1*A2) (ft ²)	Volume (ac-ft)	Volume (Total) (ac-ft)
357.50	0.0	13,369.000	0.000	0.000	0.000
358.00	0.0	14,751.000	42,163.010	0.161	0.161
365.00	0.0	26,012.000	60,351.339	3.233	3.394

Subsection: Outlet Input Data
 Label: OCS-1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	357.50 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	365.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 2 Year	Forward	Culvert - Outlet	361.00	365.00
Inlet Box	Riser - 1	Forward	Culvert - Outlet	362.50	365.00
Orifice-Circular	Orifice - NP	Forward	Culvert - Outlet	357.50	365.00
Culvert-Circular	Culvert - Outlet	Forward	TW	355.70	365.00
Irregular Weir	Weir - ESPY	Forward	TW	364.00	365.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
 Label: OCS-1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Culvert - Outlet	
Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	65.50 ft
Length (Computed Barrel)	65.50 ft
Slope (Computed)	0.011 ft/ft
Outlet Control Data	
Manning's n	0.013
Ke	0.500
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft
Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.155
T2 ratio (HW/D)	1.301
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
 Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

T1 Elevation	358.01 ft	T1 Flow	15.55 ft ³ /s
T2 Elevation	358.30 ft	T2 Flow	17.77 ft ³ /s

Subsection: Outlet Input Data
 Label: OCS-1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Riser - 1
 Structure Type: Inlet Box

Number of Openings	1
Elevation	362.50 ft
Orifice Area	16.0 ft ²
Orifice Coefficient	0.600
Weir Length	16.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s
K Reverse	1.000
Manning's n	0.000
Key, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - NP
 Structure Type: Orifice-Circular

Number of Openings	1
Elevation	357.50 ft
Orifice Diameter	2.8 in
Orifice Coefficient	0.600

Structure ID: Weir - ESPY
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
0.00	365.00
3.00	364.00
13.00	364.00
16.00	365.00

Lowest Elevation	364.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s

Structure ID: Orifice - 2 Year
 Structure Type: Orifice-Area

Number of Openings	1
Elevation	361.00 ft
Orifice Area	0.5 ft ²
Top Elevation	361.50 ft
Datum Elevation	361.25 ft
Orifice Coefficient	0.600

Structure ID: TW
 Structure Type: TW Setup, DS Channel

Subsection: Outlet Input Data
Label: OCS-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Structure ID: TW	
Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall
Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft ³ /s
Flow Tolerance (Maximum)	10.000 ft ³ /s

Subsection: Composite Rating Curve
 Label: OCS-1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
357.50	0.00	(N/A)	0.00
357.60	0.01	(N/A)	0.00
357.70	0.05	(N/A)	0.00
357.80	0.09	(N/A)	0.00
357.90	0.11	(N/A)	0.00
358.00	0.12	(N/A)	0.00
358.10	0.14	(N/A)	0.00
358.20	0.15	(N/A)	0.00
358.30	0.16	(N/A)	0.00
358.40	0.18	(N/A)	0.00
358.50	0.19	(N/A)	0.00
358.60	0.20	(N/A)	0.00
358.70	0.21	(N/A)	0.00
358.80	0.21	(N/A)	0.00
358.90	0.23	(N/A)	0.00
359.00	0.23	(N/A)	0.00
359.10	0.24	(N/A)	0.00
359.20	0.25	(N/A)	0.00
359.30	0.26	(N/A)	0.00
359.40	0.26	(N/A)	0.00
359.50	0.27	(N/A)	0.00
359.60	0.28	(N/A)	0.00
359.70	0.29	(N/A)	0.00
359.80	0.29	(N/A)	0.00
359.90	0.30	(N/A)	0.00
360.00	0.31	(N/A)	0.00
360.10	0.31	(N/A)	0.00
360.20	0.32	(N/A)	0.00
360.30	0.33	(N/A)	0.00
360.40	0.33	(N/A)	0.00
360.50	0.34	(N/A)	0.00
360.60	0.34	(N/A)	0.00
360.70	0.35	(N/A)	0.00
360.80	0.35	(N/A)	0.00
360.90	0.36	(N/A)	0.00
361.00	0.37	(N/A)	0.00
361.10	0.61	(N/A)	0.00
361.20	0.86	(N/A)	0.00
361.30	1.10	(N/A)	0.00
361.40	1.35	(N/A)	0.00
361.50	1.59	(N/A)	0.00
361.60	1.82	(N/A)	0.00
361.70	2.04	(N/A)	0.00
361.80	2.19	(N/A)	0.00

Subsection: Composite Rating Curve
 Label: OCS-1
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
361.90	2.35	(N/A)	0.00
362.00	2.51	(N/A)	0.00
362.10	2.64	(N/A)	0.00
362.20	2.77	(N/A)	0.00
362.30	2.90	(N/A)	0.00
362.40	3.04	(N/A)	0.00
362.50	3.15	(N/A)	0.00
362.60	4.75	(N/A)	0.00
362.70	7.64	(N/A)	0.00
362.80	11.33	(N/A)	0.00
362.90	15.65	(N/A)	0.00
363.00	20.55	(N/A)	0.00
363.10	25.93	(N/A)	0.00
363.20	31.75	(N/A)	0.00
363.30	36.74	(N/A)	0.00
363.40	39.74	(N/A)	0.00
363.50	40.06	(N/A)	0.00
363.60	40.36	(N/A)	0.00
363.70	40.67	(N/A)	0.00
363.80	40.98	(N/A)	0.00
363.90	41.28	(N/A)	0.00
364.00	41.57	(N/A)	0.00
364.10	42.84	(N/A)	0.00
364.20	44.97	(N/A)	0.00
364.30	47.71	(N/A)	0.00
364.40	50.99	(N/A)	0.00
364.50	54.77	(N/A)	0.00
364.60	59.04	(N/A)	0.00
364.70	63.79	(N/A)	0.00
364.80	69.01	(N/A)	0.00
364.90	74.68	(N/A)	0.00
365.00	80.82	(N/A)	0.00

Contributing Structures

(no Q: Orifice - 2
 Year,Riser - 1,Orifice -
 NP,Culvert - Outlet,Weir -
 ESPY)
 Orifice - NP,Culvert -
 Outlet (no Q: Orifice - 2
 Year,Riser - 1,Weir -
 ESPY)
 Orifice - NP,Culvert -
 Outlet (no Q: Orifice - 2
 Year,Riser - 1,Weir -
 ESPY)

Subsection: Composite Rating Curve
Label: OCS-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 1,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 1,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 1,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 1,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 1,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures

Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 1, Weir - ESPY)
Orifice - 2 Year, Riser - 1, Orifice - NP, Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year, Riser - 1, Orifice - NP, Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year, Riser - 1, Orifice - NP, Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year, Riser - 1, Orifice - NP, Culvert - Outlet (no Q: Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - 2 Year,Riser - 1,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 1,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 1,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 1,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)

Subsection: Composite Rating Curve
Label: OCS-1
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 1,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)

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Subsection: Elevation-Area Volume Curve
 Label: SCM-2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Elevation (ft)	Planimeter (ft ²)	Area (ft ²)	A1+A2+sqr (A1*A2) (ft ²)	Volume (ac-ft)	Volume (Total) (ac-ft)
357.50	0.0	66,552.000	0.000	0.000	0.000
358.00	0.0	69,828.000	204,550.324	0.783	0.783
365.00	0.0	94,157.000	245,070.110	13.127	13.910

Subsection: Outlet Input Data
 Label: OCS-2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	357.50 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	365.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 2 Year	Forward	Culvert-Outlet	358.00	365.00
Inlet Box	Riser - 2	Forward	Culvert-Outlet	360.00	365.00
Orifice-Circular	Orifice - NP	Forward	Culvert-Outlet	357.50	365.00
Culvert-Circular	Culvert-Outlet	Forward	TW	356.80	365.00
Irregular Weir	Weir - ESPY	Forward	TW	364.00	365.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Structure ID: Orifice - NP	
Structure Type: Orifice-Circular	
<hr/>	
Number of Openings	1
Elevation	357.50 ft
Orifice Diameter	4.3 in
Orifice Coefficient	0.600

Subsection: Outlet Input Data
 Label: OCS-2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Culvert-Outlet	
Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	78.50 ft
Length (Computed Barrel)	78.50 ft
Slope (Computed)	0.010 ft/ft
Outlet Control Data	
Manning's n	0.013
Ke	0.500
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft
Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.155
T2 ratio (HW/D)	1.302
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
 Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

T1 Elevation	359.11 ft	T1 Flow	15.55 ft ³ /s
T2 Elevation	359.40 ft	T2 Flow	17.77 ft ³ /s

Subsection: Outlet Input Data
 Label: OCS-2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Riser - 2
 Structure Type: Inlet Box

Number of Openings	1
Elevation	360.00 ft
Orifice Area	16.0 ft ²
Orifice Coefficient	0.600
Weir Length	16.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s
K Reverse	1.000
Manning's n	0.000
Key, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Weir - ESPY
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
0.00	365.00
3.00	364.00
13.00	364.00
16.00	365.00

Lowest Elevation	364.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s

Structure ID: Orifice - 2 Year
 Structure Type: Orifice-Area

Number of Openings	1
Elevation	358.00 ft
Orifice Area	1.0 ft ²
Top Elevation	359.00 ft
Datum Elevation	358.50 ft
Orifice Coefficient	0.600

Structure ID: TW
 Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall
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Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft

Subsection: Outlet Input Data
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Convergence Tolerances	
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft ³ /s
Flow Tolerance (Maximum)	10.000 ft ³ /s

Subsection: Composite Rating Curve
 Label: OCS-2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
357.50	0.00	(N/A)	0.00
357.60	0.02	(N/A)	0.00
357.70	0.07	(N/A)	0.00
357.80	0.15	(N/A)	0.00
357.90	0.23	(N/A)	0.00
358.00	0.27	(N/A)	0.00
358.10	0.65	(N/A)	0.00
358.20	1.03	(N/A)	0.00
358.30	1.40	(N/A)	0.00
358.40	1.77	(N/A)	0.00
358.50	2.13	(N/A)	0.00
358.60	2.50	(N/A)	0.00
358.70	2.85	(N/A)	0.00
358.80	3.21	(N/A)	0.00
358.90	3.56	(N/A)	0.00
359.00	3.90	(N/A)	0.00
359.10	4.24	(N/A)	0.00
359.20	4.56	(N/A)	0.00
359.30	4.84	(N/A)	0.00
359.40	5.12	(N/A)	0.00
359.50	5.38	(N/A)	0.00
359.60	5.63	(N/A)	0.00
359.70	5.86	(N/A)	0.00
359.80	6.09	(N/A)	0.00
359.90	6.31	(N/A)	0.00
360.00	6.53	(N/A)	0.00
360.10	8.22	(N/A)	0.00
360.20	10.75	(N/A)	0.00
360.30	13.83	(N/A)	0.00
360.40	17.41	(N/A)	0.00
360.50	21.03	(N/A)	0.00
360.60	24.14	(N/A)	0.00
360.70	25.25	(N/A)	0.00
360.80	25.73	(N/A)	0.00
360.90	26.21	(N/A)	0.00
361.00	26.68	(N/A)	0.00
361.10	27.14	(N/A)	0.00
361.20	27.60	(N/A)	0.00
361.30	28.04	(N/A)	0.00
361.40	28.48	(N/A)	0.00
361.50	28.91	(N/A)	0.00
361.60	29.34	(N/A)	0.00
361.70	29.75	(N/A)	0.00
361.80	30.17	(N/A)	0.00

Subsection: Composite Rating Curve
 Label: OCS-2
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
361.90	30.58	(N/A)	0.00
362.00	30.98	(N/A)	0.00
362.10	31.38	(N/A)	0.00
362.20	31.77	(N/A)	0.00
362.30	32.16	(N/A)	0.00
362.40	32.54	(N/A)	0.00
362.50	32.92	(N/A)	0.00
362.60	33.30	(N/A)	0.00
362.70	33.66	(N/A)	0.00
362.80	34.03	(N/A)	0.00
362.90	34.39	(N/A)	0.00
363.00	34.75	(N/A)	0.00
363.10	35.11	(N/A)	0.00
363.20	35.46	(N/A)	0.00
363.30	35.80	(N/A)	0.00
363.40	36.15	(N/A)	0.00
363.50	36.49	(N/A)	0.00
363.60	36.83	(N/A)	0.00
363.70	37.16	(N/A)	0.00
363.80	37.50	(N/A)	0.00
363.90	37.83	(N/A)	0.00
364.00	38.15	(N/A)	0.00
364.10	39.44	(N/A)	0.00
364.20	41.59	(N/A)	0.00
364.30	44.36	(N/A)	0.00
364.40	47.67	(N/A)	0.00
364.50	51.48	(N/A)	0.00
364.60	55.77	(N/A)	0.00
364.70	60.54	(N/A)	0.00
364.80	65.78	(N/A)	0.00
364.90	71.48	(N/A)	0.00
365.00	77.64	(N/A)	0.00

Contributing Structures

(no Q: Orifice - 2
 Year,Riser - 2,Orifice -
 NP,Culvert-Outlet,Weir -
 ESPY)
 Orifice - NP,Culvert-
 Outlet (no Q: Orifice - 2
 Year,Riser - 2,Weir -
 ESPY)
 Orifice - NP,Culvert-
 Outlet (no Q: Orifice - 2
 Year,Riser - 2,Weir -
 ESPY)

Subsection: Composite Rating Curve
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - NP,Culvert-Outlet (no Q: Orifice - 2 Year,Riser - 2,Weir - ESPY)
Orifice - NP,Culvert-Outlet (no Q: Orifice - 2 Year,Riser - 2,Weir - ESPY)
Orifice - NP,Culvert-Outlet (no Q: Orifice - 2 Year,Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert-Outlet (no Q: Riser - 2,Weir - ESPY)
Orifice - 2 Year,Riser - 2,Orifice - NP,Culvert-Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 2,Orifice - NP,Culvert-Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 2,Orifice - NP,Culvert-Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 2,Orifice - NP,Culvert-Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 2,Orifice - NP,Culvert-Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 2,Orifice - NP,Culvert-Outlet (no Q: Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)

Subsection: Composite Rating Curve
Label: OCS-2
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 2,Culvert-Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)

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Subsection: Elevation-Area Volume Curve
 Label: SCM-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Elevation (ft)	Planimeter (ft ²)	Area (ft ²)	A1+A2+sqr (A1*A2) (ft ²)	Volume (ac-ft)	Volume (Total) (ac-ft)
356.50	0.0	33,275.000	0.000	0.000	0.000
357.00	0.0	35,551.000	103,220.179	0.395	0.395
363.00	0.0	51,892.000	130,394.280	5.987	6.382

Subsection: Outlet Input Data
 Label: OCS-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	356.50 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	363.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 2 Year	Forward	Culvert - Outlet	358.00	363.00
Inlet Box	Riser - 3	Forward	Culvert - Outlet	361.00	363.00
Orifice-Circular	Orifice - NP	Forward	Culvert - Outlet	356.50	363.00
Culvert-Circular	Culvert - Outlet	Forward	TW	356.00	363.00
Irregular Weir	Weir - ESPY	Forward	TW	362.00	363.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
 Label: OCS-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Culvert - Outlet	
Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	65.50 ft
Length (Computed Barrel)	65.51 ft
Slope (Computed)	0.015 ft/ft
Outlet Control Data	
Manning's n	0.013
Ke	0.500
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft
Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.153
T2 ratio (HW/D)	1.299
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
 Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

T1 Elevation	358.31 ft	T1 Flow	15.55 ft ³ /s
T2 Elevation	358.60 ft	T2 Flow	17.77 ft ³ /s

Subsection: Outlet Input Data
 Label: OCS-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Orifice - NP
 Structure Type: Orifice-Circular

Number of Openings	1
Elevation	356.50 ft
Orifice Diameter	3.3 in
Orifice Coefficient	0.600

Structure ID: Riser - 3
 Structure Type: Inlet Box

Number of Openings	1
Elevation	361.00 ft
Orifice Area	16.0 ft ²
Orifice Coefficient	0.600
Weir Length	16.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Weir - ESPY
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
0.00	363.00
3.00	362.00
13.00	362.00
16.00	363.00

Lowest Elevation	362.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s

Structure ID: Orifice - 2 Year
 Structure Type: Orifice-Area

Number of Openings	1
Elevation	358.00 ft
Orifice Area	1.0 ft ²
Top Elevation	359.00 ft
Datum Elevation	358.50 ft
Orifice Coefficient	0.600

Structure ID: TW
 Structure Type: TW Setup, DS Channel

Subsection: Outlet Input Data
Label: OCS-3
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Structure ID: TW	
Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall
Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft ³ /s
Flow Tolerance (Maximum)	10.000 ft ³ /s

Subsection: Composite Rating Curve
 Label: OCS-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
356.50	0.00	(N/A)	0.00
356.60	0.02	(N/A)	0.00
356.70	0.06	(N/A)	0.00
356.80	0.11	(N/A)	0.00
356.90	0.14	(N/A)	0.00
357.00	0.17	(N/A)	0.00
357.10	0.19	(N/A)	0.00
357.20	0.21	(N/A)	0.00
357.30	0.23	(N/A)	0.00
357.40	0.24	(N/A)	0.00
357.50	0.26	(N/A)	0.00
357.60	0.27	(N/A)	0.00
357.70	0.29	(N/A)	0.00
357.80	0.30	(N/A)	0.00
357.90	0.31	(N/A)	0.00
358.00	0.32	(N/A)	0.00
358.10	0.68	(N/A)	0.00
358.20	1.03	(N/A)	0.00
358.30	1.38	(N/A)	0.00
358.40	1.72	(N/A)	0.00
358.50	2.07	(N/A)	0.00
358.60	2.41	(N/A)	0.00
358.70	2.76	(N/A)	0.00
358.80	3.10	(N/A)	0.00
358.90	3.45	(N/A)	0.00
359.00	3.79	(N/A)	0.00
359.10	4.12	(N/A)	0.00
359.20	4.43	(N/A)	0.00
359.30	4.71	(N/A)	0.00
359.40	4.98	(N/A)	0.00
359.50	5.22	(N/A)	0.00
359.60	5.47	(N/A)	0.00
359.70	5.70	(N/A)	0.00
359.80	5.92	(N/A)	0.00
359.90	6.13	(N/A)	0.00
360.00	6.34	(N/A)	0.00
360.10	6.54	(N/A)	0.00
360.20	6.74	(N/A)	0.00
360.30	6.93	(N/A)	0.00
360.40	7.10	(N/A)	0.00
360.50	7.28	(N/A)	0.00
360.60	7.46	(N/A)	0.00
360.70	7.63	(N/A)	0.00
360.80	7.79	(N/A)	0.00

Subsection: Composite Rating Curve
 Label: OCS-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
360.90	7.96	(N/A)	0.00
361.00	8.11	(N/A)	0.00
361.10	9.78	(N/A)	0.00
361.20	12.68	(N/A)	0.00
361.30	16.39	(N/A)	0.00
361.40	20.15	(N/A)	0.00
361.50	23.96	(N/A)	0.00
361.60	27.80	(N/A)	0.00
361.70	31.35	(N/A)	0.00
361.80	33.31	(N/A)	0.00
361.90	33.68	(N/A)	0.00
362.00	34.05	(N/A)	0.00
362.10	35.38	(N/A)	0.00
362.20	37.57	(N/A)	0.00
362.30	40.37	(N/A)	0.00
362.40	43.71	(N/A)	0.00
362.50	47.55	(N/A)	0.00
362.60	51.89	(N/A)	0.00
362.70	56.69	(N/A)	0.00
362.80	61.96	(N/A)	0.00
362.90	67.69	(N/A)	0.00
363.00	73.88	(N/A)	0.00

Contributing Structures

(no Q: Orifice - 2
 Year,Riser - 3,Orifice -
 NP,Culvert - Outlet,Weir -
 ESPY)
 Orifice - NP,Culvert -
 Outlet (no Q: Orifice - 2
 Year,Riser - 3,Weir -
 ESPY)
 Orifice - NP,Culvert -
 Outlet (no Q: Orifice - 2
 Year,Riser - 3,Weir -
 ESPY)
 Orifice - NP,Culvert -
 Outlet (no Q: Orifice - 2
 Year,Riser - 3,Weir -
 ESPY)
 Orifice - NP,Culvert -
 Outlet (no Q: Orifice - 2
 Year,Riser - 3,Weir -
 ESPY)

Subsection: Composite Rating Curve
 Label: OCS-3
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - NP,Culvert - Outlet (no Q: Orifice - 2 Year,Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-3
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures

Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)
Orifice - 2 Year, Orifice - NP, Culvert - Outlet (no Q: Riser - 3, Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-3
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures

Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - Outlet (no Q: Riser - 3,Weir - ESPY)
Orifice - 2 Year,Riser - 3,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 3,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 3,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-3
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - 2 Year,Riser - 3,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 3,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 3,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 3,Orifice - NP,Culvert - Outlet (no Q: Weir - ESPY)
Riser - 3,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 3,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 3,Culvert - Outlet (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 3,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 3,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 3,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 3,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 3,Culvert - Outlet,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)

Subsection: Composite Rating Curve
Label: OCS-3
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures

Riser - 3,Culvert -
Outlet,Weir - ESPY (no
Q: Orifice - 2 Year,Orifice
- NP)

Riser - 3,Culvert -
Outlet,Weir - ESPY (no
Q: Orifice - 2 Year,Orifice
- NP)

Riser - 3,Culvert -
Outlet,Weir - ESPY (no
Q: Orifice - 2 Year,Orifice
- NP)

Riser - 3,Culvert -
Outlet,Weir - ESPY (no
Q: Orifice - 2 Year,Orifice
- NP)

Riser - 3,Culvert -
Outlet,Weir - ESPY (no
Q: Orifice - 2 Year,Orifice
- NP)

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Subsection: Elevation-Area Volume Curve
 Label: SCM-4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Elevation (ft)	Planimeter (ft ²)	Area (ft ²)	A1+A2+sqr (A1*A2) (ft ²)	Volume (ac-ft)	Volume (Total) (ac-ft)
362.50	0.0	13,108.000	0.000	0.000	0.000
363.00	0.0	14,439.000	41,304.413	0.158	0.158
370.00	0.0	25,342.000	58,909.856	3.156	3.314

Subsection: Outlet Input Data
 Label: OCS-4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	362.50 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	370.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 2 Year	Forward	Culvert - 4	363.50	370.00
Inlet Box	Riser - 4	Forward	Culvert - 4	368.00	370.00
Orifice-Circular	Orifice - NP	Forward	Culvert - 4	362.50	370.00
Culvert-Circular	Culvert - 4	Forward	TW	360.50	370.00
Irregular Weir	Weir - ESPY	Forward	TW	369.00	370.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
 Label: OCS-4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Culvert - 4	
Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	78.50 ft
Length (Computed Barrel)	78.51 ft
Slope (Computed)	0.013 ft/ft
Outlet Control Data	
Manning's n	0.013
Ke	0.500
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft
Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.154
T2 ratio (HW/D)	1.300
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
 Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

T1 Elevation	362.81 ft	T1 Flow	15.55 ft ³ /s
T2 Elevation	363.10 ft	T2 Flow	17.77 ft ³ /s

Subsection: Outlet Input Data
 Label: OCS-4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Structure ID: Riser - 4
 Structure Type: Inlet Box

Number of Openings	1
Elevation	368.00 ft
Orifice Area	16.0 ft ²
Orifice Coefficient	0.600
Weir Length	16.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s
K Reverse	1.000
Manning's n	0.000
Key, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - NP
 Structure Type: Orifice-Circular

Number of Openings	1
Elevation	362.50 ft
Orifice Diameter	2.3 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Year
 Structure Type: Orifice-Area

Number of Openings	1
Elevation	363.50 ft
Orifice Area	1.0 ft ²
Top Elevation	364.50 ft
Datum Elevation	364.00 ft
Orifice Coefficient	0.600

Structure ID: Weir - ESPY
Structure Type: Irregular Weir

Station (ft)	Elevation (ft)
0.00	370.00
3.00	369.00
13.00	369.00
16.00	370.00

Lowest Elevation	369.00 ft
Weir Coefficient	3.00 (ft ^{0.5})/s

Structure ID: TW
 Structure Type: TW Setup, DS Channel

Subsection: Outlet Input Data
Label: OCS-4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Structure ID: TW	
Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall
Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft ³ /s
Flow Tolerance (Maximum)	10.000 ft ³ /s

Subsection: Composite Rating Curve
 Label: OCS-4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
362.50	0.00	(N/A)	0.00
362.60	0.01	(N/A)	0.00
362.70	0.04	(N/A)	0.00
362.80	0.06	(N/A)	0.00
362.90	0.07	(N/A)	0.00
363.00	0.09	(N/A)	0.00
363.10	0.09	(N/A)	0.00
363.20	0.10	(N/A)	0.00
363.30	0.11	(N/A)	0.00
363.40	0.12	(N/A)	0.00
363.50	0.13	(N/A)	0.00
363.60	0.47	(N/A)	0.00
363.70	0.82	(N/A)	0.00
363.80	1.17	(N/A)	0.00
363.90	1.51	(N/A)	0.00
364.00	1.86	(N/A)	0.00
364.10	2.21	(N/A)	0.00
364.20	2.55	(N/A)	0.00
364.30	2.92	(N/A)	0.00
364.40	3.24	(N/A)	0.00
364.50	3.59	(N/A)	0.00
364.60	3.92	(N/A)	0.00
364.70	4.22	(N/A)	0.00
364.80	4.50	(N/A)	0.00
364.90	4.77	(N/A)	0.00
365.00	5.02	(N/A)	0.00
365.10	5.26	(N/A)	0.00
365.20	5.49	(N/A)	0.00
365.30	5.71	(N/A)	0.00
365.40	5.94	(N/A)	0.00
365.50	6.12	(N/A)	0.00
365.60	6.31	(N/A)	0.00
365.70	6.51	(N/A)	0.00
365.80	6.70	(N/A)	0.00
365.90	6.88	(N/A)	0.00
366.00	7.05	(N/A)	0.00
366.10	7.23	(N/A)	0.00
366.20	7.39	(N/A)	0.00
366.30	7.56	(N/A)	0.00
366.40	7.72	(N/A)	0.00
366.50	7.87	(N/A)	0.00
366.60	8.02	(N/A)	0.00
366.70	8.17	(N/A)	0.00
366.80	8.32	(N/A)	0.00

Subsection: Composite Rating Curve
 Label: OCS-4
 Scenario: Post-Development 1 year

Return Event: 1 years
 Storm Event: 1 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
366.90	8.47	(N/A)	0.00
367.00	8.61	(N/A)	0.00
367.10	8.76	(N/A)	0.00
367.20	8.89	(N/A)	0.00
367.30	9.02	(N/A)	0.00
367.40	9.16	(N/A)	0.00
367.50	9.29	(N/A)	0.00
367.60	9.43	(N/A)	0.00
367.70	9.56	(N/A)	0.00
367.80	9.68	(N/A)	0.00
367.90	9.81	(N/A)	0.00
368.00	9.94	(N/A)	0.00
368.10	11.57	(N/A)	0.00
368.20	14.45	(N/A)	0.00
368.30	18.16	(N/A)	0.00
368.40	22.52	(N/A)	0.00
368.50	26.62	(N/A)	0.00
368.60	30.79	(N/A)	0.00
368.70	35.01	(N/A)	0.00
368.80	38.93	(N/A)	0.00
368.90	41.81	(N/A)	0.00
369.00	42.18	(N/A)	0.00
369.10	43.44	(N/A)	0.00
369.20	45.56	(N/A)	0.00
369.30	48.29	(N/A)	0.00
369.40	51.57	(N/A)	0.00
369.50	55.35	(N/A)	0.00
369.60	59.62	(N/A)	0.00
369.70	64.36	(N/A)	0.00
369.80	69.57	(N/A)	0.00
369.90	75.25	(N/A)	0.00
370.00	81.38	(N/A)	0.00

Contributing Structures

(no Q: Orifice - 2
 Year,Riser - 4,Orifice -
 NP,Culvert - 4,Weir -
 ESPY)
 Orifice - NP,Culvert - 4
 (no Q: Orifice - 2
 Year,Riser - 4,Weir -
 ESPY)
 Orifice - NP,Culvert - 4
 (no Q: Orifice - 2
 Year,Riser - 4,Weir -
 ESPY)

Subsection: Composite Rating Curve
Label: OCS-4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - NP,Culvert - 4 (no Q: Orifice - 2 Year,Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Orifice - 2 Year,Orifice -
NP,Culvert - 4 (no Q:
Riser - 4,Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Orifice - NP,Culvert - 4 (no Q: Riser - 4,Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)
Orifice - 2 Year,Riser - 4,Orifice - NP,Culvert - 4 (no Q: Weir - ESPY)

Subsection: Composite Rating Curve
Label: OCS-4
Scenario: Post-Development 1 year

Return Event: 1 years
Storm Event: 1 year

Composite Outflow Summary

Contributing Structures
Riser - 4,Culvert - 4 (no Q: Orifice - 2 Year,Orifice - NP,Weir - ESPY)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)
Riser - 4,Culvert - 4,Weir - ESPY (no Q: Orifice - 2 Year,Orifice - NP)