

V2 - PSP-23-03

# STORMWATER IMPACT ANALYSIS (SIA)

## Preliminary

NOTE: THIS IS A PRELIMINARY STORMWATER IMPACT ANALYSIS USING THE PRELIMINARY SITE PLAN SUBMITTAL (PSP 23-03) AS A BASIS OF DESIGN; DETAILED CONSTRUCTION DOCUMENT DESIGN WILL BE REQUIRED TO FINALIZE THE SIA, HOWEVER THE POND SIZING CALCULATIONS CONTAINED IN THIS PRELIMINARY REPORT ARE SUFFICIENT TO PROVE THAT POND SIZING FOR PURPOSES OF TREATMENT AND PEAK FLOW REDUCTION ARE ATTAINED HEREIN.



Prepared by: Josh Lambert, PE

The **STRONGROCK** Engineering Group, PLLC

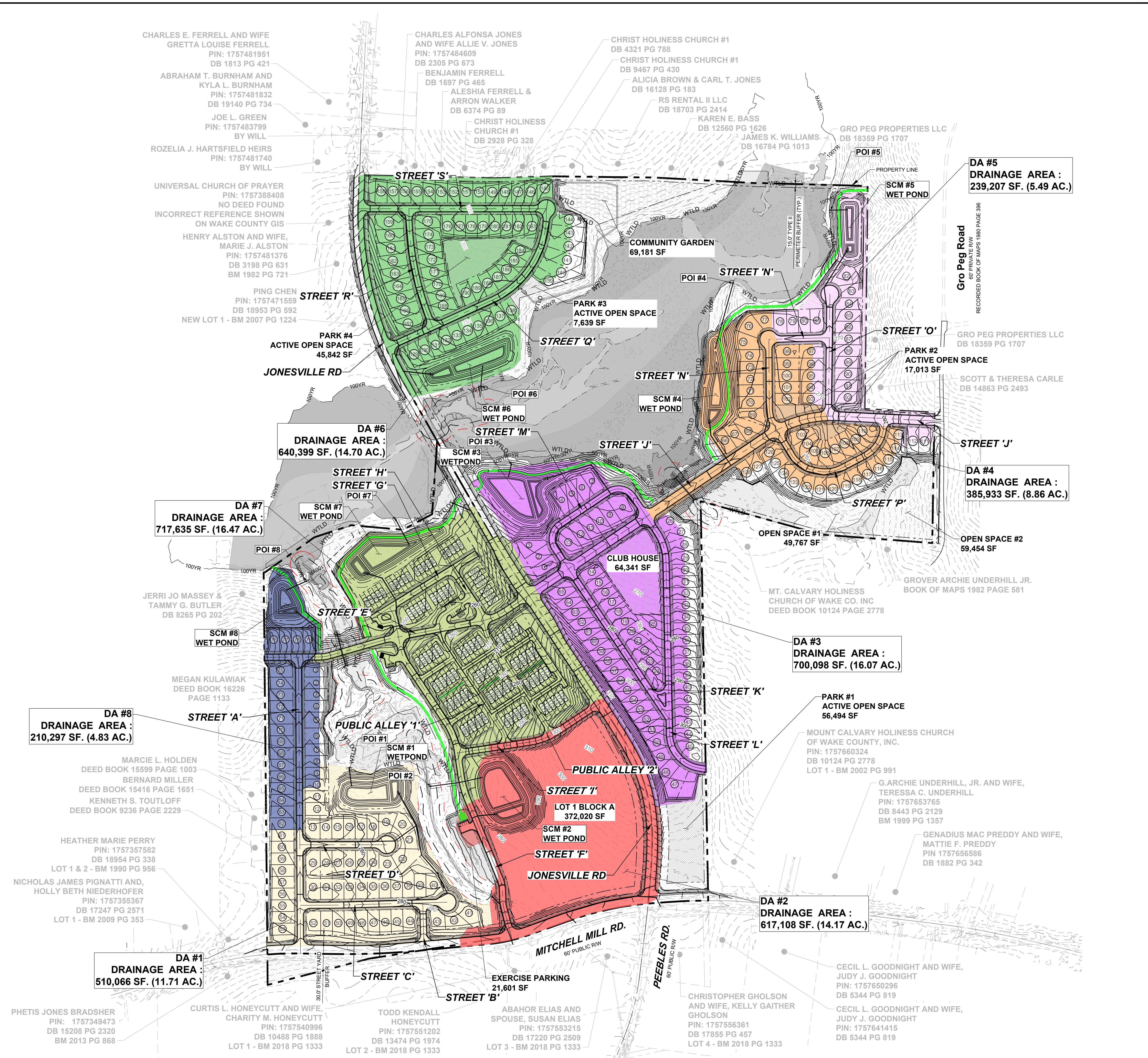
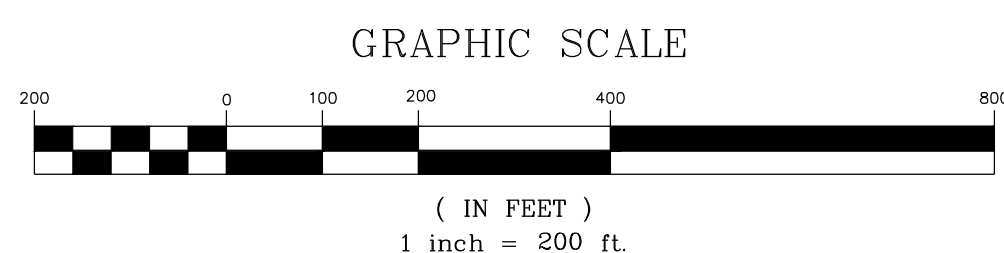
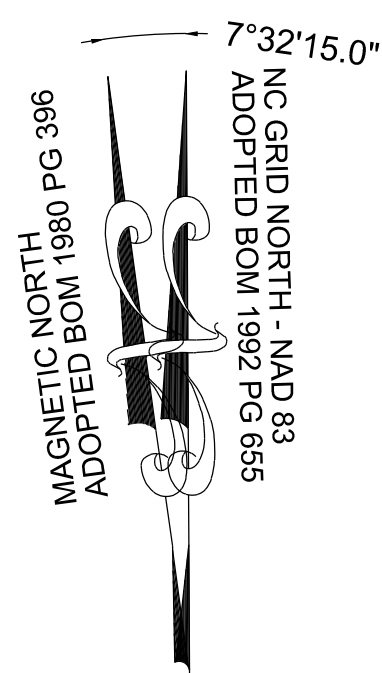
Raleigh, NC 27609  
984.200.1932 (o)  
833.241.3773 (f)

**Subcatchments  
Information  
(DA, CN)**

LEGEND:

- STORM DRAIN LINE
- FLARED END SECTION
- YARD INLET
- CATCH BASIN
- EX. MAJOR CONTOURS
- EX. MINOR CONTOURS
- PROP. MAJOR CONTOURS
- PROP. MINOR CONTOURS
- DRAINAGE AREA 1
- DRAINAGE AREA 2
- DRAINAGE AREA 3
- DRAINAGE AREA 4
- DRAINAGE AREA 5
- DRAINAGE AREA 6
- DRAINAGE AREA 7
- DRAINAGE AREA 8

**TOWNHOME NOTES:**  
 STATES INTERNAL TOWNHOME DRIVEWAYS ARE PRIVATE EASEMENTS AS PER CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT



ISREG	06/01/2023	12/05/2023	BY
PRELIMINARY SUBDIVISION PLAT P-23-02			DATE
TOWN OF ROLESVILLE COMMENTS P-23-02			REVISIONS
NO.			
NO.			

# STRONGROCK

ENGINEERING GROUP

STRONG ROCK ENGINEERING GROUP, PLLC | COMPANY LICENSE # P-2166  
 305 CHURCH AT NORTH HILLS STREET, SUITE 1110 RALEIGH, NC 27609 | INFORMATION@STRONGROCKGROUP.COM

STRONG ROCK PROJECT	NOT FOR CONSTRUCTION	SCALE	AS SHOWN	JWL	SRG	JWL
DESIGNED BY	DRAWN BY	CHECKED BY				

RESERVE @ MITCHELL MILL  
 TOWN OF ROLESVILLE, WAKE COUNTY, NORTH CAROLINA  
 PRELIMINARY SITE PLAN  
 POST-DEVELOPMENT  
 DRAINAGE AREA

DRAWING SHEET  
**EXH-01**

01 OF 01

THIS PLANSET AND ANY ASSOCIATED DOCUMENTS ARE PRELIMINARY AND NOT AUTHORIZED FOR CONSTRUCTION UNTIL SIGNED, DATED, AND OFFICIALLY RELEASED FOR CONSTRUCTION BY THE ENGINEER OF RECORD.

## Post-Development Hydrology Input Summary

Subcatchment	On-Site Area		Off-Site Area		ALL-SITE Area		Impervious Area		
	sf	ac	sf	ac	sf	ac	sf	ac	%
Sub #1	510,066	11.71		0.00	510,066	11.71	236,593	5.43	46.38%
Sub #2	617,108	14.17		0.00	617,108	14.17	406,757	9.34	65.91%
Sub #3	700,097	16.07		0.00	700,097	16.07	373,450	8.57	53.34%
Sub #4	385,933	8.86		0.00	385,933	8.86	198,257	4.55	51.37%
Sub #5	236,953	5.44		0.00	236,953	5.44	114,101	2.62	48.15%
Sub #6	640,398	14.70		0.00	640,398	14.70	289,219	6.64	45.16%
Sub #7	717,635	16.47		0.00	717,635	16.47	495,283	11.37	69.02%
Sub #8	189,603	4.35		0.00	189,603	4.35	97,320	2.23	51.33%

**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #1**

Location: **0**  
 Date: **1/0/1900**

**Part 1: Land Use Breakdown**

Sub #1	Land use	Soil Type								All	SCS CN		Rational Runoff Coefficient, C value				
		A		B		C		D			sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac								
On-Site	Roadway		0.00	59,762	1.37		0.00		0.00	59,762	1.37	11.7%	134.5		1.30		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Driveway	0	0.00	16,960	0.39	0	0.00	0	0.00	16,960	0.39	3.3%	38.2		0.37		
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Roof	0	0.00	132,500	3.04	0	0.00	0	0.00	132,500	3.04	26.0%	298.1		3.04		
	Sidewalk (Includes Patios)	0	0.00	27,371	0.63	0	0.00	0	0.00	27,371	0.63	5.4%	61.6	80.4	0.60	0.58	
	Lawn		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Managed pervious (Open Space)	0	0.00	244,473	5.61	0	0.00	0	0.00	244,473	5.61	47.9%	342.4		0.84		
	Woods		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Land Taken up by BMP		0.00	29,000	0.67		0.00		0.00	29,000	0.67	5.7%	66.6		0.67		
<b>Sum</b>			<b>0.00</b>	<b>510,066</b>	<b>11.71</b>		<b>0.00</b>		<b>0.00</b>	<b>510,066</b>	<b>11.71</b>	<b>100.0%</b>	<b>941.2</b>		<b>6.82</b>		
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
<b>Sum</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>		

510,066 11.71

CN 80.4

C 0.58

**Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)**

DC	Area (ac)	2.52	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

**Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area**

NDC	Land use	Soil Type								All	SCS CN			
		A		B		C		D			sf	ac	CN * Area	CN
		sf	ac	sf	ac	sf	ac	sf	ac					
On-Site	Impervious	0	0.00	126,746	2.91	0	0.00	0	0.00	126,746	2.91	285.1		
	Open	0	0.00	244,473	5.61	0	0.00	0	0.00	244,473	5.61	342.4		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	29,000	0.67	0	0.00	0	0.00	29,000	0.67	66.6		
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	75.5	
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
<b>Sum</b>											<b>400,219</b>	<b>9.19</b>		

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #1	Area (ac)	SCS CN
DC	2.52	98.0
NDC	9.19	75.5

**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #2**

Location: **0**  
 Date: **1/0/1900**

Part 1: Land Use Breakdown																
Sub #2	Land use	Soil Type								All			SCS CN		Rational Runoff Coefficient, C value	
		A		B		C		D		sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac							
On-Site	Roadway		0.00	87,541	2.01		0.00		0.00	87,541	2.01	14.2%	196.9	88.1	1.91	0.76
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Driveway	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0%	0.0		0.00	
	Parking lot/Play ground/Pump station		0.00	9,122	0.21		0.00		0.00	9,122	0.21	1.5%	20.5		0.20	
	Roof	0	0.00	270,000	6.20	0	0.00		0.00	270,000	6.20	43.8%	607.4		6.20	
	Sidewalk (Includes Patios)	0	0.00	40,094	0.92	0	0.00	0	0.00	40,094	0.92	6.5%	90.2		0.87	
	Lawn	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0%	0.0		0.00	
	Managed pervious (Open Space)	0	0.00	168,133	3.86	0	0.00	0	0.00	168,133	3.86	27.2%	235.4		0.58	
	Woods		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Land Taken up by BMP		0.00	42,218	0.97		0.00		0.00	42,218	0.97	6.8%	96.9		0.97	
<b>Sum</b>			<b>0.00</b>	<b>617,108</b>	<b>14.17</b>		<b>0.00</b>		<b>0.00</b>	<b>617,108</b>	<b>14.17</b>	<b>100.0%</b>	<b>1247.5</b>		<b>10.73</b>	
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
<b>Sum</b>			<b>0.00</b>		<b>0.00</b>		<b>0.00</b>		<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>	

617,108 14.17

CN 88.1

C 0.76

Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)			
DC	Area (ac)	3.77	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area															
NDC	Land use	Soil Type								All		SCS CN		Rational Runoff Coefficient, C value	
		A		B		C		D		sf	ac	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac						
On-Site	Impervious	0	0.00	242,594	5.57	0	0.00	0	0.00	242,594	5.57	545.8	84.5	0.00	
	Open	0	0.00	168,133	3.86	0	0.00	0	0.00	168,133	3.86	235.4		0.00	
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		0.00	
	Pond	0	0.00	42,218	0.97	0	0.00	0	0.00	42,218	0.97	96.9		0.00	
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		0.00	
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		0.00	
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		0.00	
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		0.00	
<b>Sum</b>										<b>452,945</b>	<b>10.40</b>	<b>878.1</b>			

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #2	Area (ac)	SCS CN
DC	3.77	98.0
NDC	10.40	84.5

**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #3**

Location: **0**  
 Date: **1/0/1900**

**Part 1: Land Use Breakdown**

Sub #3	Land use	Soil Type								All	SCS CN		Rational Runoff Coefficient, C value				
		A		B		C		D			sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac								
On-Site	Roadway		0.00	100,185	2.30		0.00		0.00	100,185	2.30	14.3%	225.4		2.18		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Driveway	0	0.00	18,880	0.43	0	0.00	0	0.00	18,880	0.43	2.7%	42.5		0.41		
	Parking lot/Play ground/Pump station		0.00	61,000	1.40		0.00		0.00	61,000	1.40	8.7%	137.2		1.33		
	Roof	0	0.00	147,500	3.39	0	0.00	0	0.00	147,500	3.39	21.1%	331.8		3.39		
	Sidewalk (Includes Patios)	0	0.00	45,885	1.05	0	0.00	0	0.00	45,885	1.05	6.6%	103.2	83.3	1.00	0.64	
	Lawn	0	0.00	128,620	2.95	0	0.00	0	0.00	128,620	2.95	18.4%	180.1		0.44		
	Managed pervious (Open Space)	0	0.00	152,900	3.51	0	0.00	0	0.00	152,900	3.51	21.8%	214.1		0.53		
	Woods		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Land Taken up by BMP		0.00	45,127	1.04		0.00		0.00	45,127	1.04	6.4%	103.6		1.04		
<b>Sum</b>			<b>700,097</b>	<b>16.07</b>		<b>0.00</b>		<b>0.00</b>	<b>700,097</b>	<b>16.07</b>	<b>100.0%</b>	<b>1338.0</b>		<b>10.32</b>			
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
<b>Sum</b>			<b>0.00</b>	<b>0.00</b>		<b>0.00</b>		<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>			

700,097 16.07

CN 83.3

C 0.64

**Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)**

DC	Area (ac)	4.98	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

**Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area**

NDC	Land use	Soil Type								All	SCS CN			
		A		B		C		D			sf	ac	CN * Area	CN
		sf	ac	sf	ac	sf	ac	sf	ac					
On-Site	Impervious	0	0.00	156,510	3.59	0	0.00	0	0.00	156,510	3.59	352.1		
	Open	0	0.00	281,520	6.46	0	0.00	0	0.00	281,520	6.46	394.2		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	45,127	1.04	0	0.00	0	0.00	45,127	1.04	103.6		
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	76.6	
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
<b>Sum</b>			<b>483,157</b>	<b>11.09</b>					<b>483,157</b>	<b>11.09</b>	<b>849.9</b>			

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #3	Area (ac)	SCS CN
DC	4.98	98.0
NDC	11.09	76.6

**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #4**

Location: **0**  
 Date: **1/0/1900**

**Part 1: Land Use Breakdown**

Sub #4	Land use	Soil Type								All	SCS CN		Rational Runoff Coefficient, C value				
		A		B		C		D			sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac								
On-Site	Roadway		0.00	66,349	1.52		0.00		0.00	66,349	1.52	17.2%	149.3		1.45		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Driveway	0	0.00	11,520	0.26	0	0.00	0	0.00	11,520	0.26	3.0%	25.9		0.25		
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Roof	0	0.00	90,000	2.07	0	0.00	0	0.00	90,000	2.07	23.3%	202.5		2.07		
	Sidewalk (Includes Patios)	0	0.00	30,388	0.70	0	0.00	0	0.00	30,388	0.70	7.9%	68.4	82.6	0.66	0.63	
	Lawn	0	0.00	78,480	1.80	0	0.00	0	0.00	78,480	1.80	20.3%	109.9		0.27		
	Managed pervious (Open Space)	0	0.00	83,423	1.92	0	0.00	0	0.00	83,423	1.92	21.6%	116.8		0.29		
	Woods		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Land Taken up by BMP		0.00	25,773	0.59		0.00		0.00	25,773	0.59	6.7%	59.2		0.59		
<b>Sum</b>			<b>385,933</b>	<b>8.86</b>		<b>0.00</b>		<b>0.00</b>	<b>385,933</b>	<b>8.86</b>	<b>100.0%</b>	<b>731.9</b>		<b>5.58</b>			
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
<b>Sum</b>				<b>0.00</b>		<b>0.00</b>		<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>			

385,933 8.86

CN 82.6

C 0.63

**Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)**

DC	Area (ac)	2.30	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

**Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area**

NDC	Land use	Soil Type								All	SCS CN			
		A		B		C		D			sf	ac	CN * Area	CN
		sf	ac	sf	ac	sf	ac	sf	ac					
On-Site	Impervious	0	0.00	97,888	2.25	0	0.00	0	0.00	97,888	2.25	220.2		
	Open	0	0.00	161,903	3.72	0	0.00	0	0.00	161,903	3.72	226.7		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	25,773	0.59	0	0.00	0	0.00	25,773	0.59	59.2		
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	77.2	
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
<b>Sum</b>									<b>285,564</b>	<b>6.56</b>	<b>506.1</b>			

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #4	Area (ac)	SCS CN
DC	2.30	98.0
NDC	6.56	77.2



**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #5**

Location: **0**  
 Date: **1/0/1900**

**Part 1: Land Use Breakdown**

Sub #5	Land use	Soil Type								All	SCS CN		Rational Runoff Coefficient, C value				
		A		B		C		D			sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac								
On-Site	Roadway		0.00	43,444	1.00		0.00		0.00	43,444	1.00	18.3%	97.7		0.95		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Driveway	0	0.00	5,760	0.13	0	0.00	0	0.00	5,760	0.13	2.4%	13.0		0.13		
	Parking lot/Play ground/Pump station		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Roof	0	0.00	45,000	1.03	0	0.00	0	0.00	45,000	1.03	19.0%	101.2		1.03		
	Sidewalk (Includes Patios)	0	0.00	19,897	0.46	0	0.00	0	0.00	19,897	0.46	8.4%	44.8	81.9	0.43	0.61	
	Lawn	0	0.00	39,240	0.90	0	0.00	0	0.00	39,240	0.90	16.6%	55.0		0.14		
	Managed pervious (Open Space)	0	0.00	65,128	1.50	0	0.00	0	0.00	65,128	1.50	27.5%	91.2		0.22		
	Woods		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Land Taken up by BMP		0.00	18,484	0.42		0.00		0.00	18,484	0.42	7.8%	42.4		0.42		
<b>Sum</b>			<b>0.00</b>	<b>236,953</b>	<b>5.44</b>		<b>0.00</b>		<b>0.00</b>	<b>236,953</b>	<b>5.44</b>	<b>100.0%</b>	<b>445.3</b>		<b>3.32</b>		
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
<b>Sum</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>			

236,953    5.44

CN    81.9

C    0.61

**Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)**

DC	Area (ac)	1.39	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

**Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area**

NDC	Land use	Soil Type								All	SCS CN			
		A		B		C		D			sf	ac	CN * Area	CN
		sf	ac	sf	ac	sf	ac	sf	ac					
On-Site	Impervious	0	0.00	53,647	1.23	0	0.00	0	0.00	53,647	1.23	120.7		
	Open	0	0.00	104,368	2.40	0	0.00	0	0.00	104,368	2.40	146.2		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	18,484	0.42	0	0.00	0	0.00	18,484	0.42	42.4		
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	76.3	
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
<b>Sum</b>									<b>176,499</b>	<b>4.05</b>	<b>309.3</b>			

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #5	Area (ac)	SCS CN
DC	1.39	98.0
NDC	4.05	76.3

**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #6**

Location: **0**  
 Date: **1/0/1900**

Part 1: Land Use Breakdown																
Sub #6	Land use	Soil Type								All			SCS CN		Rational Runoff Coefficient, C value	
		A		B		C		D		sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac							
On-Site	Roadway		0.00	84,252	1.93		0.00		0.00	84,252	1.93	13.2%	189.5		1.84	
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Driveway	0	0.00	18,880	0.43	0	0.00	0	0.00	18,880	0.43	2.9%	42.5		0.41	
	Parking lot/Play ground/Pump station		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Roof	0	0.00	147,500	3.39	0	0.00	0	0.00	147,500	3.39	23.0%	331.8		3.39	
	Sidewalk (Includes Patios)	0	0.00	38,587	0.89	0	0.00	0	0.00	38,587	0.89	6.0%	86.8	79.7	0.84	0.57
	Lawn	0	0.00	128,620	2.95	0	0.00	0	0.00	128,620	2.95	20.1%	180.1		0.44	
	Managed pervious (Open Space)	0	0.00	190,604	4.38	0	0.00	0	0.00	190,604	4.38	29.8%	266.9		0.66	
	Woods		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Land Taken up by BMP		0.00	31,955	0.73		0.00		0.00	31,955	0.73	5.0%	73.4		0.73	
<b>Sum</b>			<b>0.00</b>	<b>640,398</b>	<b>14.70</b>		<b>0.00</b>		<b>0.00</b>	<b>640,398</b>	<b>14.70</b>	<b>100.0%</b>	<b>1171.1</b>		<b>8.31</b>	
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
<b>Sum</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>	

640,398 14.70

CN 79.7

C 0.57

Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)			
DC	Area (ac)	3.21	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area															
NDC	Land use	Soil Type								All		SCS CN		Rational Runoff Coefficient, C value	
		A		B		C		D		sf	ac	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac						
On-Site	Impervious	0	0.00	149,212	3.43	0	0.00	0	0.00	149,212	3.43	335.7			
	Open	0	0.00	319,224	7.33	0	0.00	0	0.00	319,224	7.33	447.0			
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
	Pond	0	0.00	31955	0.73	0	0.00	0	0.00	31,955	0.73	73.4			
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	74.5		
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
<b>Sum</b>									<b>500,391</b>	<b>11.49</b>	<b>856.1</b>				

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #6	Area (ac)	SCS CN
DC	3.21	98.0
NDC	11.49	74.5

**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #7**

Location: **0**  
 Date: **1/0/1900**

**Part 1: Land Use Breakdown**

Sub #7	Land use	Soil Type								All	SCS CN		Rational Runoff Coefficient, C value				
		A		B		C		D			sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac								
On-Site	Roadway		0.00	194,844	4.47		0.00		0.00	194,844	4.47	27.2%	438.4		4.25		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Driveway	0	0.00	35,200	0.81	0	0.00	0	0.00	35,200	0.81	4.9%	79.2		0.77		
	Parking lot/Play ground/Pump station		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Roof	0	0.00	176,000	4.04	0	0.00	0	0.00	176,000	4.04	24.5%	396.0		4.04		
	Sidewalk (Includes Patios)	0	0.00	89,239	2.05	0	0.00	0	0.00	89,239	2.05	12.4%	200.8	88.7	1.95	0.76	
	Lawn	0	0.00	8,800	0.20	0	0.00	0	0.00	8,800	0.20	1.2%	12.3		0.03		
	Managed pervious (Open Space)	0	0.00	173,963	3.99	0	0.00	0	0.00	173,963	3.99	24.2%	243.6		0.60		
	Woods		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00		
	Land Taken up by BMP		0.00	39,589	0.91		0.00		0.00	39,589	0.91	5.5%	90.9		0.91		
<b>Sum</b>			<b>0.00</b>	<b>717,635</b>	<b>16.47</b>		<b>0.00</b>		<b>0.00</b>	<b>717,635</b>	<b>16.47</b>	<b>100.0%</b>	<b>1461.1</b>		<b>12.54</b>		
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00		
<b>Sum</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>		

717,635 16.47

CN 88.7

C 0.76

**Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)**

DC	Area (ac)	6.29	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

**Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area**

NDC	Land use	Soil Type								All	SCS CN			
		A		B		C		D			sf	ac	CN * Area	CN
		sf	ac	sf	ac	sf	ac	sf	ac					
On-Site	Impervious	0	0.00	221,239	5.08	0	0.00	0	0.00	221,239	5.08	497.7		
	Open	0	0.00	182,763	4.20	0	0.00	0	0.00	182,763	4.20	255.9		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	39589	0.91	0	0.00	0	0.00	39,589	0.91	90.9		
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	82.9	
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0		
<b>Sum</b>											<b>443,591</b>	<b>10.18</b>		

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #7	Area (ac)	SCS CN
DC	6.29	98.0
NDC	10.18	82.9

**Post-Development Hydrology**

Project: **0**  
 Subcatchment: **Sub #8**

Location: **0**  
 Date: **1/0/1900**

Part 1: Land Use Breakdown																
Sub #8	Land use	Soil Type								All			SCS CN		Rational Runoff Coefficient, C value	
		A		B		C		D		sf	ac	%	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac							
On-Site	Roadway		0.00	30,000	0.69		0.00		0.00	30,000	0.69	15.8%	67.5		0.65	
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Driveway	0	0.00	6,080	0.14	0	0.00	0	0.00	6,080	0.14	3.2%	13.7		0.13	
	Parking lot/Play ground/Pump station		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Roof	0	0.00	47,500	1.09	0	0.00	0	0.00	47,500	1.09	25.1%	106.9		1.09	
	Sidewalk (Includes Patios)	0	0.00	13,740	0.32	0	0.00	0	0.00	13,740	0.32	7.2%	30.9	82.9	0.30	0.64
	Lawn	0	0.00	41,420	0.95	0	0.00	0	0.00	41,420	0.95	21.8%	58.0		0.14	
	Managed pervious (Open Space)	0	0.00	36,626	0.84	0	0.00	0	0.00	36,626	0.84	19.3%	51.3		0.13	
	Woods		0.00	0	0.00		0.00		0.00	0	0.00	0.0%	0.0		0.00	
	Land Taken up by BMP		0.00	14,237	0.33		0.00		0.00	14,237	0.33	7.5%	32.7		0.33	
<b>Sum</b>			<b>0.00</b>	<b>189,603</b>	<b>4.35</b>		<b>0.00</b>		<b>0.00</b>	<b>189,603</b>	<b>4.35</b>	<b>100.0%</b>	<b>360.9</b>		<b>2.77</b>	
Off-Site	Roadway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Grassed Right-of-ways		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Driveway		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Parking lot/Play ground/Pump station		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Roof		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Sidewalk (Includes Patios)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Lawn		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Managed pervious (Open Space)		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Woods		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
	Land Taken up by BMP		0.00		0.00		0.00		0.00	0	0.00		0.0		0.00	
<b>Sum</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>		<b>0.0</b>		<b>0.00</b>	

189,603 4.35

CN 82.9

C 0.64

Part 2: Directly Connected (DC) Impervious Area (Only for On-Site Area)			
DC	Area (ac)	1.10	(Assumption: Roadway, driveway, parking lot, and 25% of roofs are assumed as DC impervious areas)
	CN	98.0	

Part 3: Pervious Area and Non-Directly Connected (NDC) Impervious Area															
NDC	Land use	Soil Type								All		SCS CN		Rational Runoff Coefficient, C value	
		A		B		C		D		sf	ac	CN * Area	CN	C * Area	C
		sf	ac	sf	ac	sf	ac	sf	ac						
On-Site	Impervious	0	0.00	49,365	1.13	0	0.00	0	0.00	49,365	1.13	111.1			
	Open	0	0.00	78,046	1.79	0	0.00	0	0.00	78,046	1.79	109.3			
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
	Pond	0	0.00	14,237	0.33	0	0.00	0	0.00	14,237	0.33	32.7			
Off-Site	Impervious	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	77.8		
	Open	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
	Wooded	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
	Pond	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0			
<b>Sum</b>										<b>141,648</b>	<b>3.25</b>	<b>253.0</b>			

Curve Number				
HSG	A	B	C	D
Impervious	98	98	98	98
Open	39	61	74	80
Wooded	30	55	70	77
Pond	100	100	100	100

Rational Runoff Coefficient, C	
Asphalt, Concrete	0.95
Roof	1
Unimproved Areas	0.35
Lawn (sandy soil)	0.15
Lawn (heavy soil)	0.25
Wooded areas	0.15
Wet pond	1

Sub #8	Area (ac)	SCS CN
DC	1.10	98.0
NDC	3.25	77.8

# **SCM Design Calculations**

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1

$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

11.71	ac
-------	----

Impervious portion of drainage area (ac.) =

5.43	ac
------	----

Ia =

0.46

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.47

Water Quality Volume Required:

$WQV = DV = 3630 * Rv * Rd * A =$

19,870	cf
--------	----

Water Quality Volume Provided:

27,478	cf
--------	----

**MDC WET POND Sizing**

**SCM #1 (Wet Detention Basin)**

SA/DA and Average Depth Method:

Impervious Ratio =	0.464	
Choose Permanent Pool Avg Depth, Davg =	4	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table  
 Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	40%	1.22
Upper Limit =	50%	1.47
Actual SA/DA Ratio =		1.38

SA/DA (%) =	1.38	%
DA (Drainage Area) =	11.71	ac
Therefore, SA = DA * coefficient		
SA =	0.162	ac
SA (Permanent Pool or PP) =	7,037	sf

Find Permanent Pool volume (Vpp)  
 Davg = Vpp / SA (PP average depth = PP volume / PP surface area)

Vpp = Davg * SA	28,148	cf
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Forebay volume (20% of Vpp) =	5,630	cf
Main Pool volume (80% of Vpp) =	22,518	cf

Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #1 (Wet Detention Basin)						
Forebay						
Designed Forebay						Criteria
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)
Bottom	1,545	0.0355	4	262	9,003	5,630
Top	3,034	0.0697		266		

Main Pool						
Designed Main pool						Criteria
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)
Bottom	8,370	0.1921	4	262	40,779	22,518
Top	12,955	0.2974		266		

Temporary pool						
Designed Temporary pool						Criteria
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)
Bottom	15,989	0.3671	1.5	266	27,478	19,870
Top	19,886	0.4565		267.5		



Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	3,034	0	0	0	266
depth 0.5 (bot-veg-shelf)	2,823	1,464	1,464	0.5	265.5
depth 1	2,618	1,360	2,824	1	265
depth 2	2,231	2,422	5,246	2	264
depth 3	1,874	2,050	7,296	3	263
depth 4	1,545	1,707	9,003	4	262
depth 5				5	261
depth 6				6	260
depth 7				7	259

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	12,955	0	0	0	266
depth 0.5 (vegetated shelf)	11,502	6,111	6,111	0.5	265.5
depth1	11,033	5,633	11,744	1	265
depth 2	10,116	10,571	22,315	2	264
depth 3	9,228	9,669	31,984	3	263
depth 4	8,370	8,796	40,779	4	262
depth 5				5	261
depth 6				6	260
depth 7				7	259
depth 8				8	258

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	15,989	0	0	0	266
depth 0.5 (Vegetated shelf)	18,065	8,508	8,508	0.5	266.5
depth 1	18,968	9,257	17,766	1	267
depth 1.5	19,886	9,713	27,478	1.5	267.5

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
266	0	15,989	0	0	Permanent pool
266.5	0.5	18,065	8,508	8,508	Top of vegetated shelf
267	1	18,968	9,257	17,766	
268	2	20,818	19,886	37,651	
269	3	22,724	21,764	59,415	
270	4	24,689	23,700	83,115	
271	5	26,711	25,693	108,809	
272	6	28,791	27,745	136,553	Top of pond

SCM #1 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	261
Bottom of pond (sediment clean-out top)	262
Bottom of vegetated shelf	265.5
Permanent pool	266
Top of vegetated shelf	266.5
Temporary pool	267.5
Top of riser	269
Emergency spillway	271
Top of pond	272

## Orifice Sizing - BMP A WETPOND (SCM #1)

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

Total Volume to be discharged from Ponds (Q) =  
 Depth of Storage (H) =

19,870	cf
1.5	

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.114986977 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$\begin{aligned} C_d &= 0.60 \\ g &= 32.2 \\ H/3 = h &= 0.50 \end{aligned}$$

$$\begin{aligned} A_2 &= 0.0338 \text{ sf} \\ &= 4.863 \text{ sq in} \\ \text{diameter} &= \mathbf{2.488} \text{ inches} \end{aligned}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A/\pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.045994791 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$\begin{aligned} C_d &= 0.60 \\ g &= 32.2 \\ H/3 = h &= 0.50 \end{aligned}$$

$$\begin{aligned} A_5 &= 0.014 \text{ sf} \\ &= 1.945 \text{ sq in} \\ \text{diameter} &= \mathbf{1.574} \text{ inches} \end{aligned}$$

### Orifice Chosen

$$\begin{aligned} \text{diameter} &= \mathbf{2.00} \text{ inches} \\ A &= 0.0218 \text{ sf} \end{aligned}$$

$$\begin{aligned} Q &= C_d \times A \times \sqrt{2 \times g \times h} \\ Q &= 0.0743 \text{ cfs} \end{aligned}$$

$$\begin{aligned} \text{time} &= 267501.26 \text{ seconds} \\ \mathbf{Time} &= \mathbf{3.10} \text{ days} \end{aligned}$$

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1

$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

14.17 ac

Impervious portion of drainage area (ac.) =

9.34 ac

Ia =

0.66

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.64

Water Quality Volume Required:

$WQV = DV = 3630 * Rv * Rd * A =$

33,078 cf

Water Quality Volume Provided:

46,048 cf

MDC WET POND Sizing

SCM #2 (Wet Detention Basin)

SA/DA and Average Depth Method:

Impervious Ratio =	0.659	
Choose Permanent Pool Avg Depth, Davg =	4	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table

Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	60%	1.43
Upper Limit =	70%	2.04
Actual SA/DA Ratio =		1.79

SA/DA (%) =	1.79	%
DA (Drainage Area) =	14.17	ac
Therefore, SA = DA * coefficient		
SA =	0.254	ac
SA (Permanent Pool or PP) =	11,051	sf

Find Permanent Pool volume (Vpp)

$D_{avg} = V_{pp} / SA$  (PP average depth = PP volume / PP surface area)

$V_{pp} = D_{avg} * SA$

Vpp =	44,203	cf
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Forebay volume (20% of Vpp) =	8,841	cf
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Main Pool volume (80% of Vpp) =	35,362	cf
---------------------------------	--------	----

Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #2 (Wet Detention Basin)							
Forebay							
Designed Forebay						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	2,949	0.0677	4	260	16,420	8,841	
Top	5,348	0.1228		264			

Main Pool							
Designed Main pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	17,000	0.3903	4	260	76,730	35,362	
Top	22,437	0.5151		264			

Temporary pool							
Designed Temporary pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	27,785	0.6379	1.5	264	46,048	33,078	
Top	32,492	0.7459		265.5			

Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	5,348	0	0	0	264
depth 0.5 (bot-veg-shelf)	5,020	2,592	2,592	0.5	263.5
depth 1	4,700	2,430	5,021	1	263
depth 2	4,085	4,389	9,410	2	262
depth 3	3,501	3,789	13,199	3	261
depth 4	2,949	3,221	16,420	4	260
depth 5				5	259
depth 6				6	258
depth 7				7	257

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	22,437	0	0	0	264
depth 0.5 (vegetated shelf)	20,735	10,790	10,790	0.5	263.5
depth1	20,181	10,229	21,019	1	263
depth 2	19,094	19,635	40,654	2	262
depth 3	18,034	18,561	59,215	3	261
depth 4	17,000	17,514	76,730	4	260
depth 5				5	259
depth 6				6	258
depth 7				7	257
depth 8				8	256

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	27,785	0	0	0	264
depth 0.5 (Vegetated shelf)	30,488	14,563	14,563	0.5	264.5
depth 1	31,483	15,492	30,055	1	265
depth 1.5	32,492	15,993	46,048	1.5	265.5

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
264	0	27,785	0	0	Permanent pool
264.5	0.5	30,488	14,563	14,563	Top of vegetated shelf
265	1	31,483	15,492	30,055	
266	2	33,516	32,494	62,549	
267	3	35,606	34,556	97,105	
268	4	37,753	36,674	133,779	
269	5	39,957	38,850	172,629	
270	6	42,218	41,082	213,711	Top of pond

SCM #2 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	259
Bottom of pond (sediment clean-out top)	260
Bottom of vegetated shelf	263.5
Permanent pool	264
Top of vegetated shelf	264.5
Temporary pool	265.5
Top of riser	267
Emergency spillway	-
Top of pond	270



## Orifice Sizing - BMP A WETPOND (SCM #2)

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

Total Volume to be discharged from Ponds (Q) =

33,078 cf

Depth of Storage (H) =

1.5

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.191423852 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_2 = 0.0562 \text{ sf}$$

$$8.096 \text{ sq in}$$

$$\text{diameter} = \mathbf{3.211} \text{ inches}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A / \pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.076569541 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_5 = 0.022 \text{ sf}$$

$$3.238 \text{ sq in}$$

$$\text{diameter} = \mathbf{2.031} \text{ inches}$$

### Orifice Chosen

$$\text{diameter} = \mathbf{2.50} \text{ inches}$$

$$A = 0.0341 \text{ sf}$$

$$Q = C_d \times A \times \sqrt{2 \times g \times h}$$

$$Q = 0.1161 \text{ cfs}$$

$$\text{time} = 285005.47 \text{ seconds}$$

$$\text{Time} = \mathbf{3.30} \text{ days}$$

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1
---

$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

16.07	ac
-------	----

Impervious portion of drainage area (ac.) =

8.57	ac
------	----

Ia =

0.53
------

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.53
------

Water Quality Volume Required:

WQV = DV =  $3630 * Rv * Rd * A =$

30,926	cf
--------	----

Water Quality Volume Provided:

45,502	cf
--------	----

MDC WET POND Sizing

SCM #3 (Wet Detention Basin)

SA/DA and Average Depth Method:

Impervious Ratio =	0.533	
Choose Permanent Pool Avg Depth, Davg =	4	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table  
 Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	50%	1.47
Upper Limit =	60%	1.73
Actual SA/DA Ratio =		1.56

SA/DA (%) =	1.56	%
DA (Drainage Area) =	16.07	ac
Therefore, SA = DA * coefficient		
SA =	0.250	ac
SA (Permanent Pool or PP) =	10,900	sf

Find Permanent Pool volume (Vpp)  
 $D_{avg} = V_{pp} / SA$  (PP average depth = PP volume / PP surface area)

Vpp = Davg * SA		
Vpp =	43,599	cf

Forebay volume (20% of Vpp) =	8,720	cf
Main Pool volume (80% of Vpp) =	34,880	cf

Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #3 (Wet Detention Basin)							
Forebay							
Designed Forebay						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	2,194	0.0504	4	238	14,899	8,720	
Top	5,417	0.1244		242			

Main Pool							
Designed Main pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	15,434	0.3543	4	238	71,330	34,880	
Top	21,426	0.4919		242			

Temporary pool							
Designed Temporary pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	26,843	0.6162	1.5	242	45,502	30,926	
Top	32,555	0.7474		243.5			

Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	5,417	0	0	0	242
depth 0.5 (bot-veg-shelf)	4,958	2,593	2,593	0.5	241.5
depth 1	4,518	2,368	4,961	1	241
depth 2	3,688	4,096	9,057	2	240
depth 3	2,917	3,295	12,352	3	239
depth 4	2,194	2,547	14,899	4	238
depth 5				5	237
depth 6				6	236
depth 7				7	235

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	21,426	0	0	0	242
depth 0.5 (vegetated shelf)	19,544	10,239	10,239	0.5	241.5
depth1	18,932	9,619	19,857	1	241
depth 2	17,733	18,329	38,187	2	240
depth 3	16,566	17,146	55,333	3	239
depth 4	15,434	15,997	71,330	4	238
depth 5				5	237
depth 6				6	236
depth 7				7	235
depth 8				8	234

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	26,843	0	0	0	242
depth 0.5 (Vegetated shelf)	30,042	14,214	14,214	0.5	242.5
depth 1	31,282	15,330	29,544	1	243
depth 1.5	32,555	15,958	45,502	1.5	243.5

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
242	0	26,843	0	0	Permanent pool
242.5	0.5	30,042	14,214	14,214	Top of vegetated shelf
243	1	31,282	15,330	29,544	
244	2	33,856	32,561	62,104	
245	3	36,540	35,189	97,294	
246	4	39,329	37,926	135,220	
247	5	42,196	40,754	175,974	
248	6	45,127	43,653	219,627	Top of pond

SCM #3 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	237
Bottom of pond (sediment clean-out top)	238
Bottom of vegetated shelf	241.5
Permanent pool	242
Top of vegetated shelf	242.5
Temporary pool	243.5
Top of riser	245
Emergency spillway	247
Top of pond	248

## Orifice Sizing - BMP A WETPOND (SCM #3)

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

Total Volume to be discharged from Ponds (Q) =

30,926 cf

Depth of Storage (H) =

1.5

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.178968753 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_2 = 0.0526 \text{ sf}$$
$$7.569 \text{ sq in}$$

$$\text{diameter} = \mathbf{3.104} \text{ inches}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A / \pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.071587501 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_5 = 0.021 \text{ sf}$$
$$3.028 \text{ sq in}$$

$$\text{diameter} = \mathbf{1.963} \text{ inches}$$

### Orifice Chosen

$$\text{diameter} = \mathbf{2.50} \text{ inches}$$

$$A = 0.0341 \text{ sf}$$

$$Q = C_d \times A \times \sqrt{2 \times g \times h}$$

$$Q = 0.1161 \text{ cfs}$$

$$\text{time} = 266461.43 \text{ seconds}$$

$$\text{Time} = \mathbf{3.08} \text{ days}$$

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1

$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

8.86	ac
------	----

Impervious portion of drainage area (ac.) =

4.55	ac
------	----

Ia =

0.51

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.51

Water Quality Volume Required:

$WQV = DV = 3630 * Rv * Rd * A =$

16,477	cf
--------	----

Water Quality Volume Provided:

19,866	cf
--------	----



MDC WET POND Sizing

SCM #4 (Wet Detention Basin)

SA/DA and Average Depth Method:

Impervious Ratio =	0.514	
Choose Permanent Pool Avg Depth, Davg =	3	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table  
 Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	50%	1.79
Upper Limit =	60%	2.09
Actual SA/DA Ratio =		1.83

SA/DA (%) =	1.83	%
DA (Drainage Area) =	8.86	ac
Therefore, SA = DA * coefficient		
SA =	0.162	ac
SA (Permanent Pool or PP) =	7,067	sf

Find Permanent Pool volume (Vpp)  
 $D_{avg} = V_{pp} / SA$  (PP average depth = PP volume / PP surface area)  
 $V_{pp} = D_{avg} * SA$

Vpp =	21,201	cf
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Forebay volume (20% of Vpp) =	4,240	cf
Main Pool volume (80% of Vpp) =	16,961	cf

Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #4 (Wet Detention Basin)							
Forebay							
Designed Forebay						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	959	0.0220	4	236	6,388	4,240	
Top	2,325	0.0534		240			

Main Pool							
Designed Main pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	3,705	0.0851	4	236	21,670	16,961	
Top	8,315	0.1909		240			

Temporary pool							
Designed Temporary pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	10,640	0.2443	1.5	240	19,866	16,477	
Top	15,100	0.3466		241.5			

Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	2,325	0	0	0	240
depth 0.5 (bot-veg-shelf)	2,125	1,112	1,112	0.5	239.5
depth 1	1,934	1,014	2,127	1	239
depth 2	1,575	1,751	3,878	2	238
depth 3	1,249	1,409	5,287	3	237
depth 4	959	1,101	6,388	4	236
depth 5				5	235
depth 6				6	234
depth 7				7	233

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	8,315	0	0	0	240
depth 0.5 (vegetated shelf)	6,708	3,749	3,749	0.5	239.5
depth1	6,215	3,230	6,979	1	239
depth 2	5,290	5,746	12,725	2	238
depth 3	4,459	4,869	17,593	3	237
depth 4	3,705	4,076	21,670	4	236
depth 5				5	235
depth 6				6	234
depth 7				7	233
depth 8				8	232

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	10,640	0	0	0	240
depth 0.5 (Vegetated shelf)	12,898	5,875	5,875	0.5	240.5
depth 1	13,990	6,720	12,596	1	241
depth 1.5	15,100	7,271	19,866	1.5	241.5

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
240	0	10,640	0	0	Permanent pool
240.5	0.5	12,898	5,875	5,875	Top of vegetated shelf
241	1	13,990	6,720	12,596	
242	2	16,228	15,095	27,691	
243	3	18,528	17,365	45,056	
244	4	20,885	19,695	64,751	
245	5	23,300	22,081	86,832	
246	6	25,773	24,526	111,358	Top of pond

SCM #4 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	235
Bottom of pond (sediment clean-out top)	236
Bottom of vegetated shelf	239.5
Permanent pool	240
Top of vegetated shelf	240.5
Temporary pool	241.5
Top of riser	243
Emergency spillway	245
Top of pond	246

## Orifice Sizing - BMP A WETPOND (SCM #4)

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

Total Volume to be discharged from Ponds (Q) =

16,477 cf

Depth of Storage (H) =

1.5

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.095354846 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_2 = 0.0280 \text{ sf}$$

$$4.033 \text{ sq in}$$

$$\text{diameter} = \mathbf{2.266} \text{ inches}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A / \pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.038141938 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_5 = 0.011 \text{ sf}$$

$$1.613 \text{ sq in}$$

$$\text{diameter} = \mathbf{1.433} \text{ inches}$$

### Orifice Chosen

$$\text{diameter} = \mathbf{2.00} \text{ inches}$$

$$A = 0.0218 \text{ sf}$$

$$Q = C_d \times A \times \sqrt{2 \times g \times h}$$

$$Q = 0.0743 \text{ cfs}$$

$$\text{time} = 221829.83 \text{ seconds}$$

$$\text{Time} = \mathbf{2.57} \text{ days}$$

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1
---

$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

5.44	ac
------	----

Impervious portion of drainage area (ac.) =

2.62	ac
------	----

Ia =

0.48
------

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.48
------

Water Quality Volume Required:

$WQV = DV = 3630 * Rv * Rd * A =$

9,545	cf
-------	----

Water Quality Volume Provided:

14,543	cf
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MDC WET POND Sizing

SCM #5 (Wet Detention Basin)

SA/DA and Average Depth Method:

Impervious Ratio =	0.482	
Choose Permanent Pool Avg Depth, Davg =	3	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table

Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	40%	1.51
Upper Limit =	50%	1.79
Actual SA/DA Ratio =		1.74

SA/DA (%) =	1.74	%
DA (Drainage Area) =	5.44	ac
Therefore, SA = DA * coefficient		
SA =	0.095	ac
SA (Permanent Pool or PP) =	4,119	sf

Find Permanent Pool volume (Vpp)

$D_{avg} = V_{pp} / SA$  (PP average depth = PP volume / PP surface area)

$V_{pp} = D_{avg} * SA$

Vpp =	12,357	cf
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Forebay volume (20% of Vpp) =	2,471	cf
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Main Pool volume (80% of Vpp) =	9,885	cf
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Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #5 (Wet Detention Basin)							
Forebay							
Designed Forebay						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	563	0.0129	4	241	4,084	2,471	
Top	1,559	0.0358		245			

Main Pool							
Designed Main pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	2,563	0.0588	4	241	15,873	9,885	
Top	6,350	0.1458		245			

Temporary pool							
Designed Temporary pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	7,909	0.1816	1.5	245	14,543	9,545	
Top	10,969	0.2518		246.5			



Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	1,559	0	0	0	245
depth 0.5 (bot-veg-shelf)	1,408	741	741	0.5	244.5
depth 1	1,265	668	1,409	1	244
depth 2	1,001	1,130	2,540	2	243
depth 3	767	881	3,421	3	242
depth 4	563	662	4,084	4	241
depth 5				5	240
depth 6				6	239
depth 7				7	238

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	6,350	0	0	0	245
depth 0.5 (vegetated shelf)	5,230	2,890	2,890	0.5	244.5
depth1	4,519	2,435	5,326	1	244
depth 2	3,837	4,173	9,499	2	243
depth 3	3,185	3,506	13,005	3	242
depth 4	2,563	2,868	15,873	4	241
depth 5				5	240
depth 6				6	239
depth 7				7	238
depth 8				8	237

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	7,909	0	0	0	245
depth 0.5 (Vegetated shelf)	9,458	4,336	4,336	0.5	245.5
depth 1	10,206	4,915	9,251	1	246
depth 1.5	10,969	5,293	14,543	1.5	246.5

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
245	0	7,909	0	0	Permanent pool
245.5	0.5	9,458	4,336	4,336	Top of vegetated shelf
246	1	10,206	4,915	9,251	
247	2	11,746	10,967	20,218	
248	3	13,343	12,536	32,754	
249	4	14,999	14,163	46,917	
250	5	16,712	15,848	62,765	
251	6	18,484	17,591	80,355	Top of pond

SCM #5 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	240
Bottom of pond (sediment clean-out top)	241
Bottom of vegetated shelf	244.5
Permanent pool	245
Top of vegetated shelf	245.5
Temporary pool	246.5
Top of riser	248
Emergency spillway	250
Top of pond	251

## Orifice Sizing - BMP A WETPOND (SCM #5)

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

Total Volume to be discharged from Ponds (Q) =

9,545 cf

Depth of Storage (H) =

1.5

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.055236722 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_2 = 0.0162 \text{ sf}$$
$$2.336 \text{ sq in}$$

$$\text{diameter} = \mathbf{1.725} \text{ inches}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A / \pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.022094689 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_5 = 0.006 \text{ sf}$$
$$0.934 \text{ sq in}$$

$$\text{diameter} = \mathbf{1.091} \text{ inches}$$

### Orifice Chosen

$$\text{diameter} = \mathbf{1.50} \text{ inches}$$

$$A = 0.0123 \text{ sf}$$

$$Q = C_d \times A \times \sqrt{2 \times g \times h}$$

$$Q = 0.0418 \text{ cfs}$$

$$\text{time} = 228445.47 \text{ seconds}$$

$$\text{Time} = \mathbf{2.64} \text{ days}$$

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1

$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

14.70	ac
-------	----

Impervious portion of drainage area (ac.) =

6.64	ac
------	----

Ia =

0.45

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.46

Water Quality Volume Required:

WQV = DV =  $3630 * Rv * Rd * A =$

24,360	cf
--------	----

Water Quality Volume Provided:

27,944	cf
--------	----

MDC WET POND Sizing

SCM #6 (Wet Detention Basin)

SA/DA and Average Depth Method:

Impervious Ratio =	0.452	
Choose Permanent Pool Avg Depth, Davg =	3	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table

Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	40%	1.51
Upper Limit =	50%	1.79
Actual SA/DA Ratio =		1.65

SA/DA (%) =	1.65	%
DA (Drainage Area) =	14.70	ac
Therefore, SA = DA * coefficient		
SA =	0.243	ac
SA (Permanent Pool or PP) =	10,596	sf

Find Permanent Pool volume (Vpp)

$D_{avg} = V_{pp} / SA$  (PP average depth = PP volume / PP surface area)

$V_{pp} = D_{avg} * SA$

Vpp =	31,787	cf
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Forebay volume (20% of Vpp) =	6,357	cf
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Main Pool volume (80% of Vpp) =	25,430	cf
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Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #6 (Wet Detention Basin)							
Forebay							
Designed Forebay						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	1,607	0.0369	4	230	9,852	6,357	
Top	3,405	0.0782		234			

Main Pool							
Designed Main pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	7,153	0.1642	4	230	37,189	25,430	
Top	12,528	0.2876		234			

Temporary pool							
Designed Temporary pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	15,933	0.3658	1.5	234	27,944	24,360	
Top	20,594	0.4728		235.5			

Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	3,405	0	0	0	234
depth 0.5 (bot-veg-shelf)	3,152	1,639	1,639	0.5	233.5
depth 1	2,908	1,515	3,153	1	233
depth 2	2,443	2,672	5,826	2	232
depth 3	2,009	2,222	8,048	3	231
depth 4	1,607	1,804	9,852	4	230
depth 5				5	229
depth 6				6	228
depth 7				7	227

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	12,528	0	0	0	234
depth 0.5 (vegetated shelf)	10,833	5,835	5,835	0.5	233.5
depth1	10,283	5,278	11,114	1	233
depth 2	9,208	9,741	20,854	2	232
depth 3	8,165	8,681	29,535	3	231
depth 4	7,153	7,653	37,189	4	230
depth 5				5	229
depth 6				6	228
depth 7				7	227
depth 8				8	226

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	15,933	0	0	0	234
depth 0.5 (Vegetated shelf)	18,236	8,536	8,536	0.5	234.5
depth 1	19,407	9,409	17,945	1	235
depth 1.5	20,594	9,999	27,944	1.5	235.5

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
234	0	15,933	0	0	Permanent pool
234.5	0.5	18,236	8,536	8,536	Top of vegetated shelf
235	1	19,407	9,409	17,945	
236	2	21,796	20,590	38,535	
237	3	24,247	23,011	61,546	
238	4	26,757	25,492	87,037	
239	5	29,326	28,032	115,069	
240	6	31,955	30,631	145,700	Top of pond

SCM #6 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	229
Bottom of pond (sediment clean-out top)	230
Bottom of vegetated shelf	233.5
Permanent pool	234
Top of vegetated shelf	234.5
Temporary pool	235.5
Top of riser	237
Emergency spillway	239
Top of pond	240



## Orifice Sizing - BMP A WETPOND (SCM #6)

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

Total Volume to be discharged from Ponds (Q) =

24,360 cf

Depth of Storage (H) =

1.5

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.140970956 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_2 = 0.0414 \text{ sf}$$

$$5.962 \text{ sq in}$$

$$\text{diameter} = 2.755 \text{ inches}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A / \pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.056388382 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.50$$

$$A_5 = 0.017 \text{ sf}$$

$$2.385 \text{ sq in}$$

$$\text{diameter} = 1.743 \text{ inches}$$

### Orifice Chosen

$$\text{diameter} = 2.00 \text{ inches}$$

$$A = 0.0218 \text{ sf}$$

$$Q = C_d \times A \times \sqrt{2 \times g \times h}$$

$$Q = 0.0743 \text{ cfs}$$

$$\text{time} = 327949.38 \text{ seconds}$$

$$\text{Time} = 3.80 \text{ days}$$

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1

$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

16.47	ac
-------	----

Impervious portion of drainage area (ac.) =

11.37	ac
-------	----

Ia =

0.69

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.67

Water Quality Volume Required:

$WQV = DV = 3630 * Rv * Rd * A =$

40,136	cf
--------	----

Water Quality Volume Provided:

50,486	cf
--------	----

MDC WET POND Sizing

SCM #7 (Wet Detention Basin)

SA/DA and Average Depth Method:

Impervious Ratio =	0.690	
Choose Permanent Pool Avg Depth, Davg =	4	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table  
 Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	60%	1.73
Upper Limit =	70%	2.04
Actual SA/DA Ratio =		2.01

SA/DA (%) =	2.01	%
DA (Drainage Area) =	16.47	ac
Therefore, SA = DA * coefficient		
SA =	0.331	ac
SA (Permanent Pool or PP) =	14,421	sf

Find Permanent Pool volume (Vpp)  
 $D_{avg} = V_{pp} / SA$  (PP average depth = PP volume / PP surface area)  
 $V_{pp} = D_{avg} * SA$

Vpp =	57,683	cf
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Forebay volume (20% of Vpp) =	11,537	cf
Main Pool volume (80% of Vpp) =	46,147	cf

Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #7 (Wet Detention Basin)							
Forebay							
Designed Forebay						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	1,561	0.0358	5	235	12,732	11,537	
Top	3,659	0.0840		240			

Main Pool							
Designed Main pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	10,060	0.2309	5	235	64,925	46,147	
Top	17,520	0.4022		240			

Temporary pool							
Designed Temporary pool						Criteria	PASS
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)	
Bottom	21,179	0.4862	2	240	50,486	40,136	
Top	28,135	0.6459		242			

Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	3,659	0	0	0	240
depth 0.5 (bot-veg-shelf)	3,415	1,768	1,768	0.5	239.5
depth 1	3,179	1,648	3,416	1	239
depth 2	2,729	2,951	6,367	2	238
depth 3	2,309	2,516	8,884	3	237
depth 4	1,920	2,112	10,995	4	236
depth 5	1,561	1,737	12,732	5	235
depth 6				6	234
depth 7				7	233

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	17,520	0	0	0	240
depth 0.5 (vegetated shelf)	15,391	8,222	8,222	0.5	239.5
depth1	14,720	7,527	15,749	1	239
depth 2	13,441	14,076	29,825	2	238
depth 3	12,245	12,838	42,663	3	237
depth 4	11,118	11,677	54,340	4	236
depth 5	10,060	10,585	64,925	5	235
depth 6				6	234
depth 7				7	233
depth 8				8	232

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	21,179	0	0	0	240
depth 0.5 (Vegetated shelf)	24,131	11,319	11,319	0.5	240.5
depth 1	25,439	12,391	23,711	1	241
depth 2	28,135	26,776	50,486	2	242

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
240	0	21,179	0	0	Permanent pool
240.5	0.5	24,131	11,319	11,319	Top of vegetated shelf
241	1	25,439	12,391	23,711	
242	2	28,135	26,776	50,486	
243	3	30,910	29,512	79,998	
244	4	33,744	32,317	112,314	
245	5	36,637	35,181	147,495	
246	6	39,589	38,103	185,599	Top of pond

SCM #7 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	234
Bottom of pond (sediment clean-out top)	235
Bottom of vegetated shelf	239.5
Permanent pool	240
Top of vegetated shelf	240.5
Temporary pool	242
Top of riser	243.5
Emergency spillway	245
Top of pond	246

## Orifice Sizing - BMP A WETPOND (SCM #7)

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

Total Volume to be discharged from Ponds (Q) =

40,136 cf

Depth of Storage (H) =

2.0

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.23227047 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.67$$

$$A_2 = 0.0591 \text{ sf}$$

$$8.508 \text{ sq in}$$

$$\text{diameter} = \mathbf{3.291} \text{ inches}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A / \pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.092908188 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$C_d = 0.60$$

$$g = 32.2$$

$$H/3 = h = 0.67$$

$$A_5 = 0.024 \text{ sf}$$

$$3.403 \text{ sq in}$$

$$\text{diameter} = \mathbf{2.082} \text{ inches}$$

### Orifice Chosen

$$\text{diameter} = \mathbf{2.50} \text{ inches}$$

$$A = 0.0341 \text{ sf}$$

$$Q = C_d \times A \times \sqrt{2 \times g \times h}$$

$$Q = 0.1340 \text{ cfs}$$

$$\text{time} = 299489.62 \text{ seconds}$$

$$\text{Time} = \mathbf{3.47} \text{ days}$$

DETERMINE SCM TYPE AND DIMENSIONS

Pond Runoff Volume:

Simple Method:  $V = 3630 * Rv * Rd * A$

Rd: Rainfall Depth (inches)=

1
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$Rv = 0.05 + 0.9 * Ia$

Rv = Runoff Coefficient

Ia = Impervious fraction = Impervious drainage area / Total drainage area

A = Drainage area (ac.) =

4.35	ac
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Impervious portion of drainage area (ac.) =

2.23	ac
------	----

Ia =

0.51
------

$Rv = 0.05 + 0.9 * Ia$

Rv =

0.51
------

Water Quality Volume Required:

$WQV = DV = 3630 * Rv * Rd * A =$

8,089	cf
-------	----

Water Quality Volume Provided:

11,556	cf
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MDC WET POND Sizing

SCM #8 (Wet Detention Basin)

SA/DA and Average Depth Method:

Impervious Ratio =	0.513	
Choose Permanent Pool Avg Depth, Davg =	3	ft

From Section 10.3.4 NCDENR Stormwater BMP Manual: The tabulated SA/DA Table

Table 10-1 SA/DA ratio to achieve 85% TSS removal efficiency in the mountain and piedmont regions

	% Impervious	Ratio
Lower Limit =	50%	1.79
Upper Limit =	60%	2.09
Actual SA/DA Ratio =		1.83

SA/DA (%) =	1.83	%
DA (Drainage Area) =	4.35	ac
Therefore, SA = DA * coefficient		
SA =	0.080	ac
SA (Permanent Pool or PP) =	3,469	sf

Find Permanent Pool volume (Vpp)

$D_{avg} = V_{pp} / SA$  (PP average depth = PP volume / PP surface area)

$V_{pp} = D_{avg} * SA$

Vpp =	10,408	cf
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Forebay volume (20% of Vpp) =	2,082	cf
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Main Pool volume (80% of Vpp) =	8,327	cf
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Table 10-1: Surface Area to Drainage Area Ratio for Permanent Pool Sizing to Achieve 85 Percent TSS Pollutant Removal Efficiency in the Mountain and Piedmont Regions, Adapted from Driscoll, 1986

% Impervious	Permanent Pool Average Depth (ft)					
	3	4	5	6	7	8
10%	0.51	0.43	0.37	0.3	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.4
30%	1.17	0.81	0.84	0.72	0.61	0.56
40%	1.51	1.22	1.09	0.91	0.78	0.71
50%	1.79	1.47	1.31	1.13	0.95	0.87
60%	2.09	1.73	1.49	1.31	1.12	1.03
70%	2.51	2.04	1.8	1.56	1.34	1.17
80%	2.92	2.36	2.07	1.82	1.62	1.4
90%	3.25	2.64	2.31	2.04	1.84	1.59

SCM #8 (Wet Detention Basin)						
Forebay						
Designed Forebay						Criteria
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)
Bottom	331	0.0076	4	246	3,862	2,082
Top	1,696	0.0389		250		

Main Pool						
Designed Main pool						Criteria
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)
Bottom	2,124	0.0488	4	246	12,101	8,327
Top	4,476	0.1028		250		

Temporary pool						
Designed Temporary pool						Criteria
Location	Area (sf)	Area (ac)	Depth (ft)	elevation (ft)	Volume (cf)	Volume (cf)
Bottom	6,172	0.1417	1.5	250	11,556	8,089
Top	8,666	0.1989		251.5		

Forebay	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	1,696	0	0	0	250
depth 0.5 (bot-veg-shelf)	1,498	798	798	0.5	249.5
depth 1	1,306	700	1,498	1	249
depth 2	946	1,121	2,620	2	248
depth 3	617	776	3,395	3	247
depth 4	331	467	3,862	4	246
depth 5				5	245
depth 6				6	244
depth 7				7	243

Main Pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	4,476	0	0	0	250
depth 0.5 (vegetated shelf)	3,690	2,038	2,038	0.5	249.5
depth1	3,443	1,783	3,821	1	249
depth 2	2,972	3,205	7,026	2	248
depth 3	2,533	2,750	9,775	3	247
depth 4	2,124	2,326	12,101	4	246
depth 5				5	245
depth 6				6	244
depth 7				7	243
depth 8				8	242

Temporary pool	Area (sf)	Volume (cf)	Total volume (cf)	Depth (ft)	Elevation (ft)
Permanent pool elv	6,172	0	0	0	250
depth 0.5 (Vegetated shelf)	7,589	3,434	3,434	0.5	250.5
depth 1	8,120	3,927	7,361	1	251
depth 1.5	8,666	4,196	11,556	1.5	251.5

Design area above permanent pool elevation					
Elevation (ft)	Depth (ft)	Area (sf)	Volume (cf)	Total volume (cf)	Location
250	0	6,172	0	0	Permanent pool
250.5	0.5	7,589	3,434	3,434	Top of vegetated shelf
251	1	8,120	3,927	7,361	
252	2	9,226	8,667	16,028	
253	3	10,392	9,803	25,831	
254	4	11,616	10,998	36,829	
255	5	12,898	12,251	49,081	
256	6	14,237	13,562	62,643	Top of pond

SCM #8 (Wet Detention Basin)	
Designed Elevations (ft)	
Sediment clean-out bottom	245
Bottom of pond (sediment clean-out top)	246
Bottom of vegetated shelf	249.5
Permanent pool	250
Top of vegetated shelf	250.5
Temporary pool	251.5
Top of riser	253
Emergency spillway	255
Top of pond	256

## Orifice Sizing - BMP A WETPOND (SCM #8)

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

Total Volume to be discharged from Ponds (Q) =  
 Depth of Storage (H) =

8,089	cf
1.5	

### 2 days to Discharge - 172,800 seconds

$$Q_2 = 0.046811415 \text{ cfs}$$

$$A_2 = \frac{Q_2}{C_d \times \sqrt{2gh}}$$

$$\begin{aligned} C_d &= 0.60 \\ g &= 32.2 \\ H/3 = h &= 0.50 \end{aligned}$$

$$\begin{aligned} A_2 &= 0.0137 \text{ sf} \\ &= 1.980 \text{ sq in} \\ \text{diameter} &= \mathbf{1.588} \text{ inches} \end{aligned}$$

$$A = \pi R^2 = \pi D^2 / 4$$

$$D = \sqrt{4A / \pi}$$

### 5 Days to Discharge - 432,000 seconds

$$Q_5 = 0.018724566 \text{ cfs}$$

$$A_5 = \frac{Q_5}{C_d \times \sqrt{2gh}}$$

$$\begin{aligned} C_d &= 0.60 \\ g &= 32.2 \\ H/3 = h &= 0.50 \end{aligned}$$

$$\begin{aligned} A_5 &= 0.005 \text{ sf} \\ &= 0.792 \text{ sq in} \\ \text{diameter} &= \mathbf{1.004} \text{ inches} \end{aligned}$$

### Orifice Chosen

$$\begin{aligned} \text{diameter} &= \mathbf{1.50} \text{ inches} \\ A &= 0.0123 \text{ sf} \end{aligned}$$

$$\begin{aligned} Q &= C_d \times A \times \sqrt{2 \times g \times h} \\ Q &= 0.0418 \text{ cfs} \end{aligned}$$

$$\begin{aligned} \text{time} &= 193600.47 \text{ seconds} \\ \mathbf{Time} &= \mathbf{2.24} \text{ days} \end{aligned}$$