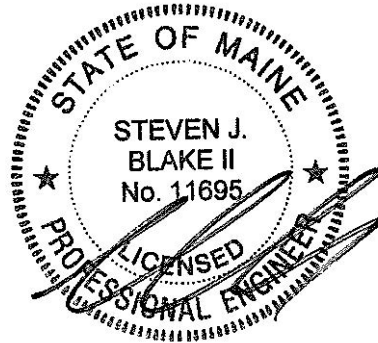


**STORMWATER MANAGEMENT REPORT
FOR
WESLEY BY THE SEA – PHASE 3
(10-LOT CLUSTER SUBDIVISION)
Dorfield Lane
Wells, Maine**

**For
Preachers' Aid Society of New England**

JANUARY 2019

Revised April 24, 2019



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STORMWATER MANAGEMENT REPORT

For:
Preachers' Aid Society of New England
51 Charles Wesley Court
Wells, Maine

1.0 INTRODUCTION

The Preachers' Aid Society of New England is proposing to build a 10-lot residential cluster subdivision located at Dorfield Lane in Wells. The project will include construction of a paved private road with sidewalks, underground utilities and stormwater management infrastructure to support development of the subdivision. The proposed infrastructure improvements will create approximately 1.603 acres of new impervious area.

The following report has been prepared to satisfy the requirements of the Town of Wells Subdivision Regulations. The stormwater management plan has also been prepared in accordance with the Maine Department of Environmental Protections "Stormwater Management Rules" Chapters 500, 501 and 502 as well as the most recent version of the "Maine Stormwater Best Management Practices Manual". The proposed project will also require a Site Location of Development Act Permit Amendment and will be required to meet the Basic, General, and Flooding Standards.

1.1 OVERVIEW OF MODELING METHODOGY AND SOURCE INFORMATION

Hydrologic Analysis: The pre and post development conditions have been modeled using modeling software (Hydrocad Version 10) which is based upon the methodology contained within the USDA Soil Conservation Service Technical Release 55. Type III 24-hour storm distributions for York County were used for the analysis. The following frequencies and 24-hour rainfall amounts were used for the analysis:

Return Period	24-Hour Rainfall Depth
2-Year Storm	3.30 inches
10-Year Storm	4.90 inches
25-Year Storm	6.20 inches
100-Year Storm	8.70 inches

Soils: The soils used for the stormwater analysis were digitized from the Medium Intensity Soils Maps for York County. Refer to Sheets A and B for soils information.

The soils include:

Map Unit Name	Hydrologic Soil Group
Adams (Loamy Sand)	A
Croghan (Loamy Sand)	A
Naumburg (Sand)	A/D*
Saco (Mucky Silt Loam)	B/D*
Water Bodies	N/A

*Assumed D

Topography: On-site: Field survey by BH2M.
Offsite: LIDAR data from the Maine Office of GIS.

Natural Resources: Wetland delineations provided by Mark Hampton Associates

1.2 **DESCRIPTION OF POINTS OF ANALYSIS**

The watershed model analyzes the discharge of runoff at one Analysis Points as described below:

Analysis Point #1

Description: Existing CMP culvert located near the southeast corner of the parcel.

Pre-Development Tributary Drainage Areas: SA-1

Post Development Tributary Drainage Areas: SA-1 thru SA-7

1.3 **PRE DEVELOPMENT CONDITIONS**

The Existing Conditions are shown on Sheet 2 and Sheet A of the accompanying plans. The parcel to be developed encompasses an area of approximately 25 acres and is located at Dorfield Lane near the intersection of Willow Way and Harriseckett Road. The parcel is mostly wooded and is primarily surrounded by residential properties. The parcel lies within the watershed of an unnamed stream that flows to Branch Brook. The parcel does not lie within an urban impaired stream watershed.

The watershed that was analyzed for this project is approximately 57 acres. The analysis point is located near the southeast boundary of the parcel and is described in Section 1.2 of this report. The watershed generally flows from north to south.

The Pre-Development Drainage Plan is included as Sheet A of the accompanying plans and the Calculations are attached as Appendix C

The Pre-Development Drainage Model predicts the following peak flow rates:

Pre-Development Peak Flows (cu. ft./sec)			
Analysis Point	2-Year	10-Year	25-Year
AP-1	0.28	3.55	10.50

1.4 POST DEVELOPMENT CONDITIONS

The proposed project will include development of 6 new house lots as well as a paved private road and sidewalk. Below is a summary of the proposed impervious area for full build-out of the project.

Proposed Impervious Area	=	1.603 ac.
Proposed Lawn Area	=	5.543 ac.
Proposed Developed Area	=	7.146 ac.

The proposed project will include a Wet Pond & Grassed Underdrained Soil Filter to provide water quality treatment and attenuation of peak flows for portions of the project.

The Post Development Drainage Plan is included as Sheet B of the accompanying plan set and the Calculations are attached as Appendix D.

The Post-Development Watershed Model predicts the following peak flow rates:

Post Development Peak Flows (cu. ft./sec)			
Analysis Point	2-Year	10-Year	25-Year
AP-1	0.25	3.23	9.44

1.5 BASIC STANDARDS

Basic Standards are the Erosion and Sediment Control measures detailed in the E & S plan shown on Sheet 7 of the project plans.

1.6 STORMWATER QUANTITY

The following Tables compare the Pre and Post Development peak discharge rates for the 2, 10, and 25-year return periods.

Pre and Post Development Peak Flow Comparison (cu. ft./sec)		
Return Period	AP-1	
	Pre	Post
2-Year	0.28	0.25
10-Year	3.55	3.23
25-Year	10.50	9.44

As shown above, the proposed stormwater infrastructure improvements reduce peak flow to below pre-development conditions.

1.7 STORMWATER QUALITY

The stormwater management system includes catch basins, underground storm drains, vegetated swales, a wet pond, and a grassed underdrained soil filter. The proposed BMP's have been designed in accordance with the design requirements outlined in the Maine Stormwater Best Management Practices Manual. Refer to Appendix E for detailed calculations. Below is a summary of the treatment areas for the project. Refer to Appendix E for detailed calculations.

Total Proposed Impervious Area:	1.603 acres
Total Proposed Developed Area:	7.146 acres
Total Treated Impervious Area:	1.444 acres
Total Treated Developed Area:	5.765 acres
Impervious Area Treatment %:	90.03% (90% Required)
Developed Area Treatment %:	80.67% (80% Required)

Detailed calculations for treatment are provided in Appendix E. Please note that we have reduced the required impervious treatment percentage from 95% to 90% by providing additional water quality volume for all treated impervious areas in accordance with Chapter 500 Section 4(c)(2)(a)(ii).

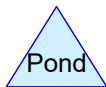
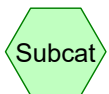
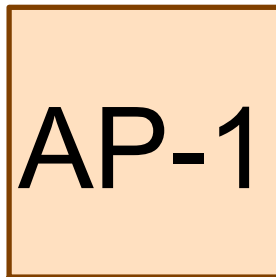
1.8 CONCLUSION

The proposed stormwater management facilities have been designed to mitigate impacts associated with development on the stormwater runoff. The proposed facilities have been designed to meet the Basic, General and Flooding Standards required by Chapter 500 and the Town of Wells Subdivision Regulations.

Appendix A
Figures

Appendix B
Soils Report

Appendix C
Pre Development Calculations



18118-Pre

Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Summary for Reach AP-1:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 57.240 ac, 1.25% Impervious, Inflow Depth > 0.02" for 2-Year Storm Event event
 Inflow = 0.28 cfs @ 17.48 hrs, Volume= 0.105 af
 Outflow = 0.28 cfs @ 17.48 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment SA-1:

Runoff = 0.28 cfs @ 17.48 hrs, Volume= 0.105 af, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Storm Event Rainfall=3.30"

Area (sf)	CN	Description
* 9,100	98	Existing Impervious
44,282	83	Paved roads w/open ditches, 50% imp, HSG A
* 251,871	39	>75% Grass cover, Good, HSG A
1,576,767	30	Woods, Good, HSG A
* 611,365	77	Woods, Good, HSG D
2,493,385	44	Weighted Average
2,462,144		98.75% Pervious Area
31,241		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	150	0.0150	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
62.2	2,360	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.6	770	0.0030	1.93	54.07	Channel Flow, Area= 28.0 sf Perim= 37.0' r= 0.76' n= 0.035
101.6	3,280	Total			

18118-Pre

Type III 24-hr 10-Year Storm Event Rainfall=4.90"

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Summary for Reach AP-1:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 57.240 ac, 1.25% Impervious, Inflow Depth > 0.28" for 10-Year Storm Event event
 Inflow = 3.55 cfs @ 13.99 hrs, Volume= 1.337 af
 Outflow = 3.55 cfs @ 13.99 hrs, Volume= 1.337 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment SA-1:

Runoff = 3.55 cfs @ 13.99 hrs, Volume= 1.337 af, Depth> 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
* 9,100	98	Existing Impervious
44,282	83	Paved roads w/open ditches, 50% imp, HSG A
* 251,871	39	>75% Grass cover, Good, HSG A
1,576,767	30	Woods, Good, HSG A
* 611,365	77	Woods, Good, HSG D
2,493,385	44	Weighted Average
2,462,144		98.75% Pervious Area
31,241		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	150	0.0150	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
62.2	2,360	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.6	770	0.0030	1.93	54.07	Channel Flow, Area= 28.0 sf Perim= 37.0' r= 0.76' n= 0.035
101.6	3,280	Total			

18118-Pre

Type III 24-hr 25-Year Storm Event Rainfall=6.20"

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Summary for Reach AP-1:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 57.240 ac, 1.25% Impervious, Inflow Depth > 0.66" for 25-Year Storm Event event
 Inflow = 10.50 cfs @ 13.69 hrs, Volume= 3.150 af
 Outflow = 10.50 cfs @ 13.69 hrs, Volume= 3.150 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment SA-1:

Runoff = 10.50 cfs @ 13.69 hrs, Volume= 3.150 af, Depth> 0.66"

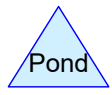
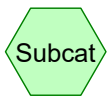
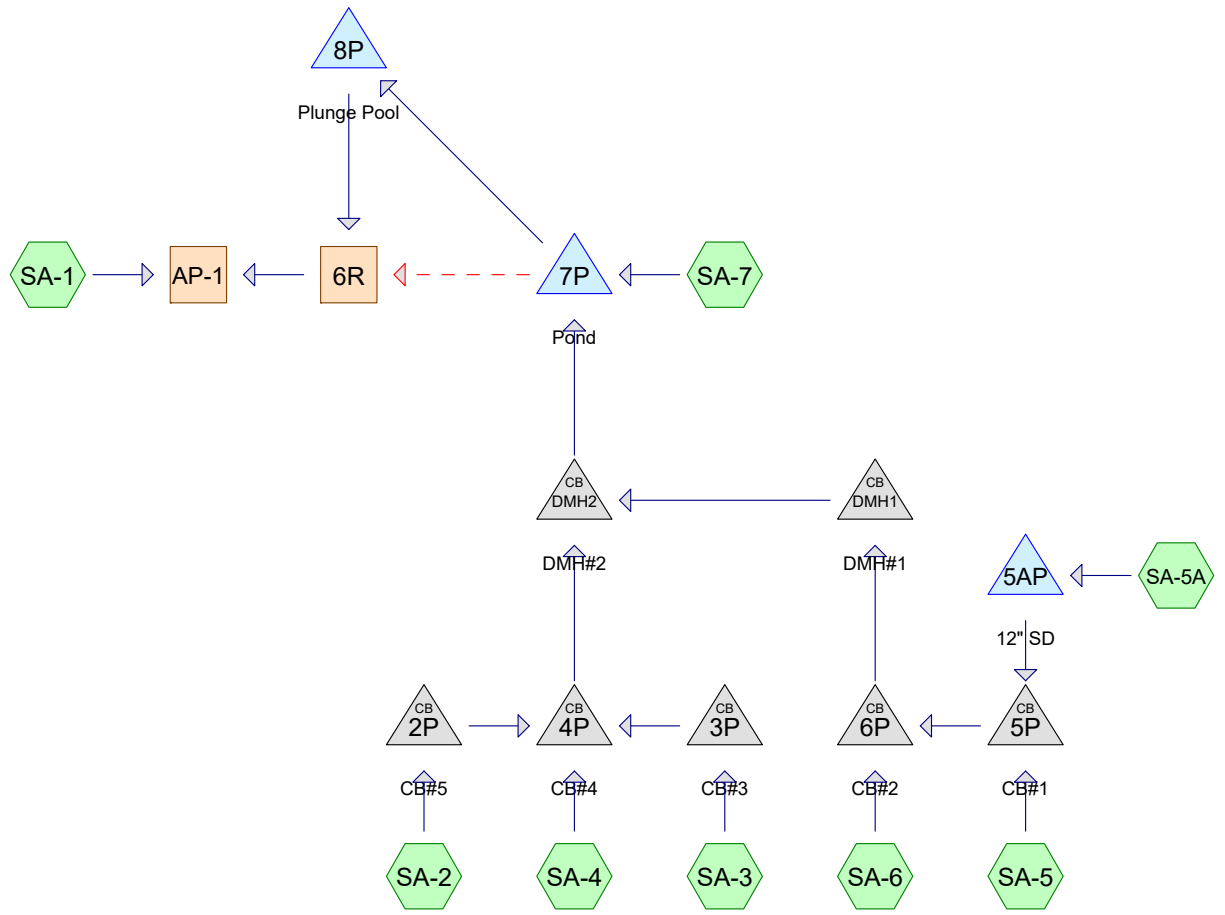
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 9,100	98	Existing Impervious
44,282	83	Paved roads w/open ditches, 50% imp, HSG A
* 251,871	39	>75% Grass cover, Good, HSG A
1,576,767	30	Woods, Good, HSG A
* 611,365	77	Woods, Good, HSG D
2,493,385	44	Weighted Average
2,462,144		98.75% Pervious Area
31,241		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	150	0.0150	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
62.2	2,360	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.6	770	0.0030	1.93	54.07	Channel Flow, Area= 28.0 sf Perim= 37.0' r= 0.76' n= 0.035
101.6	3,280	Total			

Appendix D
Post Development Calculations



Routing Diagram for 18118- Post-trial
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18118- Post-trial

Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Summary for Pond 2P: CB#5

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.090 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-Year Storm Event event
 Inflow = 0.31 cfs @ 12.05 hrs, Volume= 0.021 af
 Outflow = 0.31 cfs @ 12.05 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.31 cfs @ 12.05 hrs, Volume= 0.021 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 65.46' @ 12.05 hrs

Flood Elev= 69.06'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.17'	15.0" Round Culvert L= 152.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.17' / 64.41' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.30 cfs @ 12.05 hrs HW=65.46' TW=64.74' (Dynamic Tailwater)↑**1=Culvert** (Outlet Controls 0.30 cfs @ 2.06 fps)**Summary for Pond 3P: CB#3**

Inflow Area = 1.037 ac, 39.55% Impervious, Inflow Depth > 0.46" for 2-Year Storm Event event
 Inflow = 0.36 cfs @ 12.22 hrs, Volume= 0.040 af
 Outflow = 0.36 cfs @ 12.22 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.36 cfs @ 12.22 hrs, Volume= 0.040 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 64.87' @ 12.21 hrs

Flood Elev= 68.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.50'	12.0" Round Culvert L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.50' / 64.41' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.36 cfs @ 12.22 hrs HW=64.87' TW=64.71' (Dynamic Tailwater)↑**1=Culvert** (Outlet Controls 0.36 cfs @ 2.07 fps)**Summary for Pond 4P: CB#4**

[82] Warning: Early inflow requires earlier time span

[80] Warning: Exceeded Pond 3P by 0.04' @ 12.00 hrs (0.06 cfs 0.000 af)

18118- Post-trial

Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Inflow Area = 1.205 ac, 47.97% Impervious, Inflow Depth > 0.80" for 2-Year Storm Event event
 Inflow = 0.69 cfs @ 12.06 hrs, Volume= 0.080 af
 Outflow = 0.69 cfs @ 12.06 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.69 cfs @ 12.06 hrs, Volume= 0.080 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 64.75' @ 12.07 hrs
 Flood Elev= 68.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.31'	15.0" Round Culvert L= 92.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.31' / 63.85' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.67 cfs @ 12.06 hrs HW=64.74' TW=62.88' (Dynamic Tailwater)
 ↑**1=Culvert** (Barrel Controls 0.67 cfs @ 2.68 fps)

Summary for Pond 5AP: 12" SD

Inflow Area = 0.284 ac, 8.97% Impervious, Inflow Depth > 0.00" for 2-Year Storm Event event
 Inflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 65.51' @ 20.00 hrs Surf.Area= 7 sf Storage= 0 cf
 Flood Elev= 67.50' Surf.Area= 350 sf Storage= 230 cf

Plug-Flow detention time= 2.6 min calculated for 0.000 af (98% of inflow)
 Center-of-Mass det. time= 1.3 min (1,099.0 - 1,097.6)

Volume	Invert	Avail.Storage	Storage Description
#1	65.50'	230 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.50	5	0	0
66.00	72	19	19
67.00	350	211	230

Device	Routing	Invert	Outlet Devices
#1	Primary	65.50'	12.0" Round Culvert L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 65.50' / 64.00' S= 0.1154 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 20.00 hrs HW=65.51' TW=0.00' (Dynamic Tailwater)
 ↑**1=Culvert** (Inlet Controls 0.00 cfs @ 0.29 fps)

18118- Post-trial

Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Summary for Pond 5P: CB#1

Inflow Area = 0.574 ac, 29.05% Impervious, Inflow Depth > 0.33" for 2-Year Storm Event event
 Inflow = 0.12 cfs @ 12.51 hrs, Volume= 0.016 af
 Outflow = 0.12 cfs @ 12.51 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.12 cfs @ 12.51 hrs, Volume= 0.016 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 64.10' @ 12.51 hrs

Flood Elev= 67.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.90'	12.0" Round Culvert L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.90' / 63.81' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.12 cfs @ 12.51 hrs HW=64.10' TW=63.92' (Dynamic Tailwater)↑**1=Culvert** (Barrel Controls 0.12 cfs @ 1.64 fps)**Summary for Pond 6P: CB#2**

[82] Warning: Early inflow requires earlier time span

[80] Warning: Exceeded Pond 5P by 0.02' @ 12.00 hrs (0.01 cfs 0.000 af)

Inflow Area = 0.667 ac, 38.91% Impervious, Inflow Depth > 0.68" for 2-Year Storm Event event
 Inflow = 0.34 cfs @ 12.05 hrs, Volume= 0.038 af
 Outflow = 0.34 cfs @ 12.05 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.34 cfs @ 12.05 hrs, Volume= 0.038 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 64.01' @ 12.05 hrs

Flood Elev= 67.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.71'	15.0" Round Culvert L= 82.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.71' / 63.30' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.33 cfs @ 12.05 hrs HW=64.01' TW=63.50' (Dynamic Tailwater)↑**1=Culvert** (Barrel Controls 0.33 cfs @ 2.21 fps)**Summary for Reach 6R:**

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth = 0.00" for 2-Year Storm Event event
 Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

18118- Post-trial

Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
 Average Depth at Peak Storage= 0.00'
 Bank-Full Depth= 4.00' Flow Area= 56.0 sf, Capacity= 404.92 cfs

10.00' x 4.00' deep channel, n= 0.035
 Side Slope Z-value= 1.0 '/' Top Width= 18.00'
 Length= 500.0' Slope= 0.0080 '/'
 Inlet Invert= 52.40', Outlet Invert= 48.40'



Summary for Pond 7P: Pond

[82] Warning: Early inflow requires earlier time span

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth > 0.30" for 2-Year Storm Event event
 Inflow = 1.02 cfs @ 12.06 hrs, Volume= 0.145 af
 Outflow = 0.12 cfs @ 15.95 hrs, Volume= 0.101 af, Atten= 88%, Lag= 233.4 min
 Primary = 0.12 cfs @ 15.95 hrs, Volume= 0.101 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 58.20' @ 15.95 hrs Surf.Area= 12,265 sf Storage= 2,446 cf
 Flood Elev= 62.50' Surf.Area= 31,125 sf Storage= 80,995 cf

Plug-Flow detention time= 152.5 min calculated for 0.101 af (70% of inflow)
 Center-of-Mass det. time= 68.9 min (889.8 - 820.9)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	80,995 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	11,948	0	0
59.00	13,517	12,733	12,733
60.00	16,441	14,979	27,712
61.00	19,396	17,919	45,630
62.00	23,847	21,622	67,252
62.50	31,125	13,743	80,995

18118- Post-trial

Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	18.0" Round Culvert L= 162.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.50' / 54.37' S= 0.0070 ' ' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	61.00'	20.0' long x 40.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	59.50'	8.0' long Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)
#4	Device 1	55.50'	1.7" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.12 cfs @ 15.95 hrs HW=58.20' TW=54.68' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.12 cfs of 10.80 cfs potential flow)
 ↑ **3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
 ↑ **4=Orifice/Grate** (Orifice Controls 0.12 cfs @ 7.81 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=58.00' TW=52.40' (Dynamic Tailwater)

↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8P: Plunge Pool

[82] Warning: Early inflow requires earlier time span

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth > 0.21" for 2-Year Storm Event event
 Inflow = 0.12 cfs @ 15.95 hrs, Volume= 0.101 af
 Outflow = 0.12 cfs @ 17.40 hrs, Volume= 0.096 af, Atten= 0%, Lag= 86.9 min
 Discarded = 0.12 cfs @ 17.40 hrs, Volume= 0.096 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 54.68' @ 17.40 hrs Surf.Area= 414 sf Storage= 241 cf

Plug-Flow detention time= 26.5 min calculated for 0.095 af (94% of inflow)
 Center-of-Mass det. time= 9.5 min (899.3 - 889.8)

Volume	Invert	Avail.Storage	Storage Description	
#1	54.00'	981 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
54.00	300	0	0	300
55.00	474	384	384	487
56.00	730	597	981	758

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	8.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	54.00'	6.000 in/hr Exfiltration over Wetted area

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Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Conductivity to Groundwater Elevation = 53.50'

Discarded OutFlow Max=0.12 cfs @ 17.40 hrs HW=54.68' (Free Discharge)↑**2=Exfiltration** (Controls 0.12 cfs)**Primary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=54.00' TW=52.40' (Dynamic Tailwater)↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Reach AP-1:**

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 57.240 ac, 3.98% Impervious, Inflow Depth > 0.02" for 2-Year Storm Event event
 Inflow = 0.25 cfs @ 17.29 hrs, Volume= 0.094 af
 Outflow = 0.25 cfs @ 17.29 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond DMH1: DMH#1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.667 ac, 38.91% Impervious, Inflow Depth > 0.68" for 2-Year Storm Event event
 Inflow = 0.34 cfs @ 12.05 hrs, Volume= 0.038 af
 Outflow = 0.34 cfs @ 12.05 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.34 cfs @ 12.05 hrs, Volume= 0.038 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 63.51' @ 12.05 hrs

Flood Elev= 68.03'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.20'	15.0" Round Culvert L= 132.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.20' / 62.54' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.32 cfs @ 12.05 hrs HW=63.50' TW=62.89' (Dynamic Tailwater)↑**1=Culvert** (Outlet Controls 0.32 cfs @ 2.08 fps)**Summary for Pond DMH2: DMH#2**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.872 ac, 44.74% Impervious, Inflow Depth > 0.76" for 2-Year Storm Event event
 Inflow = 1.02 cfs @ 12.06 hrs, Volume= 0.118 af
 Outflow = 1.02 cfs @ 12.06 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.02 cfs @ 12.06 hrs, Volume= 0.118 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Peak Elev= 62.89' @ 12.06 hrs

Flood Elev= 68.54'

Device	Routing	Invert	Outlet Devices
#1	Primary	62.44'	24.0" Round Culvert L= 176.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 62.44' / 61.56' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=1.00 cfs @ 12.06 hrs HW=62.89' TW=58.04' (Dynamic Tailwater)

↳ **1=Culvert** (Barrel Controls 1.00 cfs @ 2.90 fps)

Summary for Subcatchment SA-1:

Runoff = 0.25 cfs @ 17.29 hrs, Volume= 0.094 af, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

	Area (sf)	CN	Description
*	7,358	98	Proposed Impervious
	17,267	83	Paved roads w/open ditches, 50% imp, HSG A
*	6,192	98	Existing Impervious
	86,736	39	>75% Grass cover, Good, HSG A
*	41,241	39	Proposed Grass (A)
	769,629	30	Woods, Good, HSG A
	420,122	77	Woods, Good, HSG D
*	201	98	Proposed Impervious
*	1,017	98	Existing Impervious
*	4,679	39	Proposed Grass (A)
	9,517	39	>75% Grass cover, Good, HSG A
	27,015	83	Paved roads w/open ditches, 50% imp, HSG A
	427,061	30	Woods, Good, HSG A
*	145,145	77	Woods, Good, HSG D
*	8,919	39	Proposed Grass (A)
	249,158	30	Woods, Good, HSG A
	18,089	77	Woods, Good, HSG D
	2,239,346	44	Weighted Average
	2,202,437		98.35% Pervious Area
	36,909		1.65% Impervious Area

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Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	150	0.0150	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
47.8	1,814	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	165	0.0160	0.89		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.0	381	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.6	770	0.0030	1.93	54.07	Channel Flow, Area= 28.0 sf Perim= 37.0' r= 0.76' n= 0.035
100.3	3,280	Total			

Summary for Subcatchment SA-2:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.31 cfs @ 12.05 hrs, Volume= 0.021 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

Area (sf)	CN	Description
* 3,907	98	Proposed Impervious
3,907		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	150	0.0071	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.5	48	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	198	Total			

Summary for Subcatchment SA-3:

Runoff = 0.36 cfs @ 12.22 hrs, Volume= 0.040 af, Depth> 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

Area (sf)	CN	Description
* 17,867	98	Proposed Impervious
* 27,308	39	Proposed Grass (A)
45,175	62	Weighted Average
27,308		60.45% Pervious Area
17,867		39.55% Impervious Area

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Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	110	0.0270	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.9	40	0.0071	0.77		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.8	180	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	330	Total			

Summary for Subcatchment SA-4:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.27 cfs @ 12.04 hrs, Volume= 0.019 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

Area (sf)	CN	Description
* 3,404	98	Proposed Impervious
3,404		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	150	0.0071	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	8	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.6	158	Total			

Summary for Subcatchment SA-5:

Runoff = 0.12 cfs @ 12.51 hrs, Volume= 0.016 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

Area (sf)	CN	Description
* 6,157	98	Proposed Impervious
* 5,346	39	Proposed Grass (A)
1,127	30	Woods, Good, HSG A
12,630	67	Weighted Average
6,473		51.25% Pervious Area
6,157		48.75% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	13	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.9	69	0.0300	1.21		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	96	0.0076	1.77		Shallow Concentrated Flow, Paved Kv= 20.3 fps
31.3	328	Total			

Summary for Subcatchment SA-5A:

[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

Area (sf)	CN	Description
* 1,112	98	Proposed Impervious
* 7,264	39	Proposed Grass (A)
4,014	30	Woods, Good, HSG A
12,390	41	Weighted Average
11,278		91.03% Pervious Area
1,112		8.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	150	0.0130	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.8	85	0.0130	0.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
17.7	235	Total			

Summary for Subcatchment SA-6:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.32 cfs @ 12.04 hrs, Volume= 0.022 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Type III 24-hr 2-Year Storm Event Rainfall=3.30"

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Area (sf)	CN	Description
* 4,036	98	Proposed Impervious
4,036		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	150	0.0076	1.03		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.4	46	0.0076	1.77		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.8	196	Total			

Summary for Subcatchment SA-7:

Runoff = 0.06 cfs @ 13.83 hrs, Volume= 0.027 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Event Rainfall=3.30"

Area (sf)	CN	Description
* 4,780	98	Existing Impervious
* 21,033	98	Proposed Impervious
* 146,668	39	Proposed Grass (A)
172,481	48	Weighted Average
146,668		85.03% Pervious Area
25,813		14.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.0250	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.6	55	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	308	0.0100	5.74	189.54	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=3.00' Z= 3.0 '/' Top.W=20.00' n= 0.035
13.7	513	Total			

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Type III 24-hr 10-Year Storm Event Rainfall=4.90"

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Summary for Pond 2P: CB#5

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.090 ac, 100.00% Impervious, Inflow Depth > 4.33" for 10-Year Storm Event event
 Inflow = 0.46 cfs @ 12.05 hrs, Volume= 0.032 af
 Outflow = 0.46 cfs @ 12.05 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.46 cfs @ 12.05 hrs, Volume= 0.032 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 65.55' @ 12.05 hrs
 Flood Elev= 69.06'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.17'	15.0" Round Culvert L= 152.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.17' / 64.41' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.42 cfs @ 12.05 hrs HW=65.54' TW=64.97' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 0.42 cfs @ 2.08 fps)

Summary for Pond 3P: CB#3

Inflow Area = 1.037 ac, 39.55% Impervious, Inflow Depth > 1.24" for 10-Year Storm Event event
 Inflow = 1.24 cfs @ 12.19 hrs, Volume= 0.108 af
 Outflow = 1.24 cfs @ 12.19 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.24 cfs @ 12.19 hrs, Volume= 0.108 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 65.24' @ 12.19 hrs
 Flood Elev= 68.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.50'	12.0" Round Culvert L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.50' / 64.41' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.24 cfs @ 12.19 hrs HW=65.23' TW=65.00' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 1.24 cfs @ 2.79 fps)

Summary for Pond 4P: CB#4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.205 ac, 47.97% Impervious, Inflow Depth > 1.67" for 10-Year Storm Event event
 Inflow = 1.63 cfs @ 12.14 hrs, Volume= 0.168 af
 Outflow = 1.63 cfs @ 12.14 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.63 cfs @ 12.14 hrs, Volume= 0.168 af

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Type III 24-hr 10-Year Storm Event Rainfall=4.90"

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Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 65.01' @ 12.14 hrs

Flood Elev= 68.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.31'	15.0" Round Culvert L= 92.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.31' / 63.85' S= 0.0050 '/ Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.62 cfs @ 12.14 hrs HW=65.01' TW=63.08' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 1.62 cfs @ 3.34 fps)

Summary for Pond 5AP: 12" SD

Inflow Area = 0.284 ac, 8.97% Impervious, Inflow Depth > 0.20" for 10-Year Storm Event event
 Inflow = 0.02 cfs @ 12.60 hrs, Volume= 0.005 af
 Outflow = 0.02 cfs @ 12.61 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.5 min
 Primary = 0.02 cfs @ 12.61 hrs, Volume= 0.005 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 65.57' @ 12.61 hrs Surf.Area= 14 sf Storage= 1 cf

Flood Elev= 67.50' Surf.Area= 350 sf Storage= 230 cf

Plug-Flow detention time= 0.8 min calculated for 0.005 af (100% of inflow)

Center-of-Mass det. time= 0.5 min (920.7 - 920.2)

Volume	Invert	Avail.Storage	Storage Description
#1	65.50'	230 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.50	5	0	0
66.00	72	19	19
67.00	350	211	230

Device	Routing	Invert	Outlet Devices
#1	Primary	65.50'	12.0" Round Culvert L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 65.50' / 64.00' S= 0.1154 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.02 cfs @ 12.61 hrs HW=65.57' TW=64.22' (Dynamic Tailwater)

↑**1=Culvert** (Inlet Controls 0.02 cfs @ 0.70 fps)

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Summary for Pond 5P: CB#1

Inflow Area = 0.574 ac, 29.05% Impervious, Inflow Depth > 0.89" for 10-Year Storm Event event
 Inflow = 0.33 cfs @ 12.48 hrs, Volume= 0.043 af
 Outflow = 0.33 cfs @ 12.48 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.33 cfs @ 12.48 hrs, Volume= 0.043 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 64.23' @ 12.48 hrs

Flood Elev= 67.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.90'	12.0" Round Culvert L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.90' / 63.81' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.32 cfs @ 12.48 hrs HW=64.23' TW=64.04' (Dynamic Tailwater)↑**1=Culvert** (Barrel Controls 0.32 cfs @ 2.12 fps)**Summary for Pond 6P: CB#2**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.667 ac, 38.91% Impervious, Inflow Depth > 1.37" for 10-Year Storm Event event
 Inflow = 0.56 cfs @ 12.05 hrs, Volume= 0.076 af
 Outflow = 0.56 cfs @ 12.05 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.56 cfs @ 12.05 hrs, Volume= 0.076 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 64.10' @ 12.05 hrs

Flood Elev= 67.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.71'	15.0" Round Culvert L= 82.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.71' / 63.30' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.55 cfs @ 12.05 hrs HW=64.10' TW=63.61' (Dynamic Tailwater)↑**1=Culvert** (Outlet Controls 0.55 cfs @ 2.49 fps)**Summary for Reach 6R:**

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth = 0.00" for 10-Year Storm Event event
 Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
 Average Depth at Peak Storage= 0.00'
 Bank-Full Depth= 4.00' Flow Area= 56.0 sf, Capacity= 404.92 cfs

10.00' x 4.00' deep channel, n= 0.035
 Side Slope Z-value= 1.0 '/' Top Width= 18.00'
 Length= 500.0' Slope= 0.0080 '/'
 Inlet Invert= 52.40', Outlet Invert= 48.40'



Summary for Pond 7P: Pond

[82] Warning: Early inflow requires earlier time span

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth > 0.82" for 10-Year Storm Event event
 Inflow = 2.81 cfs @ 12.24 hrs, Volume= 0.400 af
 Outflow = 0.14 cfs @ 20.00 hrs, Volume= 0.119 af, Atten= 95%, Lag= 465.7 min
 Primary = 0.14 cfs @ 20.00 hrs, Volume= 0.119 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 58.96' @ 20.00 hrs Surf.Area= 13,460 sf Storage= 12,242 cf
 Flood Elev= 62.50' Surf.Area= 31,125 sf Storage= 80,995 cf

Plug-Flow detention time= 180.9 min calculated for 0.119 af (30% of inflow)
 Center-of-Mass det. time= 48.9 min (873.9 - 825.0)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	80,995 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	11,948	0	0
59.00	13,517	12,733	12,733
60.00	16,441	14,979	27,712
61.00	19,396	17,919	45,630
62.00	23,847	21,622	67,252
62.50	31,125	13,743	80,995

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Type III 24-hr 10-Year Storm Event Rainfall=4.90"

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Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	18.0" Round Culvert L= 162.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.50' / 54.37' S= 0.0070 ' S= 0.0070 ' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	61.00'	20.0' long x 40.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	59.50'	8.0' long Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)
#4	Device 1	55.50'	1.7" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.14 cfs @ 20.00 hrs HW=58.96' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.14 cfs of 12.43 cfs potential flow)
 ↑ **3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
 ↑ **4=Orifice/Grate** (Orifice Controls 0.14 cfs @ 8.87 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=58.00' TW=52.40' (Dynamic Tailwater)

↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8P: Plunge Pool

[82] Warning: Early inflow requires earlier time span

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth > 0.24" for 10-Year Storm Event event
 Inflow = 0.14 cfs @ 20.00 hrs, Volume= 0.119 af
 Outflow = 0.14 cfs @ 20.00 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.14 cfs @ 20.00 hrs, Volume= 0.112 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 54.80' @ 20.00 hrs Surf.Area= 437 sf Storage= 294 cf

Plug-Flow detention time= 28.1 min calculated for 0.112 af (94% of inflow)
 Center-of-Mass det. time= 9.4 min (883.3 - 873.9)

Volume	Invert	Avail.Storage	Storage Description	
#1	54.00'	981 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
54.00	300	0	0	300
55.00	474	384	384	487
56.00	730	597	981	758

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	8.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	54.00'	6.000 in/hr Exfiltration over Wetted area

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Conductivity to Groundwater Elevation = 53.50'

Discarded OutFlow Max=0.14 cfs @ 20.00 hrs HW=54.80' (Free Discharge)↑**2=Exfiltration** (Controls 0.14 cfs)**Primary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=54.00' TW=52.40' (Dynamic Tailwater)↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Reach AP-1:**

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 57.240 ac, 3.98% Impervious, Inflow Depth > 0.25" for 10-Year Storm Event event
 Inflow = 3.23 cfs @ 13.95 hrs, Volume= 1.202 af
 Outflow = 3.23 cfs @ 13.95 hrs, Volume= 1.202 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond DMH1: DMH#1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.667 ac, 38.91% Impervious, Inflow Depth > 1.37" for 10-Year Storm Event event
 Inflow = 0.56 cfs @ 12.05 hrs, Volume= 0.076 af
 Outflow = 0.56 cfs @ 12.05 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.56 cfs @ 12.05 hrs, Volume= 0.076 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 63.61' @ 12.06 hrs

Flood Elev= 68.03'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.20'	15.0" Round Culvert L= 132.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.20' / 62.54' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.52 cfs @ 12.05 hrs HW=63.61' TW=63.09' (Dynamic Tailwater)↑**1=Culvert** (Outlet Controls 0.52 cfs @ 2.21 fps)**Summary for Pond DMH2: DMH#2**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.872 ac, 44.74% Impervious, Inflow Depth > 1.57" for 10-Year Storm Event event
 Inflow = 2.07 cfs @ 12.08 hrs, Volume= 0.244 af
 Outflow = 2.07 cfs @ 12.08 hrs, Volume= 0.244 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.07 cfs @ 12.08 hrs, Volume= 0.244 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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Peak Elev= 63.09' @ 12.08 hrs

Flood Elev= 68.54'

Device	Routing	Invert	Outlet Devices
#1	Primary	62.44'	24.0" Round Culvert L= 176.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 62.44' / 61.56' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=2.06 cfs @ 12.08 hrs HW=63.09' TW=58.11' (Dynamic Tailwater)

↳ **1=Culvert** (Barrel Controls 2.06 cfs @ 3.51 fps)

Summary for Subcatchment SA-1:

Runoff = 3.23 cfs @ 13.95 hrs, Volume= 1.202 af, Depth> 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

	Area (sf)	CN	Description
*	7,358	98	Proposed Impervious
	17,267	83	Paved roads w/open ditches, 50% imp, HSG A
*	6,192	98	Existing Impervious
	86,736	39	>75% Grass cover, Good, HSG A
*	41,241	39	Proposed Grass (A)
	769,629	30	Woods, Good, HSG A
	420,122	77	Woods, Good, HSG D
*	201	98	Proposed Impervious
*	1,017	98	Existing Impervious
*	4,679	39	Proposed Grass (A)
	9,517	39	>75% Grass cover, Good, HSG A
	27,015	83	Paved roads w/open ditches, 50% imp, HSG A
	427,061	30	Woods, Good, HSG A
*	145,145	77	Woods, Good, HSG D
*	8,919	39	Proposed Grass (A)
	249,158	30	Woods, Good, HSG A
	18,089	77	Woods, Good, HSG D
	2,239,346	44	Weighted Average
	2,202,437		98.35% Pervious Area
	36,909		1.65% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	150	0.0150	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
47.8	1,814	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	165	0.0160	0.89		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.0	381	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.6	770	0.0030	1.93	54.07	Channel Flow, Area= 28.0 sf Perim= 37.0' r= 0.76' n= 0.035
100.3	3,280	Total			

Summary for Subcatchment SA-2:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.46 cfs @ 12.05 hrs, Volume= 0.032 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
* 3,907	98	Proposed Impervious
3,907		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	150	0.0071	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.5	48	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	198	Total			

Summary for Subcatchment SA-3:

Runoff = 1.24 cfs @ 12.19 hrs, Volume= 0.108 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
* 17,867	98	Proposed Impervious
* 27,308	39	Proposed Grass (A)
45,175	62	Weighted Average
27,308		60.45% Pervious Area
17,867		39.55% Impervious Area

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Type III 24-hr 10-Year Storm Event Rainfall=4.90"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	110	0.0270	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.9	40	0.0071	0.77		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.8	180	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	330	Total			

Summary for Subcatchment SA-4:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.41 cfs @ 12.04 hrs, Volume= 0.028 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
*	3,404	98 Proposed Impervious
	3,404	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	150	0.0071	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	8	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.6	158	Total			

Summary for Subcatchment SA-5:

Runoff = 0.31 cfs @ 12.47 hrs, Volume= 0.038 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
*	6,157	98 Proposed Impervious
*	5,346	39 Proposed Grass (A)
	1,127	30 Woods, Good, HSG A
	12,630	67 Weighted Average
	6,473	51.25% Pervious Area
	6,157	48.75% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	13	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.9	69	0.0300	1.21		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	96	0.0076	1.77		Shallow Concentrated Flow, Paved Kv= 20.3 fps
31.3	328	Total			

Summary for Subcatchment SA-5A:

Runoff = 0.02 cfs @ 12.60 hrs, Volume= 0.005 af, Depth> 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
* 1,112	98	Proposed Impervious
* 7,264	39	Proposed Grass (A)
4,014	30	Woods, Good, HSG A
12,390	41	Weighted Average
11,278		91.03% Pervious Area
1,112		8.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	150	0.0130	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.8	85	0.0130	0.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
17.7	235	Total			

Summary for Subcatchment SA-6:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.48 cfs @ 12.04 hrs, Volume= 0.033 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
* 4,036	98	Proposed Impervious
4,036		100.00% Impervious Area

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Type III 24-hr 10-Year Storm Event Rainfall=4.90"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	150	0.0076	1.03		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.4	46	0.0076	1.77		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.8	196	Total			

Summary for Subcatchment SA-7:

Runoff = 1.07 cfs @ 12.36 hrs, Volume= 0.156 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Event Rainfall=4.90"

Area (sf)	CN	Description
* 4,780	98	Existing Impervious
* 21,033	98	Proposed Impervious
* 146,668	39	Proposed Grass (A)
172,481	48	Weighted Average
146,668		85.03% Pervious Area
25,813		14.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.0250	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.6	55	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	308	0.0100	5.74	189.54	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=3.00' Z= 3.0 ' / ' Top.W=20.00' n= 0.035
13.7	513	Total			

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Type III 24-hr 25-Year Storm Event Rainfall=6.20"

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Summary for Pond 2P: CB#5

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.090 ac, 100.00% Impervious, Inflow Depth > 5.51" for 25-Year Storm Event event
 Inflow = 0.59 cfs @ 12.05 hrs, Volume= 0.041 af
 Outflow = 0.59 cfs @ 12.05 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.59 cfs @ 12.05 hrs, Volume= 0.041 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 65.61' @ 12.06 hrs

Flood Elev= 69.06'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.17'	15.0" Round Culvert L= 152.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.17' / 64.41' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.51 cfs @ 12.05 hrs HW=65.61' TW=65.15' (Dynamic Tailwater)↑**1=Culvert** (Outlet Controls 0.51 cfs @ 2.00 fps)**Summary for Pond 3P: CB#3**

Inflow Area = 1.037 ac, 39.55% Impervious, Inflow Depth > 2.04" for 25-Year Storm Event event
 Inflow = 2.11 cfs @ 12.18 hrs, Volume= 0.176 af
 Outflow = 2.11 cfs @ 12.18 hrs, Volume= 0.176 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.11 cfs @ 12.18 hrs, Volume= 0.176 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 65.54' @ 12.19 hrs

Flood Elev= 68.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.50'	12.0" Round Culvert L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.50' / 64.41' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.09 cfs @ 12.18 hrs HW=65.53' TW=65.23' (Dynamic Tailwater)↑**1=Culvert** (Inlet Controls 2.09 cfs @ 2.66 fps)**Summary for Pond 4P: CB#4**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.205 ac, 47.97% Impervious, Inflow Depth > 2.52" for 25-Year Storm Event event
 Inflow = 2.62 cfs @ 12.15 hrs, Volume= 0.253 af
 Outflow = 2.62 cfs @ 12.15 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.62 cfs @ 12.15 hrs, Volume= 0.253 af

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Type III 24-hr 25-Year Storm Event Rainfall=6.20"

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Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 65.24' @ 12.15 hrs

Flood Elev= 68.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.31'	15.0" Round Culvert L= 92.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.31' / 63.85' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.62 cfs @ 12.15 hrs HW=65.24' TW=63.25' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 2.62 cfs @ 3.74 fps)

Summary for Pond 5AP: 12" SD

Inflow Area = 0.284 ac, 8.97% Impervious, Inflow Depth > 0.53" for 25-Year Storm Event event
 Inflow = 0.08 cfs @ 12.46 hrs, Volume= 0.013 af
 Outflow = 0.08 cfs @ 12.46 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.4 min
 Primary = 0.08 cfs @ 12.46 hrs, Volume= 0.013 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 65.65' @ 12.46 hrs Surf.Area= 25 sf Storage= 2 cf

Flood Elev= 67.50' Surf.Area= 350 sf Storage= 230 cf

Plug-Flow detention time= 0.6 min calculated for 0.012 af (100% of inflow)

Center-of-Mass det. time= 0.4 min (881.6 - 881.2)

Volume	Invert	Avail.Storage	Storage Description
#1	65.50'	230 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.50	5	0	0
66.00	72	19	19
67.00	350	211	230

Device	Routing	Invert	Outlet Devices
#1	Primary	65.50'	12.0" Round Culvert L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 65.50' / 64.00' S= 0.1154 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 12.46 hrs HW=65.65' TW=64.36' (Dynamic Tailwater)

↑**1=Culvert** (Inlet Controls 0.08 cfs @ 1.04 fps)

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Type III 24-hr 25-Year Storm Event Rainfall=6.20"

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Summary for Pond 5P: CB#1

Inflow Area = 0.574 ac, 29.05% Impervious, Inflow Depth > 1.50" for 25-Year Storm Event event
 Inflow = 0.57 cfs @ 12.46 hrs, Volume= 0.072 af
 Outflow = 0.57 cfs @ 12.46 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.57 cfs @ 12.46 hrs, Volume= 0.072 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 64.36' @ 12.45 hrs

Flood Elev= 67.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.90'	12.0" Round Culvert L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.90' / 63.81' S= 0.0050 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.46 hrs HW=64.36' TW=64.16' (Dynamic Tailwater)

↑1=Culvert (Outlet Controls 0.58 cfs @ 2.43 fps)

Summary for Pond 6P: CB#2

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.667 ac, 38.91% Impervious, Inflow Depth > 2.06" for 25-Year Storm Event event
 Inflow = 0.75 cfs @ 12.05 hrs, Volume= 0.114 af
 Outflow = 0.75 cfs @ 12.05 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.75 cfs @ 12.05 hrs, Volume= 0.114 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 64.17' @ 12.06 hrs

Flood Elev= 67.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.71'	15.0" Round Culvert L= 82.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.71' / 63.30' S= 0.0050 '/ Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.71 cfs @ 12.05 hrs HW=64.17' TW=63.69' (Dynamic Tailwater)

↑1=Culvert (Outlet Controls 0.71 cfs @ 2.61 fps)

Summary for Reach 6R:

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth > 0.16" for 25-Year Storm Event event
 Inflow = 0.31 cfs @ 16.16 hrs, Volume= 0.077 af
 Outflow = 0.30 cfs @ 16.40 hrs, Volume= 0.074 af, Atten= 2%, Lag= 14.1 min

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Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Max. Velocity= 0.57 fps, Min. Travel Time= 14.7 min
 Avg. Velocity = 0.48 fps, Avg. Travel Time= 17.2 min

Peak Storage= 265 cf @ 16.40 hrs
 Average Depth at Peak Storage= 0.05'
 Bank-Full Depth= 4.00' Flow Area= 56.0 sf, Capacity= 404.92 cfs

10.00' x 4.00' deep channel, n= 0.035
 Side Slope Z-value= 1.0 '/' Top Width= 18.00'
 Length= 500.0' Slope= 0.0080 '/'
 Inlet Invert= 52.40', Outlet Invert= 48.40'



Summary for Pond 7P: Pond

[82] Warning: Early inflow requires earlier time span

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth > 1.41" for 25-Year Storm Event event
 Inflow = 5.97 cfs @ 12.21 hrs, Volume= 0.686 af
 Outflow = 0.48 cfs @ 16.15 hrs, Volume= 0.220 af, Atten= 92%, Lag= 236.1 min
 Primary = 0.48 cfs @ 16.15 hrs, Volume= 0.220 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 59.55' @ 16.15 hrs Surf.Area= 15,137 sf Storage= 20,672 cf
 Flood Elev= 62.50' Surf.Area= 31,125 sf Storage= 80,995 cf

Plug-Flow detention time= 229.9 min calculated for 0.220 af (32% of inflow)
 Center-of-Mass det. time= 112.5 min (932.4 - 820.0)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	80,995 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	11,948	0	0
59.00	13,517	12,733	12,733
60.00	16,441	14,979	27,712
61.00	19,396	17,919	45,630
62.00	23,847	21,622	67,252
62.50	31,125	13,743	80,995

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Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	18.0" Round Culvert L= 162.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.50' / 54.37' S= 0.0070 ' S= 0.0070 ' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	61.00'	20.0' long x 40.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	59.50'	8.0' long Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)
#4	Device 1	55.50'	1.7" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.48 cfs @ 16.15 hrs HW=59.55' TW=55.06' (Dynamic Tailwater)

- ↑ **1=Culvert** (Passes 0.48 cfs of 13.57 cfs potential flow)
- ↑ **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.33 cfs @ 0.76 fps)
- ↑ **4=Orifice/Grate** (Orifice Controls 0.15 cfs @ 9.61 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=58.00' TW=52.40' (Dynamic Tailwater)

- ↑ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 8P: Plunge Pool

[82] Warning: Early inflow requires earlier time span

Inflow Area = 5.832 ac, 24.52% Impervious, Inflow Depth > 0.45" for 25-Year Storm Event event
 Inflow = 0.48 cfs @ 16.15 hrs, Volume= 0.220 af
 Outflow = 0.48 cfs @ 16.16 hrs, Volume= 0.211 af, Atten= 0%, Lag= 1.0 min
 Discarded = 0.18 cfs @ 16.16 hrs, Volume= 0.134 af
 Primary = 0.31 cfs @ 16.16 hrs, Volume= 0.077 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 55.06' @ 16.16 hrs Surf.Area= 488 sf Storage= 412 cf

Plug-Flow detention time= 20.1 min calculated for 0.211 af (96% of inflow)
 Center-of-Mass det. time= 9.0 min (941.4 - 932.4)

Volume	Invert	Avail.Storage	Storage Description	
#1	54.00'	981 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
54.00	300	0	0	300
55.00	474	384	384	487
56.00	730	597	981	758

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	8.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	54.00'	6.000 in/hr Exfiltration over Wetted area

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Conductivity to Groundwater Elevation = 53.50'

Discarded OutFlow Max=0.18 cfs @ 16.16 hrs HW=55.06' (Free Discharge)↑**2=Exfiltration** (Controls 0.18 cfs)**Primary OutFlow** Max=0.31 cfs @ 16.16 hrs HW=55.06' TW=52.45' (Dynamic Tailwater)↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.31 cfs @ 0.65 fps)**Summary for Reach AP-1:**

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 57.240 ac, 3.98% Impervious, Inflow Depth > 0.61" for 25-Year Storm Event event
 Inflow = 9.44 cfs @ 13.69 hrs, Volume= 2.907 af
 Outflow = 9.44 cfs @ 13.69 hrs, Volume= 2.907 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond DMH1: DMH#1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.667 ac, 38.91% Impervious, Inflow Depth > 2.06" for 25-Year Storm Event event
 Inflow = 0.75 cfs @ 12.05 hrs, Volume= 0.114 af
 Outflow = 0.75 cfs @ 12.05 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.75 cfs @ 12.05 hrs, Volume= 0.114 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 63.70' @ 12.07 hrs

Flood Elev= 68.03'

Device	Routing	Invert	Outlet Devices
#1	Primary	63.20'	15.0" Round Culvert L= 132.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.20' / 62.54' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.68 cfs @ 12.05 hrs HW=63.69' TW=63.24' (Dynamic Tailwater)↑**1=Culvert** (Outlet Controls 0.68 cfs @ 2.24 fps)**Summary for Pond DMH2: DMH#2**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.872 ac, 44.74% Impervious, Inflow Depth > 2.35" for 25-Year Storm Event event
 Inflow = 3.19 cfs @ 12.12 hrs, Volume= 0.367 af
 Outflow = 3.19 cfs @ 12.12 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.19 cfs @ 12.12 hrs, Volume= 0.367 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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Peak Elev= 63.25' @ 12.12 hrs

Flood Elev= 68.54'

Device	Routing	Invert	Outlet Devices
#1	Primary	62.44'	24.0" Round Culvert L= 176.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 62.44' / 61.56' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=3.17 cfs @ 12.12 hrs HW=63.25' TW=58.28' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 3.17 cfs @ 3.91 fps)

Summary for Subcatchment SA-1:

Runoff = 9.44 cfs @ 13.69 hrs, Volume= 2.833 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

	Area (sf)	CN	Description
*	7,358	98	Proposed Impervious
	17,267	83	Paved roads w/open ditches, 50% imp, HSG A
*	6,192	98	Existing Impervious
	86,736	39	>75% Grass cover, Good, HSG A
*	41,241	39	Proposed Grass (A)
	769,629	30	Woods, Good, HSG A
	420,122	77	Woods, Good, HSG D
*	201	98	Proposed Impervious
*	1,017	98	Existing Impervious
*	4,679	39	Proposed Grass (A)
	9,517	39	>75% Grass cover, Good, HSG A
	27,015	83	Paved roads w/open ditches, 50% imp, HSG A
	427,061	30	Woods, Good, HSG A
*	145,145	77	Woods, Good, HSG D
*	8,919	39	Proposed Grass (A)
	249,158	30	Woods, Good, HSG A
	18,089	77	Woods, Good, HSG D
	2,239,346	44	Weighted Average
	2,202,437		98.35% Pervious Area
	36,909		1.65% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.8	150	0.0150	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
47.8	1,814	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	165	0.0160	0.89		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.0	381	0.0160	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.6	770	0.0030	1.93	54.07	Channel Flow, Area= 28.0 sf Perim= 37.0' r= 0.76' n= 0.035
100.3	3,280	Total			

Summary for Subcatchment SA-2:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.59 cfs @ 12.05 hrs, Volume= 0.041 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 3,907	98	Proposed Impervious
3,907		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	150	0.0071	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.5	48	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	198	Total			

Summary for Subcatchment SA-3:

Runoff = 2.11 cfs @ 12.18 hrs, Volume= 0.176 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 17,867	98	Proposed Impervious
* 27,308	39	Proposed Grass (A)
45,175	62	Weighted Average
27,308		60.45% Pervious Area
17,867		39.55% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	110	0.0270	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.9	40	0.0071	0.77		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
1.8	180	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	330	Total			

Summary for Subcatchment SA-4:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.52 cfs @ 12.04 hrs, Volume= 0.036 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 3,404	98	Proposed Impervious
3,404		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	150	0.0071	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.1	8	0.0071	1.71		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.6	158	Total			

Summary for Subcatchment SA-5:

Runoff = 0.50 cfs @ 12.45 hrs, Volume= 0.059 af, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 6,157	98	Proposed Impervious
* 5,346	39	Proposed Grass (A)
1,127	30	Woods, Good, HSG A
12,630	67	Weighted Average
6,473		51.25% Pervious Area
6,157		48.75% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.2	150	0.0200	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	13	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.9	69	0.0300	1.21		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	96	0.0076	1.77		Shallow Concentrated Flow, Paved Kv= 20.3 fps
31.3	328	Total			

Summary for Subcatchment SA-5A:

Runoff = 0.08 cfs @ 12.46 hrs, Volume= 0.013 af, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 1,112	98	Proposed Impervious
* 7,264	39	Proposed Grass (A)
4,014	30	Woods, Good, HSG A
12,390	41	Weighted Average
11,278		91.03% Pervious Area
1,112		8.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	150	0.0130	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
1.8	85	0.0130	0.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
17.7	235	Total			

Summary for Subcatchment SA-6:

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.61 cfs @ 12.04 hrs, Volume= 0.043 af, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 4,036	98	Proposed Impervious
4,036		100.00% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	150	0.0076	1.03		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.30"
0.4	46	0.0076	1.77		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.8	196	Total			

Summary for Subcatchment SA-7:

Runoff = 2.93 cfs @ 12.24 hrs, Volume= 0.318 af, Depth> 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Event Rainfall=6.20"

Area (sf)	CN	Description
* 4,780	98	Existing Impervious
* 21,033	98	Proposed Impervious
* 146,668	39	Proposed Grass (A)
172,481	48	Weighted Average
146,668		85.03% Pervious Area
25,813		14.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	150	0.0250	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.30"
0.6	55	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.9	308	0.0100	5.74	189.54	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=3.00' Z= 3.0 ' /' Top.W=20.00' n= 0.035
13.7	513	Total			

Appendix E
Water Quality and BMP Sizing Calculations

