

MANAGED RELEASE CONCEPT (MRC) DESIGN SUMMARY

Complete One Design Summary Sheet for Each BMP Designed for MRC

GENERAL INFORMATION

Applicant Name: **AAMPA Holdings, LLC** Project Name: **AAMPA Holdings – Ritner Hwy**
Applicant Address: **1514 Commerce Ave, Suite 203** Municipality: **West Pennsboro Township**
City, State, Zip: **Carlisle PA 17013** County: **Cumberland**
Permit Type: ☐ NPDES PAG-02 ☒ NPDES IP ☐ ESCGP ☐ ESP

	Pre-Development	Post-Development	Change
Impervious Area (acres):	0.00	5.73	5.73

MRC BMP INFORMATION

MRC BMP Type: **P-1 – MRC Bioretention Pond 1** Stormwater BMP Manual Section: **6.4.5**

Will the BMP Include Vegetation? ☒ Yes ☐ No

If Yes, Identify Proposed Vegetation: **Mixed grasses, Shrubs, Plugs (Details of species' on Plan Sheet C-706)**

For Non-Vegetated BMPs Will There Be Pre- or Post-Treatment? ☐ Yes (Pre-) ☐ Yes (Post-) ☒ No

If Yes, Identify Proposed Pre- or Post-Treatment: _____

Name of Surface Water to Receive MRC BMP Discharges: **Big Spring Creek**

Designated Use of Surface Water: **HQ - CWF** Existing Use of Surface Water (if different): _____

Is the Surface Water Impaired? ☒ Yes ☐ No

If Yes, Identify Cause(s): **Organic Enrichment / Oxygen Depletion**

Will the BMP have an impermeable liner? ☐ Yes ☒ No

If Yes, explain why a liner is proposed: _____

BMP Media Description: **See PCSM Plan**

Are Any Deviations from MRC Design Standards Proposed? ☐ Yes ☒ No

If Yes, Identify Deviations: _____

MRC BMP DESIGN VALUES AND STANDARDS

Parameter	Design Value	Design Standard
Actual Contributing Impervious Area to BMP (acres)	5.73	
Equivalent Contributing Impervious Area to BMP (acres)	5.66	
Total Drainage Area to BMP (acres)	9.93	
MRC BMP Release Rate (cfs)	0.06	<i>No greater than 0.01 cfs / acre of equivalent contributing impervious</i>
Underdrain Outflow Rate During 1.2-Inch/2-Hour Storm (cfs)	0.00	<i><= MRC BMP Release Rate (cfs)</i>
Maximum Storm Event Routed to MRC BMP	100-yr/24-hr	

MRC BMP Design Summary
Revised, August 25, 2020

Parameter	Design Value	Design Standard
BMP Footprint Area (ft ²)	36,360	
Bottom BMP Elevation (Native Soils) (ft)	590.00	
2-Yr/24-Hr Storm Ponding Depth (ft)	0.32	<i>1 ft (recommended) (2 ft max)</i>
Maximum Ponding Depth (ft)	1.80	<i>4 ft (max)</i>
Overflow Bypass Elevation (ft)	592.70	
Media Depth (ft)	2.0	<i>2 ft (min) – 4 ft (max)</i>
Media Void Space (%)	15/30	
Internal Water Storage (IWS) Depth (ft)	1.75	<i>1 ft recommended</i>
Top of IWS Elevation (ft)	591.75	
Underdrain Pipe Diameter (in)	4.0	
Underdrain Orifice Diameter (in)	3.0	
Underdrain Outlet Elevation (ft)	591.75	
IWS Available for Routing (%)	50 – in stone	<i>50% max</i>
Separation Distance (Groundwater) (ft)	>1.0	<i>1 ft (min) (2 ft recommended)</i>
Infiltration Rate (in/hr)	0.30	
Volume of Overflow During 1.2-Inch/2-Hour Storm (cf)	0	<i>0 (No overflow allowed)</i>
1-Yr/24-Hr Pre -Development Peak Rate (cfs)	0.18	
2-Yr/24-Hr Post -Development Peak Rate (cfs)	0.16	<i>1-Yr/24-Hr Pre-Development Peak Rate (or per approved Act 167 Plan)</i>
10-Yr/24-Hr Post -Development Peak Rate (cfs)	1.20	<i>10-Yr/24-Hr Pre-Development Peak Rate</i>
50-Yr/24-Hr Post -Development Peak Rate (cfs)	8.33	<i>50-Yr/24-Hr Pre-Development Peak Rate</i>
100-Yr/24-Hr Post -Development Peak Rate (cfs)	19.03	<i>100-Yr/24-Hr Pre-Development Peak Rate</i>
Total 2-Yr/24-Hr Runoff Volume Managed by BMP (cf)	38,159	
Ponding Time @ 2-Yr/24-Hr Storm (hrs)	46.6	<i>72 hrs (surface), 7 days (underground)</i>
Ponding Time @ 10-Yr/24-Hr Storm (hrs)	70.6	<i>72 hrs (surface), 7 days (underground)</i>
Ponding Time @ 50-Yr/24-Hr Storm (hrs)	71.4	<i>72 hrs (surface), 7 days (underground)</i>
Ponding Time @ 100-Yr/24-Hr Storm (hrs)	71.7	<i>72 hrs (surface), 7 days (underground)</i>

Justin T. Doty

Licensed P.E. Name

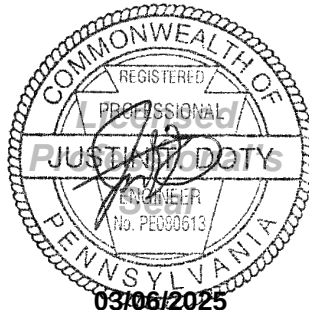
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License No.

03-06-25

Date



Summary for Subcatchment WS-1: WS-1

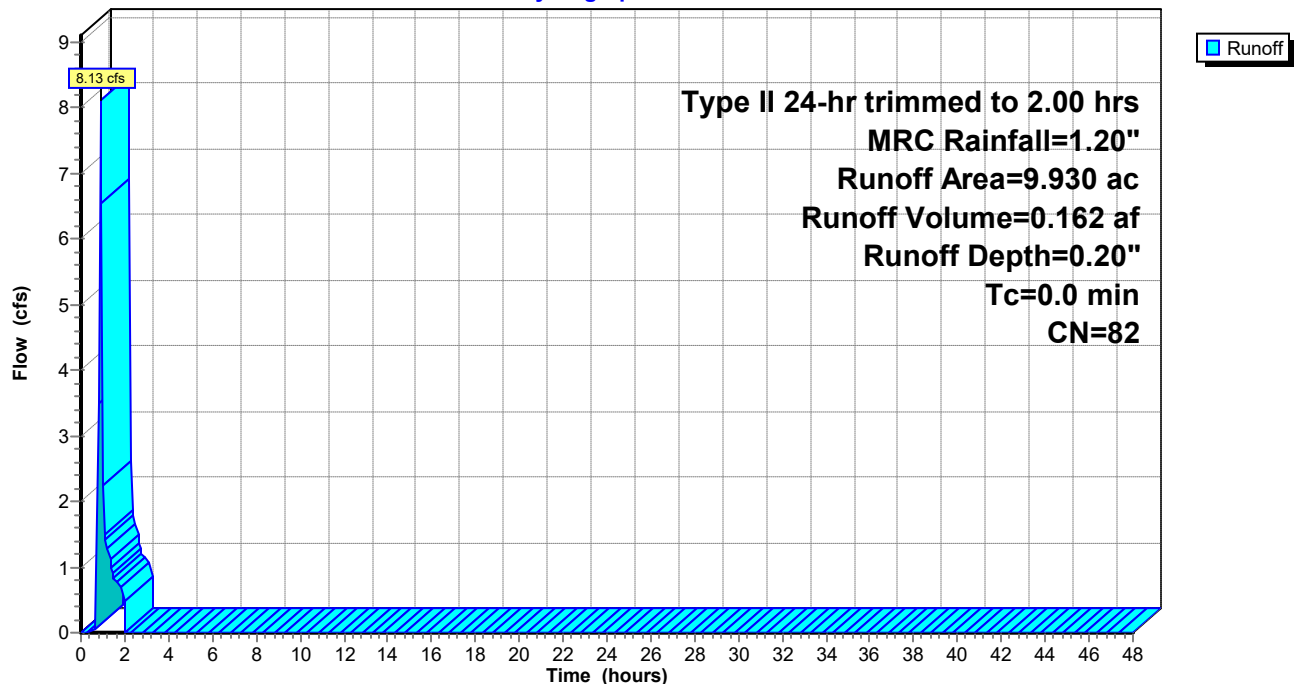
Runoff = 8.13 cfs @ 0.91 hrs, Volume= 0.162 af, Depth= 0.20"
Routed to Pond P-1 : P-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr trimmed to 2.00 hrs MRC Rainfall=1.20"

Area (ac)	CN	Description
0.840	58	Meadow, non-grazed, HSG B
5.730	98	Paved parking, HSG B
3.360	61	>75% Grass cover, Good, HSG B
9.930	82	Weighted Average
4.200		42.30% Pervious Area
5.730		57.70% Impervious Area

Subcatchment WS-1: WS-1

Hydrograph



Summary for Pond P-1: P-1

Inflow Area = 9.930 ac, 57.70% Impervious, Inflow Depth = 0.20" for MRC event
 Inflow = 8.13 cfs @ 0.91 hrs, Volume= 0.162 af
 Outflow = 0.38 cfs @ 1.99 hrs, Volume= 0.162 af, Atten= 95%, Lag= 64.6 min
 Discarded = 0.38 cfs @ 1.99 hrs, Volume= 0.162 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach F-O : Final Outflow

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 591.02' @ 1.99 hrs Surf.Area= 0.830 ac Storage= 0.127 af

Plug-Flow detention time= 153.6 min calculated for 0.162 af (100% of inflow)
 Center-of-Mass det. time= 153.3 min (223.0 - 69.7)

Volume	Invert	Avail.Storage	Storage Description	
#1	590.00'	6.045 af	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
590.00	0.830	0.0	0.000	0.000
591.75	0.830	15.0	0.218	0.218
592.00	0.830	30.0	0.062	0.280
593.50	0.920	100.0	1.312	1.593
595.00	1.010	100.0	1.447	3.040
596.00	5.000	100.0	3.005	6.045

Device	Routing	Invert	Outlet Devices
#1	Discarded	590.00'	0.300 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 588.00'
#2	Primary	591.75'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	592.70'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	593.60'	15.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.38 cfs @ 1.99 hrs HW=591.02' (Free Discharge)

↑ **1=Exfiltration** (Controls 0.38 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=590.00' (Free Discharge)

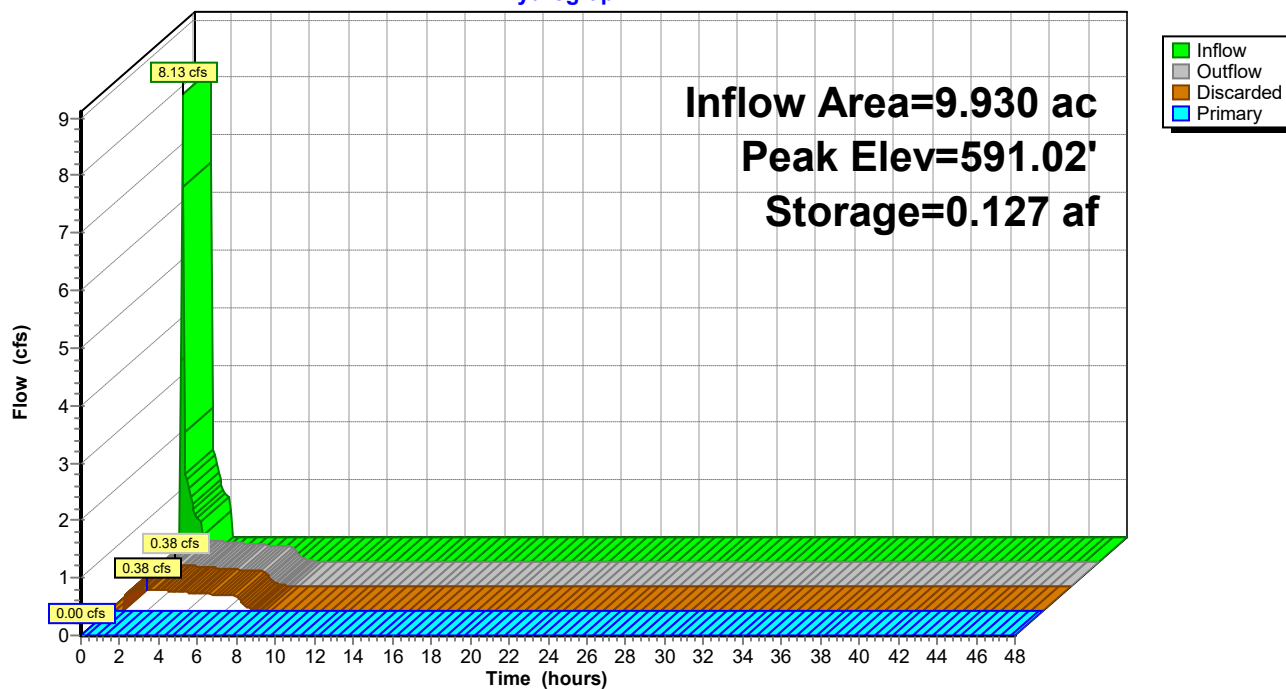
↑ **2=Orifice/Grate** (Controls 0.00 cfs)

↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-1: P-1

Hydrograph



Stage-Discharge for Pond P-1: P-1

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
590.00	0.00	0.00	0.00	595.20	144.04	1.22	142.82
590.10	0.26	0.26	0.00	595.30	155.76	1.36	154.40
590.20	0.28	0.28	0.00	595.40	167.75	1.50	166.25
590.30	0.29	0.29	0.00	595.50	180.00	1.64	178.36
590.40	0.30	0.30	0.00	595.60	192.50	1.78	190.72
590.50	0.31	0.31	0.00	595.70	205.25	1.93	203.32
590.60	0.33	0.33	0.00	595.80	218.23	2.07	216.16
590.70	0.34	0.34	0.00	595.90	231.43	2.22	229.21
590.80	0.35	0.35	0.00	596.00	244.86	2.37	242.49
590.90	0.36	0.36	0.00				
591.00	0.38	0.38	0.00				
591.10	0.39	0.39	0.00				
591.20	0.40	0.40	0.00				
591.30	0.41	0.41	0.00				
591.40	0.43	0.43	0.00				
591.50	0.44	0.44	0.00				
591.60	0.45	0.45	0.00				
591.70	0.46	0.46	0.00				
591.80	0.48	0.48	0.01				
591.90	0.53	0.49	0.04				
592.00	0.59	0.50	0.08				
592.10	0.63	0.52	0.11				
592.20	0.67	0.53	0.13				
592.30	0.70	0.55	0.15				
592.40	0.73	0.56	0.17				
592.50	0.76	0.57	0.19				
592.60	0.79	0.59	0.20				
592.70	0.82	0.60	0.21				
592.80	1.26	0.62	0.64				
592.90	2.03	0.63	1.40				
593.00	3.02	0.65	2.37				
593.10	4.17	0.66	3.50				
593.20	5.46	0.68	4.78				
593.30	6.87	0.69	6.18				
593.40	8.39	0.71	7.68				
593.50	10.01	0.72	9.29				
593.60	11.71	0.74	10.98				
593.70	15.05	0.75	14.29				
593.80	19.73	0.77	18.96				
593.90	25.31	0.78	24.53				
594.00	31.61	0.80	30.81				
594.10	38.54	0.81	37.73				
594.20	46.03	0.83	45.20				
594.30	54.02	0.84	53.18				
594.40	62.48	0.86	61.63				
594.50	71.38	0.87	70.50				
594.60	80.68	0.89	79.79				
594.70	90.36	0.90	89.45				
594.80	100.39	0.92	99.48				
594.90	110.77	0.93	109.84				
595.00	121.48	0.95	120.53				
595.10	132.61	1.08	131.53				

Stage-Area-Storage for Pond P-1: P-1

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
590.00	0.830	0.000	595.20	1.808	3.322
590.10	0.830	0.012	595.30	2.207	3.523
590.20	0.830	0.025	595.40	2.606	3.763
590.30	0.830	0.037	595.50	3.005	4.044
590.40	0.830	0.050	595.60	3.404	4.364
590.50	0.830	0.062	595.70	3.803	4.725
590.60	0.830	0.075	595.80	4.202	5.125
590.70	0.830	0.087	595.90	4.601	5.565
590.80	0.830	0.100	596.00	5.000	6.045
590.90	0.830	0.112			
591.00	0.830	0.125			
591.10	0.830	0.137			
591.20	0.830	0.149			
591.30	0.830	0.162			
591.40	0.830	0.174			
591.50	0.830	0.187			
591.60	0.830	0.199			
591.70	0.830	0.212			
591.80	0.830	0.230			
591.90	0.830	0.255			
592.00	0.830	0.280			
592.10	0.836	0.363			
592.20	0.842	0.447			
592.30	0.848	0.532			
592.40	0.854	0.617			
592.50	0.860	0.703			
592.60	0.866	0.789			
592.70	0.872	0.876			
592.80	0.878	0.963			
592.90	0.884	1.051			
593.00	0.890	1.140			
593.10	0.896	1.229			
593.20	0.902	1.319			
593.30	0.908	1.410			
593.40	0.914	1.501			
593.50	0.920	1.593			
593.60	0.926	1.685			
593.70	0.932	1.778			
593.80	0.938	1.871			
593.90	0.944	1.965			
594.00	0.950	2.060			
594.10	0.956	2.155			
594.20	0.962	2.251			
594.30	0.968	2.348			
594.40	0.974	2.445			
594.50	0.980	2.543			
594.60	0.986	2.641			
594.70	0.992	2.740			
594.80	0.998	2.839			
594.90	1.004	2.939			
595.00	1.010	3.040			
595.10	1.409	3.161			

**MRC BMP 2-YR/24-HR RUNOFF VOLUME MANAGED BY BMP
CALCULATIONS:**

P-1:

BMP Invert: 590.00

Overflow Discharge Invert: 592.70

Total Volume Depth Below Overflow: **2.70'**

Volume at Elevation 592.70 (from HydroCAD): **0.876 ac-ft**

$$0.876 \text{ ac-ft} * 43,560 \text{ cu-ft} = \underline{\underline{38,159 \text{ ft}^3}}$$

EQUIVALENT IMPERVIOUS AREA CALCULATIONS

PROJECT AAMPA Holdings - Ritner Hwy
 Drainage Area: WS-1 MRC
 1.2in-2hr Rainfall 1.20 in

Managed Area 9.93 acres

Developed Conditions:

Cover Type/Condition	Soil Type	Area (sf)	Area (Ac)	CN	S	Ia (0.2*S)	Q Runoff (In)	Runoff Volume (ft3)
Meadow	B	36590	0.84	58	7.24	1.45	0.01	27
Impervious	B	249599	5.73	98	0.20	0.04	0.99	20501
Open Space	B	146362	3.36	61	6.39	1.28	0.00	12
Total			9.93					20540

Equivalent Impervious Area: 21,041 / (0.0833 ft. * 43,560 sq. ft. / acre)

5.66 acres

Summary for Subcatchment WS-1: WS-1 P-1

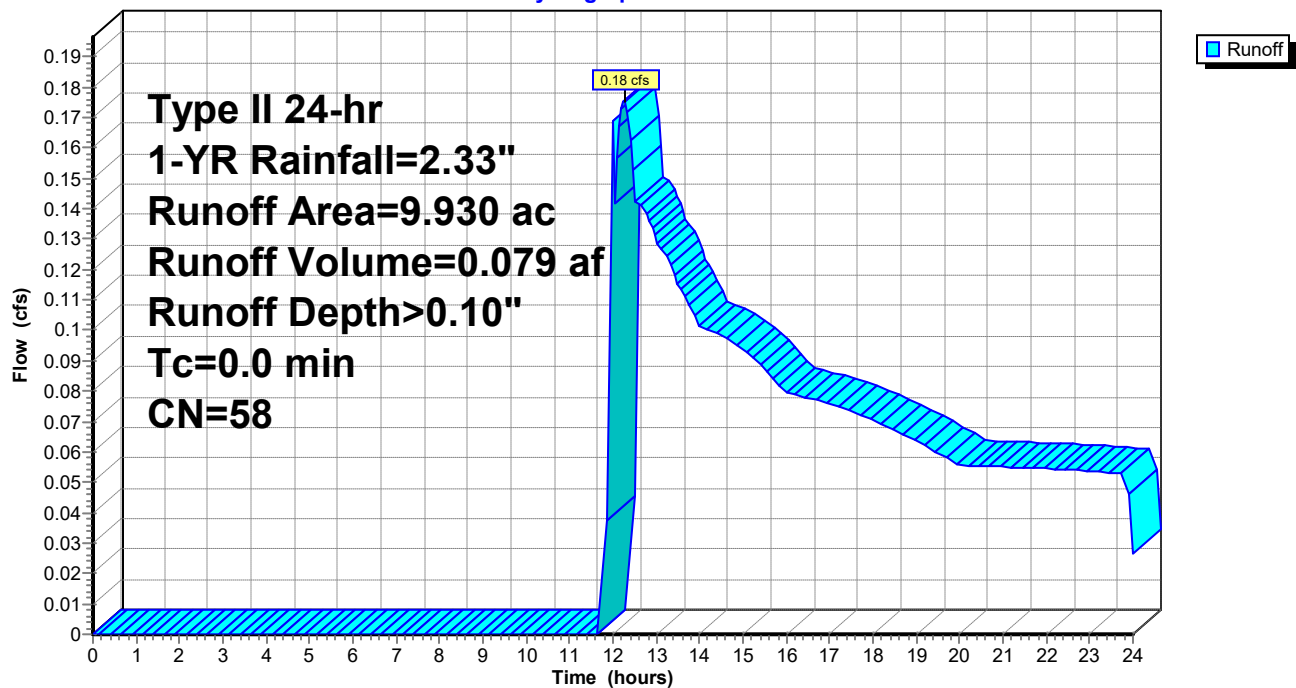
Runoff = 0.18 cfs @ 12.26 hrs, Volume= 0.079 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YR Rainfall=2.33"

Area (ac)	CN	Description
9.930	58	Meadow, non-grazed, HSG B
9.930		100.00% Pervious Area

Subcatchment WS-1: WS-1 P-1

Hydrograph

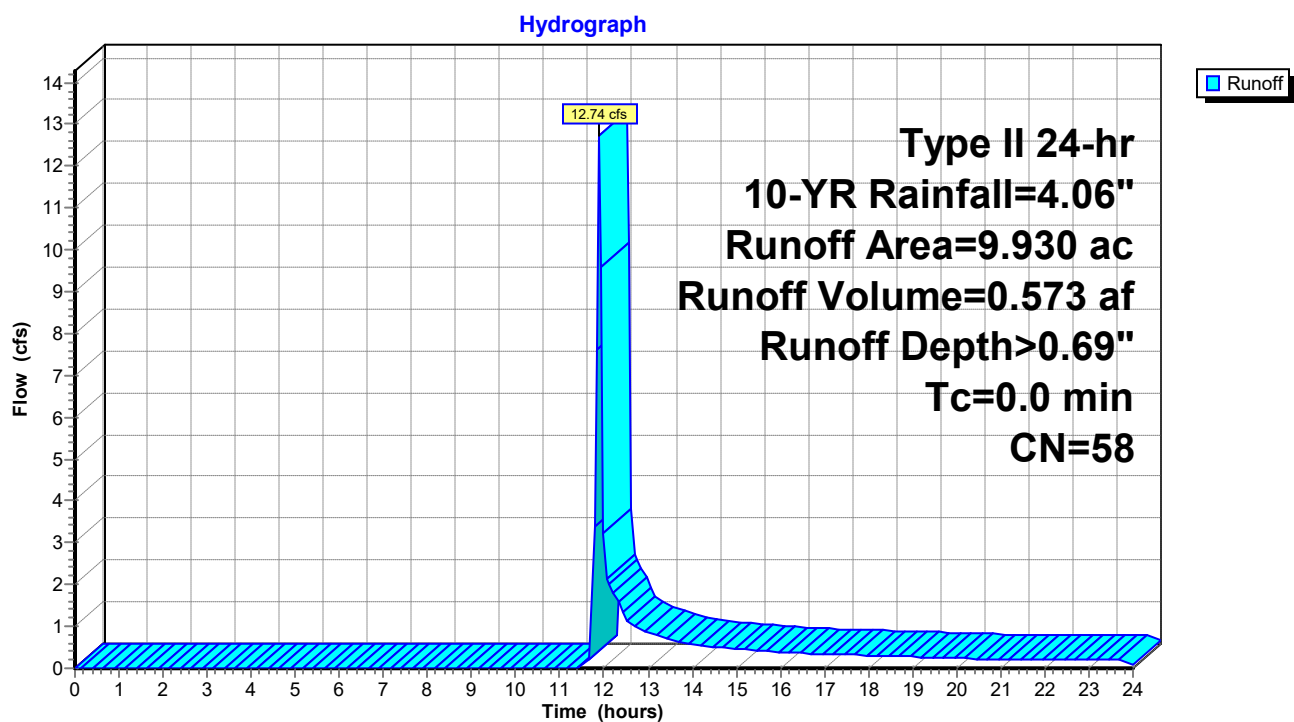


Summary for Subcatchment WS-1: WS-1 P-1

Runoff = 12.74 cfs @ 11.91 hrs, Volume= 0.573 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YR Rainfall=4.06"

Area (ac)	CN	Description
9.930	58	Meadow, non-grazed, HSG B
9.930		100.00% Pervious Area

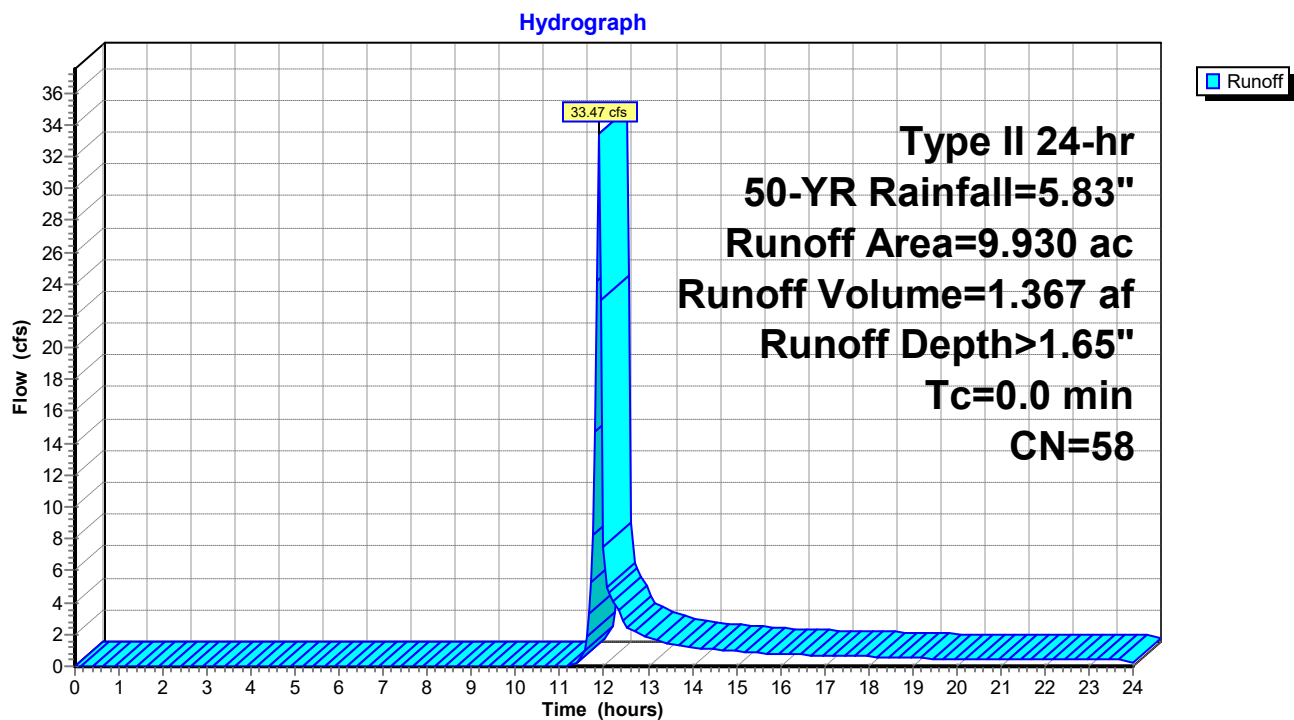
Subcatchment WS-1: WS-1 P-1

Summary for Subcatchment WS-1: WS-1 P-1

Runoff = 33.47 cfs @ 11.90 hrs, Volume= 1.367 af, Depth> 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-YR Rainfall=5.83"

Area (ac)	CN	Description
9.930	58	Meadow, non-grazed, HSG B
9.930		100.00% Pervious Area

Subcatchment WS-1: WS-1 P-1

Summary for Subcatchment WS-1: WS-1 P-1

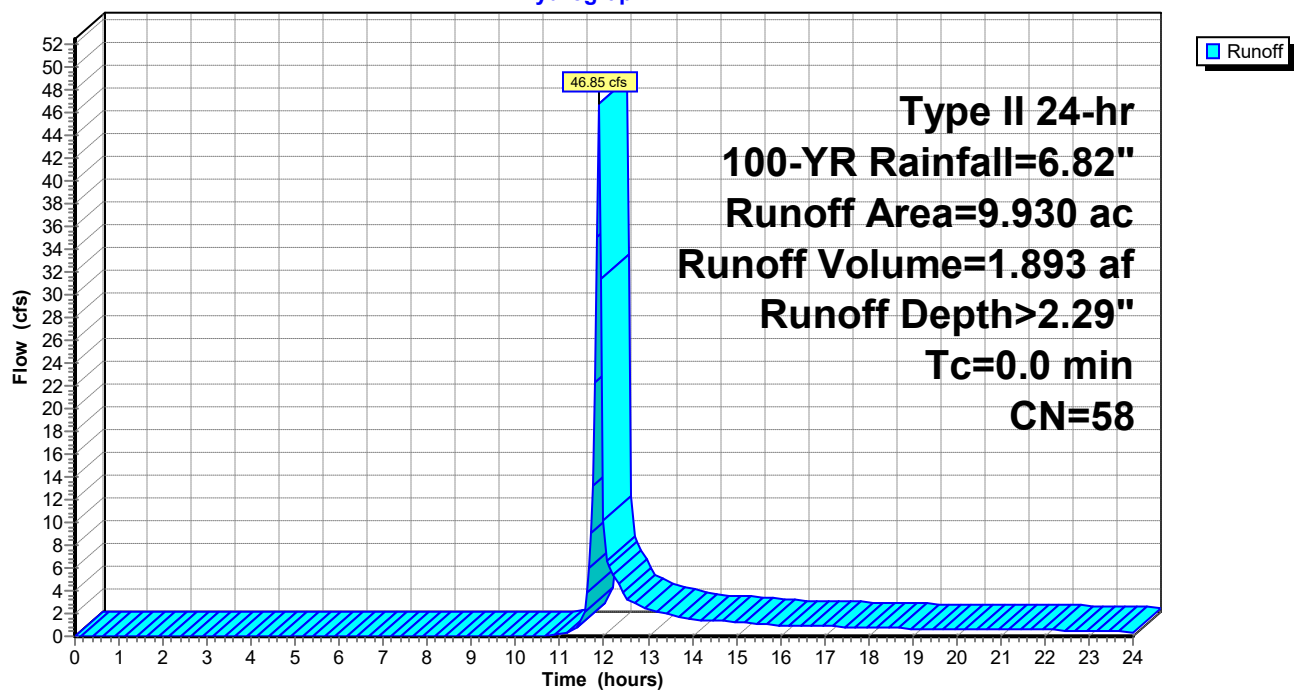
Runoff = 46.85 cfs @ 11.90 hrs, Volume= 1.893 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YR Rainfall=6.82"

Area (ac)	CN	Description
9.930	58	Meadow, non-grazed, HSG B
9.930		100.00% Pervious Area

Subcatchment WS-1: WS-1 P-1

Hydrograph



AAMPA Holdings - Ritner Hwy

P-1 MRC Dewatering Time 2 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
591.75		9496.1		0.00			0.0
			2700.7		0.04	18.75	
592.00		12196.8		0.08			18.8
			10977.1		0.12	26.51	
592.30		23173.9		0.15			45.3
			740.5		0.155	1.33	
592.32		23914.4		0.16			46.6

AAMPA Holdings - Ritner Hwy

P-1 MRC Dewatering Time 10 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
591.75		9496.1		0.00			0.0
			2700.7		0.0	18.8	
592.00		12196.8		0.08			18.8
			10977.1		0.12	26.51	
592.30		23173.9		0.15			45.3
			7448.7		0.17	12.17	
592.50		30622.6		0.19			57.4
			7535.9		0.2	10.47	
592.70		38158.5		0.21			67.9
			6882.5		0.72	2.7	
592.88		45041.0		1.23			70.6

AAMPA Holdings - Ritner Hwy

P-1 MRC Dewatering Time 50 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
591.75		9496.1		0.00			0.0
			2700.7		0.0	18.8	
592.00		12196.8		0.08			18.8
			10977.1		0.12	26.51	
592.30		23173.9		0.15			45.3
			7448.7		0.17	12.17	
592.50		30622.6		0.19			57.4
			7535.9		0.2	10.47	
592.70		38158.5		0.21			67.9
			11499.8		1.29	2.5	
593.00		49658.3		2.37			70.4
			11761.2		4.275	0.764211	
593.30		61419.5		6.18			71.1
			5575.7		7.245	0.213776	
593.44		66995.2		8.31			71.4

AAMPA Holdings - Ritner Hwy

P-1 MRC Dewatering Time 100 Year Storm Event

*WATER SURFACE ELEVATION	STORAGE VOLUME (Ac. FT.)	STORAGE VOLUME (CU. FT.)	INCREMENTAL STORAGE VOLUME (CF)	** DISCHARGE (CFS)	AVERAGE DISCHARGE (CFS)	TIME (HRS.)	ACCUMULATED TIME (HRS.)
591.75		9496.1		0.00			0.0
			2700.7		0.0	18.8	
592.00		12196.8		0.08			18.8
			10977.1		0.12	26.51	
592.30		23173.9		0.15			45.3
			7448.7		0.17	12.17	
592.50		30622.6		0.19			57.4
			7535.9		0.2	10.47	
592.70		38158.5		0.21			67.9
			11499.8		1.29	2.5	
593.00		49658.3		2.37			70.4
			11761.2		4.275	0.764211	
593.30		61419.5		6.18			71.1
			7971.5		7.735	0.286271	
593.50		69391.0		9.29			71.4
			8058.6		11.79	0.189864	
593.70		77449.6		14.29			71.6
			4051.0		16.625	0.067686	
593.80		81500.6		18.96			71.7