

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	2.86	2.86

MRC BMP INFORMATION

MRC BMP Type: **P-6 – MRC Bioretention Pond 6** Stormwater BMP Manual Section: **6.4.5**

Will the BMP Include Vegetation? ☒ Yes ☐ No

If Yes, Identify Proposed Vegetation: **Mixed grasses, Shrubs, Trees, 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)	2.86	
Equivalent Contributing Impervious Area to BMP (acres)	2.83	
Total Drainage Area to BMP (acres)	6.92	
MRC BMP Release Rate (cfs)	0.03	<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)	18,590	
Bottom BMP Elevation (Native Soils) (ft)	601.00	
2-Yr/24-Hr Storm Ponding Depth (ft)	0.22	1 ft (recommended) (2 ft max)
Maximum Ponding Depth (ft)	2.13	4 ft (max)
Overflow Bypass Elevation (ft)	603.40	
Media Depth (ft)	2.0	2 ft (min) – 4 ft (max)
Media Void Space (%)	15	
Internal Water Storage (IWS) Depth (ft)	2.0	1 ft recommended
Top of IWS Elevation (ft)	603.00	
Underdrain Pipe Diameter (in)	4.0	
Underdrain Orifice Diameter (in)	3.0	
Underdrain Outlet Elevation (ft)	603.00	
IWS Available for Routing (%)	50 – in stone	50% max
Separation Distance (Groundwater) (ft)	>1.0	1 ft (min) (2 ft recommended)
Infiltration Rate (in/hr)	0.37	
Volume of Overflow During 1.2-Inch/2-Hour Storm (cf)	0	0 (No overflow allowed)
1-Yr/24-Hr Pre -Development Peak Rate (cfs)	0.12	
2-Yr/24-Hr Post -Development Peak Rate (cfs)	0.07	1-Yr/24-Hr Pre-Development Peak Rate (or per approved Act 167 Plan)
10-Yr/24-Hr Post -Development Peak Rate (cfs)	1.37	10-Yr/24-Hr Pre-Development Peak Rate
50-Yr/24-Hr Post -Development Peak Rate (cfs)	2.98	50-Yr/24-Hr Pre-Development Peak Rate
100-Yr/24-Hr Post -Development Peak Rate (cfs)	3.62	100-Yr/24-Hr Pre-Development Peak Rate
Total 2-Yr/24-Hr Runoff Volume Managed by BMP (cf)	13,242	
Ponding Time @ 2-Yr/24-Hr Storm (hrs)	33.2	72 hrs (surface), 7 days (underground)
Ponding Time @ 10-Yr/24-Hr Storm (hrs)	36.3	72 hrs (surface), 7 days (underground)
Ponding Time @ 50-Yr/24-Hr Storm (hrs)	38.6	72 hrs (surface), 7 days (underground)
Ponding Time @ 100-Yr/24-Hr Storm (hrs)	39.6	72 hrs (surface), 7 days (underground)

Justin T. Doty

Licensed P.E. Name

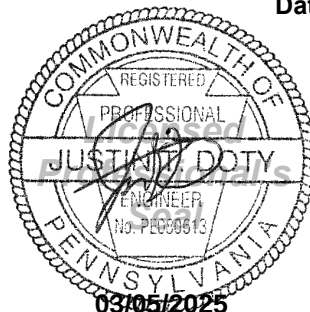
Licensed P.E. Signature

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License No.

03-05-25

Date



Summary for Subcatchment WS-13: WS-13

Runoff = 1.20 cfs @ 1.08 hrs, Volume= 0.050 af, Depth= 0.09"
 Routed to Pond P-6 : P-6

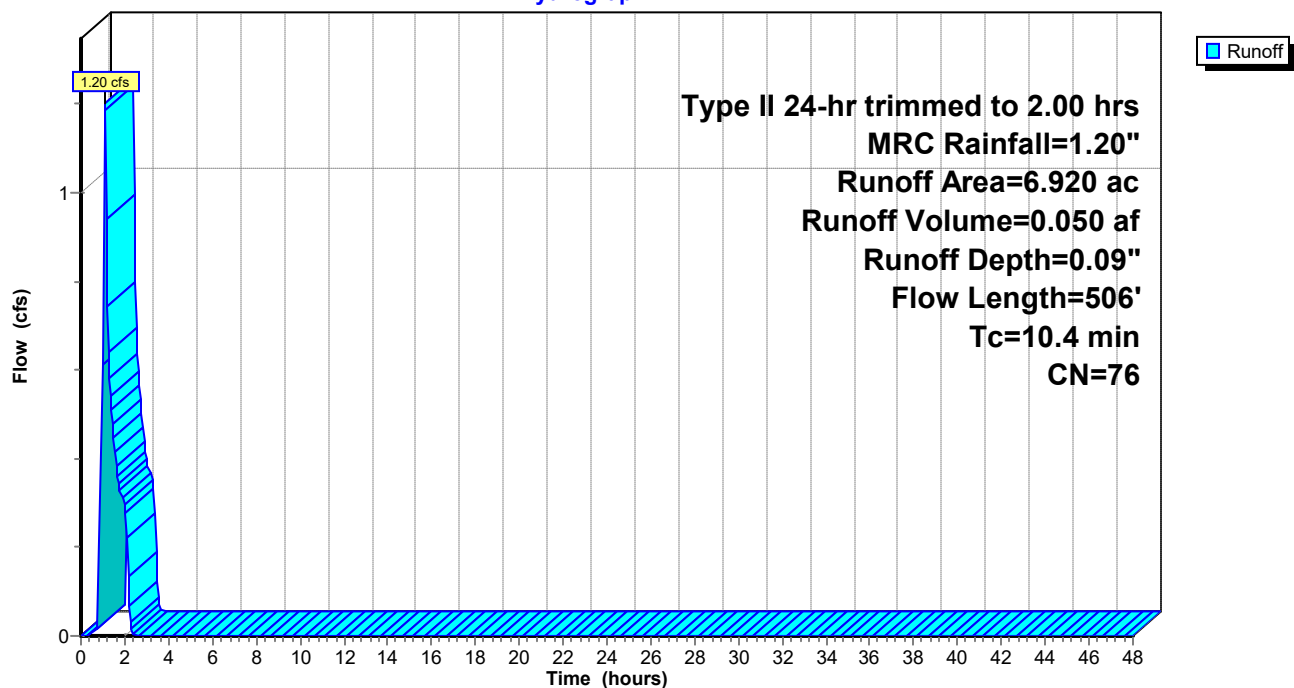
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr trimmed to 2.00 hrs MRC Rainfall=1.20"

Area (ac)	CN	Description
0.430	58	Meadow, non-grazed, HSG B
2.860	98	Paved parking, HSG B
3.630	61	>75% Grass cover, Good, HSG B
6.920	76	Weighted Average
4.060		58.67% Pervious Area
2.860		41.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0800	0.19		Sheet Flow, Grass: Dense n= 0.240 P2= 2.79"
1.6	406	0.0670	4.17		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.4	506	Total			

Subcatchment WS-13: WS-13

Hydrograph



Summary for Pond P-6: P-6

Inflow Area = 6.920 ac, 41.33% Impervious, Inflow Depth = 0.09" for MRC event
 Inflow = 1.20 cfs @ 1.08 hrs, Volume= 0.050 af
 Outflow = 0.23 cfs @ 2.09 hrs, Volume= 0.050 af, Atten= 81%, Lag= 60.2 min
 Discarded = 0.23 cfs @ 2.09 hrs, Volume= 0.050 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach OUT-C : BYPASS PIPE C OUTLET

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 601.45' @ 2.09 hrs Surf.Area= 0.430 ac Storage= 0.029 af

Plug-Flow detention time= 62.2 min calculated for 0.050 af (100% of inflow)
 Center-of-Mass det. time= 62.3 min (147.4 - 85.1)

Volume	Invert	Avail.Storage	Storage Description	
#1	601.00'	4.167 af	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
601.00	0.430	0.0	0.000	0.000
603.00	0.430	15.0	0.129	0.129
608.20	0.640	100.0	2.782	2.911
609.00	2.500	100.0	1.256	4.167

Device	Routing	Invert	Outlet Devices
#1	Discarded	601.00'	0.370 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 600.00'
#2	Device 5	603.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 5	603.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 5	604.60'	48.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	603.00'	12.0" Round Culvert L= 133.0' Ke= 1.000 Inlet / Outlet Invert= 603.00' / 602.56' S= 0.0033 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.23 cfs @ 2.09 hrs HW=601.45' (Free Discharge)

↑ **1=Exfiltration** (Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=601.00' (Free Discharge)

↑ **5=Culvert** (Controls 0.00 cfs)

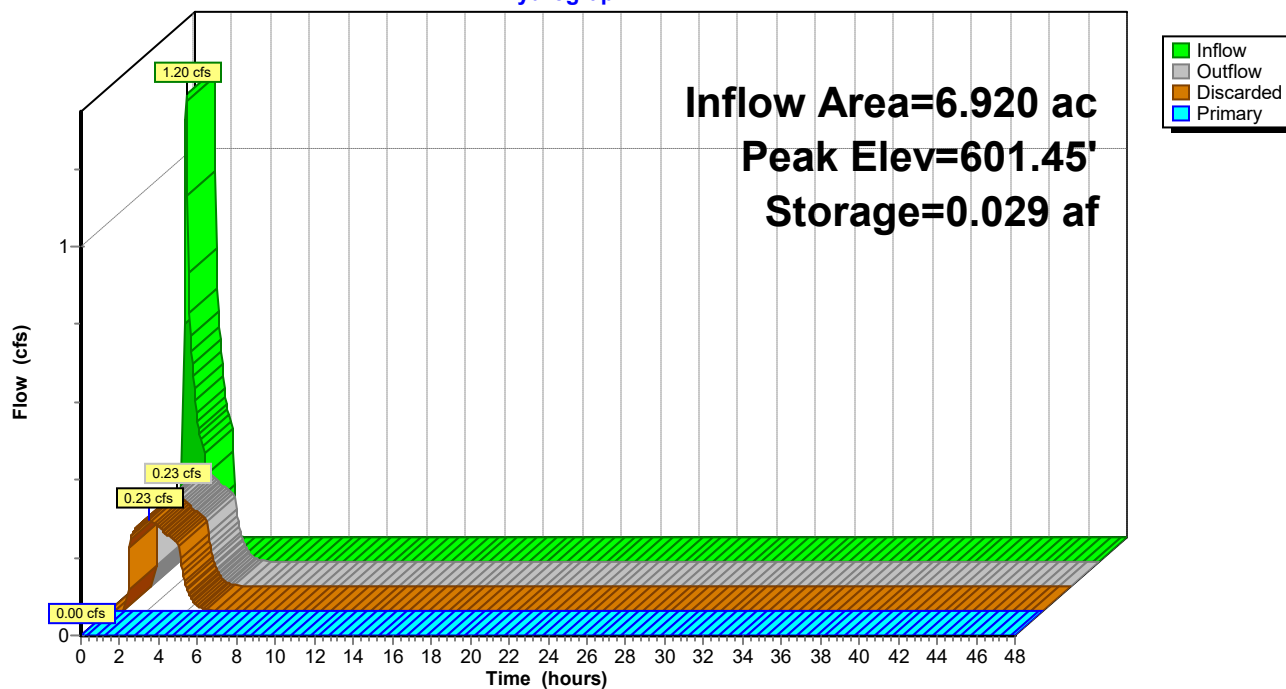
↑ **2=Orifice/Grate** (Controls 0.00 cfs)

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

↑ **4=Orifice/Grate** (Controls 0.00 cfs)

Pond P-6: P-6

Hydrograph



Stage-Discharge for Pond P-6: P-6

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
601.00	0.00	0.00	0.00	606.20	5.72	1.06	4.66
601.10	0.18	0.18	0.00	606.30	5.83	1.08	4.75
601.20	0.19	0.19	0.00	606.40	5.93	1.10	4.83
601.30	0.21	0.21	0.00	606.50	6.03	1.12	4.91
601.40	0.22	0.22	0.00	606.60	6.13	1.14	4.99
601.50	0.24	0.24	0.00	606.70	6.23	1.16	5.07
601.60	0.26	0.26	0.00	606.80	6.33	1.17	5.15
601.70	0.27	0.27	0.00	606.90	6.42	1.19	5.23
601.80	0.29	0.29	0.00	607.00	6.52	1.21	5.31
601.90	0.30	0.30	0.00	607.10	6.61	1.23	5.38
602.00	0.32	0.32	0.00	607.20	6.70	1.25	5.46
602.10	0.34	0.34	0.00	607.30	6.80	1.27	5.53
602.20	0.35	0.35	0.00	607.40	6.89	1.29	5.60
602.30	0.37	0.37	0.00	607.50	6.98	1.31	5.67
602.40	0.39	0.39	0.00	607.60	7.07	1.32	5.74
602.50	0.40	0.40	0.00	607.70	7.16	1.34	5.81
602.60	0.42	0.42	0.00	607.80	7.24	1.36	5.88
602.70	0.43	0.43	0.00	607.90	7.33	1.38	5.95
602.80	0.45	0.45	0.00	608.00	7.42	1.40	6.02
602.90	0.47	0.47	0.00	608.10	7.50	1.42	6.08
603.00	0.48	0.48	0.00	608.20	7.59	1.44	6.15
603.10	0.52	0.50	0.02	608.30	7.76	1.54	6.21
603.20	0.58	0.52	0.06	608.40	7.93	1.65	6.28
603.30	0.63	0.53	0.10	608.50	8.10	1.76	6.34
603.40	0.68	0.55	0.12	608.60	8.27	1.86	6.41
603.50	1.13	0.57	0.56	608.70	8.44	1.97	6.47
603.60	1.56	0.59	0.97	608.80	8.61	2.08	6.53
603.70	1.86	0.61	1.25	608.90	8.78	2.19	6.59
603.80	2.16	0.62	1.54	609.00	8.95	2.30	6.65
603.90	2.44	0.64	1.80				
604.00	2.66	0.66	2.01				
604.10	2.87	0.68	2.20				
604.20	3.07	0.69	2.37				
604.30	3.25	0.71	2.54				
604.40	3.42	0.73	2.69				
604.50	3.59	0.75	2.84				
604.60	3.74	0.77	2.97				
604.70	3.89	0.79	3.11				
604.80	4.04	0.80	3.23				
604.90	4.18	0.82	3.36				
605.00	4.31	0.84	3.47				
605.10	4.45	0.86	3.59				
605.20	4.57	0.88	3.70				
605.30	4.70	0.90	3.81				
605.40	4.82	0.91	3.91				
605.50	4.94	0.93	4.01				
605.60	5.06	0.95	4.11				
605.70	5.18	0.97	4.21				
605.80	5.29	0.99	4.30				
605.90	5.40	1.01	4.39				
606.00	5.51	1.02	4.48				
606.10	5.62	1.04	4.57				

Stage-Area-Storage for Pond P-6: P-6

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
601.00	0.430	0.000	606.20	0.559	1.712
601.10	0.430	0.006	606.30	0.563	1.768
601.20	0.430	0.013	606.40	0.567	1.824
601.30	0.430	0.019	606.50	0.571	1.881
601.40	0.430	0.026	606.60	0.575	1.939
601.50	0.430	0.032	606.70	0.579	1.996
601.60	0.430	0.039	606.80	0.583	2.055
601.70	0.430	0.045	606.90	0.587	2.113
601.80	0.430	0.052	607.00	0.592	2.172
601.90	0.430	0.058	607.10	0.596	2.231
602.00	0.430	0.064	607.20	0.600	2.291
602.10	0.430	0.071	607.30	0.604	2.351
602.20	0.430	0.077	607.40	0.608	2.412
602.30	0.430	0.084	607.50	0.612	2.473
602.40	0.430	0.090	607.60	0.616	2.534
602.50	0.430	0.097	607.70	0.620	2.596
602.60	0.430	0.103	607.80	0.624	2.658
602.70	0.430	0.110	607.90	0.628	2.721
602.80	0.430	0.116	608.00	0.632	2.784
602.90	0.430	0.123	608.10	0.636	2.847
603.00	0.430	0.129	608.20	0.640	2.911
603.10	0.434	0.172	608.30	0.872	2.987
603.20	0.438	0.216	608.40	1.105	3.085
603.30	0.442	0.260	608.50	1.337	3.208
603.40	0.446	0.304	608.60	1.570	3.353
603.50	0.450	0.349	608.70	1.803	3.522
603.60	0.454	0.394	608.80	2.035	3.713
603.70	0.458	0.440	608.90	2.267	3.929
603.80	0.462	0.486	609.00	2.500	4.167
603.90	0.466	0.532			
604.00	0.470	0.579			
604.10	0.474	0.626			
604.20	0.478	0.674			
604.30	0.482	0.722			
604.40	0.487	0.771			
604.50	0.491	0.819			
604.60	0.495	0.869			
604.70	0.499	0.918			
604.80	0.503	0.968			
604.90	0.507	1.019			
605.00	0.511	1.070			
605.10	0.515	1.121			
605.20	0.519	1.173			
605.30	0.523	1.225			
605.40	0.527	1.277			
605.50	0.531	1.330			
605.60	0.535	1.384			
605.70	0.539	1.437			
605.80	0.543	1.491			
605.90	0.547	1.546			
606.00	0.551	1.601			
606.10	0.555	1.656			

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

P-6:

BMP Invert: 601.00

Overflow Discharge Invert: 603.40

Total Volume Depth Below Overflow: **2.40'**

Volume at Elevation 603.40 (from HydroCAD): **0.304 ac-ft**

$$\mathbf{0.304\ ac\text{-}ft * 43,560\ cu\text{-}ft = \underline{13,242\ ft^3}}$$

WORKSHEET 4 - EQUIVALENT IMPERVIOUS AREA CALCULATIONS

PROJECT AAMPA Holdings - Ritner Hwy
 Drainage Area: WS-13 MRC
 1.2in-2hr Rainfall 1.20 in

Managed Area 6.92 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	18731	0.43	58	7.24	1.45	0.01	14
Impervious	B	124582	2.86	98	0.20	0.04	0.99	10233
Open Space	B	158123	3.63	61	6.39	1.28	0.00	13
Total			6.92					10260

Equivalent Impervious Area: 10,260 / (0.0833 ft. * 43,560 sq. ft. / acre)

2.83 acres

2022-0251 HydroCAD MRC 1yr

Prepared by Frederick, Seibert & Associates

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Type II 24-hr 1-YR Rainfall=2.33"

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Summary for Subcatchment WS-13: WS-13 P-6

Runoff = 0.12 cfs @ 12.42 hrs, Volume= 0.055 af, Depth> 0.09"
Routed to nonexistent node P-6

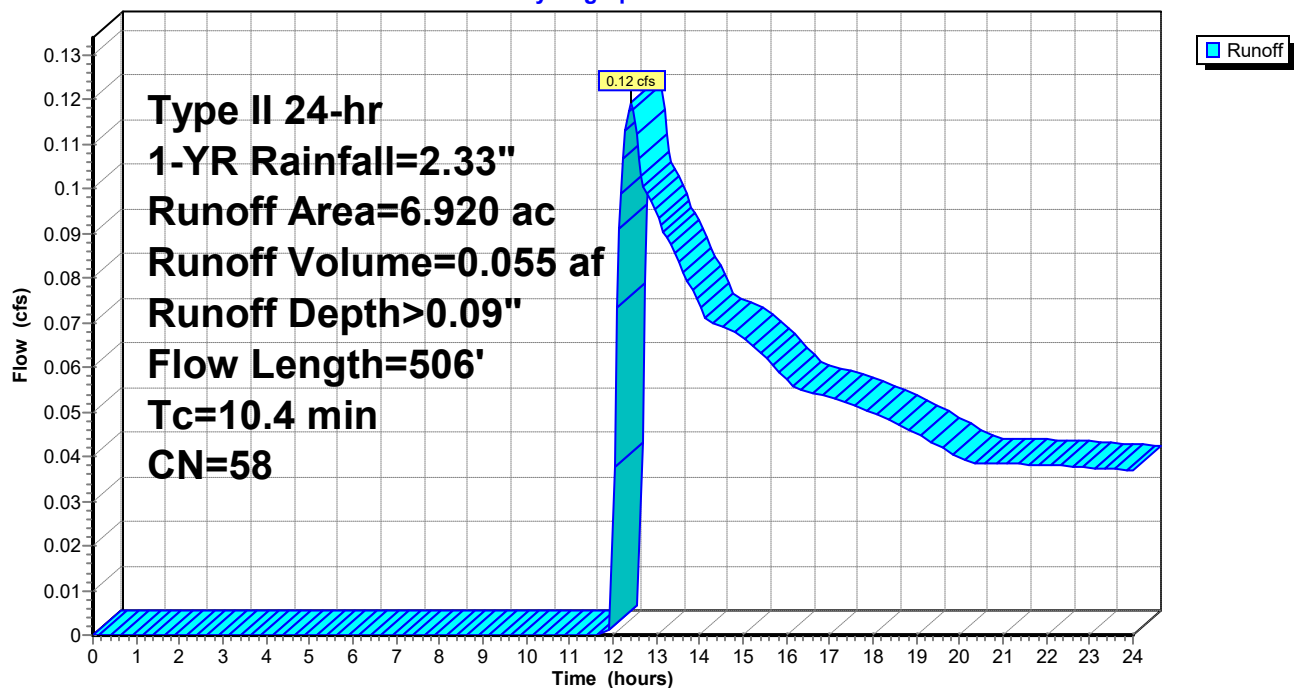
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-YR Rainfall=2.33"

Area (ac)	CN	Description
6.920	58	Meadow, non-grazed, HSG B
6.920		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0800	0.19		Sheet Flow, Grass: Dense n= 0.240 P2= 2.79"
1.6	406	0.0670	4.17		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.4	506	Total			

Subcatchment WS-13: WS-13 P-6

Hydrograph



2022-0251 HydroCAD MRC 1yr

Prepared by Frederick, Seibert & Associates

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Type II 24-hr 10-YR Rainfall=4.06"

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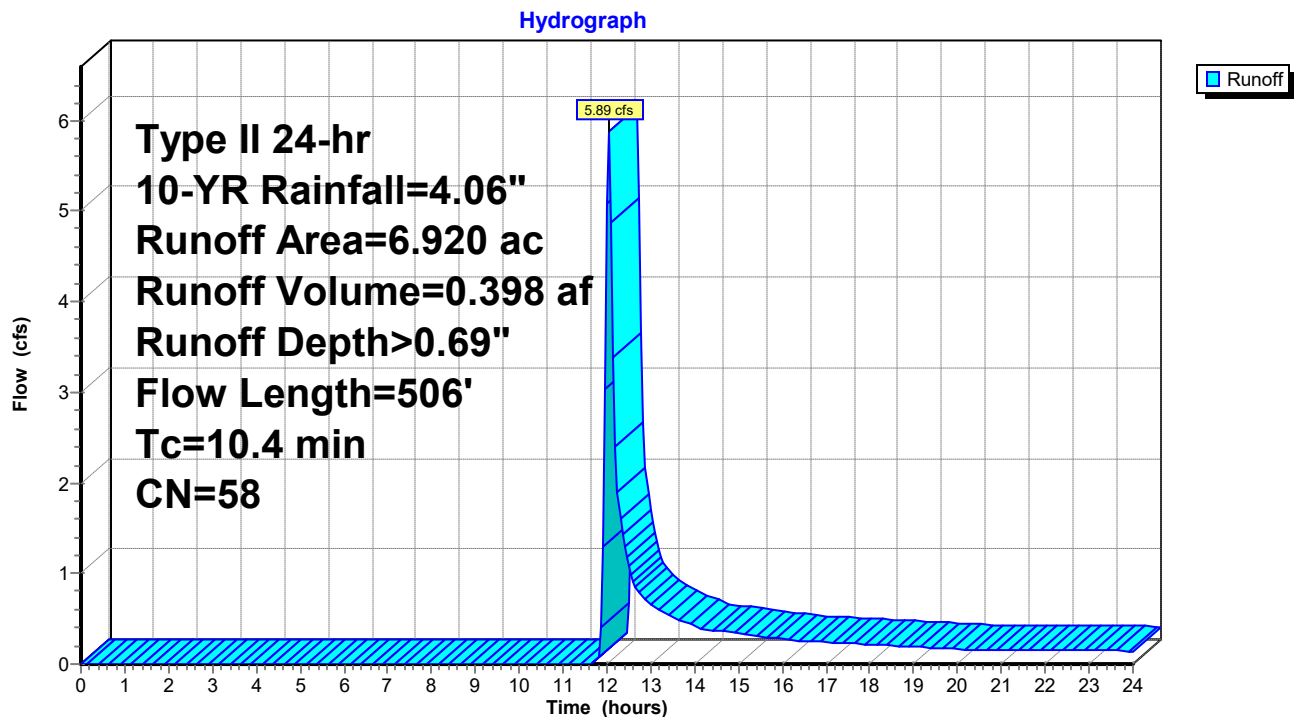
Summary for Subcatchment WS-13: WS-13 P-6

Runoff = 5.89 cfs @ 12.05 hrs, Volume= 0.398 af, Depth> 0.69"
Routed to nonexistent node P-6

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
6.920	58	Meadow, non-grazed, HSG B
6.920		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0800	0.19		Sheet Flow, Grass: Dense n= 0.240 P2= 2.79"
1.6	406	0.0670	4.17		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.4	506	Total			

Subcatchment WS-13: WS-13 P-6

Summary for Subcatchment WS-13: WS-13 P-6

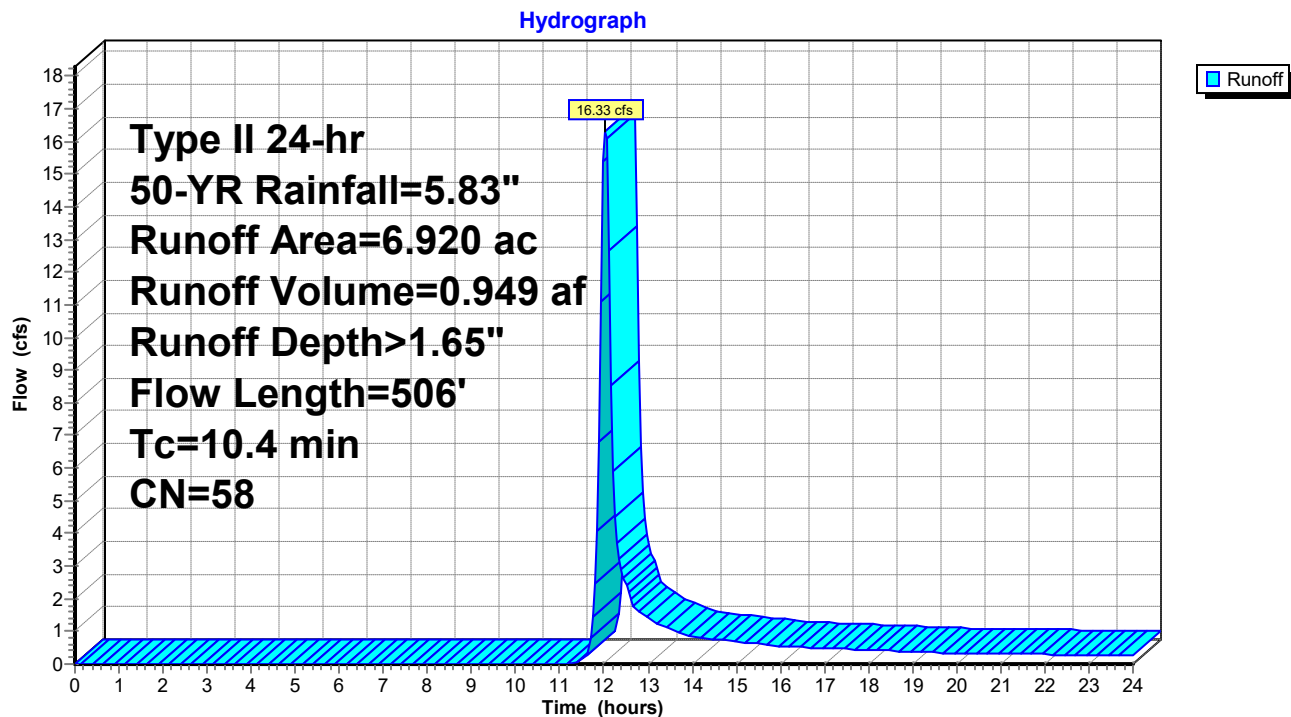
Runoff = 16.33 cfs @ 12.03 hrs, Volume= 0.949 af, Depth> 1.65"
Routed to nonexistent node P-6

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
6.920	58	Meadow, non-grazed, HSG B
6.920		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0800	0.19		Sheet Flow, Grass: Dense n= 0.240 P2= 2.79"
1.6	406	0.0670	4.17		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.4	506	Total			

Subcatchment WS-13: WS-13 P-6



2022-0251 HydroCAD MRC 1yr

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Type II 24-hr 100-YR Rainfall=6.82"

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Summary for Subcatchment WS-13: WS-13 P-6

Runoff = 23.16 cfs @ 12.03 hrs, Volume= 1.315 af, Depth> 2.28"
Routed to nonexistent node P-6

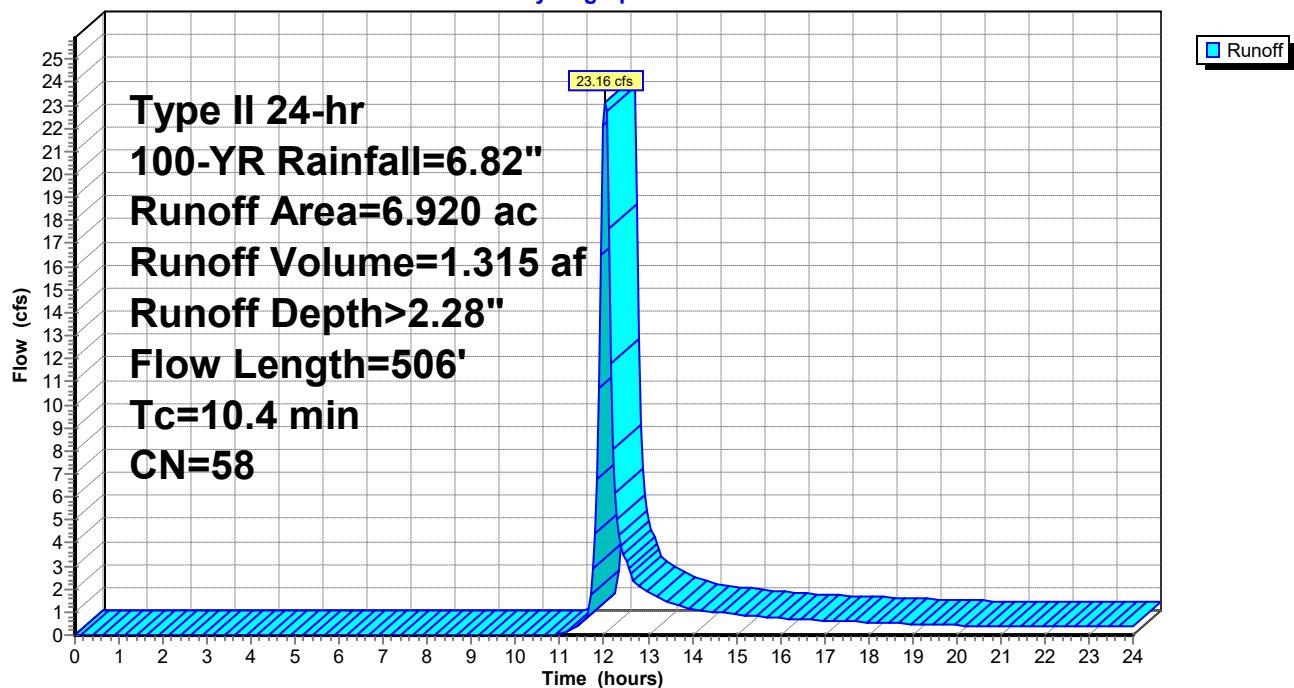
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YR Rainfall=6.82"

Area (ac)	CN	Description
6.920	58	Meadow, non-grazed, HSG B
6.920		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0800	0.19		Sheet Flow, Grass: Dense n= 0.240 P2= 2.79"
1.6	406	0.0670	4.17		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.4	506	Total			

Subcatchment WS-13: WS-13 P-6

Hydrograph



AAMPA Holdings - Ritner Hwy

P-6 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.)
603.00		5619.3		0.00			0.0
			4181.7		0.04	33.19	
603.22		9801.0		0.07			33.2

AAMPA Holdings - Ritner Hwy

P-6 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.)
603.00		5619.3		0.00			0.0
			5706.3		0.05	31.70	
603.30		11325.6		0.10			31.7
			3876.8		0.33	3.26	
603.50		15202.4		0.56			35.0
			3964.0		0.905	1.22	
603.70		19166.4		1.25			36.2
			784.1		1.31	0.2	
603.74		19950.5		1.37			36.3

AAMPA Holdings - Ritner Hwy

P-6 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.)
603.00		5619.3		0.00			0.0
			5706.3		0.05	31.70	
603.30		11325.6		0.10			31.7
			3876.8		0.33	3.26	
603.50		15202.4		0.56			35.0
			3964.0		0.905	1.22	
603.70		19166.4		1.25			36.2
			6054.8		1.63	1.0	
604.00		25221.2		2.01			37.2
			6229.1		2.275	0.760574	
604.30		31450.3		2.54			38.0
			4225.3		2.69	0.436318	
604.50		35675.6		2.84			38.4
			2178.0		2.91	0.21	
604.60		37853.6		2.97			38.6

AAMPA Holdings - Ritner Hwy

P-6 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.)
603.00		5619.3		0.00			0.0
			5706.3		0.05	31.70	
603.30		11325.6		0.10			31.7
			3876.8		0.33	3.26	
603.50		15202.4		0.56			35.0
			3964.0		0.905	1.22	
603.70		19166.4		1.25			36.2
			6054.8		1.63	1.0	
604.00		25221.2		2.01			37.2
			6229.1		2.275	0.760574	
604.30		31450.3		2.54			38.0
			4225.3		2.69	0.436318	
604.50		35675.6		2.84			38.4
			4312.4		2.98	0.40	
604.70		39988.0		3.11			38.8
			6621.1		3.29	0.56	
605.00		46609.1		3.47			39.4
			2918.5		3.545	0.2	
605.13		49527.6		3.62			39.6