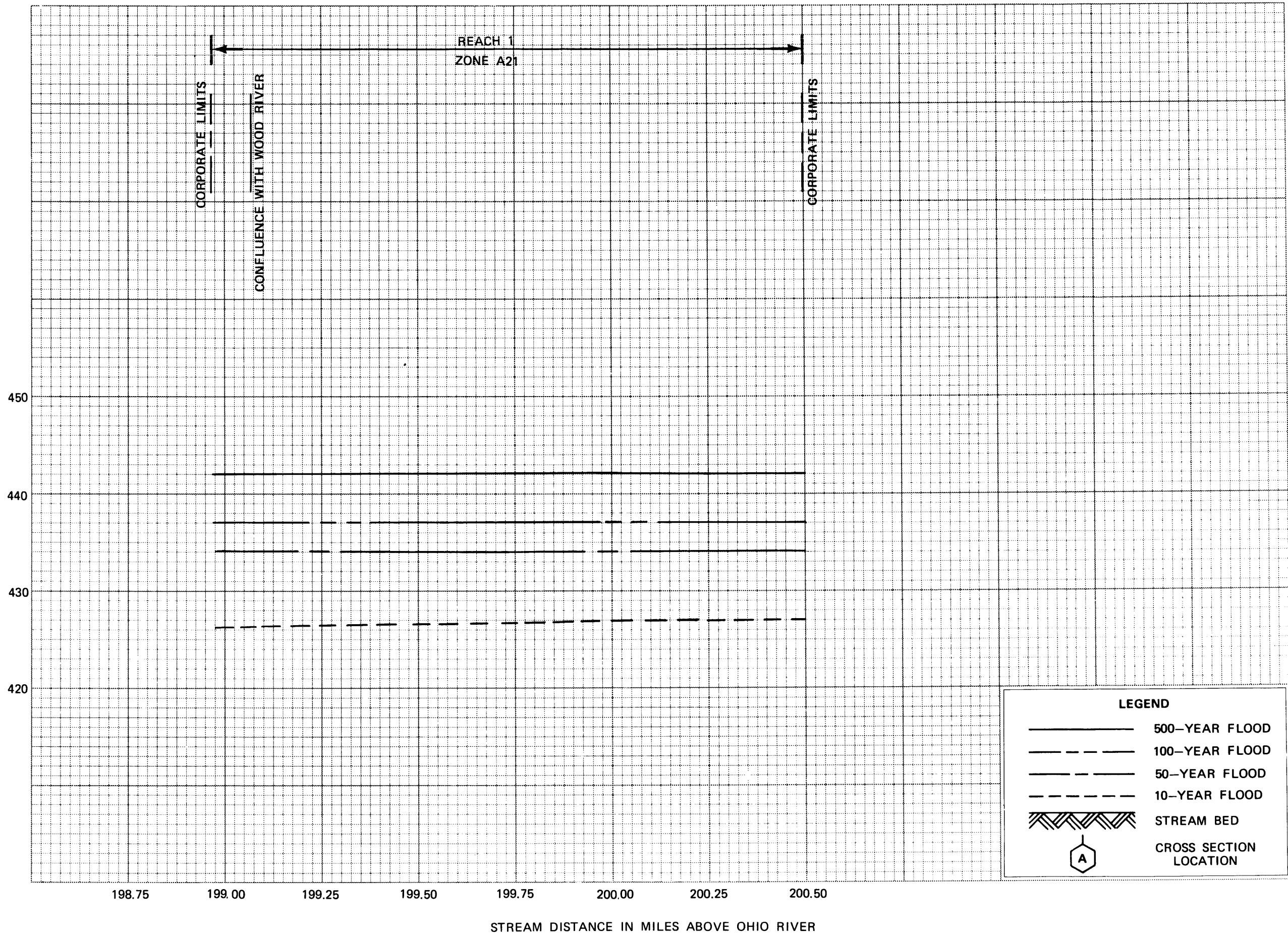


ELEVATION IN FEET (NGVD)



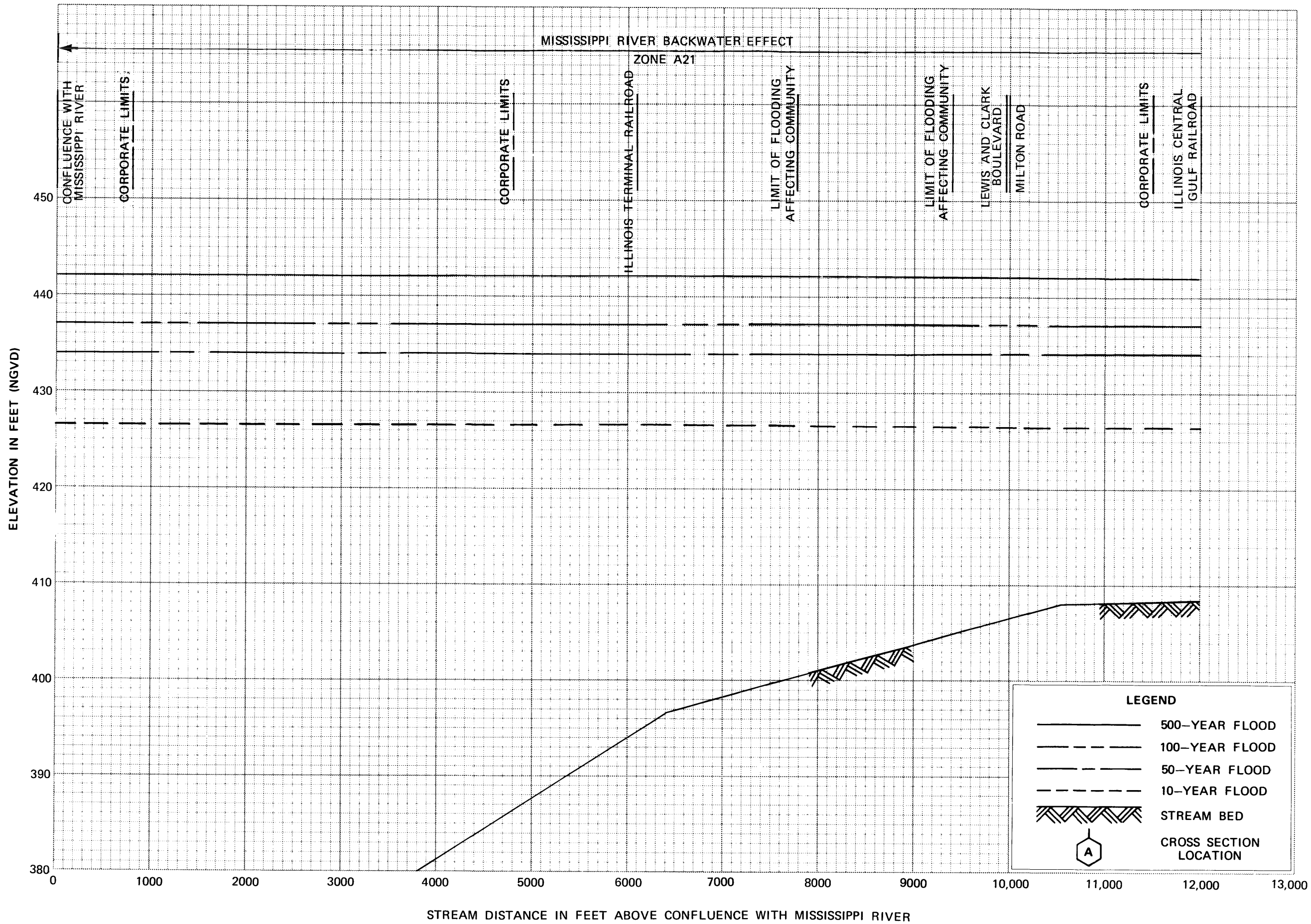
FLOOD PROFILES

MISSISSIPPI RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF EAST ALTON, IL
(MADISON CO.)

01P



FLOOD PROFILES

WOOD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF EAST ALTON, IL
(MADISON CO.)

TABLE 1 - SUMMARY OF DISCHARGES

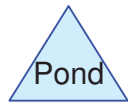
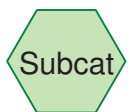
<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA</u>	<u>PEAK DISCHARGES (CFS)</u>			
	<u>SQ MILES</u>	<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
CORAL BRANCH CREEK					
Mouth	5.25	2,456	3,584	3,954	4,589
Just upstream of confluence of Black Creek	0.83	816	1,162	1,285	1,490
BELT LINE CREEK					
Mouth	1.16	722	1,169	1,300	1,513
Belt Line Road	0.99	1,041	1,437	1,587	1,883
WEST FORK WOOD RIVER					
At State Highway 140	54.2	9,200	14,600	18,200	24,700
MISSISSIPPI RIVER					
Mile 203	171,000	355,000	460,000	510,000	*650,000
WOOD RIVER					
At mouth	123.0	15,956	25,460	30,450	39,800

*Urban Design



ATTACHMENT 4

HYDROCAD REPORT – PROPOSED WEST COMPLEX POND – 100-YEAR



Routing Diagram for Pr West Pond Closure Wood River Station_Buttruss_7_8_2016

Prepared by AECOM, Printed 7/8/2016

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Summary for Subcatchment 1S: Pond 2 South Lower DA

Runoff = 71.46 cfs @ 12.03 hrs, Volume= 4.384 af, Depth= 7.37"

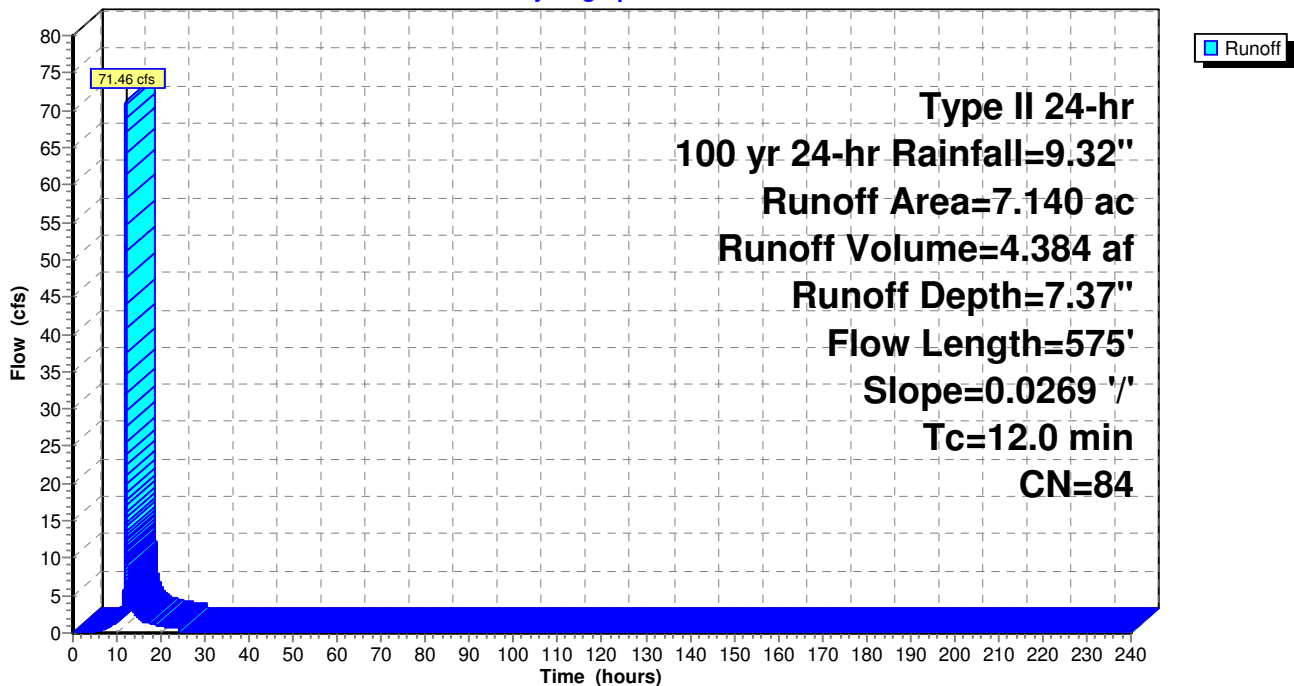
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
7.140	84	50-75% Grass cover, Fair, HSG D
7.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0269	0.19		Sheet Flow, sheet flow
					Grass: Short n= 0.150 P2= 3.10"
3.2	475	0.0269	2.46		Shallow Concentrated Flow, shallow conc
					Grassed Waterway Kv= 15.0 fps
12.0	575	Total			

Subcatchment 1S: Pond 2 South Lower DA

Hydrograph



Summary for Subcatchment 16S: Pond 2 South Upper DA

Runoff = 40.81 cfs @ 12.03 hrs, Volume= 2.471 af, Depth= 7.37"

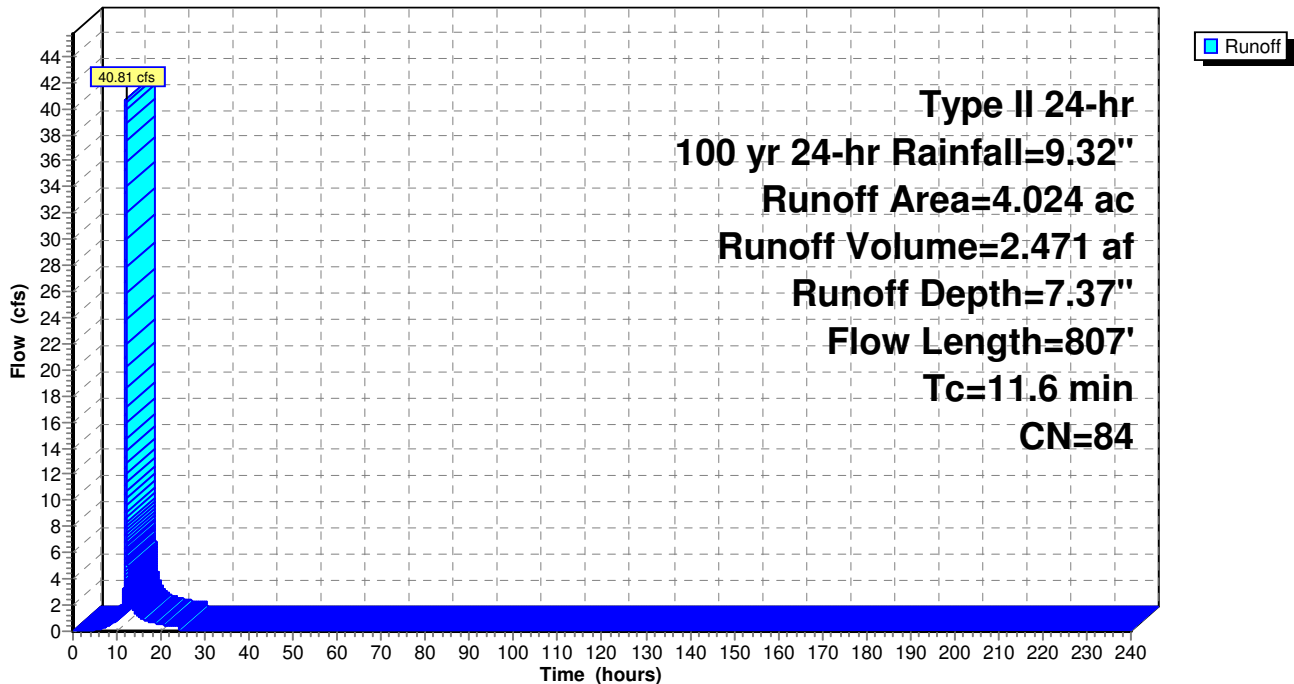
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
4.024	84	50-75% Grass cover, Fair, HSG D
4.024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	121	0.0251	0.19		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.10"
1.0	686	0.0100	10.95	11,986.99	Trap/Vee/Rect Channel Flow, Channel Flow Bot.W=0.00' D=5.00' Z= 47.6 & 40.0 '/' Top.W=438.00' n= 0.025 Earth, grassed & winding
11.6	807	Total			

Subcatchment 16S: Pond 2 South Upper DA

Hydrograph



Summary for Subcatchment 19S: Area northwest 1

Runoff = 74.26 cfs @ 12.05 hrs, Volume= 4.904 af, Depth= 7.99"

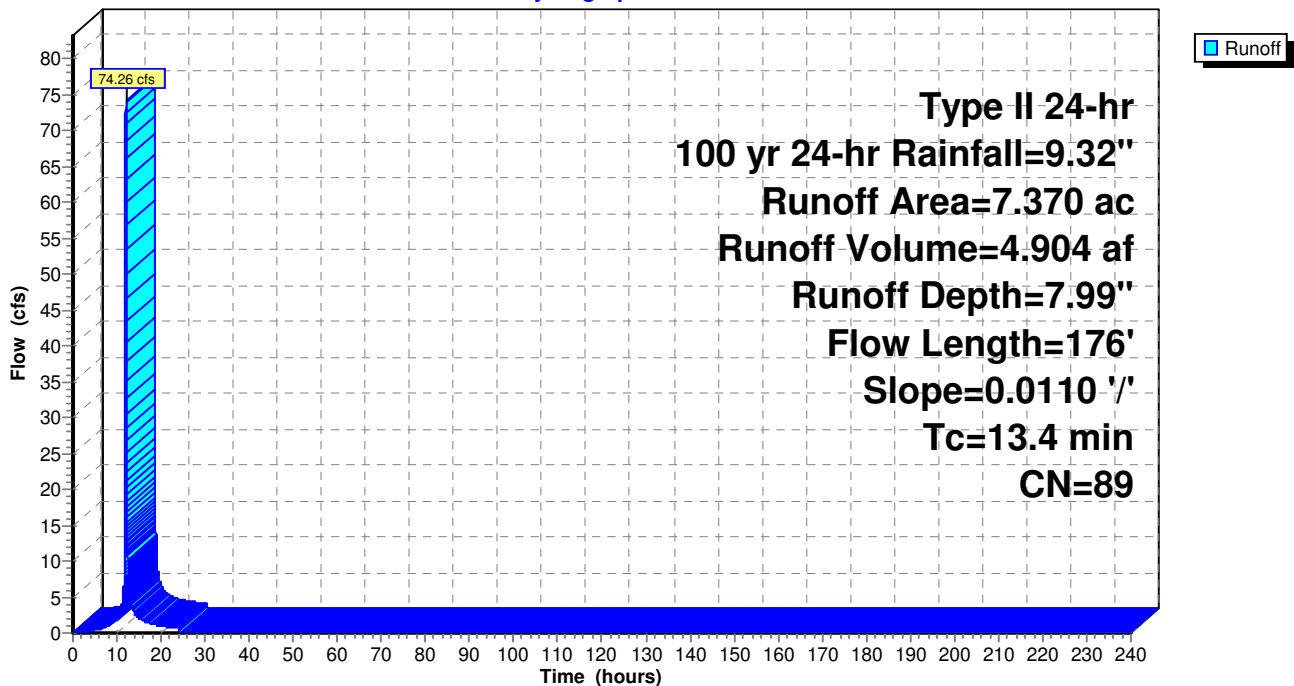
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
7.370	89	<50% Grass cover, Poor, HSG D
7.370		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0110	0.13		Sheet Flow, sf
					Grass: Short n= 0.150 P2= 3.10"
0.8	76	0.0110	1.57		Shallow Concentrated Flow, scf
					Grassed Waterway Kv= 15.0 fps
13.4	176	Total			

Subcatchment 19S: Area northwest 1

Hydrograph



Summary for Subcatchment 20S: Pond 2 South Upper DA

Runoff = 39.43 cfs @ 12.02 hrs, Volume= 2.349 af, Depth= 7.37"

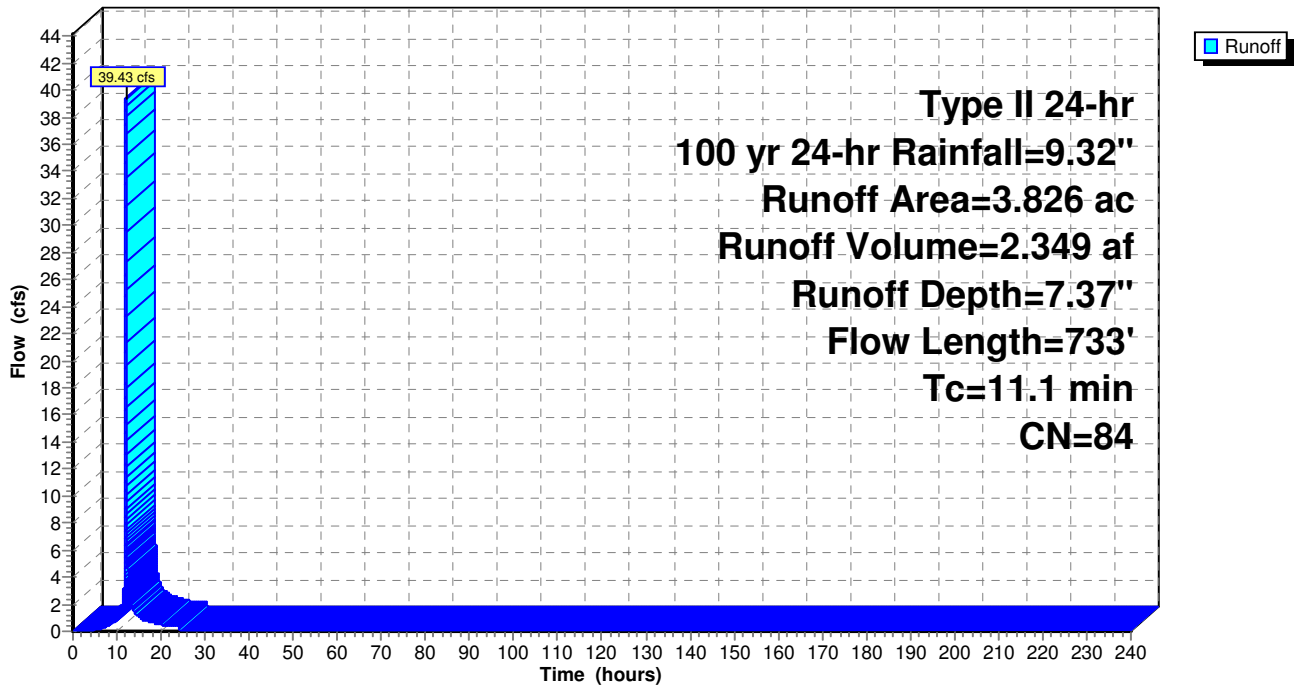
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
3.826	84	50-75% Grass cover, Fair, HSG D
3.826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0269	0.19		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.10"
1.7	258	0.0269	2.46		Shallow Concentrated Flow, Shallow Concentrated Grassed Waterway Kv= 15.0 fps
0.6	375	0.0100	10.95	10,919.28	Trap/Vee/Rect Channel Flow, Channel Flow Bot.W=0.00' D=5.00' Z= 39.8 & 40.0 '/' Top.W=399.00' n= 0.025 Earth, grassed & winding
11.1	733	Total			

Subcatchment 20S: Pond 2 South Upper DA

Hydrograph



Summary for Subcatchment 23S: Area northeast 4

Runoff = 103.30 cfs @ 12.43 hrs, Volume= 15.397 af, Depth= 9.08"

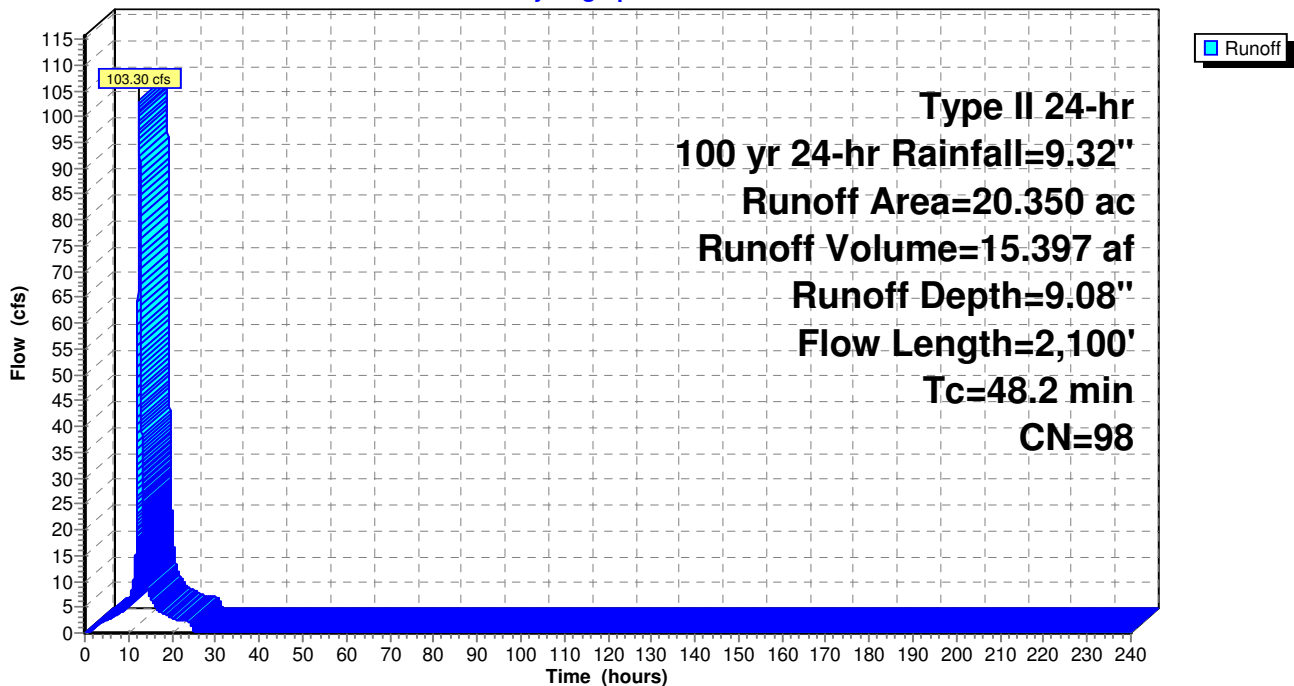
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
20.350	98	Water Surface, HSG A
20.350		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		Sheet Flow, sf
					Grass: Short n= 0.150 P2= 3.10"
35.1	2,000	0.0040	0.95		Shallow Concentrated Flow, scf
					Grassed Waterway Kv= 15.0 fps
48.2	2,100	Total			

Subcatchment 23S: Area northeast 4

Hydrograph



Summary for Subcatchment 24S: Area southeast 1

Runoff = 41.94 cfs @ 12.18 hrs, Volume= 3.783 af, Depth= 7.62"

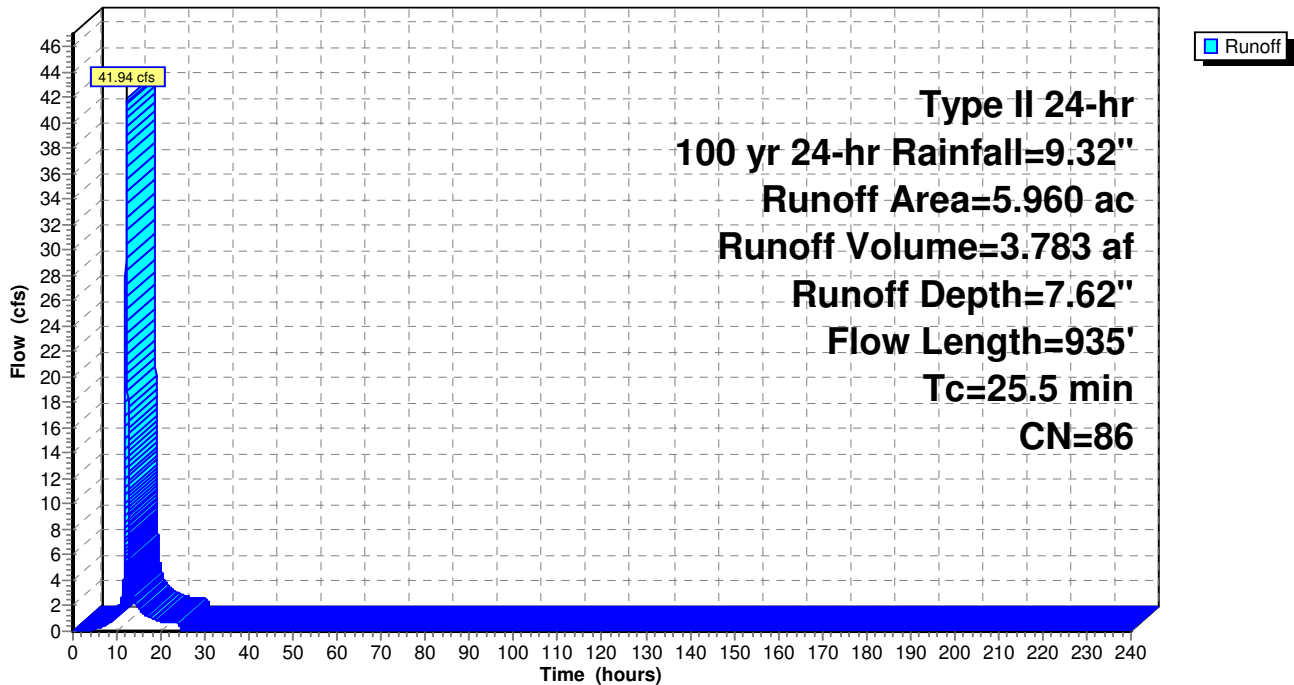
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
5.960	86	<50% Grass cover, Poor, HSG C
5.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0200	0.17		Sheet Flow, se Grass: Short n= 0.150 P2= 3.10"
12.7	135	0.0200	0.18		Sheet Flow, scf Grass: Short n= 0.150 P2= 3.10"
2.8	700	0.0040	4.11	461.82	Channel Flow, cf Area= 112.5 sf Perim= 75.0' r= 1.50' n= 0.030 Short grass
25.5	935	Total			

Subcatchment 24S: Area southeast 1

Hydrograph



Summary for Subcatchment 25S: Pond 2 North DA

Runoff = 102.80 cfs @ 12.02 hrs, Volume= 6.184 af, Depth= 7.37"

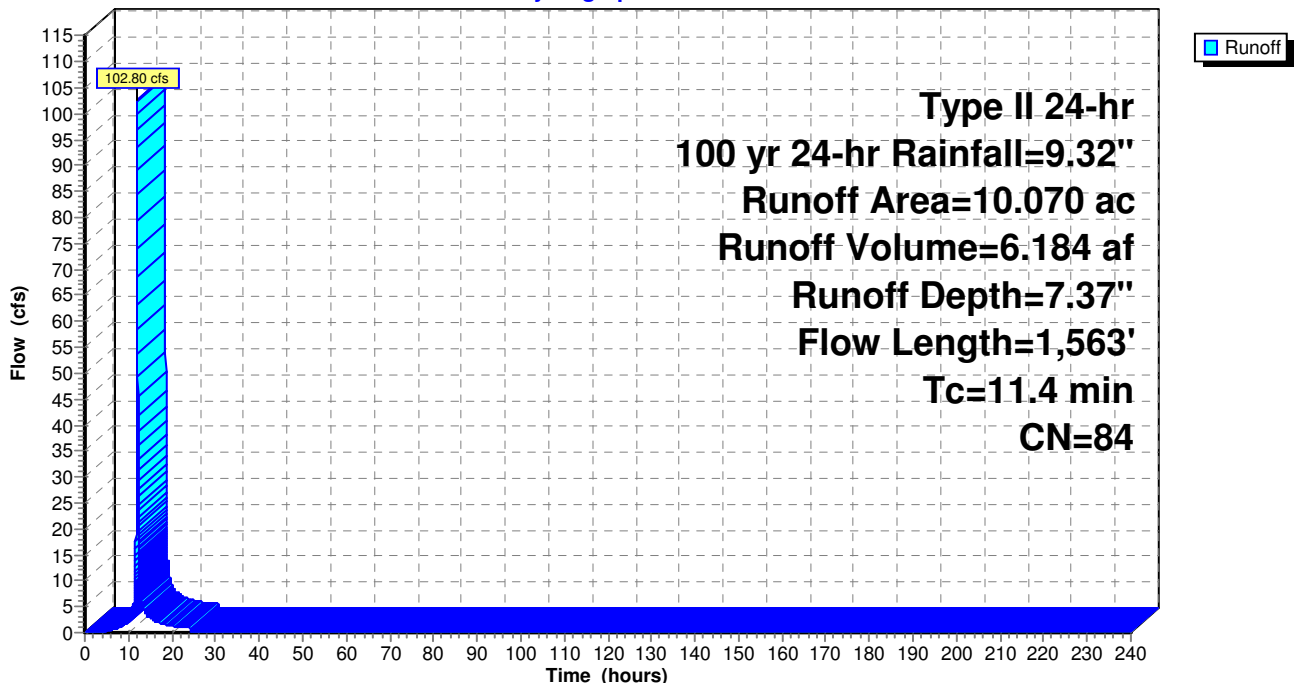
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
10.070	84	50-75% Grass cover, Fair, HSG D
10.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0263	0.19		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.10"
0.4	65	0.0263	2.43		Shallow Concentrated Flow, Shallow Concentrated Grassed Waterway Kv= 15.0 fps
0.9	609	0.0100	10.95	11,617.40	Trap/Vee/Rect Channel Flow, Channel Flow Bot.W=0.00' D=5.00' Z= 38.6 & 46.3 '/' Top.W=424.50' n= 0.025 Earth, grassed & winding
1.2	789	0.0100	10.95	10,522.28	Trap/Vee/Rect Channel Flow, Channel flow Bot.W=0.00' D=5.00' Z= 35.2 & 41.7 '/' Top.W=384.50' n= 0.025 Earth, grassed & winding
11.4	1,563	Total			

Subcatchment 25S: Pond 2 North DA

Hydrograph



Pr West Pond Closure Wood River Station_Buttre Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Prepared by AECOM

Printed 7/8/2016

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Summary for Subcatchment 26S: Pond 1 DA-Left

Runoff = 74.73 cfs @ 12.02 hrs, Volume= 4.495 af, Depth= 7.37"

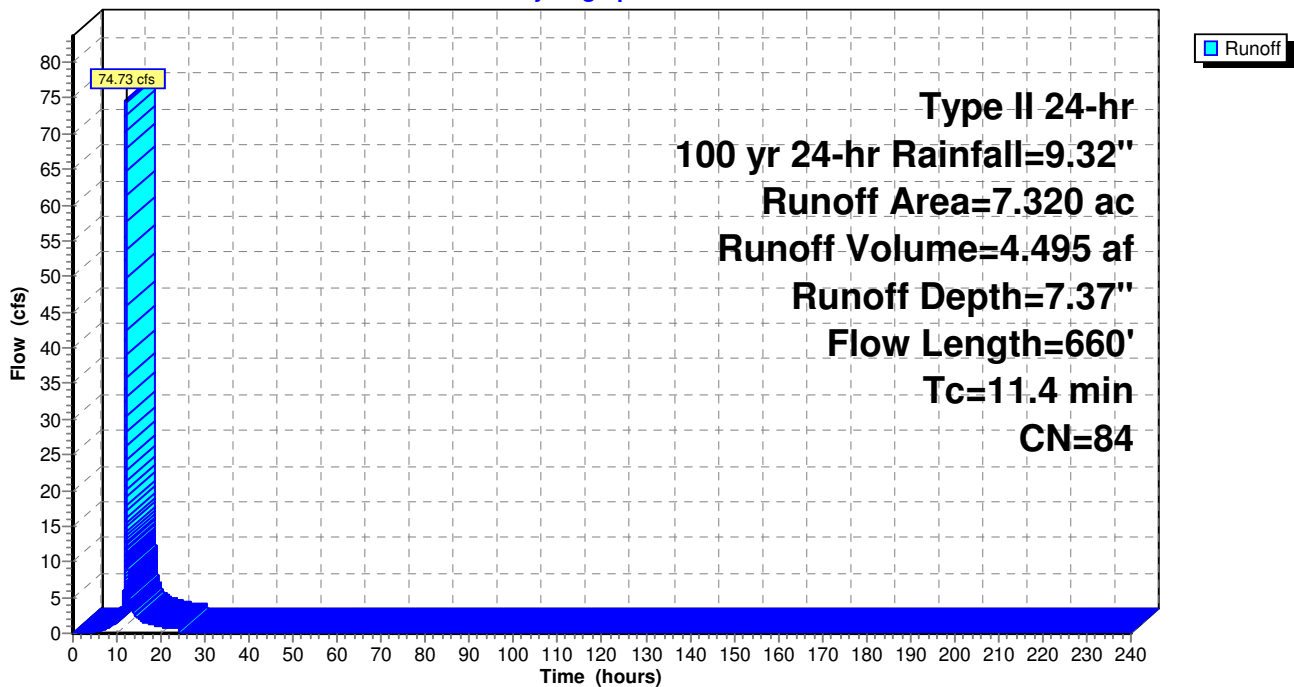
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
7.320	84	50-75% Grass cover, Fair, HSG D
7.320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0280	0.19		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.10"
1.1	160	0.0280	2.51		Shallow Concentrated Flow, Shallow Concentrated Grassed Waterway Kv= 15.0 fps
1.6	400	0.0050	4.20	731.20	Trap/Vee/Rect Channel Flow, Channel Bot.W=0.00' D=2.00' Z= 50.0 & 37.0 '/' Top.W=174.00' n= 0.025 Earth, grassed & winding
11.4	660	Total			

Subcatchment 26S: Pond 1 DA-Left

Hydrograph



Summary for Subcatchment 28S: Pond 3 DA

Runoff = 193.78 cfs @ 11.92 hrs, Volume= 9.293 af, Depth= 8.47"

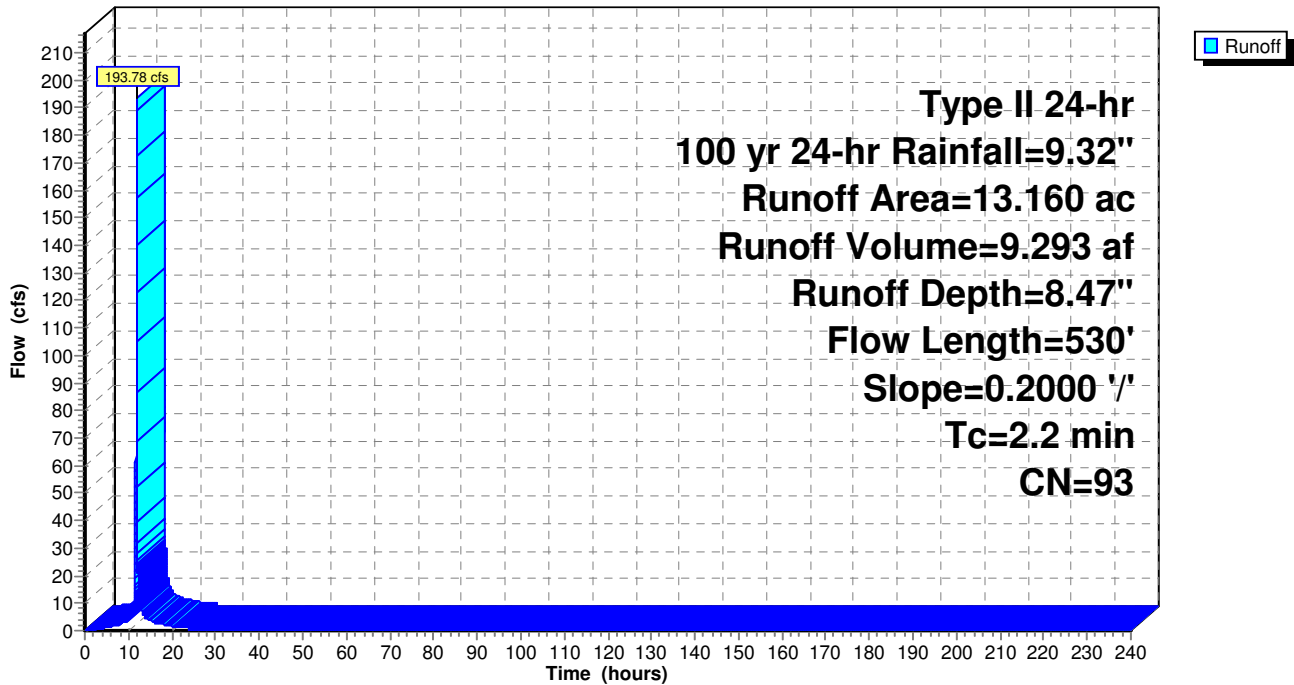
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
8.530	98	Water Surface, 0% imp, HSG C
4.630	84	50-75% Grass cover, Fair, HSG D
13.160	93	Weighted Average
13.160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	500		12.69		Lake or Reservoir, Mean Depth= 5.00'
1.5	30	0.2000	0.33		Sheet Flow, Side Slope of Pond Grass: Short n= 0.150 P2= 3.10"
2.2	530	Total			

Subcatchment 28S: Pond 3 DA

Hydrograph



Summary for Subcatchment 29S: East Primary DA

Runoff = 459.00 cfs @ 11.94 hrs, Volume= 24.046 af, Depth= 9.08"

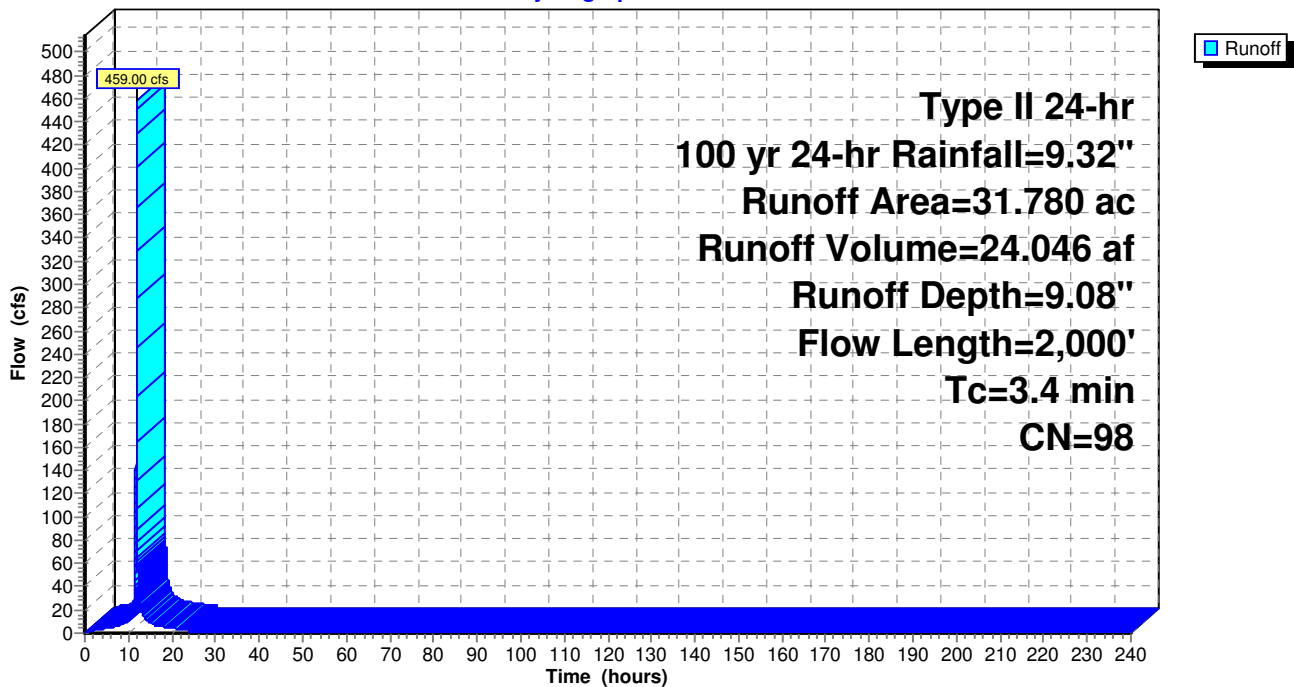
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
31.780	98	Water Surface, HSG C
31.780		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	2,000		9.83		Lake or Reservoir, Mean Depth= 3.00'

Subcatchment 29S: East Primary DA

Hydrograph



Summary for Subcatchment 30S: East Secondary DA

Runoff = 50.05 cfs @ 11.90 hrs, Volume= 2.404 af, Depth= 9.08"

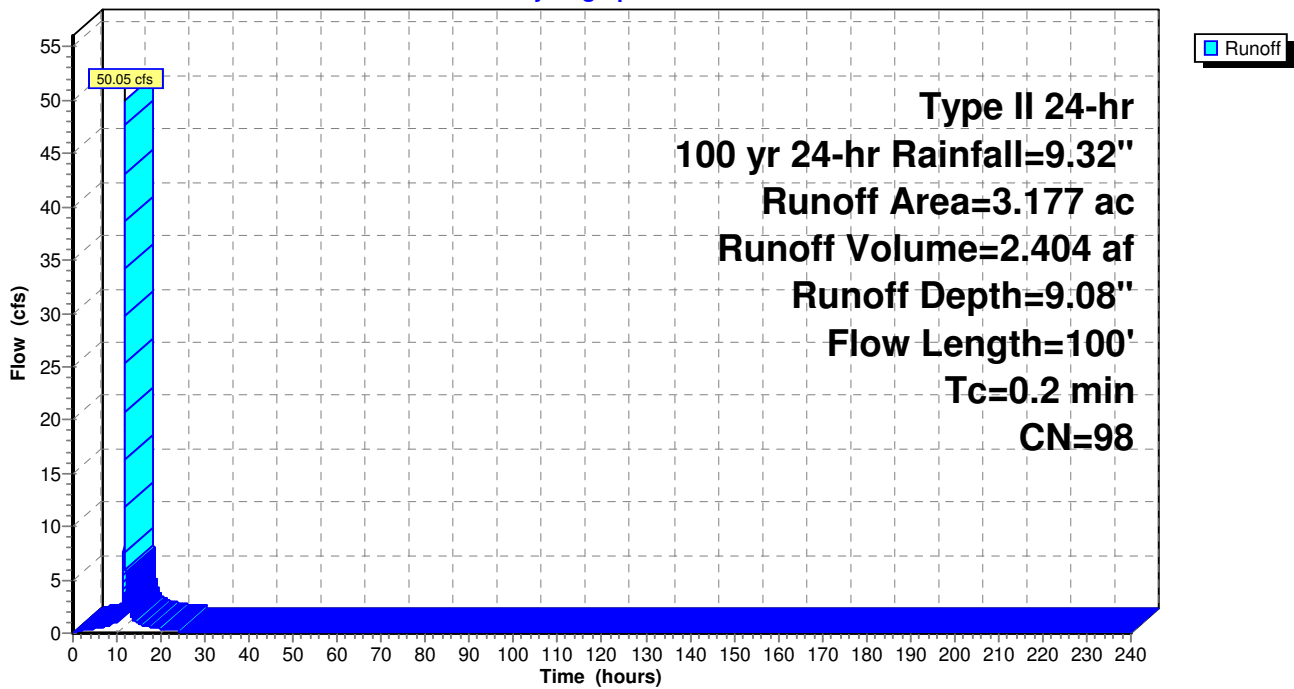
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
3.177	98	Water Surface, HSG C
3.177		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	100		8.02		Lake or Reservoir, Mean Depth= 2.00'

Subcatchment 30S: East Secondary DA

Hydrograph



Pr West Pond Closure Wood River Station_Buttre Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Prepared by AECOM

Printed 7/8/2016

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Summary for Subcatchment 31S: Area northeast 1

Runoff = 159.96 cfs @ 12.15 hrs, Volume= 13.747 af, Depth= 7.62"

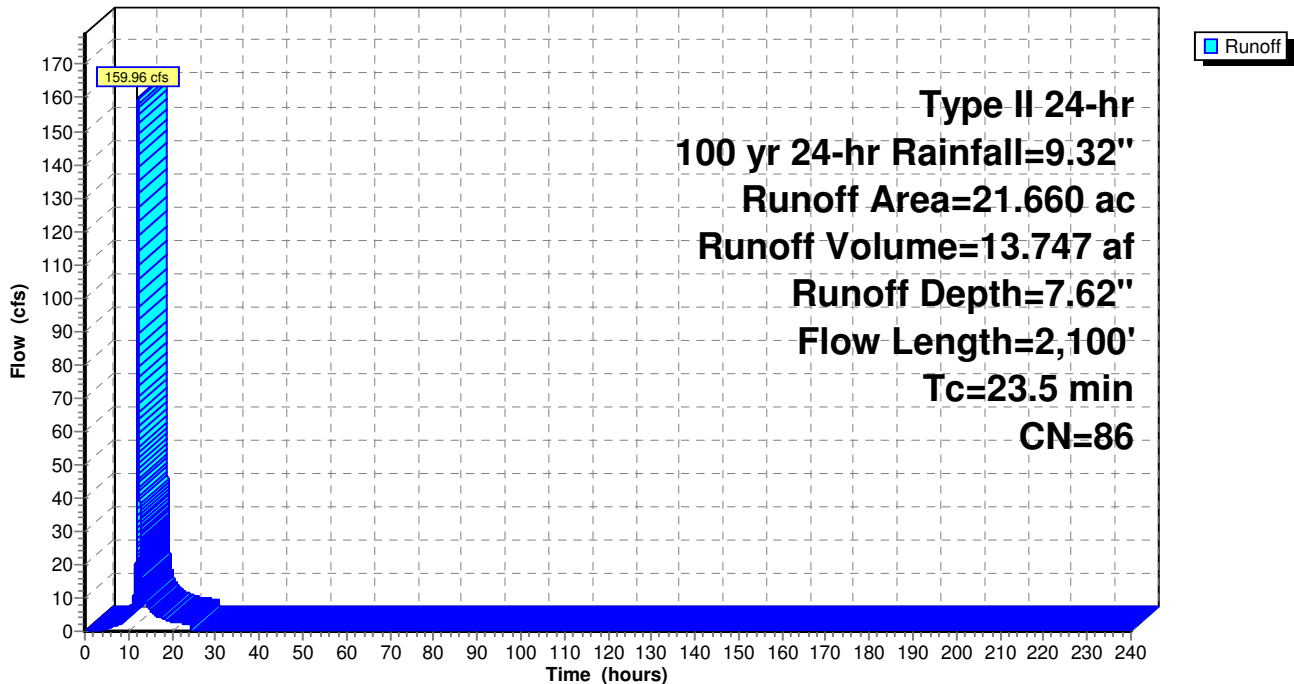
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
21.660	86	<50% Grass cover, Poor, HSG C
21.660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	100	0.0580	0.26		Sheet Flow, sf Grass: Short n= 0.150 P2= 3.10"
17.0	2,000	0.0100	1.97	24.57	Channel Flow, Area= 12.5 sf Perim= 50.0' r= 0.25' n= 0.030 Short grass
23.5	2,100	Total			

Subcatchment 31S: Area northeast 1

Hydrograph



Summary for Subcatchment 32S: Area southeast 2

Runoff = 98.33 cfs @ 12.21 hrs, Volume= 9.488 af, Depth= 7.62"

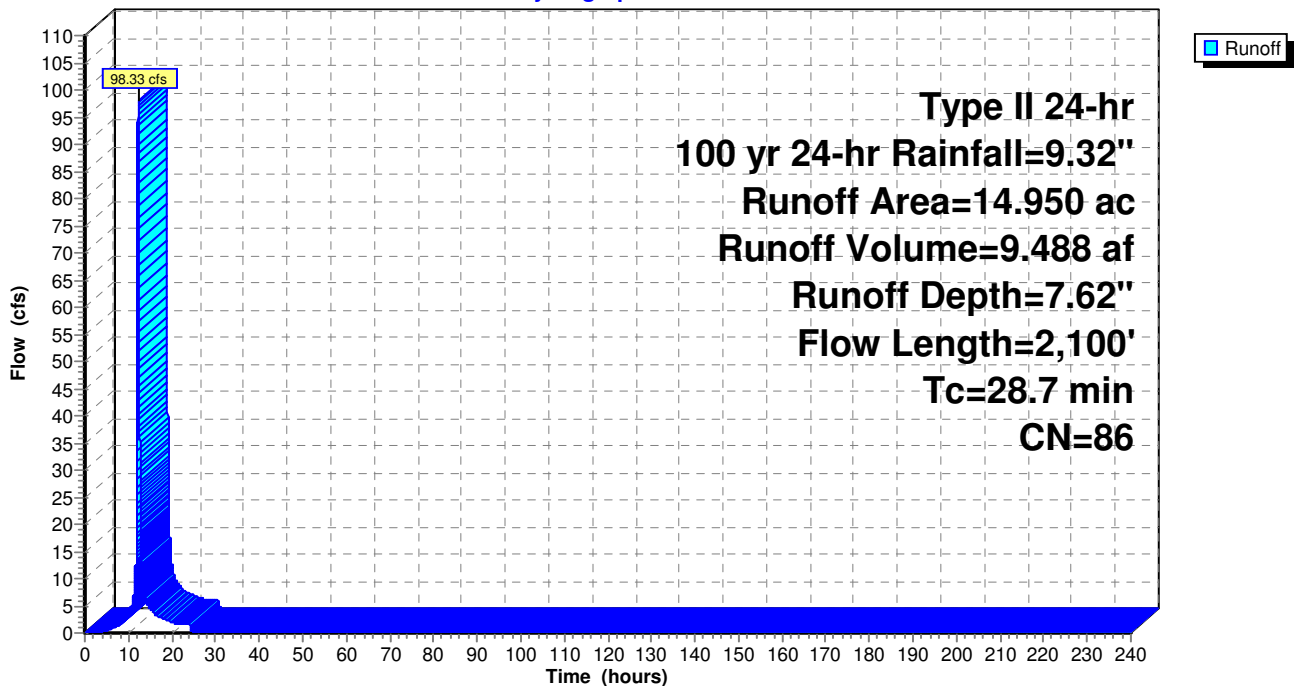
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
14.950	86	<50% Grass cover, Poor, HSG C
14.950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	100	0.0580	0.26		Sheet Flow, sf
					Grass: Short n= 0.150 P2= 3.10"
22.2	2,000	0.0100	1.50		Shallow Concentrated Flow, scf
					Grassed Waterway Kv= 15.0 fps
28.7	2,100	Total			

Subcatchment 32S: Area southeast 2

Hydrograph



Summary for Subcatchment 33S: Area northeast 2

Runoff = 619.72 cfs @ 12.02 hrs, Volume= 38.441 af, Depth= 7.99"

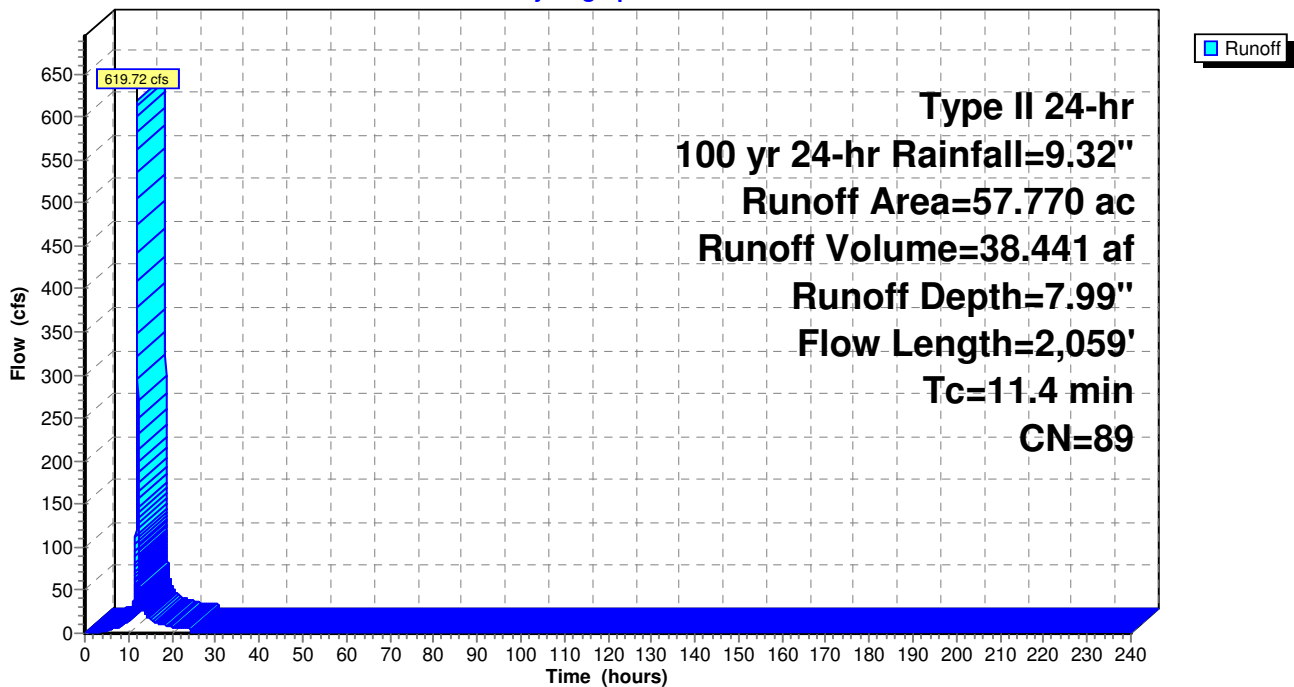
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
57.770	89	<50% Grass cover, Poor, HSG D
57.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0674	0.27		Sheet Flow, sf Grass: Short n= 0.150 P2= 3.10"
0.8	191	0.0674	3.89		Shallow Concentrated Flow, scf Grassed Waterway Kv= 15.0 fps
4.5	1,768	0.0034	6.61	1,074.68	Channel Flow, channel Area= 162.5 sf Perim= 46.9' r= 3.46' n= 0.030 Earth, grassed & winding
11.4	2,059	Total			

Subcatchment 33S: Area northeast 2

Hydrograph



Summary for Subcatchment 34S: Pond 1 DA-Middle

Runoff = 72.64 cfs @ 12.05 hrs, Volume= 4.704 af, Depth= 7.37"

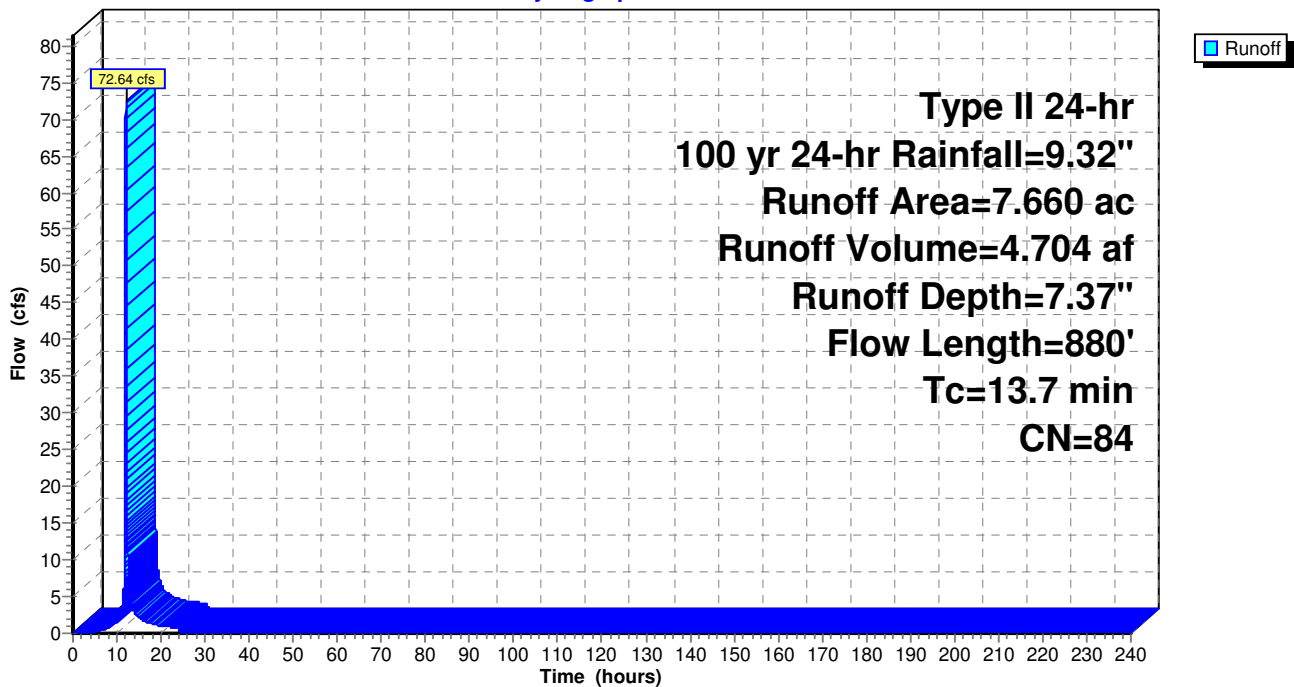
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
7.660	84	50-75% Grass cover, Fair, HSG D
7.660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.0205	0.17		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.10"
1.4	180	0.0205	2.15		Shallow Concentrated Flow, Shallow Concentrated Grassed Waterway Kv= 15.0 fps
2.4	600	0.0050	4.20	840.50	Trap/Vee/Rect Channel Flow, Channel Bot.W=0.00' D=2.00' Z= 50.0 '/' Top.W=200.00' n= 0.025 Earth, grassed & winding
13.7	880	Total			

Subcatchment 34S: Pond 1 DA-Middle

Hydrograph



Summary for Subcatchment 35S: Area northwest 3

Runoff = 735.03 cfs @ 12.13 hrs, Volume= 60.453 af, Depth= 7.99"

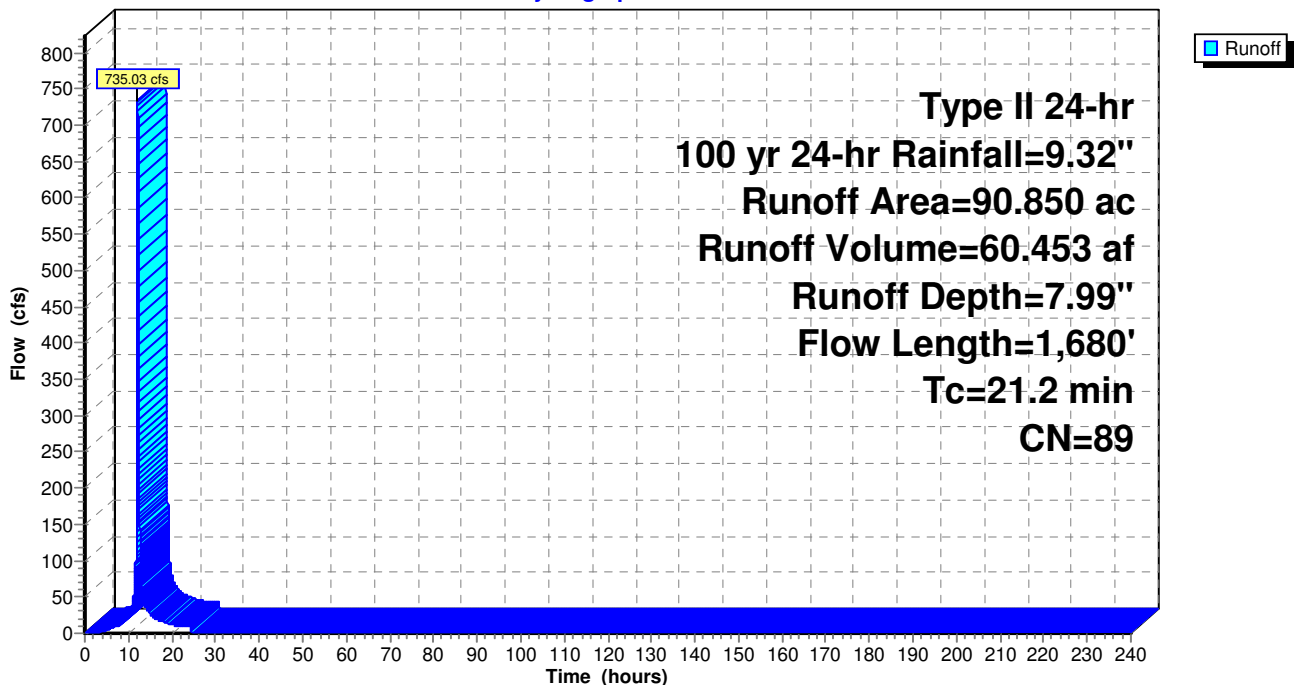
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
90.850	89	<50% Grass cover, Poor, HSG D
90.850		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		Sheet Flow, sf Grass: Short n= 0.150 P2= 3.10"
7.2	648	0.0100	1.50		Shallow Concentrated Flow, scf Grassed Waterway Kv= 15.0 fps
0.9	932	0.0300	16.80	1,679.82	Channel Flow, cf Area= 100.0 sf Perim= 36.5' r= 2.74' n= 0.030 Earth, grassed & winding
21.2	1,680	Total			

Subcatchment 35S: Area northwest 3

Hydrograph



Summary for Subcatchment 36S: Pond 1 DA-Right

Runoff = 56.24 cfs @ 12.04 hrs, Volume= 3.519 af, Depth= 7.37"

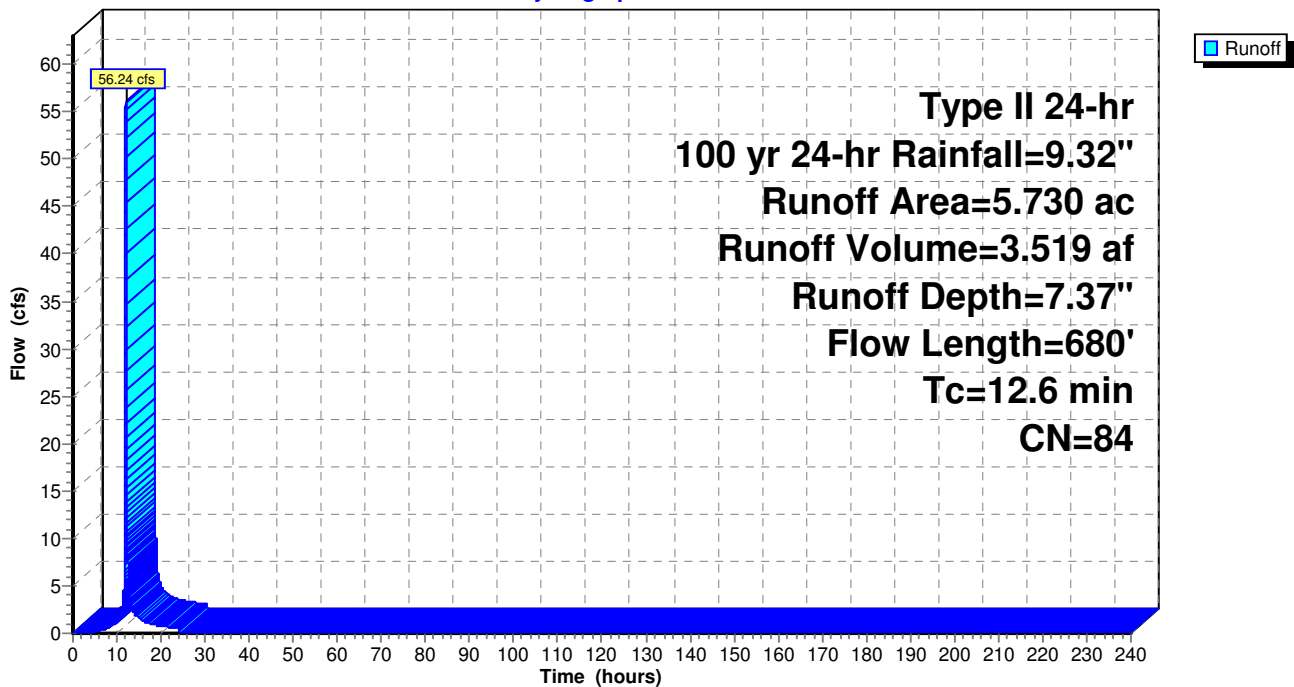
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
5.730	84	50-75% Grass cover, Fair, HSG D
5.730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0206	0.17		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.10"
1.0	130	0.0206	2.15		Shallow Concentrated Flow, Shallow Concentrated Grassed Waterway Kv= 15.0 fps
1.8	450	0.0050	4.20	840.50	Trap/Vee/Rect Channel Flow, Channel Bot.W=0.00' D=2.00' Z= 50.0 '/' Top.W=200.00' n= 0.025 Earth, grassed & winding
12.6	680	Total			

Subcatchment 36S: Pond 1 DA-Right

Hydrograph



Summary for Subcatchment 37S: Area northwest 2

Runoff = 199.56 cfs @ 12.08 hrs, Volume= 14.686 af, Depth= 7.99"

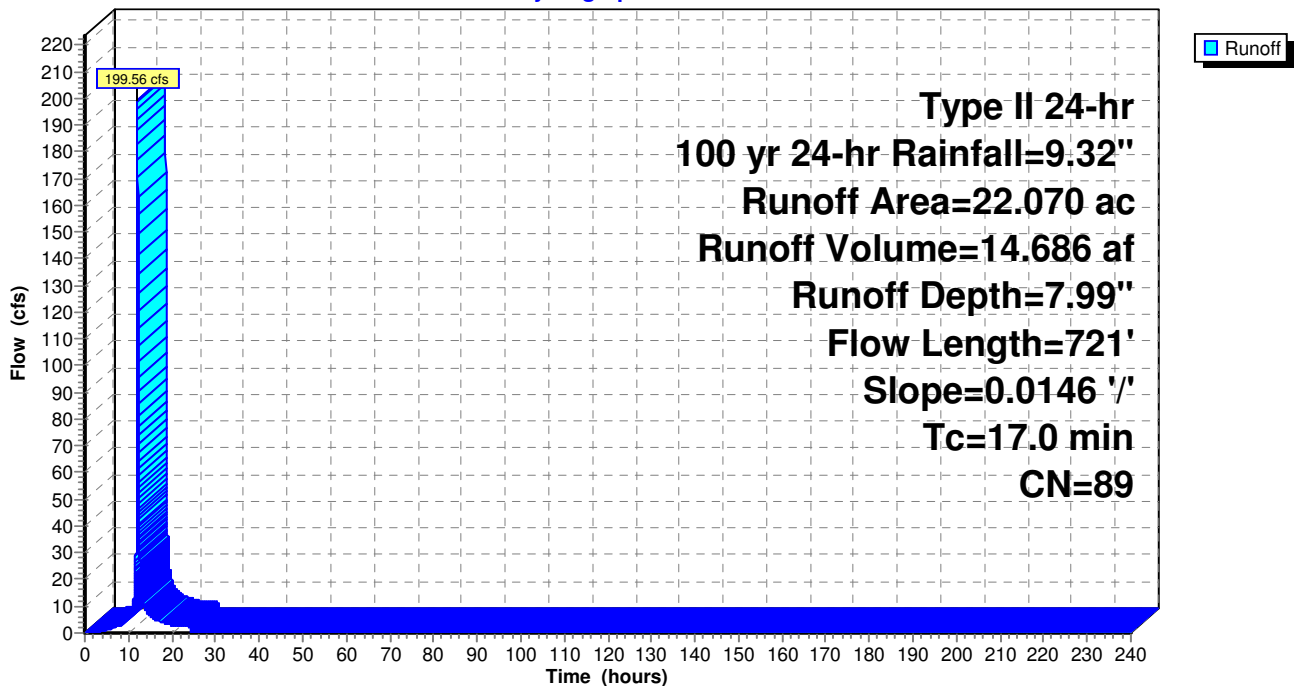
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
22.070	89	<50% Grass cover, Poor, HSG D
22.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0146	0.15		Sheet Flow, sf
					Grass: Short n= 0.150 P2= 3.10"
5.7	621	0.0146	1.81		Shallow Concentrated Flow, scf
					Grassed Waterway Kv= 15.0 fps
17.0	721	Total			

Subcatchment 37S: Area northwest 2

Hydrograph



Summary for Subcatchment 38S: Area northeast 3

Runoff = 6,307.86 cfs @ 12.19 hrs, Volume= 586.681 af, Depth= 7.99"

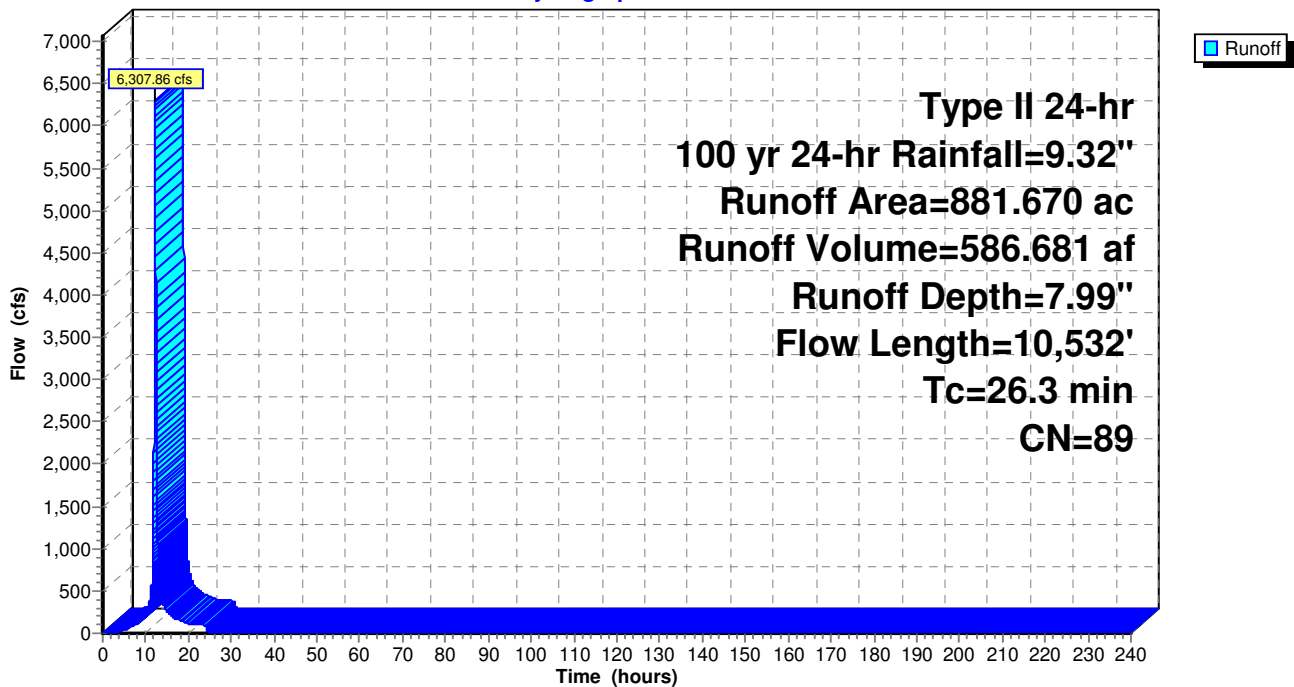
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 yr 24-hr Rainfall=9.32"

Area (ac)	CN	Description
881.670	89	<50% Grass cover, Poor, HSG D
881.670		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0674	0.27		Sheet Flow, sf Grass: Short n= 0.150 P2= 3.10"
0.8	191	0.0674	3.89		Shallow Concentrated Flow, scf Grassed Waterway Kv= 15.0 fps
19.4	10,241	0.0060	8.79	1,427.62	Channel Flow, channel Area= 162.5 sf Perim= 46.9' r= 3.46' n= 0.030 Earth, grassed & winding
26.3	10,532	Total			

Subcatchment 38S: Area northeast 3

Hydrograph



Summary for Reach 16R: Emergency Spillway Shallow Slope

Inflow = 79.06 cfs @ 13.28 hrs, Volume= 221.595 af
Outflow = 79.06 cfs @ 13.28 hrs, Volume= 221.595 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 4.70 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.29 fps, Avg. Travel Time= 0.1 min

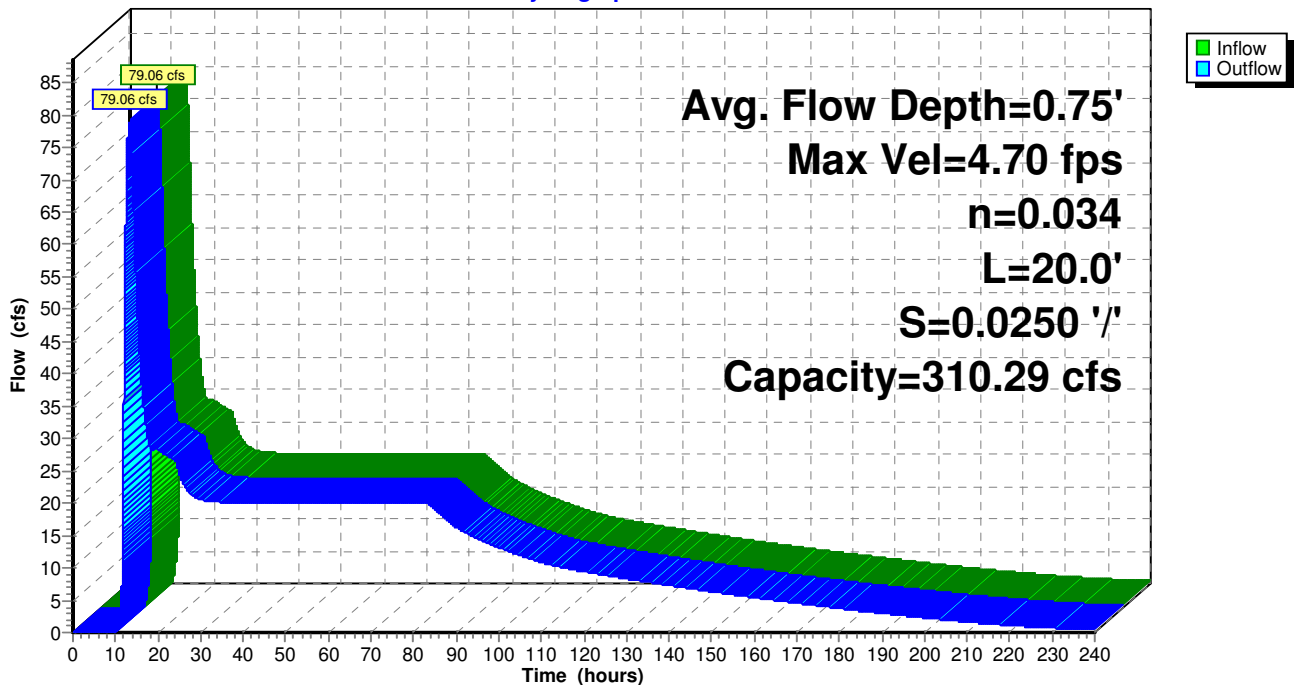
Peak Storage= 337 cf @ 13.28 hrs
Average Depth at Peak Storage= 0.75'
Bank-Full Depth= 1.50' Flow Area= 45.0 sf, Capacity= 310.29 cfs

15.00' x 1.50' deep channel, n= 0.034
Side Slope Z-value= 10.0 '/' Top Width= 45.00'
Length= 20.0' Slope= 0.0250 '/'
Inlet Invert= 428.50', Outlet Invert= 428.00'



Reach 16R: Emergency Spillway Shallow Slope

Hydrograph



Summary for Reach 17R: Emergency Spillway Steep Slope

Inflow = 79.06 cfs @ 13.28 hrs, Volume= 221.595 af
 Outflow = 79.06 cfs @ 13.28 hrs, Volume= 221.595 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Max. Velocity= 9.79 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 4.57 fps, Avg. Travel Time= 0.1 min

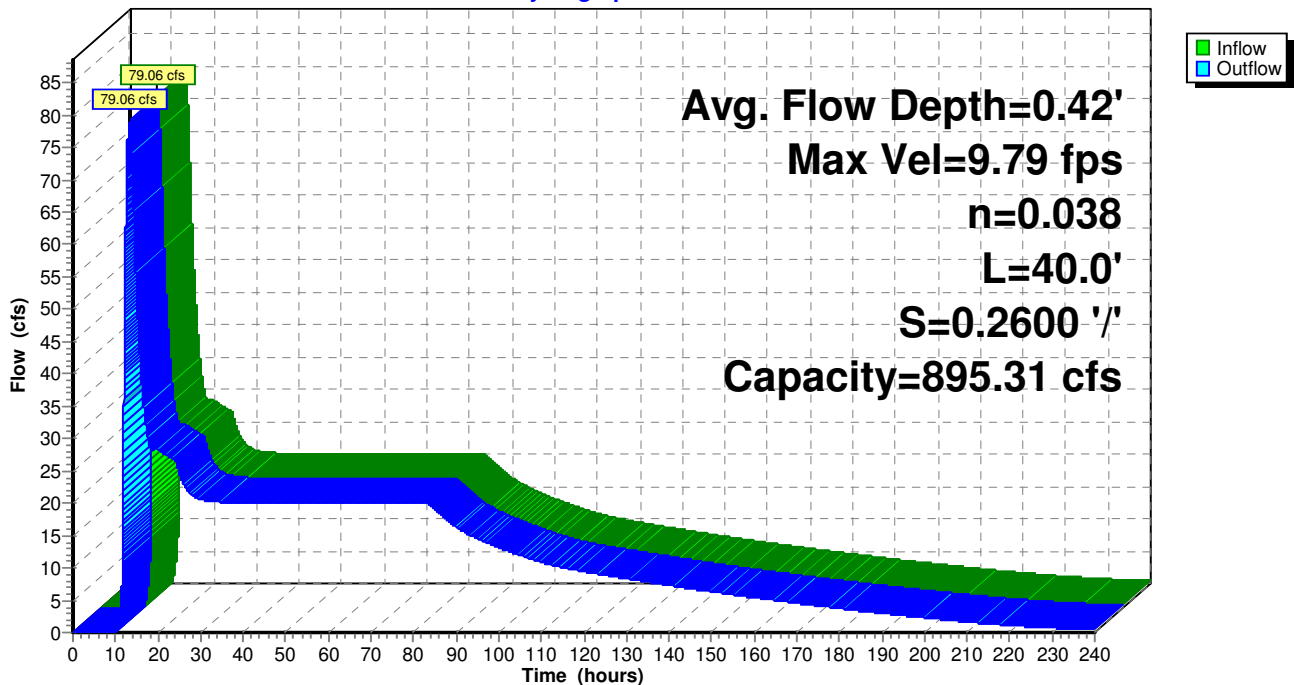
Peak Storage= 323 cf @ 13.28 hrs
 Average Depth at Peak Storage= 0.42'
 Bank-Full Depth= 1.50' Flow Area= 45.0 sf, Capacity= 895.31 cfs

15.00' x 1.50' deep channel, n= 0.038
 Side Slope Z-value= 10.0 '/' Top Width= 45.00'
 Length= 40.0' Slope= 0.2600 '/'
 Inlet Invert= 428.40', Outlet Invert= 418.00'



Reach 17R: Emergency Spillway Steep Slope

Hydrograph



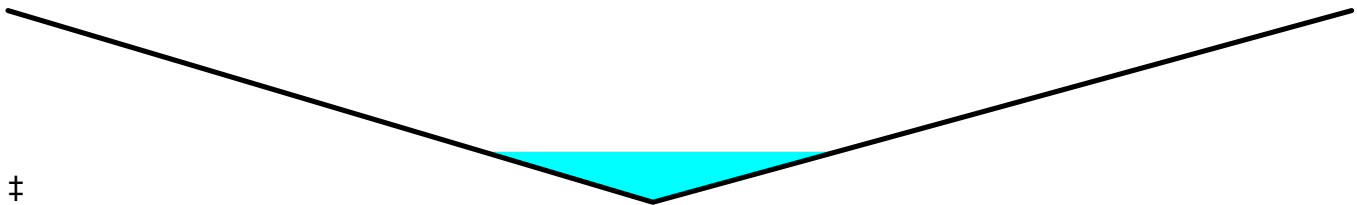
Summary for Reach 19R: V Ditch to South Pond 2 Outlet

Inflow Area = 14.990 ac, 0.00% Impervious, Inflow Depth = 7.37" for 100 yr 24-hr event
 Inflow = 151.56 cfs @ 12.03 hrs, Volume= 9.205 af
 Outflow = 139.41 cfs @ 12.07 hrs, Volume= 9.205 af, Atten= 8%, Lag= 2.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Max. Velocity= 3.24 fps, Min. Travel Time= 4.0 min
 Avg. Velocity = 1.05 fps, Avg. Travel Time= 12.4 min

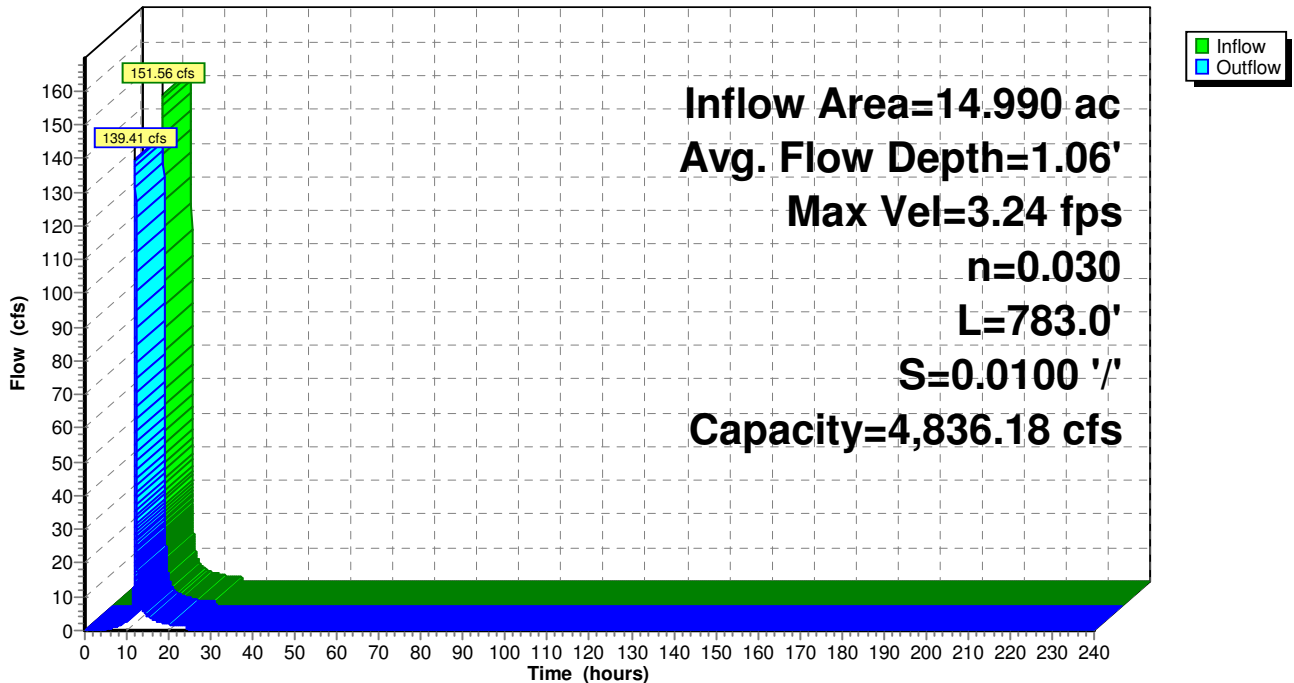
Peak Storage= 33,692 cf @ 12.07 hrs
 Average Depth at Peak Storage= 1.06'
 Defined Flood Depth= 2.00' Flow Area= 153.8 sf, Capacity= 761.65 cfs
 Bank-Full Depth= 4.00' Flow Area= 615.2 sf, Capacity= 4,836.18 cfs

0.00' x 4.00' deep channel, n= 0.030 Short grass
 Side Slope Z-value= 36.9 40.0 '/' Top Width= 307.60'
 Length= 783.0' Slope= 0.0100 '/'
 Inlet Invert= 436.00', Outlet Invert= 428.17'



Reach 19R: V Ditch to South Pond 2 Outlet

Hydrograph



Summary for Pond 1P: Pond 1-Proposed Left

Inflow Area = 7.320 ac, 0.00% Impervious, Inflow Depth = 10.97" for 100 yr 24-hr event
 Inflow = 131.47 cfs @ 12.12 hrs, Volume= 6.693 af
 Outflow = 89.40 cfs @ 12.23 hrs, Volume= 6.675 af, Atten= 32%, Lag= 6.9 min
 Primary = 18.77 cfs @ 12.21 hrs, Volume= 4.779 af
 Secondary = 70.66 cfs @ 12.23 hrs, Volume= 1.896 af
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 431.24' @ 12.23 hrs Surf.Area= 0.000 ac Storage= 1.988 af

Plug-Flow detention time= 65.2 min calculated for 6.675 af (100% of inflow)
 Center-of-Mass det. time= 63.5 min (835.2 - 771.8)

Volume	Invert	Avail.Storage	Storage Description
#1	428.00'	6.531 af	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (acre-feet)
428.00	0.000
429.00	0.032
430.00	0.388
431.00	1.485
432.00	3.561
433.00	6.531

Device	Routing	Invert	Outlet Devices
#1	Primary	428.30'	24.0" Round Culvert L= 170.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 428.30' / 425.30' S= 0.0176 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	430.50'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 Width (feet) 10.00 90.00 190.00
#3	Tertiary	432.99'	500.0' long x 15.0' 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

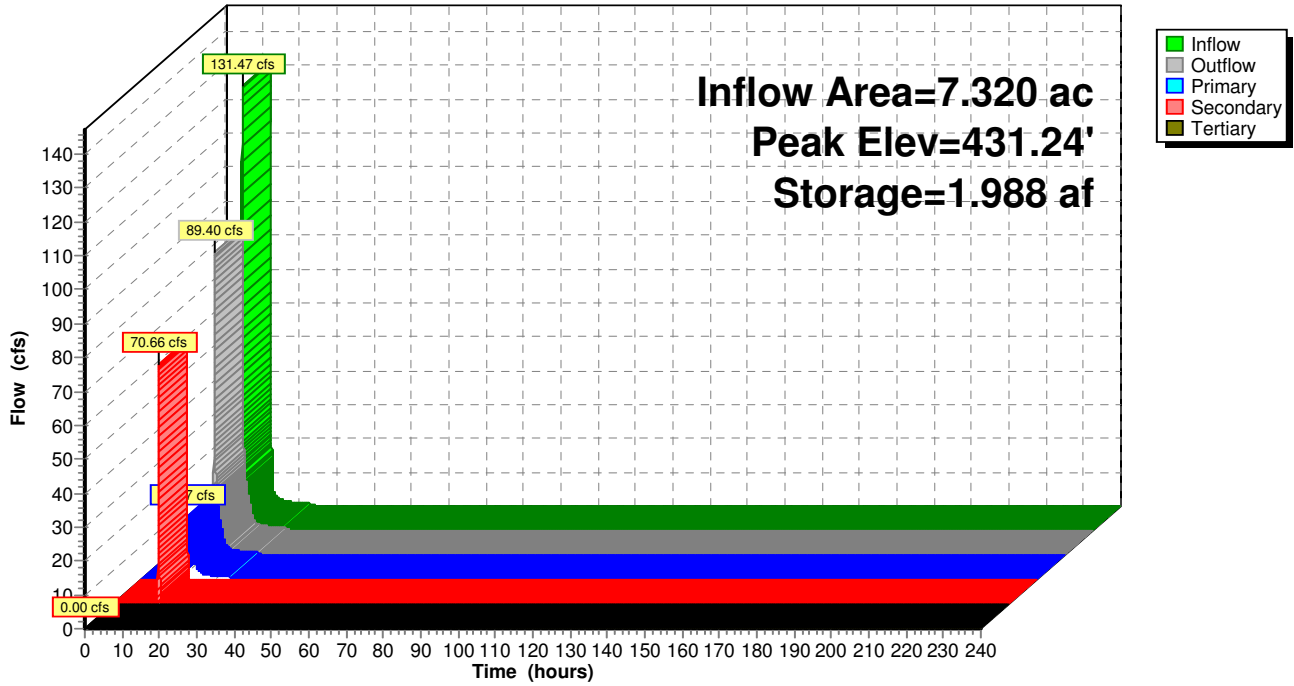
Primary OutFlow Max=18.77 cfs @ 12.21 hrs HW=431.24' TW=429.40' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 18.77 cfs @ 5.97 fps)

Secondary OutFlow Max=70.65 cfs @ 12.23 hrs HW=431.24' TW=430.56' (Dynamic Tailwater)
 ↑2=Custom Weir/Orifice (Weir Controls 70.65 cfs @ 2.40 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=428.00' TW=428.40' (Dynamic Tailwater)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: Pond 1-Proposed Left

Hydrograph



Summary for Pond 2P: Pond 2 South

Outfall information from 1998 plans E-WDR1-C131 X.
Assumed HDPE be DR 17.

Inflow Area =	14.990 ac,	0.00% Impervious,	Inflow Depth = 7.37"	for 100 yr 24-hr event
Inflow =	139.41 cfs @	12.07 hrs,	Volume=	9.205 af
Outflow =	110.74 cfs @	12.15 hrs,	Volume=	9.216 af, Atten= 21%, Lag= 4.8 min
Primary =	24.22 cfs @	12.14 hrs,	Volume=	7.019 af
Secondary =	86.53 cfs @	12.15 hrs,	Volume=	2.197 af
Tertiary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 428.91' Surf.Area= 0.000 ac Storage= 0.020 af
Peak Elev= 431.93' @ 12.15 hrs Surf.Area= 0.000 ac Storage= 1.674 af (1.654 af above start)
Flood Elev= 431.00' Surf.Area= 0.000 ac Storage= 0.731 af (0.711 af above start)

Plug-Flow detention time= 27.2 min calculated for 9.196 af (100% of inflow)
Center-of-Mass det. time= 25.4 min (822.7 - 797.3)

Volume	Invert	Avail.Storage	Storage Description
#1	428.00'	3.360 af	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (acre-feet)
428.00	0.000
429.00	0.022
430.00	0.208
431.00	0.731
432.00	1.742
433.00	3.360

Device	Routing	Invert	Outlet Devices
#1	Primary	427.30'	24.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 427.30' / 425.30' S= 0.0400 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	431.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 2.00 4.00 Width (feet) 10.00 114.50 310.00
#3	Tertiary	432.99'	350.0' long x 15.0' 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

Primary OutFlow Max=24.22 cfs @ 12.14 hrs HW=431.93' TW=429.37' (Dynamic Tailwater)

↑1=Culvert (Inlet Controls 24.22 cfs @ 7.71 fps)

Secondary OutFlow Max=86.49 cfs @ 12.15 hrs HW=431.93' TW=431.17' (Dynamic Tailwater)

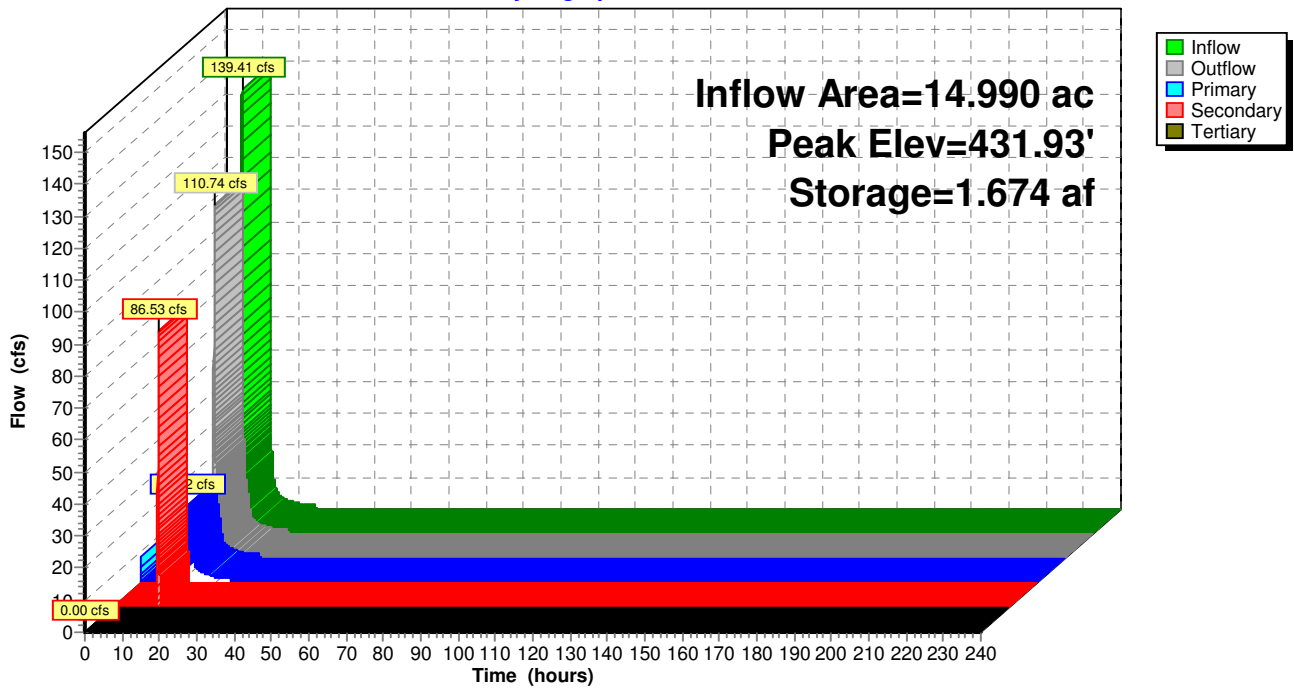
↑2=Custom Weir/Orifice (Weir Controls 86.49 cfs @ 2.70 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=428.91' TW=428.40' (Dynamic Tailwater)

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

Pond 2P: Pond 2 South

Hydrograph



Summary for Pond 3P: Pond 2 North

Inflow Area = 10.070 ac, 0.00% Impervious, Inflow Depth = 7.37" for 100 yr 24-hr event
 Inflow = 102.80 cfs @ 12.02 hrs, Volume= 6.184 af
 Outflow = 24.51 cfs @ 12.20 hrs, Volume= 6.171 af, Atten= 76%, Lag= 10.6 min
 Primary = 24.51 cfs @ 12.20 hrs, Volume= 6.171 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 432.04' @ 12.26 hrs Surf.Area= 0.000 ac Storage= 1.827 af
 Flood Elev= 431.00' Surf.Area= 0.000 ac Storage= 0.731 af

Plug-Flow detention time= 47.0 min calculated for 6.171 af (100% of inflow)
 Center-of-Mass det. time= 45.7 min (835.4 - 789.7)

Volume	Invert	Avail.Storage	Storage Description
#1	428.00'	4.000 af	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (acre-feet)
428.00	0.000
429.00	0.023
430.00	0.210
431.00	0.731
432.00	1.756
433.00	3.434
434.00	4.000

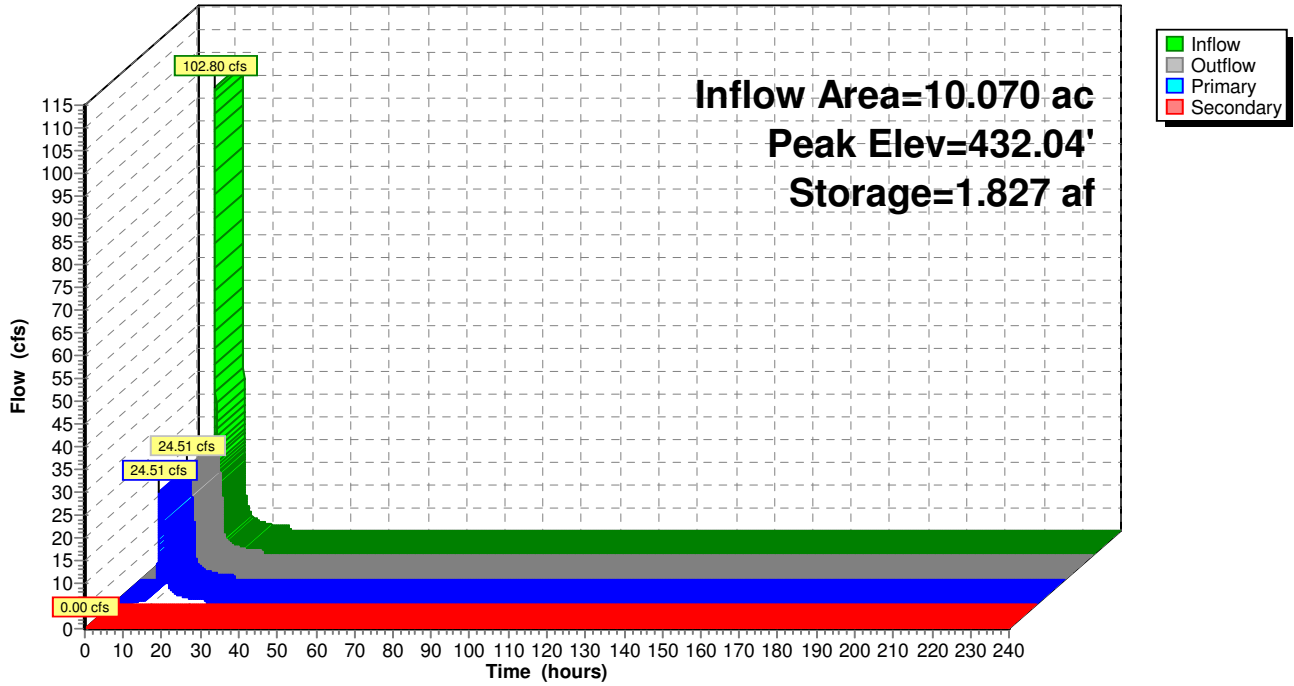
Device	Routing	Invert	Outlet Devices
#1	Primary	427.30'	24.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 427.30' / 425.30' S= 0.0400 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	432.99'	350.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (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

Primary OutFlow Max=24.51 cfs @ 12.20 hrs HW=432.03' TW=429.40' (Dynamic Tailwater)
 ↑1=Culvert (Inlet Controls 24.51 cfs @ 7.80 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=428.00' TW=428.40' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Pond 2 North

Hydrograph



Summary for Pond 4P: Proposed Pond 3 with Auxiliary Spillway

Outfall information from 1997 As-Built plans E-WDR1-C101, EWDR1 C-109.

Inflow Area = 58.930 ac, 0.00% Impervious, Inflow Depth > 88.80" for 100 yr 24-hr event
 Inflow = 276.89 cfs @ 11.93 hrs, Volume= 436.077 af, Incl. 20.11 cfs Base Flow
 Outflow = 97.30 cfs @ 13.25 hrs, Volume= 434.658 af, Atten= 65%, Lag= 79.6 min
 Primary = 25.60 cfs @ 0.01 hrs, Volume= 213.063 af
 Secondary = 79.06 cfs @ 13.28 hrs, Volume= 221.595 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 428.40' Surf.Area= 0.000 ac Storage= 30.218 af
 Peak Elev= 429.64' @ 13.28 hrs Surf.Area= 0.000 ac Storage= 42.390 af (12.172 af above start)

Plug-Flow detention time= 1,142.5 min calculated for 404.429 af (93% of inflow)
 Center-of-Mass det. time= 110.0 min (6,770.3 - 6,660.3)

Volume	Invert	Avail.Storage	Storage Description
#1	425.00'	96.000 af	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (acre-feet)
425.00	0.000
426.00	8.514
427.00	17.331
428.00	26.438
429.00	35.887
430.00	45.977
435.00	96.000

Device	Routing	Invert	Outlet Devices
#1	Primary	419.74'	24.0" Round 24" Culvert L= 650.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 417.50' / 419.74' S= -0.0034 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	425.83'	90.0 deg x 3.2' long x 1.50' rise Sharp-Crested Vee/Trap Weir X 2.00 Cv= 2.50 (C= 3.13)
#3	Device 1	427.33'	46.0" x 46.0" Horiz. Orifice/Grate X 0.90 C= 0.600 Limited to weir flow at low heads
#4	Secondary	432.00'	1,200.0' long x 15.0' breadth Proposed Crest-Broad-Crested Rectangular Weir X 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
#5	Secondary	428.50'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.50 Width (feet) 15.00 45.00

Primary OutFlow Max=25.60 cfs @ 0.01 hrs HW=428.40' TW=415.29' (Dynamic Tailwater)

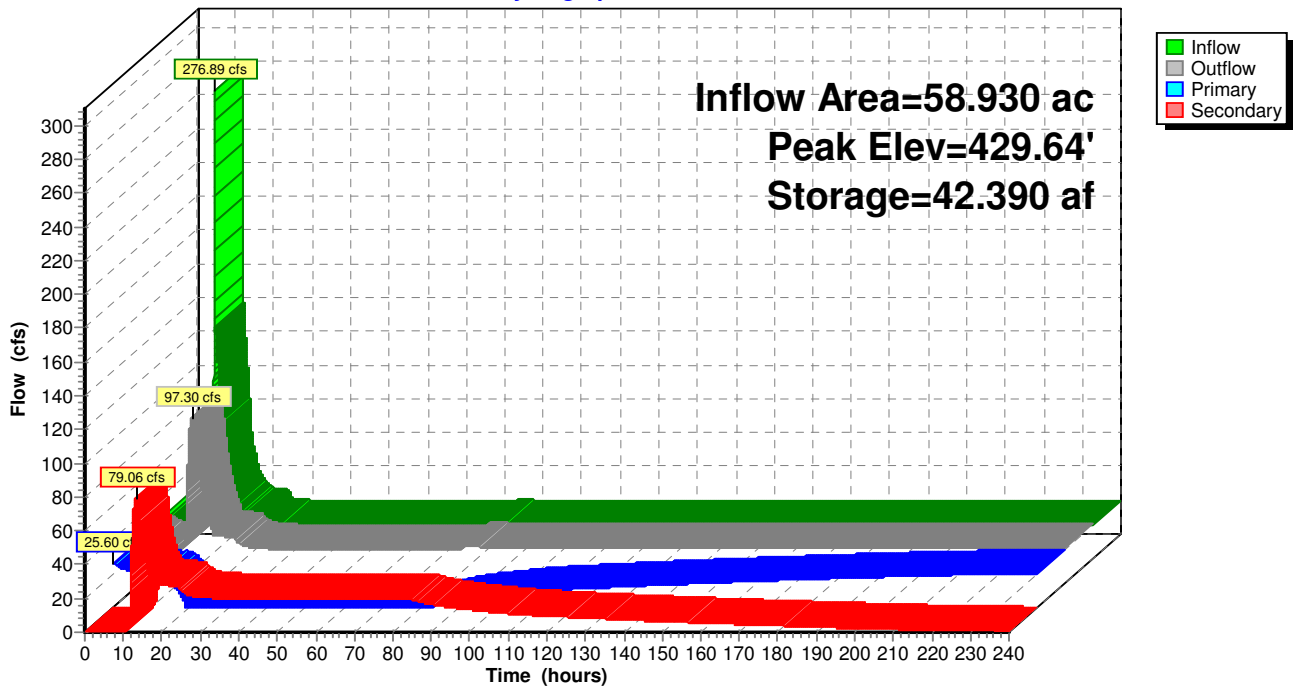
- 1=24" Culvert (Outlet Controls 25.60 cfs @ 8.15 fps)
- 2=Sharp-Crested Vee/Trap Weir (Passes < 86.57 cfs potential flow)
- 3=Orifice/Grate (Passes < 50.04 cfs potential flow)

Secondary OutFlow Max=79.06 cfs @ 13.28 hrs HW=429.64' TW=429.25' (Dynamic Tailwater)

- 4=Proposed Crest-Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 5=Custom Weir/Orifice (Weir Controls 79.06 cfs @ 2.61 fps)

Pond 4P: Proposed Pond 3 with Auxiliary Spillway

Hydrograph



Summary for Pond 10P: Wood River

Inflow Area = 939.440 ac, 0.00% Impervious, Inflow Depth = 0.00" for 100 yr 24-hr event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 407.00' Surf.Area= 31,600.000 ac Storage= 61,600.000 af
 Peak Elev= 407.00' @ 0.00 hrs Surf.Area= 31,600.000 ac Storage= 61,600.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	405.00'	1,000,000.000 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
405.00	30,000.000	0.000	0.000
430.00	50,000.000	1,000,000.000	1,000,000.000

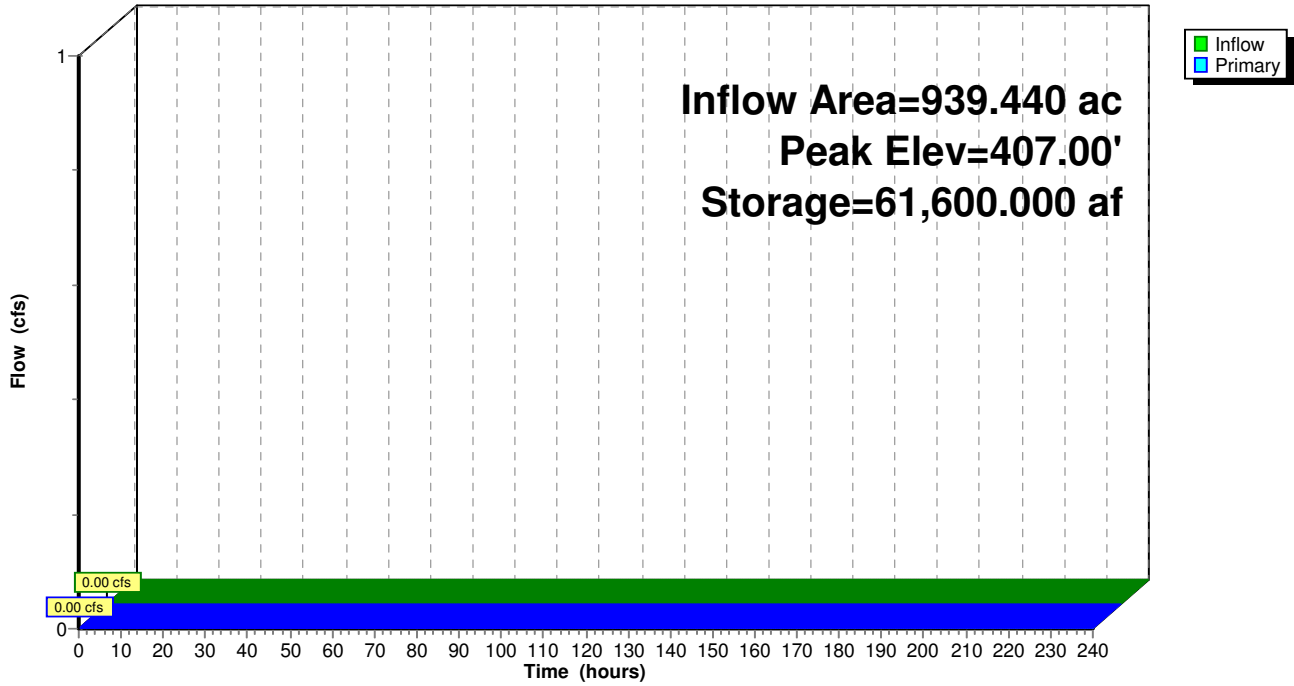
Device	Routing	Invert	Outlet Devices
#1	Primary	420.00'	300.0' long x 30.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=407.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 10P: Wood River

Hydrograph



Summary for Pond 11P: Pond northeast 1

48" outlet culvert information is from pipe survey done in 2015.
Assumed a CB located on 48" line at 224.5' measured from east.

Inflow Area = 56.617 ac, 61.74% Impervious, Inflow Depth >101.29" for 100 yr 24-hr event
Inflow = 280.04 cfs @ 12.15 hrs, Volume= 477.898 af
Outflow = 114.98 cfs @ 17.03 hrs, Volume= 472.836 af, Atten= 59%, Lag= 292.8 min
Primary = 68.66 cfs @ 14.63 hrs, Volume= 250.338 af
Secondary = 67.42 cfs @ 17.64 hrs, Volume= 222.499 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 416.50' Surf.Area= 0.379 ac Storage= 0.819 af
Peak Elev= 431.42' @ 39.19 hrs Surf.Area= 23.350 ac Storage= 112.686 af (111.867 af above start)

Plug-Flow detention time= 1,233.4 min calculated for 471.988 af (99% of inflow)
Center-of-Mass det. time= 1,107.7 min (4,489.2 - 3,381.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	413.00'	313.043 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
413.00	0.100	350.0	0.000	0.000	0.100	
416.00	0.350	1,766.0	0.637	0.637	5.574	
422.00	0.770	1,852.0	3.278	3.915	6.195	
430.00	23.350	10,827.0	75.627	79.543	214.082	
437.00	23.350	10,827.0	163.450	242.993	215.822	
440.00	23.350	10,827.0	70.050	313.043	216.568	

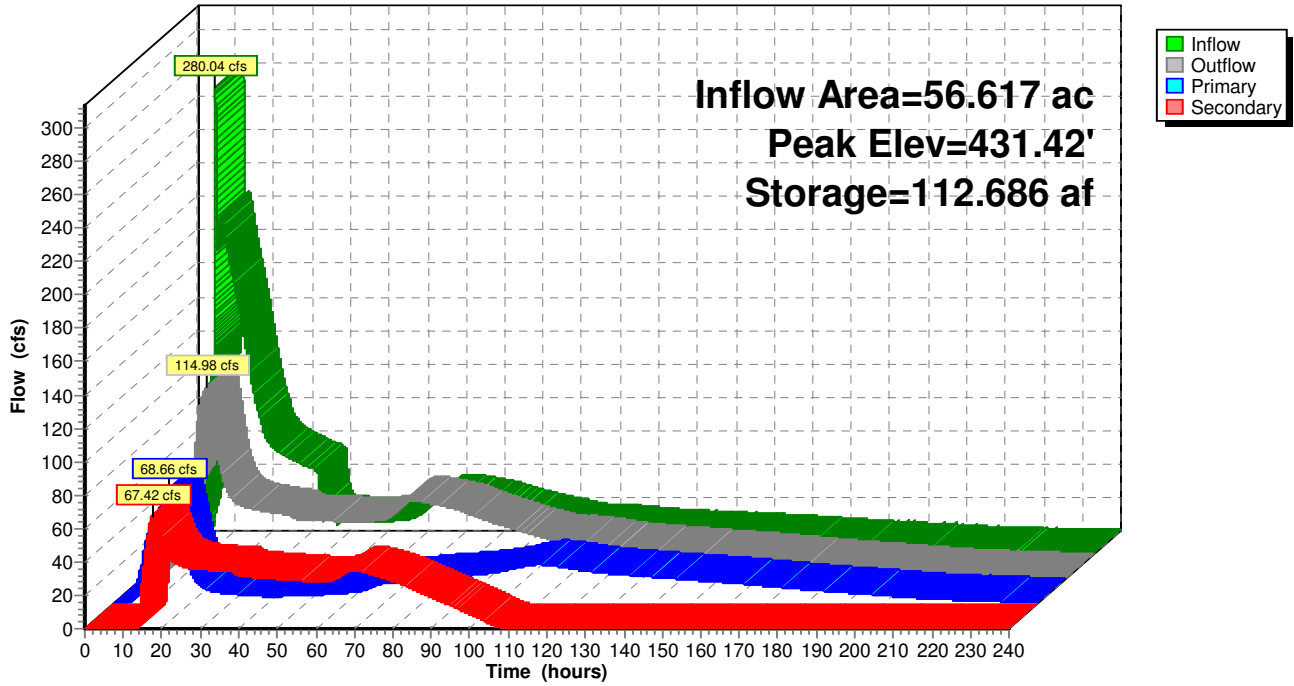
Device	Routing	Invert	Outlet Devices							
#1	Primary	418.12'	48.0" Round 48" Culvert L= 224.5' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 415.09' / 418.12' S= -0.0135 ' /' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 12.57 sf							
#2	Secondary	428.00'	15.0' long x 15.0' breadth 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							

Primary OutFlow Max=68.66 cfs @ 14.63 hrs HW=428.67' TW=426.07' (Dynamic Tailwater)
↑1=48" Culvert (Outlet Controls 68.66 cfs @ 5.46 fps)

Secondary OutFlow Max=67.43 cfs @ 17.64 hrs HW=429.50' TW=428.48' (Dynamic Tailwater)
↑2=Broad-Crested Rectangular Weir (Weir Controls 67.43 cfs @ 2.99 fps)

Pond 11P: Pond northeast 1

Hydrograph



Summary for Pond 12P: Pond southeast 1

36" outlet culvert information is from pipe survey done in 2015.

Inflow Area = 156.807 ac, 35.27% Impervious, Inflow Depth > 66.55" for 100 yr 24-hr event
 Inflow = 125.18 cfs @ 16.54 hrs, Volume= 869.635 af
 Outflow = 76.71 cfs @ 39.52 hrs, Volume= 860.561 af, Atten= 39%, Lag= 1,378.7 min
 Primary = 76.71 cfs @ 39.52 hrs, Volume= 860.561 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 431.40' @ 39.15 hrs Surf.Area= 5.956 ac Storage= 48.539 af

Plug-Flow detention time= 415.7 min calculated for 860.551 af (99% of inflow)
 Center-of-Mass det. time= 324.8 min (5,962.2 - 5,637.5)

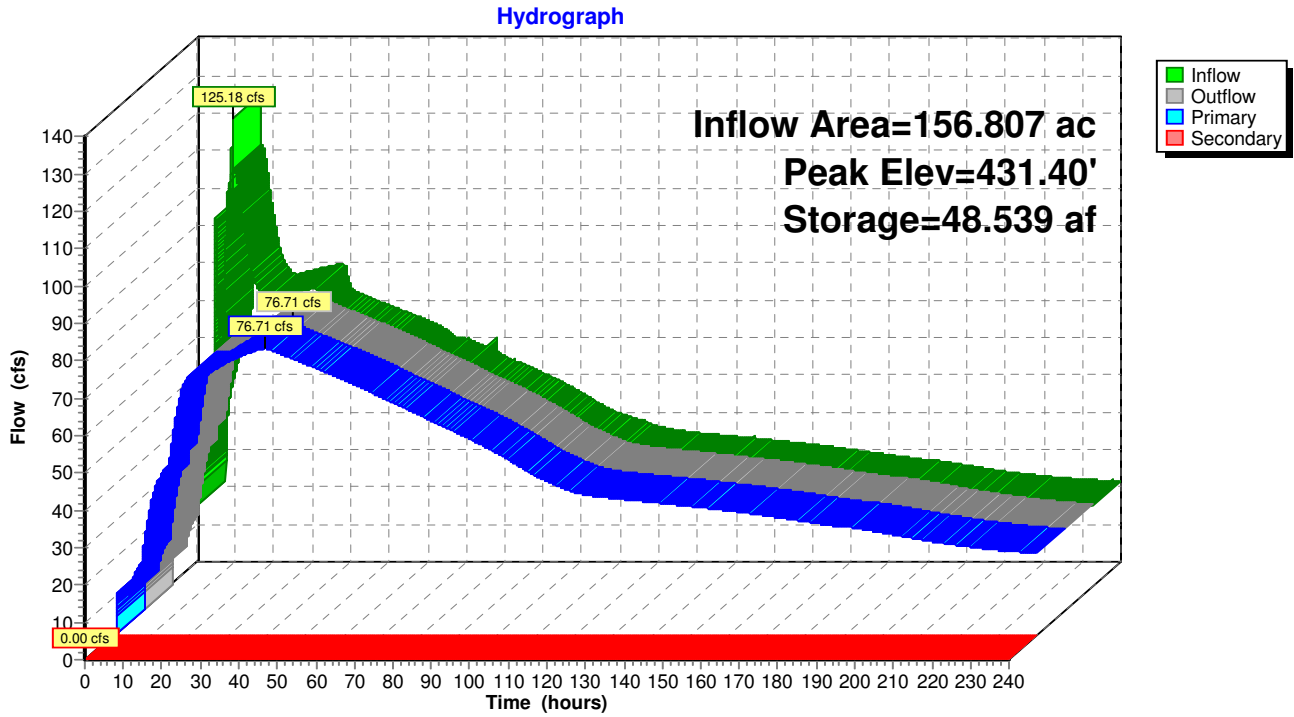
Volume	Invert	Avail.Storage	Storage Description			
#1	415.00'	99.749 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
415.00	0.100	350.0	0.000	0.000	0.100	
419.00	0.497	1,823.0	1.093	1.093	5.948	
423.00	3.370	2,327.0	6.882	7.975	9.774	
430.00	5.956	2,360.0	32.214	40.189	10.245	
440.00	5.956	2,360.0	59.560	99.749	10.787	

Device	Routing	Invert	Outlet Devices							
#1	Primary	415.99'	36.0" Round Culvert							
			L= 189.0' RCP, square edge headwall, Ke= 0.500							
			Inlet / Outlet Invert= 415.99' / 415.00' S= 0.0052 '/' Cc= 0.900							
			n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf							
#2	Secondary	431.50'	700.0' long x 15.0' 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							

Primary OutFlow Max=76.71 cfs @ 39.52 hrs HW=431.40' TW=426.32' (Dynamic Tailwater)
 ↑1=Culvert (Inlet Controls 76.71 cfs @ 10.85 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=415.10' TW=420.00' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 12P: Pond southeast 1



Summary for Pond 13P: Pond southeast 2

48" outlet culvert information is from pipe survey done in 2015. Assumed a CB located on 48" line at 224.5' measured from east.

Inflow Area = 71.567 ac, 48.85% Impervious, Inflow Depth > 80.87" for 100 yr 24-hr event
 Inflow = 156.11 cfs @ 12.21 hrs, Volume= 482.325 af
 Outflow = 56.65 cfs @ 70.84 hrs, Volume= 477.227 af, Atten= 64%, Lag= 3,517.7 min
 Primary = 39.28 cfs @ 12.49 hrs, Volume= 160.543 af
 Secondary = 46.13 cfs @ 68.75 hrs, Volume= 316.715 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 431.41' @ 39.21 hrs Surf.Area= 14.950 ac Storage= 88.358 af

Plug-Flow detention time= 1,048.7 min calculated for 477.207 af (99% of inflow)
 Center-of-Mass det. time= 953.3 min (5,369.9 - 4,416.6)

Volume	Invert	Avail.Storage	Storage Description
#1	419.00'	216.816 af	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
419.00	0.100	350.0	0.000	0.000	0.100
423.00	2.530	1,465.0	4.177	4.177	3.798
424.00	4.870	2,426.0	3.637	7.814	10.629
425.00	6.990	3,464.0	5.898	13.712	21.798
430.00	14.950	6,415.0	53.604	67.316	75.059
440.00	14.950	6,415.0	149.500	216.816	76.532

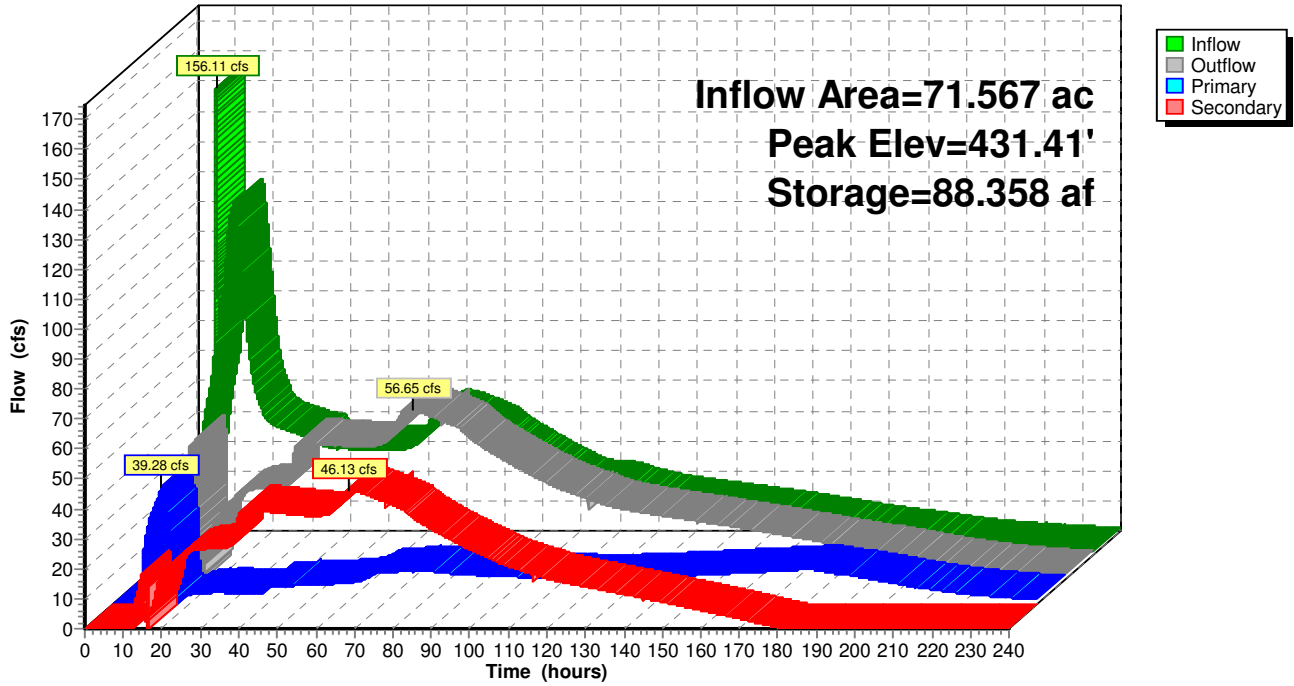
Device	Routing	Invert	Outlet Devices
#1	Primary	419.08'	48.0" Round 48" Culvert L= 70.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 418.12' / 419.08' S= -0.0137 '/' Cc= 0.900 n= 0.011, Flow Area= 12.57 sf
#2	Secondary	425.00'	10.0' long x 15.0' breadth Broad-Crested Rectangular Weir 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

Primary OutFlow Max=39.28 cfs @ 12.49 hrs HW=425.24' TW=424.82' (Dynamic Tailwater)
 ↑1=48" Culvert (Inlet Controls 39.28 cfs @ 3.13 fps)

Secondary OutFlow Max=46.14 cfs @ 68.75 hrs HW=429.84' TW=429.81' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 46.14 cfs @ 0.95 fps)

Pond 13P: Pond southeast 2

Hydrograph



Summary for Pond 14P: Pond northeast 4

Inflow Area = 20.350 ac, 100.00% Impervious, Inflow Depth = 13.34" for 100 yr 24-hr event
 Inflow = 164.71 cfs @ 15.13 hrs, Volume= 192.212 af
 Outflow = 93.92 cfs @ 17.01 hrs, Volume= 177.133 af, Atten= 43%, Lag= 112.6 min
 Primary = 93.92 cfs @ 17.01 hrs, Volume= 175.532 af
 Secondary = 24.41 cfs @ 38.75 hrs, Volume= 1.601 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 431.53' @ 38.75 hrs Surf.Area= 12.513 ac Storage= 34.284 af

Plug-Flow detention time= 544.1 min calculated for 177.133 af (92% of inflow)
 Center-of-Mass det. time= 389.3 min (2,161.4 - 1,772.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	423.00'	204.679 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
423.00	2.000	1,505.0	0.000	0.000	2.000	
424.00	2.000	1,505.0	2.000	2.000	2.035	
425.00	2.740	1,731.0	2.360	4.360	3.371	
426.00	3.240	1,874.0	2.987	7.347	4.314	
427.00	4.000	2,325.0	3.613	10.960	7.774	
428.00	4.230	2,490.0	4.114	15.075	9.226	
429.00	4.530	2,672.0	4.379	19.454	10.943	
430.00	4.840	2,851.0	4.684	24.138	12.751	
431.00	5.880	3,173.0	5.352	29.489	16.295	
432.00	20.350	6,542.0	12.390	41.879	76.087	
440.00	20.350	6,542.0	162.800	204.679	77.289	

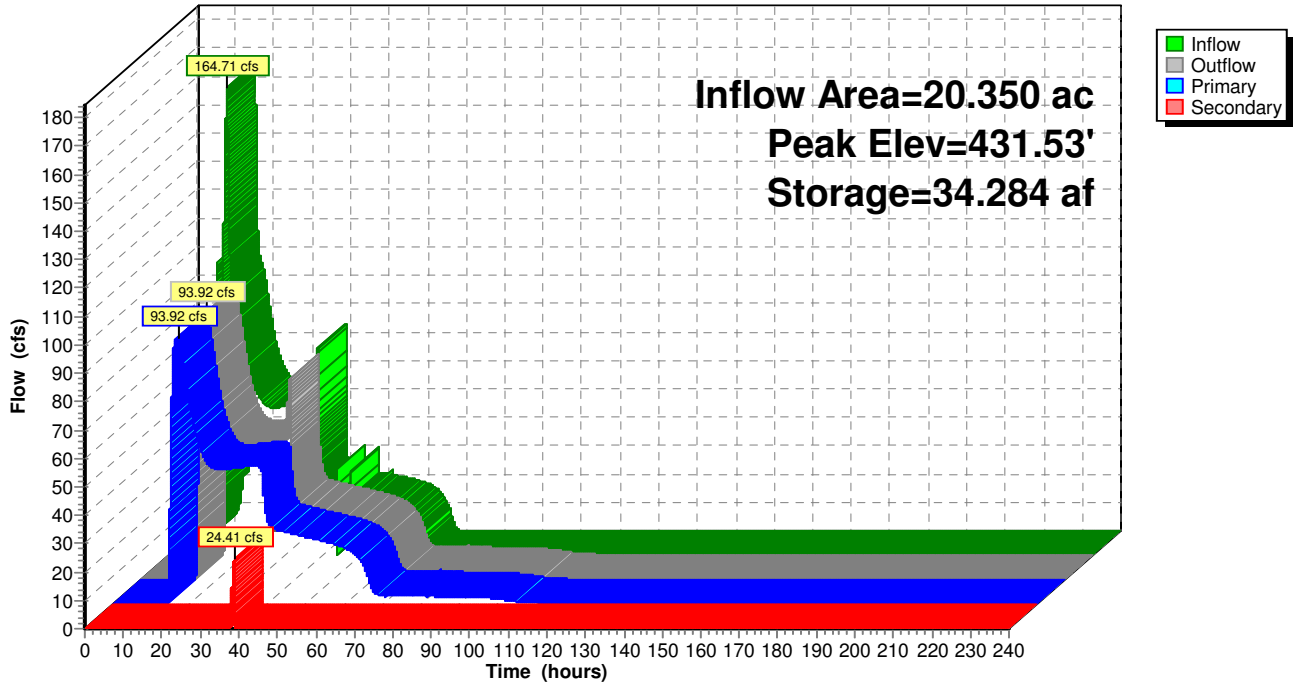
Device	Routing	Invert	Outlet Devices									
#1	Primary	428.00'	8.0' long x 15.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									
#2	Secondary	431.50'	1,500.0' long x 15.0' 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									

Primary OutFlow Max=93.92 cfs @ 17.01 hrs HW=430.71' TW=428.00' (Dynamic Tailwater)
 ↑1=**Broad-Crested Rectangular Weir** (Weir Controls 93.92 cfs @ 4.33 fps)

Secondary OutFlow Max=24.36 cfs @ 38.75 hrs HW=431.53' TW=426.35' (Dynamic Tailwater)
 ↑2=**Broad-Crested Rectangular Weir** (Weir Controls 24.36 cfs @ 0.49 fps)

Pond 14P: Pond northeast 4

Hydrograph



Summary for Pond 16P: East primary pond

Outfall information from 2005 East Ash Pond Expansion plans (URS) sheets P-05 and D-01 (WDR1-C173).

Outlet #5 is a proposed weir.

Inflow Area = 31.780 ac, 100.00% Impervious, Inflow Depth = 9.08" for 100 yr 24-hr event
 Inflow = 459.00 cfs @ 11.94 hrs, Volume= 24.046 af
 Outflow = 4.07 cfs @ 19.80 hrs, Volume= 23.250 af, Atten= 99%, Lag= 471.8 min
 Primary = 4.07 cfs @ 19.80 hrs, Volume= 23.250 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 439.50' Surf.Area= 0.000 ac Storage= 22.011 af
 Peak Elev= 441.73' @ 19.80 hrs Surf.Area= 0.000 ac Storage= 41.853 af (19.842 af above start)
 Flood Elev= 450.00' Surf.Area= 0.000 ac Storage= 144.222 af (122.211 af above start)

Plug-Flow detention time= 10,412.7 min calculated for 1.239 af (5% of inflow)
 Center-of-Mass det. time= 2,936.3 min (3,669.0 - 732.7)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	187.743 af	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (acre-feet)
420.00	0.000
434.00	4.290
436.00	6.840
438.00	14.429
440.00	24.538
448.00	104.822
450.00	144.222
451.00	165.532
452.00	187.743

Device	Routing	Invert	Outlet Devices
#1	Primary	435.00'	26.3" Round 30" HDPE SDR 17 Culvert L= 679.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 435.00' / 431.94' S= 0.0045 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.77 sf
#2	Device 1	439.50'	11.2" Round 12" HDPE SDR 17 Culvert L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 439.50' / 439.40' S= 0.0033 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.68 sf
#3	Device 1	443.65'	11.2" Round 12" HDPE SDR 17 Culvert L= 15.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 443.65' / 443.55' S= 0.0067 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.68 sf
#4	Device 1	446.60'	11.2" Round 12" HDPE SDR 17 Culvert L= 5.0' RCP, square edge headwall, Ke= 0.500

			Inlet / Outlet Invert= 446.60' / 446.50' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.68 sf
#5	Device 1	447.60'	3.5' long x 0.7' breadth Broad-Crested Rectangular Weir X 2.00 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
#6	Device 1	449.60'	60.0" x 60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#7	Secondary	450.00'	Custom Weir top of Embankment, Cv= 2.62 (C= 3.28) Head (feet) 0.00 1.00 2.00 Width (feet) 380.00 550.00 2,200.00

Primary OutFlow Max=4.07 cfs @ 19.80 hrs HW=441.73' TW=431.20' (Dynamic Tailwater)

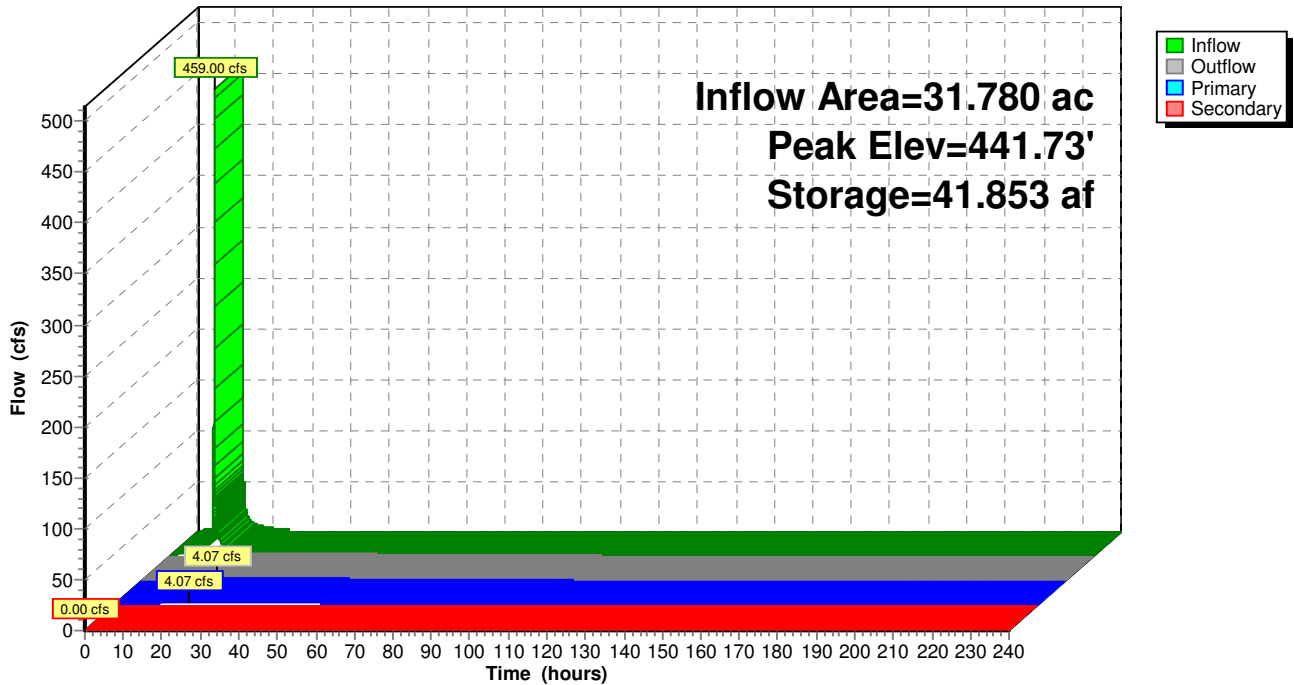
- 1=30" HDPE SDR 17 Culvert (Passes 4.07 cfs of 27.82 cfs potential flow)
- 2=12" HDPE SDR 17 Culvert (Barrel Controls 4.07 cfs @ 5.95 fps)
- 3=12" HDPE SDR 17 Culvert (Controls 0.00 cfs)
- 4=12" HDPE SDR 17 Culvert (Controls 0.00 cfs)
- 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 6=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=439.50' TW=416.53' (Dynamic Tailwater)

- 7=Custom Weir top of Embankment (Controls 0.00 cfs)

Pond 16P: East primary pond

Hydrograph



Summary for Pond 17P: East secondary pond

Inflow Area = 34.957 ac, 100.00% Impervious, Inflow Depth > 8.81" for 100 yr 24-hr event
 Inflow = 52.52 cfs @ 11.90 hrs, Volume= 25.654 af
 Outflow = 23.68 cfs @ 0.00 hrs, Volume= 32.587 af, Atten= 55%, Lag= 0.0 min
 Primary = 23.68 cfs @ 0.00 hrs, Volume= 32.587 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 431.61' Surf.Area= 0.000 ac Storage= 8.700 af
 Peak Elev= 431.61' @ 0.00 hrs Surf.Area= 0.000 ac Storage= 8.700 af

Plug-Flow detention time= 2,836.6 min calculated for 23.886 af (93% of inflow)
 Center-of-Mass det. time= 1,060.5 min (4,454.2 - 3,393.6)

Volume	Invert	Avail.Storage	Storage Description
#1	419.00'	15.748 af	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (acre-feet)
419.00	0.000
420.00	0.388
425.00	2.466
430.00	6.876
431.00	7.976
432.00	9.163
433.00	10.426
436.70	15.748

Device	Routing	Invert	Outlet Devices
#1	Primary	420.00'	31.5" Round 36" HDPE SDR 17 Culvert L= 566.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 420.00' / 415.60' S= 0.0078 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 5.41 sf
#2	Device 1	420.50'	5.8" Round 6" HDPE SDR 17 Culvert L= 4.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 420.50' / 420.40' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.18 sf
#3	Device 1	431.00'	90.0 deg x 3.0' long Sharp-Crested Vee/Trap Weir X 4.00 Cv= 2.50 (C= 3.13)
#4	Device 1	432.60'	1.0' long x 0.5' breadth Broad-Crested Rectangular Weir X 4.00 Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	433.00'	15.0' long x 15.0' 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
#6	Tertiary	434.00'	430.0' long x 15.0' 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

Primary OutFlow Max=23.68 cfs @ 0.00 hrs HW=431.61' TW=416.53' (Dynamic Tailwater)

- 1=36" HDPE SDR 17 Culvert (Passes 23.68 cfs of 62.76 cfs potential flow)
- 2=6" HDPE SDR 17 Culvert (Inlet Controls 2.91 cfs @ 15.87 fps)
- 3=Sharp-Crested Vee/Trap Weir (Weir Controls 20.77 cfs @ 2.36 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=431.61' TW=417.00' (Dynamic Tailwater)

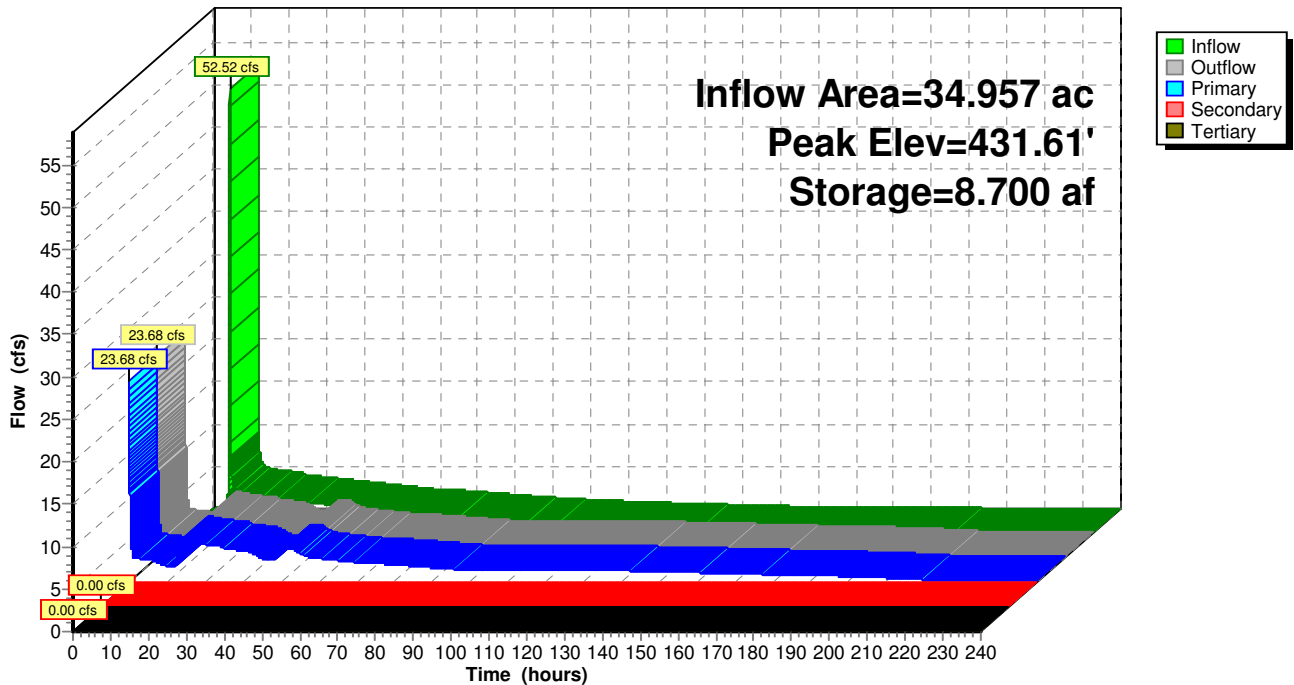
- 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=431.61' (Free Discharge)

- 6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 17P: East secondary pond

Hydrograph

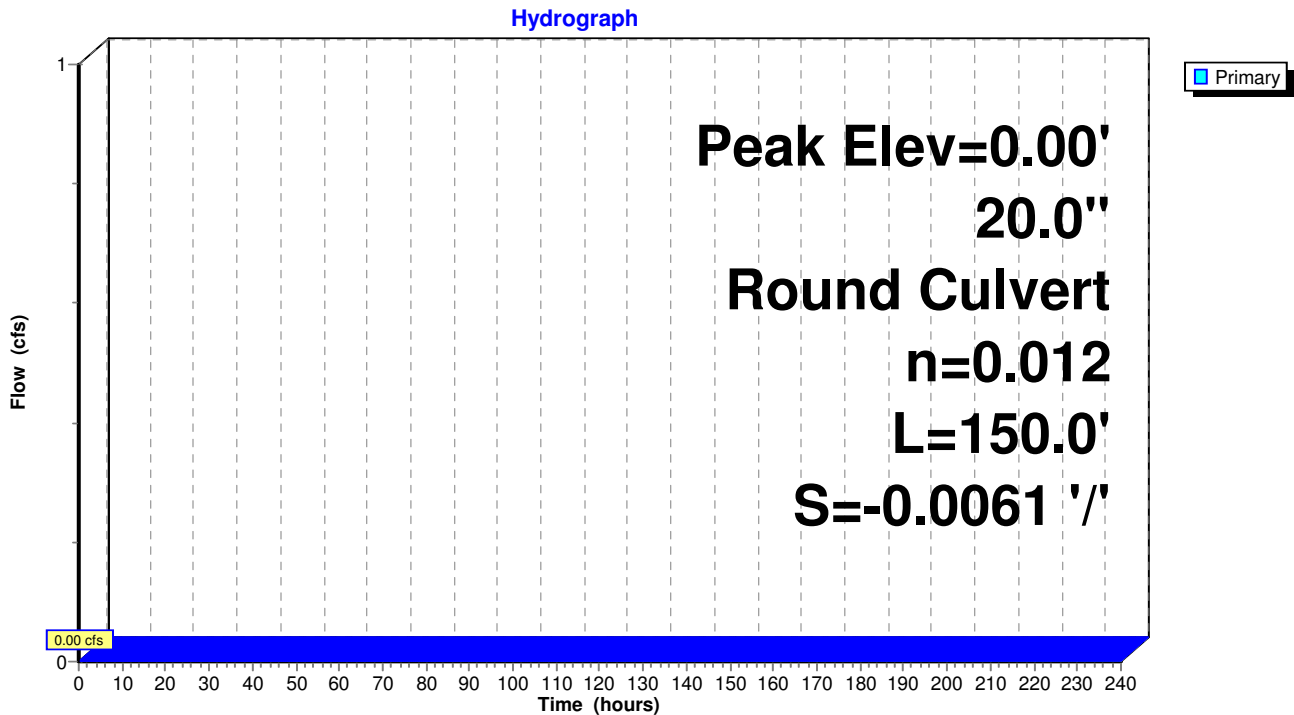


Summary for Pond 18P: MH 2- Pond 3 outlet

Device #	Routing	Invert	Outlet Devices
#1	Primary	419.74'	20.0" Round 24" DI Culvert L= 150.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 418.83' / 419.74' S= -0.0061 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 2.18 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
 ↳ 1=24" DI Culvert (Controls 0.00 cfs)

Pond 18P: MH 2- Pond 3 outlet



Summary for Pond 19P: Pond northeast 2

72" secondary outlet culvert information is from pipe survey done in 2015.

72" primary outlet to Wood River - invert information from pipe survey done in 2015. pipe size needs to be verified.

Inflow Area = 939.440 ac, 0.00% Impervious, Inflow Depth = 7.99" for 100 yr 24-hr event
 Inflow = 1,377.00 cfs @ 12.73 hrs, Volume= 625.169 af
 Outflow = 332.29 cfs @ 15.13 hrs, Volume= 608.359 af, Atten= 76%, Lag= 143.7 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 188.02 cfs @ 13.76 hrs, Volume= 431.565 af
 Tertiary = 158.04 cfs @ 15.13 hrs, Volume= 176.815 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 431.54' @ 38.74 hrs Surf.Area= 57.490 ac Storage= 254.687 af

Plug-Flow detention time= 1,826.6 min calculated for 608.359 af (97% of inflow)
 Center-of-Mass det. time= 1,795.3 min (2,940.1 - 1,144.7)

Volume	Invert	Avail.Storage	Storage Description
#1	417.00'	568.575 af	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
417.00	0.100	350.0	0.000	0.000	0.100
419.00	1.990	5,689.0	1.691	1.691	59.002
421.00	3.760	4,359.0	5.657	7.348	83.417
424.00	4.590	4,650.0	12.504	19.852	88.216
426.00	17.660	9,055.0	20.836	40.688	198.504
428.00	26.300	8,763.0	43.674	84.362	208.018
430.00	57.490	11,537.0	81.783	166.145	310.893
437.00	57.490	11,537.0	402.430	568.575	312.747

Device	Routing	Invert	Outlet Devices
#1	Primary	408.36'	72.0" Round 72" Conc Culvert X 0.00 L= 272.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 408.36' / 406.76' S= 0.0059 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 28.27 sf
#2	Secondary	412.67'	72.0" Round 72" CMP Culvert L= 149.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 411.82' / 412.67' S= -0.0057 '/ Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 28.27 sf
#3	Tertiary	430.00'	100.0' long x 15.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=417.00' TW=407.00' (Dynamic Tailwater)

↑1=72" Conc Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=188.02 cfs @ 13.76 hrs HW=430.27' TW=428.15' (Dynamic Tailwater)

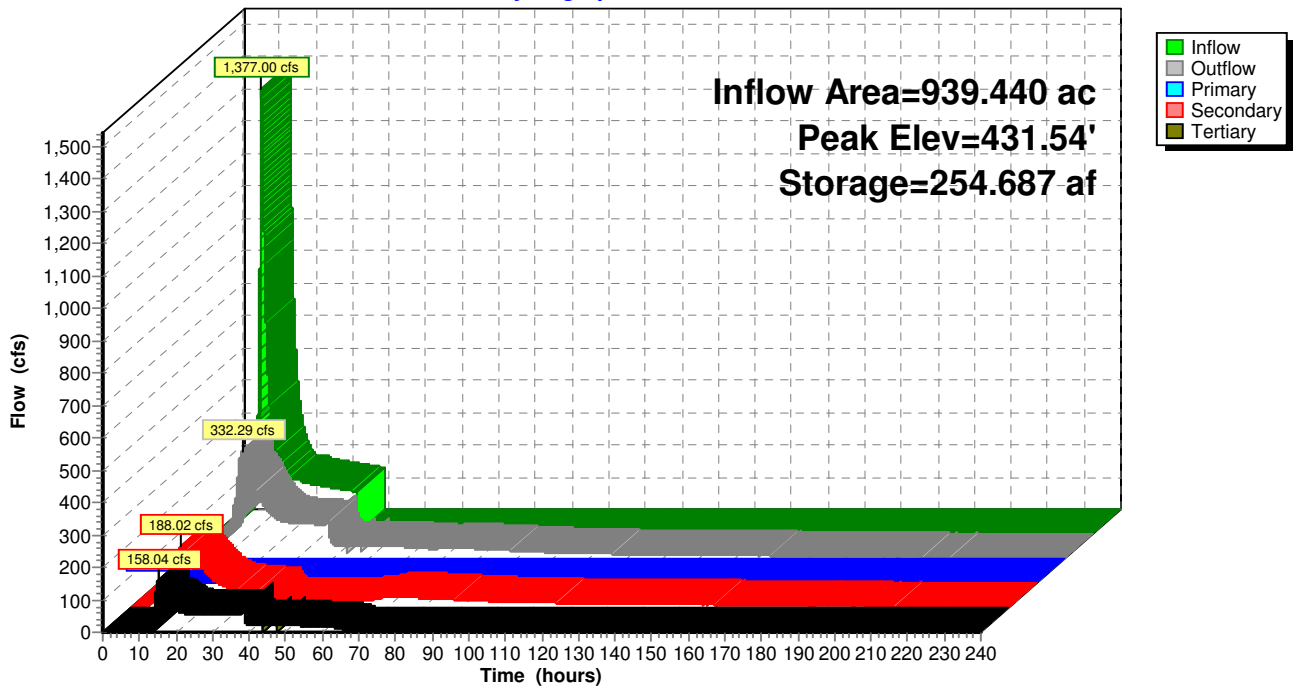
↑2=72" CMP Culvert (Outlet Controls 188.02 cfs @ 6.65 fps)

Tertiary OutFlow Max=158.04 cfs @ 15.13 hrs HW=430.71' TW=430.01' (Dynamic Tailwater)

↑3=Broad-Crested Rectangular Weir (Weir Controls 158.04 cfs @ 2.24 fps)

Pond 19P: Pond northeast 2

Hydrograph



Summary for Pond 20P: Pond northwest 1

36" outlet culvert information from pipe survey done in 2015.

Inflow Area = 164.177 ac, 33.69% Impervious, Inflow Depth > 79.57" for 100 yr 24-hr event
 Inflow = 155.12 cfs @ 12.05 hrs, Volume= 1,088.662 af
 Outflow = 117.38 cfs @ 38.75 hrs, Volume= 1,082.616 af, Atten= 24%, Lag= 1,601.7 min
 Primary = 50.41 cfs @ 38.86 hrs, Volume= 795.983 af
 Secondary = 83.51 cfs @ 13.17 hrs, Volume= 54.475 af
 Tertiary = 57.21 cfs @ 38.88 hrs, Volume= 232.158 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 420.00' Surf.Area= 1.627 ac Storage= 3.038 af
 Peak Elev= 426.36' @ 38.88 hrs Surf.Area= 4.565 ac Storage= 25.789 af (22.751 af above start)
 Flood Elev= 431.00' Surf.Area= 6.072 ac Storage= 51.273 af (48.235 af above start)

Plug-Flow detention time= 247.5 min calculated for 1,079.578 af (99% of inflow)
 Center-of-Mass det. time= 159.6 min (5,784.5 - 5,624.8)

Volume	Invert	Avail.Storage	Storage Description
#1	417.00'	73.223 af	Custom Stage Data (Irregular) Listed below

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
417.00	0.240	1,004.0	0.000	0.000	0.240
421.00	2.090	3,177.0	4.051	4.051	16.839
422.00	2.660	3,203.0	2.369	6.420	17.150
423.00	3.220	3,233.0	2.936	9.356	17.511
424.00	3.800	3,249.0	3.506	12.862	17.714
435.00	7.370	3,202.0	60.361	73.223	18.699

Device	Routing	Invert	Outlet Devices
#1	Primary	411.77'	36.0" Round Culvert L= 141.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 411.77' / 411.58' S= 0.0013 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	422.00'	25.0' long x 15.0' 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	Tertiary	426.00'	100.0' long x 15.0' 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

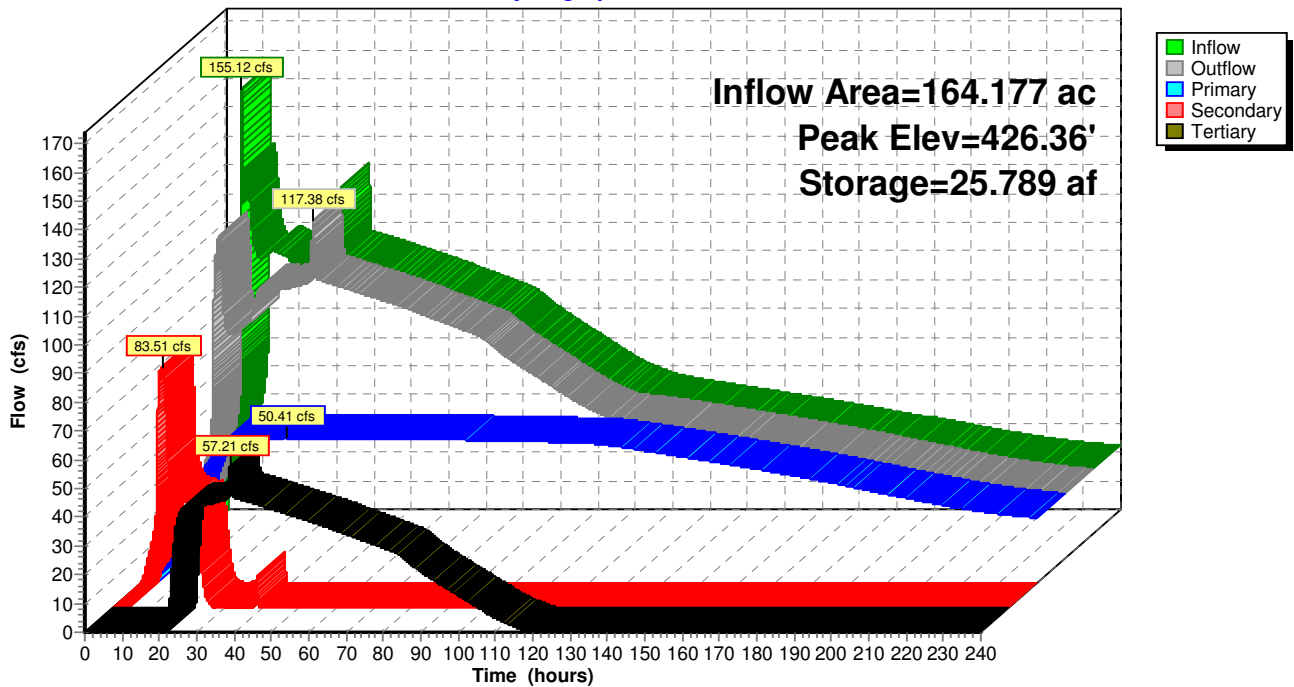
Primary OutFlow Max=50.41 cfs @ 38.86 hrs HW=426.36' TW=422.18' (Dynamic Tailwater)
↑1=Culvert (Outlet Controls 50.41 cfs @ 7.13 fps)

Secondary OutFlow Max=83.51 cfs @ 13.17 hrs HW=423.52' TW=423.12' (Dynamic Tailwater)
↑2=Broad-Crested Rectangular Weir (Weir Controls 83.51 cfs @ 2.20 fps)

Tertiary OutFlow Max=57.21 cfs @ 38.88 hrs HW=426.36' TW=422.18' (Dynamic Tailwater)
↑3=Broad-Crested Rectangular Weir (Weir Controls 57.21 cfs @ 1.61 fps)

Pond 20P: Pond northwest 1

Hydrograph



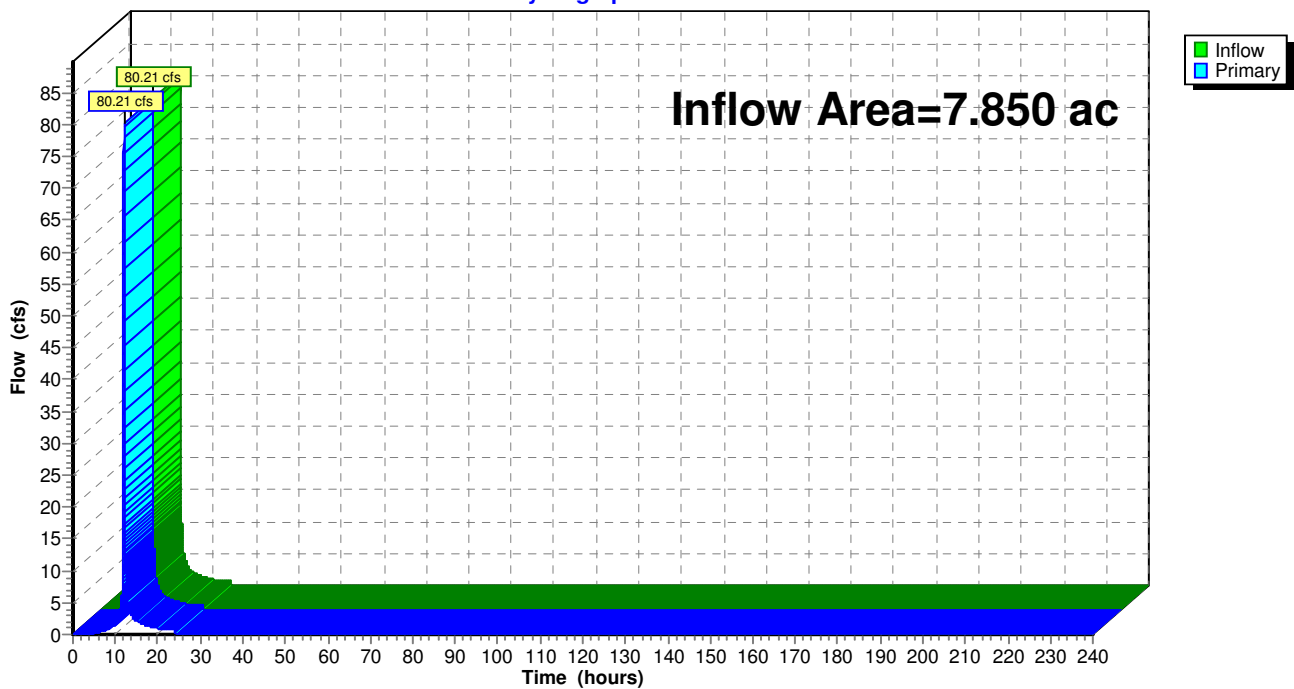
Summary for Pond 21P: Ccombined Upper Pond 2 South DA

Inflow Area = 7.850 ac, 0.00% Impervious, Inflow Depth = 7.37" for 100 yr 24-hr event
Inflow = 80.21 cfs @ 12.03 hrs, Volume= 4.820 af
Primary = 80.21 cfs @ 12.03 hrs, Volume= 4.820 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3

Pond 21P: Ccombined Upper Pond 2 South DA

Hydrograph



Summary for Pond 23P: Pond northeast 3

Outlet culvert information assumed. Needs to be verified.

Inflow Area = 881.670 ac, 0.00% Impervious, Inflow Depth = 7.99" for 100 yr 24-hr event
 Inflow = 6,307.86 cfs @ 12.19 hrs, Volume= 586.681 af
 Outflow = 1,331.28 cfs @ 12.74 hrs, Volume= 586.727 af, Atten= 79%, Lag= 33.3 min
 Primary = 215.43 cfs @ 10.05 hrs, Volume= 423.796 af
 Secondary = 1,137.59 cfs @ 12.75 hrs, Volume= 162.931 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 436.38' @ 12.75 hrs Surf.Area= 192.320 ac Storage= 265.401 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 379.0 min (1,168.9 - 789.9)

Volume	Invert	Avail.Storage	Storage Description
#1	435.00'	961.600 af	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
435.00	192.320	11,582.0	0.000	0.000	192.320
440.00	192.320	11,582.0	961.600	961.600	193.649

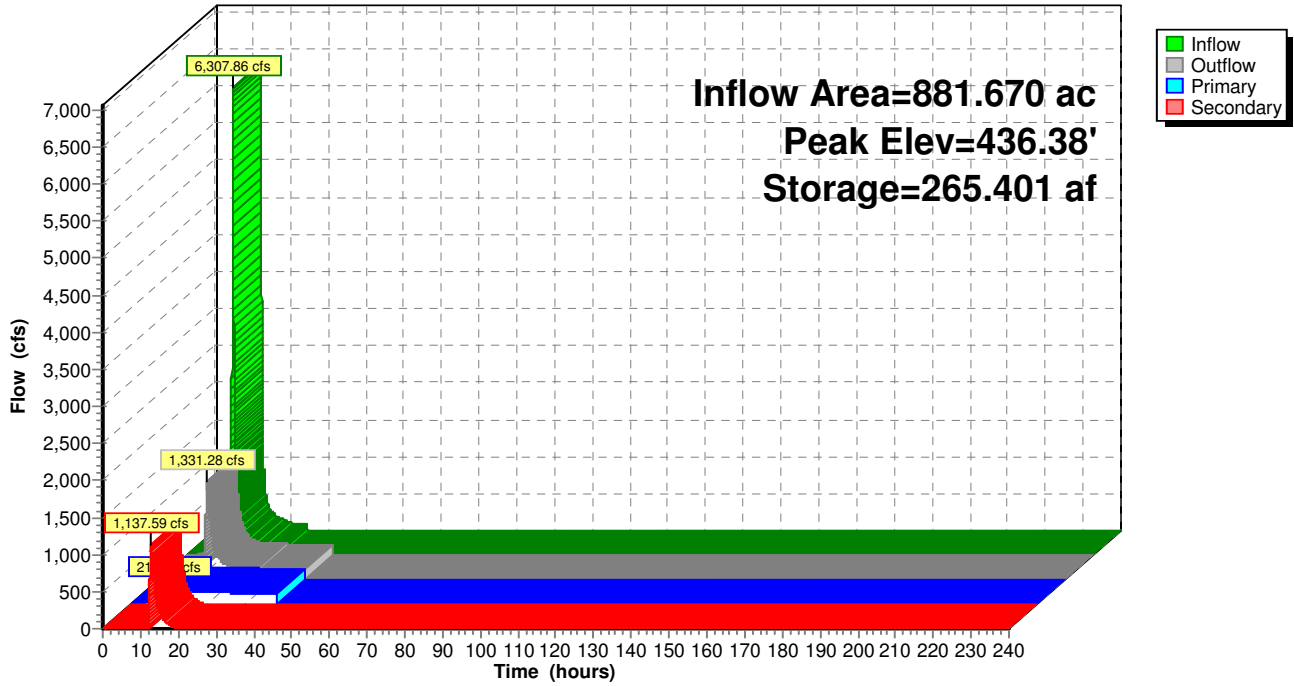
Device	Routing	Invert	Outlet Devices
#1	Primary	418.00'	60.0" Round 60" Culvert L= 260.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 418.00' / 417.00' S= 0.0038 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 19.63 sf
#2	Secondary	436.00'	1,800.0' long x 15.0' breadth Br-Crest Rec Weir over RR 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

Primary OutFlow Max=215.52 cfs @ 10.05 hrs HW=435.00' TW=425.58' (Dynamic Tailwater)
 ↑1=60" Culvert (Outlet Controls 215.52 cfs @ 10.98 fps)

Secondary OutFlow Max=1,137.52 cfs @ 12.75 hrs HW=436.38' TW=428.78' (Dynamic Tailwater)
 ↑2=Br-Crest Rec Weir over RR (Weir Controls 1,137.52 cfs @ 1.66 fps)

Pond 23P: Pond northeast 3

Hydrograph



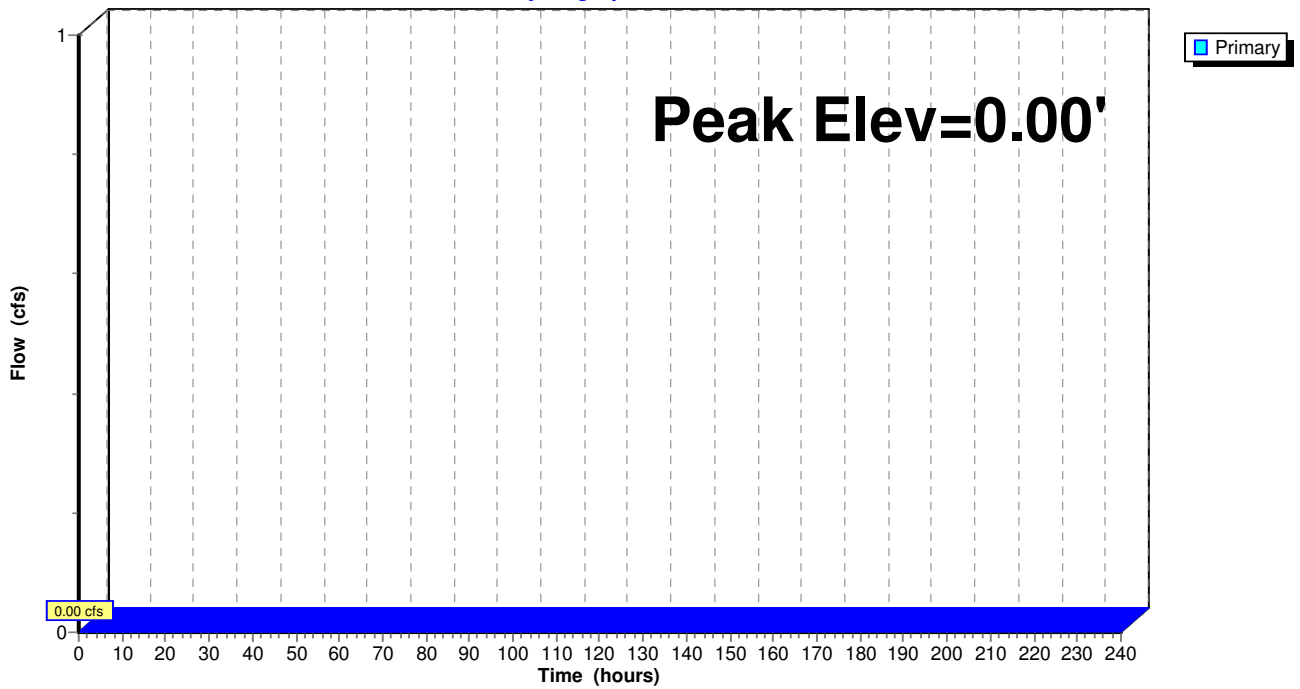
Summary for Pond 29P: outlet

Device	Routing	Invert	Outlet Devices
#1	Primary	418.00'	Special & User-Defined Head (feet) 0.00 0.10 200.00 Disch. (cfs) 0.000 1,250.000 1,250.000

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
 ↳1=Special & User-Defined (Controls 0.00 cfs)

Pond 29P: outlet

Hydrograph



Summary for Pond 30P: Pond northwest 3

Inflow Area = 277.097 ac, 19.96% Impervious, Inflow Depth > 47.14" for 100 yr 24-hr event
 Inflow = 756.07 cfs @ 12.13 hrs, Volume= 1,088.594 af
 Outflow = 473.79 cfs @ 12.30 hrs, Volume= 1,086.520 af, Atten= 37%, Lag= 10.3 min
 Secondary = 473.79 cfs @ 12.30 hrs, Volume= 1,086.520 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 422.00' Surf.Area= 31.349 ac Storage= 245.508 af
 Peak Elev= 422.50' @ 12.30 hrs Surf.Area= 32.717 ac Storage= 261.444 af (15.937 af above start)

Plug-Flow detention time= 2,913.7 min calculated for 841.012 af (77% of inflow)
 Center-of-Mass det. time= 31.4 min (5,779.5 - 5,748.1)

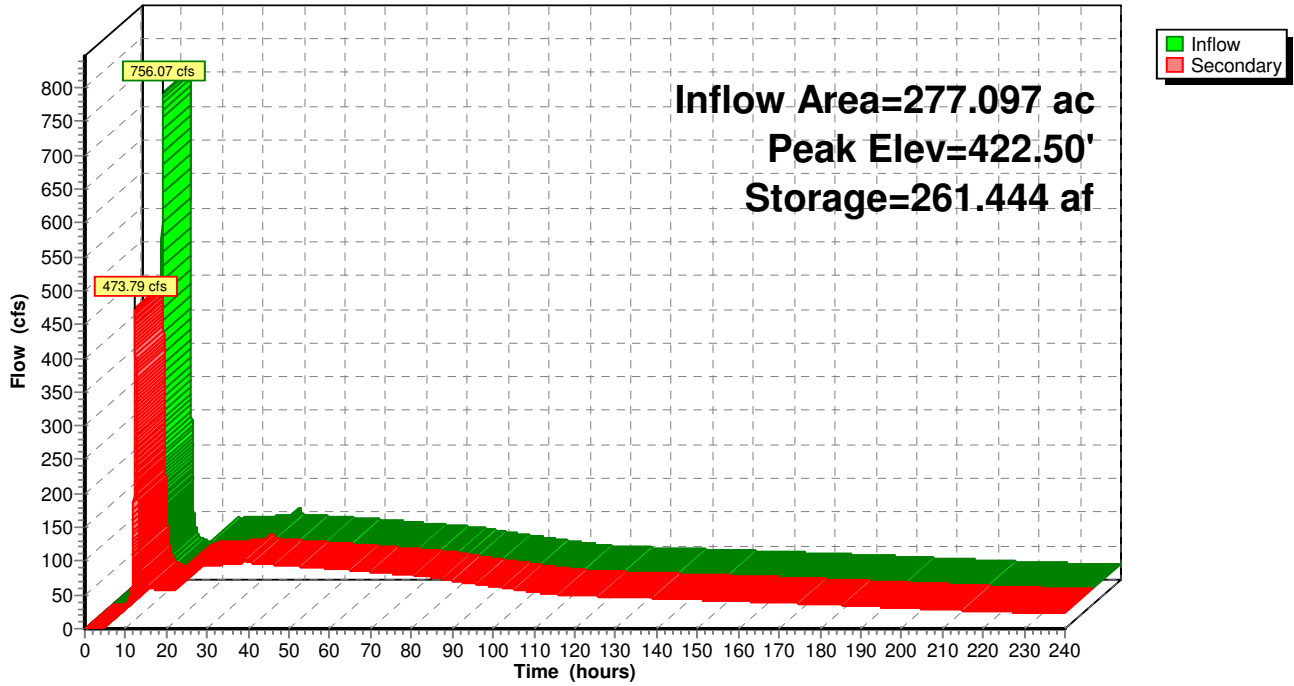
Volume	Invert	Avail.Storage	Storage Description			
#1	404.00'	1,070.034 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
404.00	3.950	1,865.0	0.000	0.000	3.950	
409.00	5.960	3,891.0	24.603	24.603	25.257	
429.00	53.280	7,862.0	513.733	538.336	110.560	
432.00	77.590	9,000.0	195.166	733.502	145.621	
436.00	90.850	10,130.0	336.532	1,070.034	185.121	

Device	Routing	Invert	Outlet Devices									
#1	Secondary	422.00'	500.0' long x 15.0' 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									

Secondary OutFlow Max=473.73 cfs @ 12.30 hrs HW=422.50' (Free Discharge)
 ↑1=**Broad-Crested Rectangular Weir** (Weir Controls 473.73 cfs @ 1.90 fps)

Pond 30P: Pond northwest 3

Hydrograph



Summary for Pond 35P: Pond 1-Proposed Middle

Inflow Area = 7.660 ac, 0.00% Impervious, Inflow Depth = 10.34" for 100 yr 24-hr event
 Inflow = 106.73 cfs @ 12.16 hrs, Volume= 6.600 af
 Outflow = 17.56 cfs @ 12.54 hrs, Volume= 6.425 af, Atten= 84%, Lag= 22.5 min
 Primary = 17.45 cfs @ 12.49 hrs, Volume= 6.423 af
 Secondary = 0.15 cfs @ 12.57 hrs, Volume= 0.002 af
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 431.03' @ 12.57 hrs Surf.Area= 0.000 ac Storage= 3.678 af

Plug-Flow detention time= 314.2 min calculated for 6.424 af (97% of inflow)
 Center-of-Mass det. time= 298.5 min (1,074.6 - 776.1)

Volume	Invert	Avail.Storage	Storage Description
#1	427.00'	12.057 af	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (acre-feet)
427.00	0.000
428.00	0.015
429.00	0.306
430.00	1.341
431.00	3.586
432.00	7.223
433.00	12.057

Device	Routing	Invert	Outlet Devices
#1	Primary	427.50'	24.0" Round Culvert L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 427.50' / 425.30' S= 0.0147 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	431.00'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.50 1.50 2.50 Width (feet) 10.00 140.00 240.00
#3	Tertiary	432.99'	500.0' long x 15.0' 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

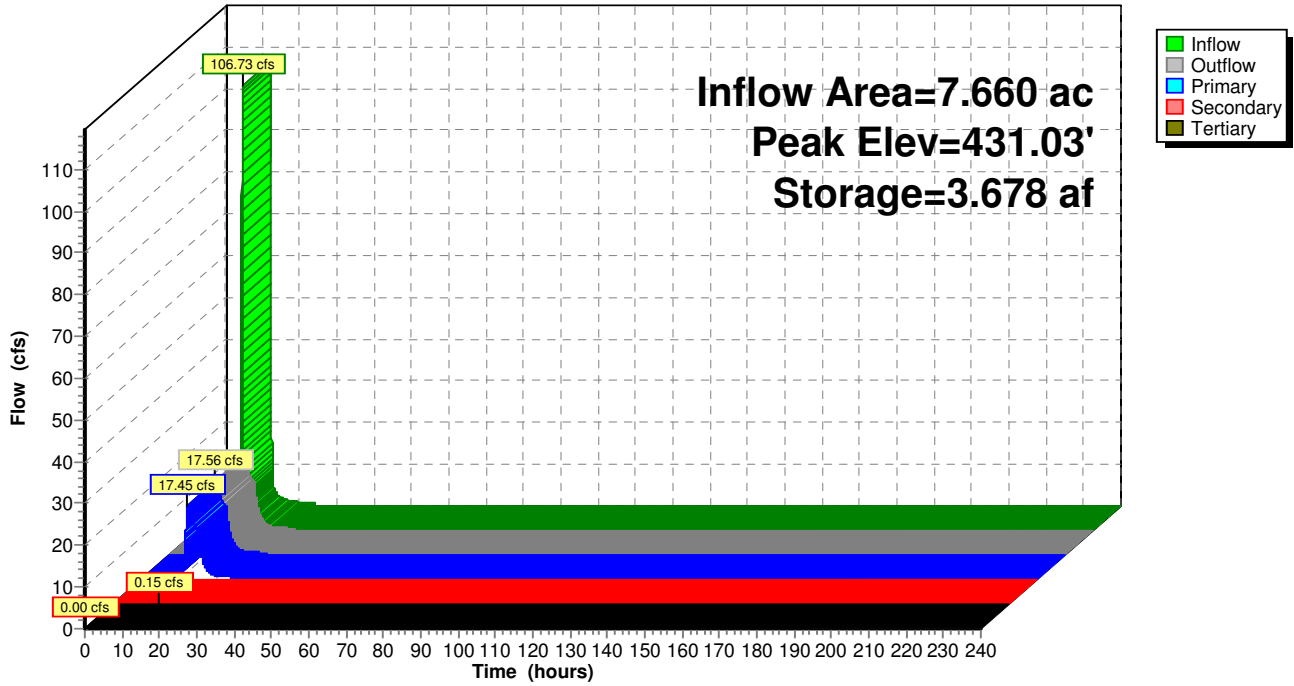
Primary OutFlow Max=17.45 cfs @ 12.49 hrs HW=431.01' TW=429.53' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 17.45 cfs @ 5.56 fps)

Secondary OutFlow Max=0.15 cfs @ 12.57 hrs HW=431.03' TW=430.51' (Dynamic Tailwater)
 ↑2=Custom Weir/Orifice (Weir Controls 0.15 cfs @ 0.51 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=427.00' TW=428.40' (Dynamic Tailwater)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 35P: Pond 1-Proposed Middle

Hydrograph



Summary for Pond 36P: Pond northwest 2

Inflow Area = 22.070 ac, 0.00% Impervious, Inflow Depth = 37.60" for 100 yr 24-hr event
 Inflow = 273.96 cfs @ 12.09 hrs, Volume= 69.161 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 420.00' Surf.Area= 5.845 ac Storage= 5.485 af
 Peak Elev= 426.36' @ 90.56 hrs Surf.Area= 13.725 ac Storage= 74.646 af (69.161 af above start)
 Flood Elev= 431.00' Surf.Area= 19.780 ac Storage= 150.850 af (145.365 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description			
#1	419.00'	150.850 af	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
419.00	2.460	2,939.0	0.000	0.000	2.460	
421.00	9.230	3,000.0	10.970	10.970	3.136	
422.00	10.130	3,100.0	9.677	20.647	4.252	
423.00	11.400	3,166.0	10.759	31.405	5.011	
424.00	12.290	3,477.0	11.842	43.248	8.786	
426.00	13.260	3,816.0	25.544	68.791	13.306	
431.00	19.780	4,882.0	82.059	150.850	30.252	

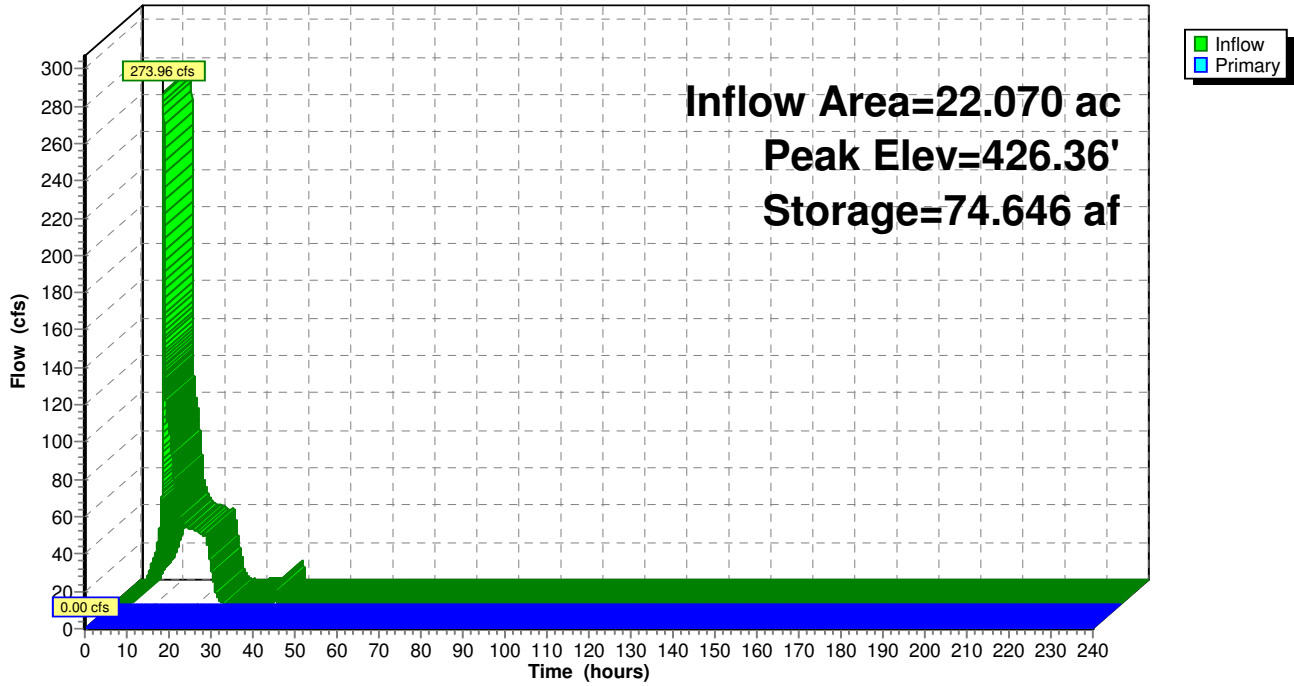
Device	Routing	Invert	Outlet Devices									
#1	Primary	430.00'	50.0' long x 15.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.00' TW=422.00' (Dynamic Tailwater)

↑1=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 36P: Pond northwest 2

Hydrograph



Summary for Pond 37P: Pond 1-Proposed Right

Inflow Area = 5.730 ac, 0.00% Impervious, Inflow Depth = 7.37" for 100 yr 24-hr event
 Inflow = 56.24 cfs @ 12.04 hrs, Volume= 3.520 af
 Outflow = 15.22 cfs @ 12.23 hrs, Volume= 3.501 af, Atten= 73%, Lag= 11.4 min
 Primary = 15.22 cfs @ 12.23 hrs, Volume= 3.501 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 430.61' @ 12.27 hrs Surf.Area= 0.000 ac Storage= 1.186 af

Plug-Flow detention time= 113.3 min calculated for 3.500 af (99% of inflow)
 Center-of-Mass det. time= 110.1 min (900.8 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	428.00'	7.338 af	Custom Stage Data Listed below
Elevation (feet)	Cum.Store (acre-feet)		
428.00	0.000		
429.00	0.036		
430.00	0.437		
431.00	1.670		
432.00	4.001		
433.00	7.338		

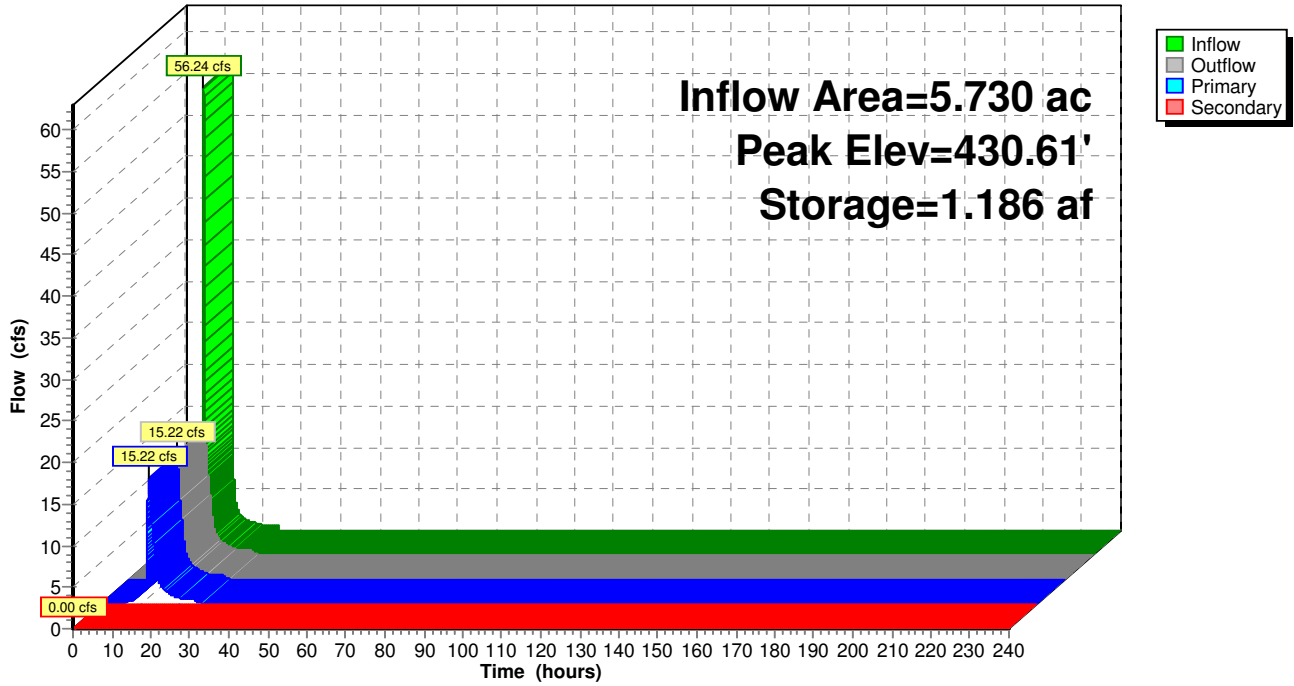
Device	Routing	Invert	Outlet Devices
#1	Primary	428.30'	24.0" Round Culvert L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 428.30' / 425.30' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	432.99'	500.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (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

Primary OutFlow Max=15.22 cfs @ 12.23 hrs HW=430.60' TW=429.42' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 15.22 cfs @ 5.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=428.00' TW=428.40' (Dynamic Tailwater)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 37P: Pond 1-Proposed Right

Hydrograph





ATTACHMENT 5

RIPRAP SIZING FOR PROPOSED EMERGENCY SPILLWAY

Resources: USACE, 1994. *Hydraulic Design of Flood Control Channels*. Engineer Manual No. 1110-2-1601.
http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1601.pdf

Objective: Calculate Require Riprap Size for Proposed Stormwater Channel

Values to be changed
Intermediate Values
Final output

Assumptions:

Design Conditions

Maximum Flow (Q)	=	78	ft ³ /s
Average Channel Width	=	17	ft
Flow per unit width (q)	=	4.647059	ft ² /s
Design Velocity	=	9.38	ft/s
Slope	=	0.26	ft/ft
Bottom width	=	15	ft
Sideslope Horizontal	=	10	ft
Sideslope Vertical	=	1	ft
Side Slope Angle	=	0.099669	radians
Manning's n trial	=	0.38	-
Manning's n output	=	0.037866	-
Factor of Safety (min 1.1)	=	1.5	-
Stability Coefficient (Cs)	=	0.3	-
Vertical Velocity Dist. Coeff (Cv)	=	1	-
Thickness Coeff. (Ct)	=	3	-
Local Flow Depth (d)	=	0.4	ft
Specific Weight of Stone	=	165	lb/ft ³
Unit Weight of Water	=	62.4	lb/ft ³
Gravitational Constant (g)	=	32.2	ft/s ²

Use eq. 3-3

<- Complete iterations until these <- two match

Calculated Values (3-3):

Slope Correction Factor (K1)	=	0.987946	-
D30	=	2.209808	ft
D30	=	14.5129	in
Volume of spherical stone with D30	=	0.925758	ft ³
Weight of D30 Stone	=	152.7501	lb
Weight of D90 Stone	=	600	lb
Volume of D90 Stone	=	3.636364	ft ³
Selected D90 from gradation with D30 matching calculated D30	=	1.908315	ft

Manning's n Value	=	0.037866	-
K value	=	0.034	-

$$K_1 = \sqrt{1 + \frac{m^2 \theta}{\sin^2 \phi}} \quad (3-4)$$

$$D_{30} = S C_1 C_2 C_3 C_4 \left[\frac{V_c}{V_c - V_s} \right]^{10} \left[\frac{V}{K_1 g d} \right]^{1.4} \quad (3-3)$$

$$D_{30} = D_{30} (D_{90}/D_{30})^{0.58} \quad (3-2)$$

where

- $K = 0.056$, average of all flume data
- $= 0.034$ for velocity and stone size calculation
- $= 0.038$ for capacity and freeboard calculation
- $D_{30}(min)$ = size of which 90 percent of sample is finer, from minimum or lower limit curve of gradation specification, ft
- D_{30} = riprap size of which 30 percent is finer by weight, length
- S = safety factor (see 7 below)
- C_1 = stability coefficient for equivalent flumes:
 $D_{30}/D_{30} = 1.7$ to 3.2
 $= 0.81$ for angular rock
 $= 0.75$ for rounded rock
- C_2 = vertical velocity distribution coefficient
 $= 1.0$ for straight channels, made of bed
 $= 0.281 + 0.2 \log (R/W)$, canals of beds 1 ft to 30 ft
 $= 2.81$
- C_3 = 1.25, dimensionless constant
- C_4 = 1.25, ratio of dikes
- C_5 = thickness coefficient (see 411 below)
- $= 1.0$ for thickness = $(D_{30}(min) + 1.5 D_{30}(min))$, whichever is greater
- d = local depth of flow, length (same location as V)
- V_c = unit weight of water, weight/volume
- V = local depth-averaged velocity, V_m for side slope riprap applications
- θ = side slope correction factor (see 411 below)
- g = gravitational constant, length/time²

$$D_{30} = \frac{1.95 S^{0.58} q^{0.58}}{g^{0.58}} \quad (3-5)$$

- s = slope of bed
 - q = unit discharge
 - Equation 3-5 is applicable to thickness = $1.5 D_{30}$, angular rock; unit weight of 167 pcf (D_{30}) from 1.7 to 3.2, slopes from 2 to 20 percent, and uniform flow on a down-slope with no backflow. The following notes should be used for application of Equation 3-5:
 - (1) Estimate q = Q/W , where q = bottom width of channel
 - (2) Multiply q by flow concentration factor of 1.25 (the general factor 4 approach flow is desired)
 - (3) Compute D_{30} using Equation 3-5
 - (4) Use uniform gradation having $D_{30}/D_{30} \leq 1.7$ such as Table 3-1
 - (5) Round application to weight channels with side slope of 0.2:1 (H:V)
 - (6) Use finer filter fabric rock
- The guideline for steep slope riprap generally results in large riprap sizes. Consider riprap in stone used instead of stone riprap or steep slope applications.

$$n = K [D_{30}(min)]^{0.58} \quad (3-2)$$

where

- $K = 0.056$, average of all flume data
- $= 0.034$ for velocity and stone size calculation
- $= 0.038$ for capacity and freeboard calculation
- $D_{30}(min)$ = size of which 90 percent of sample is finer, from minimum or lower limit curve of gradation specification, ft

Selected Riprap Sizing = RR 7, 30 inches thick minimum w/ 12 inches of bedding

Grad. No.	Percent Passing Rock Size (ft)													
	1000 ^a	600 ^a	400 ^a	300	170	150 ^b	90	50 ^c	40	12	10	6	3	1
RR 3							100							85-8
RR 4							100							85-8
RR 5							100		50-20					85-8
RR 6							100		50-20					85-8
RR 7							100		50-20					85-8

Gradation	Min. Thickness	Bedding Thickness
RR 1 & RR 2	6 in. (150 mm)	-
RR 3	8 in. (200 mm)	-
RR 4	10 in. (250 mm)	6 in. (150 mm)
RR 5	22 in. (550 mm)	8 in. (200 mm)
RR 6	26 in. (650 mm)	10 in. (250 mm)
RR 7	30 in. (750 mm)	12 in. (300 mm)

APPENDIX D — INDOT COURSE AGGREGATE SIZE SPECIFICATIONS

Size, in. (mm)	Retrievment	Class 1	Class 2	Uniform A	Uniform B
30 (750)			100		
24 (600)		100	85-100		
18 (450)	100	85-100	60-80		
12 (300)	90-100	35-50	20-40		
8 (200)				100	
6 (150)	20-40	10-30	0-20	35-80	95-100
3 (75)	0-10	0-10	0-10		35-80
1 (25)				0-20	0-20
Depth of Riprap, minimum	18 in. (450 mm)	24 in. (600 mm)	30 in. (750 mm)		

Attorney Client Privileged

Attachment E. Supporting Data

Attachment E. Supporting Data

Subsurface Investigation

A subsurface exploration was performed at the west ash complex, including 15 soil borings, installation of 9 geotechnical piezometers to monitor groundwater, and a program of 11 cone-penetration test (CPT) soundings, with seismic wave velocity measurements and pore pressure dissipation testing. The borings were drilled by AECOM's subcontractor Terracon Consultants, Inc. of St. Louis, MO, under the full-time supervision of AECOM geotechnical personnel. Terracon used an All-Terrain Vehicle-mounted drill rig in conjunction with 3-¼ inch inner diameter hollow stem augers to drill the borings. CPT soundings were performed by AECOM's subcontractor ConeTec, Inc., again with full-time oversight by AECOM personnel.

Boring depths varied from 30 to 70 feet and CPT depths varied from 30 to 50 feet below existing grades. Boring and CPT sounding locations are depicted in Figure 1 (Attachment E).

Representative soil samples were collected from each of the borings for classification and/or testing. The soil samples were obtained by Standard Penetration Testing (SPT) with a split-spoon sampler, in general accordance with ASTM D 1586. Undisturbed samples of fly ash and/or fine-grained soils were obtained using 3-inch outside diameter steel (Shelby) tubes, either conventionally pushed in accordance with ASTM D 1587 or by utilizing a piston sampler in accordance with ASTM D 6519 (in ash and very soft soils).

The field investigation was complimented by a comprehensive laboratory testing program. The program was designed to establish the index and engineering properties of the soils encountered at the site, with a focus on establishing the parameters pertinent to the pond closure design (including shear strength of the soils for use in slope stability analyses, and compressibility of the ashes and soft soils underlying the site, for use in cap settlement analyses). The program included the following tests:

- Moisture Content
- Atterberg Limits
- Grain Size Analyses
- One-Dimensional Consolidation Testing
- Consolidated-Undrained Triaxial Testing
- Direct Simple Shear Testing
- Cyclic Direct Simple Shear Testing

At the time of this 30% design submittal, approximately 75% of the assigned testing has been received, but some tests are still in progress. Our design evaluations have been based on the data in hand. Some adjustment as a result of forthcoming data may be warranted, and will be appropriately incorporated at later design stages.

Additionally, AECOM reviewed historical geotechnical information that was available in Dynegey's files. This information included boring location map and boring logs for the subsurface investigation performed by Sargent and Lundy (dating to 1977) to support the original design of the pond system. This information included 19 borings drilled to depths up to 85 feet below the pre-existing (pre-pond construction) grades. The historical information includes boring profile and SPT information, but no

laboratory testing. The subsurface profile revealed by the historical borings was similar to that encountered by AECOM in the current investigation, and the historical borings were therefore used to supplement the current data in our evaluations.

1.1.1. **Subsurface Investigation Findings and Interpretation**

The borings encountered the following generalized soil profile at the site (soil layers are listed from highest elevation to lowest):

Fine-Grained Dike Fill Materials: The perimeter dikes at Ponds 2W, 2E, and 3 are largely comprised of fine-grained soil fills classified as lean clay (CL) and fat clay (CH). The clays generally had a stiff to hard consistency and appeared to be well-compacted materials. The Pond 1 dikes were raised in the early 1990s, from an original elevation around 432 feet to the current elevation around 445 ft. Based on our borings, the material used to raise these dikes consists of a silty sand (SM) to sandy silt (ML). These fills were medium dense in the borings, and appeared to be well compacted.

Ponded Ash Materials: Sluiced ash materials were encountered in the borings drilled in Pond 2W and Pond 1. The material was generally classified as a silt (fly ash). Above the residual pond water table, the ash was loose to medium dense. Below the water level, the ash became loose to very loose and saturated.

Native Alluvial Clay: Most of the west ash complex is underlain by a native clay of alluvial origin. The stratum was typically classified as a fat clay (CH), with some zones lean clay (CL) occasionally identified. At the west complex, the clay consistency varied from soft to stiff, generally improving from east to west. The clay thickness generally thins from east to west.

Native Sand: Native sand materials, anticipated to be of alluvial origin, were encountered in all borings drilled at the west ash complex. In most cases, the sands were encountered below the alluvial clay, but in some instances were encountered directly below the dike fills or ponded ash. In general, the sands were medium dense, but some zones of looser material were also encountered at several borings. The sands were typically saturated, and were relatively clean (fines content typically in the range of 5 to 20%).

Groundwater Table: Based on preliminary data from the piezometers, the static groundwater table exists in the range of El. 400 to 410 across the complex, which corresponds to the native clay or sand deposits. A perched (residual) water table is also present within the ponds themselves. Generally, this perched water table exists within 10 feet of the existing ash surface in the ponds.

**Appendix F.
Groundwater Management Zone
(GMZ) Application**

SMARTER SOLUTIONS

EXCEPTIONAL SERVICE

VALUE

**GROUNDWATER MANAGEMENT ZONE
APPLICATION**

**West Ash Pond Complex
Wood River Power Station
Alton, Illinois**

FINAL

October 19, 2016



ENVIRONMENTAL CONSULTANTS



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GROUNDWATER MANAGEMENT ZONE APPLICATION

**WEST ASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS**

Project No. 2376

Prepared For:

**Dynegy Operating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234**

Prepared By:

**Natural Resource Technology, Inc.
234 W. Florida Street, Fifth Floor
Milwaukee, Wisconsin 53204**

**FINAL
October 19, 2016**

Handwritten signature of Stuart J. Cravens in black ink.

**Stuart J. Cravens, PG
Principal Hydrogeologist**

Handwritten signature of Nathaniel R. Keller in black ink.

**Nathaniel R. Keller, PG
Hydrogeologist**

**Title 35, Illinois Admin. Code, Part 620 – APPENDIX D
Confirmation of an Adequate Corrective Action Pursuant to 35 Ill. Adm. Code 620.250(a)(2)**

Pursuant to 35 Ill. Adm. Code 620.250(a) if an owner or operator provides a written confirmation to the Agency that an adequate corrective action, equivalent to a corrective action process approved by the Agency, is being undertaken in a timely and appropriate manner, then a groundwater management zone may be established as a three-dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site. This document provides the form in which the written confirmation is to be submitted to the Agency.

- Note 1. Parts I and II are to be submitted to IEPA at the time that the facility claims the alternative groundwater standards. Part III is to be submitted at the completion of the site investigation. At the completion of the corrective process, a final report is to be filed which includes the confirmation statement included in Part IV.
- Note 2. The issuance of a permit by IEPA's Division of Air Pollution Control or Water Pollution Control for a treatment system does not imply that the Agency has approved the corrective action process.
- Note 3. If the facility is conducting a cleanup of a unit which is subject to the requirements of the Resource Conservation and Recovery Act (RCRA) or the 35 Ill. Adm. Code 731 regulations for Underground Storage Tanks, this confirmation process is not applicable and cannot be used.
- Note 4. If the answers to any of these questions require explanation or clarification, provide such in an attachment to this document.

Information provided in the following technical documents is referenced within this form:

- AECOM, 2016. Closure and Post-Closure Care Plan for Wood River West Ash Pond Complex at Dynegy Midwest Generation, LLC, Wood River Power Station, #1 Chesson Lane, Alton, IL 62002.
- NRT, 2016a. Groundwater Management Zone Application, West Ash Pond Complex, Wood River Power Station, Alton, Illinois.
- NRT, 2016b. Groundwater Monitoring Plan, West Ash Pond Complex, Wood River Power Station, Alton, Illinois.
- NRT, 2016c. Hydrogeologic Site Characterization Report, West Ash Pond Complex, Wood River Power Station, Alton, Illinois.

Part I. Facility Information

Facility Name Wood River Power Station
 Facility Address 1 Chessen Ln, Alton, IL 62002
 County Madison
 Standard Industrial Code (SIC) 4911

- Provide a general description of the type of industry, products manufactured, raw materials used, location and size of the facility. ***Electric power generation and coal combustion residual (CCR) disposal. The Wood River Power Station ceased electrical generation in June 2016 and the station has been retired from service. The power generating station and the West Ash Pond Complex are situated on the left descending bank of the Mississippi River at river mile 200. The Wood River Power Station encompasses approximately 390 acres within which the West Ash Pond Complex (52.5 acres) is located.***
- What specific units (operating or closed) are present at the facility which are or were used to manage waste, hazardous waste, hazardous substances or petroleum?

	<u>YES</u>	<u>NO</u>
Landfill	<u> </u>	<u>X</u>
Surface Impoundment	<u>X</u>	<u> </u>
Land Treatment	<u> </u>	<u>X</u>
Spray Irrigation	<u> </u>	<u>X</u>
Waste Pile	<u> </u>	<u>X</u>
Incinerator	<u> </u>	<u>X</u>
Storage Tank (above ground)	<u> </u>	<u>X</u>
Storage Tank (underground)	<u> </u>	<u>X</u>
Container Storage Area	<u>X</u>	<u> </u>
Injection Well	<u> </u>	<u>X</u>
Water Treatment Units	<u> </u>	<u>X</u>
Septic Tanks	<u> </u>	<u>X</u>
French Drains	<u> </u>	<u>X</u>
Transfer Station	<u> </u>	<u>X</u>
Other Units (please describe)	<u> </u>	<u> </u>

- Provide an extract from a USGS topographic or county map showing the location of the site and a more detailed scaled map of the facility with each waste management unit identified in Question 2 or known/suspected source clearly identified. Map scale must be specified and the location of the facility must be provided with respect to Township, Range and Section. ***The West Ash Pond Complex is located within Section 19 Township 5 North and Range 9 West. Figure 1 in NRT, 2016a (attached) shows the Wood River Power Station boundary on a USGS topographic map. Figure 2 in NRT, 2016a (attached) shows the West Ash Pond Complex on an aerial photograph.***
- Has the facility ever conducted operations which involved the generation, manufacture, processing, transportation, treatment, storage or handling of "hazardous substances" as defined by the Illinois Environmental Protection Act? Yes No
 If the answer to this question is "yes" generally describe these operations. ***Storage and handling of sodium hydroxide, sulfuric acid, gasoline, and hydrazine.***

**Groundwater Management Zone Application for West Ash Pond Complex
Wood River Power Station, Alton, Illinois**



5. Has the facility generated, stored or treated hazardous waste as defined by the Resource Conservation and Recovery Act? Yes No
If the answer to this question is "yes" generally describe these operations. **Generation and/or storage of sodium hydroxide, sulfuric acid, and hydrazine.**
6. Has the facility conducted operations which involved the processing, storage or handling of petroleum? Yes No If the answer to this question is "yes" generally describe these operations. **Storage and handling of diesel fuel, gasoline, and lubricating oils.**
7. Has the facility ever held any of the following permits?
- a. Permits for any waste storage, waste treatment or waste disposal operation. Yes No
If the answer to this question is "yes", identify the IEPA permit numbers.
 - b. Interim Status under the Resources Conservation and Recovery Act (filing of a RCRA Part A application). Yes No
If the answer to this question is "yes", attach a copy of the last approved Part A application.
 - c. RCRA Part B Permits. Yes No
If the answer to this question is "yes", identify the permit log number.
8. Has the facility ever conducted the closure of a RCRA hazardous waste management unit? Yes No
9. Have any of the following State or federal government actions taken place for a release at the facility?
- a. Written notification regarding known, suspected or alleged contamination on or emanating from the property (e.g., a Notice pursuant to Section 4(q) of the Environment Protection Act)? Yes No
If the to this question is "yes", identify the caption and date of issuance.
 - b. Consent Decree or Order under RCRA, CERCLA, EPAAct Section 22.2 (State Superfund), or EPAAct Section 21(f) (State RCRA). Yes No
 - c. If either of Items a. or b. were answered by checking "yes", is the notice, order or decree still in effect? Yes No
10. What groundwater classification will the facility be subject to at the completion of the remediation?
Class I Class II Class III Class IV
If more than one Class applies, please explain.
11. Describe the circumstances which the release to groundwater was identified. **Groundwater sampling at the West Ash Pond Complex was initiated in 1984; however, consistent data collection began in 1996. Exceedances of Class I groundwater quality standards associated with releases from the West Ash Pond Complex in monitoring wells include the parameters boron, manganese, and total dissolved solids.**

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate.

Wood River Power Station

Facility Name

1 Chessen Ln, Alton, IL 62002

Location of Facility

1190205002

Illinois EPA Identification Number

Signature of Owner/Operator

Dynegy Midwest Generation, LLC

Name of Owner/Operator

10-19-2014

Date