

**Supplemental Storm Drainage Report
Proposed Affordable Housing Development
Clark Lane
Waterford, Connecticut**

Prepared for

Kingstown Properties LLC

February 5, 2023

Prepared by:

Provost & Rovero, Inc.

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Section 1

Executive Summary

SUPPLEMENTAL NARRATIVE

This supplemental report presents additional information in prepared in response to review comments during the public hearing process before the Waterford Conservation and Inland Wetlands Commission.

HYDROLOGIC ANALYSIS

The design of the detention basin and bioretention basin have been revised. The previously submitted hydrologic model did not account for any stormwater detention provided by the bioretention basin. The detailed hydrologic calculations presented in Section 4 include the detention effects of the bioretention basin and reflect ground cover and elevation adjustments in the model. The following is a summary of existing and proposed peak flow rates at the analysis point:

<u>Storm Event</u>	<u>Existing Peak Flow (cfs)</u>	<u>Proposed Peak Flow (cfs)</u>
2 year	36.89	31.56
5 year	67.20	57.96
10 year	87.01	75.20
25 year	114.72	99.40
50 year	136.23	126.74
100 year	165.57	162.75

The following is a summary of proposed peak flow rates at the detention basin discharge:

<u>Storm Event</u>	<u>Proposed Peak Flow (cfs)</u>
2 year	1.98
5 year	2.95
10 year	3.46
25 year	7.60
50 year	14.15
100 year	23.78

The detention basin outlet is equipped with a riprap lined plunge pool and concrete weir level spreader. The discharge from the detention basin during a 100 year storm was analyzed to ensure that the level spreader would not result in erosive flow velocities. The 100 year detention basin discharge is 23.78 cfs which will result in a flow velocity from the level spreader of 1.70 ft/sec. Per the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, the allowable velocity for sandy loam soils consistent with those observed on site is 2.5 ft/sec. Based on this analysis, downstream erosion of native soils is not anticipated as a result of the detention basin discharge.

Detailed hydrologic calculations are presented in Section 4.

WATER QUALITY DESIGN

The design of the bioretention basin has been revised to reflect 2020 guidance from the University of New Hampshire Stormwater Center. The revised basin design is enhanced with an internal storage reservoir (ISR) which essentially functions as a subsurface gravel wetland system below the biofiltration system. The primary benefit of the ISR system is enhanced nitrogen

removal. Additionally, the bioretention soil mix has been revised to further enhance phosphorus removal. Actual removal rates for nitrogen and phosphorus are anticipated to be approximately 85% and 87% respectively based on testing by the UNHSC. Revised design and sizing calculations are presented in Section 3.

STORM SEWER DESIGN

Revised storm sewer summary calculations are presented in Section 2.

TEMPORARY EROSION AND SEDIMENTATION CONTROL DESIGN

The temporary sediment basin has been revised to coincide with the updated hydrologic cover conditions and the permanent configuration of the stormwater basins. Revised design calculations are presented in Section 5.

Section 2

Storm Sewer Design Calculations

Upstream Node	Downstream Node	Diameter (in)	Material	Manning's n	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Upstream Rim Elev (ft)	Upstream HGL (ft)	Downstream Rim Elev (ft)	Downstream HGL (ft)	Slope (%)	Total Flow (cfs)	Maximum Flow (cfs)	Peak Time (min)	Upstream Velocity (fps)	Downstream Velocity (fps)
DMH 103	FES 102	36.00	CPP	0.012	51.99	91.00	90.30	104.00	92.01	95.00	91.31	1.35	20.54	90.43	26.08	9.81	9.81
SC 104	DMH 103	24.00	CPP	0.012	112.28	96.30	95.70	103.80	98.34	104.00	97.33	0.53	20.67	19.32	25.99	6.58	7.54
CB 107	SC 104	24.00	CPP	0.012	54.60	96.60	96.30	104.54	99.09	103.80	98.74	0.55	19.68	19.59	25.73	6.26	6.26
CB 108	CB 107	24.00	CPP	0.012	97.05	97.10	96.60	106.53	100.23	104.54	99.64	0.52	19.26	18.97	25.59	6.13	6.13
CB 111	CB 108	24.00	CPP	0.012	255.02	98.30	97.10	104.55	102.08	106.53	100.55	0.47	19.01	18.13	25.34	6.05	6.05
DMH 113	CB 111	24.00	CPP	0.012	125.07	98.90	98.30	105.84	102.61	104.55	102.25	0.48	13.25	18.31	24.66	4.22	4.22
DMH 116	DMH 113	24.00	CPP	0.012	145.11	99.60	98.90	107.52	102.88	105.84	102.73	0.48	7.79	18.36	24.19	2.48	2.48
CB 117	DMH 116	24.00	CPP	0.012	296.95	101.00	99.60	104.69	103.22	107.52	102.89	0.47	8.14	18.15	23.24	2.59	2.59
CB 119	CB 117	15.00	CPP	0.012	196.76	104.50	101.00	108.35	105.28	104.69	103.25	1.78	3.72	10.07	21.33	4.62	3.03
CB 121	CB 119	15.00	CPP	0.012	133.41	108.00	104.50	111.33	108.49	108.35	105.37	2.62	1.53	12.23	10.34	3.43	1.68
CB 122	CB 121	15.00	CPP	0.012	24.00	108.20	108.00	111.33	108.58	111.33	108.58	0.83	0.96	6.89	9.47	2.99	1.71
CB 120	CB 119	15.00	CPP	0.012	24.00	104.70	104.50	108.35	105.37	108.35	105.37	0.83	1.64	6.89	10.34	2.53	1.80
CB 118	CB 117	15.00	CPP	0.012	24.00	101.20	101.00	104.69	103.32	104.69	103.25	0.83	3.79	6.89	21.33	3.09	3.09
DMH 114	DMH 113	18.00	CPP	0.012	86.04	102.40	101.90	108.00	103.35	105.84	102.85	0.58	6.34	9.36	24.19	5.37	5.37
DMH 115	DMH 114	15.00	CPP	0.012	24.29	108.98	104.00	112.00	109.36	108.00	104.38	20.50	6.34	34.18	19.12	20.19	20.19
CB 112	CB 111	15.00	CPP	0.012	24.00	100.65	100.55	104.55	102.37	104.55	102.25	0.42	5.00	4.87	24.66	4.07	4.07
CB 109	CB 108	15.00	CPP	0.012	50.05	98.35	98.10	107.15	100.56	106.53	100.55	0.50	0.93	5.33	25.34	0.75	0.75
CB 110	CB 109	15.00	CPP	0.012	24.00	103.50	103.25	107.15	103.72	107.15	103.47	1.04	0.46	7.70	5.12	3.28	3.28
CB 105	SC 104	24.00	CPP	0.012	41.32	98.70	96.30	102.82	99.08	103.80	98.74	5.81	1.19	63.71	25.73	2.90	0.38
CB 106	CB 105	24.00	CPP	0.012	24.00	98.90	98.70	102.82	99.16	102.82	99.11	0.83	0.58	24.13	6.00	2.40	1.26

Section 3

Water Quality Design Calculations

Provost & Rovero, Inc.

P.O. Box 191, 57 East Main Street Plainfield, CT 06374

Telephone (860) 230-0856

Fax (860) 230-0860

Job: 213009 - Water Quality Design

Sheet No. 1 of 1

Calculated by: DJH Date: 2/5/23

Checked by: _____ Date: _____

Scale: _____

Retention basin design

Base design on 2020 information from UNHSC

Impervious area draining to basin = 5.29 ac.

Storage capacity of basin:

Surface ponding storage

<u>Elevation (ft)</u>	<u>Area (ft²)</u>	<u>Volume (ft³)</u>	
95	9,768		
		10,308	19,945 ft ³
96	10,848		WQV @ 96.86
		11,408	
97	11,968		
		<u>$\Sigma = 21,716 \text{ ft}^3$</u>	

BSM void storage volume

$$\text{Volume} = (9,768 \text{ ft}^2) (1.5 \text{ ft thick}) (0.3 \text{ void ratio}) = 4,396 \text{ ft}^3$$

ISR void storage volume + Stone filter void storage volume

$$\text{Volume} = (9,768 \text{ ft}^2) (2.1 \text{ ft thick}) (0.4 \text{ void ratio}) = 8,205 \text{ ft}^3$$

$$\text{Total Storage Capacity} = 21,716 \text{ ft}^3 + 4,396 \text{ ft}^3 + 8,205 \text{ ft}^3 = 34,317 \text{ ft}^3$$

$$\text{Runoff Depth} = \frac{34,317 \text{ ft}^3}{5.29 \text{ ac. } (43,560 \text{ ft}^2/\text{ac})} = 0.15 \text{ ft} = 1.79''$$

TSS Phosphorus Load Reduction = 100%

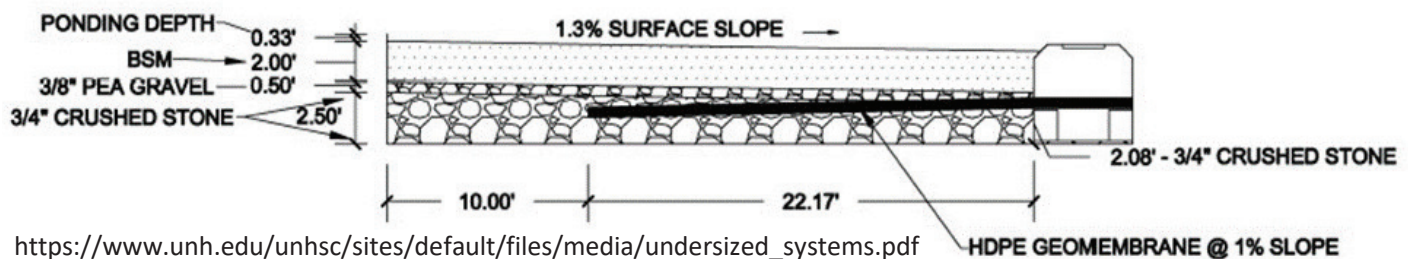
Cumulative Phosphorus Load Reduction = 87%

Cumulative Zinc Phosphorus Load Reduction = ~~85%~~ 98%

Cumulative Nitrogen Load Reduction = 85%

Enhanced Biofiltration with Internal Storage Reservoir (ISR) Factsheet

Enhanced Biofiltration is a practice that provides temporary storage of runoff for filtering through an engineered soil media, augmented for enhanced phosphorus removal, followed by detention and denitrification in a subsurface internal storage reservoir (ISR) comprised of gravel. Runoff flows are routed through filter media and directed to the underlying ISR via an impermeable membrane for temporary storage. An elevated outlet control at the top of the ISR is designed to provide a retention time of at least 24 hours in the system to allow for sufficient time for denitrification and nitrogen reduction to occur prior to discharge. The design storage capacity for using the cumulative performance curves is comprised of void spaces in the filter media, temporary ponding at the surface of the practice and the void spaces in the gravel ISR. The cumulative phosphorus load reduction curve for this control is intended to be used for systems in which the filter media has been augmented with materials designed and/or known to be effective at capturing phosphorus. If the filter media is not augmented to enhance phosphorus capture, then the phosphorus performance curve for the Bio-Filter should be used for estimating phosphorus load reductions. The University of New Hampshire Stormwater Center (UNHSC) developed the design of this control practice and a design templated can be found at UNHSC's website.



Pollutant Export Rate by Land Use¹

Source Category by Land Use	Land Surface Cover	P Load Export Rate ¹ (lbs./acre/year)	N Load Export Rate ² (lbs./acre/year)
Commercial (COM) and Industrial (IND)	Directly connected impervious	1.78	15
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32	14.1
Medium-Density Residential (MDR)	Directly connected impervious	1.96	14.1
Low-Density Residential (LDR) - "Rural"	Directly connected impervious	1.52	14.1

General Equations

¹ From NH Small MS4 General Permit, Appendix F

Physical Storage Capacity: Depth of Runoff * Drainage Area
Cost: Physical Storage Capacity * Cost Index * Adjustment Factor ¹
Yearly Pollutant Removal: Pollutant Load Export Rate * Drainage Area * Efficiency

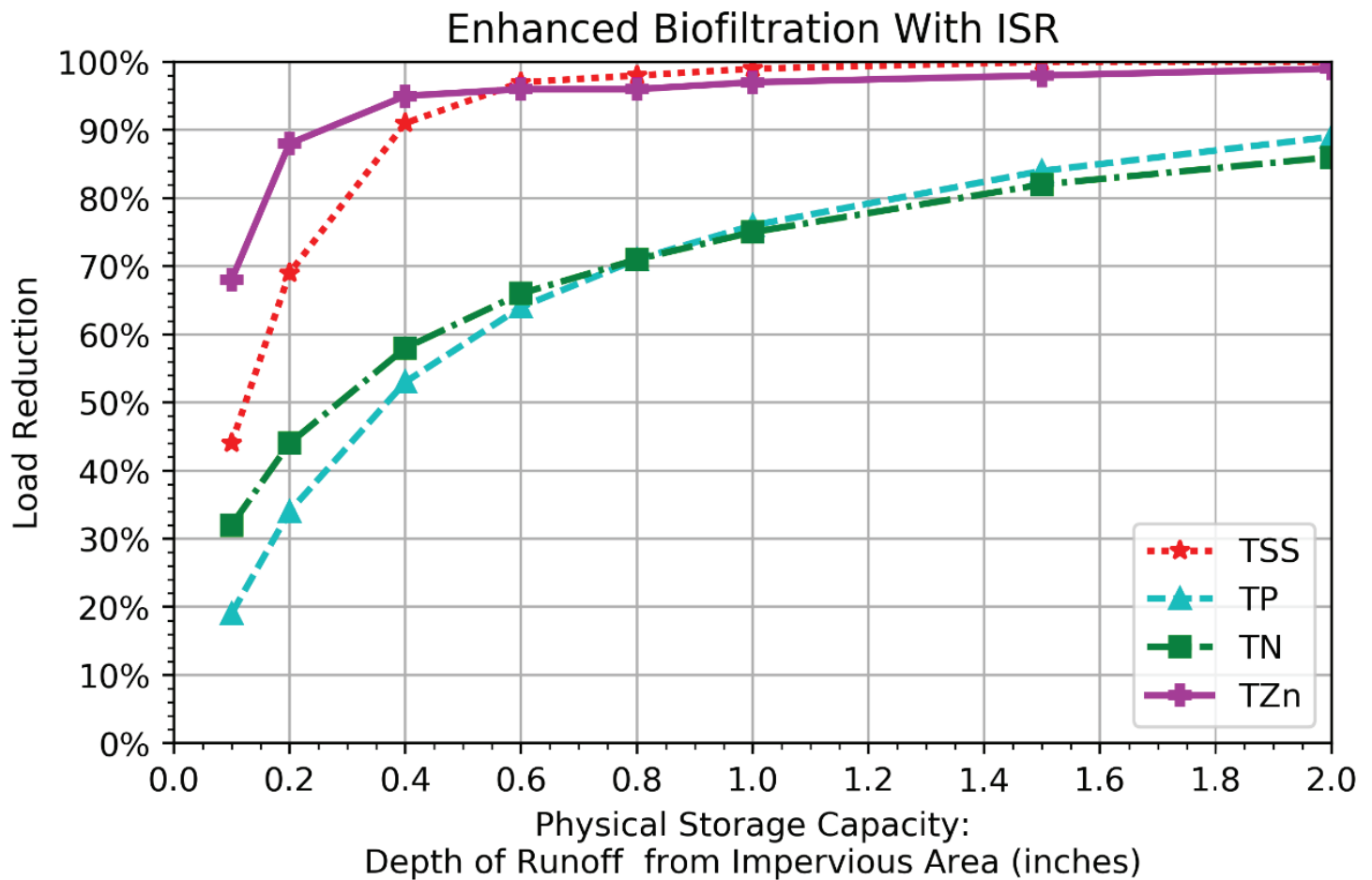
Cost

	Materials and Installation Cost (\$/ft ³) (2020)	Design Cost (\$/ft ³) (2020)	Total Cost (\$/ft ³) (2020) ^{1,2}
Rural	10.42	5.61	16.02
Mixed	20.83	11.22	32.05
Urban	31.25	16.83	48.07

¹ EPA Memorandum "Methodology for developing cost estimates for Opti-Tool." February 20, 2016

² Converted from 2010 to 2020 dollars using U.S. Department of Labor (USDOL). (2012). Bureau of Labor Statistics consumer price index inflation calculator. http://www.bls.gov/data/inflation_calculator.htm

BMP Performance Curve for Enhanced Biofiltration w/ ISR



Enhanced Biofiltration w/ ISR BMP Performance Table: Long-Term Phosphorus & Nitrogen Load Reduction								
BMP Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative TSS Phosphorus Load Reduction	44%	69%	91%	97%	98%	99%	100%	100%
Cumulative Phosphorus Load Reduction	19%	34%	53%	64%	71%	76%	84%	89%
Cumulative Nitrogen Load Reduction	32%	44%	58%	66%	71%	75%	82%	86%
Cumulative Zinc Phosphorus Load Reduction	68%	88%	95%	96%	96%	97%	98%	99%

WATER QUALITY OUTLET ORIFICE

Type III 24-hr 2 year Rainfall=3.20"

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Printed 2/5/2023

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Summary for Pond 1P: Bioretention Basin

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.20 cfs @ 0.00 hrs, Volume= 0.456 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.20 cfs @ 0.00 hrs, Volume= 0.456 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Starting Elev= 96.86' Surf.Area= 11,330 sf Storage= 19,844 cf

Peak Elev= 96.86' @ 0.00 hrs Surf.Area= 11,330 sf Storage= 19,844 cf

Plug-Flow detention time= (not calculated: no plugs found)

Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	21,436 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	9,768	0	0
96.00	10,848	10,308	10,308
97.00	11,408	11,128	21,436

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	2.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.20 cfs @ 0.00 hrs HW=96.86' (Free Discharge)↑**1=Orifice/Grate** (Orifice Controls 0.20 cfs @ 9.04 fps)

WATER QUALITY OUTLET ORIFICE

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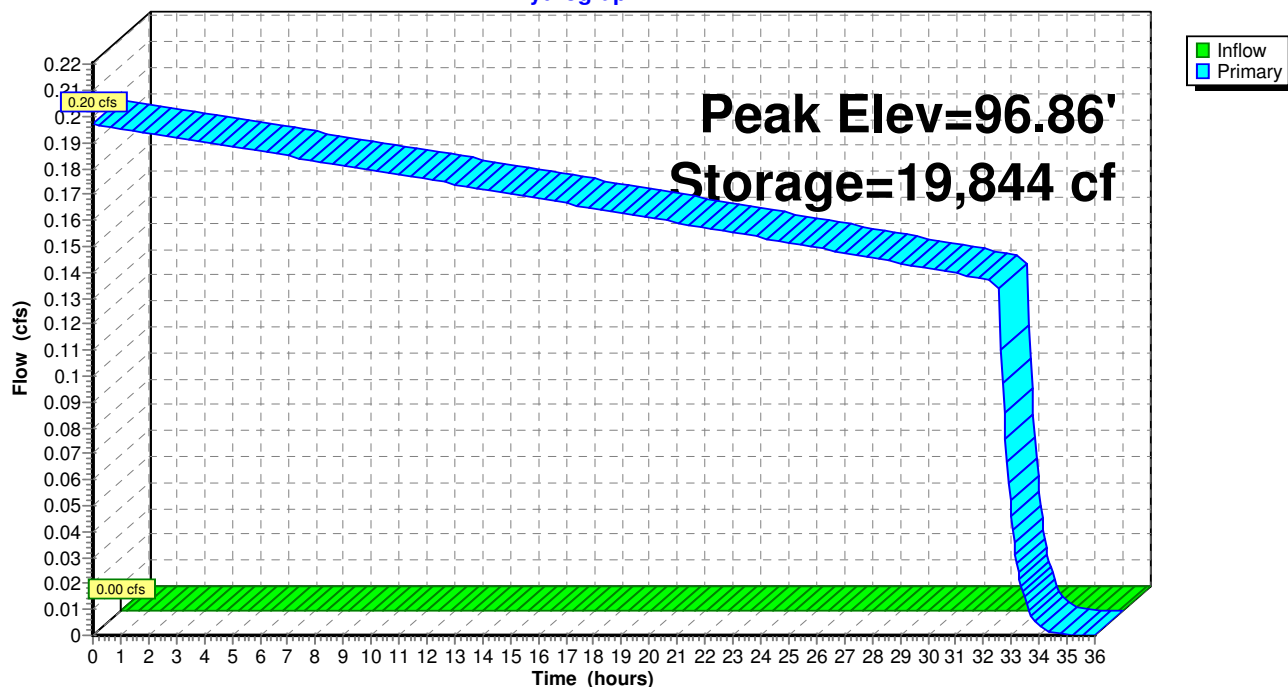
Type III 24-hr 2 year Rainfall=3.20"

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Pond 1P: Bioretention Basin

Hydrograph



WATER QUALITY OUTLET ORIFICE*Type III 24-hr 2 year Rainfall=3.20"*

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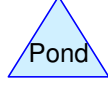
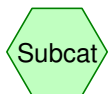
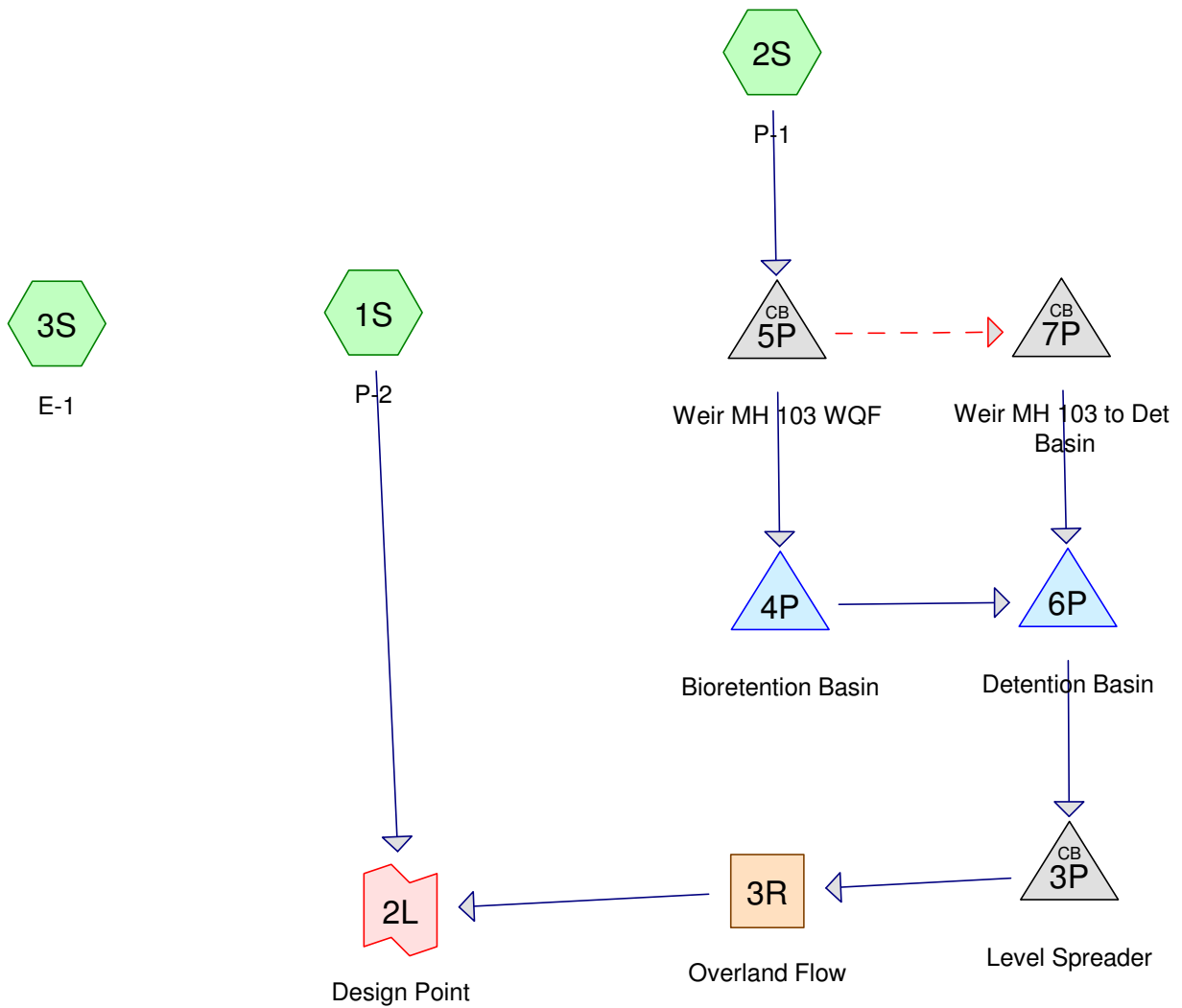
Page 3

Hydrograph for Pond 1P: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	19,844	96.86	0.20
1.00	0.00	19,137	96.80	0.20
2.00	0.00	18,437	96.74	0.19
3.00	0.00	17,742	96.67	0.19
4.00	0.00	17,054	96.61	0.19
5.00	0.00	16,373	96.55	0.19
6.00	0.00	15,698	96.49	0.19
7.00	0.00	15,029	96.43	0.18
8.00	0.00	14,367	96.37	0.18
9.00	0.00	13,711	96.31	0.18
10.00	0.00	13,061	96.25	0.18
11.00	0.00	12,419	96.19	0.18
12.00	0.00	11,782	96.14	0.18
13.00	0.00	11,153	96.08	0.17
14.00	0.00	10,529	96.02	0.17
15.00	0.00	9,913	95.96	0.17
16.00	0.00	9,303	95.91	0.17
17.00	0.00	8,699	95.85	0.17
18.00	0.00	8,103	95.79	0.16
19.00	0.00	7,513	95.74	0.16
20.00	0.00	6,930	95.68	0.16
21.00	0.00	6,353	95.63	0.16
22.00	0.00	5,784	95.57	0.16
23.00	0.00	5,221	95.52	0.16
24.00	0.00	4,666	95.47	0.15
25.00	0.00	4,117	95.41	0.15
26.00	0.00	3,575	95.36	0.15
27.00	0.00	3,040	95.31	0.15
28.00	0.00	2,513	95.25	0.15
29.00	0.00	1,992	95.20	0.14
30.00	0.00	1,479	95.15	0.14
31.00	0.00	973	95.10	0.14
32.00	0.00	474	95.05	0.14
33.00	0.00	66	95.01	0.05
34.00	0.00	5	95.00	0.00
35.00	0.00	0	95.00	0.00
36.00	0.00	0	95.00	0.00

Section 4

Hydrologic Analysis Calculations



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Project Notes

CarlsonStageIncrement|1.0000|

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
21.549	39	>75% Grass cover, Good, HSG A (1S, 3S)
6.976	61	>75% Grass cover, Good, HSG B (1S, 3S)
46.790	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S)
1.996	80	>75% Grass cover, Good, HSG D (1S, 3S)
22.152	98	Paved parking HSG A (1S, 3S)
1.644	98	Paved parking HSG B (1S, 3S)
19.305	98	Paved parking HSG C (1S, 2S, 3S)
1.046	98	Paved parking HSG D (1S, 3S)
7.008	30	Woods, Good, HSG A (1S, 3S)
7.864	55	Woods, Good, HSG B (1S, 3S)
41.589	70	Woods, Good, HSG C (1S, 2S, 3S)
21.166	77	Woods, Good, HSG D (1S, 3S)
3.956	72	Woods/grass comb., Good, HSG C (1S, 2S, 3S)
0.402	79	Woods/grass comb., Good, HSG D (1S, 3S)
203.443	72	TOTAL AREA

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
50.709	HSG A	1S, 3S
16.484	HSG B	1S, 3S
111.640	HSG C	1S, 2S, 3S
24.610	HSG D	1S, 3S
0.000	Other	
203.443		TOTAL AREA

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
21.549	6.976	46.790	1.996	0.000	77.311	>75% Grass cover, Good	1S, 2S, 3S
22.152	1.644	19.305	1.046	0.000	44.147	Paved parking	1S, 2S, 3S
7.008	7.864	41.589	21.166	0.000	77.627	Woods, Good	1S, 2S, 3S
0.000	0.000	3.956	0.402	0.000	4.358	Woods/grass comb., Good	1S, 2S, 3S
50.709	16.484	111.640	24.610	0.000	203.443	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	5P	95.40	95.00	70.0	0.0057	0.013	12.0	0.0	0.0
2	6P	90.25	90.00	44.0	0.0057	0.012	30.0	0.0	0.0
3	6P	90.30	90.25	5.0	0.0100	0.012	10.0	0.0	0.0
4	7P	91.00	90.00	50.0	0.0200	0.013	36.0	0.0	0.0

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: P-2Runoff Area=87.970 ac 20.82% Impervious Runoff Depth=0.88"
Flow Length=4,420' Tc=68.3 min CN=71 Runoff=29.66 cfs 6.437 af**Subcatchment 2S: P-1**Runoff Area=13.736 ac 38.54% Impervious Runoff Depth=1.61"
Tc=26.0 min CN=83 Runoff=15.55 cfs 1.842 af**Subcatchment 3S: E-1**Runoff Area=101.737 ac 20.18% Impervious Runoff Depth=0.93"
Flow Length=4,420' Tc=68.3 min CN=72 Runoff=36.89 cfs 7.882 af**Reach 3R: Overland Flow**Avg. Flow Depth=0.04' Max Vel=1.05 fps Inflow=1.98 cfs 1.383 af
n=0.400 L=760.0' S=0.0368 '/' Capacity=35.52 cfs Outflow=1.98 cfs 1.378 af**Pond 3P: Level Spreader**Peak Elev=90.05' Inflow=1.98 cfs 1.383 af
Outflow=1.98 cfs 1.383 af**Pond 4P: Bioretention Basin**Peak Elev=96.90' Storage=20,529 cf Inflow=3.60 cfs 0.809 af
Outflow=0.31 cfs 0.493 af**Pond 5P: Weir MH 103 WQF**Peak Elev=97.21' Inflow=15.55 cfs 1.842 af
Primary=3.60 cfs 0.809 af Secondary=11.95 cfs 1.033 af Outflow=15.55 cfs 1.842 af**Pond 6P: Detention Basin**Peak Elev=91.63' Storage=23,893 cf Inflow=12.21 cfs 1.526 af
Outflow=1.98 cfs 1.383 af**Pond 7P: Weir MH 103 to Det Basin**Peak Elev=92.33' Inflow=11.95 cfs 1.033 af
36.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=11.95 cfs 1.033 af**Link 2L: Design Point**Inflow=31.56 cfs 7.815 af
Primary=31.56 cfs 7.815 af**Total Runoff Area = 203.443 ac Runoff Volume = 16.161 af Average Runoff Depth = 0.95"**
78.30% Pervious = 159.296 ac 21.70% Impervious = 44.147 ac

Summary for Subcatchment 1S: P-2

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 29.66 cfs @ 12.98 hrs, Volume= 6.437 af, Depth= 0.88"

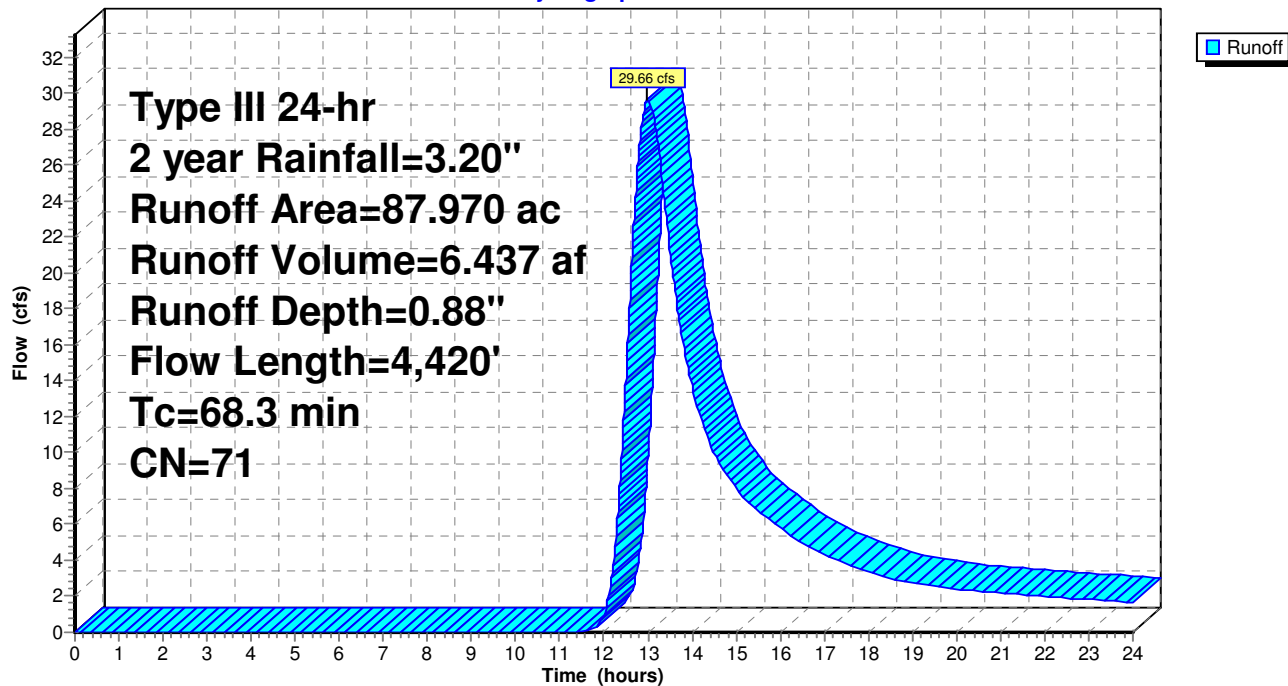
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.20"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.449	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
16.559	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
5.898	98	Paved parking HSG C
10.774	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
18.163	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
87.970	71	Weighted Average
69.651		79.18% Pervious Area
18.319		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 1S: P-2

Hydrograph



Summary for Subcatchment 2S: P-1

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 15.55 cfs @ 12.37 hrs, Volume= 1.842 af, Depth= 1.61"

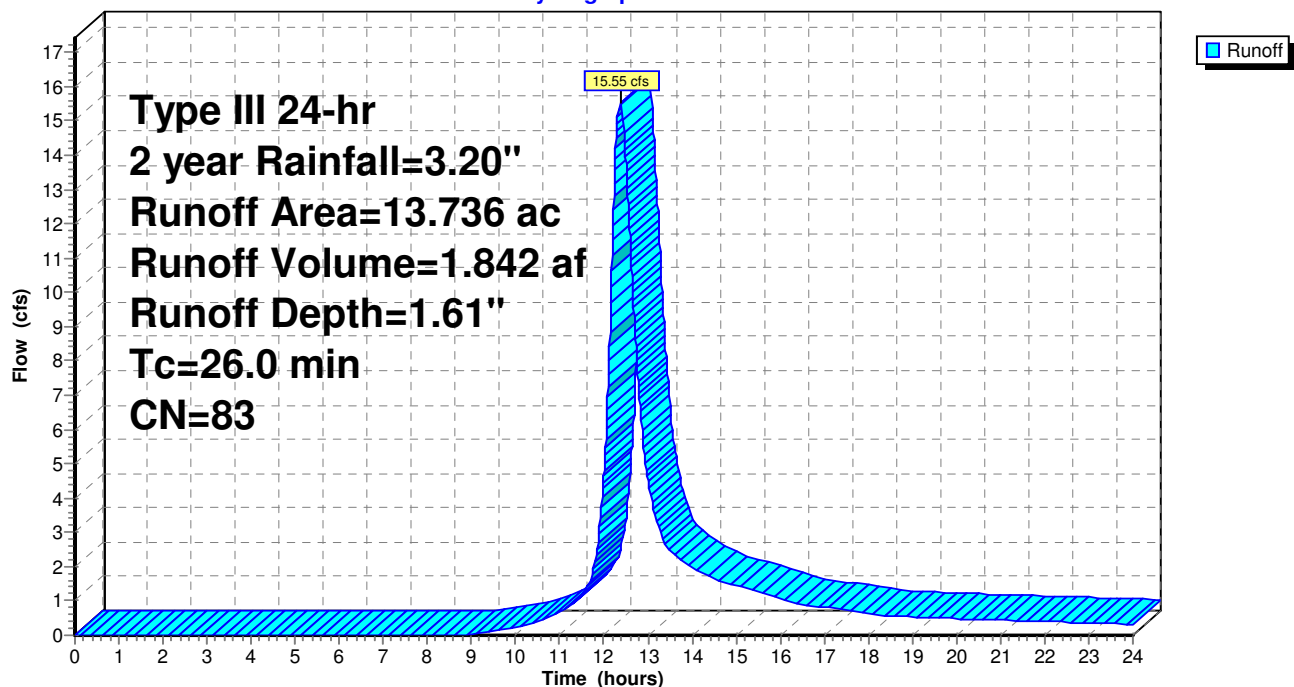
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.20"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
5.294	98	Paved parking HSG C
7.453	74	>75% Grass cover, Good, HSG C
13.736	83	Weighted Average
8.442		61.46% Pervious Area
5.294		38.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-1

Hydrograph



Summary for Subcatchment 3S: E-1

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 36.89 cfs @ 12.98 hrs, Volume= 7.882 af, Depth= 0.93"

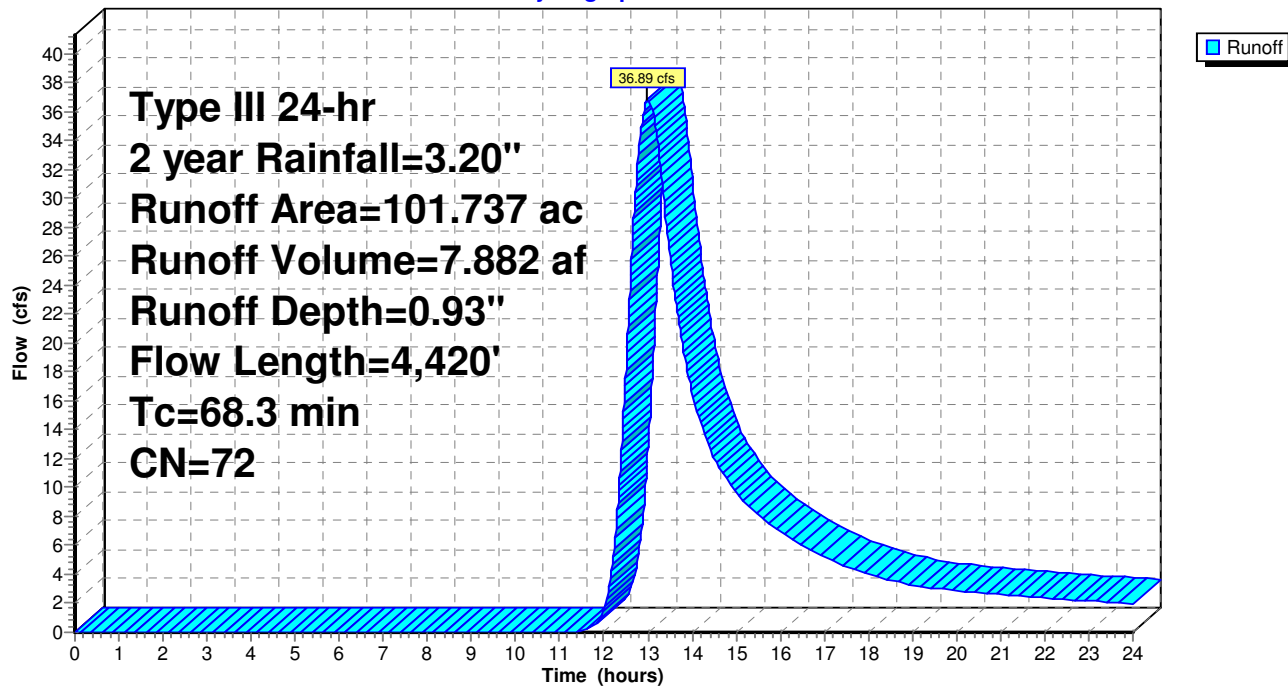
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.20"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.982	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
24.566	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
8.113	98	Paved parking HSG C
10.775	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
21.174	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
101.737	72	Weighted Average
81.203		79.82% Pervious Area
20.534		20.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, watercourse Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 3S: E-1

Hydrograph



Summary for Reach 3R: Overland Flow

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 1.21" for 2 year event
 Inflow = 1.98 cfs @ 13.12 hrs, Volume= 1.383 af
 Outflow = 1.98 cfs @ 13.32 hrs, Volume= 1.378 af, Atten= 0%, Lag= 12.5 min

Routing by Dyn-Muskingum-Cunge method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Reference Flow= 26.64 cfs Estimated Depth= 0.84' Velocity= 0.62 fps

m= 1.648, c= 1.03 fps, dt= 0.6 min, dx= 760.0' / 21 = 36.2', K= 0.6 min, X= 0.309

Max. Velocity= 1.05 fps, Min. Travel Time= 12.1 min

Avg. Velocity= 0.99 fps, Avg. Travel Time= 12.8 min

Peak Storage= 1,469 cf @ 13.23 hrs

Average Depth at Peak Storage= 0.04'

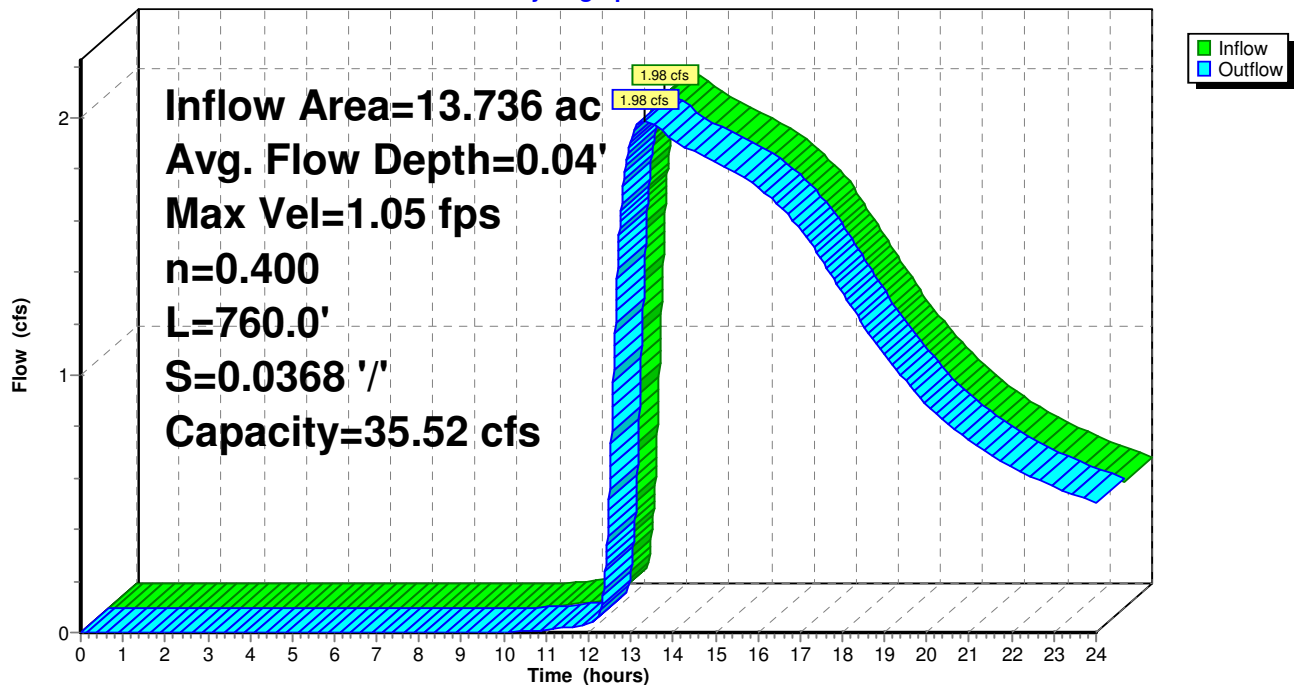
Bank-Full Depth= 1.00' Flow Area= 51.0 sf, Capacity= 35.52 cfs

50.00' x 1.00' deep channel, n= 0.400

Side Slope Z-value= 1.0 '/' Top Width= 52.00'

Length= 760.0' Slope= 0.0368 '/'

Inlet Invert= 88.00', Outlet Invert= 60.00'

**Reach 3R: Overland Flow****Hydrograph**

Summary for Pond 3P: Level Spreader

[57] Hint: Peaked at 90.05' (Flood elevation advised)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 1.21" for 2 year event
 Inflow = 1.98 cfs @ 13.12 hrs, Volume= 1.383 af
 Outflow = 1.98 cfs @ 13.12 hrs, Volume= 1.383 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.98 cfs @ 13.12 hrs, Volume= 1.383 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

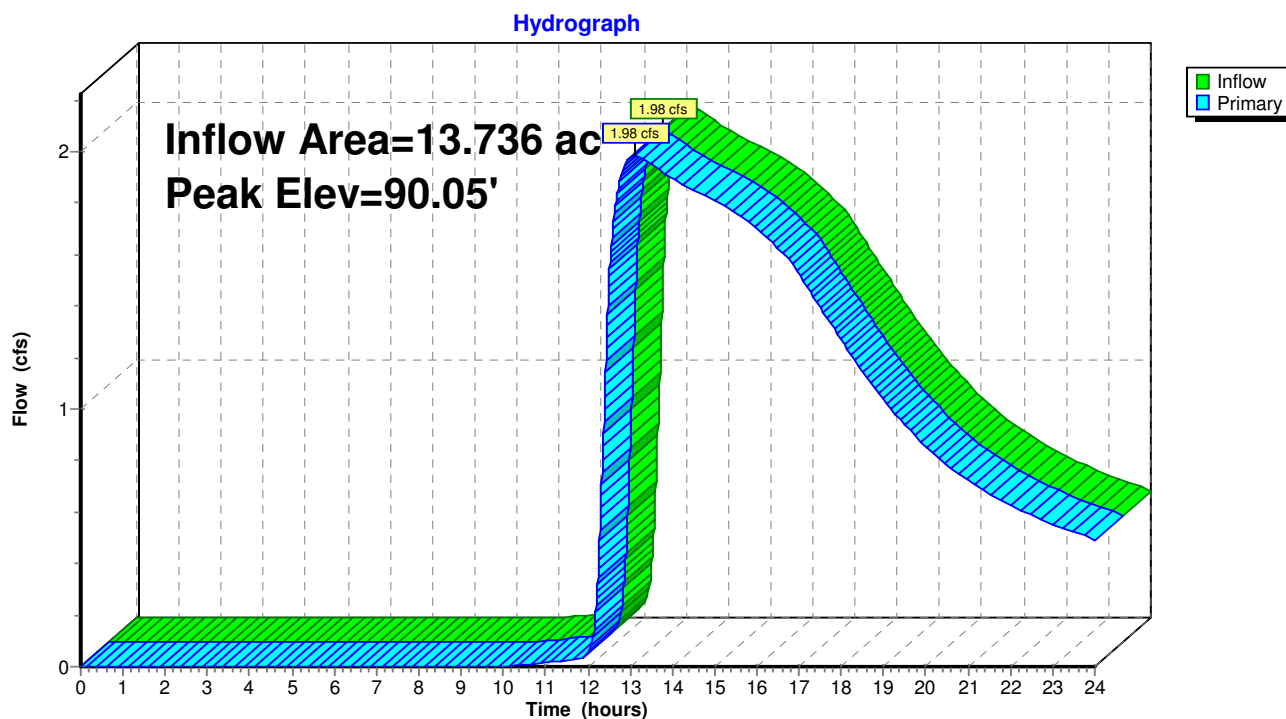
Peak Elev= 90.05' @ 13.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	56.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=1.98 cfs @ 13.12 hrs HW=90.05' TW=88.04' (Dynamic Tailwater)

↑1=Sharp-Crested Rectangular Weir (Weir Controls 1.98 cfs @ 0.73 fps)

Pond 3P: Level Spreader



Summary for Pond 4P: Bioretention Basin

[80] Warning: Exceeded Pond 5P by 1.37' @ 25.07 hrs (2.87 cfs 0.197 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 0.71" for 2 year event
 Inflow = 3.60 cfs @ 12.37 hrs, Volume= 0.809 af
 Outflow = 0.31 cfs @ 14.98 hrs, Volume= 0.493 af, Atten= 91%, Lag= 157.0 min
 Primary = 0.31 cfs @ 14.98 hrs, Volume= 0.493 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 96.90' @ 14.98 hrs Surf.Area= 11,856 sf Storage= 20,529 cf

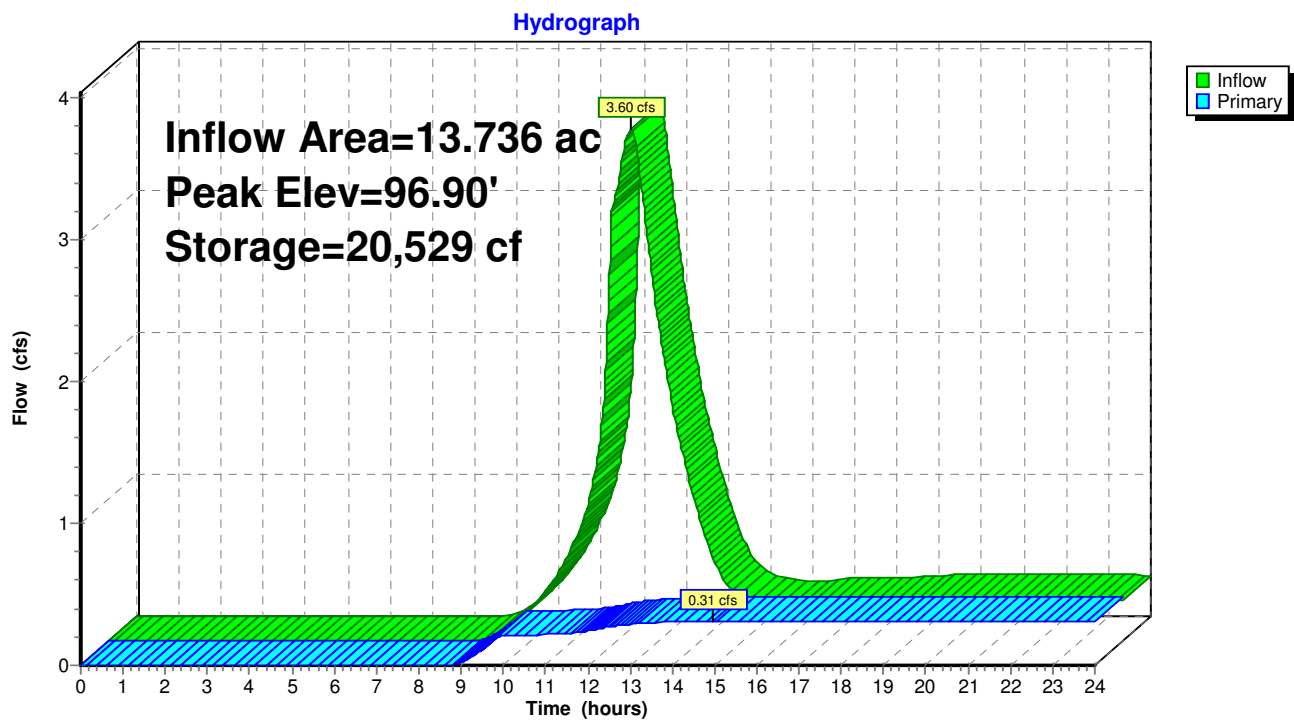
Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 333.4 min (1,201.1 - 867.7)

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	34,250 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	9,768	0	0
96.00	10,848	10,308	10,308
97.00	11,968	11,408	21,716
98.00	13,100	12,534	34,250

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	2.5" Vert. Orifice/Grate C= 0.600
#2	Primary	97.00'	16.0' long x 6.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65			
2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83			

Primary OutFlow Max=0.31 cfs @ 14.98 hrs HW=96.90' TW=91.48' (Dynamic Tailwater)

↑ **1=Orifice/Grate** (Orifice Controls 0.31 cfs @ 9.07 fps)
 — **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Bioretention Basin

Summary for Pond 5P: Weir MH 103 WQF

[57] Hint: Peaked at 97.21' (Flood elevation advised)

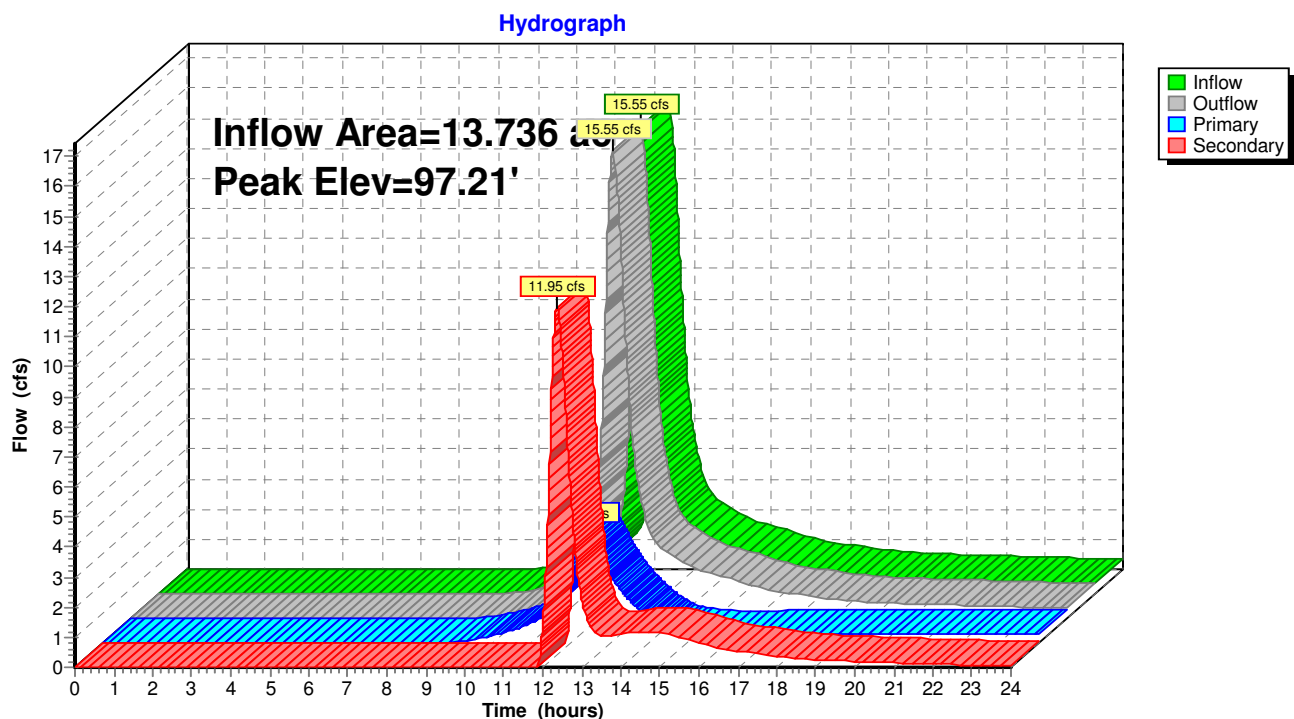
Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 1.61" for 2 year event
 Inflow = 15.55 cfs @ 12.37 hrs, Volume= 1.842 af
 Outflow = 15.55 cfs @ 12.37 hrs, Volume= 1.842 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.60 cfs @ 12.37 hrs, Volume= 0.809 af
 Secondary = 11.95 cfs @ 12.37 hrs, Volume= 1.033 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.21' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	95.40'	12.0" Round Culvert L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.40' / 95.00' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	96.83'	60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.60 cfs @ 12.37 hrs HW=97.21' TW=95.92' (Dynamic Tailwater)
 ↑1=Culvert (Barrel Controls 3.60 cfs @ 4.59 fps)

Secondary OutFlow Max=11.95 cfs @ 12.37 hrs HW=97.21' TW=92.33' (Dynamic Tailwater)
 ↑2=Orifice/Grate (Weir Controls 11.95 cfs @ 2.01 fps)

Pond 5P: Weir MH 103 WQF

Summary for Pond 6P: Detention Basin

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 1.33" for 2 year event
 Inflow = 12.21 cfs @ 12.37 hrs, Volume= 1.526 af
 Outflow = 1.98 cfs @ 13.12 hrs, Volume= 1.383 af, Atten= 84%, Lag= 44.9 min
 Primary = 1.98 cfs @ 13.12 hrs, Volume= 1.383 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 91.63' @ 13.12 hrs Surf.Area= 18,984 sf Storage= 23,893 cf

Plug-Flow detention time= 201.7 min calculated for 1.383 af (91% of inflow)
 Center-of-Mass det. time= 132.9 min (1,088.7 - 955.9)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	122,564 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	16,859	0	0
92.00	19,568	30,963	30,963
94.00	22,870	42,438	73,401
95.00	24,576	23,723	97,124
96.00	26,304	25,440	122,564

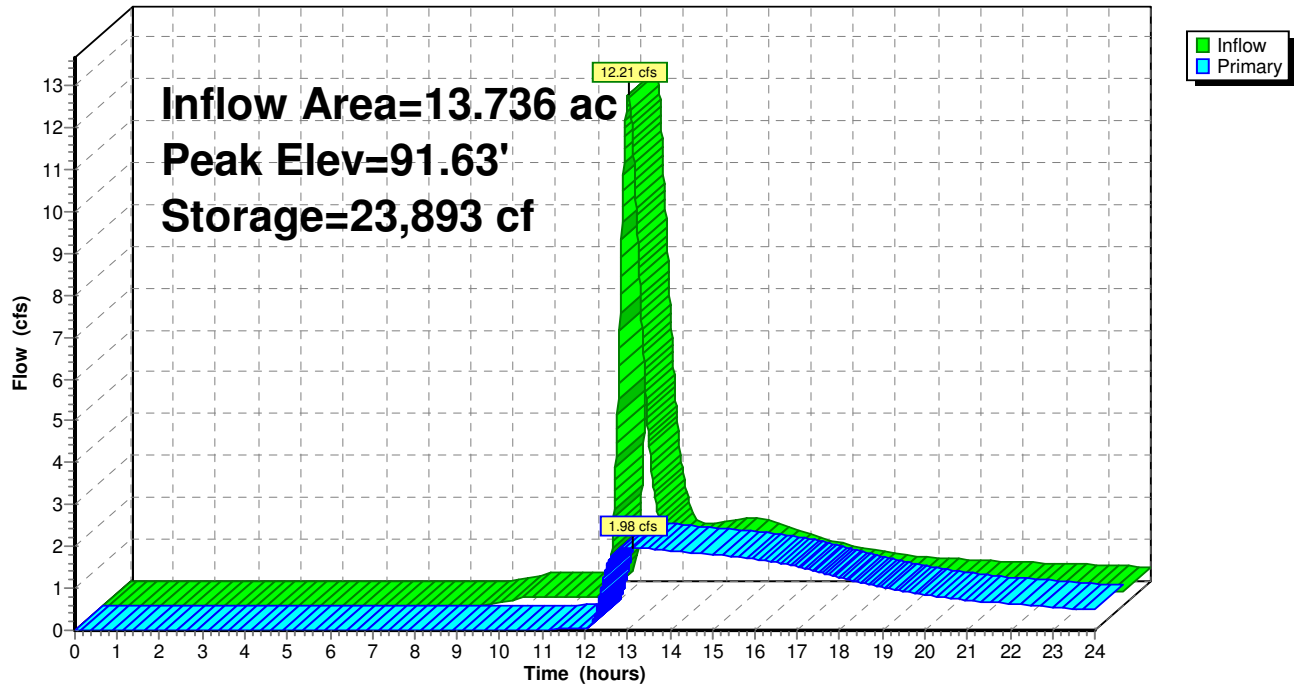
Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	30.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	90.30'	10.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.30' / 90.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	93.90'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=1.98 cfs @ 13.12 hrs HW=91.63' TW=90.05' (Dynamic Tailwater)

1=Culvert (Passes 1.98 cfs of 8.63 cfs potential flow)
 2=Culvert (Inlet Controls 1.98 cfs @ 3.64 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Detention Basin

Hydrograph



Summary for Pond 7P: Weir MH 103 to Det Basin

[57] Hint: Peaked at 92.33' (Flood elevation advised)

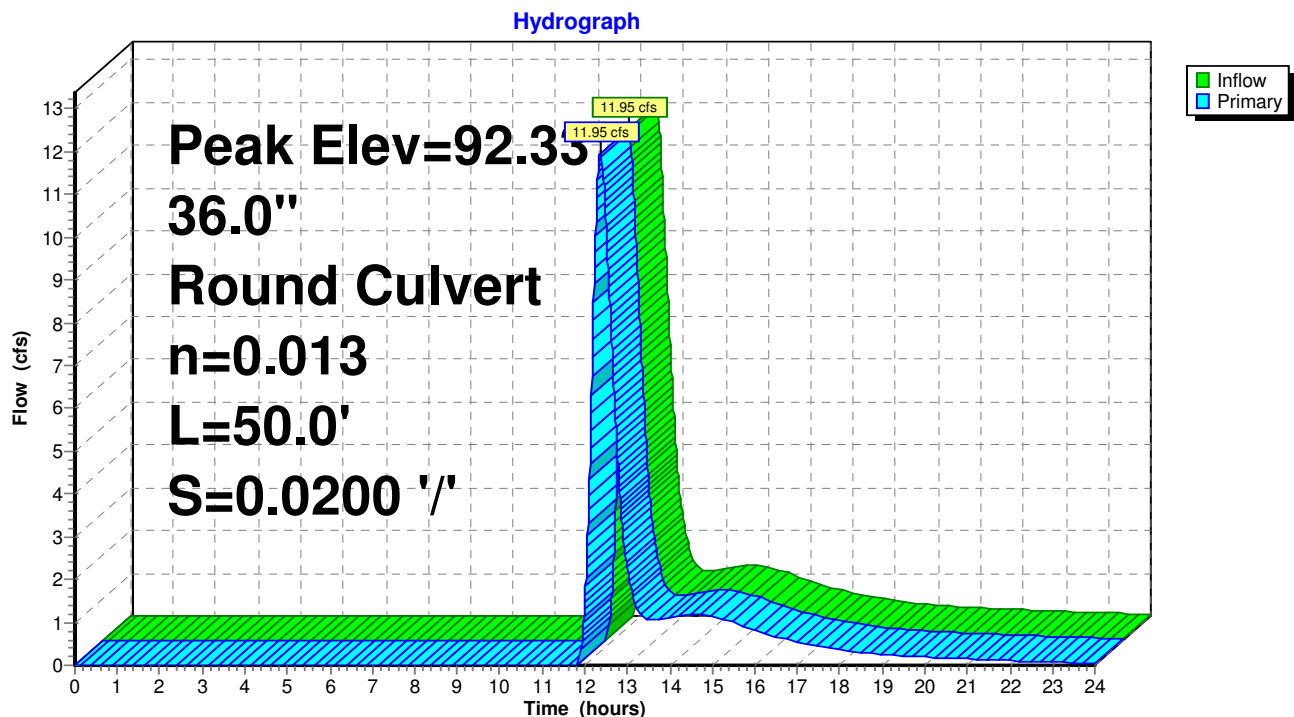
Inflow = 11.95 cfs @ 12.37 hrs, Volume= 1.033 af
 Outflow = 11.95 cfs @ 12.37 hrs, Volume= 1.033 af, Atten= 0%, Lag= 0.0 min
 Primary = 11.95 cfs @ 12.37 hrs, Volume= 1.033 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 92.33' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	91.00'	36.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

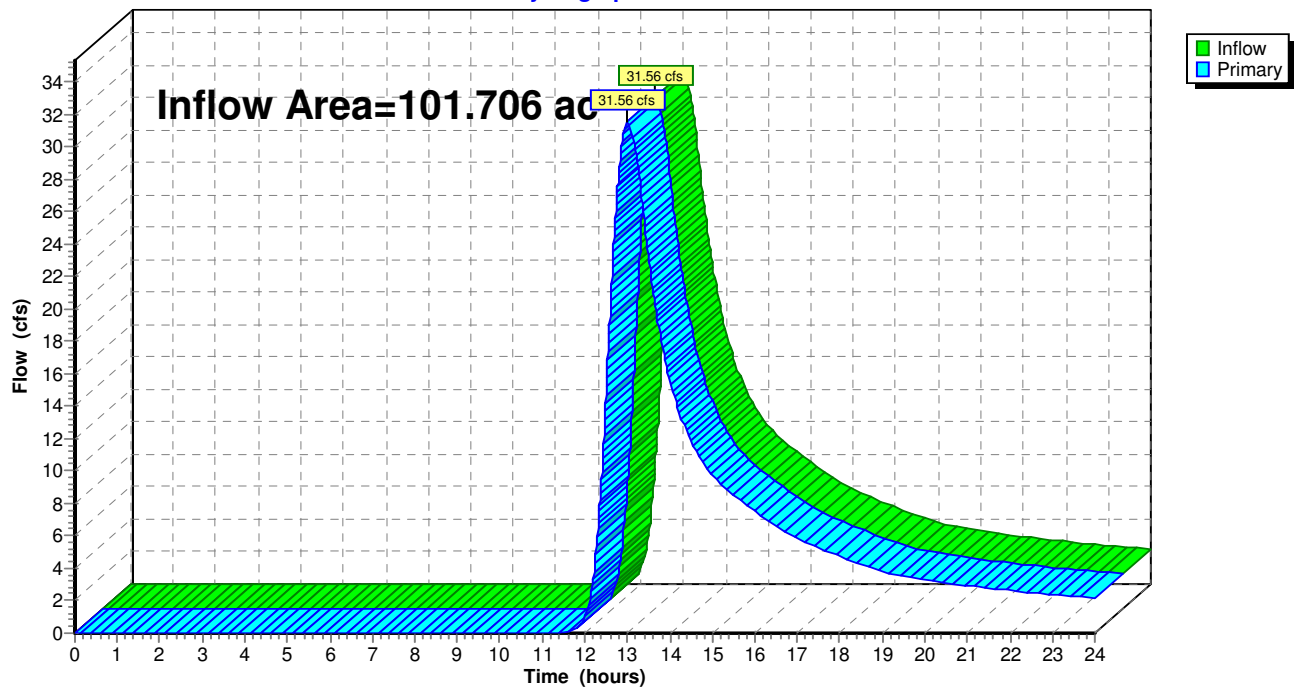
Primary OutFlow Max=11.95 cfs @ 12.37 hrs HW=92.33' TW=90.96' (Dynamic Tailwater)
 ↑1=Culvert (Inlet Controls 11.95 cfs @ 3.93 fps)

Pond 7P: Weir MH 103 to Det Basin

Summary for Link 2L: Design Point

Inflow Area = 101.706 ac, 23.22% Impervious, Inflow Depth > 0.92" for 2 year event
Inflow = 31.56 cfs @ 12.98 hrs, Volume= 7.815 af
Primary = 31.56 cfs @ 12.98 hrs, Volume= 7.815 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Design Point**Hydrograph**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: P-2Runoff Area=87.970 ac 20.82% Impervious Runoff Depth=1.53"
Flow Length=4,420' Tc=68.3 min CN=71 Runoff=55.21 cfs 11.236 af**Subcatchment 2S: P-1**Runoff Area=13.736 ac 38.54% Impervious Runoff Depth=2.46"
Tc=26.0 min CN=83 Runoff=23.87 cfs 2.817 af**Subcatchment 3S: E-1**Runoff Area=101.737 ac 20.18% Impervious Runoff Depth=1.60"
Flow Length=4,420' Tc=68.3 min CN=72 Runoff=67.20 cfs 13.581 af**Reach 3R: Overland Flow**Avg. Flow Depth=0.06' Max Vel=1.05 fps Inflow=2.95 cfs 2.345 af
n=0.400 L=760.0' S=0.0368 '/' Capacity=35.52 cfs Outflow=2.95 cfs 2.339 af**Pond 3P: Level Spreader**Peak Elev=90.06' Inflow=2.95 cfs 2.345 af
Outflow=2.95 cfs 2.345 af**Pond 4P: Bioretention Basin**Peak Elev=96.96' Storage=21,186 cf Inflow=3.35 cfs 0.838 af
Outflow=0.31 cfs 0.518 af**Pond 5P: Weir MH 103 WQF**Peak Elev=97.37' Inflow=23.87 cfs 2.817 af
Primary=3.35 cfs 0.838 af Secondary=20.61 cfs 1.978 af Outflow=23.87 cfs 2.817 af**Pond 6P: Detention Basin**Peak Elev=92.74' Storage=45,921 cf Inflow=20.90 cfs 2.497 af
Outflow=2.95 cfs 2.345 af**Pond 7P: Weir MH 103 to Det Basin**Peak Elev=92.85' Inflow=20.61 cfs 1.978 af
36.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=20.61 cfs 1.978 af**Link 2L: Design Point**Inflow=57.96 cfs 13.574 af
Primary=57.96 cfs 13.574 af**Total Runoff Area = 203.443 ac Runoff Volume = 27.633 af Average Runoff Depth = 1.63"**
78.30% Pervious = 159.296 ac 21.70% Impervious = 44.147 ac

Summary for Subcatchment 1S: P-2

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 55.21 cfs @ 12.98 hrs, Volume= 11.236 af, Depth= 1.53"

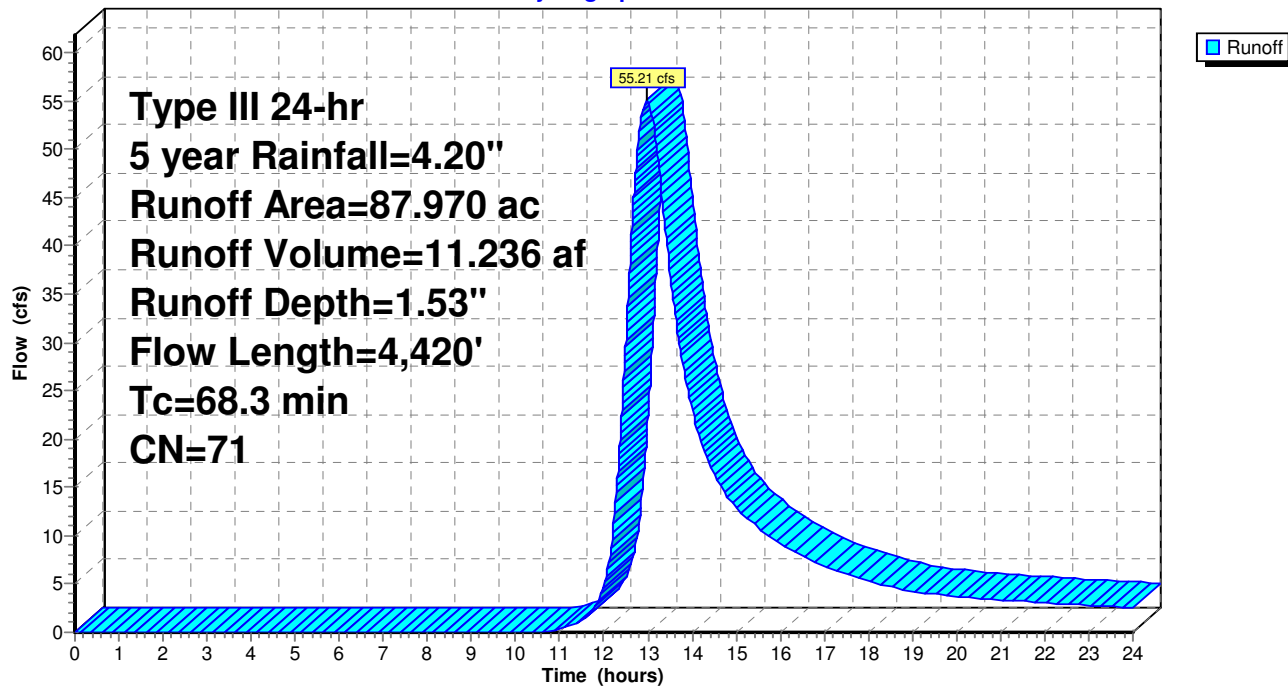
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 5 year Rainfall=4.20"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.449	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
16.559	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
5.898	98	Paved parking HSG C
10.774	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
18.163	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
87.970	71	Weighted Average
69.651		79.18% Pervious Area
18.319		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 1S: P-2

Hydrograph



Summary for Subcatchment 2S: P-1

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 23.87 cfs @ 12.36 hrs, Volume= 2.817 af, Depth= 2.46"

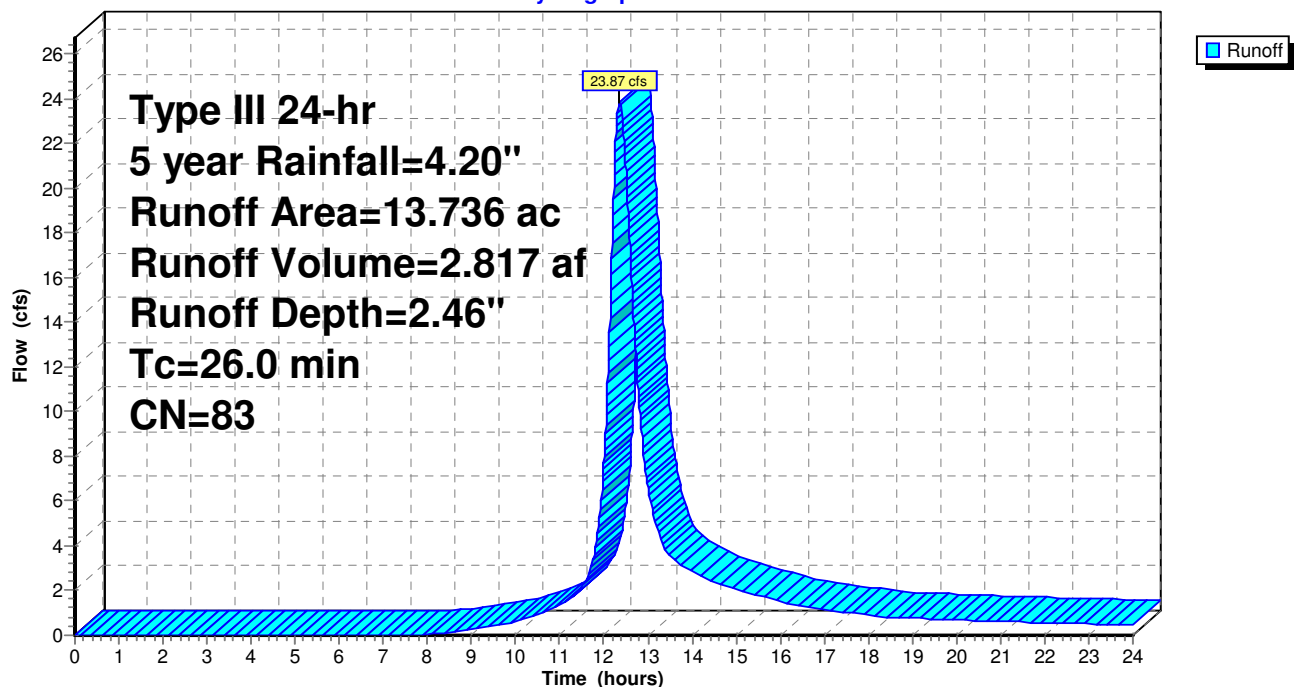
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 5 year Rainfall=4.20"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
5.294	98	Paved parking HSG C
7.453	74	>75% Grass cover, Good, HSG C
13.736	83	Weighted Average
8.442		61.46% Pervious Area
5.294		38.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-1

Hydrograph



Summary for Subcatchment 3S: E-1

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 67.20 cfs @ 12.98 hrs, Volume= 13.581 af, Depth= 1.60"

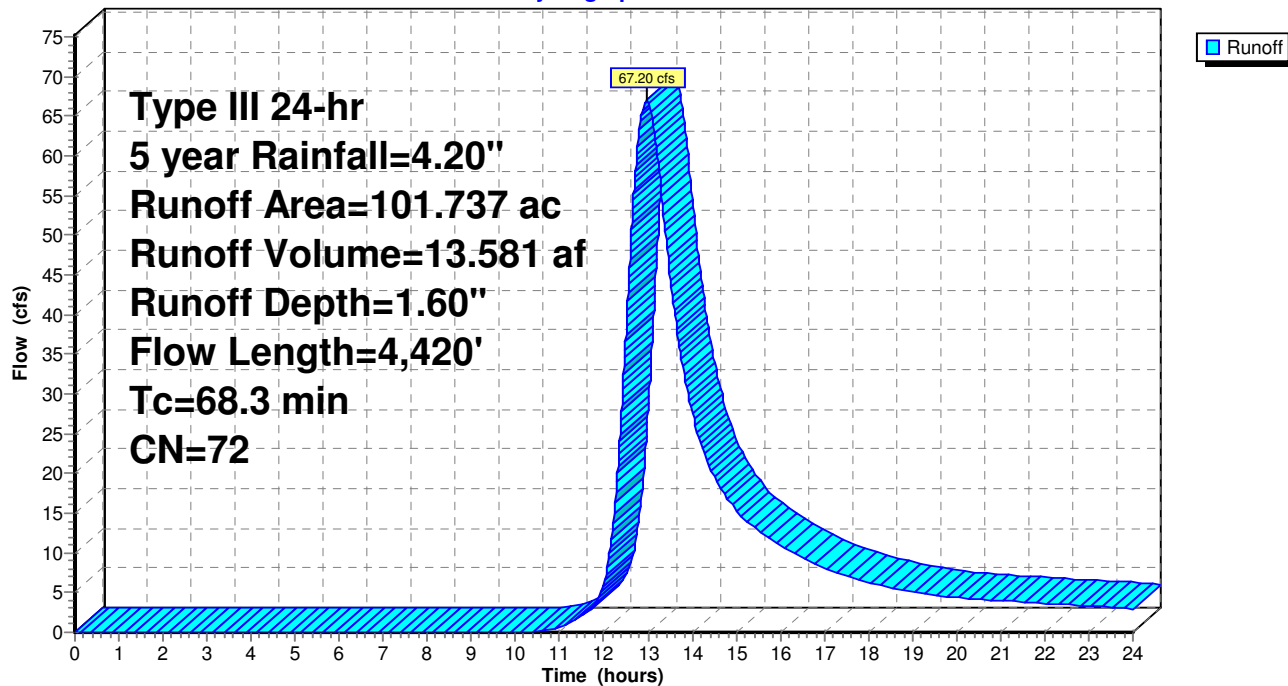
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 5 year Rainfall=4.20"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.982	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
24.566	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
8.113	98	Paved parking HSG C
10.775	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
21.174	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
101.737	72	Weighted Average
81.203		79.82% Pervious Area
20.534		20.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, watercourse Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 3S: E-1

Hydrograph



Summary for Reach 3R: Overland Flow

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 2.05" for 5 year event
 Inflow = 2.95 cfs @ 13.83 hrs, Volume= 2.345 af
 Outflow = 2.95 cfs @ 14.04 hrs, Volume= 2.339 af, Atten= 0%, Lag= 12.3 min

Routing by Dyn-Muskingum-Cunge method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Reference Flow= 26.64 cfs Estimated Depth= 0.84' Velocity= 0.62 fps

m= 1.648, c= 1.03 fps, dt= 0.6 min, dx= 760.0' / 21 = 36.2', K= 0.6 min, X= 0.309

Max. Velocity= 1.05 fps, Min. Travel Time= 12.0 min

Avg. Velocity= 0.99 fps, Avg. Travel Time= 12.8 min

Peak Storage= 2,184 cf @ 13.93 hrs

Average Depth at Peak Storage= 0.06'

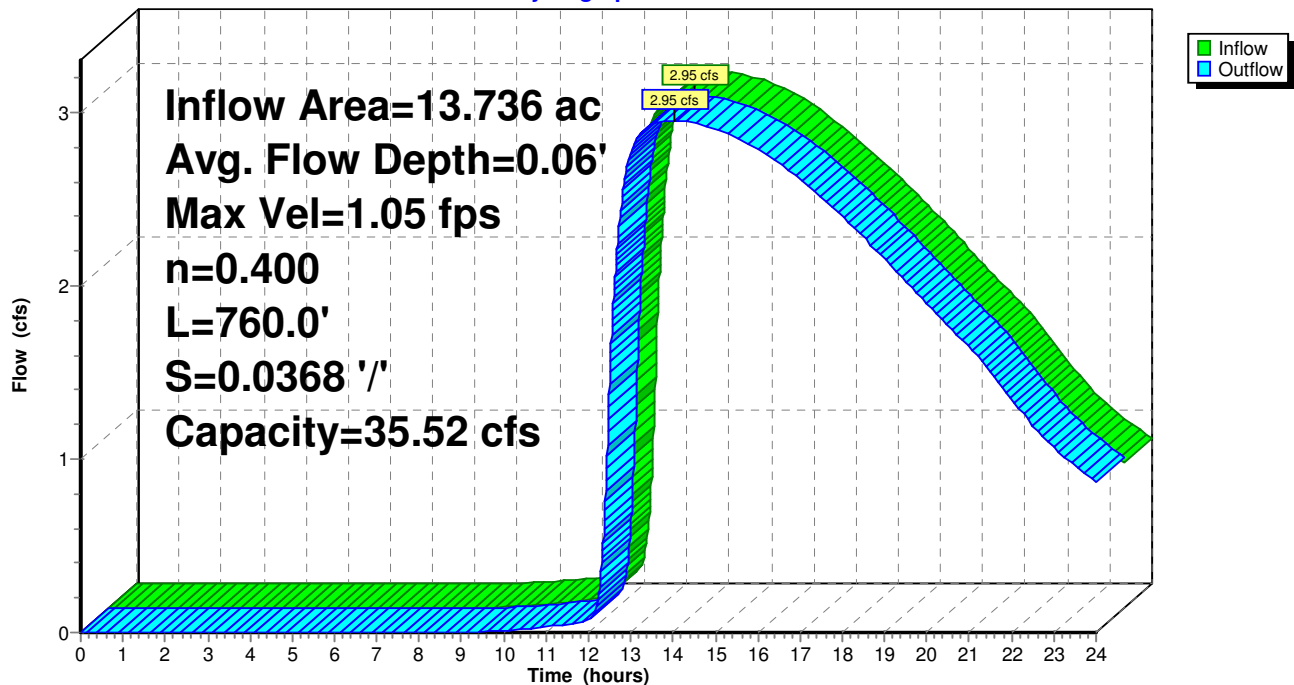
Bank-Full Depth= 1.00' Flow Area= 51.0 sf, Capacity= 35.52 cfs

50.00' x 1.00' deep channel, n= 0.400

Side Slope Z-value= 1.0 '/' Top Width= 52.00'

Length= 760.0' Slope= 0.0368 '/'

Inlet Invert= 88.00', Outlet Invert= 60.00'

**Reach 3R: Overland Flow****Hydrograph**

Summary for Pond 3P: Level Spreader

[57] Hint: Peaked at 90.06' (Flood elevation advised)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 2.05" for 5 year event
 Inflow = 2.95 cfs @ 13.83 hrs, Volume= 2.345 af
 Outflow = 2.95 cfs @ 13.83 hrs, Volume= 2.345 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.95 cfs @ 13.83 hrs, Volume= 2.345 af

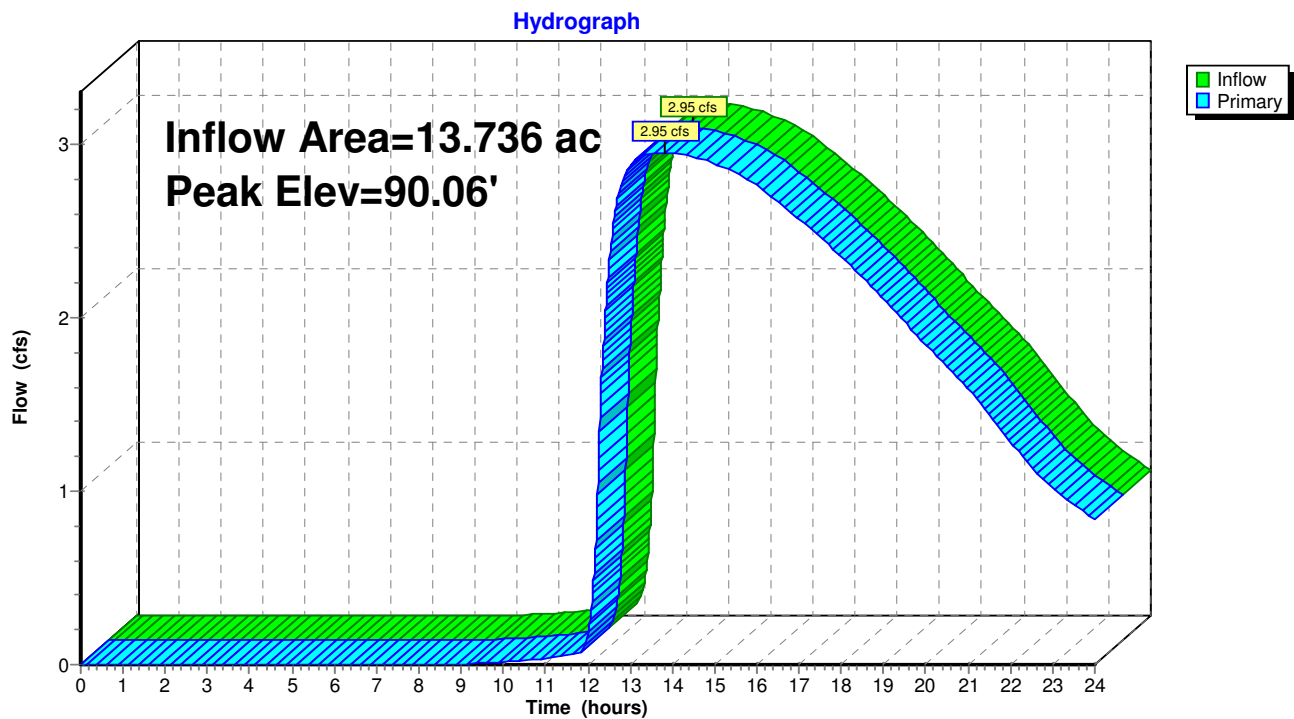
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 90.06' @ 13.83 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	56.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=2.95 cfs @ 13.83 hrs HW=90.06' TW=88.06' (Dynamic Tailwater)

↑1=Sharp-Crested Rectangular Weir (Weir Controls 2.95 cfs @ 0.83 fps)

Pond 3P: Level Spreader

Summary for Pond 4P: Bioretention Basin

[80] Warning: Exceeded Pond 5P by 1.35' @ 25.43 hrs (2.84 cfs 0.161 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 0.73" for 5 year event
 Inflow = 3.35 cfs @ 12.25 hrs, Volume= 0.838 af
 Outflow = 0.31 cfs @ 13.98 hrs, Volume= 0.518 af, Atten= 91%, Lag= 104.3 min
 Primary = 0.31 cfs @ 13.98 hrs, Volume= 0.518 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 96.96' @ 13.98 hrs Surf.Area= 11,918 sf Storage= 21,186 cf

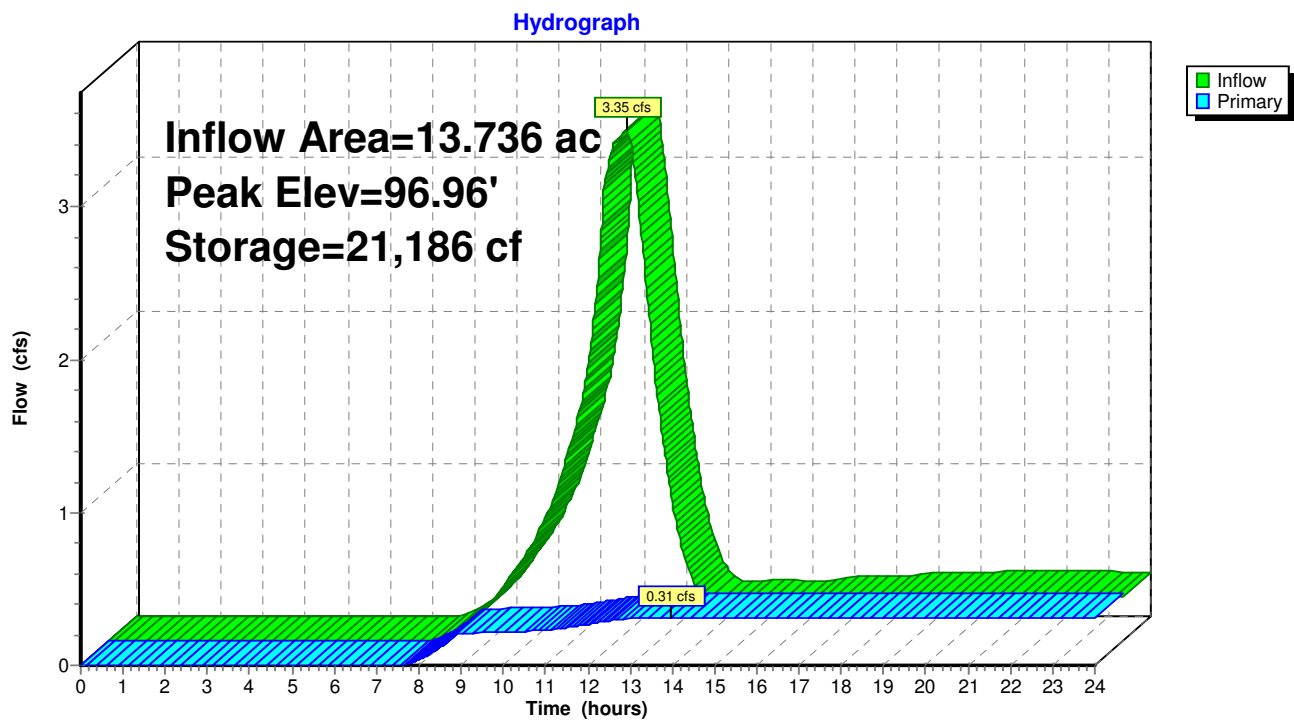
Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 335.8 min (1,172.3 - 836.5)

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	34,250 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	9,768	0	0
96.00	10,848	10,308	10,308
97.00	11,968	11,408	21,716
98.00	13,100	12,534	34,250

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	2.5" Vert. Orifice/Grate C= 0.600
#2	Primary	97.00'	16.0' long x 6.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65			
2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83			

Primary OutFlow Max=0.31 cfs @ 13.98 hrs HW=96.96' TW=92.74' (Dynamic Tailwater)

↑ **1=Orifice/Grate** (Orifice Controls 0.31 cfs @ 9.14 fps)
 — **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Bioretention Basin

Summary for Pond 5P: Weir MH 103 WQF

[57] Hint: Peaked at 97.37' (Flood elevation advised)

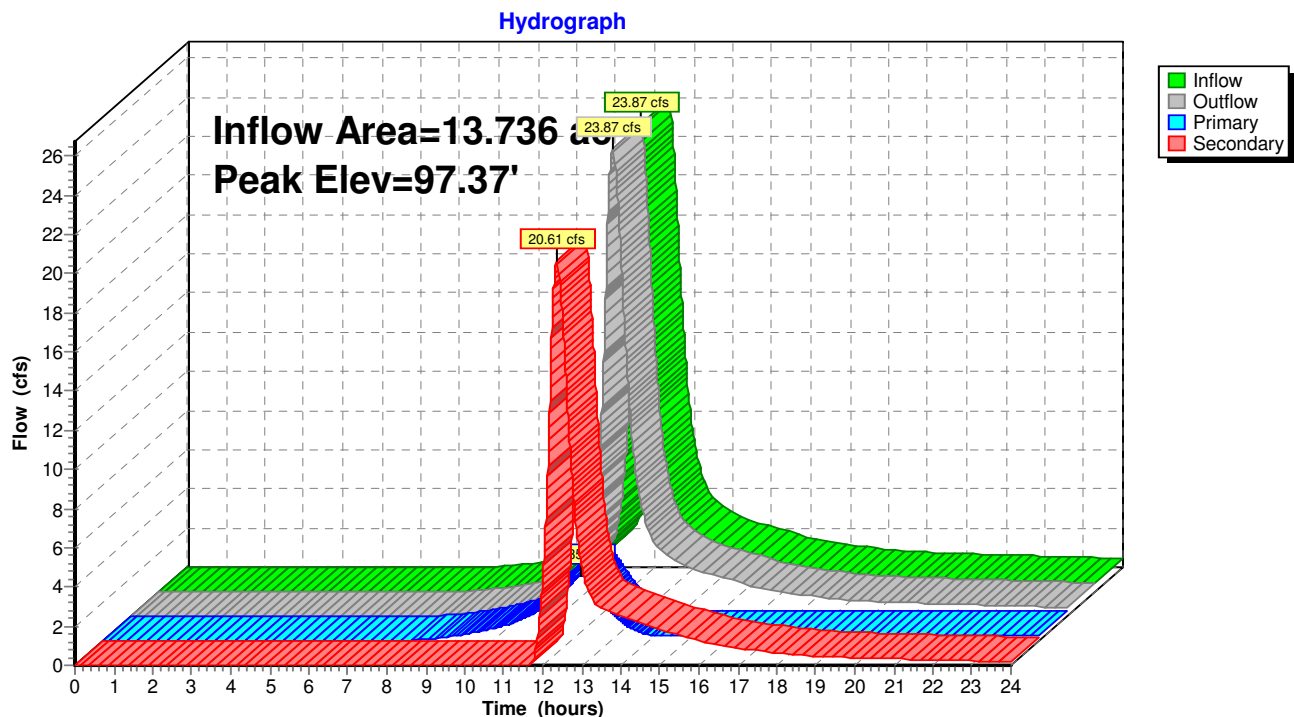
Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 2.46" for 5 year event
 Inflow = 23.87 cfs @ 12.36 hrs, Volume= 2.817 af
 Outflow = 23.87 cfs @ 12.36 hrs, Volume= 2.817 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.35 cfs @ 12.25 hrs, Volume= 0.838 af
 Secondary = 20.61 cfs @ 12.36 hrs, Volume= 1.978 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.37' @ 12.36 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	95.40'	12.0" Round Culvert L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.40' / 95.00' S= 0.0057 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	96.83'	60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.35 cfs @ 12.25 hrs HW=97.32' TW=96.28' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 3.35 cfs @ 4.26 fps)

Secondary OutFlow Max=20.61 cfs @ 12.36 hrs HW=97.37' TW=92.82' (Dynamic Tailwater)
 ↑2=Orifice/Grate (Weir Controls 20.61 cfs @ 2.41 fps)

Pond 5P: Weir MH 103 WQF

Summary for Pond 6P: Detention Basin

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 2.18" for 5 year event
 Inflow = 20.90 cfs @ 12.36 hrs, Volume= 2.497 af
 Outflow = 2.95 cfs @ 13.83 hrs, Volume= 2.345 af, Atten= 86%, Lag= 88.1 min
 Primary = 2.95 cfs @ 13.83 hrs, Volume= 2.345 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 92.74' @ 13.83 hrs Surf.Area= 20,792 sf Storage= 45,921 cf

Plug-Flow detention time= 222.9 min calculated for 2.345 af (94% of inflow)
 Center-of-Mass det. time= 177.4 min (1,086.7 - 909.3)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	122,564 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	16,859	0	0
92.00	19,568	30,963	30,963
94.00	22,870	42,438	73,401
95.00	24,576	23,723	97,124
96.00	26,304	25,440	122,564

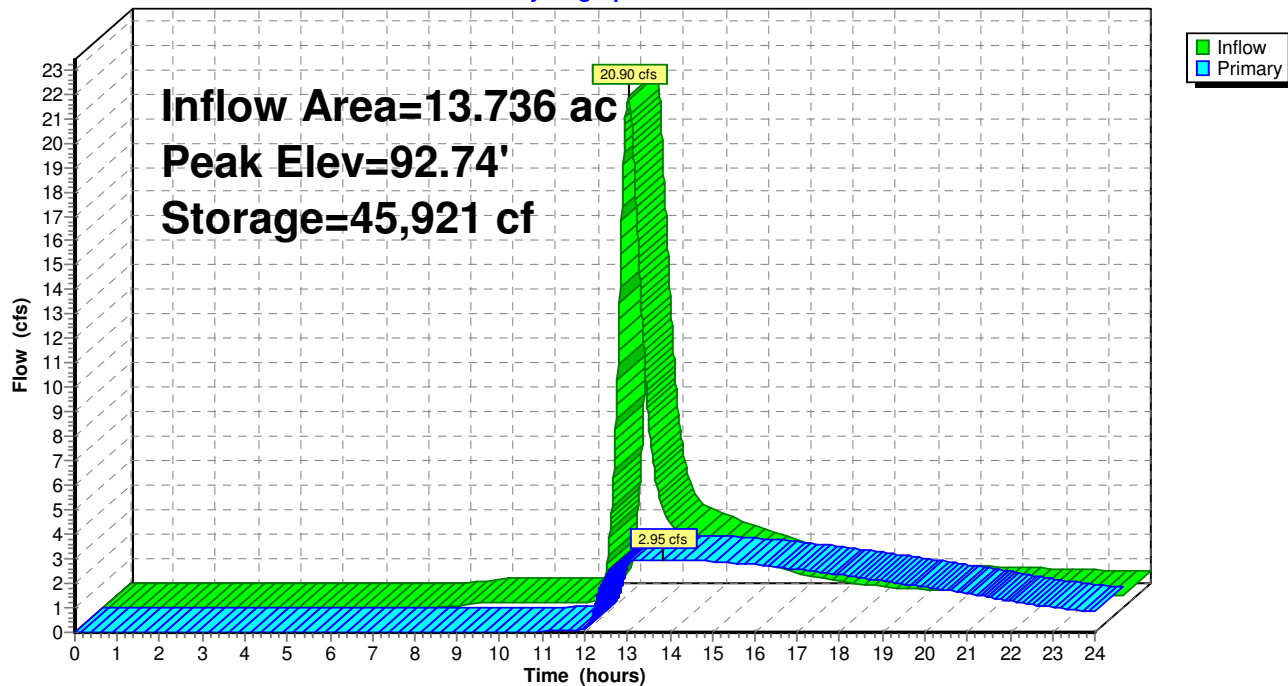
Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	30.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	90.30'	10.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.30' / 90.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	93.90'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=2.95 cfs @ 13.83 hrs HW=92.74' TW=90.06' (Dynamic Tailwater)

1=Culvert (Passes 2.95 cfs of 22.17 cfs potential flow)
 2=Culvert (Inlet Controls 2.95 cfs @ 5.41 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Detention Basin

Hydrograph



Summary for Pond 7P: Weir MH 103 to Det Basin

[57] Hint: Peaked at 92.85' (Flood elevation advised)

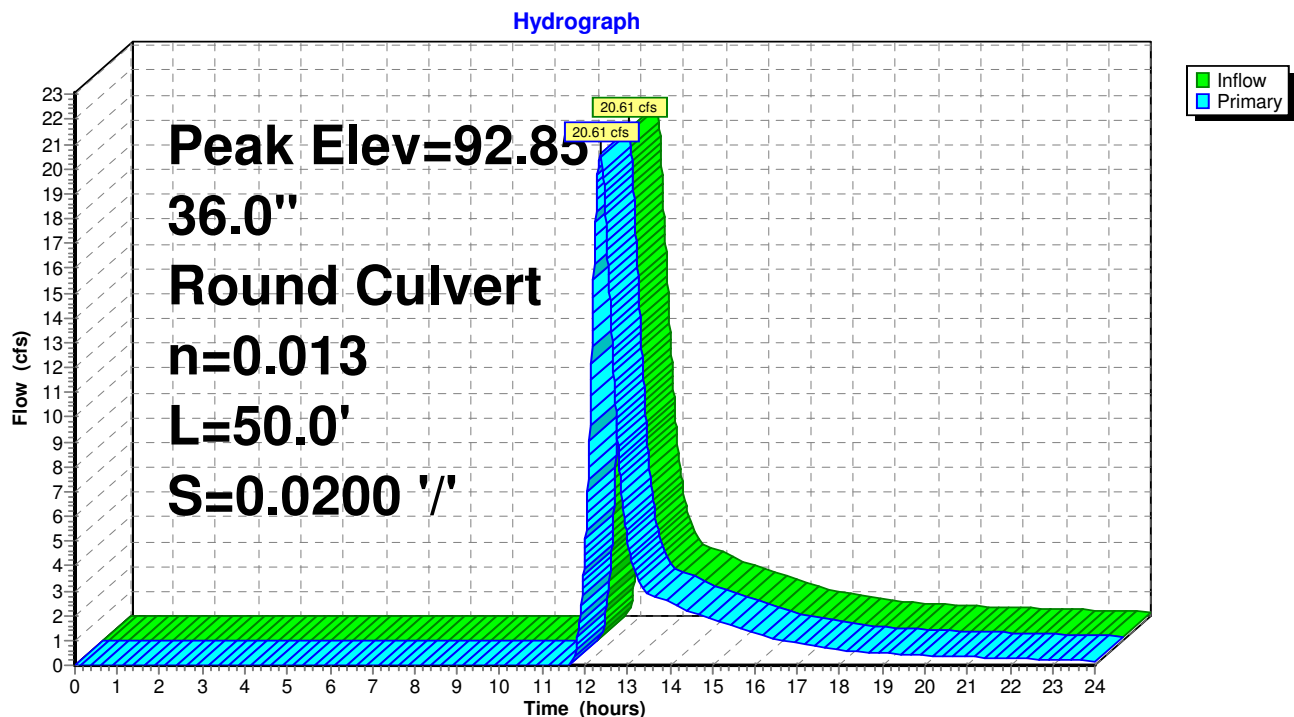
Inflow	=	20.61 cfs @ 12.36 hrs,	Volume=	1.978 af
Outflow	=	20.61 cfs @ 12.36 hrs,	Volume=	1.978 af, Atten= 0%, Lag= 0.0 min
Primary	=	20.61 cfs @ 12.36 hrs,	Volume=	1.978 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 92.85' @ 12.45 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	91.00'	36.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.00' S= 0.0200 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=20.61 cfs @ 12.36 hrs HW=92.82' TW=91.48' (Dynamic Tailwater)
 ↑ **1=Culvert** (Inlet Controls 20.61 cfs @ 4.59 fps)

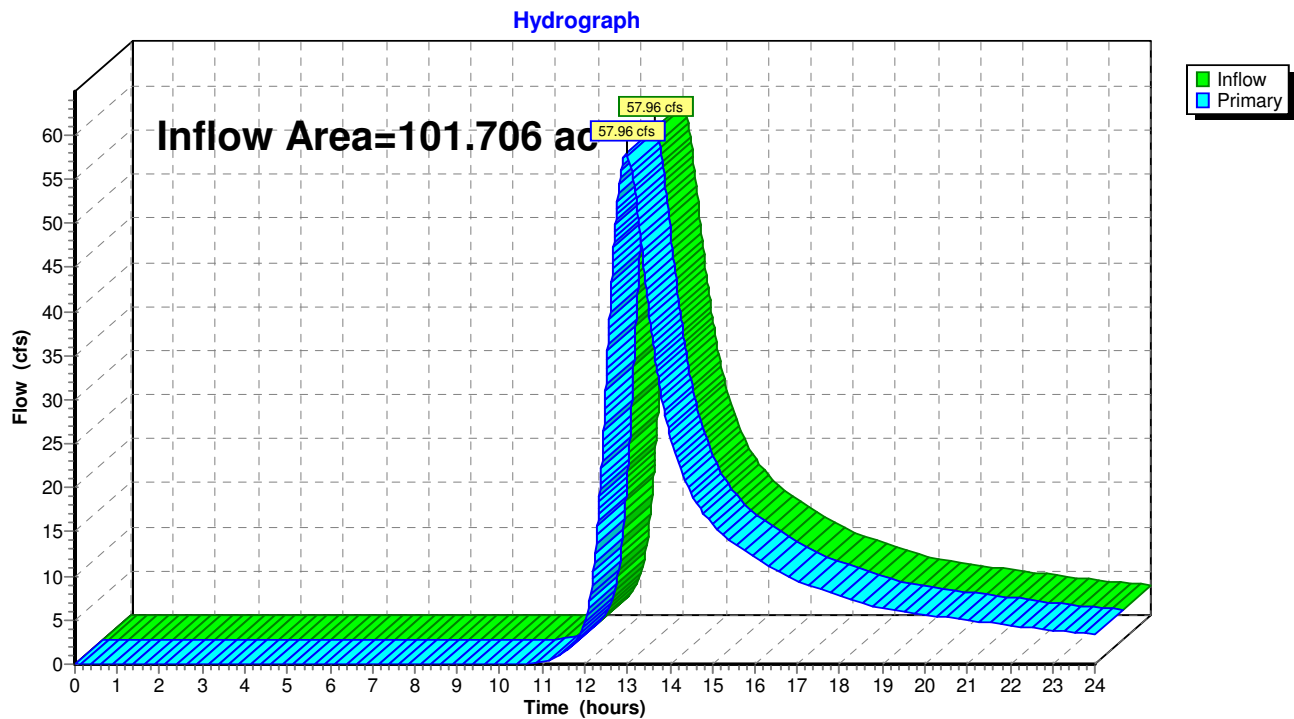
Pond 7P: Weir MH 103 to Det Basin

Summary for Link 2L: Design Point

Inflow Area = 101.706 ac, 23.22% Impervious, Inflow Depth > 1.60" for 5 year event
Inflow = 57.96 cfs @ 12.98 hrs, Volume= 13.574 af
Primary = 57.96 cfs @ 12.98 hrs, Volume= 13.574 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Design Point



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: P-2Runoff Area=87.970 ac 20.82% Impervious Runoff Depth=1.97"
Flow Length=4,420' Tc=68.3 min CN=71 Runoff=72.03 cfs 14.416 af**Subcatchment 2S: P-1**Runoff Area=13.736 ac 38.54% Impervious Runoff Depth=2.99"
Tc=26.0 min CN=83 Runoff=28.99 cfs 3.427 af**Subcatchment 3S: E-1**Runoff Area=101.737 ac 20.18% Impervious Runoff Depth=2.05"
Flow Length=4,420' Tc=68.3 min CN=72 Runoff=87.01 cfs 17.338 af**Reach 3R: Overland Flow**Avg. Flow Depth=0.07' Max Vel=1.06 fps Inflow=3.46 cfs 2.944 af
n=0.400 L=760.0' S=0.0368 '/' Capacity=35.52 cfs Outflow=3.46 cfs 2.938 af**Pond 3P: Level Spreader**Peak Elev=90.07' Inflow=3.46 cfs 2.944 af
Outflow=3.46 cfs 2.944 af**Pond 4P: Bioretention Basin**Peak Elev=97.01' Storage=21,891 cf Inflow=3.07 cfs 0.854 af
Outflow=0.38 cfs 0.533 af**Pond 5P: Weir MH 103 WQF**Peak Elev=97.47' Inflow=28.99 cfs 3.427 af
Primary=3.07 cfs 0.854 af Secondary=25.99 cfs 2.572 af Outflow=28.99 cfs 3.427 af**Pond 6P: Detention Basin**Peak Elev=93.49' Storage=62,048 cf Inflow=26.29 cfs 3.105 af
Outflow=3.46 cfs 2.944 af**Pond 7P: Weir MH 103 to Det Basin**Peak Elev=93.51' Inflow=25.99 cfs 2.572 af
36.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=25.99 cfs 2.572 af**Link 2L: Design Point**Inflow=75.20 cfs 17.354 af
Primary=75.20 cfs 17.354 af**Total Runoff Area = 203.443 ac Runoff Volume = 35.181 af Average Runoff Depth = 2.08"**
78.30% Pervious = 159.296 ac 21.70% Impervious = 44.147 ac

Summary for Subcatchment 1S: P-2

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 72.03 cfs @ 12.98 hrs, Volume= 14.416 af, Depth= 1.97"

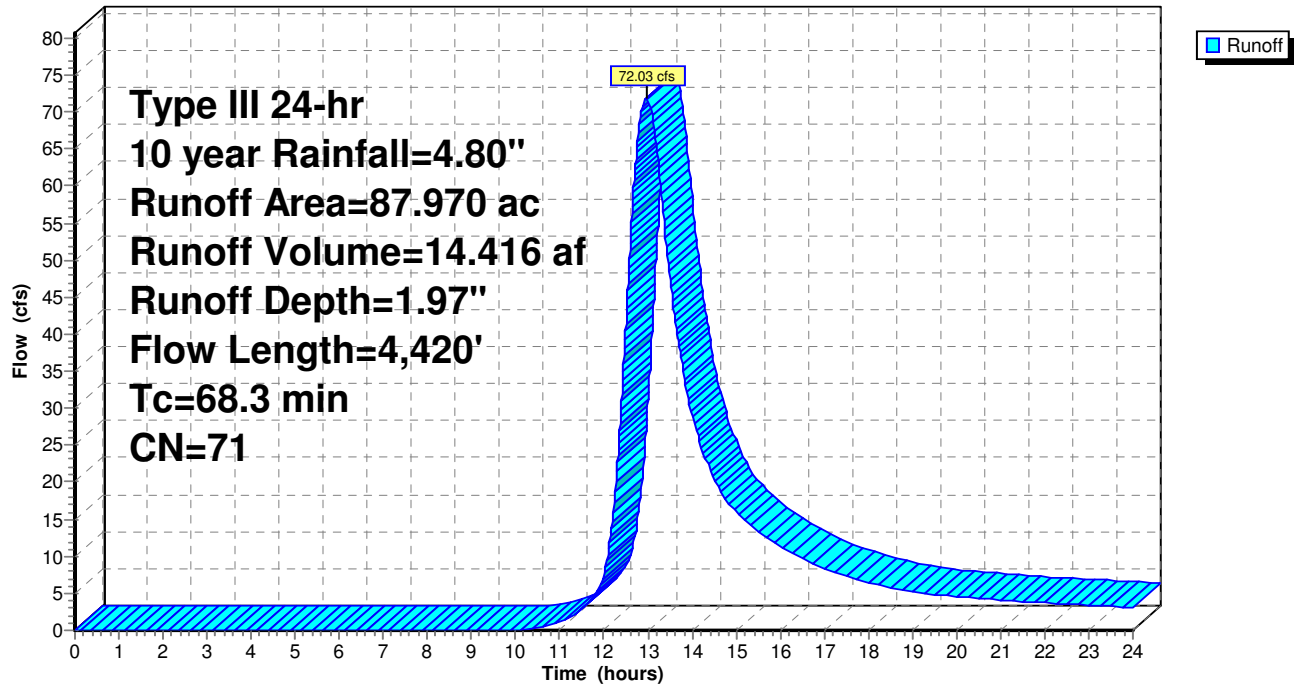
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.449	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
16.559	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
5.898	98	Paved parking HSG C
10.774	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
18.163	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
87.970	71	Weighted Average
69.651		79.18% Pervious Area
18.319		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 1S: P-2

Hydrograph



Summary for Subcatchment 2S: P-1

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 28.99 cfs @ 12.34 hrs, Volume= 3.427 af, Depth= 2.99"

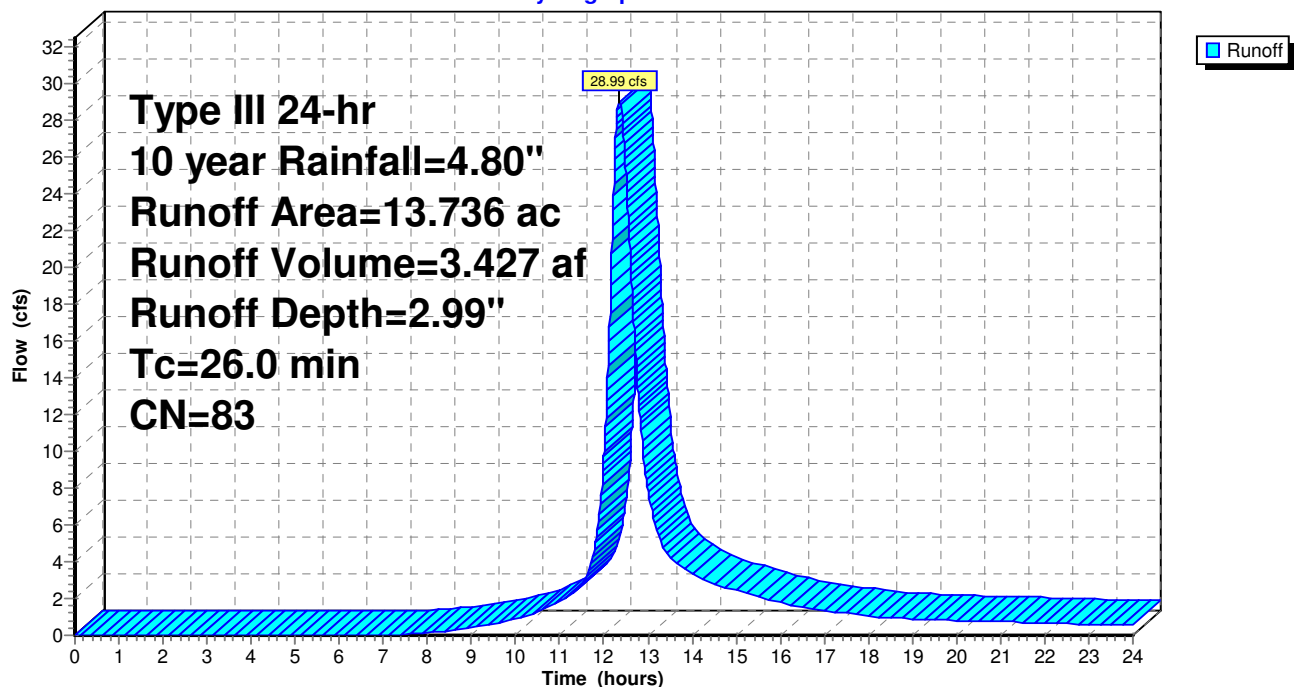
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
5.294	98	Paved parking HSG C
7.453	74	>75% Grass cover, Good, HSG C
13.736	83	Weighted Average
8.442		61.46% Pervious Area
5.294		38.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-1

Hydrograph



Summary for Subcatchment 3S: E-1

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 87.01 cfs @ 12.97 hrs, Volume= 17.338 af, Depth= 2.05"

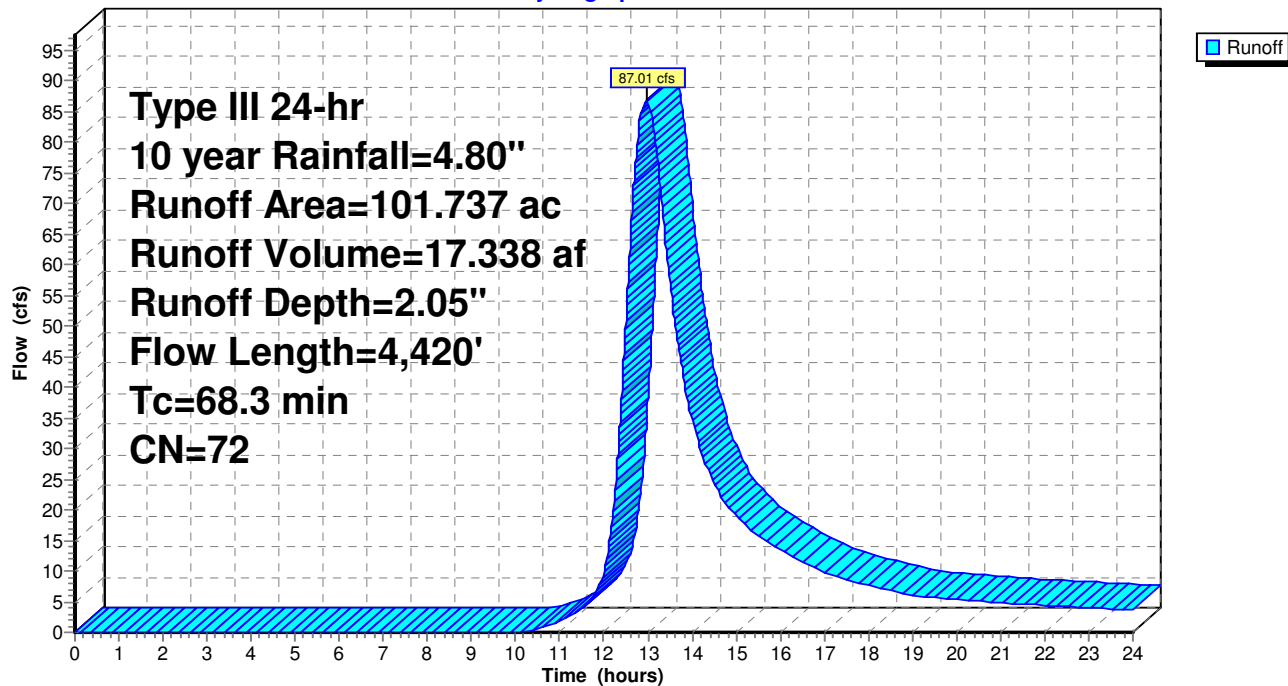
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.982	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
24.566	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
8.113	98	Paved parking HSG C
10.775	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
21.174	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
101.737	72	Weighted Average
81.203		79.82% Pervious Area
20.534		20.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, watercourse Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 3S: E-1

Hydrograph



Summary for Reach 3R: Overland Flow

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 2.57" for 10 year event
 Inflow = 3.46 cfs @ 14.03 hrs, Volume= 2.944 af
 Outflow = 3.46 cfs @ 14.24 hrs, Volume= 2.938 af, Atten= 0%, Lag= 12.4 min

Routing by Dyn-Muskingum-Cunge method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Reference Flow= 26.64 cfs Estimated Depth= 0.84' Velocity= 0.62 fps

m= 1.648, c= 1.03 fps, dt= 0.6 min, dx= 760.0' / 21 = 36.2', K= 0.6 min, X= 0.309

Max. Velocity= 1.06 fps, Min. Travel Time= 12.0 min

Avg. Velocity= 0.99 fps, Avg. Travel Time= 12.8 min

Peak Storage= 2,558 cf @ 14.14 hrs

Average Depth at Peak Storage= 0.07'

Bank-Full Depth= 1.00' Flow Area= 51.0 sf, Capacity= 35.52 cfs

50.00' x 1.00' deep channel, n= 0.400

Side Slope Z-value= 1.0 '/' Top Width= 52.00'

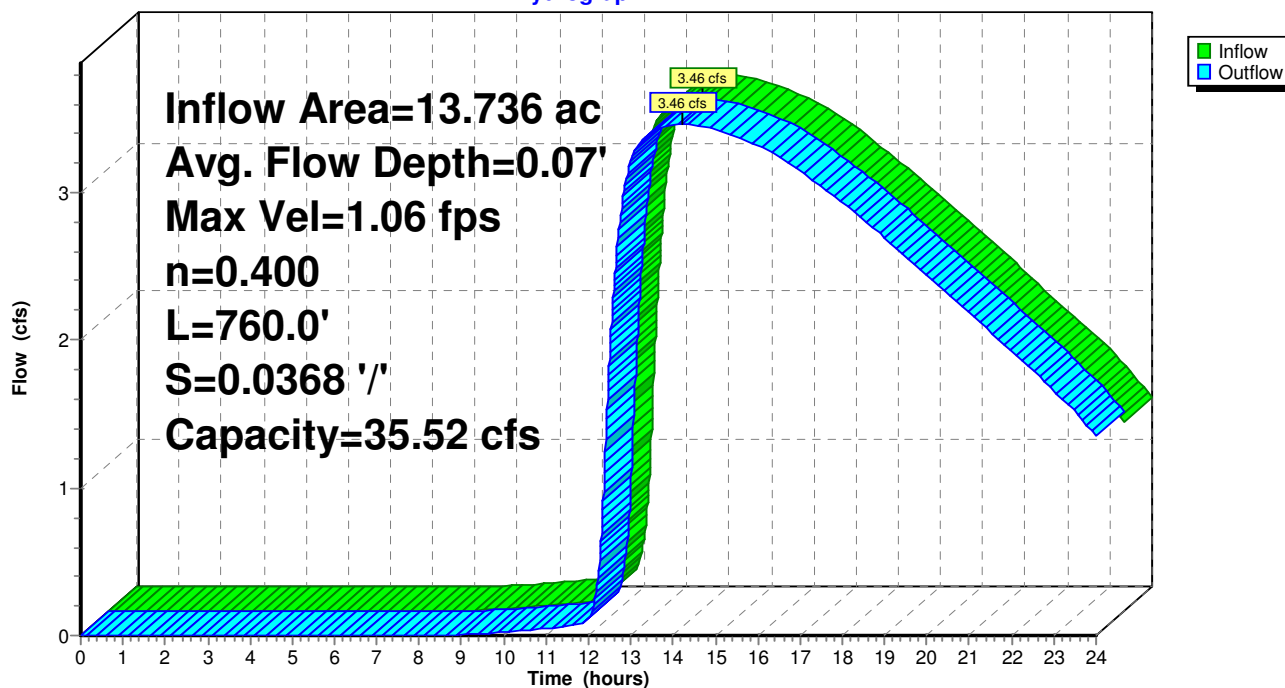
Length= 760.0' Slope= 0.0368 '/'

Inlet Invert= 88.00', Outlet Invert= 60.00'



Reach 3R: Overland Flow

Hydrograph



Summary for Pond 3P: Level Spreader

[57] Hint: Peaked at 90.07' (Flood elevation advised)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 2.57" for 10 year event
 Inflow = 3.46 cfs @ 14.03 hrs, Volume= 2.944 af
 Outflow = 3.46 cfs @ 14.03 hrs, Volume= 2.944 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.46 cfs @ 14.03 hrs, Volume= 2.944 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

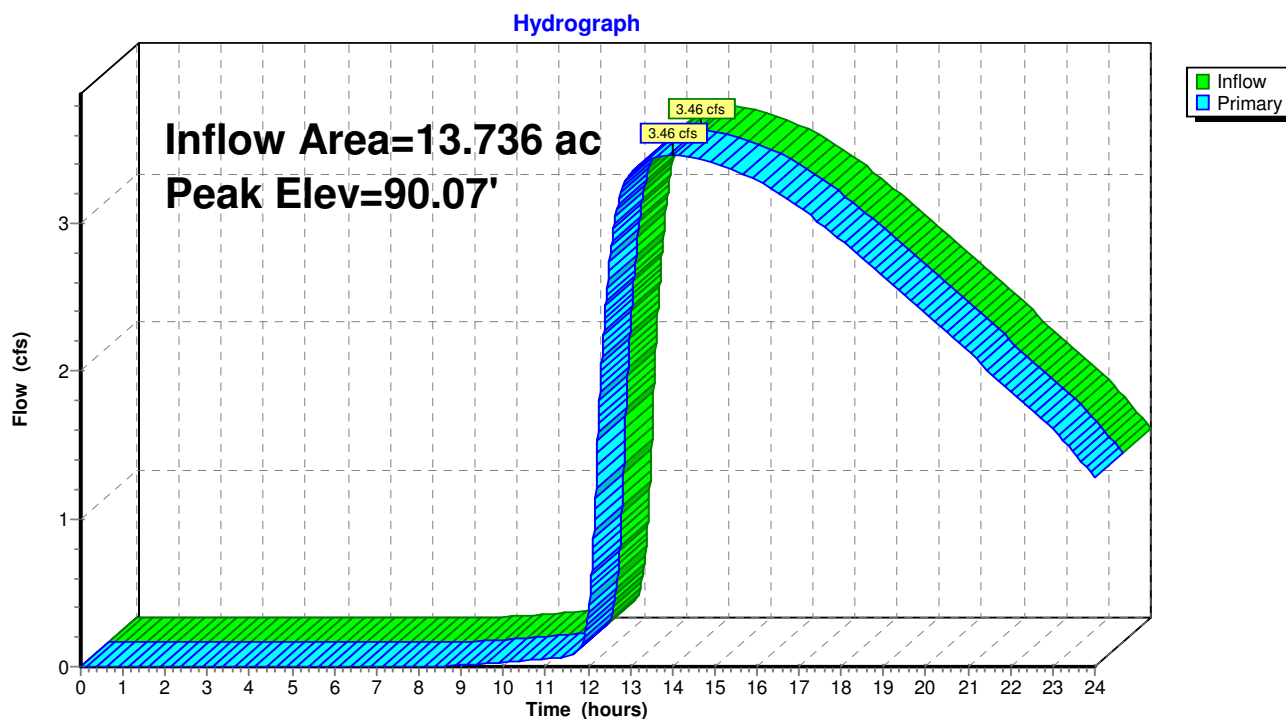
Peak Elev= 90.07' @ 14.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	56.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=3.46 cfs @ 14.03 hrs HW=90.07' TW=88.07' (Dynamic Tailwater)

↑1=Sharp-Crested Rectangular Weir (Weir Controls 3.46 cfs @ 0.88 fps)

Pond 3P: Level Spreader



Summary for Pond 4P: Bioretention Basin

[80] Warning: Exceeded Pond 5P by 1.39' @ 25.05 hrs (2.91 cfs 0.202 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 0.75" for 10 year event
 Inflow = 3.07 cfs @ 12.27 hrs, Volume= 0.854 af
 Outflow = 0.38 cfs @ 13.32 hrs, Volume= 0.533 af, Atten= 88%, Lag= 63.2 min
 Primary = 0.38 cfs @ 13.32 hrs, Volume= 0.533 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.01' @ 13.33 hrs Surf.Area= 11,985 sf Storage= 21,891 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 338.8 min (1,156.0 - 817.2)

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	34,250 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

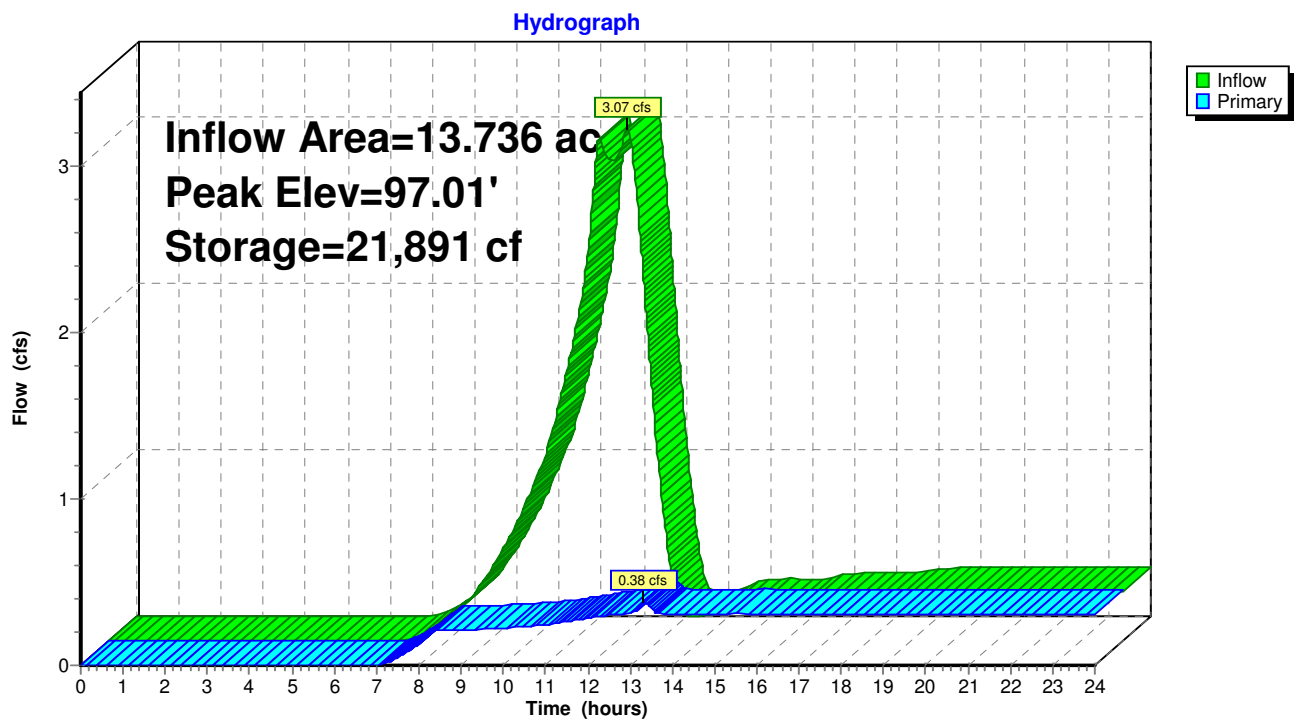
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	9,768	0	0
96.00	10,848	10,308	10,308
97.00	11,968	11,408	21,716
98.00	13,100	12,534	34,250

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	2.5" Vert. Orifice/Grate C= 0.600
#2	Primary	97.00'	16.0' long x 6.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65
			2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.38 cfs @ 13.32 hrs HW=97.01' TW=93.42' (Dynamic Tailwater)

↑ **1=Orifice/Grate** (Orifice Controls 0.31 cfs @ 9.13 fps)

└ **2=Broad-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.29 fps)

Pond 4P: Bioretention Basin

Summary for Pond 5P: Weir MH 103 WQF

[57] Hint: Peaked at 97.47' (Flood elevation advised)

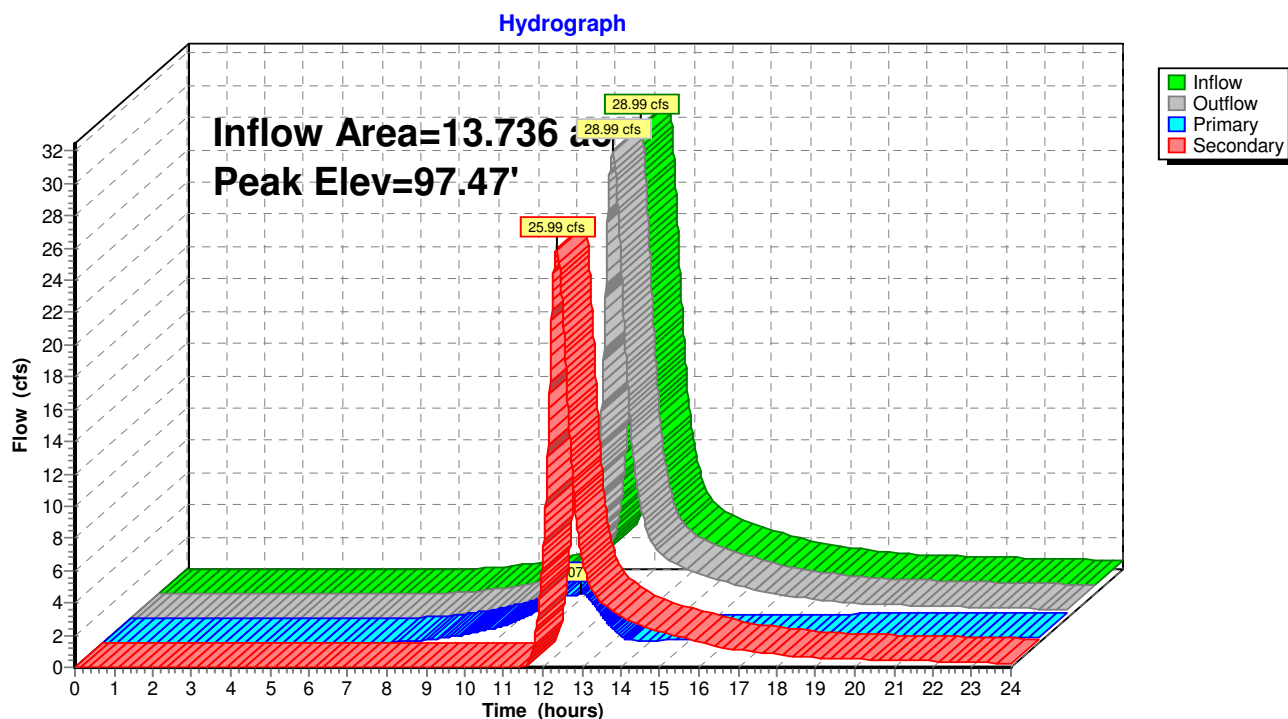
Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 2.99" for 10 year event
 Inflow = 28.99 cfs @ 12.34 hrs, Volume= 3.427 af
 Outflow = 28.99 cfs @ 12.34 hrs, Volume= 3.427 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.07 cfs @ 12.27 hrs, Volume= 0.854 af
 Secondary = 25.99 cfs @ 12.36 hrs, Volume= 2.572 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.47' @ 12.36 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	95.40'	12.0" Round Culvert L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.40' / 95.00' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	96.83'	60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.07 cfs @ 12.27 hrs HW=97.43' TW=96.55' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 3.07 cfs @ 3.91 fps)

Secondary OutFlow Max=25.99 cfs @ 12.36 hrs HW=97.46' TW=93.14' (Dynamic Tailwater)
 ↑2=Orifice/Grate (Weir Controls 25.99 cfs @ 2.61 fps)

Pond 5P: Weir MH 103 WQF

Summary for Pond 6P: Detention Basin

[80] Warning: Exceeded Pond 7P by 0.06' @ 24.61 hrs (0.01 cfs 0.000 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 2.71" for 10 year event
 Inflow = 26.29 cfs @ 12.36 hrs, Volume= 3.105 af
 Outflow = 3.46 cfs @ 14.03 hrs, Volume= 2.944 af, Atten= 87%, Lag= 100.6 min
 Primary = 3.46 cfs @ 14.03 hrs, Volume= 2.944 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 93.49' @ 14.03 hrs Surf.Area= 22,035 sf Storage= 62,048 cf

Plug-Flow detention time= 244.6 min calculated for 2.944 af (95% of inflow)
 Center-of-Mass det. time= 205.9 min (1,099.4 - 893.5)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	122,564 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	16,859	0	0
92.00	19,568	30,963	30,963
94.00	22,870	42,438	73,401
95.00	24,576	23,723	97,124
96.00	26,304	25,440	122,564

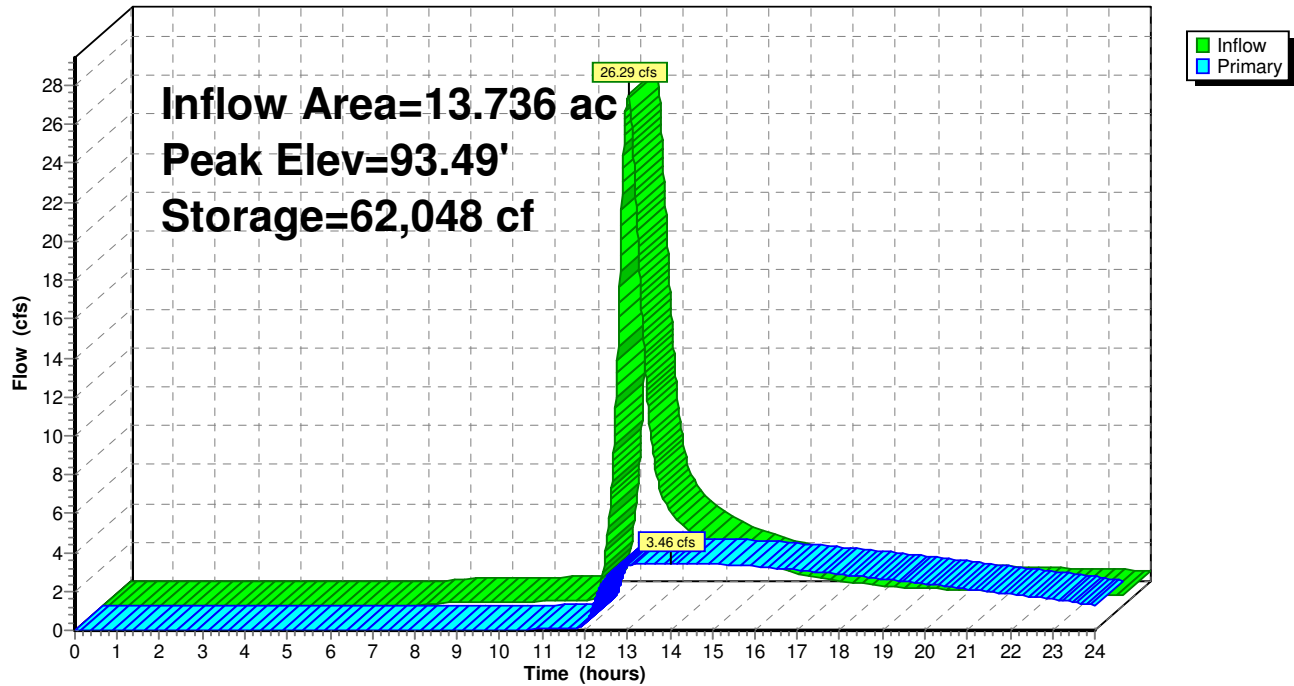
Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	30.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	90.30'	10.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.30' / 90.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	93.90'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=3.46 cfs @ 14.03 hrs HW=93.49' TW=90.07' (Dynamic Tailwater)

- 1=Culvert (Passes 3.46 cfs of 30.00 cfs potential flow)
- 2=Culvert (Inlet Controls 3.46 cfs @ 6.34 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Detention Basin

Hydrograph



Summary for Pond 7P: Weir MH 103 to Det Basin

[57] Hint: Peaked at 93.51' (Flood elevation advised)

Inflow = 25.99 cfs @ 12.36 hrs, Volume= 2.572 af
 Outflow = 25.99 cfs @ 12.36 hrs, Volume= 2.572 af, Atten= 0%, Lag= 0.0 min
 Primary = 25.99 cfs @ 12.36 hrs, Volume= 2.572 af

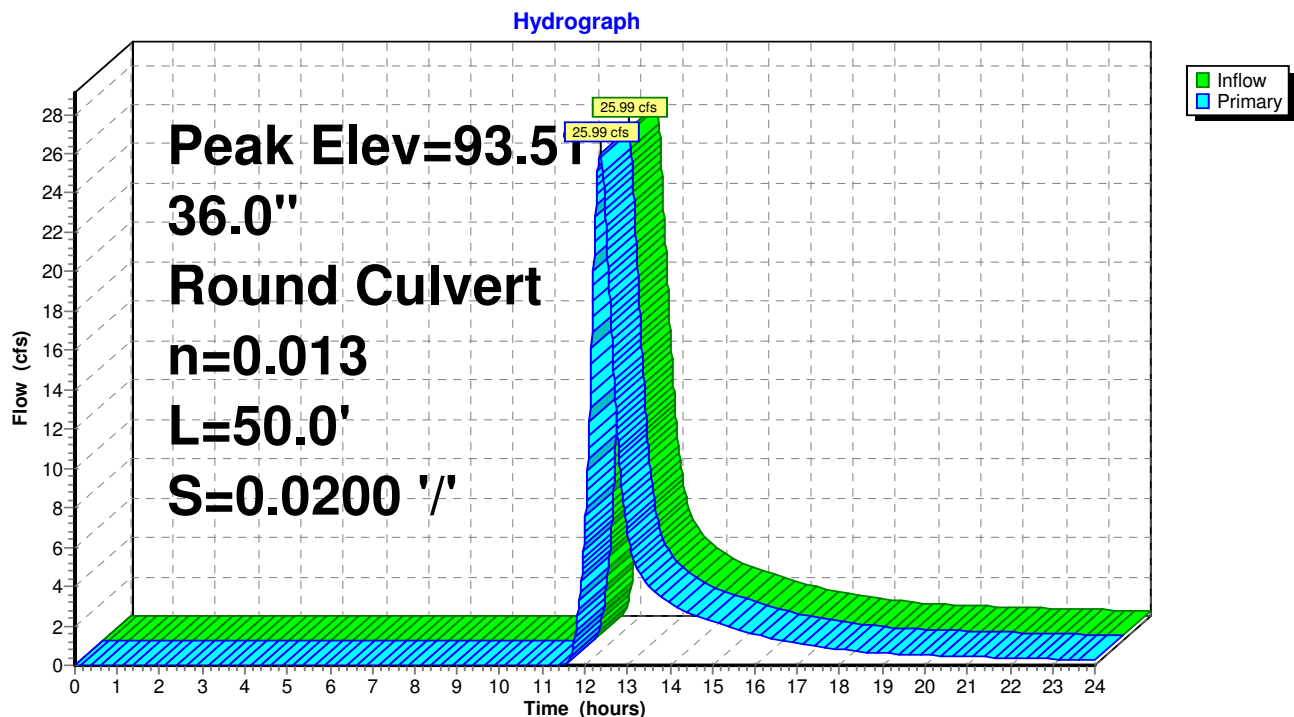
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 93.51' @ 13.99 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	91.00'	36.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=25.99 cfs @ 12.36 hrs HW=93.14' TW=91.82' (Dynamic Tailwater)

1=Culvert (Outlet Controls 25.99 cfs @ 6.77 fps)

Pond 7P: Weir MH 103 to Det Basin

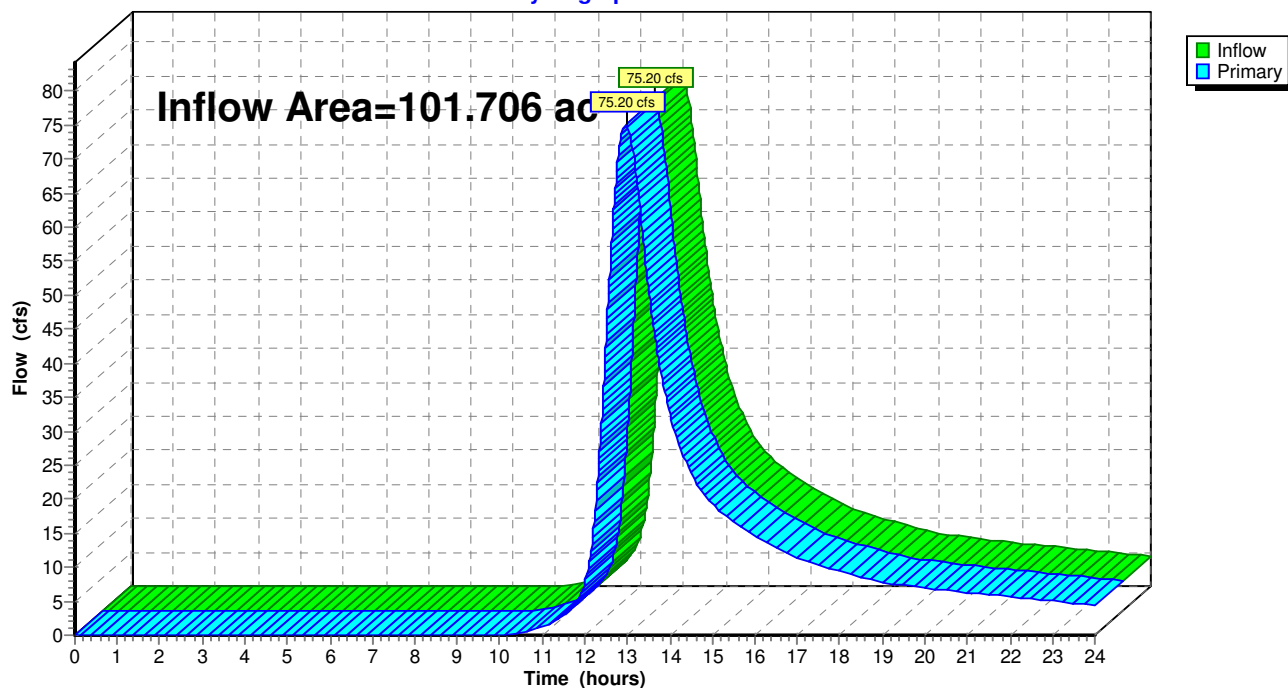
Summary for Link 2L: Design Point

Inflow Area = 101.706 ac, 23.22% Impervious, Inflow Depth > 2.05" for 10 year event
Inflow = 75.20 cfs @ 12.98 hrs, Volume= 17.354 af
Primary = 75.20 cfs @ 12.98 hrs, Volume= 17.354 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Design Point

Hydrograph



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: P-2Runoff Area=87.970 ac 20.82% Impervious Runoff Depth=2.58"
Flow Length=4,420' Tc=68.3 min CN=71 Runoff=95.63 cfs 18.913 af**Subcatchment 2S: P-1**Runoff Area=13.736 ac 38.54% Impervious Runoff Depth=3.72"
Tc=26.0 min CN=83 Runoff=35.94 cfs 4.260 af**Subcatchment 3S: E-1**Runoff Area=101.737 ac 20.18% Impervious Runoff Depth=2.67"
Flow Length=4,420' Tc=68.3 min CN=72 Runoff=114.72 cfs 22.632 af**Reach 3R: Overland Flow**Avg. Flow Depth=0.15' Max Vel=1.09 fps Inflow=7.60 cfs 3.764 af
n=0.400 L=760.0' S=0.0368 '/' Capacity=35.52 cfs Outflow=7.59 cfs 3.756 af**Pond 3P: Level Spreader**Peak Elev=90.12' Inflow=7.60 cfs 3.764 af
Outflow=7.60 cfs 3.764 af**Pond 4P: Bioretention Basin**Peak Elev=97.08' Storage=22,692 cf Inflow=2.85 cfs 0.911 af
Outflow=1.16 cfs 0.588 af**Pond 5P: Weir MH 103 WQF**Peak Elev=97.58' Inflow=35.94 cfs 4.260 af
Primary=2.85 cfs 0.911 af Secondary=33.17 cfs 3.349 af Outflow=35.94 cfs 4.260 af**Pond 6P: Detention Basin**Peak Elev=94.18' Storage=77,475 cf Inflow=33.48 cfs 3.937 af
Outflow=7.60 cfs 3.764 af**Pond 7P: Weir MH 103 to Det Basin**Peak Elev=94.22' Inflow=33.17 cfs 3.349 af
36.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=33.17 cfs 3.349 af**Link 2L: Design Point**Inflow=99.40 cfs 22.670 af
Primary=99.40 cfs 22.670 af**Total Runoff Area = 203.443 ac Runoff Volume = 45.805 af Average Runoff Depth = 2.70"**
78.30% Pervious = 159.296 ac 21.70% Impervious = 44.147 ac

Summary for Subcatchment 1S: P-2

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 95.63 cfs @ 12.97 hrs, Volume= 18.913 af, Depth= 2.58"

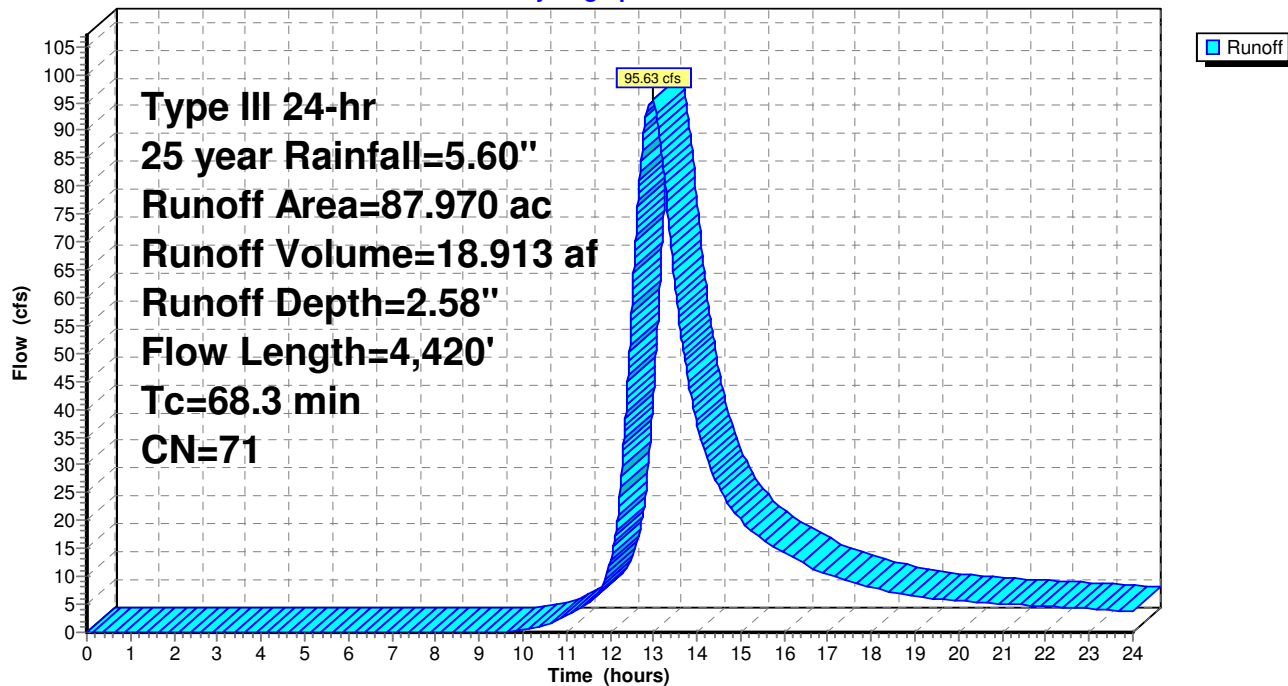
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.60"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.449	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
16.559	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
5.898	98	Paved parking HSG C
10.774	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
18.163	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
87.970	71	Weighted Average
69.651		79.18% Pervious Area
18.319		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 1S: P-2

Hydrograph



Summary for Subcatchment 2S: P-1

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CarlsonSurface||

Runoff = 35.94 cfs @ 12.34 hrs, Volume= 4.260 af, Depth= 3.72"

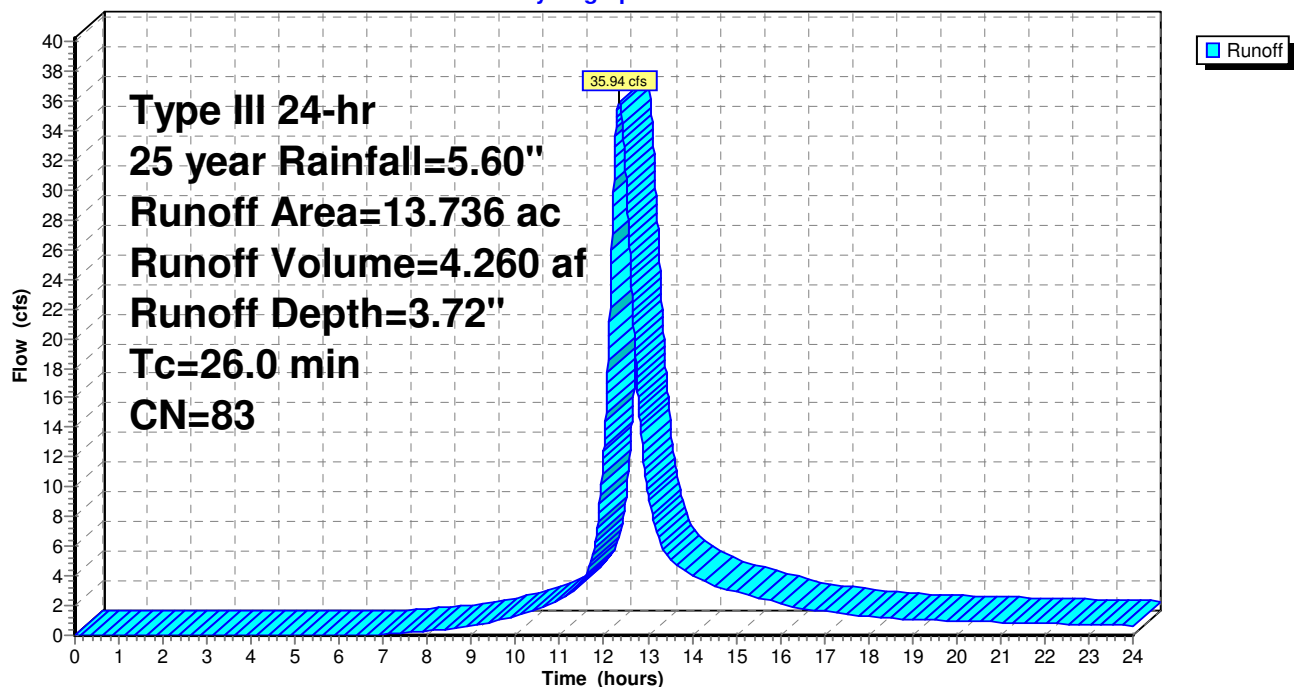
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.60"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
5.294	98	Paved parking HSG C
7.453	74	>75% Grass cover, Good, HSG C
13.736	83	Weighted Average
8.442		61.46% Pervious Area
5.294		38.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-1

Hydrograph



Summary for Subcatchment 3S: E-1

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 114.72 cfs @ 12.97 hrs, Volume= 22.632 af, Depth= 2.67"

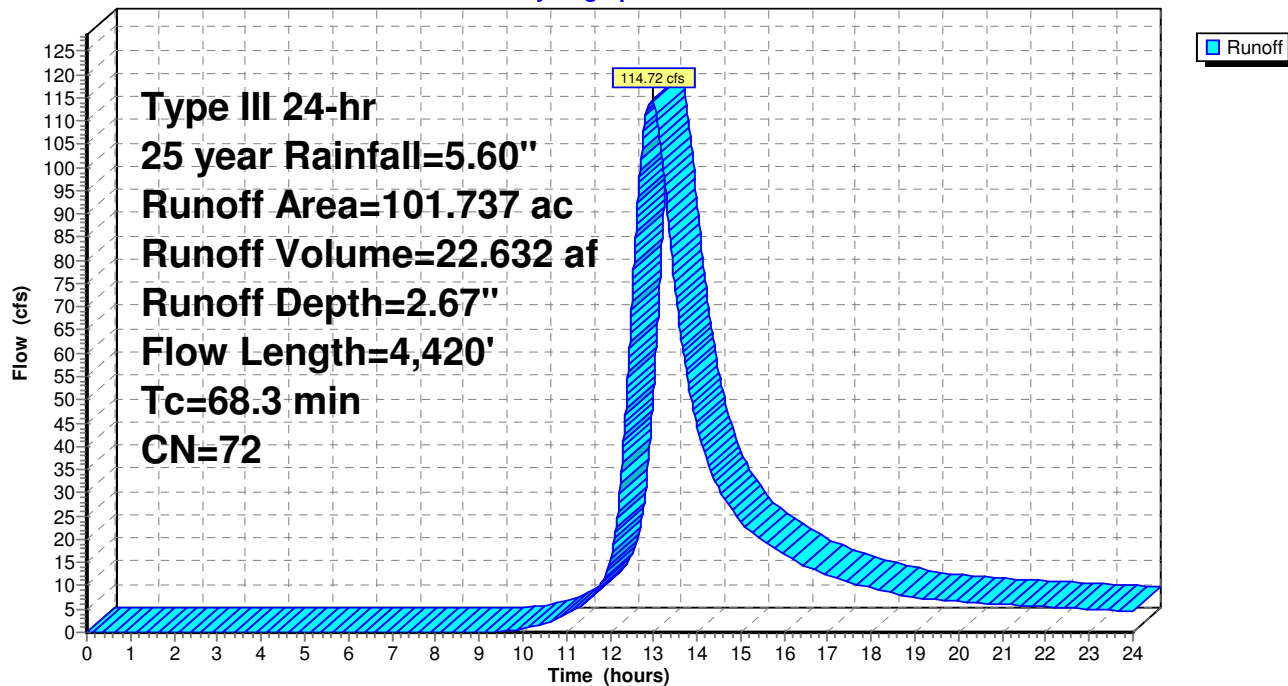
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.60"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.982	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
24.566	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
8.113	98	Paved parking HSG C
10.775	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
21.174	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
101.737	72	Weighted Average
81.203		79.82% Pervious Area
20.534		20.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, watercourse Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 3S: E-1

Hydrograph



Summary for Reach 3R: Overland Flow

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 3.29" for 25 year event
 Inflow = 7.60 cfs @ 13.16 hrs, Volume= 3.764 af
 Outflow = 7.59 cfs @ 13.37 hrs, Volume= 3.756 af, Atten= 0%, Lag= 12.5 min

Routing by Dyn-Muskingum-Cunge method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Reference Flow= 26.64 cfs Estimated Depth= 0.84' Velocity= 0.62 fps

m= 1.648, c= 1.03 fps, dt= 0.6 min, dx= 760.0' / 21 = 36.2', K= 0.6 min, X= 0.309

Max. Velocity= 1.09 fps, Min. Travel Time= 11.7 min

Avg. Velocity= 0.99 fps, Avg. Travel Time= 12.8 min

Peak Storage= 5,578 cf @ 13.28 hrs

Average Depth at Peak Storage= 0.15'

Bank-Full Depth= 1.00' Flow Area= 51.0 sf, Capacity= 35.52 cfs

50.00' x 1.00' deep channel, n= 0.400

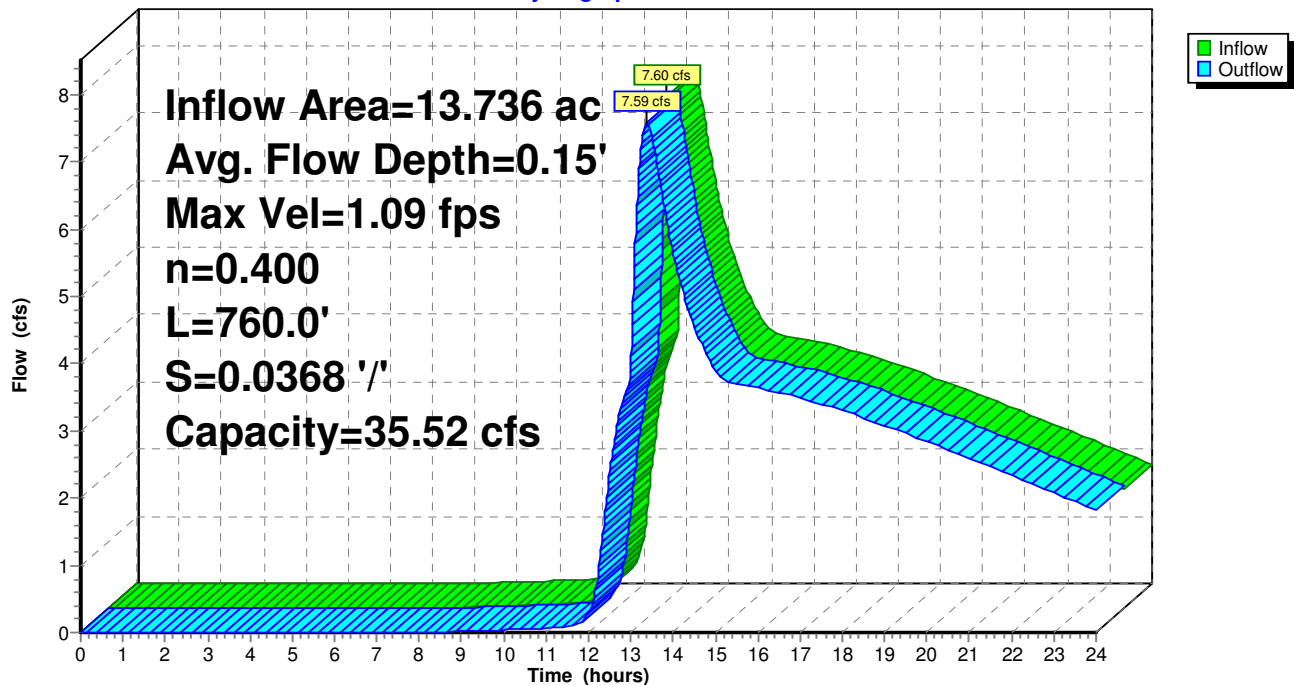
Side Slope Z-value= 1.0 '/' Top Width= 52.00'

Length= 760.0' Slope= 0.0368 '/'

Inlet Invert= 88.00', Outlet Invert= 60.00'

**Reach 3R: Overland Flow**

Hydrograph



Summary for Pond 3P: Level Spreader

[57] Hint: Peaked at 90.12' (Flood elevation advised)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 3.29" for 25 year event
 Inflow = 7.60 cfs @ 13.16 hrs, Volume= 3.764 af
 Outflow = 7.60 cfs @ 13.16 hrs, Volume= 3.764 af, Atten= 0%, Lag= 0.0 min
 Primary = 7.60 cfs @ 13.16 hrs, Volume= 3.764 af

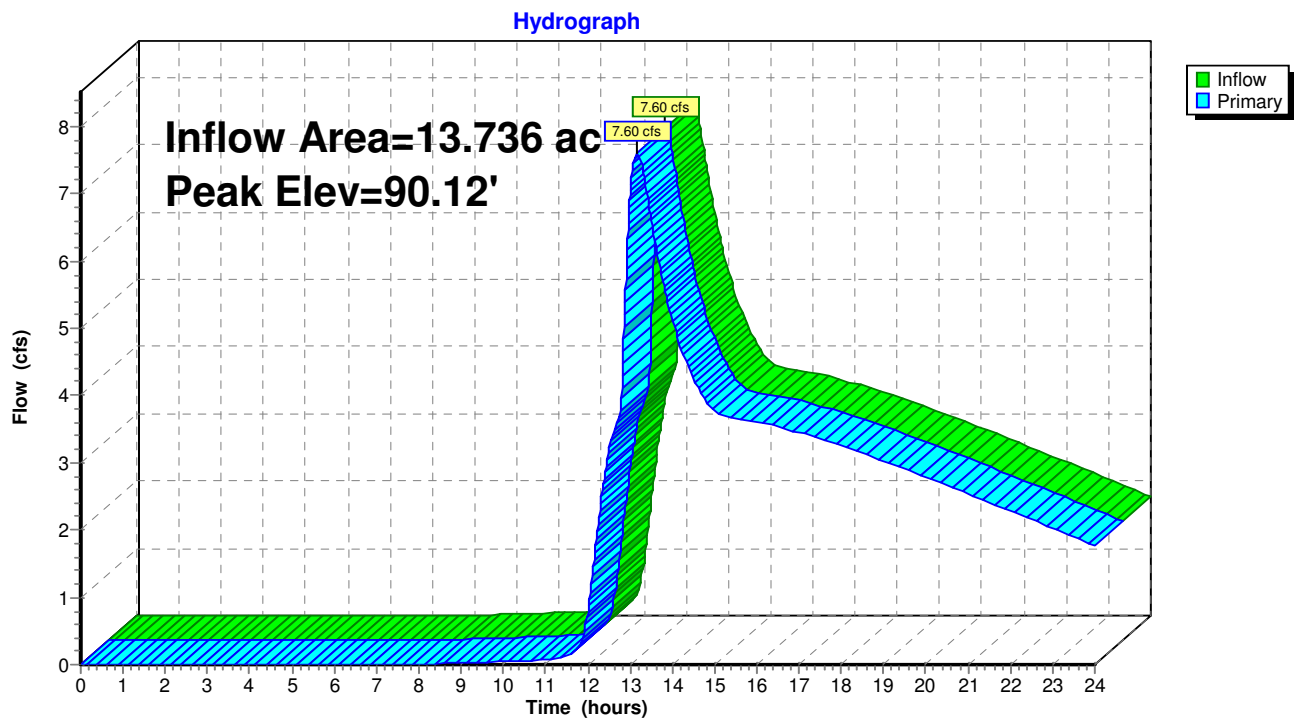
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 90.12' @ 13.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	56.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=7.60 cfs @ 13.16 hrs HW=90.12' TW=88.14' (Dynamic Tailwater)

1=Sharp-Crested Rectangular Weir (Weir Controls 7.60 cfs @ 1.14 fps)

Pond 3P: Level Spreader

Summary for Pond 4P: Bioretention Basin

[80] Warning: Exceeded Pond 5P by 1.38' @ 25.24 hrs (2.89 cfs 0.182 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 0.80" for 25 year event
 Inflow = 2.85 cfs @ 11.24 hrs, Volume= 0.911 af
 Outflow = 1.16 cfs @ 12.85 hrs, Volume= 0.588 af, Atten= 59%, Lag= 96.8 min
 Primary = 1.16 cfs @ 12.85 hrs, Volume= 0.588 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.08' @ 12.86 hrs Surf.Area= 12,060 sf Storage= 22,692 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 321.0 min (1,112.8 - 791.9)

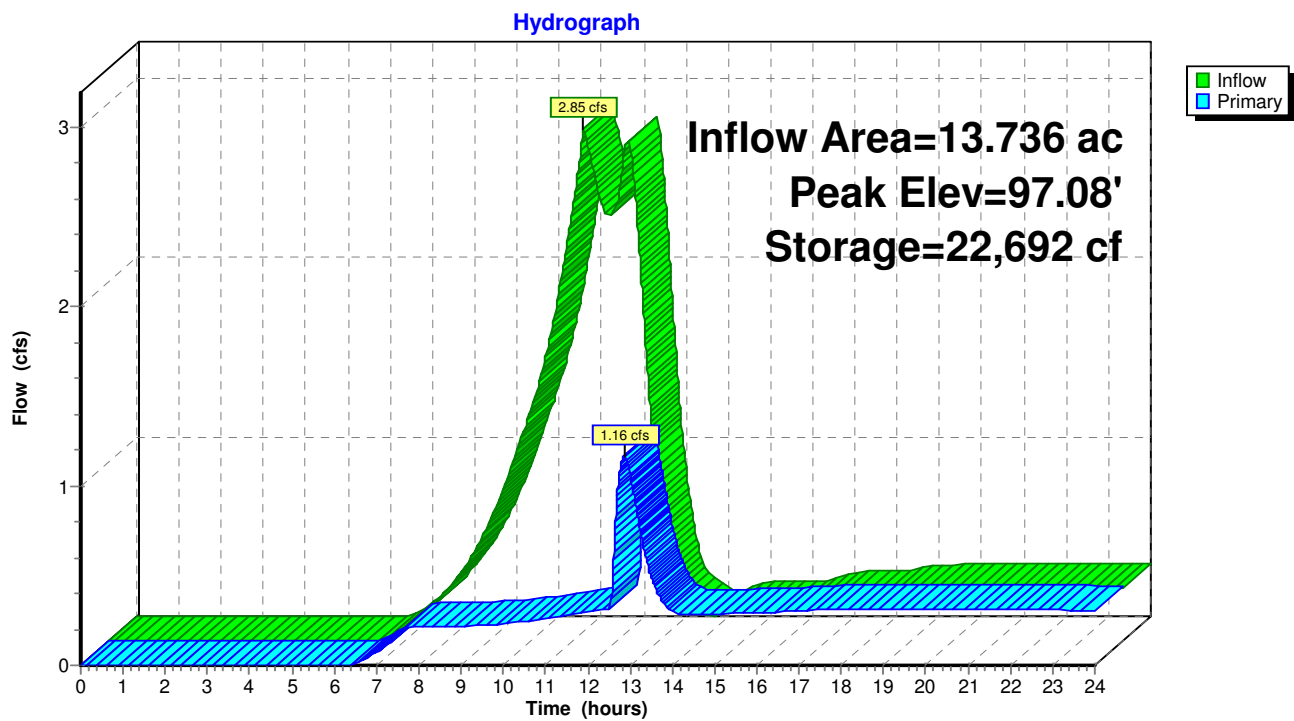
Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	34,250 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	9,768	0	0
96.00	10,848	10,308	10,308
97.00	11,968	11,408	21,716
98.00	13,100	12,534	34,250

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	2.5" Vert. Orifice/Grate C= 0.600
#2	Primary	97.00'	16.0' long x 6.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65			
2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83			

Primary OutFlow Max=1.16 cfs @ 12.85 hrs HW=97.08' TW=94.03' (Dynamic Tailwater)

↑ **1=Orifice/Grate** (Orifice Controls 0.29 cfs @ 8.42 fps)

└ **2=Broad-Crested Rectangular Weir** (Weir Controls 0.88 cfs @ 0.68 fps)

Pond 4P: Bioretention Basin

Summary for Pond 5P: Weir MH 103 WQF

[57] Hint: Peaked at 97.58' (Flood elevation advised)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 3.72" for 25 year event
 Inflow = 35.94 cfs @ 12.34 hrs, Volume= 4.260 af
 Outflow = 35.94 cfs @ 12.34 hrs, Volume= 4.260 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.85 cfs @ 11.24 hrs, Volume= 0.911 af
 Secondary = 33.17 cfs @ 12.34 hrs, Volume= 3.349 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.58' @ 12.34 hrs

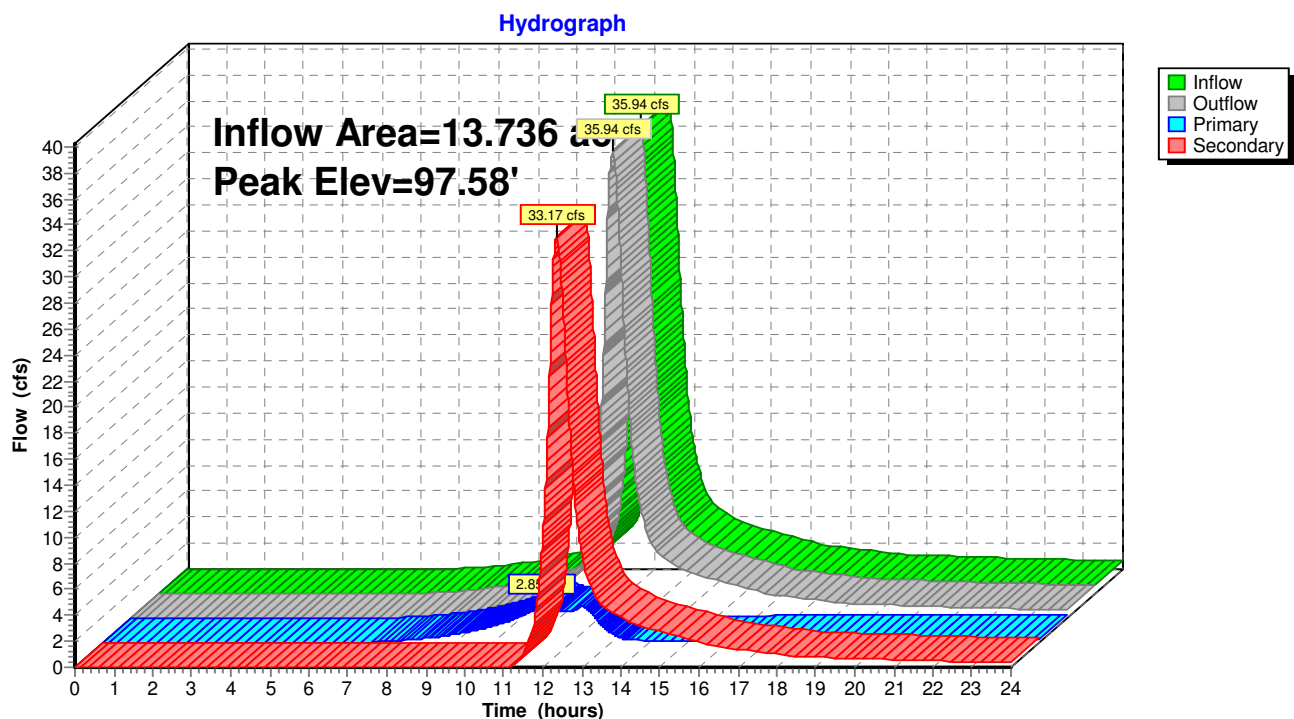
Device	Routing	Invert	Outlet Devices
#1	Primary	95.40'	12.0" Round Culvert L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.40' / 95.00' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	96.83'	60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.85 cfs @ 11.24 hrs HW=96.83' TW=96.08' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 2.85 cfs @ 3.63 fps)

Secondary OutFlow Max=33.17 cfs @ 12.34 hrs HW=97.58' TW=93.58' (Dynamic Tailwater)

↑**2=Orifice/Grate** (Weir Controls 33.17 cfs @ 2.83 fps)

Pond 5P: Weir MH 103 WQF

Summary for Pond 6P: Detention Basin

[80] Warning: Exceeded Pond 7P by 0.29' @ 24.67 hrs (0.45 cfs 0.004 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 3.44" for 25 year event
 Inflow = 33.48 cfs @ 12.34 hrs, Volume= 3.937 af
 Outflow = 7.60 cfs @ 13.16 hrs, Volume= 3.764 af, Atten= 77%, Lag= 49.4 min
 Primary = 7.60 cfs @ 13.16 hrs, Volume= 3.764 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 94.18' @ 13.16 hrs Surf.Area= 23,172 sf Storage= 77,475 cf

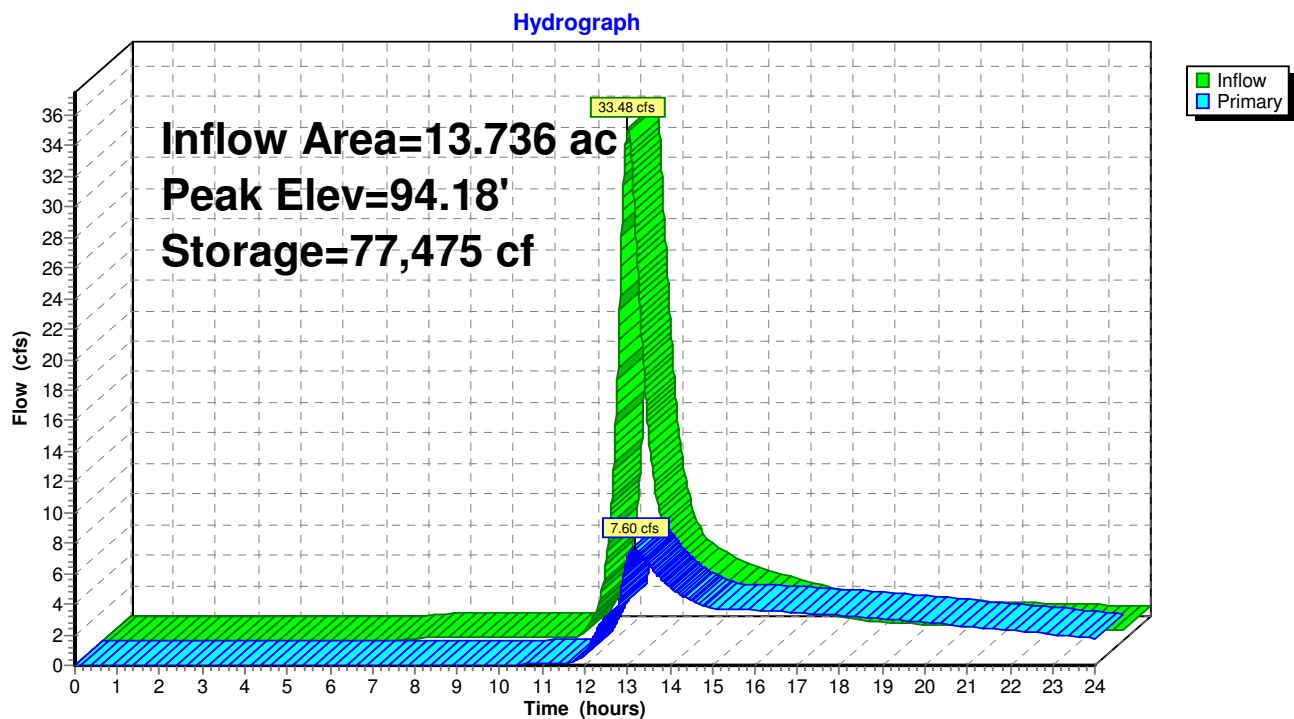
Plug-Flow detention time= 241.9 min calculated for 3.763 af (96% of inflow)
 Center-of-Mass det. time= 209.2 min (1,087.5 - 878.3)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	122,564 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	16,859	0	0
92.00	19,568	30,963	30,963
94.00	22,870	42,438	73,401
95.00	24,576	23,723	97,124
96.00	26,304	25,440	122,564

Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	30.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	90.30'	10.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.30' / 90.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	93.90'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=7.60 cfs @ 13.16 hrs HW=94.18' TW=90.12' (Dynamic Tailwater)

- 1=Culvert (Passes 7.60 cfs of 37.53 cfs potential flow)
- 2=Culvert (Inlet Controls 3.86 cfs @ 7.07 fps)
- 3=Orifice/Grate (Weir Controls 3.74 cfs @ 1.72 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Detention Basin

Summary for Pond 7P: Weir MH 103 to Det Basin

[57] Hint: Peaked at 94.22' (Flood elevation advised)

Inflow = 33.17 cfs @ 12.34 hrs, Volume= 3.349 af
 Outflow = 33.17 cfs @ 12.34 hrs, Volume= 3.349 af, Atten= 0%, Lag= 0.0 min
 Primary = 33.17 cfs @ 12.34 hrs, Volume= 3.349 af

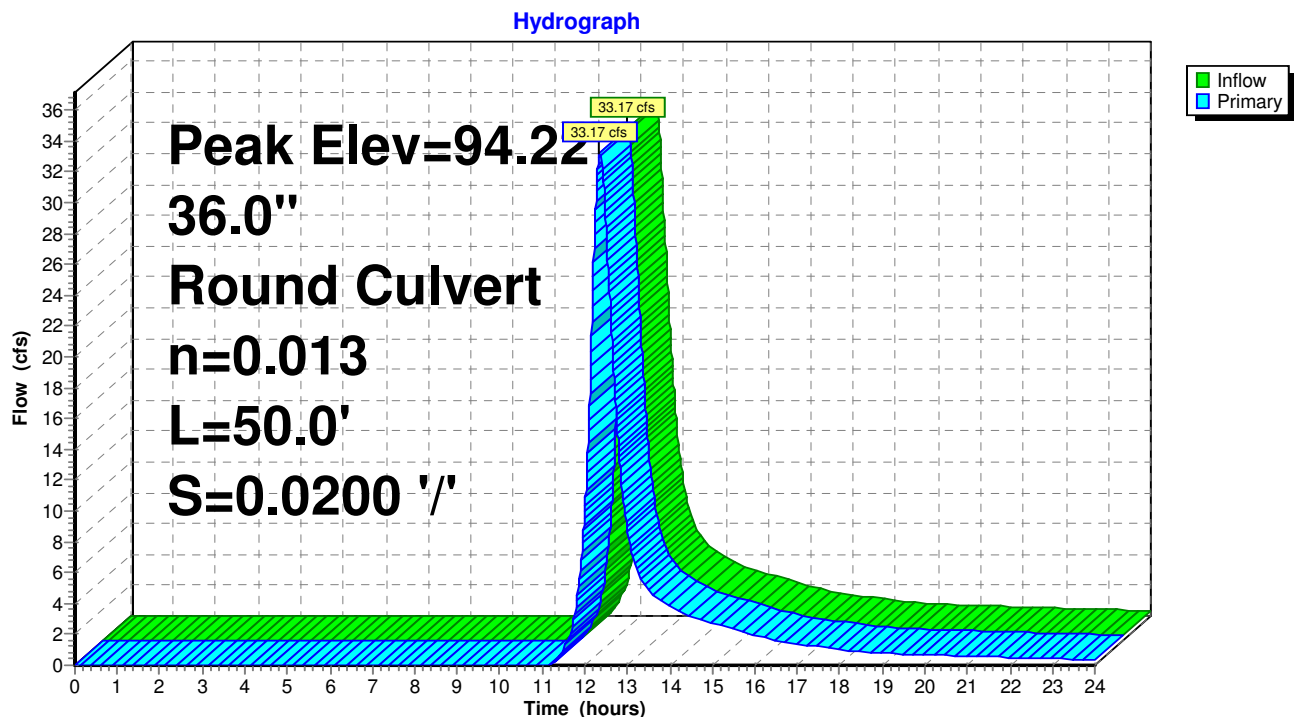
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 94.22' @ 13.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	91.00'	36.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.00' S= 0.0200 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=33.17 cfs @ 12.34 hrs HW=93.58' TW=92.25' (Dynamic Tailwater)

↑1=Culvert (Outlet Controls 33.17 cfs @ 6.88 fps)

Pond 7P: Weir MH 103 to Det Basin

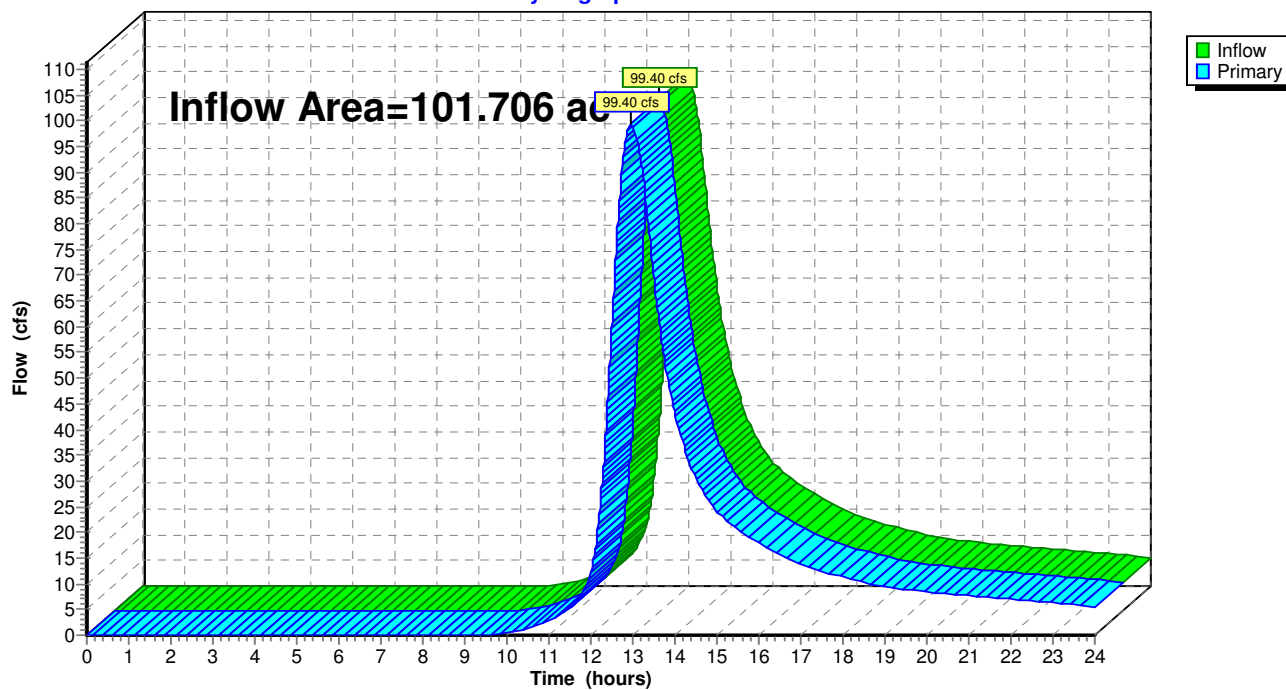
Summary for Link 2L: Design Point

Inflow Area = 101.706 ac, 23.22% Impervious, Inflow Depth > 2.67" for 25 year event
Inflow = 99.40 cfs @ 12.98 hrs, Volume= 22.670 af
Primary = 99.40 cfs @ 12.98 hrs, Volume= 22.670 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Design Point

Hydrograph



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: P-2Runoff Area=87.970 ac 20.82% Impervious Runoff Depth=3.06"
Flow Length=4,420' Tc=68.3 min CN=71 Runoff=113.99 cfs 22.438 af**Subcatchment 2S: P-1**Runoff Area=13.736 ac 38.54% Impervious Runoff Depth=4.28"
Tc=26.0 min CN=83 Runoff=41.17 cfs 4.896 af**Subcatchment 3S: E-1**Runoff Area=101.737 ac 20.18% Impervious Runoff Depth=3.16"
Flow Length=4,420' Tc=68.3 min CN=72 Runoff=136.23 cfs 26.770 af**Reach 3R: Overland Flow**Avg. Flow Depth=0.27' Max Vel=1.14 fps Inflow=14.15 cfs 4.393 af
n=0.400 L=760.0' S=0.0368 '/' Capacity=35.52 cfs Outflow=14.10 cfs 4.385 af**Pond 3P: Level Spreader**Peak Elev=90.18' Inflow=14.15 cfs 4.393 af
Outflow=14.15 cfs 4.393 af**Pond 4P: Bioretention Basin**Peak Elev=97.11' Storage=23,065 cf Inflow=2.80 cfs 0.965 af
Outflow=1.70 cfs 0.641 af**Pond 5P: Weir MH 103 WQF**Peak Elev=97.66' Inflow=41.17 cfs 4.896 af
Primary=2.80 cfs 0.965 af Secondary=38.53 cfs 3.931 af Outflow=41.17 cfs 4.896 af**Pond 6P: Detention Basin**Peak Elev=94.44' Storage=83,597 cf Inflow=38.91 cfs 4.572 af
Outflow=14.15 cfs 4.393 af**Pond 7P: Weir MH 103 to Det Basin**Peak Elev=94.67' Inflow=38.53 cfs 3.931 af
36.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=38.53 cfs 3.931 af**Link 2L: Design Point**Inflow=126.74 cfs 26.823 af
Primary=126.74 cfs 26.823 af**Total Runoff Area = 203.443 ac Runoff Volume = 54.104 af Average Runoff Depth = 3.19"**
78.30% Pervious = 159.296 ac 21.70% Impervious = 44.147 ac

Summary for Subcatchment 1S: P-2

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 113.99 cfs @ 12.97 hrs, Volume= 22.438 af, Depth= 3.06"

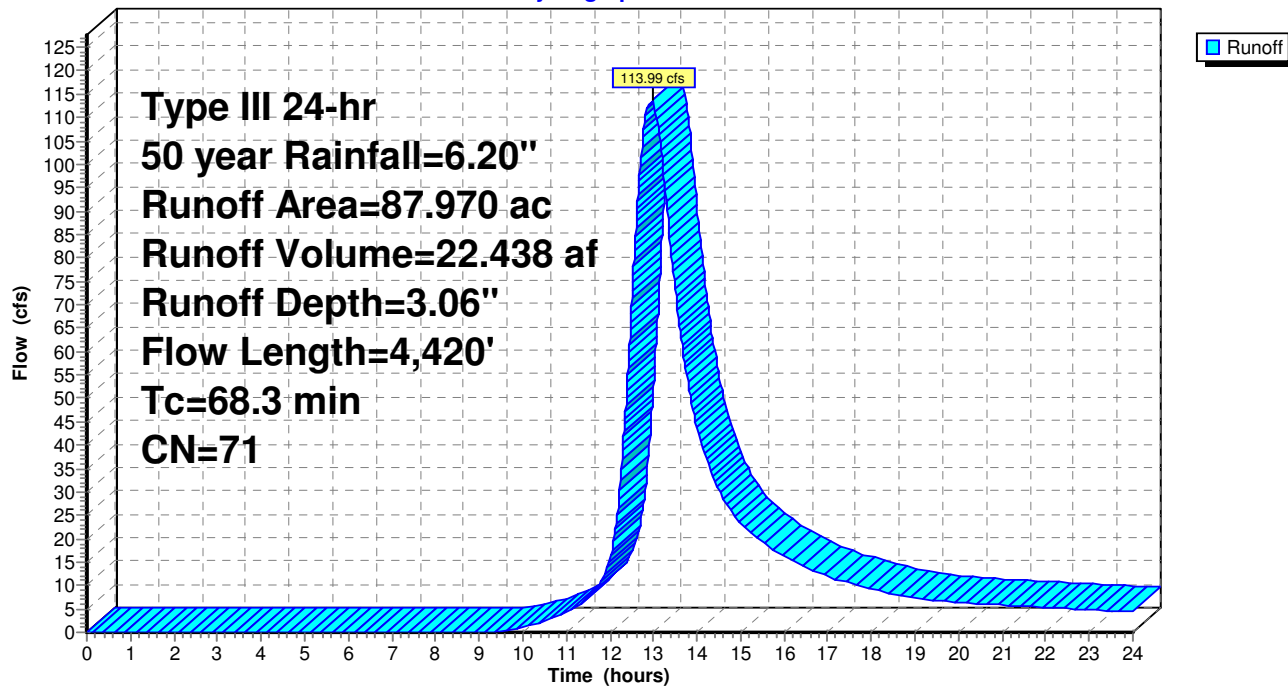
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50 year Rainfall=6.20"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.449	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
16.559	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
5.898	98	Paved parking HSG C
10.774	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
18.163	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
87.970	71	Weighted Average
69.651		79.18% Pervious Area
18.319		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 1S: P-2

Hydrograph



Summary for Subcatchment 2S: P-1

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 41.17 cfs @ 12.34 hrs, Volume= 4.896 af, Depth= 4.28"

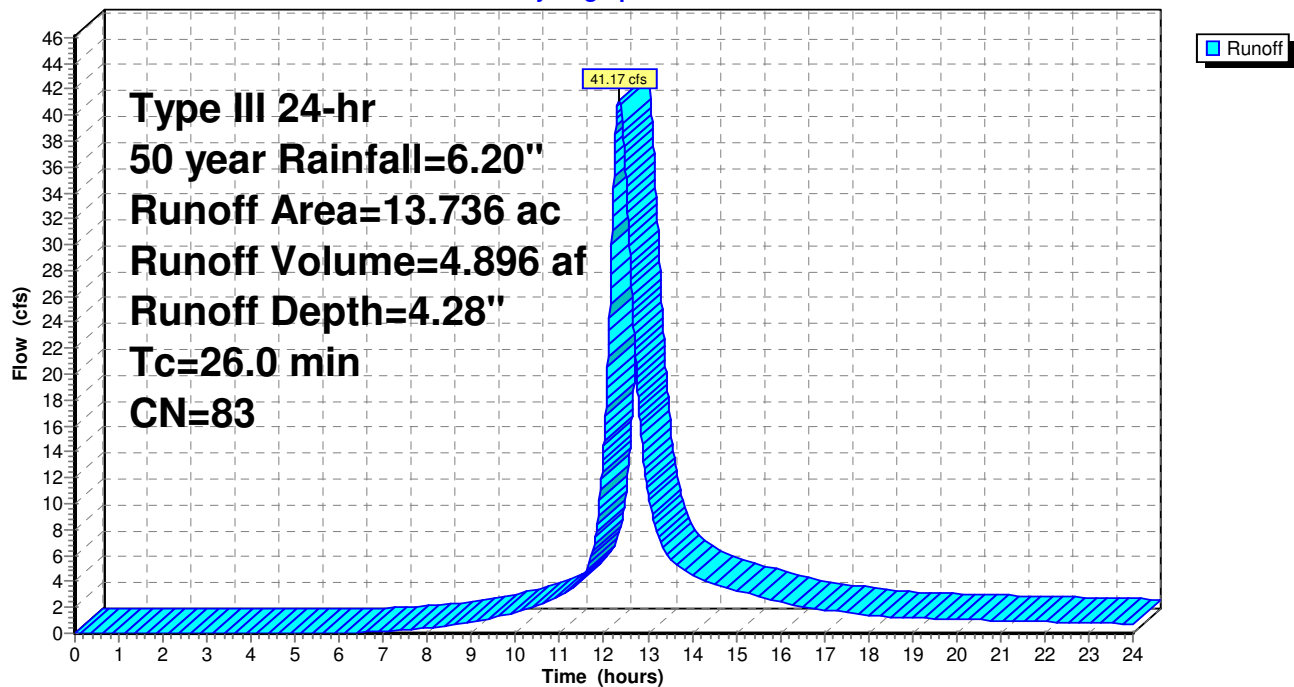
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50 year Rainfall=6.20"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
5.294	98	Paved parking HSG C
7.453	74	>75% Grass cover, Good, HSG C
13.736	83	Weighted Average
8.442		61.46% Pervious Area
5.294		38.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-1

Hydrograph



Summary for Subcatchment 3S: E-1

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 136.23 cfs @ 12.97 hrs, Volume= 26.770 af, Depth= 3.16"

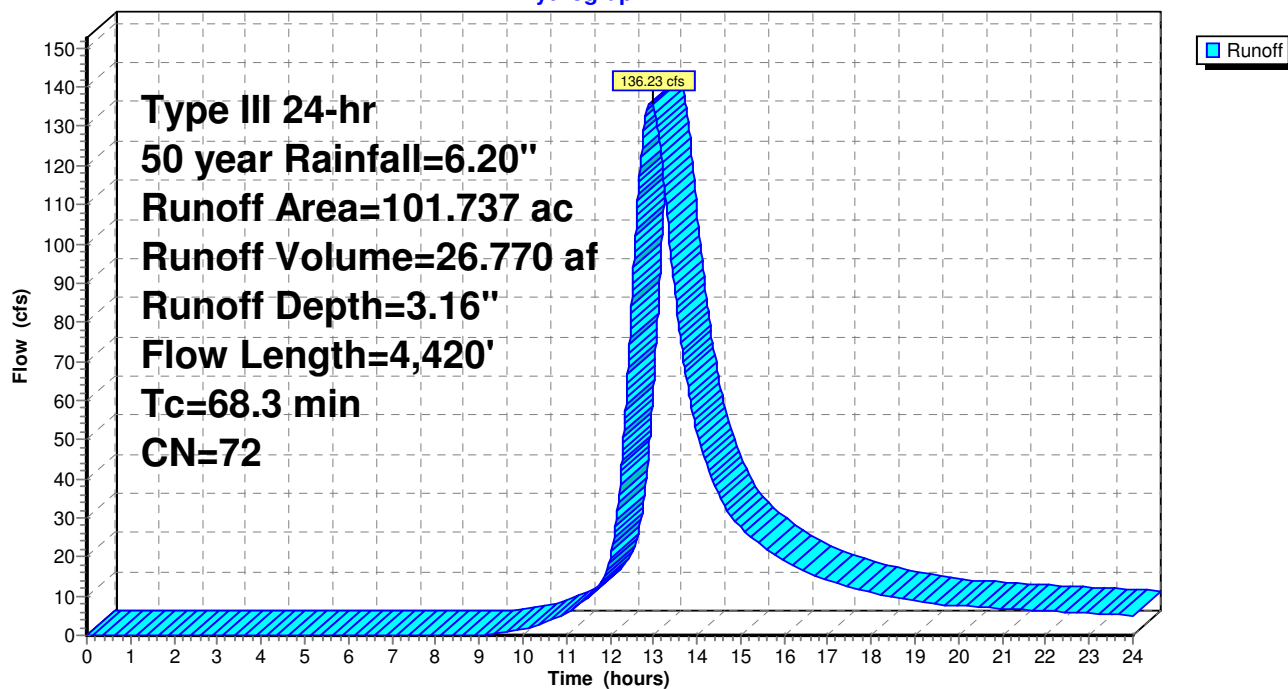
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50 year Rainfall=6.20"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.982	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
24.566	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
8.113	98	Paved parking HSG C
10.775	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
21.174	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
101.737	72	Weighted Average
81.203		79.82% Pervious Area
20.534		20.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, watercourse Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 3S: E-1

Hydrograph



Summary for Reach 3R: Overland Flow

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 3.84" for 50 year event
 Inflow = 14.15 cfs @ 12.89 hrs, Volume= 4.393 af
 Outflow = 14.10 cfs @ 13.10 hrs, Volume= 4.385 af, Atten= 0%, Lag= 12.5 min

Routing by Dyn-Muskingum-Cunge method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Reference Flow= 26.64 cfs Estimated Depth= 0.84' Velocity= 0.62 fps

m= 1.648, c= 1.03 fps, dt= 0.6 min, dx= 760.0' / 21 = 36.2', K= 0.6 min, X= 0.309

Max. Velocity= 1.14 fps, Min. Travel Time= 11.1 min

Avg. Velocity= 0.99 fps, Avg. Travel Time= 12.7 min

Peak Storage= 10,276 cf @ 13.01 hrs

Average Depth at Peak Storage= 0.27'

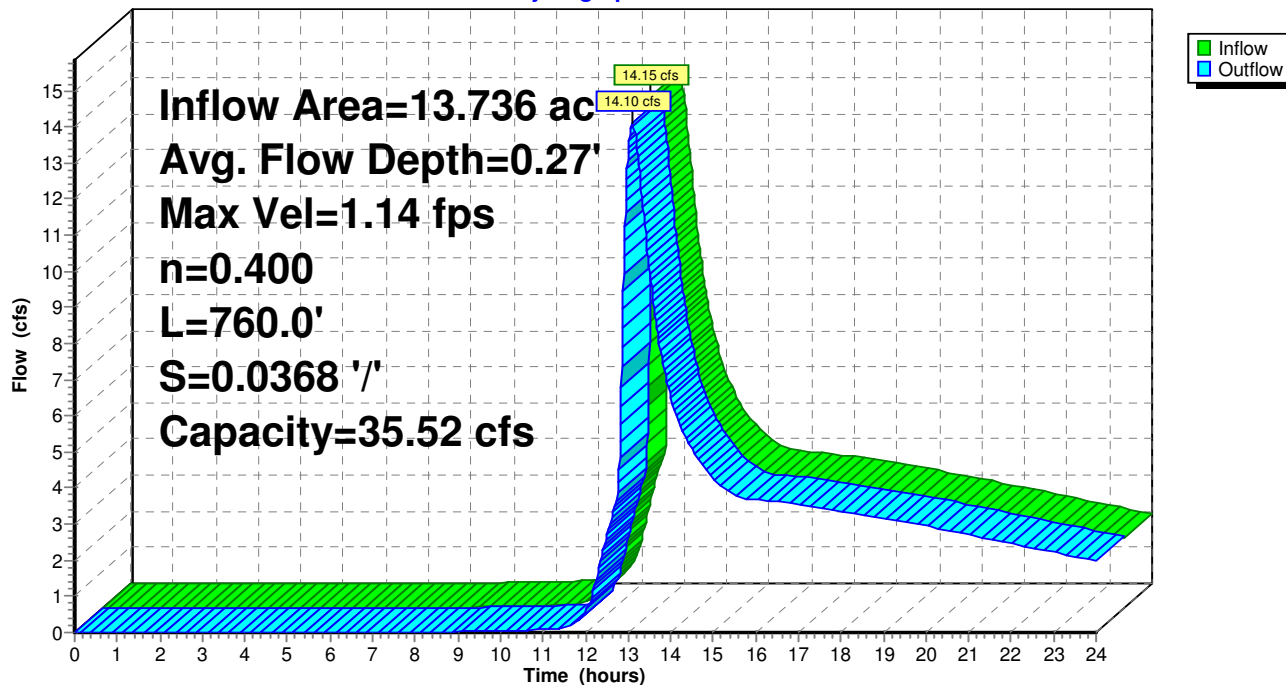
Bank-Full Depth= 1.00' Flow Area= 51.0 sf, Capacity= 35.52 cfs

50.00' x 1.00' deep channel, n= 0.400

Side Slope Z-value= 1.0 '/' Top Width= 52.00'

Length= 760.0' Slope= 0.0368 '/'

Inlet Invert= 88.00', Outlet Invert= 60.00'

**Reach 3R: Overland Flow****Hydrograph**

Summary for Pond 3P: Level Spreader

[57] Hint: Peaked at 90.18' (Flood elevation advised)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 3.84" for 50 year event
 Inflow = 14.15 cfs @ 12.89 hrs, Volume= 4.393 af
 Outflow = 14.15 cfs @ 12.89 hrs, Volume= 4.393 af, Atten= 0%, Lag= 0.0 min
 Primary = 14.15 cfs @ 12.89 hrs, Volume= 4.393 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

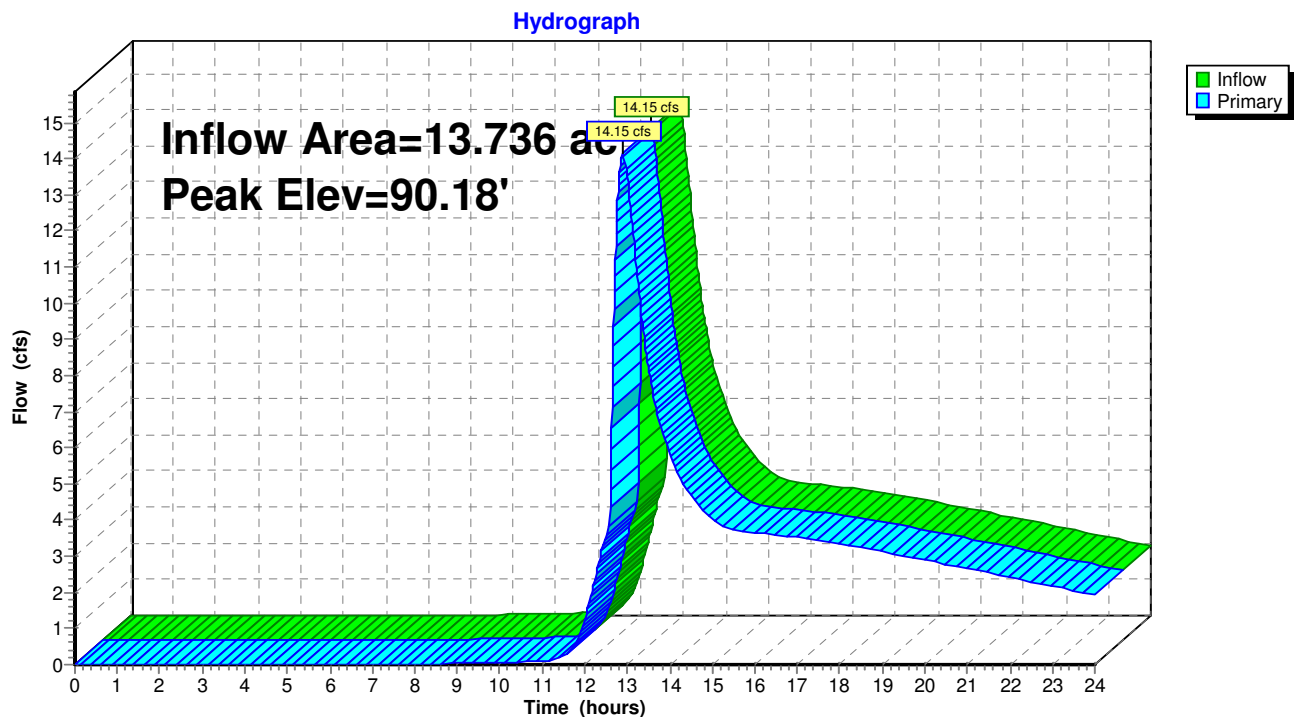
Peak Elev= 90.18' @ 12.89 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	56.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=14.15 cfs @ 12.89 hrs HW=90.18' TW=88.24' (Dynamic Tailwater)

1=Sharp-Crested Rectangular Weir (Weir Controls 14.15 cfs @ 1.41 fps)

Pond 3P: Level Spreader



Summary for Pond 4P: Bioretention Basin

[80] Warning: Exceeded Pond 5P by 1.36' @ 25.50 hrs (2.86 cfs 0.154 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 0.84" for 50 year event
 Inflow = 2.80 cfs @ 10.92 hrs, Volume= 0.965 af
 Outflow = 1.70 cfs @ 12.69 hrs, Volume= 0.641 af, Atten= 39%, Lag= 106.1 min
 Primary = 1.70 cfs @ 12.69 hrs, Volume= 0.641 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.11' @ 12.70 hrs Surf.Area= 12,095 sf Storage= 23,065 cf

Plug-Flow detention time= 441.7 min calculated for 0.641 af (66% of inflow)
 Center-of-Mass det. time= 303.8 min (1,079.3 - 775.5)

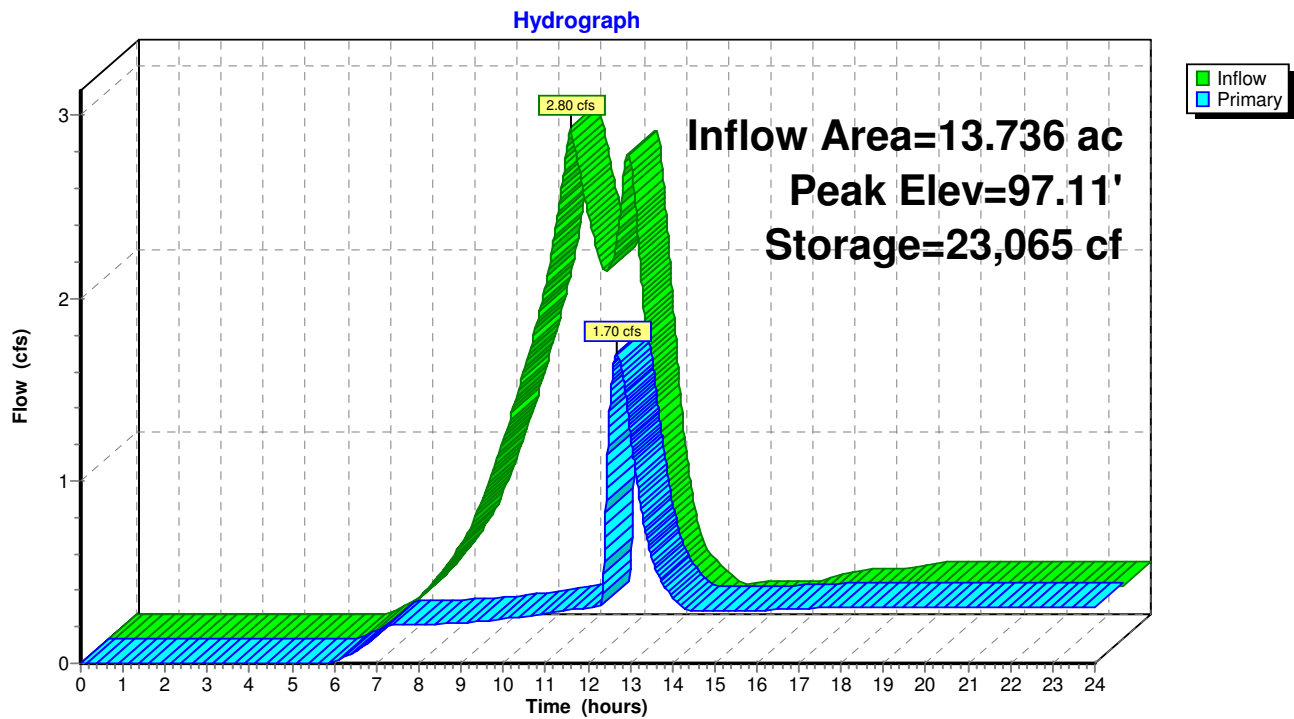
Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	34,250 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	9,768	0	0
96.00	10,848	10,308	10,308
97.00	11,968	11,408	21,716
98.00	13,100	12,534	34,250

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	2.5" Vert. Orifice/Grate C= 0.600
#2	Primary	97.00'	16.0' long x 6.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65			
2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83			

Primary OutFlow Max=1.70 cfs @ 12.69 hrs HW=97.11' TW=94.28' (Dynamic Tailwater)

↑ **1=Orifice/Grate** (Orifice Controls 0.28 cfs @ 8.11 fps)

└ **2=Broad-Crested Rectangular Weir** (Weir Controls 1.42 cfs @ 0.79 fps)

Pond 4P: Bioretention Basin

Summary for Pond 5P: Weir MH 103 WQF

[57] Hint: Peaked at 97.66' (Flood elevation advised)

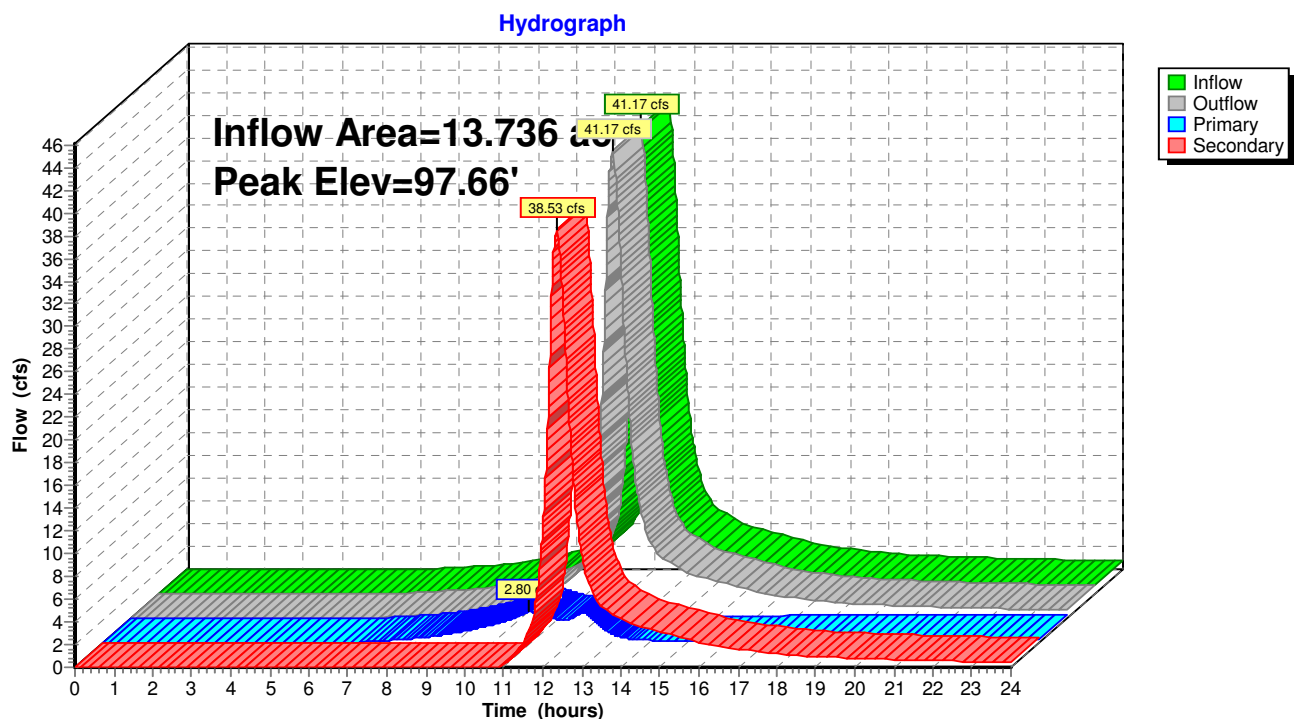
Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 4.28" for 50 year event
 Inflow = 41.17 cfs @ 12.34 hrs, Volume= 4.896 af
 Outflow = 41.17 cfs @ 12.34 hrs, Volume= 4.896 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.80 cfs @ 10.92 hrs, Volume= 0.965 af
 Secondary = 38.53 cfs @ 12.34 hrs, Volume= 3.931 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.66' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	95.40'	12.0" Round Culvert L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.40' / 95.00' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	96.83'	60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.80 cfs @ 10.92 hrs HW=96.83' TW=96.10' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 2.80 cfs @ 3.57 fps)

Secondary OutFlow Max=38.51 cfs @ 12.34 hrs HW=97.66' TW=93.98' (Dynamic Tailwater)
 ↑2=Orifice/Grate (Weir Controls 38.51 cfs @ 2.97 fps)

Pond 5P: Weir MH 103 WQF

Summary for Pond 6P: Detention Basin

[80] Warning: Exceeded Pond 7P by 0.40' @ 24.70 hrs (0.98 cfs 0.011 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 3.99" for 50 year event
 Inflow = 38.91 cfs @ 12.36 hrs, Volume= 4.572 af
 Outflow = 14.15 cfs @ 12.89 hrs, Volume= 4.393 af, Atten= 64%, Lag= 31.6 min
 Primary = 14.15 cfs @ 12.89 hrs, Volume= 4.393 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 94.44' @ 12.89 hrs Surf.Area= 23,618 sf Storage= 83,597 cf

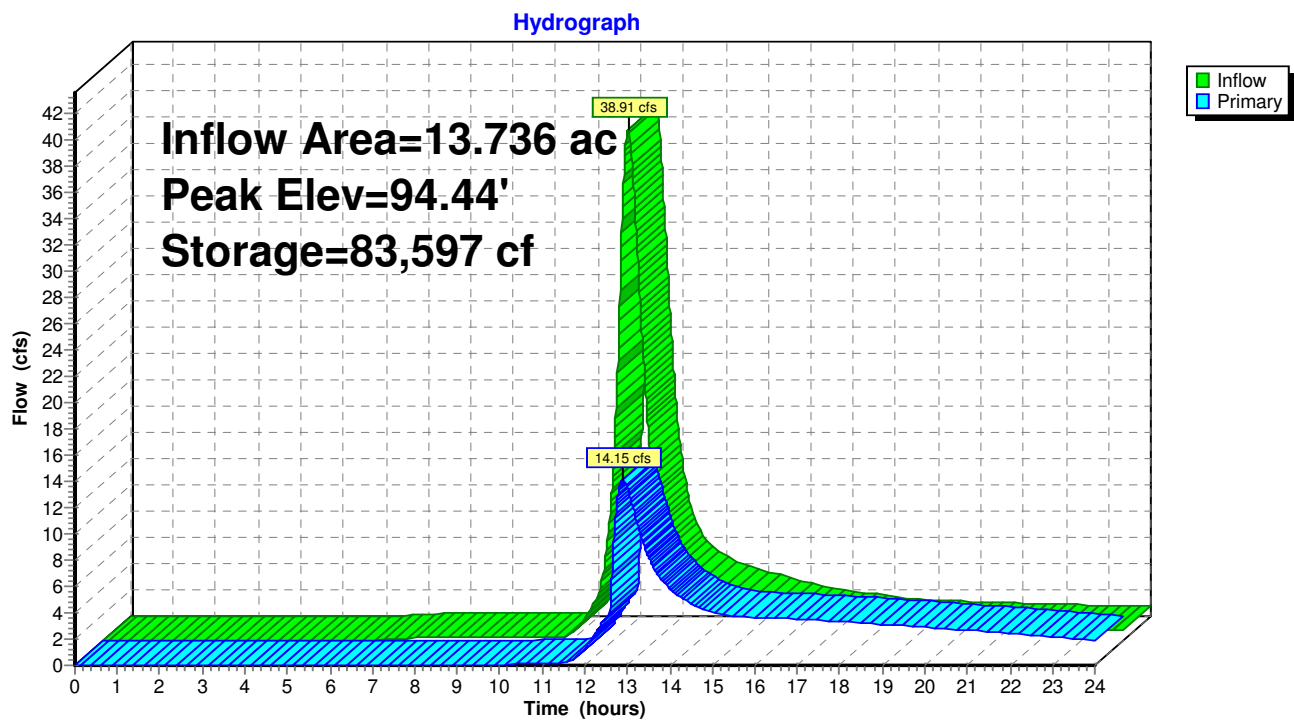
Plug-Flow detention time= 220.8 min calculated for 4.391 af (96% of inflow)
 Center-of-Mass det. time= 191.6 min (1,061.2 - 869.6)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	122,564 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	16,859	0	0
92.00	19,568	30,963	30,963
94.00	22,870	42,438	73,401
95.00	24,576	23,723	97,124
96.00	26,304	25,440	122,564

Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	30.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	90.30'	10.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.30' / 90.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	93.90'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=14.15 cfs @ 12.89 hrs HW=94.44' TW=90.18' (Dynamic Tailwater)

- 1=Culvert (Passes 14.15 cfs of 40.36 cfs potential flow)
- 2=Culvert (Inlet Controls 4.00 cfs @ 7.33 fps)
- 3=Orifice/Grate (Weir Controls 10.15 cfs @ 2.40 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Detention Basin

Summary for Pond 7P: Weir MH 103 to Det Basin

[57] Hint: Peaked at 94.67' (Flood elevation advised)

Inflow = 38.53 cfs @ 12.34 hrs, Volume= 3.931 af
 Outflow = 38.53 cfs @ 12.34 hrs, Volume= 3.931 af, Atten= 0%, Lag= 0.0 min
 Primary = 38.53 cfs @ 12.34 hrs, Volume= 3.931 af

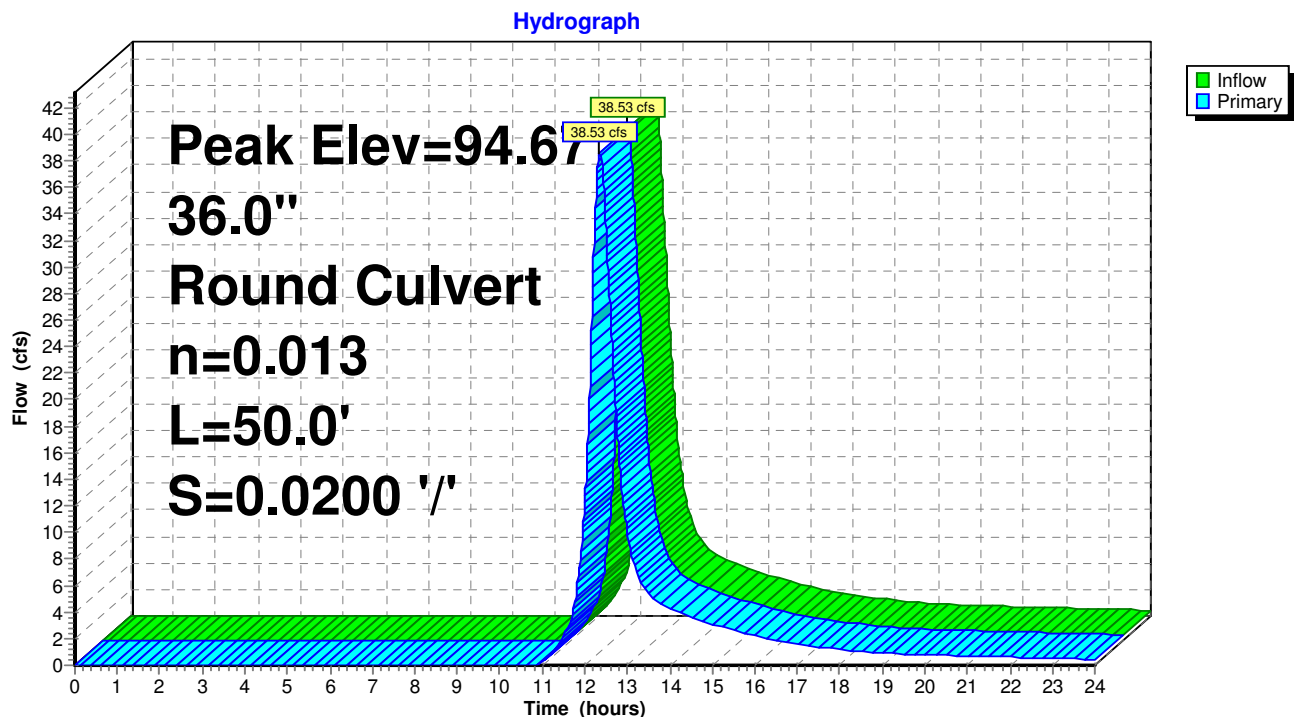
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 94.67' @ 12.69 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	91.00'	36.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.00' S= 0.0200 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=38.60 cfs @ 12.34 hrs HW=93.98' TW=92.69' (Dynamic Tailwater)

1=Culvert (Outlet Controls 38.60 cfs @ 6.84 fps)

Pond 7P: Weir MH 103 to Det Basin

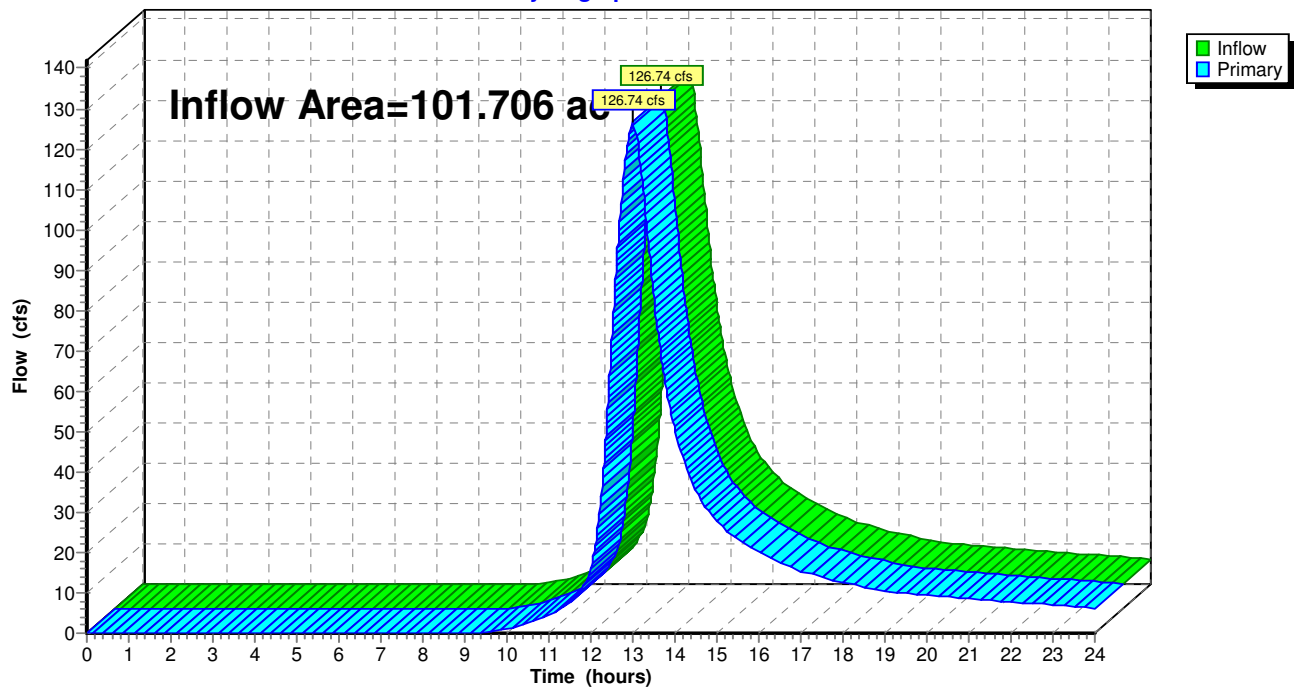
Summary for Link 2L: Design Point

Inflow Area = 101.706 ac, 23.22% Impervious, Inflow Depth > 3.16" for 50 year event
Inflow = 126.74 cfs @ 12.98 hrs, Volume= 26.823 af
Primary = 126.74 cfs @ 12.98 hrs, Volume= 26.823 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Design Point

Hydrograph



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Muskingum-Cunge method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: P-2Runoff Area=87.970 ac 20.82% Impervious Runoff Depth=3.72"
Flow Length=4,420' Tc=68.3 min CN=71 Runoff=139.12 cfs 27.296 af**Subcatchment 2S: P-1**Runoff Area=13.736 ac 38.54% Impervious Runoff Depth=5.03"
Tc=26.0 min CN=83 Runoff=48.15 cfs 5.755 af**Subcatchment 3S: E-1**Runoff Area=101.737 ac 20.18% Impervious Runoff Depth=3.83"
Flow Length=4,420' Tc=68.3 min CN=72 Runoff=165.57 cfs 32.463 af**Reach 3R: Overland Flow**Avg. Flow Depth=0.45' Max Vel=1.18 fps Inflow=23.78 cfs 5.242 af
n=0.400 L=760.0' S=0.0368 '/' Capacity=35.52 cfs Outflow=23.66 cfs 5.233 af**Pond 3P: Level Spreader**Peak Elev=90.25' Inflow=23.78 cfs 5.242 af
Outflow=23.78 cfs 5.242 af**Pond 4P: Bioretention Basin**Peak Elev=97.14' Storage=23,356 cf Inflow=2.73 cfs 1.032 af
Outflow=2.17 cfs 0.707 af**Pond 5P: Weir MH 103 WQF**Peak Elev=97.75' Inflow=48.15 cfs 5.755 af
Primary=2.73 cfs 1.032 af Secondary=45.51 cfs 4.723 af Outflow=48.15 cfs 5.755 af**Pond 6P: Detention Basin**Peak Elev=94.74' Storage=90,693 cf Inflow=47.12 cfs 5.430 af
Outflow=23.78 cfs 5.242 af**Pond 7P: Weir MH 103 to Det Basin**Peak Elev=95.56' Inflow=45.51 cfs 4.723 af
36.0" Round Culvert n=0.013 L=50.0' S=0.0200 '/' Outflow=45.51 cfs 4.723 af**Link 2L: Design Point**Inflow=162.75 cfs 32.529 af
Primary=162.75 cfs 32.529 af**Total Runoff Area = 203.443 ac Runoff Volume = 65.514 af Average Runoff Depth = 3.86"**
78.30% Pervious = 159.296 ac 21.70% Impervious = 44.147 ac

Summary for Subcatchment 1S: P-2

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 139.12 cfs @ 12.97 hrs, Volume= 27.296 af, Depth= 3.72"

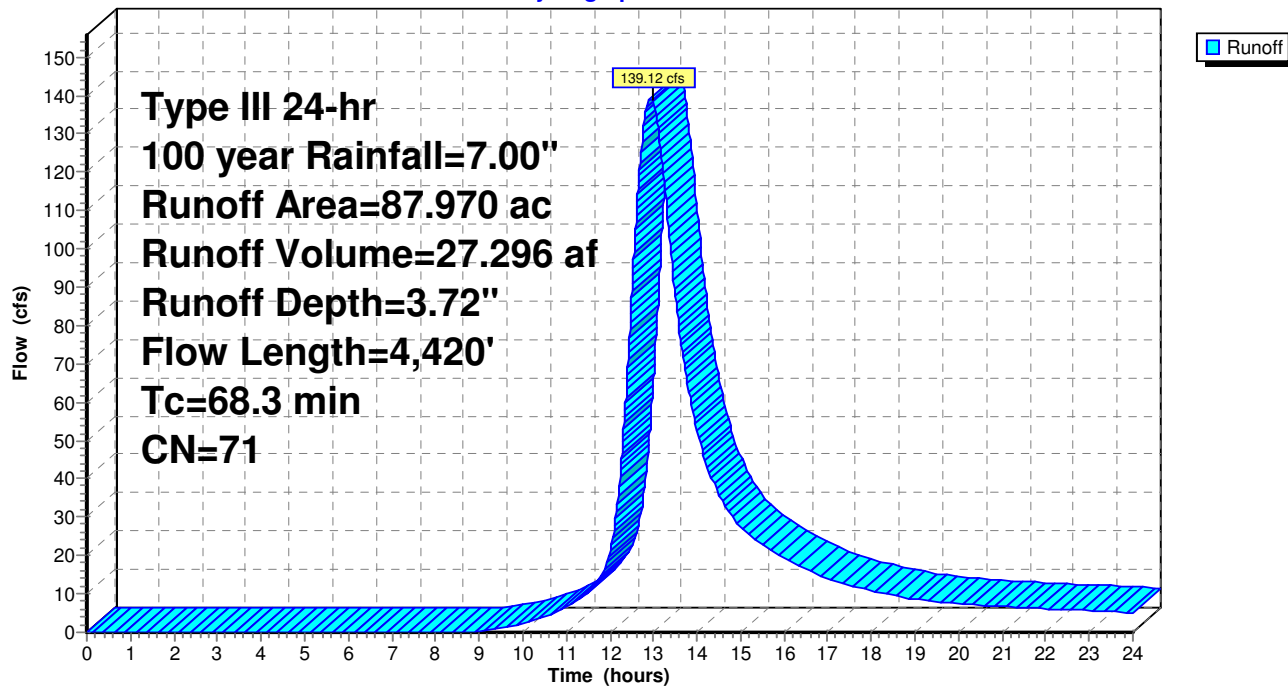
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.449	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
16.559	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
5.898	98	Paved parking HSG C
10.774	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
18.163	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
87.970	71	Weighted Average
69.651		79.18% Pervious Area
18.319		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 1S: P-2

Hydrograph



Summary for Subcatchment 2S: P-1

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 48.15 cfs @ 12.34 hrs, Volume= 5.755 af, Depth= 5.03"

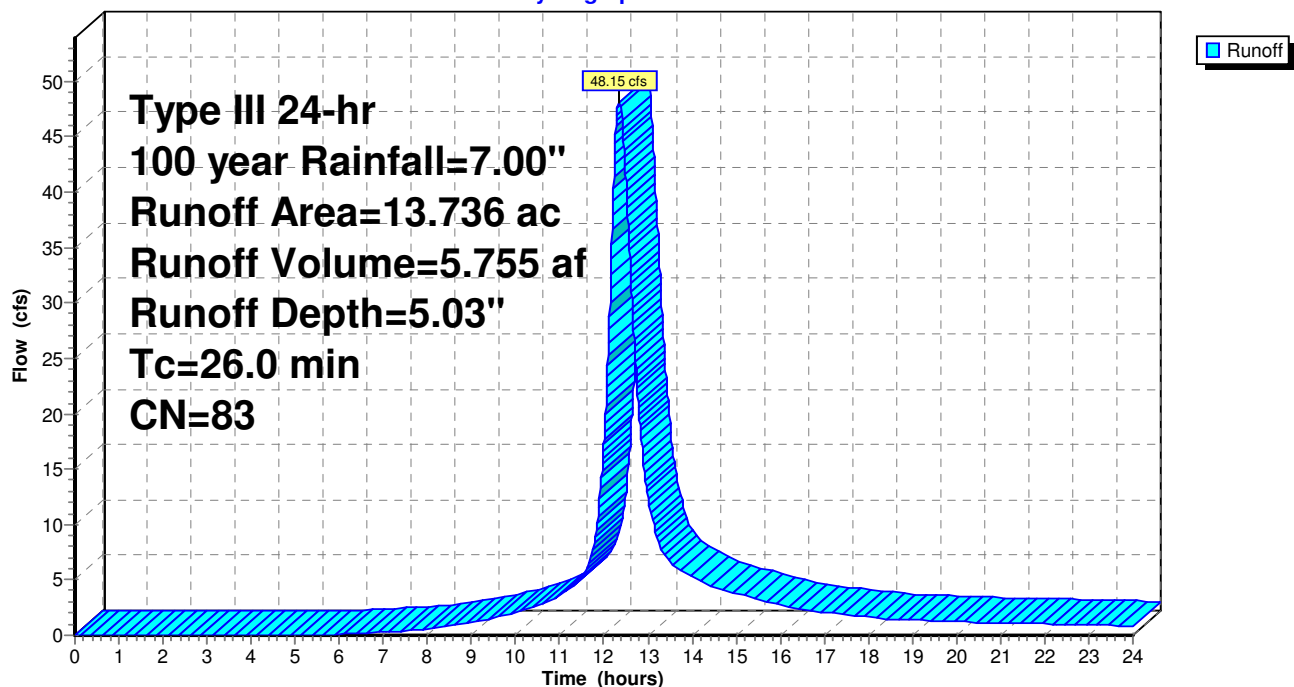
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
5.294	98	Paved parking HSG C
7.453	74	>75% Grass cover, Good, HSG C
13.736	83	Weighted Average
8.442		61.46% Pervious Area
5.294		38.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-1

Hydrograph



Summary for Subcatchment 3S: E-1

CarlsonPlanXYPos|1171180.9301|691042.4469|

CarlsonSurface||

Runoff = 165.57 cfs @ 12.91 hrs, Volume= 32.463 af, Depth= 3.83"

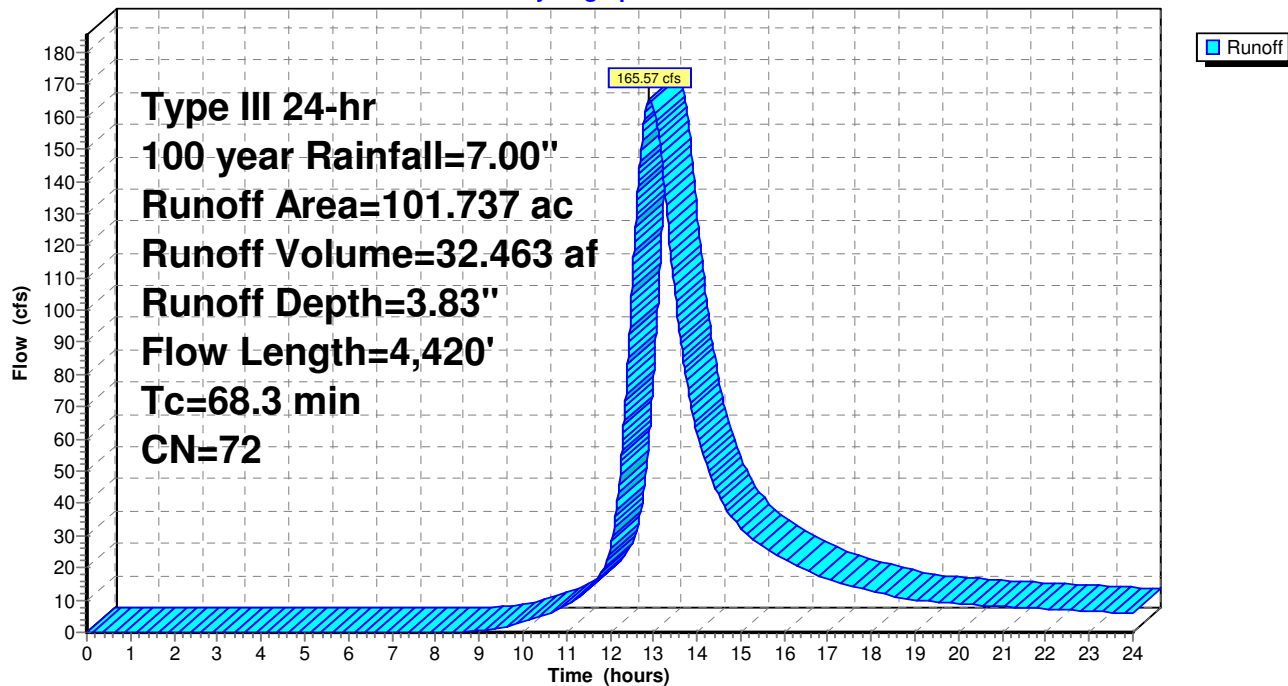
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (ac)	CN	Description
11.076	98	Paved parking HSG A
10.583	77	Woods, Good, HSG D
1.982	72	Woods/grass comb., Good, HSG C
0.201	79	Woods/grass comb., Good, HSG D
3.504	30	Woods, Good, HSG A
24.566	70	Woods, Good, HSG C
3.932	55	Woods, Good, HSG B
0.822	98	Paved parking HSG B
0.523	98	Paved parking HSG D
8.113	98	Paved parking HSG C
10.775	39	>75% Grass cover, Good, HSG A
3.488	61	>75% Grass cover, Good, HSG B
21.174	74	>75% Grass cover, Good, HSG C
0.998	80	>75% Grass cover, Good, HSG D
101.737	72	Weighted Average
81.203		79.82% Pervious Area
20.534		20.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0200	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.6	980	0.0490	4.49		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.8	1,230		3.00		Direct Entry, pipe flow
43.6	2,110	0.0260	0.81		Shallow Concentrated Flow, watercourse Woodland Kv= 5.0 fps
68.3	4,420	Total			

Subcatchment 3S: E-1

Hydrograph



Summary for Reach 3R: Overland Flow

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 4.58" for 100 year event
 Inflow = 23.78 cfs @ 12.74 hrs, Volume= 5.242 af
 Outflow = 23.66 cfs @ 12.95 hrs, Volume= 5.233 af, Atten= 1%, Lag= 12.5 min

Routing by Dyn-Muskingum-Cunge method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Reference Flow= 26.64 cfs Estimated Depth= 0.84' Velocity= 0.62 fps

m= 1.648, c= 1.03 fps, dt= 0.6 min, dx= 760.0' / 21 = 36.2', K= 0.6 min, X= 0.309

Max. Velocity= 1.18 fps, Min. Travel Time= 10.7 min

Avg. Velocity= 0.99 fps, Avg. Travel Time= 12.7 min

Peak Storage= 17,141 cf @ 12.86 hrs

Average Depth at Peak Storage= 0.45'

Bank-Full Depth= 1.00' Flow Area= 51.0 sf, Capacity= 35.52 cfs

50.00' x 1.00' deep channel, n= 0.400

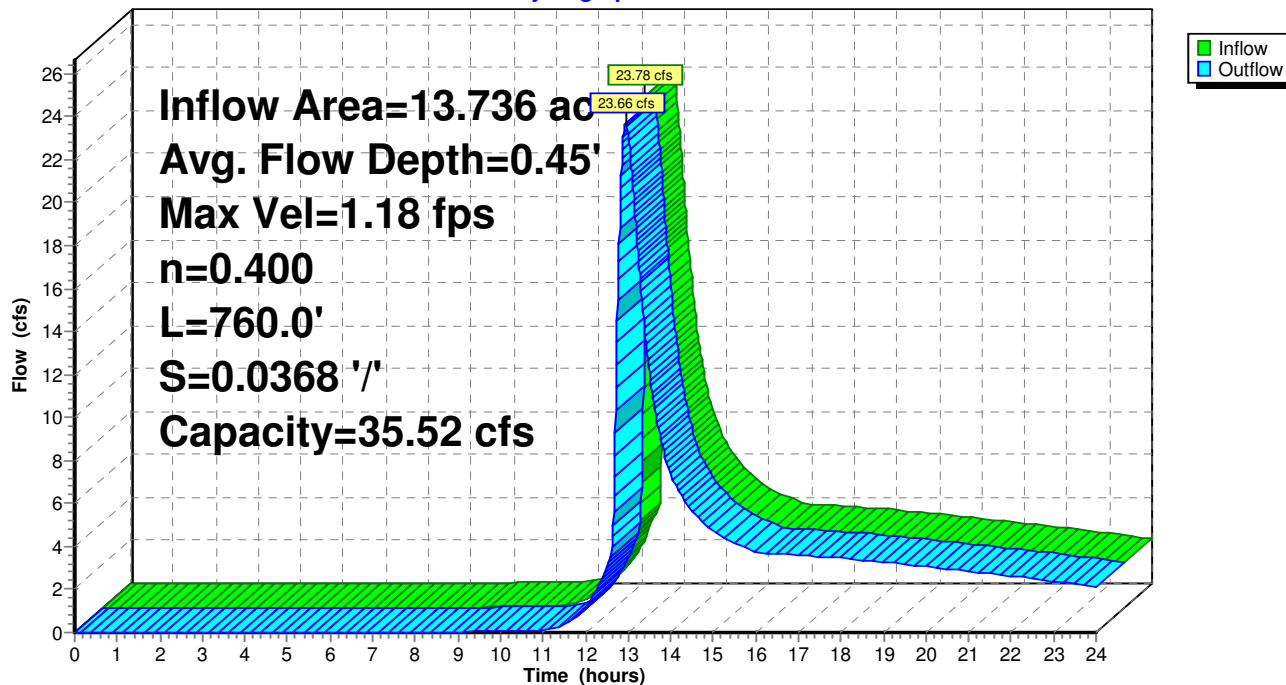
Side Slope Z-value= 1.0 '/' Top Width= 52.00'

Length= 760.0' Slope= 0.0368 '/'

Inlet Invert= 88.00', Outlet Invert= 60.00'

**Reach 3R: Overland Flow**

Hydrograph



Summary for Pond 3P: Level Spreader

[57] Hint: Peaked at 90.25' (Flood elevation advised)

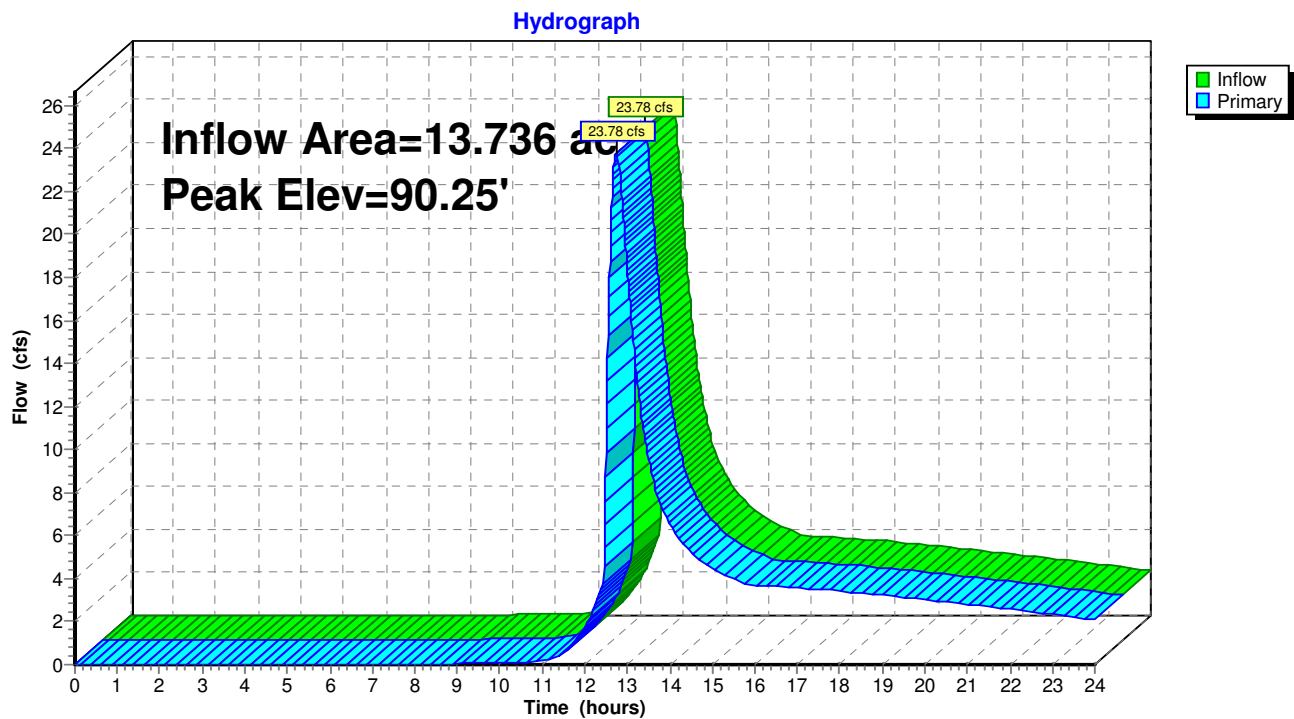
Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 4.58" for 100 year event
 Inflow = 23.78 cfs @ 12.74 hrs, Volume= 5.242 af
 Outflow = 23.78 cfs @ 12.74 hrs, Volume= 5.242 af, Atten= 0%, Lag= 0.0 min
 Primary = 23.78 cfs @ 12.74 hrs, Volume= 5.242 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 90.25' @ 12.74 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.00'	56.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=23.78 cfs @ 12.74 hrs HW=90.25' TW=88.39' (Dynamic Tailwater)
 ↳ **1=Sharp-Crested Rectangular Weir** (Weir Controls 23.78 cfs @ 1.69 fps)

Pond 3P: Level Spreader

Summary for Pond 4P: Bioretention Basin

[80] Warning: Exceeded Pond 5P by 1.36' @ 25.48 hrs (2.87 cfs 0.156 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 0.90" for 100 year event
 Inflow = 2.73 cfs @ 10.53 hrs, Volume= 1.032 af
 Outflow = 2.17 cfs @ 12.57 hrs, Volume= 0.707 af, Atten= 21%, Lag= 122.0 min
 Primary = 2.17 cfs @ 12.57 hrs, Volume= 0.707 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.14' @ 12.57 hrs Surf.Area= 12,122 sf Storage= 23,356 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 287.4 min (1,044.2 - 756.9)

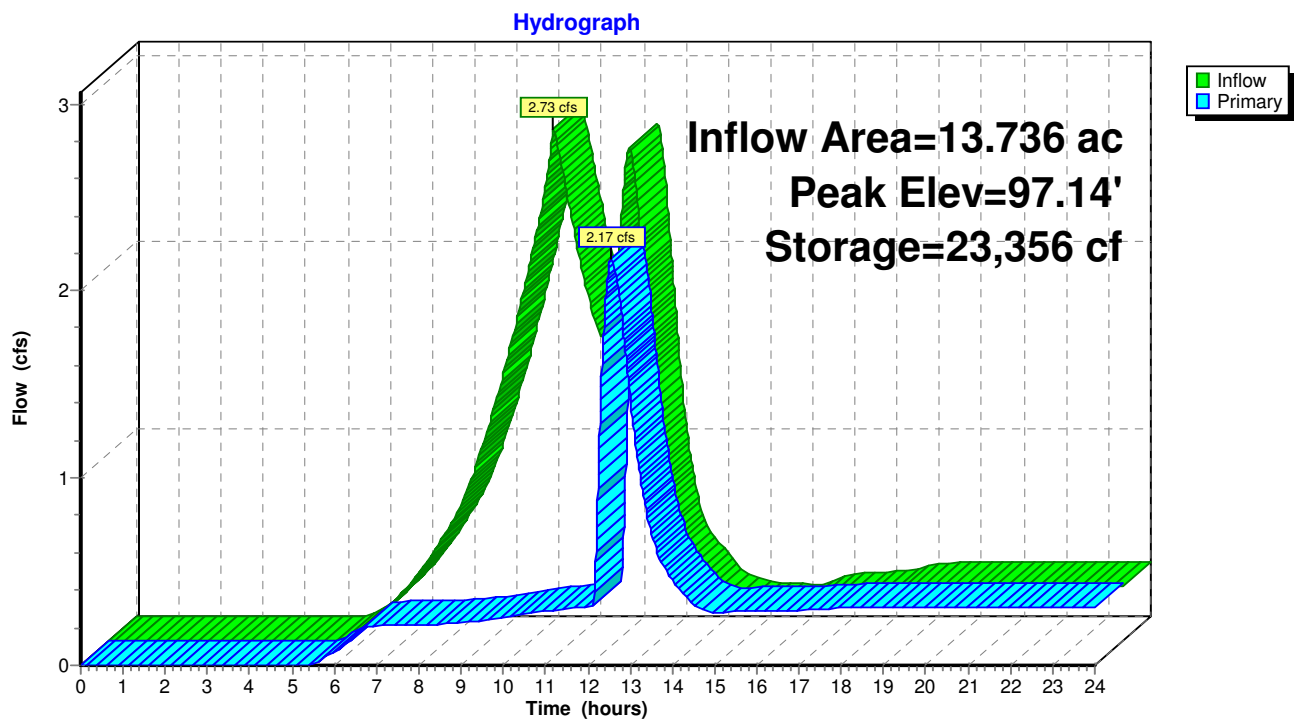
Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	34,250 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	9,768	0	0
96.00	10,848	10,308	10,308
97.00	11,968	11,408	21,716
98.00	13,100	12,534	34,250

Device	Routing	Invert	Outlet Devices
#1	Primary	93.25'	2.5" Vert. Orifice/Grate C= 0.600
#2	Primary	97.00'	16.0' long x 6.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65			
2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83			

Primary OutFlow Max=2.17 cfs @ 12.57 hrs HW=97.14' TW=94.53' (Dynamic Tailwater)

↑ **1=Orifice/Grate** (Orifice Controls 0.27 cfs @ 7.78 fps)

└ **2=Broad-Crested Rectangular Weir** (Weir Controls 1.90 cfs @ 0.87 fps)

Pond 4P: Bioretention Basin

Summary for Pond 5P: Weir MH 103 WQF

[57] Hint: Peaked at 97.75' (Flood elevation advised)

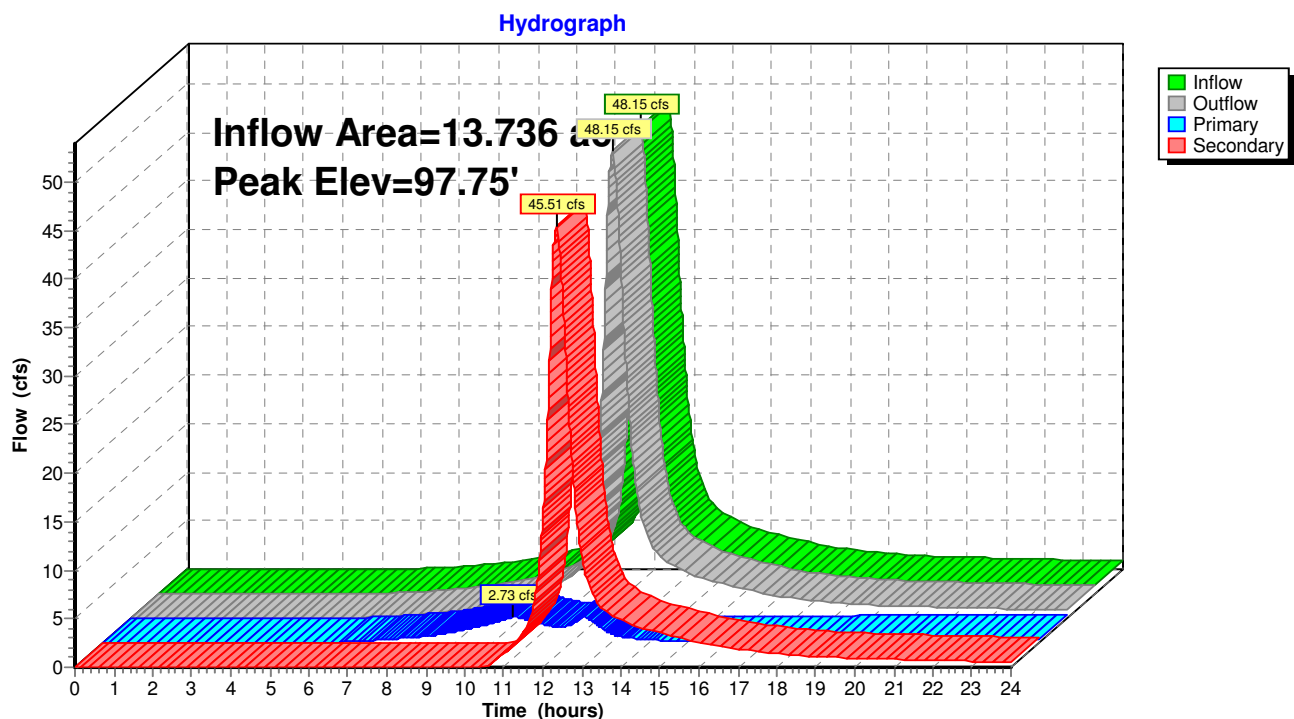
Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth = 5.03" for 100 year event
 Inflow = 48.15 cfs @ 12.34 hrs, Volume= 5.755 af
 Outflow = 48.15 cfs @ 12.34 hrs, Volume= 5.755 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.73 cfs @ 10.53 hrs, Volume= 1.032 af
 Secondary = 45.51 cfs @ 12.34 hrs, Volume= 4.723 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 97.75' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	95.40'	12.0" Round Culvert L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 95.40' / 95.00' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	96.83'	60.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.73 cfs @ 10.53 hrs HW=96.83' TW=96.14' (Dynamic Tailwater)
 ↑1=Culvert (Outlet Controls 2.73 cfs @ 3.48 fps)

Secondary OutFlow Max=45.50 cfs @ 12.34 hrs HW=97.75' TW=95.05' (Dynamic Tailwater)
 ↑2=Orifice/Grate (Weir Controls 45.50 cfs @ 3.14 fps)

Pond 5P: Weir MH 103 WQF

Summary for Pond 6P: Detention Basin

[80] Warning: Exceeded Pond 7P by 0.54' @ 24.77 hrs (1.91 cfs 0.023 af)

Inflow Area = 13.736 ac, 38.54% Impervious, Inflow Depth > 4.74" for 100 year event
 Inflow = 47.12 cfs @ 12.35 hrs, Volume= 5.430 af
 Outflow = 23.78 cfs @ 12.74 hrs, Volume= 5.242 af, Atten= 50%, Lag= 23.4 min
 Primary = 23.78 cfs @ 12.74 hrs, Volume= 5.242 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 94.74' @ 12.74 hrs Surf.Area= 24,125 sf Storage= 90,693 cf

Plug-Flow detention time= 198.6 min calculated for 5.242 af (97% of inflow)
 Center-of-Mass det. time= 172.8 min (1,032.9 - 860.1)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	122,564 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	16,859	0	0
92.00	19,568	30,963	30,963
94.00	22,870	42,438	73,401
95.00	24,576	23,723	97,124
96.00	26,304	25,440	122,564

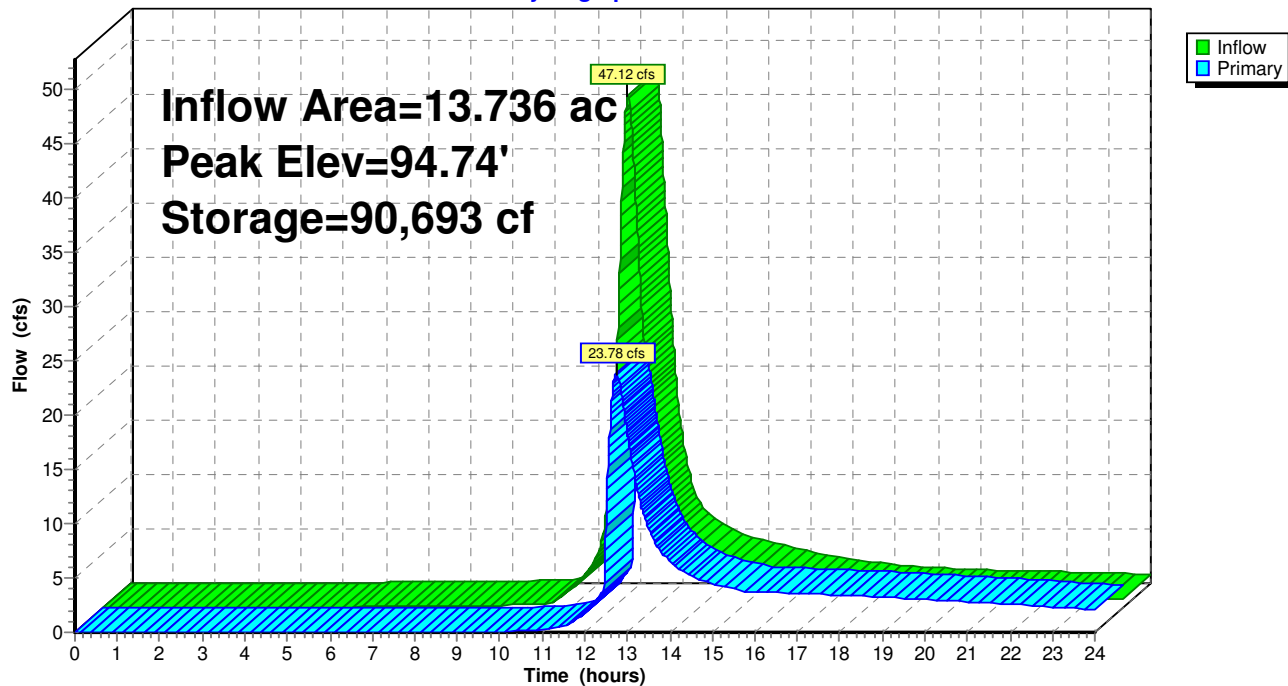
Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	30.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	90.30'	10.0" Round Culvert L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.30' / 90.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#3	Device 1	93.90'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=23.78 cfs @ 12.74 hrs HW=94.74' TW=90.25' (Dynamic Tailwater)

- 1=Culvert (Passes 23.78 cfs of 42.52 cfs potential flow)
- 2=Culvert (Inlet Controls 4.16 cfs @ 7.62 fps)
- 3=Orifice/Grate (Weir Controls 19.63 cfs @ 2.99 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Detention Basin

Hydrograph



Summary for Pond 7P: Weir MH 103 to Det Basin

[57] Hint: Peaked at 95.56' (Flood elevation advised)

Inflow	=	45.51 cfs @ 12.34 hrs,	Volume=	4.723 af
Outflow	=	45.51 cfs @ 12.34 hrs,	Volume=	4.723 af, Atten= 0%, Lag= 0.0 min
Primary	=	45.51 cfs @ 12.34 hrs,	Volume=	4.723 af

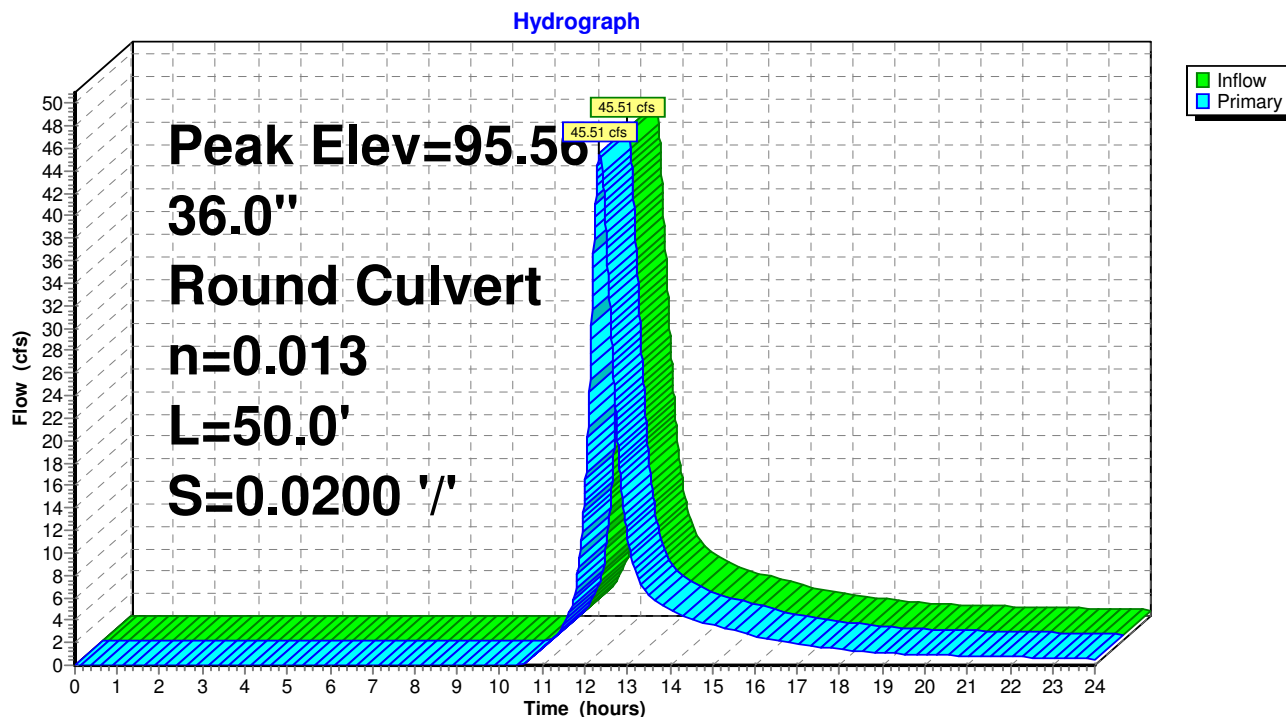
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 95.56' @ 12.50 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	91.00'	36.0" Round Culvert L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf

Primary OutFlow Max=45.50 cfs @ 12.34 hrs HW=95.05' TW=93.26' (Dynamic Tailwater)
 ↑1=Culvert (Inlet Controls 45.50 cfs @ 6.44 fps)

Pond 7P: Weir MH 103 to Det Basin



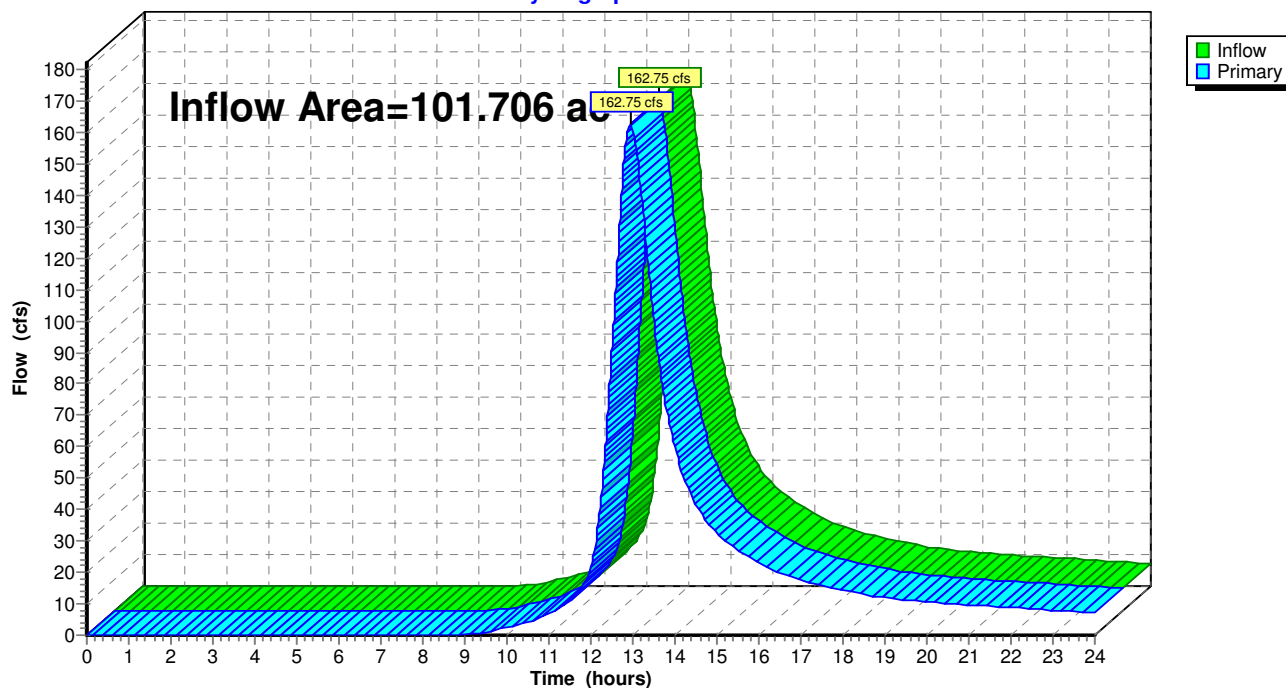
Summary for Link 2L: Design Point

Inflow Area = 101.706 ac, 23.22% Impervious, Inflow Depth > 3.84" for 100 year event
Inflow = 162.75 cfs @ 12.95 hrs, Volume= 32.529 af
Primary = 162.75 cfs @ 12.95 hrs, Volume= 32.529 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Design Point

Hydrograph



Provost & Rovero, Inc.

P.O. Box 191, 57 East Main Street Plainfield, CT 06374

Telephone (860) 230-0856

Fax (860) 230-0860

Job: 213009 - Level Spreader Design

Sheet No. 1 of 1

Calculated by: DJH Date: 2/5/23

Checked by: _____ Date: _____

Scale: _____

100 yr detention basin discharge = 23.78 ft³/s

Level spreader weir length = 56'

Per HydroCAD report, water elevation over weir = 90.25

∴ flow depth = 0.25'

$$V = \frac{Q}{A} = \frac{23.78 \text{ ft}^3/\text{s}}{(56 \text{ ft})(0.25 \text{ ft})} = 1.70 \text{ ft/s}$$

Per 2002 E&S Guidelines, allowable velocity for sandy loam = 2.5 ft/s

∴ Level spreader flow will not cause soil erosion

Section 5

Erosion and Sediment Control Design

Provost & Rovero, Inc.

P.O. Box 191, 57 East Main Street Plainfield, CT 06374

Telephone (860) 230-0856

Fax (860) 230-0860

Job: 213009 - Revised E&S Design

Sheet No. 1 of 2

Calculated by: DJH Date: 2/5/23

Checked by: _____ Date: _____

Scale: _____

DA with temporary diversion swales = 11.78 ac.

A: 6.04 acres construction site @ 50 ton/ac/yr
5.74 acres developed @ 1.0 ton/ac/yr

$$A_{avg} = 26 \text{ ton/ac/yr}$$

DR for silt/sand mix = 0.50

TE = 0.80 (assume 80% efficiency)

$$\phi = 85 \text{ #/ft}^3$$

$$\text{Sediment Volume, } V = \frac{(DA)(A)(DR)(TE)(2,000 \text{ #/ton})}{\phi (43,560 \text{ ft}^2/\text{ac})}$$

$$V = \frac{(11.78 \text{ ac})(26 \text{ ton/ac/yr})(0.50)(0.80)(2,000 \text{ #/ton})}{(85 \text{ #/ft}^3)(43,560 \text{ ft}^2/\text{ac})} = 0.066 \text{ ac}\cdot\text{ft/yr}$$

Assume 18 month disturbed period (construction duration)

$$\therefore \text{Required Sediment Storage} = (0.066 \text{ ac}\cdot\text{ft/yr})(1.5 \text{ yr}) = 0.10 \text{ ac}\cdot\text{ft}$$

Determine detention Storage volume

$$Q_{10} = 27.83 \text{ cfs}$$

$$V_r = 3.302 \text{ ac}\cdot\text{ft} / 11.78 \text{ ac} = 0.28 \text{ ft} = 3.4 \text{ in}$$

$$Q_{10} / DA = 27.83 / 11.78 = 2.36$$

From Figure SB-13, $Q_0 / Q_i = 0.10$

$$\therefore Q_0 = 0.10(27.83 \text{ cfs}) = 2.8 \text{ cfs}$$

Provost & Rovero, Inc.

P.O. Box 191, 57 East Main Street Plainfield, CT 06374

Telephone (860) 230-0856

Fax (860) 230-0860

Job: 213009-Revised E&S Design

Sheet No. 2 of 2

Calculated by: DJH Date: 2/5/23

Checked by: _____ Date: _____

Scale: _____

$$\text{Release Rate} = \frac{(2.8 \text{ cfs})(640 \text{ ac/sm})}{11.78 \text{ ac}} = 152 \text{ csm}$$

$$\text{From Figure DB-6 } V_s = (1.90 \text{ in})(11.78 \text{ ac})(1 \text{ ft}/12 \text{ in}) = 1.87 \text{ ac}\cdot\text{ft}$$

$$\begin{aligned}\text{Total Storage Required} &= 1.87 \text{ ac}\cdot\text{ft} + 0.10 \text{ ac}\cdot\text{ft} = 1.97 \text{ ac}\cdot\text{ft} \\ &= 85,813 \text{ ft}^3\end{aligned}$$

Basin Volume:

Elevation (ft)	Area (ft ²)	Volume (ft ³)	Cum. Vol. (ft ³)
90.3	23,193		
		43,070	43,070
92	27,478		
		60,143	103,213
94	32,665		
		33,992	137,205
95	35,319		

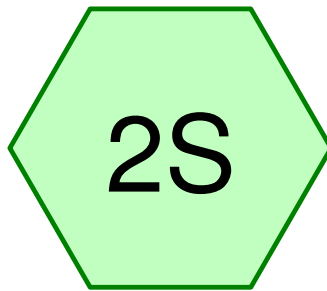
Required basin volume is at elevation 93.42

Set principal spillway at elevation 93.42

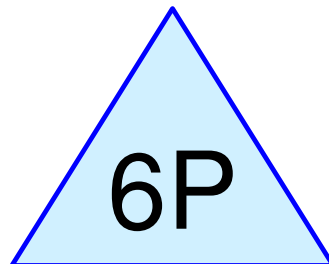
Use permanent detention basin emergency spillway at elevation 95.00

100 yr. water surface elevation = 94.33

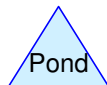
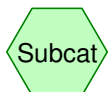
Top of embankment = 96.00



P-2



Sediment Basin



Routing Diagram for 213009 E&S REV 2-4-23

Prepared by Provost & Rovero, Inc., Printed 2/5/2023

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Project Notes

CarlsonStageIncrement|1.0000|

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.321	74	>75% Grass cover, Good, HSG C (2S)
6.040	91	Newly graded area, HSG C (2S)
2.430	98	Paved parking HSG C (2S)
0.464	70	Woods, Good, HSG C (2S)
0.525	72	Woods/grass comb., Good, HSG C (2S)
11.780	87	TOTAL AREA

213009 E&S REV 2-4-23

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Printed 2/5/2023

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Page 4

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
11.780	HSG C	2S
0.000	HSG D	
0.000	Other	
11.780		TOTAL AREA

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Page 5

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	2.321	0.000	0.000	2.321	>75% Grass cover, Good	2S
0.000	0.000	6.040	0.000	0.000	6.040	Newly graded area	2S
0.000	0.000	2.430	0.000	0.000	2.430	Paved parking	2S
0.000	0.000	0.464	0.000	0.000	0.464	Woods, Good	2S
0.000	0.000	0.525	0.000	0.000	0.525	Woods/grass comb., Good	2S
0.000	0.000	11.780	0.000	0.000	11.780	TOTAL AREA	

213009 E&S REV 2-4-23

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Printed 2/5/2023

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Page 6

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	6P	90.25	90.00	44.0	0.0057	0.012	24.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 2S: P-2

Runoff Area=11.780 ac 20.63% Impervious Runoff Depth>1.91"
Tc=26.0 min CN=87 Runoff=15.93 cfs 1.870 af

Pond 6P: Sediment Basin

Peak Elev=93.32' Storage=81,456 cf Inflow=15.93 cfs 1.870 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 11.780 ac Runoff Volume = 1.870 af Average Runoff Depth = 1.91"
79.37% Pervious = 9.350 ac 20.63% Impervious = 2.430 ac

Summary for Subcatchment 2S: P-2

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 15.93 cfs @ 12.36 hrs, Volume= 1.870 af, Depth> 1.91"

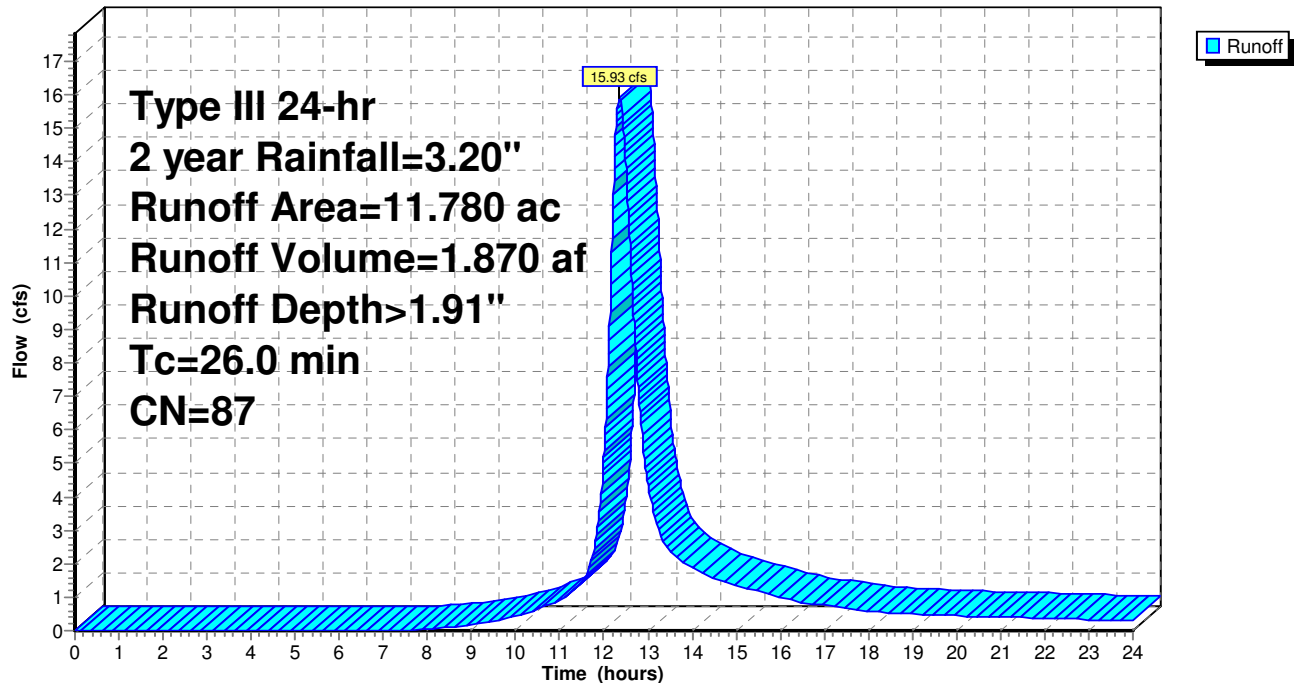
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.20"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
2.430	98	Paved parking HSG C
2.321	74	>75% Grass cover, Good, HSG C
6.040	91	Newly graded area, HSG C
11.780	87	Weighted Average
9.350		79.37% Pervious Area
2.430		20.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-2

Hydrograph



Summary for Pond 6P: Sediment Basin

Inflow Area = 11.780 ac, 20.63% Impervious, Inflow Depth > 1.91" for 2 year event
 Inflow = 15.93 cfs @ 12.36 hrs, Volume= 1.870 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 Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 93.32' @ 24.00 hrs Surf.Area= 30,889 sf Storage= 81,456 cf

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

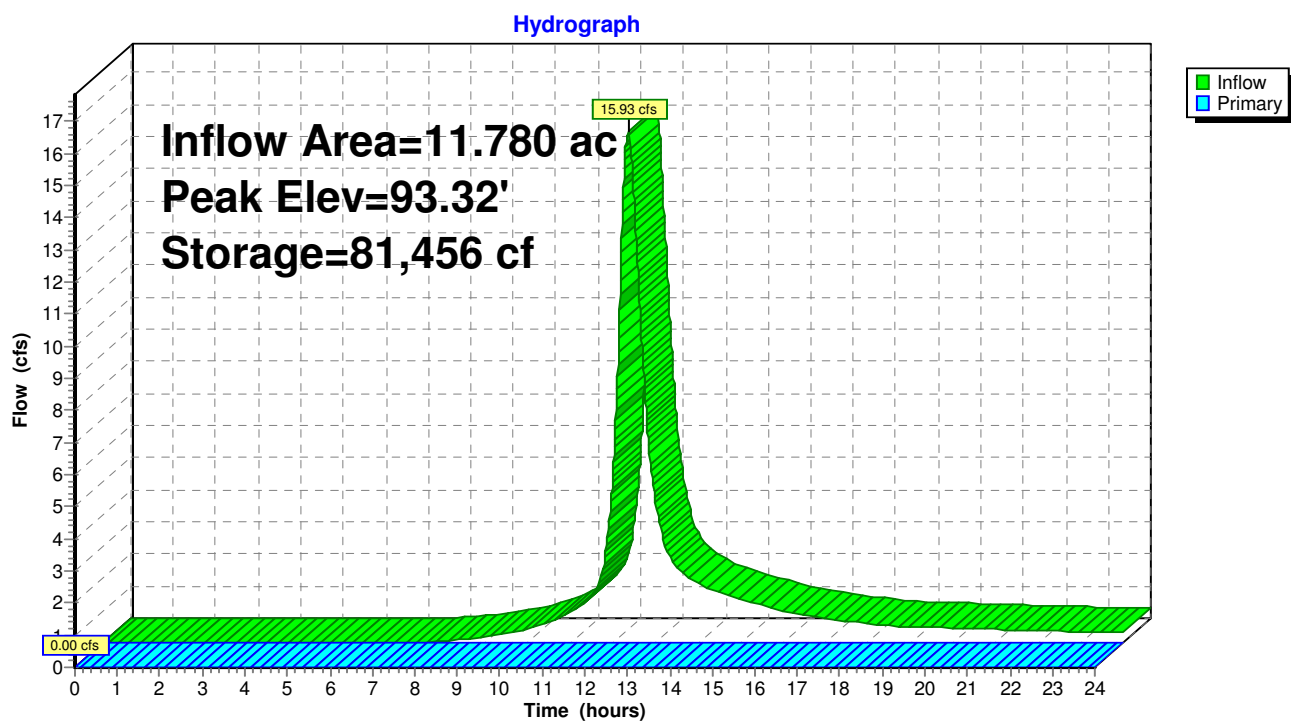
Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	173,871 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	23,193	0	0
92.00	27,478	43,070	43,070
94.00	32,665	60,143	103,213
95.00	35,319	33,992	137,205
96.00	38,012	36,666	173,871

Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	24.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	93.42'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=90.30' (Free Discharge)

1=Culvert (Passes 0.00 cfs of 0.01 cfs potential flow)
 2=Orifice/Grate (Controls 0.00 cfs)
 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Sediment Basin

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 2S: P-2

Runoff Area=11.780 ac 20.63% Impervious Runoff Depth>3.36"
Tc=26.0 min CN=87 Runoff=27.83 cfs 3.302 af

Pond 6P: Sediment Basin

Peak Elev=93.69' Storage=93,120 cf Inflow=27.83 cfs 3.302 af
Outflow=3.56 cfs 1.304 af

Total Runoff Area = 11.780 ac Runoff Volume = 3.302 af Average Runoff Depth = 3.36"
79.37% Pervious = 9.350 ac 20.63% Impervious = 2.430 ac

Summary for Subcatchment 2S: P-2

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 27.83 cfs @ 12.34 hrs, Volume= 3.302 af, Depth> 3.36"

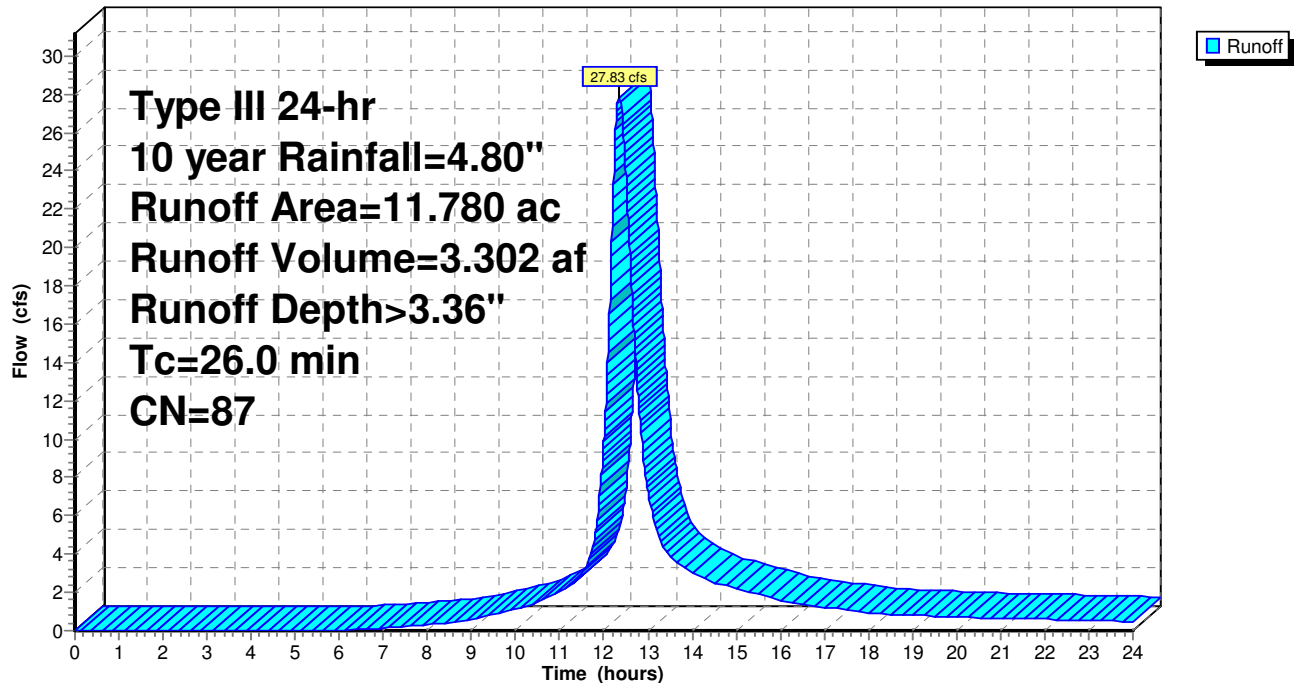
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
2.430	98	Paved parking HSG C
2.321	74	>75% Grass cover, Good, HSG C
6.040	91	Newly graded area, HSG C
11.780	87	Weighted Average
9.350		79.37% Pervious Area
2.430		20.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-2

Hydrograph



Summary for Pond 6P: Sediment Basin

Inflow Area = 11.780 ac, 20.63% Impervious, Inflow Depth > 3.36" for 10 year event
 Inflow = 27.83 cfs @ 12.34 hrs, Volume= 3.302 af
 Outflow = 3.56 cfs @ 13.64 hrs, Volume= 1.304 af, Atten= 87%, Lag= 77.8 min
 Primary = 3.56 cfs @ 13.64 hrs, Volume= 1.304 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 93.69' @ 13.64 hrs Surf.Area= 31,854 sf Storage= 93,120 cf

Plug-Flow detention time= 301.1 min calculated for 1.304 af (39% of inflow)
 Center-of-Mass det. time= 178.6 min (997.0 - 818.3)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	173,871 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	23,193	0	0
92.00	27,478	43,070	43,070
94.00	32,665	60,143	103,213
95.00	35,319	33,992	137,205
96.00	38,012	36,666	173,871

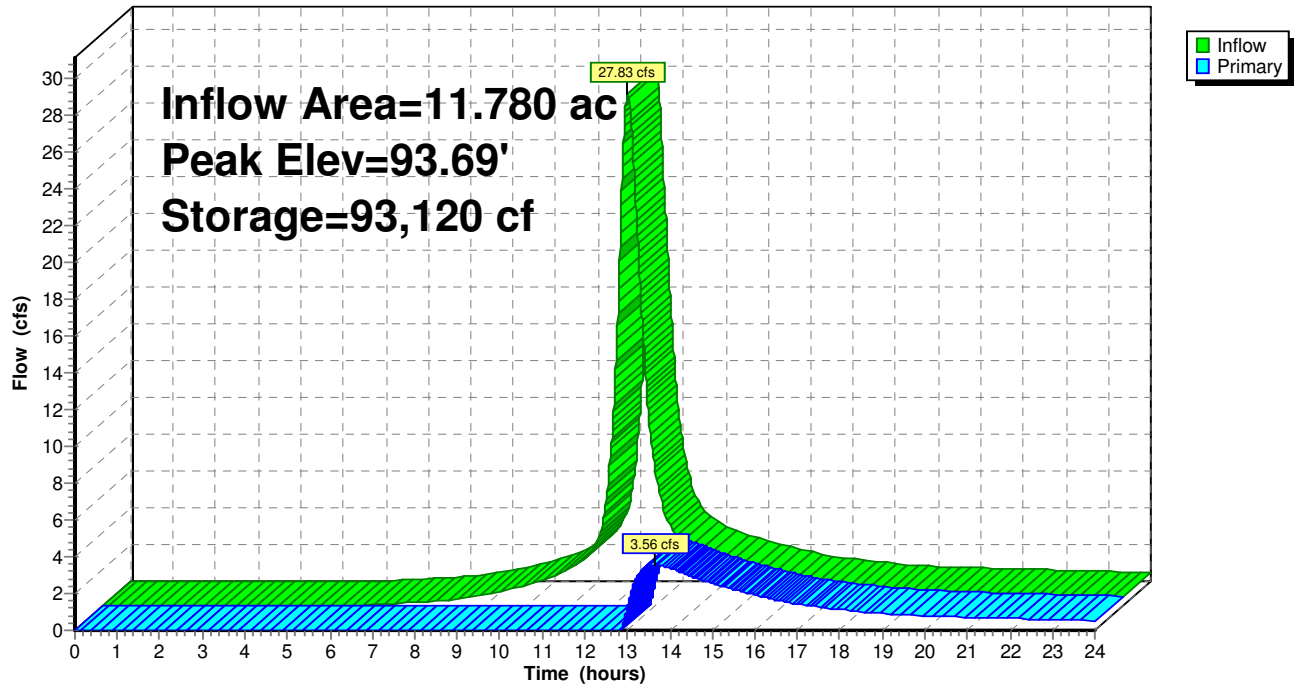
Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	24.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 ' / Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	93.42'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=3.55 cfs @ 13.64 hrs HW=93.69' (Free Discharge)

1=Culvert (Passes 3.55 cfs of 23.35 cfs potential flow)
 2=Orifice/Grate (Weir Controls 3.55 cfs @ 1.69 fps)
 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Sediment Basin

Hydrograph



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 2S: P-2

Runoff Area=11.780 ac 20.63% Impervious Runoff Depth=4.12"
Tc=26.0 min CN=87 Runoff=33.82 cfs 4.041 af

Pond 6P: Sediment Basin

Peak Elev=93.92' Storage=100,719 cf Inflow=33.82 cfs 4.041 af
Outflow=9.18 cfs 2.038 af

Total Runoff Area = 11.780 ac Runoff Volume = 4.041 af Average Runoff Depth = 4.12"
79.37% Pervious = 9.350 ac 20.63% Impervious = 2.430 ac

Summary for Subcatchment 2S: P-2

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 33.82 cfs @ 12.34 hrs, Volume= 4.041 af, Depth> 4.12"

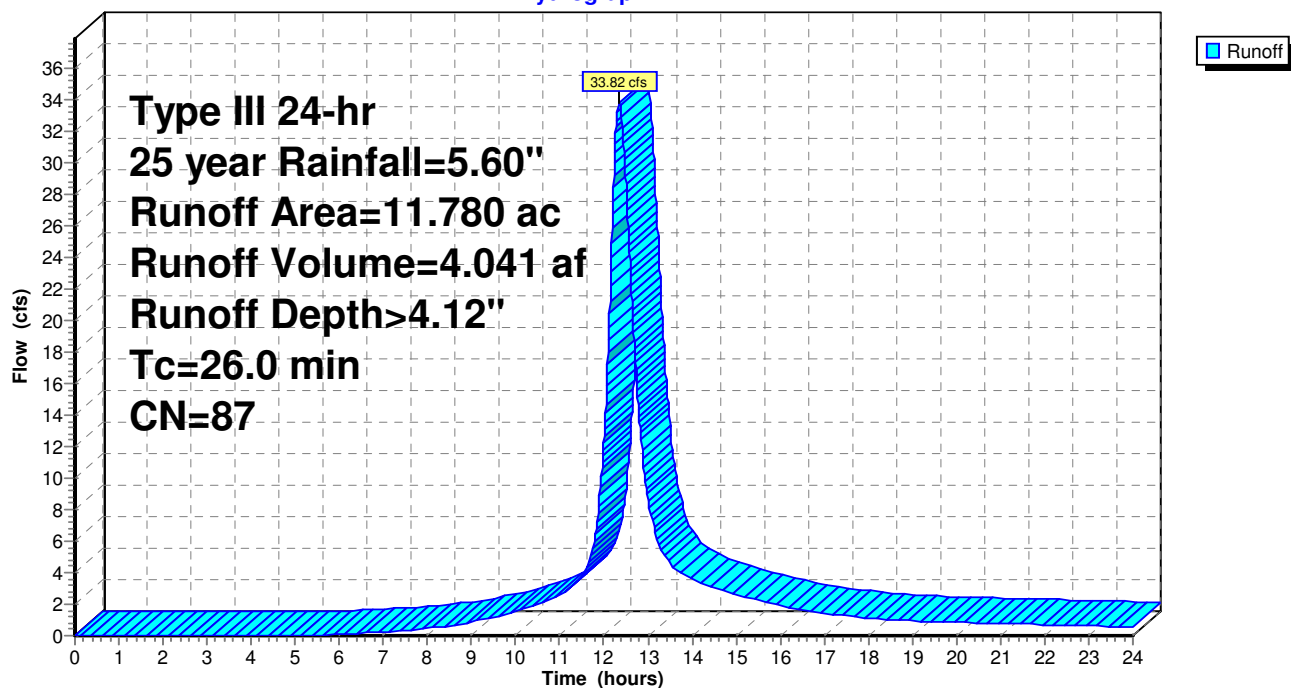
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.60"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
2.430	98	Paved parking HSG C
2.321	74	>75% Grass cover, Good, HSG C
6.040	91	Newly graded area, HSG C
11.780	87	Weighted Average
9.350		79.37% Pervious Area
2.430		20.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-2

Hydrograph



Summary for Pond 6P: Sediment Basin

Inflow Area = 11.780 ac, 20.63% Impervious, Inflow Depth > 4.12" for 25 year event
 Inflow = 33.82 cfs @ 12.34 hrs, Volume= 4.041 af
 Outflow = 9.18 cfs @ 12.97 hrs, Volume= 2.038 af, Atten= 73%, Lag= 38.0 min
 Primary = 9.18 cfs @ 12.97 hrs, Volume= 2.038 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 93.92' @ 12.97 hrs Surf.Area= 32,466 sf Storage= 100,719 cf

Plug-Flow detention time= 244.1 min calculated for 2.038 af (50% of inflow)
 Center-of-Mass det. time= 133.1 min (945.9 - 812.8)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	173,871 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

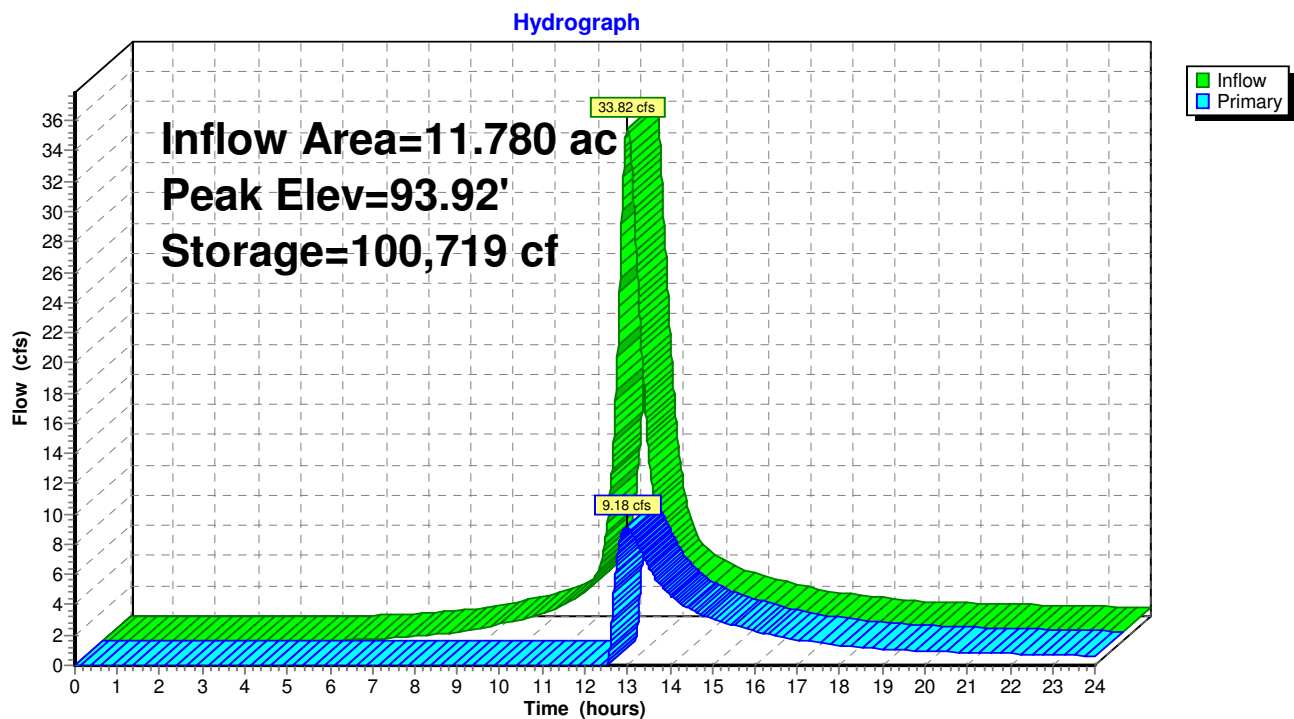
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	23,193	0	0
92.00	27,478	43,070	43,070
94.00	32,665	60,143	103,213
95.00	35,319	33,992	137,205
96.00	38,012	36,666	173,871

Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	24.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 ' / Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	93.42'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=9.17 cfs @ 12.97 hrs HW=93.92' (Free Discharge)

1=Culvert (Passes 9.17 cfs of 24.73 cfs potential flow)
 2=Orifice/Grate (Weir Controls 9.17 cfs @ 2.32 fps)
 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Sediment Basin



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Muskingum-Cunge method - Pond routing by Stor-Ind method

Subcatchment 2S: P-2

Runoff Area=11.780 ac 20.63% Impervious Runoff Depth>5.46"
Tc=26.0 min CN=87 Runoff=44.28 cfs 5.356 af

Pond 6P: Sediment Basin

Peak Elev=94.33' Storage=114,251 cf Inflow=44.28 cfs 5.356 af
Outflow=22.30 cfs 3.343 af

Total Runoff Area = 11.780 ac Runoff Volume = 5.356 af Average Runoff Depth = 5.46"
79.37% Pervious = 9.350 ac 20.63% Impervious = 2.430 ac

Summary for Subcatchment 2S: P-2

CarlsonPlanXYPos|1170813.5231|690121.8114|

CarlsonSurface||

Runoff = 44.28 cfs @ 12.34 hrs, Volume= 5.356 af, Depth> 5.46"

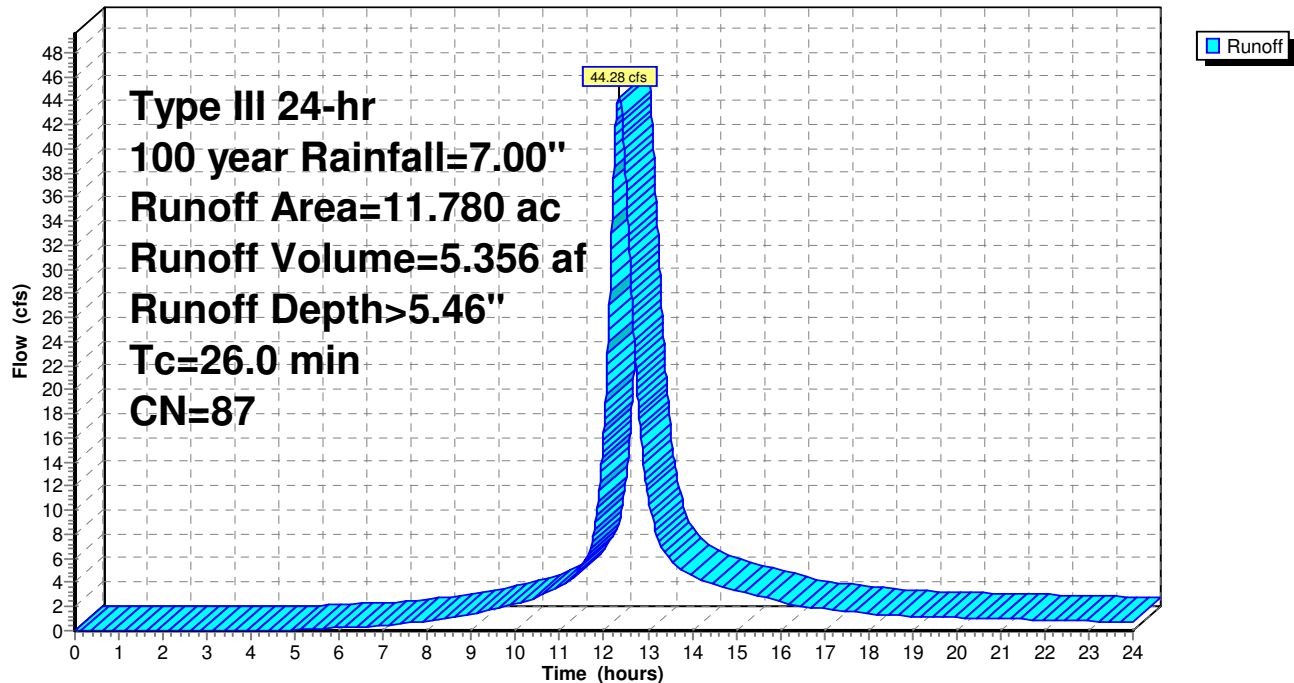
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (ac)	CN	Description
0.464	70	Woods, Good, HSG C
0.525	72	Woods/grass comb., Good, HSG C
2.430	98	Paved parking HSG C
2.321	74	>75% Grass cover, Good, HSG C
6.040	91	Newly graded area, HSG C
11.780	87	Weighted Average
9.350		79.37% Pervious Area
2.430		20.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.0					Direct Entry, Storm sewer TC

Subcatchment 2S: P-2

Hydrograph



Summary for Pond 6P: Sediment Basin

Inflow Area = 11.780 ac, 20.63% Impervious, Inflow Depth > 5.46" for 100 year event
 Inflow = 44.28 cfs @ 12.34 hrs, Volume= 5.356 af
 Outflow = 22.30 cfs @ 12.72 hrs, Volume= 3.343 af, Atten= 50%, Lag= 22.8 min
 Primary = 22.30 cfs @ 12.72 hrs, Volume= 3.343 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 94.33' @ 12.72 hrs Surf.Area= 33,550 sf Storage= 114,251 cf

Plug-Flow detention time= 198.0 min calculated for 3.343 af (62% of inflow)
 Center-of-Mass det. time= 99.4 min (904.5 - 805.1)

Volume	Invert	Avail.Storage	Storage Description
#1	90.30'	173,871 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	23,193	0	0
92.00	27,478	43,070	43,070
94.00	32,665	60,143	103,213
95.00	35,319	33,992	137,205
96.00	38,012	36,666	173,871

Device	Routing	Invert	Outlet Devices
#1	Primary	90.25'	24.0" Round Culvert L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 90.25' / 90.00' S= 0.0057 ' S= 0.0057 ' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	93.42'	30.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	95.00'	20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=22.42 cfs @ 12.72 hrs HW=94.33' (Free Discharge)

1=Culvert (Passes 22.42 cfs of 26.56 cfs potential flow)
 2=Orifice/Grate (Weir Controls 22.42 cfs @ 3.13 fps)
 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Sediment Basin