



ALLEN ENGINEERING & ASSOCIATES, INC.

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DRAINAGE ANALYSIS  
For  
“Blackstone Street Improvements”  
Blackstone Street  
In  
Bellingham, MA 02019



February 14, 2025

Revised:  
June 20, 2025  
October 31, 2025

Prepared For:  
Wall Street Development Corp.  
P.O. Box 272  
Westwood, MA 02090

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**Blackstone Street Improvements**  
**Bellingham, MA**

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## **SUMMARY OF EXISTING DRAINAGE CONDITIONS**

### **Site Description:**

The project for which this analysis has been prepared comprises 1,900 linear feet of a town-owned gravel road that runs along a varying width ROW in the town of Bellingham, Massachusetts. The existing gravel road slopes down and splits an existing wetland, then slopes back up the hill to a high point, and then slopes back down the hill before entering the Town of Blackstone. Locus contains several wetland systems, which have been identified and delineated by Goddard Consulting LLC and mapped by Allen Engineering & Associates, Inc.

Allen Engineering & Associates, Inc. has reviewed the Soil Survey for Worcester County prepared by the USDA/NRCS and has found the site to contain several soil types having hydrologic soil group (HSG) designations ranging from "A" through "D". The "D" or very slow infiltrating soils appear to be associated with the mapped wetlands, while the remaining areas are located within areas designated as "Canton" and "Ridgebury". On-site test data is appended to this report in section 4.

### **Hydrology Background:**

Allen Engineering & Associates, Inc. has utilized AutoCAD and HydroCAD software to perform this drainage analysis. Autocad was used to generate the existing and proposed drainage plans that can be found in sections 1 and 2 of this report. These plans were used to define such items as subcatchment areas, time of concentration paths and ground cover. Three design evaluation points numbered EV1, EV2 and EV3 in the calculations have been established corresponding to the existing surface runoff collection area. HydroCAD was used to calculate the rates and volume of storm water runoff during various storm events at these evaluation points. These rates are summarized for the existing and proposed site conditions on page iii.

## **SUMMARY OF PROPOSED DEVELOPMENT DRAINAGE CONDITIONS**

### **Site Description:**

The proposed project (“the Project”) consists of improving the 1900 lf of gravel road. The proposed road is a 22-foot paved travel way with a modified Cape Cod berm. It ends with a 45-foot radius cul-de-sac. A proposed open box culvert and retaining wall will allow for limited wetland impact and hydraulically connect the two existing wetlands.

### **Stormwater Management:**

The proposed drainage system has been designed to meet the Stormwater Management Standards set by the Massachusetts Department of Environmental Protection (DEP). As detailed in the following standards compliance section the total peak flow rate for the constructed site is less than the existing rates for all storm events examined, and the stormwater runoff is treated to the required level and volume by approved Best Management Practices for Total Suspended Solids removal.

Stormwater runoff from the paved roadway will collect in deep sump hooded catch basins. The stormwater will then be sent to 2 different infiltration basins. The infiltration basins have been designed in accordance with the Massachusetts Stormwater Management Standards to recharge the required volume of runoff as well as provide temporary storage volume necessary to attenuate post-development peak rates to pre-development conditions.



# SUMMARY OF HYDROLOGY

Blackstone Street Improvement

Using HydroCAD Software

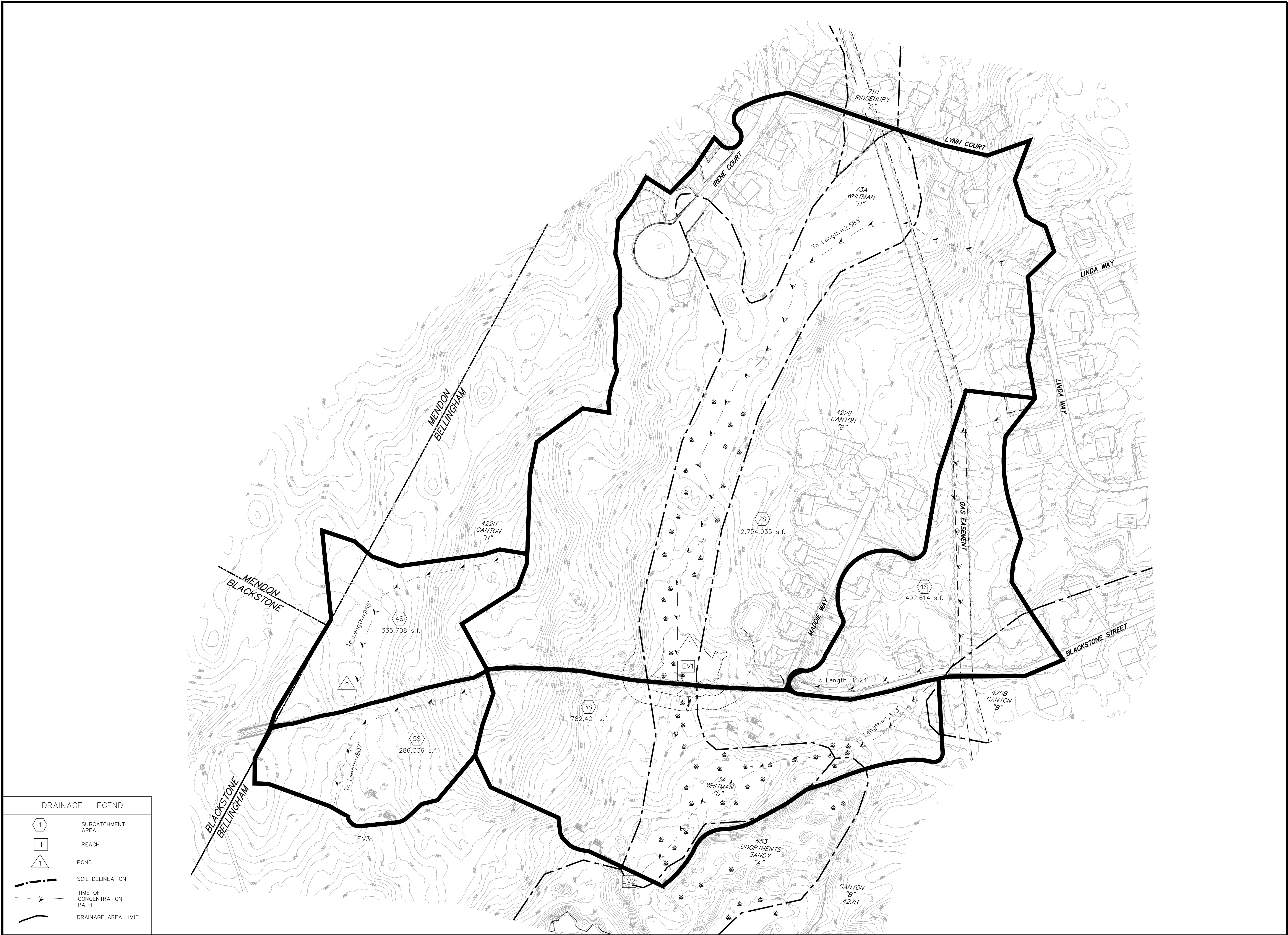
<u>Job No.:</u>	00454	<u>Calced By:</u>	M. Allen
<u>Client:</u>	Wall Street Development Corp	<u>Date:</u>	2/14/2025
<u>Location:</u>	Blackstone Street, Bellingham MA	<u>Revised:</u>	31-Oct-25

**TABLE 1: Summary of Peak Rates of Stormwater Runoff**

Evaluation Point	HydroCAD symbols	Existing Conditions Runoff (CFS)				HydroCAD symbols	Proposed Conditions Runoff (CFS)			
		2-Yr	10-Yr	25-Yr	100-Yr		2-Yr	10-Yr	25-Yr	100-Yr
Vernal Pool	EV1	2.78	25.27	45.93	134.84	EV1	2.78	25.27	45.93	134.84
Wetland	EV2	13.86	38.09	68.89	200.32	EV2	8.47	33.09	59.94	182.05
Off Site	EV3	0.90	4.87	8.29	16.56	EV3	0.55	3.60	6.37	13.01
<b>TOTAL</b>		<b>17.54</b>	<b>68.23</b>	<b>123.11</b>	<b>351.72</b>		<b>11.80</b>	<b>61.96</b>	<b>112.24</b>	<b>329.90</b>

## **Existing Drainage Calculations**





### LEGEND

EDGE OF WETLAND  
 EXISTING CONTOUR  
 EXISTING TREE LINE

### NOTES

- ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.
- HORIZONTAL DATUM: NAD 83
- PARTIAL WETLAND RESOURCES FLAGGED BY GODDARD CONSULTING IN 2024. FLAGS WERE FIELD LOCATED BY ALLEN ENGINEERING & ASSOCIATES IN NOVEMBER 2024.
- PROPERTY LINE AND TOPOGRAPHIC INFORMATION OBTAINED BY ALLEN ENGINEERING & ASSOCIATES, INC IN AUGUST, 2024.
- UNDERGROUND UTILITIES SHOWN HAVE BEEN COMPILED FROM AVAILABLE PLANS FROM PUBLIC AND PRIVATE AGENCIES, OR AS INDICATED BY FIELD OBSERVATIONS AND ARE APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OR STRUCTURES NOT SHOWN HEREON MIGHT EXIST. BEFORE ANY EXCAVATION OR CONSTRUCTION CALL DIG-SAFE AT 811.
- TOPOGRAPHIC INFORMATION OBTAINED FROM LIDAR DATA ISSUED BY NOAA (2021).

OWNER:

**Wall Street Development Corp.**  
P.O. Box 272  
Westwood, MA 02090

TITLE:

**EXISTING DRAINAGE PLAN**  
for  
**Blackstone Street Improvements**  
Bellingham, MA

SEAL:

PROFESSIONAL ENGINEER

PREPARED BY:

**ALLEN ENGINEERING & ASSOCIATES, INC.**  
Civil Engineers · Surveyors  
Land Development Consultants  
140 Hartford Avenue East  
Hopedale, Ma 01747  
(508) 381-3212 • [www.allen-ea.com](http://www.allen-ea.com)

SCALE: 1" = 150 FEET

DATE: 10/31/25

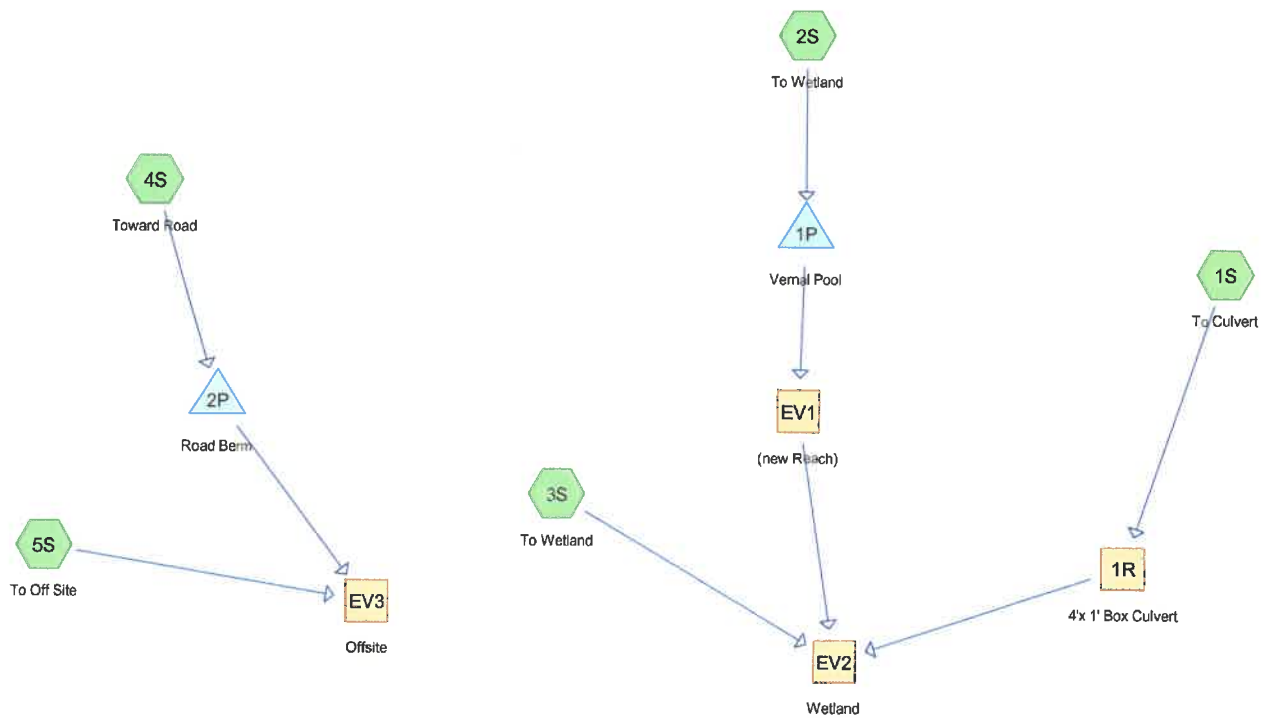
PROJECT: #1247

### REVISIONS

#	DATE	DESCRIPTION	INIT
1	6-20-25	ROADWAY AND DRAINAGE	MEA
2	10-31-25	PER PEER REVIEW	MEA

JOB NO: 00454 SHEET: 1 of 1





**Routing Diagram for 00454-EX - Rev1**  
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**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
409,337	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S)
20,077	80	>75% Grass cover, Good, HSG D (2S)
5,248	96	Gravel surface, HSG B (2S, 5S)
7,421	96	Gravel surface, HSG D (2S)
92,735	98	Paved roads w/curbs & sewers, HSG B (1S, 2S)
44,336	98	Roofs, HSG B (1S, 2S, 3S)
3,202	98	Roofs, HSG D (2S)
3,275,715	55	Woods, Good, HSG B (1S, 2S, 3S, 4S, 5S)
793,923	77	Woods, Good, HSG D (2S, 3S)
<b>4,651,994</b>	<b>61</b>	<b>TOTAL AREA</b>

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Type III 24-hr 2 YR Rainfall=3.38"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 2.90 cfs @ 12.51 hrs, Volume= 21,338 cf, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b>
					Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

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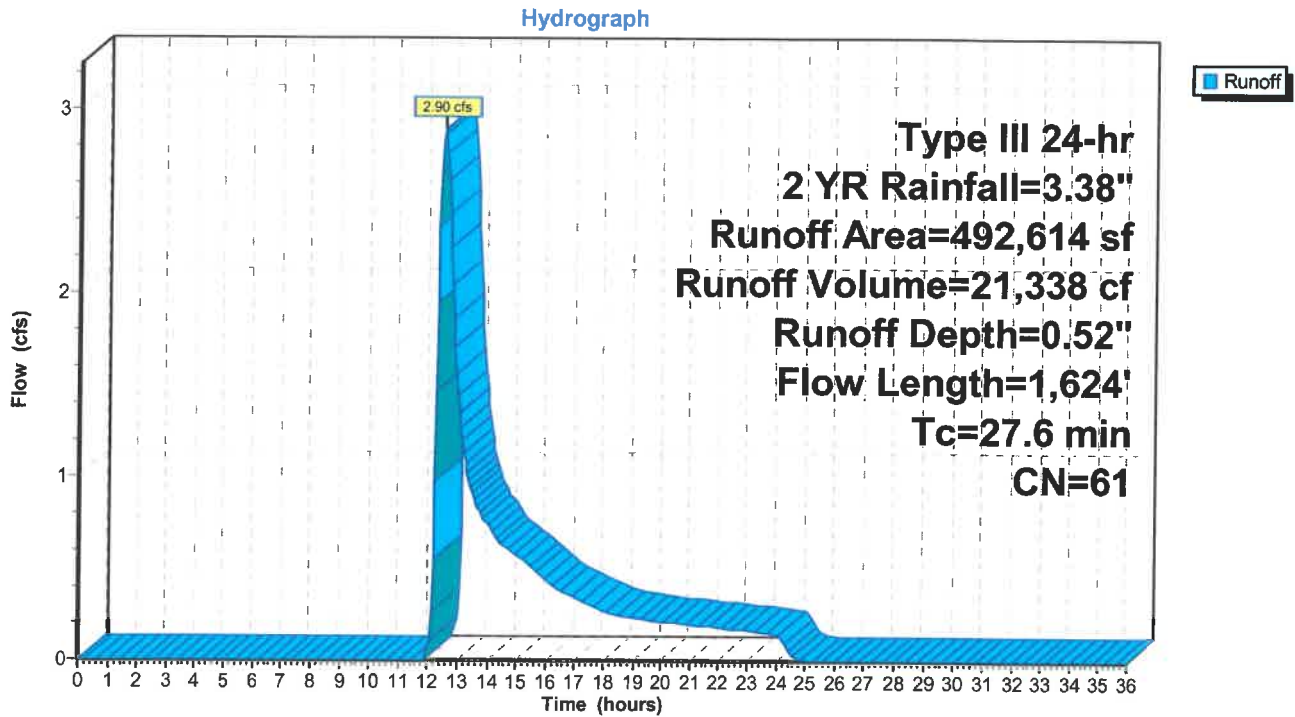
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## Subcatchment 1S: To Culvert



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**Summary for Subcatchment 2S: To Wetland**

Runoff = 9.98 cfs @ 12.81 hrs, Volume= 101,720 cf, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

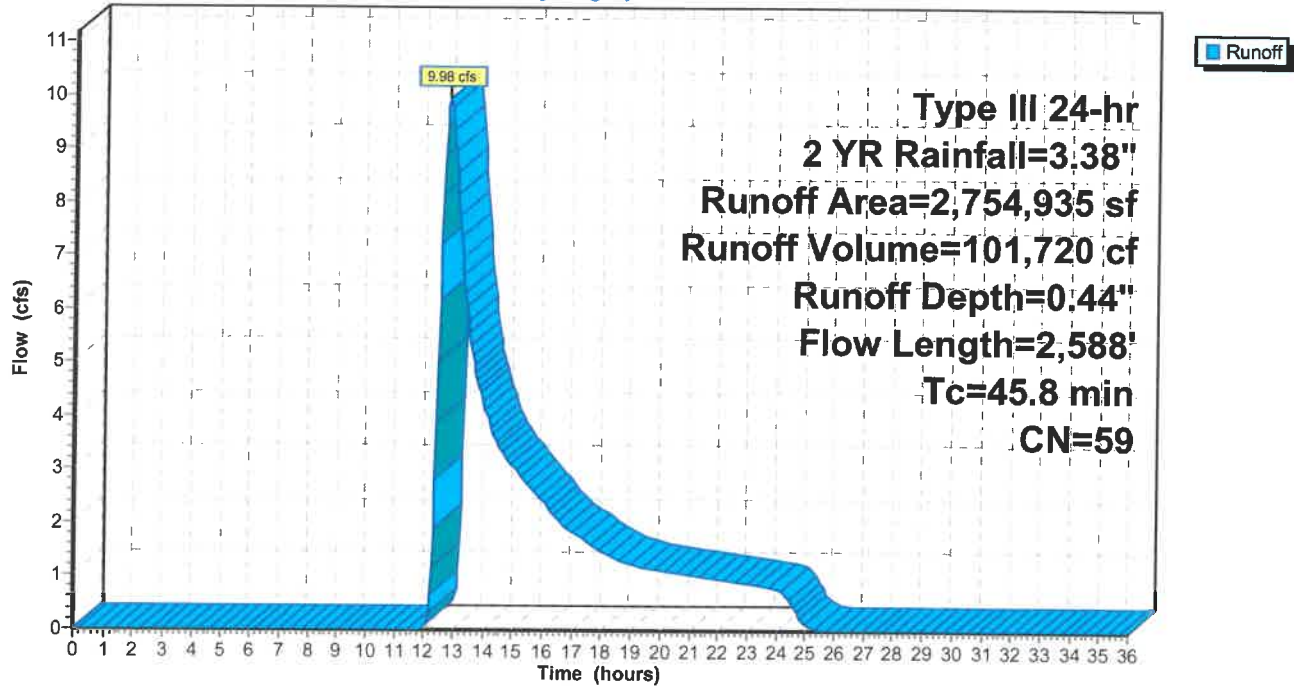
  

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b>
					Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b>
					Area= 1.2 sf Perim= 3.5' r= 0.34'
					n= 0.070 Medium-dense brush
45.8	2,588	Total			



**Subcatchment 2S: To Wetland**

Hydrograph



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**Summary for Subcatchment 3S: To Wetland**

Runoff = 11.02 cfs @ 12.45 hrs, Volume= 64,434 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
205,649	55	Woods, Good, HSG B
557,046	77	Woods, Good, HSG D
4,470	98	Roofs, HSG B
15,236	61	>75% Grass cover, Good, HSG B
782,401	71	Weighted Average
777,931		99.43% Pervious Area
4,470		0.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		<b>Sheet Flow, Sheet</b> Grass: Short n= 0.150 P2= 3.22"
3.1	190	0.0210	1.01		<b>Shallow Concentrated Flow, Shallow</b> Short Grass Pasture Kv= 7.0 fps
16.2	735	0.0230	0.76		<b>Shallow Concentrated Flow, c-d</b> Woodland Kv= 5.0 fps
5.2	348	0.0115	1.12	1.34	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
29.0	1,323	Total			

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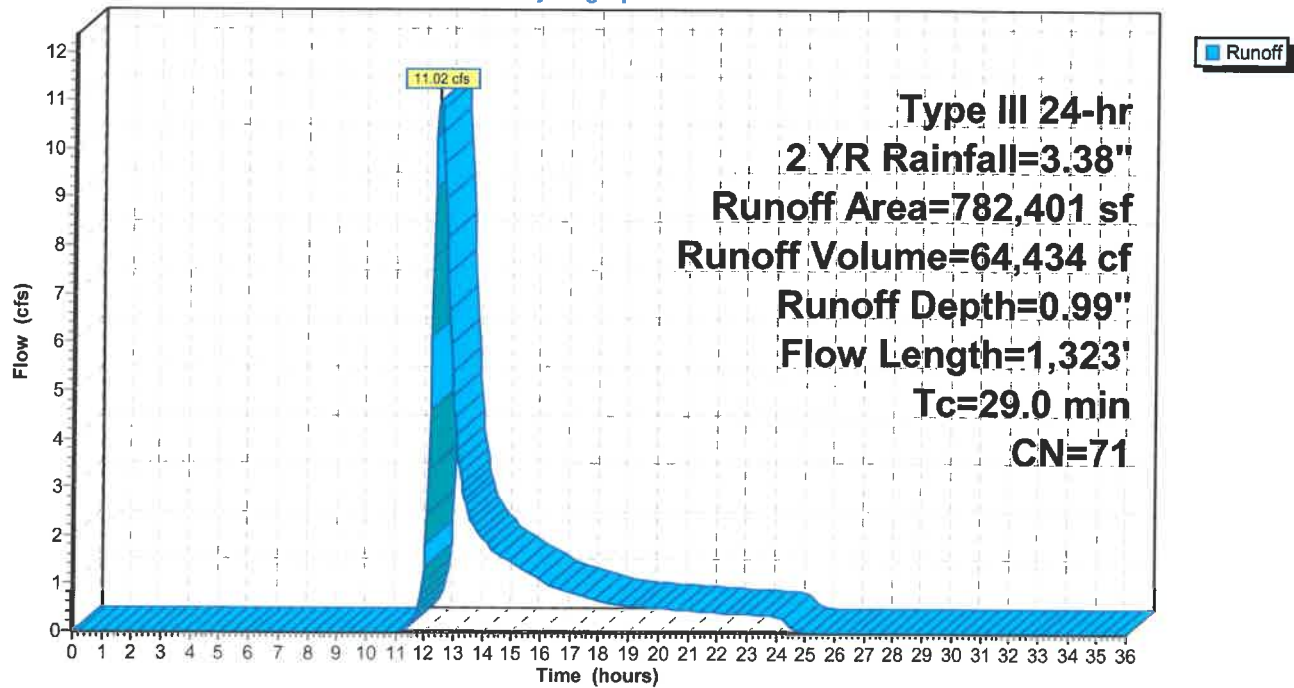
00454 - Existing Conditions R1  
Type III 24-hr 2 YR Rainfall=3.38"

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### Subcatchment 3S: To Wetland

Hydrograph



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Type III 24-hr 2 YR Rainfall=3.38"

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**Summary for Subcatchment 4S: Toward Road**

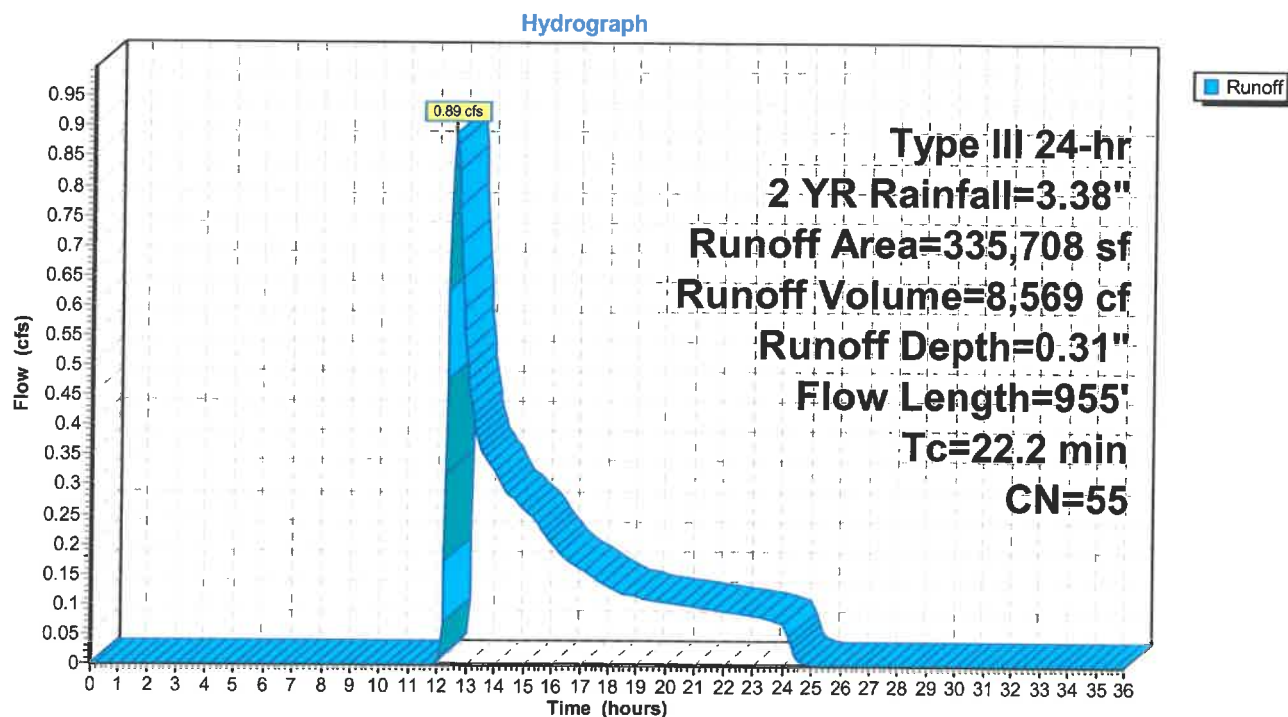
Runoff = 0.89 cfs @ 12.55 hrs, Volume= 8,569 cf, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
335,708	55	Woods, Good, HSG B
335,708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
15.1	905	0.0401	1.00		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
22.2	955	Total			

**Subcatchment 4S: Toward Road**

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**Summary for Subcatchment 5S: To Off Site**

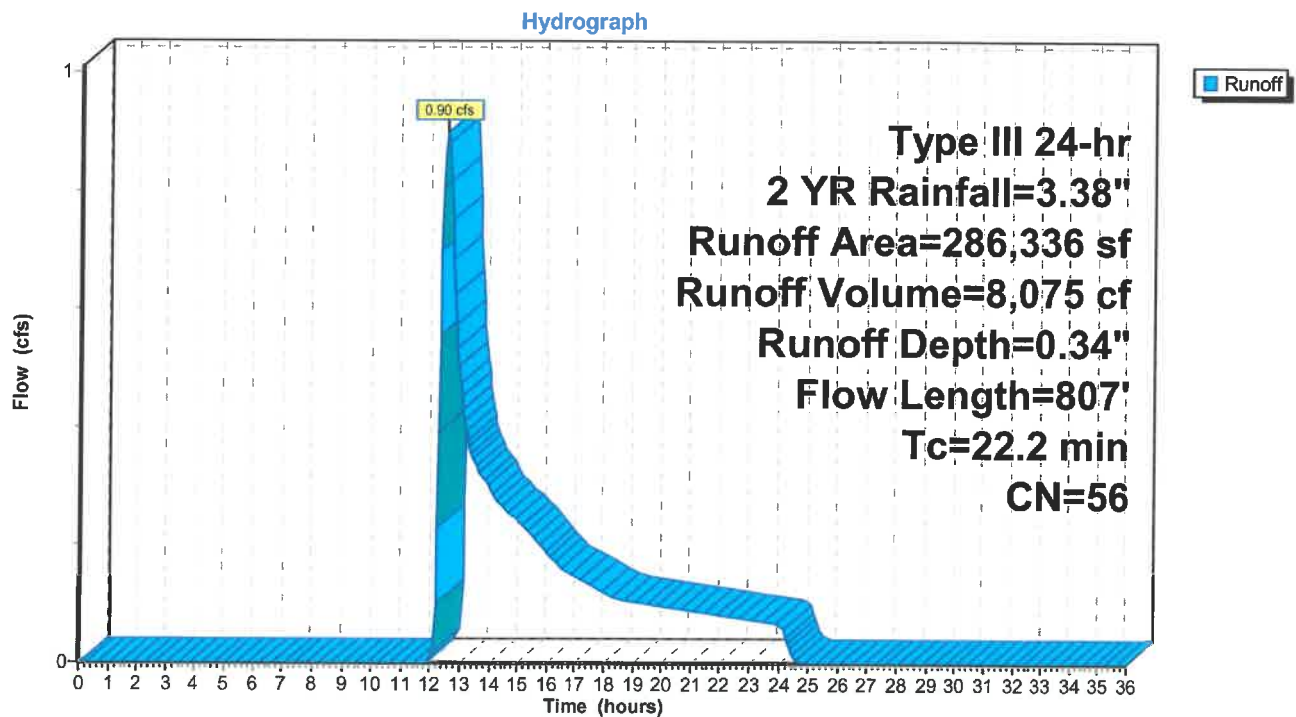
Runoff = 0.90 cfs @ 12.52 hrs, Volume= 8,075 cf, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
281,970	55	Woods, Good, HSG B
286,336	56	Weighted Average
286,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0312	0.08		<b>Sheet Flow, a-b</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
11.9	757	0.0449	1.06		<b>Shallow Concentrated Flow, b-c</b>
					Woodland Kv= 5.0 fps
22.2	807	Total			

**Subcatchment 5S: To Off Site**

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Type III 24-hr 2 YR Rainfall=3.38"

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### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 0.52" for 2 YR event  
Inflow = 2.90 cfs @ 12.51 hrs, Volume= 21,338 cf  
Outflow = 2.90 cfs @ 12.51 hrs, Volume= 21,338 cf, Atten= 0%, Lag= 0.4 min

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

Max. Velocity= 4.55 fps, Min. Travel Time= 0.2 min

Avg. Velocity= 1.95 fps, Avg. Travel Time= 0.5 min

Peak Storage= 39 cf @ 12.51 hrs

Average Depth at Peak Storage= 0.16', Surface Width= 4.00'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe

n= 0.013 Concrete, trowel finish

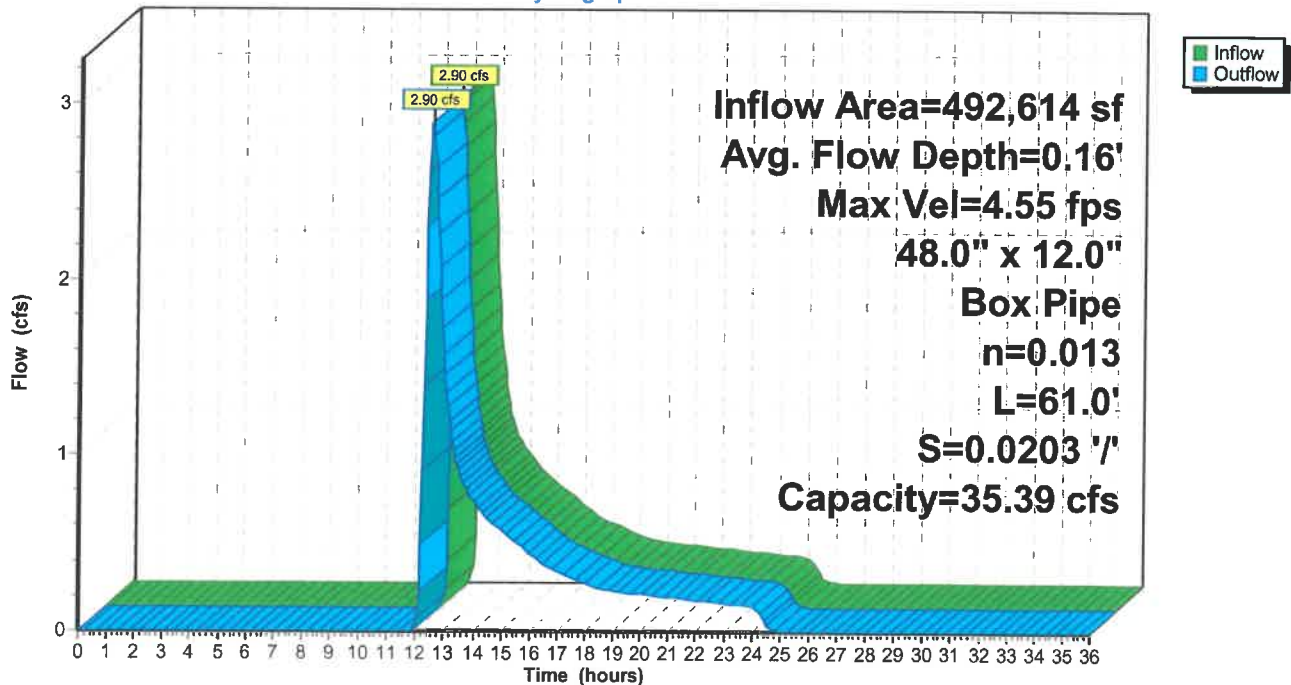
Length= 61.0' Slope= 0.0203 '/'

Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

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### Summary for Reach EV1: (new Reach)

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 0.27" for 2 YR event  
Inflow = 2.78 cfs @ 15.43 hrs, Volume= 62,728 cf  
Outflow = 2.78 cfs @ 15.44 hrs, Volume= 62,728 cf, Atten= 0%, Lag= 0.6 min

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

Max. Velocity= 1.46 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 0.71 fps, Avg. Travel Time= 0.2 min

Peak Storage= 15 cf @ 15.44 hrs

Average Depth at Peak Storage= 0.09', Surface Width= 20.93'

Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides

Side Slope Z-value= 5.0 ' Top Width= 25.00'

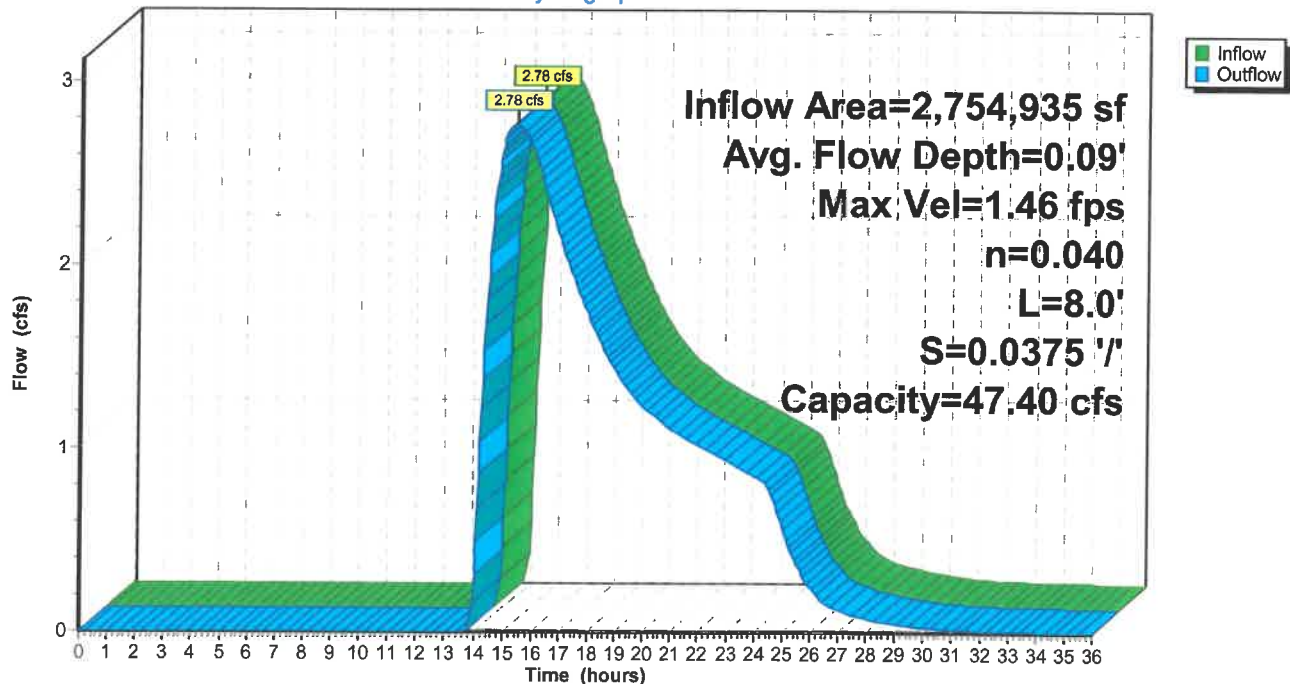
Length= 8.0' Slope= 0.0375 '/'

Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: (new Reach)

Hydrograph





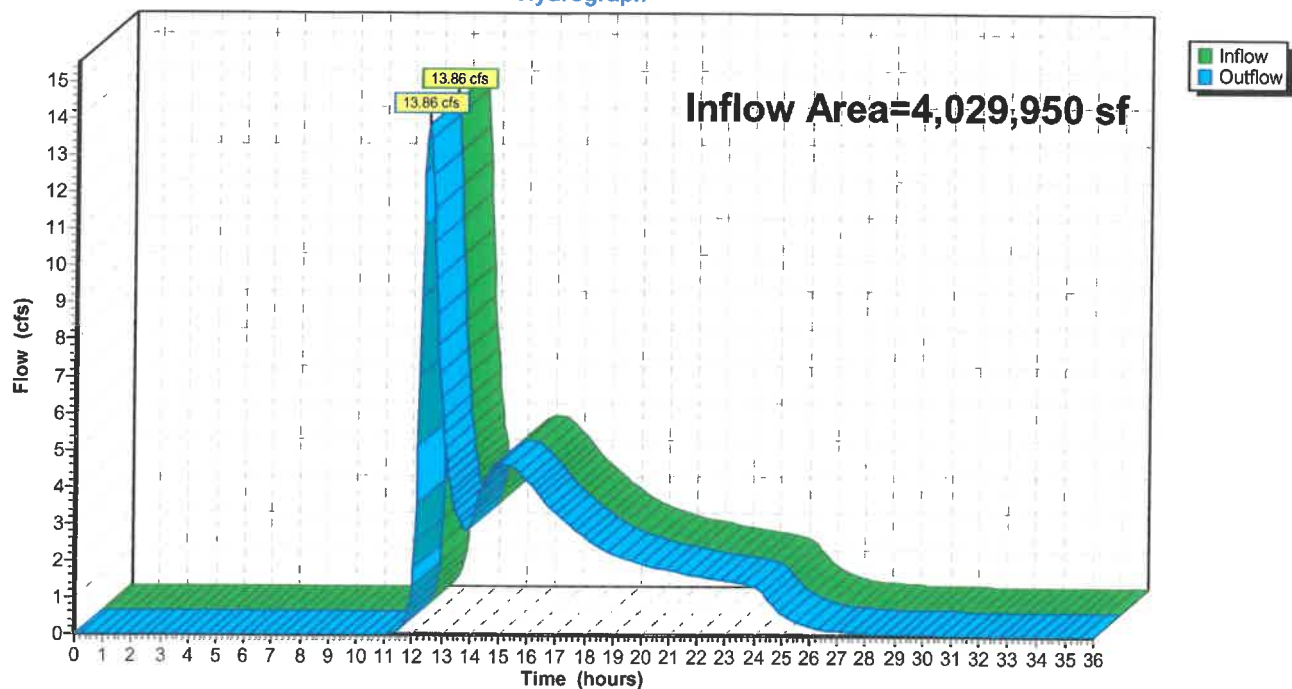
**Summary for Reach EV2: Wetland**

Inflow Area = 4,029,950 sf, 3.48% Impervious, Inflow Depth > 0.44" for 2 YR event  
Inflow = 13.86 cfs @ 12.46 hrs, Volume= 148,500 cf  
Outflow = 13.86 cfs @ 12.46 hrs, Volume= 148,500 cf, Atten= 0%, Lag= 0.0 min

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

**Reach EV2: Wetland**

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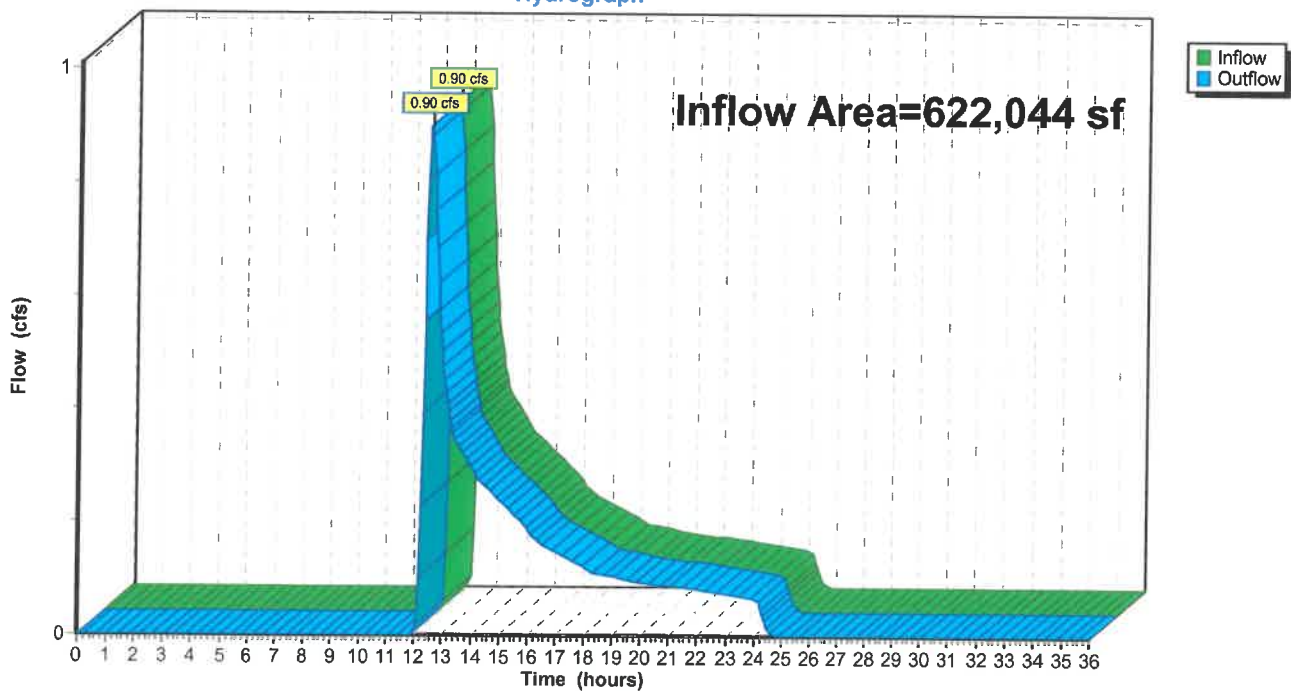
### Summary for Reach EV3: Offsite

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 0.16" for 2 YR event  
Inflow = 0.90 cfs @ 12.52 hrs, Volume= 8,075 cf  
Outflow = 0.90 cfs @ 12.52 hrs, Volume= 8,075 cf, Atten= 0%, Lag= 0.0 min

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

### Reach EV3: Offsite

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**Summary for Pond 1P: Vernal Pool**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth = 0.44" for 2 YR event  
 Inflow = 9.98 cfs @ 12.81 hrs, Volume= 101,720 cf  
 Outflow = 2.78 cfs @ 15.43 hrs, Volume= 62,728 cf, Atten= 72%, Lag= 157.3 min  
 Primary = 2.78 cfs @ 15.43 hrs, Volume= 62,728 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 294.07' @ 15.43 hrs Surf.Area= 33,327 sf Storage= 47,404 cf

Plug-Flow detention time= 302.0 min calculated for 62,641 cf (62% of inflow)  
 Center-of-Mass det. time= 169.8 min ( 1,125.3 - 955.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=2.77 cfs @ 15.43 hrs HW=294.07' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 2.77 cfs @ 1.30 fps)

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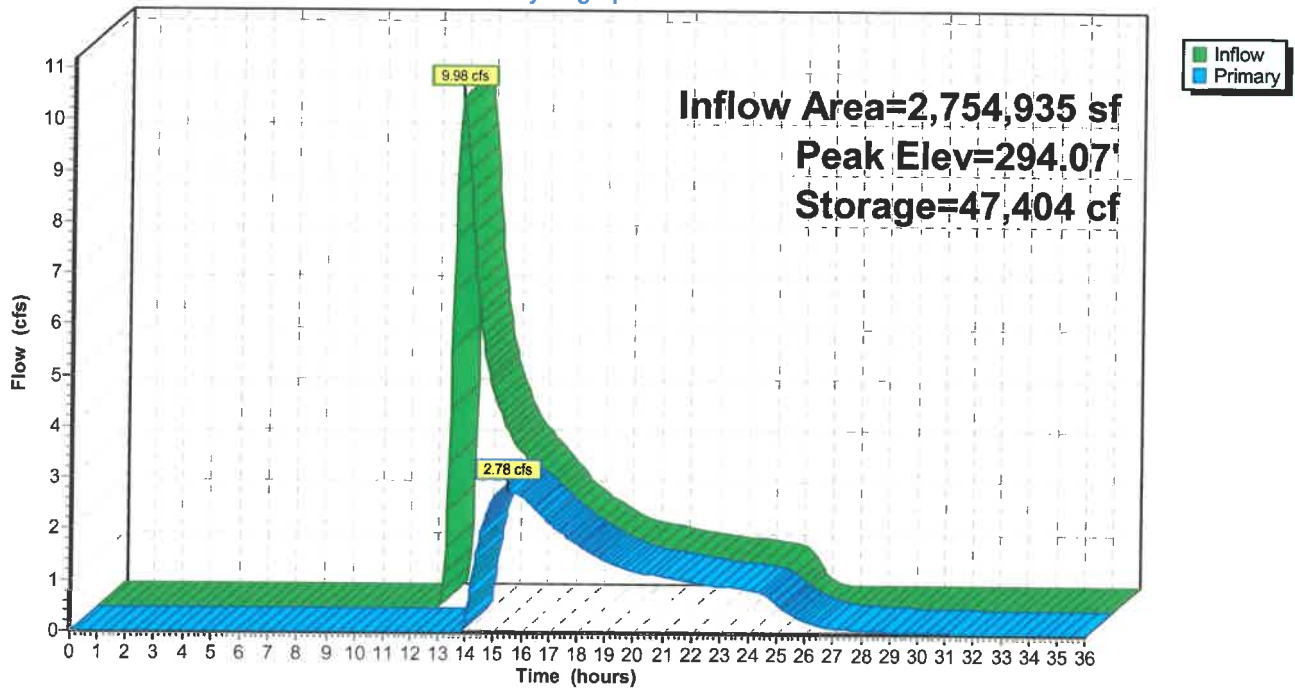
00454 - Existing Conditions R1  
Type III 24-hr 2 YR Rainfall=3.38"

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## Pond 1P: Vernal Pool

Hydrograph



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00454 - Existing Conditions R1  
Type III 24-hr 2 YR Rainfall=3.38"

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**Summary for Pond 2P: Road Berm**

Inflow Area = 335,708 sf, 0.00% Impervious, Inflow Depth = 0.31" for 2 YR event  
 Inflow = 0.89 cfs @ 12.55 hrs, Volume= 8,569 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 310.48' @ 25.30 hrs Surf.Area= 24,353 sf Storage= 8,567 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	310.00'	256,496 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

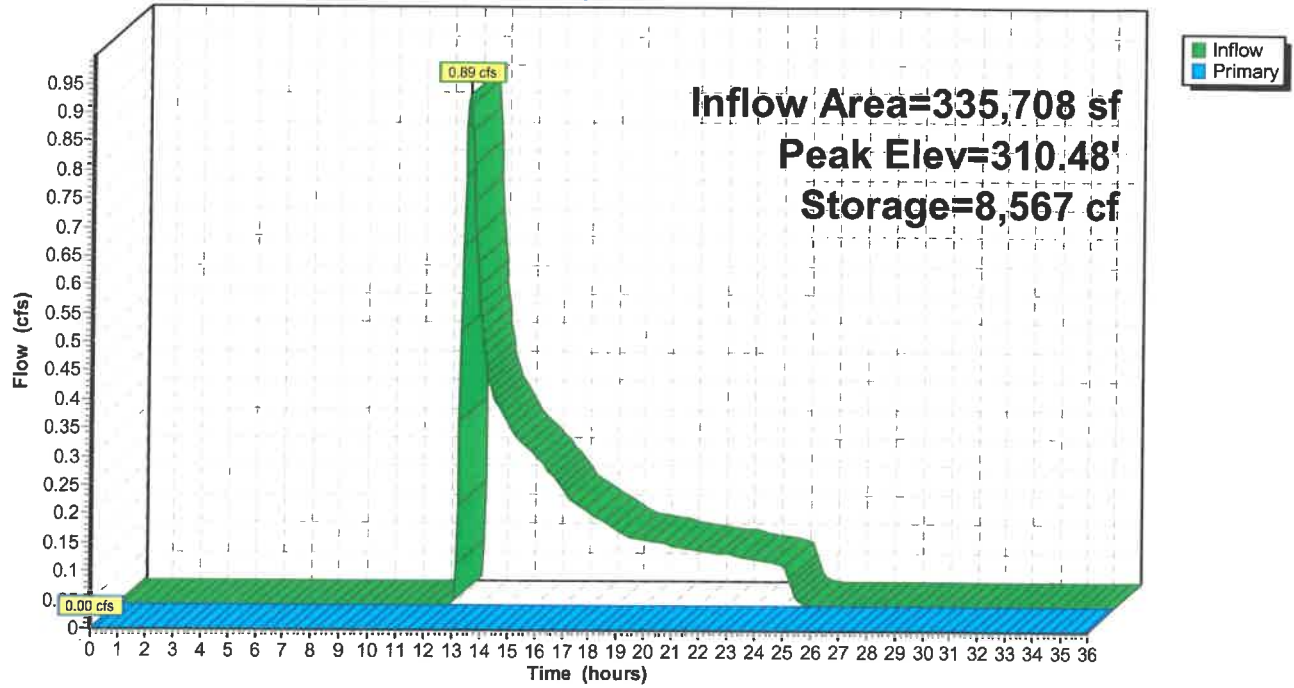
Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	<b>8.0' long x 15.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)

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

# Pond 2P: Road Berm

## Hydrograph



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00454 - Existing Conditions R1  
Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 10.78 cfs @ 12.43 hrs, Volume= 61,957 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

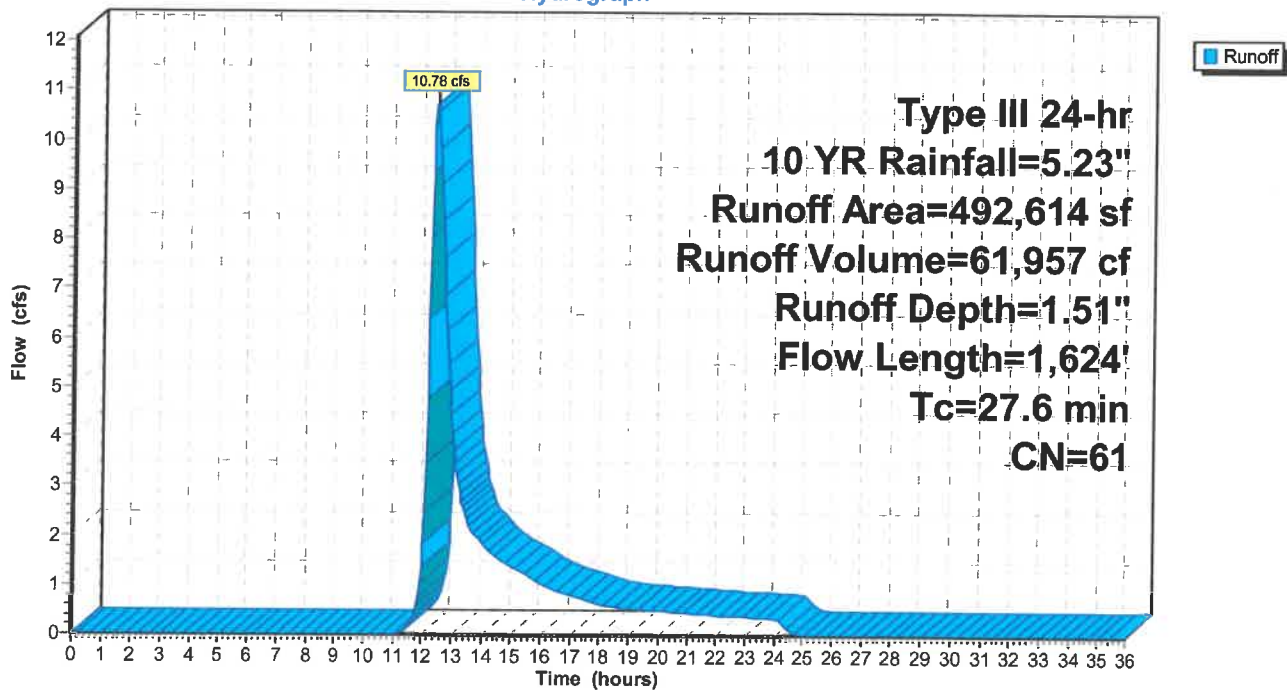
Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b>
					Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

## Subcatchment 1S: To Culvert

Hydrograph



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00454 - Existing Conditions R1  
Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Subcatchment 2S: To Wetland**

Runoff = 41.58 cfs @ 12.70 hrs, Volume= 313,788 cf, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

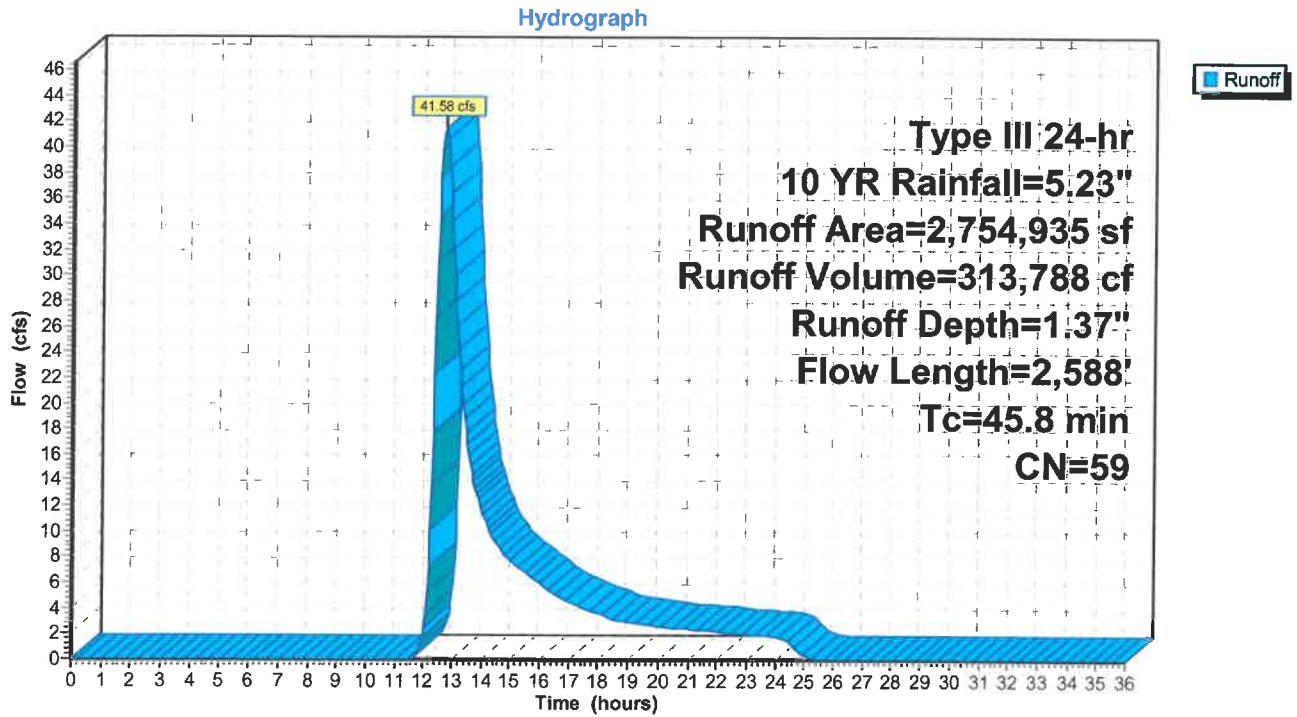
Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b>
					Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b>
					Area= 1.2 sf Perim= 3.5' r= 0.34'
					n= 0.070 Medium-dense brush
45.8	2,588	Total			



## Subcatchment 2S: To Wetland



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00454 - Existing Conditions R1  
Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Subcatchment 3S: To Wetland**

Runoff = 27.32 cfs @ 12.42 hrs, Volume= 149,430 cf, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

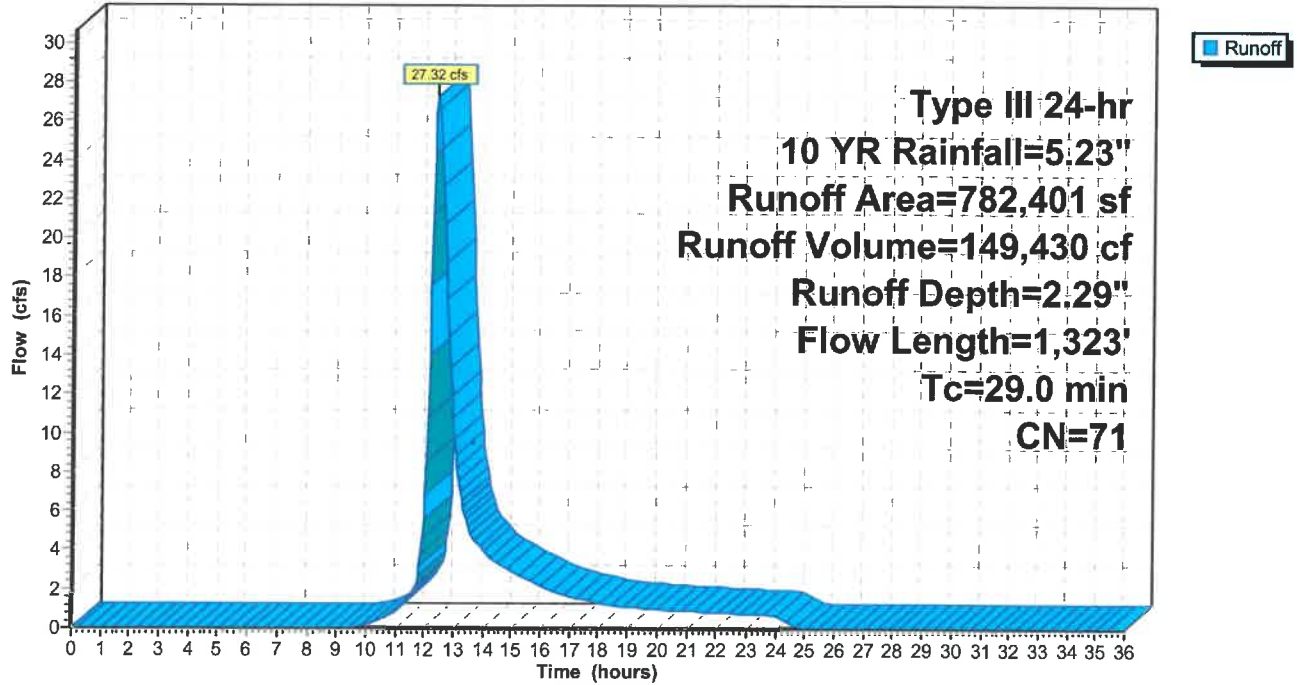
Area (sf)	CN	Description
205,649	55	Woods, Good, HSG B
557,046	77	Woods, Good, HSG D
4,470	98	Roofs, HSG B
15,236	61	>75% Grass cover, Good, HSG B
782,401	71	Weighted Average
777,931		99.43% Pervious Area
4,470		0.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		<b>Sheet Flow, Sheet</b> Grass: Short n= 0.150 P2= 3.22"
3.1	190	0.0210	1.01		<b>Shallow Concentrated Flow, Shallow</b> Short Grass Pasture Kv= 7.0 fps
16.2	735	0.0230	0.76		<b>Shallow Concentrated Flow, c-d</b> Woodland Kv= 5.0 fps
5.2	348	0.0115	1.12	1.34	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
29.0	1,323	Total			

## Subcatchment 3S: To Wetland

Hydrograph



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00454 - Existing Conditions R1  
Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Subcatchment 4S: Toward Road**

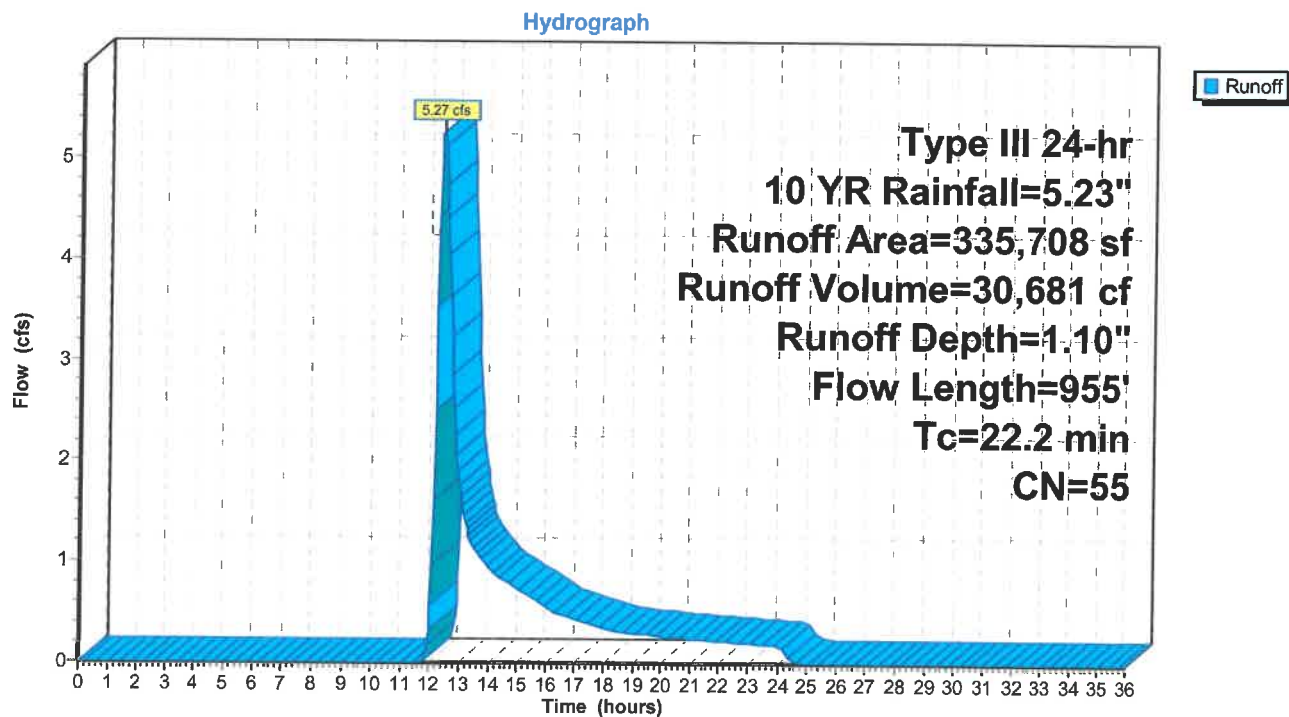
Runoff = 5.27 cfs @ 12.37 hrs, Volume= 30,681 cf, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
335,708	55	Woods, Good, HSG B
335,708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
15.1	905	0.0401	1.00		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
22.2	955	Total			

**Subcatchment 4S: Toward Road**

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Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Subcatchment 5S: To Off Site**

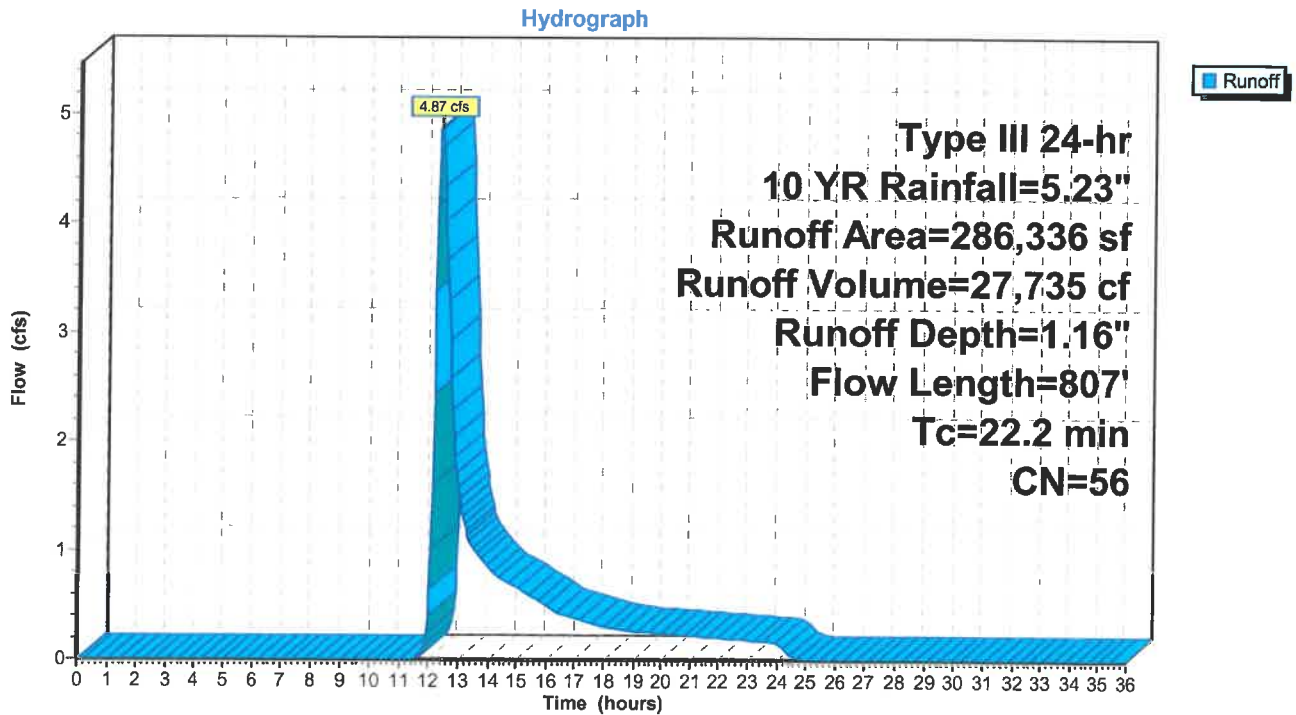
Runoff = 4.87 cfs @ 12.37 hrs, Volume= 27,735 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
281,970	55	Woods, Good, HSG B
286,336	56	Weighted Average
286,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0312	0.08		<b>Sheet Flow, a-b</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
11.9	757	0.0449	1.06		<b>Shallow Concentrated Flow, b-c</b>
					Woodland Kv= 5.0 fps
22.2	807	Total			

**Subcatchment 5S: To Off Site**

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Type III 24-hr 10 YR Rainfall=5.23"

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### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 1.51" for 10 YR event  
Inflow = 10.78 cfs @ 12.43 hrs, Volume= 61,957 cf  
Outflow = 10.77 cfs @ 12.43 hrs, Volume= 61,957 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.41 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 2.72 fps, Avg. Travel Time= 0.4 min

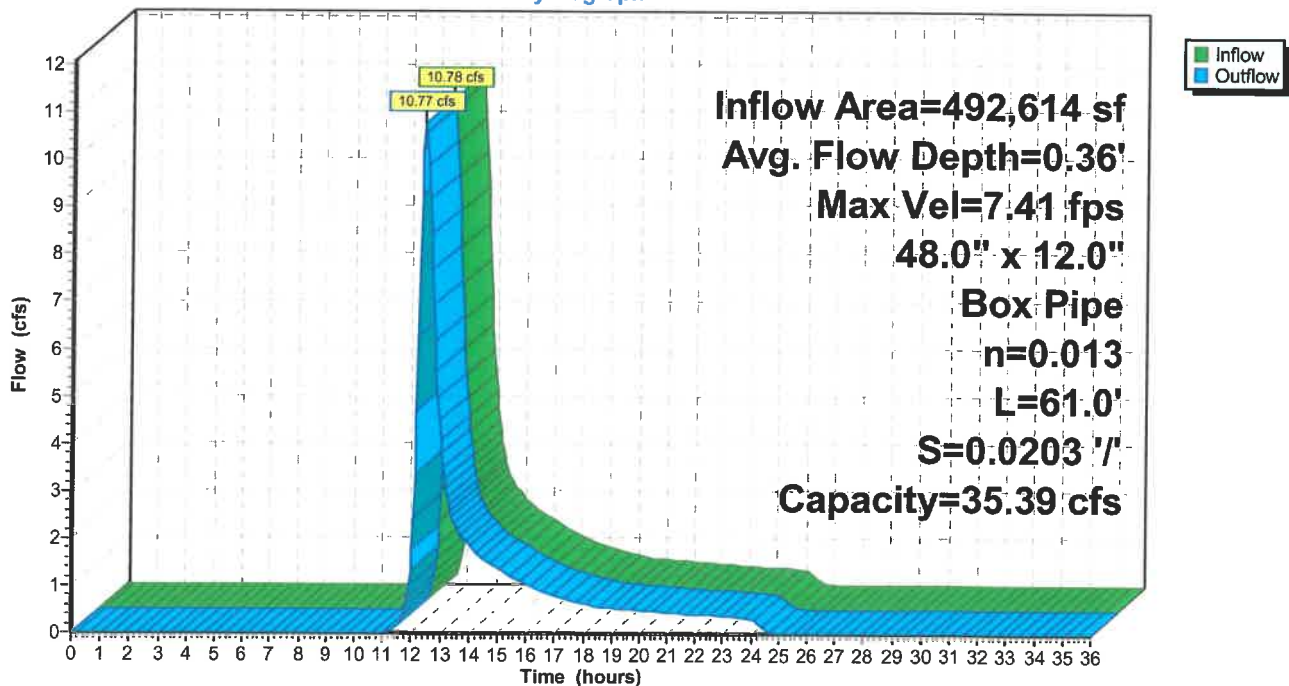
Peak Storage= 89 cf @ 12.43 hrs  
Average Depth at Peak Storage= 0.36', Surface Width= 4.00'  
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe  
n= 0.013 Concrete, trowel finish  
Length= 61.0' Slope= 0.0203 '/'  
Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

Hydrograph



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Type III 24-hr 10 YR Rainfall=5.23"

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### Summary for Reach EV1: (new Reach)

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 1.20" for 10 YR event  
Inflow = 25.27 cfs @ 13.17 hrs, Volume= 274,792 cf  
Outflow = 25.27 cfs @ 13.17 hrs, Volume= 274,791 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.36 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.12 fps, Avg. Travel Time= 0.1 min

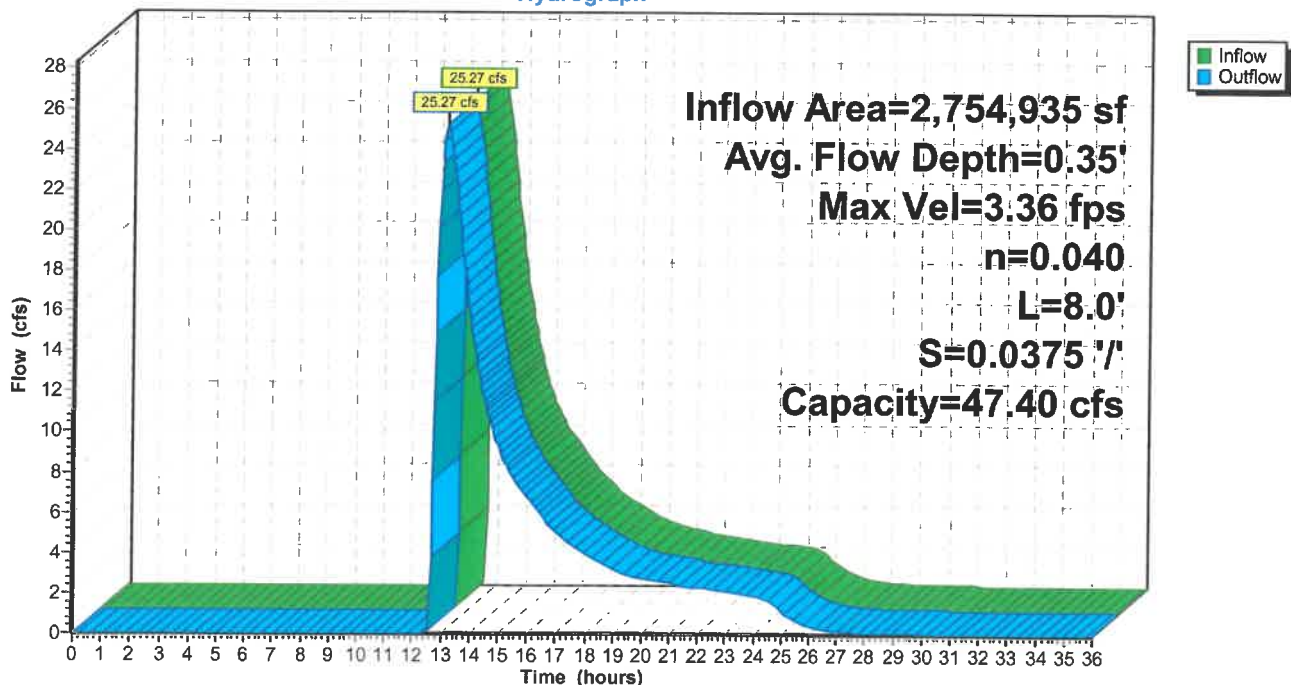
Peak Storage= 60 cf @ 13.17 hrs  
Average Depth at Peak Storage= 0.35', Surface Width= 23.46'  
Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides  
Side Slope Z-value= 5.0 '/' Top Width= 25.00'  
Length= 8.0' Slope= 0.0375 '/'  
Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: (new Reach)

Hydrograph





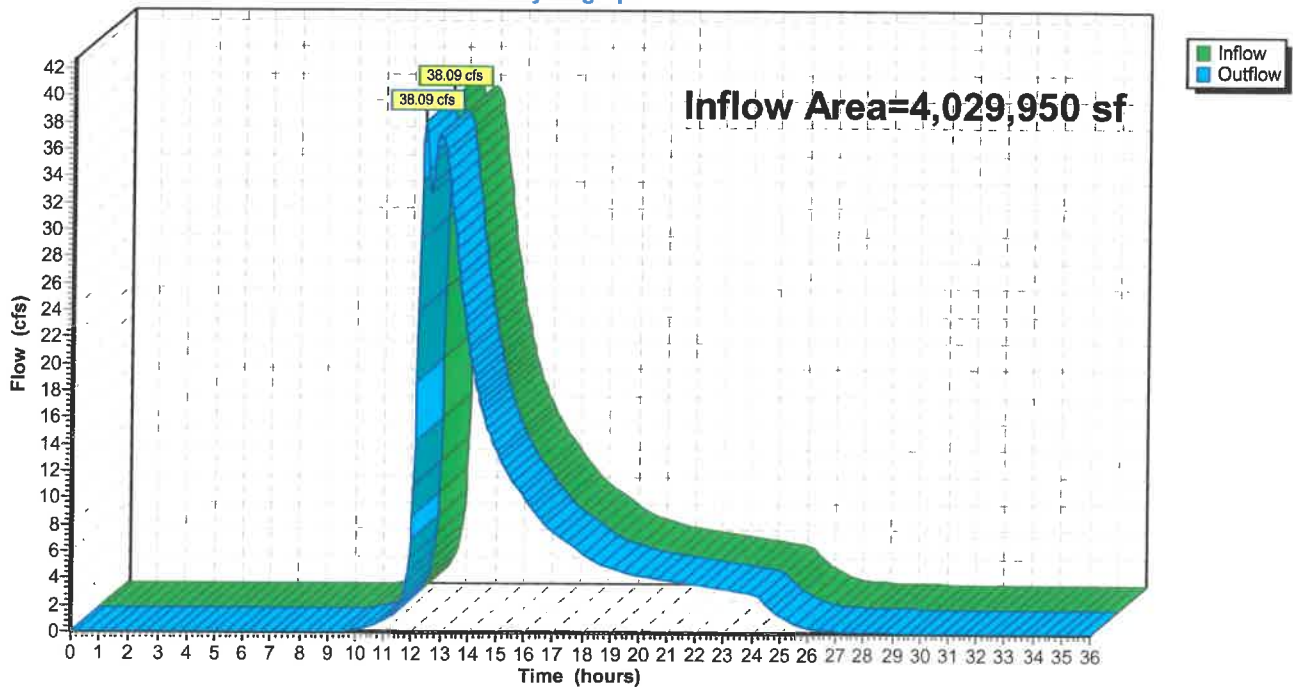
**Summary for Reach EV2: Wetland**

Inflow Area = 4,029,950 sf, 3.48% Impervious, Inflow Depth = 1.45" for 10 YR event  
Inflow = 38.09 cfs @ 12.42 hrs, Volume= 486,178 cf  
Outflow = 38.09 cfs @ 12.42 hrs, Volume= 486,178 cf, Atten= 0%, Lag= 0.0 min

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

**Reach EV2: Wetland**

Hydrograph





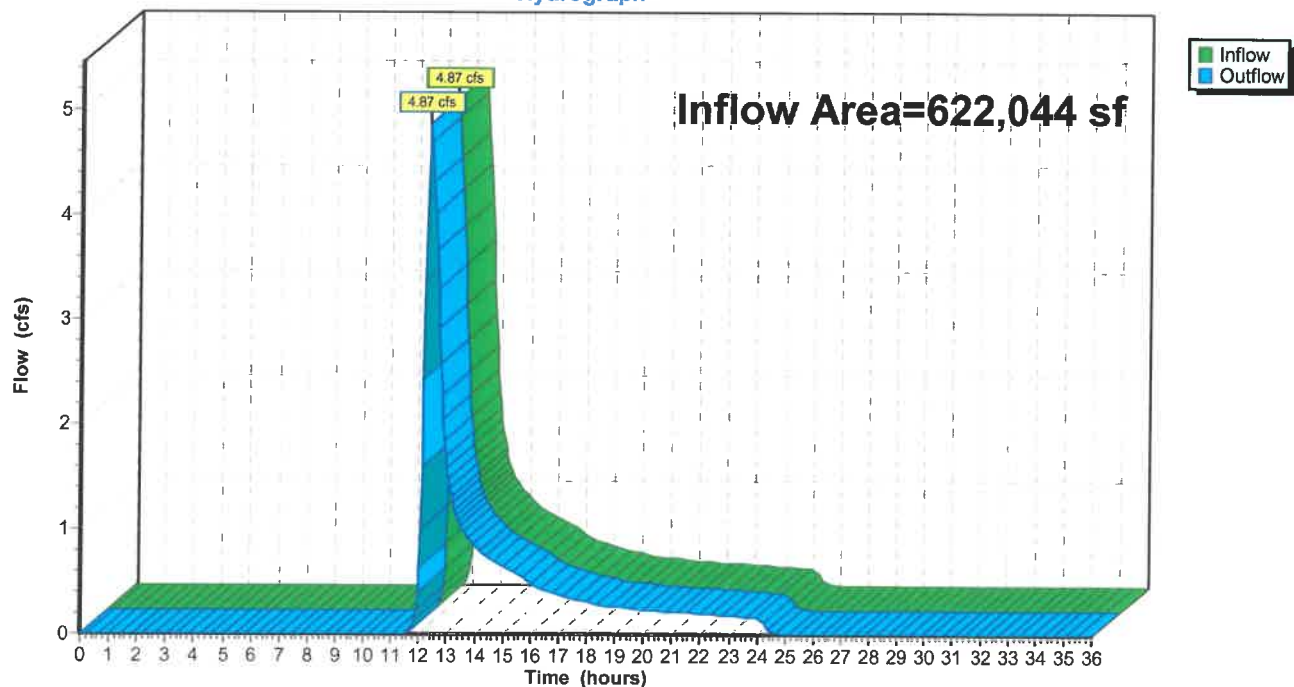
**Summary for Reach EV3: Offsite**

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 0.54" for 10 YR event  
Inflow = 4.87 cfs @ 12.37 hrs, Volume= 27,735 cf  
Outflow = 4.87 cfs @ 12.37 hrs, Volume= 27,735 cf, Atten= 0%, Lag= 0.0 min

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

**Reach EV3: Offsite**

Hydrograph



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Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Pond 1P: Vernal Pool**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth = 1.37" for 10 YR event  
 Inflow = 41.58 cfs @ 12.70 hrs, Volume= 313,788 cf  
 Outflow = 25.27 cfs @ 13.17 hrs, Volume= 274,792 cf, Atten= 39%, Lag= 28.3 min  
 Primary = 25.27 cfs @ 13.17 hrs, Volume= 274,792 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 294.91' @ 13.17 hrs Surf.Area= 45,996 sf Storage= 81,001 cf

Plug-Flow detention time= 120.7 min calculated for 274,792 cf (88% of inflow)  
 Center-of-Mass det. time= 62.4 min ( 974.5 - 912.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

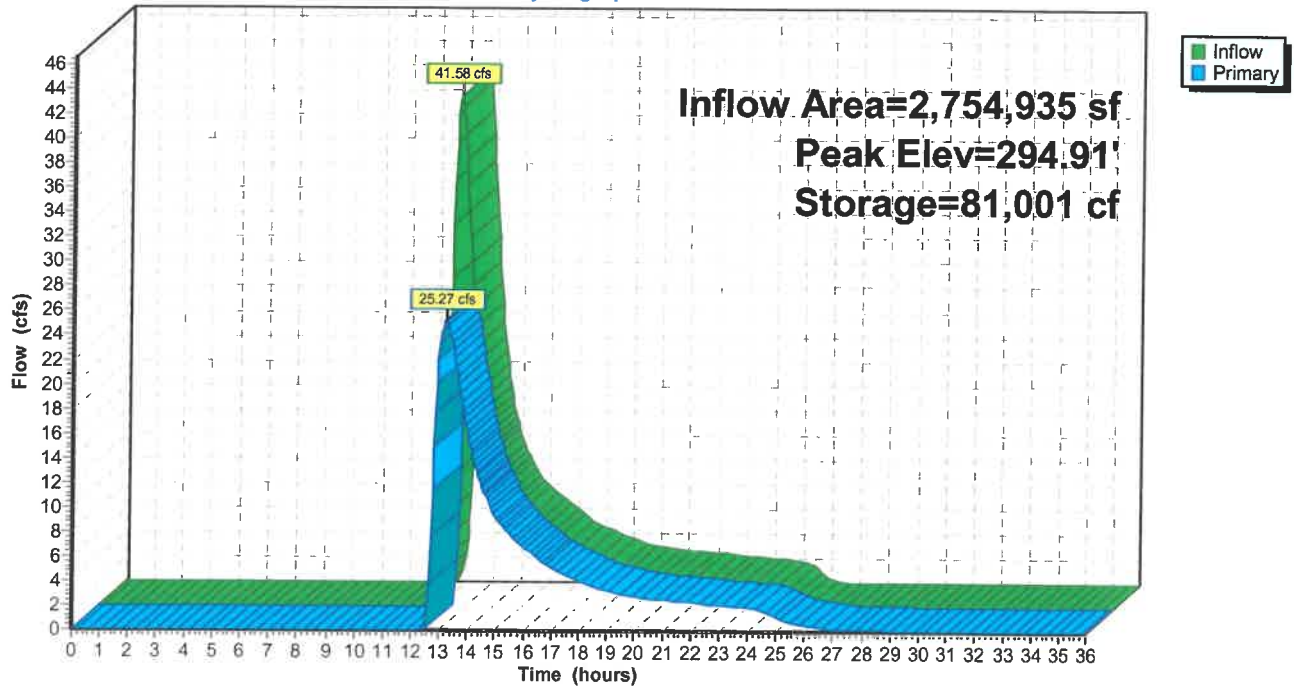
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=25.23 cfs @ 13.17 hrs HW=294.91' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 25.23 cfs @ 2.83 fps)

# Pond 1P: Vernal Pool

Hydrograph



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00454 - Existing Conditions R1  
Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Pond 2P: Road Berm**

Inflow Area = 335,708 sf, 0.00% Impervious, Inflow Depth = 1.10" for 10 YR event  
 Inflow = 5.27 cfs @ 12.37 hrs, Volume= 30,681 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 311.15' @ 25.30 hrs Surf.Area= 42,547 sf Storage= 30,676 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	310.00'	256,496 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	<b>8.0' long x 15.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)

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

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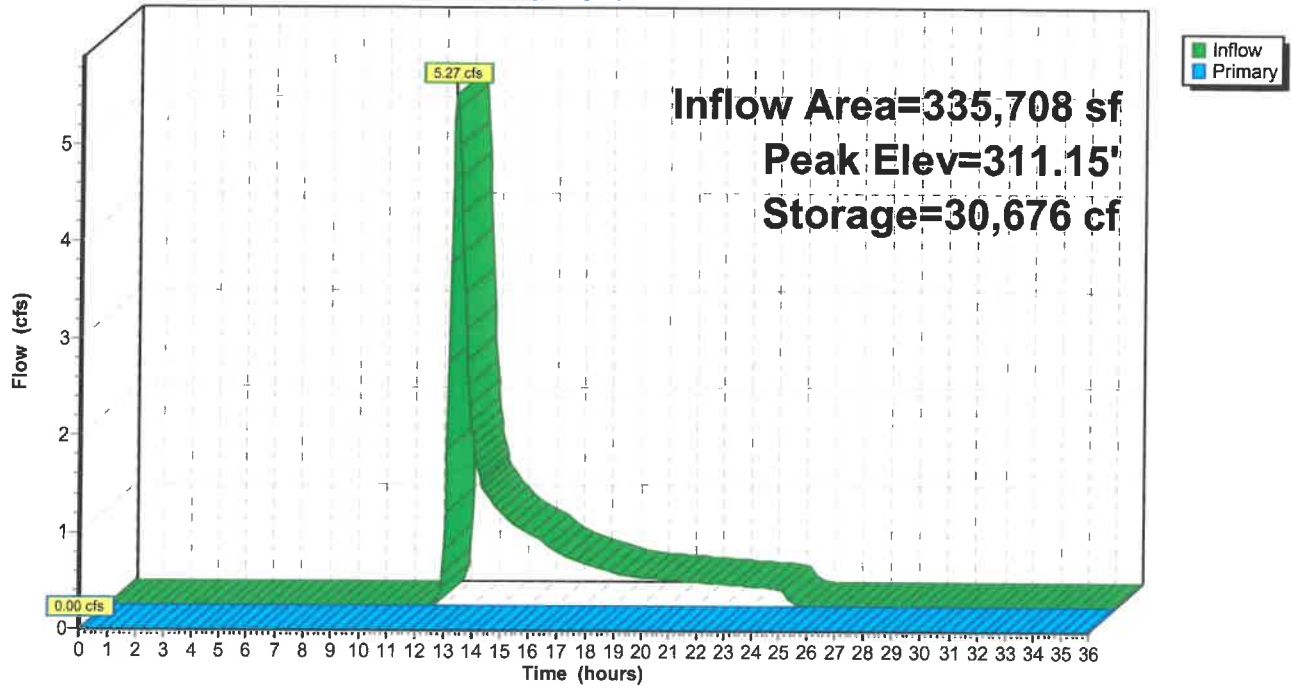
00454 - Existing Conditions R1  
Type III 24-hr 10 YR Rainfall=5.23"

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**Pond 2P: Road Berm**

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 16.88 cfs @ 12.41 hrs, Volume= 92,937 cf, Depth= 2.26"

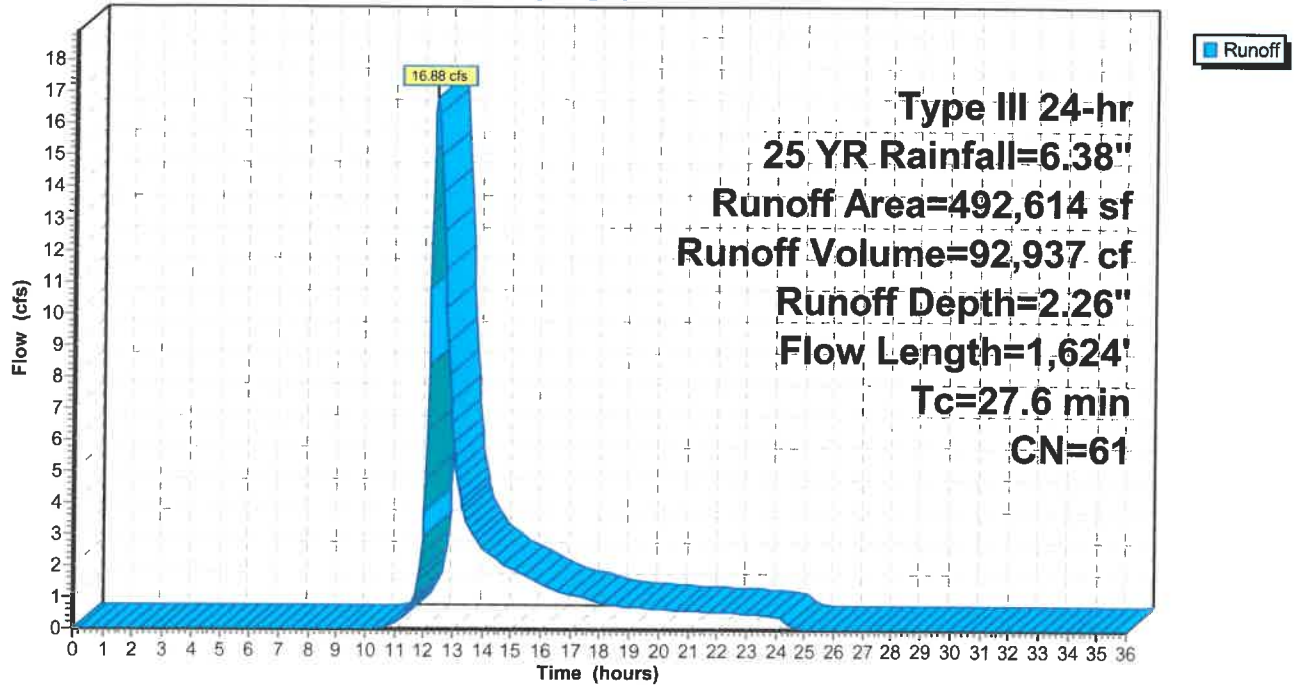
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b>
					Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

## Subcatchment 1S: To Culvert

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Subcatchment 2S: To Wetland**

Runoff = 66.94 cfs @ 12.68 hrs, Volume= 478,830 cf, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

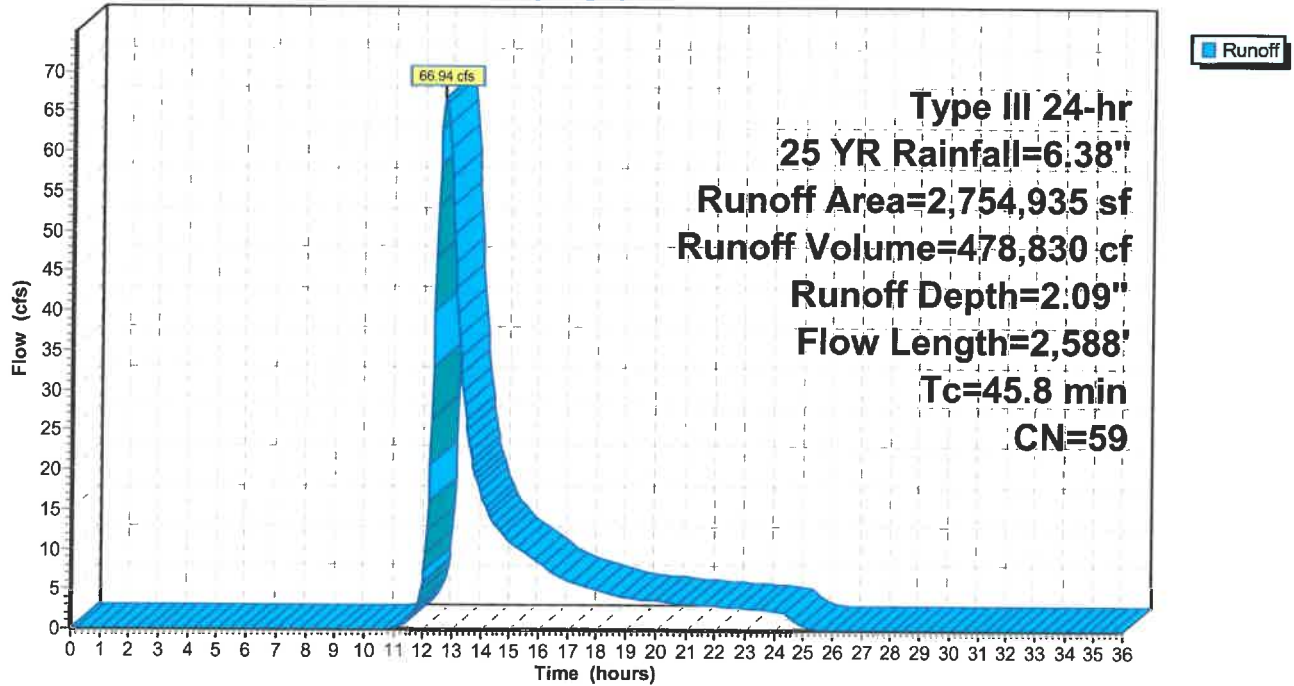
  

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b>
					Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b>
					Area= 1.2 sf Perim= 3.5' r= 0.34'
					n= 0.070 Medium-dense brush
45.8	2,588	Total			



## Subcatchment 2S: To Wetland

Hydrograph



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00454 - Existing Conditions R1  
Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Subcatchment 3S: To Wetland**

Runoff = 38.63 cfs @ 12.41 hrs, Volume= 209,152 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

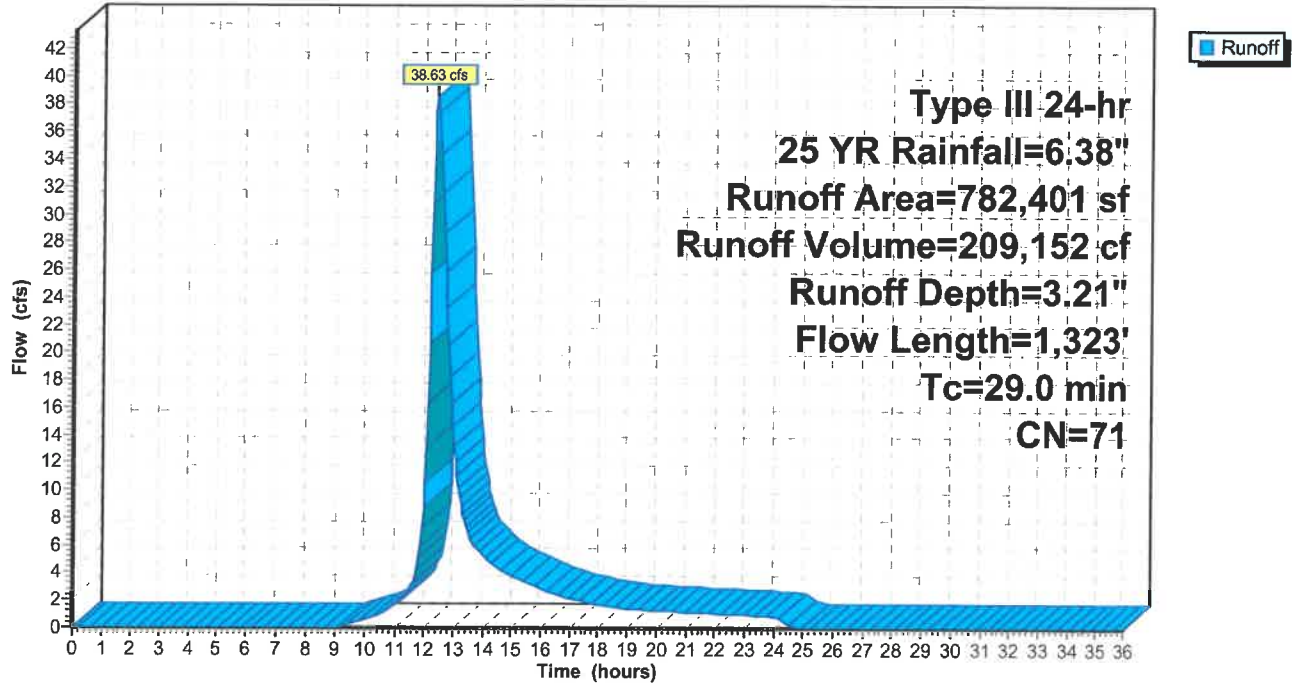
Area (sf)	CN	Description
205,649	55	Woods, Good, HSG B
557,046	77	Woods, Good, HSG D
4,470	98	Roofs, HSG B
15,236	61	>75% Grass cover, Good, HSG B
782,401	71	Weighted Average
777,931		99.43% Pervious Area
4,470		0.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		<b>Sheet Flow, Sheet</b> Grass: Short n= 0.150 P2= 3.22"
3.1	190	0.0210	1.01		<b>Shallow Concentrated Flow, Shallow</b> Short Grass Pasture Kv= 7.0 fps
16.2	735	0.0230	0.76		<b>Shallow Concentrated Flow, c-d</b> Woodland Kv= 5.0 fps
5.2	348	0.0115	1.12	1.34	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
29.0	1,323	Total			

## Subcatchment 3S: To Wetland

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Subcatchment 4S: Toward Road**

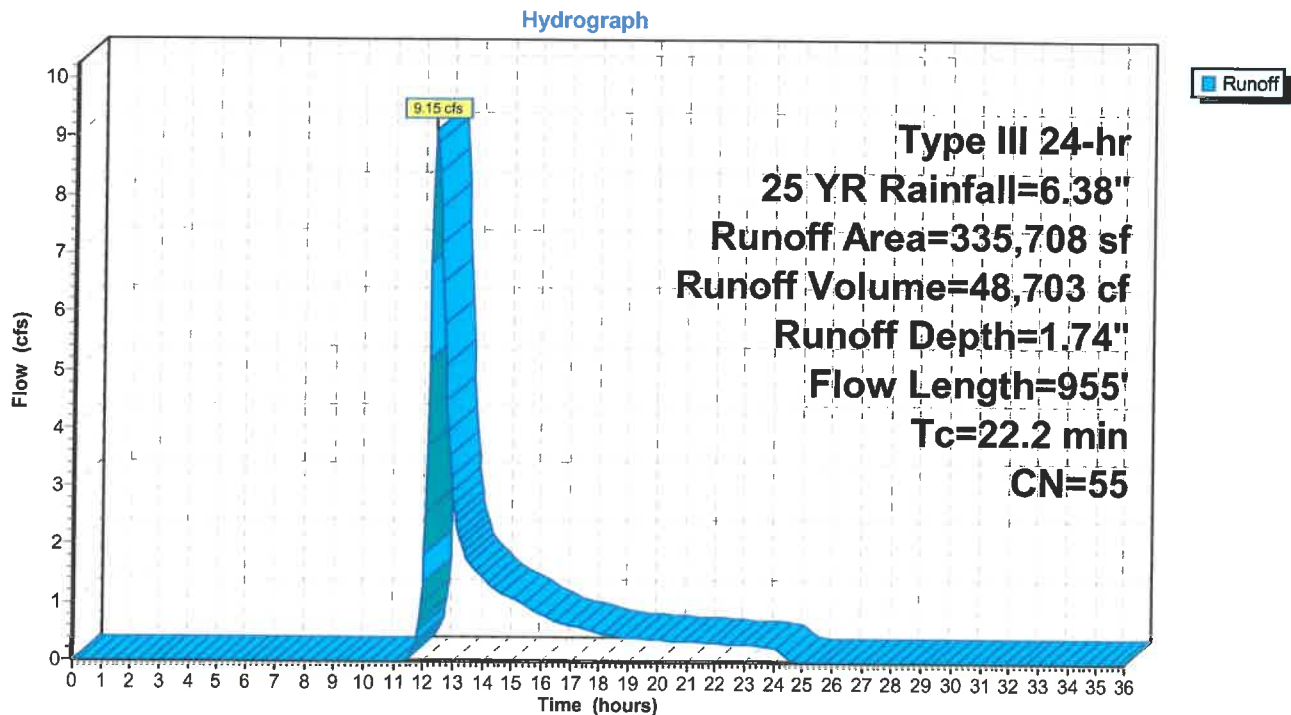
Runoff = 9.15 cfs @ 12.35 hrs, Volume= 48,703 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
335,708	55	Woods, Good, HSG B
335,708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
15.1	905	0.0401	1.00		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
22.2	955	Total			

**Subcatchment 4S: Toward Road**

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Type III 24-hr 25 YR Rainfall=6.38"

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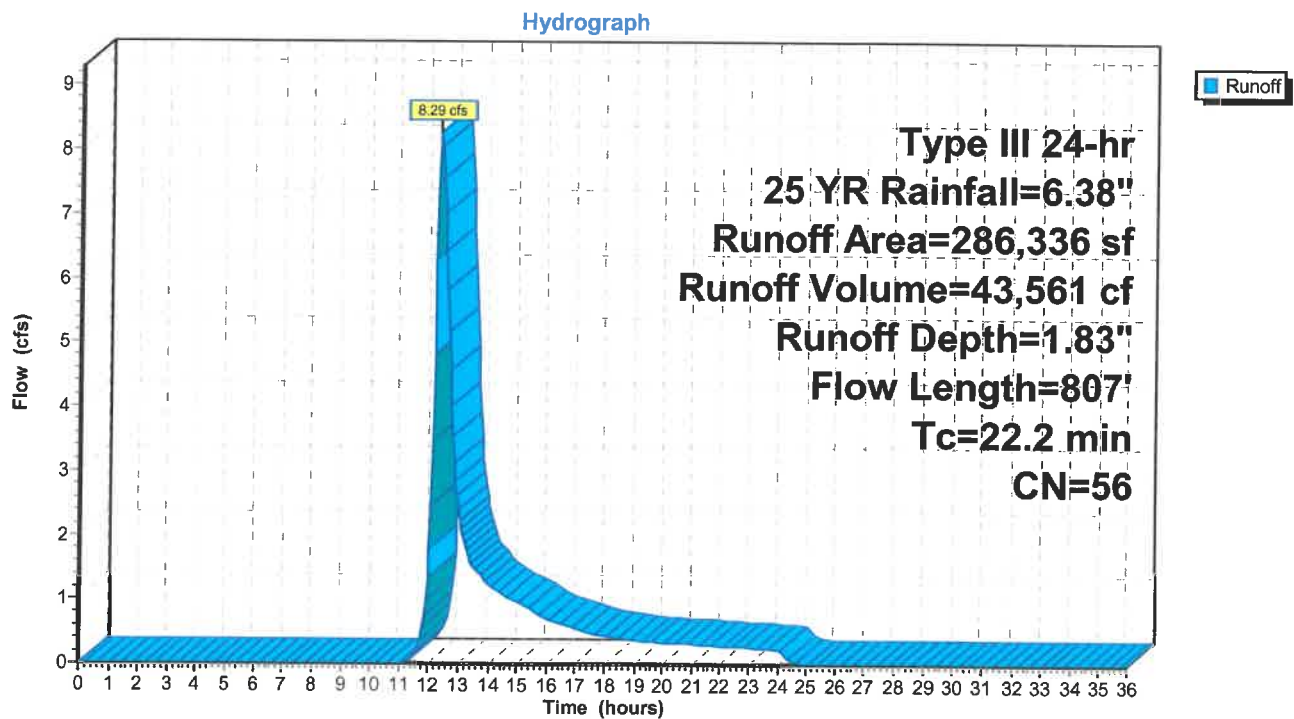
**Summary for Subcatchment 5S: To Off Site**

Runoff = 8.29 cfs @ 12.34 hrs, Volume= 43,561 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
281,970	55	Woods, Good, HSG B
286,336	56	Weighted Average
286,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0312	0.08		<b>Sheet Flow, a-b</b>
11.9	757	0.0449	1.06		Woods: Light underbrush n= 0.400 P2= 3.22"
					<b>Shallow Concentrated Flow, b-c</b>
					Woodland Kv= 5.0 fps
22.2	807	Total			

**Subcatchment 5S: To Off Site**

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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 2.26" for 25 YR event  
Inflow = 16.88 cfs @ 12.41 hrs, Volume= 92,937 cf  
Outflow = 16.87 cfs @ 12.42 hrs, Volume= 92,937 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.70 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 3.06 fps, Avg. Travel Time= 0.3 min

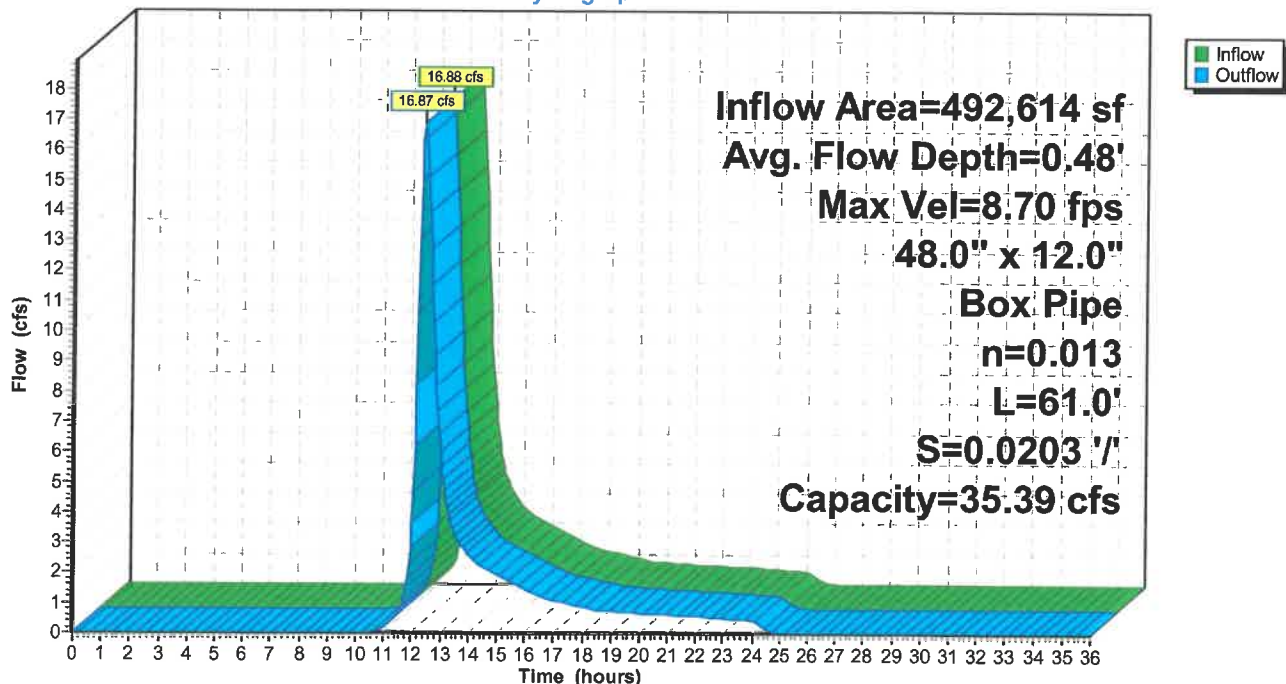
Peak Storage= 118 cf @ 12.41 hrs  
Average Depth at Peak Storage= 0.48' , Surface Width= 4.00'  
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe  
n= 0.013 Concrete, trowel finish  
Length= 61.0' Slope= 0.0203 '/'  
Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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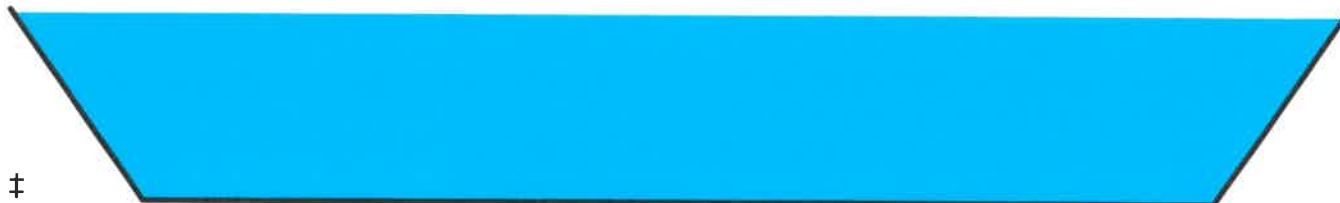
### Summary for Reach EV1: (new Reach)

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth = 1.92" for 25 YR event  
Inflow = 45.97 cfs @ 13.05 hrs, Volume= 439,831 cf  
Outflow = 45.93 cfs @ 13.06 hrs, Volume= 439,831 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.17 fps, Min. Travel Time= 0.0 min  
Avg. Velocity = 1.29 fps, Avg. Travel Time= 0.1 min

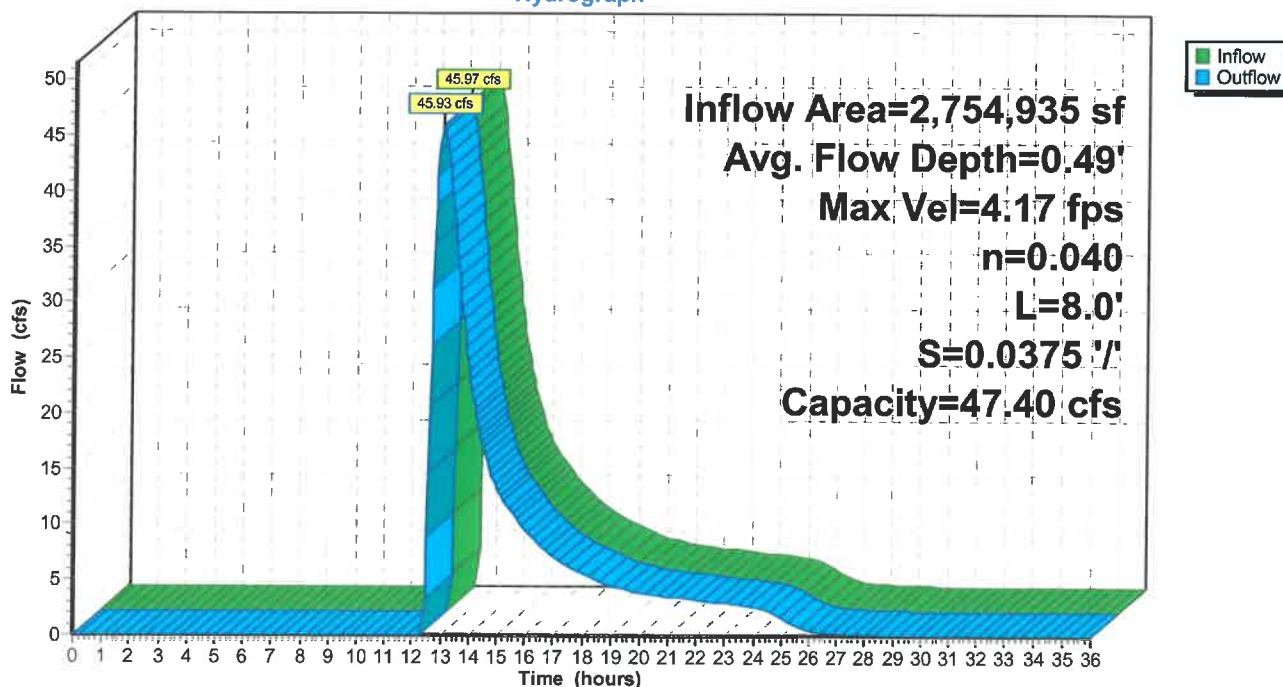
Peak Storage= 88 cf @ 13.06 hrs  
Average Depth at Peak Storage= 0.49' , Surface Width= 24.91'  
Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides  
Side Slope Z-value= 5.0 '/' Top Width= 25.00'  
Length= 8.0' Slope= 0.0375 '/'  
Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: (new Reach)

Hydrograph





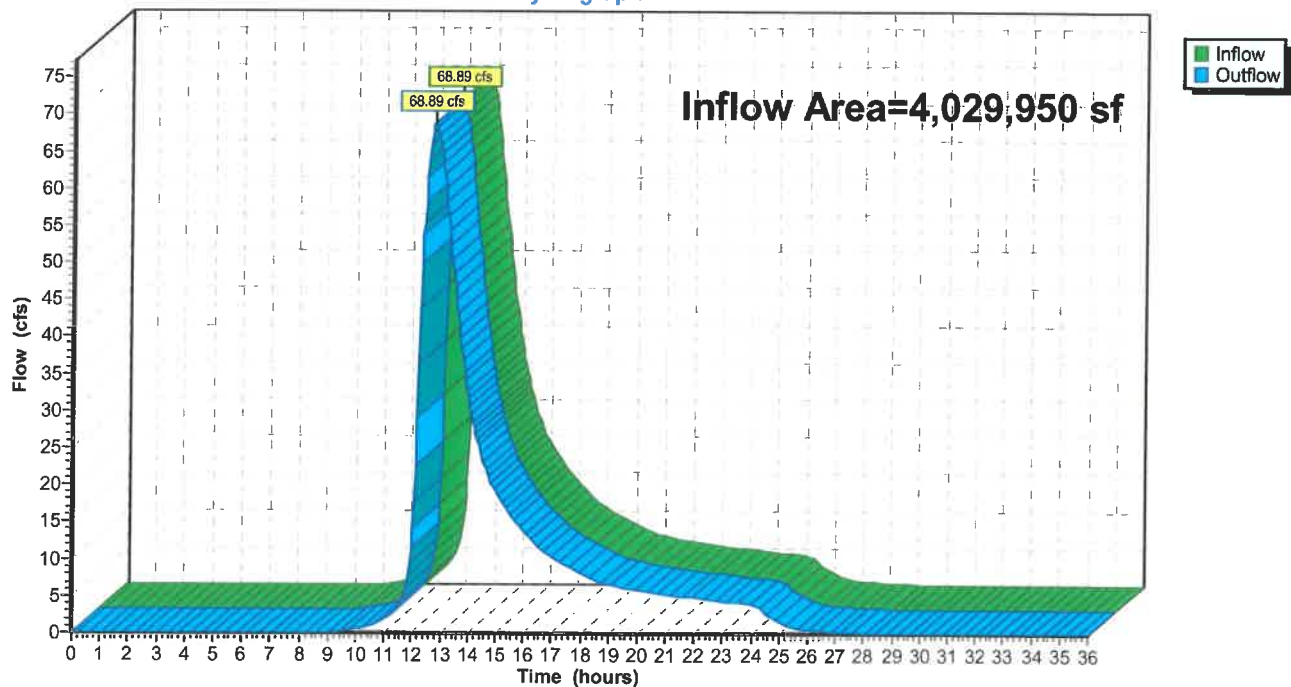
**Summary for Reach EV2: Wetland**

Inflow Area = 4,029,950 sf, 3.48% Impervious, Inflow Depth = 2.21" for 25 YR event  
Inflow = 68.89 cfs @ 12.75 hrs, Volume= 741,920 cf  
Outflow = 68.89 cfs @ 12.75 hrs, Volume= 741,920 cf, Atten= 0%, Lag= 0.0 min

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

**Reach EV2: Wetland**

Hydrograph





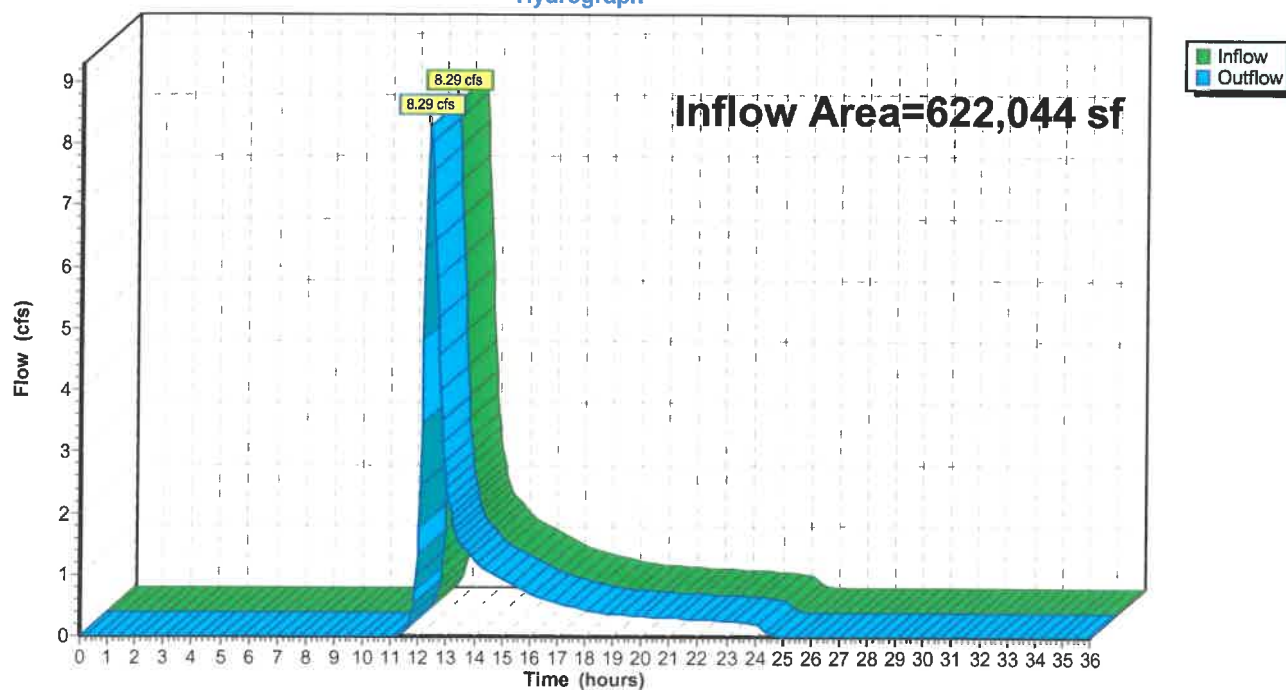
**Summary for Reach EV3: Offsite**

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 0.84" for 25 YR event  
Inflow = 8.29 cfs @ 12.34 hrs, Volume= 43,561 cf  
Outflow = 8.29 cfs @ 12.34 hrs, Volume= 43,561 cf, Atten= 0%, Lag= 0.0 min

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

**Reach EV3: Offsite**

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Pond 1P: Vernal Pool**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth = 2.09" for 25 YR event  
 Inflow = 66.94 cfs @ 12.68 hrs, Volume= 478,830 cf  
 Outflow = 45.97 cfs @ 13.05 hrs, Volume= 439,831 cf, Atten= 31%, Lag= 22.6 min  
 Primary = 45.97 cfs @ 13.05 hrs, Volume= 439,831 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 295.48' @ 13.05 hrs Surf.Area= 58,432 sf Storage= 110,347 cf

Plug-Flow detention time= 89.0 min calculated for 439,221 cf (92% of inflow)  
 Center-of-Mass det. time= 48.7 min ( 947.2 - 898.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

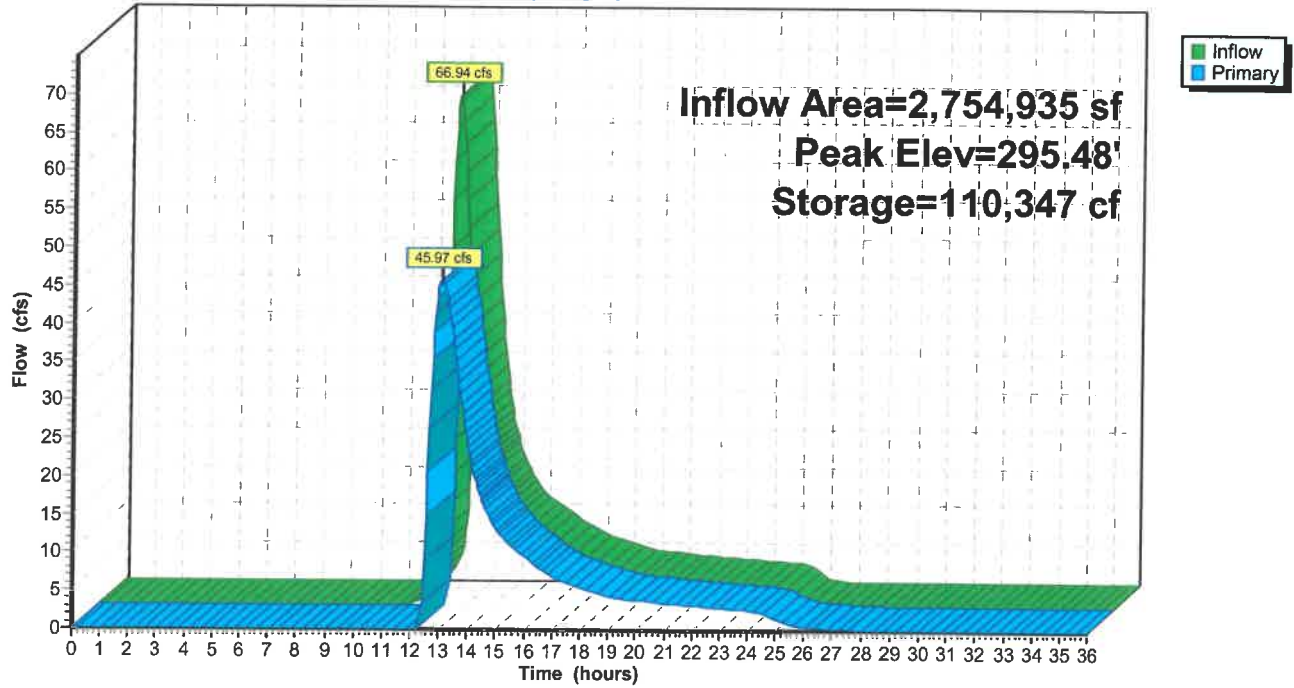
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=45.95 cfs @ 13.05 hrs HW=295.48' (Free Discharge)**1=Broad-Crested Rectangular Weir** (Weir Controls 45.95 cfs @ 3.42 fps)

**Pond 1P: Vernal Pool**

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Pond 2P: Road Berm**

Inflow Area = 335,708 sf, 0.00% Impervious, Inflow Depth = 1.74" for 25 YR event  
 Inflow = 9.15 cfs @ 12.35 hrs, Volume= 48,703 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 311.52' @ 25.30 hrs Surf.Area= 52,940 sf Storage= 48,702 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	310.00'	256,496 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

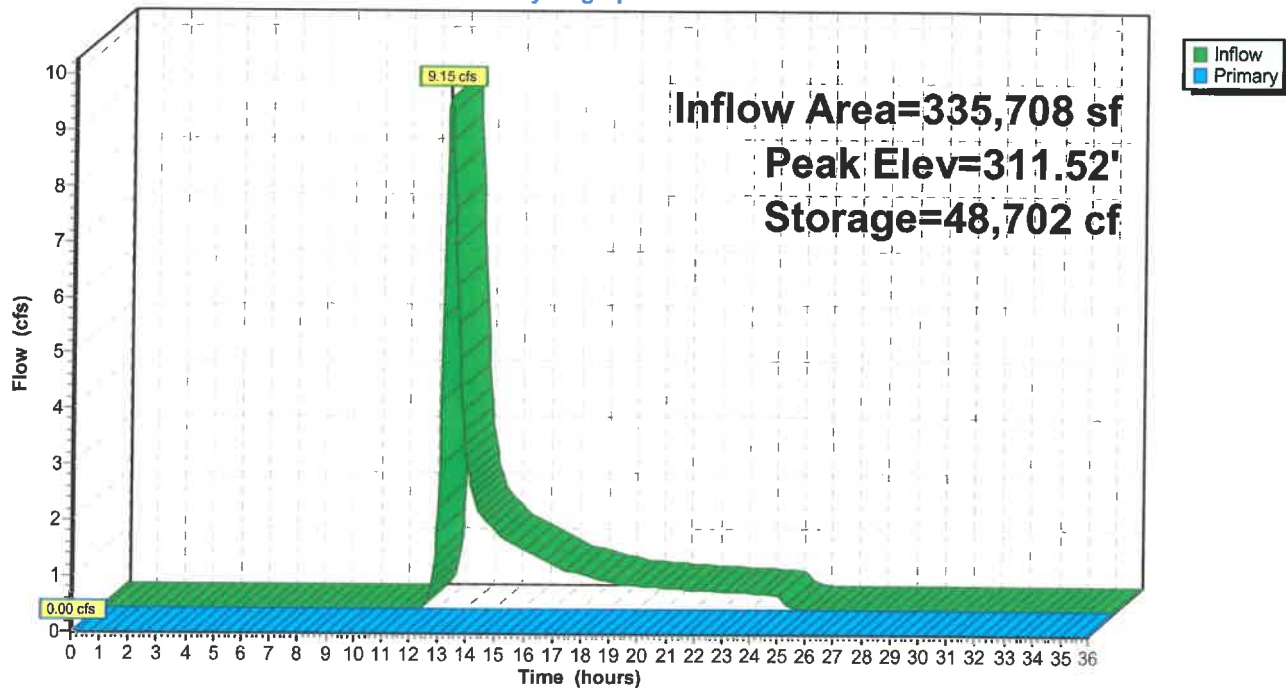
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	<b>8.0' long x 15.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)  
 1=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

# Pond 2P: Road Berm

## Hydrograph



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Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 30.99 cfs @ 12.40 hrs, Volume= 165,275 cf, Depth= 4.03"

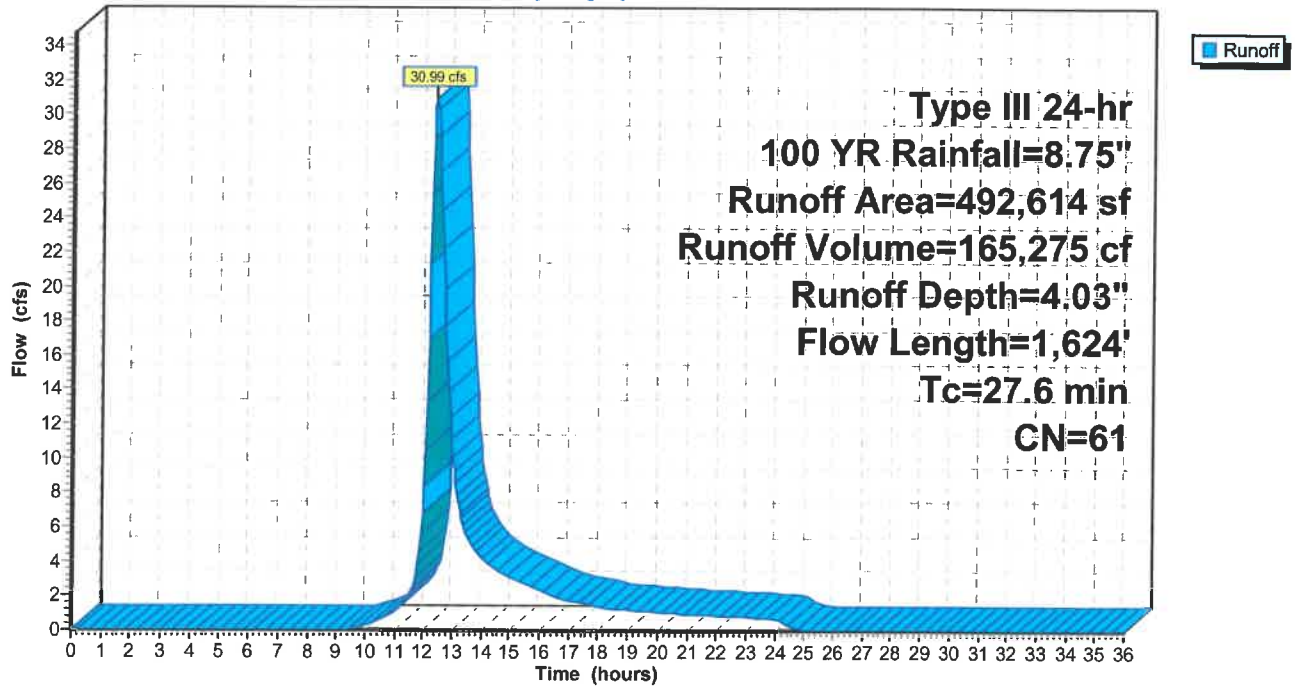
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b>
					Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

## Subcatchment 1S: To Culvert

Hydrograph



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Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Subcatchment 2S: To Wetland**

Runoff = 126.66 cfs @ 12.65 hrs, Volume= 869,134 cf, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

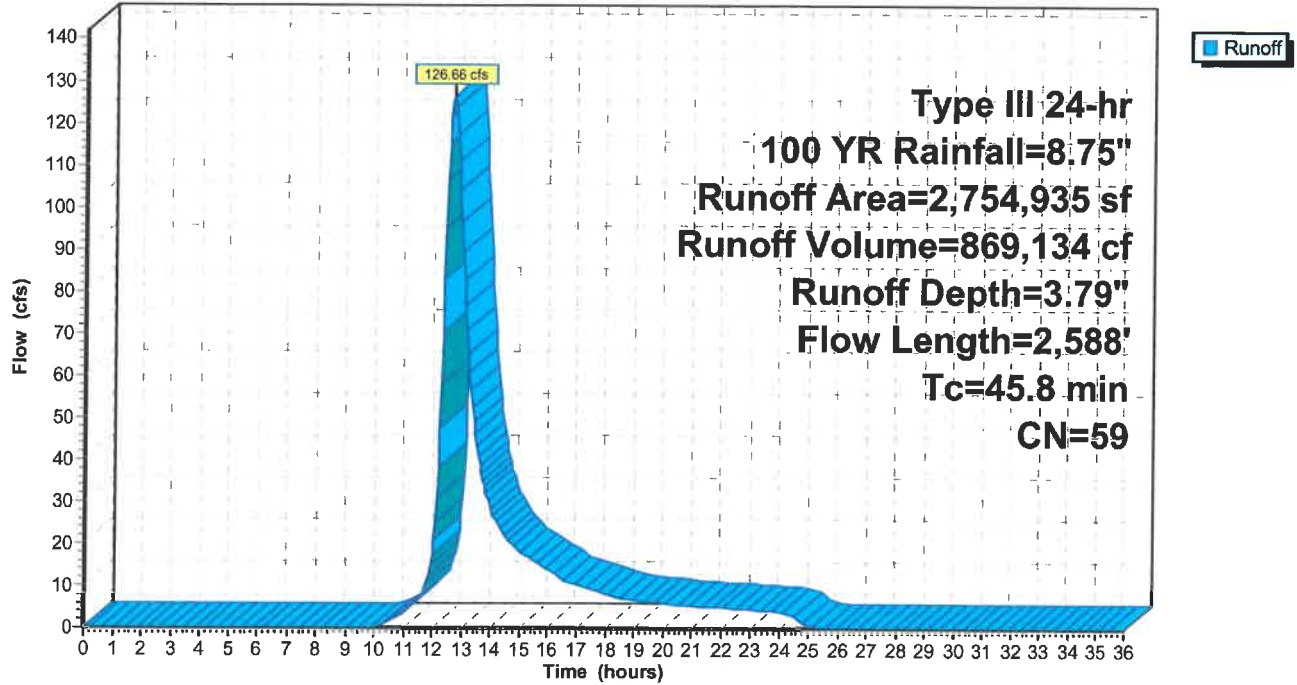
  

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b>
					Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b>
					Area= 1.2 sf Perim= 3.5' r= 0.34'
					n= 0.070 Medium-dense brush
45.8	2,588	Total			



## Subcatchment 2S: To Wetland

Hydrograph



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Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Subcatchment 3S: To Wetland**

Runoff = 63.23 cfs @ 12.40 hrs, Volume= 341,441 cf, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

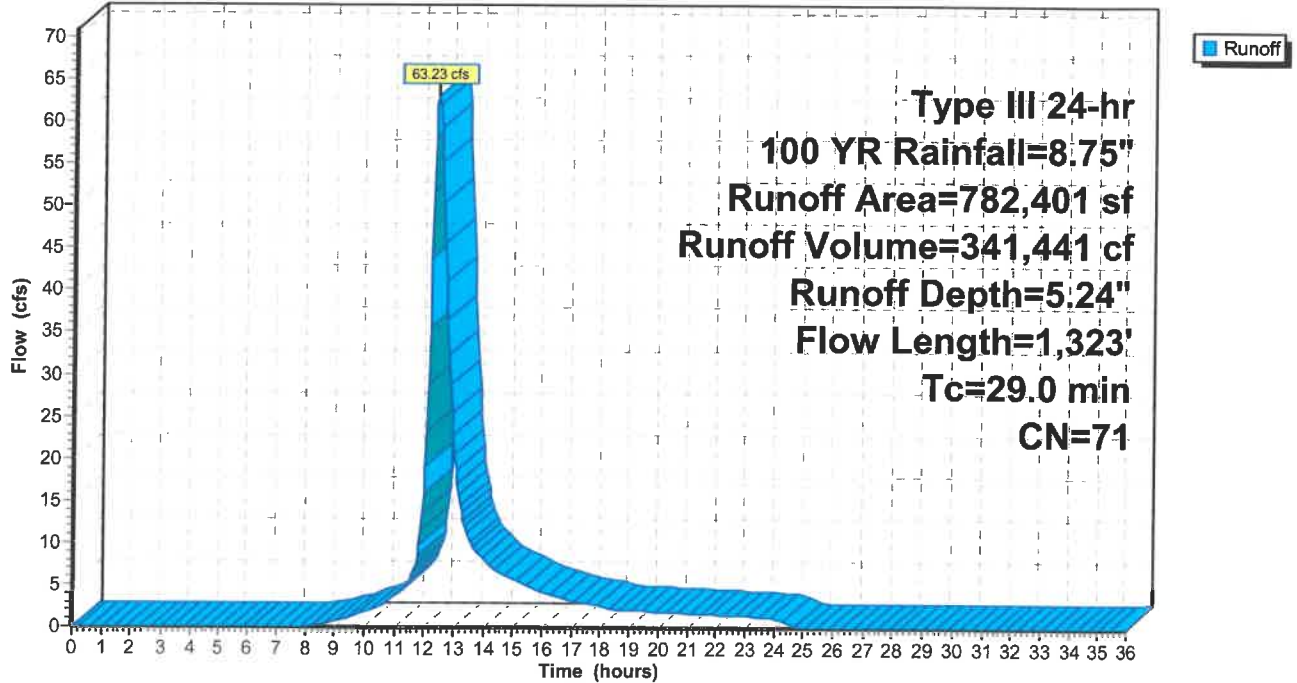
Area (sf)	CN	Description
205,649	55	Woods, Good, HSG B
557,046	77	Woods, Good, HSG D
4,470	98	Roofs, HSG B
15,236	61	>75% Grass cover, Good, HSG B
782,401	71	Weighted Average
777,931		99.43% Pervious Area
4,470		0.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		<b>Sheet Flow, Sheet</b> Grass: Short n= 0.150 P2= 3.22"
3.1	190	0.0210	1.01		<b>Shallow Concentrated Flow, Shallow</b> Short Grass Pasture Kv= 7.0 fps
16.2	735	0.0230	0.76		<b>Shallow Concentrated Flow, c-d</b> Woodland Kv= 5.0 fps
5.2	348	0.0115	1.12	1.34	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
29.0	1,323	Total			

**Subcatchment 3S: To Wetland**

Hydrograph



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**Summary for Subcatchment 4S: Toward Road**

Runoff = 18.61 cfs @ 12.33 hrs, Volume= 92,555 cf, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

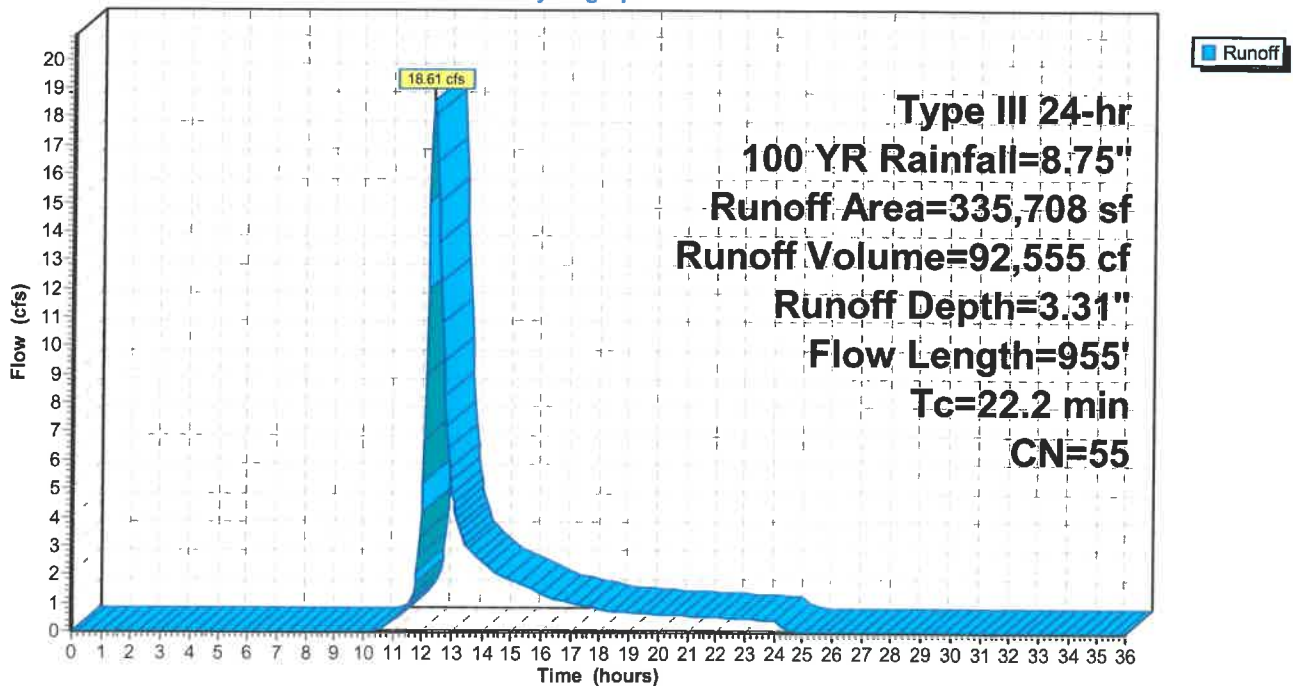
Area (sf)	CN	Description
335,708	55	Woods, Good, HSG B
335,708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
15.1	905	0.0401	1.00		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
22.2	955	Total			

**Subcatchment 4S: Toward Road**

Hydrograph



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Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Subcatchment 5S: To Off Site**

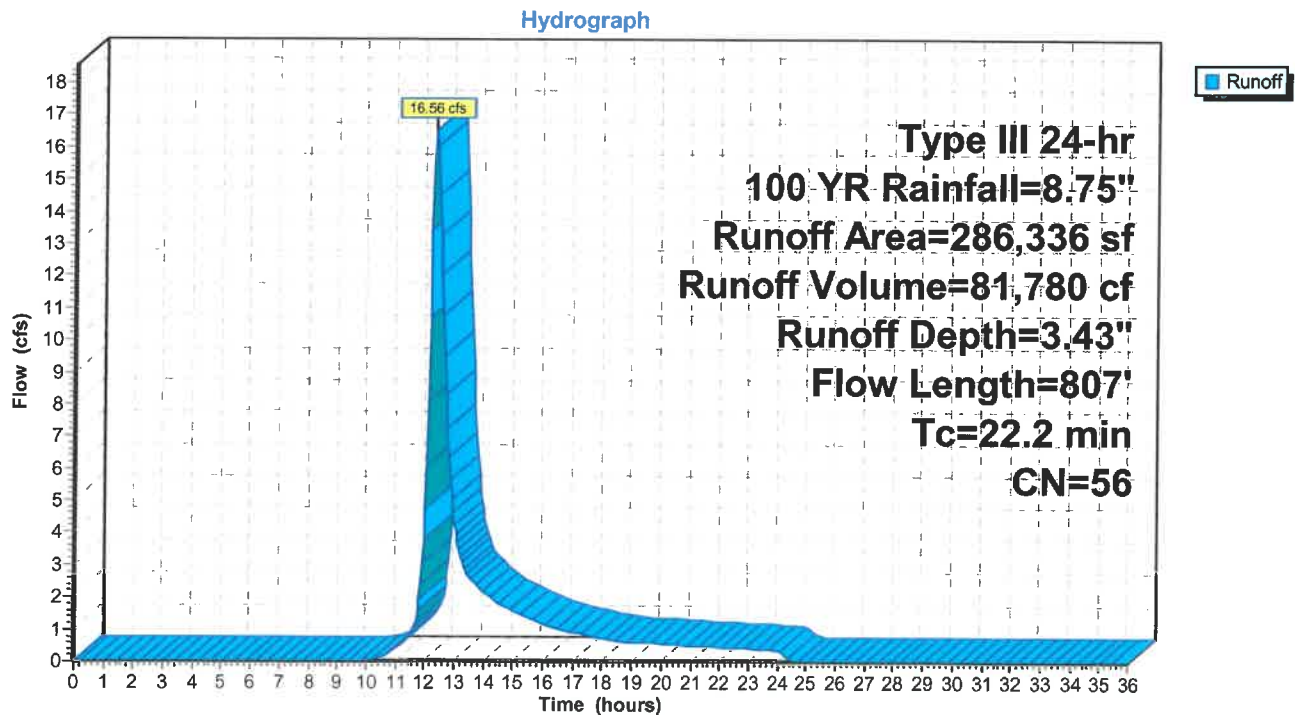
Runoff = 16.56 cfs @ 12.32 hrs, Volume= 81,780 cf, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
281,970	55	Woods, Good, HSG B
286,336	56	Weighted Average
286,336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0312	0.08		<b>Sheet Flow, a-b</b>
11.9	757	0.0449	1.06		Woods: Light underbrush n= 0.400 P2= 3.22"
					<b>Shallow Concentrated Flow, b-c</b>
					Woodland Kv= 5.0 fps
22.2	807	Total			

**Subcatchment 5S: To Off Site**

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Type III 24-hr 100 YR Rainfall=8.75"

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### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 4.03" for 100 YR event  
Inflow = 30.99 cfs @ 12.40 hrs, Volume= 165,275 cf  
Outflow = 30.97 cfs @ 12.40 hrs, Volume= 165,275 cf, Atten= 0%, Lag= 0.2 min

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

Max. Velocity= 10.70 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 3.64 fps, Avg. Travel Time= 0.3 min

Peak Storage= 177 cf @ 12.40 hrs

Average Depth at Peak Storage= 0.72', Surface Width= 4.00'

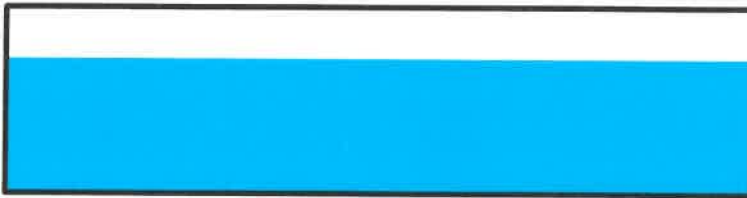
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe

n= 0.013 Concrete, trowel finish

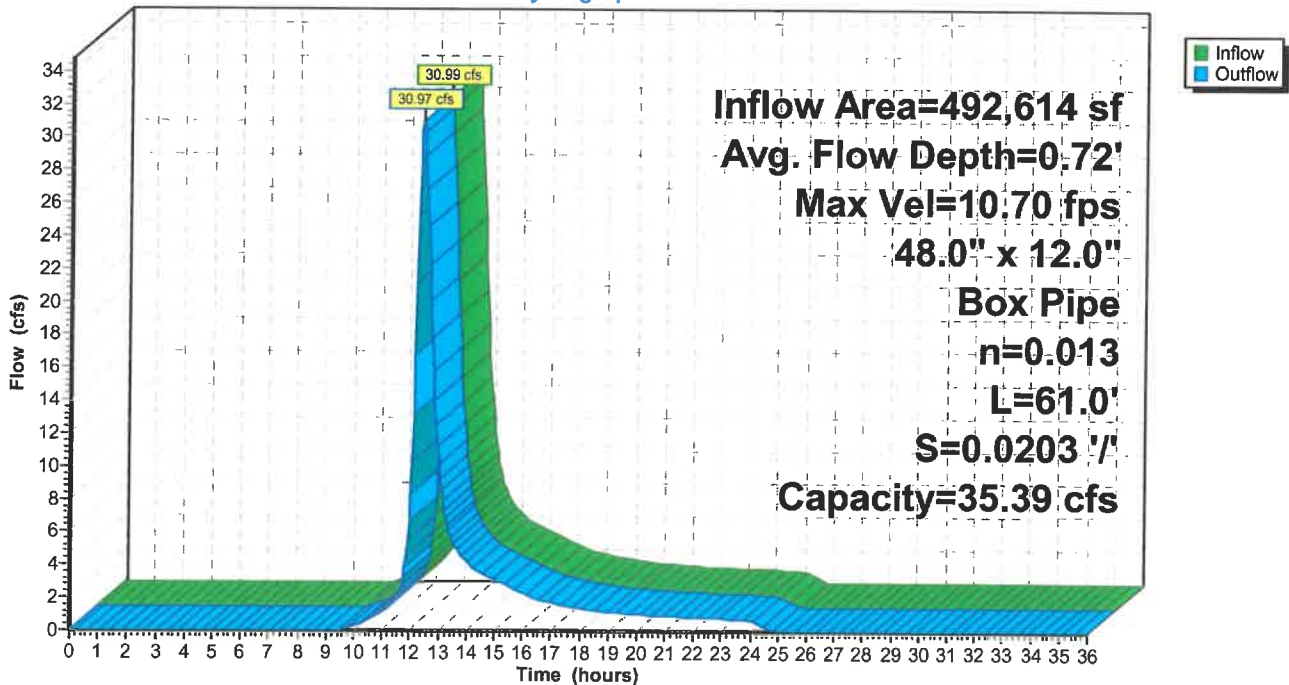
Length= 61.0' Slope= 0.0203 '/'

Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

Hydrograph



## 00454-EX - Rev1

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Type III 24-hr 100 YR Rainfall=8.75"

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### Summary for Reach EV1: (new Reach)

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth = 3.62" for 100 YR event  
Inflow = 135.67 cfs @ 12.67 hrs, Volume= 830,132 cf  
Outflow = 134.84 cfs @ 12.67 hrs, Volume= 830,132 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.42 fps, Min. Travel Time= 0.0 min  
Avg. Velocity = 1.56 fps, Avg. Travel Time= 0.1 min

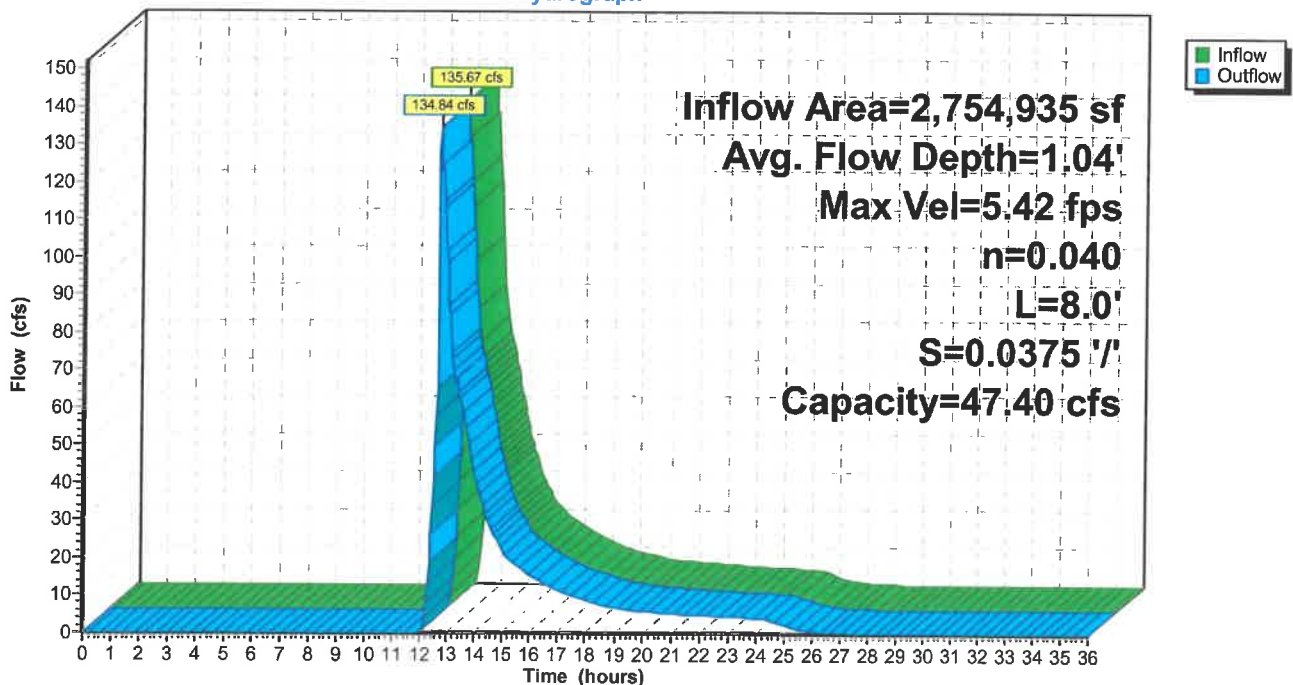
Peak Storage= 198 cf @ 12.67 hrs  
Average Depth at Peak Storage= 1.04' , Surface Width= 30.42'  
Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides  
Side Slope Z-value= 5.0 ' / ' Top Width= 25.00'  
Length= 8.0' Slope= 0.0375 ' / '  
Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: (new Reach)

Hydrograph





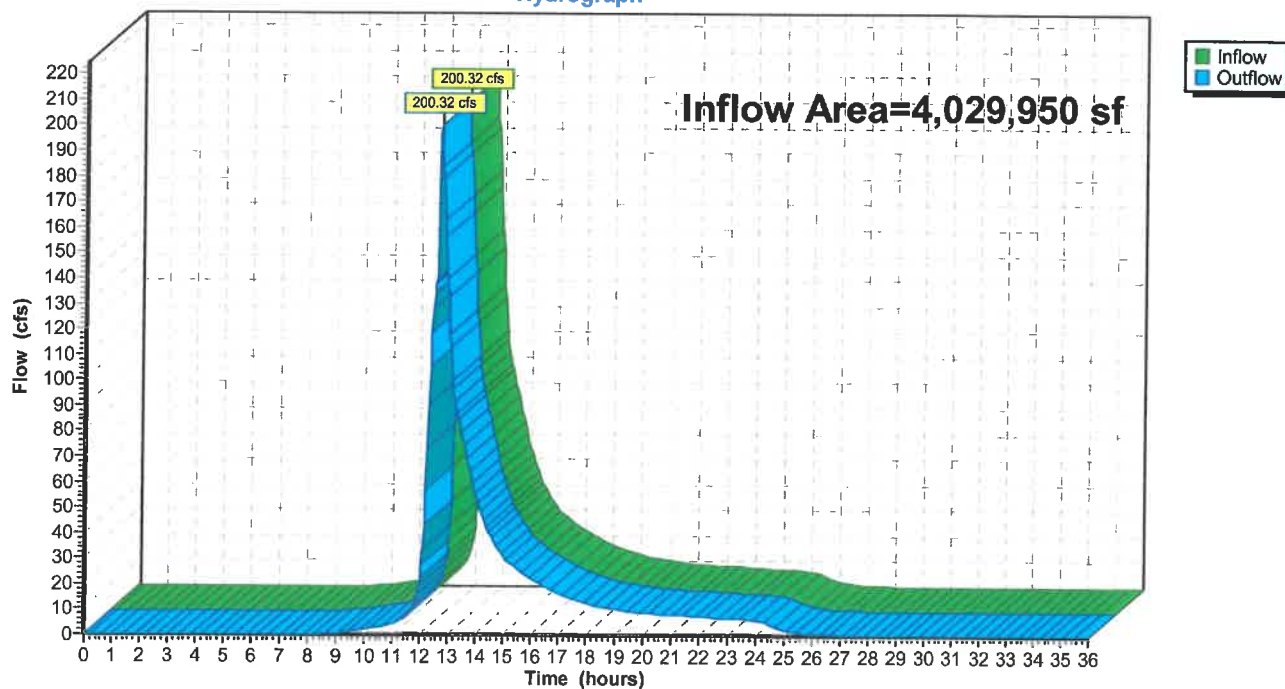
**Summary for Reach EV2: Wetland**

Inflow Area = 4,029,950 sf, 3.48% Impervious, Inflow Depth = 3.98" for 100 YR event  
Inflow = 200.32 cfs @ 12.67 hrs, Volume= 1,336,848 cf  
Outflow = 200.32 cfs @ 12.67 hrs, Volume= 1,336,848 cf, Atten= 0%, Lag= 0.0 min

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

**Reach EV2: Wetland**

Hydrograph



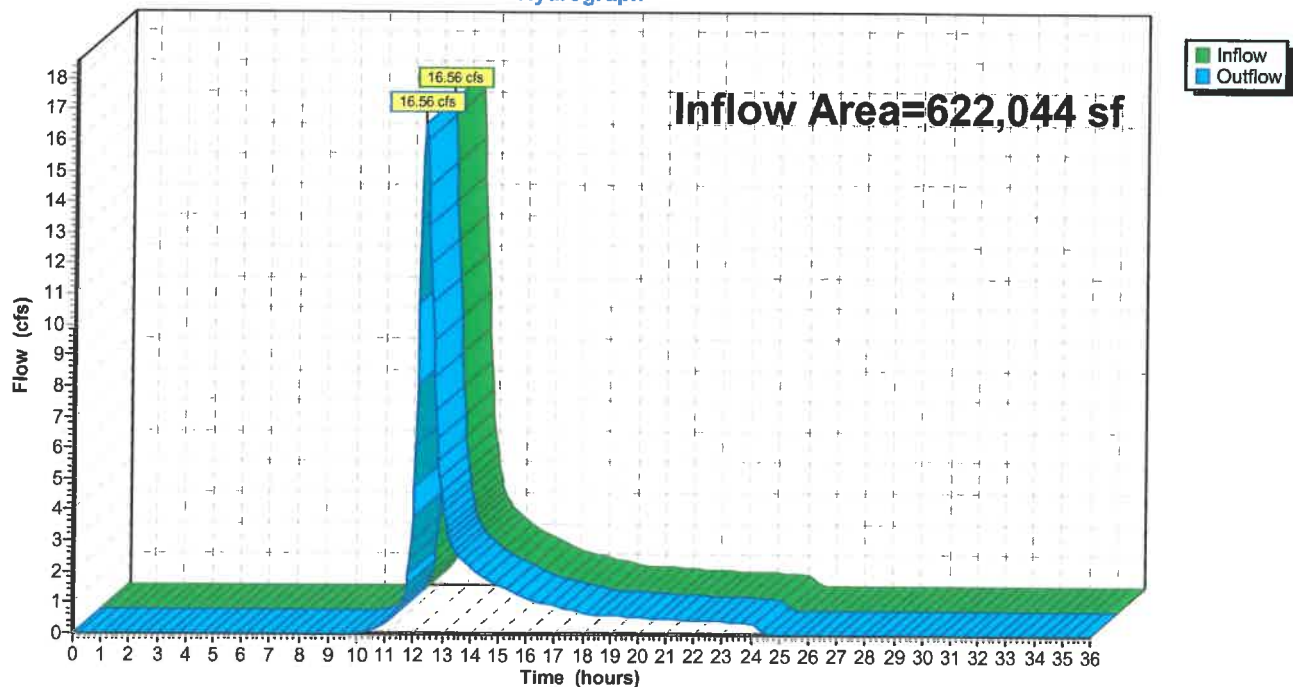
**Summary for Reach EV3: Offsite**

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 1.58" for 100 YR event  
Inflow = 16.56 cfs @ 12.32 hrs, Volume= 81,780 cf  
Outflow = 16.56 cfs @ 12.32 hrs, Volume= 81,780 cf, Atten= 0%, Lag= 0.0 min

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

**Reach EV3: Offsite**

Hydrograph



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**Summary for Pond 1P: Vernal Pool**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth = 3.79" for 100 YR event  
 Inflow = 126.66 cfs @ 12.65 hrs, Volume= 869,134 cf  
 Outflow = 135.67 cfs @ 12.67 hrs, Volume= 830,132 cf, Atten= 0%, Lag= 1.0 min  
 Primary = 135.67 cfs @ 12.67 hrs, Volume= 830,132 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 297.27' @ 12.67 hrs Surf.Area= 70,541 sf Storage= 143,915 cf

Plug-Flow detention time= 60.7 min calculated for 828,981 cf (95% of inflow)  
 Center-of-Mass det. time= 36.7 min ( 917.2 - 880.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Custom Stage Data (Prismatic) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

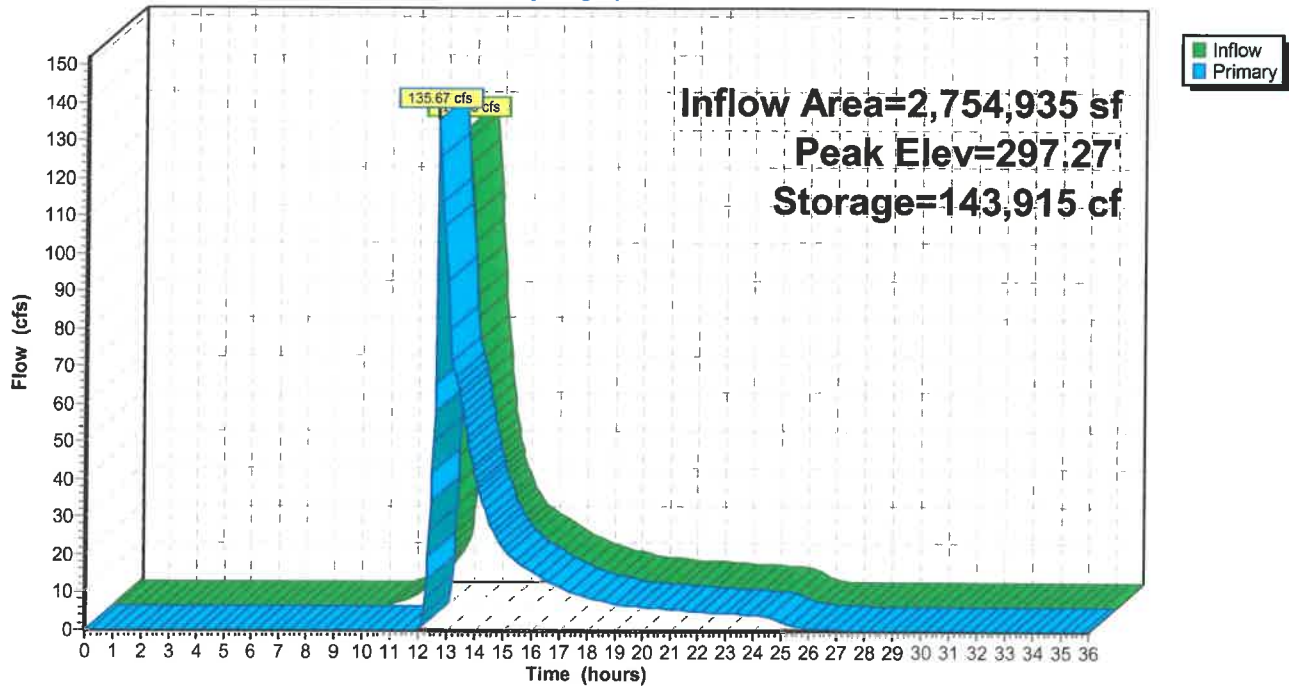
Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=127.01 cfs @ 12.67 hrs HW=297.11' (Free Discharge)

1=Broad-Crested Rectangular Weir (Weir Controls 127.01 cfs @ 4.80 fps)

# Pond 1P: Vernal Pool

Hydrograph



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**Summary for Pond 2P: Road Berm**

Inflow Area = 335,708 sf, 0.00% Impervious, Inflow Depth = 3.31" for 100 YR event  
 Inflow = 18.61 cfs @ 12.33 hrs, Volume= 92,555 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 312.22' @ 25.30 hrs Surf.Area= 71,387 sf Storage= 92,551 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	310.00'	256,496 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

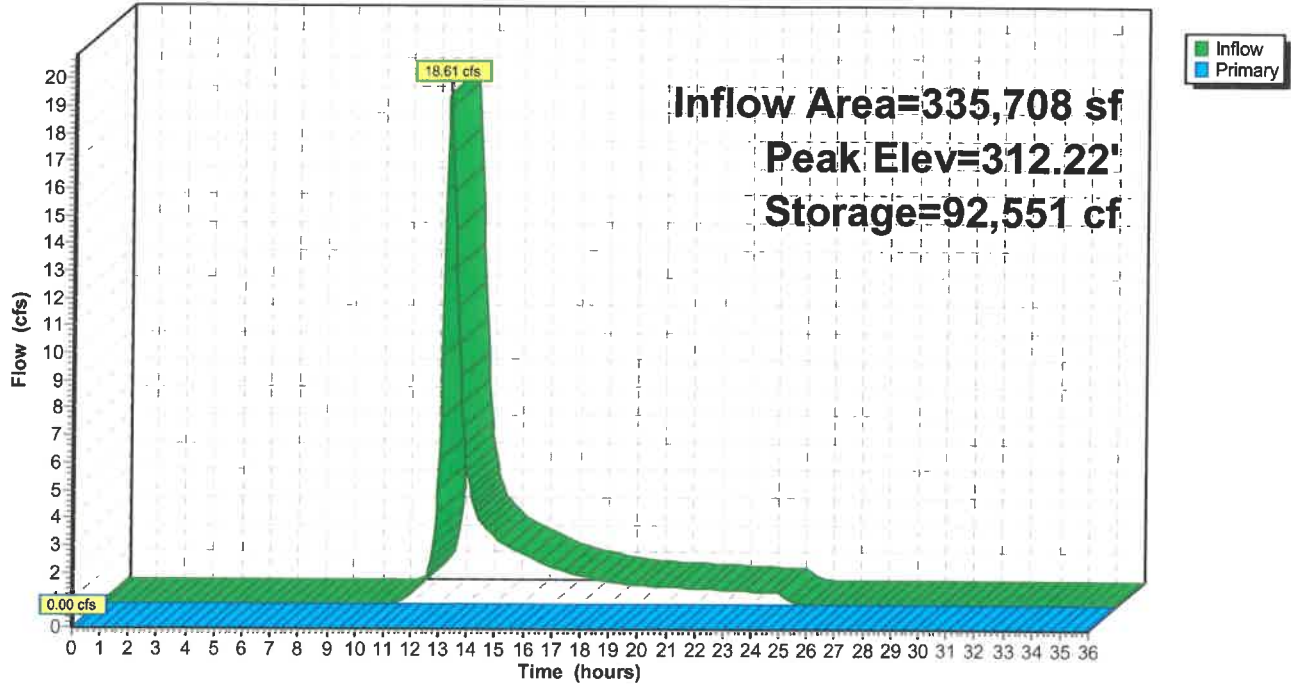
Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	<b>8.0' long x 15.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)

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

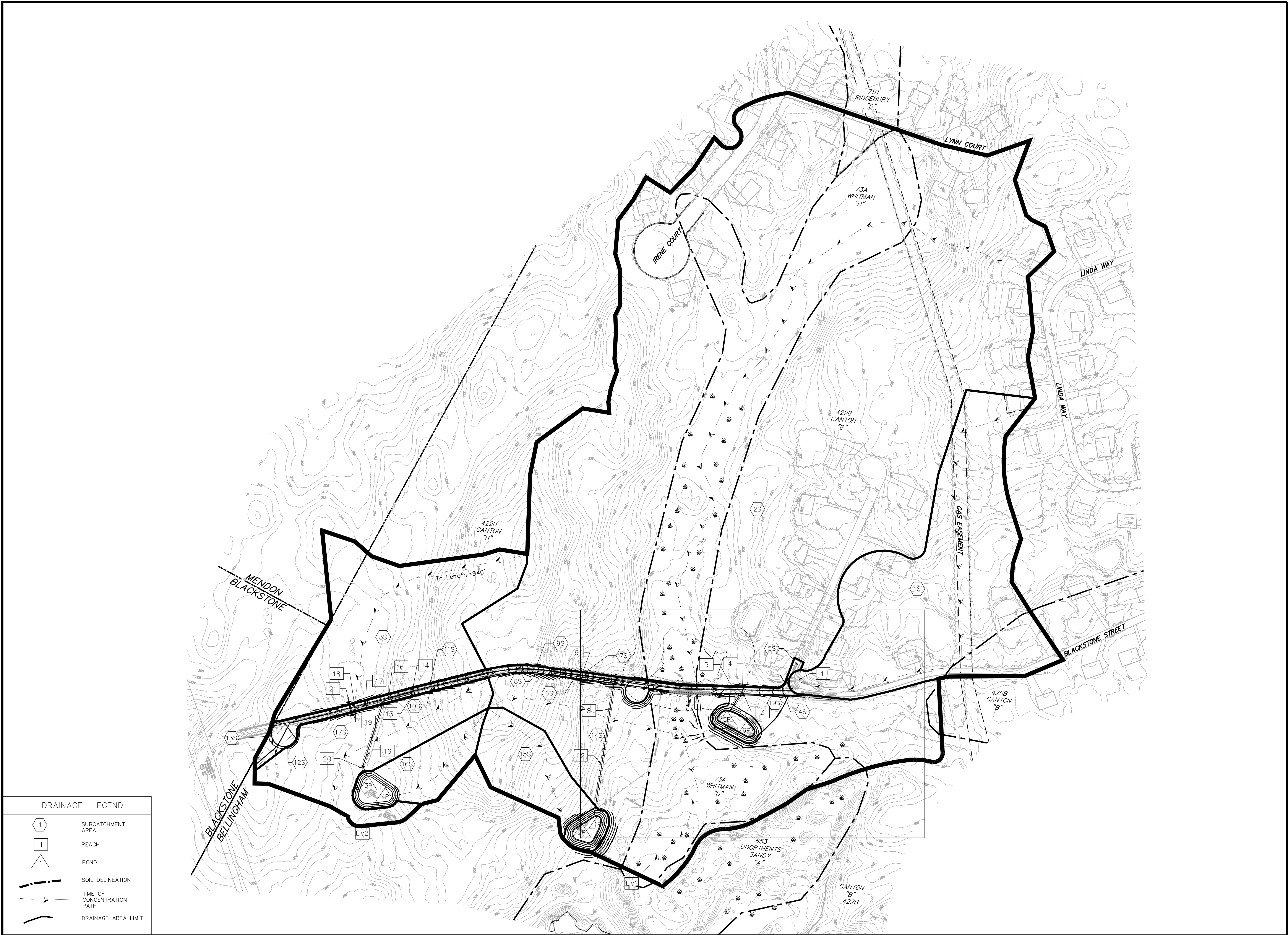
**Pond 2P: Road Berm**

Hydrograph



## **Post-Development Drainage Calculations**





DRAINAGE LEGEND	
	SUBCATCHMENT AREA
	REACH
	POND
	SOIL DELINEATION
	TIME OF CONCENTRATION PATH
	DRAINAGE AREA LIMIT

**LEGEND**  
 EDGE OF WETLAND  
 EXISTING CONTOUR  
 PROPOSED CONTOUR  
 EXISTING TREE LINE

**NOTES**  
1. ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.  
2. HORIZONTAL DATUM: NAD 83  
3. PARTIAL WETLAND RESOURCES FLAGGED BY GODDARD CONSULTING IN 2024. FLAGS WERE FIELD LOCATED BY ALLEN ENGINEERING & ASSOCIATES IN NOVEMBER 2024.  
4. PROPERTY LINE AND TOPOGRAPHIC INFORMATION OBTAINED BY ALLEN ENGINEERING & ASSOCIATES, INC IN AUGUST, 2024.  
5. UNDERGROUND UTILITIES SHOWN HAVE BEEN COMPILED FROM AVAILABLE PLANS FROM PUBLIC AND PRIVATE AGENCIES, OR AS INDICATED BY FIELD OBSERVATIONS AND ARE APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OR STRUCTURES NOT SHOWN HEREON MIGHT EXIST. BEFORE ANY EXCAVATION OR CONSTRUCTION CALL DIG-SAFE AT 811.  
6. TOPOGRAPHIC INFORMATION OBTAINED FROM LIDAR DATA ISSUED BY NOAA (2021).

OWNER:  
**Wall Street Development Corp.**  
P.O. Box 272  
Westwood, MA 02090

TITLE:  
**PROPOSED DRAINAGE PLAN**  
for  
**Blackstone Street Improvements**  
Bellingham, MA

SEAL:

PROFESSIONAL ENGINEER

PREPARED BY:

**ALLEN ENGINEERING & ASSOCIATES, INC.**  
Civil Engineers · Surveyors  
Land Development Consultants  
140 Hartford Avenue East  
Hopedale, Ma 01747  
(508) 381-3212 • www.allen-ea.com

SCALE: 1" = 150 FEET

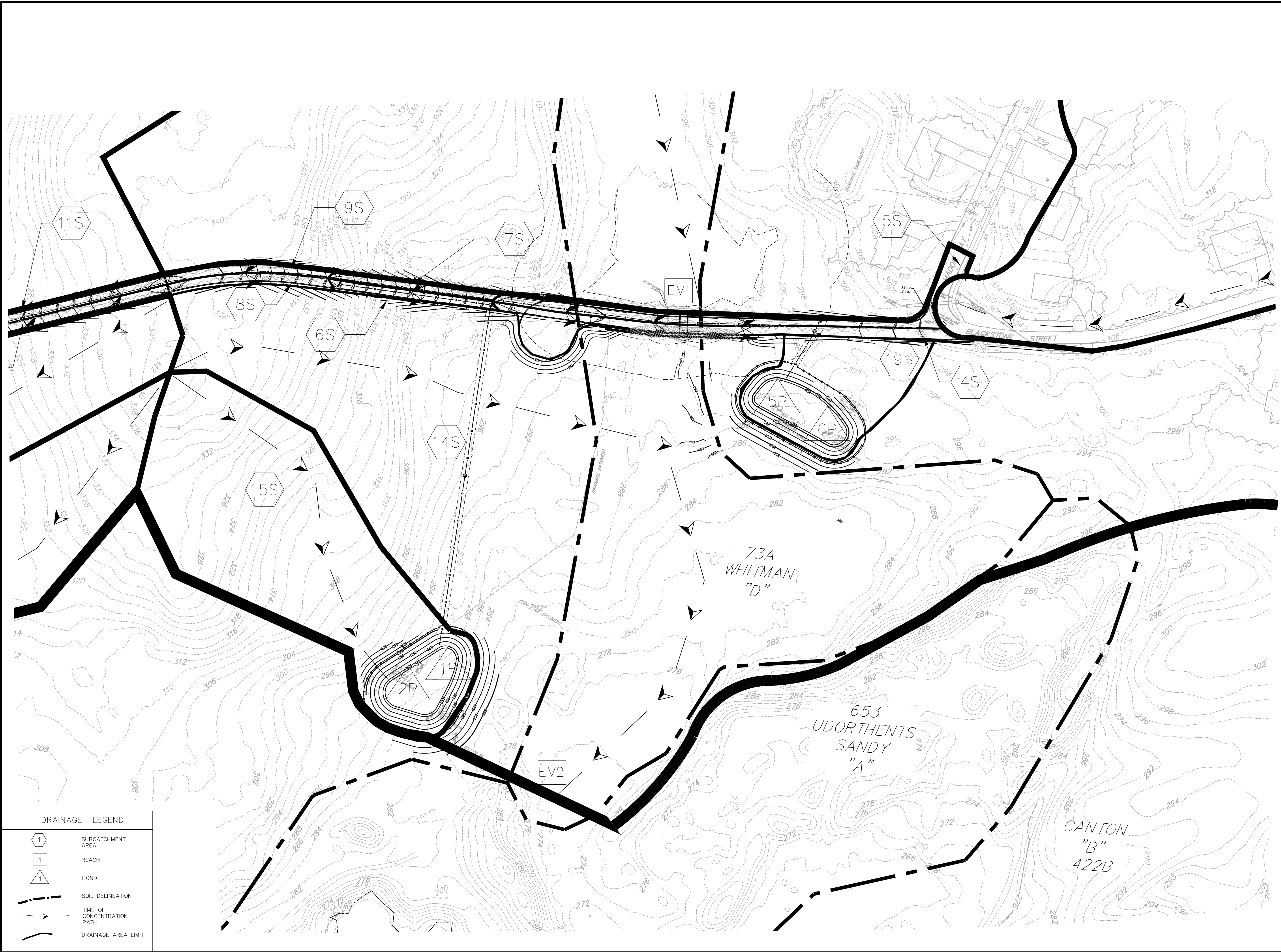
DATE: 10/31/25

**REVISIONS**

#	DATE	DESCRIPTION	INIT
1	6-20-25	ROADWAY AND DRAINAGE	MEA
2	10-31-25	PER PEER REVIEW	MEA

JOB NO: 00454  
SHEET: 1 of 3





DRAINAGE LEGEND

1

1

1

SUBCATCHMENT AREA  
REACH  
POND

SOIL DELINEATION  
TIME OF CONCENTRATION PATH

DRAINAGE AREA LIMIT

LEGEND

EDGE OF WETLAND

EXISTING CONTOUR

PROPOSED CONTOUR

EXISTING TREE LINE

NOTES

1. ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.

2. HORIZONTAL DATUM: NAD 83

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OWNER:

Wall Street Development Corp.  
P.O. Box 272  
Westwood, MA 02090

TITLE:

PROPOSED DRAINAGE PLAN  
for  
Blackstone Street Improvements  
Bellingham, MA

SEAL:

MARK

10/31/25

PROFESSIONAL ENGINEER

PREPARED BY:

ALLEN ENGINEERING & ASSOCIATES, INC.

Civil Engineers · Surveyors  
Land Development Consultants  
140 Hartford Avenue East  
Hopedale, Ma 01747  
(508) 381-3212 · www.allen-ea.com

SCALE:

1" = 60 FEET

0

60

120

180

DATE:

Lcpwct{#1: #247

REVISIONS

#	DATE	DESCRIPTION	INIT
1	6-20-25	ROADWAY AND DRAINAGE	MEA
2	10-31-25	PER PEER REVIEW	MEA

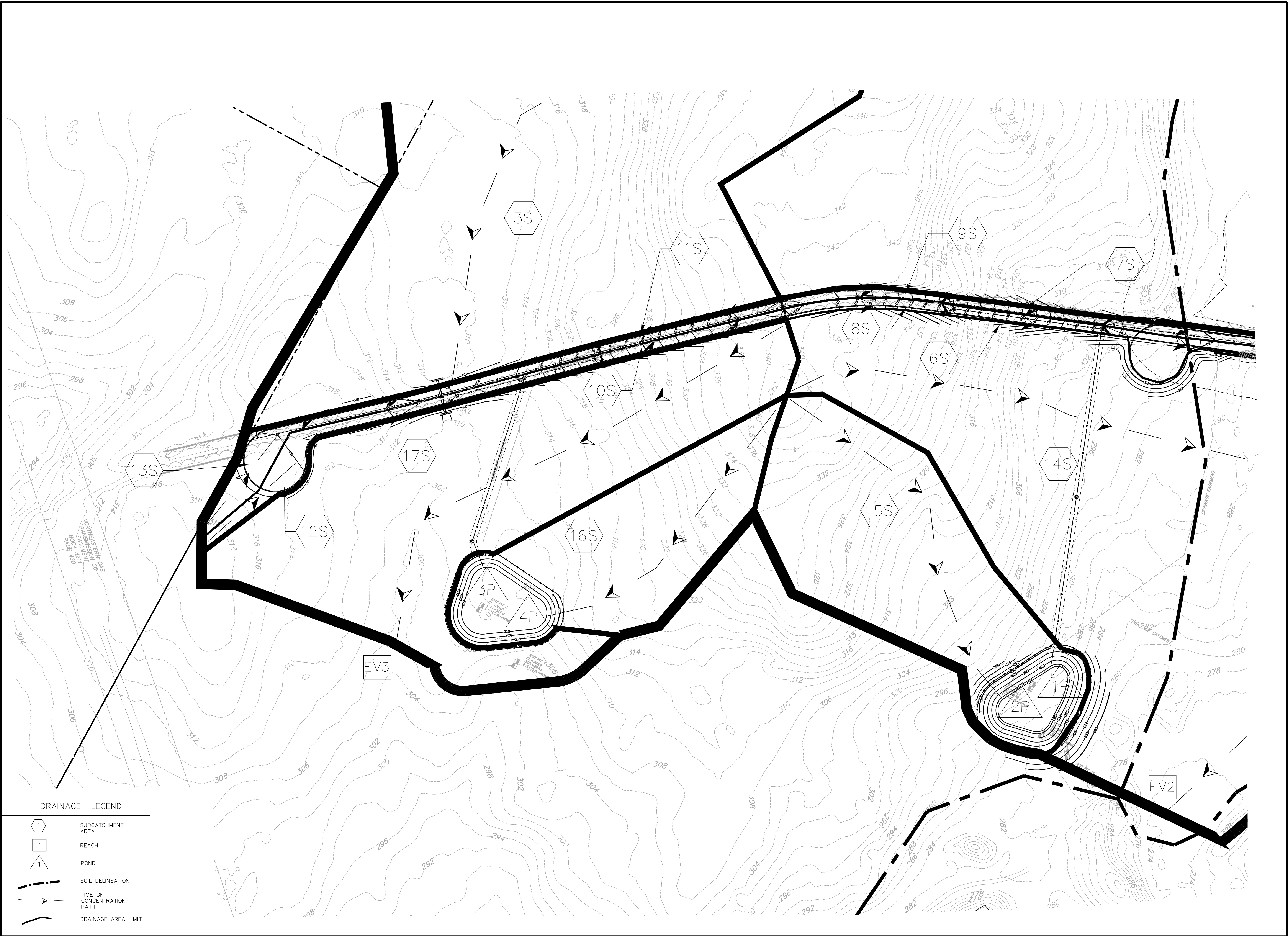
JOB NO:

00454

SHEET:

2 of 3





DRAINAGE LEGEND

1

1

1

SUBCATCHMENT AREA  
REACH  
POND  
SOIL DELINEATION  
TIME OF CONCENTRATION PATH  
DRAINAGE AREA LIMIT

LEGEND

EDGE OF WETLAND  
EXISTING CONTOUR  
PROPOSED CONTOUR  
EXISTING TREE LINE

NOTES

1. ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.

2. HORIZONTAL DATUM: NAD 83

3. PARTIAL WETLAND RESOURCES FLAGGED BY GODDARD CONSULTING IN 2024. FLAGS WERE FIELD LOCATED BY ALLEN ENGINEERING & ASSOCIATES IN NOVEMBER 2024.

4. PROPERTY LINE AND TOPOGRAPHIC INFORMATION OBTAINED BY ALLEN ENGINEERING & ASSOCIATES, INC IN AUGUST, 2024.

5. UNDERGROUND UTILITIES SHOWN HAVE BEEN COMPILED FROM AVAILABLE PLANS FROM PUBLIC AND PRIVATE AGENCIES, OR AS INDICATED BY FIELD OBSERVATIONS AND ARE APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OR STRUCTURES NOT SHOWN HEREON MIGHT EXIST. BEFORE ANY EXCAVATION OR CONSTRUCTION CALL DIG-SAFE AT 811.

6. TOPOGRAPHIC INFORMATION OBTAINED FROM LIDAR DATA ISSUED BY NOAA (2021).

OWNER:

Wall Street Development Corp.  
P.O. Box 272  
Westwood, MA 02090

TITLE:

PROPOSED DRAINAGE PLAN  
for  
Blackstone Street Improvements  
Bellingham, MA

SEAL:

MASSACHUSETTS  
MARK

10/31/25

PROFESSIONAL ENGINEER

PREPARED BY:

ALLEN ENGINEERING & ASSOCIATES, INC.

Civil Engineers • Surveyors  
Land Development Consultants  
140 Hartford Avenue East  
Hopedale, Ma 01747  
(508) 381-3212 • www.allen-ea.com

SCALE:

1"= 60 FEET

DATE:

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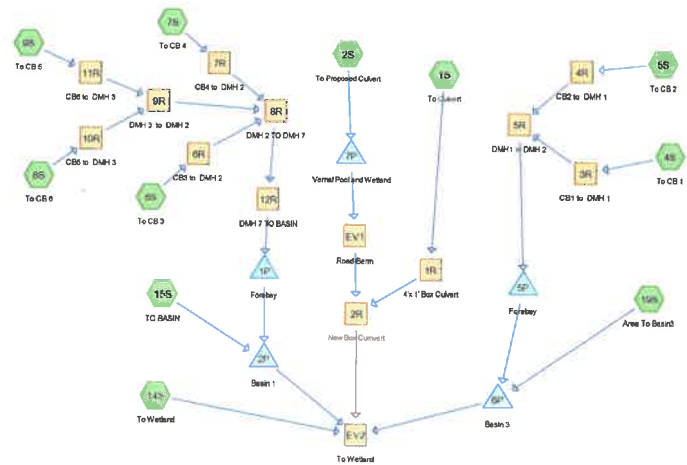
REVISIONS

#	DATE	DESCRIPTION	INIT
1	6-20-25	ROADWAY AND DRAINAGE	MEA
2	10-31-25	PER PEER REVIEW	MEA

JOB NO: 00454

SHEET: 3 of 3





**Link**

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**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
525,559	61	>75% Grass cover, Good, HSG B (1S, 2S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 19S)
20,077	80	>75% Grass cover, Good, HSG D (2S)
882	96	Gravel surface, HSG B (2S)
7,421	96	Gravel surface, HSG D (2S)
146,933	98	Paved roads w/curbs & sewers, HSG B (1S, 2S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S)
39,866	98	Roofs, HSG B (1S, 2S)
3,202	98	Roofs, HSG D (2S)
3,410,518	55	Woods, Good, HSG B (1S, 2S, 3S, 14S, 15S, 16S, 17S)
497,536	77	Woods, Good, HSG D (2S, 14S)
<b>4,651,994</b>	<b>60</b>	<b>TOTAL AREA</b>

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00454 - Proposed Conditions R2  
Type III 24-hr 2 YR Rainfall=3.38"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 2.90 cfs @ 12.51 hrs, Volume= 21,126 cf, Depth&gt; 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b> Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b> Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

## 00454 - PROPOSED DRAINAGE

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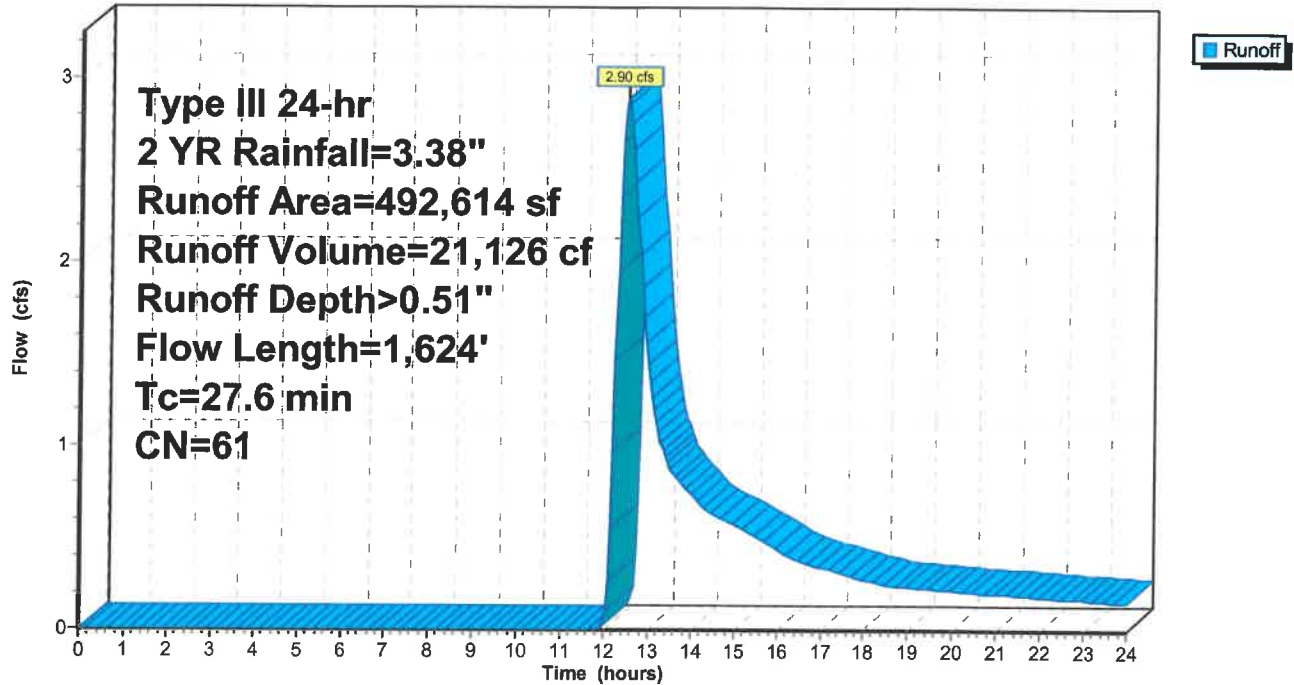
00454 - Proposed Conditions R2  
Type III 24-hr 2 YR Rainfall=3.38"

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### Subcatchment 1S: To Culvert

Hydrograph



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Type III 24-hr 2 YR Rainfall=3.38"

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**Summary for Subcatchment 2S: To Proposed Culvert**

Runoff = 9.98 cfs @ 12.81 hrs, Volume= 99,846 cf, Depth&gt; 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b> Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b> Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
45.8	2,588	Total			



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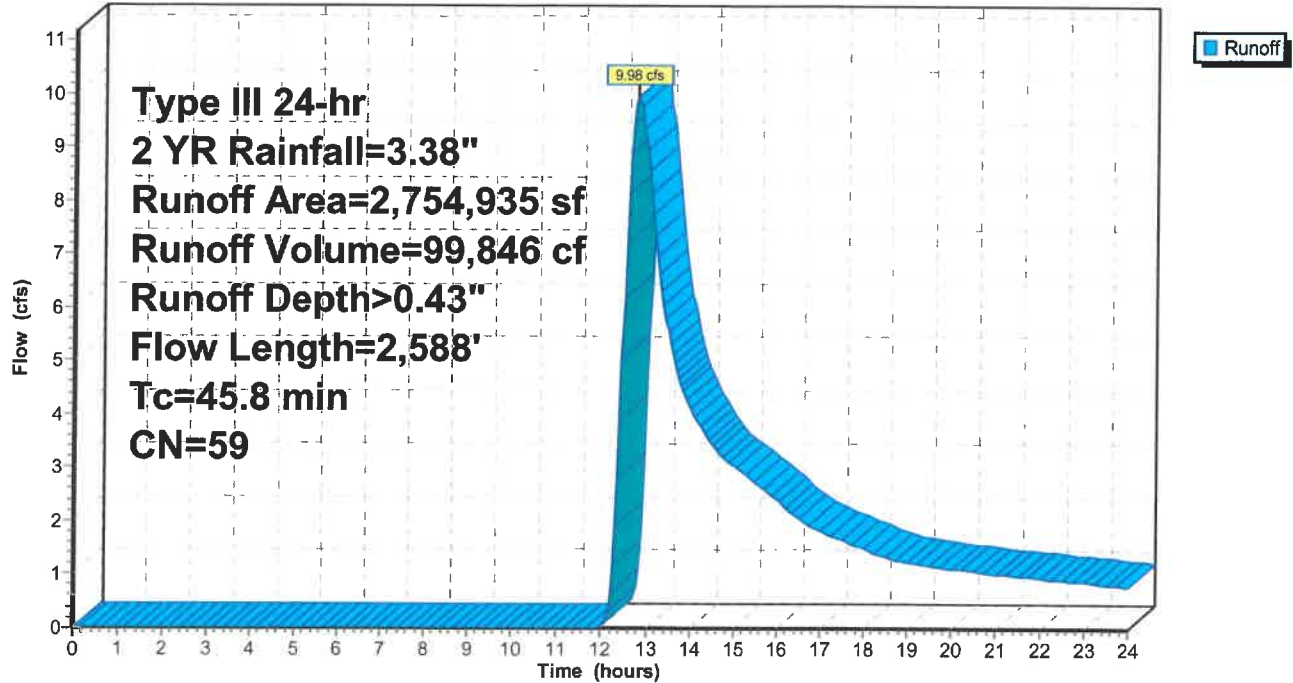
00454 - Proposed Conditions R2  
Type III 24-hr 2 YR Rainfall=3.38"

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### Subcatchment 2S: To Proposed Culvert

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Type III 24-hr 2 YR Rainfall=3.38"

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### Summary for Subcatchment 3S: To 8" pipes

Runoff = 0.85 cfs @ 12.54 hrs, Volume= 8,039 cf, Depth> 0.30"

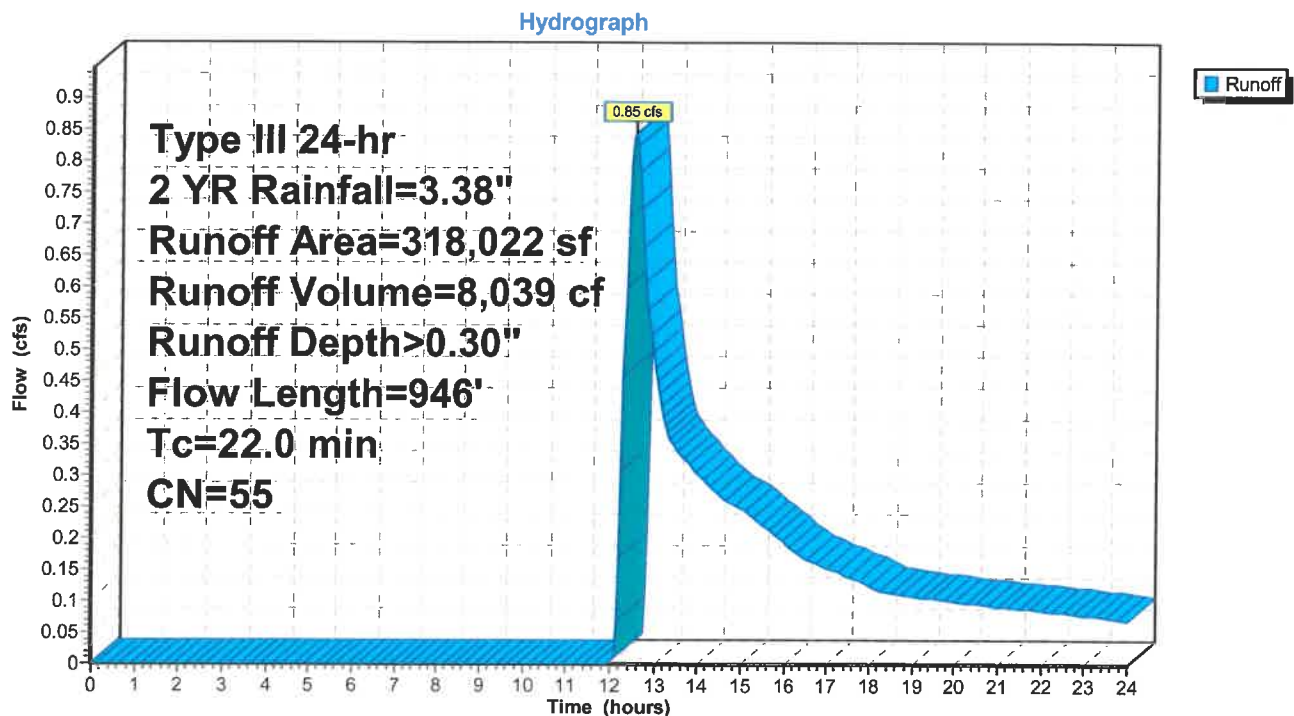
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
318,022	55	Woods, Good, HSG B
318,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow, Sheet Flow</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
22.0	946	Total			

### Subcatchment 3S: To 8" pipes



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Type III 24-hr 2 YR Rainfall=3.38"

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### Summary for Subcatchment 4S: To CB 1

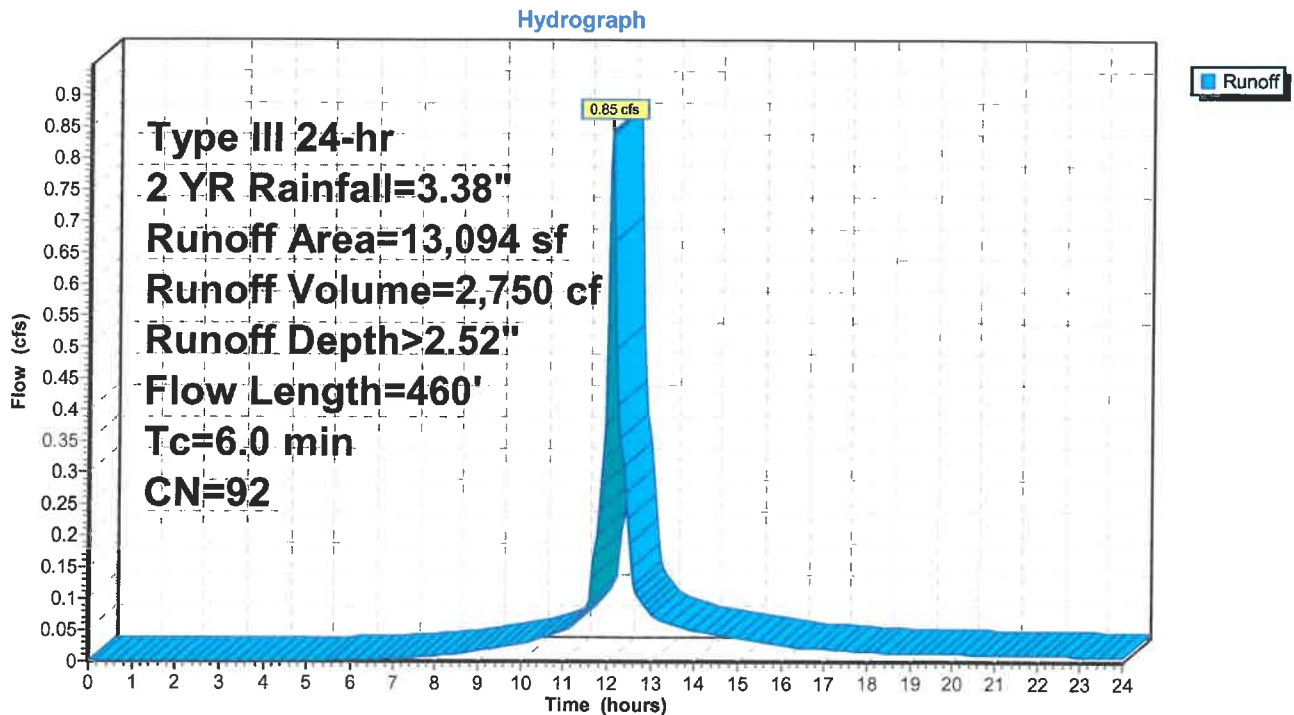
Runoff = 0.85 cfs @ 12.09 hrs, Volume= 2,750 cf, Depth> 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
11,086	98	Paved roads w/curbs & sewers, HSG B
2,008	61	>75% Grass cover, Good, HSG B
13,094	92	Weighted Average
2,008		15.34% Pervious Area
11,086		84.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 4S: To CB 1



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Type III 24-hr 2 YR Rainfall=3.38"

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### Summary for Subcatchment 5S: To CB 2

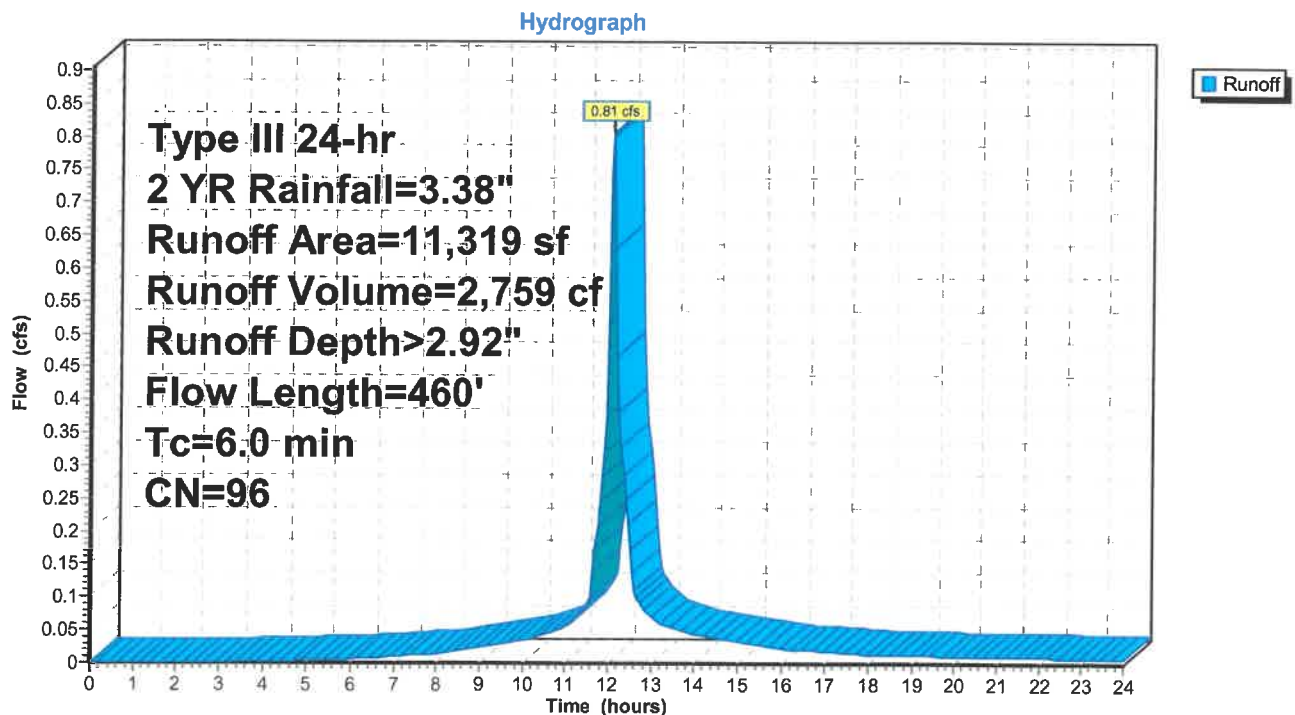
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 2,759 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
10,719	98	Paved roads w/curbs & sewers, HSG B
600	61	>75% Grass cover, Good, HSG B
11,319	96	Weighted Average
600		5.30% Pervious Area
10,719		94.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 5S: To CB 2



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### Summary for Subcatchment 6S: To CB 3

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 584 cf, Depth> 2.24"

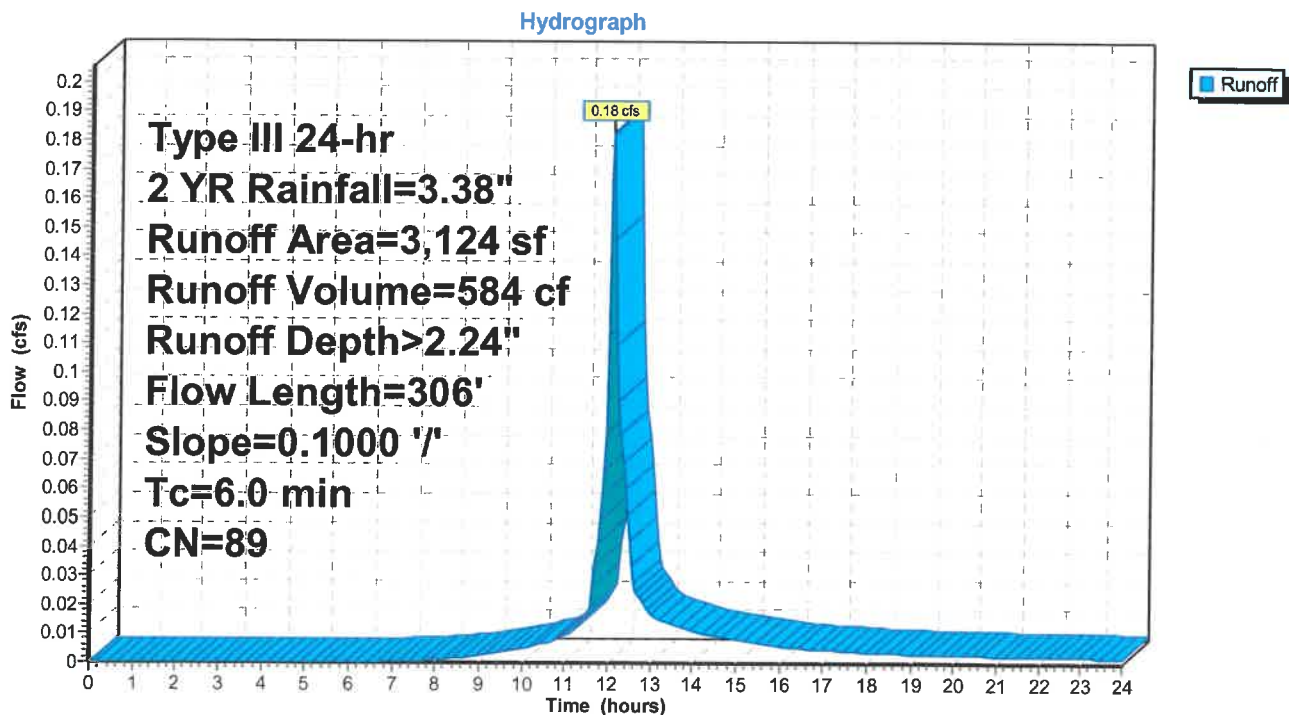
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
2,343	98	Paved roads w/curbs & sewers, HSG B
781	61	>75% Grass cover, Good, HSG B
3,124	89	Weighted Average
781		25.00% Pervious Area
2,343		75.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 6S: To CB 3



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Type III 24-hr 2 YR Rainfall=3.38"

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### Summary for Subcatchment 7S: To CB 4

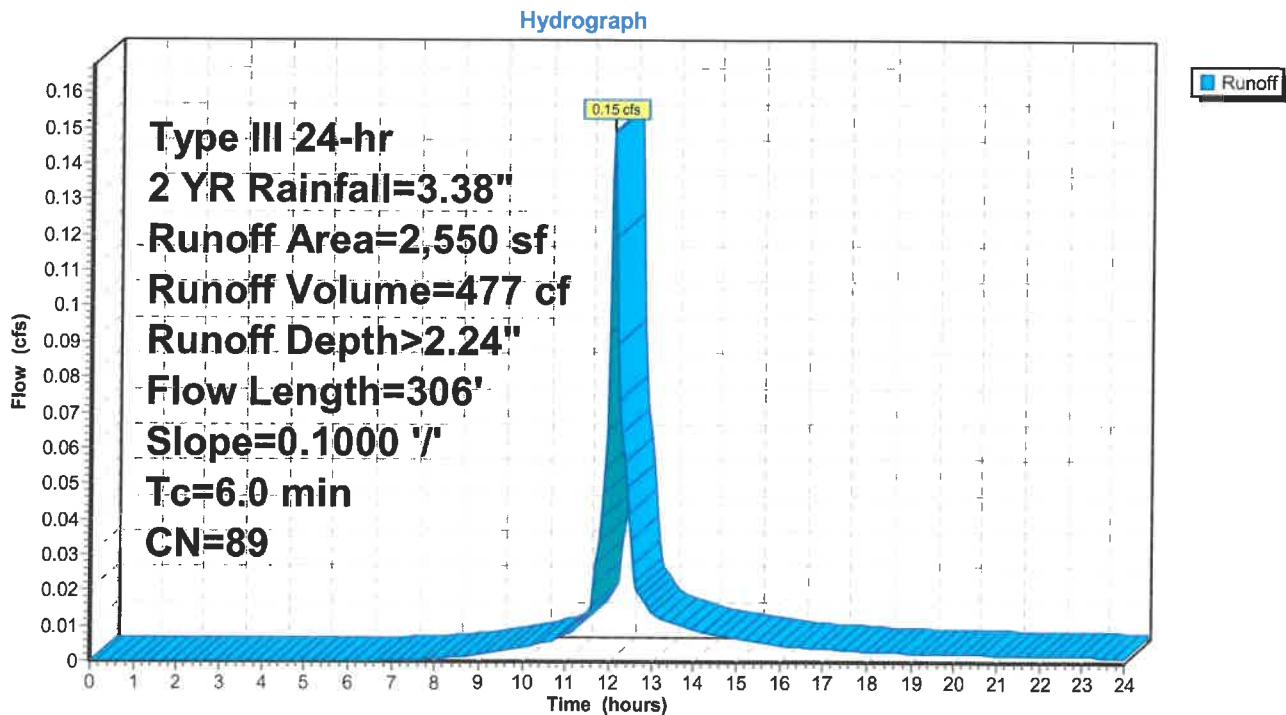
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 477 cf, Depth> 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
1,913	98	Paved roads w/curbs & sewers, HSG B
637	61	>75% Grass cover, Good, HSG B
2,550	89	Weighted Average
637		24.98% Pervious Area
1,913		75.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 7S: To CB 4





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Type III 24-hr 2 YR Rainfall=3.38"

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### Summary for Subcatchment 8S: To CB 6

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 612 cf, Depth> 1.99"

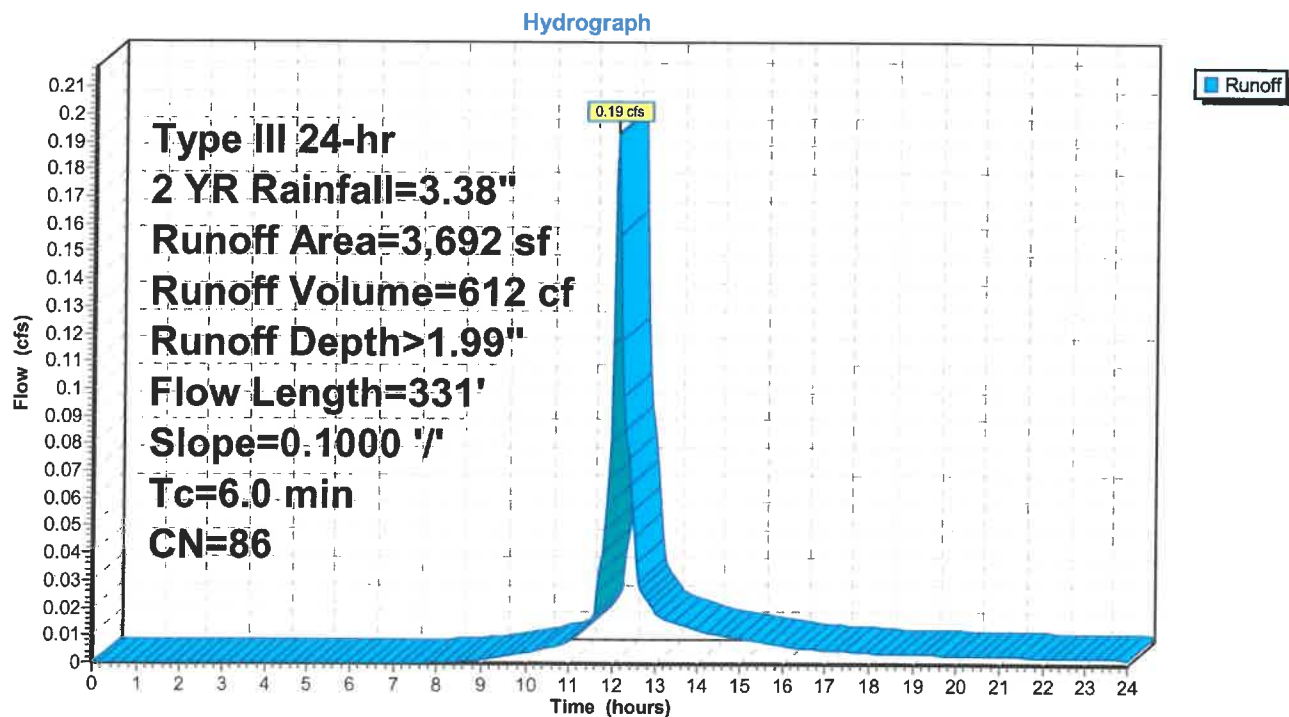
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
2,493	98	Paved roads w/curbs & sewers, HSG B
1,199	61	>75% Grass cover, Good, HSG B
3,692	86	Weighted Average
1,199		32.48% Pervious Area
2,493		67.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 8S: To CB 6



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### Summary for Subcatchment 9S: To CB 5

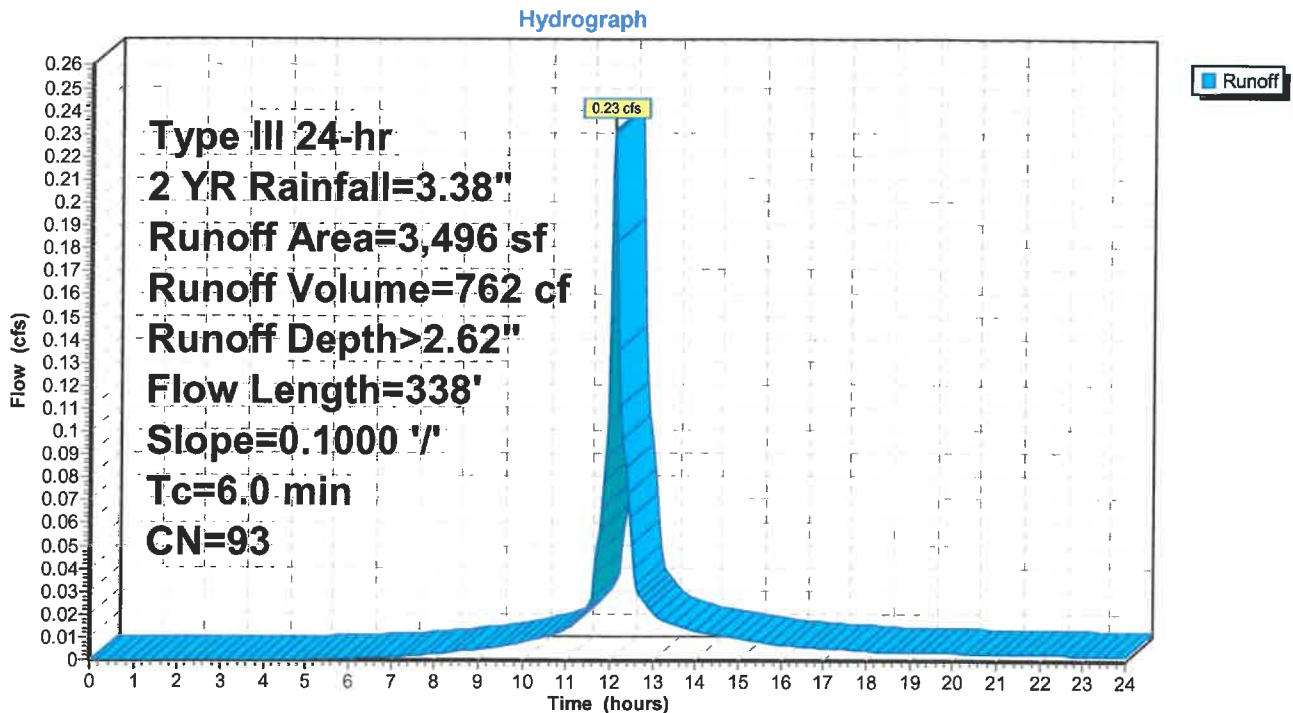
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 762 cf, Depth> 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
3,000	98	Paved roads w/curbs & sewers, HSG B
496	61	>75% Grass cover, Good, HSG B
3,496	93	Weighted Average
496		14.19% Pervious Area
3,000		85.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 9S: To CB 5





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### Summary for Subcatchment 10S: To CB 7

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 722 cf, Depth> 1.99"

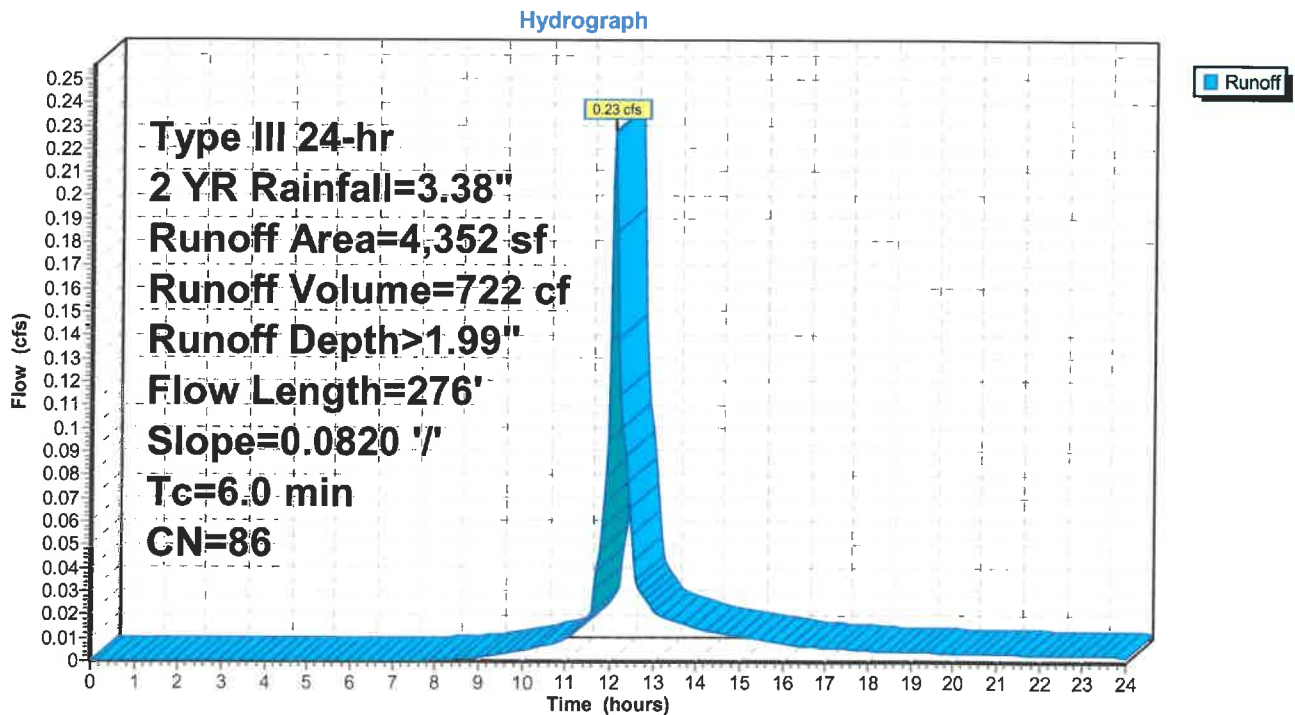
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 10S: To CB 7



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## Summary for Subcatchment 11S: To CB 8

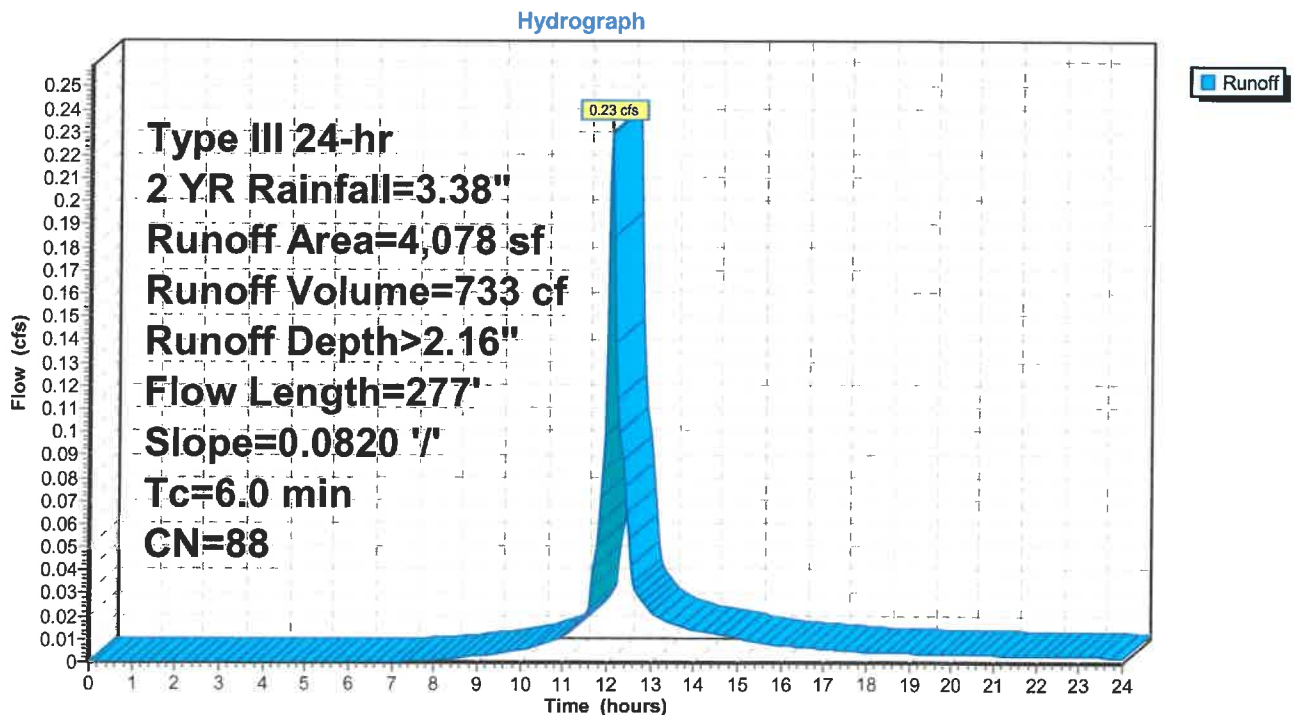
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 733 cf, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

## Subcatchment 11S: To CB 8



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### Summary for Subcatchment 12S: To CB 9

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,069 cf, Depth> 1.83"

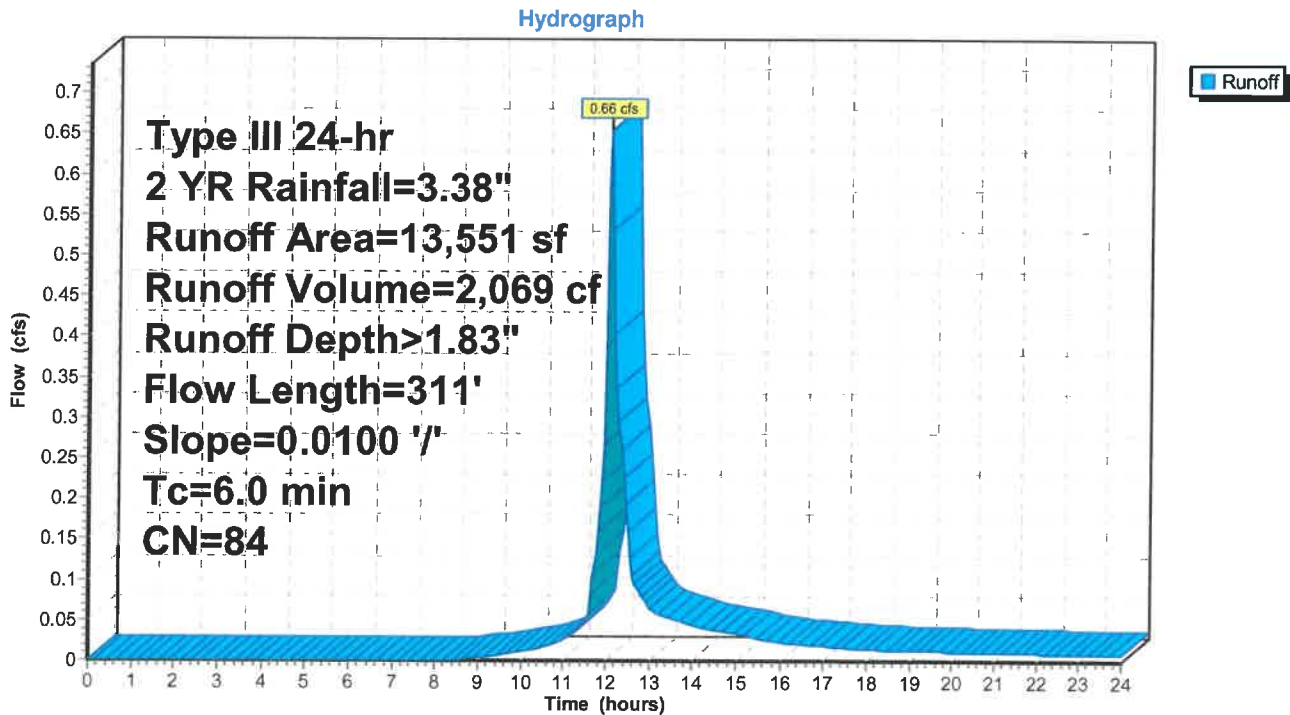
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 12S: To CB 9



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### Summary for Subcatchment 13S: To CB 10

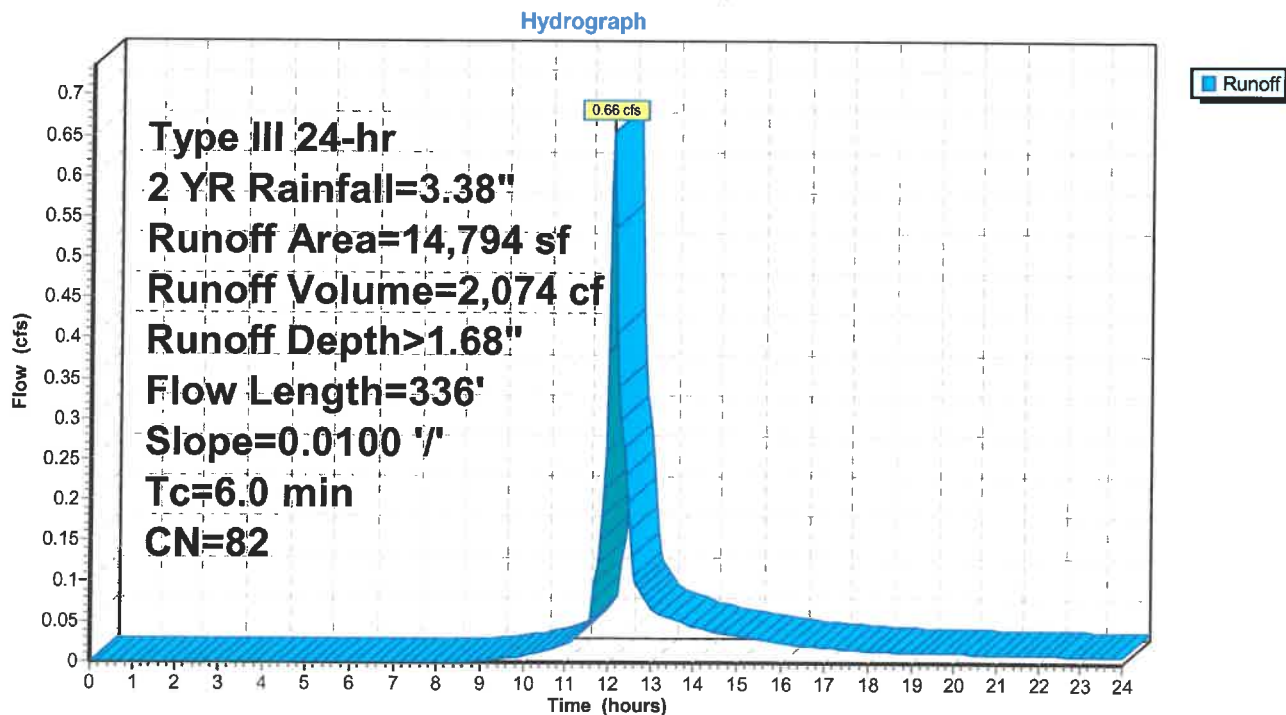
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,074 cf, Depth> 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 13S: To CB 10



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### Summary for Subcatchment 14S: To Wetland

Runoff = 5.73 cfs @ 12.42 hrs, Volume= 34,852 cf, Depth> 0.68"

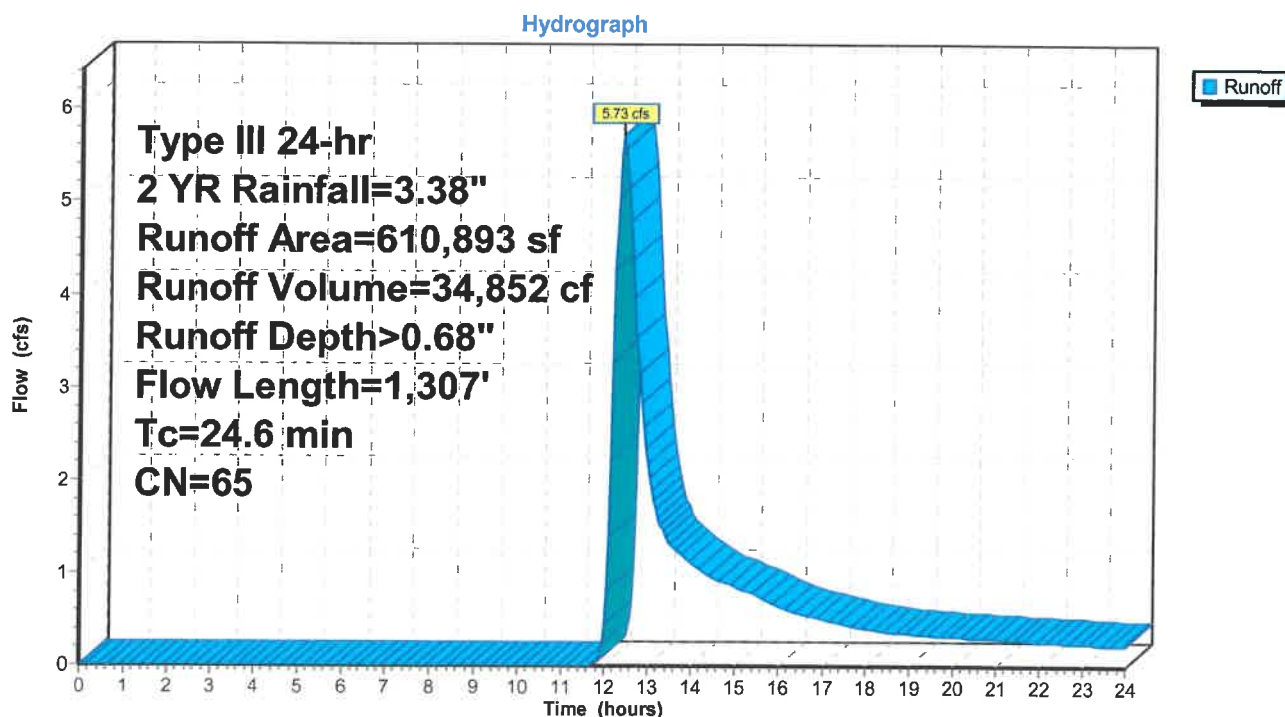
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
326,808	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
610,893	65	Weighted Average
610,893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
7.9	648	0.0750	1.37		Woods: Light underbrush n= 0.400 P2= 3.22" <b>Shallow Concentrated Flow, Shallow</b>
6.9	609	0.0200	1.47	1.76	Woodland Kv= 5.0 fps <b>Channel Flow, Stream</b>
					Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

### Subcatchment 14S: To Wetland



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Type III 24-hr 2 YR Rainfall=3.38"

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### Summary for Subcatchment 15S: TO BASIN

Runoff = 0.39 cfs @ 12.39 hrs, Volume= 3,126 cf, Depth> 0.34"

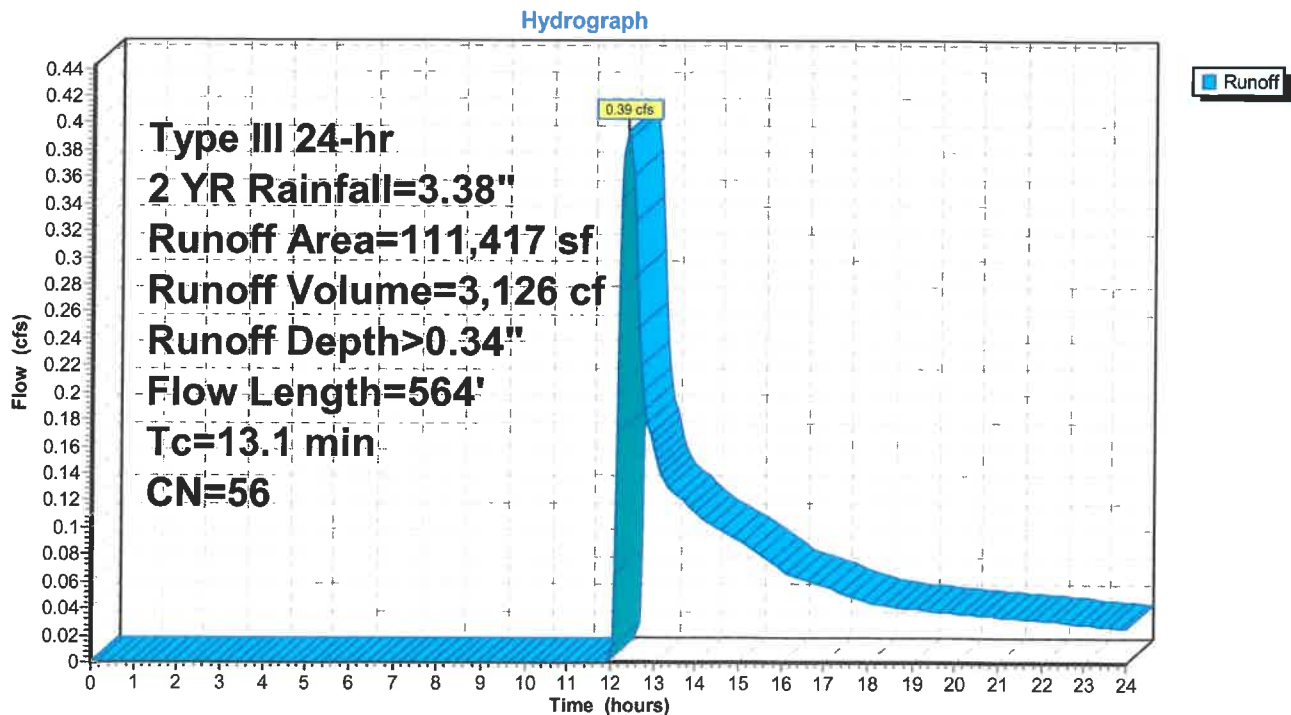
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
89,974	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
111,417	56	Weighted Average
111,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

### Subcatchment 15S: TO BASIN





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## Summary for Subcatchment 16S: TO BASIN

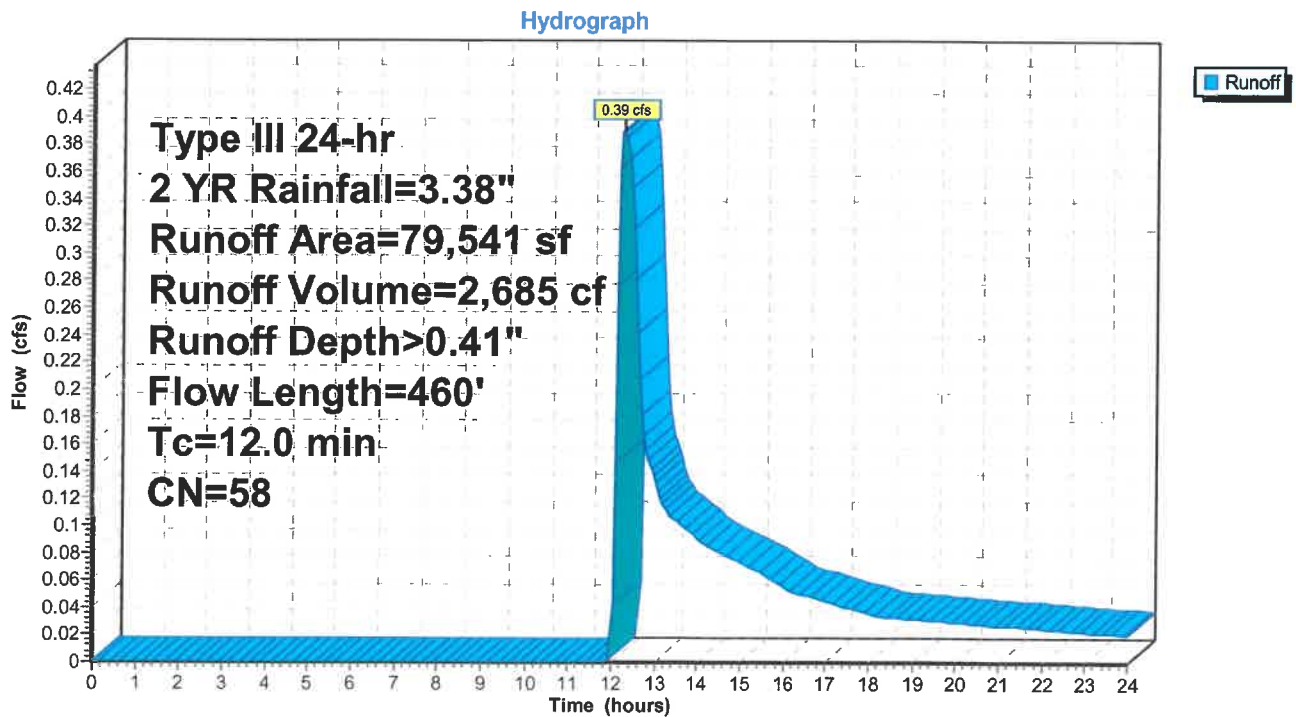
Runoff = 0.39 cfs @ 12.28 hrs, Volume= 2,685 cf, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		<b>Shallow Concentrated Flow,</b> Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

## Subcatchment 16S: TO BASIN



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### Summary for Subcatchment 17S: To Off Site

Runoff = 0.55 cfs @ 12.38 hrs, Volume= 4,554 cf, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

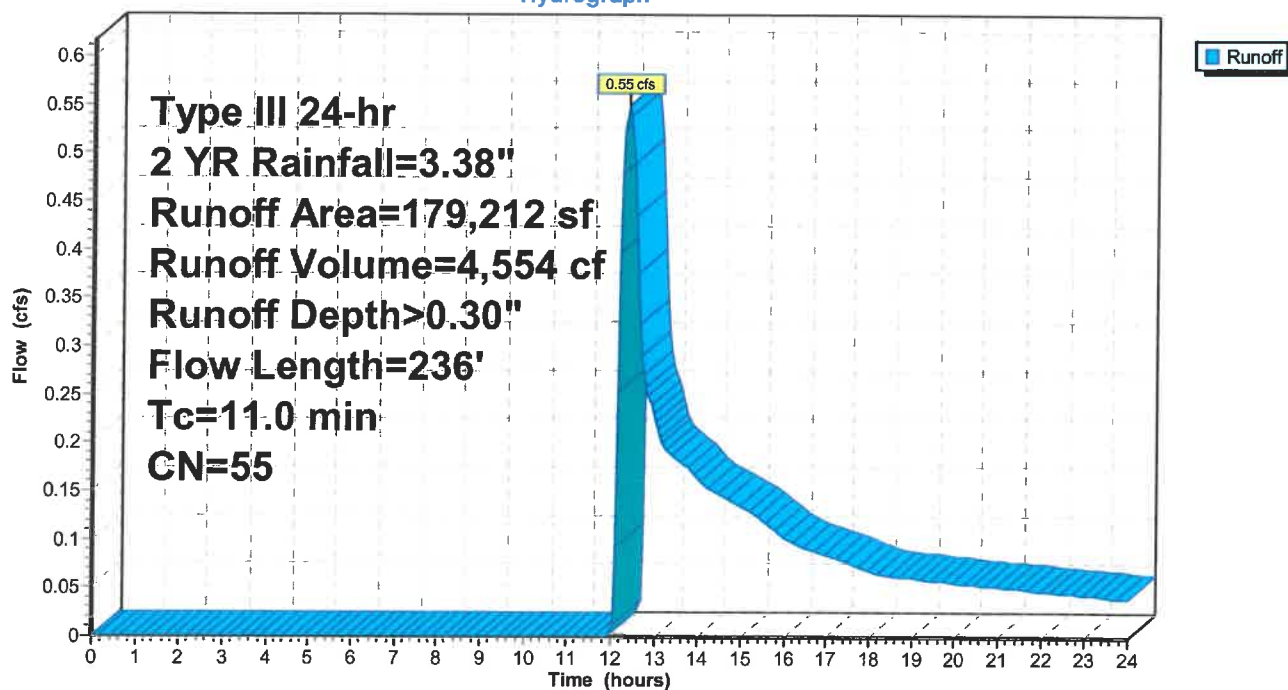
Area (sf)	CN	Description
179,212	55	Woods, Good, HSG B
179,212		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	236	Total			

### Subcatchment 17S: To Off Site

Hydrograph





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### Summary for Subcatchment 19S: Area To Basin3

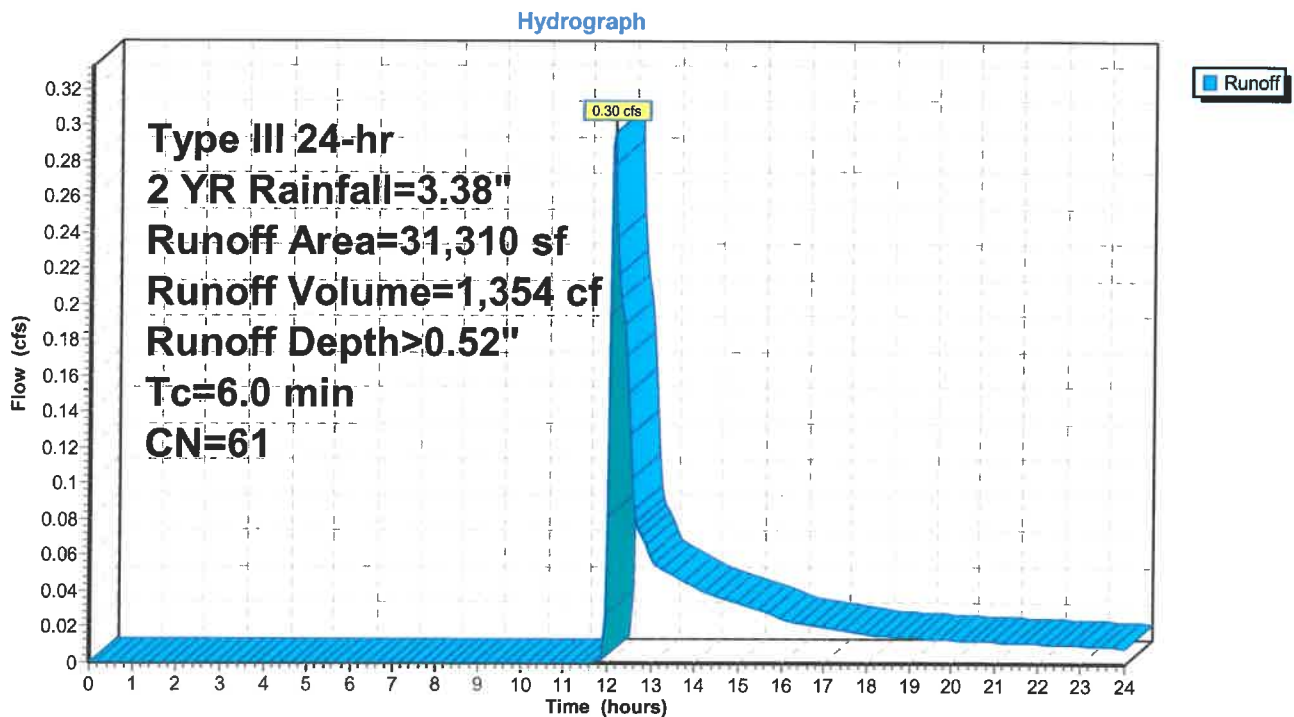
Runoff = 0.30 cfs @ 12.12 hrs, Volume= 1,354 cf, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
31,310	61	>75% Grass cover, Good, HSG B
31,310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, a-b

### Subcatchment 19S: Area To Basin3



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### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 0.51" for 2 YR event  
Inflow = 2.90 cfs @ 12.51 hrs, Volume= 21,126 cf  
Outflow = 2.90 cfs @ 12.51 hrs, Volume= 21,118 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.55 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 2.07 fps, Avg. Travel Time= 0.5 min

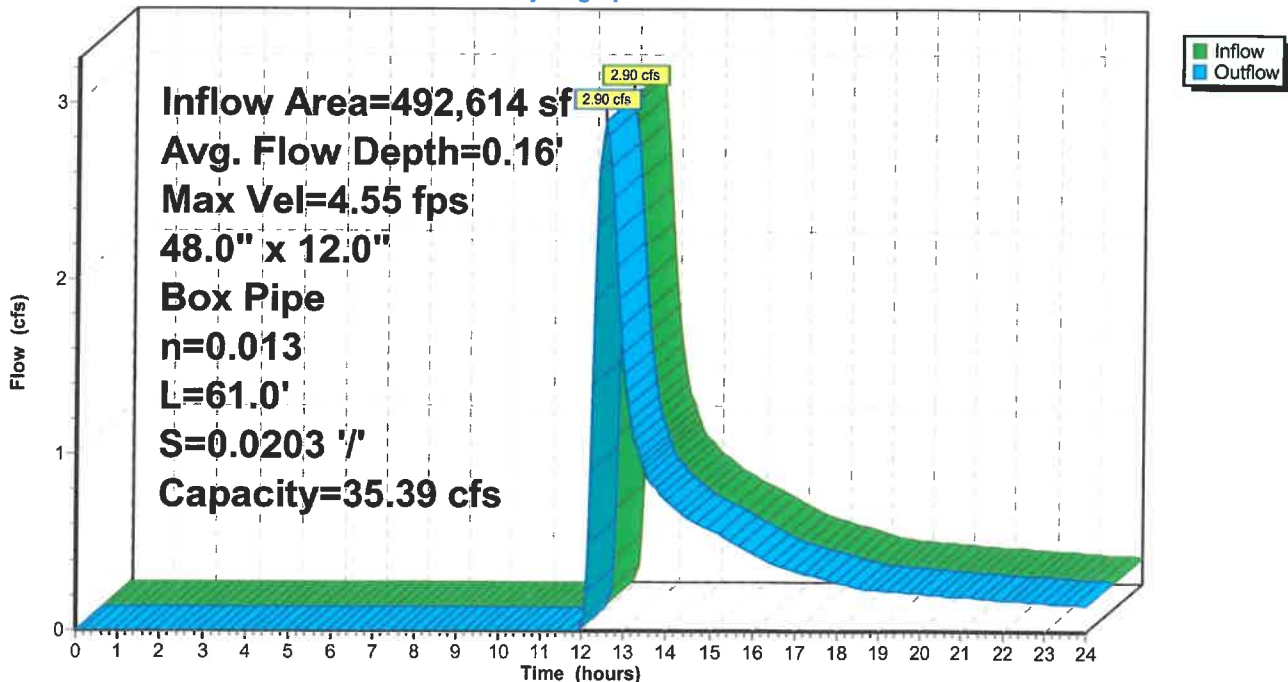
Peak Storage= 39 cf @ 12.51 hrs  
Average Depth at Peak Storage= 0.16', Surface Width= 4.00'  
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe  
n= 0.013 Concrete, trowel finish  
Length= 61.0' Slope= 0.0203 '/'  
Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

Hydrograph



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### Summary for Reach 2R: New Box Cumvert

Inflow Area = 3,247,549 sf, 4.18% Impervious, Inflow Depth > 0.29" for 2 YR event  
Inflow = 3.31 cfs @ 15.34 hrs, Volume= 78,232 cf  
Outflow = 3.31 cfs @ 15.31 hrs, Volume= 78,213 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.54 fps, Min. Travel Time= 0.1 min  
Avg. Velocity = 3.49 fps, Avg. Travel Time= 0.2 min

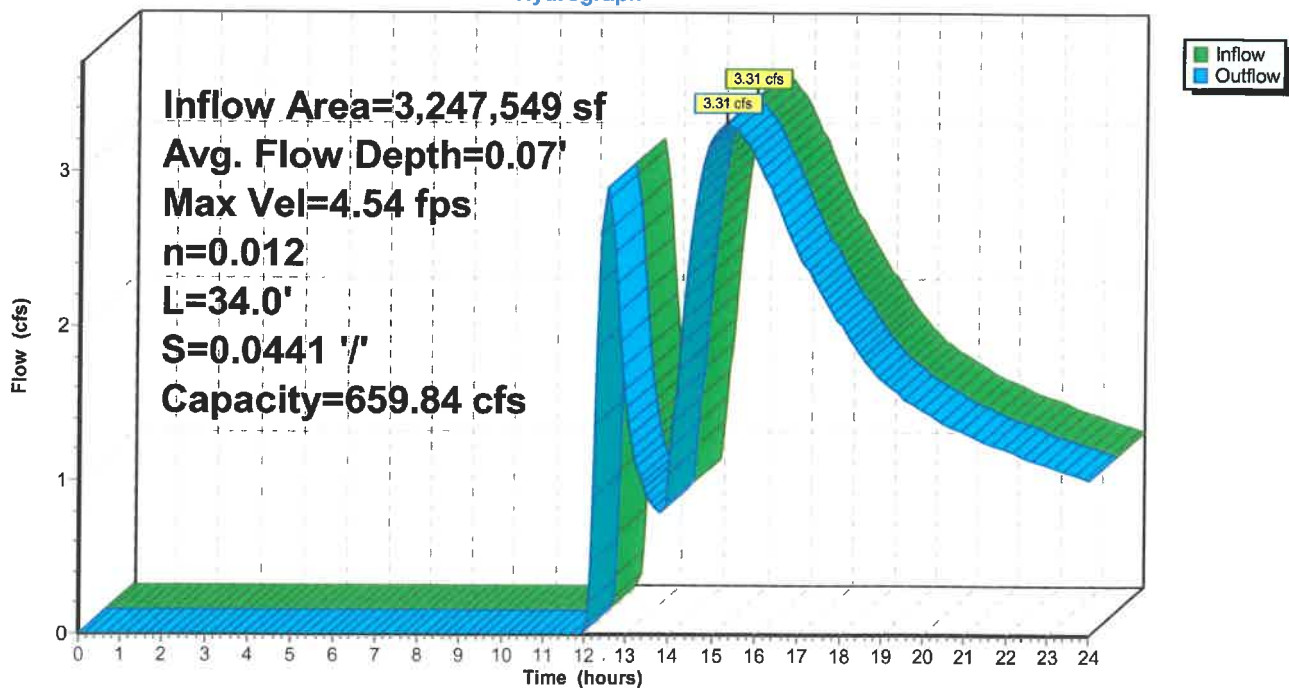
Peak Storage= 25 cf @ 15.31 hrs  
Average Depth at Peak Storage= 0.07' , Surface Width= 10.00'  
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 659.84 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished  
Length= 34.0' Slope= 0.0441 '/'  
Inlet Invert= 294.00', Outlet Invert= 292.50'



### Reach 2R: New Box Cumvert

Hydrograph



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### Summary for Reach 3R: CB1 to DMH 1

Inflow Area = 13,094 sf, 84.66% Impervious, Inflow Depth > 2.52" for 2 YR event  
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 2,750 cf  
Outflow = 0.85 cfs @ 12.09 hrs, Volume= 2,750 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.64 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.22 fps, Avg. Travel Time= 0.1 min

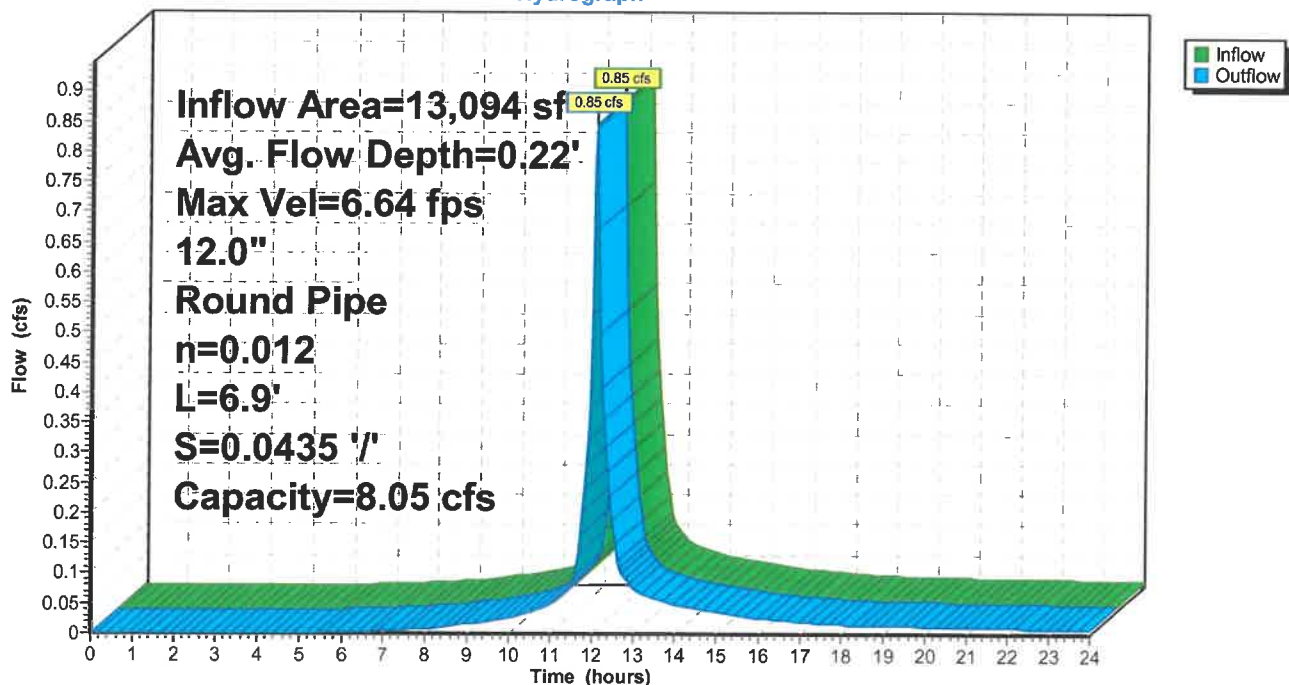
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.22' , Surface Width= 0.83'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.9' Slope= 0.0435 '/'  
Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 3R: CB1 to DMH 1

Hydrograph



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### Summary for Reach 4R: CB2 to DMH 1

Inflow Area = 11,319 sf, 94.70% Impervious, Inflow Depth > 2.92" for 2 YR event  
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 2,759 cf  
Outflow = 0.81 cfs @ 12.09 hrs, Volume= 2,759 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.54 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.16 fps, Avg. Travel Time= 0.1 min

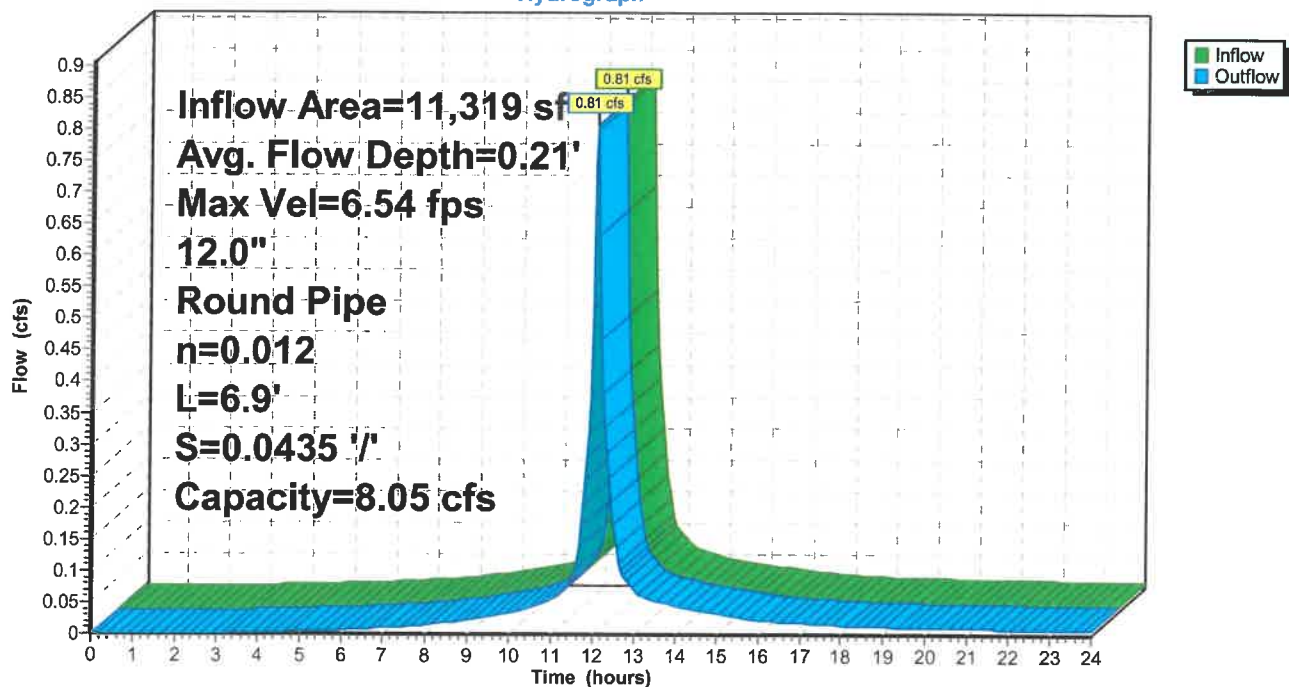
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.21', Surface Width= 0.82'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.9' Slope= 0.0435 '/'  
Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 4R: CB2 to DMH 1

Hydrograph



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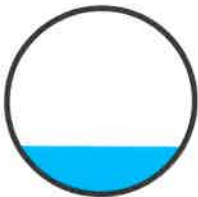
### Summary for Reach 5R: DMH1 to DMH 2

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 2.71" for 2 YR event  
Inflow = 1.65 cfs @ 12.09 hrs, Volume= 5,509 cf  
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 5,507 cf, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.57 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 1.47 fps, Avg. Travel Time= 0.9 min

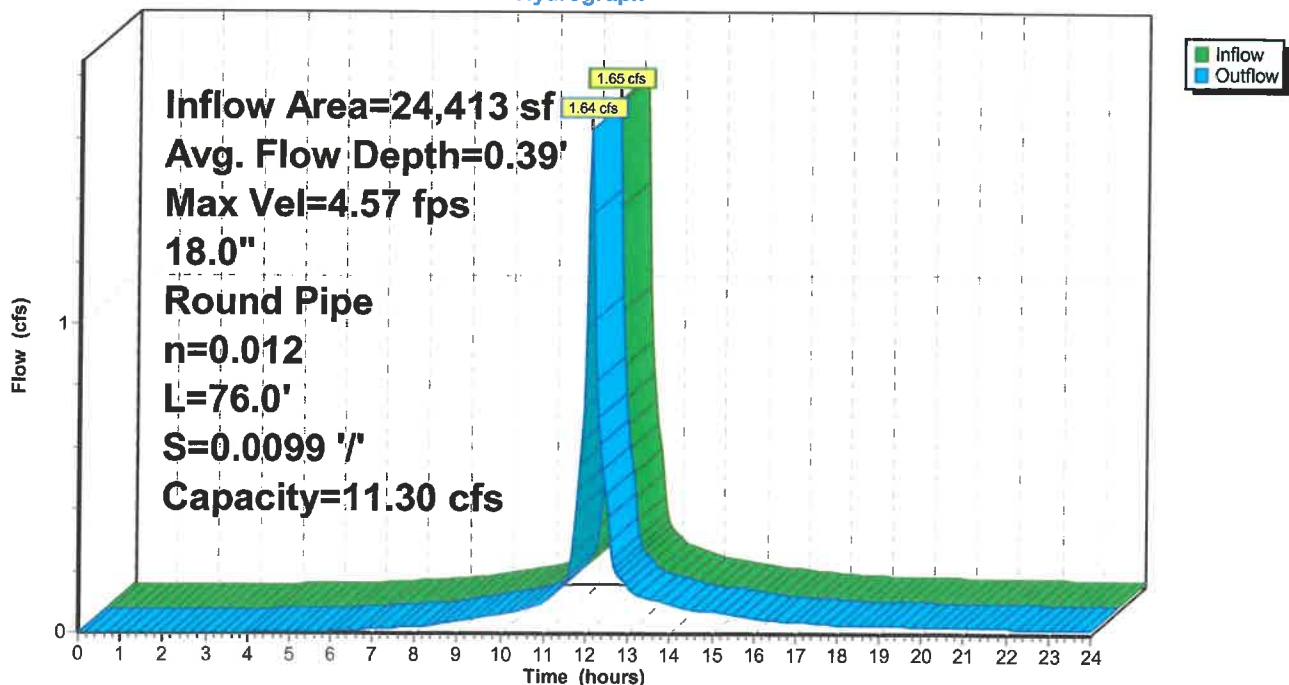
Peak Storage= 28 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.39' , Surface Width= 1.31'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.30 cfs

18.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 76.0' Slope= 0.0099 '/'  
Inlet Invert= 291.75', Outlet Invert= 291.00'



### Reach 5R: DMH1 to DMH 2

Hydrograph





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### Summary for Reach 6R: CB3 to DMH 2

Inflow Area = 3,124 sf, 75.00% Impervious, Inflow Depth > 2.24" for 2 YR event  
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 584 cf  
Outflow = 0.18 cfs @ 12.09 hrs, Volume= 584 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.34 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.52 fps, Avg. Travel Time= 0.1 min

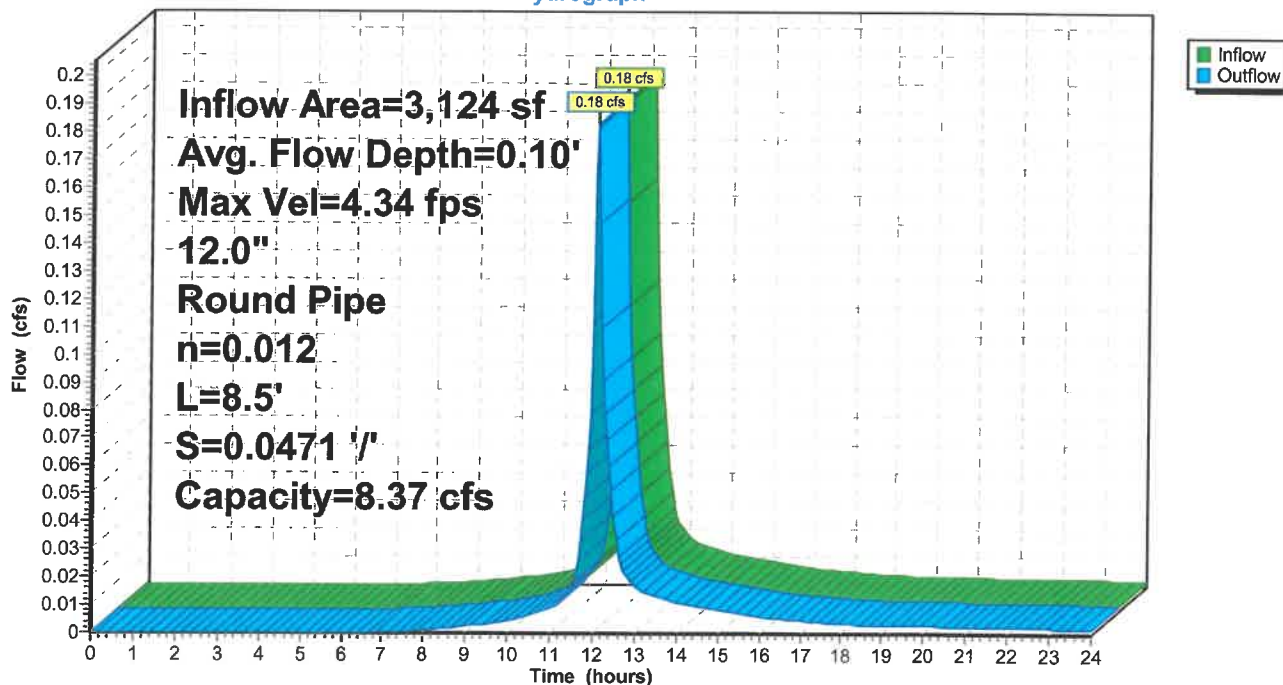
Peak Storage= 0 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.10' , Surface Width= 0.61'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 8.5' Slope= 0.0471 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 6R: CB3 to DMH 2

Hydrograph



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### Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 2,550 sf, 75.02% Impervious, Inflow Depth > 2.24" for 2 YR event  
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 477 cf  
Outflow = 0.15 cfs @ 12.09 hrs, Volume= 477 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.43 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.20 fps, Avg. Travel Time= 0.2 min

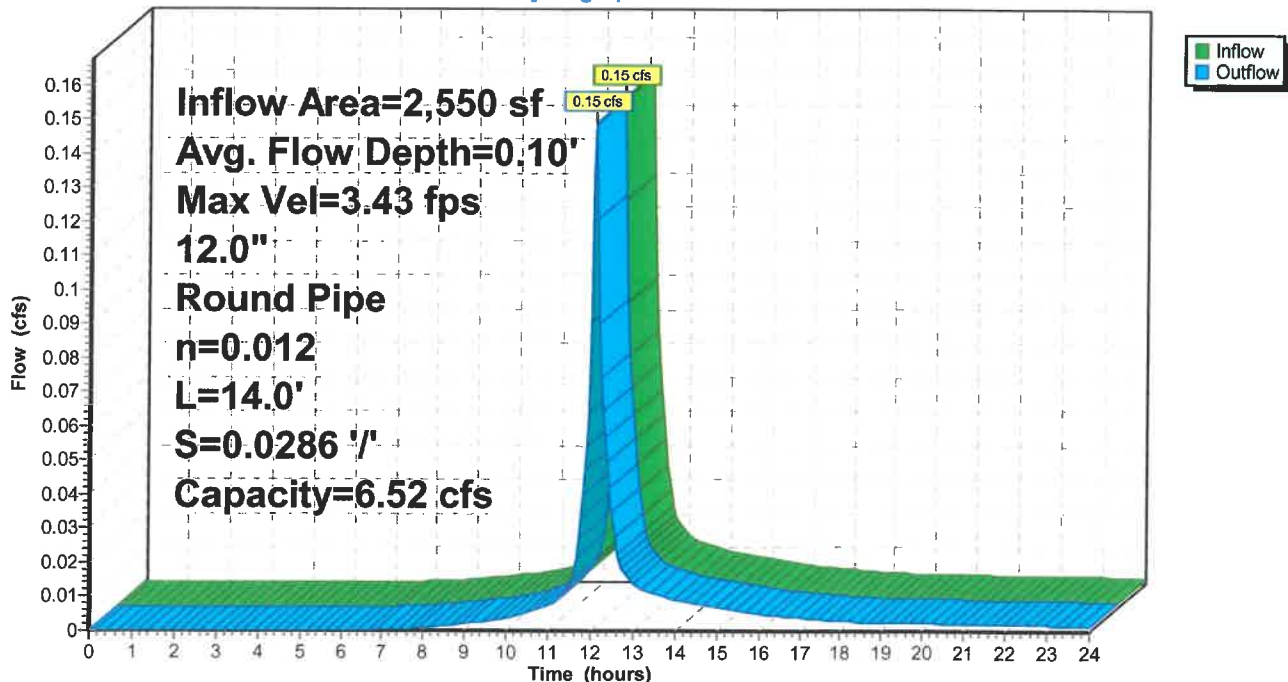
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.10' , Surface Width= 0.61'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.52 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 14.0' Slope= 0.0286 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 7R: CB4 to DMH 2

Hydrograph





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### Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 2.27" for 2 YR event  
Inflow = 0.75 cfs @ 12.10 hrs, Volume= 2,436 cf  
Outflow = 0.71 cfs @ 12.12 hrs, Volume= 2,434 cf, Atten= 4%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.63 fps, Min. Travel Time= 0.9 min

Avg. Velocity= 1.53 fps, Avg. Travel Time= 2.6 min

Peak Storage= 38 cf @ 12.11 hrs

Average Depth at Peak Storage= 0.22', Surface Width= 1.06'

Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.09 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

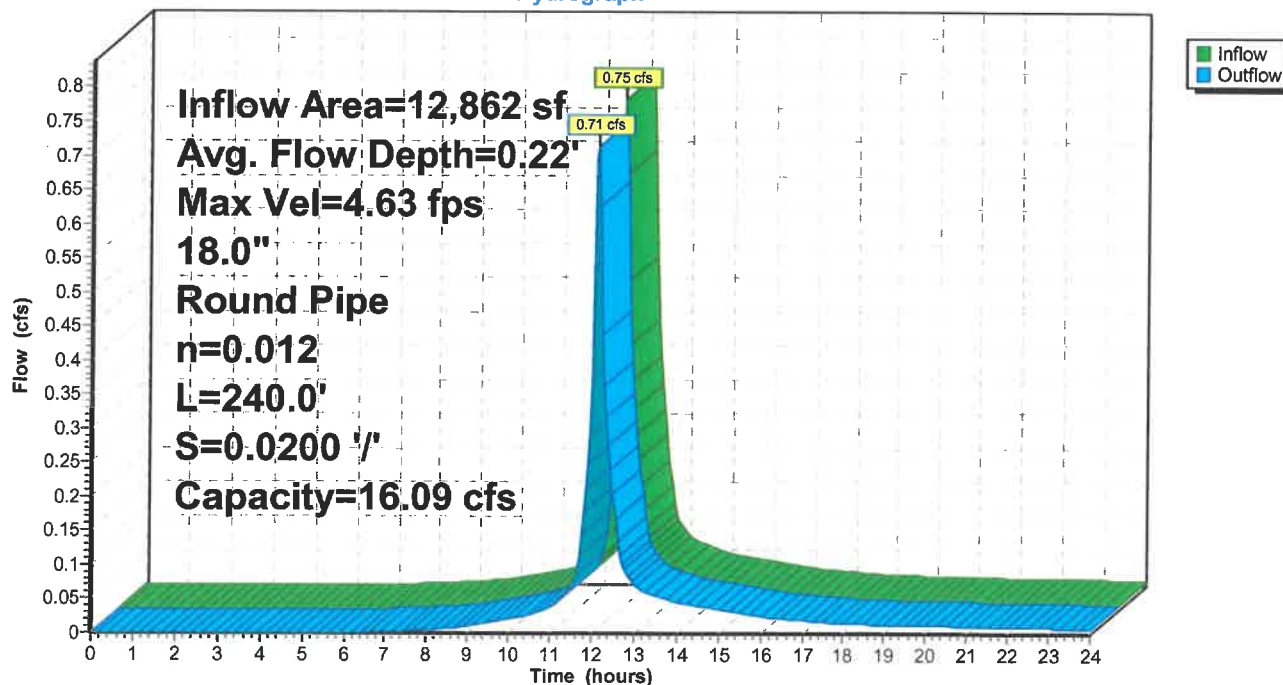
Length= 240.0' Slope= 0.0200 '/'

Inlet Invert= 294.80', Outlet Invert= 290.00'



### Reach 8R: DMH 2 TO DMH 7

Hydrograph



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### Summary for Reach 9R: DMH 3 to DMH 2

Inflow Area = 7,188 sf, 76.42% Impervious, Inflow Depth > 2.30" for 2 YR event  
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 1,375 cf  
Outflow = 0.42 cfs @ 12.10 hrs, Volume= 1,374 cf, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.73 fps, Min. Travel Time= 0.5 min  
Avg. Velocity= 2.23 fps, Avg. Travel Time= 1.6 min

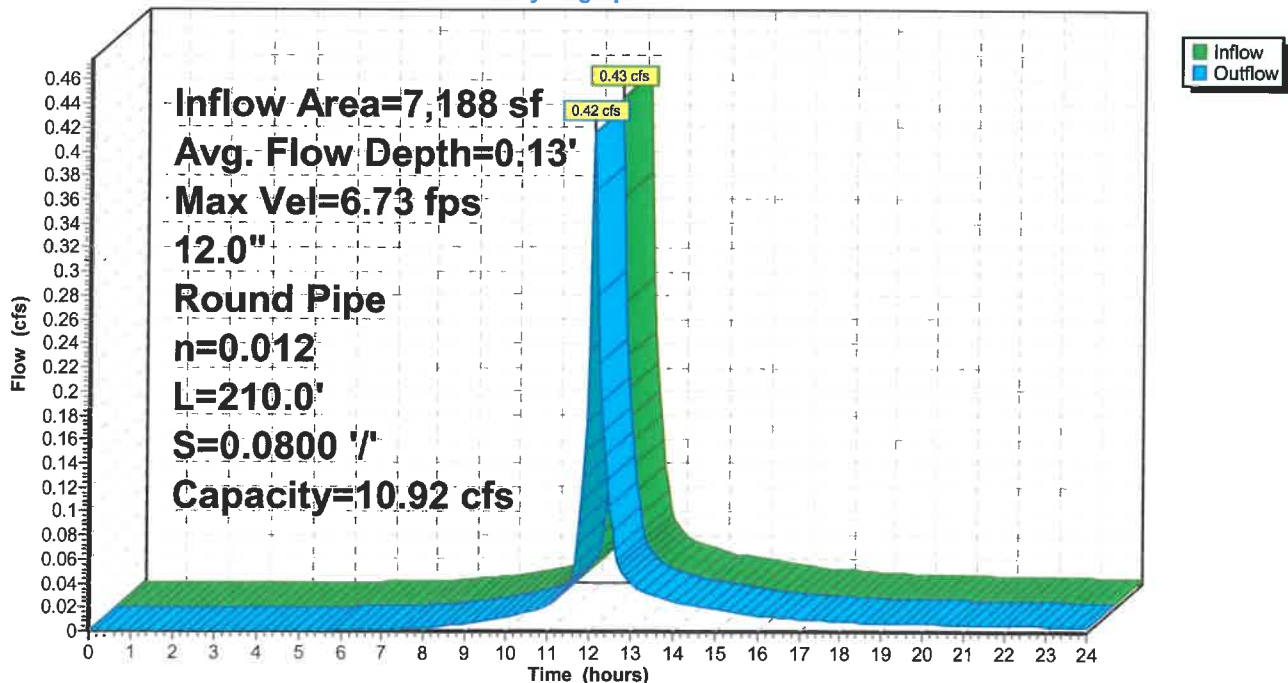
Peak Storage= 13 cf @ 12.10 hrs  
Average Depth at Peak Storage= 0.13' , Surface Width= 0.68'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 210.0' Slope= 0.0800 '/'  
Inlet Invert= 315.40', Outlet Invert= 298.60'



### Reach 9R: DMH 3 to DMH 2

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### Summary for Reach 10R: CB5 to DMH 3

Inflow Area = 3,692 sf, 67.52% Impervious, Inflow Depth > 1.99" for 2 YR event  
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 612 cf  
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 612 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.31 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.54 fps, Avg. Travel Time= 0.1 min

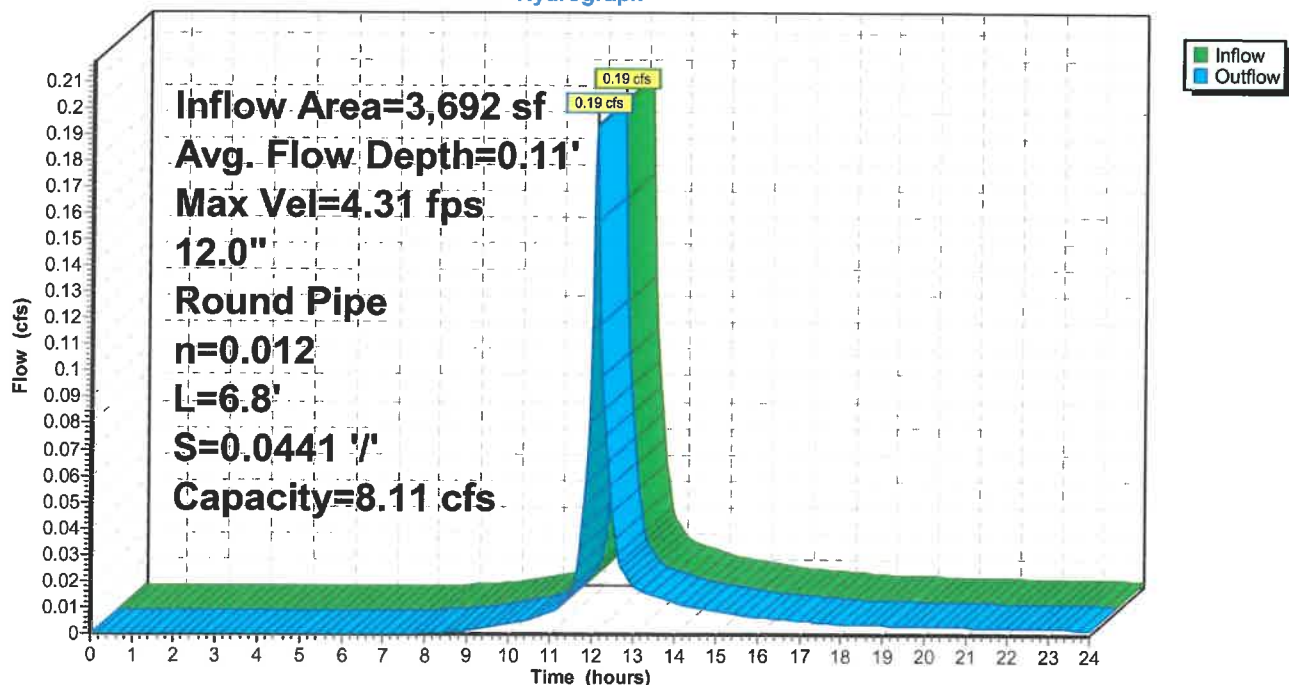
Peak Storage= 0 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.11', Surface Width= 0.62'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.11 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.8' Slope= 0.0441 '/  
Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 10R: CB5 to DMH 3

Hydrograph



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### Summary for Reach 11R: CB6 to DMH 3

Inflow Area = 3,496 sf, 85.81% Impervious, Inflow Depth > 2.62" for 2 YR event  
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 762 cf  
Outflow = 0.23 cfs @ 12.09 hrs, Volume= 762 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.59 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.20 fps, Avg. Travel Time= 0.2 min

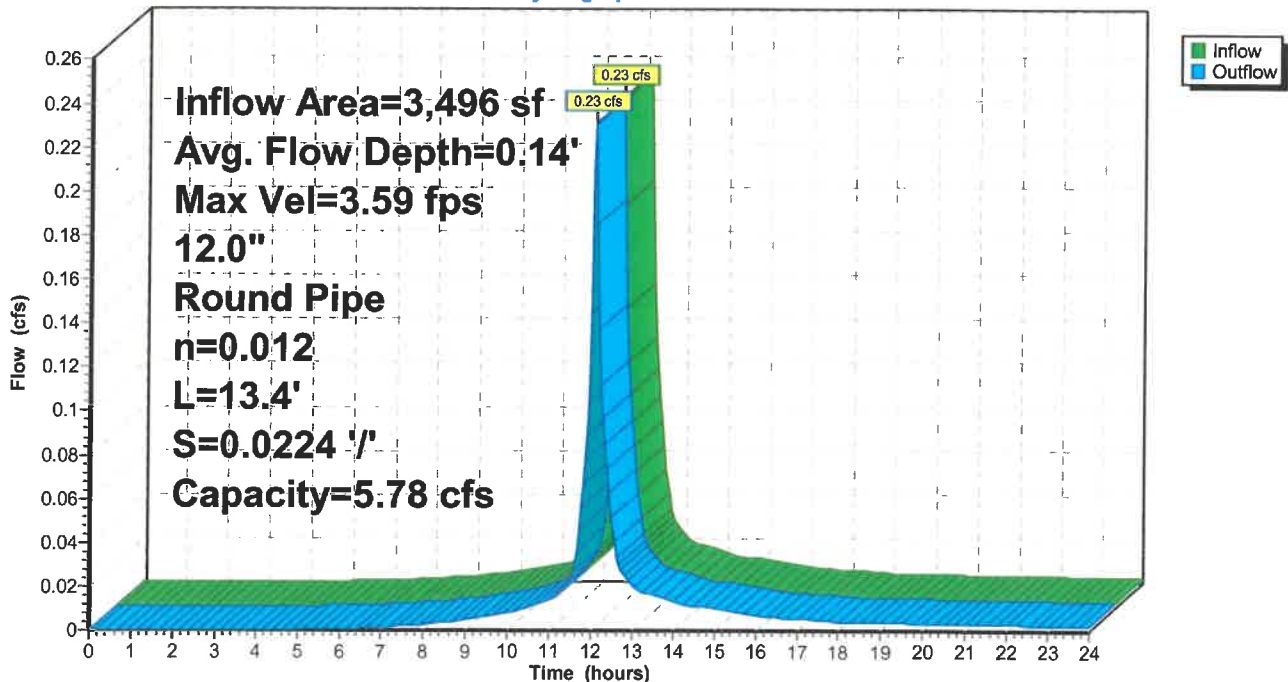
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.14' , Surface Width= 0.69'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.78 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 13.4' Slope= 0.0224 '/'  
Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 11R: CB6 to DMH 3

Hydrograph



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### Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 2.27" for 2 YR event  
Inflow = 0.71 cfs @ 12.12 hrs, Volume= 2,434 cf  
Outflow = 0.70 cfs @ 12.15 hrs, Volume= 2,432 cf, Atten= 3%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.21 fps, Min. Travel Time= 0.8 min

Avg. Velocity= 1.77 fps, Avg. Travel Time= 2.3 min

Peak Storage= 33 cf @ 12.14 hrs

Average Depth at Peak Storage= 0.20' , Surface Width= 1.01'

Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.43 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

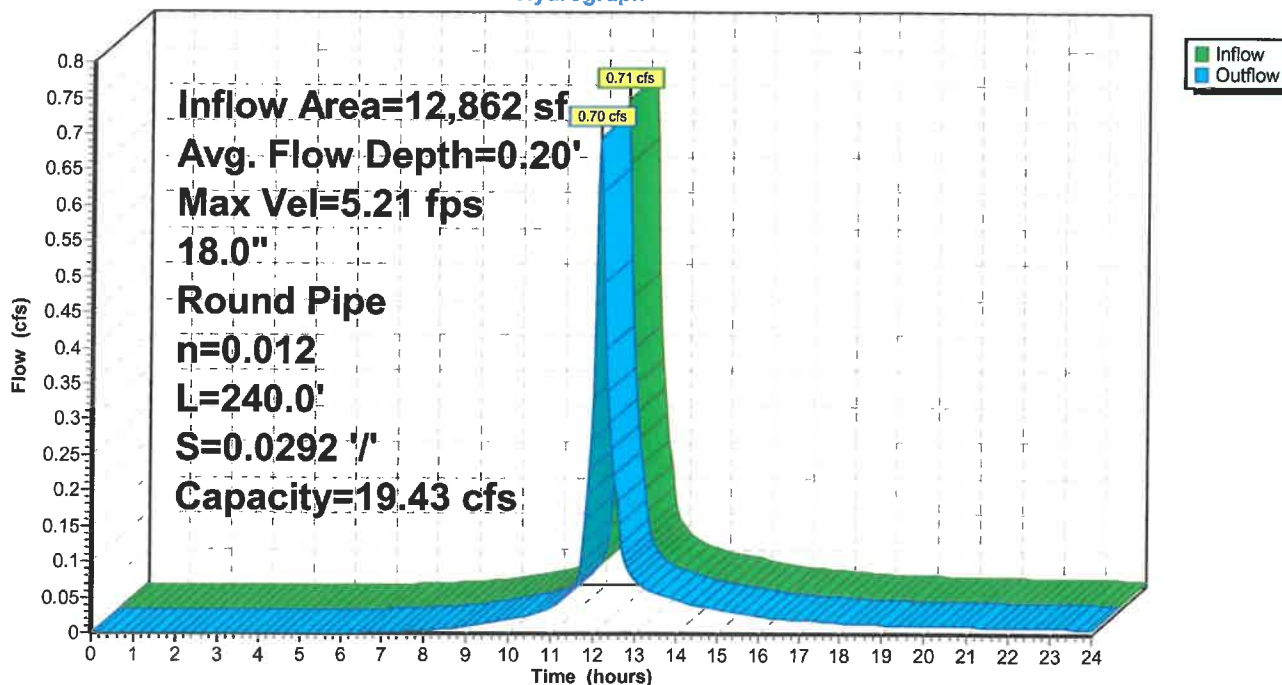
Length= 240.0' Slope= 0.0292 '/'

Inlet Invert= 290.00', Outlet Invert= 283.00'



### Reach 12R: DMH 7 TO BASIN

Hydrograph



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### Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 1.99" for 2 YR event  
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 722 cf  
Outflow = 0.23 cfs @ 12.09 hrs, Volume= 722 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.19 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 1.48 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.12' , Surface Width= 0.65'

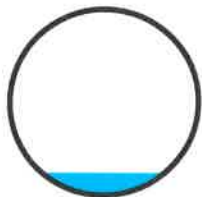
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

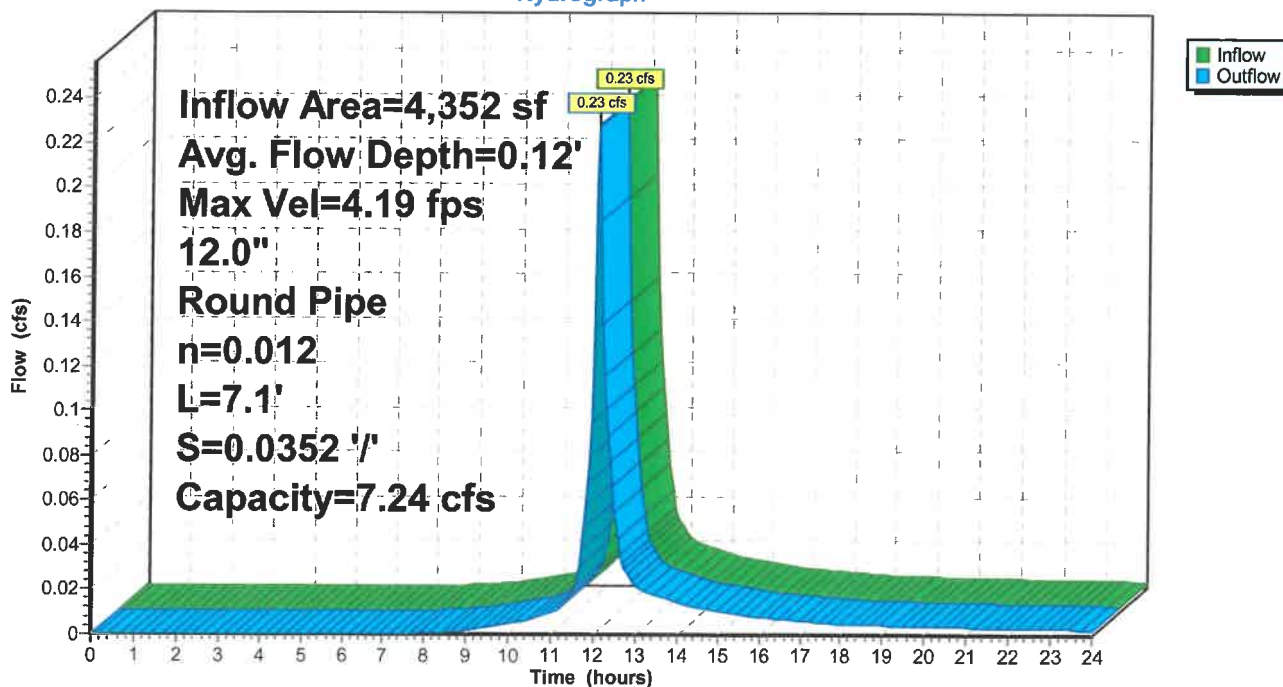
Length= 7.1' Slope= 0.0352 '/'

Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 13R: CB7 TO DMH 4

#### Hydrograph





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### Summary for Reach 14R: CB 8 TO DMH 4

Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 2.16" for 2 YR event  
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 733 cf  
Outflow = 0.23 cfs @ 12.09 hrs, Volume= 733 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.36 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.16 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.14' , Surface Width= 0.70'

Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

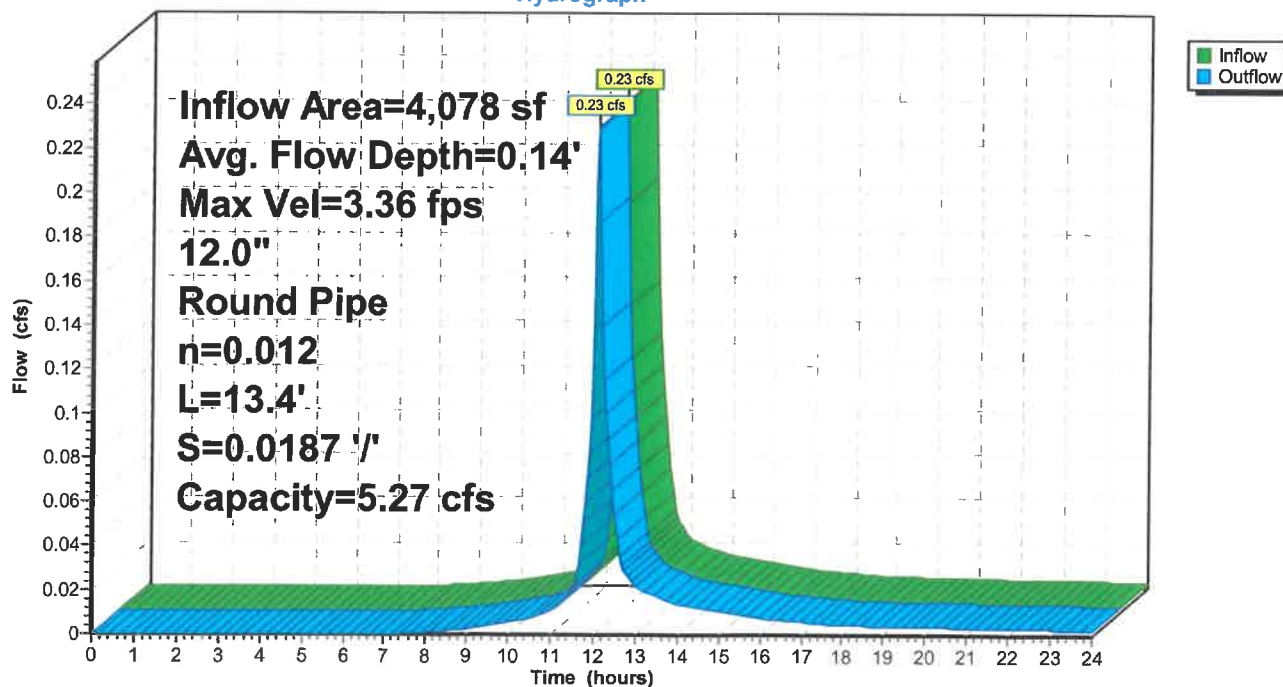
Length= 13.4' Slope= 0.0187 '/'

Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 14R: CB 8 TO DMH 4

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### Summary for Reach 15R: DMH 4 TO DMH 5

Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 2.07" for 2 YR event  
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 1,455 cf  
Outflow = 0.45 cfs @ 12.10 hrs, Volume= 1,455 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.88 fps, Min. Travel Time= 0.2 min

Avg. Velocity= 2.38 fps, Avg. Travel Time= 0.7 min

Peak Storage= 7 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.14' , Surface Width= 0.69'

Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

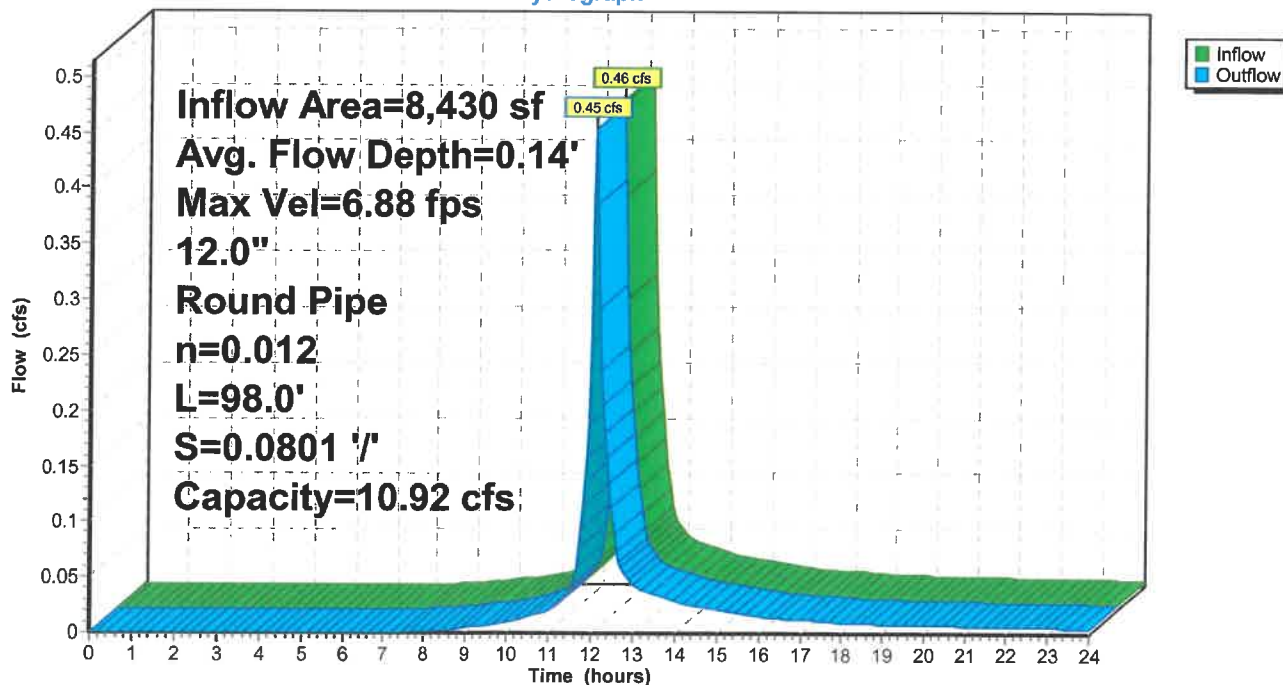
Length= 98.0' Slope= 0.0801 '/'

Inlet Invert= 316.20', Outlet Invert= 308.35'



### Reach 15R: DMH 4 TO DMH 5

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### Summary for Reach 16R: DMH 5 TO DMH 6

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 1.83" for 2 YR event  
Inflow = 1.75 cfs @ 12.10 hrs, Volume= 5,597 cf  
Outflow = 1.66 cfs @ 12.13 hrs, Volume= 5,592 cf, Atten= 5%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.74 fps, Min. Travel Time= 0.9 min

Avg. Velocity= 1.64 fps, Avg. Travel Time= 2.5 min

Peak Storage= 89 cf @ 12.11 hrs

Average Depth at Peak Storage= 0.42' , Surface Width= 1.18'

Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

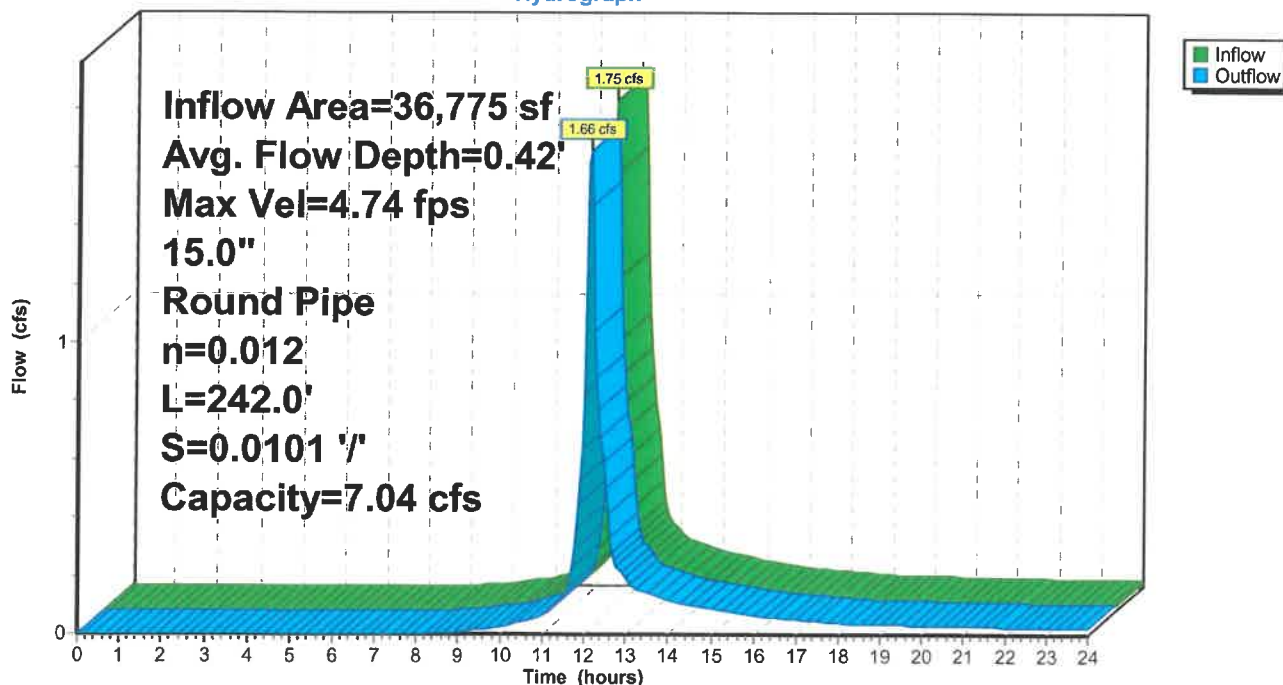
Length= 242.0' Slope= 0.0101 '/'

Inlet Invert= 308.10', Outlet Invert= 305.65'



### Reach 16R: DMH 5 TO DMH 6

Hydrograph



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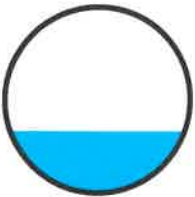
### Summary for Reach 17R: DMH 6 TO DMH 5

Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 1.75" for 2 YR event  
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 4,143 cf  
Outflow = 1.30 cfs @ 12.10 hrs, Volume= 4,142 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.71 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 2.05 fps, Avg. Travel Time= 0.8 min

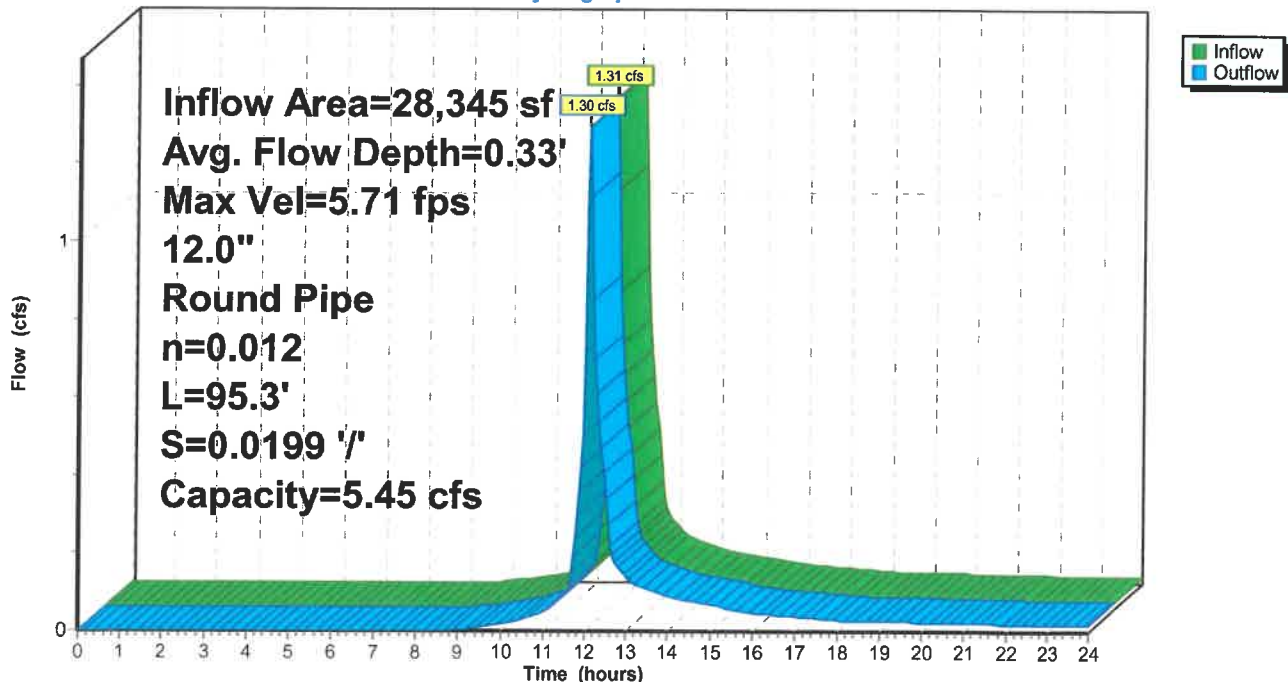
Peak Storage= 22 cf @ 12.10 hrs  
Average Depth at Peak Storage= 0.33', Surface Width= 0.94'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 95.3' Slope= 0.0199 '/'  
Inlet Invert= 310.25', Outlet Invert= 308.35'



### Reach 17R: DMH 6 TO DMH 5

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### Summary for Reach 18R: CB 10 TO DMH 6

Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 1.68" for 2 YR event  
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 2,074 cf  
Outflow = 0.66 cfs @ 12.10 hrs, Volume= 2,074 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.64 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.68 fps, Avg. Travel Time= 0.1 min

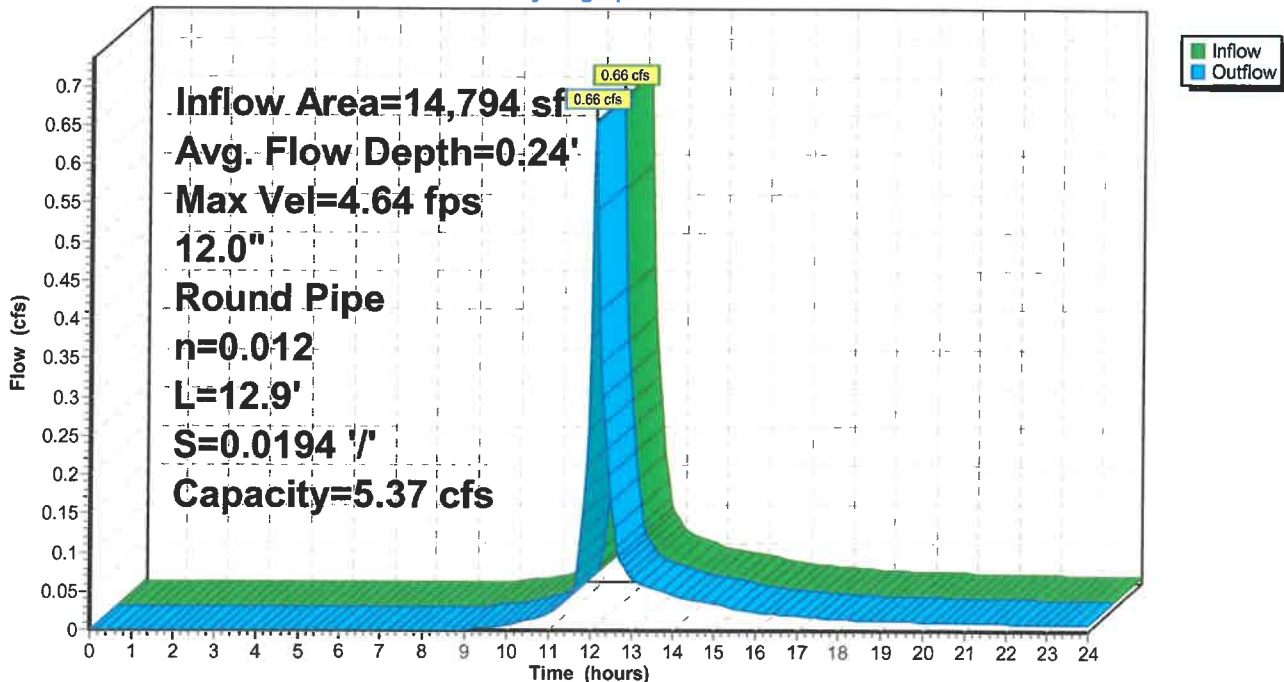
Peak Storage= 2 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.24' , Surface Width= 0.85'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 12.9' Slope= 0.0194 '/'  
Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 18R: CB 10 TO DMH 6

Hydrograph



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Type III 24-hr 2 YR Rainfall=3.38"

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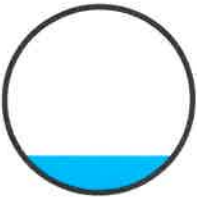
### Summary for Reach 19R: CB 9 TO DMH 6

Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 1.83" for 2 YR event  
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 2,069 cf  
Outflow = 0.66 cfs @ 12.09 hrs, Volume= 2,069 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.75 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.05 fps, Avg. Travel Time= 0.1 min

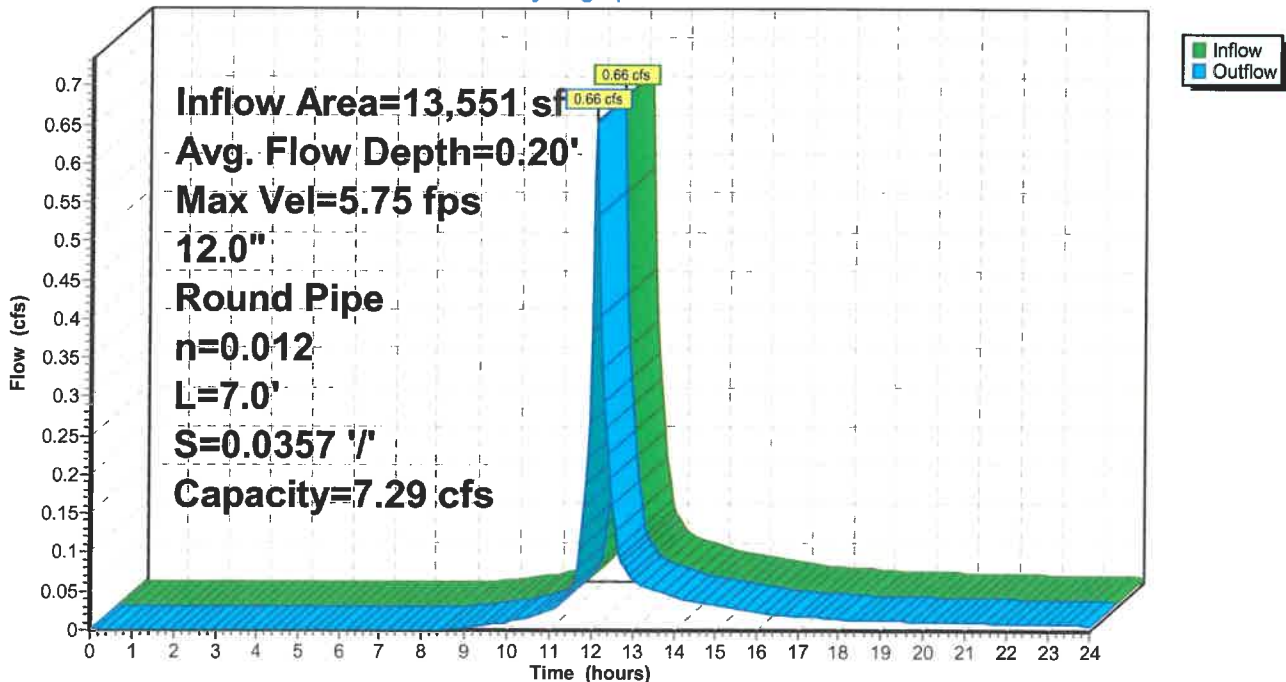
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 7.0' Slope= 0.0357 '/'  
Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 19R: CB 9 TO DMH 6

Hydrograph



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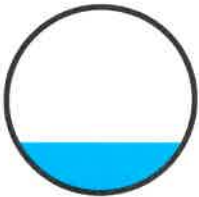
### Summary for Reach 20R: DMH 6 to Basin

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 1.82" for 2 YR event  
Inflow = 1.66 cfs @ 12.13 hrs, Volume= 5,592 cf  
Outflow = 1.66 cfs @ 12.13 hrs, Volume= 5,591 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.11 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 2.14 fps, Avg. Travel Time= 0.2 min

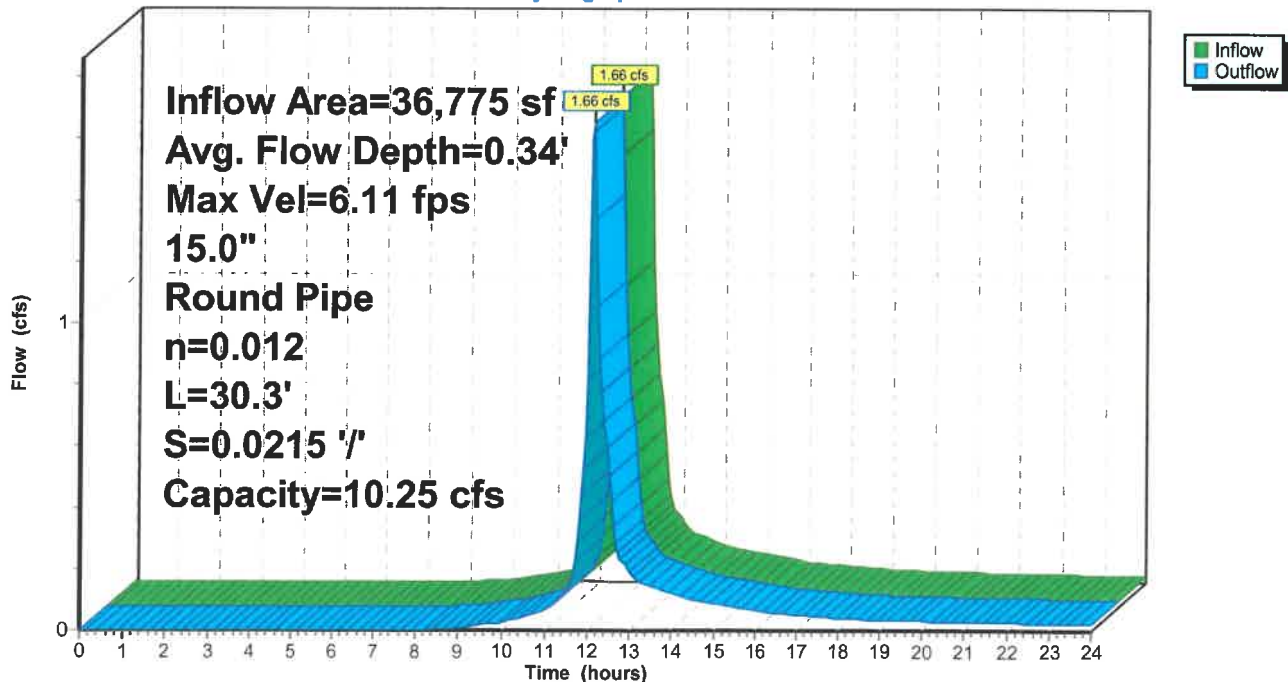
Peak Storage= 8 cf @ 12.13 hrs  
Average Depth at Peak Storage= 0.34', Surface Width= 1.11'  
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 30.3' Slope= 0.0215 '/'  
Inlet Invert= 305.65', Outlet Invert= 305.00'



### Reach 20R: DMH 6 to Basin

Hydrograph





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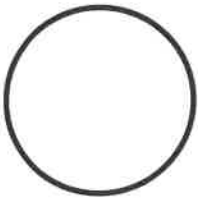
### Summary for Reach 21R: 2-8" DI

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2 YR event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min  
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

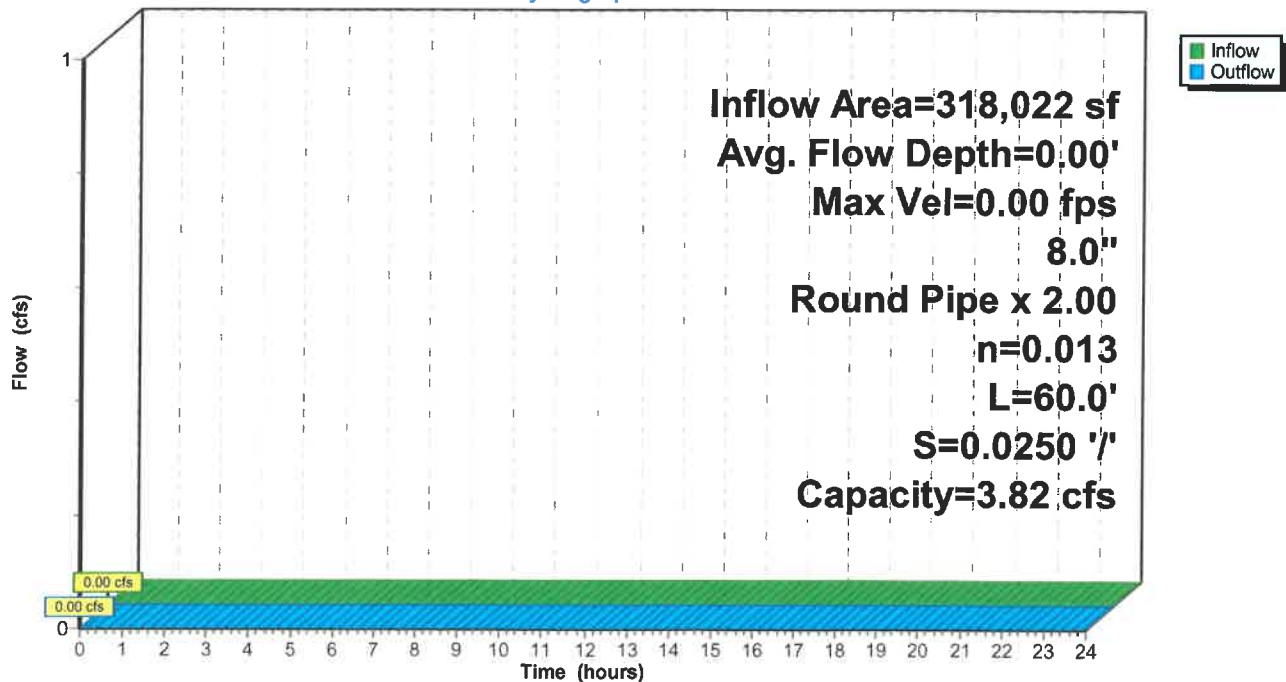
Peak Storage= 0 cf @ 0.00 hrs  
Average Depth at Peak Storage= 0.00'  
Bank-Full Depth= 0.67' Flow Area= 0.7 sf, Capacity= 3.82 cfs

A factor of 2.00 has been applied to the storage and discharge capacity  
8.0" Round Pipe  
n= 0.013 Corrugated PE, smooth interior  
Length= 60.0' Slope= 0.0250 '/'  
Inlet Invert= 312.50', Outlet Invert= 311.00'



### Reach 21R: 2-8" DI

Hydrograph





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### Summary for Reach EV1: Road Berm

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 0.25" for 2 YR event  
Inflow = 2.78 cfs @ 15.43 hrs, Volume= 57,126 cf  
Outflow = 2.78 cfs @ 15.44 hrs, Volume= 57,114 cf, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 1.46 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.14 fps, Avg. Travel Time= 0.1 min

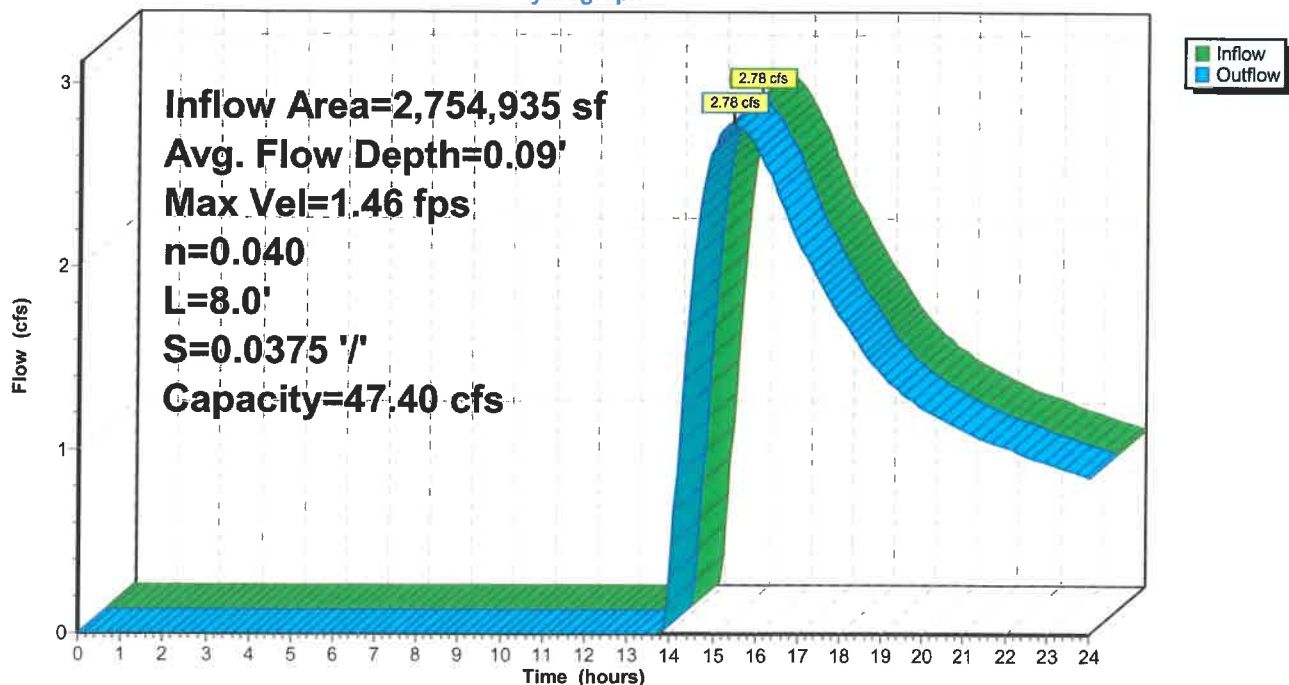
Peak Storage= 15 cf @ 15.44 hrs  
Average Depth at Peak Storage= 0.09', Surface Width= 20.93'  
Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides  
Side Slope Z-value= 5.0 '/' Top Width= 25.00'  
Length= 8.0' Slope= 0.0375 '/'  
Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: Road Berm

#### Hydrograph



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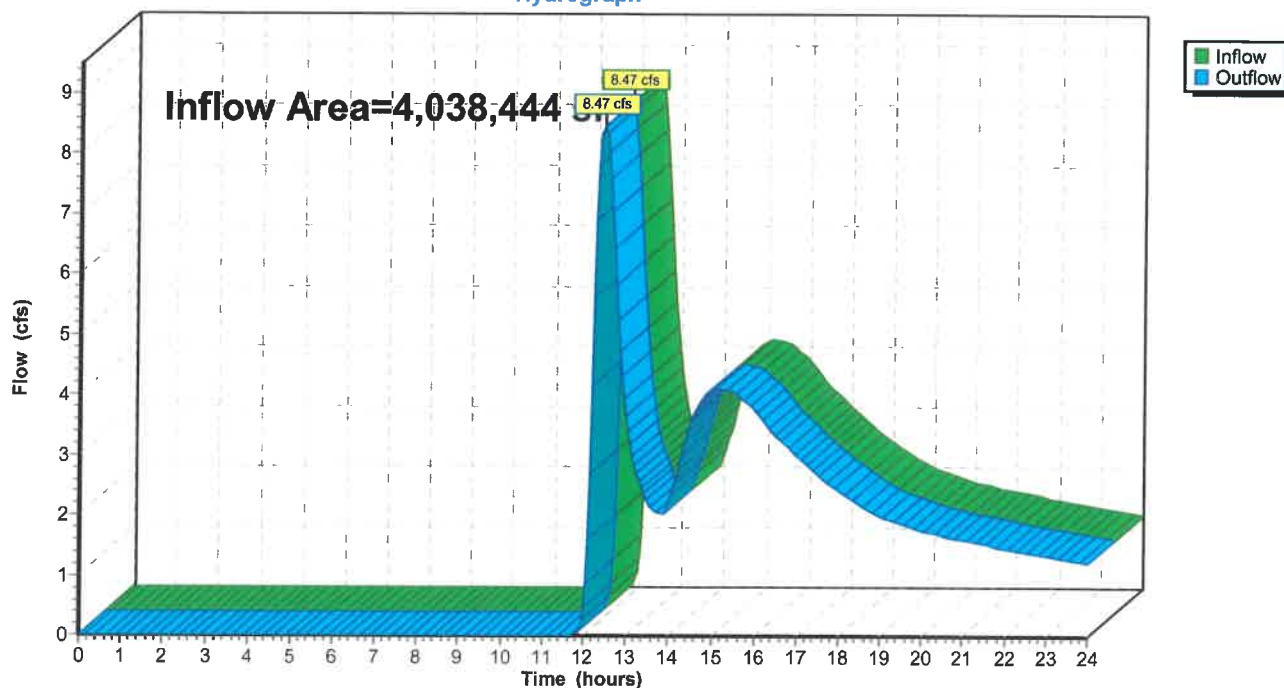
### Summary for Reach EV2: To Wetland

Inflow Area = 4,038,444 sf, 4.14% Impervious, Inflow Depth > 0.34" for 2 YR event  
Inflow = 8.47 cfs @ 12.45 hrs, Volume= 113,065 cf  
Outflow = 8.47 cfs @ 12.45 hrs, Volume= 113,065 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV2: To Wetland

Hydrograph



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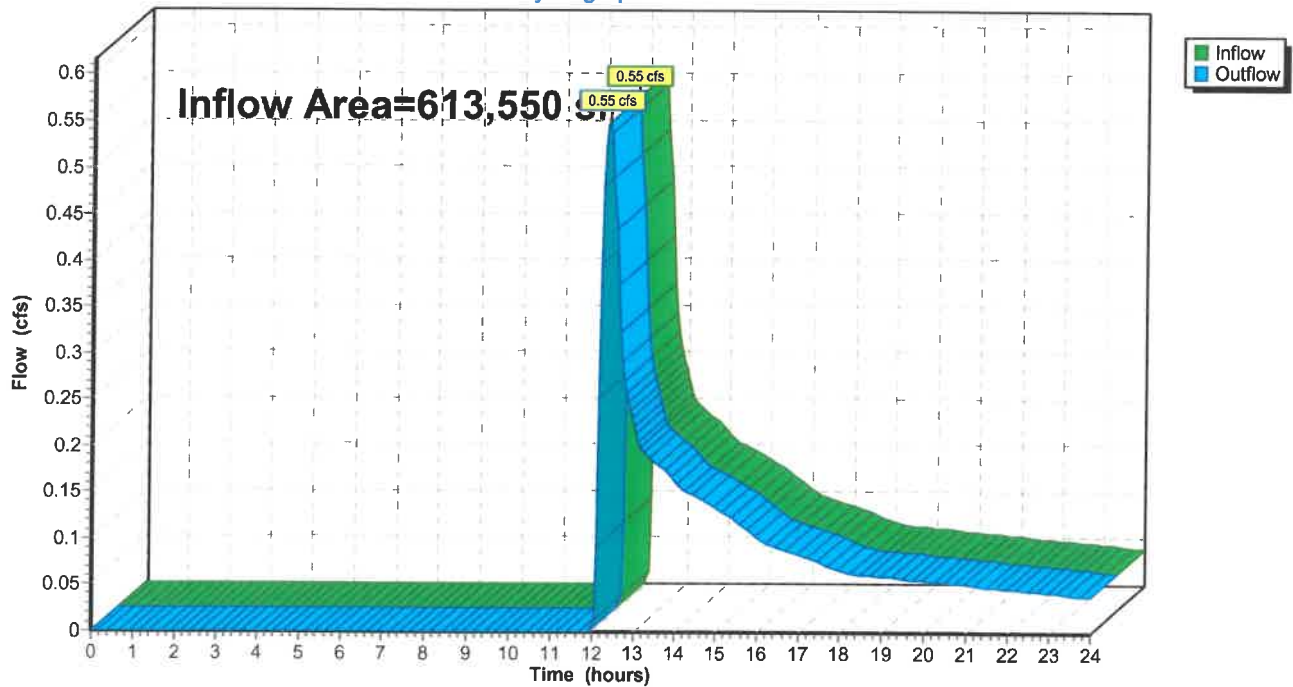
### Summary for Reach EV3: To Offsite

Inflow Area = 613,550 sf, 3.69% Impervious, Inflow Depth > 0.09" for 2 YR event  
Inflow = 0.55 cfs @ 12.38 hrs, Volume= 4,554 cf  
Outflow = 0.55 cfs @ 12.38 hrs, Volume= 4,554 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV3: To Offsite

Hydrograph



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**Summary for Pond 1P: Forebay**

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 2.27" for 2 YR event  
 Inflow = 0.70 cfs @ 12.15 hrs, Volume= 2,432 cf  
 Outflow = 0.70 cfs @ 12.15 hrs, Volume= 2,432 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.70 cfs @ 12.15 hrs, Volume= 2,432 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 281.00' @ 12.15 hrs Surf.Area= 1,232 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 2,432 cf (100% of inflow)

Center-of-Mass det. time= 0.0 min ( 810.3 - 810.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	252.50'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=30,307.96 cfs @ 12.15 hrs HW=281.00' (Free Discharge)↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 30,307.96 cfs @ 17.72 fps)

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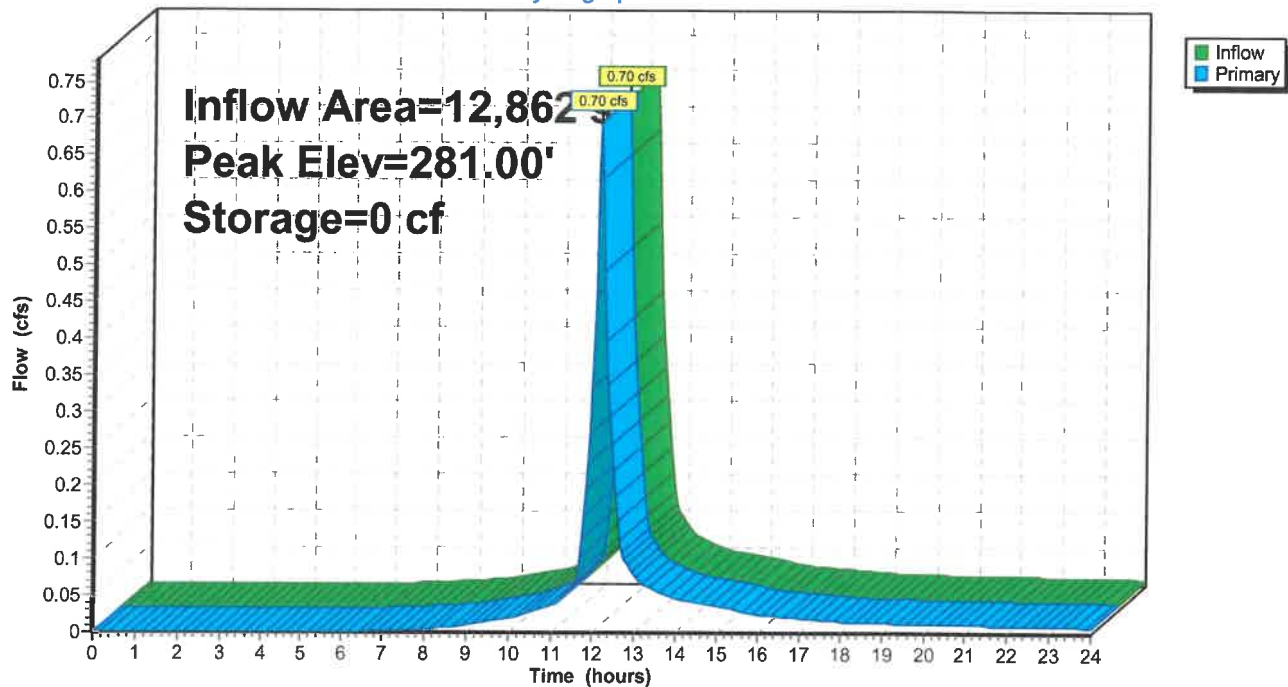
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## Pond 1P: Forebay

### Hydrograph



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**Summary for Pond 2P: Basin 1**

Inflow Area = 124,279 sf, 7.84% Impervious, Inflow Depth > 0.54" for 2 YR event  
 Inflow = 0.90 cfs @ 12.19 hrs, Volume= 5,558 cf  
 Outflow = 0.12 cfs @ 15.10 hrs, Volume= 5,387 cf, Atten= 86%, Lag= 174.4 min  
 Discarded = 0.12 cfs @ 15.10 hrs, Volume= 5,387 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 281.43' @ 15.10 hrs Surf.Area= 4,808 sf Storage= 2,021 cf

Plug-Flow detention time= 179.8 min calculated for 5,376 cf (97% of inflow)  
 Center-of-Mass det. time= 163.3 min ( 1,047.2 - 884.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	287.50'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=0.12 cfs @ 15.10 hrs HW=281.43' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.12 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



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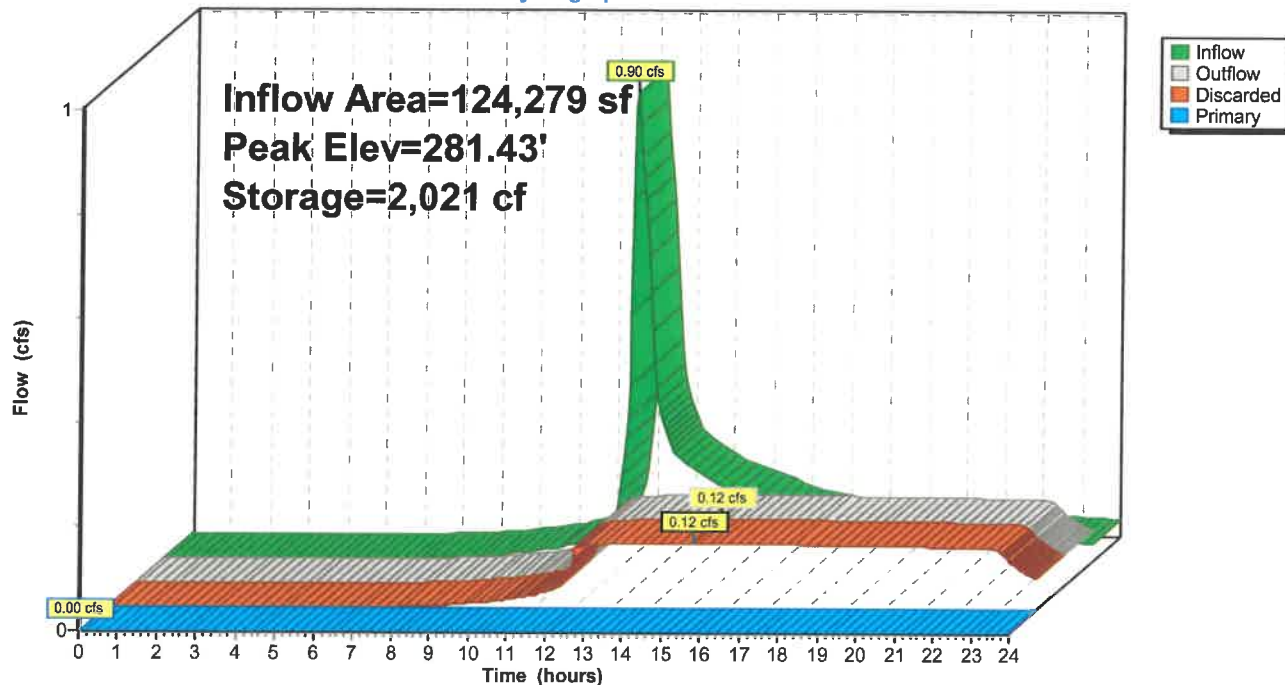
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## Pond 2P: Basin 1

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**Summary for Pond 3P: Forebay**

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 1.82" for 2 YR event  
 Inflow = 1.66 cfs @ 12.13 hrs, Volume= 5,591 cf  
 Outflow = 1.03 cfs @ 12.32 hrs, Volume= 3,327 cf, Atten= 38%, Lag= 11.3 min  
 Primary = 1.03 cfs @ 12.32 hrs, Volume= 3,327 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 305.53' @ 12.30 hrs Surf.Area= 1,770 sf Storage= 2,316 cf

Plug-Flow detention time= 192.5 min calculated for 3,327 cf (59% of inflow)  
 Center-of-Mass det. time= 84.1 min ( 913.2 - 829.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	<b>65.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=0.81 cfs @ 12.32 hrs HW=305.53' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 0.81 cfs @ 0.43 fps)

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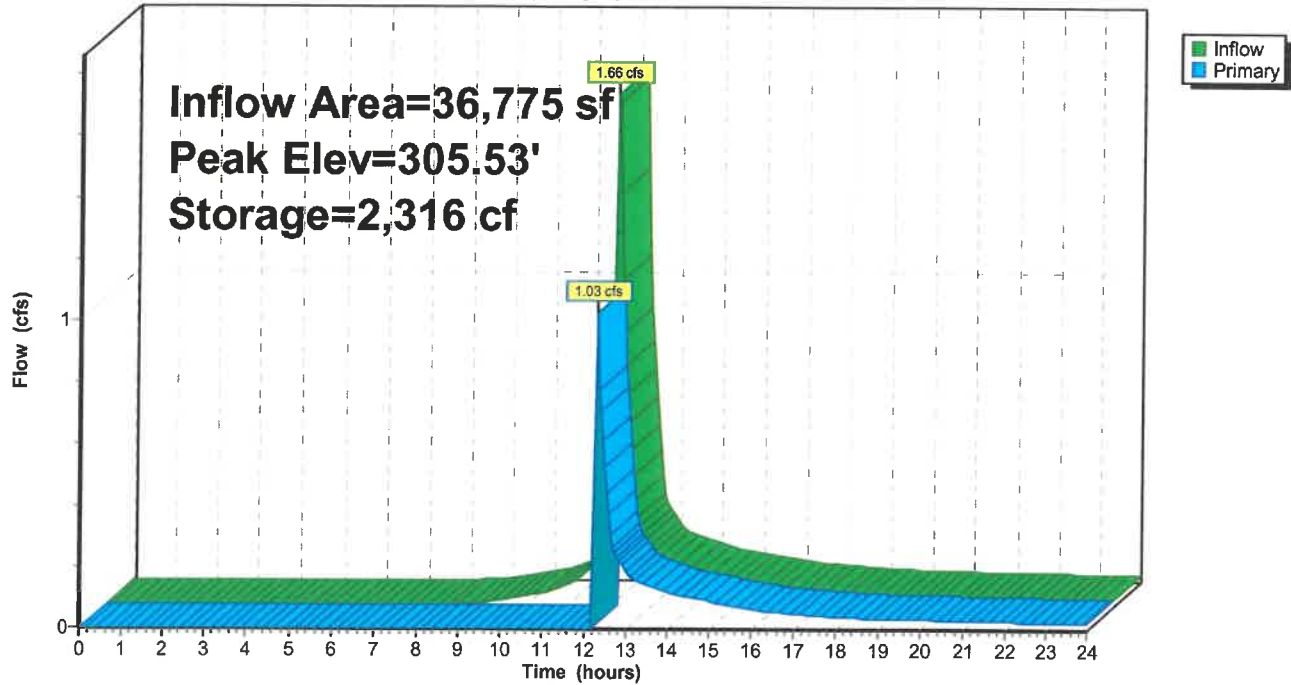
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### Pond 3P: Forebay

Hydrograph



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**Summary for Pond 4P: Basin 2**

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 0.62" for 2 YR event  
 Inflow = 1.41 cfs @ 12.32 hrs, Volume= 6,012 cf  
 Outflow = 0.18 cfs @ 14.56 hrs, Volume= 5,919 cf, Atten= 87%, Lag= 134.6 min  
 Discarded = 0.18 cfs @ 14.56 hrs, Volume= 5,919 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 304.25' @ 14.56 hrs Surf.Area= 7,203 sf Storage= 1,759 cf

Plug-Flow detention time= 103.5 min calculated for 5,907 cf (98% of inflow)  
 Center-of-Mass det. time= 95.5 min ( 1,015.2 - 919.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	49,460 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199
309.30	12,176	447.0	3,556	49,460	14,461

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	304.00'	<b>1.100 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.18 cfs @ 14.56 hrs HW=304.25' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.18 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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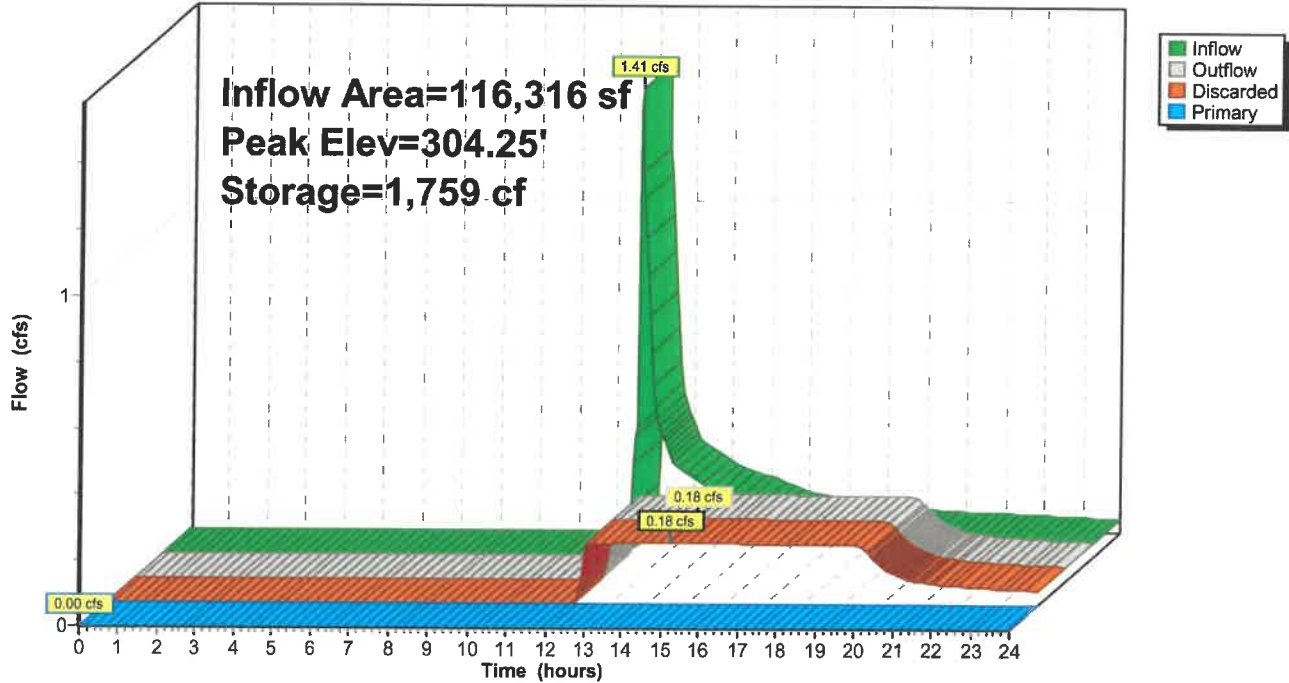
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### Pond 4P: Basin 2

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**Summary for Pond 5P: Forebay**

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 2.71" for 2 YR event  
 Inflow = 1.64 cfs @ 12.10 hrs, Volume= 5,507 cf  
 Outflow = 0.88 cfs @ 12.24 hrs, Volume= 2,883 cf, Atten= 46%, Lag= 8.5 min  
 Primary = 0.88 cfs @ 12.24 hrs, Volume= 2,883 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 291.03' @ 12.24 hrs Surf.Area= 1,651 sf Storage= 2,702 cf

Plug-Flow detention time= 218.7 min calculated for 2,877 cf (52% of inflow)  
 Center-of-Mass det. time= 108.2 min ( 892.6 - 784.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	6,501 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	1,002	133.0	0	0	1,002
290.00	1,339	153.0	1,166	1,166	1,479
292.00	1,976	173.0	3,294	4,461	2,092
293.00	2,105	184.0	2,040	6,501	2,452

Device	Routing	Invert	Outlet Devices
#1	Primary	291.00'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=0.73 cfs @ 12.24 hrs HW=291.03' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 0.73 cfs @ 0.43 fps)



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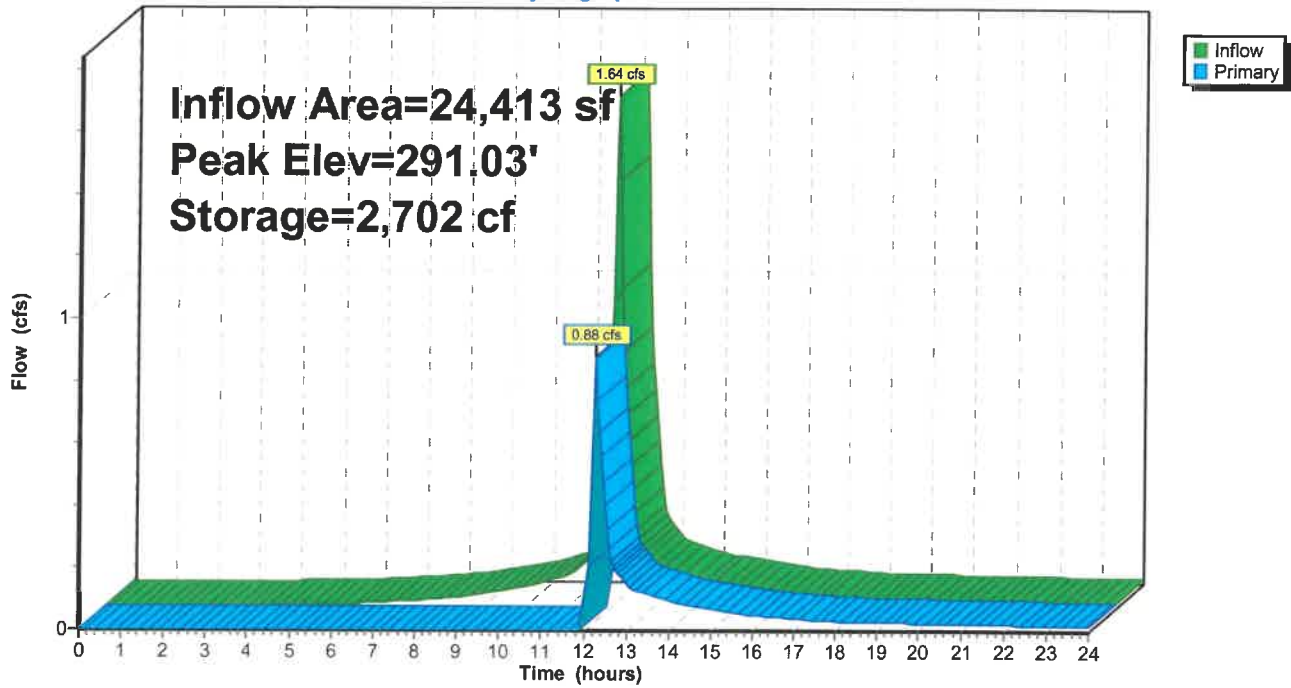
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### Pond 5P: Forebay

Hydrograph



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**Summary for Pond 6P: Basin 3**

Inflow Area = 55,723 sf, 39.13% Impervious, Inflow Depth > 0.91" for 2 YR event  
 Inflow = 1.11 cfs @ 12.23 hrs, Volume= 4,237 cf  
 Outflow = 0.16 cfs @ 13.59 hrs, Volume= 4,184 cf, Atten= 85%, Lag= 81.3 min  
 Discarded = 0.16 cfs @ 13.59 hrs, Volume= 4,184 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 289.20' @ 13.59 hrs Surf.Area= 6,302 sf Storage= 1,242 cf

Plug-Flow detention time= 80.1 min calculated for 4,184 cf (99% of inflow)  
 Center-of-Mass det. time= 73.5 min ( 970.7 - 897.2 )

Volume	Invert	Avail.Storage	Storage Description		
#1	289.00'	44,208 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	6,102	334.0	0	0	6,102
290.00	7,134	353.0	6,611	6,611	7,196
292.00	9,367	391.0	16,450	23,062	9,566
294.00	11,827	428.0	21,146	44,208	12,112

Device	Routing	Invert	Outlet Devices
#1	Primary	293.00'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	289.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=0.16 cfs @ 13.59 hrs HW=289.20' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.16 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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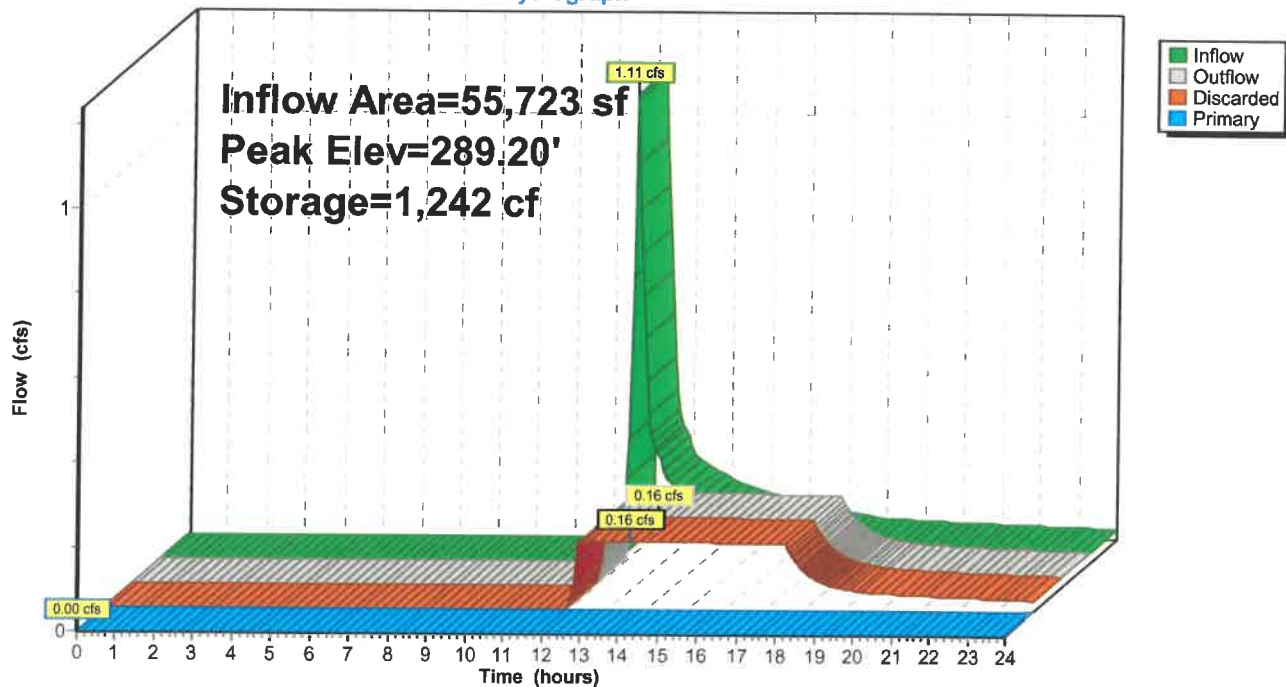
00454 - Proposed Conditions R2  
Type III 24-hr 2 YR Rainfall=3.38"

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## Pond 6P: Basin 3

Hydrograph



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**Summary for Pond 7P: Vernal Pool and Wetland**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 0.43" for 2 YR event  
 Inflow = 9.98 cfs @ 12.81 hrs, Volume= 99,846 cf  
 Outflow = 2.78 cfs @ 15.43 hrs, Volume= 57,126 cf, Atten= 72%, Lag= 157.3 min  
 Primary = 2.78 cfs @ 15.43 hrs, Volume= 57,126 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 294.07' @ 15.43 hrs Surf.Area= 33,327 sf Storage= 47,404 cf

Plug-Flow detention time= 273.4 min calculated for 57,126 cf (57% of inflow)  
 Center-of-Mass det. time= 138.6 min ( 1,084.4 - 945.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Upgradient wetland (Prismatic) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=2.77 cfs @ 15.43 hrs HW=294.07' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 2.77 cfs @ 1.30 fps)

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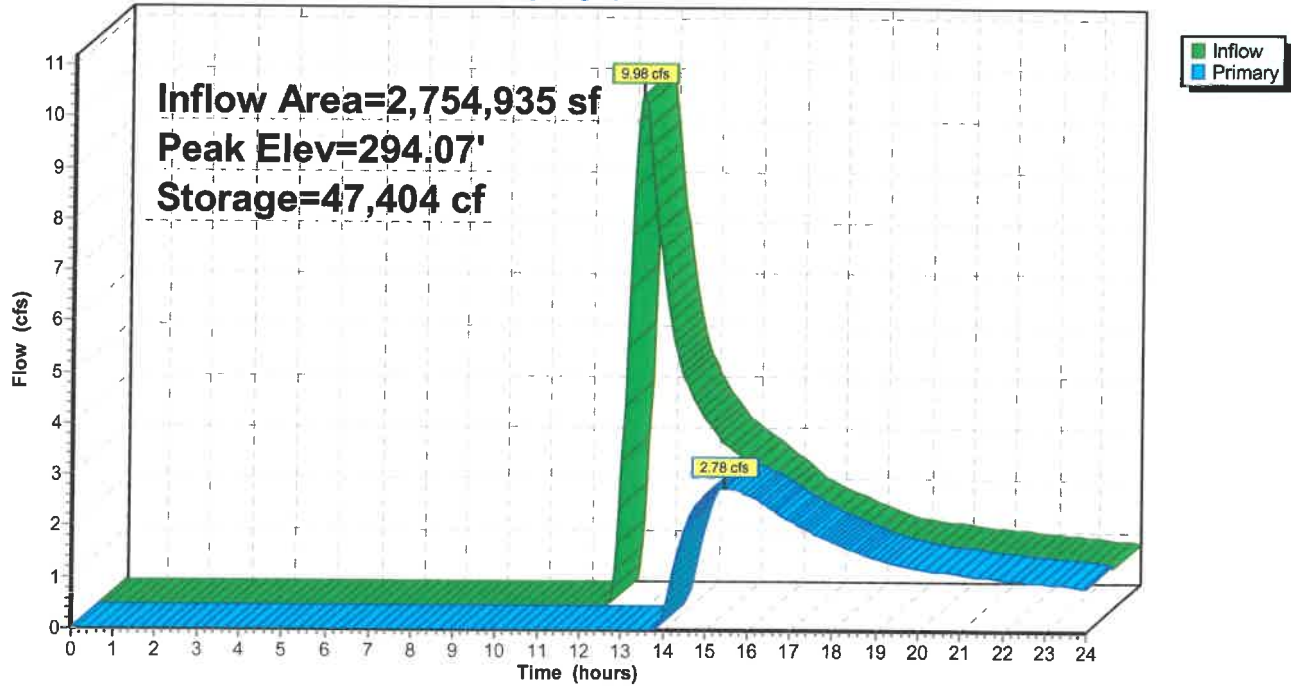
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Type III 24-hr 2 YR Rainfall=3.38"

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## Pond 7P: Vernal Pool and Wetland

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**Summary for Pond 8P: Road Berm**

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth > 0.30" for 2 YR event  
 Inflow = 0.85 cfs @ 12.54 hrs, Volume= 8,039 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 310.46' @ 24.00 hrs Surf.Area= 23,736 sf Storage= 8,027 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	310.00'	256,496 cf	<b>Upgradient wetland (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

Device	Routing	Invert	Outlet Devices
#1	Primary	312.50'	<b>8.0" Vert. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)  
 ↳ **1=Orifice/Grate** ( Controls 0.00 cfs)



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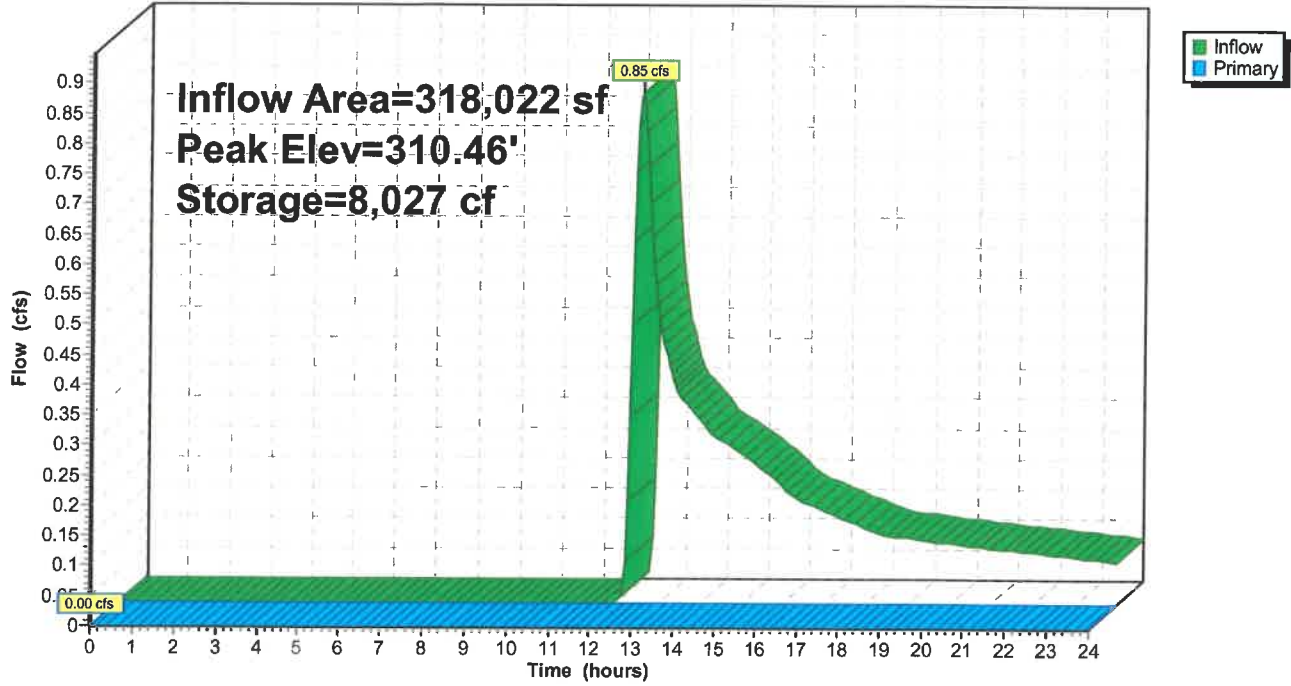
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Type III 24-hr 2 YR Rainfall=3.38"

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### Pond 8P: Road Berm

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Type III 24-hr 10 YR Rainfall=5.23"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 10.78 cfs @ 12.43 hrs, Volume= 61,489 cf, Depth&gt; 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b>
					Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

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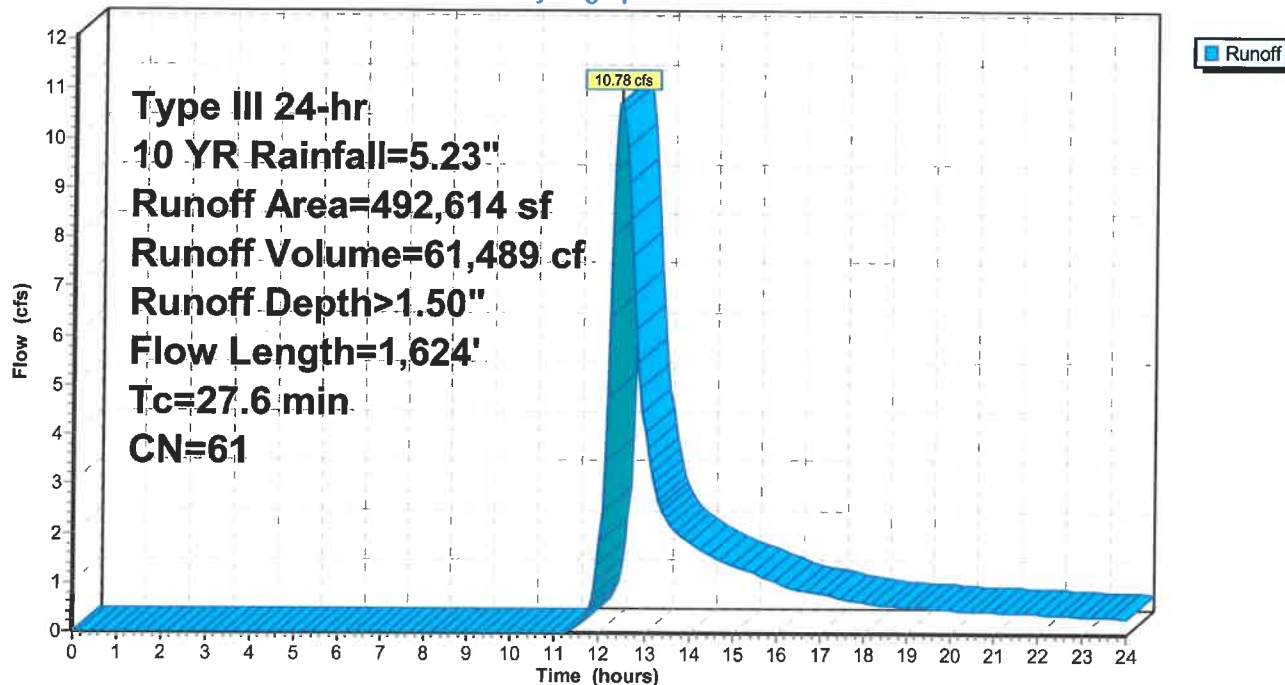
00454 - Proposed Conditions R2  
Type III 24-hr 10 YR Rainfall=5.23"

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### Subcatchment 1S: To Culvert

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**Summary for Subcatchment 2S: To Proposed Culvert**

Runoff = 41.58 cfs @ 12.70 hrs, Volume= 309,492 cf, Depth&gt; 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b> Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b> Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
45.8	2,588	Total			

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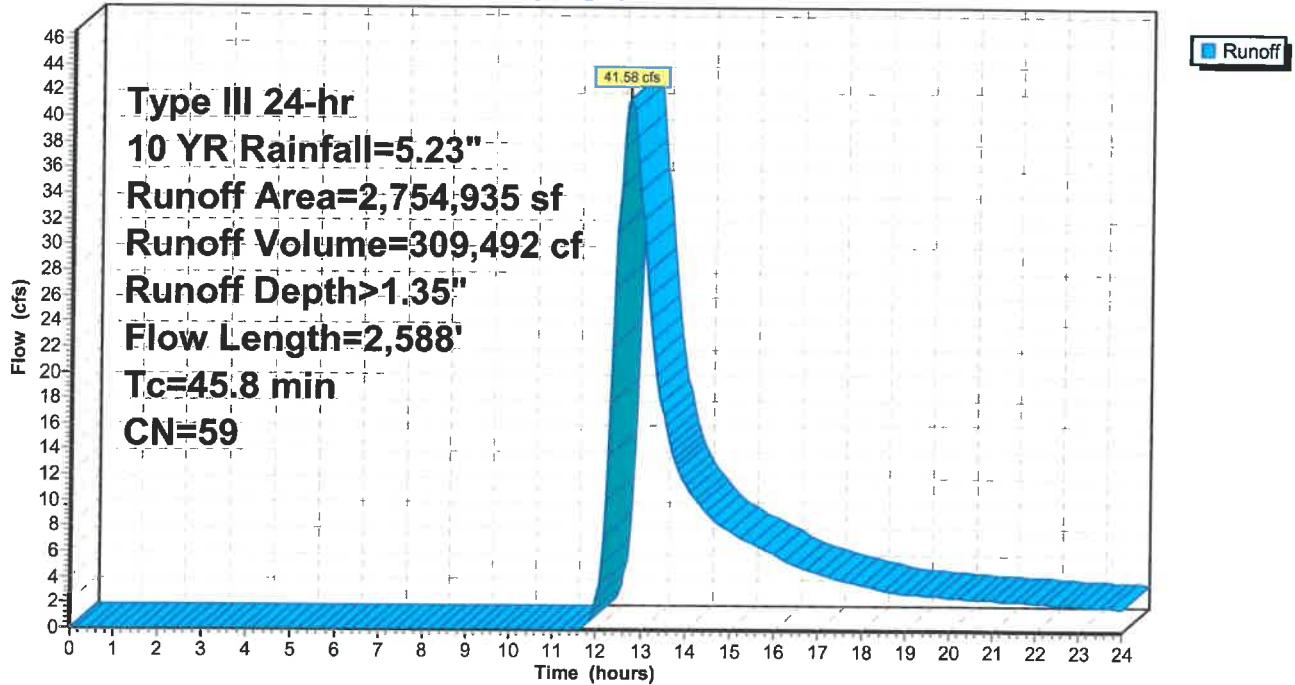
00454 - Proposed Conditions R2  
Type III 24-hr 10 YR Rainfall=5.23"

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### Subcatchment 2S: To Proposed Culvert

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Type III 24-hr 10 YR Rainfall=5.23"

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### Summary for Subcatchment 3S: To 8" pipes

Runoff = 5.01 cfs @ 12.37 hrs, Volume= 28,868 cf, Depth> 1.09"

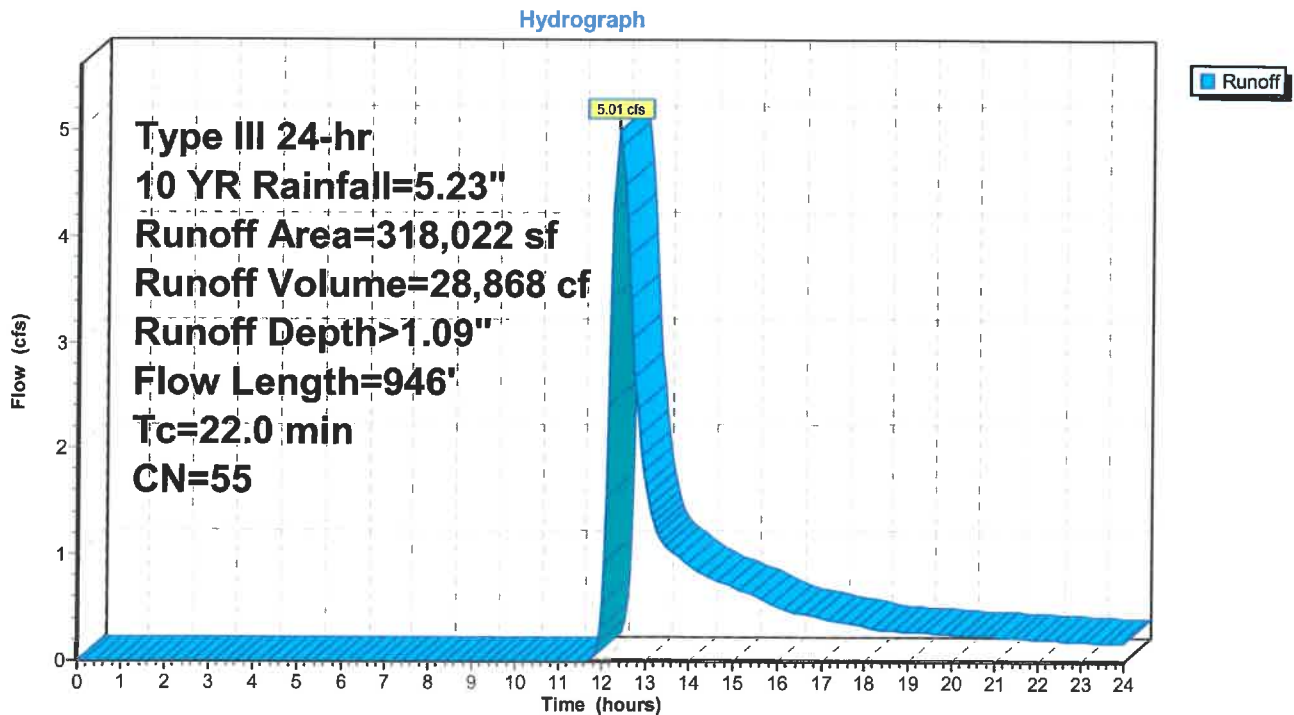
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
318,022	55	Woods, Good, HSG B
318,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow, Sheet Flow</b>
14.9	896	0.0401	1.00		Woods: Light underbrush n= 0.400 P2= 3.22" <b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
22.0	946	Total			

### Subcatchment 3S: To 8" pipes





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Type III 24-hr 10 YR Rainfall=5.23"

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### Summary for Subcatchment 4S: To CB 1

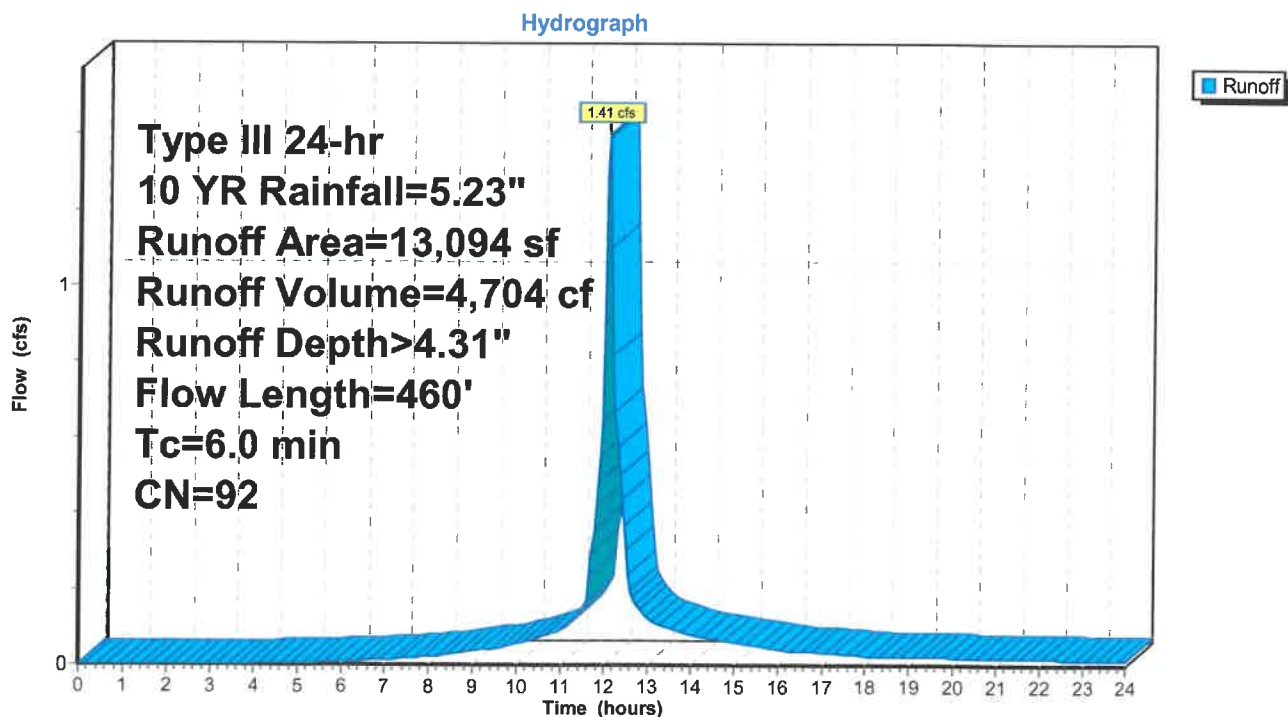
Runoff = 1.41 cfs @ 12.09 hrs, Volume= 4,704 cf, Depth> 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
11,086	98	Paved roads w/curbs & sewers, HSG B
2,008	61	>75% Grass cover, Good, HSG B
13,094	92	Weighted Average
2,008		15.34% Pervious Area
11,086		84.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 4S: To CB 1



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Type III 24-hr 10 YR Rainfall=5.23"

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### Summary for Subcatchment 5S: To CB 2

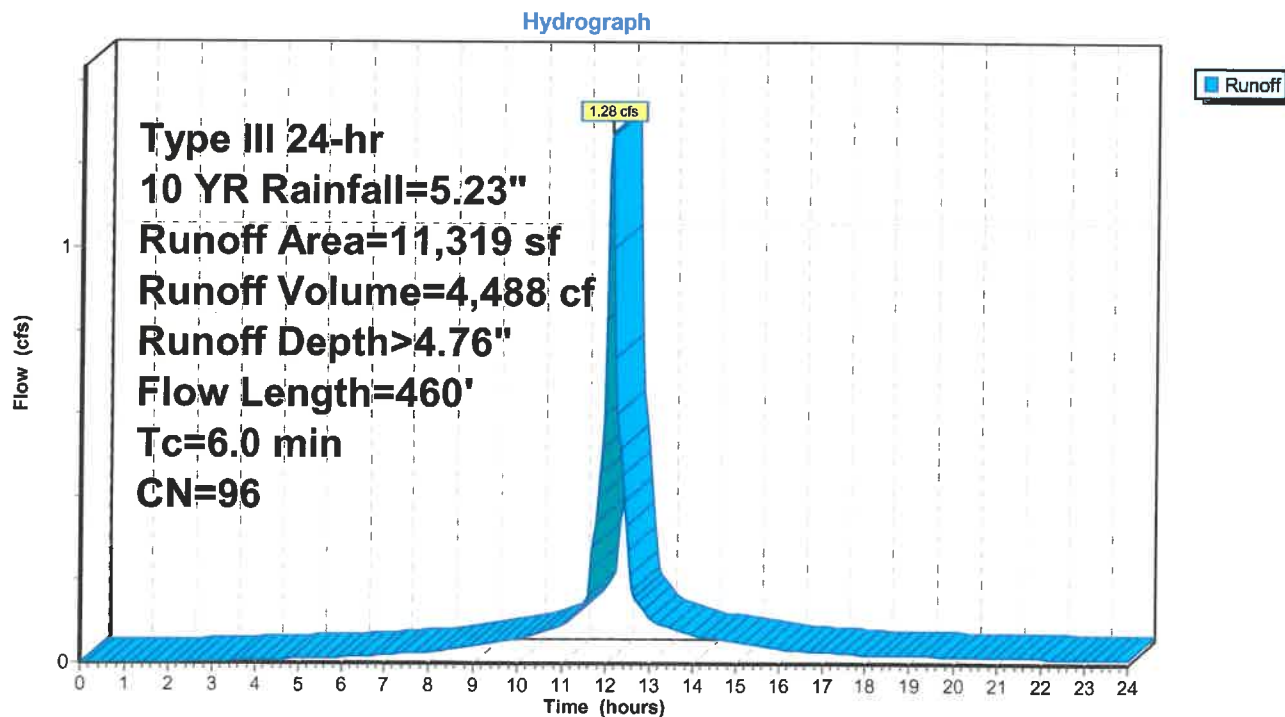
Runoff = 1.28 cfs @ 12.09 hrs, Volume= 4,488 cf, Depth> 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
10,719	98	Paved roads w/curbs & sewers, HSG B
600	61	>75% Grass cover, Good, HSG B
11,319	96	Weighted Average
600		5.30% Pervious Area
10,719		94.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 5S: To CB 2



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Type III 24-hr 10 YR Rainfall=5.23"

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### Summary for Subcatchment 6S: To CB 3

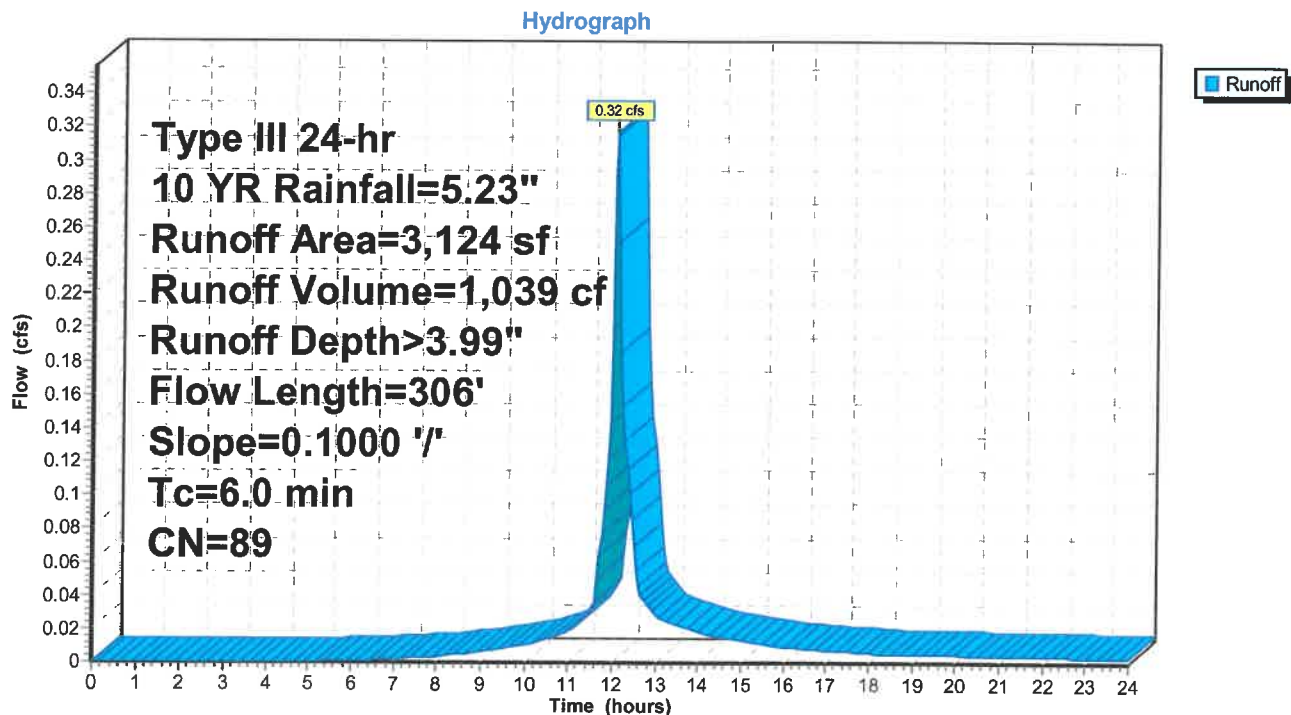
Runoff = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf, Depth> 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
2,343	98	Paved roads w/curbs & sewers, HSG B
781	61	>75% Grass cover, Good, HSG B
3,124	89	Weighted Average
781		25.00% Pervious Area
2,343		75.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 6S: To CB 3



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### Summary for Subcatchment 7S: To CB 4

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 848 cf, Depth> 3.99"

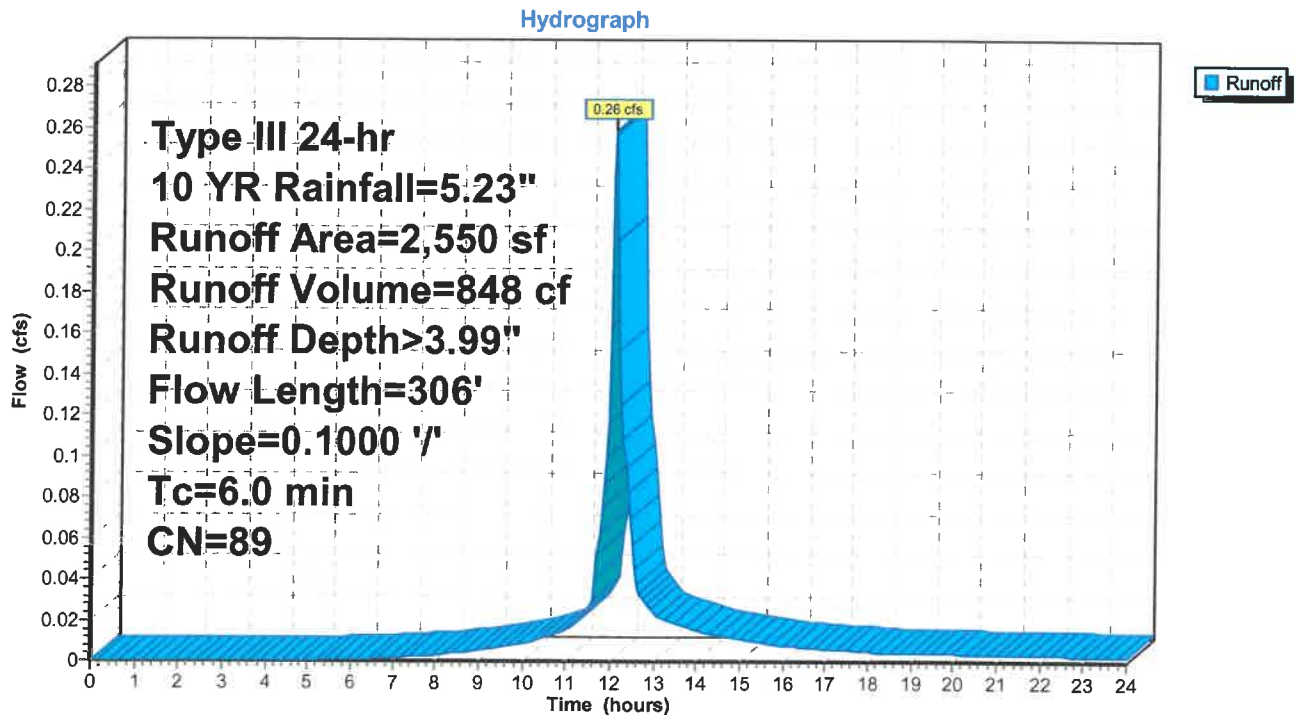
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
1,913	98	Paved roads w/curbs & sewers, HSG B
637	61	>75% Grass cover, Good, HSG B
2,550	89	Weighted Average
637		24.98% Pervious Area
1,913		75.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 7S: To CB 4



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### Summary for Subcatchment 8S: To CB 6

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,132 cf, Depth> 3.68"

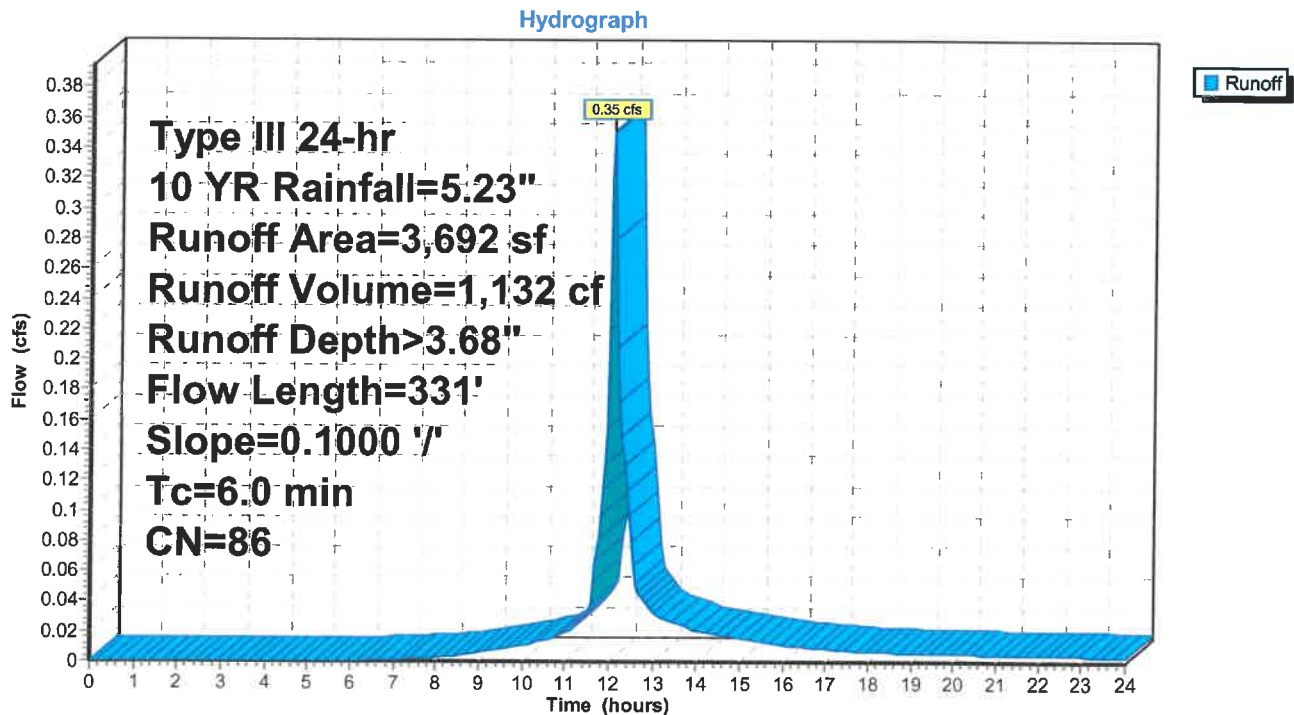
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
2,493	98	Paved roads w/curbs & sewers, HSG B
1,199	61	>75% Grass cover, Good, HSG B
3,692	86	Weighted Average
1,199		32.48% Pervious Area
2,493		67.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 8S: To CB 6



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### Summary for Subcatchment 9S: To CB 5

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 1,288 cf, Depth> 4.42"

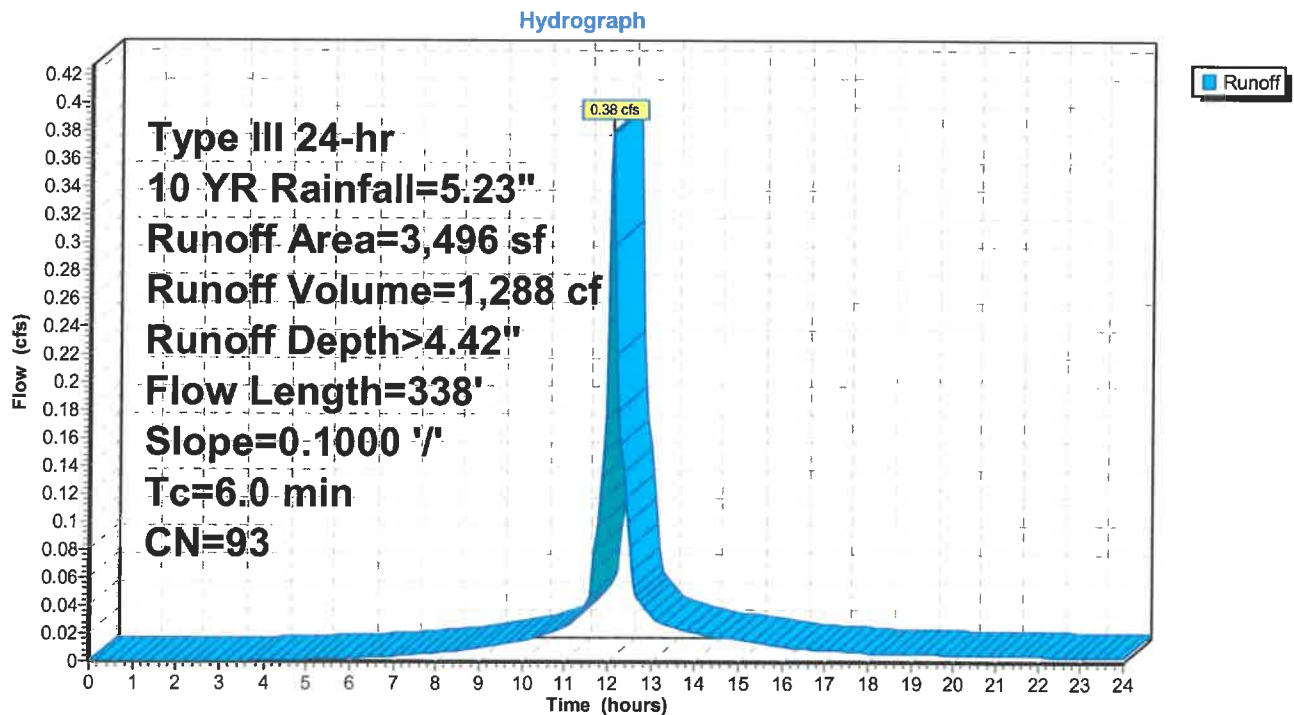
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
3,000	98	Paved roads w/curbs & sewers, HSG B
496	61	>75% Grass cover, Good, HSG B
3,496	93	Weighted Average
496		14.19% Pervious Area
3,000		85.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 9S: To CB 5





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### Summary for Subcatchment 10S: To CB 7

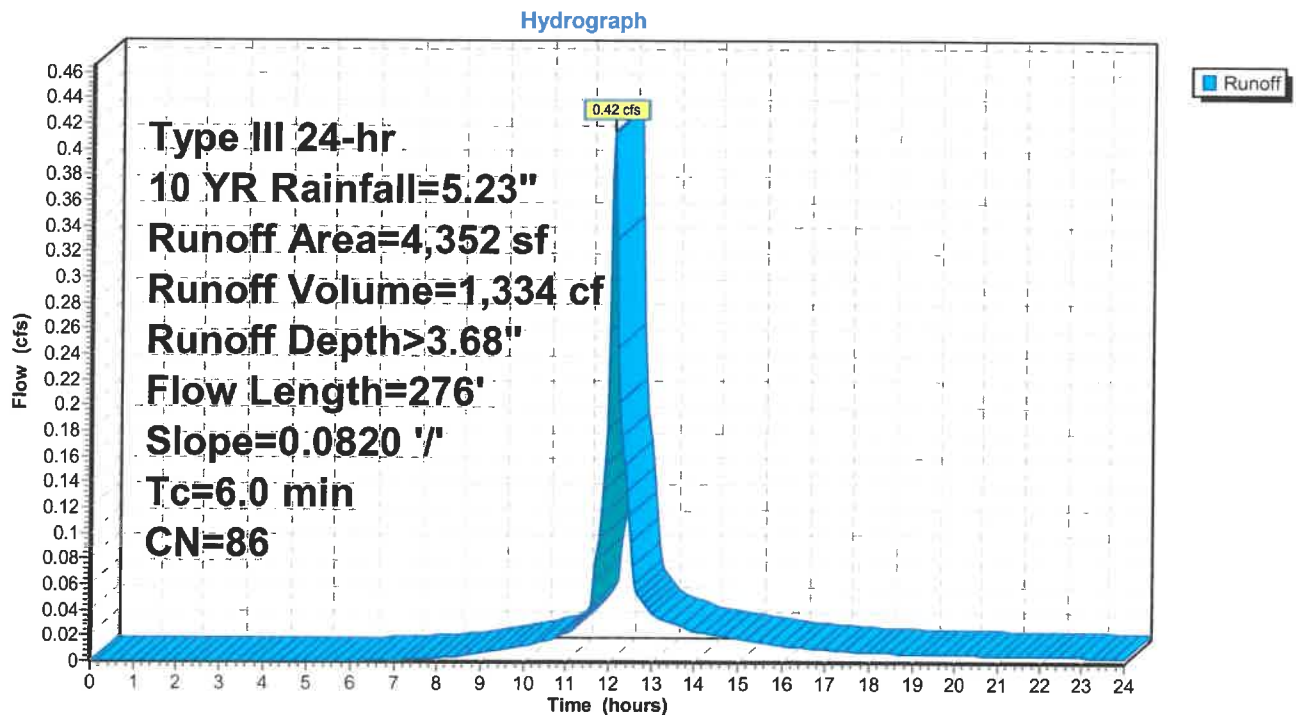
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 1,334 cf, Depth> 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 10S: To CB 7



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### Summary for Subcatchment 11S: To CB 8

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,320 cf, Depth> 3.88"

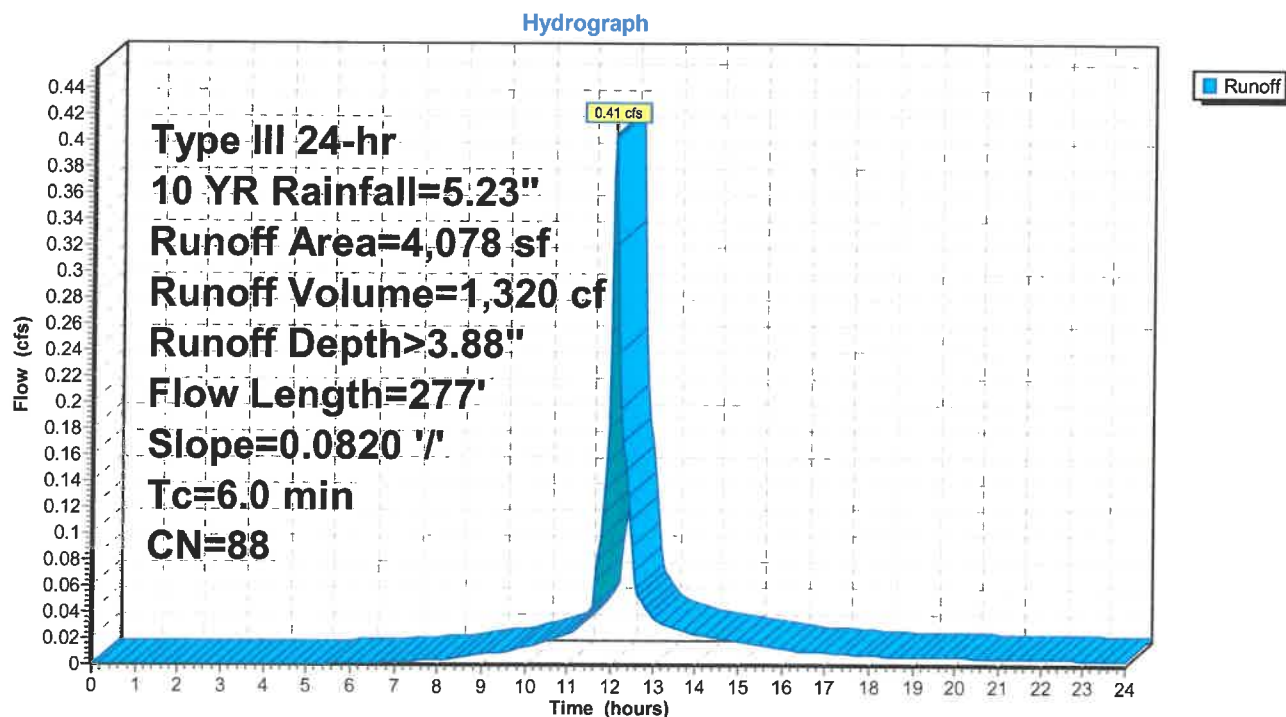
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 11S: To CB 8



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### Summary for Subcatchment 12S: To CB 9

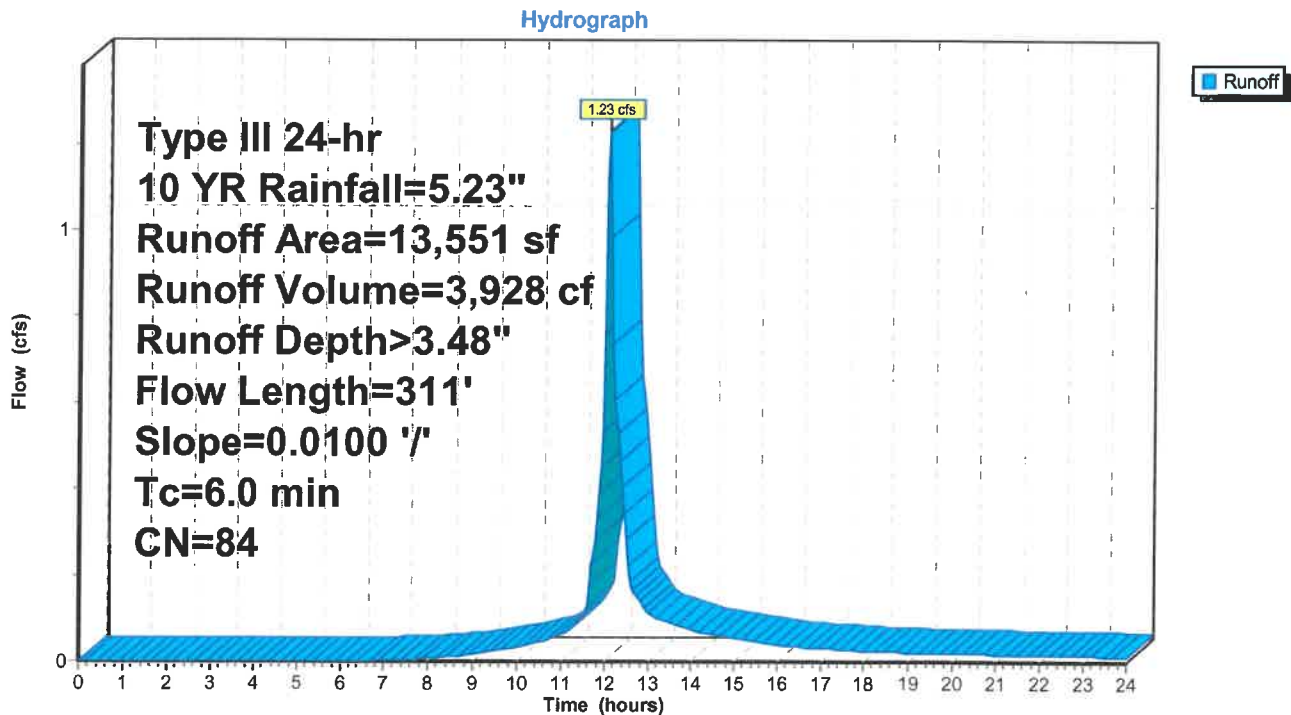
Runoff = 1.23 cfs @ 12.09 hrs, Volume= 3,928 cf, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

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## Summary for Subcatchment 13S: To CB 10

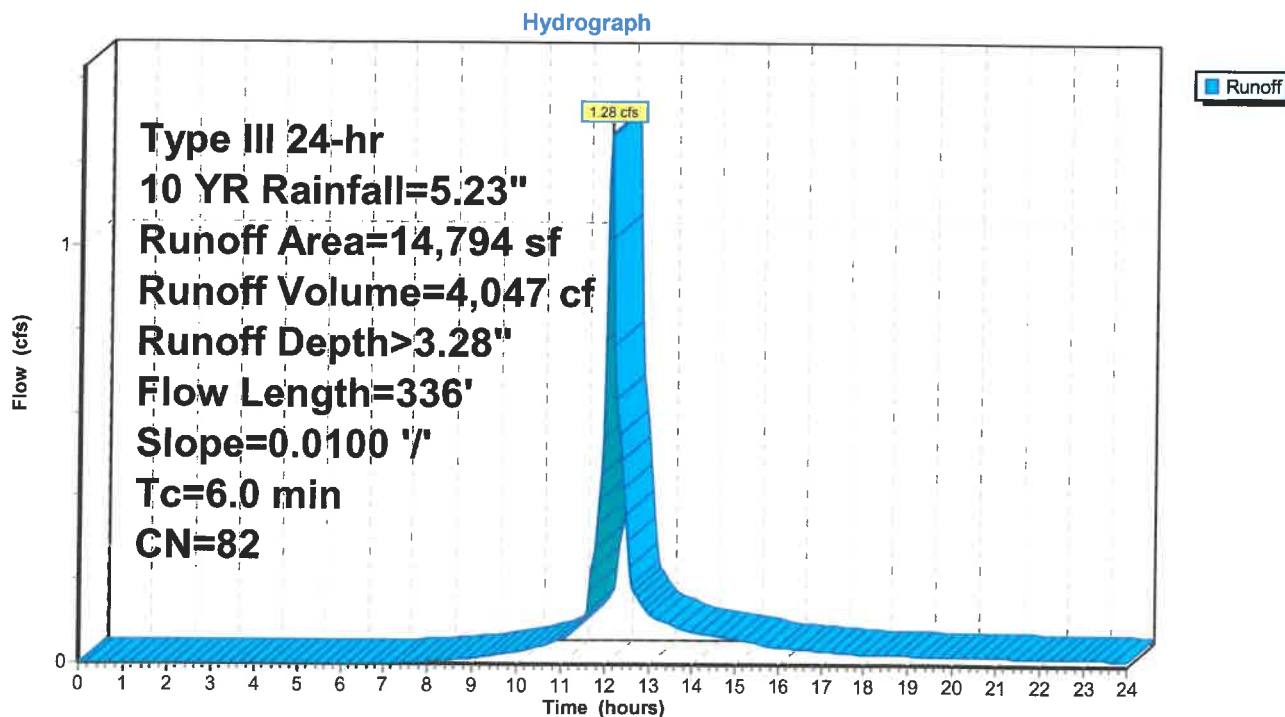
Runoff = 1.28 cfs @ 12.09 hrs, Volume= 4,047 cf, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
* 8,333	98	Paved roads w/curbs & sewers, HSG B
6,461	61	>75% Grass cover, Good, HSG B
14,794	82	Weighted Average
6,461		43.67% Pervious Area
8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

## Subcatchment 13S: To CB 10



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### Summary for Subcatchment 14S: To Wetland

Runoff = 17.50 cfs @ 12.37 hrs, Volume= 91,499 cf, Depth> 1.80"

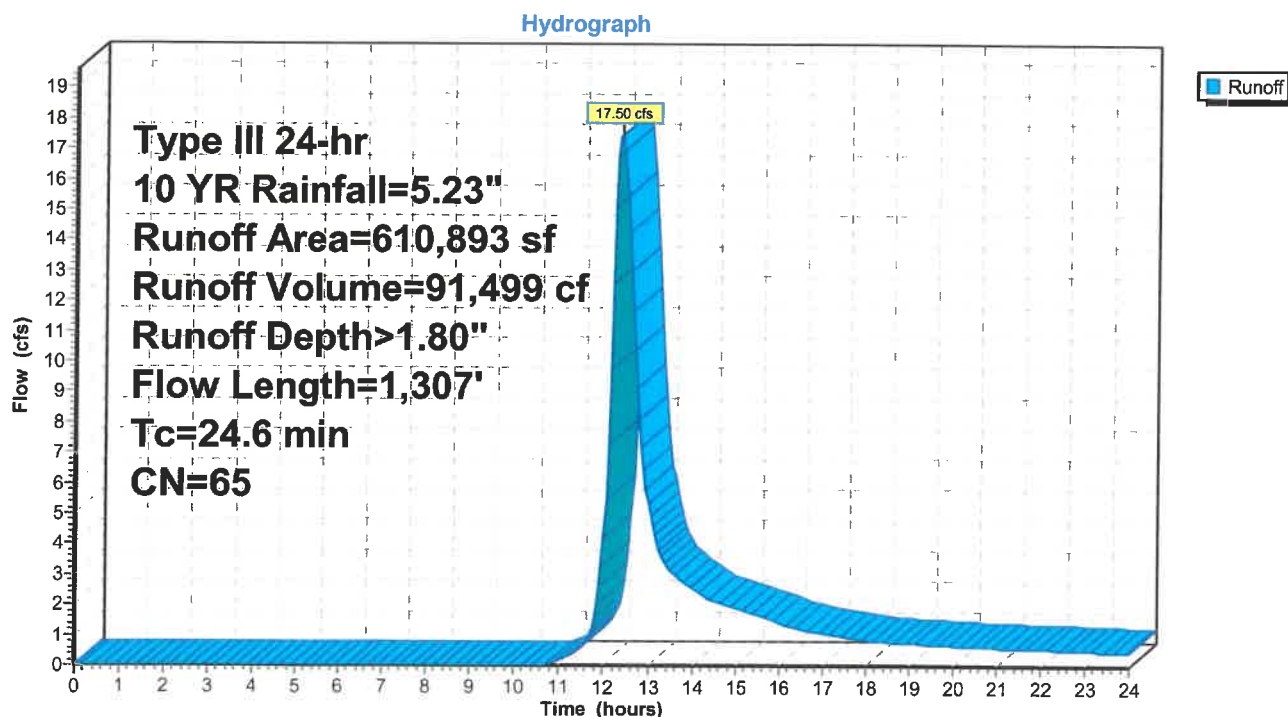
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
326,808	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
610,893	65	Weighted Average
610,893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
7.9	648	0.0750	1.37		Woods: Light underbrush n= 0.400 P2= 3.22" <b>Shallow Concentrated Flow, Shallow</b>
6.9	609	0.0200	1.47	1.76	Woodland Kv= 5.0 fps <b>Channel Flow, Stream</b>
					Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

### Subcatchment 14S: To Wetland



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**Summary for Subcatchment 15S: TO BASIN**

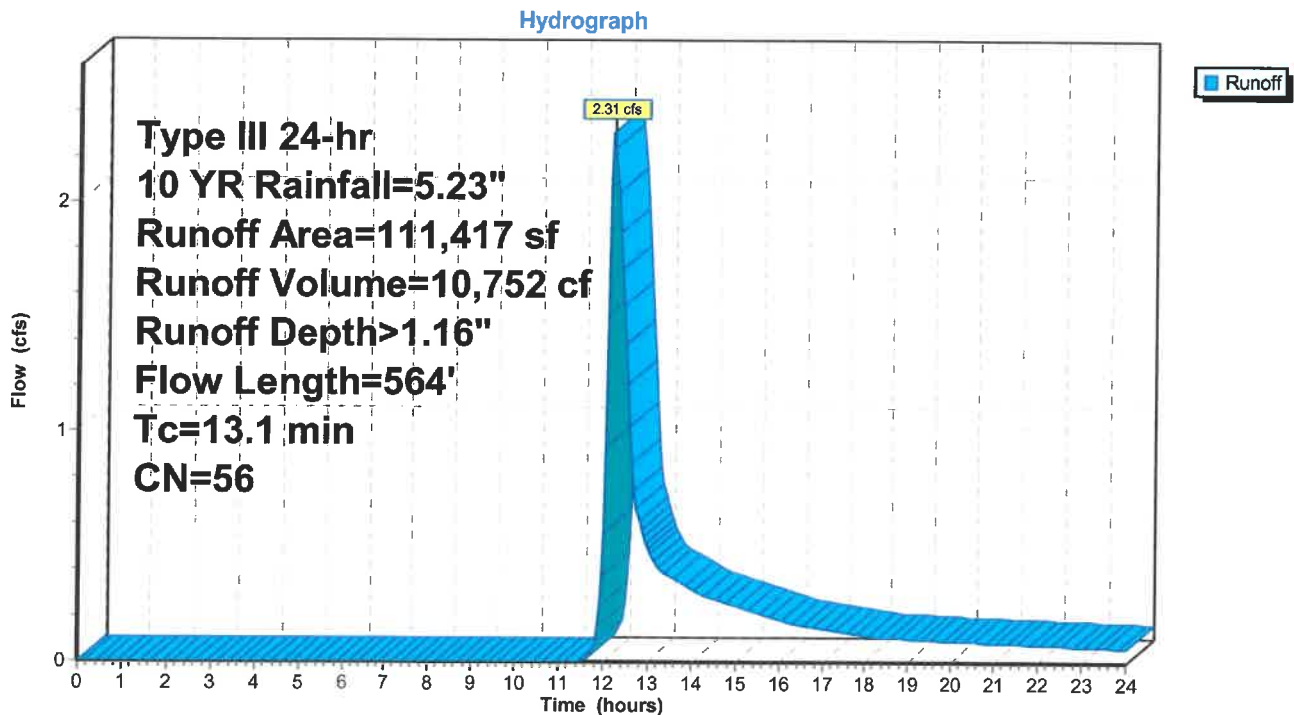
Runoff = 2.31 cfs @ 12.21 hrs, Volume= 10,752 cf, Depth&gt; 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
89,974	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
111,417	56	Weighted Average
111,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

**Subcatchment 15S: TO BASIN**



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### Summary for Subcatchment 16S: TO BASIN

Runoff = 1.97 cfs @ 12.19 hrs, Volume= 8,573 cf, Depth> 1.29"

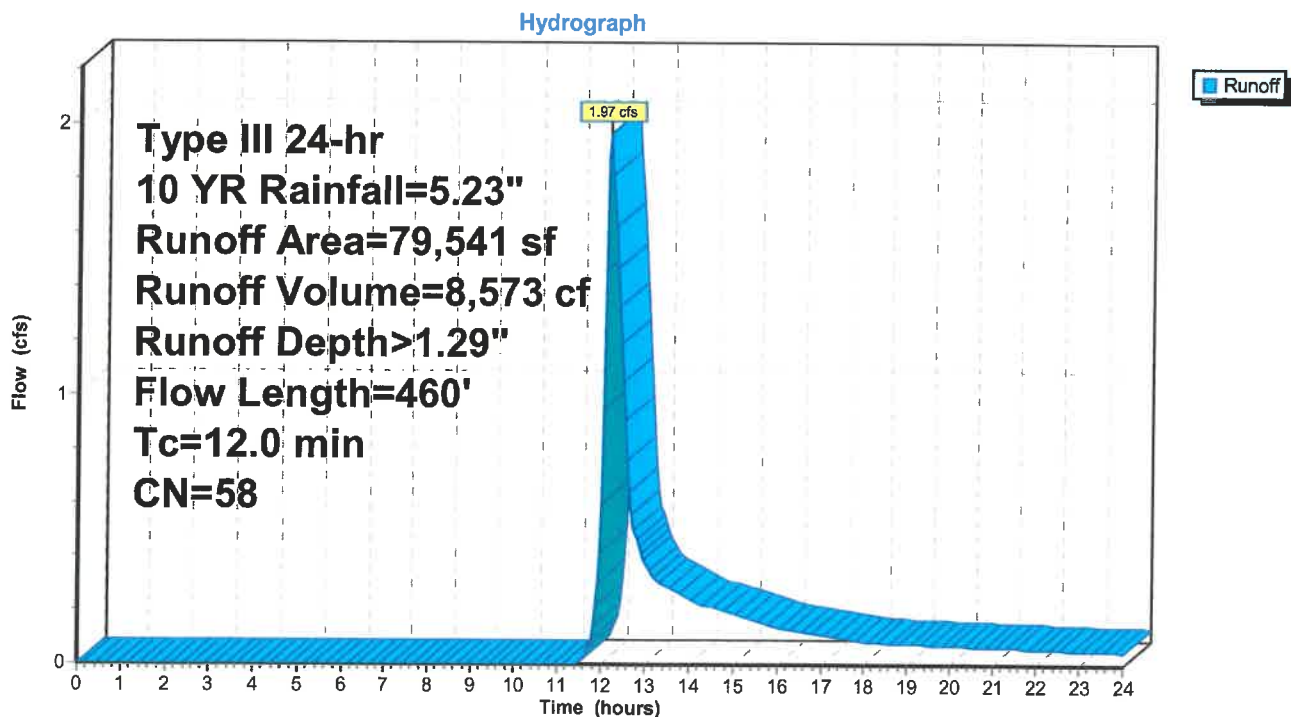
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		<b>Shallow Concentrated Flow,</b> Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

### Subcatchment 16S: TO BASIN



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**Summary for Subcatchment 17S: To Off Site**

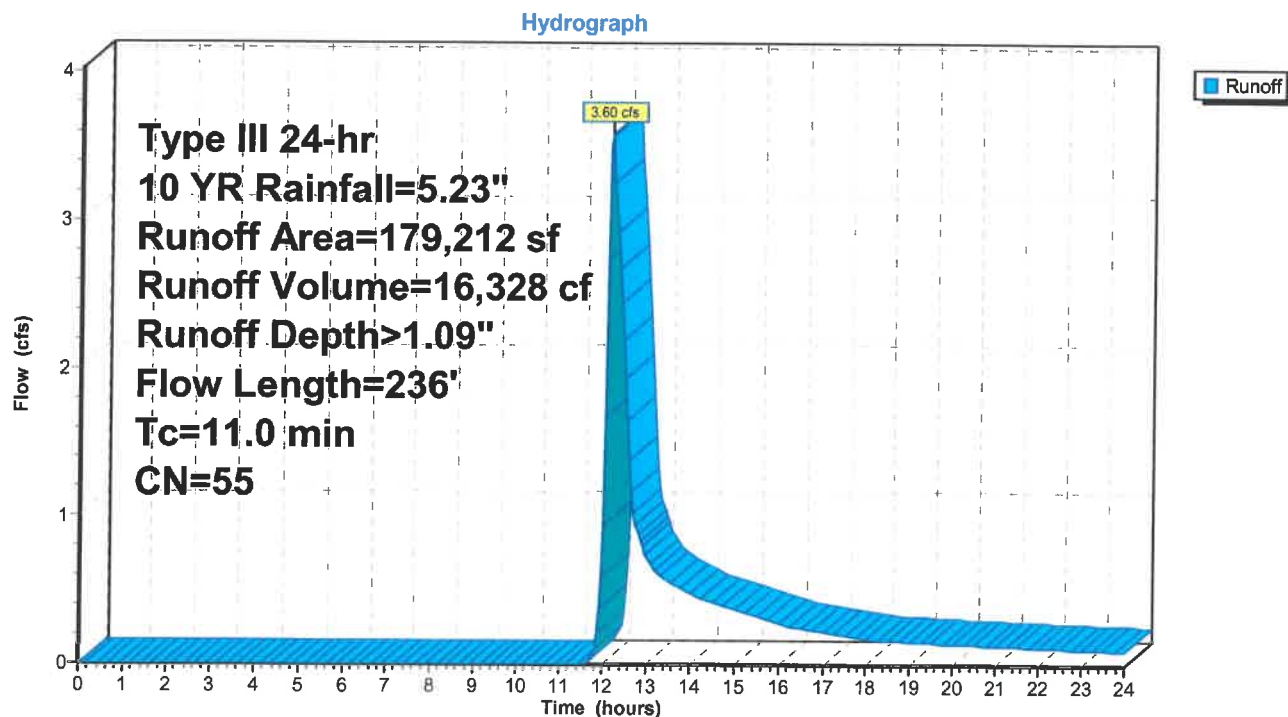
Runoff = 3.60 cfs @ 12.18 hrs, Volume= 16,328 cf, Depth&gt; 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
179,212	55	Woods, Good, HSG B
179,212		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	236	Total			

**Subcatchment 17S: To Off Site**

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### Summary for Subcatchment 19S: Area To Basin3

Runoff = 1.16 cfs @ 12.10 hrs, Volume= 3,933 cf, Depth> 1.51"

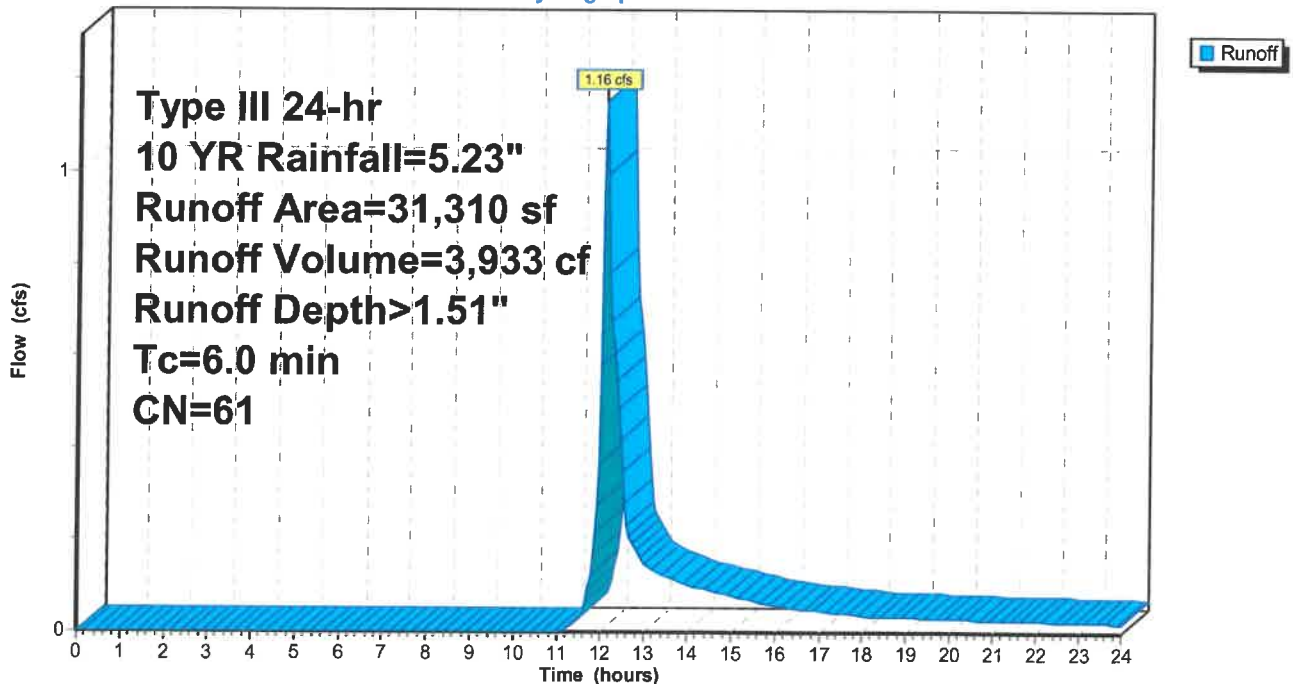
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
31,310	61	>75% Grass cover, Good, HSG B
31,310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, a-b

### Subcatchment 19S: Area To Basin3

Hydrograph



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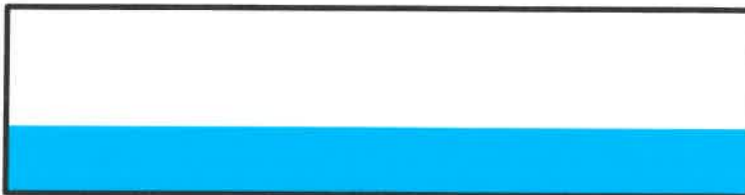
### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 1.50" for 10 YR event  
Inflow = 10.78 cfs @ 12.43 hrs, Volume= 61,489 cf  
Outflow = 10.77 cfs @ 12.43 hrs, Volume= 61,476 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.41 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 2.91 fps, Avg. Travel Time= 0.3 min

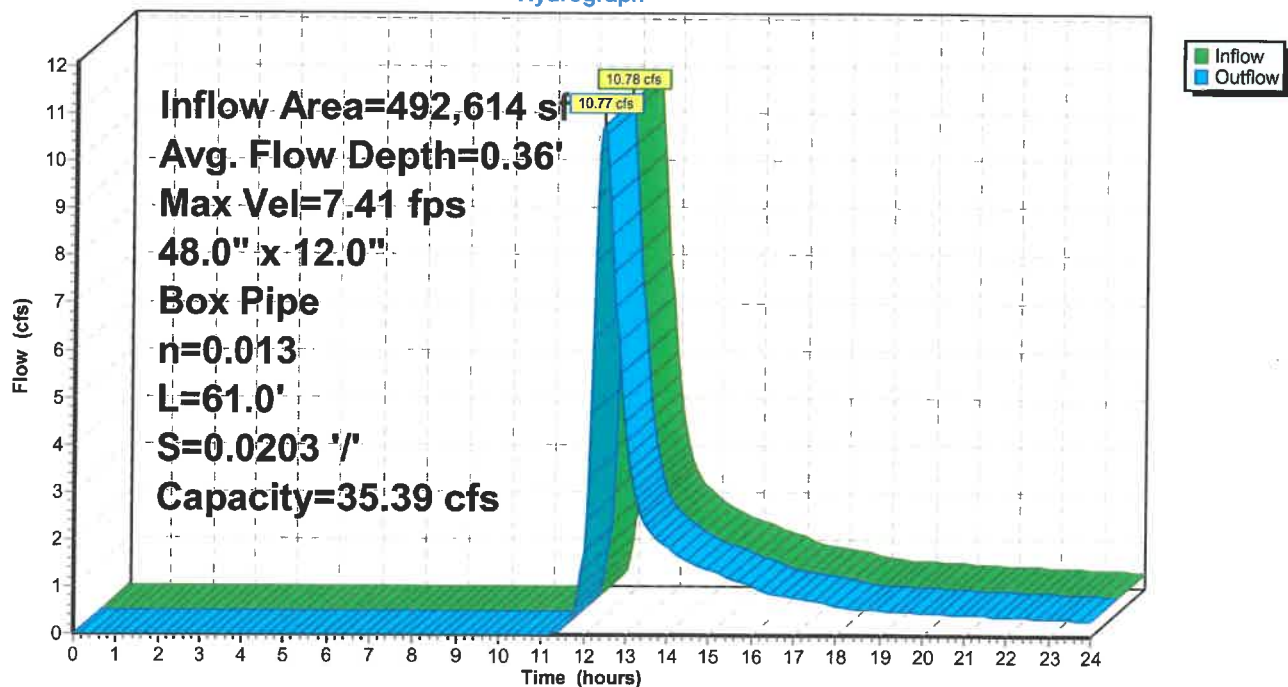
Peak Storage= 89 cf @ 12.43 hrs  
Average Depth at Peak Storage= 0.36', Surface Width= 4.00'  
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe  
n= 0.013 Concrete, trowel finish  
Length= 61.0' Slope= 0.0203 '/'  
Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

Hydrograph



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### Summary for Reach 2R: New Box Cumvert

Inflow Area = 3,247,549 sf, 4.18% Impervious, Inflow Depth > 1.20" for 10 YR event  
Inflow = 28.52 cfs @ 13.13 hrs, Volume= 325,405 cf  
Outflow = 28.51 cfs @ 13.13 hrs, Volume= 325,378 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 10.52 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 5.53 fps, Avg. Travel Time= 0.1 min

Peak Storage= 92 cf @ 13.13 hrs

Average Depth at Peak Storage= 0.27' , Surface Width= 10.00'

Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 659.84 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished

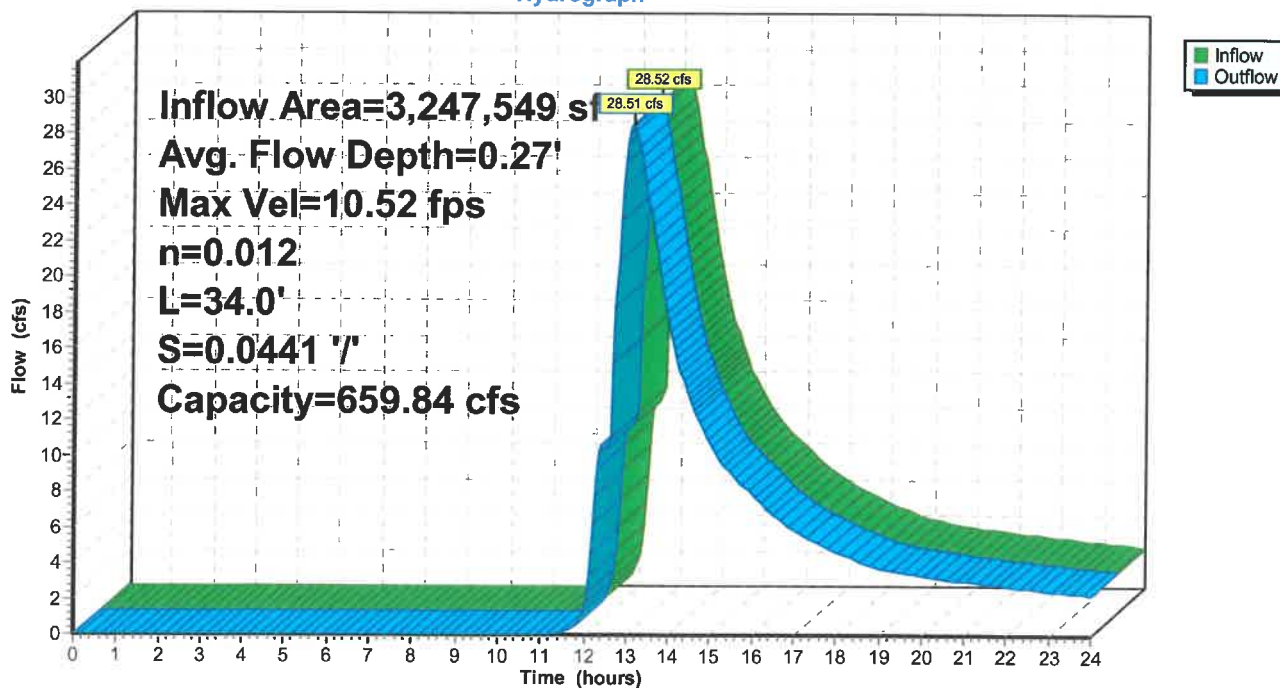
Length= 34.0' Slope= 0.0441 '/'

Inlet Invert= 294.00', Outlet Invert= 292.50'



### Reach 2R: New Box Cumvert

Hydrograph



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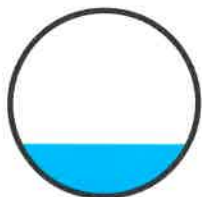
### Summary for Reach 3R: CB1 to DMH 1

Inflow Area = 13,094 sf, 84.66% Impervious, Inflow Depth > 4.31" for 10 YR event  
Inflow = 1.41 cfs @ 12.09 hrs, Volume= 4,704 cf  
Outflow = 1.41 cfs @ 12.09 hrs, Volume= 4,704 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.68 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.54 fps, Avg. Travel Time= 0.0 min

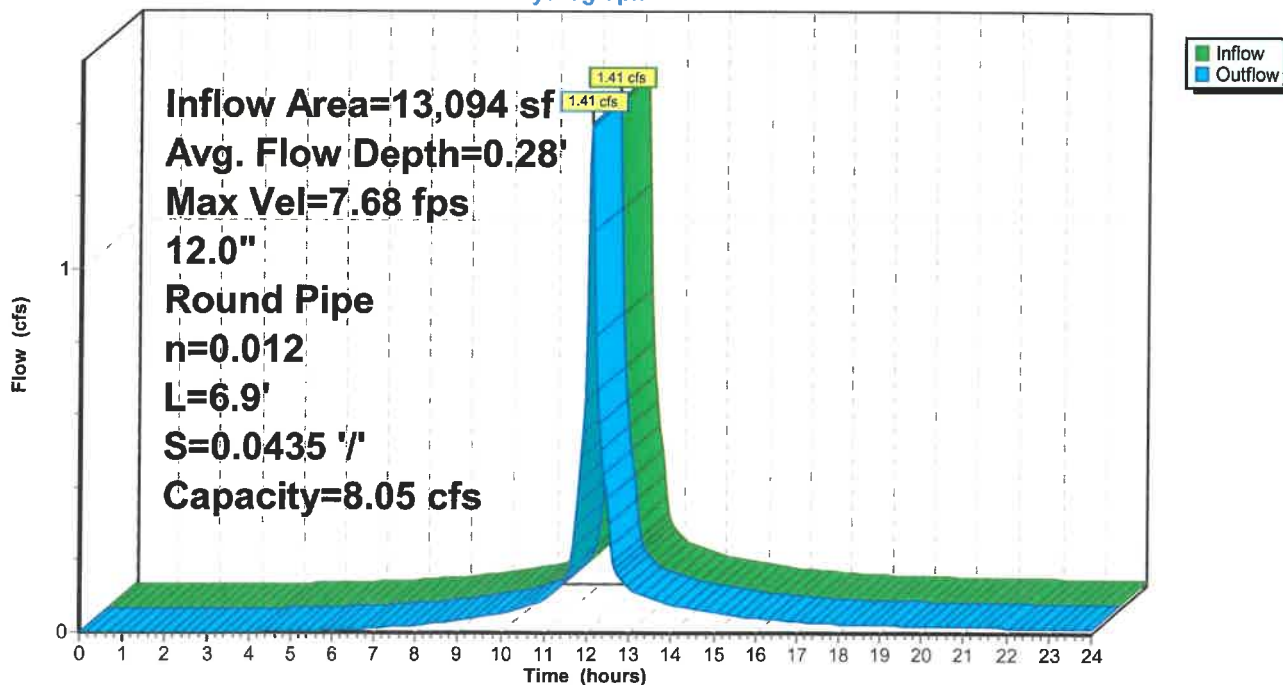
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.28' , Surface Width= 0.90'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.9' Slope= 0.0435 '/'  
Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 3R: CB1 to DMH 1

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### Summary for Reach 4R: CB2 to DMH 1

Inflow Area = 11,319 sf, 94.70% Impervious, Inflow Depth > 4.76" for 10 YR event  
Inflow = 1.28 cfs @ 12.09 hrs, Volume= 4,488 cf  
Outflow = 1.28 cfs @ 12.09 hrs, Volume= 4,488 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.48 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 2.47 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.27' , Surface Width= 0.89'

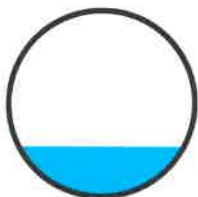
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

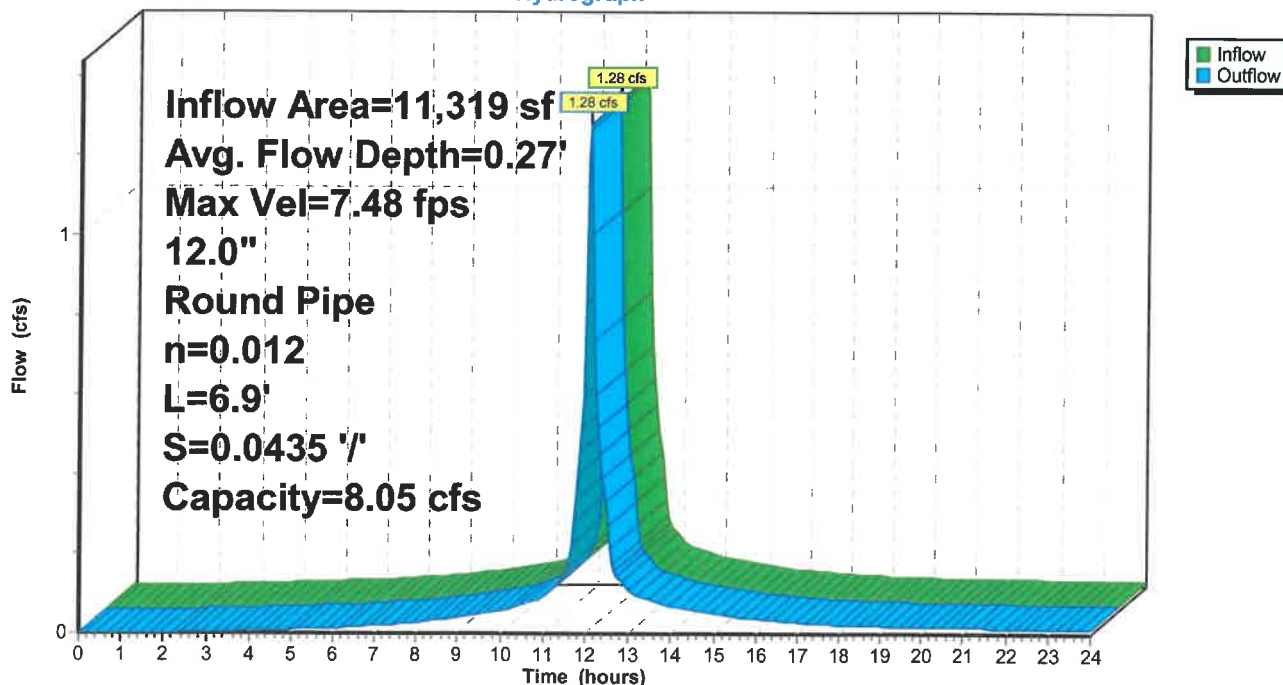
Length= 6.9' Slope= 0.0435 '/'

Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 4R: CB2 to DMH 1

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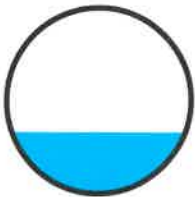
### Summary for Reach 5R: DMH1 to DMH 2

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 4.52" for 10 YR event  
Inflow = 2.68 cfs @ 12.09 hrs, Volume= 9,192 cf  
Outflow = 2.66 cfs @ 12.09 hrs, Volume= 9,190 cf, Atten= 1%, Lag= 0.4 min

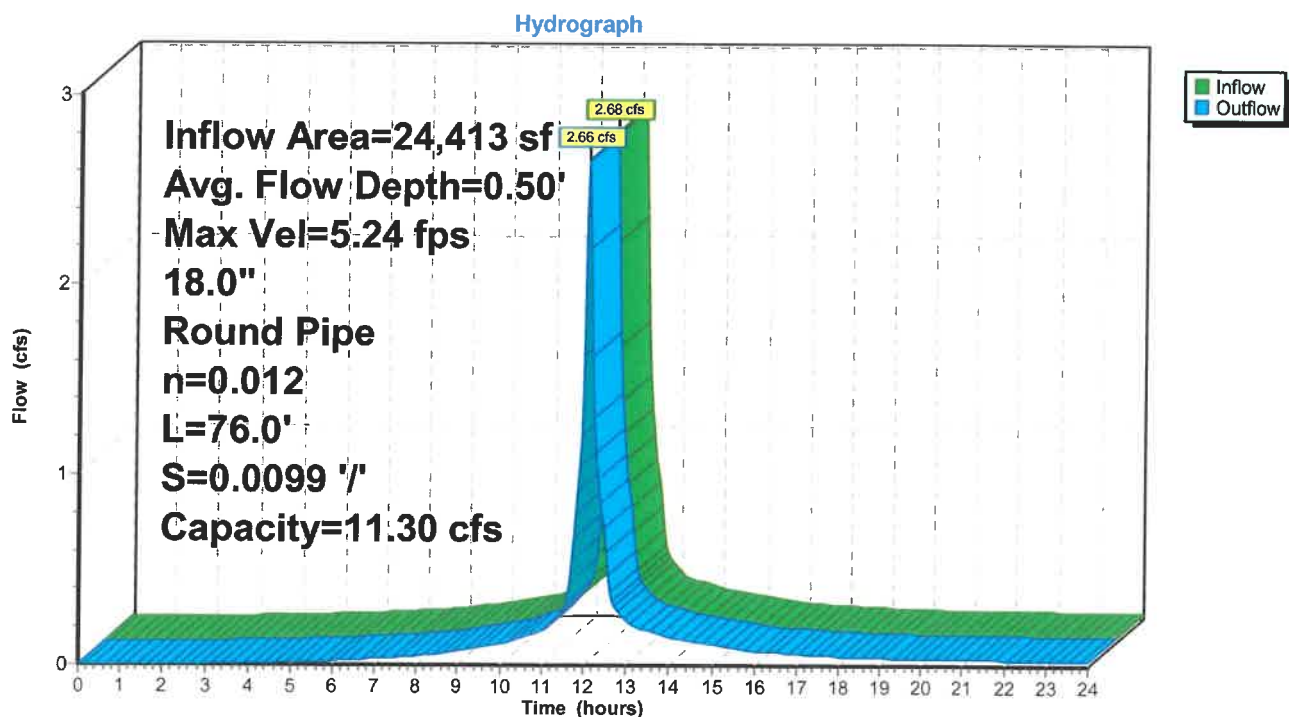
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.24 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 1.70 fps, Avg. Travel Time= 0.7 min

Peak Storage= 39 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.50', Surface Width= 1.41'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.30 cfs

18.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 76.0' Slope= 0.0099 '/'  
Inlet Invert= 291.75', Outlet Invert= 291.00'



### Reach 5R: DMH1 to DMH 2



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### Summary for Reach 6R: CB3 to DMH 2

Inflow Area = 3,124 sf, 75.00% Impervious, Inflow Depth > 3.99" for 10 YR event  
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf  
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.11 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.72 fps, Avg. Travel Time= 0.1 min

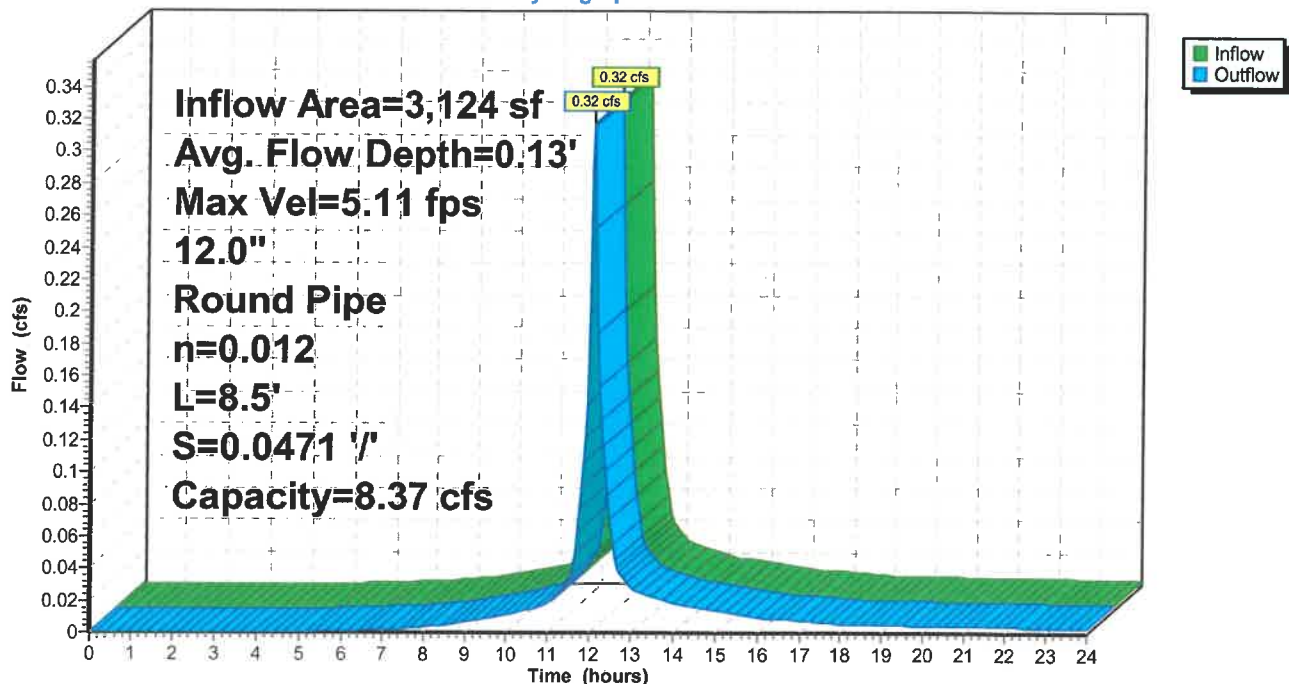
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.13', Surface Width= 0.68'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 8.5' Slope= 0.0471 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 6R: CB3 to DMH 2

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### Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 2,550 sf, 75.02% Impervious, Inflow Depth > 3.99" for 10 YR event  
Inflow = 0.26 cfs @ 12.09 hrs, Volume= 848 cf  
Outflow = 0.26 cfs @ 12.09 hrs, Volume= 848 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.04 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.36 fps, Avg. Travel Time= 0.2 min

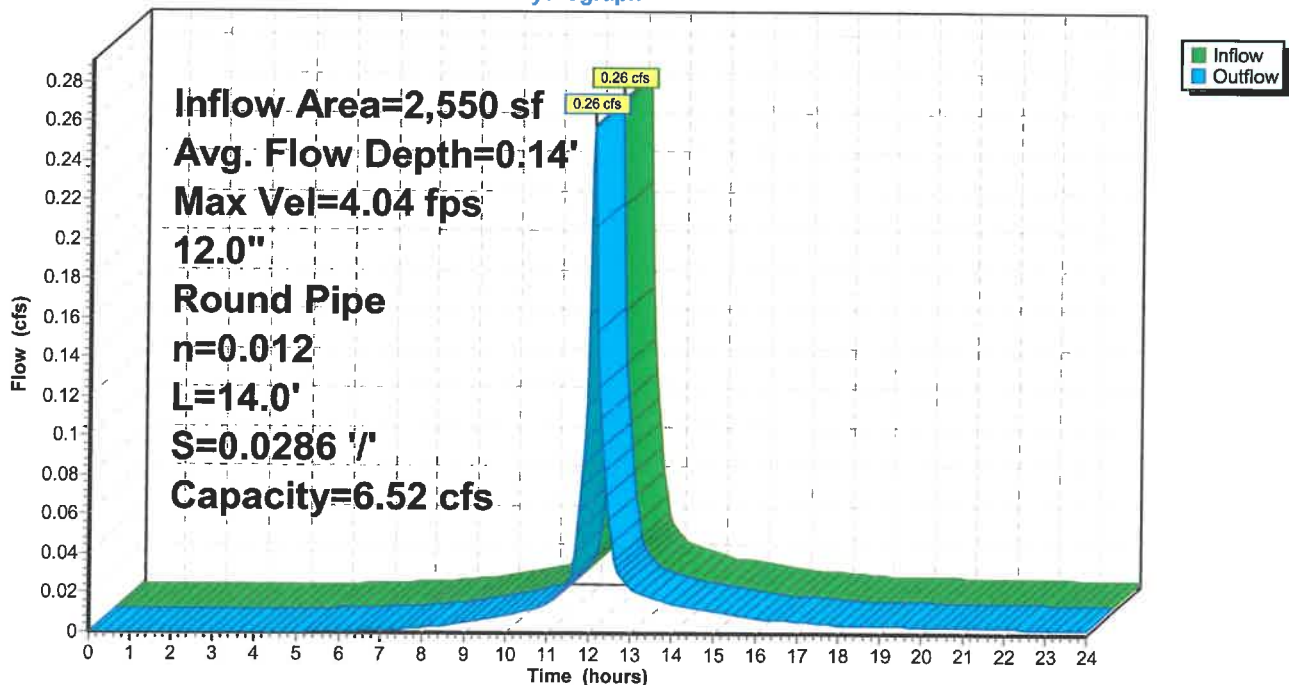
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.14', Surface Width= 0.69'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.52 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 14.0' Slope= 0.0286 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 7R: CB4 to DMH 2

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### Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 4.02" for 10 YR event  
Inflow = 1.29 cfs @ 12.10 hrs, Volume= 4,305 cf  
Outflow = 1.25 cfs @ 12.12 hrs, Volume= 4,302 cf, Atten= 4%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.46 fps, Min. Travel Time= 0.7 min

Avg. Velocity= 1.77 fps, Avg. Travel Time= 2.3 min

Peak Storage= 57 cf @ 12.11 hrs

Average Depth at Peak Storage= 0.29' , Surface Width= 1.18'

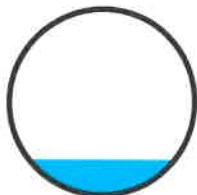
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.09 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

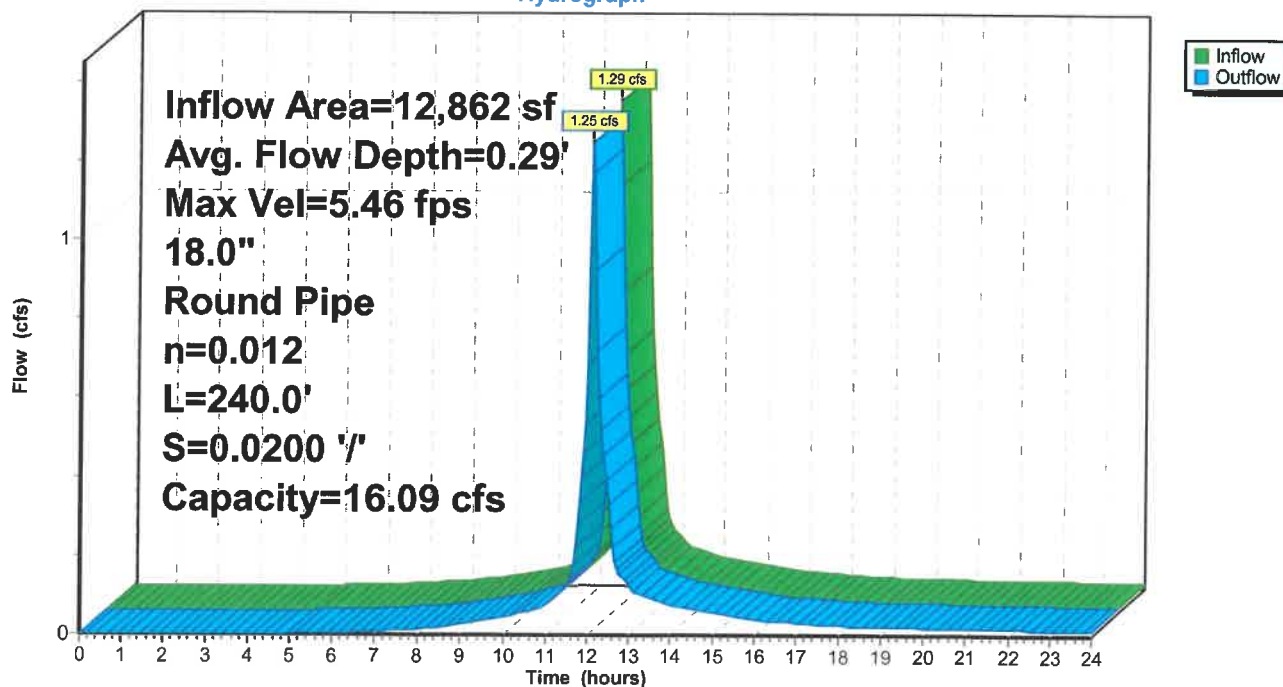
Length= 240.0' Slope= 0.0200 '/'

Inlet Invert= 294.80', Outlet Invert= 290.00'



### Reach 8R: DMH 2 TO DMH 7

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### Summary for Reach 9R: DMH 3 to DMH 2

Inflow Area = 7,188 sf, 76.42% Impervious, Inflow Depth > 4.04" for 10 YR event  
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 2,420 cf  
Outflow = 0.72 cfs @ 12.10 hrs, Volume= 2,419 cf, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.91 fps, Min. Travel Time= 0.4 min  
Avg. Velocity= 2.56 fps, Avg. Travel Time= 1.4 min

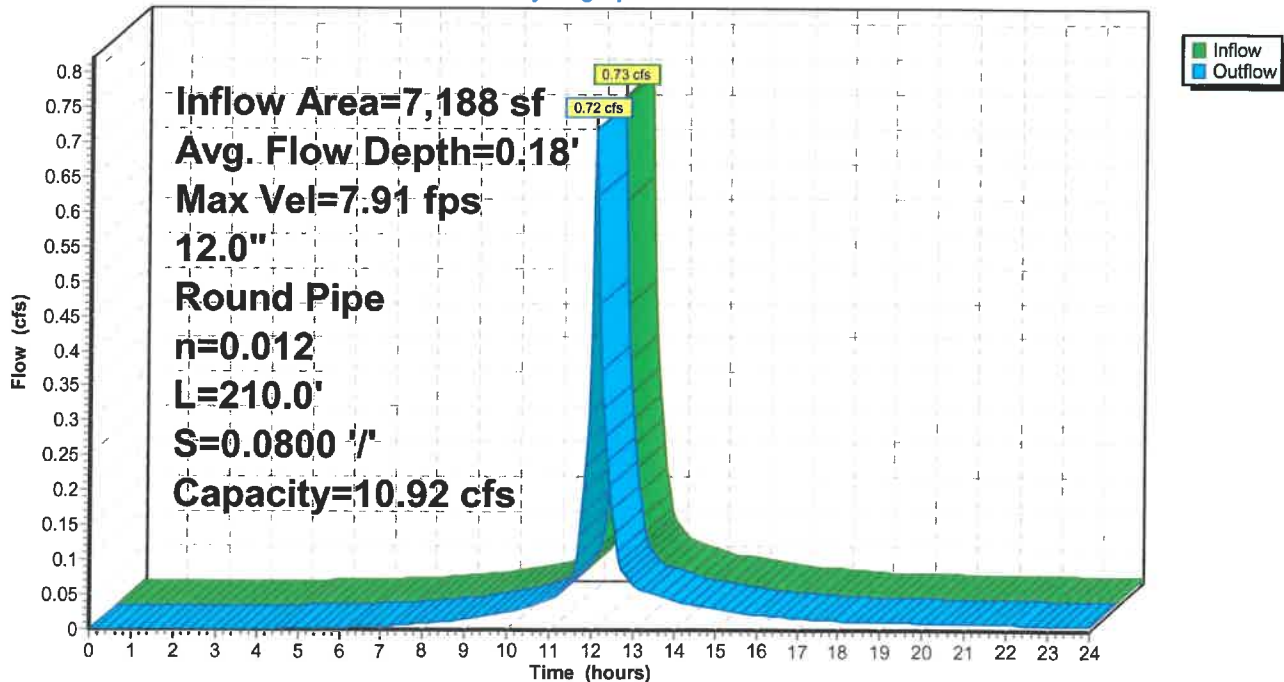
Peak Storage= 19 cf @ 12.10 hrs  
Average Depth at Peak Storage= 0.18' , Surface Width= 0.76'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 210.0' Slope= 0.0800 '/'  
Inlet Invert= 315.40', Outlet Invert= 298.60'



### Reach 9R: DMH 3 to DMH 2

Hydrograph





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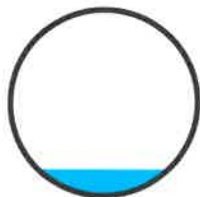
### Summary for Reach 10R: CB5 to DMH 3

Inflow Area = 3,692 sf, 67.52% Impervious, Inflow Depth > 3.68" for 10 YR event  
Inflow = 0.35 cfs @ 12.09 hrs, Volume= 1,132 cf  
Outflow = 0.35 cfs @ 12.09 hrs, Volume= 1,132 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.15 fps, Min. Travel Time= 0.0 min  
Avg. Velocity = 1.75 fps, Avg. Travel Time= 0.1 min

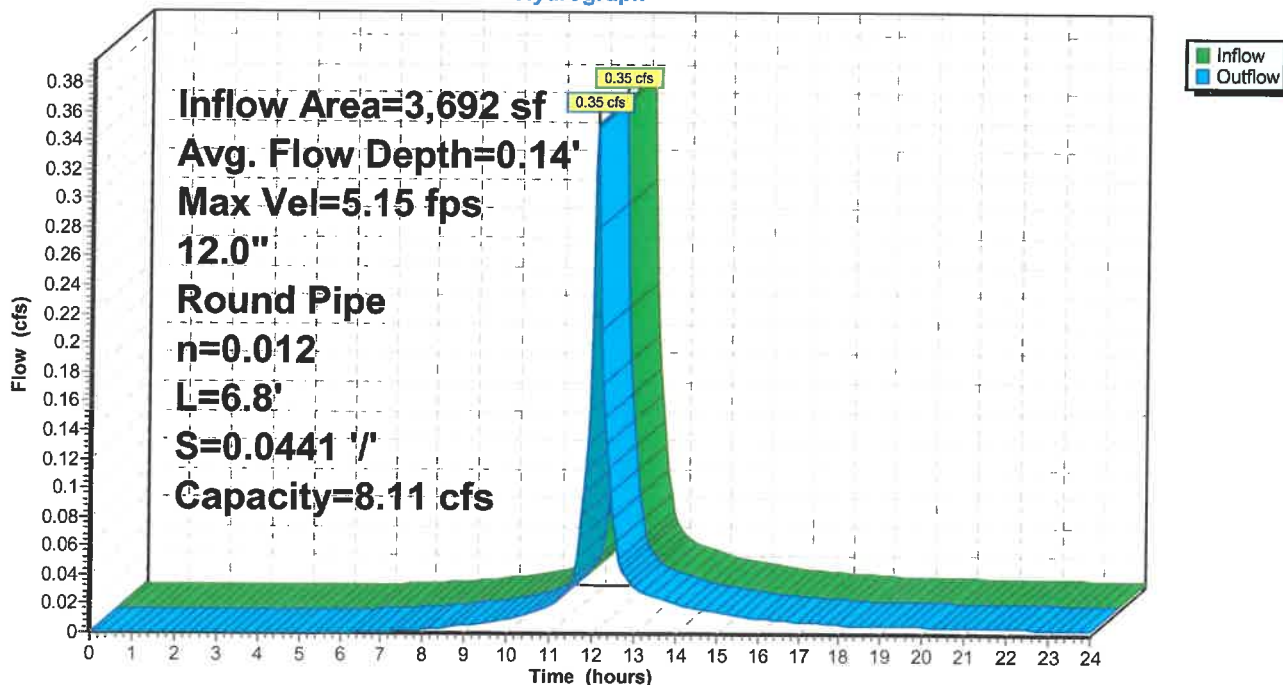
Peak Storage= 0 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.14' , Surface Width= 0.70'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.11 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.8' Slope= 0.0441 '/'  
Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 10R: CB5 to DMH 3

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### Summary for Reach 11R: CB6 to DMH 3

Inflow Area = 3,496 sf, 85.81% Impervious, Inflow Depth > 4.42" for 10 YR event  
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 1,288 cf  
Outflow = 0.38 cfs @ 12.09 hrs, Volume= 1,288 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.15 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.37 fps, Avg. Travel Time= 0.2 min

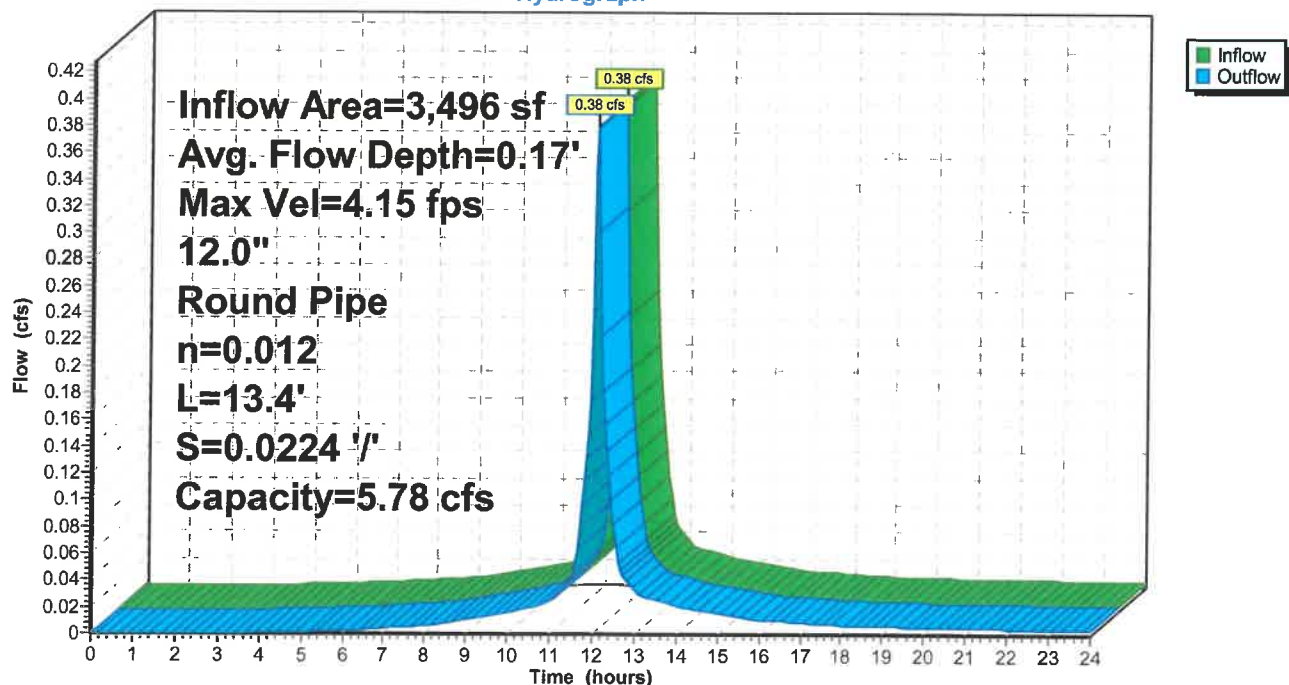
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.17', Surface Width= 0.76'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.78 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 13.4' Slope= 0.0224 '/'  
Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 11R: CB6 to DMH 3

Hydrograph



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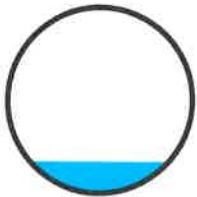
### Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 4.01" for 10 YR event  
Inflow = 1.25 cfs @ 12.12 hrs, Volume= 4,302 cf  
Outflow = 1.21 cfs @ 12.14 hrs, Volume= 4,300 cf, Atten= 3%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.11 fps, Min. Travel Time= 0.7 min  
Avg. Velocity= 2.03 fps, Avg. Travel Time= 2.0 min

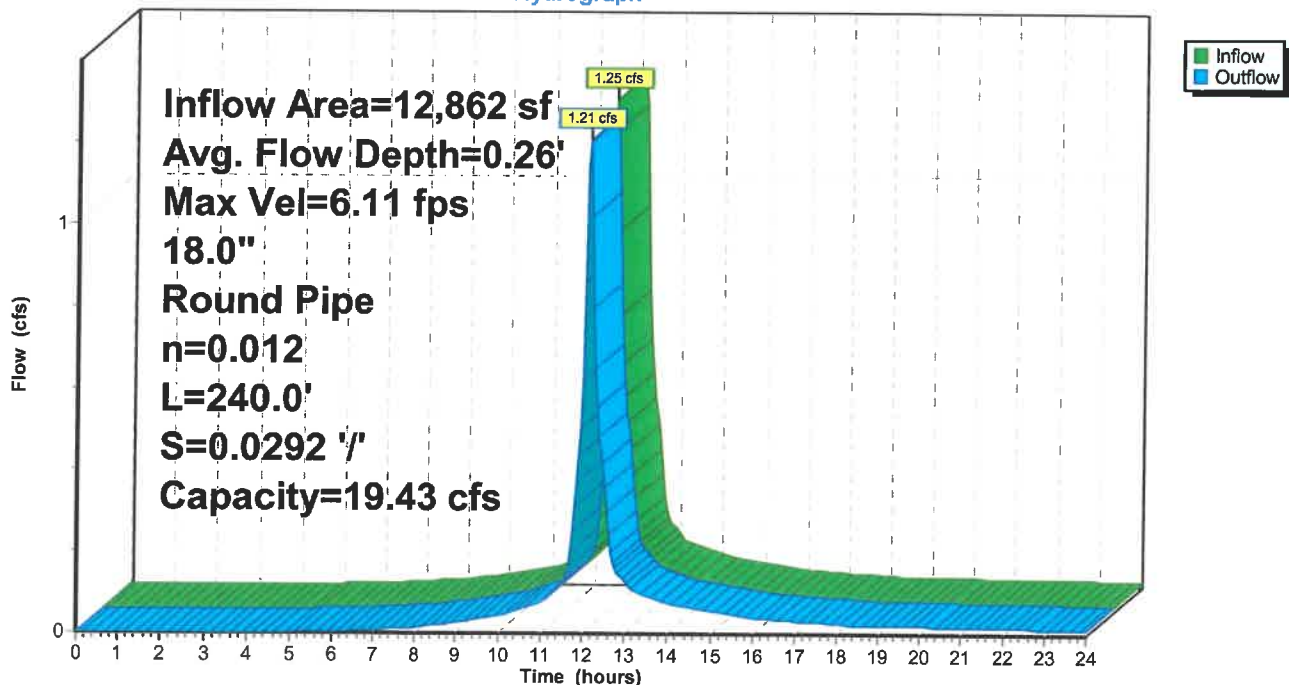
Peak Storage= 48 cf @ 12.13 hrs  
Average Depth at Peak Storage= 0.26', Surface Width= 1.13'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.43 cfs

18.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 240.0' Slope= 0.0292 '/'  
Inlet Invert= 290.00', Outlet Invert= 283.00'



### Reach 12R: DMH 7 TO BASIN

Hydrograph



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### Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 3.68" for 10 YR event  
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,334 cf  
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,334 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 1.69 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.16', Surface Width= 0.74'

Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

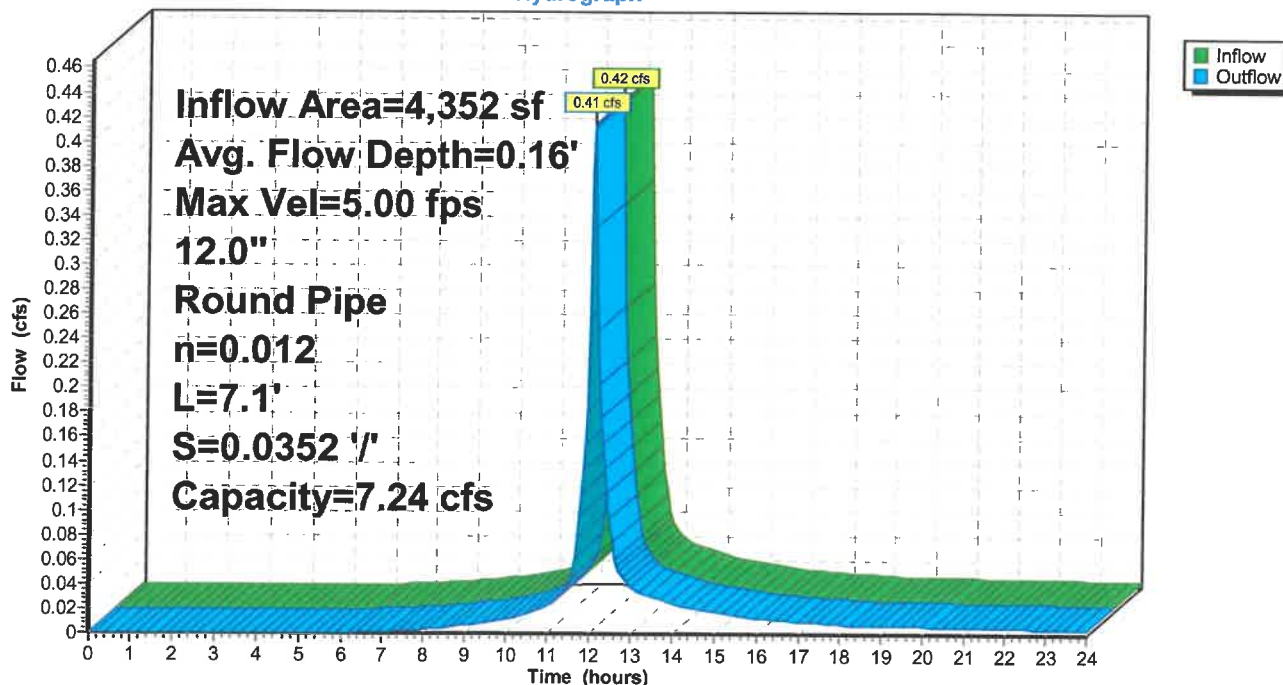
Length= 7.1' Slope= 0.0352 '/'

Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 13R: CB7 TO DMH 4

Hydrograph



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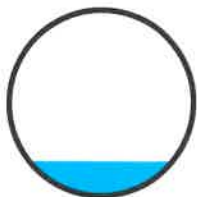
### Summary for Reach 14R: CB 8 TO DMH 4

Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 3.88" for 10 YR event  
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,320 cf  
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,320 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.97 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.33 fps, Avg. Travel Time= 0.2 min

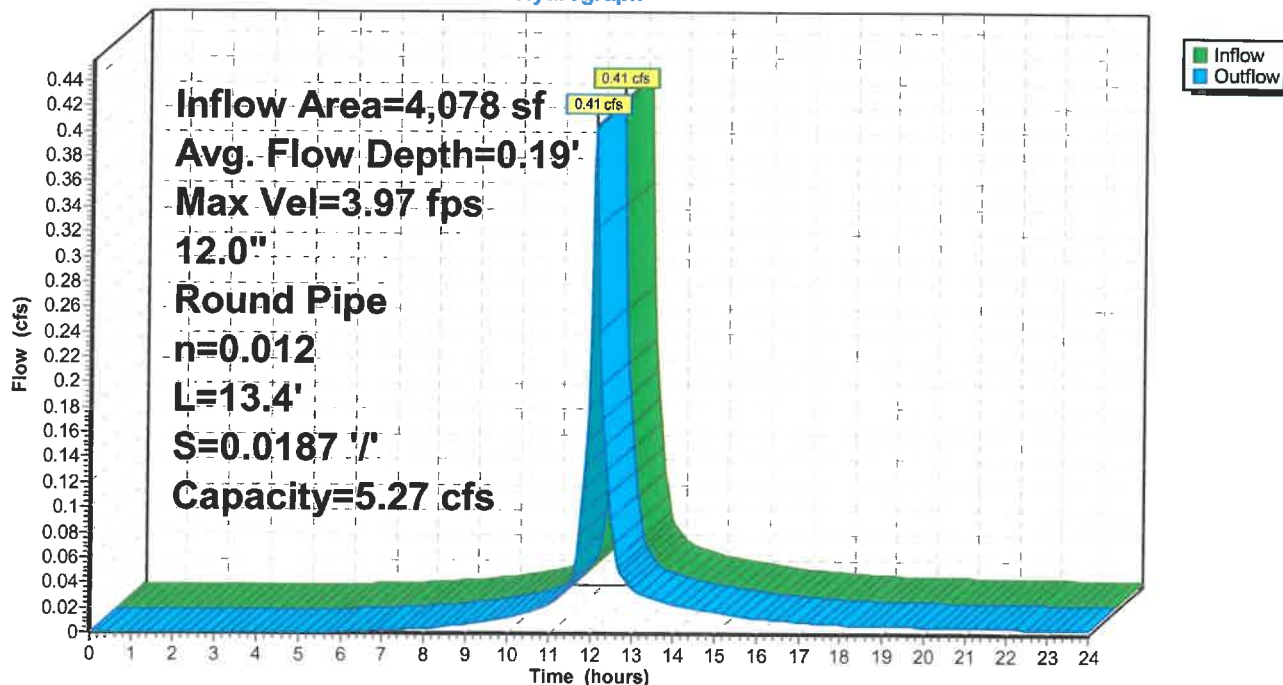
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.19', Surface Width= 0.78'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 13.4' Slope= 0.0187 '/'  
Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 14R: CB 8 TO DMH 4

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### Summary for Reach 15R: DMH 4 TO DMH 5

Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 3.78" for 10 YR event  
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 2,655 cf  
Outflow = 0.82 cfs @ 12.10 hrs, Volume= 2,654 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.18 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 2.73 fps, Avg. Travel Time= 0.6 min

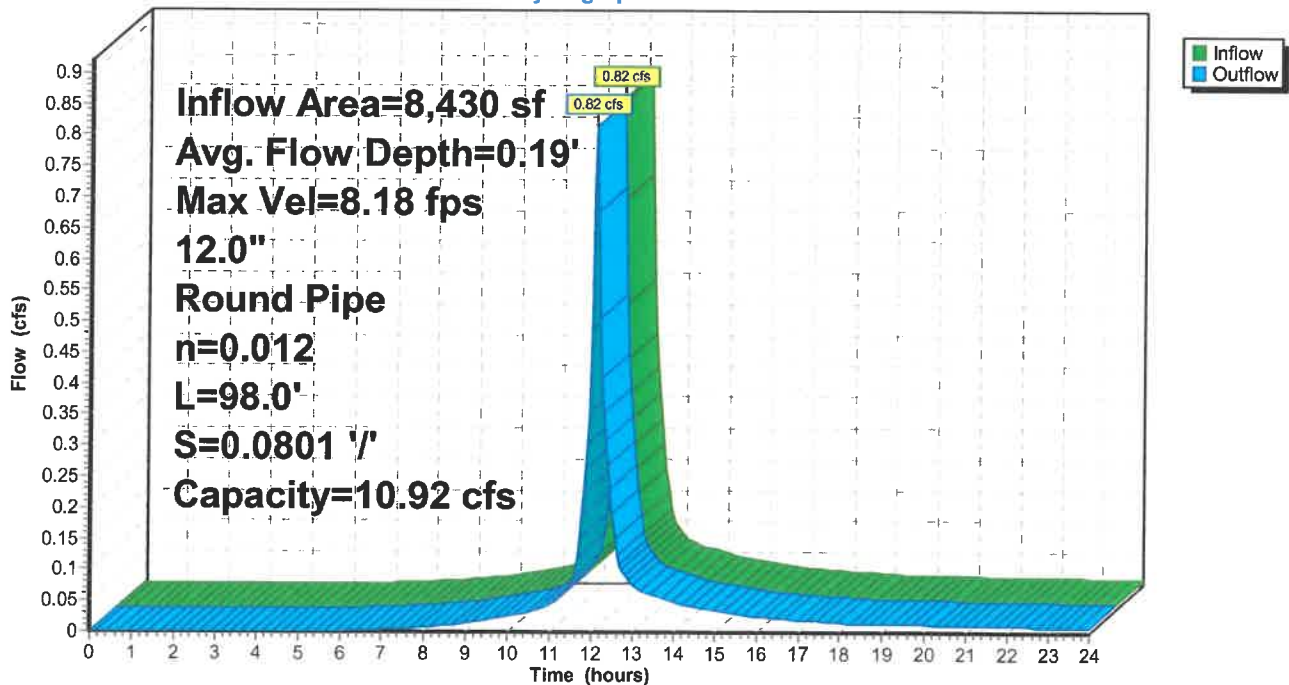
Peak Storage= 10 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.19' , Surface Width= 0.78'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 98.0' Slope= 0.0801 '/'  
Inlet Invert= 316.20', Outlet Invert= 308.35'



### Reach 15R: DMH 4 TO DMH 5

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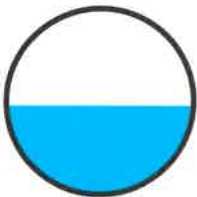
### Summary for Reach 16R: DMH 5 TO DMH 6

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 3.47" for 10 YR event  
Inflow = 3.30 cfs @ 12.10 hrs, Volume= 10,628 cf  
Outflow = 3.18 cfs @ 12.12 hrs, Volume= 10,620 cf, Atten= 4%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.64 fps, Min. Travel Time= 0.7 min  
Avg. Velocity= 1.90 fps, Avg. Travel Time= 2.1 min

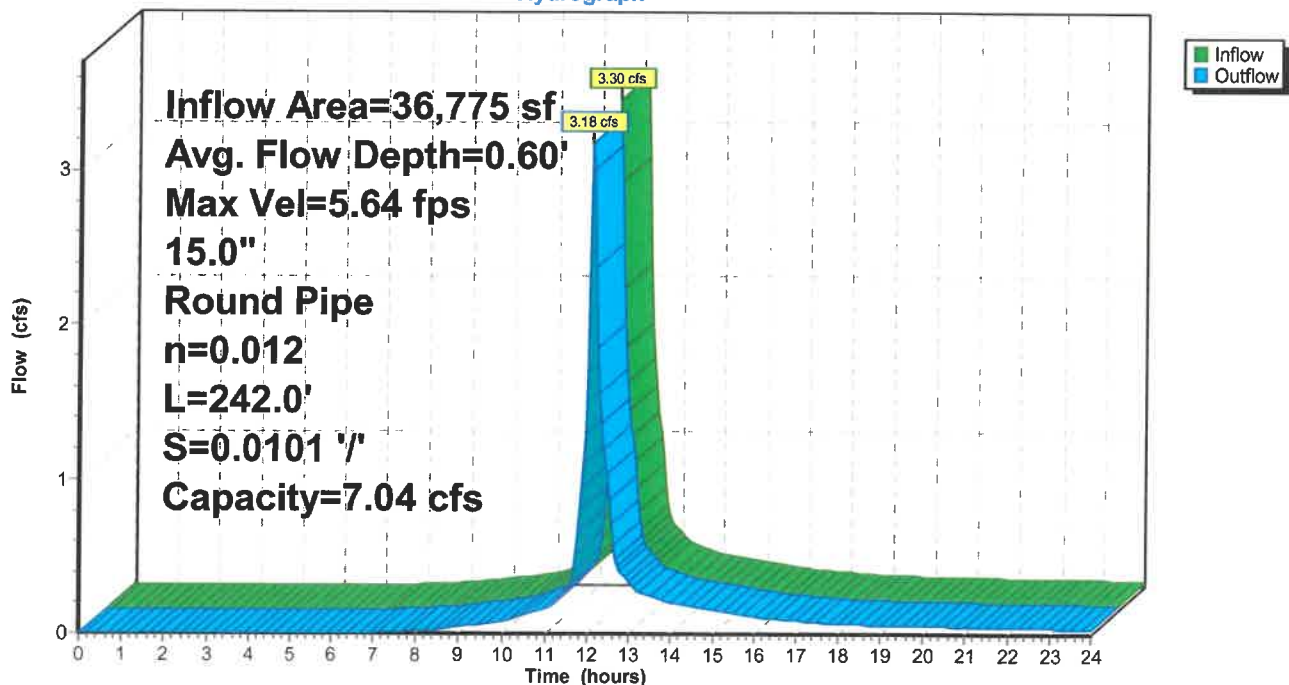
Peak Storage= 141 cf @ 12.11 hrs  
Average Depth at Peak Storage= 0.60', Surface Width= 1.25'  
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 242.0' Slope= 0.0101 '/'  
Inlet Invert= 308.10', Outlet Invert= 305.65'



### Reach 16R: DMH 5 TO DMH 6

Hydrograph



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### Summary for Reach 17R: DMH 6 TO DMH 5

Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 3.38" for 10 YR event  
Inflow = 2.51 cfs @ 12.09 hrs, Volume= 7,975 cf  
Outflow = 2.48 cfs @ 12.10 hrs, Volume= 7,974 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.79 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 2.37 fps, Avg. Travel Time= 0.7 min

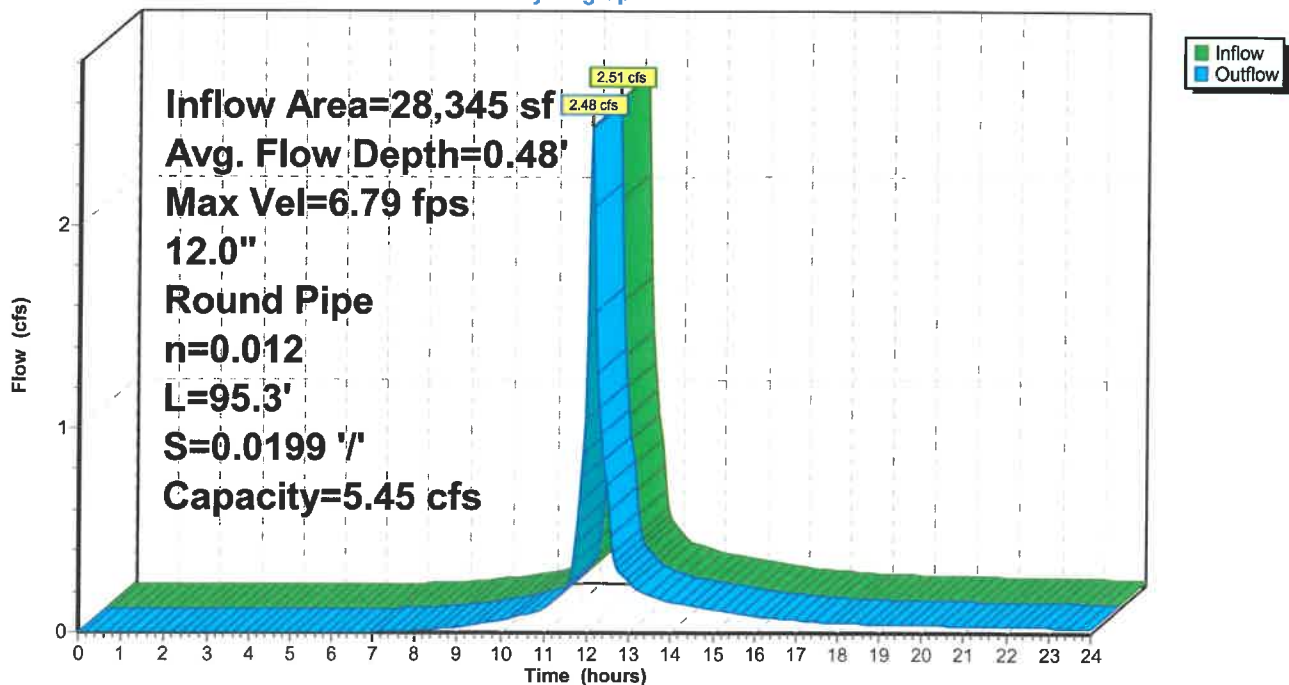
Peak Storage= 35 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.48' , Surface Width= 1.00'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 95.3' Slope= 0.0199 '/'  
Inlet Invert= 310.25', Outlet Invert= 308.35'



### Reach 17R: DMH 6 TO DMH 5

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### Summary for Reach 18R: CB 10 TO DMH 6

Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 3.28" for 10 YR event  
Inflow = 1.28 cfs @ 12.09 hrs, Volume= 4,047 cf  
Outflow = 1.27 cfs @ 12.09 hrs, Volume= 4,047 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.60 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.96 fps, Avg. Travel Time= 0.1 min

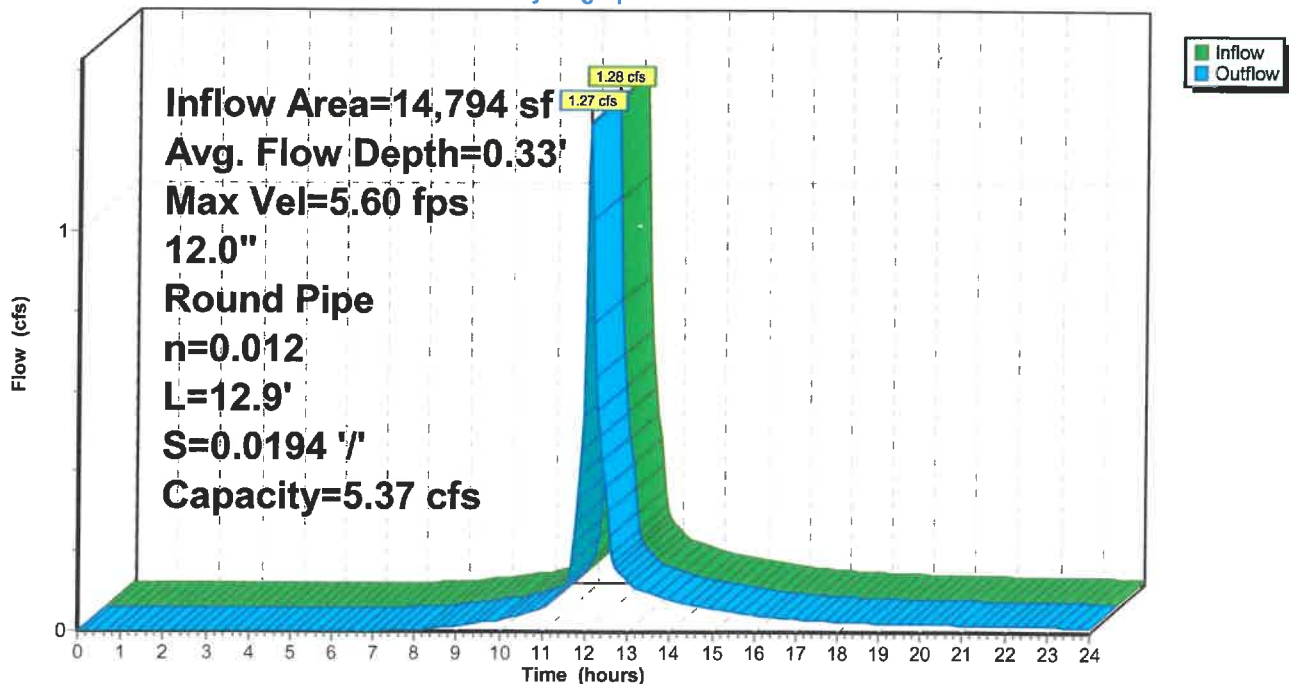
Peak Storage= 3 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.33', Surface Width= 0.94'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 12.9' Slope= 0.0194 '/'  
Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 18R: CB 10 TO DMH 6

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### Summary for Reach 19R: CB 9 TO DMH 6

Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 3.48" for 10 YR event  
Inflow = 1.23 cfs @ 12.09 hrs, Volume= 3,928 cf  
Outflow = 1.23 cfs @ 12.09 hrs, Volume= 3,928 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.90 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 2.37 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.28' , Surface Width= 0.90'

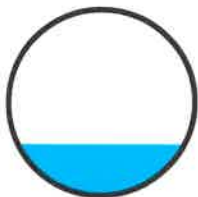
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

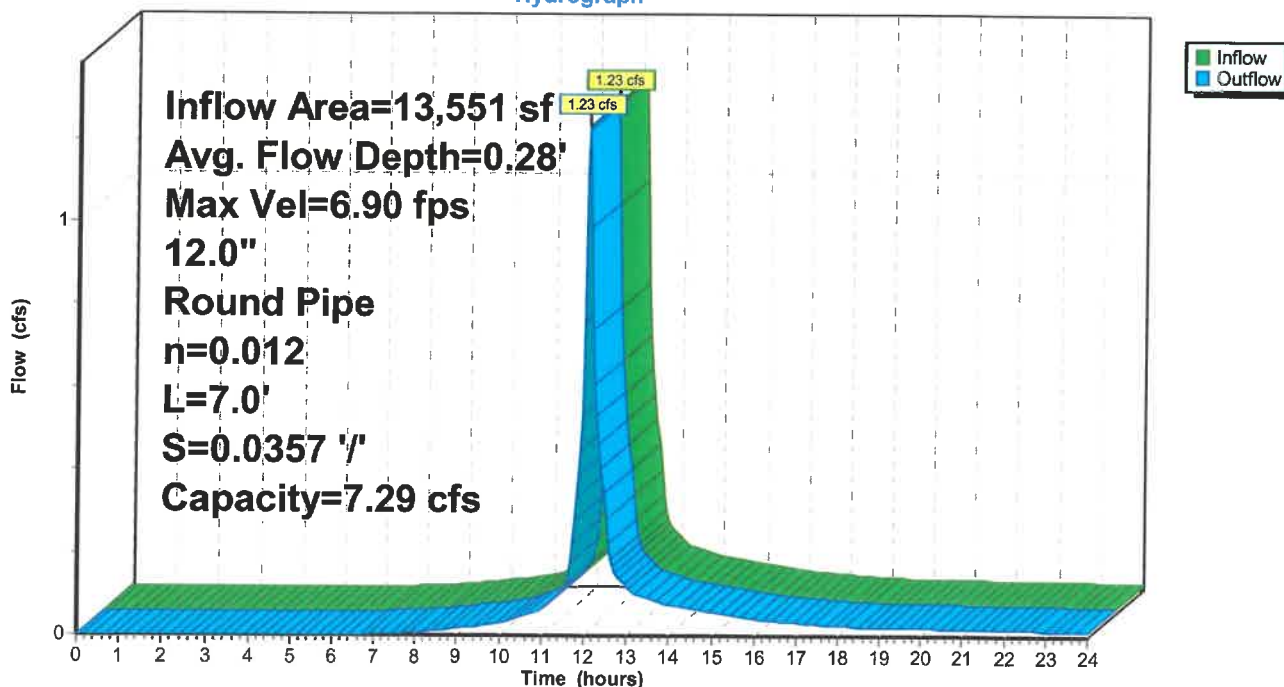
Length= 7.0' Slope= 0.0357 '/'

Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 19R: CB 9 TO DMH 6

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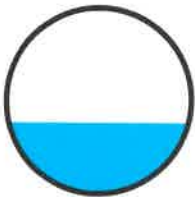
### Summary for Reach 20R: DMH 6 to Basin

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 3.47" for 10 YR event  
Inflow = 3.18 cfs @ 12.12 hrs, Volume= 10,620 cf  
Outflow = 3.17 cfs @ 12.12 hrs, Volume= 10,620 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.34 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 2.48 fps, Avg. Travel Time= 0.2 min

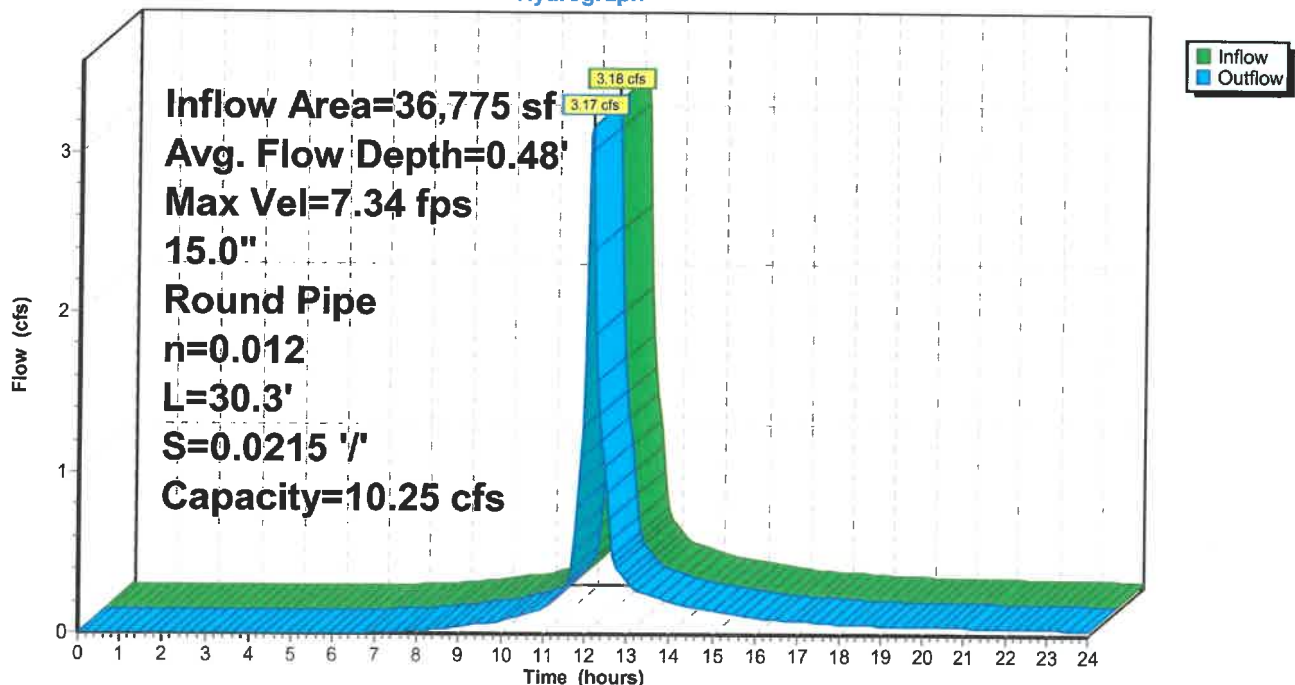
Peak Storage= 13 cf @ 12.12 hrs  
Average Depth at Peak Storage= 0.48', Surface Width= 1.22'  
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 30.3' Slope= 0.0215 '/'  
Inlet Invert= 305.65', Outlet Invert= 305.00'



### Reach 20R: DMH 6 to Basin

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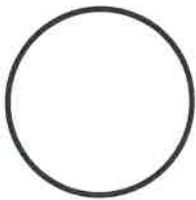
### Summary for Reach 21R: 2-8" DI

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth = 0.00" for 10 YR event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

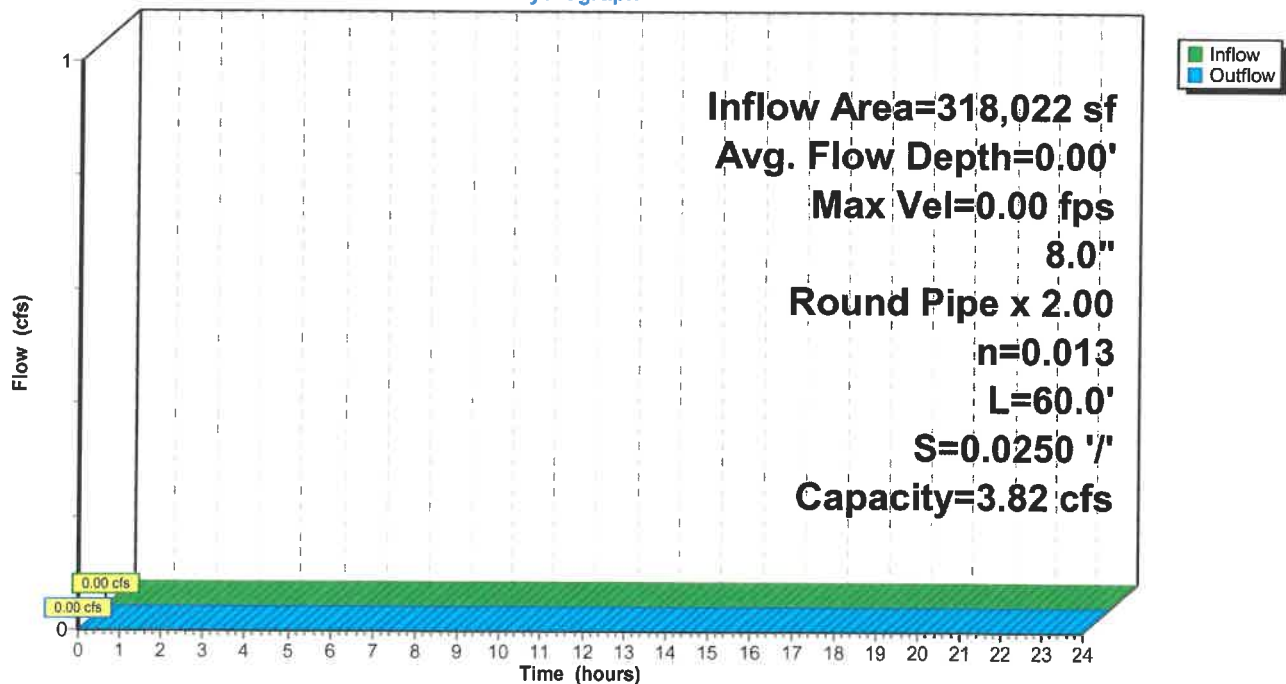
Peak Storage= 0 cf @ 0.00 hrs  
Average Depth at Peak Storage= 0.00'  
Bank-Full Depth= 0.67' Flow Area= 0.7 sf, Capacity= 3.82 cfs

A factor of 2.00 has been applied to the storage and discharge capacity  
8.0" Round Pipe  
n= 0.013 Corrugated PE, smooth interior  
Length= 60.0' Slope= 0.0250 '/'  
Inlet Invert= 312.50', Outlet Invert= 311.00'



### Reach 21R: 2-8" DI

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### Summary for Reach EV1: Road Berm

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 1.15" for 10 YR event  
Inflow = 25.27 cfs @ 13.17 hrs, Volume= 263,946 cf  
Outflow = 25.27 cfs @ 13.17 hrs, Volume= 263,929 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.36 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.85 fps, Avg. Travel Time= 0.1 min

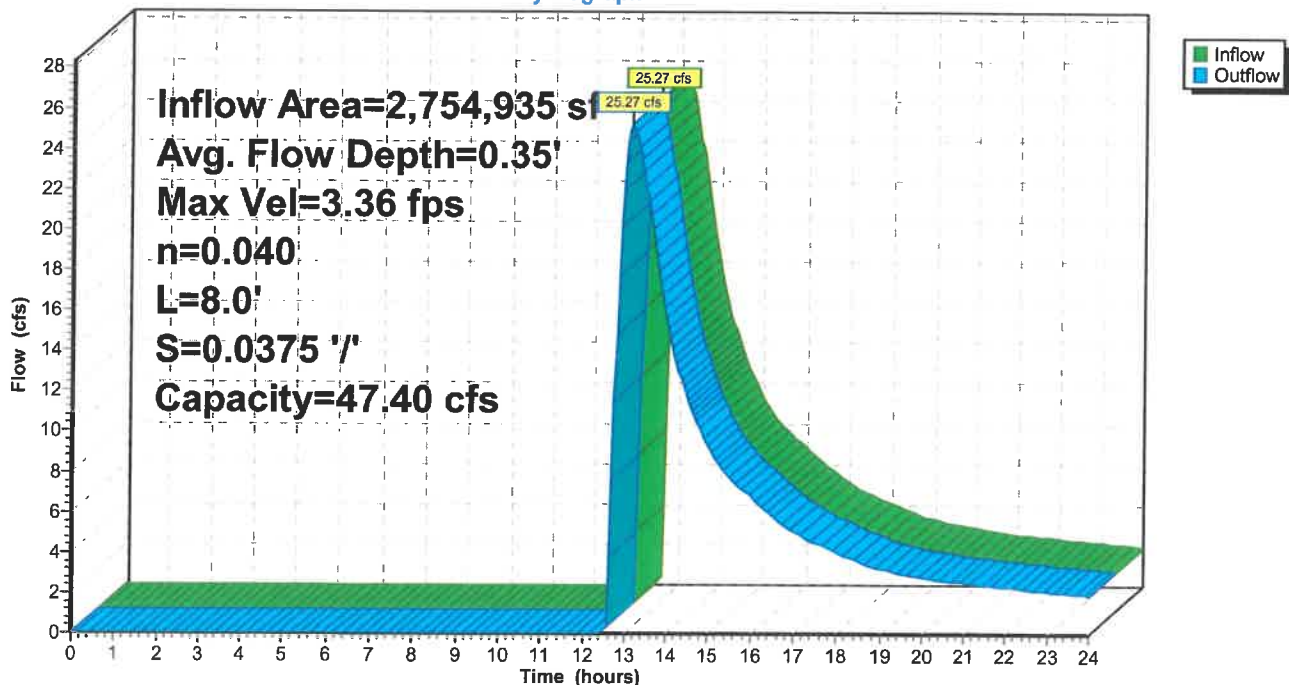
Peak Storage= 60 cf @ 13.17 hrs  
Average Depth at Peak Storage= 0.35', Surface Width= 23.46'  
Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides  
Side Slope Z-value= 5.0 '/' Top Width= 25.00'  
Length= 8.0' Slope= 0.0375 '/'  
Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: Road Berm

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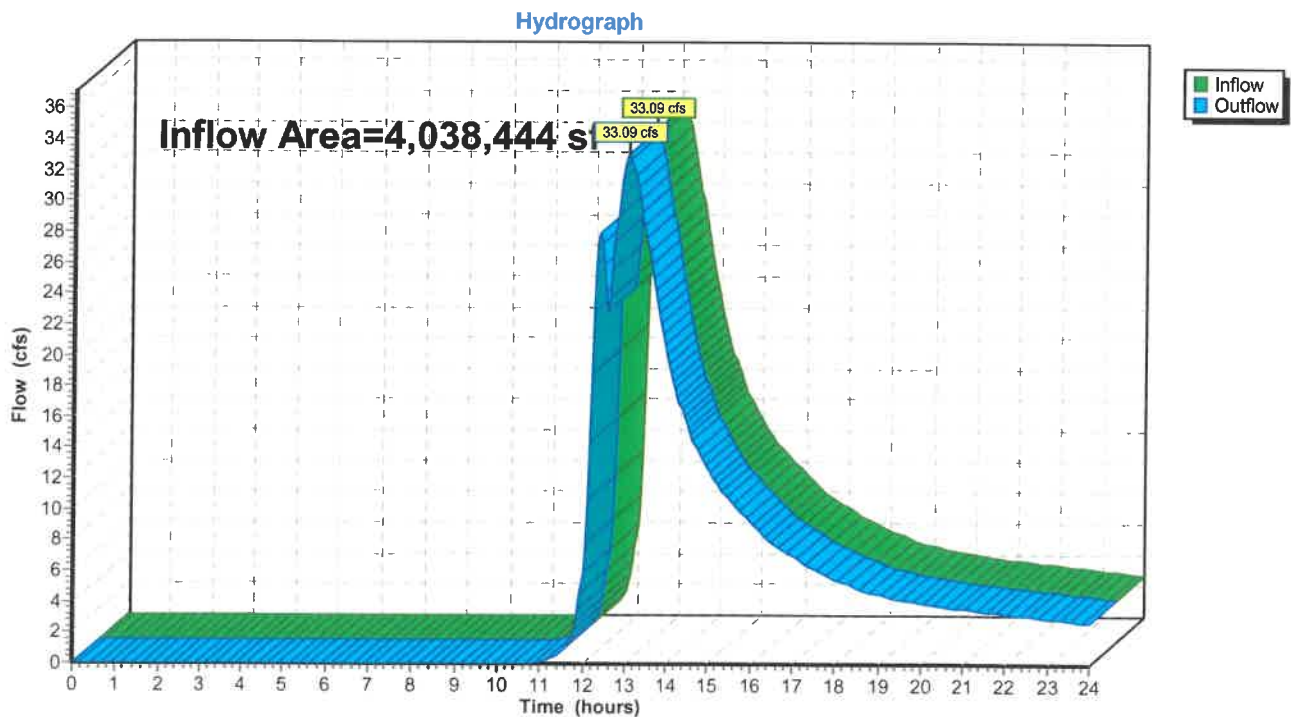
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### Summary for Reach EV2: To Wetland

Inflow Area = 4,038,444 sf, 4.14% Impervious, Inflow Depth > 1.24" for 10 YR event  
Inflow = 33.09 cfs @ 13.07 hrs, Volume= 416,877 cf  
Outflow = 33.09 cfs @ 13.07 hrs, Volume= 416,877 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV2: To Wetland



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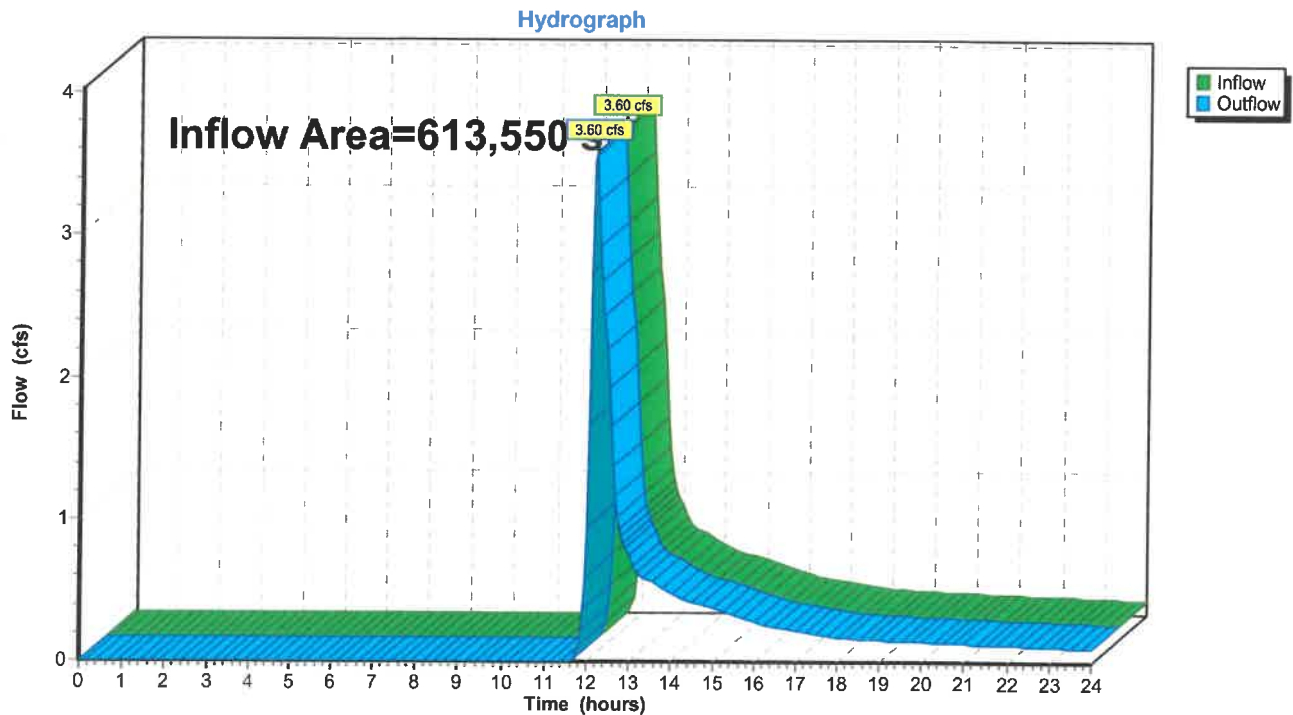
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### Summary for Reach EV3: To Offsite

Inflow Area = 613,550 sf, 3.69% Impervious, Inflow Depth > 0.32" for 10 YR event  
Inflow = 3.60 cfs @ 12.18 hrs, Volume= 16,328 cf  
Outflow = 3.60 cfs @ 12.18 hrs, Volume= 16,328 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV3: To Offsite



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**Summary for Pond 1P: Forebay**

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 4.01" for 10 YR event  
 Inflow = 1.21 cfs @ 12.14 hrs, Volume= 4,300 cf  
 Outflow = 1.21 cfs @ 12.14 hrs, Volume= 4,300 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.21 cfs @ 12.14 hrs, Volume= 4,300 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 281.00' @ 12.14 hrs Surf.Area= 1,232 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 4,300 cf (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 794.3 - 794.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	252.50'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=30,307.96 cfs @ 12.14 hrs HW=281.00' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 30,307.96 cfs @ 17.72 fps)

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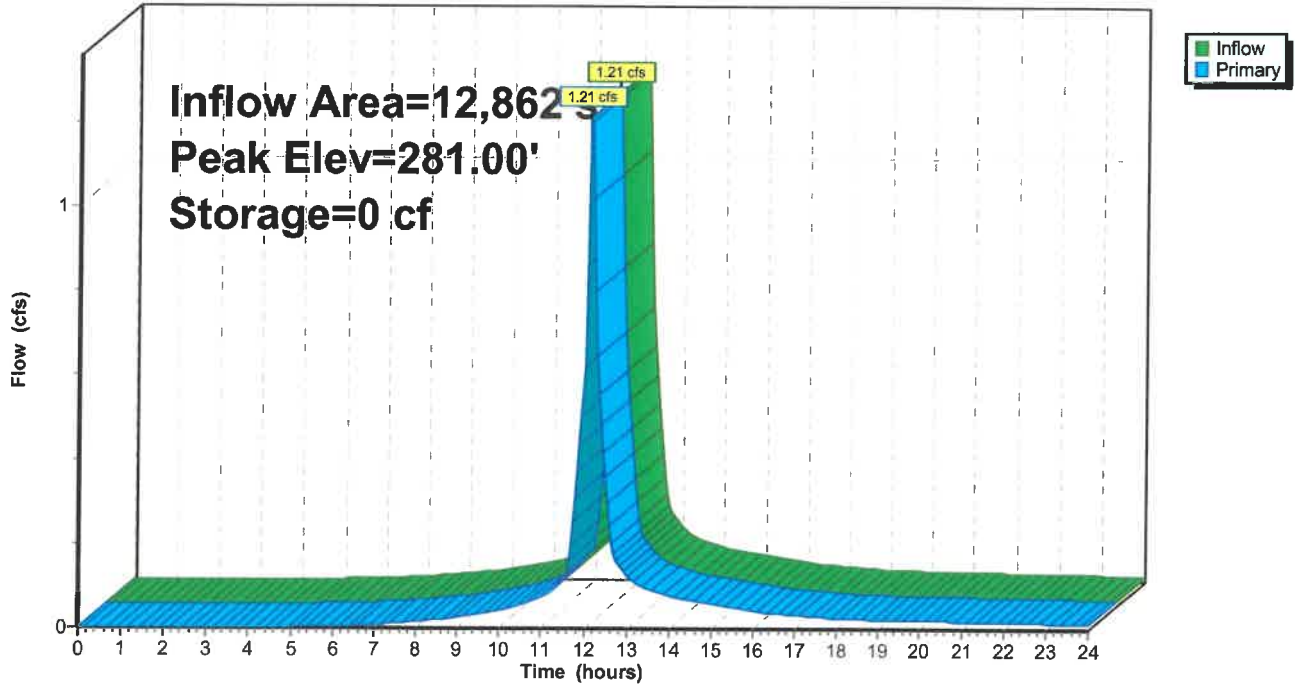
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## Pond 1P: Forebay

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**Summary for Pond 2P: Basin 1**

Inflow Area = 124,279 sf, 7.84% Impervious, Inflow Depth > 1.45" for 10 YR event  
 Inflow = 3.34 cfs @ 12.18 hrs, Volume= 15,052 cf  
 Outflow = 0.15 cfs @ 17.71 hrs, Volume= 7,046 cf, Atten= 95%, Lag= 331.5 min  
 Discarded = 0.15 cfs @ 17.71 hrs, Volume= 7,046 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 282.76' @ 17.71 hrs Surf.Area= 5,700 sf Storage= 9,012 cf

Plug-Flow detention time= 320.1 min calculated for 7,031 cf (47% of inflow)  
 Center-of-Mass det. time= 181.0 min ( 1,043.2 - 862.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	287.50'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=0.15 cfs @ 17.71 hrs HW=282.76' (Free Discharge)  
 ↗ **2=Exfiltration** (Exfiltration Controls 0.15 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)  
 ↗ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



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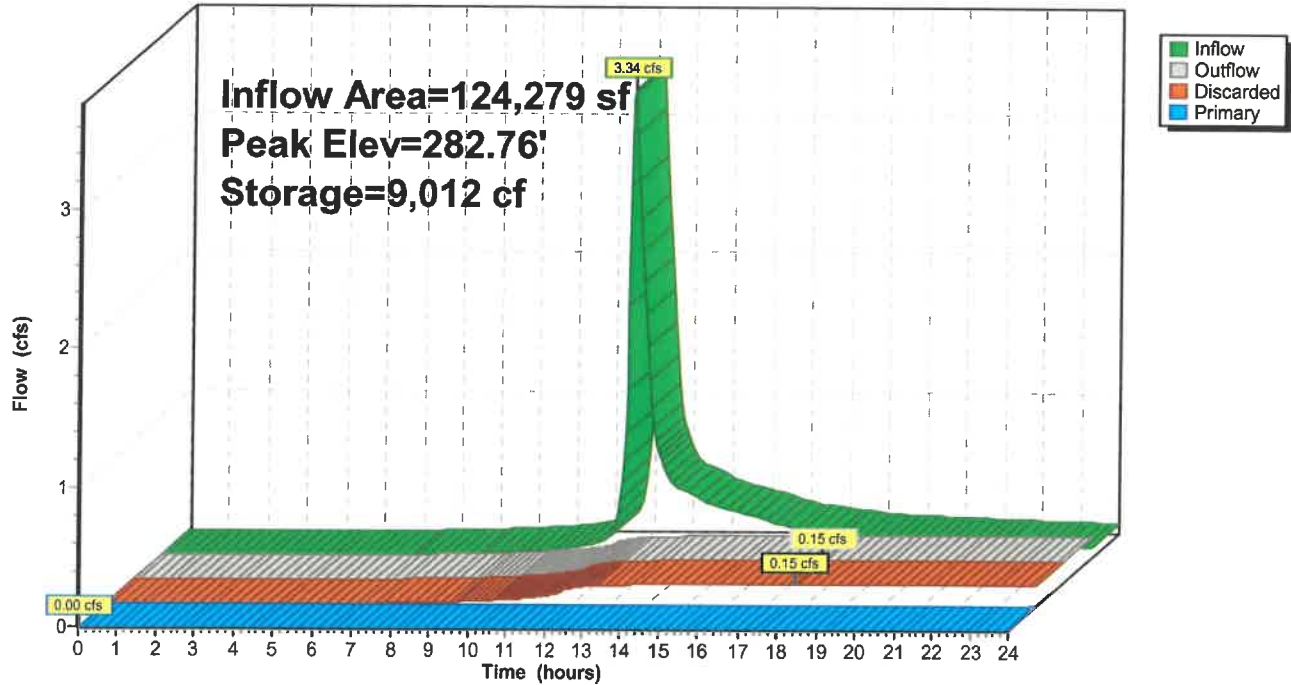
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### Pond 2P: Basin 1

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**Summary for Pond 3P: Forebay**

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 3.47" for 10 YR event  
 Inflow = 3.17 cfs @ 12.12 hrs, Volume= 10,620 cf  
 Outflow = 3.22 cfs @ 12.12 hrs, Volume= 8,354 cf, Atten= 0%, Lag= 0.1 min  
 Primary = 3.22 cfs @ 12.12 hrs, Volume= 8,354 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 305.57' @ 12.12 hrs Surf.Area= 1,781 sf Storage= 2,390 cf

Plug-Flow detention time= 119.7 min calculated for 8,337 cf (79% of inflow)  
 Center-of-Mass det. time= 42.3 min ( 852.9 - 810.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	<b>65.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=3.02 cfs @ 12.12 hrs HW=305.57' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 3.02 cfs @ 0.67 fps)

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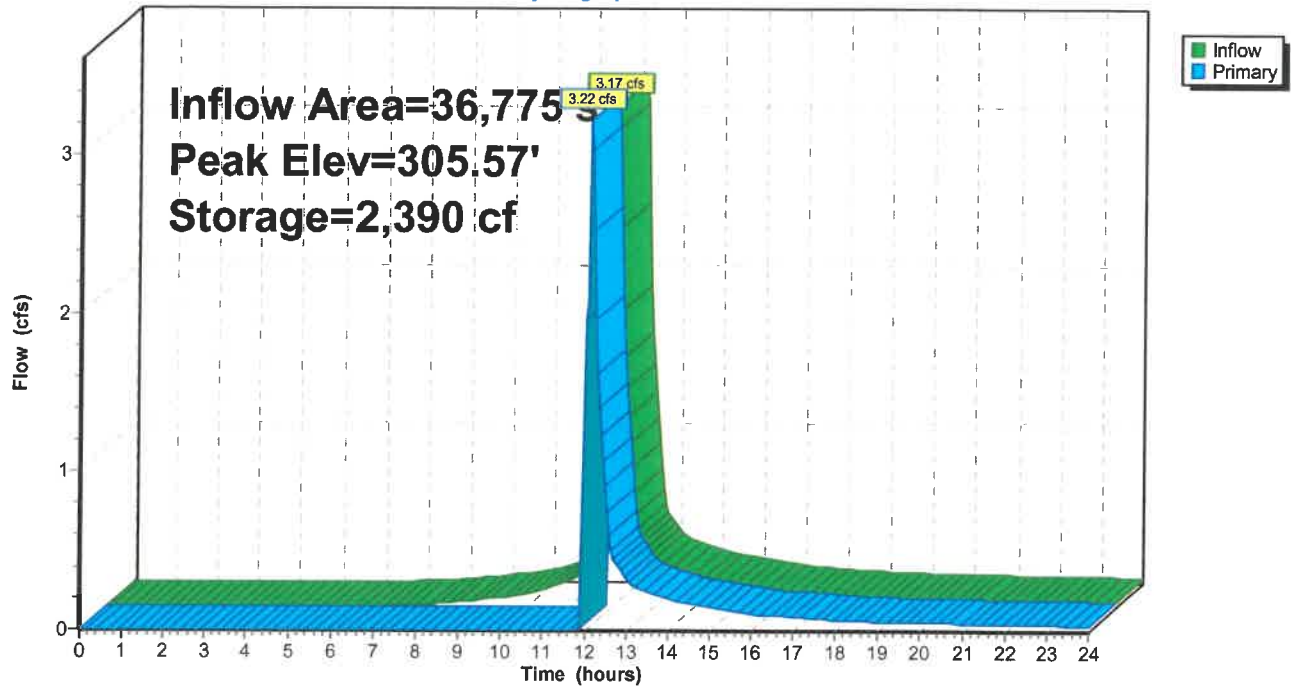
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### Pond 3P: Forebay

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**Summary for Pond 4P: Basin 2**

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 1.75" for 10 YR event  
 Inflow = 4.92 cfs @ 12.15 hrs, Volume= 16,926 cf  
 Outflow = 0.21 cfs @ 16.83 hrs, Volume= 8,872 cf, Atten= 96%, Lag= 280.9 min  
 Discarded = 0.21 cfs @ 16.83 hrs, Volume= 8,872 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 305.34' @ 16.83 hrs Surf.Area= 8,114 sf Storage= 10,098 cf

Plug-Flow detention time= 338.5 min calculated for 8,872 cf (52% of inflow)  
 Center-of-Mass det. time= 211.7 min ( 1,079.4 - 867.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	49,460 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199
309.30	12,176	447.0	3,556	49,460	14,461

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	304.00'	<b>1.100 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.21 cfs @ 16.83 hrs HW=305.34' (Free Discharge)  
 ↗ **2=Exfiltration** (Exfiltration Controls 0.21 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)  
 ↗ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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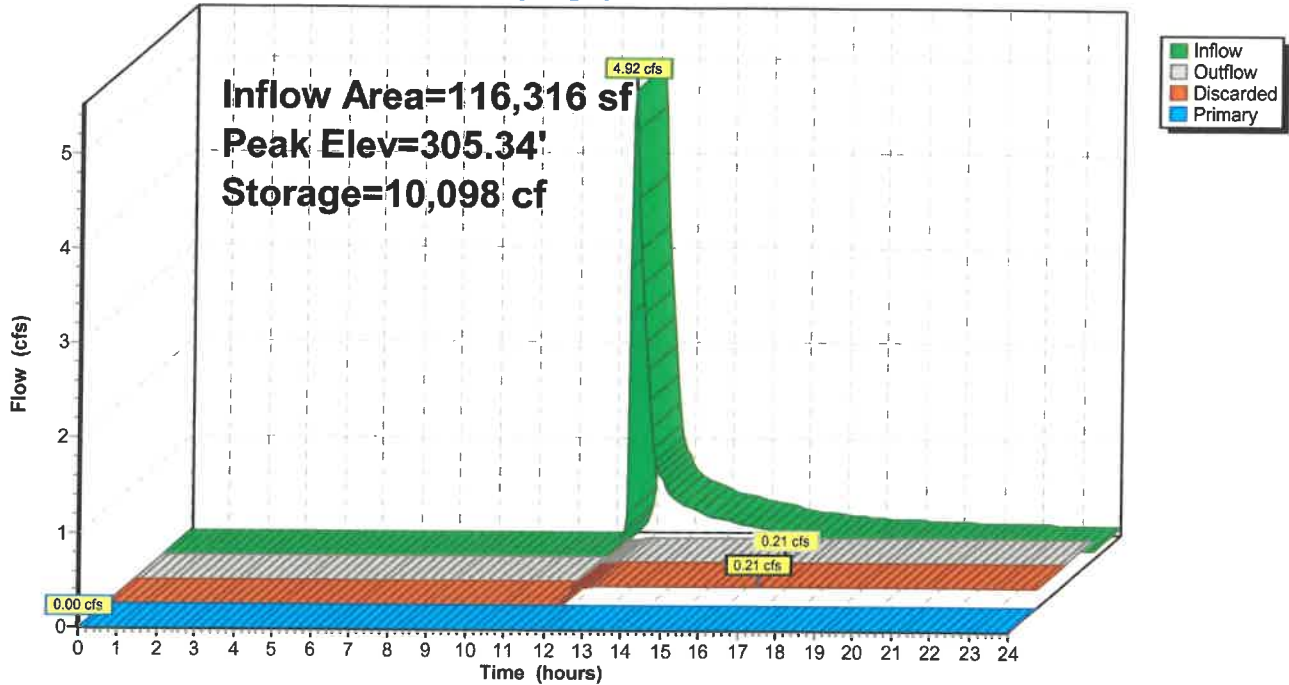
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## Pond 4P: Basin 2

### Hydrograph



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**Summary for Pond 5P: Forebay**

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 4.52" for 10 YR event  
 Inflow = 2.66 cfs @ 12.09 hrs, Volume= 9,190 cf  
 Outflow = 2.61 cfs @ 12.10 hrs, Volume= 6,571 cf, Atten= 2%, Lag= 0.4 min  
 Primary = 2.61 cfs @ 12.10 hrs, Volume= 6,571 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 291.06' @ 12.10 hrs Surf.Area= 1,663 sf Storage= 2,762 cf

Plug-Flow detention time= 157.2 min calculated for 6,557 cf (71% of inflow)  
 Center-of-Mass det. time= 68.7 min ( 840.5 - 771.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	6,501 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	1,002	133.0	0	0	1,002
290.00	1,339	153.0	1,166	1,166	1,479
292.00	1,976	173.0	3,294	4,461	2,092
293.00	2,105	184.0	2,040	6,501	2,452

Device	Routing	Invert	Outlet Devices
#1	Primary	291.00'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=2.52 cfs @ 12.10 hrs HW=291.06' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 2.52 cfs @ 0.65 fps)



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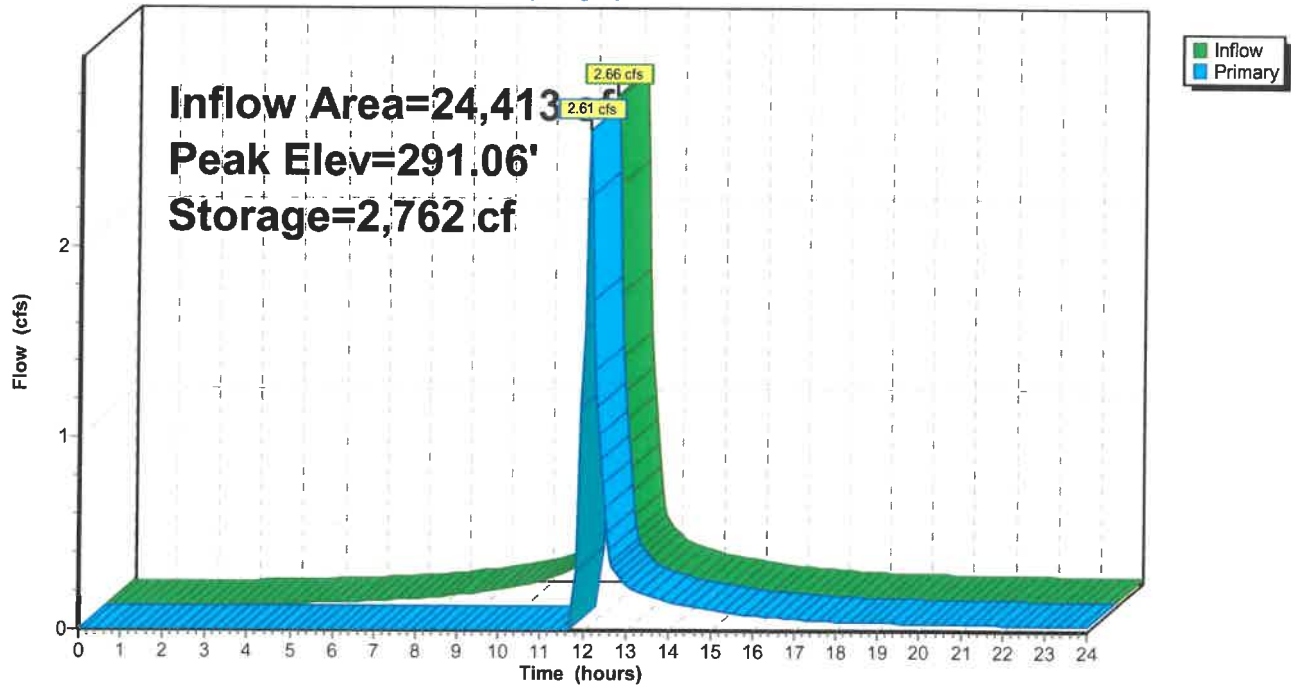
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## Pond 5P: Forebay

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**Summary for Pond 6P: Basin 3**

Inflow Area = 55,723 sf, 39.13% Impervious, Inflow Depth > 2.26" for 10 YR event  
 Inflow = 3.76 cfs @ 12.10 hrs, Volume= 10,504 cf  
 Outflow = 0.18 cfs @ 15.25 hrs, Volume= 7,689 cf, Atten= 95%, Lag= 189.1 min  
 Discarded = 0.18 cfs @ 15.25 hrs, Volume= 7,689 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 289.88' @ 15.25 hrs Surf.Area= 7,003 sf Storage= 5,746 cf

Plug-Flow detention time= 314.6 min calculated for 7,673 cf (73% of inflow)  
 Center-of-Mass det. time= 222.1 min ( 1,073.0 - 850.9 )

Volume	Invert	Avail.Storage	Storage Description		
#1	289.00'	44,208 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	6,102	334.0	0	0	6,102
290.00	7,134	353.0	6,611	6,611	7,196
292.00	9,367	391.0	16,450	23,062	9,566
294.00	11,827	428.0	21,146	44,208	12,112

Device	Routing	Invert	Outlet Devices
#1	Primary	293.00'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	289.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=0.18 cfs @ 15.25 hrs HW=289.88' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.18 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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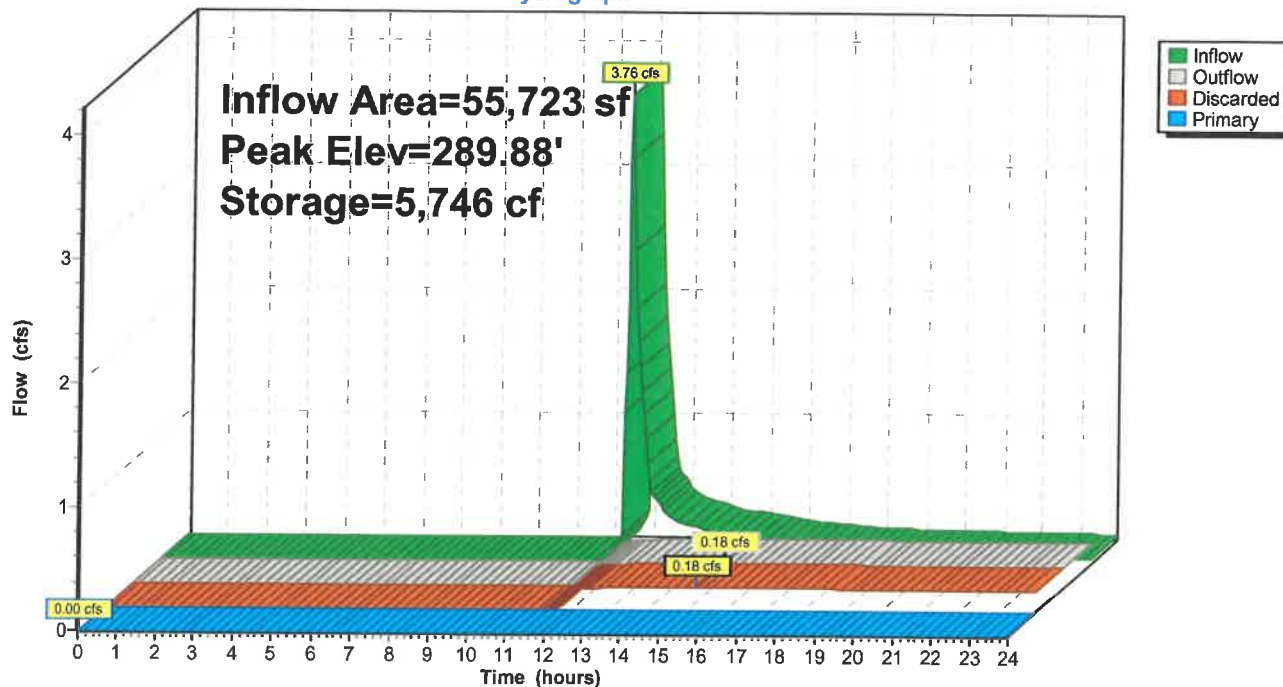
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## Pond 6P: Basin 3

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**Summary for Pond 7P: Vernal Pool and Wetland**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 1.35" for 10 YR event  
 Inflow = 41.58 cfs @ 12.70 hrs, Volume= 309,492 cf  
 Outflow = 25.27 cfs @ 13.17 hrs, Volume= 263,946 cf, Atten= 39%, Lag= 28.3 min  
 Primary = 25.27 cfs @ 13.17 hrs, Volume= 263,946 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 294.91' @ 13.17 hrs Surf.Area= 45,996 sf Storage= 81,001 cf

Plug-Flow detention time= 110.1 min calculated for 263,946 cf (85% of inflow)  
 Center-of-Mass det. time= 47.5 min ( 951.8 - 904.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Upgradient wetland (Prismatic) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=25.23 cfs @ 13.17 hrs HW=294.91' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 25.23 cfs @ 2.83 fps)

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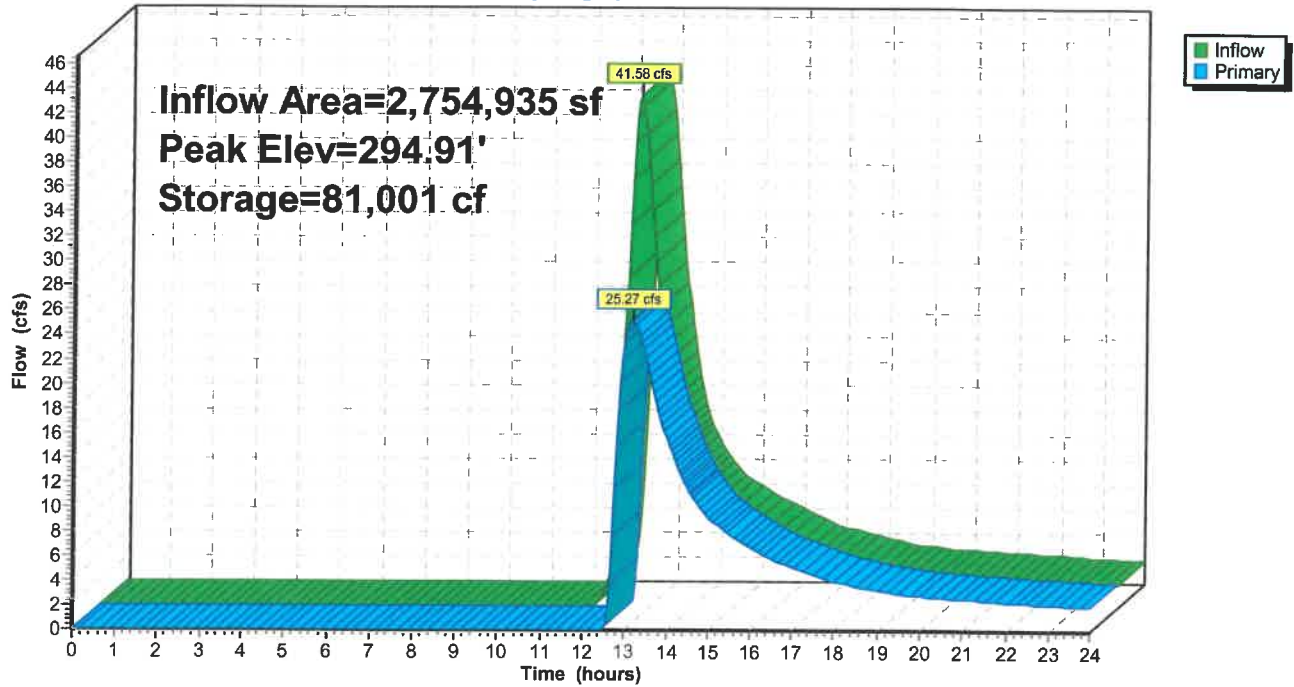
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### Pond 7P: Vernal Pool and Wetland

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**Summary for Pond 8P: Road Berm**

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth > 1.09" for 10 YR event  
 Inflow = 5.01 cfs @ 12.37 hrs, Volume= 28,868 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 311.10' @ 24.00 hrs Surf.Area= 41,347 sf Storage= 28,847 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	310.00'	256,496 cf	<b>Upgradient wetland (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

Device	Routing	Invert	Outlet Devices
#1	Primary	312.50'	<b>8.0" Vert. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)  
 ↑1=Orifice/Grate ( Controls 0.00 cfs)



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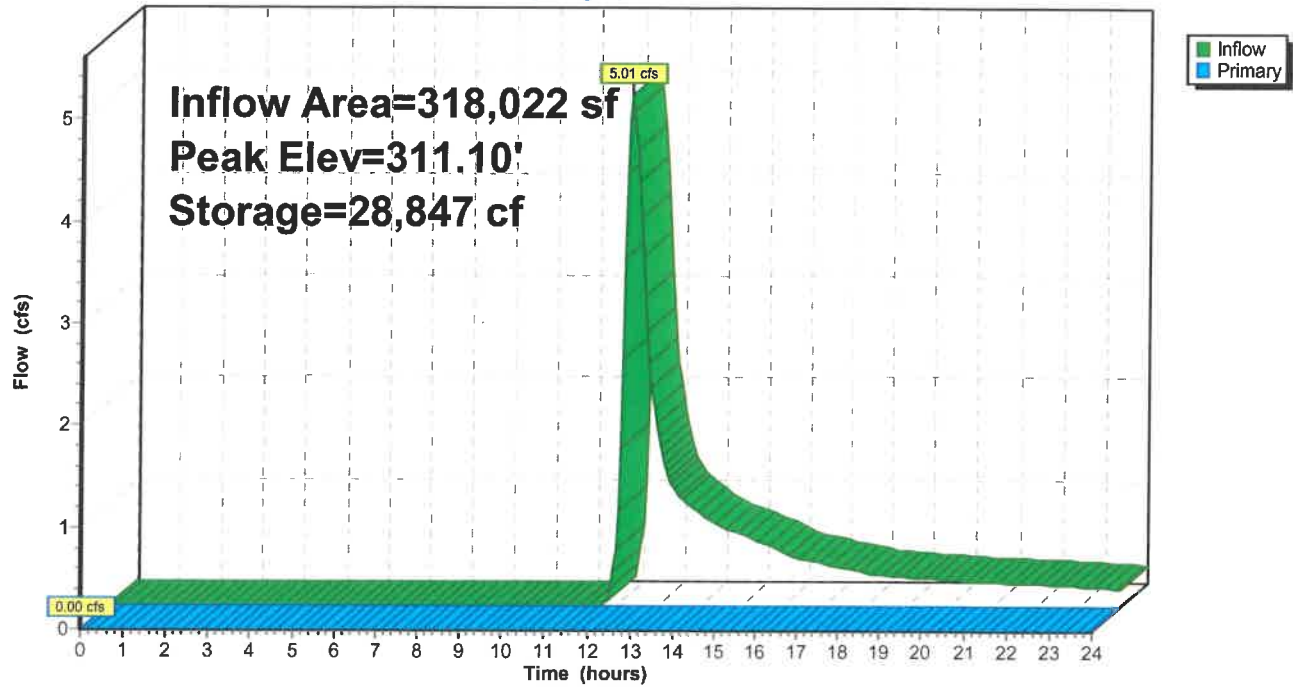
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## Pond 8P: Road Berm

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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 16.88 cfs @ 12.41 hrs, Volume= 92,300 cf, Depth&gt; 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b>
					Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

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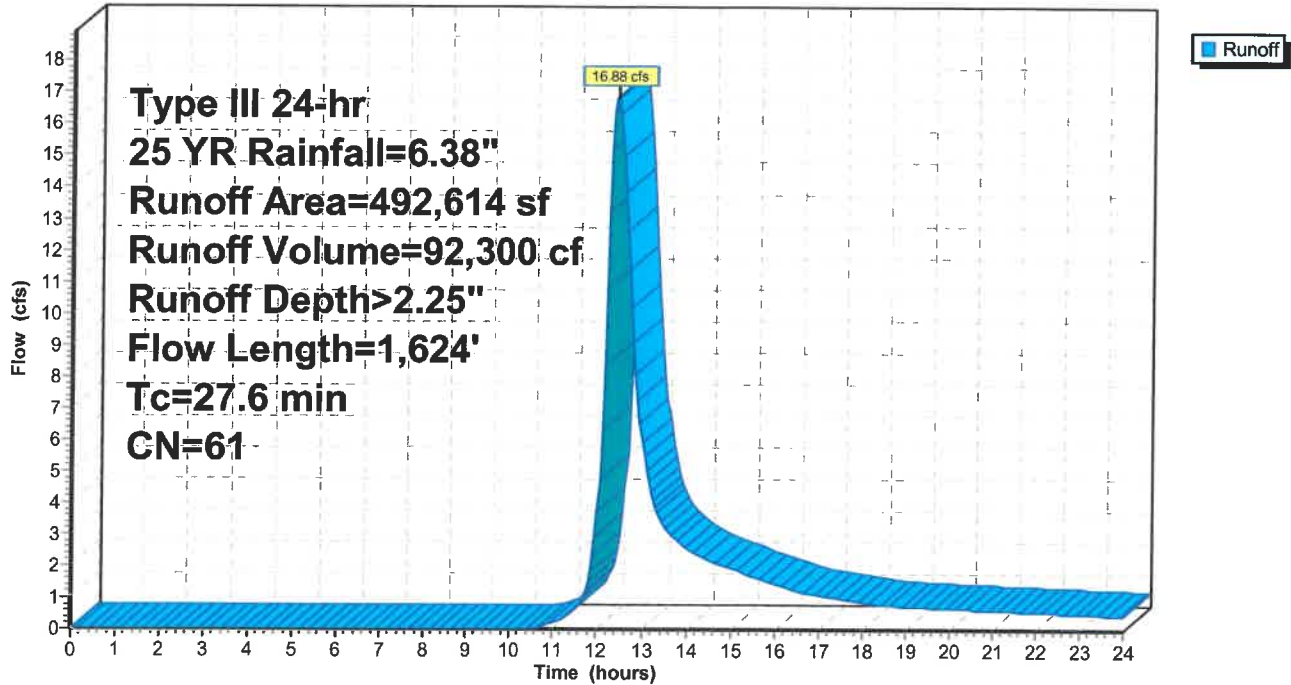
00454 - Proposed Conditions R2  
Type III 24-hr 25 YR Rainfall=6.38"

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### Subcatchment 1S: To Culvert

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Subcatchment 2S: To Proposed Culvert**

Runoff = 66.94 cfs @ 12.68 hrs, Volume= 472,904 cf, Depth&gt; 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b>
					Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b>
					Area= 1.2 sf Perim= 3.5' r= 0.34'
					n= 0.070 Medium-dense brush, winter
45.8	2,588	Total			

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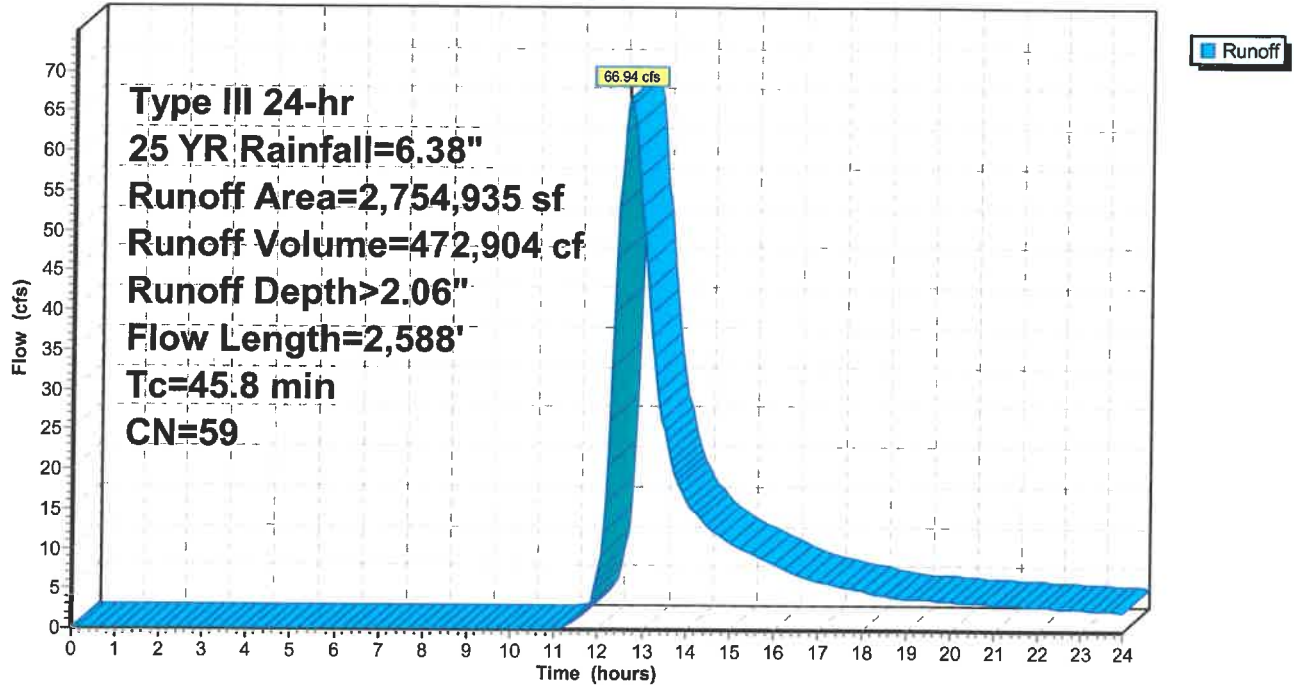
00454 - Proposed Conditions R2  
Type III 24-hr 25 YR Rainfall=6.38"

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### Subcatchment 2S: To Proposed Culvert

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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 3S: To 8" pipes

Runoff = 8.70 cfs @ 12.34 hrs, Volume= 45,859 cf, Depth> 1.73"

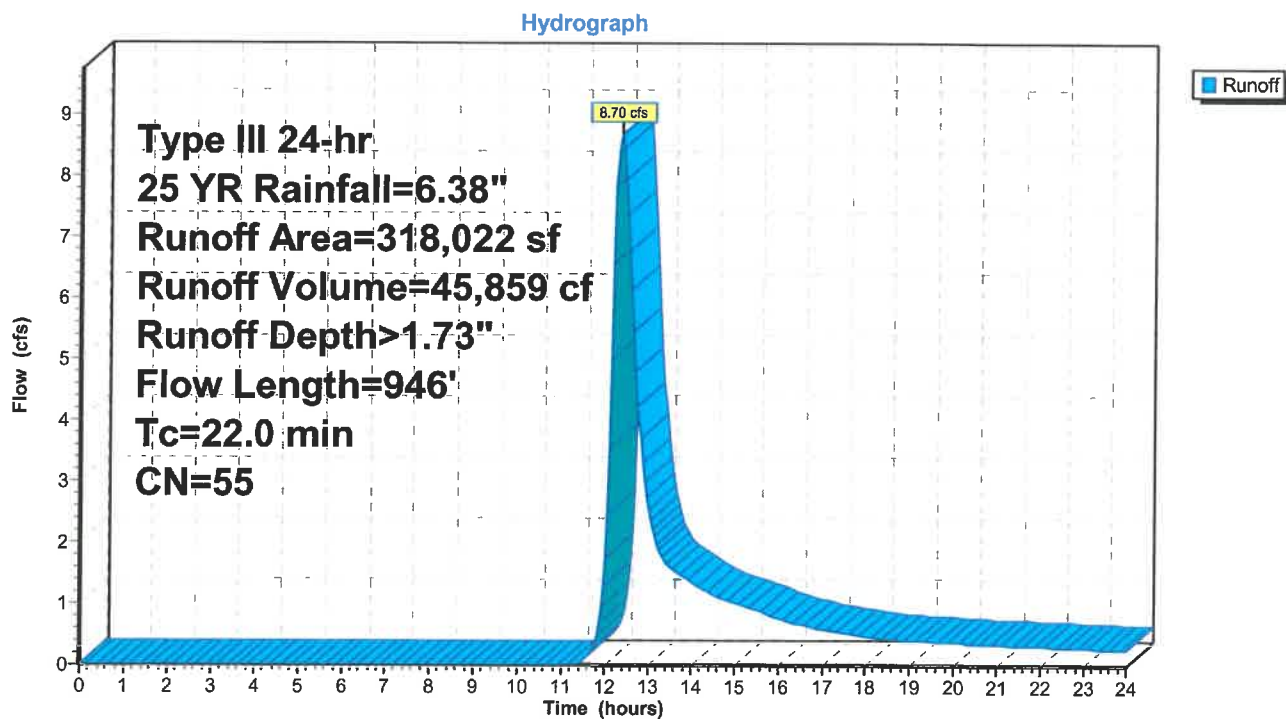
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
318,022	55	Woods, Good, HSG B
318,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow, Sheet Flow</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
22.0	946	Total			

### Subcatchment 3S: To 8" pipes





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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 4S: To CB 1

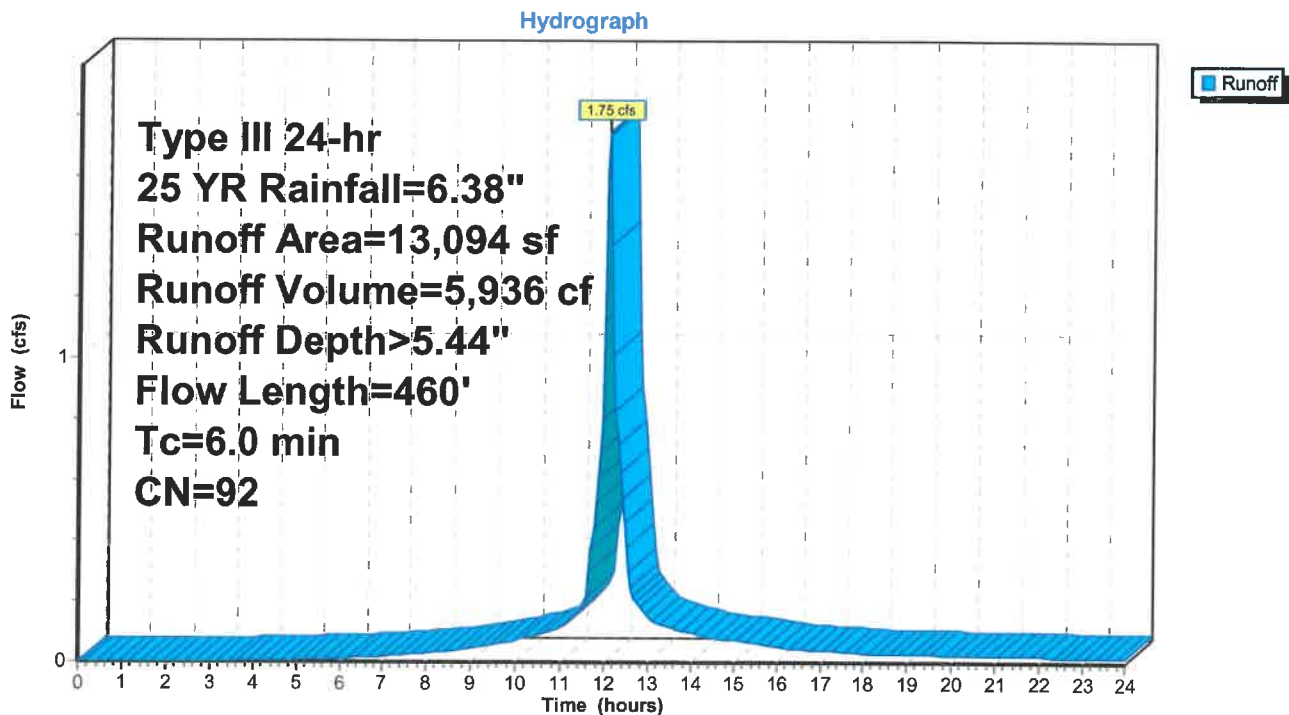
Runoff = 1.75 cfs @ 12.09 hrs, Volume= 5,936 cf, Depth> 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
11,086	98	Paved roads w/curbs & sewers, HSG B
2,008	61	>75% Grass cover, Good, HSG B
13,094	92	Weighted Average
2,008		15.34% Pervious Area
11,086		84.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 4S: To CB 1



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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 5S: To CB 2

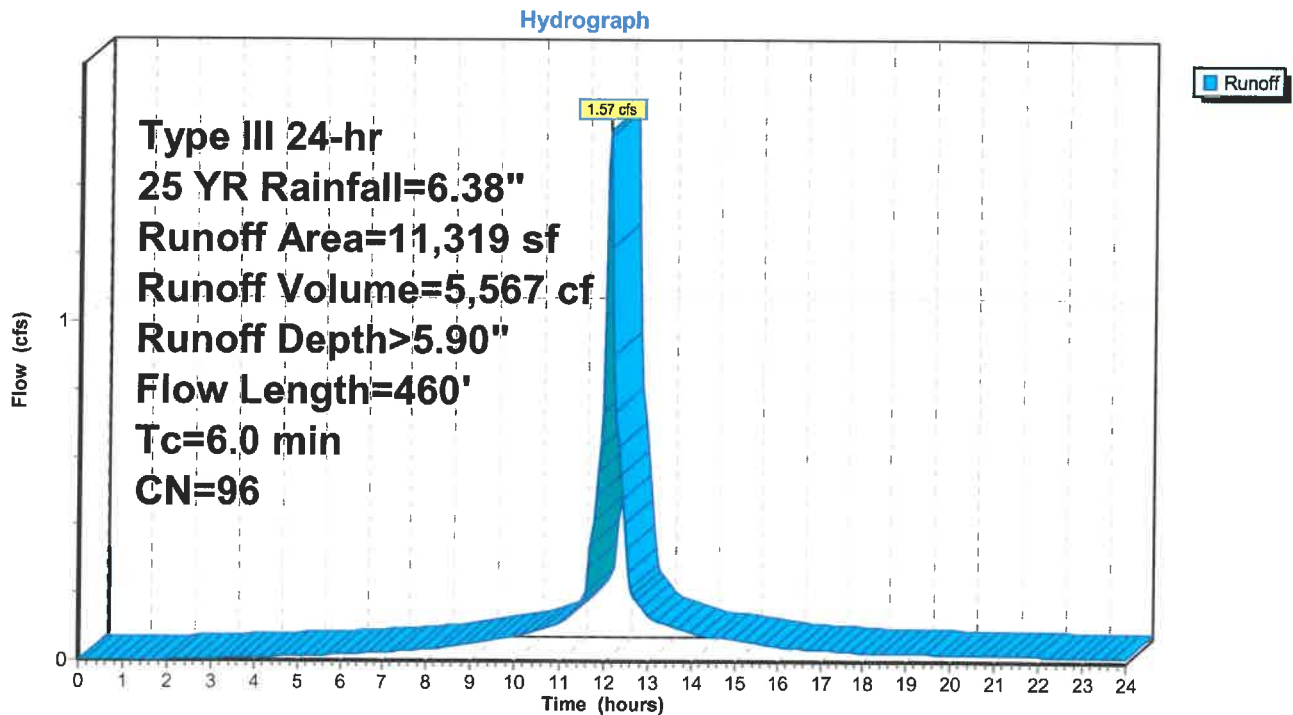
Runoff = 1.57 cfs @ 12.09 hrs, Volume= 5,567 cf, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
10,719	98	Paved roads w/curbs & sewers, HSG B
600	61	>75% Grass cover, Good, HSG B
11,319	96	Weighted Average
600		5.30% Pervious Area
10,719		94.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 5S: To CB 2



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Type III 24-hr 25 YR Rainfall=6.38"

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## Summary for Subcatchment 6S: To CB 3

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,328 cf, Depth> 5.10"

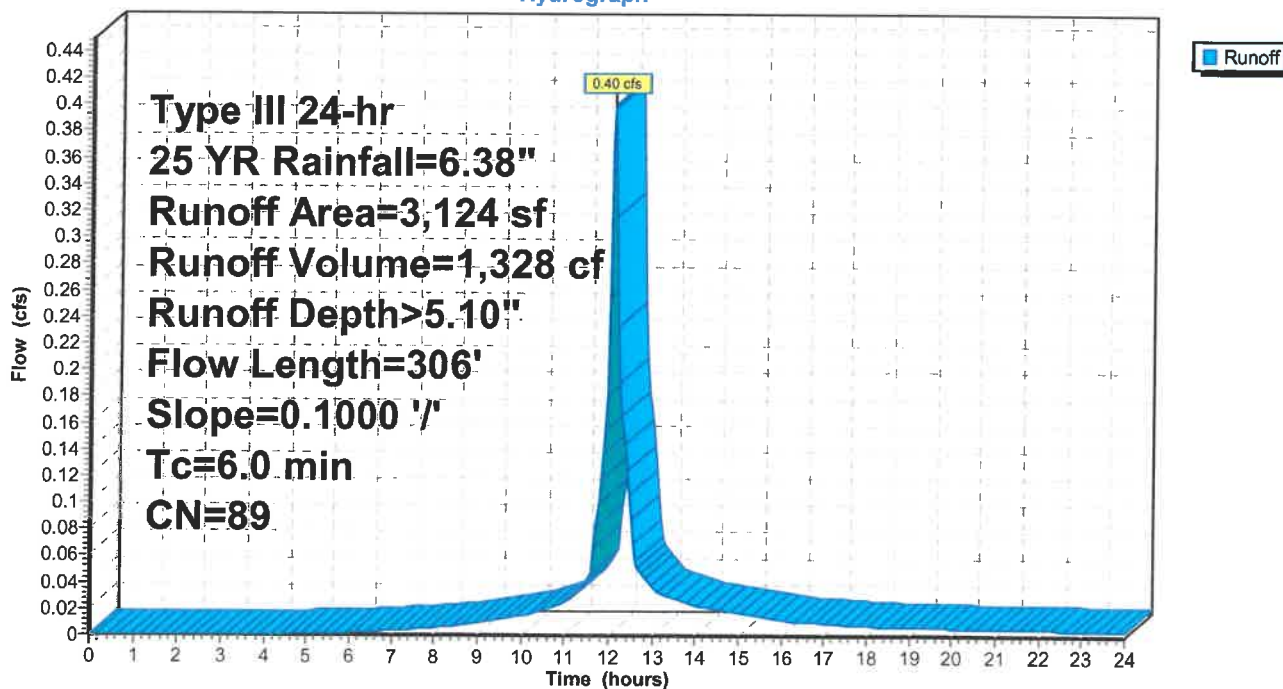
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
2,343	98	Paved roads w/curbs & sewers, HSG B
781	61	>75% Grass cover, Good, HSG B
3,124	89	Weighted Average
781		25.00% Pervious Area
2,343		75.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

## Subcatchment 6S: To CB 3

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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 7S: To CB 4

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,084 cf, Depth> 5.10"

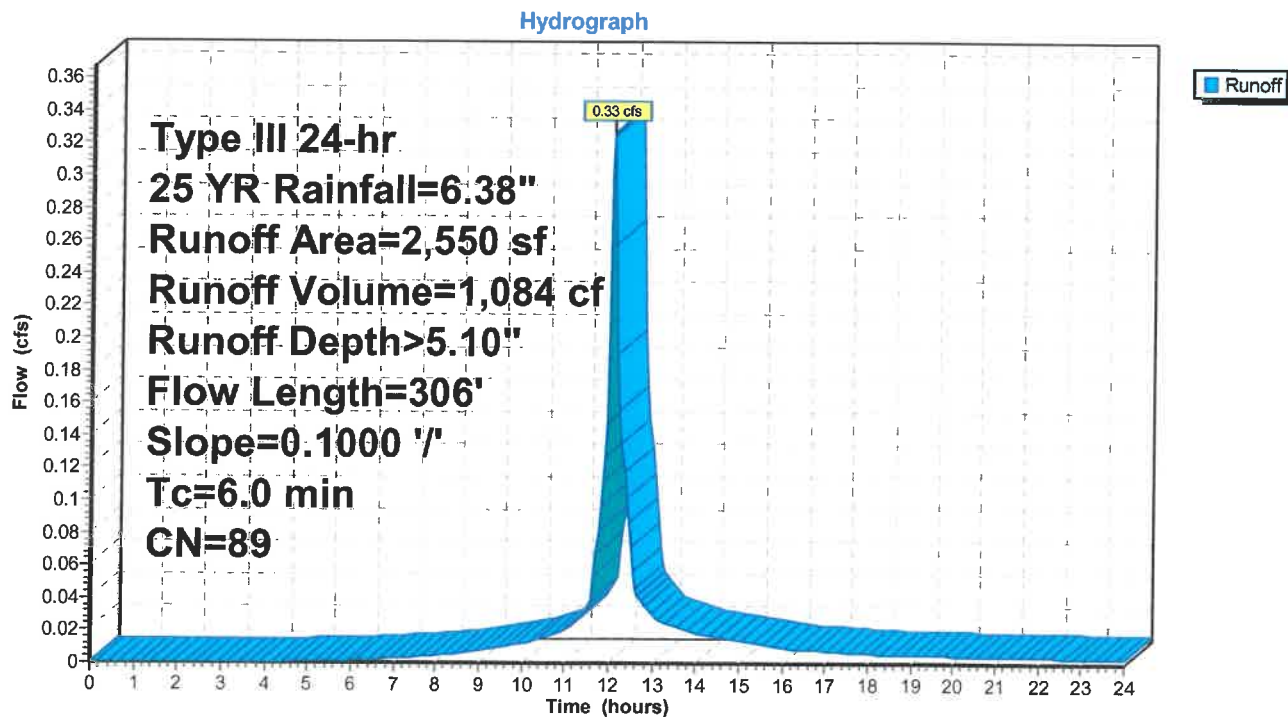
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
1,913	98	Paved roads w/curbs & sewers, HSG B
637	61	>75% Grass cover, Good, HSG B
2,550	89	Weighted Average
637		24.98% Pervious Area
1,913		75.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 7S: To CB 4



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**Summary for Subcatchment 8S: To CB 6**

Runoff = 0.45 cfs @ 12.09 hrs, Volume= 1,467 cf, Depth&gt; 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

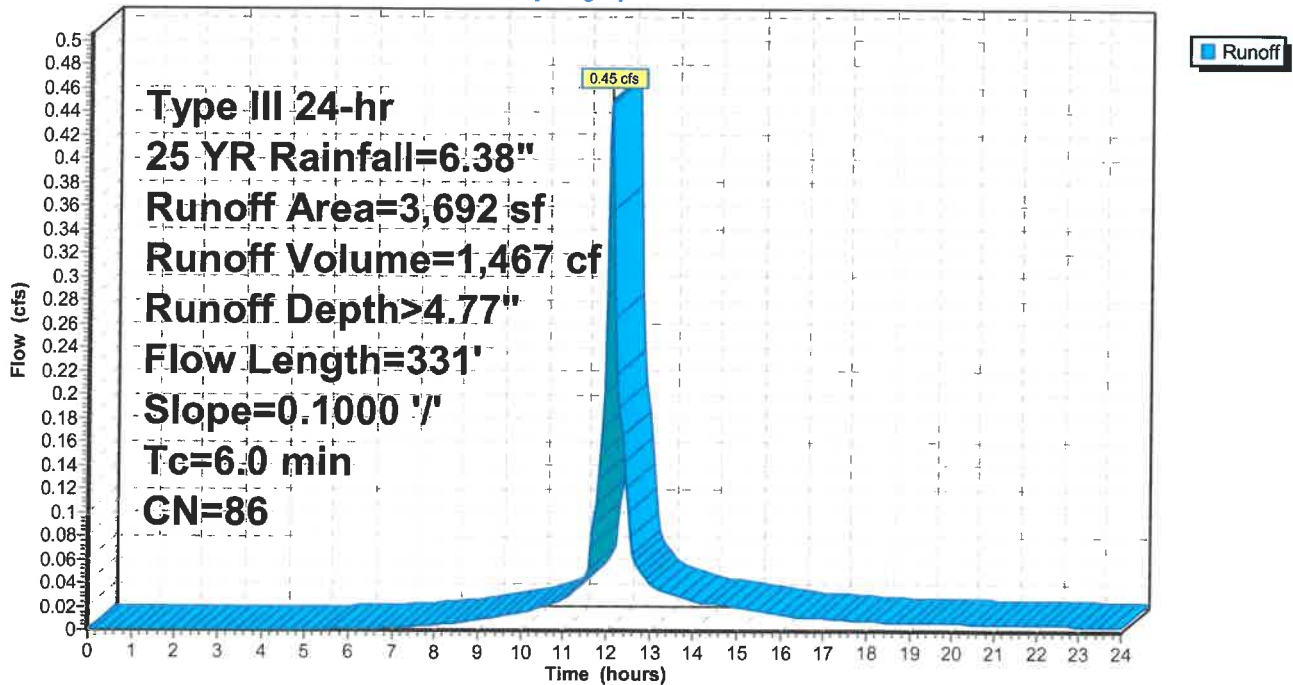
Area (sf)	CN	Description
2,493	98	Paved roads w/curbs & sewers, HSG B
1,199	61	>75% Grass cover, Good, HSG B
3,692	86	Weighted Average
1,199		32.48% Pervious Area
2,493		67.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 8S: To CB 6**

Hydrograph



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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 9S: To CB 5

Runoff = 0.47 cfs @ 12.09 hrs, Volume= 1,618 cf, Depth> 5.55"

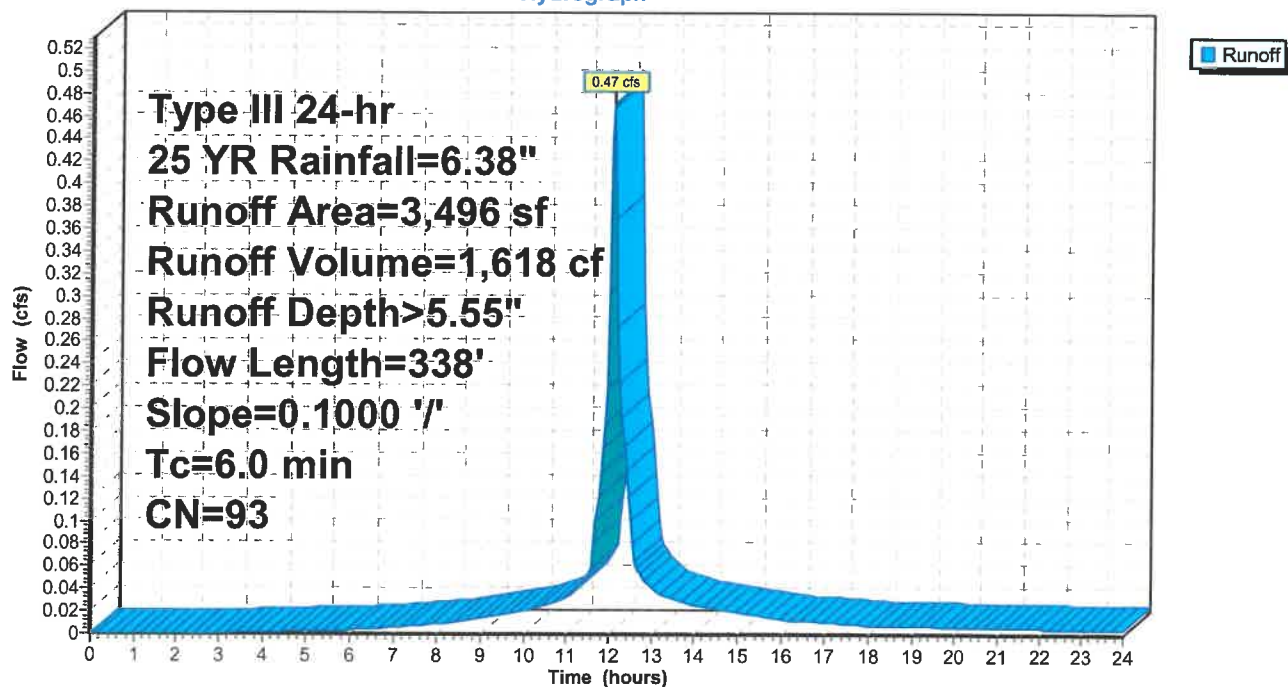
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
3,000	98	Paved roads w/curbs & sewers, HSG B
496	61	>75% Grass cover, Good, HSG B
3,496	93	Weighted Average
496		14.19% Pervious Area
3,000		85.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 9S: To CB 5

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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 10S: To CB 7

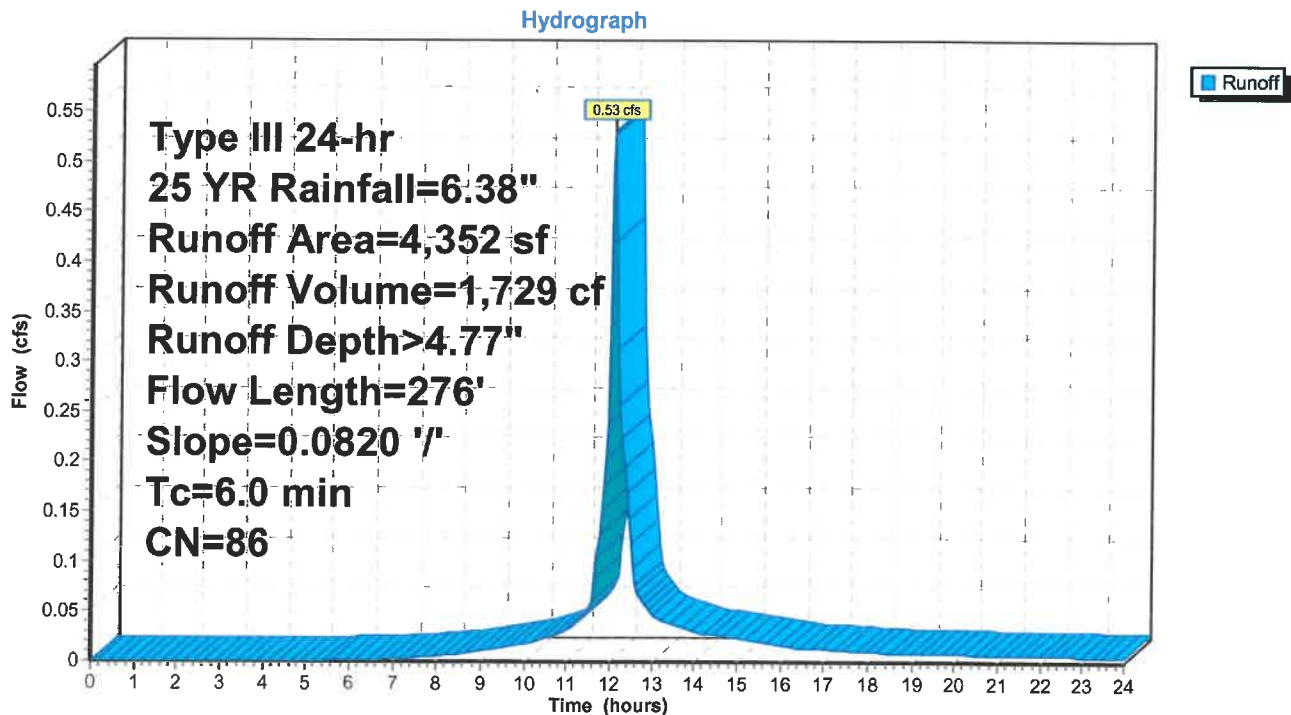
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf, Depth> 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 10S: To CB 7



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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 11S: To CB 8

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,695 cf, Depth> 4.99"

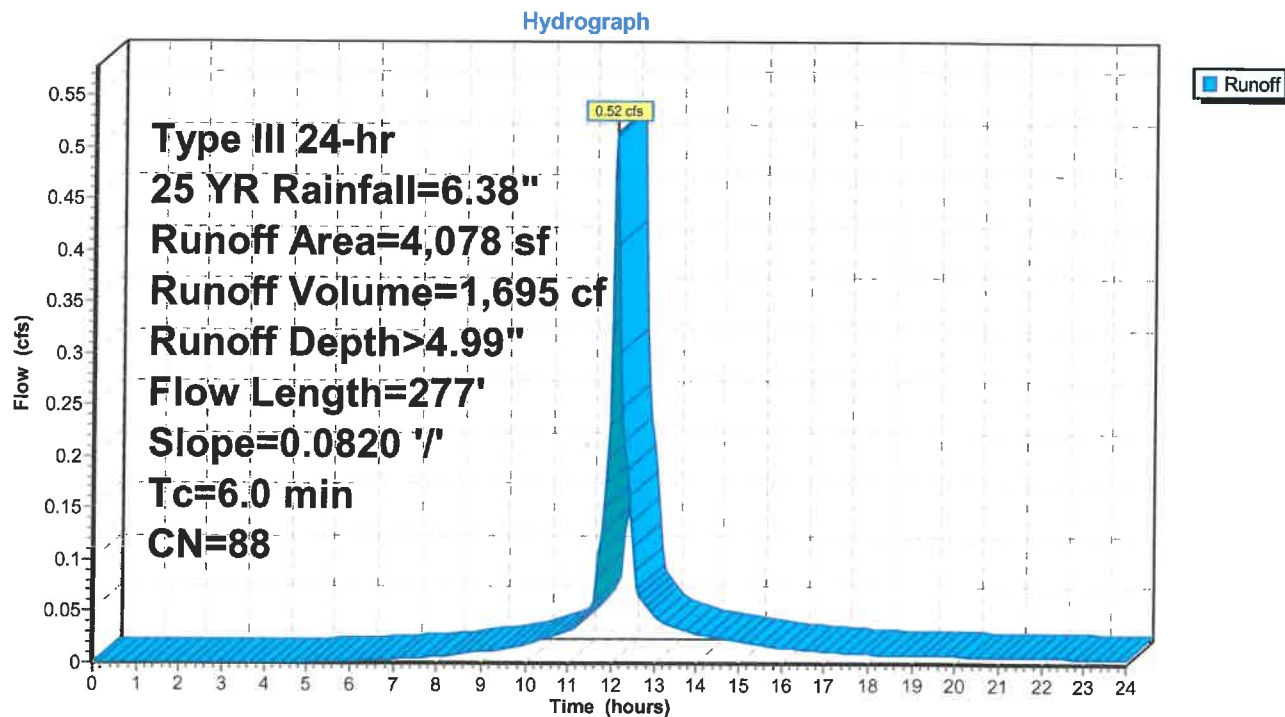
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 11S: To CB 8



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### Summary for Subcatchment 12S: To CB 9

Runoff = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf, Depth> 4.55"

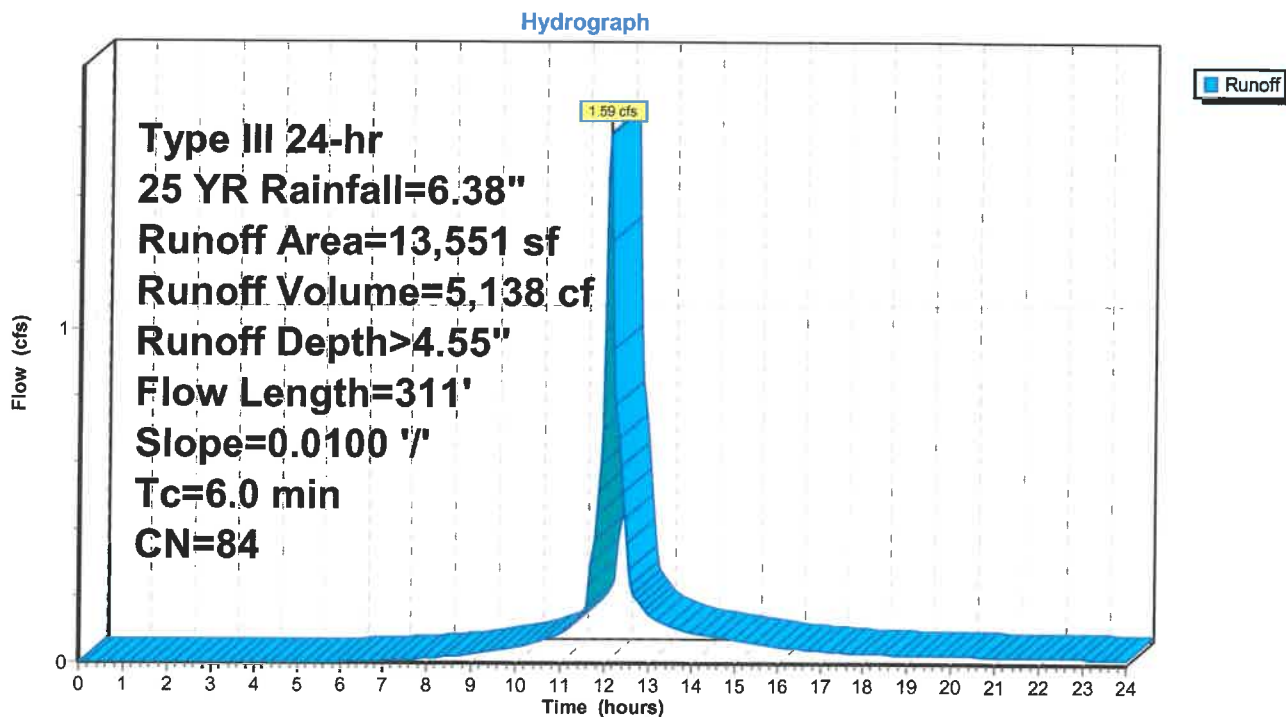
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 12S: To CB 9



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**Summary for Subcatchment 13S: To CB 10**

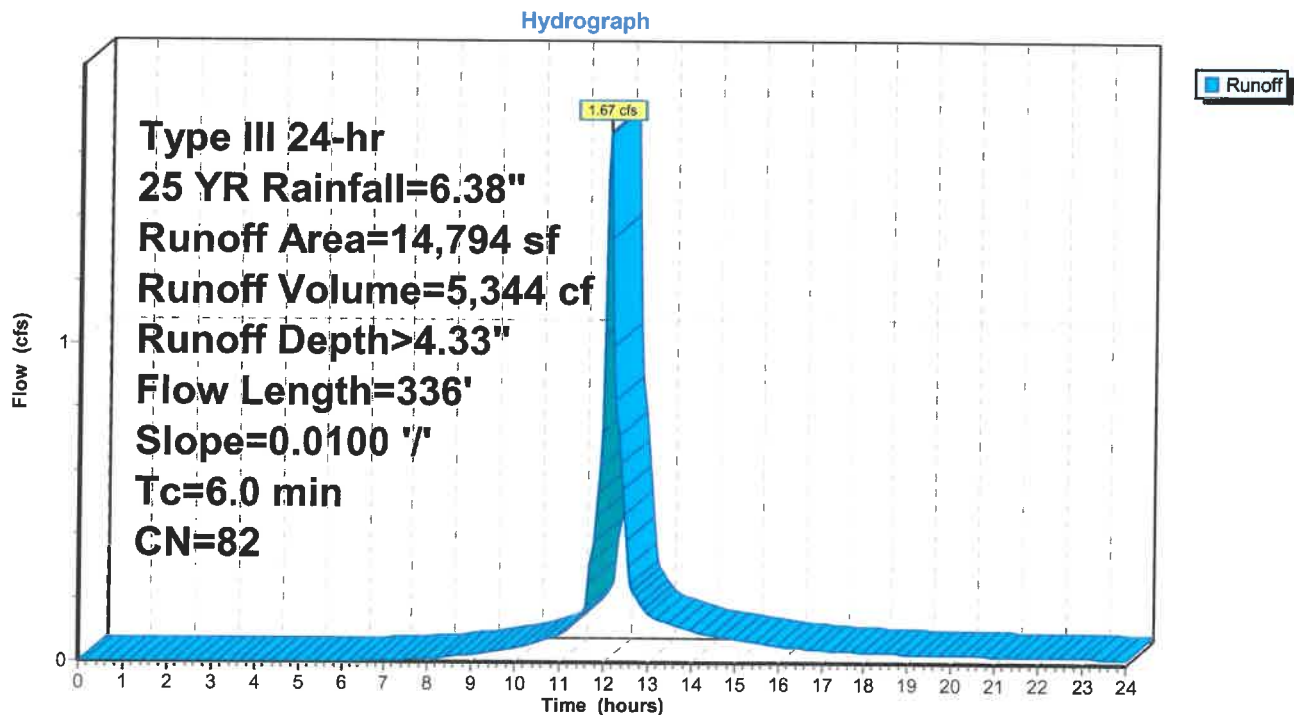
Runoff = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf, Depth&gt; 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 13S: To CB 10**

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## Summary for Subcatchment 14S: To Wetland

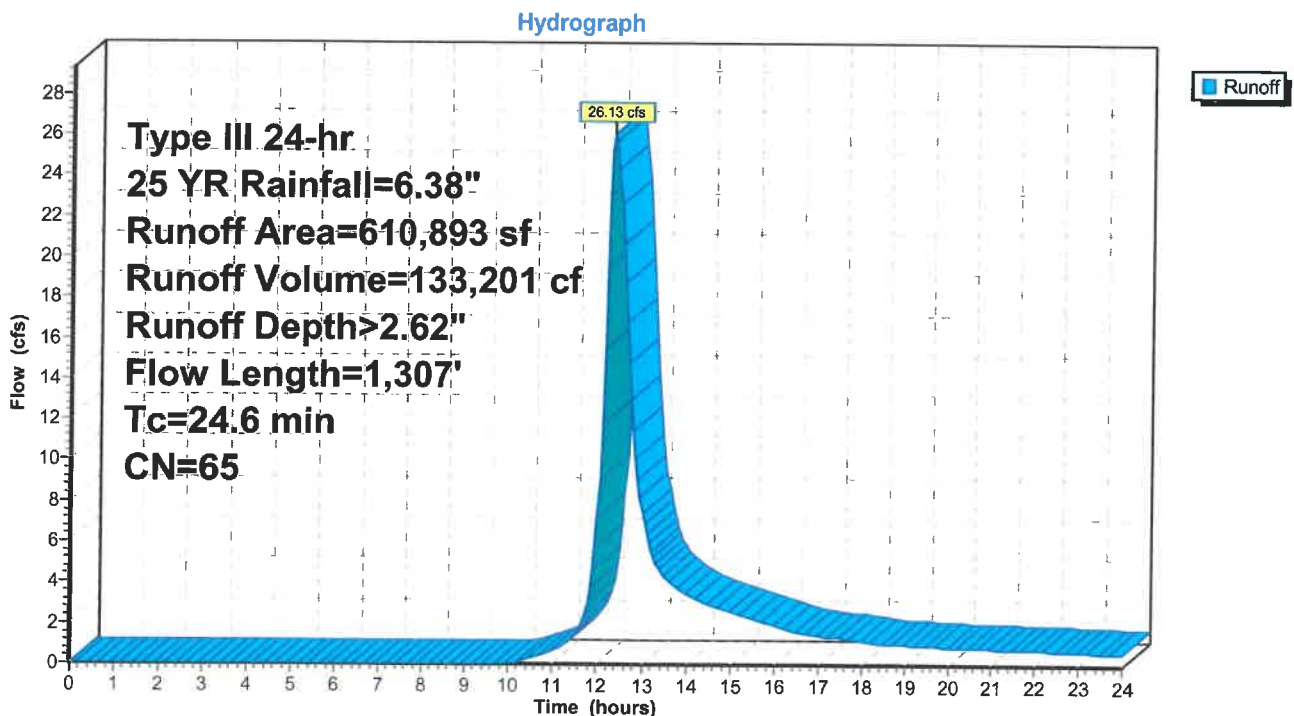
Runoff = 26.13 cfs @ 12.36 hrs, Volume= 133,201 cf, Depth> 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
326,808	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
610,893	65	Weighted Average
610,893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b> Woods: Light underbrush n= 0.400 P2= 3.22"
7.9	648	0.0750	1.37		<b>Shallow Concentrated Flow, Shallow</b> Woodland Kv= 5.0 fps
6.9	609	0.0200	1.47	1.76	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

## Subcatchment 14S: To Wetland



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Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Subcatchment 15S: TO BASIN**

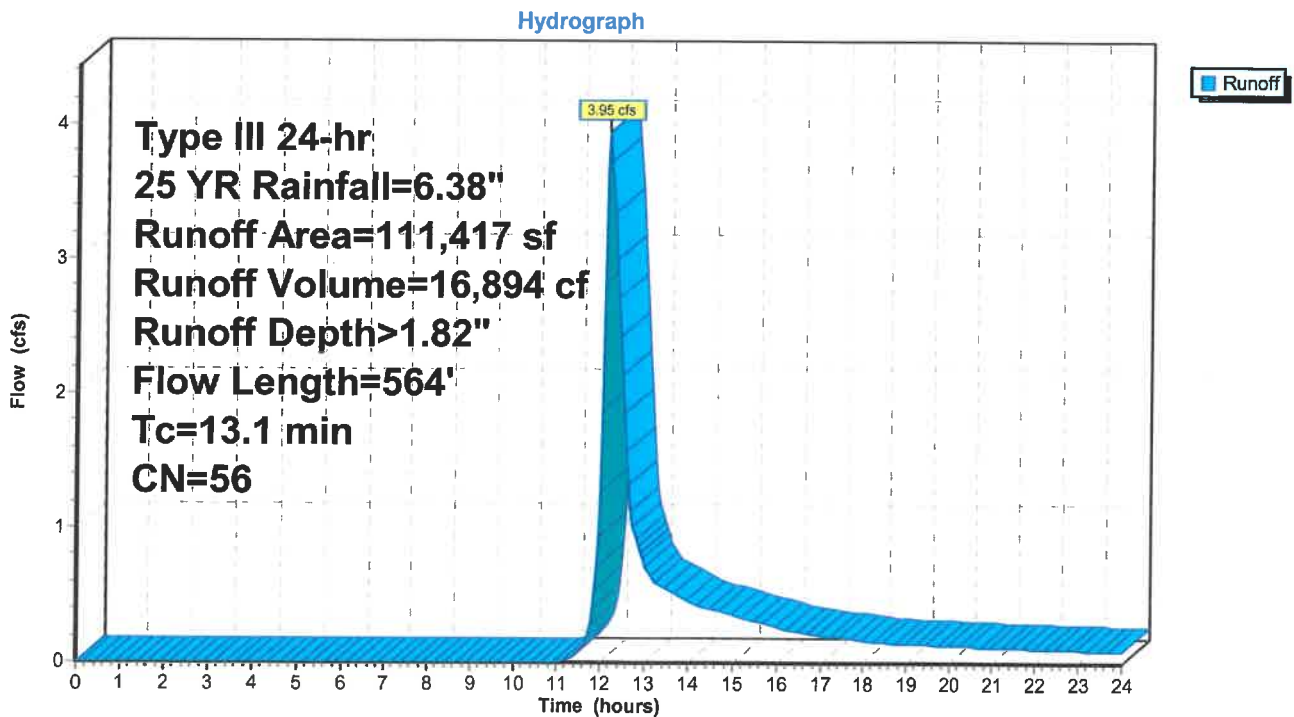
Runoff = 3.95 cfs @ 12.20 hrs, Volume= 16,894 cf, Depth&gt; 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
89,974	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
111,417	56	Weighted Average
111,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

**Subcatchment 15S: TO BASIN**



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## Summary for Subcatchment 16S: TO BASIN

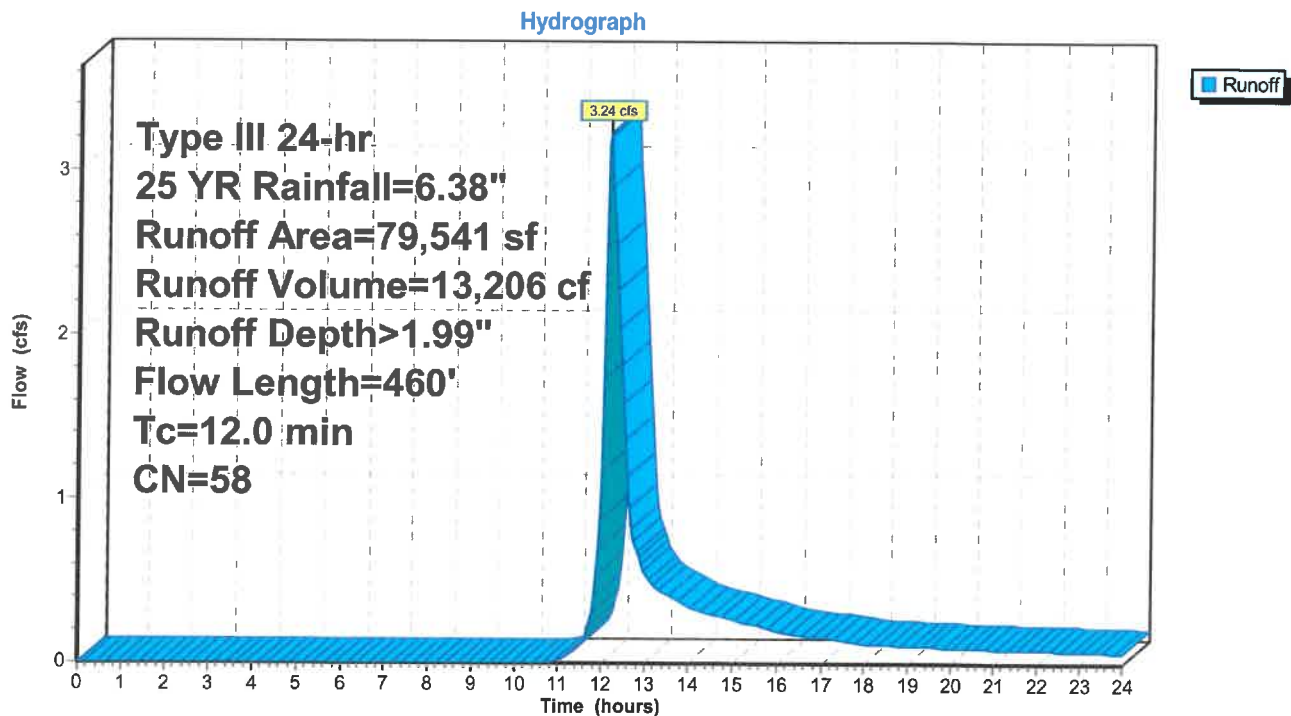
Runoff = 3.24 cfs @ 12.18 hrs, Volume= 13,206 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		<b>Shallow Concentrated Flow,</b> Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

## Subcatchment 16S: TO BASIN



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Type III 24-hr 25 YR Rainfall=6.38"

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### Summary for Subcatchment 17S: To Off Site

Runoff = 6.37 cfs @ 12.17 hrs, Volume= 25,928 cf, Depth> 1.74"

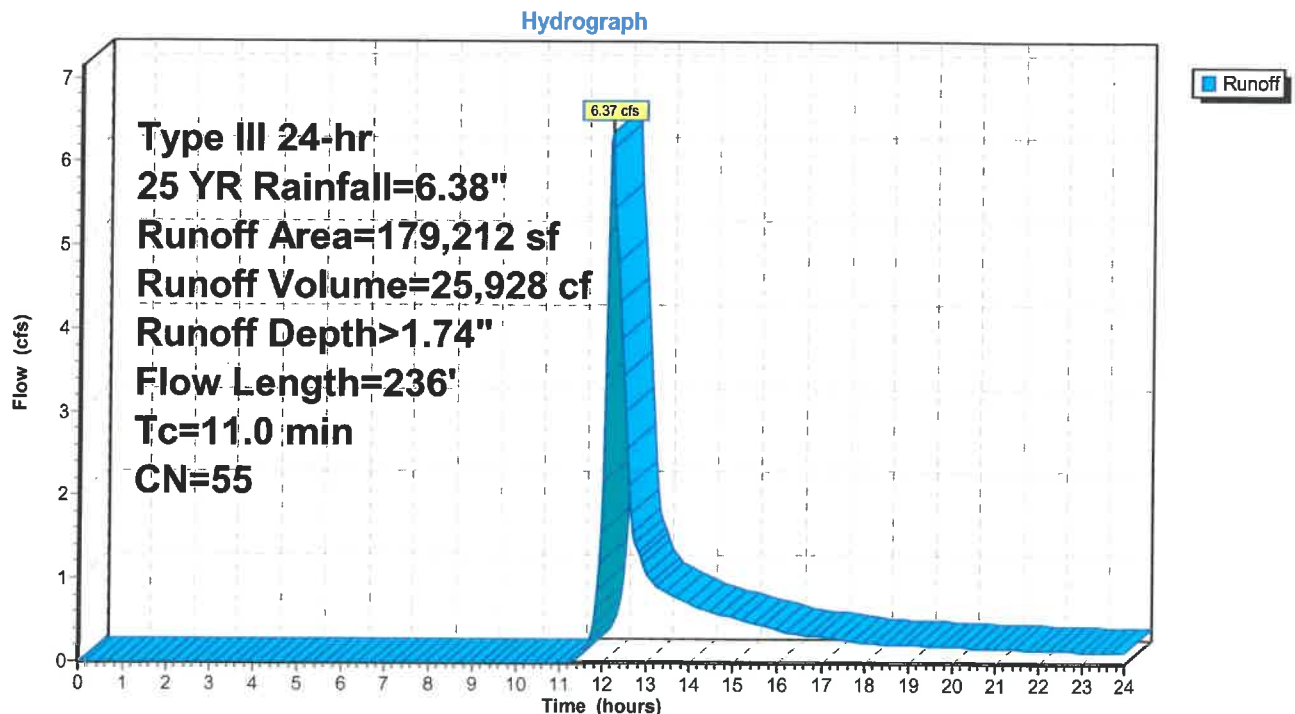
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
179,212	55	Woods, Good, HSG B
179,212		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	236	Total			

### Subcatchment 17S: To Off Site



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## Summary for Subcatchment 19S: Area To Basin3

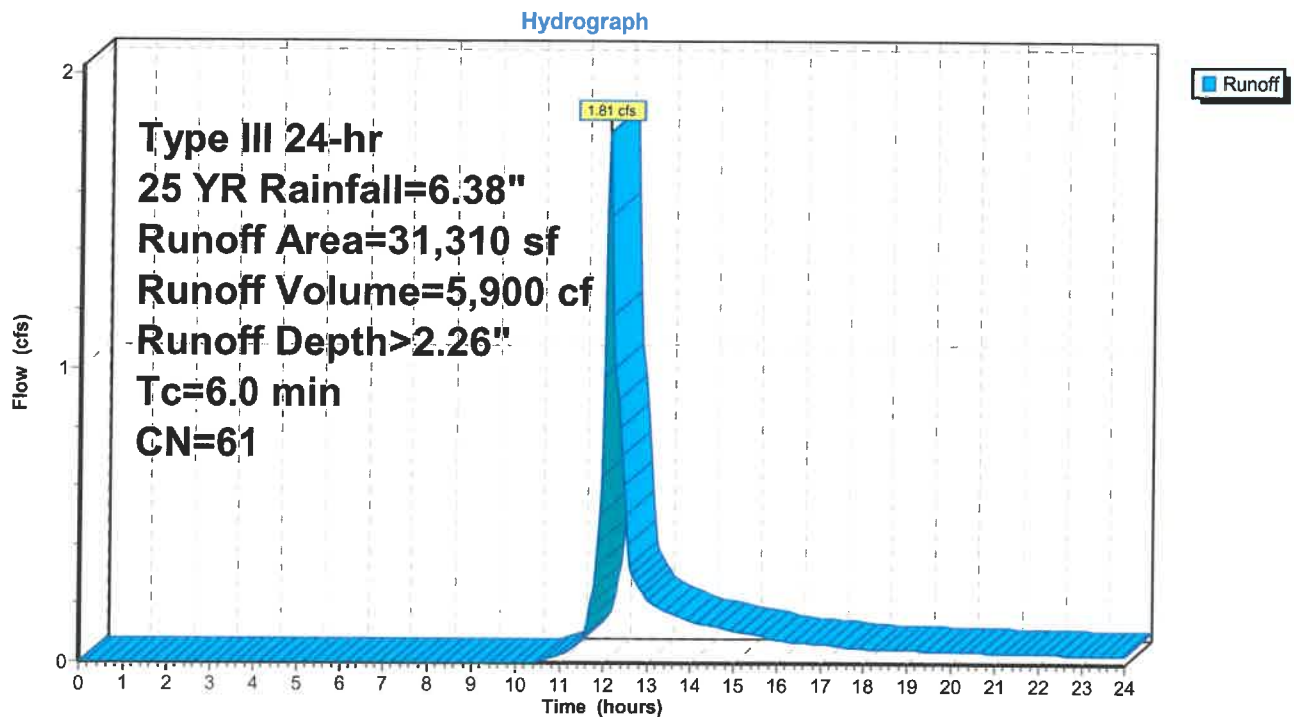
Runoff = 1.81 cfs @ 12.10 hrs, Volume= 5,900 cf, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
31,310	61	>75% Grass cover, Good, HSG B
31,310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, a-b

## Subcatchment 19S: Area To Basin3



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### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 2.25" for 25 YR event  
Inflow = 16.88 cfs @ 12.41 hrs, Volume= 92,300 cf  
Outflow = 16.87 cfs @ 12.42 hrs, Volume= 92,284 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 8.70 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 3.27 fps, Avg. Travel Time= 0.3 min

Peak Storage= 118 cf @ 12.41 hrs

Average Depth at Peak Storage= 0.48' , Surface Width= 4.00'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe

n= 0.013 Concrete, trowel finish

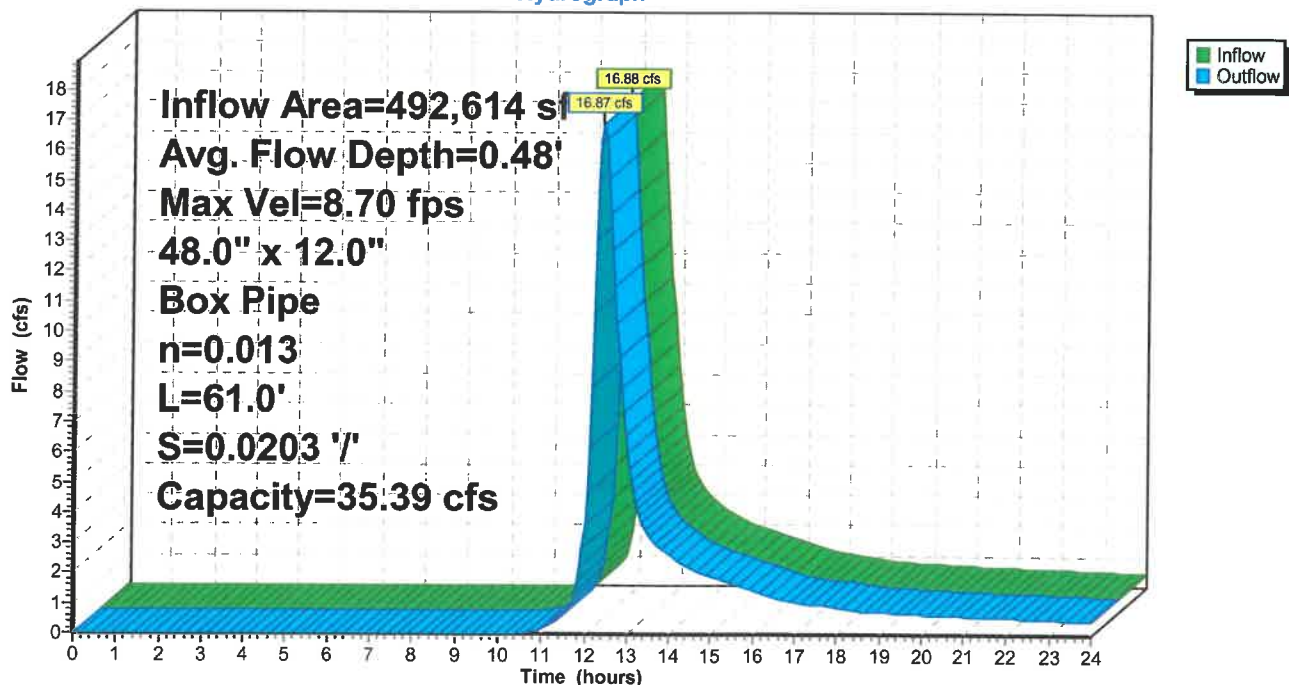
Length= 61.0' Slope= 0.0203 '/

Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

Hydrograph



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### Summary for Reach 2R: New Box Cumvert

Inflow Area = 3,247,549 sf, 4.18% Impervious, Inflow Depth > 1.91" for 25 YR event  
Inflow = 51.73 cfs @ 13.00 hrs, Volume= 518,035 cf  
Outflow = 51.72 cfs @ 13.00 hrs, Volume= 518,003 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 13.23 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 6.26 fps, Avg. Travel Time= 0.1 min

Peak Storage= 133 cf @ 13.00 hrs

Average Depth at Peak Storage= 0.39', Surface Width= 10.00'

Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 659.84 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished

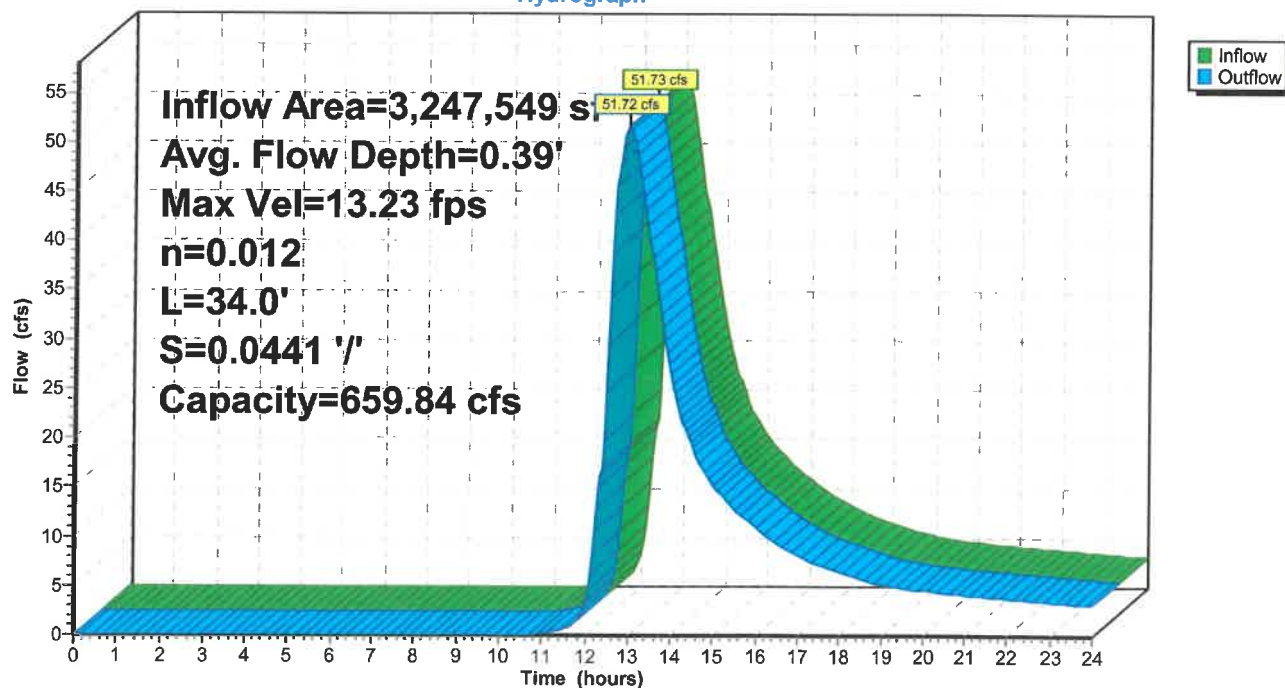
Length= 34.0' Slope= 0.0441 '/'

Inlet Invert= 294.00', Outlet Invert= 292.50'



### Reach 2R: New Box Cumvert

Hydrograph



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### Summary for Reach 3R: CB1 to DMH 1

Inflow Area = 13,094 sf, 84.66% Impervious, Inflow Depth > 5.44" for 25 YR event  
Inflow = 1.75 cfs @ 12.09 hrs, Volume= 5,936 cf  
Outflow = 1.75 cfs @ 12.09 hrs, Volume= 5,936 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.17 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.71 fps, Avg. Travel Time= 0.0 min

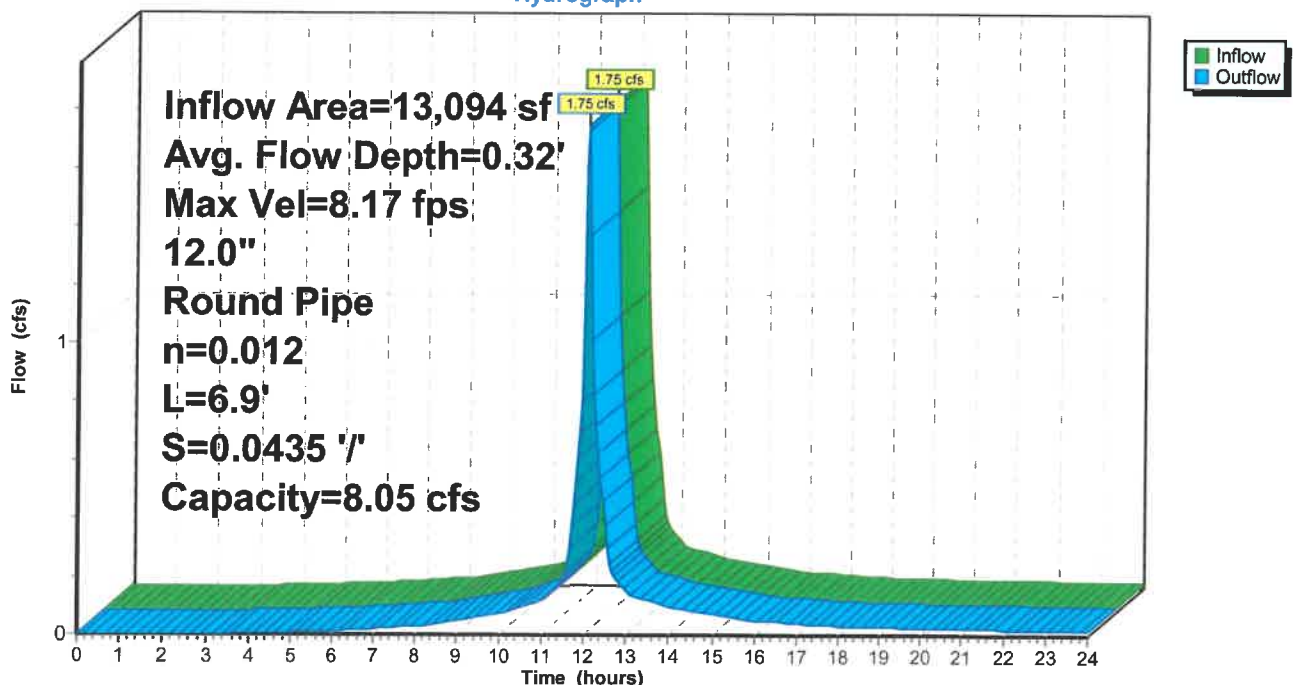
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.32', Surface Width= 0.93'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.9' Slope= 0.0435 '/'  
Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 3R: CB1 to DMH 1

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### Summary for Reach 4R: CB2 to DMH 1

Inflow Area = 11,319 sf, 94.70% Impervious, Inflow Depth > 5.90" for 25 YR event  
Inflow = 1.57 cfs @ 12.09 hrs, Volume= 5,567 cf  
Outflow = 1.57 cfs @ 12.09 hrs, Volume= 5,567 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.92 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.64 fps, Avg. Travel Time= 0.0 min

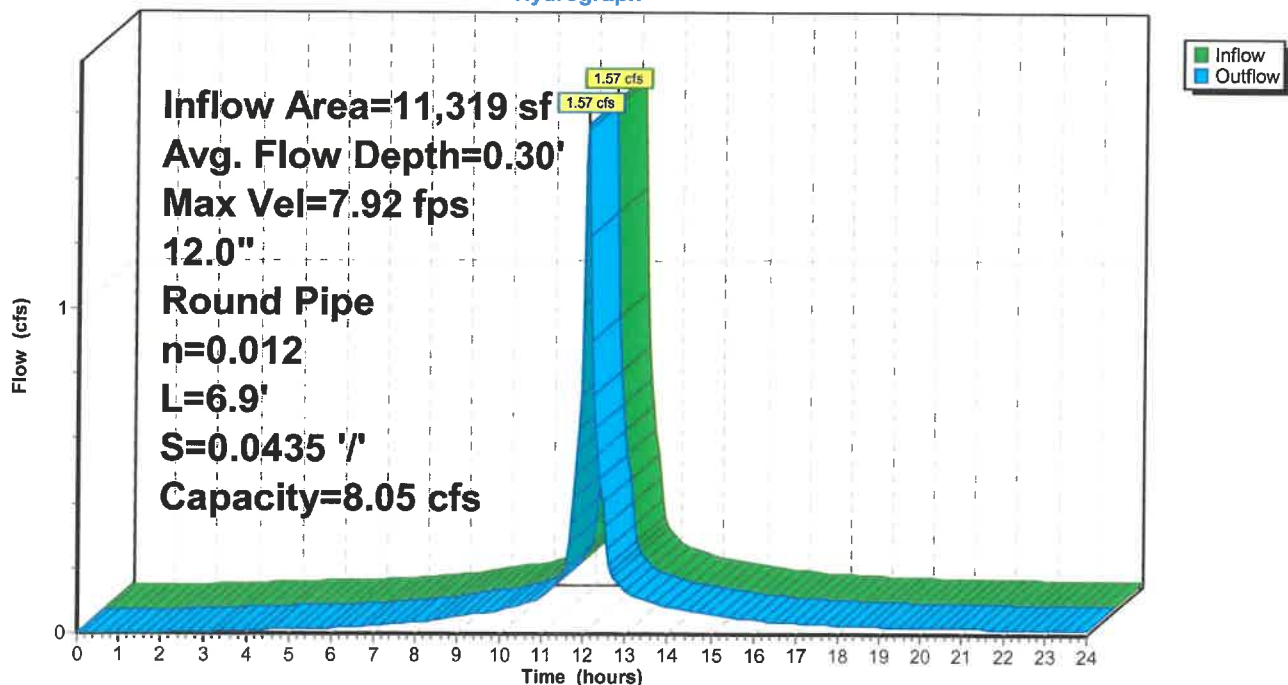
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.30', Surface Width= 0.92'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.9' Slope= 0.0435 '/'  
Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 4R: CB2 to DMH 1

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### Summary for Reach 5R: DMH1 to DMH 2

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 5.65" for 25 YR event  
Inflow = 3.32 cfs @ 12.09 hrs, Volume= 11,503 cf  
Outflow = 3.30 cfs @ 12.09 hrs, Volume= 11,501 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.56 fps, Min. Travel Time= 0.2 min

Avg. Velocity= 1.82 fps, Avg. Travel Time= 0.7 min

Peak Storage= 45 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.56', Surface Width= 1.45'

Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.30 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

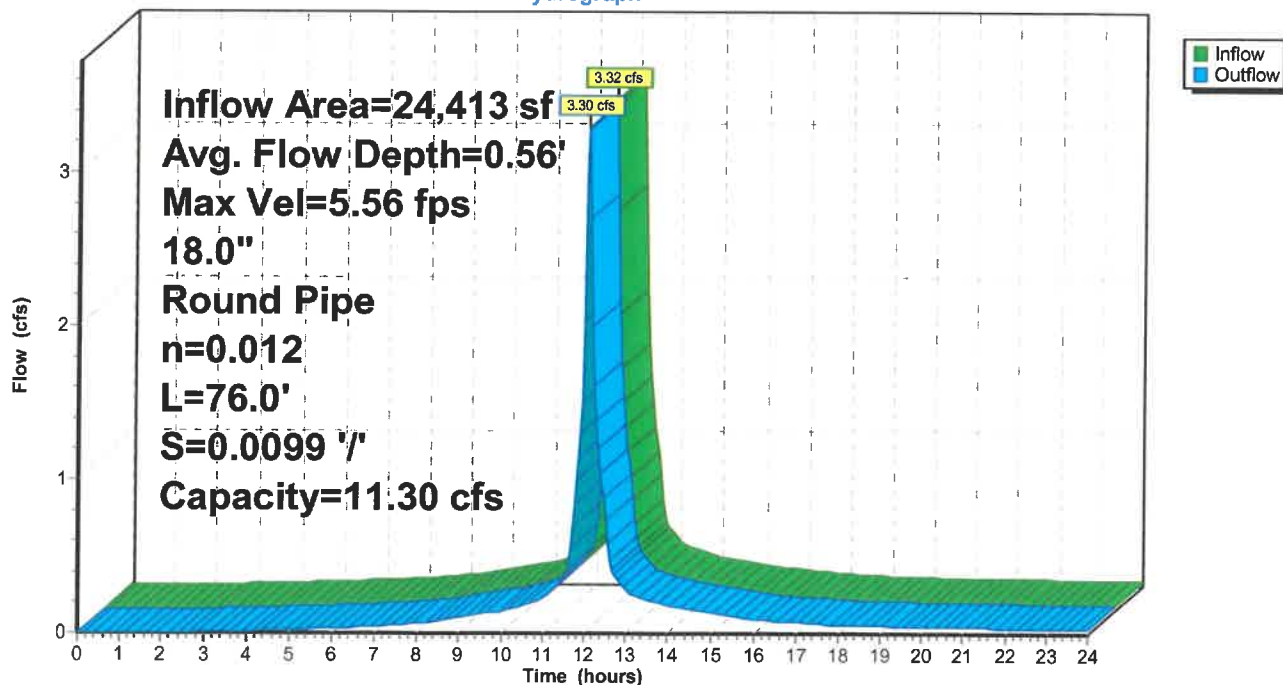
Length= 76.0' Slope= 0.0099 '/'

Inlet Invert= 291.75', Outlet Invert= 291.00'



### Reach 5R: DMH1 to DMH 2

Hydrograph



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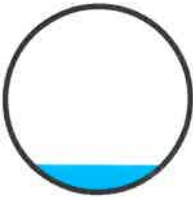
### Summary for Reach 6R: CB3 to DMH 2

Inflow Area = 3,124 sf, 75.00% Impervious, Inflow Depth > 5.10" for 25 YR event  
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 1,328 cf  
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 1,328 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.47 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.82 fps, Avg. Travel Time= 0.1 min

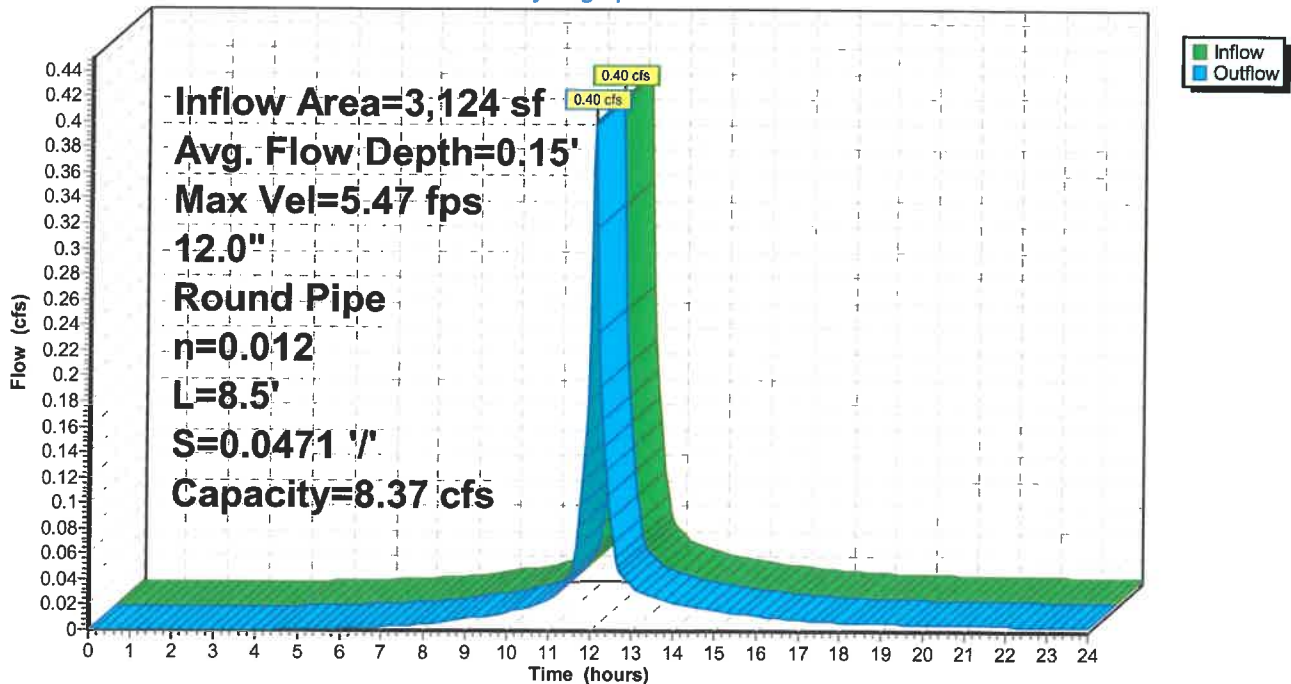
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.15' , Surface Width= 0.71'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 8.5' Slope= 0.0471 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 6R: CB3 to DMH 2

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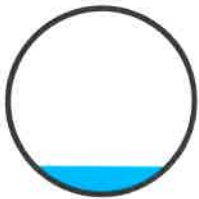
### Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 2,550 sf, 75.02% Impervious, Inflow Depth > 5.10" for 25 YR event  
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,084 cf  
Outflow = 0.33 cfs @ 12.09 hrs, Volume= 1,084 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.33 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.44 fps, Avg. Travel Time= 0.2 min

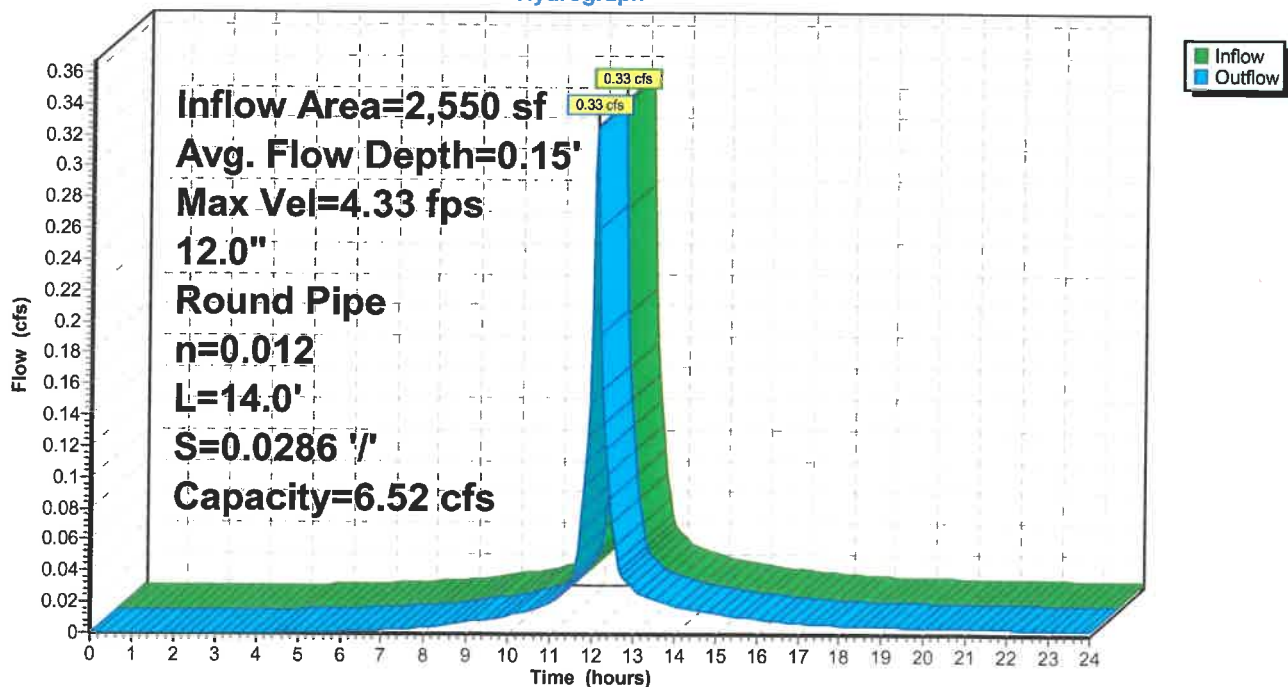
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.15', Surface Width= 0.72'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.52 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 14.0' Slope= 0.0286 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 7R: CB4 to DMH 2

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### Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 5.13" for 25 YR event  
Inflow = 1.63 cfs @ 12.10 hrs, Volume= 5,496 cf  
Outflow = 1.58 cfs @ 12.11 hrs, Volume= 5,492 cf, Atten= 3%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.85 fps, Min. Travel Time= 0.7 min

Avg. Velocity= 1.88 fps, Avg. Travel Time= 2.1 min

Peak Storage= 67 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.32', Surface Width= 1.23'

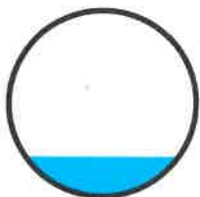
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.09 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

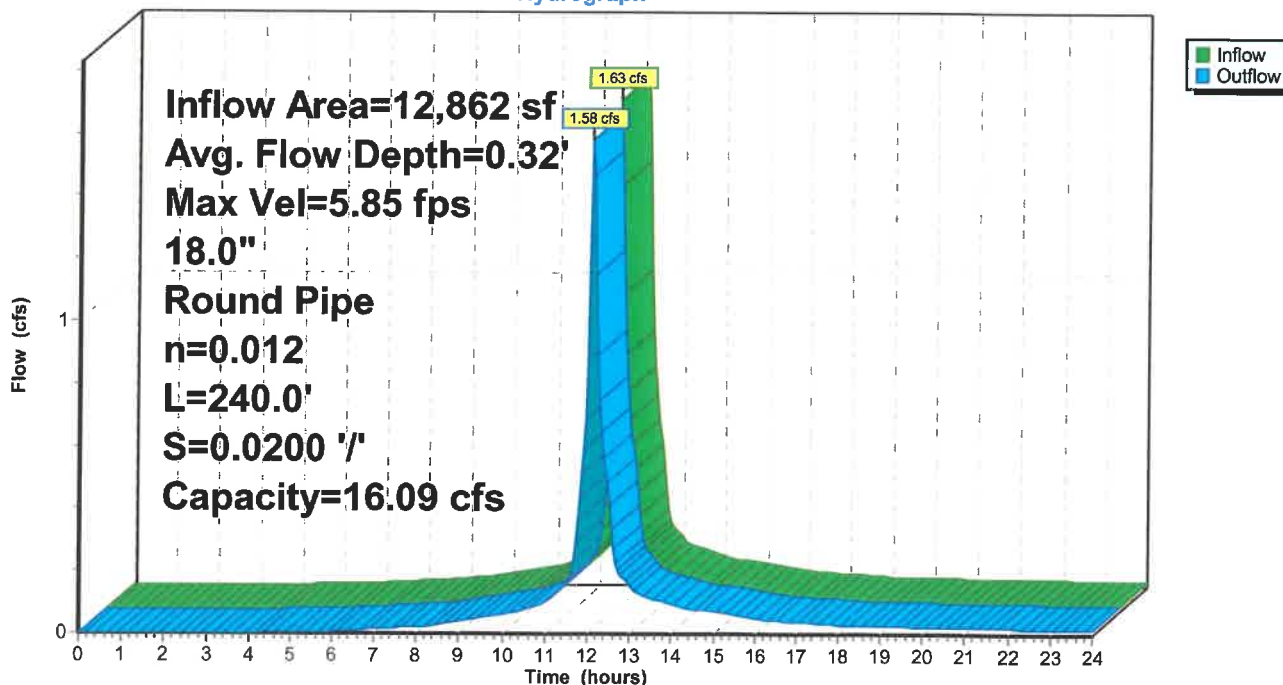
Length= 240.0' Slope= 0.0200 '/'

Inlet Invert= 294.80', Outlet Invert= 290.00'



### Reach 8R: DMH 2 TO DMH 7

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### Summary for Reach 9R: DMH 3 to DMH 2

Inflow Area = 7,188 sf, 76.42% Impervious, Inflow Depth > 5.15" for 25 YR event  
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 3,085 cf  
Outflow = 0.91 cfs @ 12.10 hrs, Volume= 3,084 cf, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 8.47 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 2.73 fps, Avg. Travel Time= 1.3 min

Peak Storage= 23 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.20', Surface Width= 0.80'

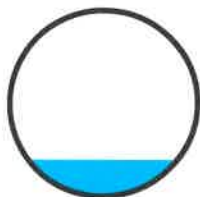
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

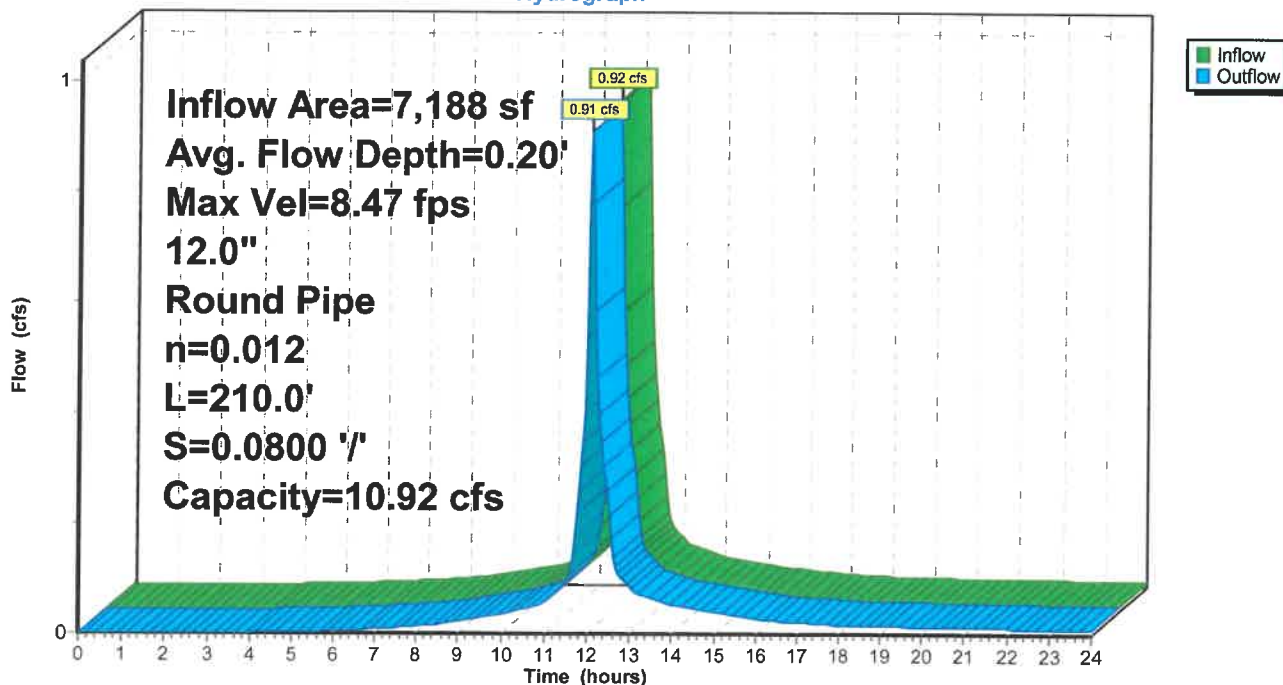
Length= 210.0' Slope= 0.0800 '/'

Inlet Invert= 315.40', Outlet Invert= 298.60'



### Reach 9R: DMH 3 to DMH 2

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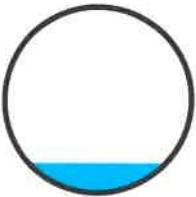
### Summary for Reach 10R: CB5 to DMH 3

Inflow Area = 3,692 sf, 67.52% Impervious, Inflow Depth > 4.77" for 25 YR event  
Inflow = 0.45 cfs @ 12.09 hrs, Volume= 1,467 cf  
Outflow = 0.45 cfs @ 12.09 hrs, Volume= 1,467 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.54 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.86 fps, Avg. Travel Time= 0.1 min

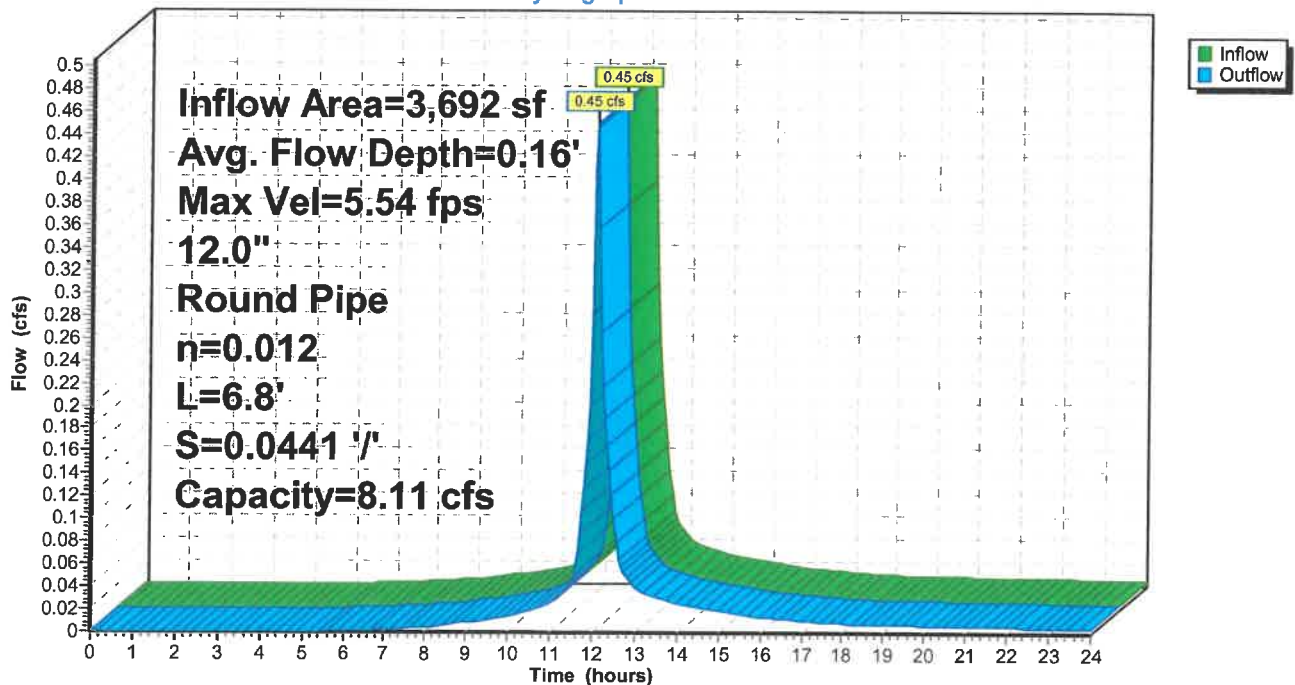
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.16' , Surface Width= 0.73'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.11 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.8' Slope= 0.0441 '/'  
Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 10R: CB5 to DMH 3

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### Summary for Reach 11R: CB6 to DMH 3

Inflow Area = 3,496 sf, 85.81% Impervious, Inflow Depth > 5.55" for 25 YR event  
Inflow = 0.47 cfs @ 12.09 hrs, Volume= 1,618 cf  
Outflow = 0.47 cfs @ 12.09 hrs, Volume= 1,618 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.42 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.46 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.19', Surface Width= 0.79'

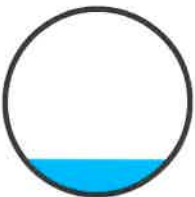
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.78 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

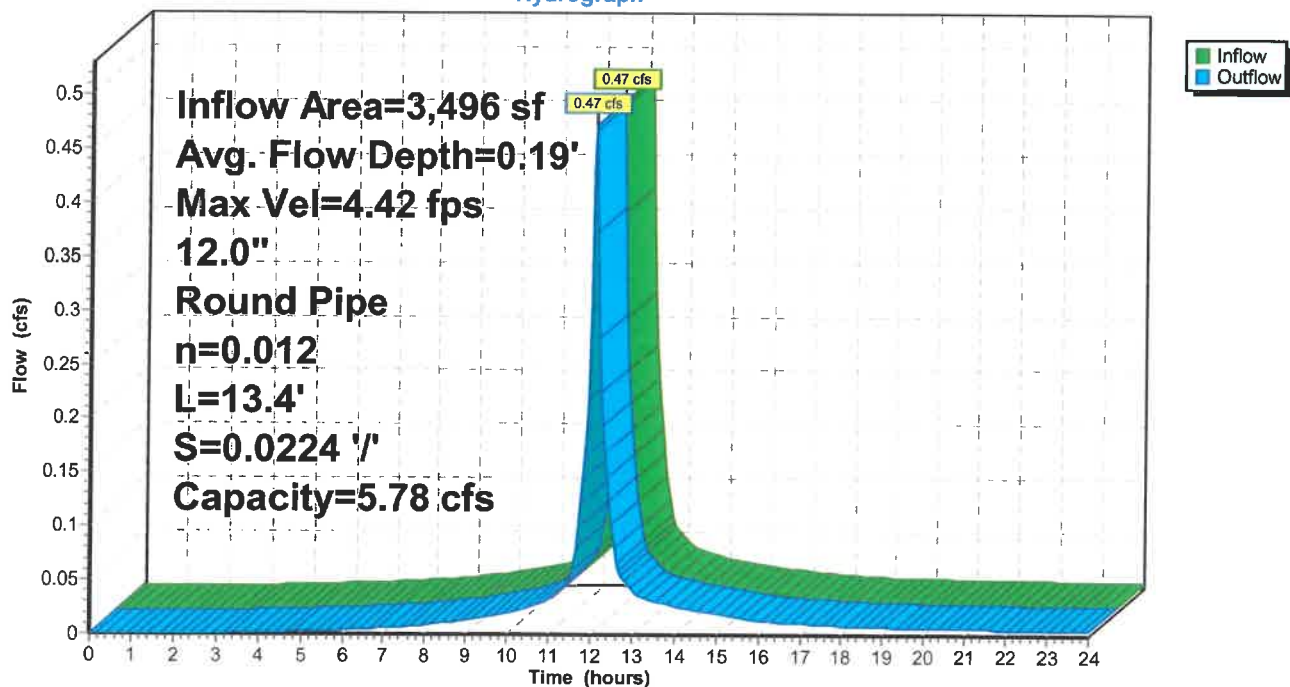
Length= 13.4' Slope= 0.0224 '/'

Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 11R: CB6 to DMH 3

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### Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 5.12" for 25 YR event  
Inflow = 1.58 cfs @ 12.11 hrs, Volume= 5,492 cf  
Outflow = 1.53 cfs @ 12.13 hrs, Volume= 5,489 cf, Atten= 3%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.56 fps, Min. Travel Time= 0.6 min  
Avg. Velocity= 2.16 fps, Avg. Travel Time= 1.9 min

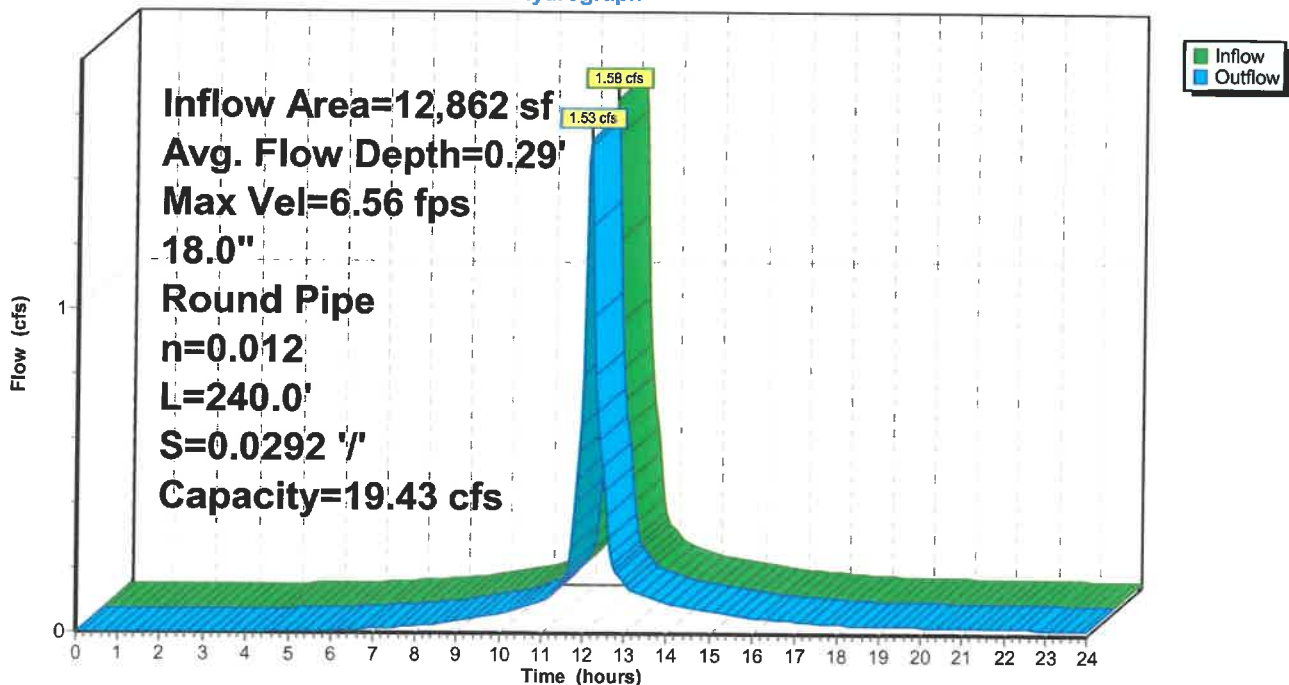
Peak Storage= 57 cf @ 12.12 hrs  
Average Depth at Peak Storage= 0.29' , Surface Width= 1.18'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.43 cfs

18.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 240.0' Slope= 0.0292 '/'  
Inlet Invert= 290.00', Outlet Invert= 283.00'



### Reach 12R: DMH 7 TO BASIN

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### Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 4.77" for 25 YR event  
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf  
Outflow = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.38 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 1.80 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.18', Surface Width= 0.77'

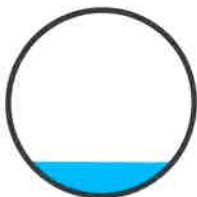
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

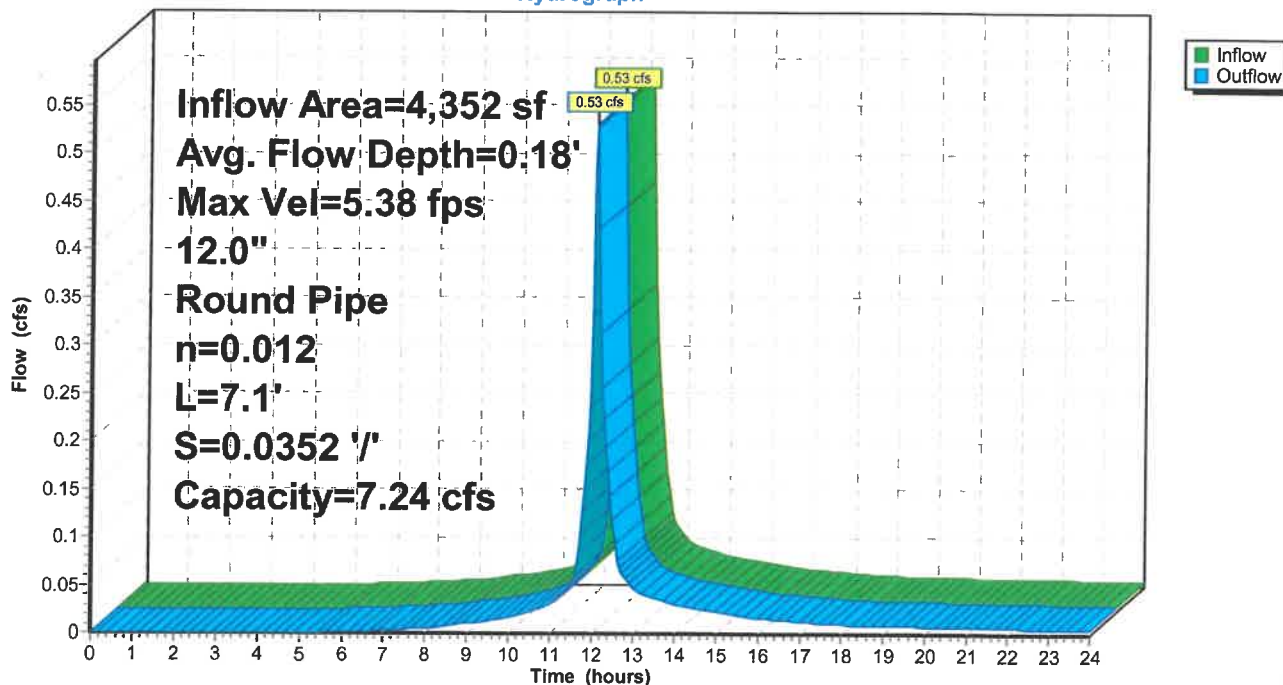
Length= 7.1' Slope= 0.0352 '/'

Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 13R: CB7 TO DMH 4

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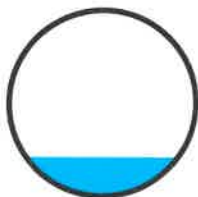
### Summary for Reach 14R: CB 8 TO DMH 4

Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 4.99" for 25 YR event  
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,695 cf  
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 1,695 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.26 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 1.41 fps, Avg. Travel Time= 0.2 min

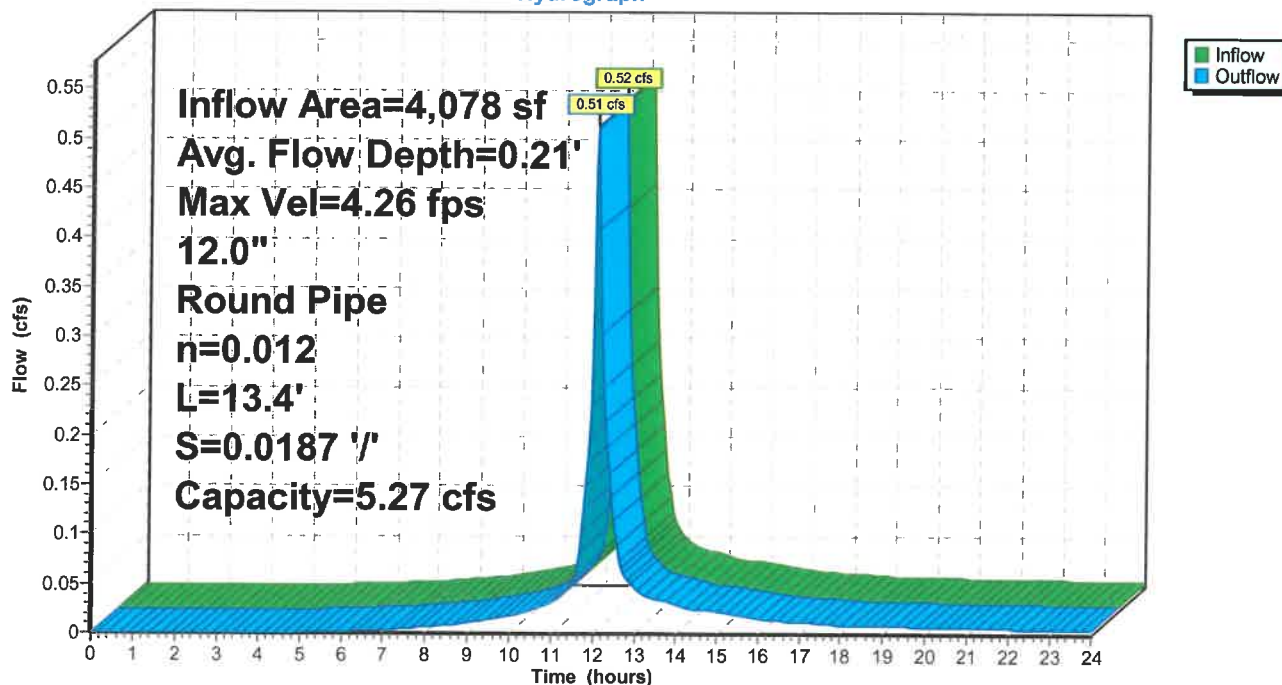
Peak Storage= 2 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.21', Surface Width= 0.82'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 13.4' Slope= 0.0187 '/'  
Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 14R: CB 8 TO DMH 4

Hydrograph



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### Summary for Reach 15R: DMH 4 TO DMH 5

Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 4.87" for 25 YR event  
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 3,424 cf  
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 3,424 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.78 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 2.90 fps, Avg. Travel Time= 0.6 min

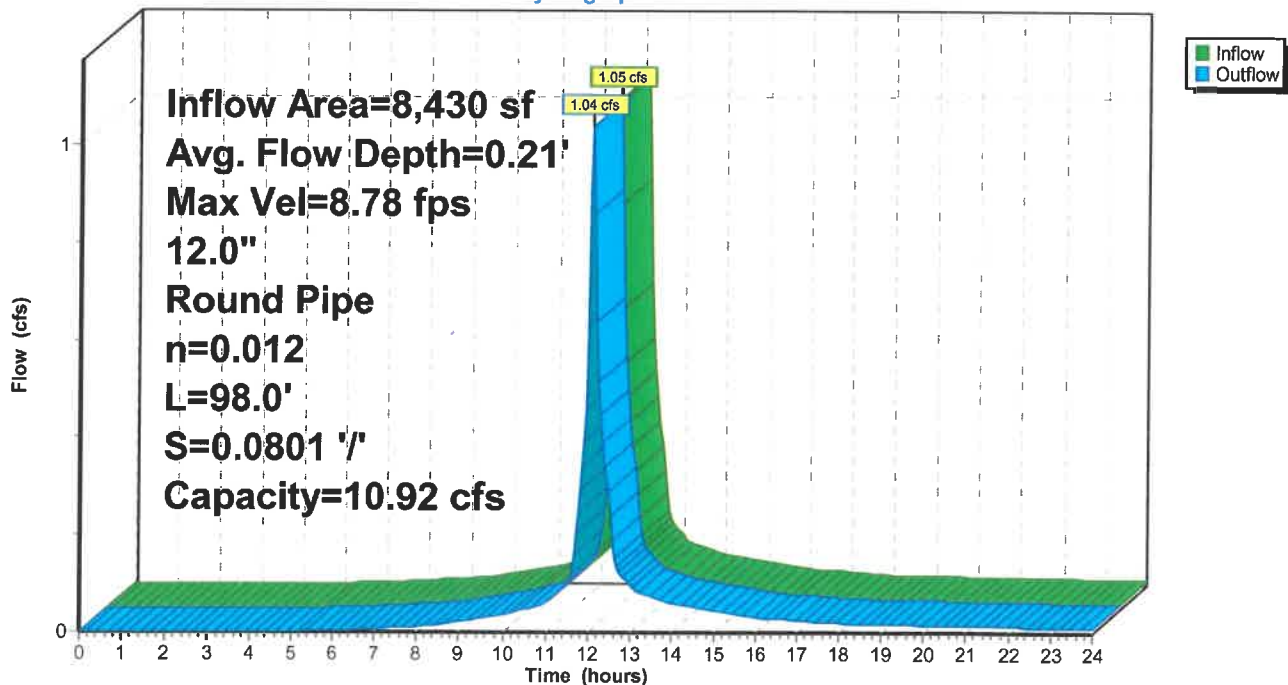
Peak Storage= 12 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.21', Surface Width= 0.81'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 98.0' Slope= 0.0801 '/'  
Inlet Invert= 316.20', Outlet Invert= 308.35'



### Reach 15R: DMH 4 TO DMH 5

Hydrograph





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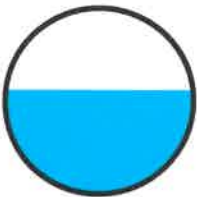
### Summary for Reach 16R: DMH 5 TO DMH 6

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.54" for 25 YR event  
Inflow = 4.28 cfs @ 12.10 hrs, Volume= 13,903 cf  
Outflow = 4.13 cfs @ 12.11 hrs, Volume= 13,895 cf, Atten= 3%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.01 fps, Min. Travel Time= 0.7 min  
Avg. Velocity= 2.03 fps, Avg. Travel Time= 2.0 min

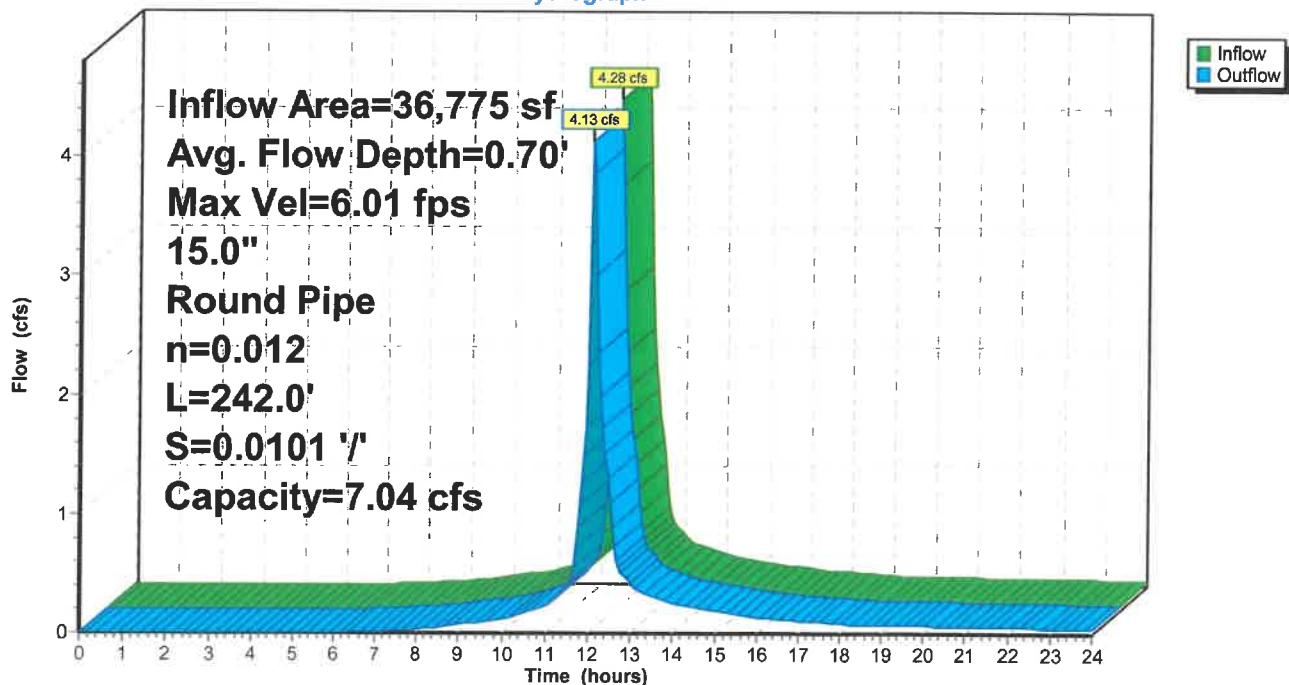
Peak Storage= 172 cf @ 12.10 hrs  
Average Depth at Peak Storage= 0.70' , Surface Width= 1.24'  
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 242.0' Slope= 0.0101 '/'  
Inlet Invert= 308.10', Outlet Invert= 305.65'



### Reach 16R: DMH 5 TO DMH 6

Hydrograph



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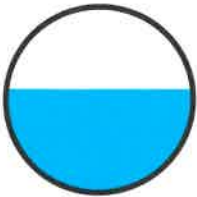
### Summary for Reach 17R: DMH 6 TO DMH 5

Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 4.44" for 25 YR event  
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,482 cf  
Outflow = 3.24 cfs @ 12.10 hrs, Volume= 10,479 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.25 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 2.52 fps, Avg. Travel Time= 0.6 min

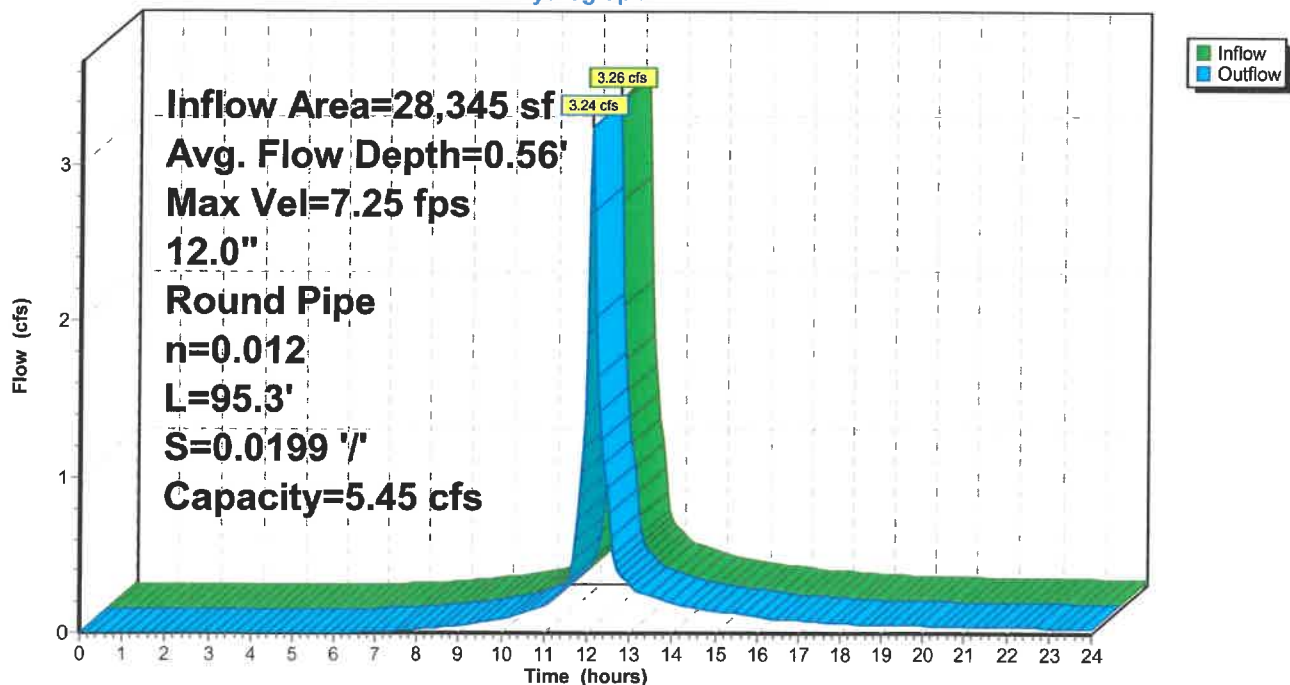
Peak Storage= 43 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.56' , Surface Width= 0.99'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 95.3' Slope= 0.0199 '/'  
Inlet Invert= 310.25', Outlet Invert= 308.35'



### Reach 17R: DMH 6 TO DMH 5

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### Summary for Reach 18R: CB 10 TO DMH 6

Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 4.33" for 25 YR event  
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf  
Outflow = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.03 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.08 fps, Avg. Travel Time= 0.1 min

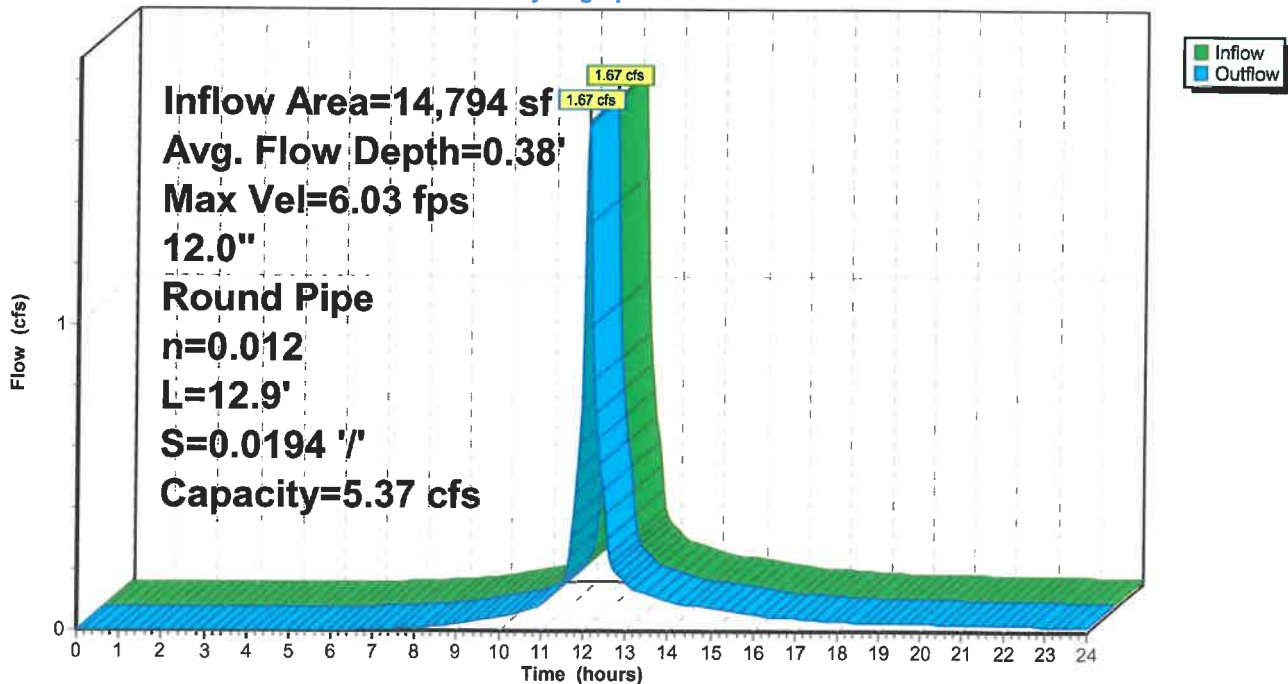
Peak Storage= 4 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.38', Surface Width= 0.97'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 12.9' Slope= 0.0194 '/'  
Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 18R: CB 10 TO DMH 6

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### Summary for Reach 19R: CB 9 TO DMH 6

Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 4.55" for 25 YR event  
Inflow = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf  
Outflow = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.42 fps, Min. Travel Time= 0.0 min  
Avg. Velocity = 2.52 fps, Avg. Travel Time= 0.0 min

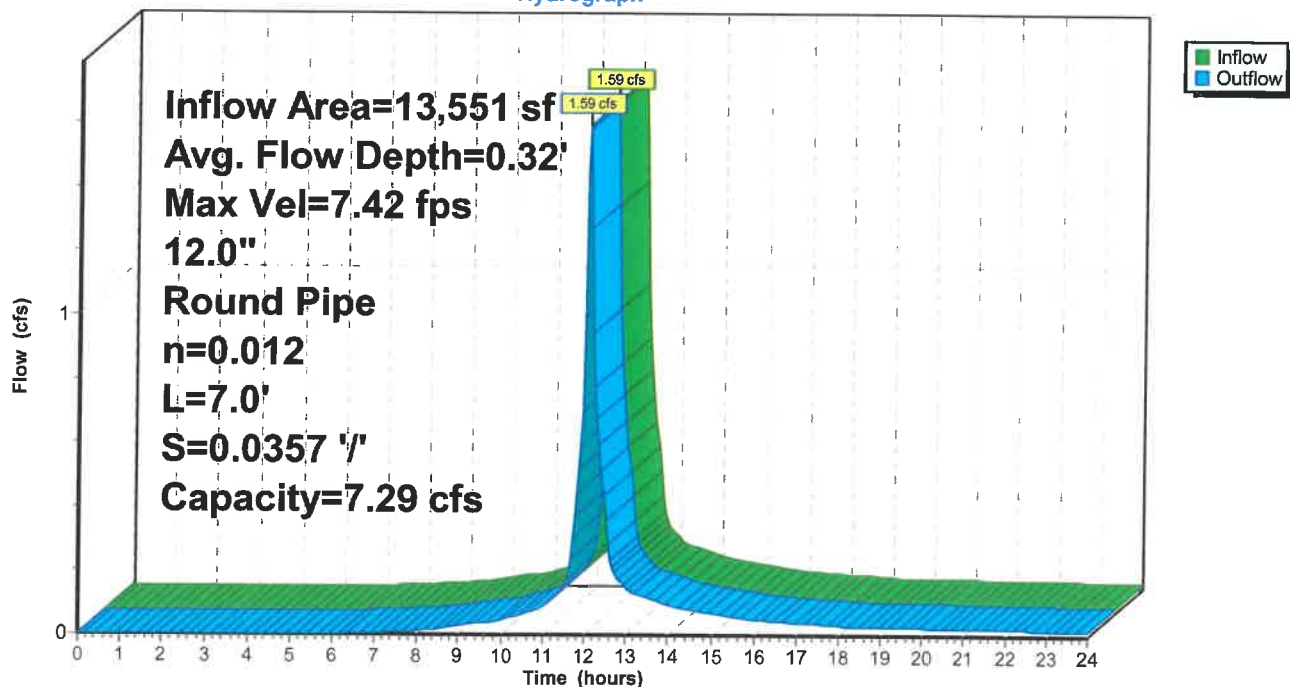
Peak Storage= 2 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.32', Surface Width= 0.93'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 7.0' Slope= 0.0357 '/'  
Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 19R: CB 9 TO DMH 6

Hydrograph



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### Summary for Reach 20R: DMH 6 to Basin

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.53" for 25 YR event  
Inflow = 4.13 cfs @ 12.11 hrs, Volume= 13,895 cf  
Outflow = 4.12 cfs @ 12.12 hrs, Volume= 13,894 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.88 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 2.64 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 12.12 hrs

Average Depth at Peak Storage= 0.55', Surface Width= 1.24'

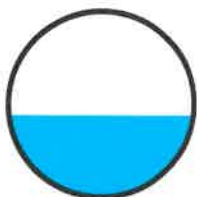
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

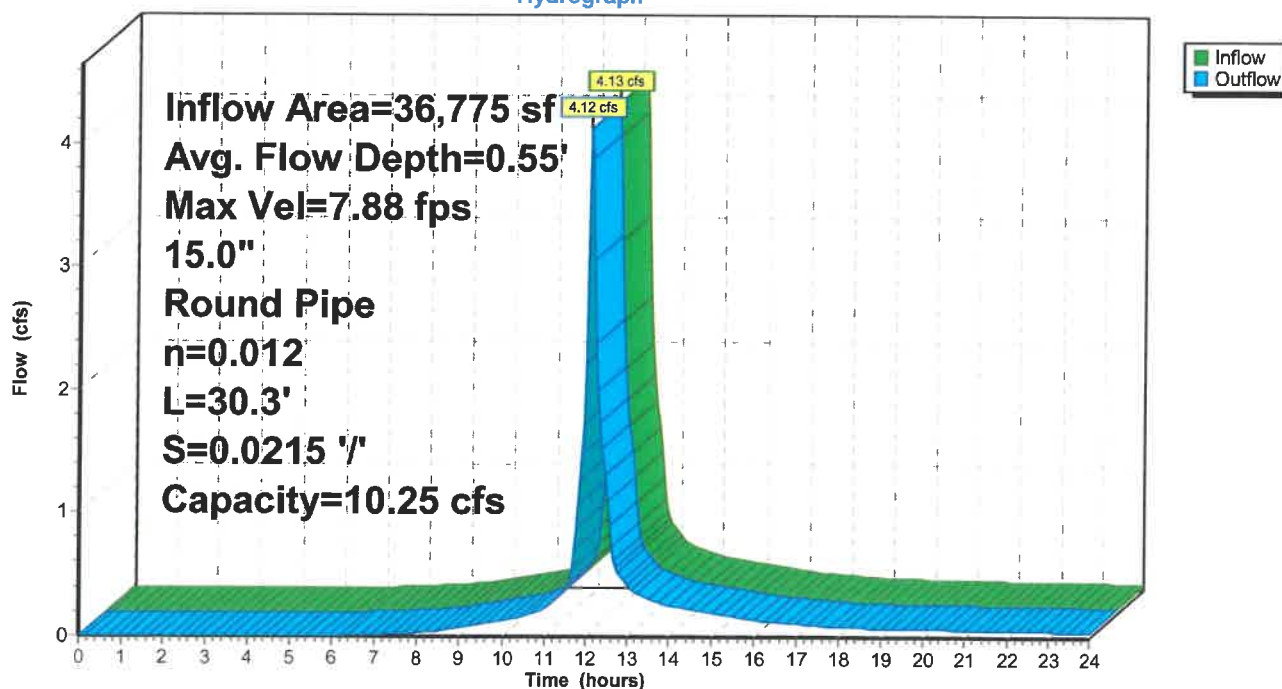
Length= 30.3' Slope= 0.0215 '/'

Inlet Invert= 305.65', Outlet Invert= 305.00'



### Reach 20R: DMH 6 to Basin

Hydrograph



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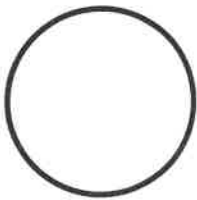
### Summary for Reach 21R: 2-8" DI

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth = 0.00" for 25 YR event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min  
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

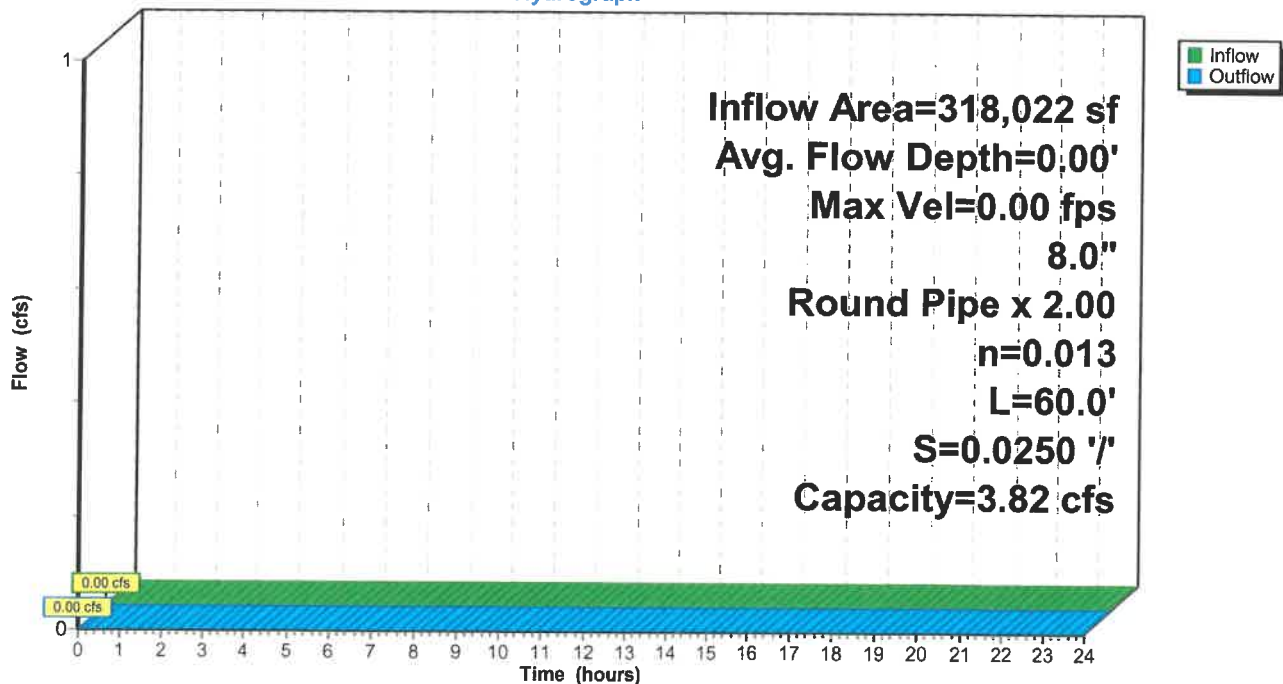
Peak Storage= 0 cf @ 0.00 hrs  
Average Depth at Peak Storage= 0.00'  
Bank-Full Depth= 0.67' Flow Area= 0.7 sf, Capacity= 3.82 cfs

A factor of 2.00 has been applied to the storage and discharge capacity  
8.0" Round Pipe  
n= 0.013 Corrugated PE, smooth interior  
Length= 60.0' Slope= 0.0250 '/'  
Inlet Invert= 312.50', Outlet Invert= 311.00'



### Reach 21R: 2-8" DI

Hydrograph





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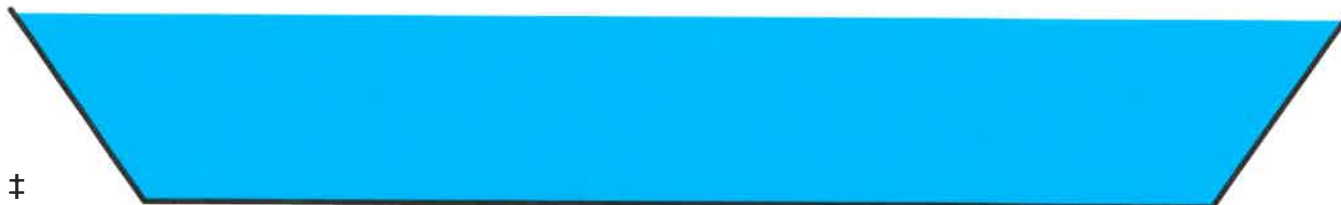
### Summary for Reach EV1: Road Berm

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 1.85" for 25 YR event  
Inflow = 45.97 cfs @ 13.05 hrs, Volume= 425,771 cf  
Outflow = 45.93 cfs @ 13.06 hrs, Volume= 425,751 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.17 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.16 fps, Avg. Travel Time= 0.1 min

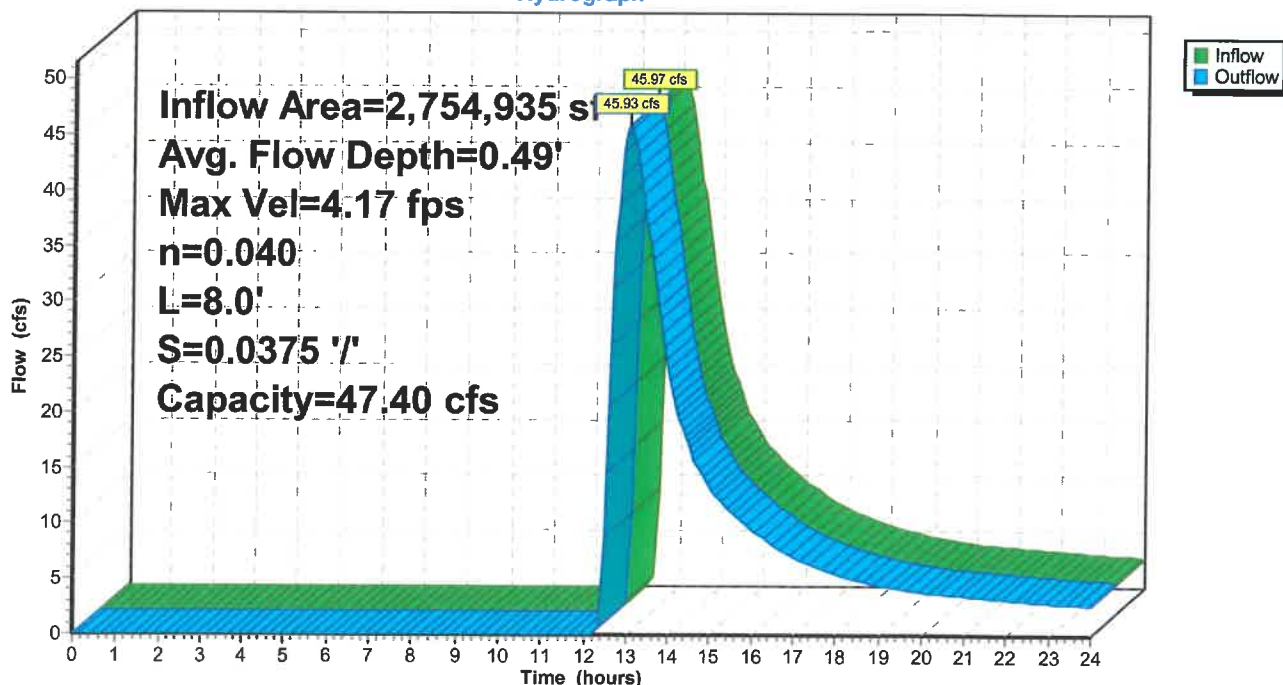
Peak Storage= 88 cf @ 13.06 hrs  
Average Depth at Peak Storage= 0.49' , Surface Width= 24.91'  
Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides  
Side Slope Z-value= 5.0 '/' Top Width= 25.00'  
Length= 8.0' Slope= 0.0375 '/'  
Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: Road Berm

Hydrograph



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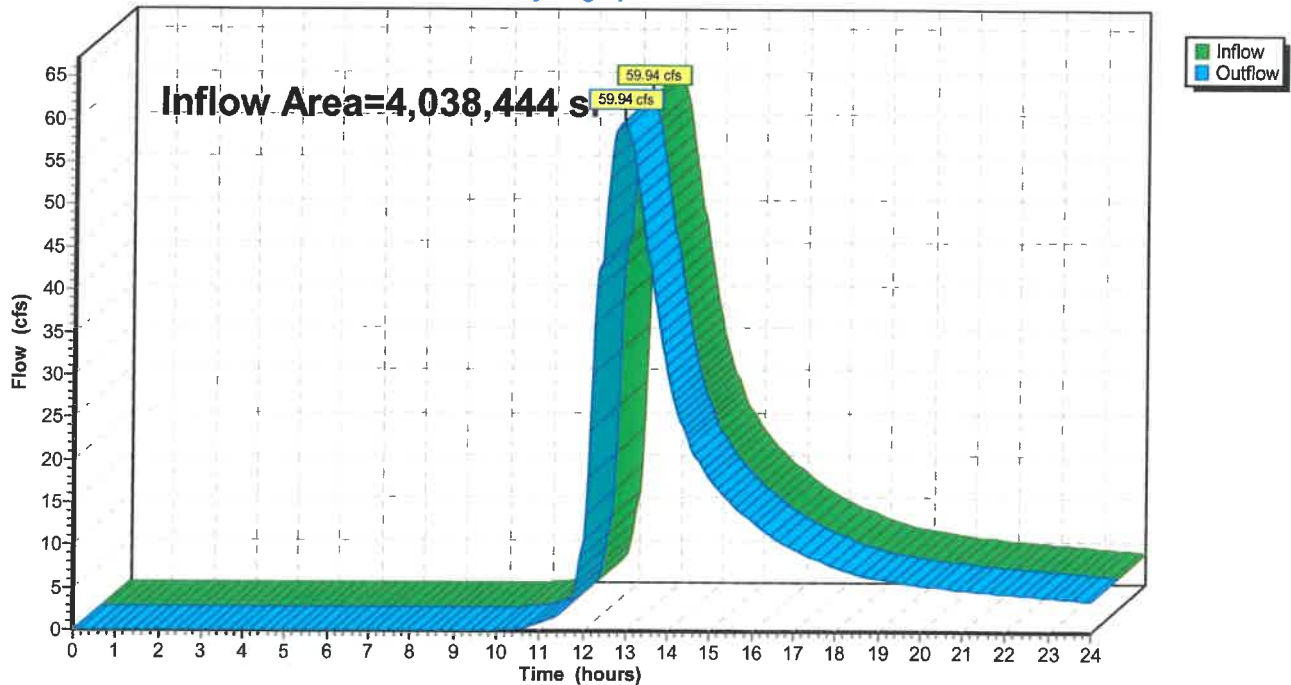
### Summary for Reach EV2: To Wetland

Inflow Area = 4,038,444 sf, 4.14% Impervious, Inflow Depth > 1.94" for 25 YR event  
Inflow = 59.94 cfs @ 12.89 hrs, Volume= 651,204 cf  
Outflow = 59.94 cfs @ 12.89 hrs, Volume= 651,204 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV2: To Wetland

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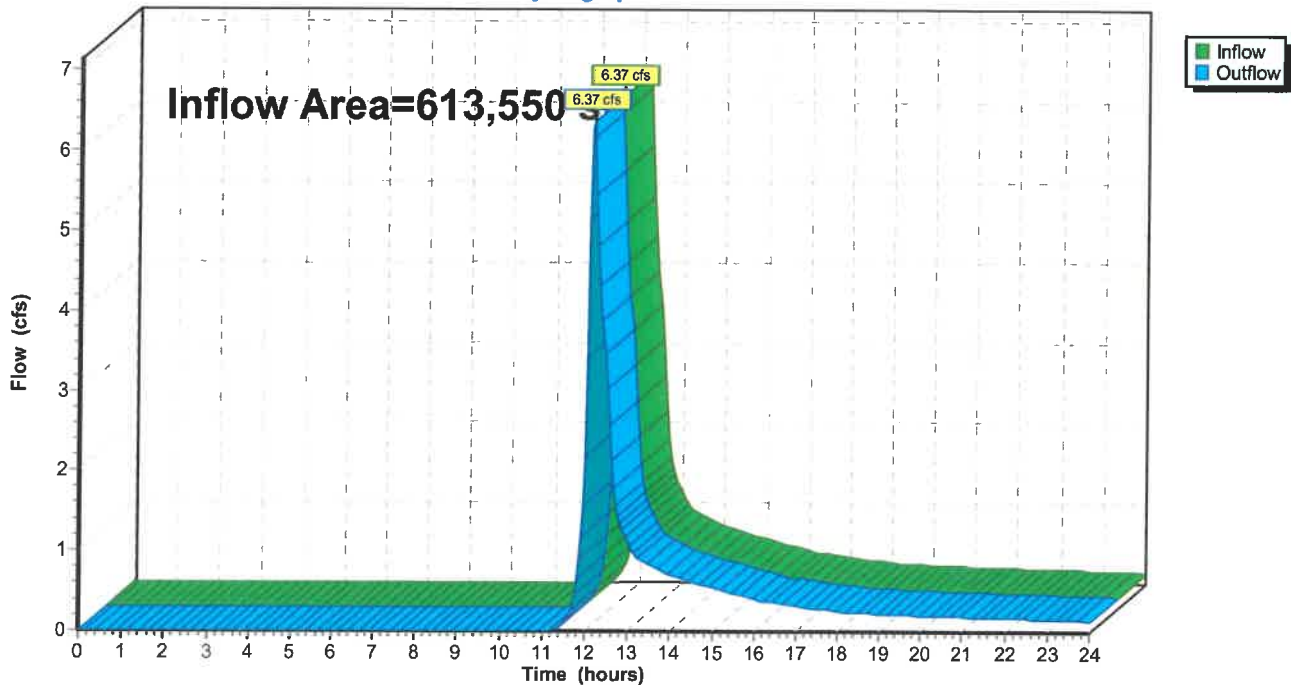
### Summary for Reach EV3: To Offsite

Inflow Area = 613,550 sf, 3.69% Impervious, Inflow Depth > 0.51" for 25 YR event  
Inflow = 6.37 cfs @ 12.17 hrs, Volume= 25,928 cf  
Outflow = 6.37 cfs @ 12.17 hrs, Volume= 25,928 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV3: To Offsite

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**Summary for Pond 1P: Forebay**

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 5.12" for 25 YR event  
 Inflow = 1.53 cfs @ 12.13 hrs, Volume= 5,489 cf  
 Outflow = 1.53 cfs @ 12.13 hrs, Volume= 5,489 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.53 cfs @ 12.13 hrs, Volume= 5,489 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 281.00' @ 12.13 hrs Surf.Area= 1,232 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 5,478 cf (100% of inflow)

Center-of-Mass det. time= 0.0 min ( 787.7 - 787.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	252.50'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=30,307.96 cfs @ 12.13 hrs HW=281.00' (Free Discharge)

1=Broad-Crested Rectangular Weir (Weir Controls 30,307.96 cfs @ 17.72 fps)

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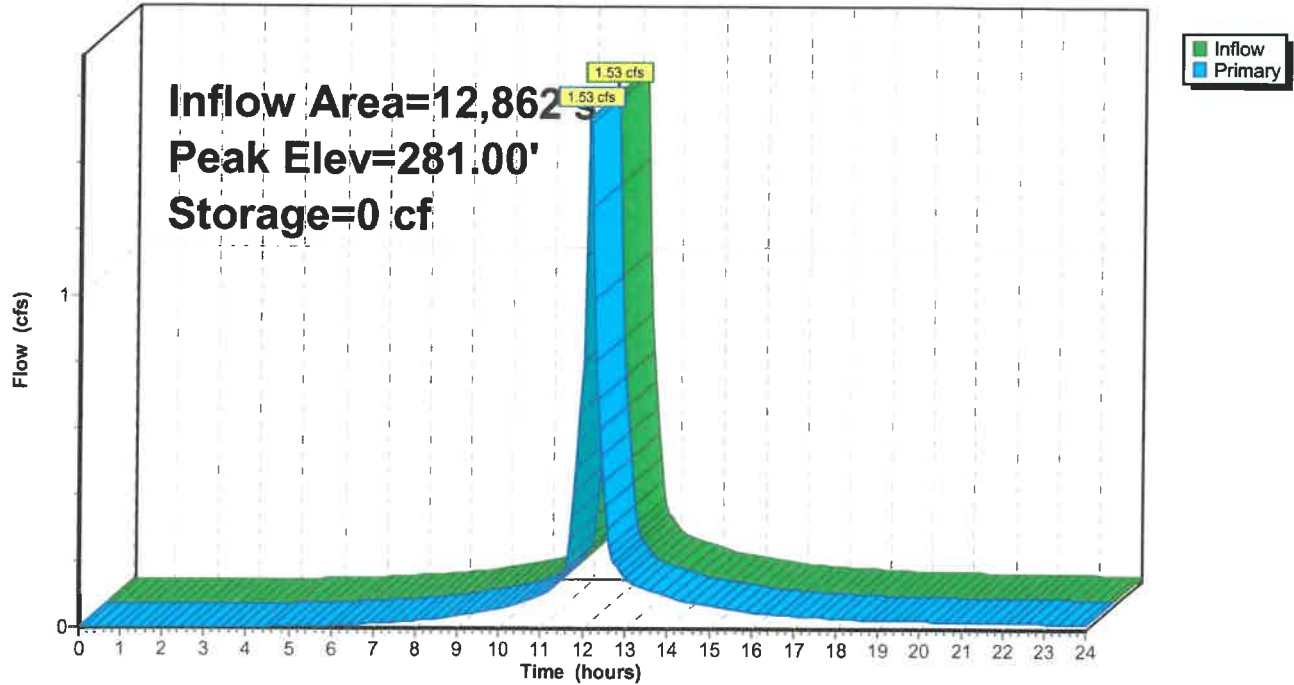
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## Pond 1P: Forebay

### Hydrograph



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**Summary for Pond 2P: Basin 1**

Inflow Area = 124,279 sf, 7.84% Impervious, Inflow Depth > 2.16" for 25 YR event  
 Inflow = 5.27 cfs @ 12.18 hrs, Volume= 22,384 cf  
 Outflow = 0.17 cfs @ 18.88 hrs, Volume= 8,161 cf, Atten= 97%, Lag= 402.0 min  
 Discarded = 0.17 cfs @ 18.88 hrs, Volume= 8,161 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 283.73' @ 18.88 hrs Surf.Area= 6,392 sf Storage= 14,875 cf

Plug-Flow detention time= 325.4 min calculated for 8,144 cf (36% of inflow)  
 Center-of-Mass det. time= 183.8 min ( 1,036.9 - 853.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	287.50'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=0.17 cfs @ 18.88 hrs HW=283.73' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.17 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



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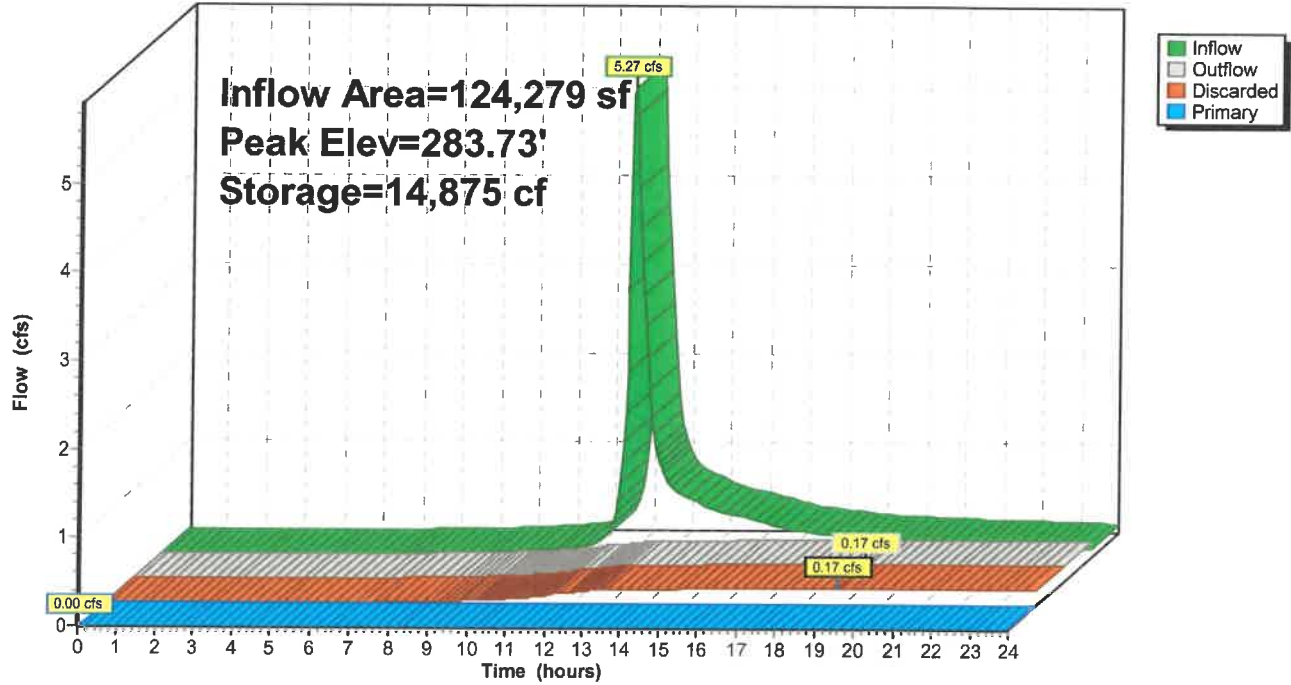
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## Pond 2P: Basin 1

Hydrograph



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**Summary for Pond 3P: Forebay**

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.53" for 25 YR event  
 Inflow = 4.12 cfs @ 12.12 hrs, Volume= 13,894 cf  
 Outflow = 4.10 cfs @ 12.12 hrs, Volume= 11,628 cf, Atten= 1%, Lag= 0.5 min  
 Primary = 4.10 cfs @ 12.12 hrs, Volume= 11,628 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 305.58' @ 12.12 hrs Surf.Area= 1,784 sf Storage= 2,412 cf

Plug-Flow detention time= 101.7 min calculated for 11,604 cf (84% of inflow)  
 Center-of-Mass det. time= 36.0 min ( 838.9 - 802.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	<b>65.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=3.89 cfs @ 12.12 hrs HW=305.58' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 3.89 cfs @ 0.73 fps)

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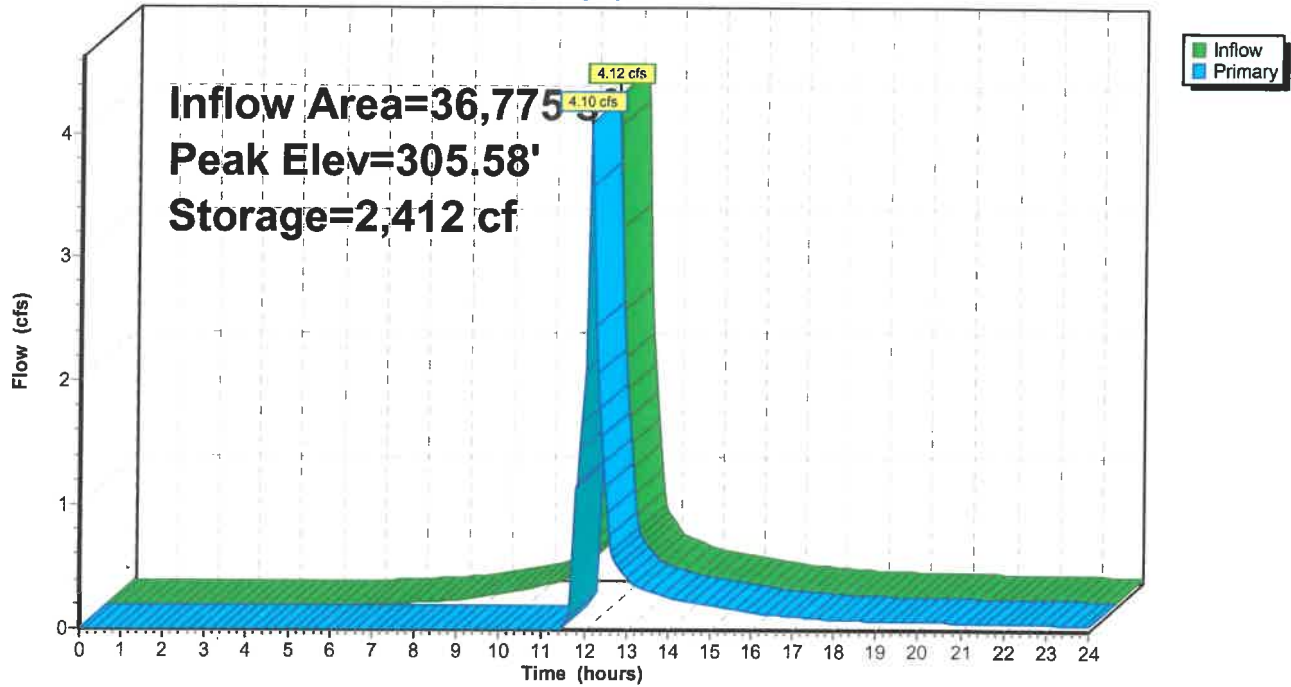
00454 - Proposed Conditions R2  
Type III 24-hr 25 YR Rainfall=6.38"

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## Pond 3P: Forebay

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**Summary for Pond 4P: Basin 2**

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 2.56" for 25 YR event  
 Inflow = 7.13 cfs @ 12.15 hrs, Volume= 24,834 cf  
 Outflow = 0.22 cfs @ 17.73 hrs, Volume= 9,764 cf, Atten= 97%, Lag= 335.1 min  
 Discarded = 0.22 cfs @ 17.73 hrs, Volume= 9,764 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 306.10' @ 17.73 hrs Surf.Area= 8,787 sf Storage= 16,582 cf

Plug-Flow detention time= 347.5 min calculated for 9,764 cf (39% of inflow)  
 Center-of-Mass det. time= 220.2 min ( 1,074.6 - 854.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	49,460 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199
309.30	12,176	447.0	3,556	49,460	14,461

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	304.00'	<b>1.100 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.22 cfs @ 17.73 hrs HW=306.10' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.22 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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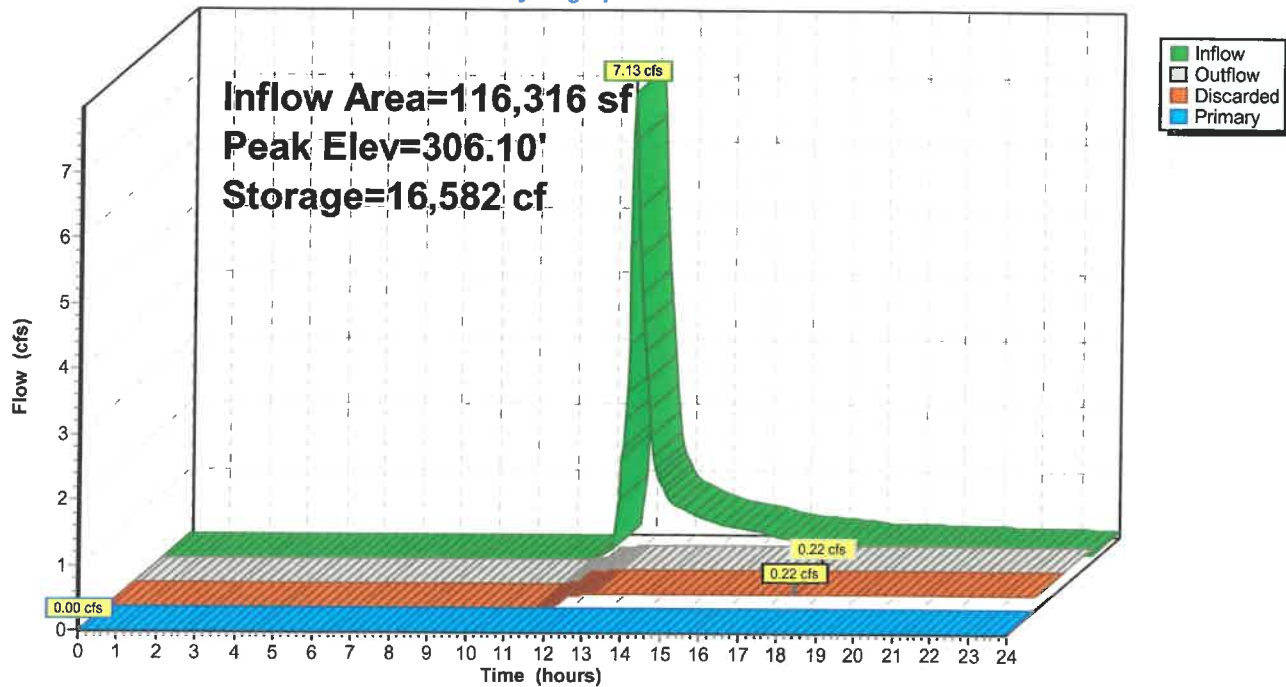
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### Pond 4P: Basin 2

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**Summary for Pond 5P: Forebay**

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 5.65" for 25 YR event  
 Inflow = 3.30 cfs @ 12.09 hrs, Volume= 11,501 cf  
 Outflow = 3.23 cfs @ 12.10 hrs, Volume= 8,832 cf, Atten= 2%, Lag= 0.4 min  
 Primary = 3.23 cfs @ 12.10 hrs, Volume= 8,832 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 291.08' @ 12.10 hrs Surf.Area= 1,666 sf Storage= 2,780 cf

Plug-Flow detention time= 143.3 min calculated for 8,832 cf (77% of inflow)  
 Center-of-Mass det. time= 62.1 min ( 828.7 - 766.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	6,501 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	1,002	133.0	0	0	1,002
290.00	1,339	153.0	1,166	1,166	1,479
292.00	1,976	173.0	3,294	4,461	2,092
293.00	2,105	184.0	2,040	6,501	2,452

Device	Routing	Invert	Outlet Devices
#1	Primary	291.00'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=3.19 cfs @ 12.10 hrs HW=291.08' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 3.19 cfs @ 0.70 fps)



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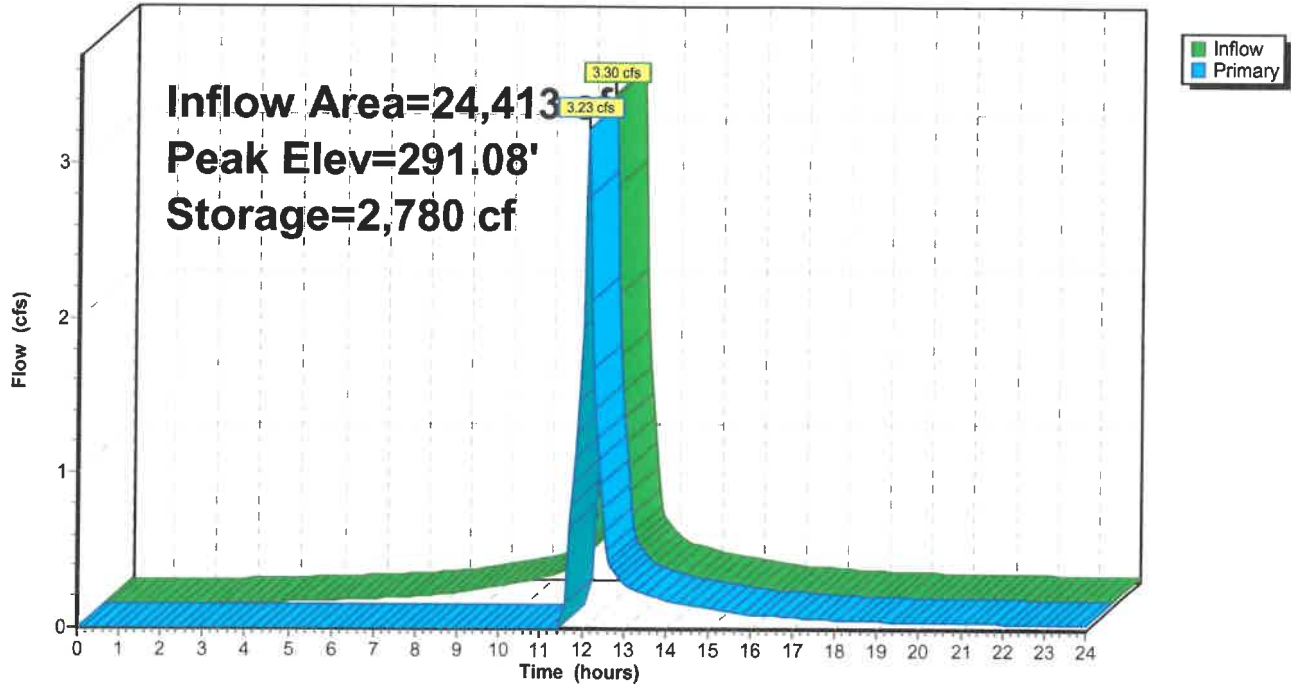
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## Pond 5P: Forebay

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**Summary for Pond 6P: Basin 3**

Inflow Area = 55,723 sf, 39.13% Impervious, Inflow Depth > 3.17" for 25 YR event  
 Inflow = 5.03 cfs @ 12.10 hrs, Volume= 14,732 cf  
 Outflow = 0.19 cfs @ 15.81 hrs, Volume= 8,415 cf, Atten= 96%, Lag= 222.5 min  
 Discarded = 0.19 cfs @ 15.81 hrs, Volume= 8,415 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 290.32' @ 15.81 hrs Surf.Area= 7,474 sf Storage= 8,973 cf

Plug-Flow detention time= 337.6 min calculated for 8,397 cf (57% of inflow)  
 Center-of-Mass det. time= 228.2 min ( 1,067.8 - 839.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	44,208 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	6,102	334.0	0	0	6,102
290.00	7,134	353.0	6,611	6,611	7,196
292.00	9,367	391.0	16,450	23,062	9,566
294.00	11,827	428.0	21,146	44,208	12,112

Device	Routing	Invert	Outlet Devices
#1	Primary	293.00'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	289.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=0.19 cfs @ 15.81 hrs HW=290.32' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.19 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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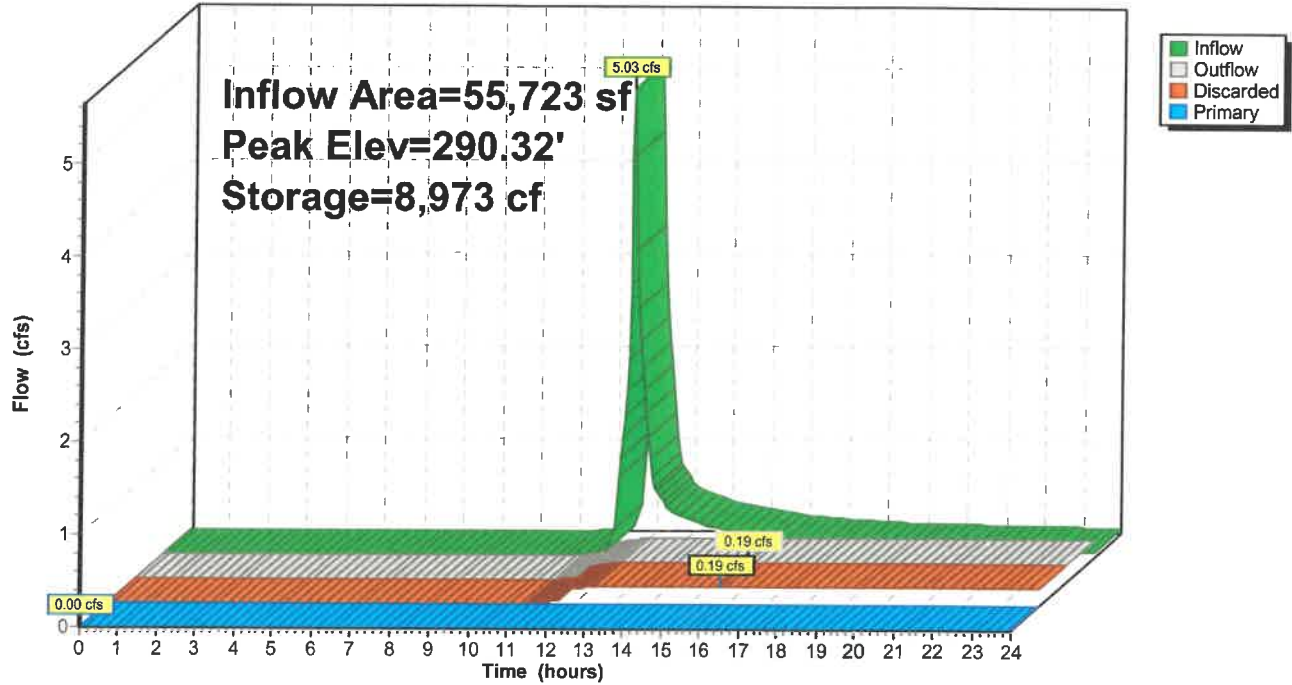
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## Pond 6P: Basin 3

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**Summary for Pond 7P: Vernal Pool and Wetland**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 2.06" for 25 YR event  
 Inflow = 66.94 cfs @ 12.68 hrs, Volume= 472,904 cf  
 Outflow = 45.97 cfs @ 13.05 hrs, Volume= 425,771 cf, Atten= 31%, Lag= 22.6 min  
 Primary = 45.97 cfs @ 13.05 hrs, Volume= 425,771 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 295.48' @ 13.05 hrs Surf.Area= 58,432 sf Storage= 110,347 cf

Plug-Flow detention time= 82.7 min calculated for 425,771 cf (90% of inflow)  
 Center-of-Mass det. time= 36.9 min ( 928.3 - 891.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Upgradient wetland (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=45.95 cfs @ 13.05 hrs HW=295.48' (Free Discharge)  
 ↗ **1=Broad-Crested Rectangular Weir** (Weir Controls 45.95 cfs @ 3.42 fps)

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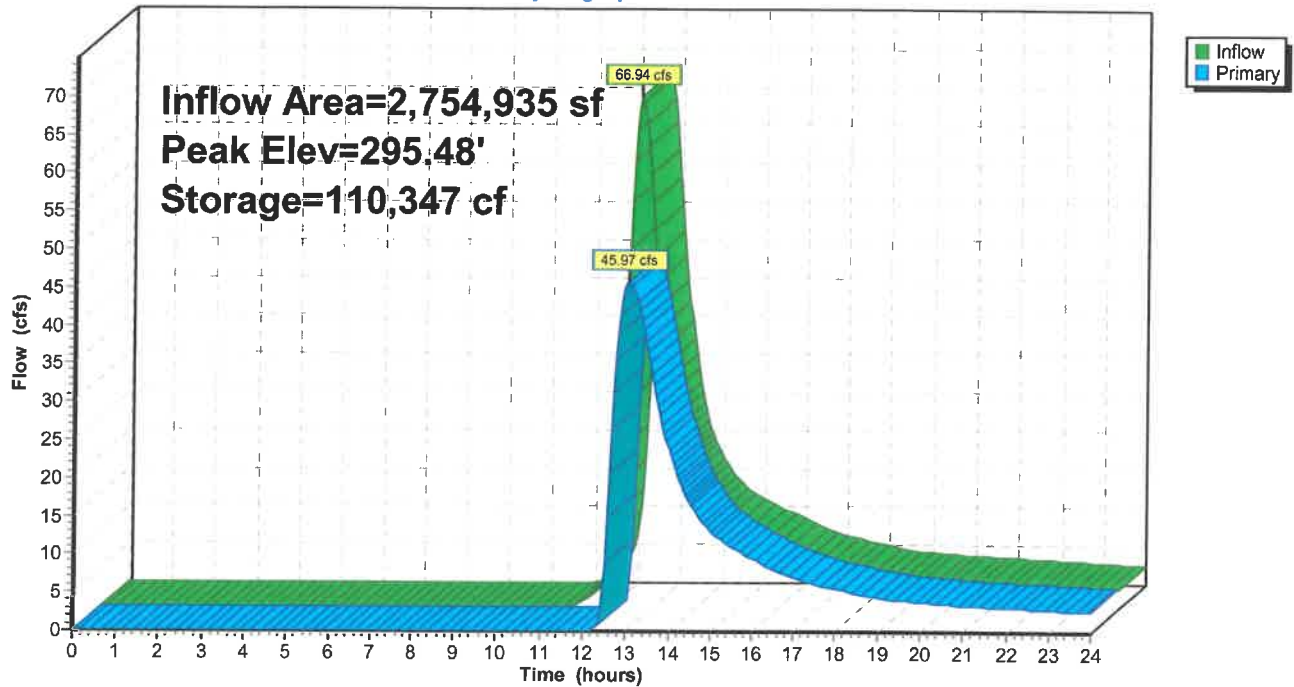
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## Pond 7P: Vernal Pool and Wetland

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### Summary for Pond 8P: Road Berm

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth > 1.73" for 25 YR event  
Inflow = 8.70 cfs @ 12.34 hrs, Volume= 45,859 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Peak Elev= 311.47' @ 24.00 hrs Surf.Area= 51,426 sf Storage= 45,832 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	310.00'	256,496 cf	<b>Upgradient wetland (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

Device	Routing	Invert	Outlet Devices
#1	Primary	312.50'	<b>8.0" Vert. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)  
↑1=Orifice/Grate ( Controls 0.00 cfs)



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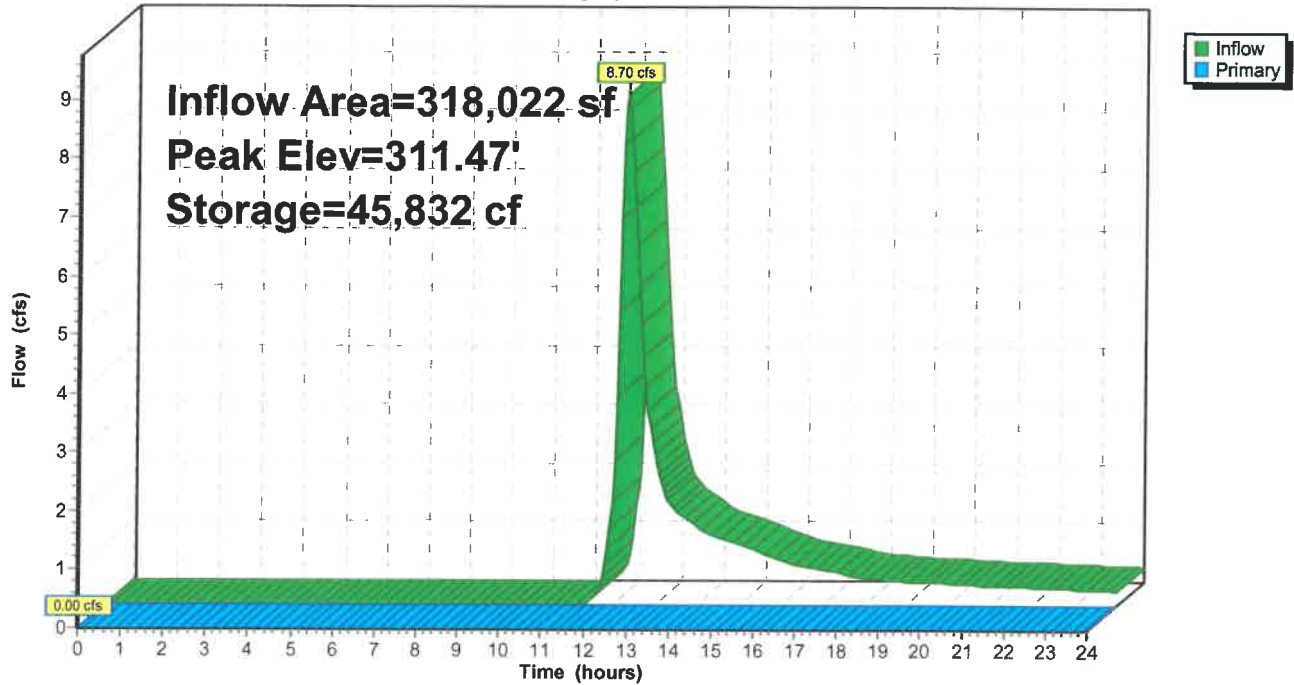
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### Pond 8P: Road Berm

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Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Subcatchment 1S: To Culvert**

Runoff = 30.99 cfs @ 12.40 hrs, Volume= 164,278 cf, Depth&gt; 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		<b>Shallow Concentrated Flow,</b>
					Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

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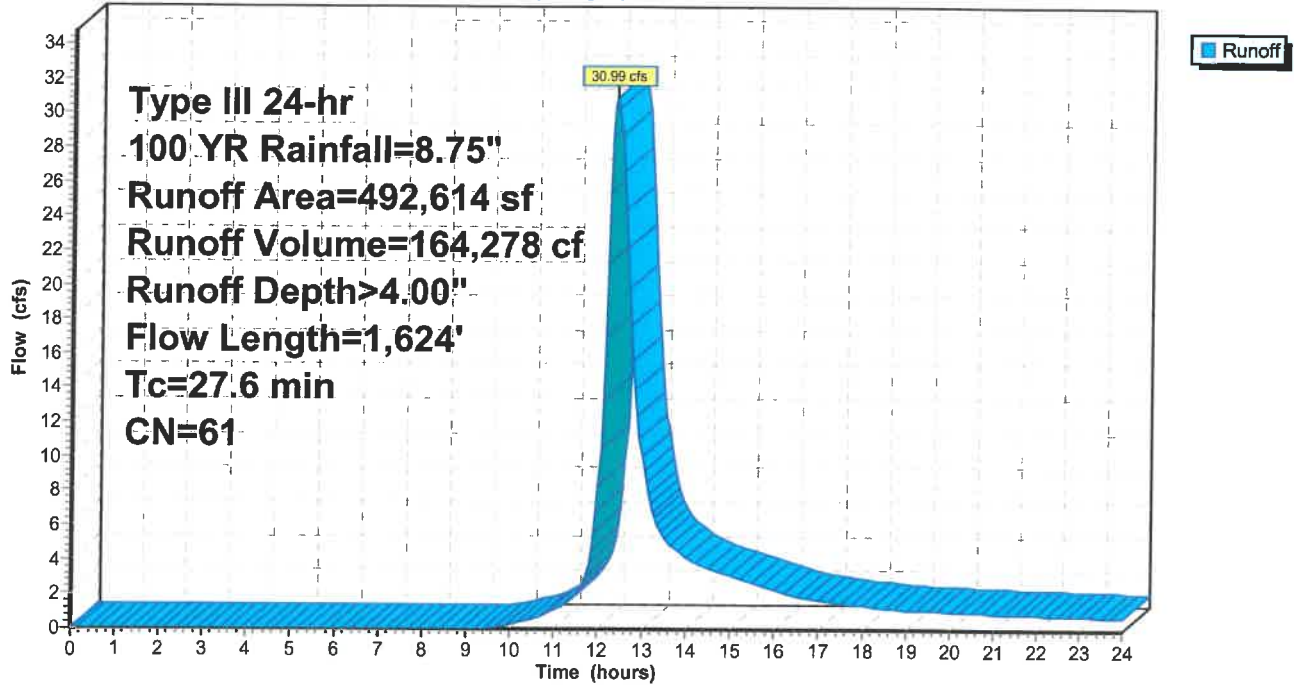
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### Subcatchment 1S: To Culvert

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**Summary for Subcatchment 2S: To Proposed Culvert**

Runoff = 126.66 cfs @ 12.65 hrs, Volume= 859,736 cf, Depth&gt; 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,163,489	55	Woods, Good, HSG B
236,877	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
2,754,935	59	Weighted Average
2,668,243		96.85% Pervious Area
86,692		3.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b> Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		<b>Shallow Concentrated Flow, Shallow</b> Woodland Kv= 5.0 fps
32.5	2,172	0.0115	1.12	1.34	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
45.8	2,588	Total			

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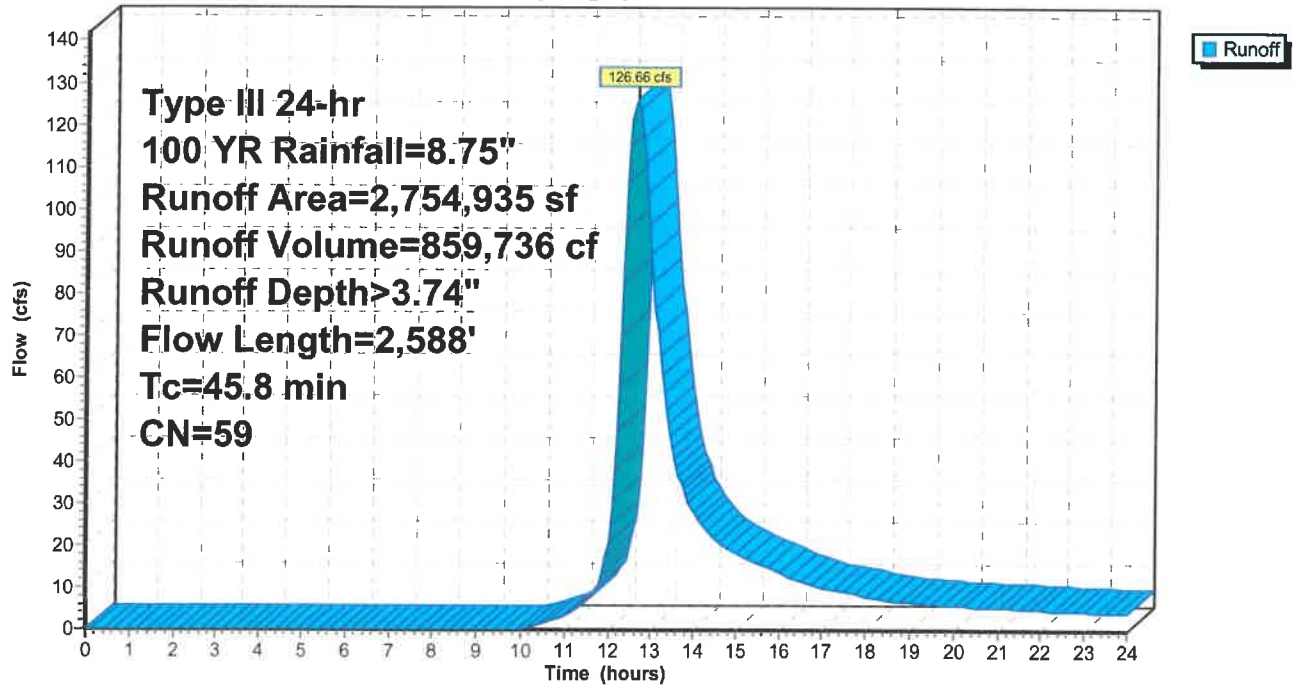
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### Subcatchment 2S: To Proposed Culvert

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### Summary for Subcatchment 3S: To 8" pipes

Runoff = 17.73 cfs @ 12.32 hrs, Volume= 87,225 cf, Depth> 3.29"

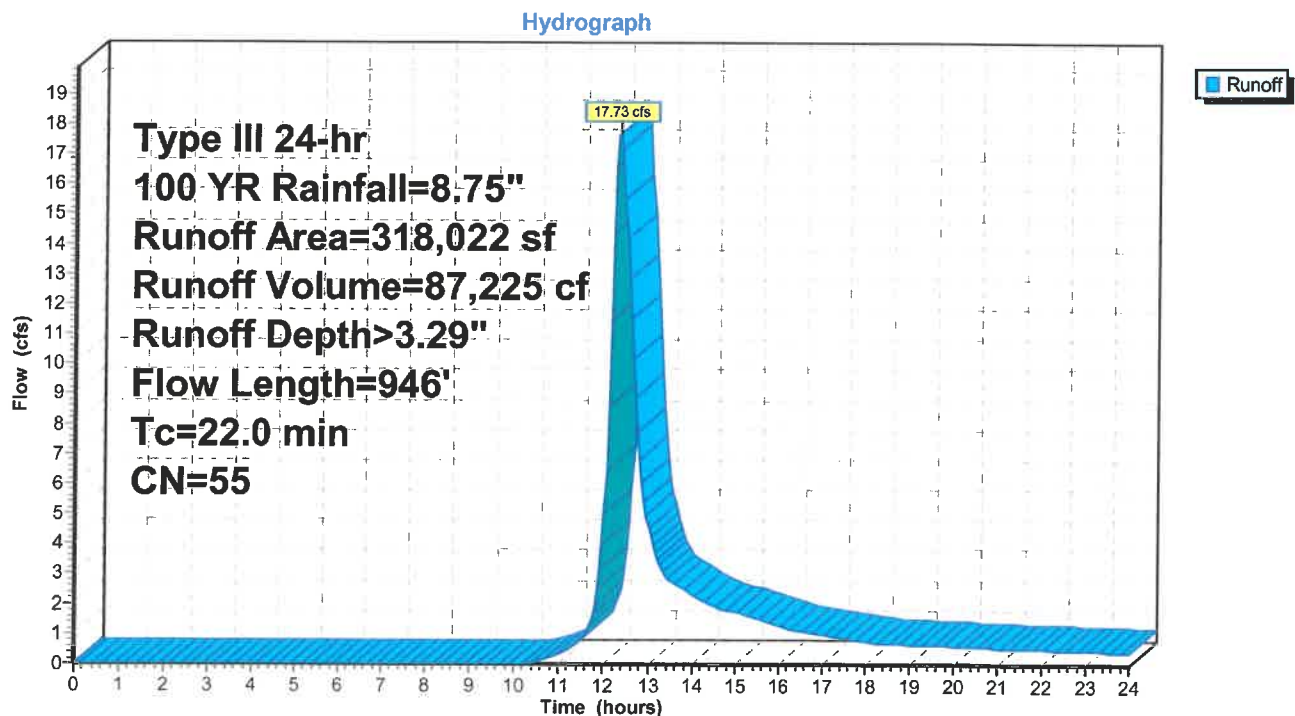
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
318,022	55	Woods, Good, HSG B
318,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow, Sheet Flow</b>
					Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
22.0	946	Total			

### Subcatchment 3S: To 8" pipes





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### Summary for Subcatchment 4S: To CB 1

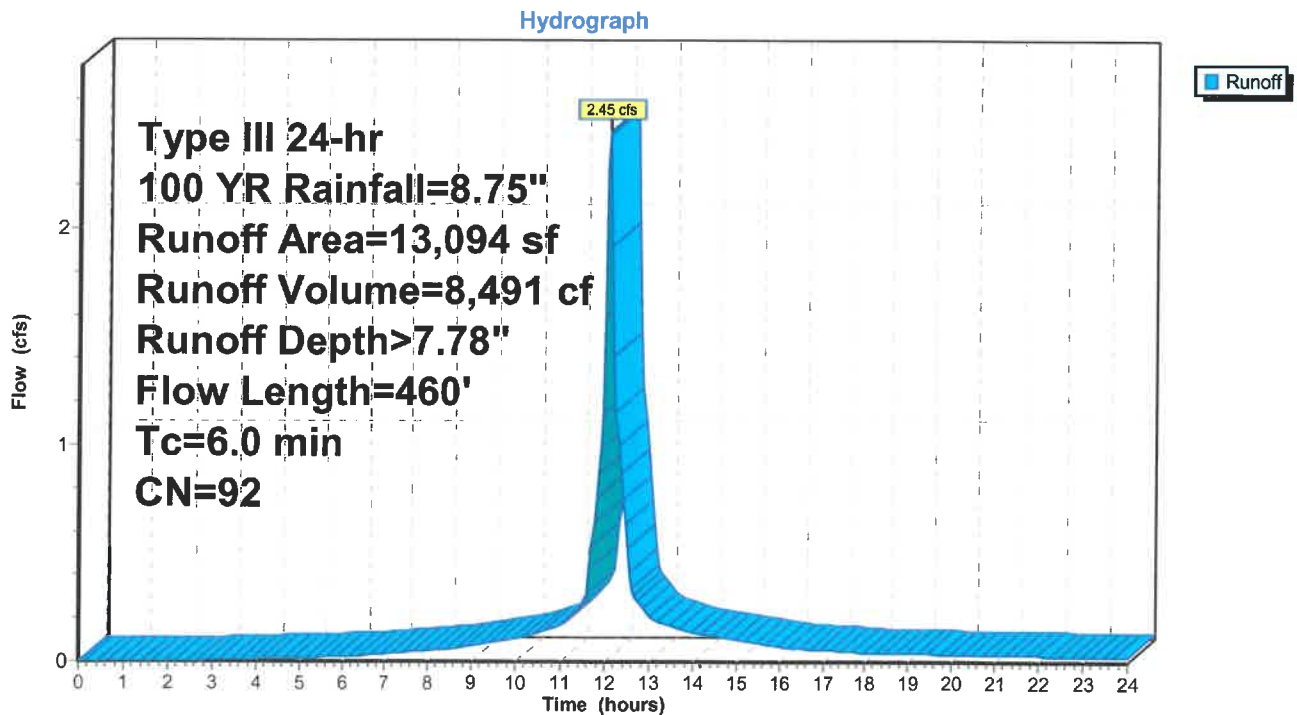
Runoff = 2.45 cfs @ 12.09 hrs, Volume= 8,491 cf, Depth> 7.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
11,086	98	Paved roads w/curbs & sewers, HSG B
2,008	61	>75% Grass cover, Good, HSG B
13,094	92	Weighted Average
2,008		15.34% Pervious Area
11,086		84.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 4S: To CB 1



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## Summary for Subcatchment 5S: To CB 2

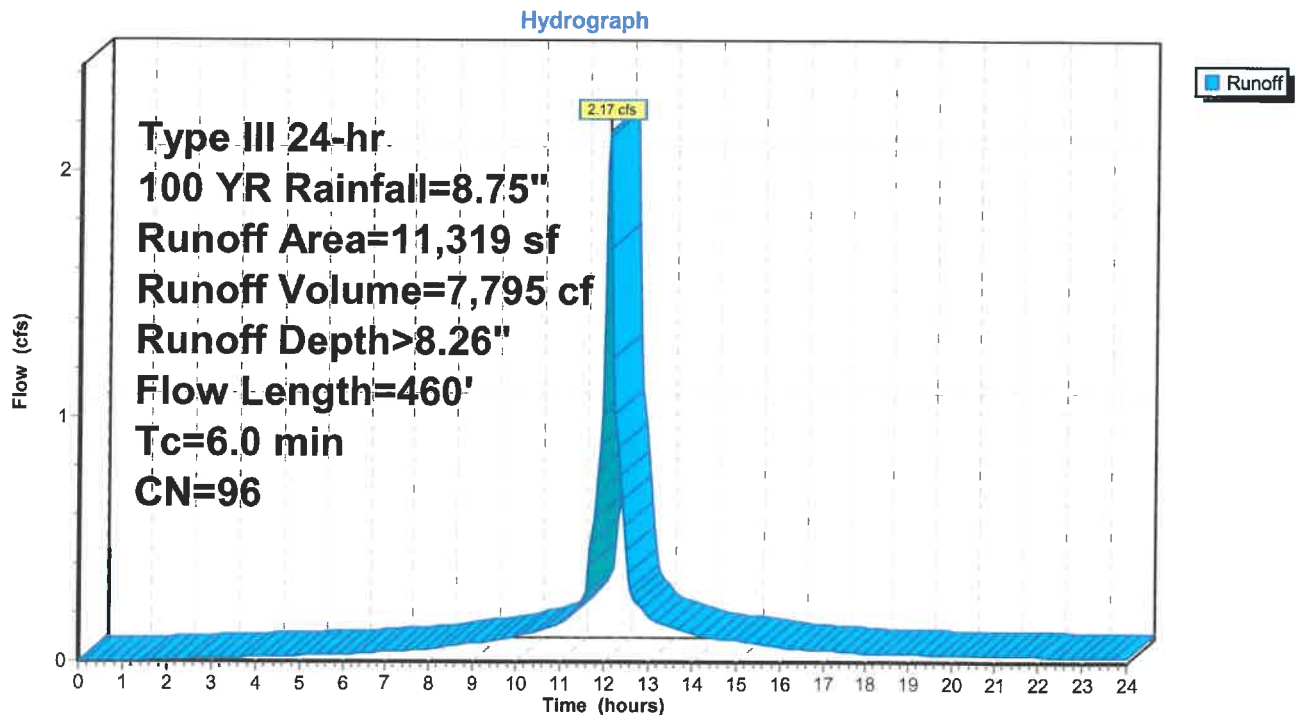
Runoff = 2.17 cfs @ 12.09 hrs, Volume= 7,795 cf, Depth> 8.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
10,719	98	Paved roads w/curbs & sewers, HSG B
600	61	>75% Grass cover, Good, HSG B
11,319	96	Weighted Average
600		5.30% Pervious Area
10,719		94.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
3.3	410	0.0102	2.05		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.9	460	Total, Increased to minimum Tc = 6.0 min			

## Subcatchment 5S: To CB 2



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### Summary for Subcatchment 6S: To CB 3

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 1,931 cf, Depth> 7.42"

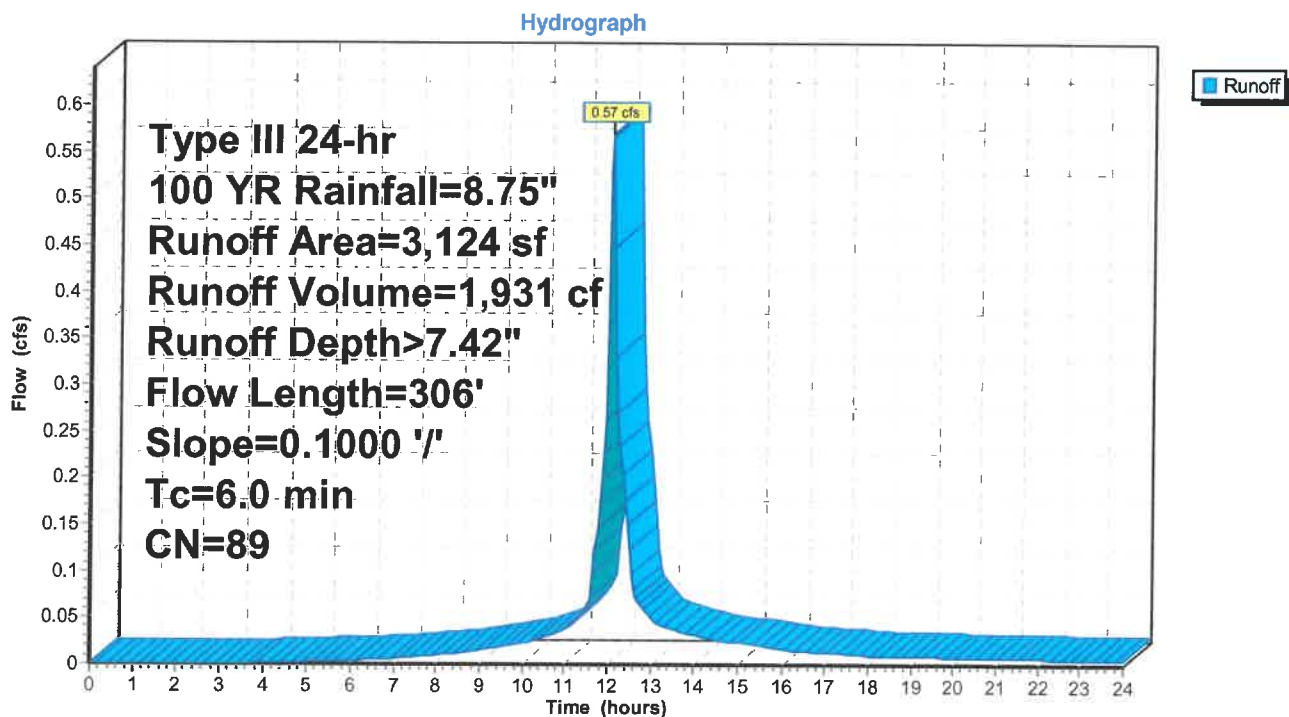
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
2,343	98	Paved roads w/curbs & sewers, HSG B
781	61	>75% Grass cover, Good, HSG B
3,124	89	Weighted Average
781		25.00% Pervious Area
2,343		75.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 6S: To CB 3



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### Summary for Subcatchment 7S: To CB 4

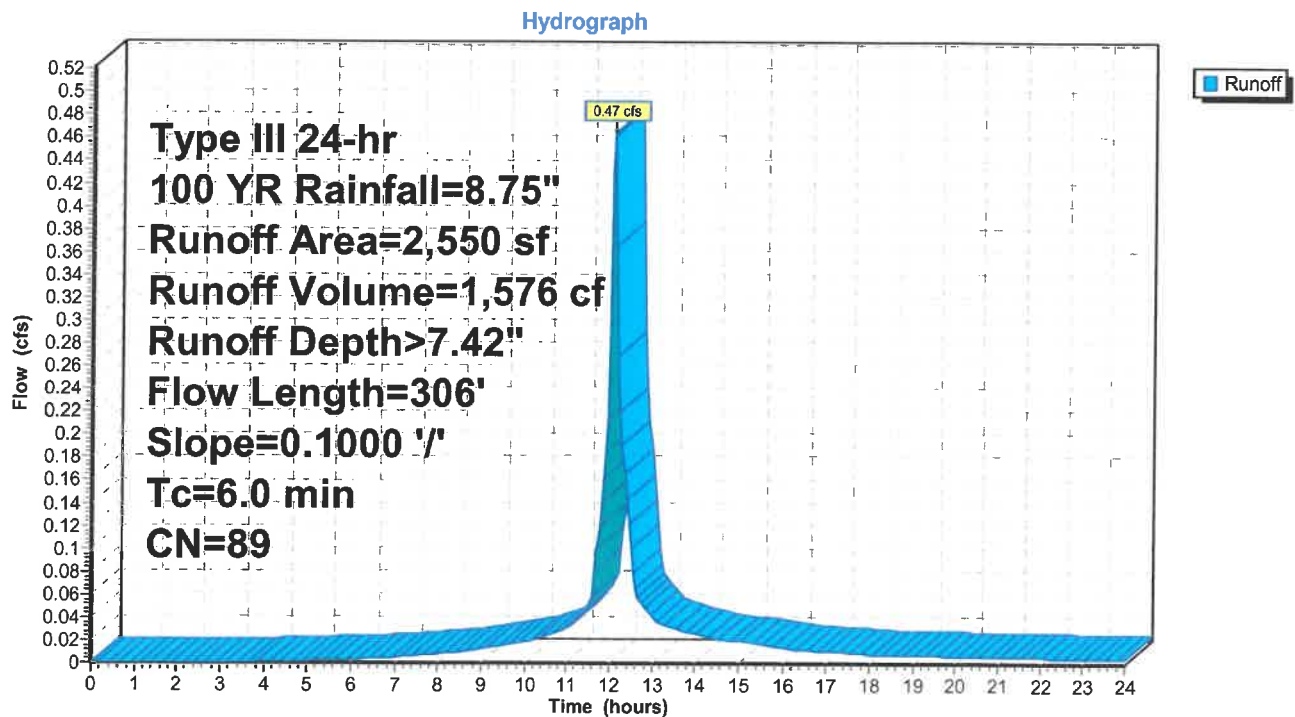
Runoff = 0.47 cfs @ 12.09 hrs, Volume= 1,576 cf, Depth> 7.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
1,913	98	Paved roads w/curbs & sewers, HSG B
637	61	>75% Grass cover, Good, HSG B
2,550	89	Weighted Average
637		24.98% Pervious Area
1,913		75.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 7S: To CB 4



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### Summary for Subcatchment 8S: To CB 6

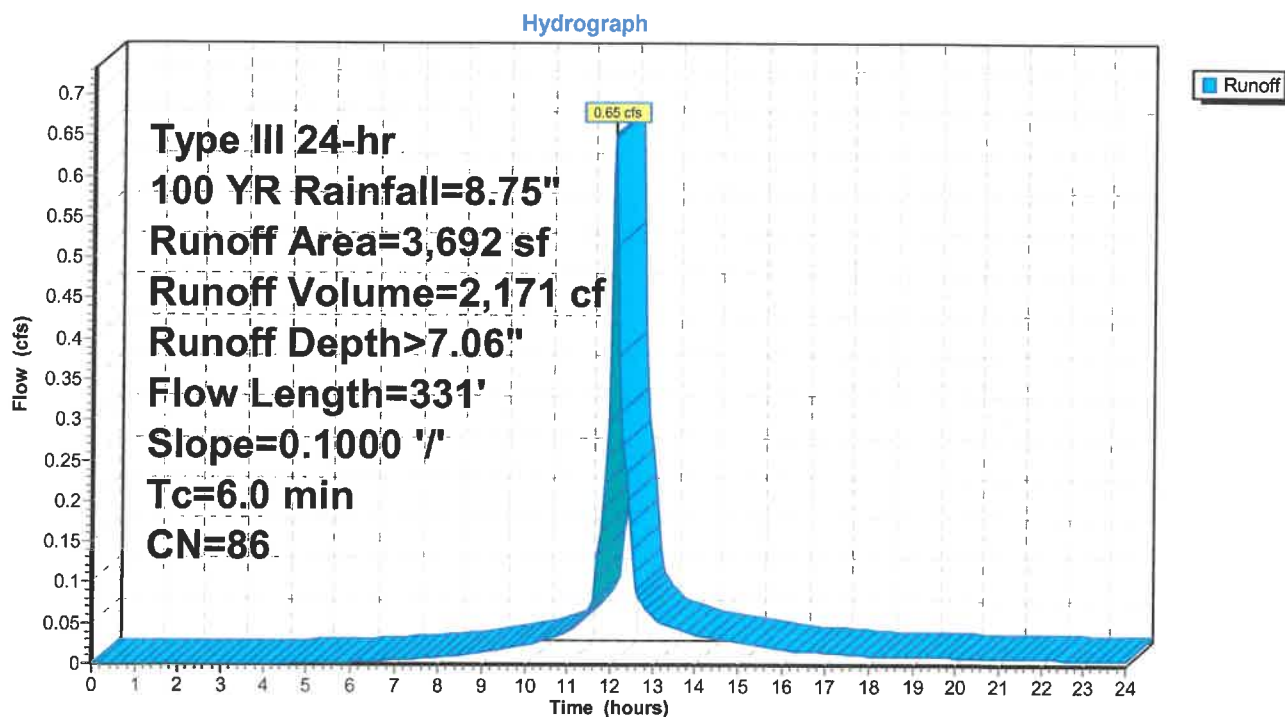
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 2,171 cf, Depth> 7.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
2,493	98	Paved roads w/curbs & sewers, HSG B
1,199	61	>75% Grass cover, Good, HSG B
3,692	86	Weighted Average
1,199		32.48% Pervious Area
2,493		67.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 8S: To CB 6



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### Summary for Subcatchment 9S: To CB 5

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,302 cf, Depth> 7.90"

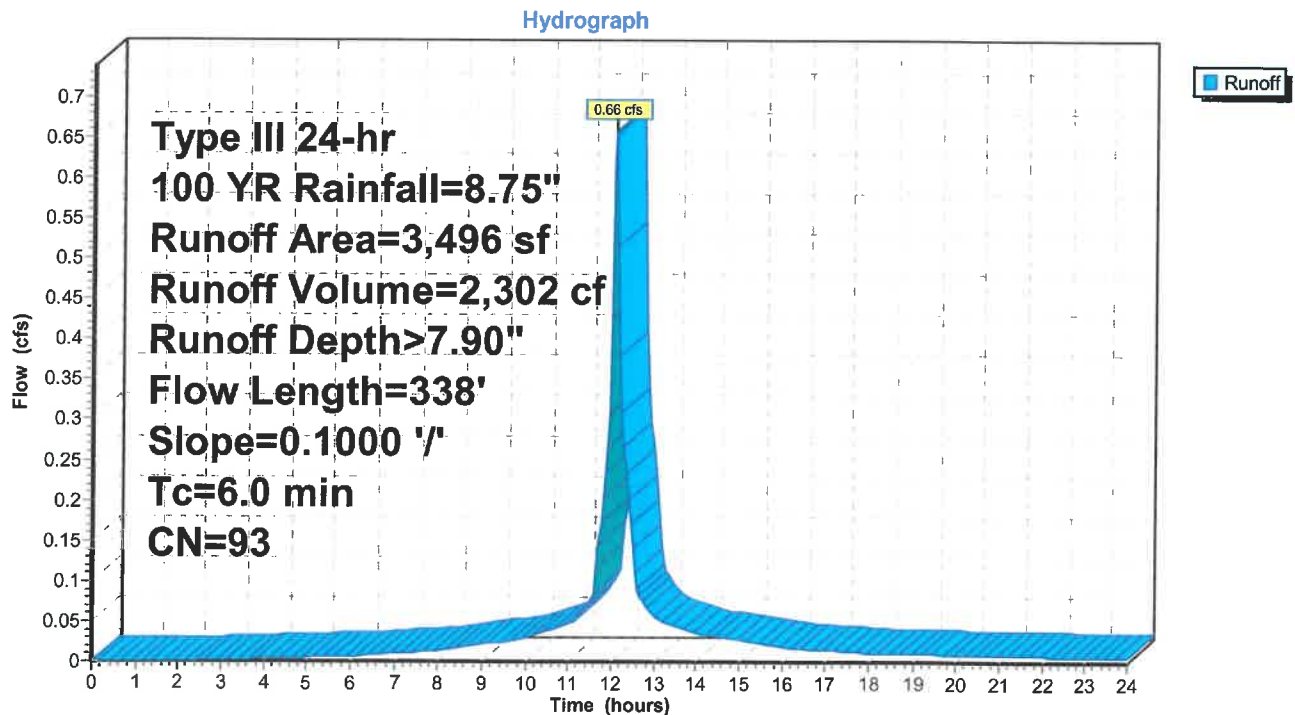
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
3,000	98	Paved roads w/curbs & sewers, HSG B
496	61	>75% Grass cover, Good, HSG B
3,496	93	Weighted Average
496		14.19% Pervious Area
3,000		85.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 9S: To CB 5





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### Summary for Subcatchment 10S: To CB 7

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 2,559 cf, Depth> 7.06"

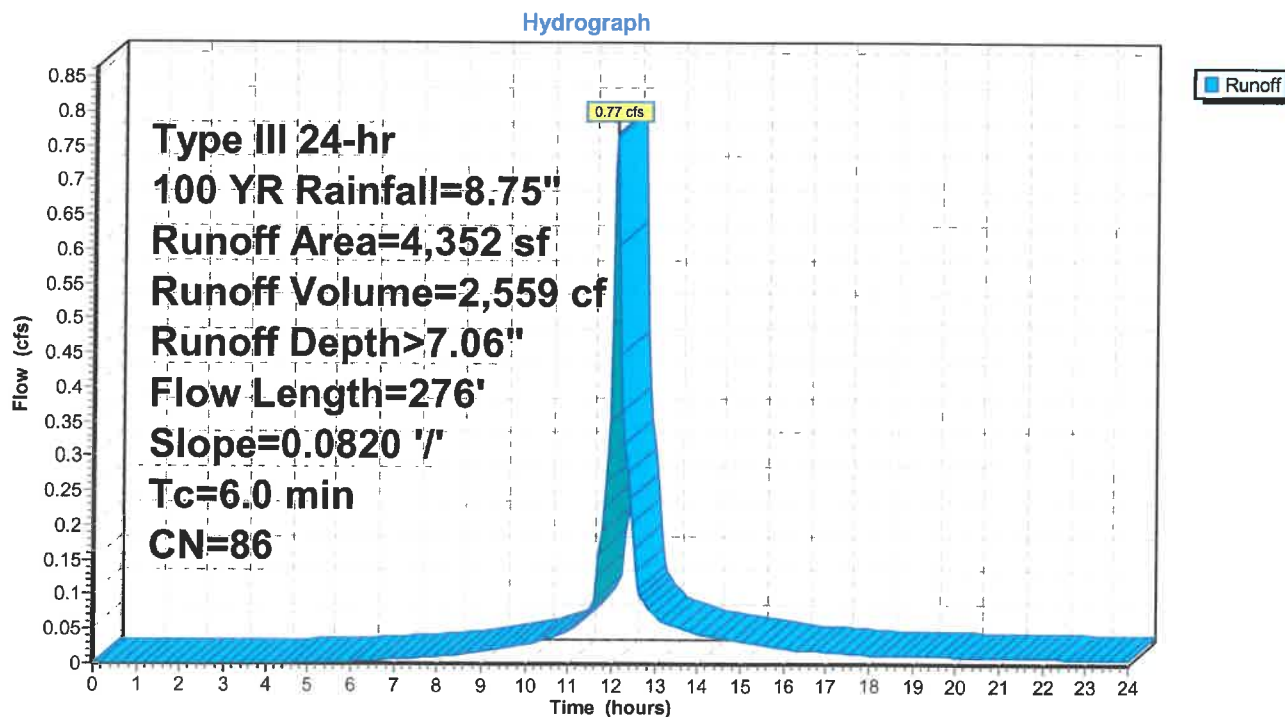
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 10S: To CB 7



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### Summary for Subcatchment 11S: To CB 8

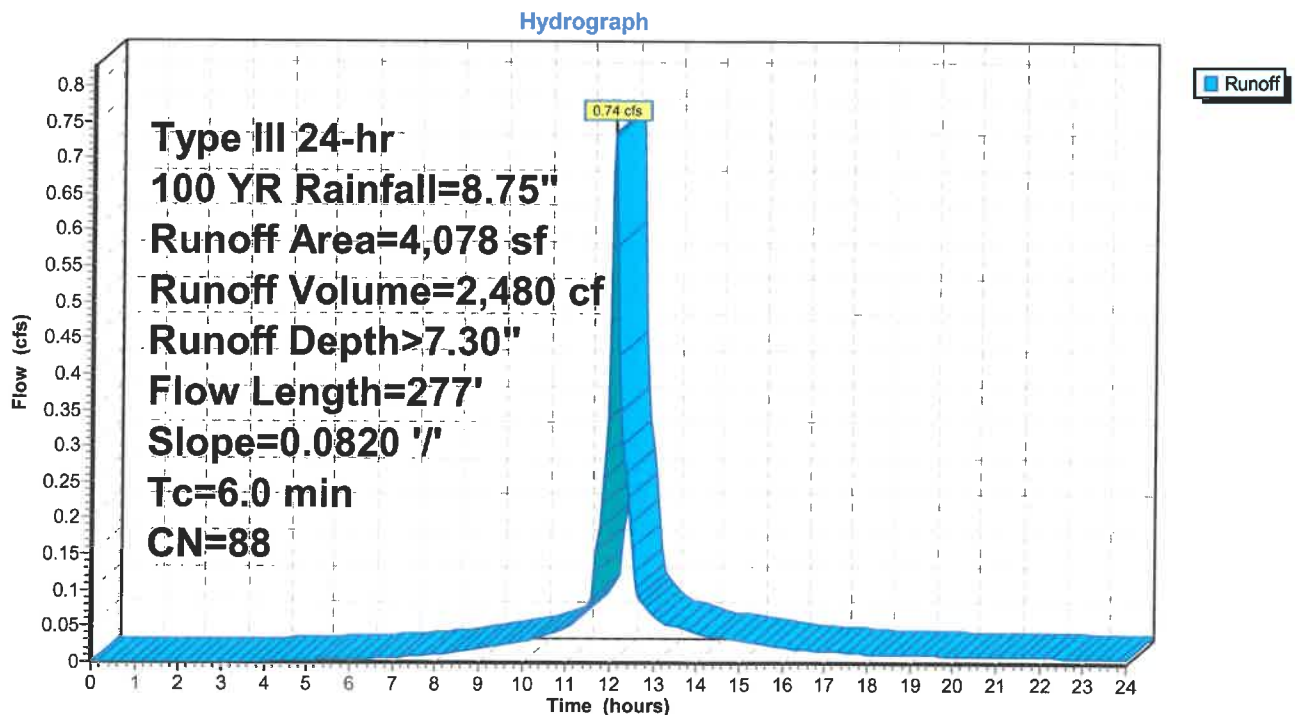
Runoff = 0.74 cfs @ 12.09 hrs, Volume= 2,480 cf, Depth> 7.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 11S: To CB 8



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### Summary for Subcatchment 12S: To CB 9

Runoff = 2.34 cfs @ 12.09 hrs, Volume= 7,693 cf, Depth> 6.81"

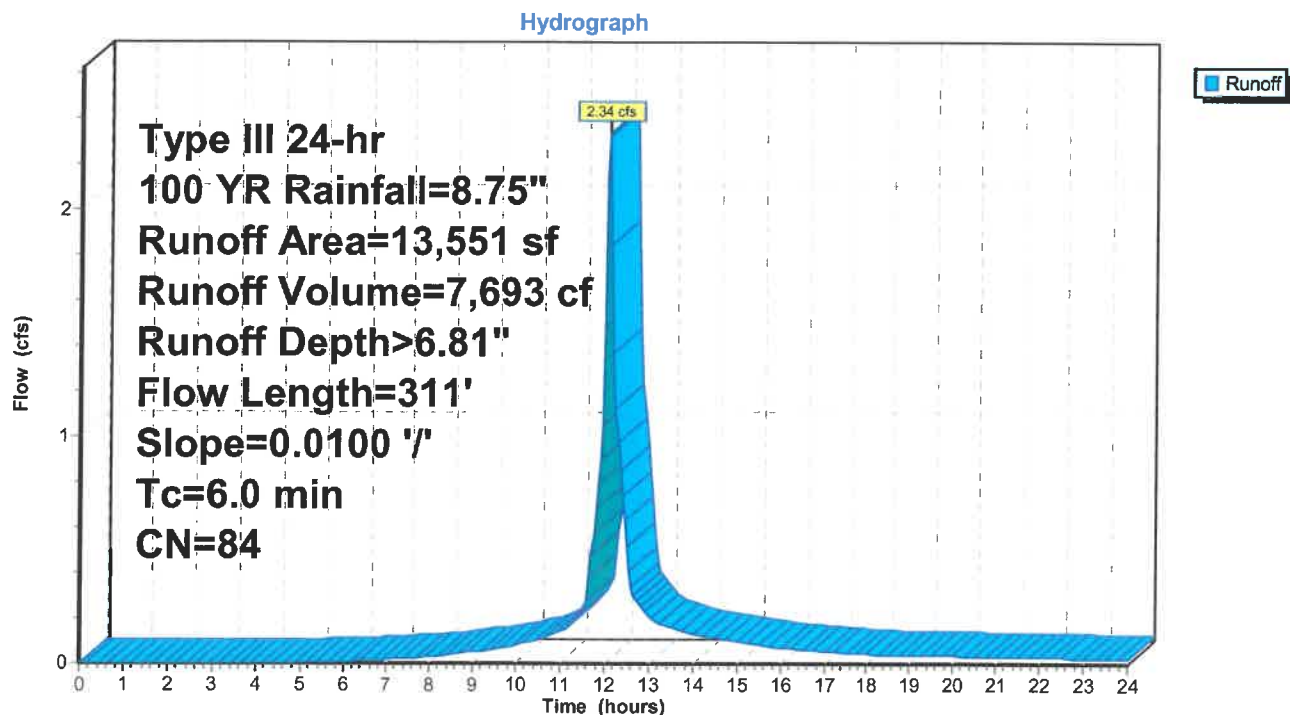
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 12S: To CB 9



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### Summary for Subcatchment 13S: To CB 10

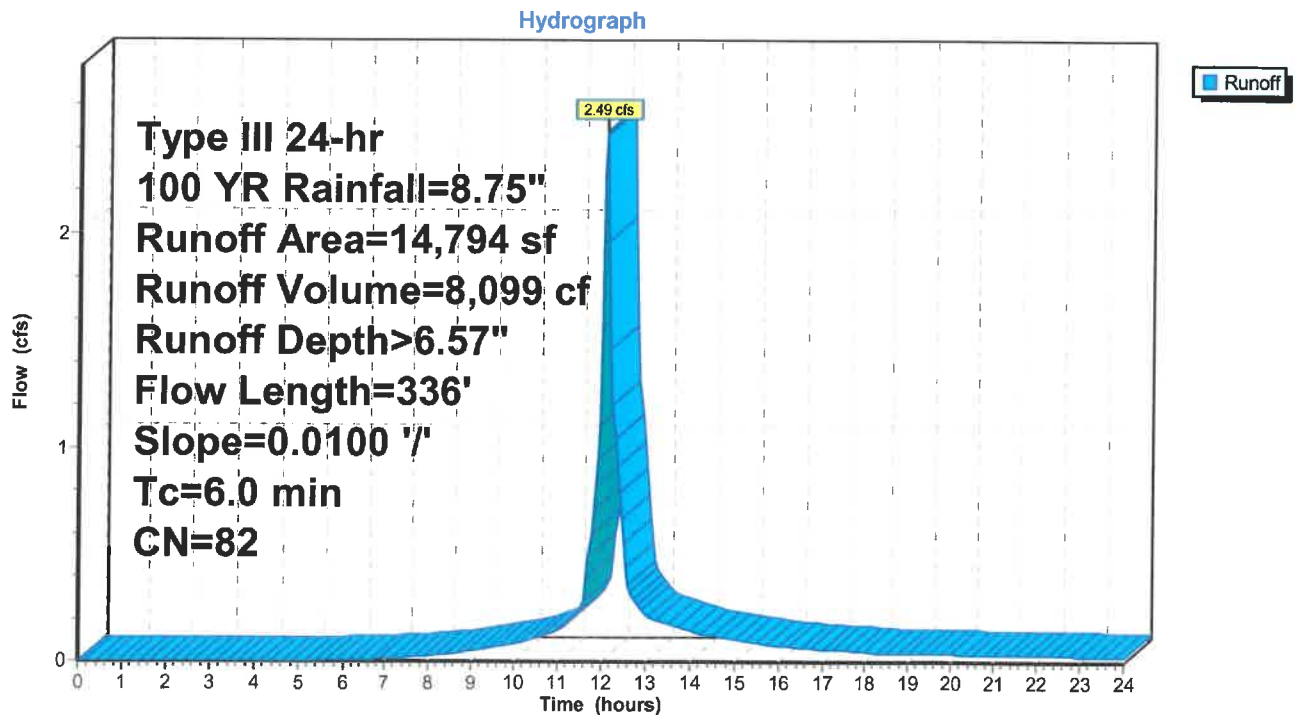
Runoff = 2.49 cfs @ 12.09 hrs, Volume= 8,099 cf, Depth> 6.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

### Subcatchment 13S: To CB 10



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## Summary for Subcatchment 14S: To Wetland

Runoff = 45.59 cfs @ 12.35 hrs, Volume= 228,390 cf, Depth> 4.49"

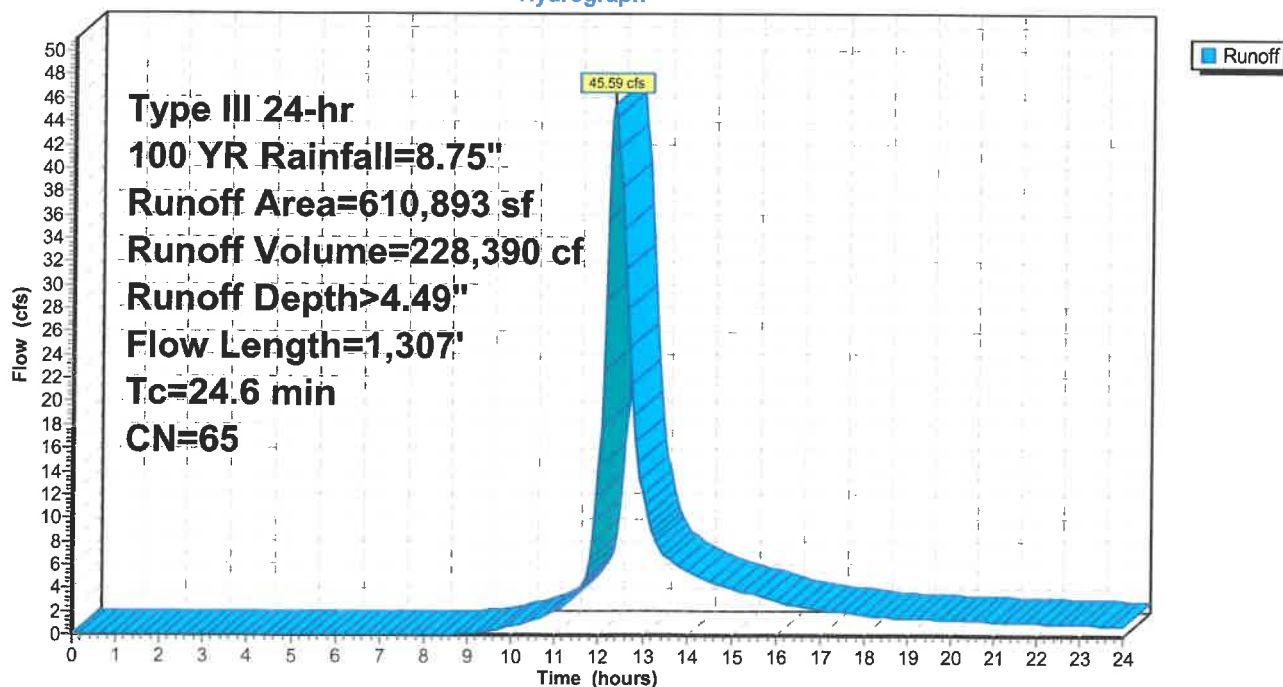
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
326,808	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
610,893	65	Weighted Average
610,893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		<b>Sheet Flow, Sheet</b> Woods: Light underbrush n= 0.400 P2= 3.22"
7.9	648	0.0750	1.37		<b>Shallow Concentrated Flow, Shallow</b> Woodland Kv= 5.0 fps
6.9	609	0.0200	1.47	1.76	<b>Channel Flow, Stream</b> Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

## Subcatchment 14S: To Wetland

Hydrograph



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### Summary for Subcatchment 15S: TO BASIN

Runoff = 7.89 cfs @ 12.19 hrs, Volume= 31,731 cf, Depth> 3.42"

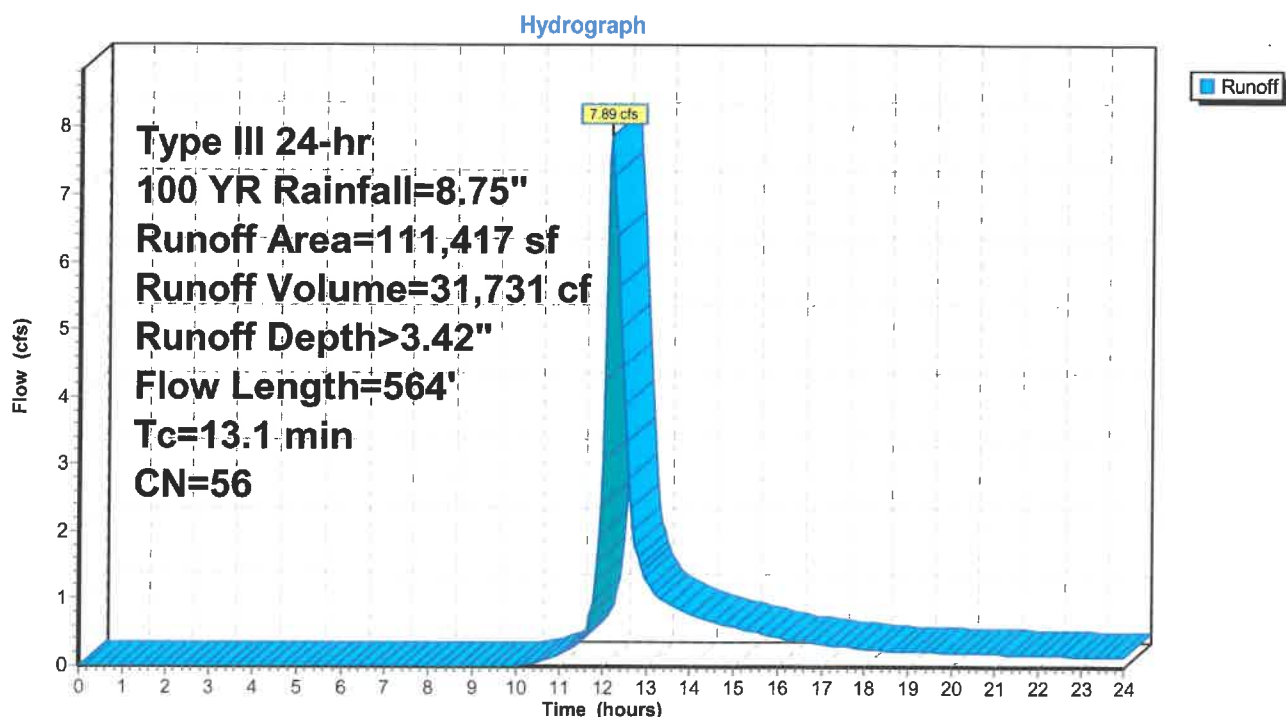
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
89,974	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
111,417	56	Weighted Average
111,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

### Subcatchment 15S: TO BASIN





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## Summary for Subcatchment 16S: TO BASIN

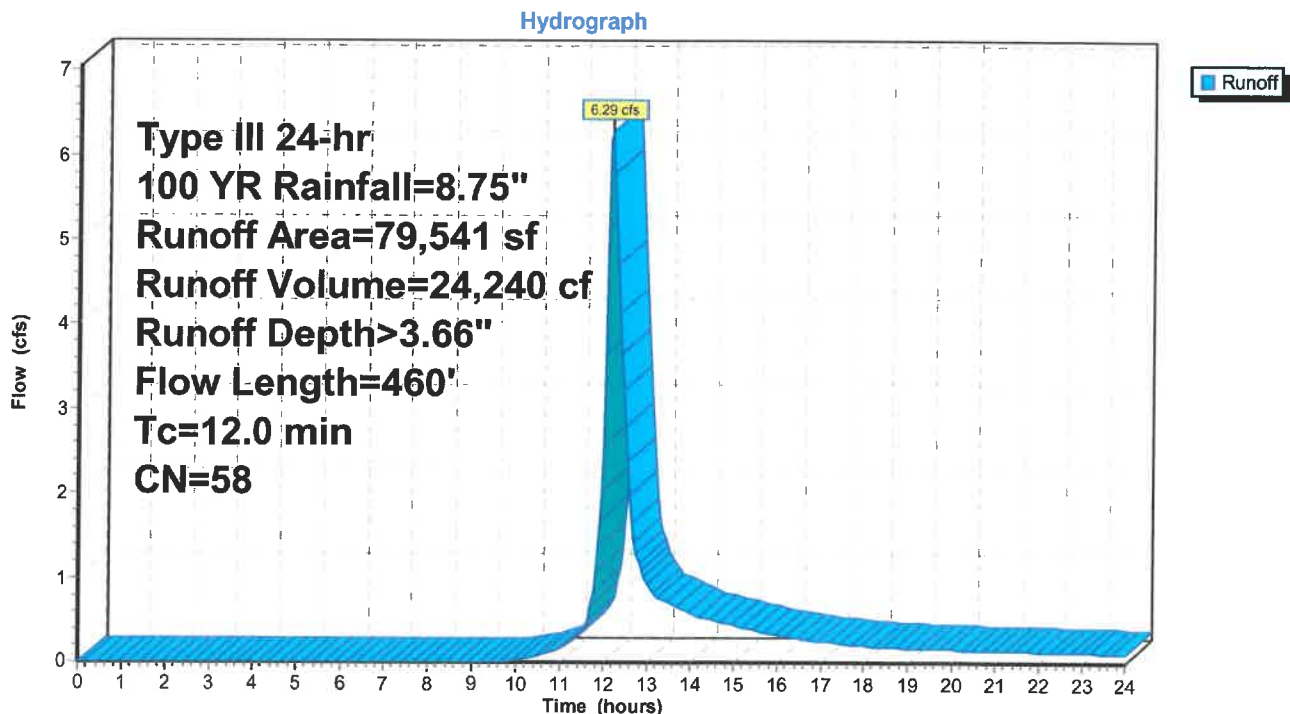
Runoff = 6.29 cfs @ 12.17 hrs, Volume= 24,240 cf, Depth> 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		<b>Shallow Concentrated Flow,</b> Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

## Subcatchment 16S: TO BASIN



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### Summary for Subcatchment 17S: To Off Site

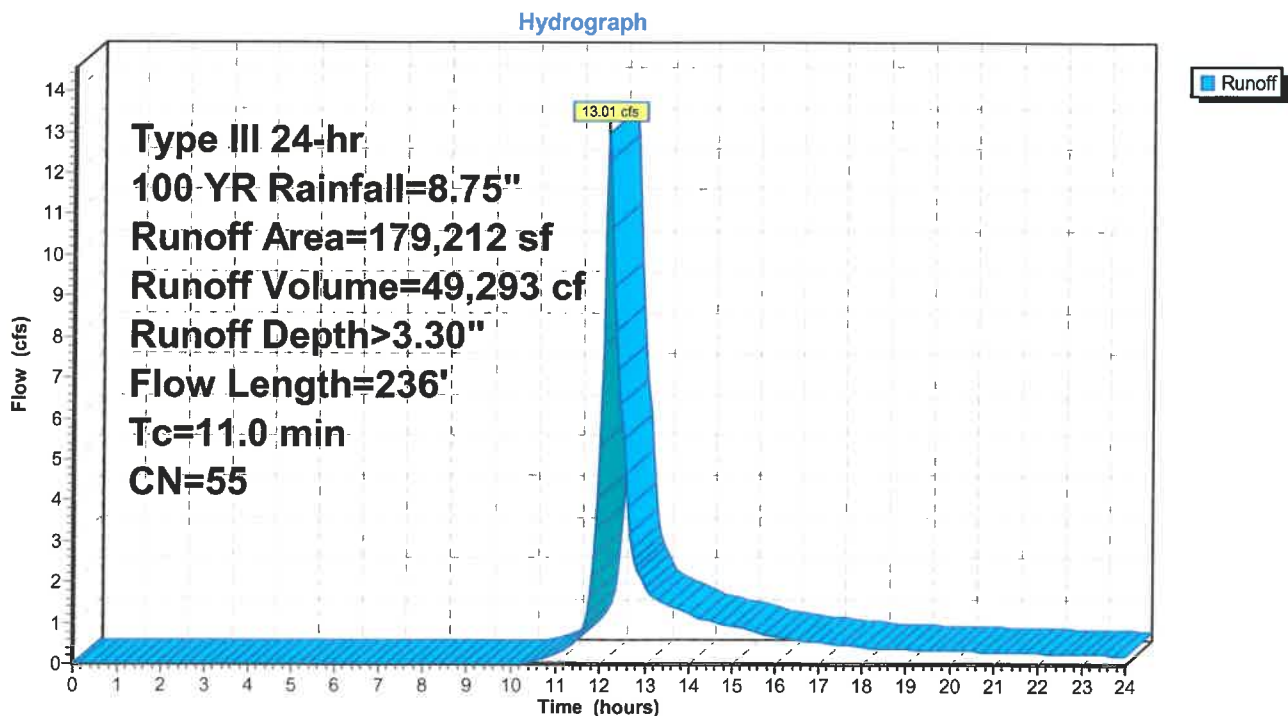
Runoff = 13.01 cfs @ 12.16 hrs, Volume= 49,293 cf, Depth> 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

Area (sf)	CN	Description
179,212	55	Woods, Good, HSG B
179,212		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	236	Total			

### Subcatchment 17S: To Off Site



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### Summary for Subcatchment 19S: Area To Basin3

Runoff = 3.31 cfs @ 12.10 hrs, Volume= 10,494 cf, Depth> 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 YR Rainfall=8.75"

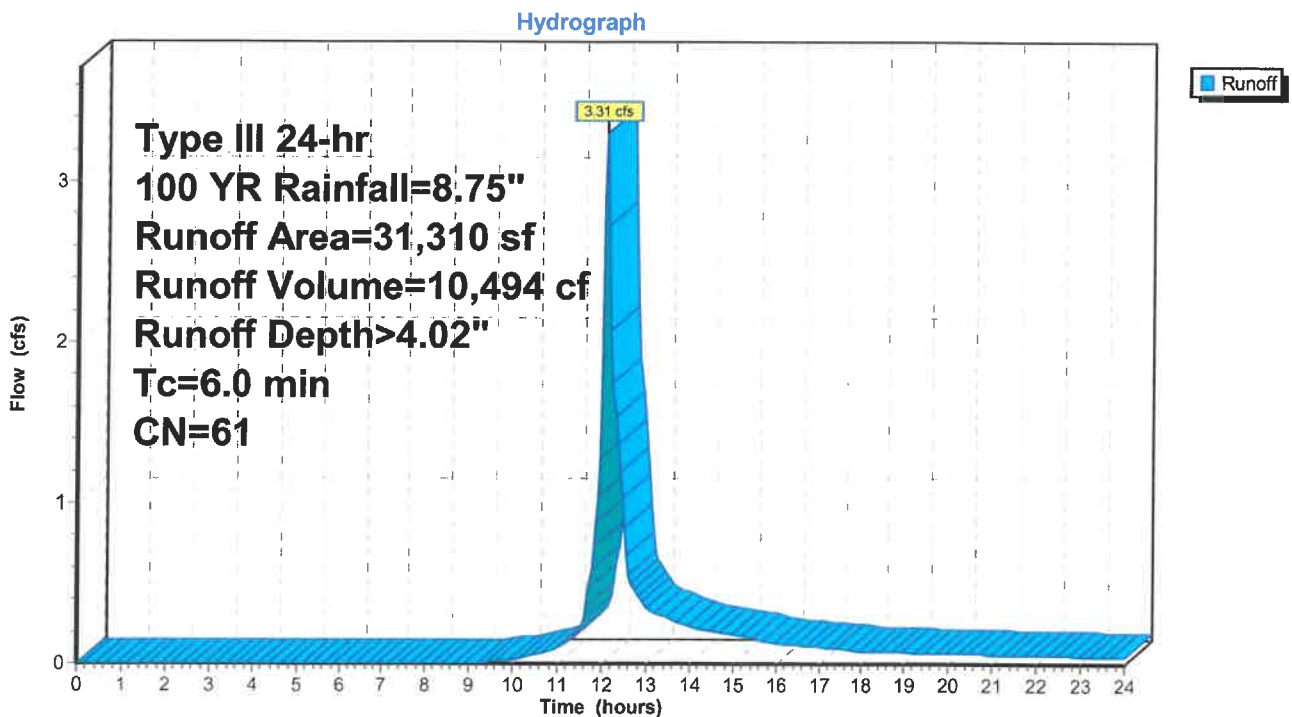
Area (sf)	CN	Description
31,310	61	>75% Grass cover, Good, HSG B
31,310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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6.0

Direct Entry, a-b

### Subcatchment 19S: Area To Basin3



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### Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 4.00" for 100 YR event  
Inflow = 30.99 cfs @ 12.40 hrs, Volume= 164,278 cf  
Outflow = 30.97 cfs @ 12.40 hrs, Volume= 164,258 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 10.70 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 3.87 fps, Avg. Travel Time= 0.3 min

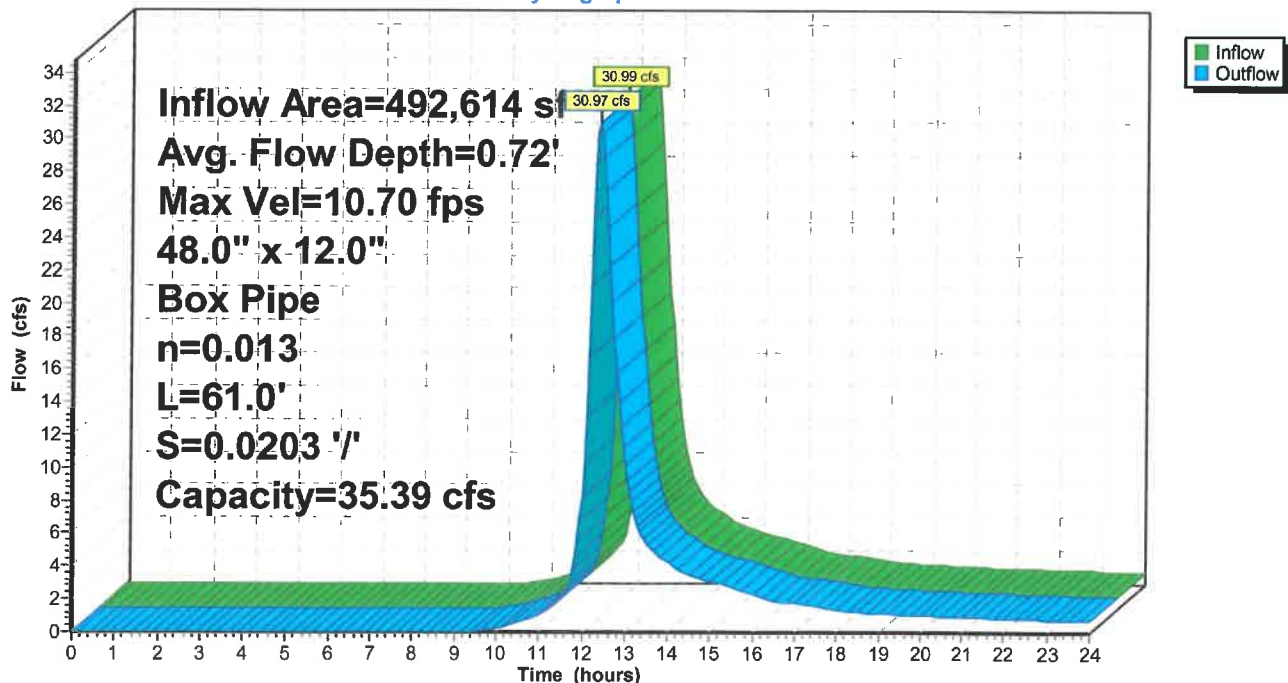
Peak Storage= 177 cf @ 12.40 hrs  
Average Depth at Peak Storage= 0.72' , Surface Width= 4.00'  
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe  
n= 0.013 Concrete, trowel finish  
Length= 61.0' Slope= 0.0203 '/'  
Inlet Invert= 301.34', Outlet Invert= 300.10'



### Reach 1R: 4'x 1' Box Culvert

Hydrograph



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### Summary for Reach 2R: New Box Cumvert

Inflow Area = 3,247,549 sf, 4.18% Impervious, Inflow Depth > 3.60" for 100 YR event  
Inflow = 156.22 cfs @ 12.67 hrs, Volume= 973,820 cf  
Outflow = 155.36 cfs @ 12.67 hrs, Volume= 973,780 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 19.74 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 7.34 fps, Avg. Travel Time= 0.1 min

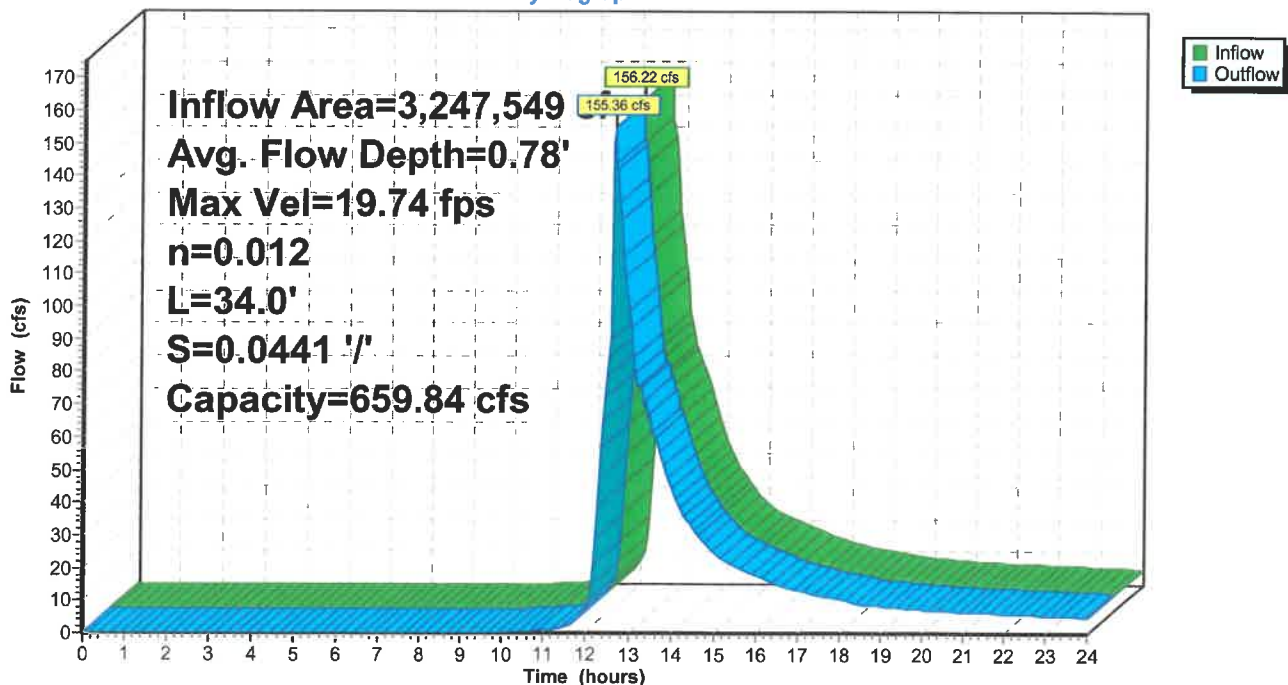
Peak Storage= 266 cf @ 12.67 hrs  
Average Depth at Peak Storage= 0.78' , Surface Width= 10.00'  
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 659.84 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished  
Length= 34.0' Slope= 0.0441 '/'  
Inlet Invert= 294.00', Outlet Invert= 292.50'



### Reach 2R: New Box Cumvert

Hydrograph



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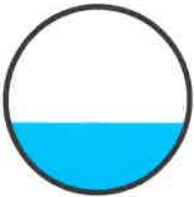
### Summary for Reach 3R: CB1 to DMH 1

Inflow Area = 13,094 sf, 84.66% Impervious, Inflow Depth > 7.78" for 100 YR event  
Inflow = 2.45 cfs @ 12.09 hrs, Volume= 8,491 cf  
Outflow = 2.45 cfs @ 12.09 hrs, Volume= 8,491 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.97 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 3.00 fps, Avg. Travel Time= 0.0 min

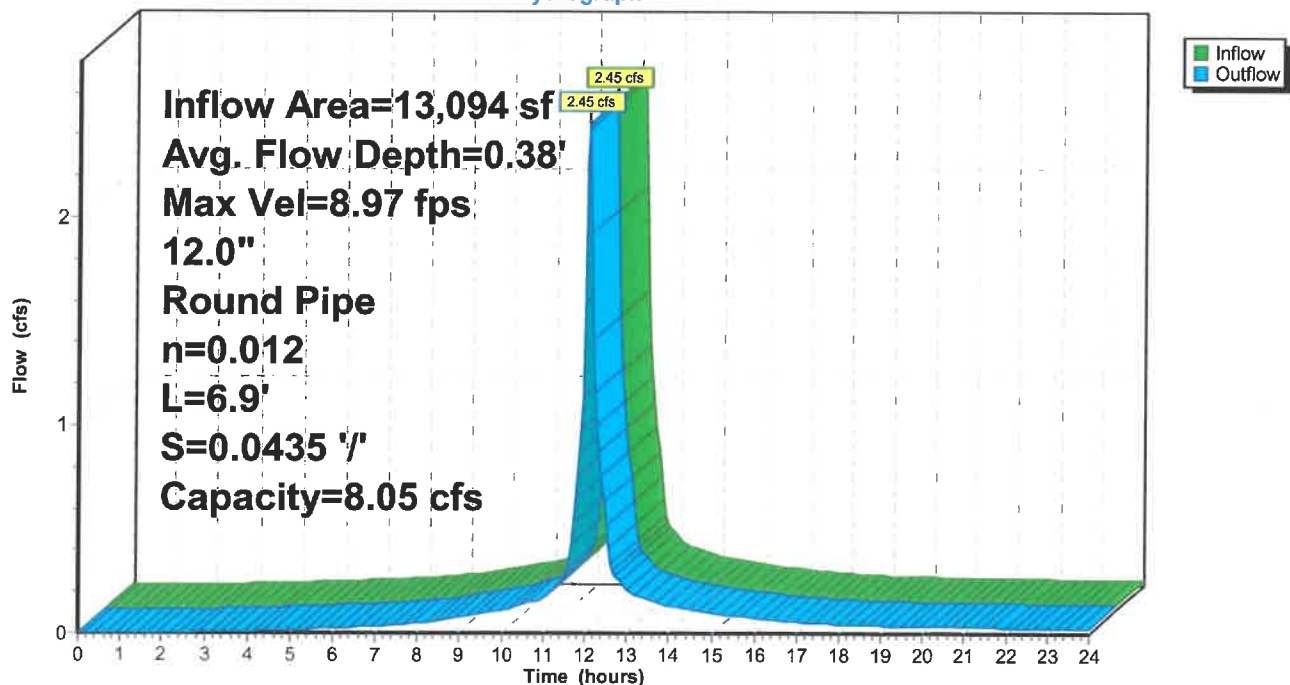
Peak Storage= 2 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.38', Surface Width= 0.97'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.9' Slope= 0.0435 '/'  
Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 3R: CB1 to DMH 1

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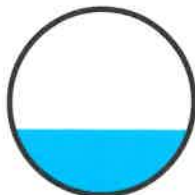
### Summary for Reach 4R: CB2 to DMH 1

Inflow Area = 11,319 sf, 94.70% Impervious, Inflow Depth > 8.26" for 100 YR event  
Inflow = 2.17 cfs @ 12.09 hrs, Volume= 7,795 cf  
Outflow = 2.17 cfs @ 12.09 hrs, Volume= 7,795 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.67 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.91 fps, Avg. Travel Time= 0.0 min

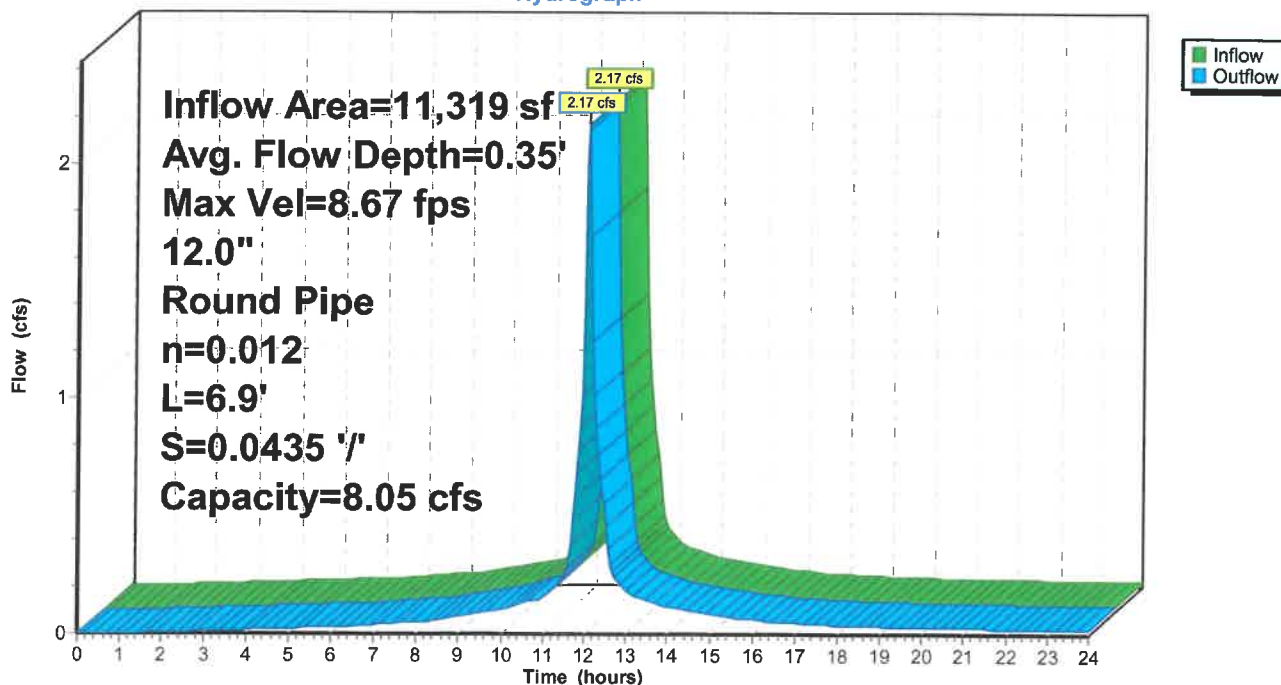
Peak Storage= 2 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.35', Surface Width= 0.96'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.9' Slope= 0.0435 '/'  
Inlet Invert= 295.20', Outlet Invert= 294.90'



### Reach 4R: CB2 to DMH 1

Hydrograph



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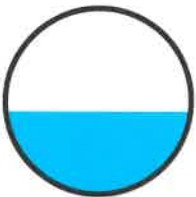
### Summary for Reach 5R: DMH1 to DMH 2

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 8.01" for 100 YR event  
Inflow = 4.62 cfs @ 12.09 hrs, Volume= 16,286 cf  
Outflow = 4.59 cfs @ 12.09 hrs, Volume= 16,283 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.07 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 2.02 fps, Avg. Travel Time= 0.6 min

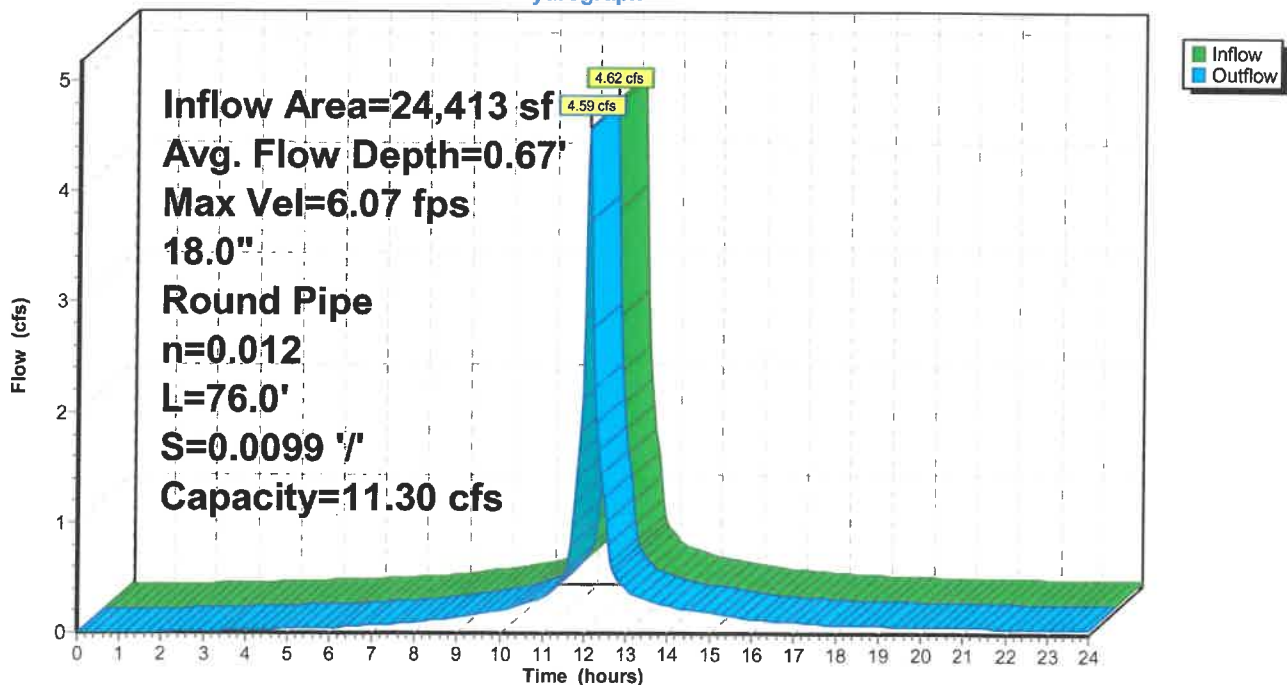
Peak Storage= 58 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.67' , Surface Width= 1.49'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.30 cfs

18.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 76.0' Slope= 0.0099 '/  
Inlet Invert= 291.75', Outlet Invert= 291.00'



### Reach 5R: DMH1 to DMH 2

Hydrograph



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### Summary for Reach 6R: CB3 to DMH 2

Inflow Area = 3,124 sf, 75.00% Impervious, Inflow Depth > 7.42" for 100 YR event  
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 1,931 cf  
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 1,931 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.08 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.01 fps, Avg. Travel Time= 0.1 min

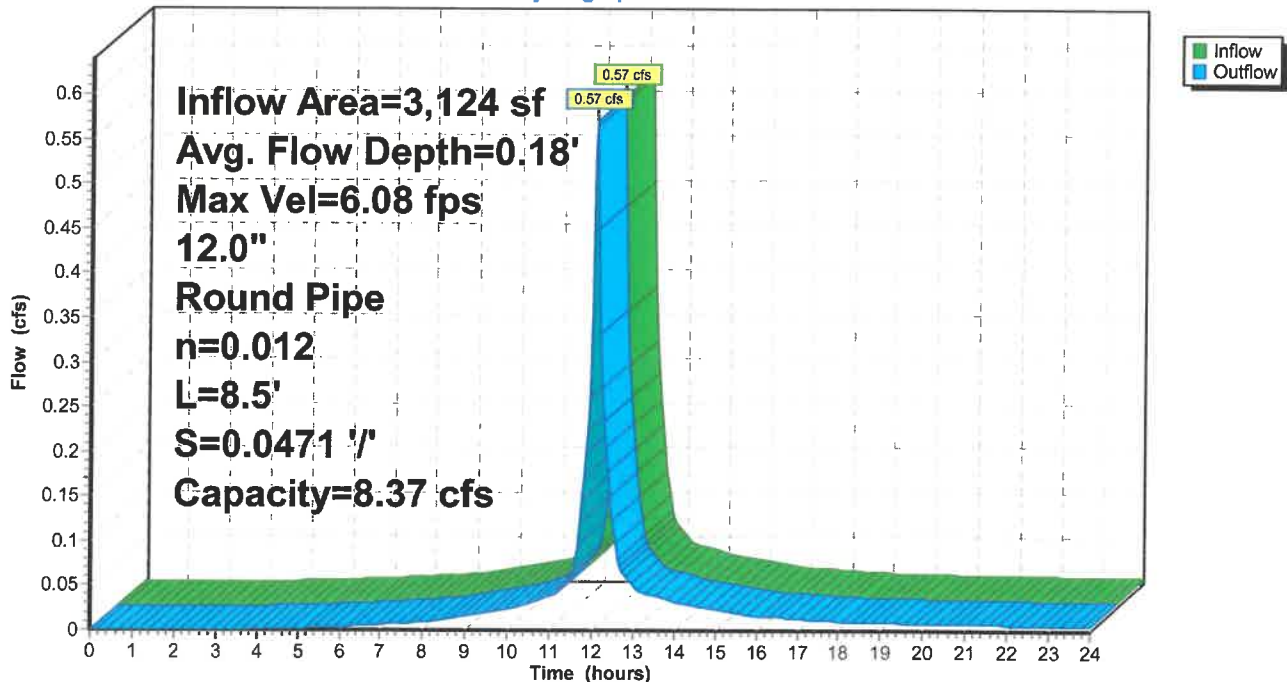
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.18' , Surface Width= 0.76'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 8.5' Slope= 0.0471 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 6R: CB3 to DMH 2

Hydrograph



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### Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 2,550 sf, 75.02% Impervious, Inflow Depth > 7.42" for 100 YR event  
Inflow = 0.47 cfs @ 12.09 hrs, Volume= 1,576 cf  
Outflow = 0.47 cfs @ 12.09 hrs, Volume= 1,576 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.80 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.59 fps, Avg. Travel Time= 0.1 min

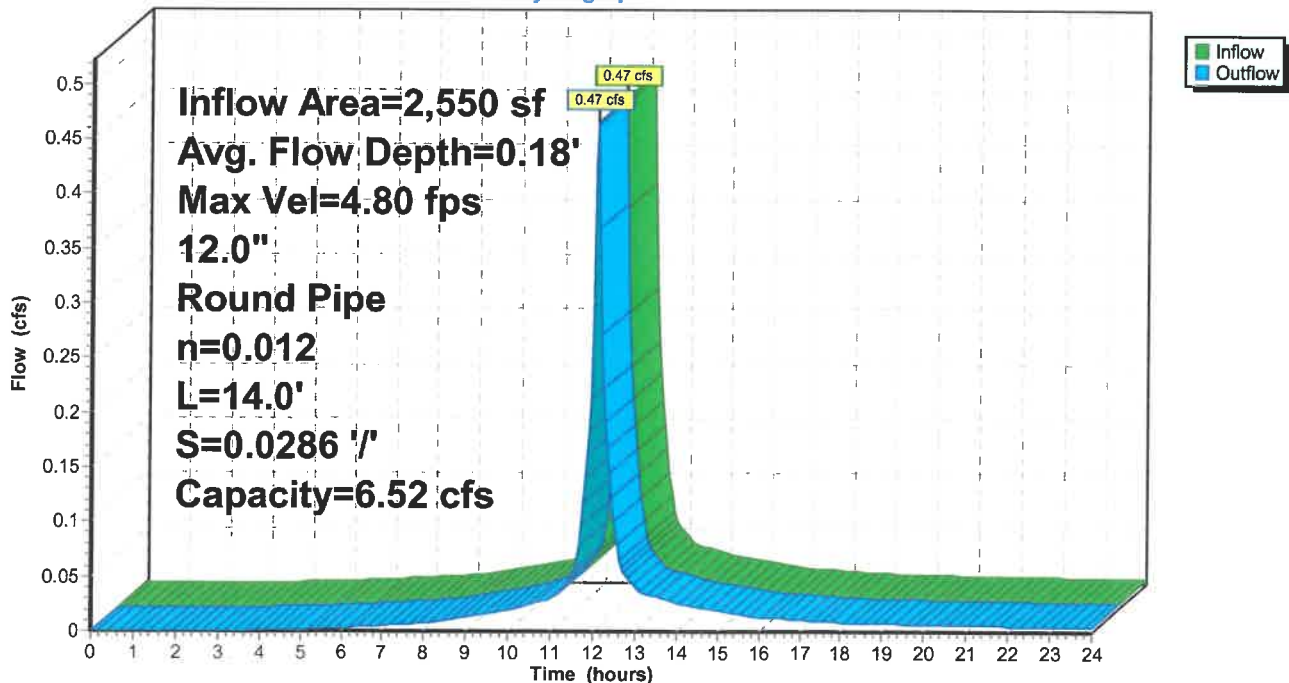
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.18' , Surface Width= 0.77'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.52 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 14.0' Slope= 0.0286 '/'  
Inlet Invert= 299.00', Outlet Invert= 298.60'



### Reach 7R: CB4 to DMH 2

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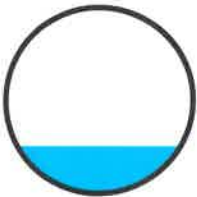
### Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 7.44" for 100 YR event  
Inflow = 2.33 cfs @ 12.09 hrs, Volume= 7,979 cf  
Outflow = 2.26 cfs @ 12.11 hrs, Volume= 7,975 cf, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.48 fps, Min. Travel Time= 0.6 min  
Avg. Velocity= 2.09 fps, Avg. Travel Time= 1.9 min

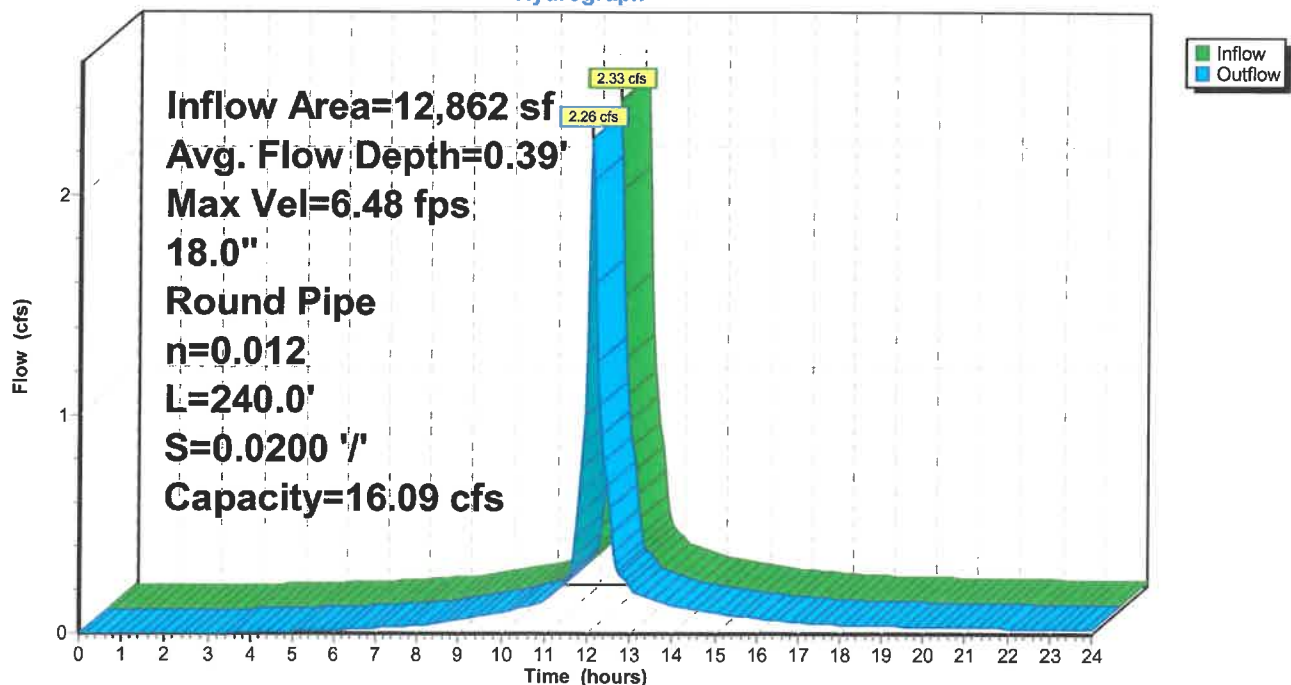
Peak Storage= 86 cf @ 12.10 hrs  
Average Depth at Peak Storage= 0.39', Surface Width= 1.31'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 16.09 cfs

18.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 240.0' Slope= 0.0200 '/'  
Inlet Invert= 294.80', Outlet Invert= 290.00'



### Reach 8R: DMH 2 TO DMH 7

Hydrograph



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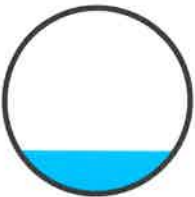
### Summary for Reach 9R: DMH 3 to DMH 2

Inflow Area = 7,188 sf, 76.42% Impervious, Inflow Depth > 7.47" for 100 YR event  
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 4,473 cf  
Outflow = 1.29 cfs @ 12.10 hrs, Volume= 4,471 cf, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 9.38 fps, Min. Travel Time= 0.4 min  
Avg. Velocity= 3.02 fps, Avg. Travel Time= 1.2 min

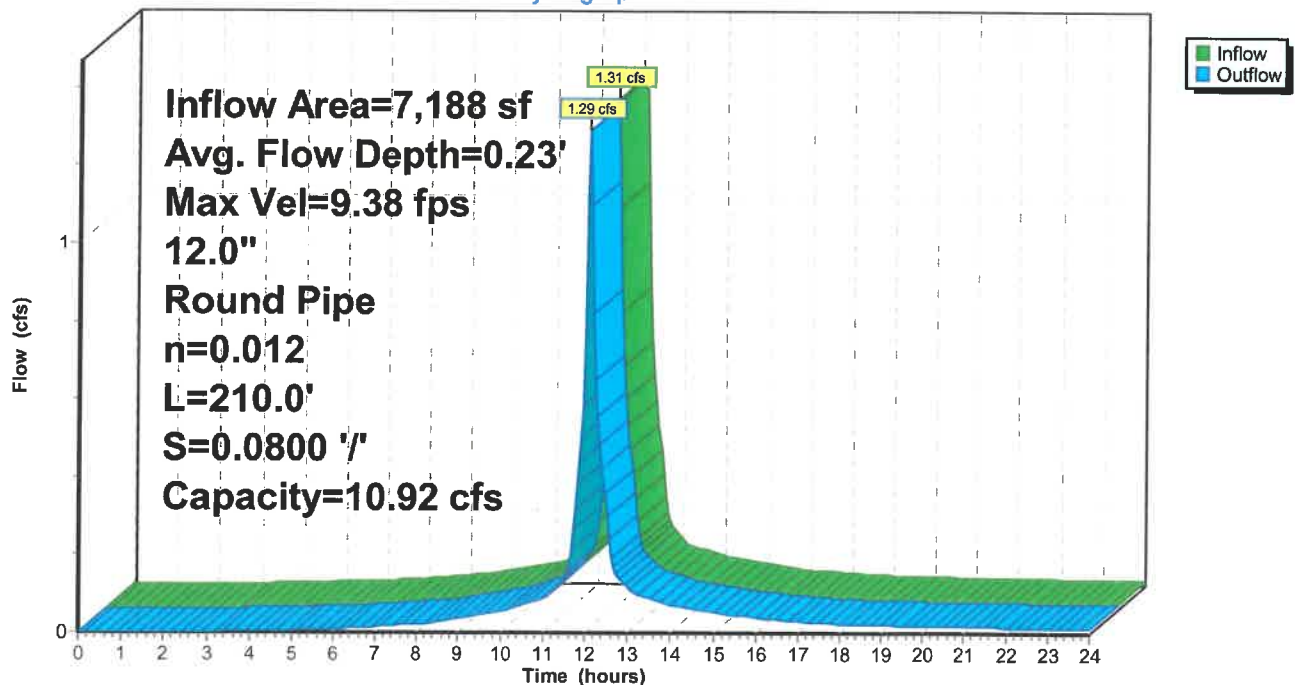
Peak Storage= 29 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.23' , Surface Width= 0.85'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 210.0' Slope= 0.0800 '/'  
Inlet Invert= 315.40', Outlet Invert= 298.60'



### Reach 9R: DMH 3 to DMH 2

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### Summary for Reach 10R: CB5 to DMH 3

Inflow Area = 3,692 sf, 67.52% Impervious, Inflow Depth > 7.06" for 100 YR event  
Inflow = 0.65 cfs @ 12.09 hrs, Volume= 2,171 cf  
Outflow = 0.65 cfs @ 12.09 hrs, Volume= 2,171 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.18 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.05 fps, Avg. Travel Time= 0.1 min

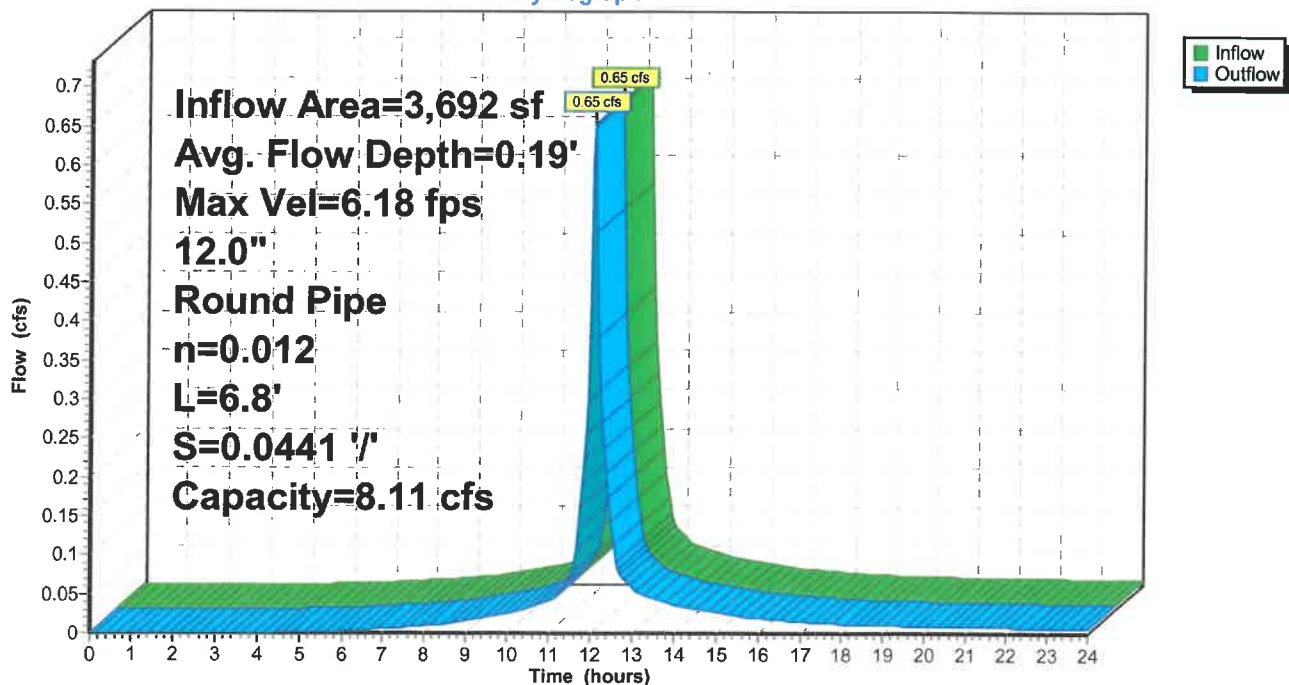
Peak Storage= 1 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.19' , Surface Width= 0.79'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.11 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 6.8' Slope= 0.0441 '/'  
Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 10R: CB5 to DMH 3

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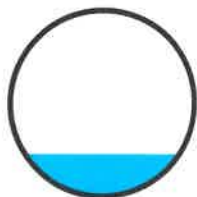
### Summary for Reach 11R: CB6 to DMH 3

Inflow Area = 3,496 sf, 85.81% Impervious, Inflow Depth > 7.90" for 100 YR event  
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 2,302 cf  
Outflow = 0.66 cfs @ 12.09 hrs, Volume= 2,302 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.88 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.61 fps, Avg. Travel Time= 0.1 min

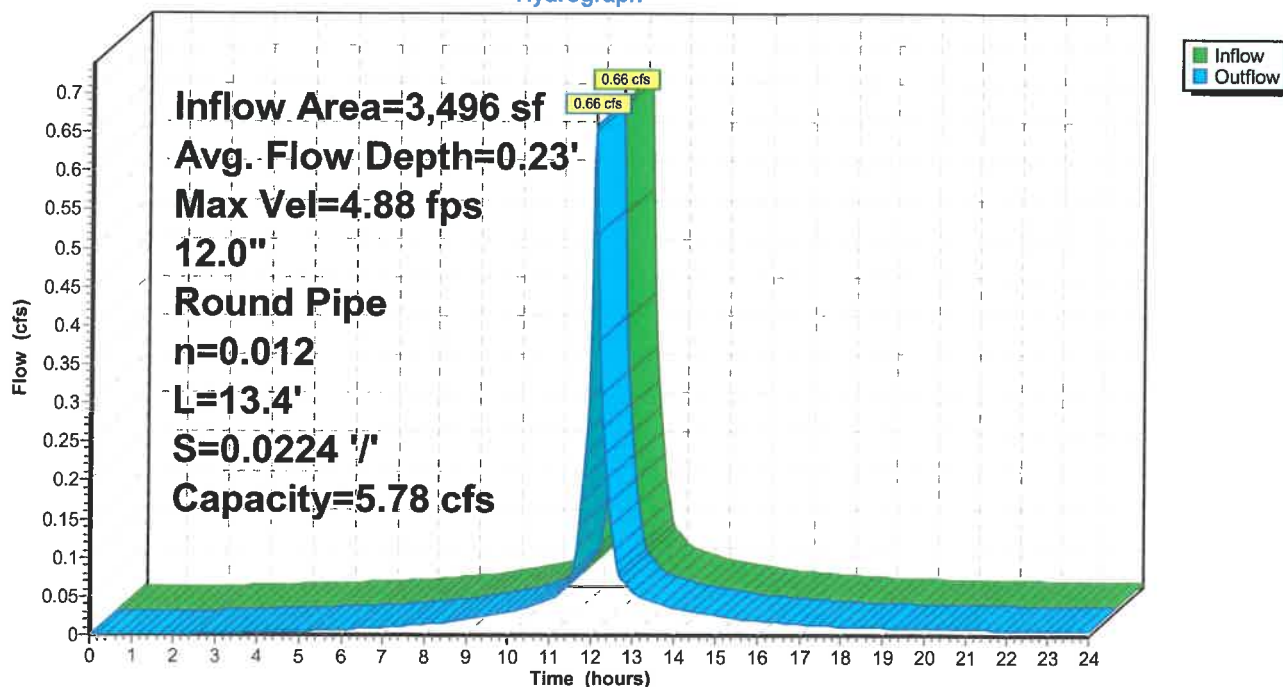
Peak Storage= 2 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.23' , Surface Width= 0.84'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.78 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 13.4' Slope= 0.0224 '/'  
Inlet Invert= 319.00', Outlet Invert= 318.70'



### Reach 11R: CB6 to DMH 3

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### Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 7.44" for 100 YR event  
Inflow = 2.26 cfs @ 12.11 hrs, Volume= 7,975 cf  
Outflow = 2.19 cfs @ 12.13 hrs, Volume= 7,971 cf, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.31 fps, Min. Travel Time= 0.5 min  
Avg. Velocity= 2.39 fps, Avg. Travel Time= 1.7 min

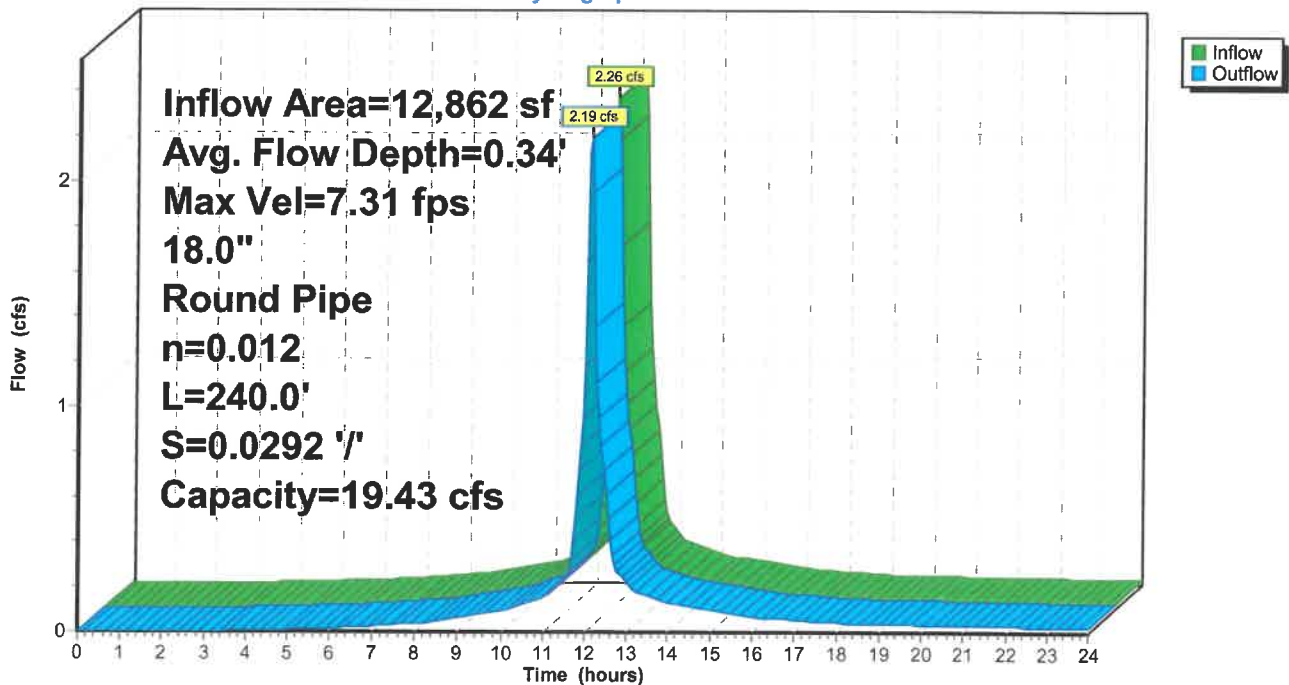
Peak Storage= 74 cf @ 12.12 hrs  
Average Depth at Peak Storage= 0.34' , Surface Width= 1.26'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 19.43 cfs

18.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 240.0' Slope= 0.0292 '/'  
Inlet Invert= 290.00', Outlet Invert= 283.00'



### Reach 12R: DMH 7 TO BASIN

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### Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 7.06" for 100 YR event  
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 2,559 cf  
Outflow = 0.77 cfs @ 12.09 hrs, Volume= 2,559 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.99 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 1.98 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.22' , Surface Width= 0.83'

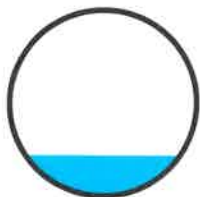
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

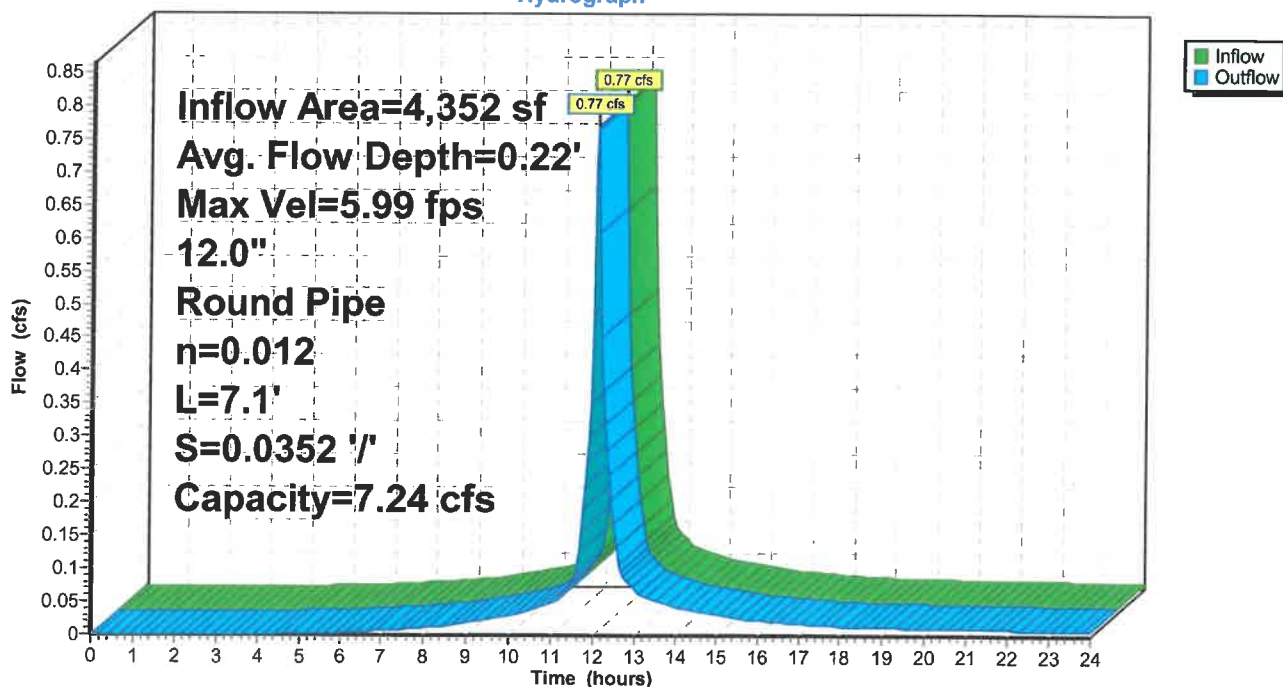
Length= 7.1' Slope= 0.0352 '/'

Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 13R: CB7 TO DMH 4

#### Hydrograph



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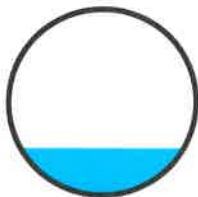
### Summary for Reach 14R: CB 8 TO DMH 4

Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 7.30" for 100 YR event  
Inflow = 0.74 cfs @ 12.09 hrs, Volume= 2,480 cf  
Outflow = 0.74 cfs @ 12.09 hrs, Volume= 2,480 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 4.72 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 1.56 fps, Avg. Travel Time= 0.1 min

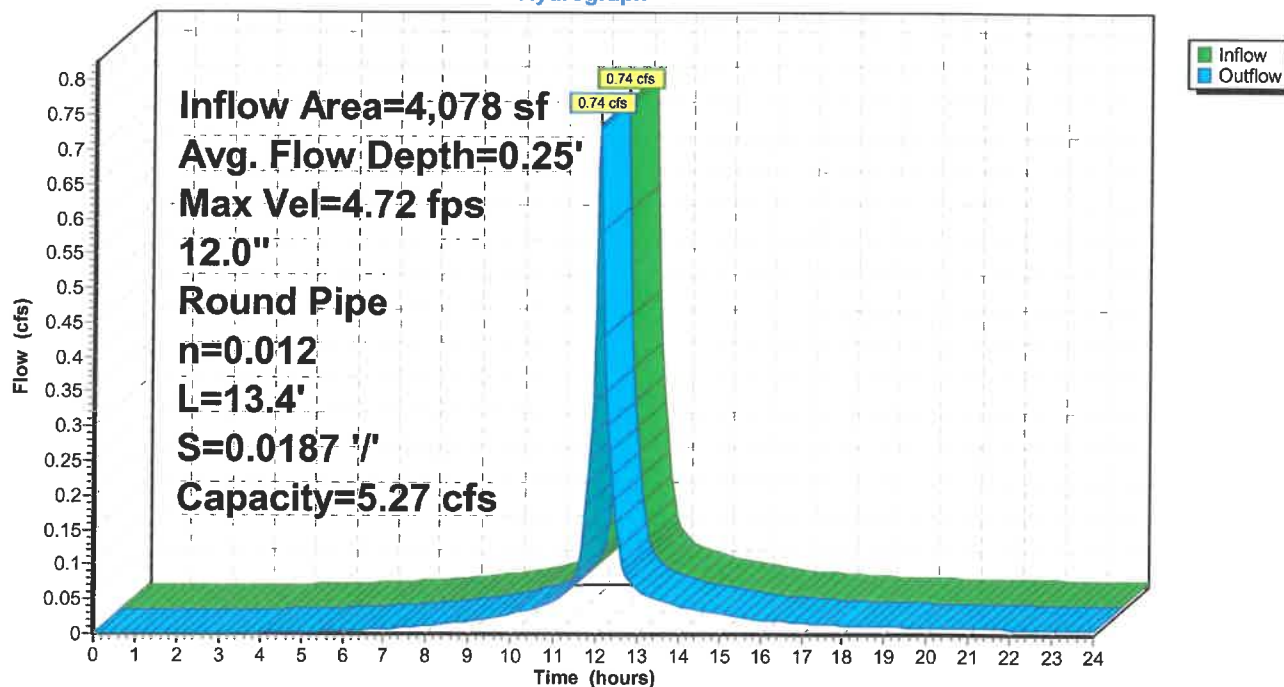
Peak Storage= 2 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.25', Surface Width= 0.87'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 13.4' Slope= 0.0187 1/100  
Inlet Invert= 321.00', Outlet Invert= 320.75'



### Reach 14R: CB 8 TO DMH 4

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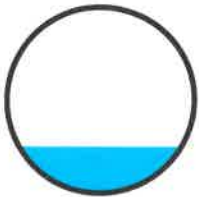
### Summary for Reach 15R: DMH 4 TO DMH 5

Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 7.17" for 100 YR event  
Inflow = 1.51 cfs @ 12.09 hrs, Volume= 5,039 cf  
Outflow = 1.50 cfs @ 12.09 hrs, Volume= 5,038 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 9.76 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 3.20 fps, Avg. Travel Time= 0.5 min

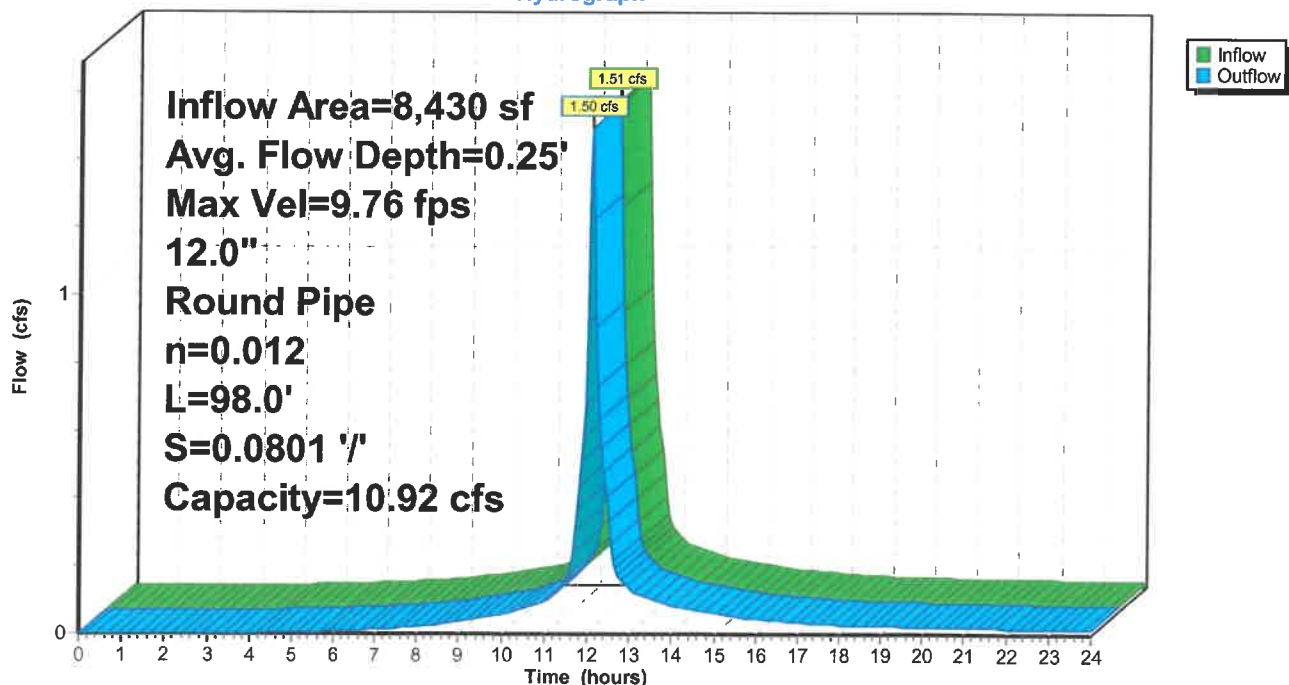
Peak Storage= 15 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.25' , Surface Width= 0.87'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 98.0' Slope= 0.0801 '/'  
Inlet Invert= 316.20', Outlet Invert= 308.35'



### Reach 15R: DMH 4 TO DMH 5

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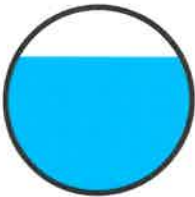
### Summary for Reach 16R: DMH 5 TO DMH 6

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 6.80" for 100 YR event  
Inflow = 6.29 cfs @ 12.09 hrs, Volume= 20,827 cf  
Outflow = 6.09 cfs @ 12.11 hrs, Volume= 20,816 cf, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.48 fps, Min. Travel Time= 0.6 min  
Avg. Velocity= 2.26 fps, Avg. Travel Time= 1.8 min

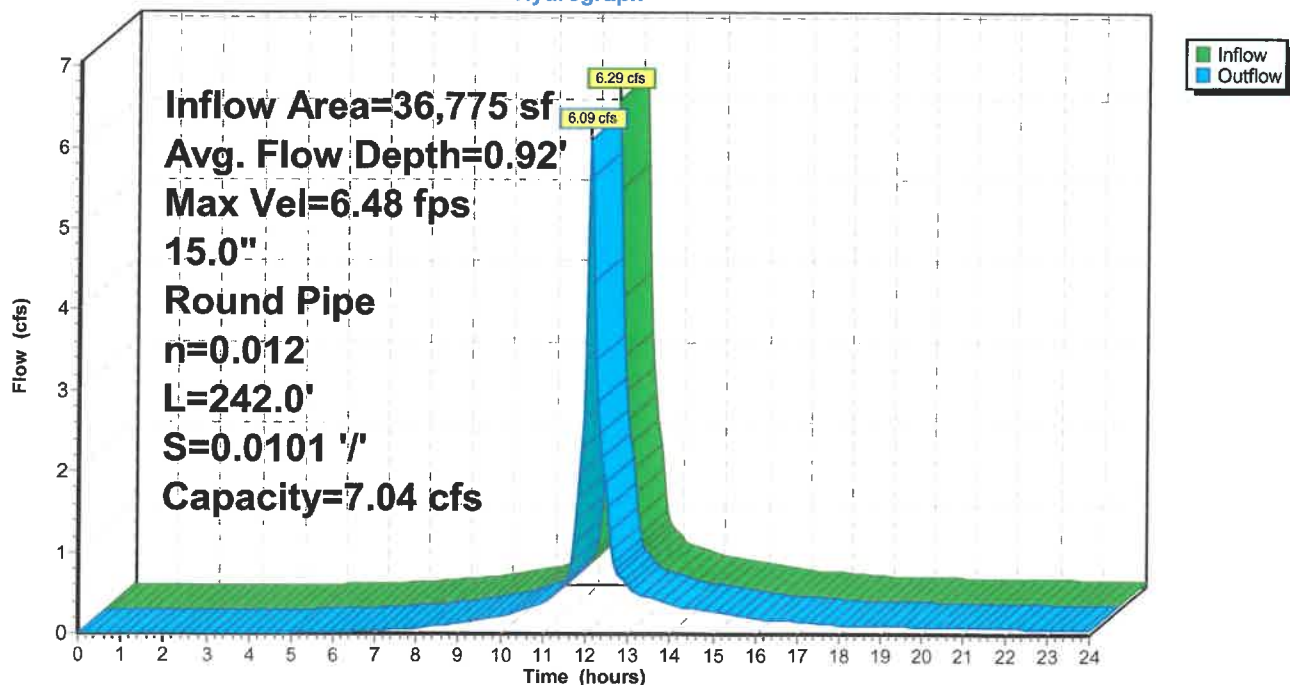
Peak Storage= 234 cf @ 12.10 hrs  
Average Depth at Peak Storage= 0.92', Surface Width= 1.10'  
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 242.0' Slope= 0.0101 '/'  
Inlet Invert= 308.10', Outlet Invert= 305.65'



### Reach 16R: DMH 5 TO DMH 6

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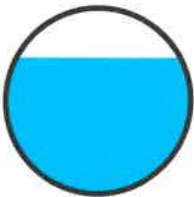
### Summary for Reach 17R: DMH 6 TO DMH 5

Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 6.69" for 100 YR event  
Inflow = 4.83 cfs @ 12.09 hrs, Volume= 15,792 cf  
Outflow = 4.79 cfs @ 12.10 hrs, Volume= 15,789 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.83 fps, Min. Travel Time= 0.2 min  
Avg. Velocity= 2.79 fps, Avg. Travel Time= 0.6 min

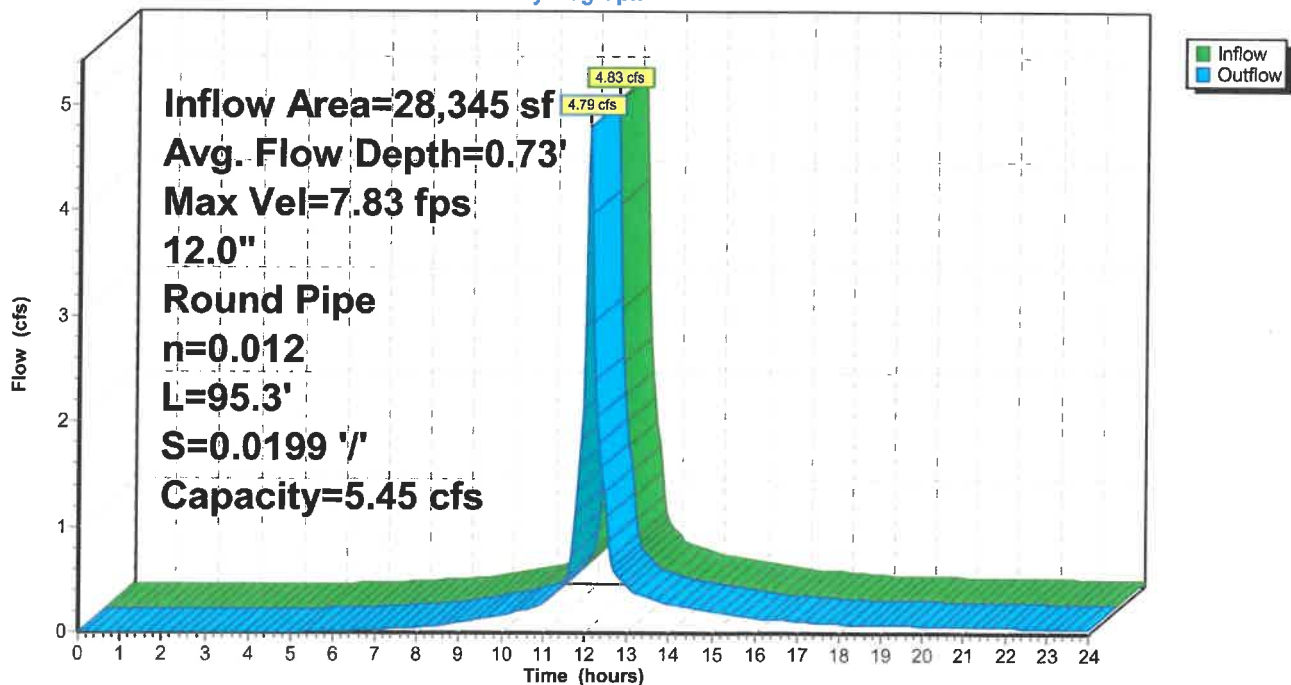
Peak Storage= 59 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.73', Surface Width= 0.89'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 95.3' Slope= 0.0199 '/'  
Inlet Invert= 310.25', Outlet Invert= 308.35'



### Reach 17R: DMH 6 TO DMH 5

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### Summary for Reach 18R: CB 10 TO DMH 6

Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 6.57" for 100 YR event  
Inflow = 2.49 cfs @ 12.09 hrs, Volume= 8,099 cf  
Outflow = 2.49 cfs @ 12.09 hrs, Volume= 8,099 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.70 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.30 fps, Avg. Travel Time= 0.1 min

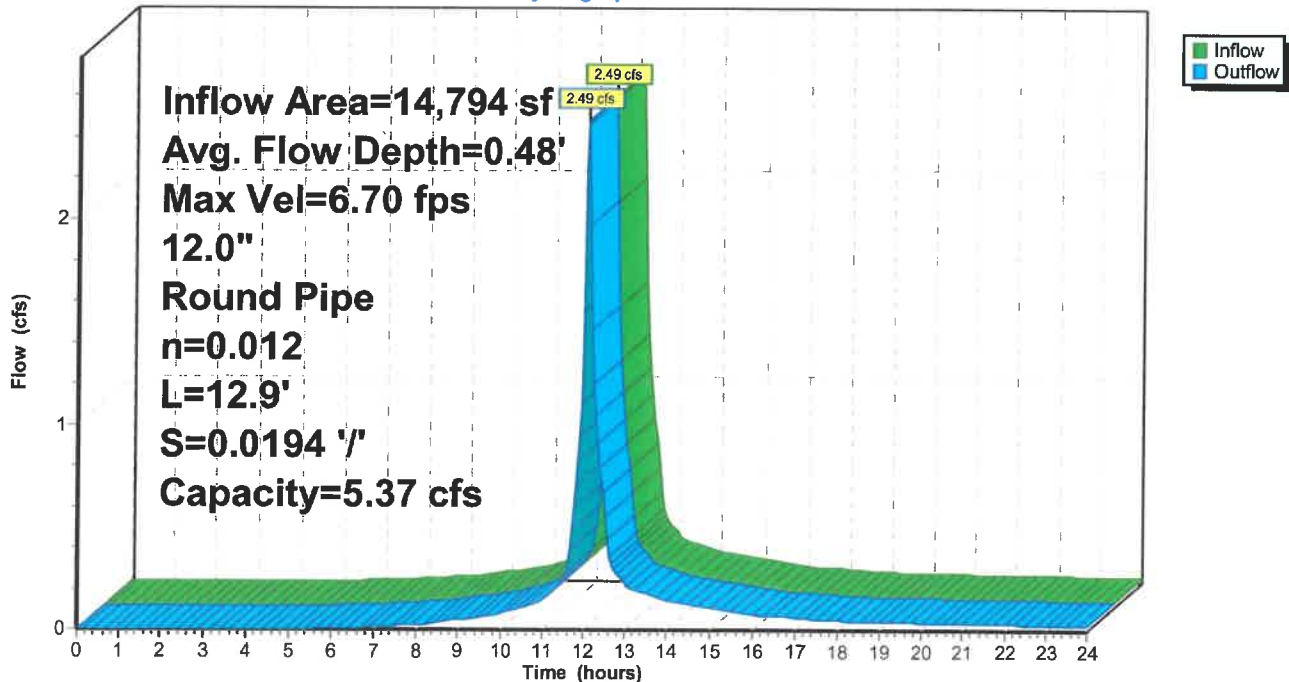
Peak Storage= 5 cf @ 12.09 hrs  
Average Depth at Peak Storage= 0.48', Surface Width= 1.00'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 12.9' Slope= 0.0194 '/'  
Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 18R: CB 10 TO DMH 6

Hydrograph



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### Summary for Reach 19R: CB 9 TO DMH 6

Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 6.81" for 100 YR event  
Inflow = 2.34 cfs @ 12.09 hrs, Volume= 7,693 cf  
Outflow = 2.34 cfs @ 12.09 hrs, Volume= 7,693 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Max. Velocity= 8.25 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 2.78 fps, Avg. Travel Time= 0.0 min

Peak Storage= 2 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.39', Surface Width= 0.98'

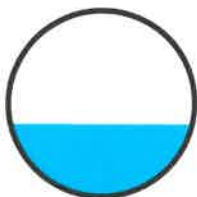
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

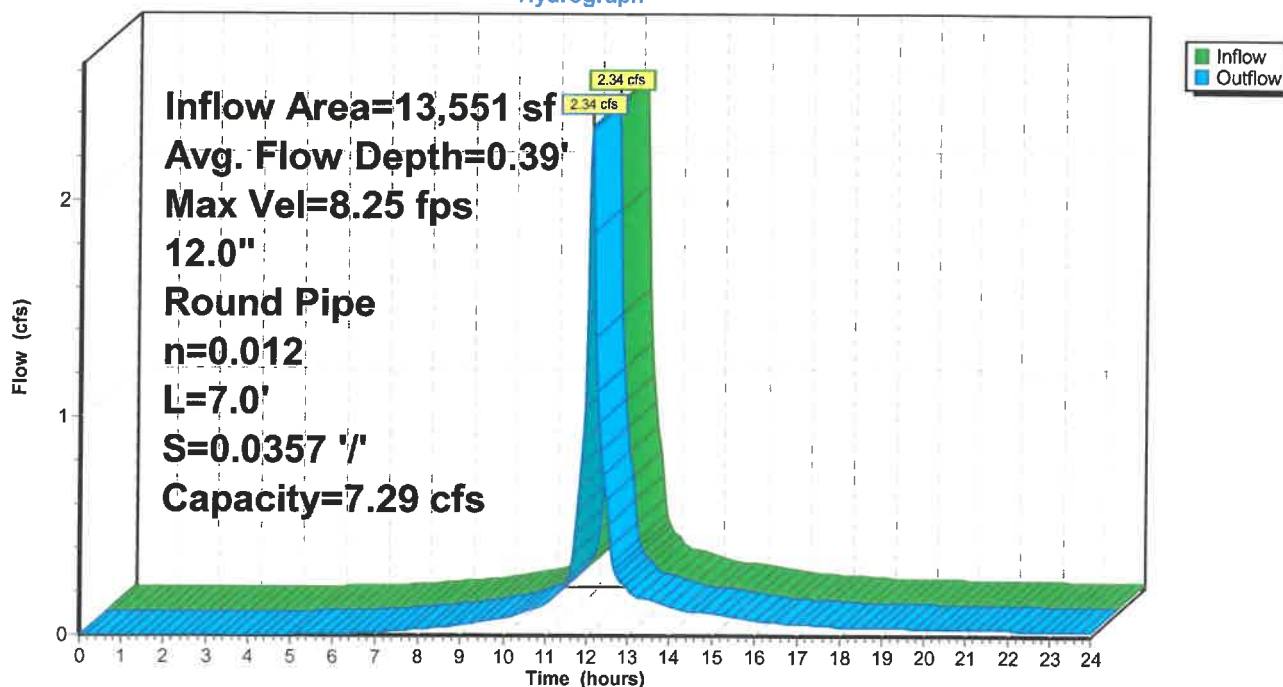
Length= 7.0' Slope= 0.0357 '/'

Inlet Invert= 310.50', Outlet Invert= 310.25'



### Reach 19R: CB 9 TO DMH 6

Hydrograph



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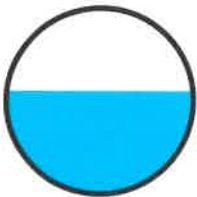
### Summary for Reach 20R: DMH 6 to Basin

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 6.79" for 100 YR event  
Inflow = 6.09 cfs @ 12.11 hrs, Volume= 20,816 cf  
Outflow = 6.08 cfs @ 12.11 hrs, Volume= 20,815 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.69 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 2.95 fps, Avg. Travel Time= 0.2 min

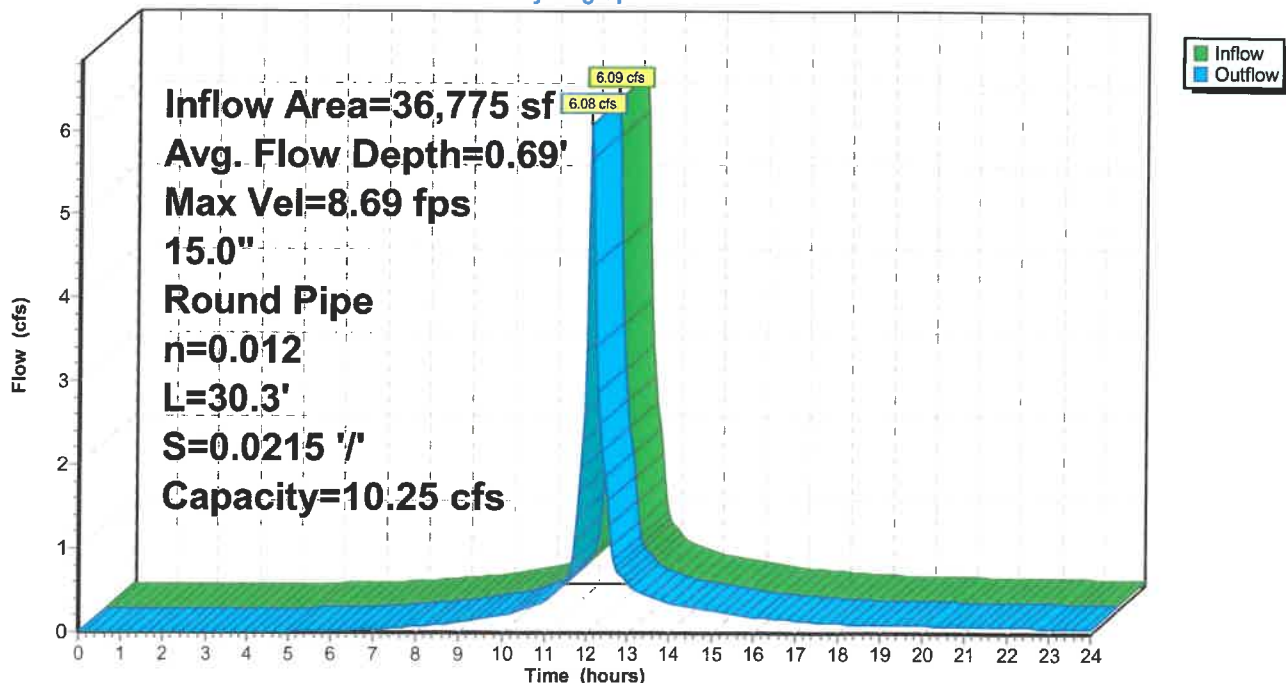
Peak Storage= 21 cf @ 12.11 hrs  
Average Depth at Peak Storage= 0.69' , Surface Width= 1.24'  
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe  
n= 0.012 Corrugated PP, smooth interior  
Length= 30.3' Slope= 0.0215 '/'  
Inlet Invert= 305.65', Outlet Invert= 305.00'



### Reach 20R: DMH 6 to Basin

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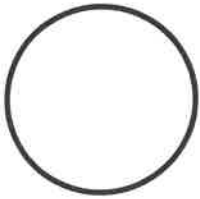
### Summary for Reach 21R: 2-8" DI

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth = 0.00" for 100 YR event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min  
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

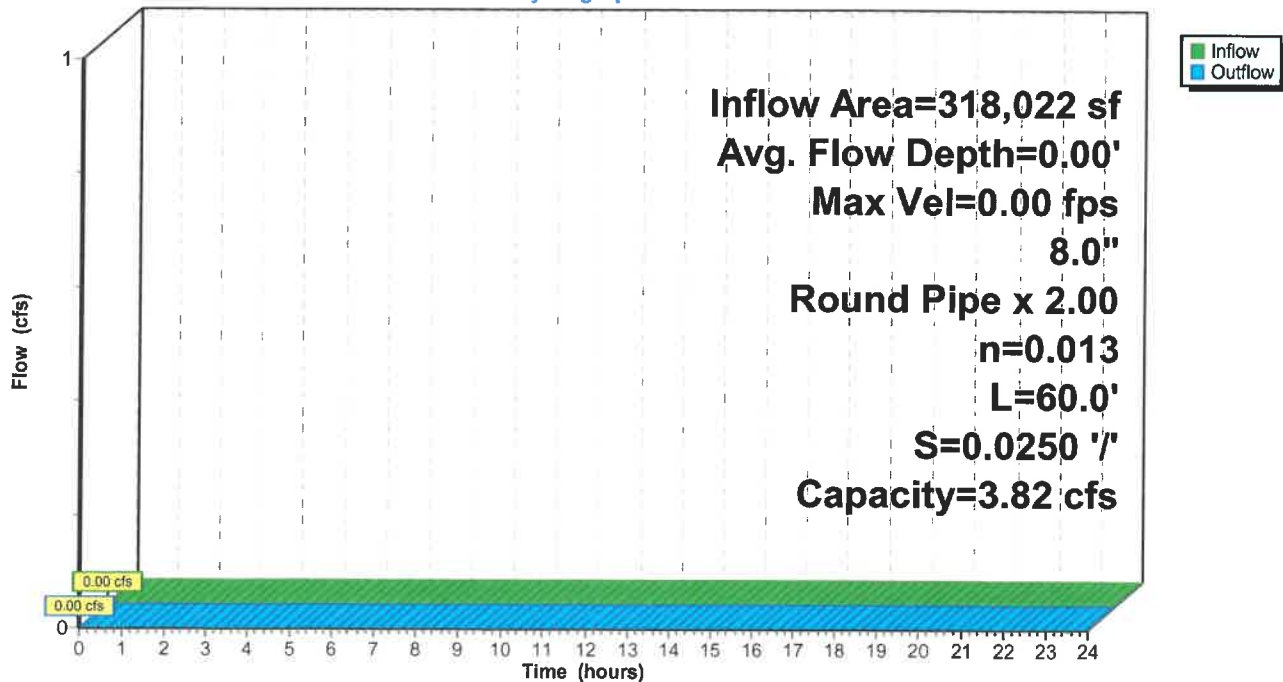
Peak Storage= 0 cf @ 0.00 hrs  
Average Depth at Peak Storage= 0.00'  
Bank-Full Depth= 0.67' Flow Area= 0.7 sf, Capacity= 3.82 cfs

A factor of 2.00 has been applied to the storage and discharge capacity  
8.0" Round Pipe  
n= 0.013 Corrugated PE, smooth interior  
Length= 60.0' Slope= 0.0250 '/'  
Inlet Invert= 312.50', Outlet Invert= 311.00'



### Reach 21R: 2-8" DI

#### Hydrograph





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### Summary for Reach EV1: Road Berm

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 3.53" for 100 YR event  
Inflow = 135.67 cfs @ 12.67 hrs, Volume= 809,588 cf  
Outflow = 134.84 cfs @ 12.67 hrs, Volume= 809,562 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.42 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 2.62 fps, Avg. Travel Time= 0.1 min

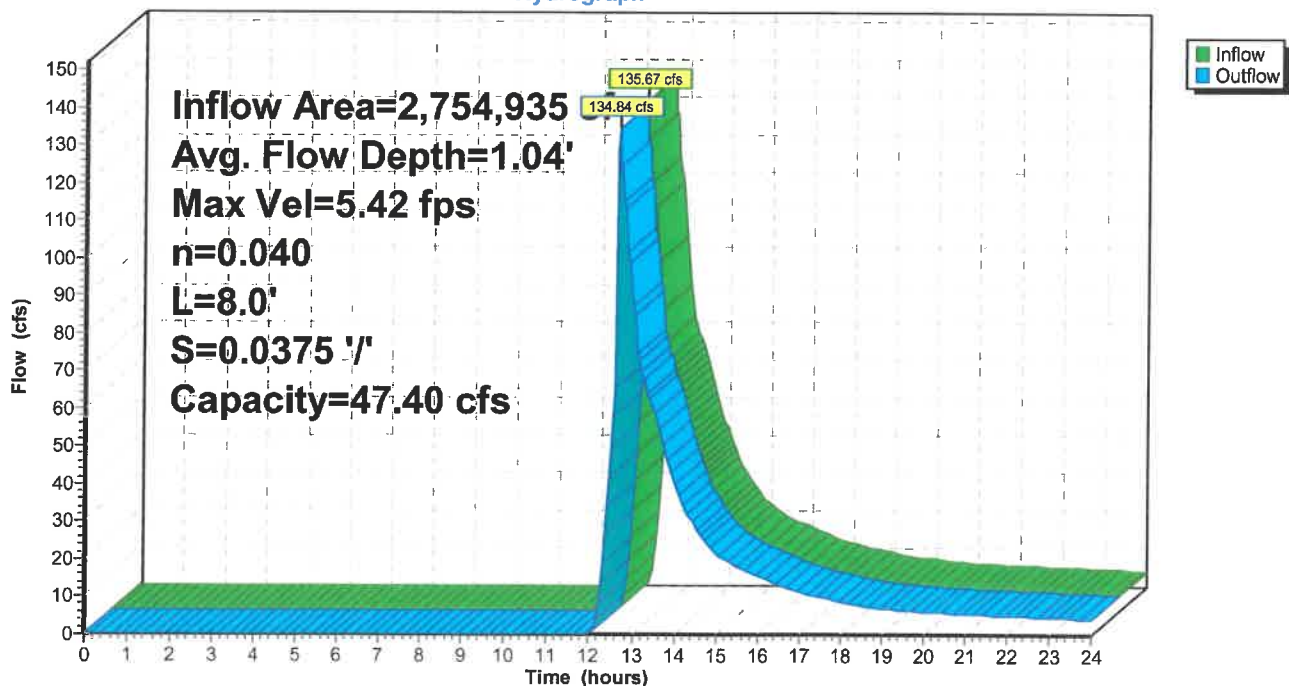
Peak Storage= 198 cf @ 12.67 hrs  
Average Depth at Peak Storage= 1.04' , Surface Width= 30.42'  
Bank-Full Depth= 0.50' Flow Area= 11.3 sf, Capacity= 47.40 cfs

20.00' x 0.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides  
Side Slope Z-value= 5.0 ' / ' Top Width= 25.00'  
Length= 8.0' Slope= 0.0375 ' / '  
Inlet Invert= 293.90', Outlet Invert= 293.60'



### Reach EV1: Road Berm

Hydrograph



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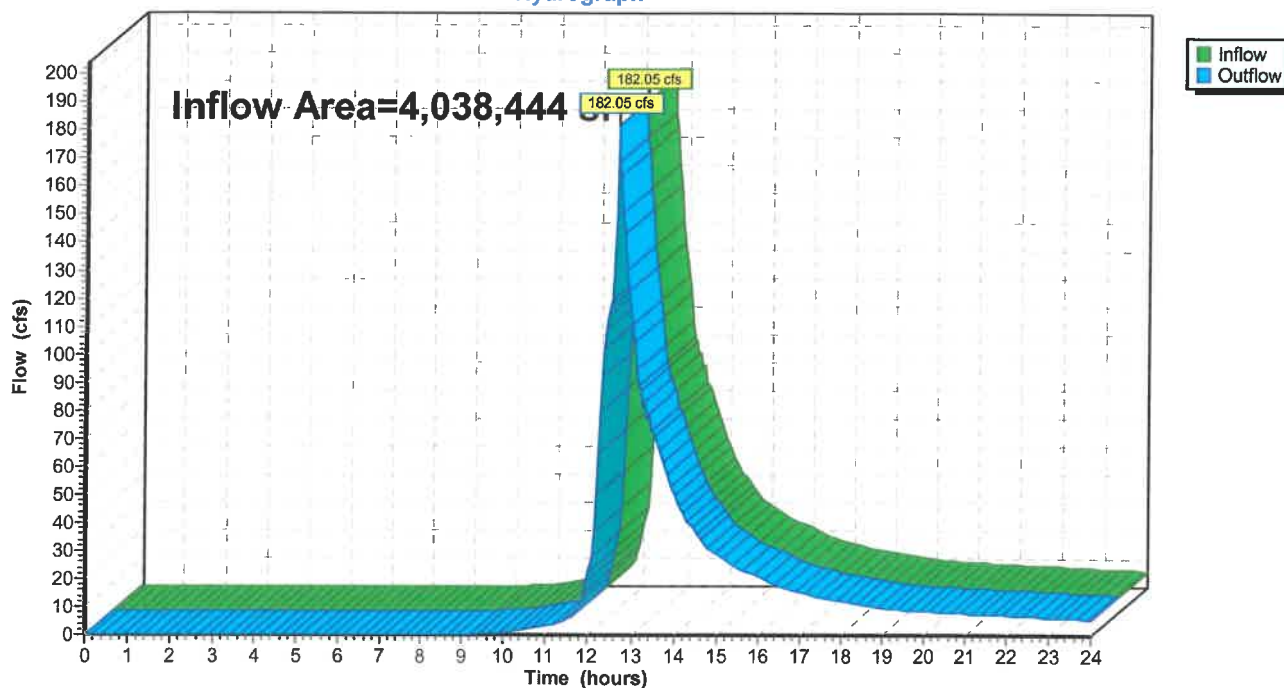
### Summary for Reach EV2: To Wetland

Inflow Area = 4,038,444 sf, 4.14% Impervious, Inflow Depth > 3.57" for 100 YR event  
Inflow = 182.05 cfs @ 12.67 hrs, Volume= 1,202,170 cf  
Outflow = 182.05 cfs @ 12.67 hrs, Volume= 1,202,170 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV2: To Wetland

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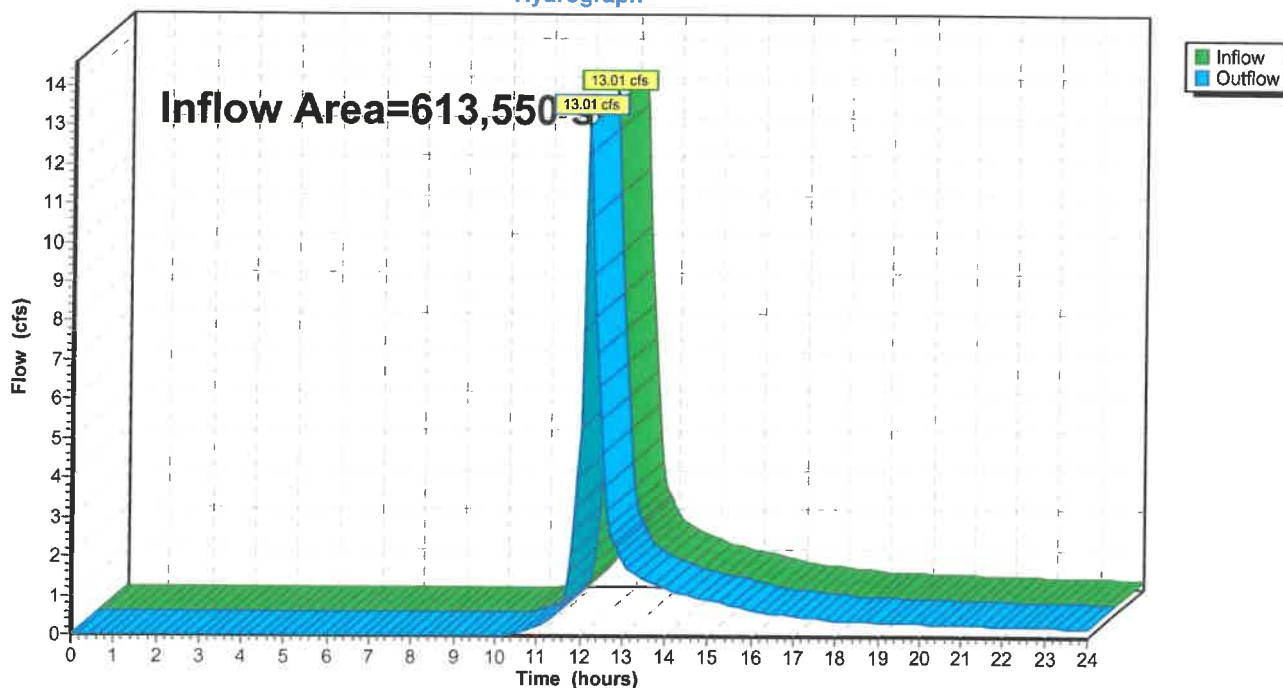
### Summary for Reach EV3: To Offsite

Inflow Area = 613,550 sf, 3.69% Impervious, Inflow Depth > 0.96" for 100 YR event  
Inflow = 13.01 cfs @ 12.16 hrs, Volume= 49,293 cf  
Outflow = 13.01 cfs @ 12.16 hrs, Volume= 49,293 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Reach EV3: To Offsite

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**Summary for Pond 1P: Forebay**

Inflow Area = 12,862 sf, 75.80% Impervious, Inflow Depth > 7.44" for 100 YR event  
 Inflow = 2.19 cfs @ 12.13 hrs, Volume= 7,971 cf  
 Outflow = 2.19 cfs @ 12.13 hrs, Volume= 7,971 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.19 cfs @ 12.13 hrs, Volume= 7,971 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 281.00' @ 12.13 hrs Surf.Area= 1,232 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 7,971 cf (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 778.0 - 778.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	252.50'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=30,307.96 cfs @ 12.13 hrs HW=281.00' (Free Discharge)  
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 30,307.96 cfs @ 17.72 fps)

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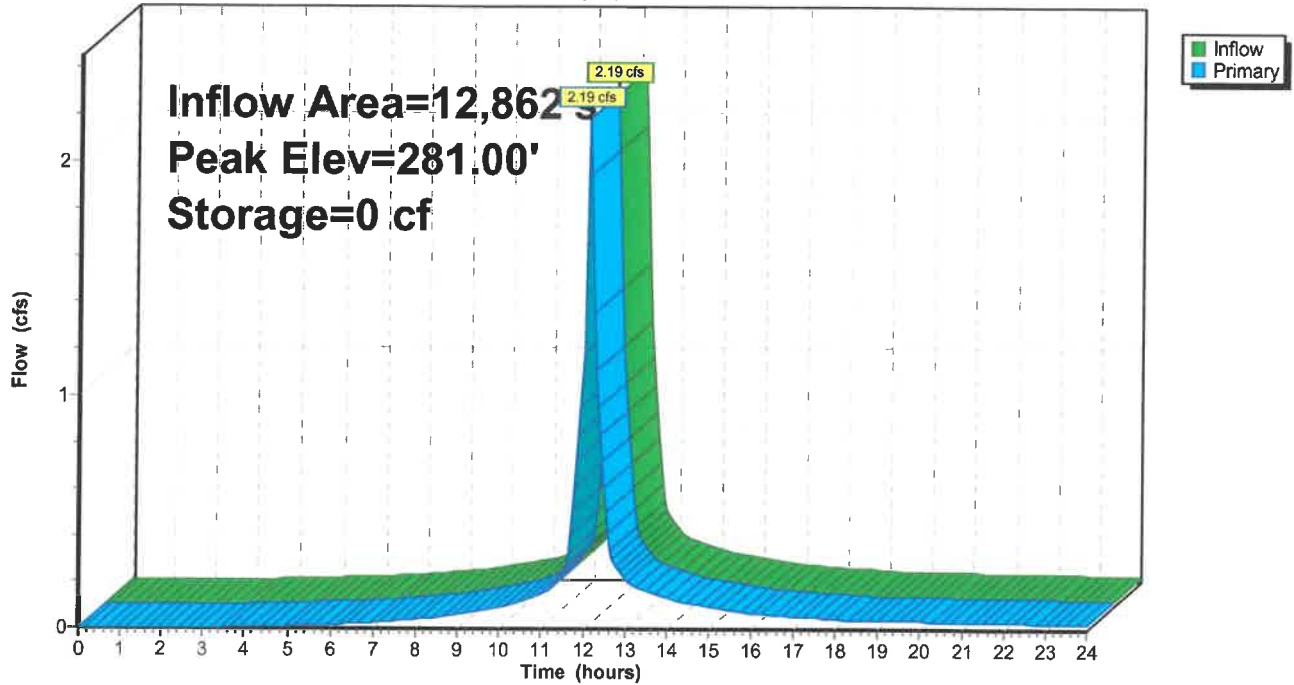
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## Pond 1P: Forebay

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**Summary for Pond 2P: Basin 1**

Inflow Area = 124,279 sf, 7.84% Impervious, Inflow Depth > 3.83" for 100 YR event  
 Inflow = 9.85 cfs @ 12.17 hrs, Volume= 39,703 cf  
 Outflow = 0.22 cfs @ 21.23 hrs, Volume= 10,603 cf, Atten= 98%, Lag= 543.1 min  
 Discarded = 0.22 cfs @ 21.23 hrs, Volume= 10,603 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 285.76' @ 21.23 hrs Surf.Area= 7,937 sf Storage= 29,382 cf

Plug-Flow detention time= 332.6 min calculated for 10,581 cf (27% of inflow)  
 Center-of-Mass det. time= 187.8 min ( 1,027.4 - 839.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	287.50'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=0.22 cfs @ 21.23 hrs HW=285.76' (Free Discharge)  
 ↗ **2=Exfiltration** (Exfiltration Controls 0.22 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)  
 ↗ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



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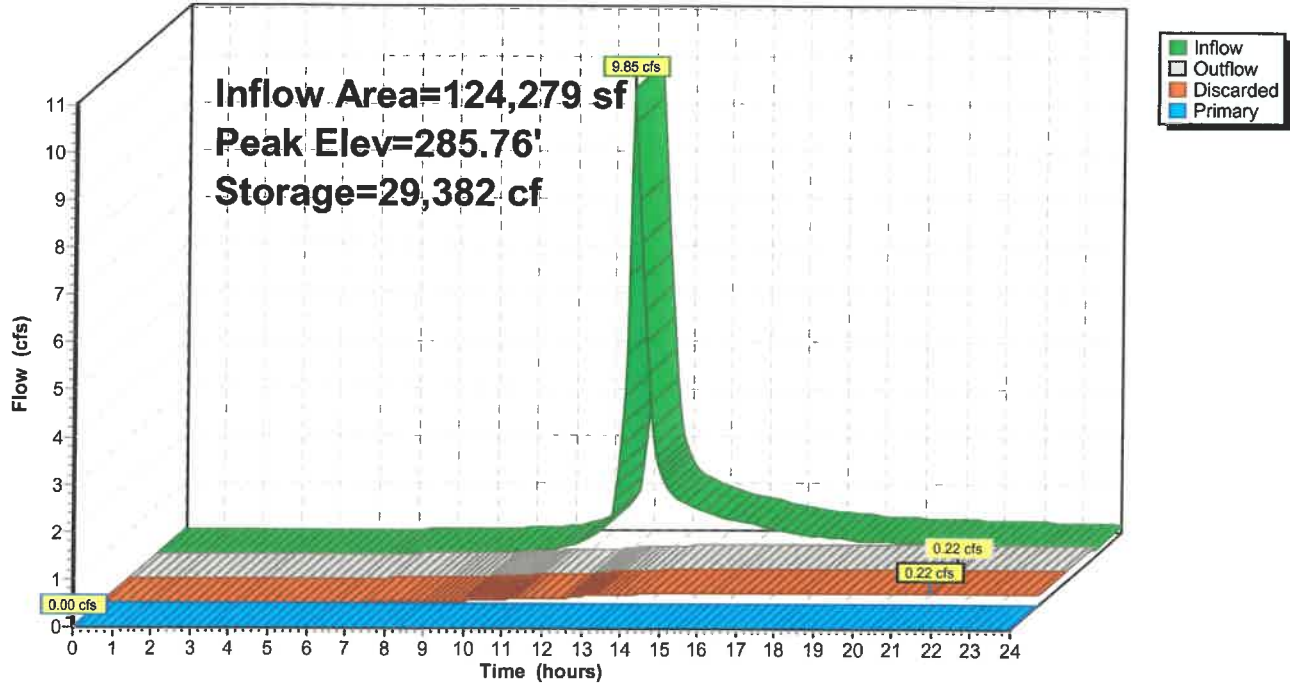
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## Pond 2P: Basin 1

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**Summary for Pond 3P: Forebay**

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 6.79" for 100 YR event  
 Inflow = 6.08 cfs @ 12.11 hrs, Volume= 20,815 cf  
 Outflow = 6.05 cfs @ 12.12 hrs, Volume= 18,548 cf, Atten= 0%, Lag= 0.4 min  
 Primary = 6.05 cfs @ 12.12 hrs, Volume= 18,548 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 305.61' @ 12.12 hrs Surf.Area= 1,791 sf Storage= 2,458 cf

Plug-Flow detention time= 80.3 min calculated for 18,509 cf (89% of inflow)  
 Center-of-Mass det. time= 30.0 min ( 821.7 - 791.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	<b>65.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=5.83 cfs @ 12.12 hrs HW=305.61' (Free Discharge)  
**1=Broad-Crested Rectangular Weir** (Weir Controls 5.83 cfs @ 0.83 fps)

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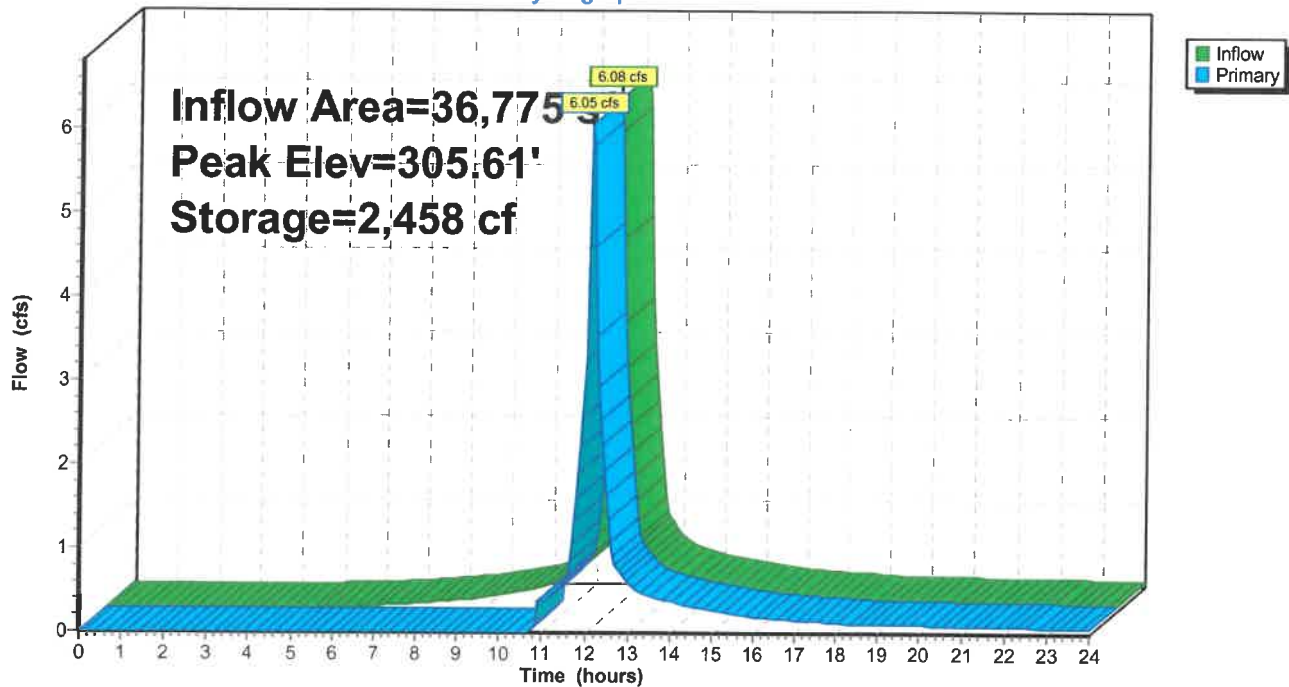
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### Pond 3P: Forebay

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**Summary for Pond 4P: Basin 2**

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 4.41" for 100 YR event  
 Inflow = 11.97 cfs @ 12.15 hrs, Volume= 42,787 cf  
 Outflow = 0.26 cfs @ 19.70 hrs, Volume= 11,884 cf, Atten= 98%, Lag= 453.3 min  
 Discarded = 0.26 cfs @ 19.70 hrs, Volume= 11,884 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 307.69' @ 19.70 hrs Surf.Area= 10,247 sf Storage= 31,640 cf

Plug-Flow detention time= 347.8 min calculated for 11,884 cf (28% of inflow)  
 Center-of-Mass det. time= 220.4 min ( 1,058.1 - 837.7 )

Volume	Invert	Avail.Storage	Storage Description		
#1	304.00'	49,460 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199
309.30	12,176	447.0	3,556	49,460	14,461

Device	Routing	Invert	Outlet Devices									
#1	Primary	308.60'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b>									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	304.00'	<b>1.100 in/hr Exfiltration over Surface area</b>									

**Discarded OutFlow** Max=0.26 cfs @ 19.70 hrs HW=307.69' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.26 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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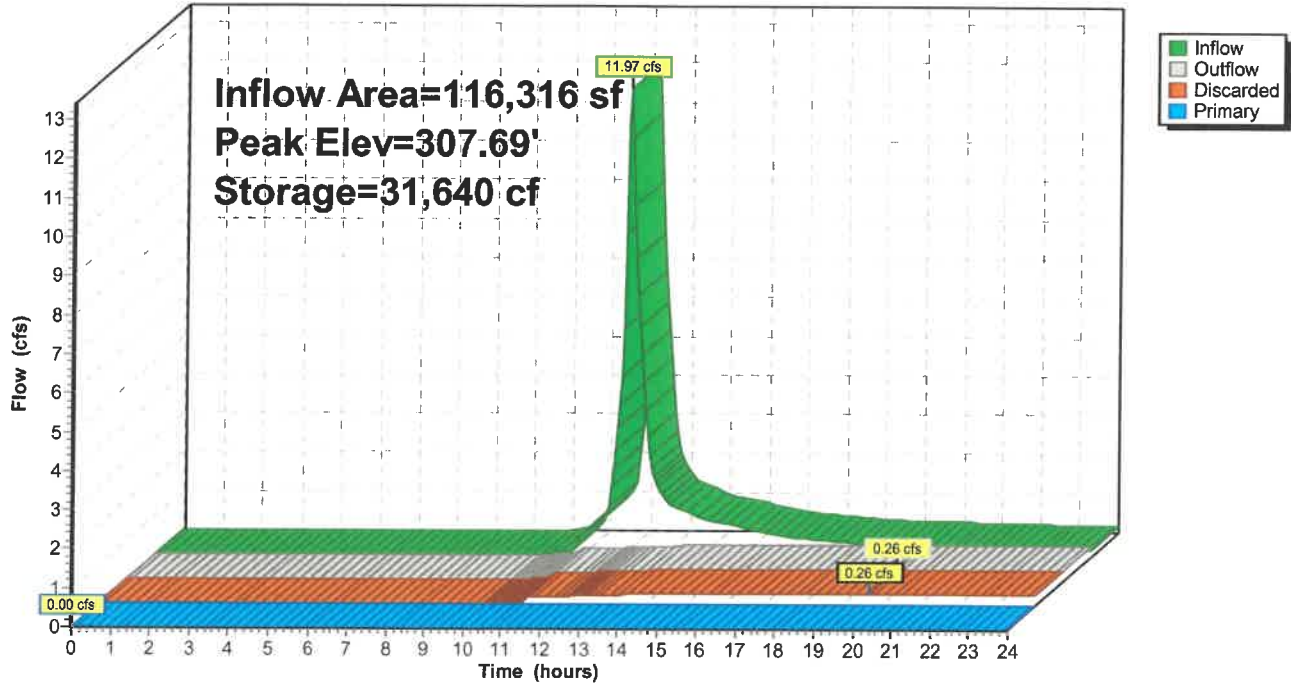
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## Pond 4P: Basin 2

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**Summary for Pond 5P: Forebay**

Inflow Area = 24,413 sf, 89.32% Impervious, Inflow Depth > 8.00" for 100 YR event  
 Inflow = 4.59 cfs @ 12.09 hrs, Volume= 16,283 cf  
 Outflow = 4.51 cfs @ 12.10 hrs, Volume= 13,640 cf, Atten= 2%, Lag= 0.3 min  
 Primary = 4.51 cfs @ 12.10 hrs, Volume= 13,640 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 291.09' @ 12.10 hrs Surf.Area= 1,672 sf Storage= 2,811 cf

Plug-Flow detention time= 119.7 min calculated for 13,640 cf (84% of inflow)  
 Center-of-Mass det. time= 52.9 min ( 812.1 - 759.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	6,501 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	1,002	133.0	0	0	1,002
290.00	1,339	153.0	1,166	1,166	1,479
292.00	1,976	173.0	3,294	4,461	2,092
293.00	2,105	184.0	2,040	6,501	2,452

Device	Routing	Invert	Outlet Devices
#1	Primary	291.00'	<b>60.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

**Primary OutFlow** Max=4.41 cfs @ 12.10 hrs HW=291.09' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 4.41 cfs @ 0.78 fps)



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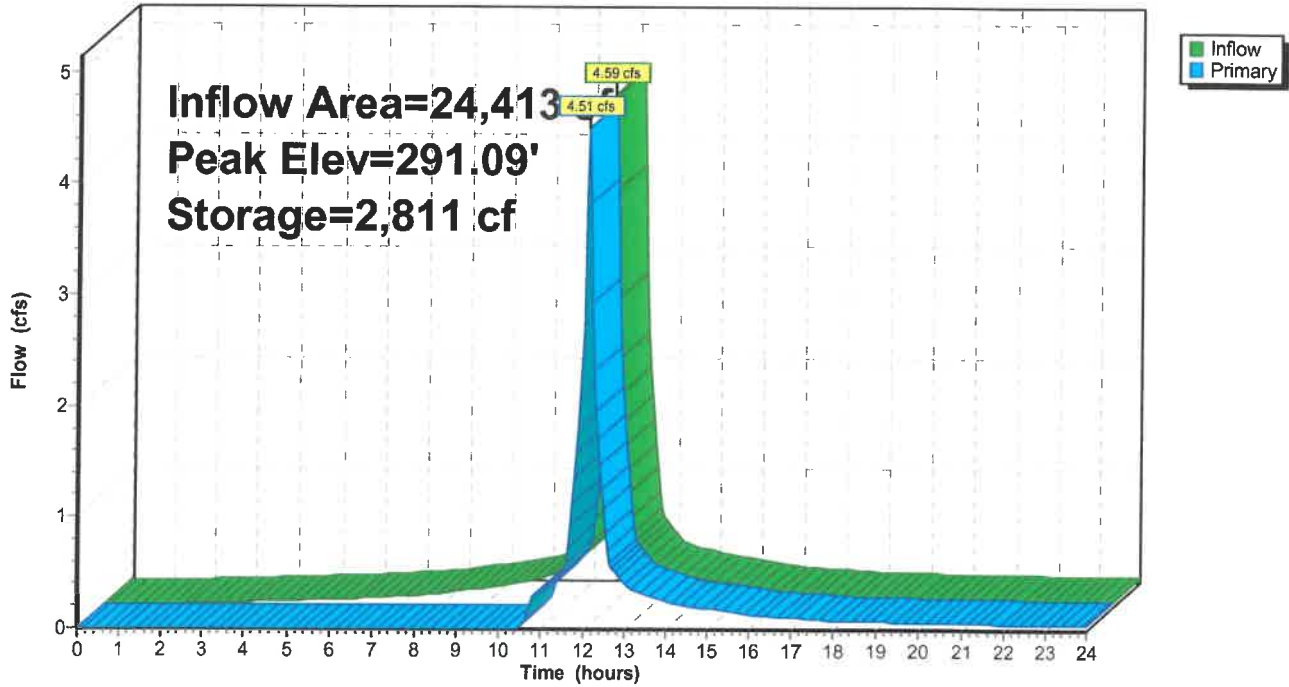
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## Pond 5P: Forebay

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**Summary for Pond 6P: Basin 3**

Inflow Area = 55,723 sf, 39.13% Impervious, Inflow Depth > 5.20" for 100 YR event  
 Inflow = 7.82 cfs @ 12.10 hrs, Volume= 24,135 cf  
 Outflow = 0.22 cfs @ 16.79 hrs, Volume= 10,138 cf, Atten= 97%, Lag= 281.4 min  
 Discarded = 0.22 cfs @ 16.79 hrs, Volume= 10,138 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 291.23' @ 16.79 hrs Surf.Area= 8,474 sf Storage= 16,215 cf

Plug-Flow detention time= 339.2 min calculated for 10,138 cf (42% of inflow)  
 Center-of-Mass det. time= 225.6 min ( 1,049.3 - 823.7 )

Volume	Invert	Avail.Storage	Storage Description		
#1	289.00'	44,208 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	6,102	334.0	0	0	6,102
290.00	7,134	353.0	6,611	6,611	7,196
292.00	9,367	391.0	16,450	23,062	9,566
294.00	11,827	428.0	21,146	44,208	12,112

Device	Routing	Invert	Outlet Devices									
#1	Primary	293.00'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b>									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	289.00'	<b>1.100 in/hr Exfiltration over Wetted area</b>									

**Discarded OutFlow** Max=0.22 cfs @ 16.79 hrs HW=291.23' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.22 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## 00454 - PROPOSED DRAINAGE

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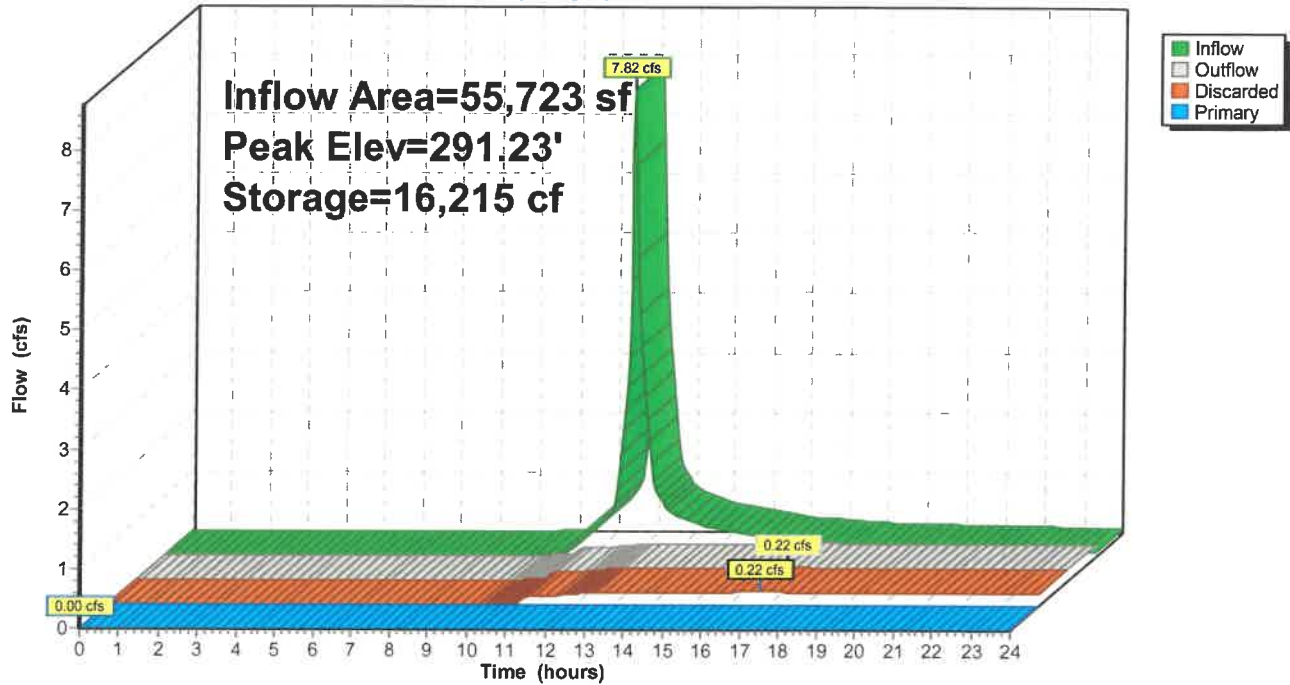
00454 - Proposed Conditions R2  
Type III 24-hr 100 YR Rainfall=8.75"

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### Pond 6P: Basin 3

Hydrograph



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Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Pond 7P: Vernal Pool and Wetland**

Inflow Area = 2,754,935 sf, 3.15% Impervious, Inflow Depth > 3.74" for 100 YR event  
 Inflow = 126.66 cfs @ 12.65 hrs, Volume= 859,736 cf  
 Outflow = 135.67 cfs @ 12.67 hrs, Volume= 809,588 cf, Atten= 0%, Lag= 1.0 min  
 Primary = 135.67 cfs @ 12.67 hrs, Volume= 809,588 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 297.27' @ 12.67 hrs Surf.Area= 70,541 sf Storage= 143,915 cf

Plug-Flow detention time= 56.9 min calculated for 807,904 cf (94% of inflow)  
 Center-of-Mass det. time= 28.0 min ( 902.1 - 874.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	291.30'	143,915 cf	<b>Upgradient wetland (Prismatic) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
291.30	3,358	0	0
292.20	10,815	6,378	6,378
294.00	32,324	38,825	45,203
295.00	47,280	39,802	85,005
296.00	70,541	58,911	143,915

Device	Routing	Invert	Outlet Devices
#1	Primary	293.80'	<b>8.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=127.01 cfs @ 12.67 hrs HW=297.11' (Free Discharge)**1=Broad-Crested Rectangular Weir** (Weir Controls 127.01 cfs @ 4.80 fps)

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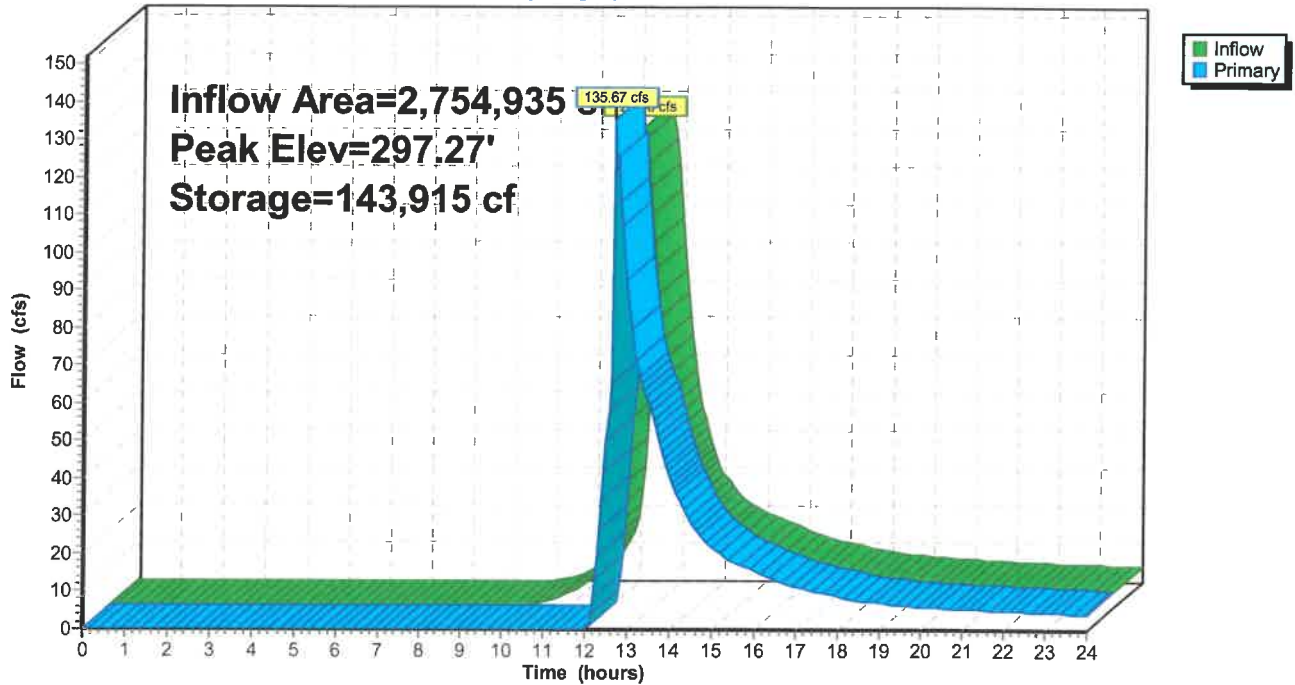
00454 - Proposed Conditions R2  
Type III 24-hr 100 YR Rainfall=8.75"

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### Pond 7P: Vernal Pool and Wetland

Hydrograph



**00454 - PROPOSED DRAINAGE**00454 - Proposed Conditions R2  
Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Pond 8P: Road Berm**

Inflow Area = 318,022 sf, 0.00% Impervious, Inflow Depth > 3.29" for 100 YR event  
 Inflow = 17.73 cfs @ 12.32 hrs, Volume= 87,225 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 312.15' @ 24.00 hrs Surf.Area= 69,589 sf Storage= 87,184 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	310.00'	256,496 cf	<b>Upgradient wetland (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
310.00	11,020	0	0
312.00	66,074	77,094	77,094
314.00	113,328	179,402	256,496

Device	Routing	Invert	Outlet Devices
#1	Primary	312.50'	<b>8.0" Vert. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=310.00' (Free Discharge)

↑1=Orifice/Grate ( Controls 0.00 cfs)



# 00454 - PROPOSED DRAINAGE

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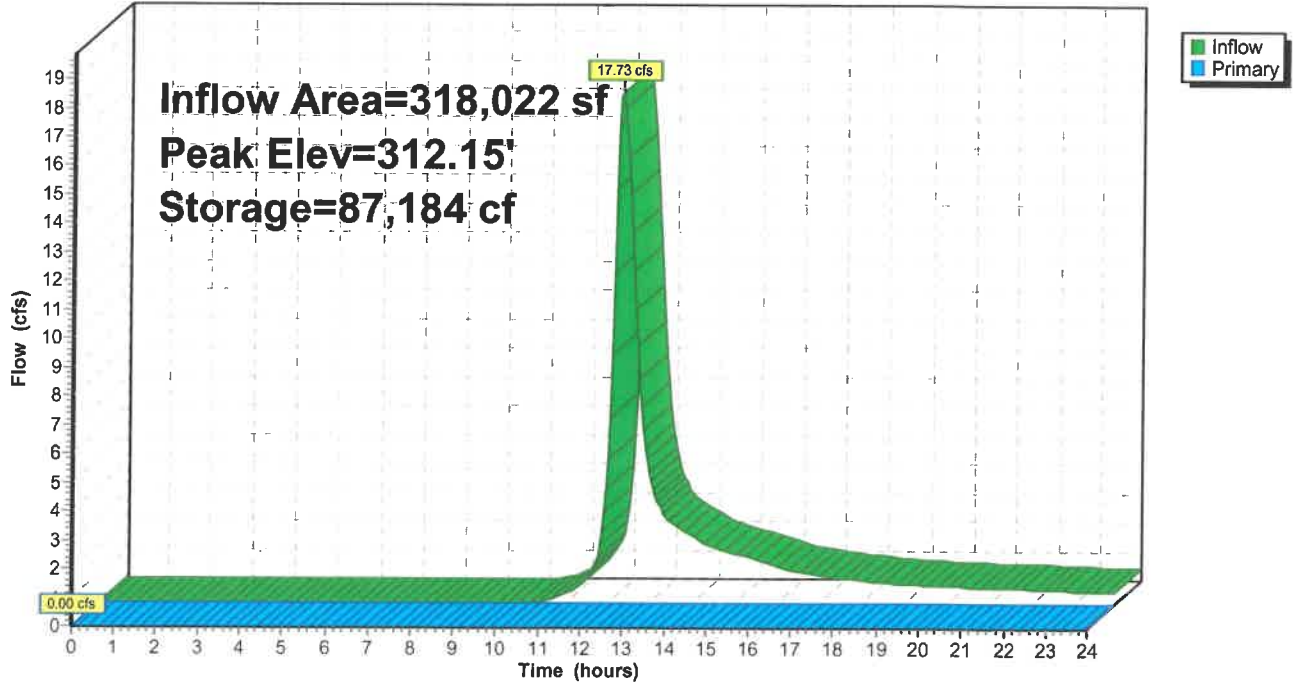
00454 - Proposed Conditions R2  
Type III 24-hr 100 YR Rainfall=8.75"

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## Pond 8P: Road Berm

Hydrograph



# **Stormwater Management**



# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8<sup>2</sup>
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

<sup>1</sup> The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

<sup>2</sup> For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

### Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



 10/31/25  
Signature and Date

## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☐ New development
- ☐ Redevelopment
- ☒ Mix of New Development and Redevelopment



# Checklist for Stormwater Report

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## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and
- ☐ pipe Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands
- ☐ designs) Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): \_\_\_\_\_

### Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



# Checklist for Stormwater Report

## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- ☐ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - ☒ Static
  - ☐ Simple Dynamic
  - ☐ Dynamic Field<sup>1</sup>
- ☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
  - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
  - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.





# Checklist for Stormwater Report

## Checklist (continued)

### Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - ☐ is within the Zone II or Interim Wellhead Protection Area
    - ☐ is near or to other critical areas
    - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - ☐ involves runoff from land uses with higher potential pollutant loads.
  - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



# Checklist for Stormwater Report

## Checklist (continued)

### Standard 4: Water Quality (continued)

- ☐ The BMP is sized (and calculations provided) based on:
  - ☐ The ½" or 1" Water Quality Volume or
  - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

### Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior** to the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



# Checklist for Stormwater Report

## Checklist (continued)

### Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - ☐ Limited Project
  - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - ☐ Bike Path and/or Foot Path
  - ☐ Redevelopment Project
  - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Checklist for Stormwater Report

## Checklist (continued)

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - ☒ Name of the stormwater management system owners;
  - ☒ Party responsible for operation and maintenance;
  - ☐ Schedule for implementation of routine and non-routine maintenance tasks;
  - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
  - ☐ Description and delineation of public safety features;
  - ☐ Estimated operation and maintenance budget; and
  - ☐ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- ☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

## **STORMWATER MANAGEMENT COMPLIANCE**

**Standard #1** No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

- No new conveyances will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. The new stormwater discharges are treated and provided with hardened outfalls to avoid surface erosion.

**Standard #2** Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

- See Table-Section 1, Page 1 - Summary of Peak Rates of Stormwater Runoff  
Post-development peak discharge rates do not exceed existing peak discharge rates.

**Standard #3** Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures, including environmentally sensitive site design, low-impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

- Impervious area = proposed paved road, sidewalks, and houses  
Flow to Infiltration Basin 1 (10-Yr Storm)  
Impervious area HSG-B (0.35") = 26,755 sf = Req'd. recharge = 780.35 cf  
Basin 1 Volume = 49,192 cf  
Flow to Infiltration Basin 2  
Impervious area HSG-B (0.35") = 22,644 sf = Req'd. recharge = 660.45 cf  
Basin 2 Volume = 40,270 cf  
Flow to Infiltration Basin 3  
Impervious area HSG-B (0.35") = 21,804 sf = Req'd. recharge = 635.96 cf  
Basin 3 Volume = 36,806 cf  
  
Capture Area Adjustment  
Site Total Impervious Area = 185,202 sf  
Impervious Area to Basins = 71,203 sf  
Adjustment Factor =  $185,202 / 71,203 = 2.601$   
 $2.601 \times 2,076 \text{ cf (total of initial req't.)} = \mathbf{5,397.07 \text{ cf total required recharge}}$   
Basin 1 + 2 + 3 Vol. = **126,268 cf total provided recharge**  
  
• **72 Hour max. drawdown (Static)**  
Infiltration Basin 1 -  $49,192 \text{ cf} / 4,532 \text{ sf (bottom area)} = 10.85' \text{ depth (130.2")} / 2.41''/\text{hr} = \mathbf{54 \text{ hours}}$   
Infiltration Basin 2 -  $40,270 \text{ cf} / 7,004 \text{ sf (bottom area)} = 5.75' \text{ depth (69")} / 2.41''/\text{hr} = \mathbf{28.6 \text{ hours}}$   
Infiltration Basin 3 -  $36,806 \text{ cf} / 6,102 \text{ sf (bottom area)} = 6.03' \text{ depth (72.4")} / 2.41''/\text{hr} = \mathbf{30.1 \text{ hours}}$

\*1982 Rawls Rates - 2.41''/hr Loamy Sand (on-site soil tests)

**Standard #4** Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

- a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
- b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
- c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

- **Pretreatment sizing (Forebay – 0.5"/Impervious Acre)**

Forebay 1: Impervious Paved Roadway =  $26,755 \text{ sf} \times 0.5'' (0.0417') = 1,116 \text{ cf req'd}$   
Forebay 1 Volume = 1,506 cf  
Forebay 2: Impervious Paved Roadway =  $22,644 \text{ sf} \times 0.5'' (0.0417') = 944.25 \text{ cf req'd}$   
Forebay 2 Volume = 1,413 cf  
Forebay 3: Impervious Paved Roadway =  $21,804 \text{ sf} \times 0.5'' (0.0417') = 909.23 \text{ cf req'd}$   
Forebay 3 Volume = 3,307 cf

- **Water Quality Volume – 1.0"**

- Infiltration Basin 1

- Impervious Paved Roadway =  $26,755 \text{ sf} \times 1.0'' (0.083') = 2,202 \text{ cf req'd}$

- Basin 1 Volume = 49,192 cf

- Infiltration Basin 2

- Impervious Paved Roadway =  $22,644 \text{ sf} \times 1.0'' (0.083') = 1,879 \text{ cf req'd}$

- Basin 2 Volume = 40,270 cf

- Infiltration Basin 3

- Impervious Paved Roadway =  $21,804 \text{ sf} \times 1.0'' (0.083') = 1,809 \text{ cf req'd}$

- Basin 3 Volume = 36,806 cf

- **TSS Removal – 80% Min.**

SEE ATTACHED SHEETS

**Standard #5** For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

- Locus site does not meet the criteria to be designated as a "LUHPPL

**Standard #6** Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

- Stormwater does not discharge within the Zone II or Interim Wellhead Protection Area of a public water supply or to any other critical area.

**Standard #7** A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

- The site is not a redevelopment project.

**Standard #8** A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

- The plan set includes notes and details to avoid sediment migration and construction period erosion. Detailed methods and schedules to be incorporated into the Storm Water Pollution Prevention Plan as required by the EPA/NPDES Construction Activities Permit prior to construction.

**Standard #9** A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

- **Long-term operation and maintenance plan**

The proposed stormwater management system and the Best Management Practices (BMP's) are to be constructed in accordance with the approved site design plans. During the construction process the general site contractor and property owner shall be designated as the owners of the BMP's and will be responsible for their operation and maintenance. Once the BMP's are constructed they are to be protected from sedimentation until the site is stabilized and vegetated. Inspections should be performed routinely and after every major storm event. Any accumulated sediments and debris are to be removed and any eroded areas are to be re-graded and re-vegetated.

**Post-Development Phase Ownership:**

After the completion of the site construction, the entire drainage system will be the responsibility of the property owner Wall Street Corporation, P.O. Box 272, Westwood, MA 02090.

**Emergency Fuel Spill Response:**

In the event of a fuel spill the responsible party shall call 9-1-1. They shall follow local and state removal procedures for the contaminant. The responsible contractor shall also call the Bellingham Board of Health at (508) 966-5820, and the Mass DEP at (508) 792-7650. Any contaminated soil must be completely removed from the property and be delivered to a certified land fill.

**Operation & Maintenance:**

The following are the minimum maintenance criteria for the proposed BMP's. Responsible parties should however review the Mass DEP Stormwater Handbook for further explanation.



#### Deep Sump Hooded Catch Basins and Manholes & Oil Grit Chamber

The catch basin shall be inspected and cleaned twice per year (early spring/late fall) and after each major storm event. Also, any catch basin or manhole shall be cleaned out if 12 inches of sediment has accumulated. Inspections shall include structural integrity of hood, depth of sediment in sump and amount of trash and/or debris around grate. Any leaf litter and/or debris shall be removed from catch basin grates after each major storm event.

#### Sediment Forebay and Infiltration Basin

In the first few months of use inspect the basin after every major storm to ensure it is stabilized and functioning properly. Thereafter mow grass and inspect at least twice per year. Remove grass clippings and any accumulated organic matter and debris. Remove sediment within forebay when within six inches of weir crest. Perform maintenance only when dry – do not compact the basin bottom.

## **Standard #10**

### **Illicit Discharge Compliance Statement**

Owner: Wall Street Development Corporation  
Address: P.O Box 272, Westwood, MA 02090  
Tel. (617) 922-8730

#### **Responsibility**

Owners are responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharges (as defined by the USEPA).

#### **Engineer's Compliance Statement:**

To the best of my knowledge, the submitted plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.

For a redevelopment project (if applicable), all actions taken to identify and remove illicit discharges, including without limitation, visual screening, dye or smoke testing, and the removal of any sources of illicit discharges to the stormwater management system are documented and included with this statement.

  
\_\_\_\_\_  
Professional Engineer

10/31/25  
\_\_\_\_\_  
Date

**INSTRUCTIONS:**

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Blackstone Street Bellingham MA - Basin 1

B BMP <sup>1</sup>	C TSS Removal Rate <sup>1</sup>	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Separate Form Needs to  
be Completed for Each  
Outlet or BMP Train

**Total TSS Removal =**

85%

00454 Blackstone Street
Improvements
Prepared By: Mark Allen
Date: 6/20/2025

\*Equals remaining load from previous BMP (E)  
which enters the BMP

Non-automated TSS Calculation Sheet  
must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

- 1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
- 2. Select BMP from Drop Down Menu
- 3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Blackstone Street Bellingham MA - Basin 2

B	C	D	E	F
BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

00454 Blackstone Street
Improvements
Mark Allen
6/20/2025

Project:  
Prepared By:  
Date:

\*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed  
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

- 1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
- 2. Select BMP from Drop Down Menu
- 3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Blackstone Street Bellingham MA - Basin 3

B	C	D	E	F
BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

TSS Removal Calculation Worksheet

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

85%

00454 Blackstone Street
Improvements
Mark Allen
6/20/2025

Project:  
Prepared By:  
Date:

\*Equals remaining load from previous BMP (E) which enters the BMP

**00454-PR - 25 YEAR FROZEN**00454 - 25 YEAR FROZEN  
Type III 24-hr 25 YR Rainfall=6.38"

Prepared by {enter your company name here}

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Page 5

**Summary for Pond 2P: Basin 1**

Inflow Area = 124,279 sf, 7.84% Impervious, Inflow Depth > 2.16" for 25 YR event  
 Inflow = 5.27 cfs @ 12.18 hrs, Volume= 22,384 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 284.84' @ 24.00 hrs Surf.Area= 7,213 sf Storage= 22,374 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	281.00'	54,203 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	287.50'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)  
 1=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

# 00454-PR - 25 YEAR FROZEN

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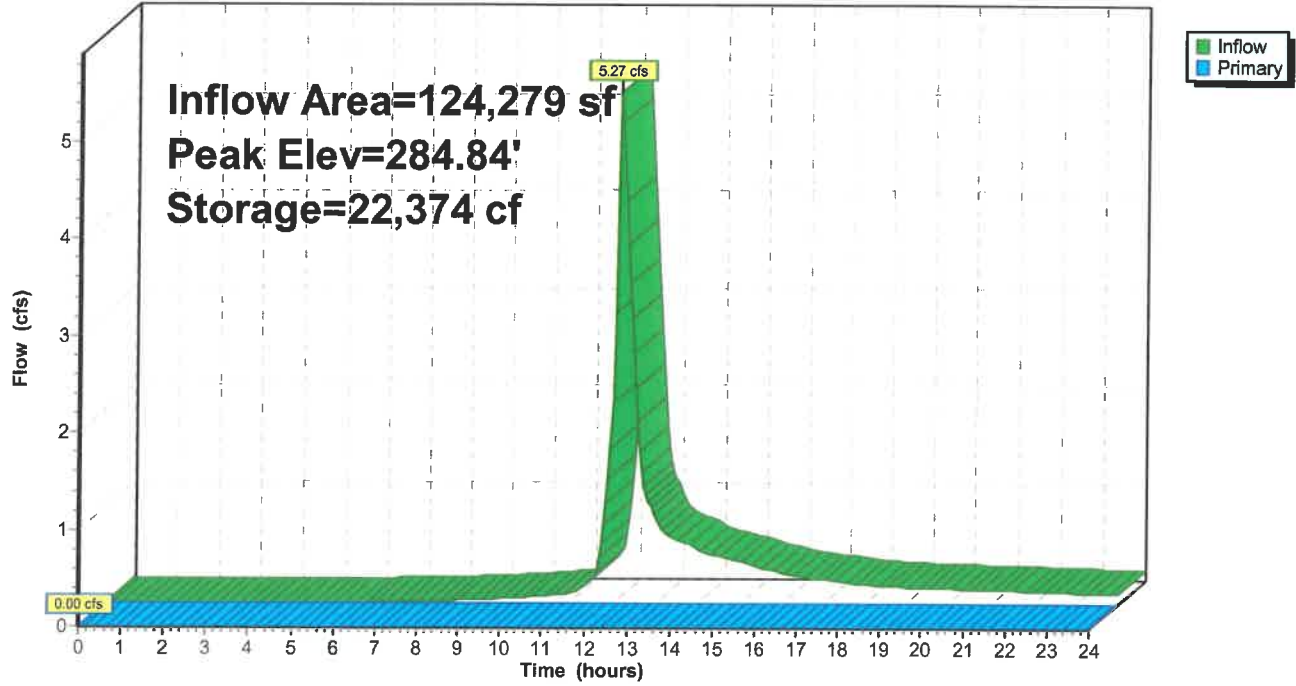
00454 - 25 YEAR FROZEN  
Type III 24-hr 25 YR Rainfall=6.38"

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## Pond 2P: Basin 1

Hydrograph





**00454-PR - 25 YEAR FROZEN**00454 - 25 YEAR FROZEN  
Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Pond 4P: Basin 2**

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 2.56" for 25 YR event  
 Inflow = 7.13 cfs @ 12.15 hrs, Volume= 24,834 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 307.00' @ 24.00 hrs Surf.Area= 9,600 sf Storage= 24,823 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	304.00'	49,460 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199
309.30	12,176	447.0	3,556	49,460	14,461

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)

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

**00454-PR - 25 YEAR FROZEN**

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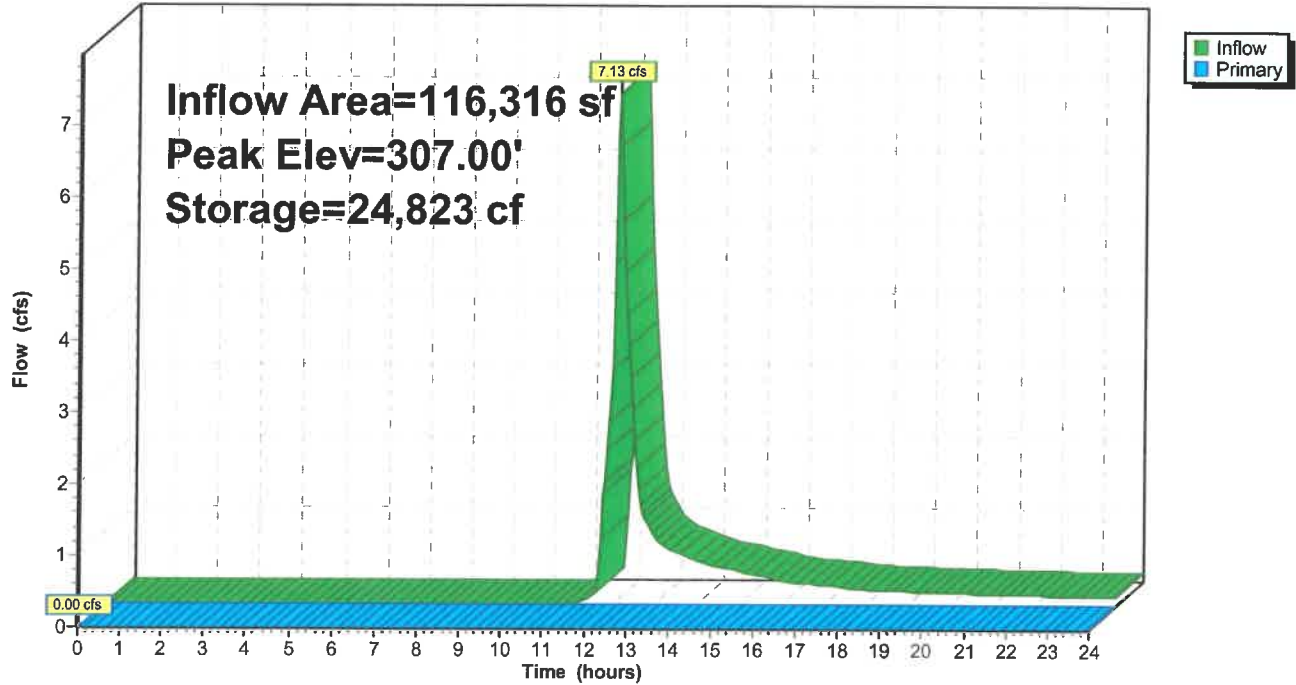
00454 - 25 YEAR FROZEN  
Type III 24-hr 25 YR Rainfall=6.38"

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Page 10

**Pond 4P: Basin 2**

Hydrograph



**00454-PR - 25 YEAR FROZEN**00454 - 25 YEAR FROZEN  
Type III 24-hr 25 YR Rainfall=6.38"

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**Summary for Pond 6P: Basin 3**

Inflow Area = 55,723 sf, 39.13% Impervious, Inflow Depth > 3.17" for 25 YR event  
 Inflow = 5.03 cfs @ 12.10 hrs, Volume= 14,732 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 291.05' @ 24.00 hrs Surf.Area= 8,273 sf Storage= 14,727 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	289.00'	44,208 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	6,102	334.0	0	0	6,102
290.00	7,134	353.0	6,611	6,611	7,196
292.00	9,367	391.0	16,450	23,062	9,566
294.00	11,827	428.0	21,146	44,208	12,112

Device	Routing	Invert	Outlet Devices
#1	Primary	293.00'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)  
 1=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

# 00454-PR - 25 YEAR FROZEN

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00454 - 25 YEAR FROZEN

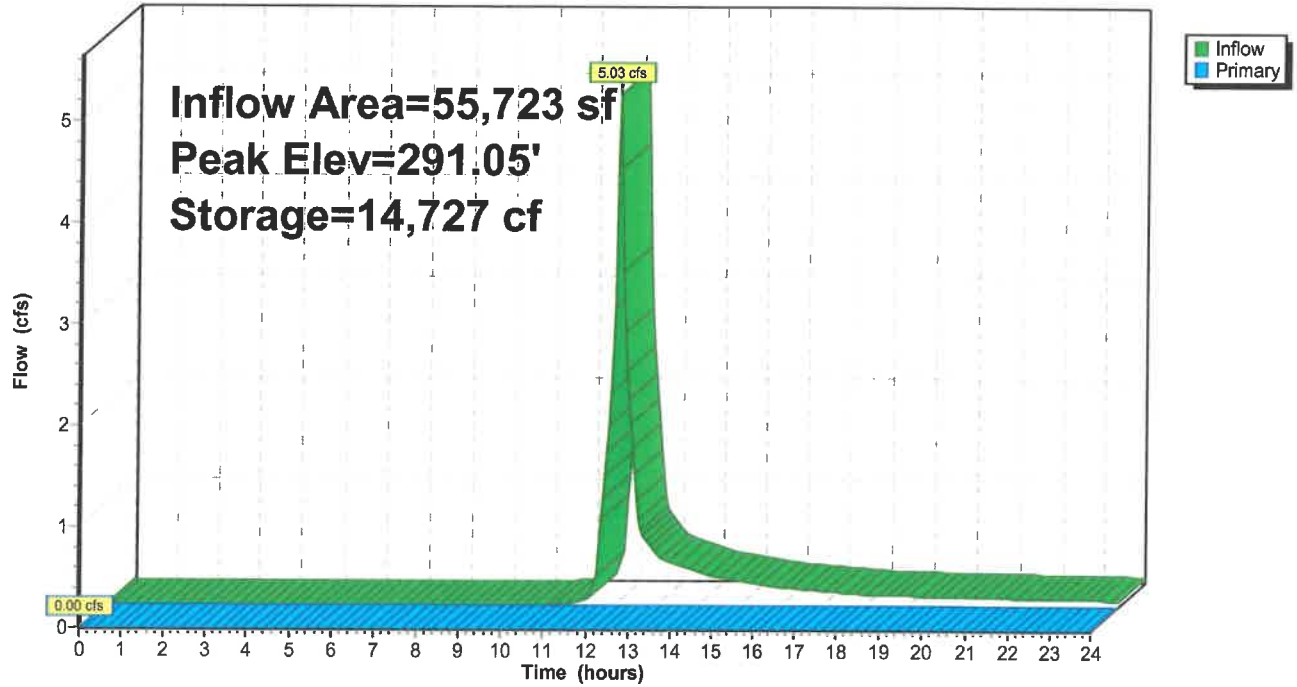
Type III 24-hr 25 YR Rainfall=6.38"

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## Pond 6P: Basin 3

Hydrograph



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Type III 24-hr 100 YR Rainfall=8.75"

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Page 5

**Summary for Pond 2P: Basin 1**

Inflow Area = 124,279 sf, 7.84% Impervious, Inflow Depth > 3.83" for 100 YR event  
 Inflow = 9.85 cfs @ 12.17 hrs, Volume= 39,703 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 286.99' @ 24.00 hrs Surf.Area= 8,934 sf Storage= 39,687 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	281.00'	54,203 cf	<b>Custom Stage Data (Irregular) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	287.50'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)

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

# 00454-PR - 100 YEAR BASIN FAILURE

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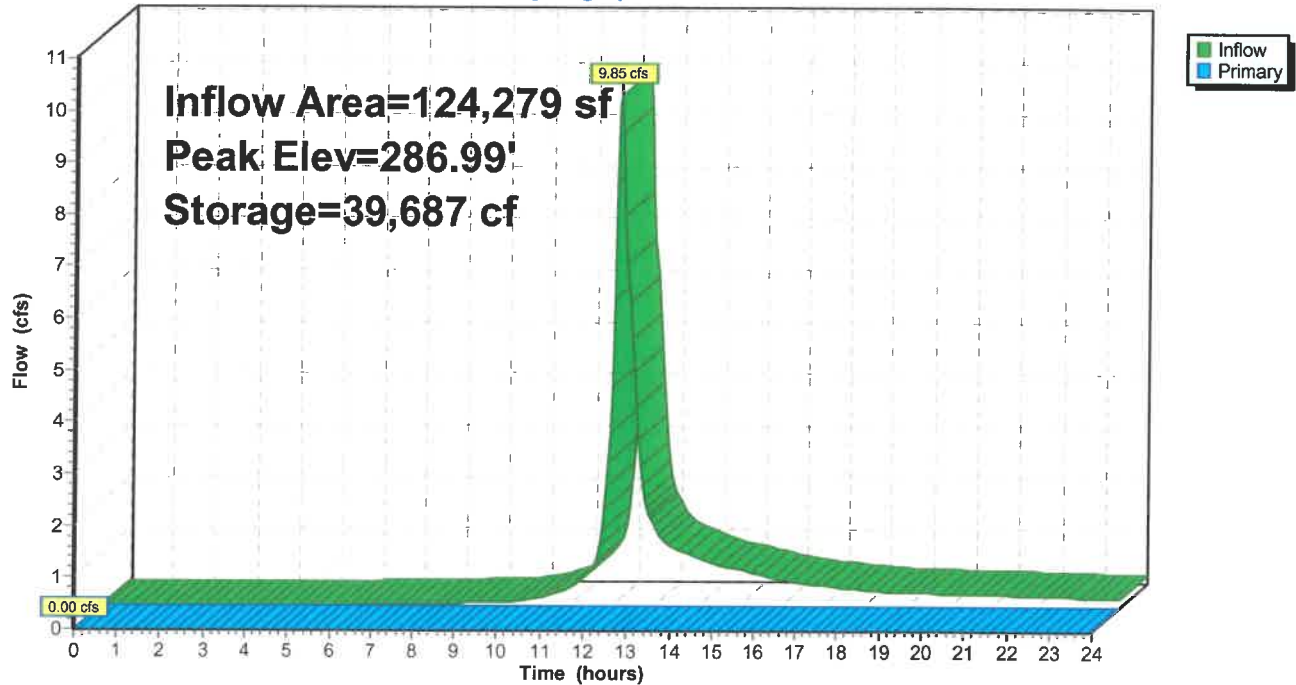
Type III 24-hr 100 YR Rainfall=8.75"

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## Pond 2P: Basin 1

### Hydrograph



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Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Pond 4P: Basin 2**

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 4.41" for 100 YR event  
 Inflow = 11.97 cfs @ 12.15 hrs, Volume= 42,787 cf  
 Outflow = 0.19 cfs @ 22.91 hrs, Volume= 1,198 cf, Atten= 98%, Lag= 646.0 min  
 Primary = 0.19 cfs @ 22.91 hrs, Volume= 1,198 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 308.62' @ 22.91 hrs Surf.Area= 11,133 sf Storage= 41,604 cf

Plug-Flow detention time= 727.9 min calculated for 1,198 cf (3% of inflow)  
 Center-of-Mass det. time= 548.7 min ( 1,386.3 - 837.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	49,460 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199
309.30	12,176	447.0	3,556	49,460	14,461

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=0.15 cfs @ 22.91 hrs HW=308.62' (Free Discharge)  
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 0.15 cfs @ 0.36 fps)



# 00454-PR - 100 YEAR BASIN FAILURE

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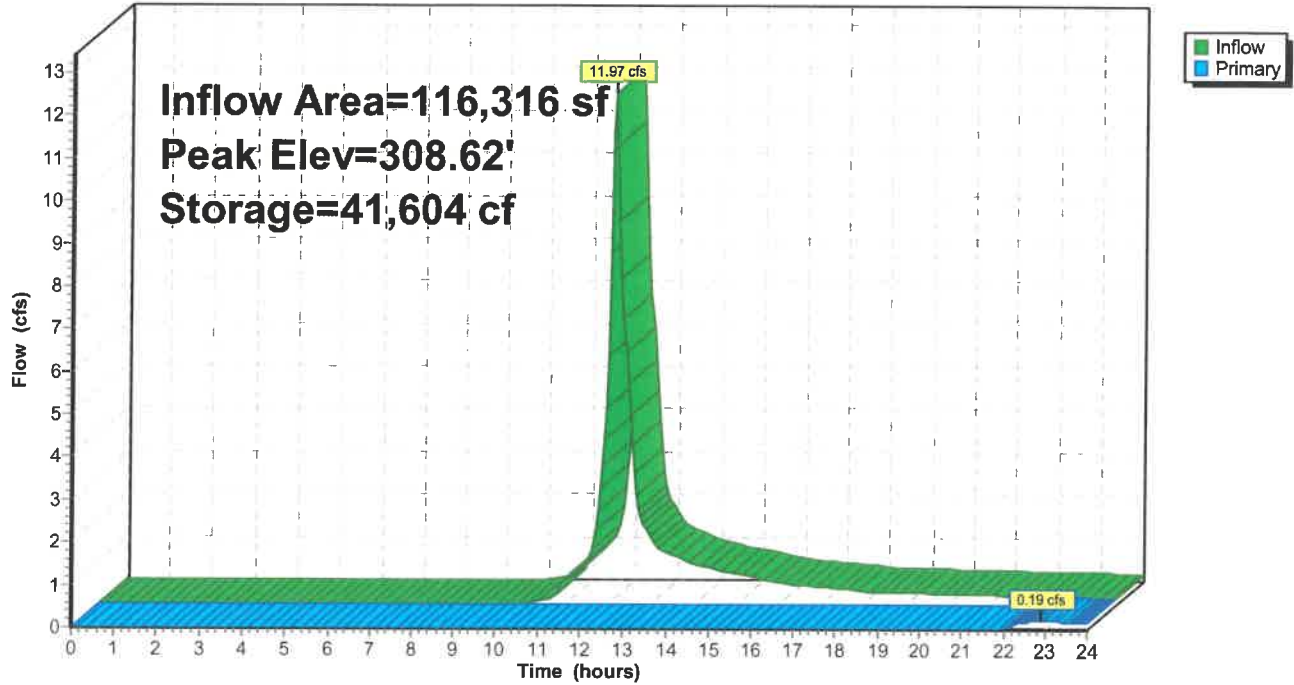
Type III 24-hr 100 YR Rainfall=8.75"

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## Pond 4P: Basin 2

Hydrograph



**00454-PR - 100 YEAR BASIN FAILURE**

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00454 - 100 YEAR FROZEN-FAILURE

Type III 24-hr 100 YR Rainfall=8.75"

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**Summary for Pond 6P: Basin 3**

Inflow Area = 55,723 sf, 39.13% Impervious, Inflow Depth > 5.20" for 100 YR event  
 Inflow = 7.82 cfs @ 12.10 hrs, Volume= 24,135 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 292.11' @ 24.00 hrs Surf.Area= 9,498 sf Storage= 24,127 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	289.00'	44,208 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	6,102	334.0	0	0	6,102
290.00	7,134	353.0	6,611	6,611	7,196
292.00	9,367	391.0	16,450	23,062	9,566
294.00	11,827	428.0	21,146	44,208	12,112

Device	Routing	Invert	Outlet Devices
#1	Primary	293.00'	<b>20.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)

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

# 00454-PR - 100 YEAR BASIN FAILURE

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00454 - 100 YEAR FROZEN-FAILURE

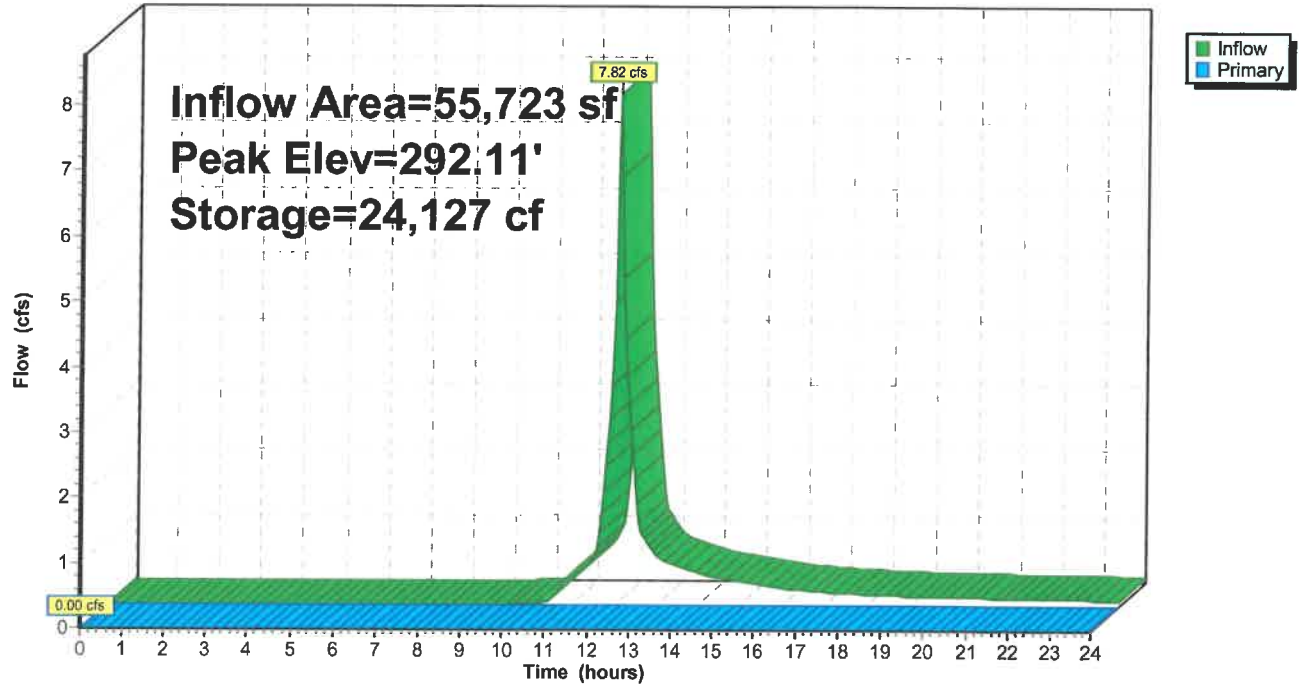
Type III 24-hr 100 YR Rainfall=8.75"

Printed 11/4/2025

Page 14

## Pond 6P: Basin 3

### Hydrograph



## 00454-PR - 50 YEAR CULVERT DESIGN

Prepared by {enter your company name here}

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00454 - 50 YEAR Culvert  
Type III 24-hr 50 YR Rainfall=7.23"

Printed 11/4/2025

Page 4

### Summary for Reach 2R: New Box Cumvert

Inflow Area = 3,247,549 sf, 4.18% Impervious, Inflow Depth > 2.49" for 50 YR event  
Inflow = 70.29 cfs @ 12.95 hrs, Volume= 673,823 cf  
Outflow = 70.28 cfs @ 12.95 hrs, Volume= 673,788 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 14.87 fps, Min. Travel Time= 0.0 min  
Avg. Velocity= 6.70 fps, Avg. Travel Time= 0.1 min

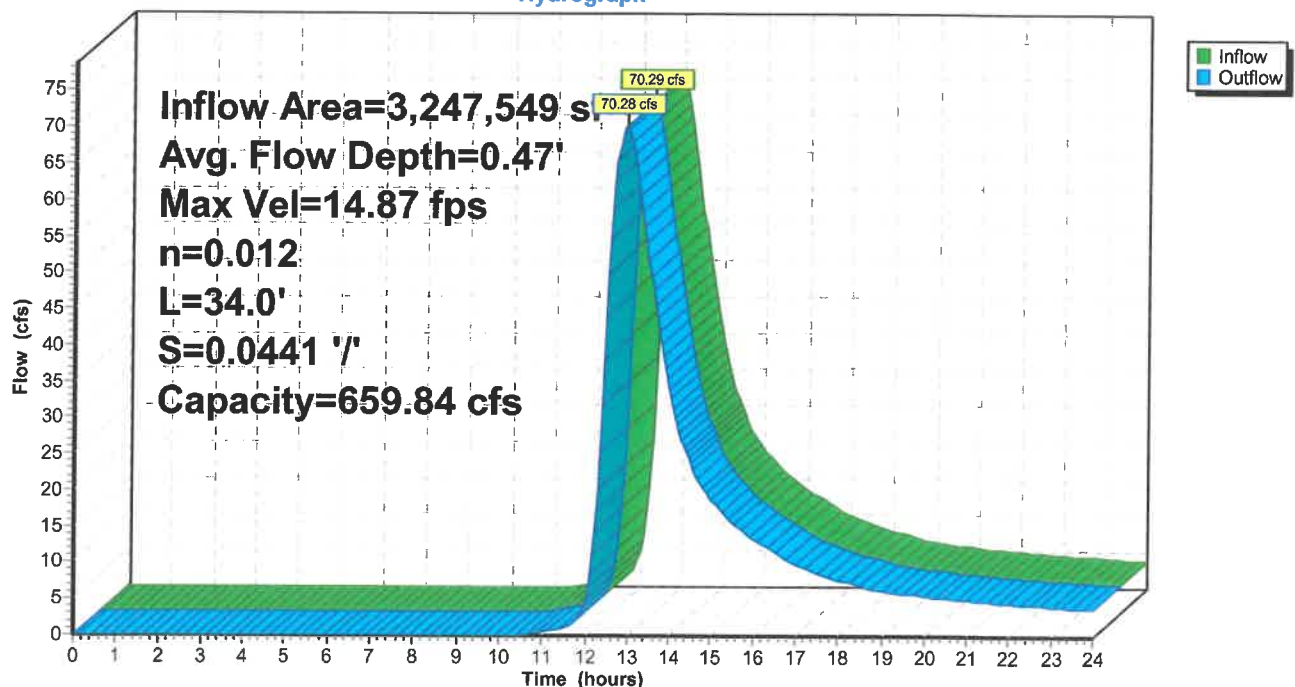
Peak Storage= 161 cf @ 12.95 hrs  
Average Depth at Peak Storage= 0.47', Surface Width= 10.00'  
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 659.84 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished  
Length= 34.0' Slope= 0.0441 '/'  
Inlet Invert= 294.00', Outlet Invert= 292.50'



### Reach 2R: New Box Cumvert

Hydrograph



# PHOSPHORUS REMOVAL CALCULATIONS

Blackstone Street Improvements, Bellingham

Job No.:	00454	Calcd By:	M. Allen
Client:	Wall Street Development	Date:	10/31/2025
Location:	Blackstone Street, Bellingham MA	Revised:	

## Phosphorus Removal Analysis

### 1. Pre-Development Phosphorus Load (Lpre)

$$L_{pre} = (C_{pre} * P * P_j * R_v(pre) * A) * 0.227$$

- Lpre - is the average annual load of phosphorus in lbs/year
- Cpre - is pollutant concentration of phosphorus in runoff from the pre-development land use (0.05 lbs/ac/year - undeveloped)
- P - is the annual rainfall in inches (45)
- Pj - is the fraction of rainfall events that produce runoff (0.9 typical)
- Rv(pre) - is the coefficient of pre-development conditions calculated as  
 $R_v = 0.05 + 0.009 * I$ , where I is the percentage of impervious
- A - is the area of the development site in acres
- 0.227 - is a unit conversion factor

### 2. Post-Development Phosphorus Load (Lpost)

$$L_{post} = (C_{post} * P * P_j * R_v(post) * A) * 0.227$$

- Lpost - is the average annual load of phosphorus in lbs/year
- Cpost - is pollutant concentration of phosphorus in runoff from the post-development land use (0.30 lbs/ac/year - urban)
- P - is the annual rainfall in inches (45)
- Pj - is the fraction of rainfall events that produce runoff (0.9 typical)
- Rv(post) - is the coefficient of post-development conditions calculated as  
 $R_v = 0.05 + 0.009 * I$ , where I is the percentage of impervious
- A - is the area of the development site in acres
- 0.227 - is a unit conversion factor

### 3. Phosphorus Removal

$$RR = L_{post} - L_{pre} - (L_{post} * \text{reduction target})$$

RR - Required removal

LR - Load Reduction from BMP's                      lbs / year

$$LR = L_{post} * B_{MP} * DA$$

BMP - removal efficiency of the BMP

DA - is the fraction of the total drainage area served by the BMP as a decimal.

### 4. Calculation

Total Site    106.8 acres  
Existing       %Impervious= 3.41%  
Proposed      %Impervious= 4.08%

$$L_{pre} = (0.05 * 45 * 0.9 * 0.080 * 106.8) * 0.227$$

0.037 lbs / year

$$L_{post} = (0.3 * 45 * 0.9 * 0.086 * 106.8) * 0.227$$

0.568 lbs / year

BMP Removal Rate    Infiltration Basin

$$LR = 0.568 * 0.9 * 1.0$$

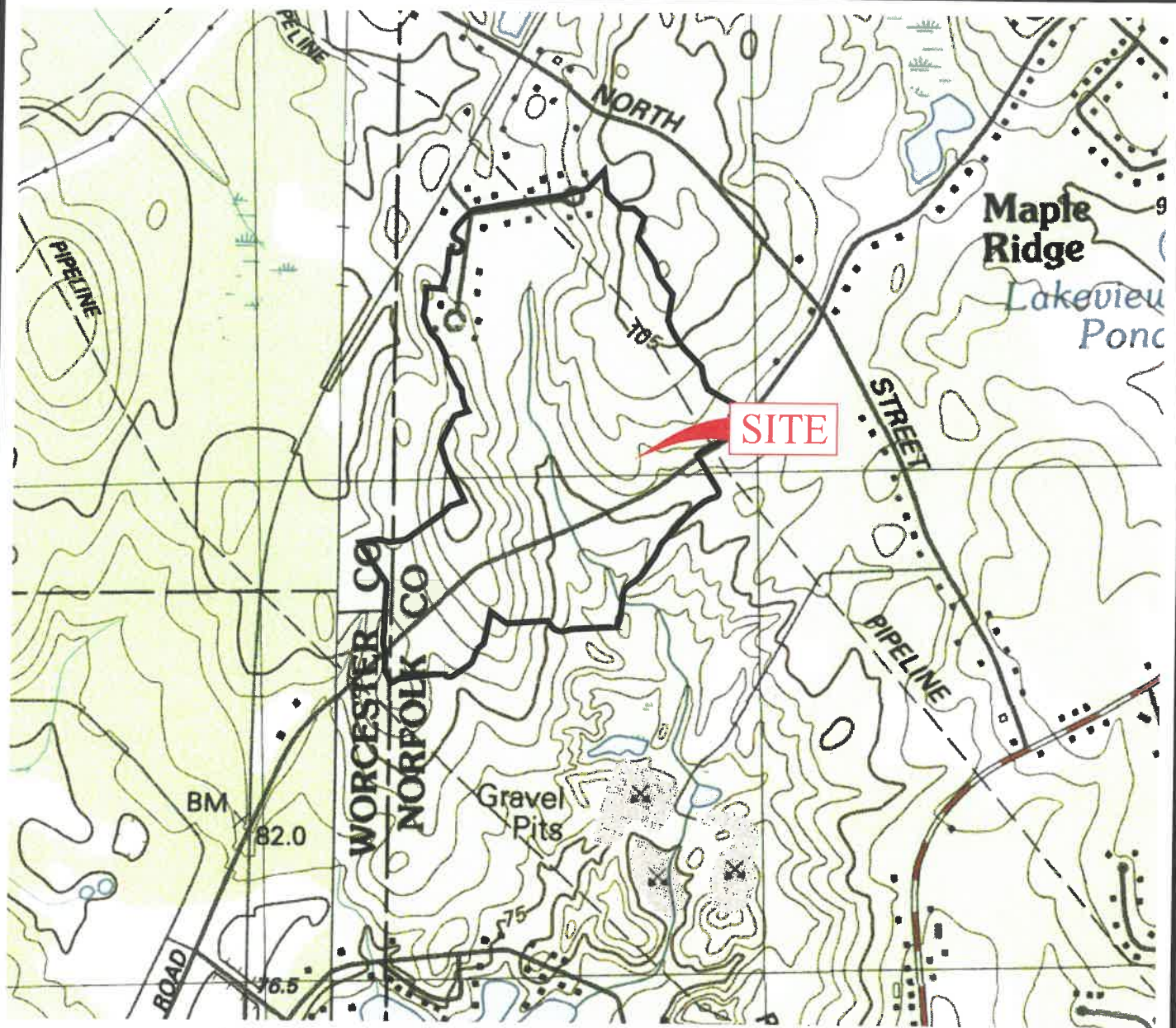
0.51 lbs / year removed

$$0.51 \text{ lbs per year} / 0.568 \text{ lbs per year}$$

= 89.9% Removal Rate

## **Supplemental Information**





## PORTION OF U.S.G.S. GEODETIC MAP

SITE: **Blackstone Street  
Bellingham, MA 02019**

PREPARED BY: **ALLEN ENGINEERING  
& ASSOCIATES, INC.**



Civil Engineers • Surveyors  
Land Development Consultants

140 Hartford Avenue East  
Hopedale, Ma 01747  
(508) 381-3212 • Phone  
[www.allen-ea.com](http://www.allen-ea.com)

DATE: **1/28/2025**

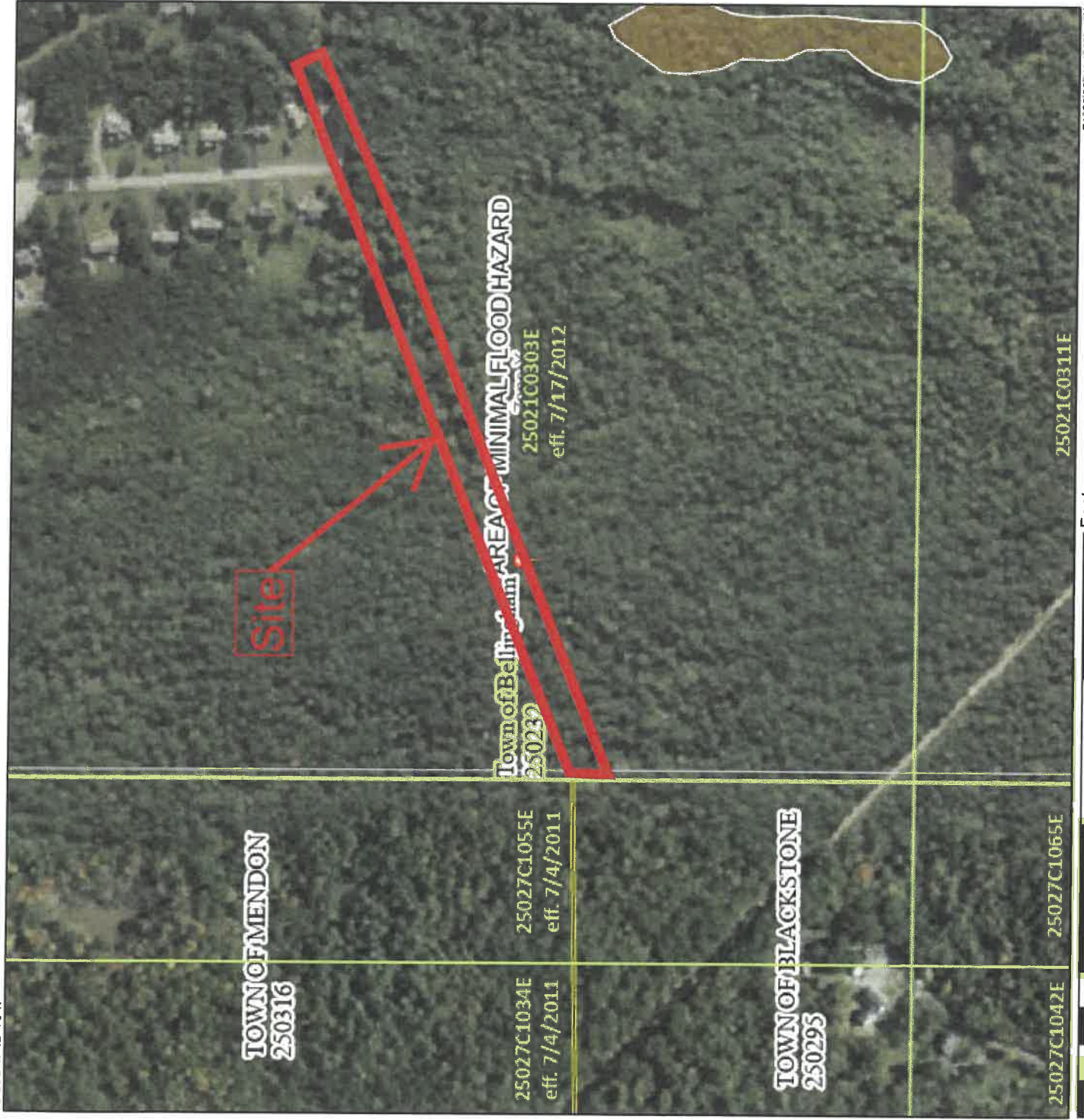
JOB NO: **00454**



# National Flood Hazard Layer FIRMette



71°30'5"W 42°48'N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

Without Base Flood Elevation (BFE)  
*Zone A, V, A99*

With BFE or Depth *Zone AE, AO, AH, VE, AR*

Regulatory Floodway

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*

Future Conditions 1% Annual Chance Flood Hazard *Zone X*

Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*

Area with Flood Risk due to Levee *Zone D*

NO SCREEN

Area of Minimal Flood Hazard *Zone X*

Effective LOMRS

Area of Undetermined Flood Hazard *Zone D*

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

Digital Data Available

No Digital Data Available

Unmapped

MAP PANELS

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **1/24/2025 at 9:28 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



Commonwealth of Massachusetts  
City/Town of Bellingham

## Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

### C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 01 Hole #

Date 11/12/24

Time Am

Longitude

Latitude

Weather

1. Land Use Woodland

(e.g., woodland, agricultural field, vacant lot, etc.)

Trees

Vegetation

Surface Stones (e.g., cobbles, stones, boulders, etc.)

Slope (%)

Description of Location:

2. Soil Parent Material:

Landform

Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet

Drainage Way >100 feet

Wetlands >100 feet

Property Line >10 feet

Drinking Water Well feet

Other feet

4. Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil/Fill Material

☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No

If yes: Depth to Weeping in Hole

Depth to Standing Water in Hole

#### Soil Log

Soil Log												
Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other	
				Depth	Color	Percent	Gravel	Cobbles & Stones				
0-7"	Ap	LS	10YR 3/1	Cnc :								
				Dpl:								
7-18"	BW	LS	2.5YR 6/8	Cnc :								
				Dpl:								
18-120"	C	LS	2.5Y 6/3	Cnc :				25%				
				Dpl:								
				Cnc :								
				Dpl:								
				Cnc :								
				Dpl:								
				Cnc :								
				Dpl:								

Additional Notes:



Commonwealth of Massachusetts  
City/Town of Bellingham

## Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

### C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 02 Hole # 11/12/24 Am Date Time

1. Land Use: Woodland

(e.g., woodland, agricultural field, vacant lot, etc.)

Trees  
Vegetation

Weather Latitude Longitude

Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location:

2. Soil Parent Material:

3. Distances from: Open Water Body >100 feet Landform Drainage Way >100 feet Position on Landscape (SU, SH, BS, FS, TS, Plain) Wetlands >100 feet  
Property Line >10 feet Drinking Water Well feet Other feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: Depth to Weeping in Hole 122" Depth Standing Water in Hole

#### Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features		Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel			
0-6"	Ap	LS	10YR 3/1	Cnc : Dpl:						
6-19"	Bw	LS	2.5YR 6/8	Cnc : Dpl:						
19-124"	C	LS	2.5Y 6/3	Cnc : Dpl:			30%			
				Cnc : Dpl:						
				Cnc : Dpl:						
				Cnc : Dpl:						
				Cnc : Dpl:						
Additional Notes:										



Commonwealth of Massachusetts  
City/Town of Bellingham

## Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

### C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 03      Date: 11/12/24      Time: Am      Weather:      Latitude:      Longitude:      Slope (%):

1. Land Use: Woodland      Trees:      Vegetation:      Surface Stones (e.g., cobbles, stones, boulders, etc.):

Description of Location:

2. Soil Parent Material:

3. Distances from:      Open Water Body: >100 feet      Drainage Way: >100 feet      Wetlands: >100 feet      Other:      feet

Property Line: >10 feet      Drinking Water Well:      feet      Other:      feet

4. Unsuitable Materials Present: ☐ Yes ☒ No      If Yes: ☐ Disturbed Soil/Fill Material      ☐ Weathered/Fractured Rock      ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No      If yes:      Depth to Weeping in Hole      Depth to Standing Water in Hole

### Soil Log

Soil Log												
Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other	
				Depth	Color	Percent	Gravel	Cobbles & Stones				
0-120"	C	LS	2.5Y6/3	Cnc :			25%					
				Dpl:								
				Cnc :								
				Dpl:								
				Cnc :								
				Dpl:								
				Cnc :								
				Dpl:								
				Cnc :								
				Dpl:								
				Cnc :								
				Dpl:								
Additional Notes:												



Commonwealth of Massachusetts  
City/Town of Bellingham

## Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

### C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 04 11/12/24 Am Time Latitude Longitude

1. Land Use: Woodland Trees Weather Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)  
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation

Description of Location:

2. Soil Parent Material: Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet

Property Line >10 feet Drinking Water Well Other feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: Depth to Weeping in Hole Depth Standing Water in Hole

#### Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features		Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel			
0-27"	Fill	LS		Cnc : Dpl:						
27-122"	C	LS		Cnc : Dpl:			25%			
				Cnc : Dpl:						
				Cnc : Dpl:						
				Cnc : Dpl:						
				Cnc : Dpl:						
				Cnc : Dpl:						
Additional Notes:										





United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# **Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts; and Worcester County, Massachusetts, Southern Part**



January 15, 2025

# Preface

---

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

---

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

## Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

## Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

---

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.





































# Custom Soil Resource Report Soil Map





## Custom Soil Resource Report

### MAP LEGEND

<b>Area of Interest (AOI)</b>	 Area of Interest (AOI)	 Spoil Area
<b>Soils</b>	 Soil Map Unit Polygons	 Stony Spot
 Soil Map Unit Lines	 Very Stony Spot	 Wet Spot
 Soil Map Unit Points	 Other	 Special Line Features
<b>Special Point Features</b>	 Blowout	<b>Water Features</b>
 Borrow Pit	 Streams and Canals	<b>Transportation</b>
 Clay Spot	 Rails	 Interstate Highways
 Closed Depression	 US Routes	 Major Roads
 Gravel Pit	 Local Roads	<b>Background</b>
 Gravelly Spot	 Aerial Photography	
 Landfill		
 Lava Flow		
 Marsh or swamp		
 Mine or Quarry		
 Miscellaneous Water		
 Perennial Water		
 Rock Outcrop		
 Saline Spot		
 Sandy Spot		
 Severely Eroded Spot		
 Sinkhole		
 Slide or Slip		
 Sodid Spot		

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts  
Survey Area Data: Version 20, Aug 27, 2024

Soil Survey Area: Worcester County, Massachusetts, Southern Part  
Survey Area Data: Version 17, Aug 27, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

## Custom Soil Resource Report

### MAP LEGEND

### MAP INFORMATION

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	1.3	0.7%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	18.3	9.6%
245C	Hinckley loamy sand, 8 to 15 percent slopes	0.3	0.2%
420B	Canton fine sandy loam, 3 to 8 percent slopes	8.6	4.5%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	138.0	72.5%
653	Udorthents, sandy	10.6	5.6%
<b>Subtotals for Soil Survey Area</b>		<b>177.1</b>	<b>93.0%</b>
<b>Totals for Area of Interest</b>		<b>190.4</b>	<b>100.0%</b>

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	13.3	7.0%
<b>Subtotals for Soil Survey Area</b>		<b>13.3</b>	<b>7.0%</b>
<b>Totals for Area of Interest</b>		<b>190.4</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

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Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion

## Custom Soil Resource Report

of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Norfolk and Suffolk Counties, Massachusetts

### 71B—Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony

#### Map Unit Setting

*National map unit symbol:* 2w69c

*Elevation:* 0 to 1,290 feet

*Mean annual precipitation:* 36 to 71 inches

*Mean annual air temperature:* 39 to 55 degrees F

*Frost-free period:* 140 to 240 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Ridgebury, extremely stony, and similar soils:* 80 percent

*Minor components:* 20 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Ridgebury, Extremely Stony

##### Setting

*Landform:* Drumlins, depressions, ground moraines, hills, drainageways

*Landform position (two-dimensional):* Footslope, toeslope

*Landform position (three-dimensional):* Head slope, base slope

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

##### Typical profile

*Oe - 0 to 1 inches:* moderately decomposed plant material

*A - 1 to 6 inches:* fine sandy loam

*Bw - 6 to 10 inches:* sandy loam

*Bg - 10 to 19 inches:* gravelly sandy loam

*Cd - 19 to 66 inches:* gravelly sandy loam

##### Properties and qualities

*Slope:* 3 to 8 percent

*Surface area covered with cobbles, stones or boulders:* 9.0 percent

*Depth to restrictive feature:* 15 to 35 inches to densic material

*Drainage class:* Poorly drained

*Runoff class:* Very high

*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)

*Depth to water table:* About 0 to 6 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)

*Available water supply, 0 to 60 inches:* Low (about 3.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7s

*Hydrologic Soil Group:* D

*Ecological site:* F144AY009CT - Wet Till Depressions

*Hydric soil rating:* Yes

## Minor Components

### Woodbridge, extremely stony

*Percent of map unit:* 10 percent

*Landform:* Ground moraines, hills, drumlins

*Landform position (two-dimensional):* Summit, backslope, footslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex

*Across-slope shape:* Linear

*Hydric soil rating:* No

### Whitman, extremely stony

*Percent of map unit:* 8 percent

*Landform:* Depressions

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

### Paxton, extremely stony

*Percent of map unit:* 2 percent

*Landform:* Ground moraines, hills, drumlins

*Landform position (two-dimensional):* Summit, shoulder, backslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Linear, convex

*Hydric soil rating:* No

## 73A—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

### Map Unit Setting

*National map unit symbol:* 2w695

*Elevation:* 0 to 1,580 feet

*Mean annual precipitation:* 36 to 71 inches

*Mean annual air temperature:* 39 to 55 degrees F

*Frost-free period:* 140 to 240 days

*Farmland classification:* Not prime farmland

### Map Unit Composition

*Whitman, extremely stony, and similar soils:* 81 percent

*Minor components:* 19 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Whitman, Extremely Stony

#### Setting

*Landform:* Drumlins, ground moraines, hills, drainageways, depressions

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Base slope

*Down-slope shape:* Concave

*Across-slope shape:* Concave



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*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

### Typical profile

*Oi - 0 to 1 inches:* peat

*A - 1 to 10 inches:* fine sandy loam

*Bg - 10 to 17 inches:* gravelly fine sandy loam

*Cdg - 17 to 61 inches:* fine sandy loam

### Properties and qualities

*Slope:* 0 to 3 percent

*Surface area covered with cobbles, stones or boulders:* 9.0 percent

*Depth to restrictive feature:* 7 to 38 inches to densic material

*Drainage class:* Very poorly drained

*Runoff class:* Negligible

*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)

*Depth to water table:* About 0 to 6 inches

*Frequency of flooding:* None

*Frequency of ponding:* Frequent

*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)

*Available water supply, 0 to 60 inches:* Low (about 3.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7s

*Hydrologic Soil Group:* D

*Ecological site:* F144AY041MA - Very Wet Till Depressions

*Hydric soil rating:* Yes

### Minor Components

#### Ridgebury, extremely stony

*Percent of map unit:* 10 percent

*Landform:* Drumlins, depressions, ground moraines, hills, drainageways

*Landform position (two-dimensional):* Footslope, toeslope

*Landform position (three-dimensional):* Head slope, base slope

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

#### Scarboro

*Percent of map unit:* 5 percent

*Landform:* Drainageways, depressions, outwash terraces, outwash deltas

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

#### Swansea

*Percent of map unit:* 3 percent

*Landform:* Marshes, bogs, swamps

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

#### Woodbridge, extremely stony

*Percent of map unit:* 1 percent

## Custom Soil Resource Report

*Landform:* Ground moraines, hills, drumlins  
*Landform position (two-dimensional):* Summit, backslope, footslope  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

### 245C—Hinckley loamy sand, 8 to 15 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2svm9  
*Elevation:* 0 to 1,480 feet  
*Mean annual precipitation:* 36 to 71 inches  
*Mean annual air temperature:* 39 to 55 degrees F  
*Frost-free period:* 140 to 240 days  
*Farmland classification:* Farmland of statewide importance

#### Map Unit Composition

*Hinckley and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Hinckley

##### Setting

*Landform:* Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces  
*Landform position (two-dimensional):* Shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Head slope, nose slope, side slope, crest, riser  
*Down-slope shape:* Concave, convex, linear  
*Across-slope shape:* Convex, linear, concave  
*Parent material:* Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

##### Typical profile

*Oe - 0 to 1 inches:* moderately decomposed plant material  
*A - 1 to 8 inches:* loamy sand  
*Bw1 - 8 to 11 inches:* gravelly loamy sand  
*Bw2 - 11 to 16 inches:* gravelly loamy sand  
*BC - 16 to 19 inches:* very gravelly loamy sand  
*C - 19 to 65 inches:* very gravelly sand

##### Properties and qualities

*Slope:* 8 to 15 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Excessively drained  
*Runoff class:* Very low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to very high (1.42 to 99.90 in/hr)

## Custom Soil Resource Report

*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Low (about 3.1 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* A  
*Ecological site:* F144AY022MA - Dry Outwash  
*Hydric soil rating:* No

### Minor Components

#### Sudbury

*Percent of map unit:* 5 percent  
*Landform:* Outwash deltas, moraines, outwash plains, kame terraces, outwash terraces  
*Landform position (two-dimensional):* Backslope, footslope  
*Landform position (three-dimensional):* Base slope, tread  
*Down-slope shape:* Concave, linear  
*Across-slope shape:* Concave, linear  
*Hydric soil rating:* No

#### Windsor

*Percent of map unit:* 5 percent  
*Landform:* Eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces, moraines  
*Landform position (two-dimensional):* Shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Head slope, nose slope, side slope, crest, riser  
*Down-slope shape:* Concave, convex, linear  
*Across-slope shape:* Convex, linear, concave  
*Hydric soil rating:* No

#### Merrimac

*Percent of map unit:* 5 percent  
*Landform:* Kames, outwash plains, outwash terraces, moraines, eskers  
*Landform position (two-dimensional):* Shoulder, backslope, footslope, toeslope  
*Landform position (three-dimensional):* Head slope, nose slope, side slope, crest, riser  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

## 420B—Canton fine sandy loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 2w81b  
*Elevation:* 0 to 1,180 feet

## Custom Soil Resource Report

*Mean annual precipitation:* 36 to 71 inches  
*Mean annual air temperature:* 39 to 55 degrees F  
*Frost-free period:* 140 to 240 days  
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Canton and similar soils:* 80 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Canton

#### Setting

*Landform:* Hills, moraines, ridges  
*Landform position (two-dimensional):* Summit, shoulder, backslope  
*Landform position (three-dimensional):* Nose slope, side slope, crest  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex  
*Parent material:* Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

#### Typical profile

*Ap - 0 to 7 inches:* fine sandy loam  
*Bw1 - 7 to 15 inches:* fine sandy loam  
*Bw2 - 15 to 26 inches:* gravelly fine sandy loam  
*2C - 26 to 65 inches:* gravelly loamy sand

#### Properties and qualities

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* 19 to 39 inches to strongly contrasting textural stratification  
*Drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.14 to 14.17 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Very low (about 2.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2s  
*Hydrologic Soil Group:* B  
*Ecological site:* F144AY034CT - Well Drained Till Uplands  
*Hydric soil rating:* No

### Minor Components

#### Scituate

*Percent of map unit:* 10 percent  
*Landform:* Hills, drumlins, ground moraines  
*Landform position (two-dimensional):* Summit, backslope, footslope  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

## Custom Soil Resource Report

### Montauk

*Percent of map unit:* 5 percent  
*Landform:* Moraines, ground moraines, hills, drumlins  
*Landform position (two-dimensional):* Summit, shoulder, backslope  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

### Charlton

*Percent of map unit:* 4 percent  
*Landform:* Ridges, ground moraines, hills  
*Landform position (two-dimensional):* Summit, shoulder, backslope  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

### Swansea

*Percent of map unit:* 1 percent  
*Landform:* Marshes, depressions, bogs, swamps, kettles  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

## 422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

### Map Unit Setting

*National map unit symbol:* 2w818  
*Elevation:* 0 to 1,180 feet  
*Mean annual precipitation:* 36 to 71 inches  
*Mean annual air temperature:* 39 to 55 degrees F  
*Frost-free period:* 145 to 240 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Canton, extremely stony, and similar soils:* 80 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Canton, Extremely Stony

#### Setting

*Landform:* Moraines, hills, ridges  
*Landform position (two-dimensional):* Summit, shoulder, backslope  
*Landform position (three-dimensional):* Nose slope, side slope, crest  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex  
*Parent material:* Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

## Custom Soil Resource Report

### Typical profile

*Oi - 0 to 2 inches:* slightly decomposed plant material

*A - 2 to 5 inches:* fine sandy loam

*Bw1 - 5 to 16 inches:* fine sandy loam

*Bw2 - 16 to 22 inches:* gravelly fine sandy loam

*2C - 22 to 67 inches:* gravelly loamy sand

### Properties and qualities

*Slope:* 0 to 8 percent

*Surface area covered with cobbles, stones or boulders:* 9.0 percent

*Depth to restrictive feature:* 19 to 39 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.14 to 14.17 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)

*Available water supply, 0 to 60 inches:* Low (about 3.4 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7s

*Hydrologic Soil Group:* B

*Ecological site:* F144AY034CT - Well Drained Till Uplands

*Hydric soil rating:* No

### Minor Components

#### Charlton, extremely stony

*Percent of map unit:* 6 percent

*Landform:* Ridges, ground moraines, hills

*Landform position (two-dimensional):* Summit, shoulder, backslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Convex

*Hydric soil rating:* No

#### Scituate, extremely stony

*Percent of map unit:* 6 percent

*Landform:* Hills, ground moraines, drumlins

*Landform position (two-dimensional):* Summit, backslope, footslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Convex

*Hydric soil rating:* No

#### Montauk, extremely stony

*Percent of map unit:* 4 percent

*Landform:* Recessional moraines, ground moraines, hills, drumlins

*Landform position (two-dimensional):* Summit, shoulder, backslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Convex

## Custom Soil Resource Report

*Hydric soil rating:* No

### **Swansea**

*Percent of map unit:* 4 percent

*Landform:* Marshes, depressions, bogs, swamps, kettles

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

## **653—Udorthents, sandy**

### **Map Unit Setting**

*National map unit symbol:* vky8

*Elevation:* 0 to 3,000 feet

*Mean annual precipitation:* 45 to 54 inches

*Mean annual air temperature:* 43 to 54 degrees F

*Frost-free period:* 145 to 240 days

*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Udorthents and similar soils:* 85 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Udorthents**

#### **Setting**

*Landform position (two-dimensional):* Shoulder, summit

*Landform position (three-dimensional):* Riser, tread

*Down-slope shape:* Convex, linear

*Across-slope shape:* Convex, linear

*Parent material:* Excavated and filled sandy glaciofluvial deposits

#### **Typical profile**

*H1 - 0 to 6 inches:* variable

*H2 - 6 to 60 inches:* variable

#### **Properties and qualities**

*Slope:* 0 to 25 percent

*Depth to restrictive feature:* More than 80 inches

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to very high (0.06 to 20.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 6s

*Hydrologic Soil Group:* A



## Custom Soil Resource Report

*Hydric soil rating:* Unranked

### Minor Components

#### Udorthents

*Percent of map unit:* 8 percent

*Hydric soil rating:* Unranked

#### Urban land

*Percent of map unit:* 5 percent

*Hydric soil rating:* Unranked

#### Swansea

*Percent of map unit:* 2 percent

*Landform:* Bogs

*Hydric soil rating:* Yes

## Worcester County, Massachusetts, Southern Part

### 422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

#### Map Unit Setting

*National map unit symbol:* 2w818  
*Elevation:* 0 to 1,180 feet  
*Mean annual precipitation:* 36 to 71 inches  
*Mean annual air temperature:* 39 to 55 degrees F  
*Frost-free period:* 145 to 240 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Canton, extremely stony, and similar soils:* 80 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Canton, Extremely Stony

##### Setting

*Landform:* Moraines, hills, ridges  
*Landform position (two-dimensional):* Summit, shoulder, backslope  
*Landform position (three-dimensional):* Nose slope, side slope, crest  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex  
*Parent material:* Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

##### Typical profile

*Oi - 0 to 2 inches:* slightly decomposed plant material  
*A - 2 to 5 inches:* fine sandy loam  
*Bw1 - 5 to 16 inches:* fine sandy loam  
*Bw2 - 16 to 22 inches:* gravelly fine sandy loam  
*2C - 22 to 67 inches:* gravelly loamy sand

##### Properties and qualities

*Slope:* 0 to 8 percent  
*Surface area covered with cobbles, stones or boulders:* 9.0 percent  
*Depth to restrictive feature:* 19 to 39 inches to strongly contrasting textural stratification  
*Drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.14 to 14.17 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Low (about 3.4 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7s  
*Hydrologic Soil Group:* B  
*Ecological site:* F144AY034CT - Well Drained Till Uplands

## Custom Soil Resource Report

*Hydric soil rating:* No

### Minor Components

#### **Charlton, extremely stony**

*Percent of map unit:* 6 percent

*Landform:* Ridges, ground moraines, hills

*Landform position (two-dimensional):* Summit, shoulder, backslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Convex

*Hydric soil rating:* No

#### **Scituate, extremely stony**

*Percent of map unit:* 6 percent

*Landform:* Hills, ground moraines, drumlins

*Landform position (two-dimensional):* Summit, backslope, footslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Convex

*Hydric soil rating:* No

#### **Montauk, extremely stony**

*Percent of map unit:* 4 percent

*Landform:* Recessionial moraines, ground moraines, hills, drumlins

*Landform position (two-dimensional):* Summit, shoulder, backslope

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Convex, linear

*Across-slope shape:* Convex

*Hydric soil rating:* No

#### **Swansea**

*Percent of map unit:* 4 percent

*Landform:* Marshes, depressions, bogs, swamps, kettles

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

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## POINT PRECIPITATION FREQUENCY ESTIMATES

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### PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.329 (0.256-0.415)	0.397 (0.309-0.502)	0.508 (0.395-0.645)	0.601 (0.464-0.766)	0.728 (0.544-0.970)	0.824 (0.603-1.12)	0.924 (0.656-1.30)	1.04 (0.697-1.49)	1.19 (0.772-1.78)	1.32 (0.834-2.01)
10-min	0.466 (0.363-0.588)	0.562 (0.438-0.711)	0.720 (0.559-0.913)	0.851 (0.657-1.09)	1.03 (0.770-1.37)	1.17 (0.854-1.59)	1.31 (0.929-1.85)	1.47 (0.988-2.12)	1.69 (1.10-2.52)	1.87 (1.18-2.85)
15-min	0.548 (0.427-0.692)	0.662 (0.515-0.837)	0.848 (0.659-1.08)	1.00 (0.773-1.28)	1.21 (0.906-1.62)	1.37 (1.00-1.87)	1.54 (1.09-2.17)	1.72 (1.16-2.49)	1.99 (1.29-2.97)	2.20 (1.39-3.35)
30-min	0.748 (0.583-0.944)	0.904 (0.704-1.14)	1.16 (0.900-1.47)	1.37 (1.06-1.75)	1.66 (1.24-2.21)	1.88 (1.38-2.56)	2.11 (1.50-2.97)	2.36 (1.59-3.41)	2.72 (1.76-4.07)	3.01 (1.90-4.59)
60-min	0.947 (0.738-1.20)	1.14 (0.892-1.45)	1.47 (1.14-1.86)	1.74 (1.34-2.22)	2.11 (1.57-2.81)	2.39 (1.75-3.25)	2.68 (1.90-3.78)	3.00 (2.02-4.33)	3.46 (2.24-5.16)	3.82 (2.42-5.83)
2-hr	1.21 (0.953-1.52)	1.48 (1.16-1.86)	1.92 (1.50-2.42)	2.28 (1.77-2.89)	2.78 (2.09-3.68)	3.15 (2.32-4.26)	3.54 (2.53-4.98)	3.99 (2.70-5.72)	4.63 (3.01-6.88)	5.16 (3.27-7.82)
3-hr	1.40 (1.11-1.76)	1.72 (1.35-2.15)	2.23 (1.75-2.80)	2.65 (2.07-3.35)	3.24 (2.44-4.28)	3.68 (2.72-4.96)	4.14 (2.97-5.81)	4.67 (3.16-6.68)	5.45 (3.55-8.07)	6.10 (3.88-9.21)
6-hr	1.81 (1.43-2.25)	2.21 (1.75-2.74)	2.86 (2.26-3.57)	3.40 (2.67-4.27)	4.15 (3.16-5.46)	4.71 (3.51-6.34)	5.30 (3.85-7.44)	6.02 (4.09-8.55)	7.10 (4.64-10.4)	8.02 (5.12-12.0)
12-hr	2.30 (1.84-2.84)	2.80 (2.23-3.46)	3.61 (2.87-4.48)	4.29 (3.38-5.34)	5.22 (4.00-6.84)	5.90 (4.44-7.92)	6.65 (4.88-9.32)	7.57 (5.16-10.7)	8.98 (5.88-13.1)	10.2 (6.52-15.2)
24-hr	2.76 (2.22-3.38)	3.38 (2.71-4.14)	4.39 (3.51-5.40)	5.23 (4.15-6.47)	6.38 (4.92-8.32)	7.23 (5.48-9.67)	8.16 (6.03-11.4)	9.32 (6.38-13.1)	11.1 (7.30-16.1)	12.7 (8.13-18.7)
2-day	3.12 (2.52-3.79)	3.87 (3.13-4.72)	5.11 (4.11-6.24)	6.13 (4.90-7.54)	7.55 (5.86-9.78)	8.58 (6.54-11.4)	9.72 (7.23-13.5)	11.1 (7.66-15.5)	13.4 (8.82-19.3)	15.3 (9.86-22.5)
3-day	3.39 (2.75-4.11)	4.21 (3.41-5.10)	5.54 (4.47-6.74)	6.64 (5.33-8.13)	8.16 (6.35-10.5)	9.28 (7.08-12.3)	10.5 (7.82-14.5)	12.0 (8.30-16.7)	14.4 (9.55-20.7)	16.5 (10.7-24.2)
4-day	3.66 (2.98-4.42)	4.50 (3.66-5.45)	5.89 (4.77-7.14)	7.03 (5.66-8.58)	8.61 (6.71-11.1)	9.77 (7.47-12.9)	11.0 (8.22-15.2)	12.6 (8.73-17.5)	15.1 (10.0-21.6)	17.3 (11.2-25.2)
7-day	4.40 (3.60-5.29)	5.30 (4.34-6.38)	6.78 (5.52-8.18)	8.00 (6.47-9.71)	9.68 (7.57-12.3)	10.9 (8.36-14.2)	12.3 (9.12-16.7)	13.9 (9.64-19.1)	16.4 (10.9-23.3)	18.5 (12.0-26.8)
10-day	5.12 (4.20-6.13)	6.05 (4.96-7.25)	7.58 (6.19-9.11)	8.84 (7.17-10.7)	10.6 (8.29-13.4)	11.9 (9.10-15.4)	13.3 (9.84-17.8)	14.9 (10.4-20.4)	17.3 (11.5-24.5)	19.4 (12.6-27.9)
20-day	7.23 (5.98-8.60)	8.22 (6.79-9.78)	9.84 (8.09-11.8)	11.2 (9.13-13.4)	13.0 (10.2-16.3)	14.4 (11.1-18.4)	15.9 (11.7-21.0)	17.5 (12.2-23.7)	19.7 (13.2-27.6)	21.5 (14.0-30.8)
30-day	8.97 (7.45-10.6)	10.0 (8.29-11.9)	11.7 (9.64-13.9)	13.1 (10.7-15.6)	15.0 (11.8-18.6)	16.4 (12.6-20.8)	17.9 (13.2-23.4)	19.5 (13.7-26.2)	21.5 (14.4-30.0)	23.1 (15.0-32.9)
45-day	11.1 (9.28-13.1)	12.2 (10.2-14.4)	13.9 (11.6-16.5)	15.4 (12.7-18.3)	17.4 (13.7-21.4)	18.9 (14.6-23.7)	20.4 (15.1-26.4)	21.9 (15.4-29.3)	23.7 (16.0-32.9)	25.0 (16.3-35.4)
60-day	12.9 (10.8-15.2)	14.0 (11.7-16.5)	15.8 (13.2-18.7)	17.3 (14.3-20.6)	19.4 (15.3-23.7)	21.0 (16.2-26.2)	22.5 (16.6-28.8)	23.9 (16.9-31.9)	25.5 (17.2-35.2)	26.5 (17.3-37.5)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

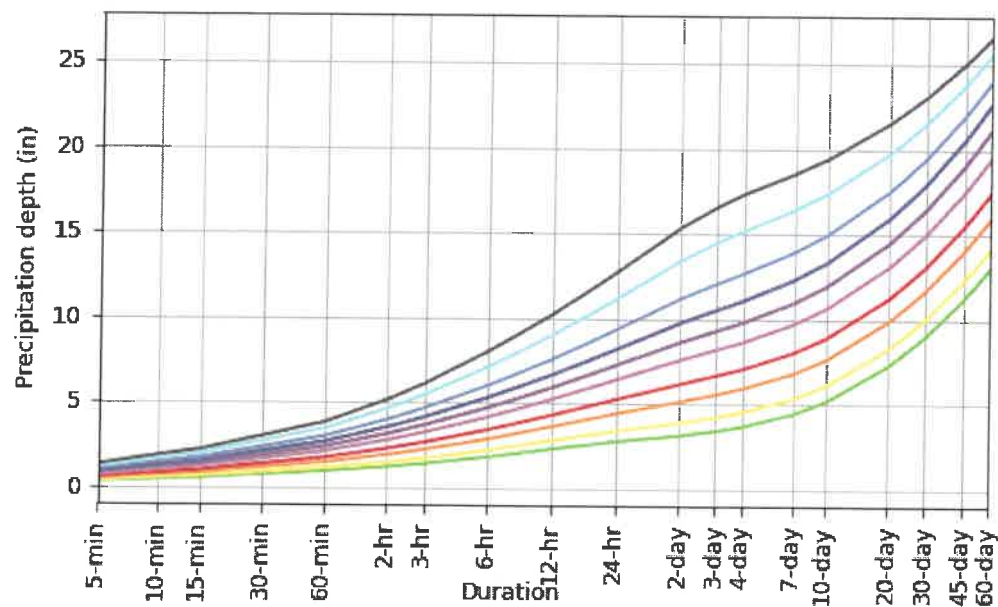
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

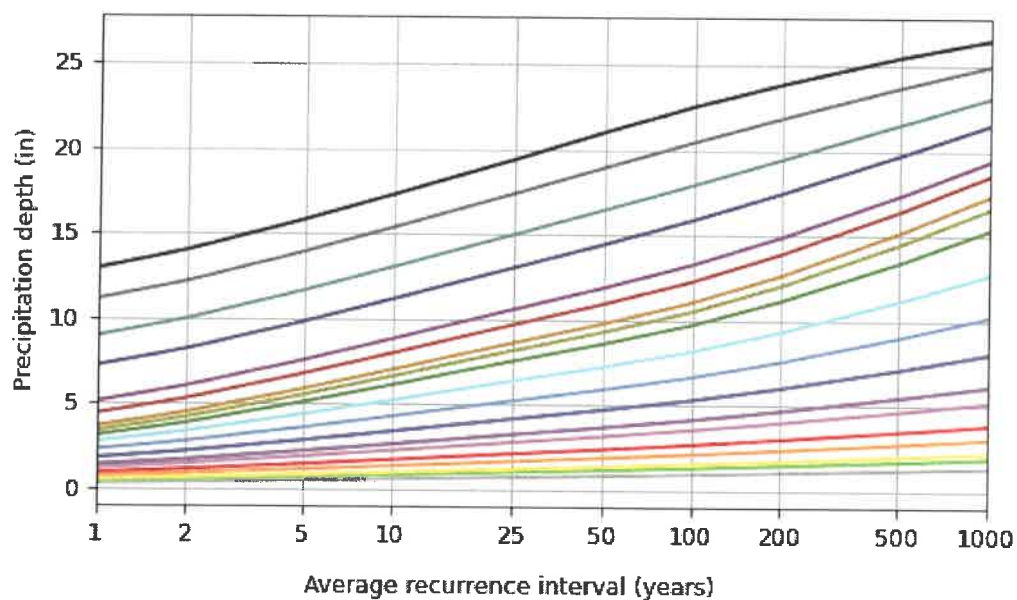
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### PF graphical

PDS-based depth-duration-frequency (DDF) curves  
Latitude: 42.0668°, Longitude: -71.4929°



Average recurrence interval (years)	
1	
2	
5	
10	
25	
50	
100	
200	
500	
1000	

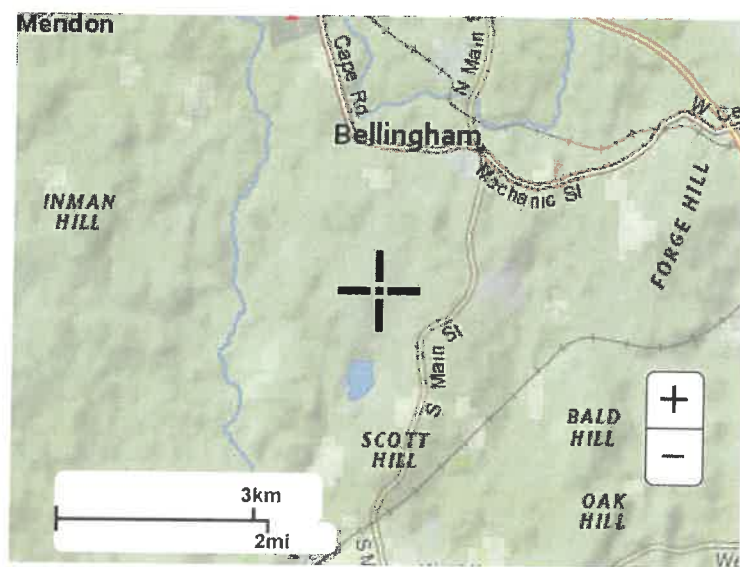


Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

## Maps & aerals

Small scale terrain





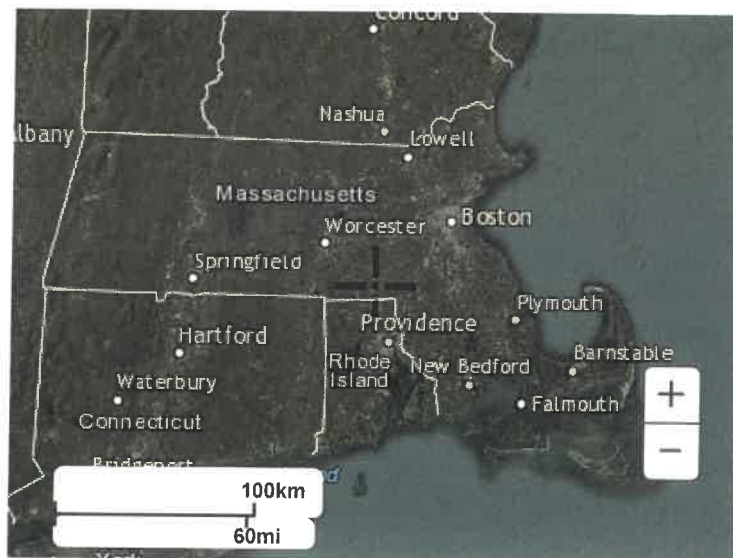
Large scale terrain



Large scale map



Large scale aerial



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