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# STORMWATER MANAGEMENT REPORT AND DRAINAGE CALCULATIONS

## AMENDED SITE PLAN PROPOSED HOTEL AT JUMPING BROOK CORPORATE PARK

BLOCK 4006, LOT 1  
NEPTUNE TOWNSHIP, MONMOUTH COUNTY, NEW JERSEY

APRIL 27, 2017

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PREPARED BY:  
DW SMITH ASSOCIATES, LLC



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TIMOTHY P. LURIE, PE, PP  
New Jersey PE License No. 40279



DWSA Job Number 15-736.00

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## **INTRODUCTION**

This report is being prepared as a result of an amended site plan whereby the previously approved Restaurant along the frontage of N.J.S.H. Route 66 has been amended to a proposed hotel. This report accompanies an application for an Amended Site Plan for the Proposed Hotel on the previously approved Hampton Inn at Jumping Brook Corporate Park project, located in Neptune Township, Monmouth County, New Jersey. There will be no changes to the existing Hampton Inn portion of the approved project site. The project site is bound by Victoria Boulevard, N.J.S.H. Route No. 66 and McNamara Way. The site is located on 4.446 acres, known as Block 4006, Lot 1 as shown on the Neptune Township Tax Map. The property in question lies within the C-1 zone and is a planned commercial development.

The entire Jumping Brook Corporate Park project was previously approved by Neptune Township in May 2009. An Amended Site Plan for a change to the location and layout of the proposed restaurant pad on this property was previously approved by Neptune Township in January 2012.

As part of this amended site plan, the areas that pertain to the existing Hampton Inn portion of the site have remain unchanged, and are denoted on the site plans. Due to the changes to the site plan involving the addition of the second hotel in place of the restaurant pad, several stormwater inlets had to be relocated and pipes rerouted to convey the runoff to the existing underground stormwater systems, which remain unchanged from the previously approved design. This report will show that although the layout and routing has changed, along with the drainage areas and impervious areas, the previously designed and approved stormwater management system is adequately sized to handle the additional flow generated and the runoff rates will be reduced to the levels required.

## **DRAINAGE AREAS**

The table below summarizes the drainage areas contributing to the Stormwater Management facilities for the originally approved design and the amended design.

<b>Drainage Area</b>	<b>Approved Design</b>	<b>Amended Design</b>
<b>To Underground Detention System</b>		
DA #2-11	0.56 Ac.	0.56 Ac.
DA #2-9	0.78 Ac.	0.82 Ac.
DA #2-8	0.02 Ac.	0.02 Ac.
DA #2-7	0.11 Ac.	0.17 Ac.
DA #2-6	0.15 Ac.	0.00 Ac.
DA #2-5	0.23 Ac.	0.23 Ac.
DA #2-5A	0.08 Ac.	0.02 Ac.
DA #2-4	0.20 Ac.	0.22 Ac.
DA #2-3	0.04 Ac.	0.03 Ac.
DA #2-2	0.19 Ac.	0.21 Ac.

DA #2-1	0.23 Ac.	0.26 Ac.
DA #PROPOSED ROOF	0.16 Ac.	0.23 Ac.
<b>subtotal</b>	<b>2.75 Ac.</b>	<b>2.77 Ac.</b>
To Underground Retention System		
DA #EX. HAMPTON INN ROOF	0.26 Ac.	0.26 Ac.
<b>subtotal</b>	<b>0.26 Ac.</b>	<b>0.26 Ac.</b>
<b>DA #BYPASS area</b>	<b>1.64 Ac.</b>	<b>1.62 Ac.</b>
<b>TOTAL</b>		
	<b>4.65 Ac.</b>	<b>4.65 Ac.</b>

As seen in the chart above, the total overall drainage area has not changed. The contributing area to the underground detention system has increased by 0.02 acres. Calculations for the amended drainage areas are included in the Appendix of this report.

### **IMPERVIOUS AREAS**

The table below summarizes the amount of impervious area contained within the 4.65 acre overall site drainage area.

<b>Impervious Area – Approved Design</b>	<b>Impervious Area - Amended Design</b>	<b>Increase in impervious area</b>
<b>2.67 Ac. (116,305 sf)</b>	<b>2.83 Ac. (123,275 sf)</b>	<b>0.16 Ac. (6,970 sf)</b>

As seen in the chart above, the amount of impervious area has increased by 6,970 square feet due to the proposed amended site revisions, resulting in a greater amount of impervious cover and subsequently, increased stormwater runoff quantity being routed to the previously designed stormwater management system.

### **RUNOFF FLOWRATES**

The table below summarizes the rate of runoff generated from the site draining to the previously designated analysis point which represents a summation of the runoff from the stormwater management systems and the bypass areas flowing offsite. Calculations for the amended flowrates are included in Appendix A of this report. (The Pre-Development flowrates are taken from the approved report originally prepared by LGA Engineering, Inc, dated October 2008.)

<b>Storm Event</b>	<b>Pre-Dev Flowrate – Original Approved Design</b>	<b>Reduction Rate / Allowable Runoff Rate</b>	<b>Post-Dev Flowrate – Amended Design</b>
<b>2-year</b>	<b>1.15 cfs</b>	<b>50% = 0.57 cfs</b>	<b>1.05 cfs *</b>
<b>10-year</b>	<b>4.09 cfs</b>	<b>75% = 3.07 cfs</b>	<b>2.91 cfs **</b>
<b>100-year</b>	<b>12.27 cfs</b>	<b>80% = 9.81 cfs</b>	<b>10.81 cfs ***</b>

\* For the 2 year storm, the overall flowrate leaving the site is 1.05 cfs, which is 91% of the pre-development flowrate, which doesn't meet the 50% reduction requirement. This 1.05 cfs equals the approved flowrate of the original design. A Design Waiver was previously granted for this 9% flowrate reduction. The flowrate remains unchanged as part of this amended design.

\*\* For the 10 year storm, the overall flowrate leaving the site is 2.91 cfs, which meets the 75% reduction of the pre-development flowrate leaving the site.

\*\*\* For the 100 year storm, the overall flowrate leaving the site is 10.81 cfs, which does not meet the 80% reduction of the pre-development flowrate leaving the site. In order to reduce the flowrate to the required 9.81 cfs, additional storage volume of the stormwater management system must be analyzed. The additional stormwater flow created by the impervious area results in a volume of water of 1,303 cubic feet. In reviewing the original drainage calculations, as a matter of conservative analysis, the storage volume within the manifold header pipes of the system, as well as the storage volume of the stormwater pipes routed to the existing system were not included in the analysis. When analyzed, the actual storage volume of these pipes and manifold structures are as follows:

<b>Pipe diameter</b>	<b>Linear Feet of Pipe</b>	<b>Available Storage Volume</b>
<b>15 inch</b>	<b>528 LF</b>	<b>648 cu-ft</b>
<b>18 inch</b>	<b>27 LF</b>	<b>48 cu-ft</b>
<b>24 inch</b>	<b>14 LF</b>	<b>44 cu-ft</b>
<b>30 inch</b>	<b>42 LF</b>	<b>206 cu-ft</b>
<b>48 inch</b>	<b>77 LF</b>	<b>967 cu-ft</b>
<b>Total available Stormwater Manifold and Pipe Storage</b>		<b>1,913 cu-ft</b>

This 1,913 cubic feet of storage volume exceeds the required 1,303 cubic feet of storage volume, and therefore will provide the additional storage volume necessary to maintain the required pre-development reduction flowrates for the 100 year storm event.

## **WATER QUALITY**

A Stormfilter Water Quality unit has been previously installed downstream of the underground stormwater management system, and the unit will continue to function and treat the runoff to 80% TSS Removal as originally intended.

## **CONCLUSION**

A review of the methodology and analysis used for this stormwater management study reveals that the originally approved stormwater management system will continue to serve the site as originally intended, while still meeting the required reduction rates, water quality measures, and sizing requirements. Based on the information provided there will be no negative impact due to stormwater runoff to areas downstream of the project, and the development can take place while adhering to the rules and regulations promulgated by the Local, County and State reviewing agencies.

## **APPENDIX A**

## **Weighted “c” and Storm Pipe Routing Calculations**

BY: JJB

**PROPOSED HOTEL - JUMPING BROOK CORPORATE PARK**  
 NEPTUNE TOWNSHIP, MONMOUTH CO, NEW JERSEY

JOB NO. 15-736.00  
 DATE: 12/2/2016  
 REV:

**RATIONAL "c" COMPUTATIONS**

AREA	WOODS						GRASS						IMPERVIOUS		AREA	"C"					
	HSG A		HSG B		HSG C		HSG D		HSG A		HSG B		HSG C				HSG D				
	Area	Weighted (c=0.10)	Area	Weighted (c=0.10)	Area	Weighted (c=0.45)	Area	Weighted (c=0.59)	Area	Weighted (c=0.25)	Area	Weighted (c=0.25)	Area	Weighted (c=0.51)			Area	Weighted (c=0.65)	Area	Weighted (c=0.99)	
Inlet CDI#2-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.26	0.96	
Inlet CDI#2-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.18	0.21	0.88	
Inlet CDI#2-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.99	
Inlet CDI#2-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.22	0.89	
Hotel Roof	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23	0.23	0.99	
Inlet CDI#2-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.23	0.93	
Inlet CDI#2-5A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.99	
MH CMH#2-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Inlet CDI#2-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.15	0.17	0.90	
Inlet CDI#2-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.99	
Inlet CDI#2-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.72	0.82	0.91	
MH CMH#2-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

BY: JJB

**PROPOSED HOTEL - JUMPING BROOK CORPORATE PARK  
NEPTUNE TOWNSHIP, MONMOUTH CO, NEW JERSEY**

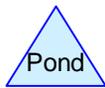
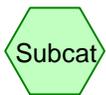
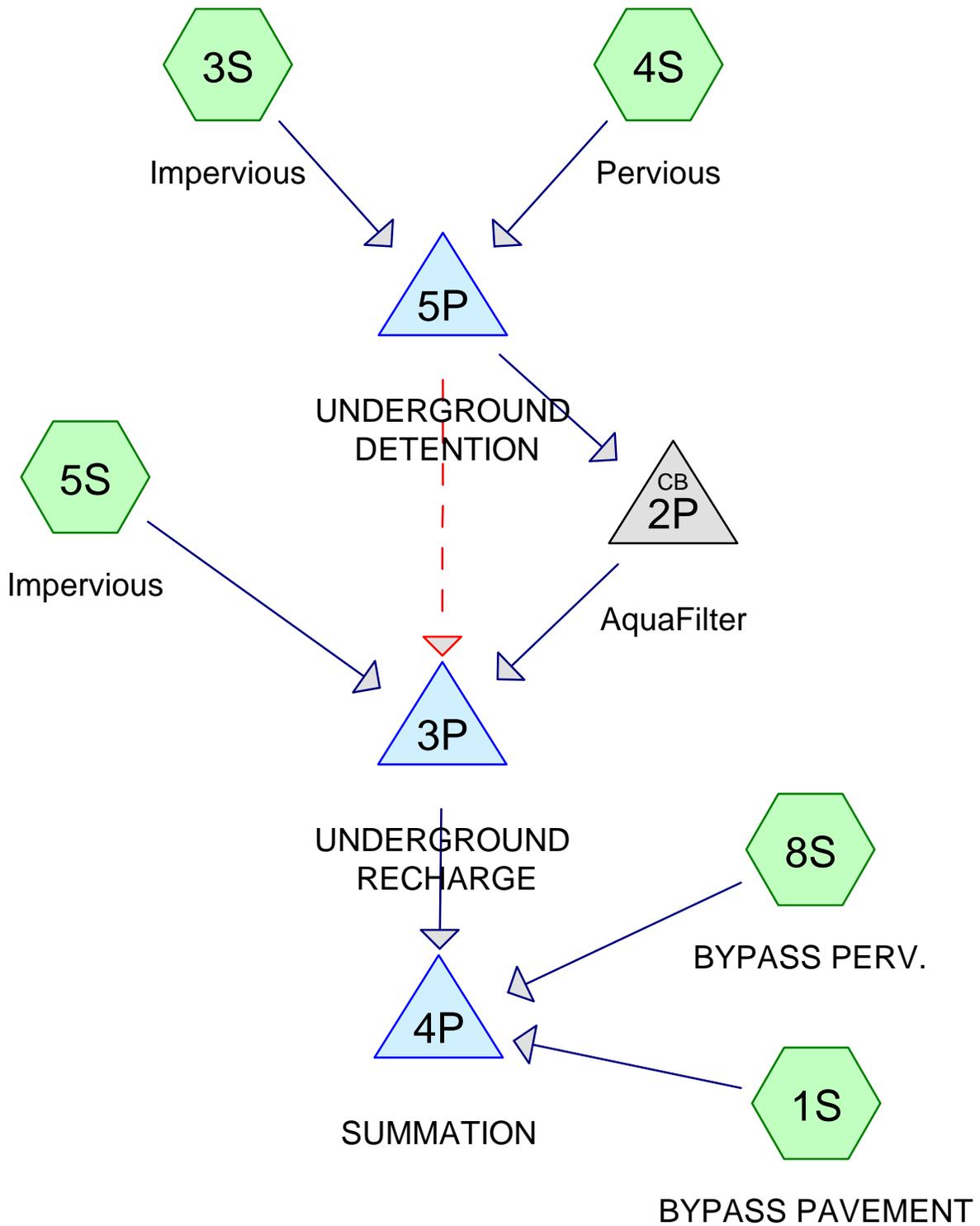
JOB NO. 15-736.00  
DATE: 4/27/2017  
REV:

**STORM SEWER COMPUTATIONS - RATIONAL METHOD (Q=CIA)**

STORM EVENT = 25 YEAR STORM																	
Inflow Point #	Inflow (Ac.)		"C"	"C" Avg.	Tc Minutes			"I"	"Q" cfs	RCP PVC	n = 0.013 n = 0.010	Pipe Size	Slope	Qf	Vf	Vact	L
	Sub-Total	Total			To Inlet	In Pipe	Total										
Inlet CDI#2-1	0.26	0.26	0.96	0.96	10.0	0.7	10.7	6.60	1.7	15 Dia. RCP	0.23%	3.1	2.5	2.2	100		
Inlet CDI#2-2	0.21	0.47	0.88	0.93	10.7	0.5	11.2	6.55	2.8	15 Dia. RCP	0.20%	2.9	2.4	2.6	75		
Inlet CDI#2-3	0.03	0.50	0.99	0.93	11.2	0.5	11.7	6.51	3.0	15 Dia. RCP	0.30%	3.5	2.9	3.0	93		
Inlet CDI#2-4	0.22	0.72	0.89	0.92	11.7	0.4	12.2	6.46	4.3	15 Dia. RCP	0.55%	4.8	3.9	4.1	101		
TO MH CMH#2-6																	
Hotel Roof	0.23	0.23	0.99	0.99	10.0	0.1	10.1	6.60	1.5	12 Dia. PVC	1.00%	4.6	5.9	4.5	29		
Inlet CDI#2-5	0.23	0.46	0.93	0.96	10.1	0.3	10.4	6.60	2.9	15 Dia. RCP	0.66%	5.2	4.3	3.8	76		
Inlet CDI#2-5A	0.02	0.48	0.99	0.96	10.4	0.4	10.8	6.58	3.0	15 Dia. RCP	0.66%	5.2	4.3	3.8	101		
MH CMH#2-6	0.00	1.20	0.00	0.93	12.2	0.1	12.3	6.43	7.2	18 Dia. RCP	0.63%	8.3	4.7	4.9	27		
TO MH CMH#2-10																	
Inlet CDI#2-7	0.17	0.17	0.90	0.90	10.0	0.5	10.5	6.60	1.0	15 Dia. RCP	0.16%	2.6	2.1	1.7	62		
Inlet CDI#2-8	0.02	0.19	0.99	0.91	10.5	0.1	10.6	6.57	1.1	15 Dia. RCP	0.33%	3.7	3.0	2.3	15		
Inlet CDI#2-9	0.82	1.01	0.91	0.91	10.6	0.2	10.8	6.56	6.0	15 Dia. RCP	1.09%	6.7	5.5	5.8	68		
MH CMH#2-10	0.00	2.21	0.00	0.92	12.3	12.3	TO EXISTING UNDERGROUND DETENTION SYSTEM										

## **2 Year Storm**

### **Post Development Calculations – Amended Site Plan**



**post-dev-conditions**

Prepared by DW Smith Associates

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amended site design  
Type III 24-hr 2-yr Rainfall=3.40"

Printed 12/14/2016

Time span=0.00-35.00 hrs, dt=0.05 hrs, 701 points  
Runoff by SCS TR-20 method, UH=SCS  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: BYPASS PAVEMENT** Runoff Area=0.090 ac 100.00% Impervious Runoff Depth=3.17"  
Tc=10.0 min CN=98 Runoff=0.26 cfs 0.024 af

**Subcatchment 3S: Impervious** Runoff Area=2.480 ac 100.00% Impervious Runoff Depth=3.17"  
Tc=10.0 min CN=98 Runoff=7.09 cfs 0.654 af

**Subcatchment 4S: Pervious** Runoff Area=0.290 ac 0.00% Impervious Runoff Depth=0.53"  
Tc=10.0 min CN=61 Runoff=0.10 cfs 0.013 af

**Subcatchment 5S: Impervious** Runoff Area=0.260 ac 100.00% Impervious Runoff Depth=3.17"  
Tc=10.0 min CN=98 Runoff=0.74 cfs 0.069 af

**Subcatchment 8S: BYPASS PERV.** Runoff Area=1.530 ac 0.00% Impervious Runoff Depth=0.66"  
Tc=10.0 min CN=64 Runoff=0.80 cfs 0.084 af

**Pond 2P: AquaFilter** Peak Elev=97.83' Inflow=2.10 cfs 0.619 af  
15.0" Round Culvert n=0.013 L=10.0' S=0.0020 '/ Outflow=2.10 cfs 0.619 af

**Pond 3P: UNDERGROUND RECHARGE** Peak Elev=97.82' Storage=11,609 cf Inflow=3.57 cfs 0.735 af  
Discarded=0.52 cfs 0.734 af Primary=0.01 cfs 0.001 af Outflow=0.53 cfs 0.735 af

**Pond 4P: SUMMATION** Inflow=1.05 cfs 0.108 af  
Primary=1.05 cfs 0.108 af

**Pond 5P: UNDERGROUND DETENTION** Peak Elev=98.43' Storage=8,094 cf Inflow=7.19 cfs 0.667 af  
Primary=2.10 cfs 0.619 af Secondary=1.11 cfs 0.048 af Outflow=3.22 cfs 0.667 af

**Total Runoff Area = 4.650 ac Runoff Volume = 0.843 af Average Runoff Depth = 2.18"**  
**39.14% Pervious = 1.820 ac 60.86% Impervious = 2.830 ac**

**post-dev-conditions**

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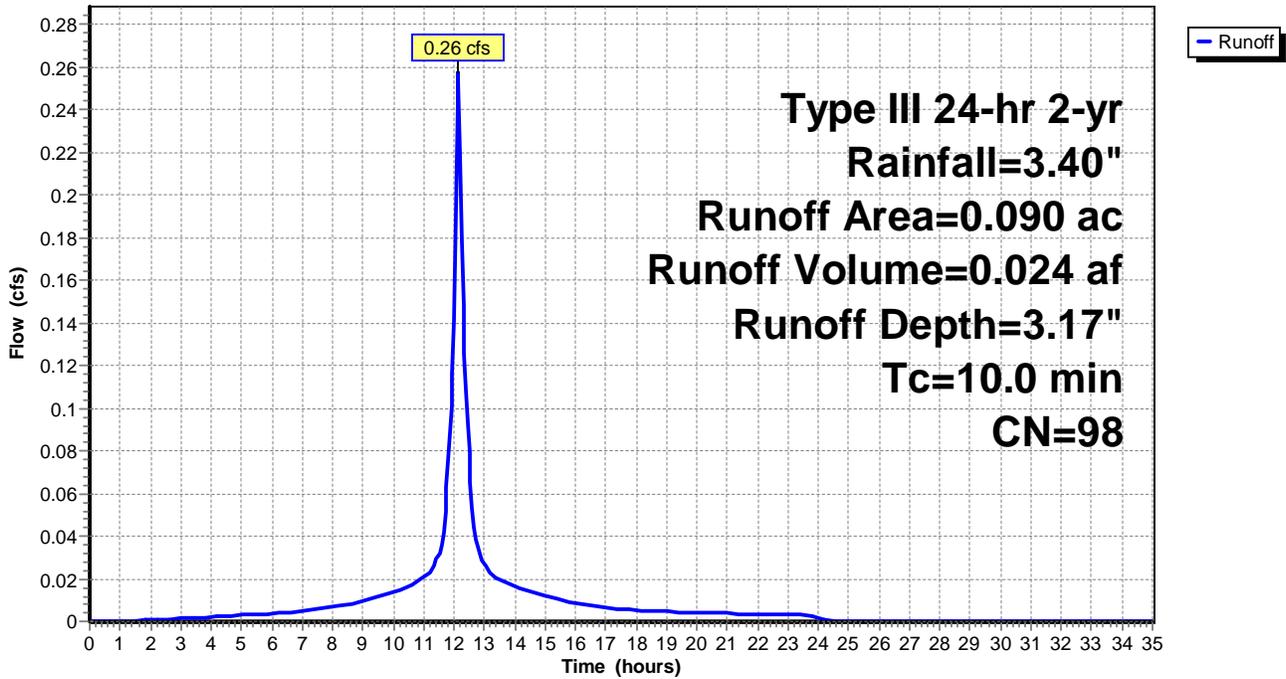
amended site design

Type III 24-hr 2-yr Rainfall=3.40"

Printed 12/14/2016

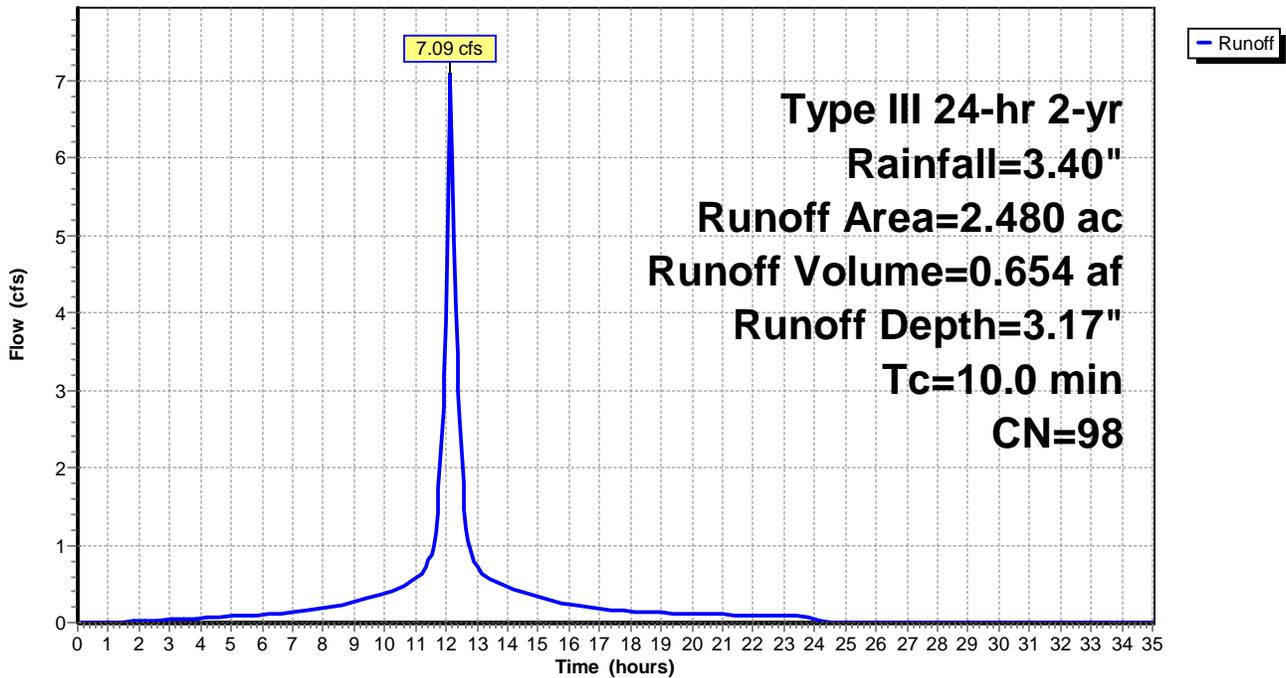
**Subcatchment 1S: BYPASS PAVEMENT**

Hydrograph



**Subcatchment 3S: Impervious**

Hydrograph



**post-dev-conditions**

Prepared by DW Smith Associates

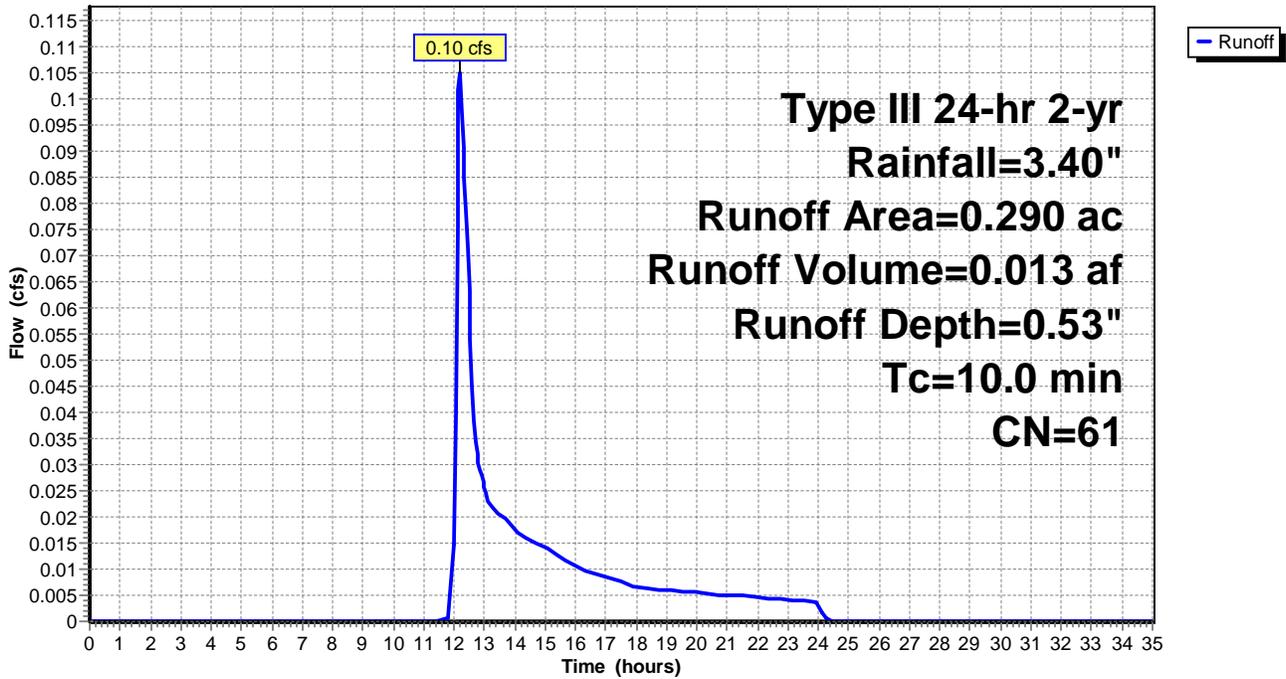
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Type III 24-hr 2-yr Rainfall=3.40"

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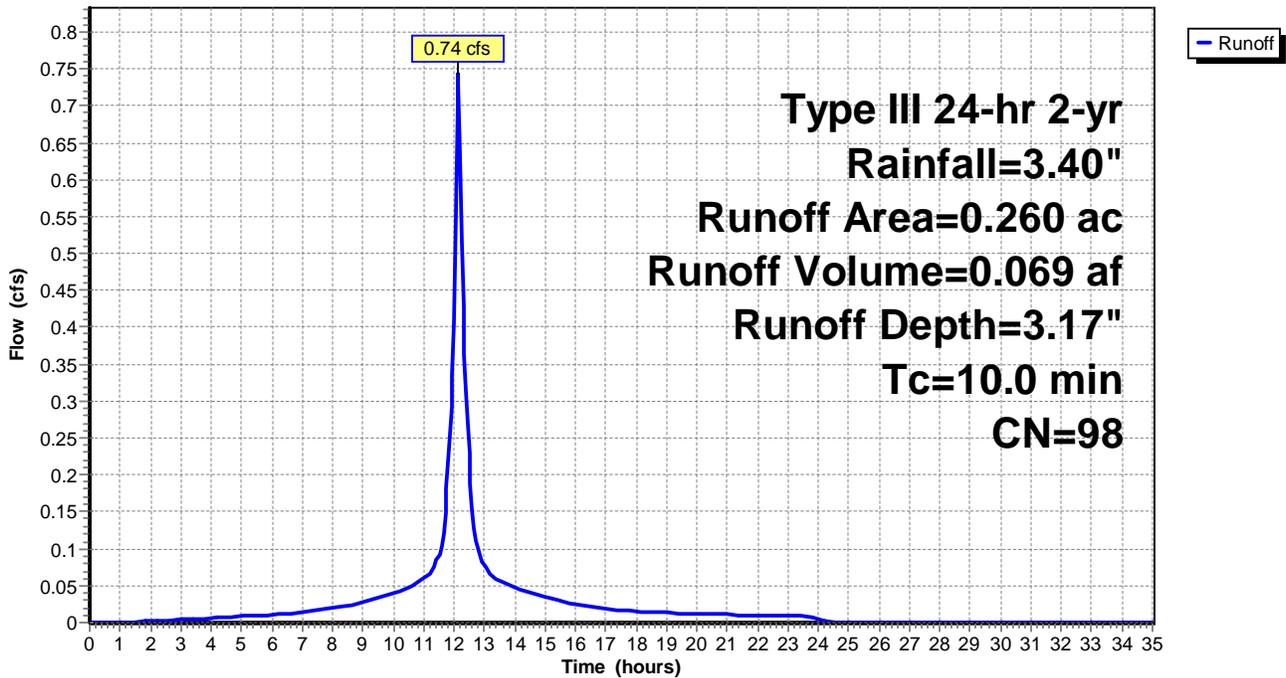
**Subcatchment 4S: Pervious**

Hydrograph



**Subcatchment 5S: Impervious**

Hydrograph



**post-dev-conditions**

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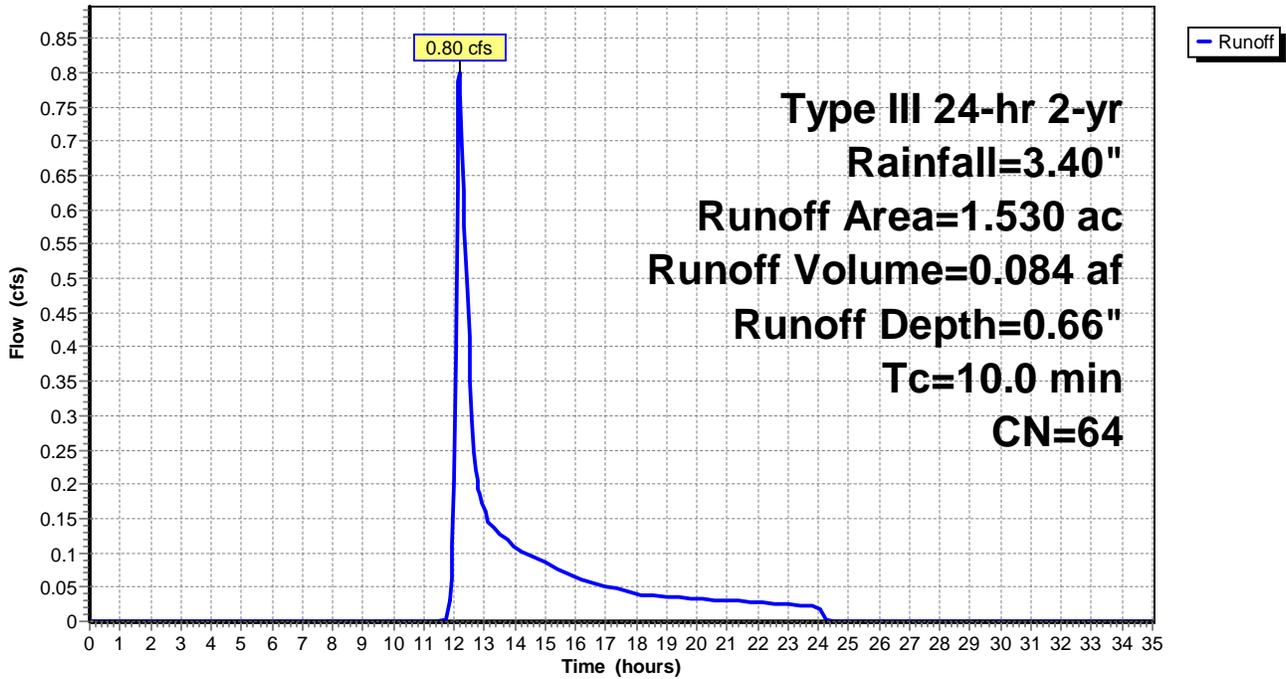
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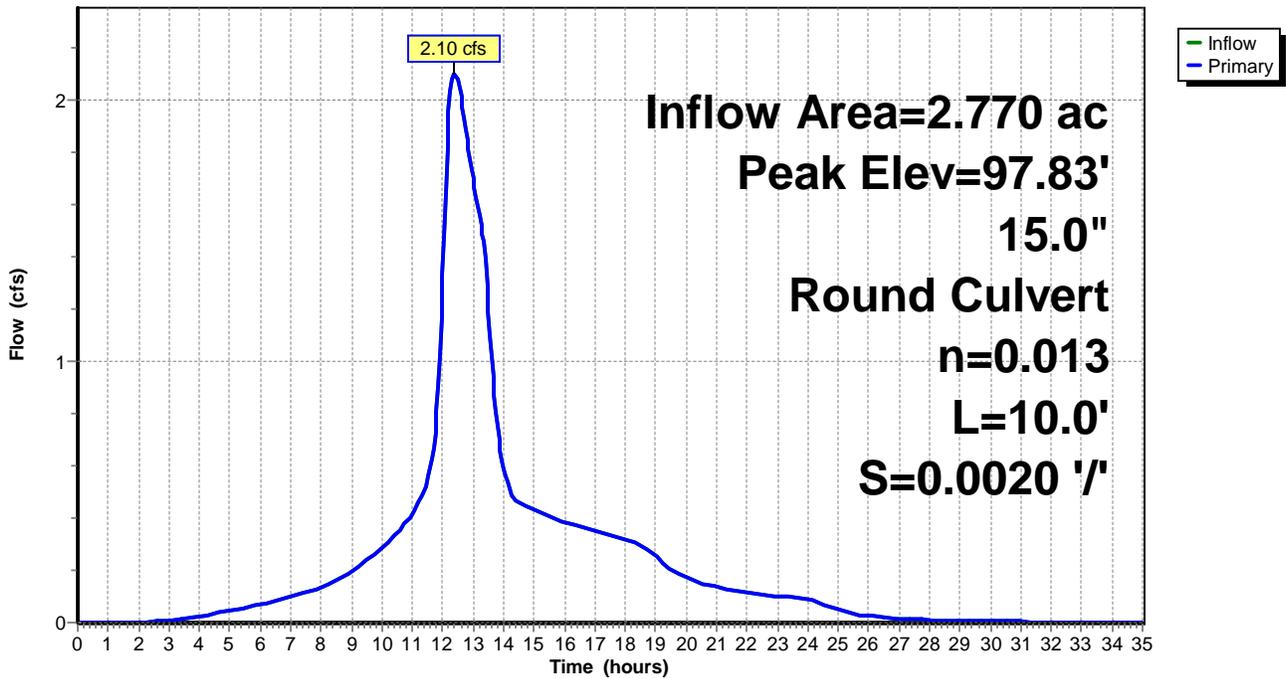
**Subcatchment 8S: BYPASS PERV.**

Hydrograph



**Pond 2P: AquaFilter**

Hydrograph



**post-dev-conditions**

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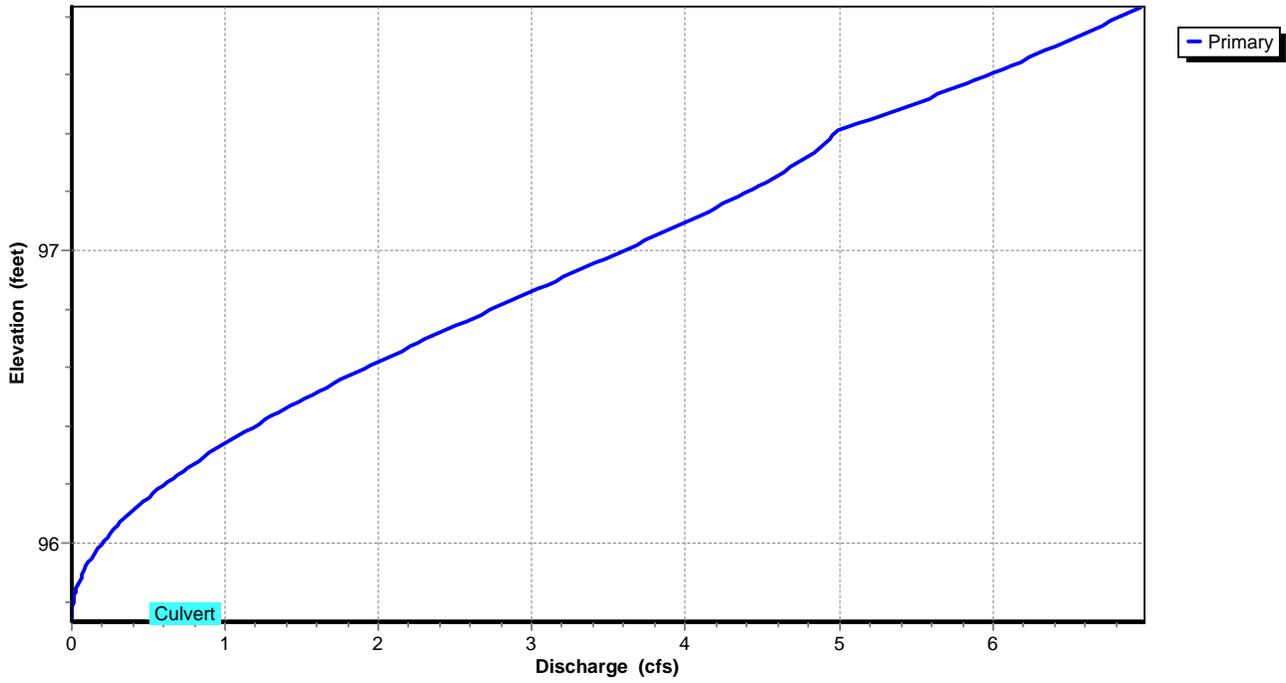
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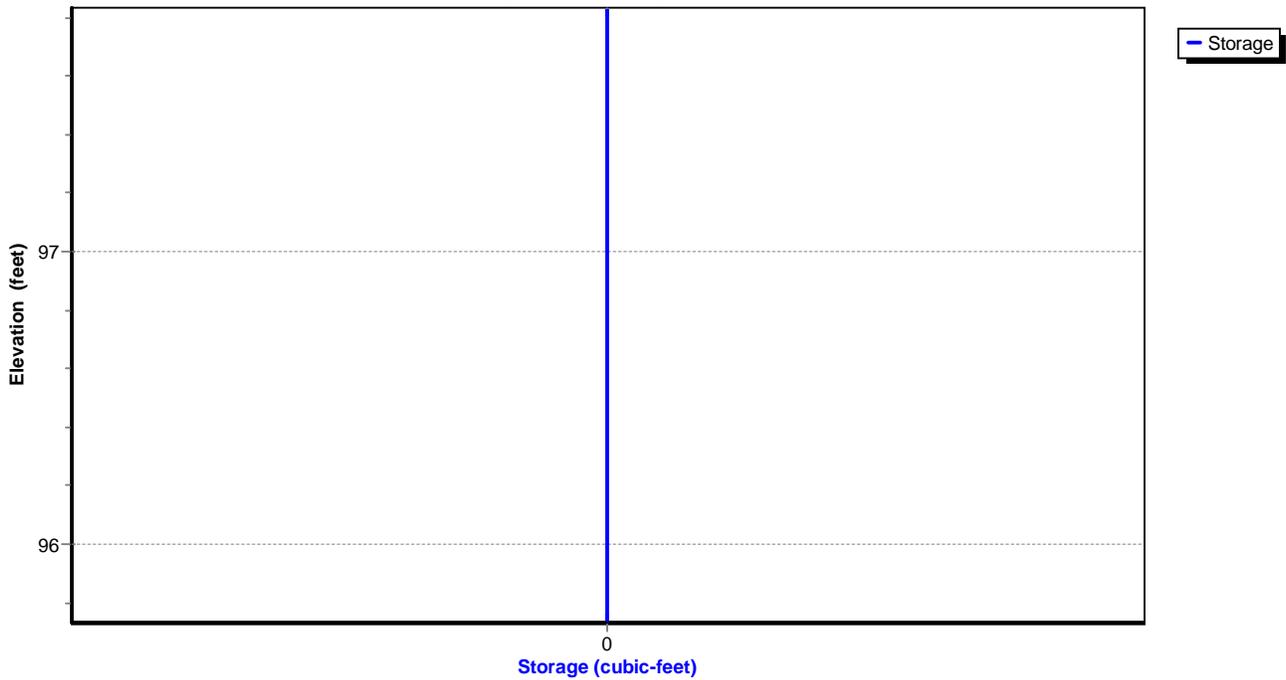
**Pond 2P: AquaFilter**

Stage-Discharge



**Pond 2P: AquaFilter**

Stage-Area-Storage



**post-dev-conditions**

Prepared by DW Smith Associates

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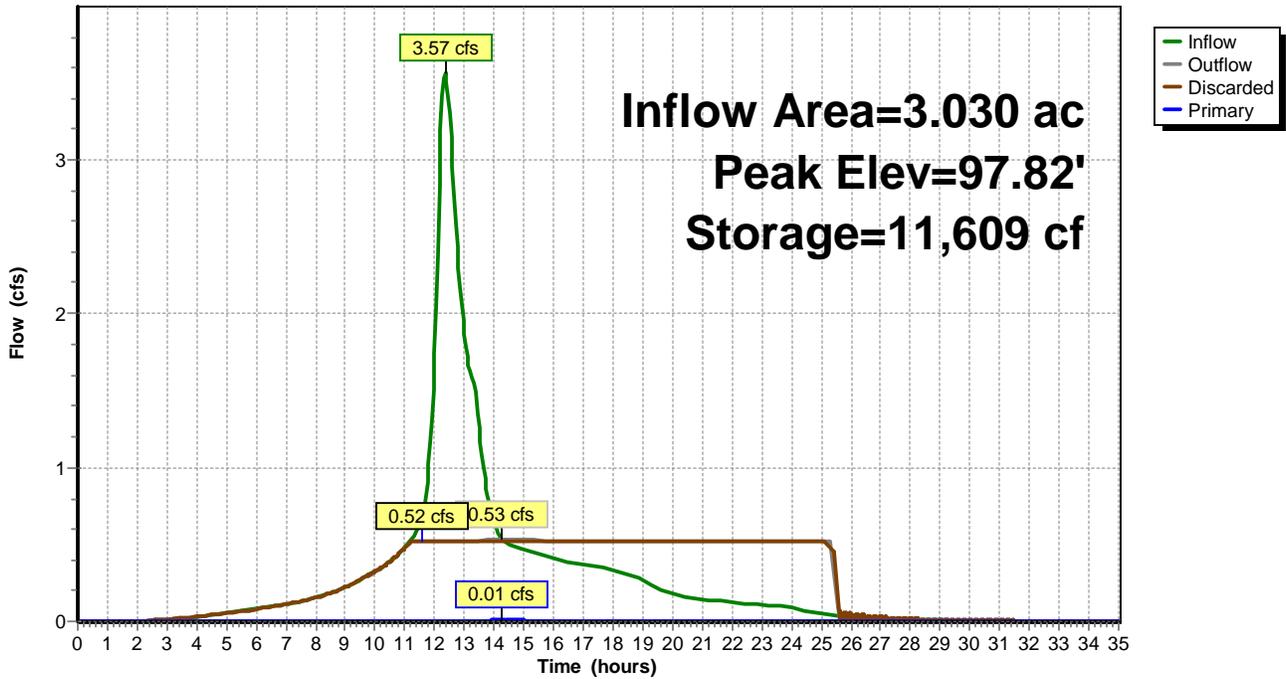
amended site design

Type III 24-hr 2-yr Rainfall=3.40"

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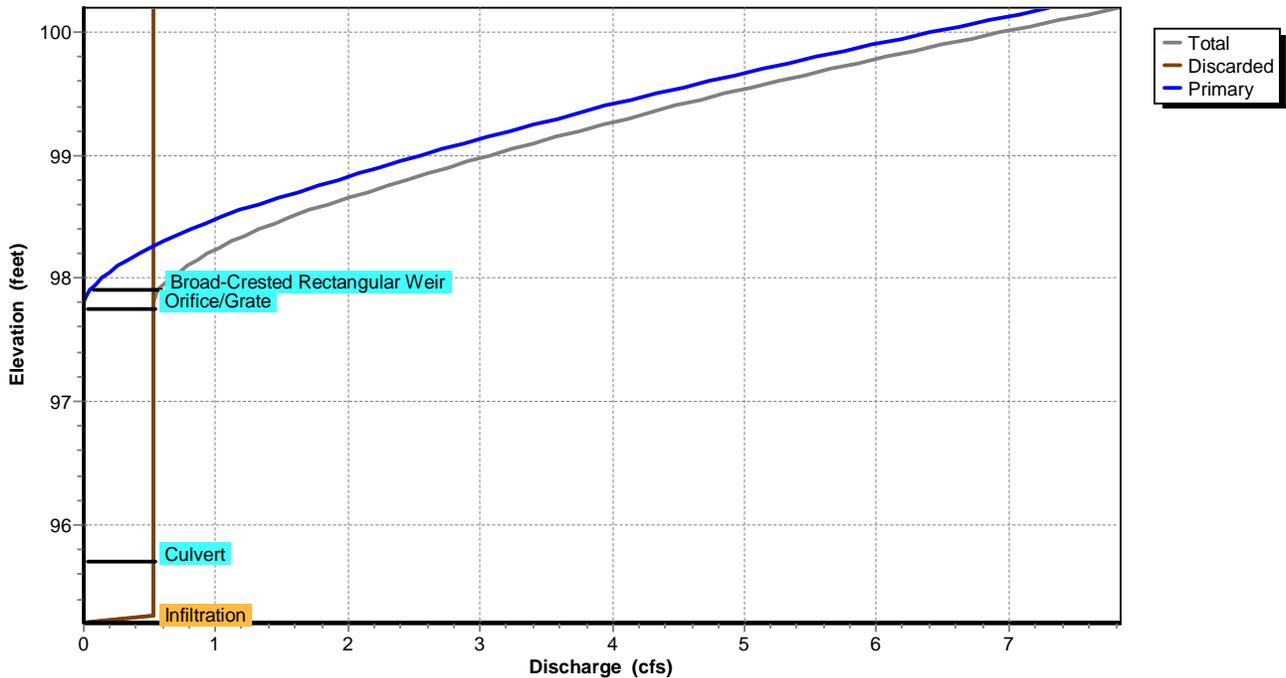
**Pond 3P: UNDERGROUND RECHARGE**

Hydrograph



**Pond 3P: UNDERGROUND RECHARGE**

Stage-Discharge



**post-dev-conditions**

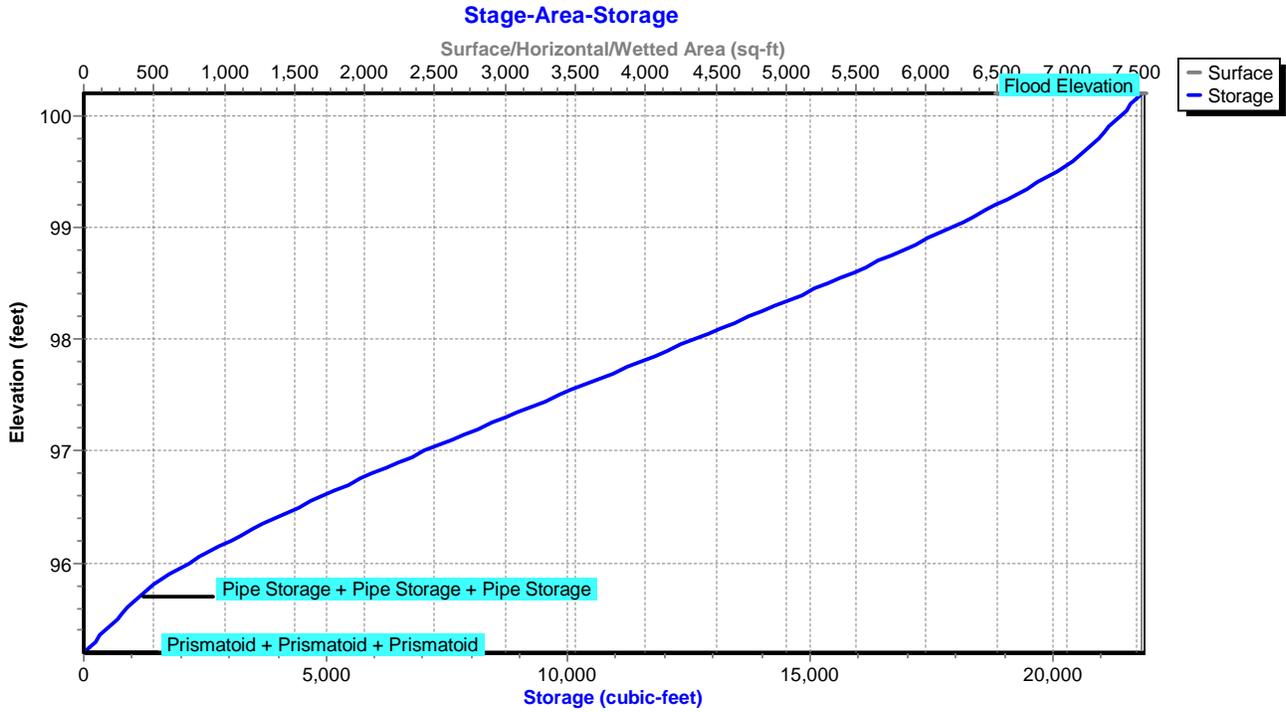
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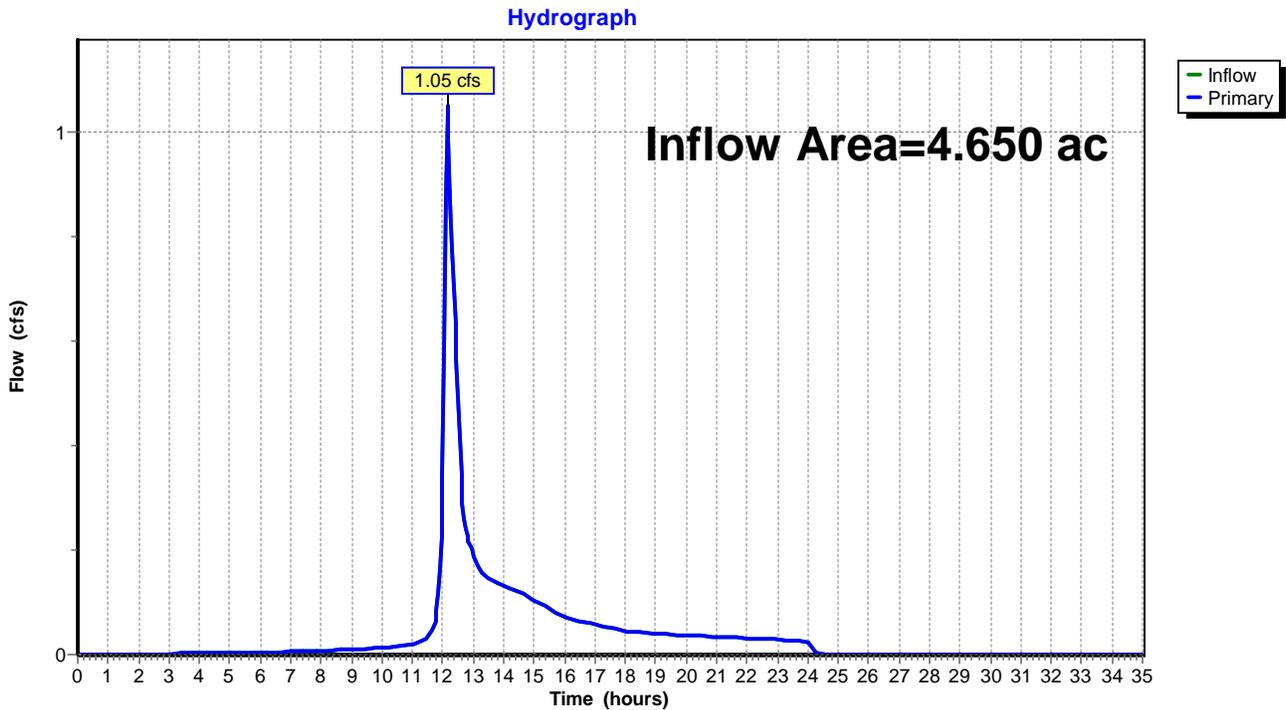
amended site design  
Type III 24-hr 2-yr Rainfall=3.40"

Printed 12/14/2016

**Pond 3P: UNDERGROUND RECHARGE**



**Pond 4P: SUMMATION**



**post-dev-conditions**

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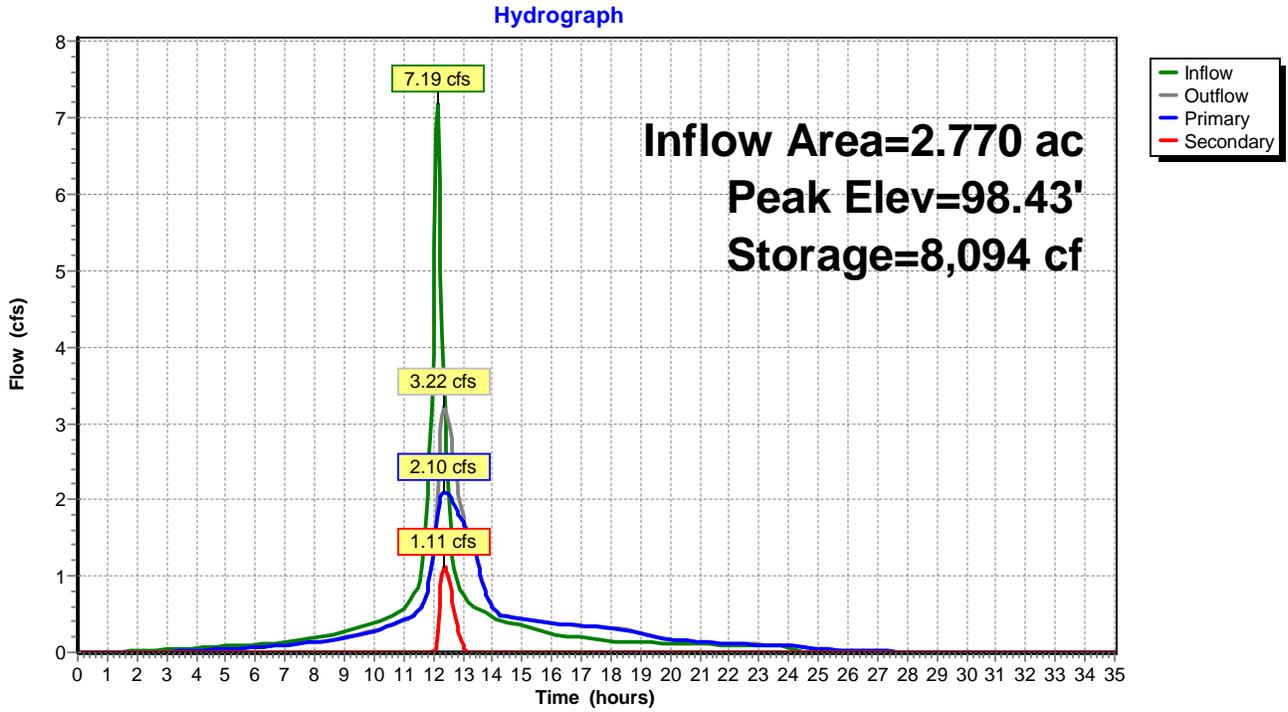
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amended site design

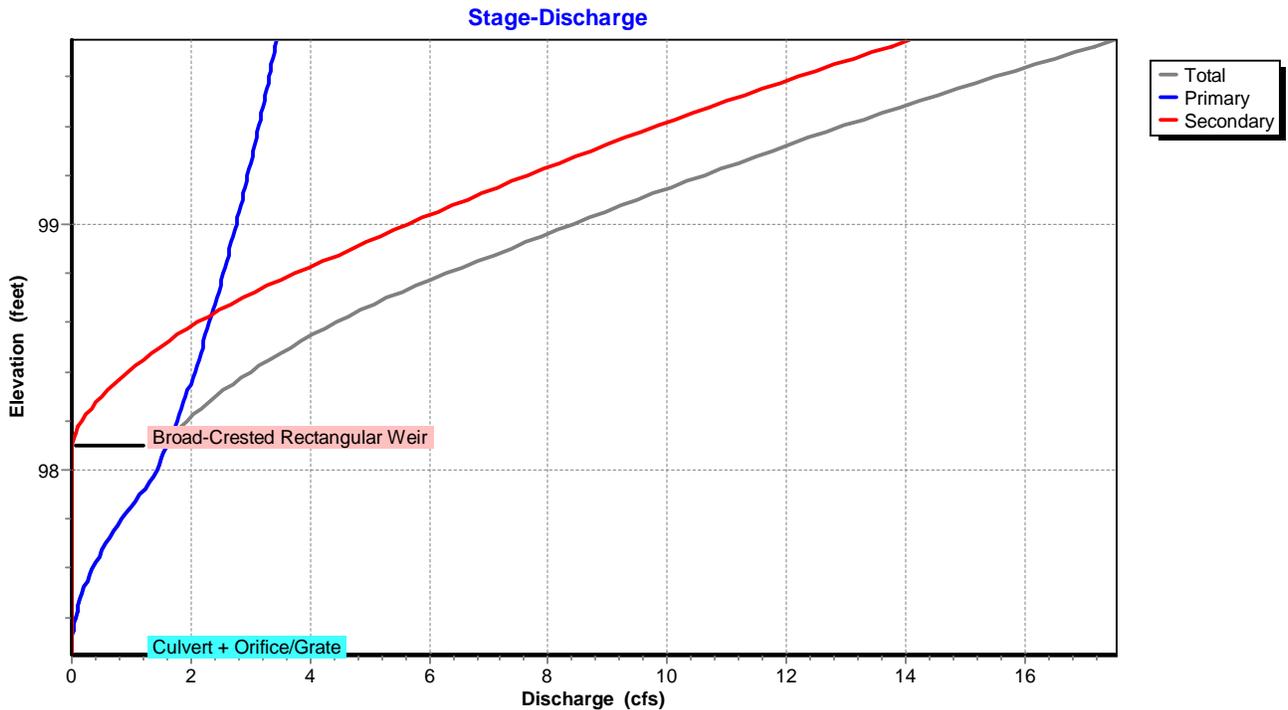
Type III 24-hr 2-yr Rainfall=3.40"

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**Pond 5P: UNDERGROUND DETENTION**



**Pond 5P: UNDERGROUND DETENTION**



**post-dev-conditions**

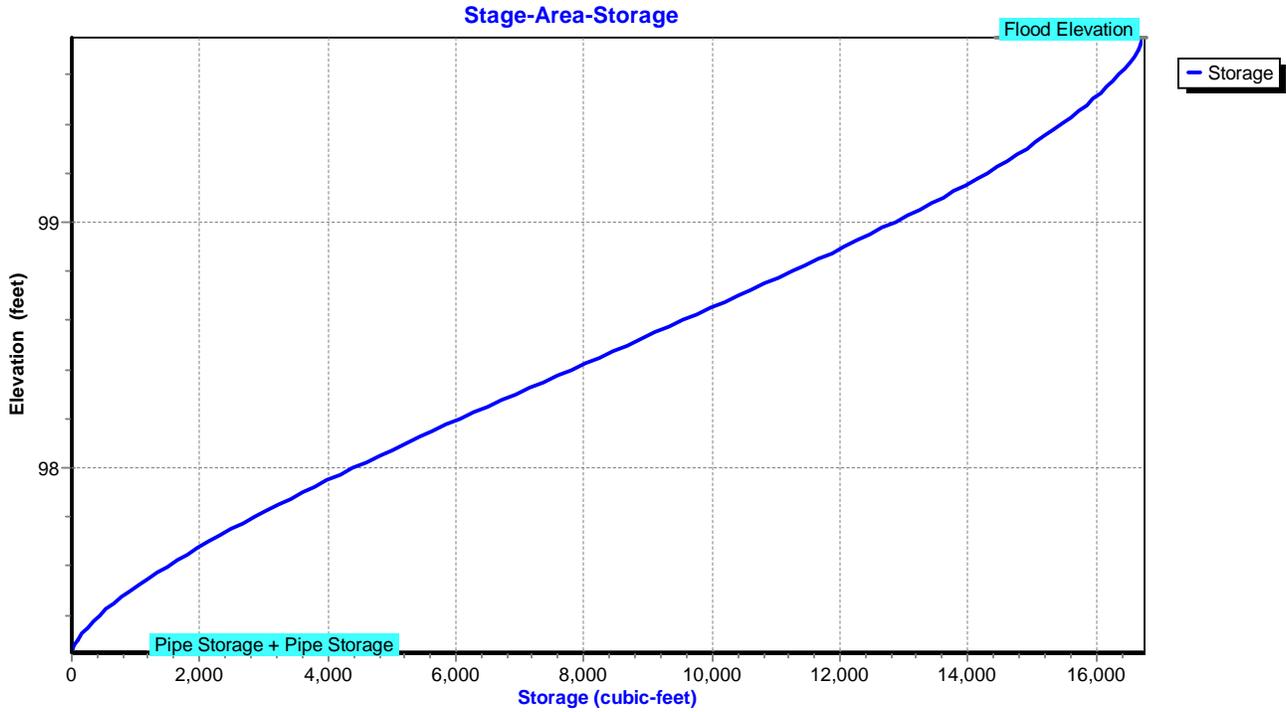
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amended site design  
Type III 24-hr 2-yr Rainfall=3.40"

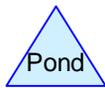
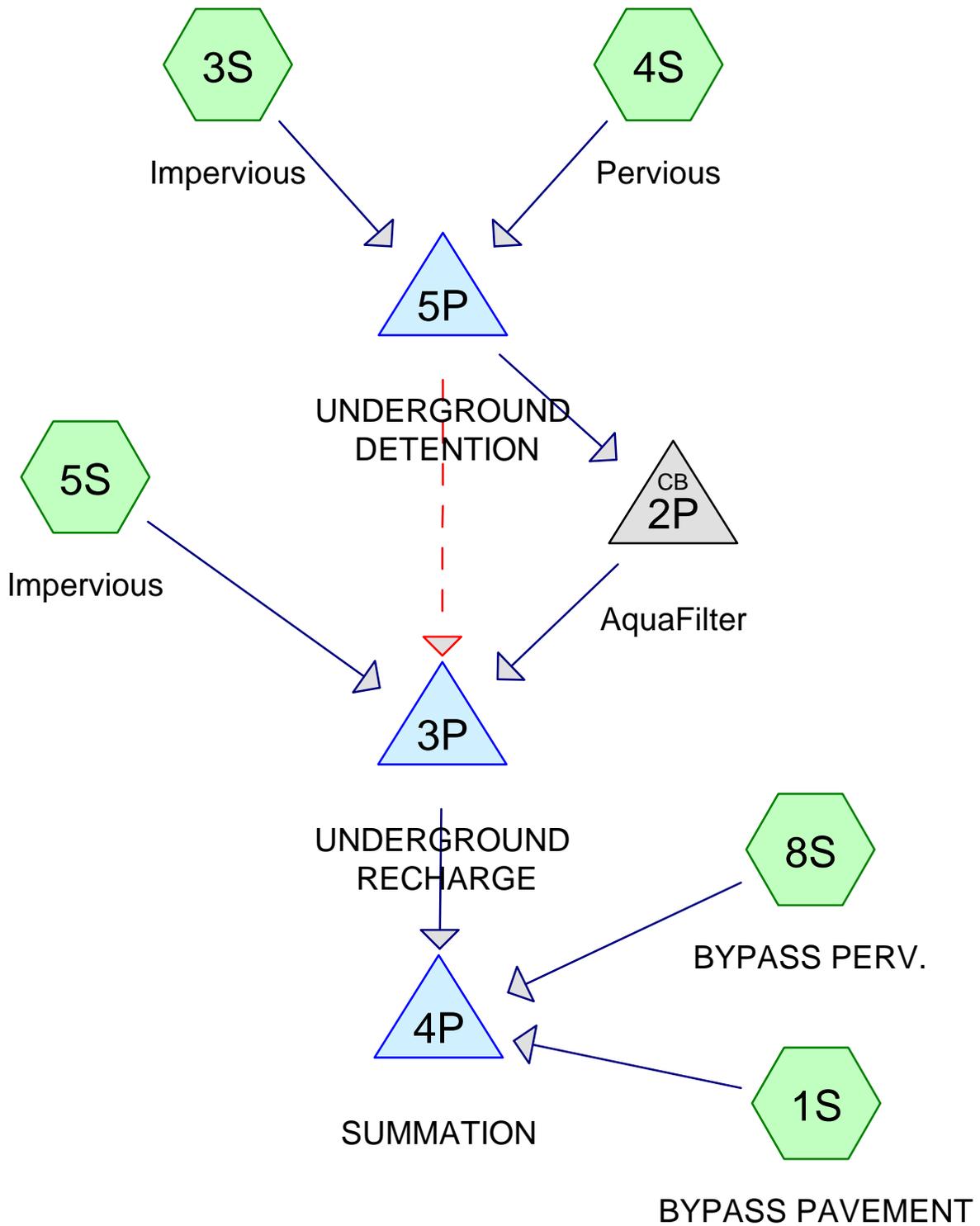
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**Pond 5P: UNDERGROUND DETENTION**



## **10 Year Storm**

### **Post Development Calculations – Amended Site Plan**



**Drainage Diagram for post-dev-conditions**  
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**post-dev-conditions**

Prepared by DW Smith Associates

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amended site design

Type III 24-hr 10-yr Rainfall=5.20"

Printed 12/14/2016

Time span=0.00-35.00 hrs, dt=0.05 hrs, 701 points

Runoff by SCS TR-20 method, UH=SCS

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

**Subcatchment 1S: BYPASS PAVEMENT** Runoff Area=0.090 ac 100.00% Impervious Runoff Depth=4.96"  
Tc=10.0 min CN=98 Runoff=0.40 cfs 0.037 af

**Subcatchment 3S: Impervious** Runoff Area=2.480 ac 100.00% Impervious Runoff Depth=4.96"  
Tc=10.0 min CN=98 Runoff=10.92 cfs 1.026 af

**Subcatchment 4S: Pervious** Runoff Area=0.290 ac 0.00% Impervious Runoff Depth=1.49"  
Tc=10.0 min CN=61 Runoff=0.40 cfs 0.036 af

**Subcatchment 5S: Impervious** Runoff Area=0.260 ac 100.00% Impervious Runoff Depth=4.96"  
Tc=10.0 min CN=98 Runoff=1.15 cfs 0.108 af

**Subcatchment 8S: BYPASS PERV.** Runoff Area=1.530 ac 0.00% Impervious Runoff Depth=1.71"  
Tc=10.0 min CN=64 Runoff=2.52 cfs 0.218 af

**Pond 2P: AquaFilter** Peak Elev=98.49' Inflow=2.55 cfs 0.766 af  
15.0" Round Culvert n=0.013 L=10.0' S=0.0020 '/ Outflow=2.55 cfs 0.766 af

**Pond 3P: UNDERGROUND RECHARGE** Peak Elev=98.48' Storage=15,250 cf Inflow=6.94 cfs 1.168 af  
Discarded=0.52 cfs 0.945 af Primary=1.00 cfs 0.224 af Outflow=1.52 cfs 1.169 af

**Pond 4P: SUMMATION** Inflow=2.91 cfs 0.480 af  
Primary=2.91 cfs 0.480 af

**Pond 5P: UNDERGROUND DETENTION** Peak Elev=98.80' Storage=11,257 cf Inflow=11.32 cfs 1.062 af  
Primary=2.55 cfs 0.766 af Secondary=3.75 cfs 0.295 af Outflow=6.30 cfs 1.061 af

**Total Runoff Area = 4.650 ac Runoff Volume = 1.425 af Average Runoff Depth = 3.68"**  
**39.14% Pervious = 1.820 ac 60.86% Impervious = 2.830 ac**

**post-dev-conditions**

Prepared by DW Smith Associates

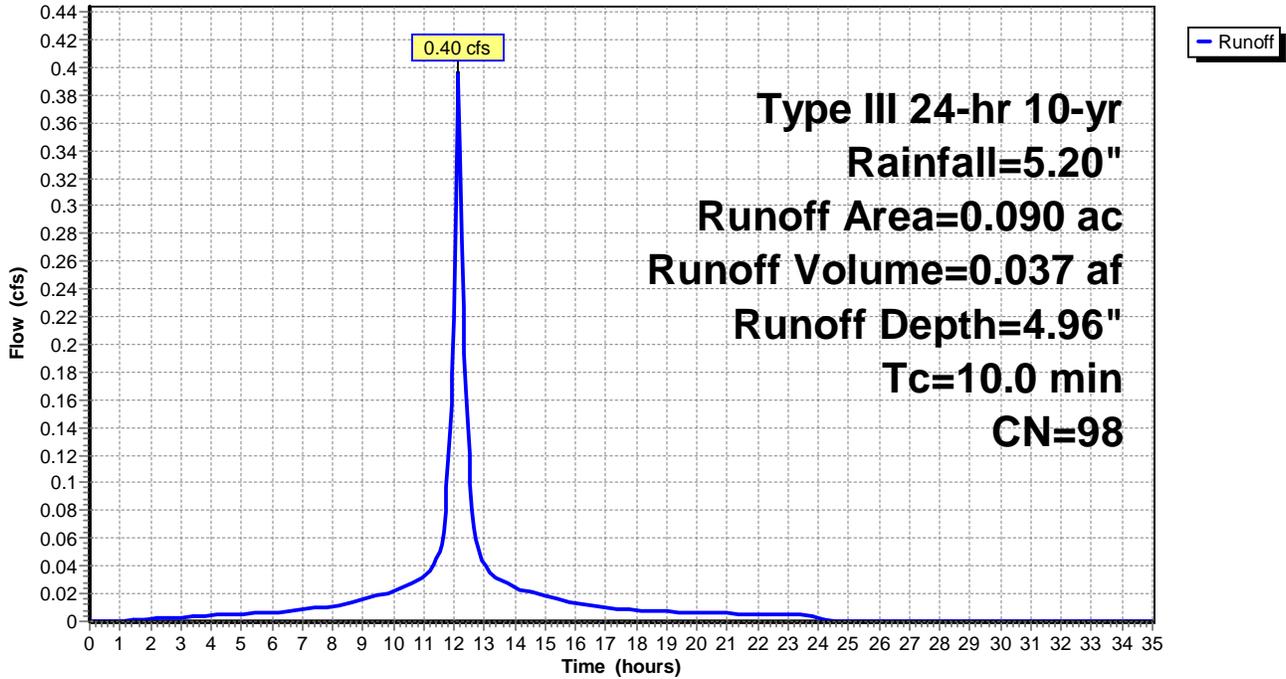
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amended site design  
Type III 24-hr 10-yr Rainfall=5.20"

Printed 12/14/2016

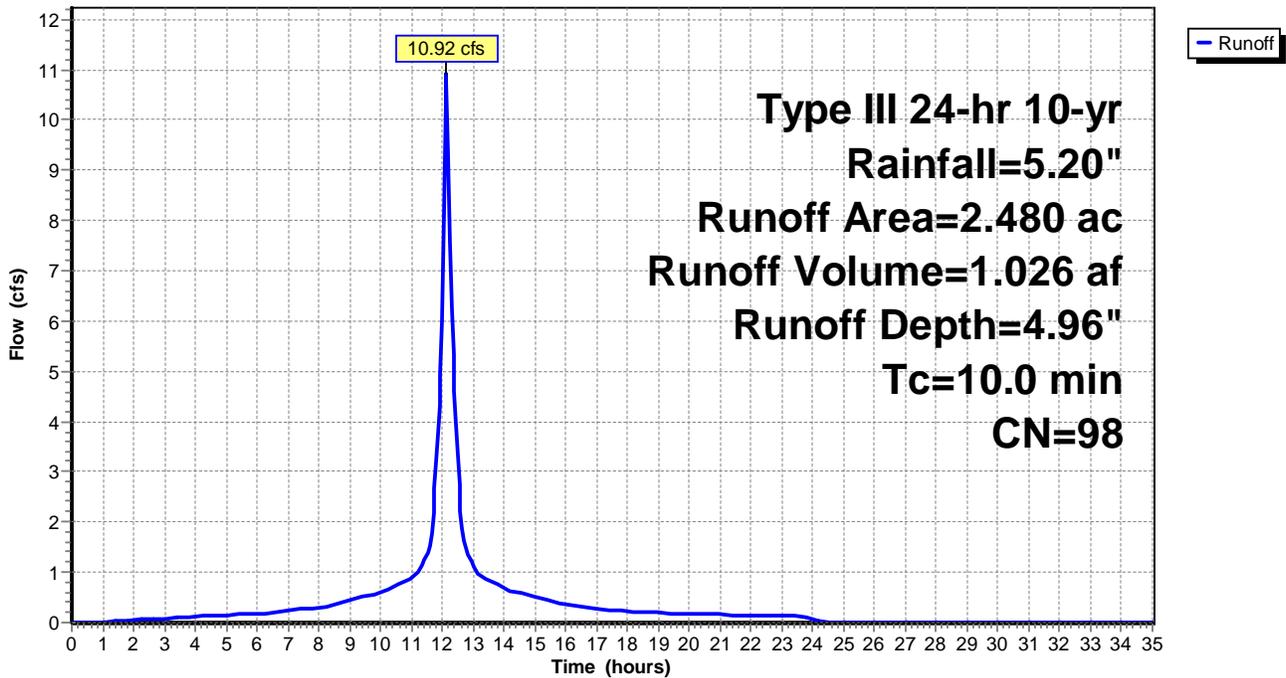
**Subcatchment 1S: BYPASS PAVEMENT**

Hydrograph



**Subcatchment 3S: Impervious**

Hydrograph



**post-dev-conditions**

Prepared by DW Smith Associates

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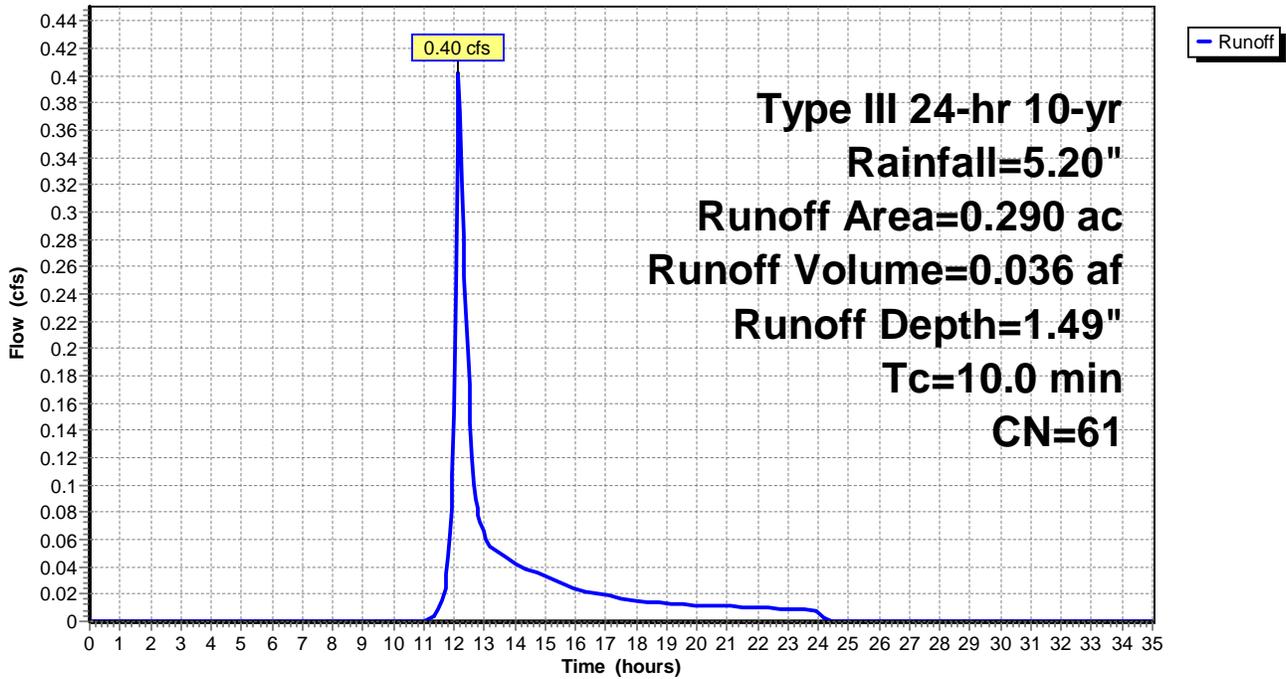
amended site design

Type III 24-hr 10-yr Rainfall=5.20"

Printed 12/14/2016

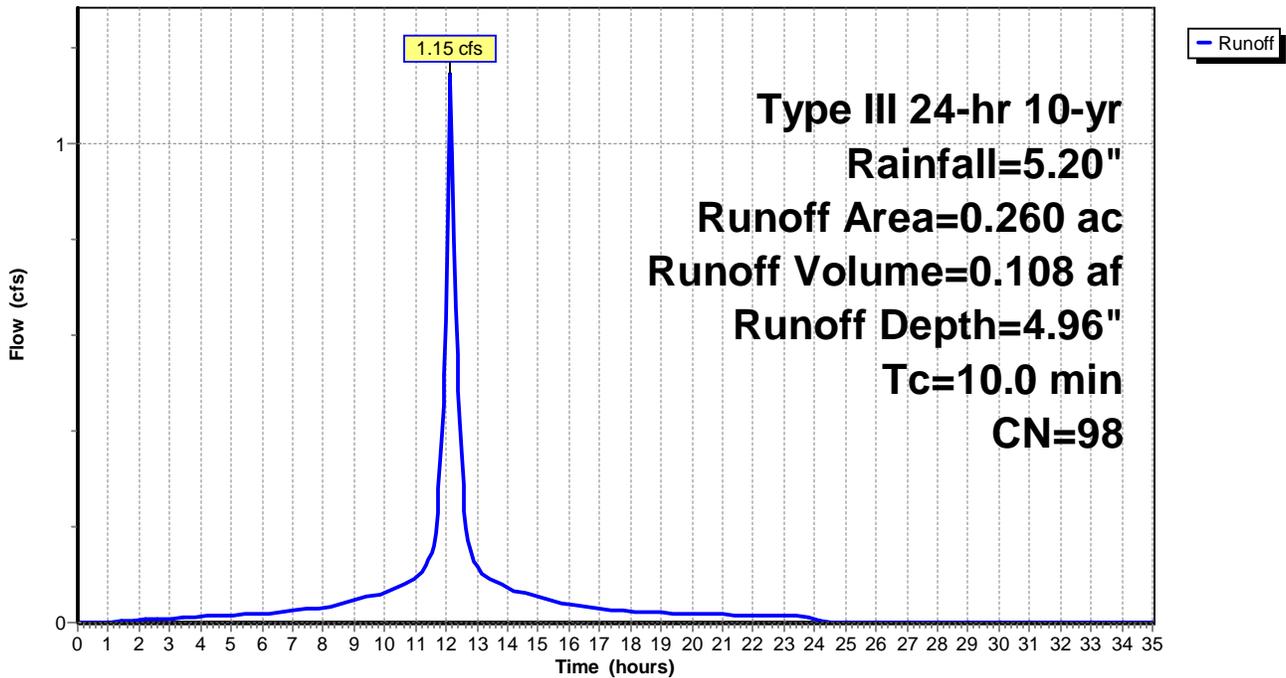
**Subcatchment 4S: Pervious**

Hydrograph



**Subcatchment 5S: Impervious**

Hydrograph



**post-dev-conditions**

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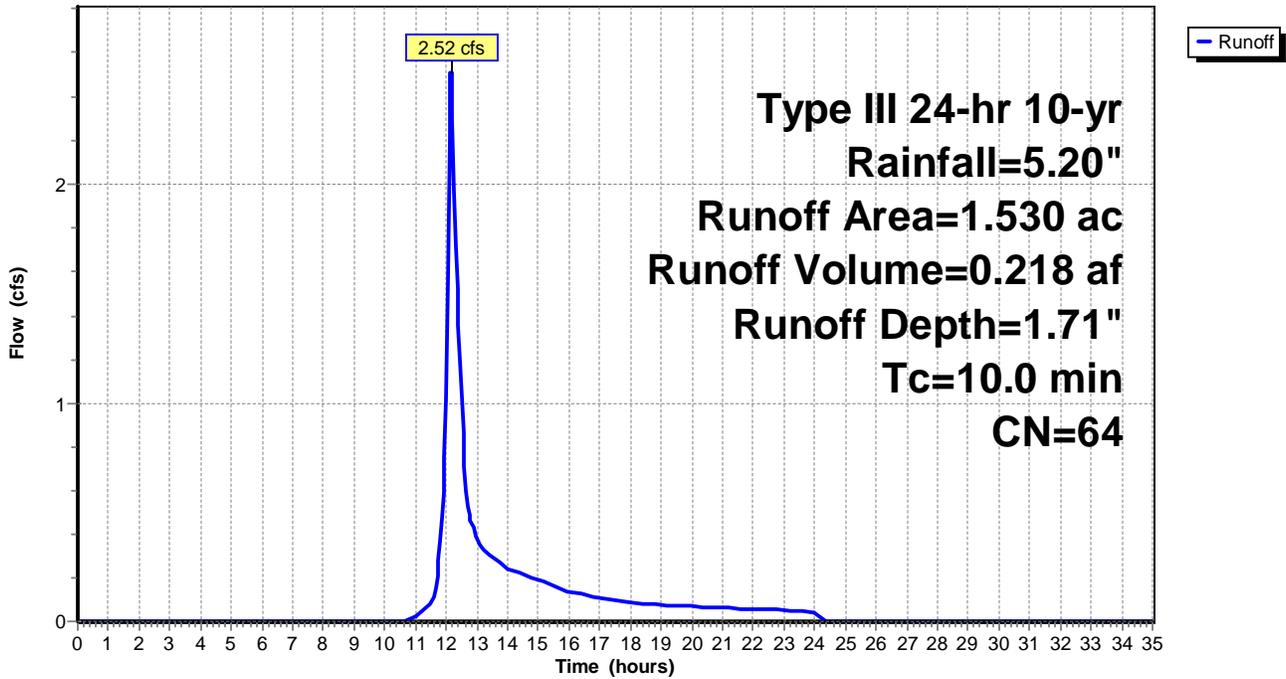
amended site design

Type III 24-hr 10-yr Rainfall=5.20"

Printed 12/14/2016

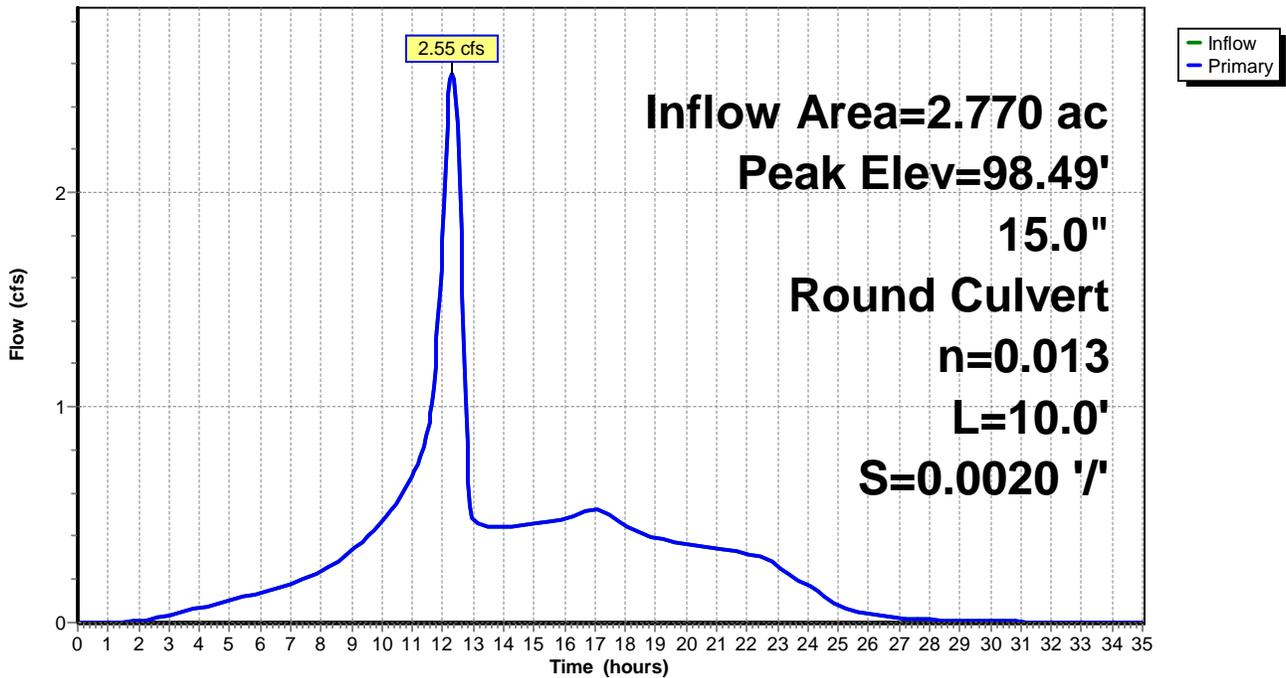
**Subcatchment 8S: BYPASS PERV.**

Hydrograph



**Pond 2P: AquaFilter**

Hydrograph



**post-dev-conditions**

Prepared by DW Smith Associates

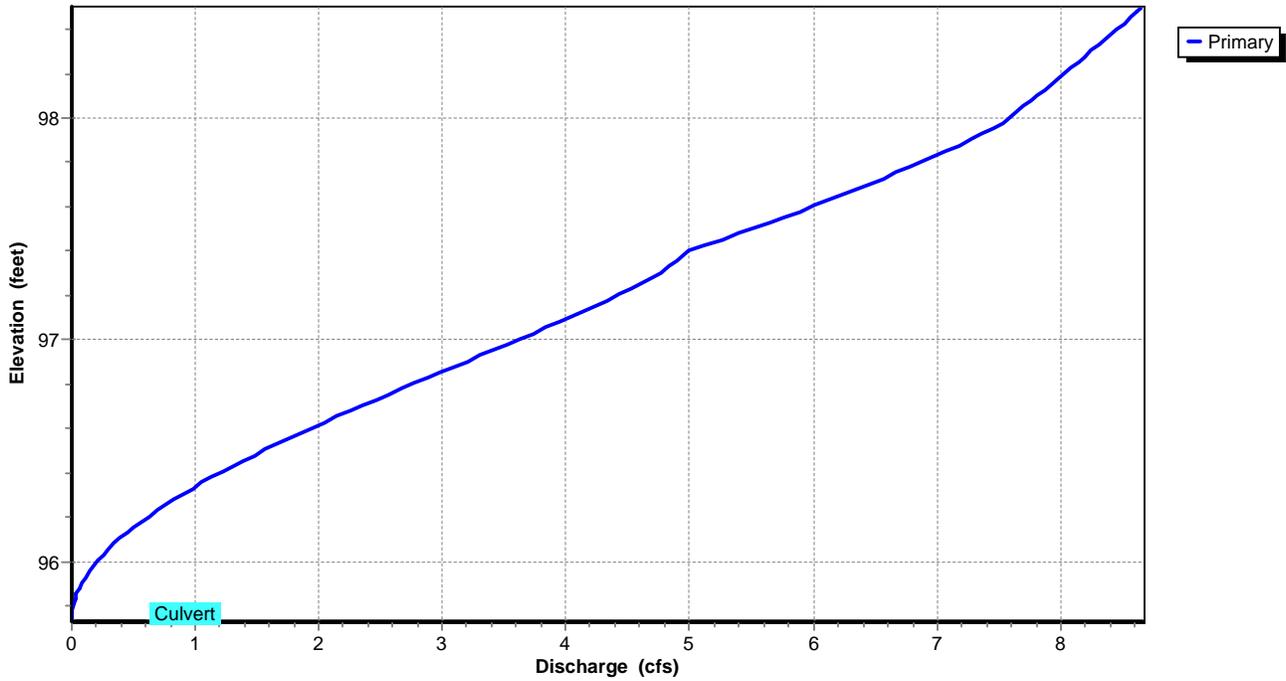
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amended site design  
Type III 24-hr 10-yr Rainfall=5.20"

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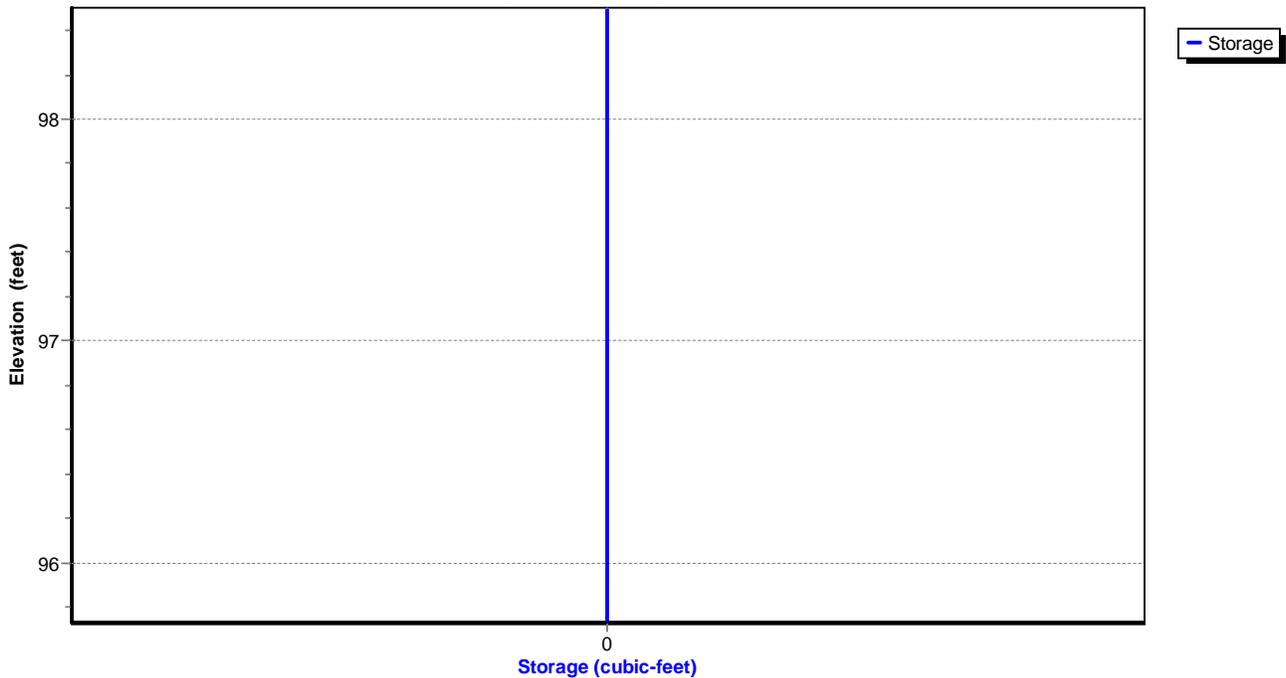
**Pond 2P: AquaFilter**

Stage-Discharge



**Pond 2P: AquaFilter**

Stage-Area-Storage



**post-dev-conditions**

Prepared by DW Smith Associates

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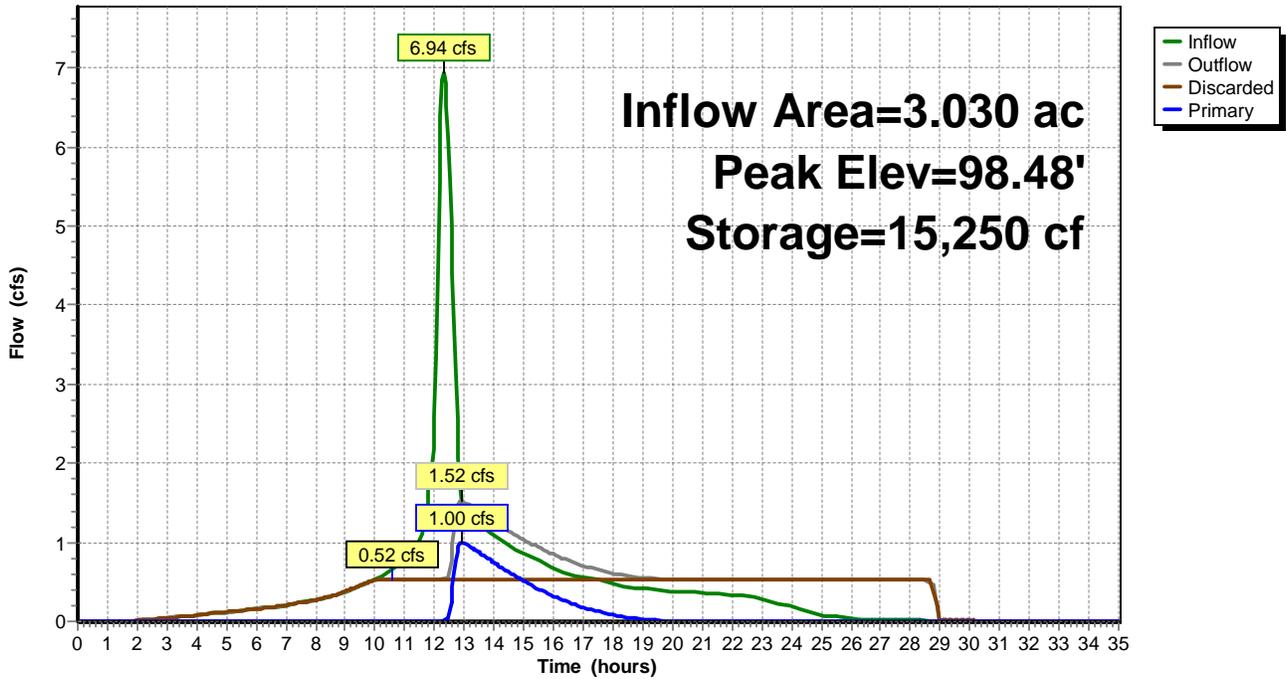
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Type III 24-hr 10-yr Rainfall=5.20"

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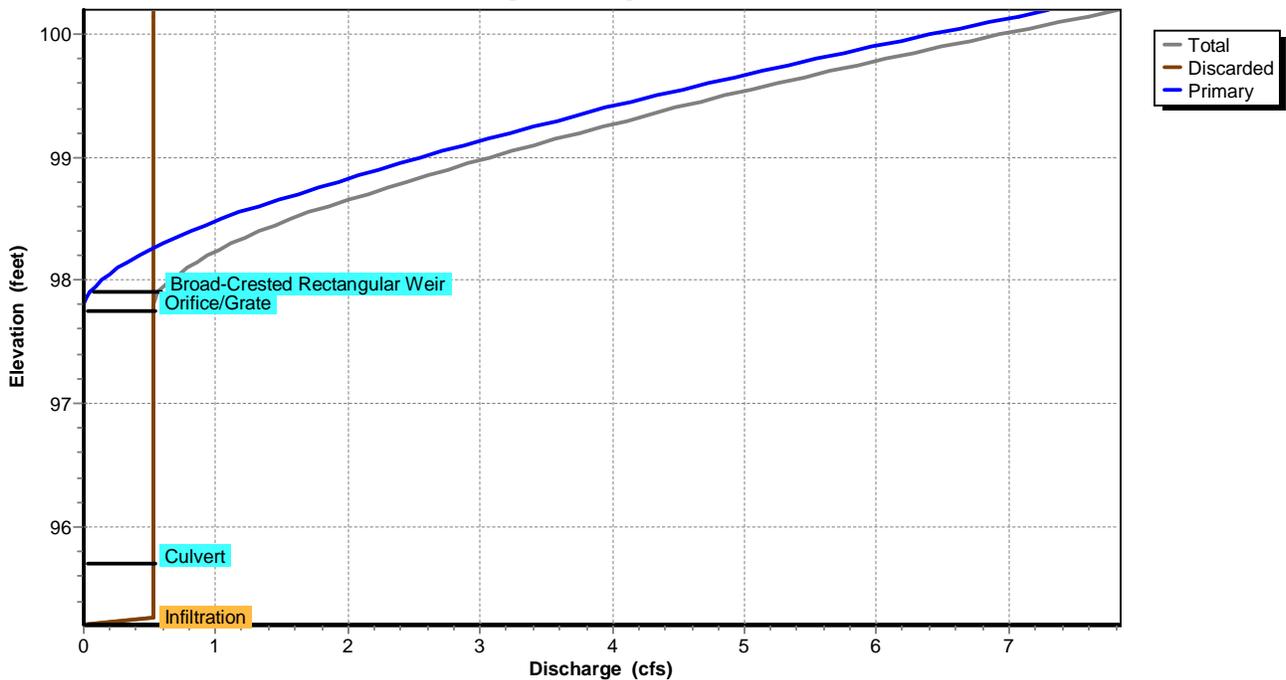
**Pond 3P: UNDERGROUND RECHARGE**

Hydrograph



**Pond 3P: UNDERGROUND RECHARGE**

Stage-Discharge



**post-dev-conditions**

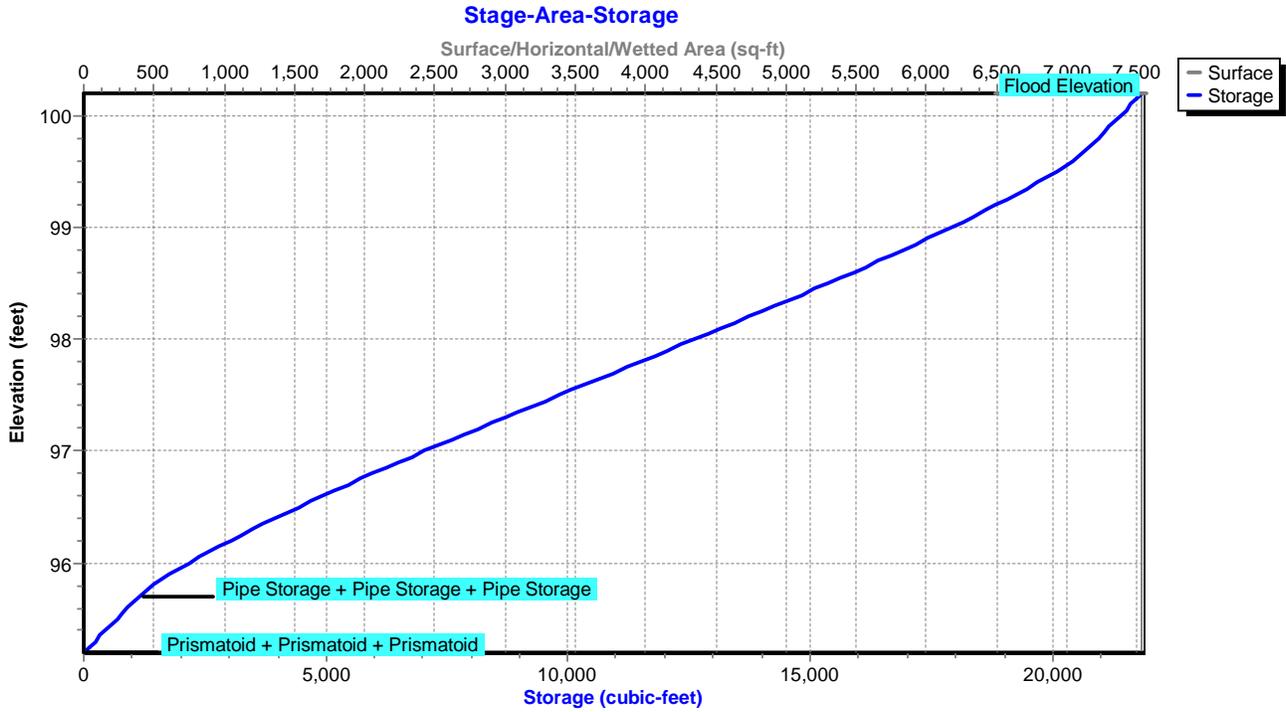
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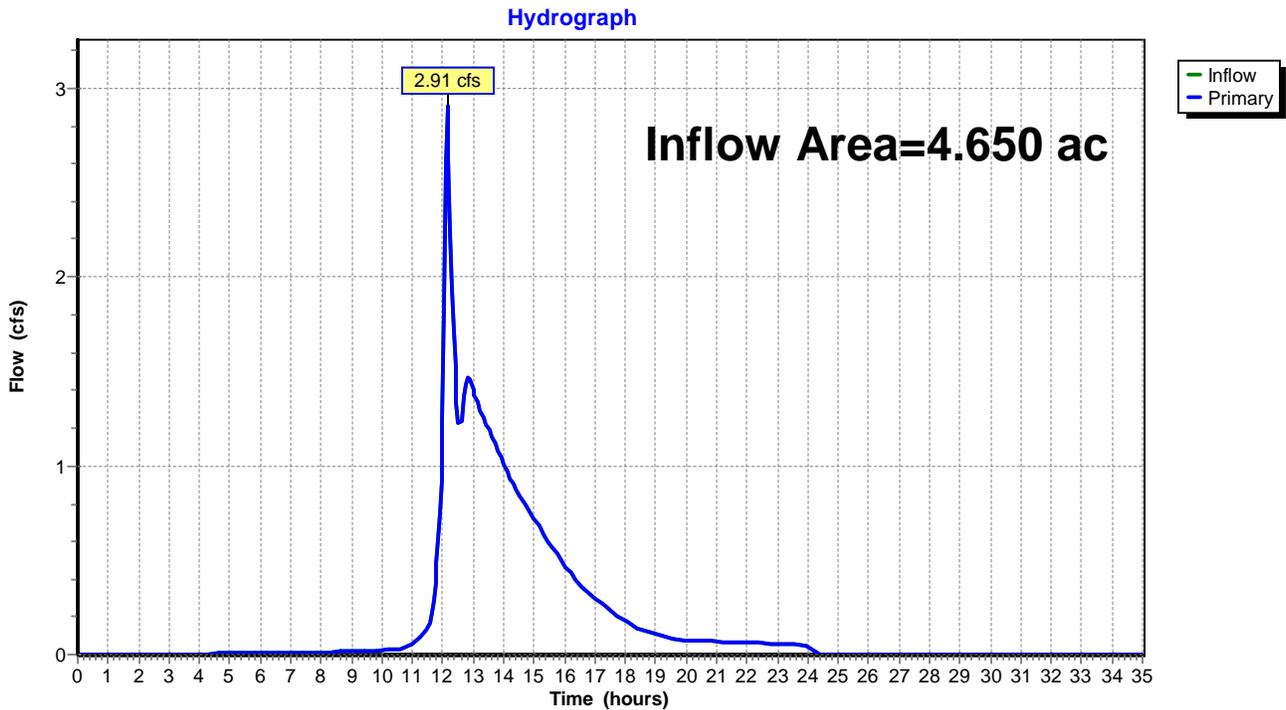
amended site design  
Type III 24-hr 10-yr Rainfall=5.20"

Printed 12/14/2016

**Pond 3P: UNDERGROUND RECHARGE**



**Pond 4P: SUMMATION**



**post-dev-conditions**

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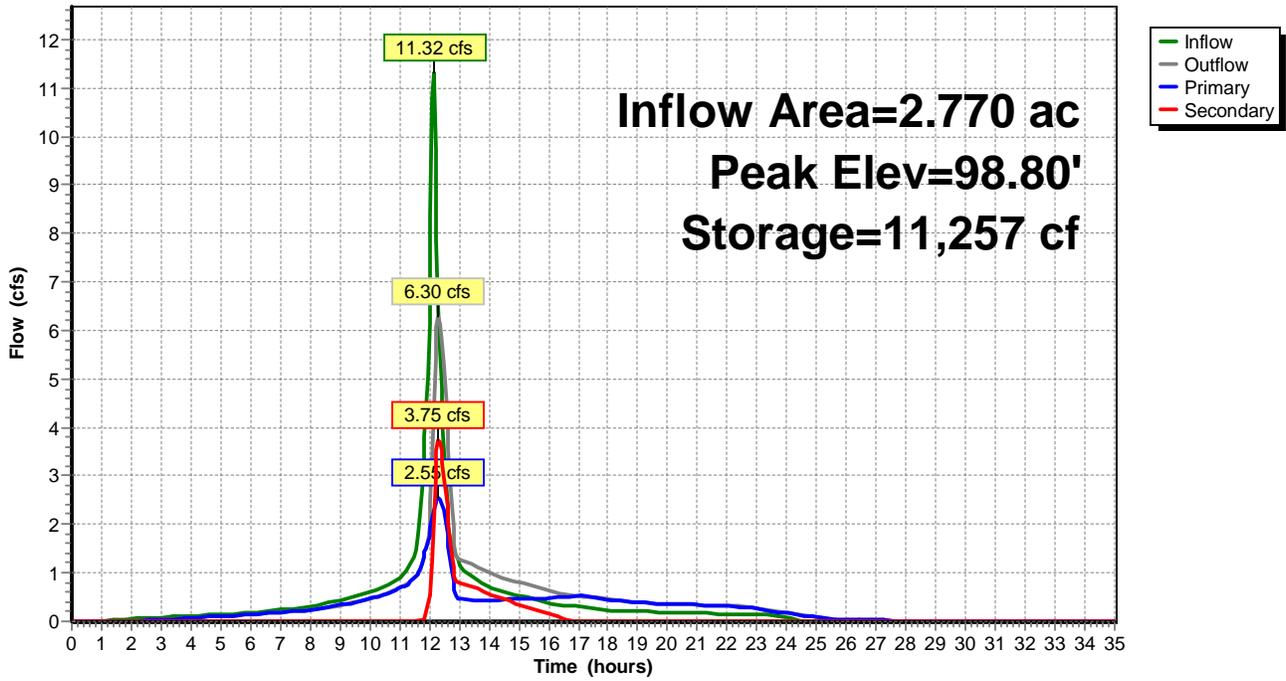
amended site design

Type III 24-hr 10-yr Rainfall=5.20"

Printed 12/14/2016

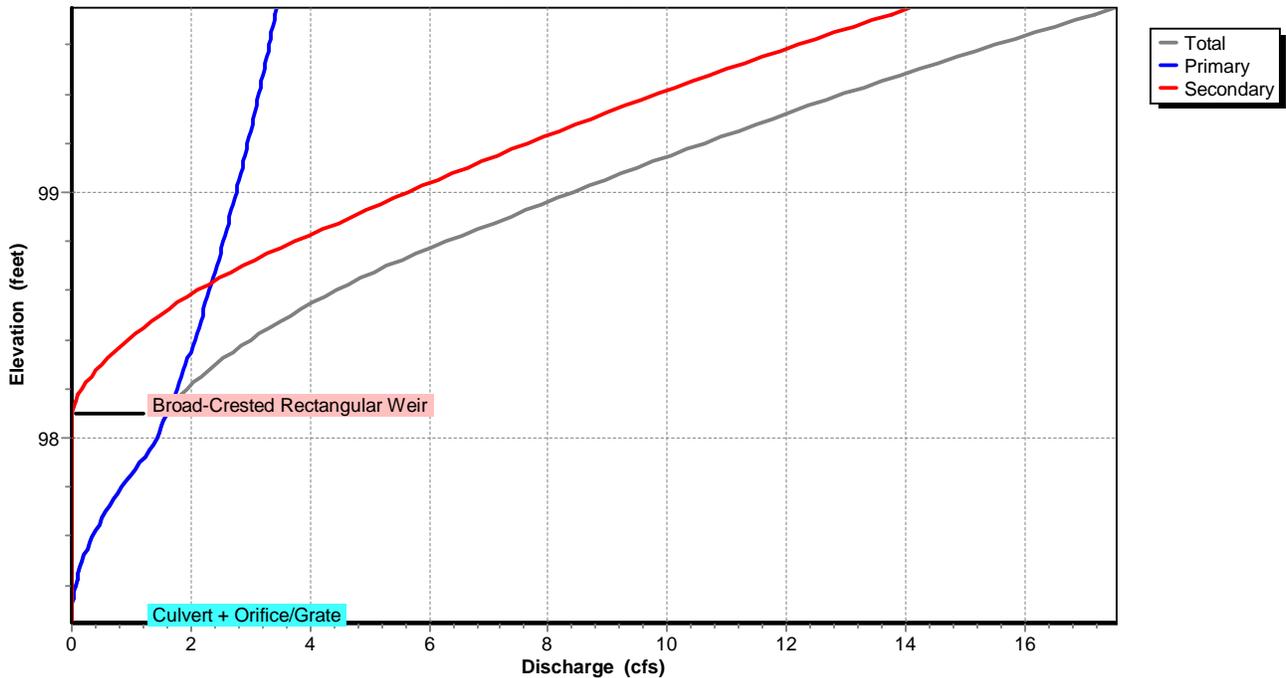
**Pond 5P: UNDERGROUND DETENTION**

Hydrograph



**Pond 5P: UNDERGROUND DETENTION**

Stage-Discharge



**post-dev-conditions**

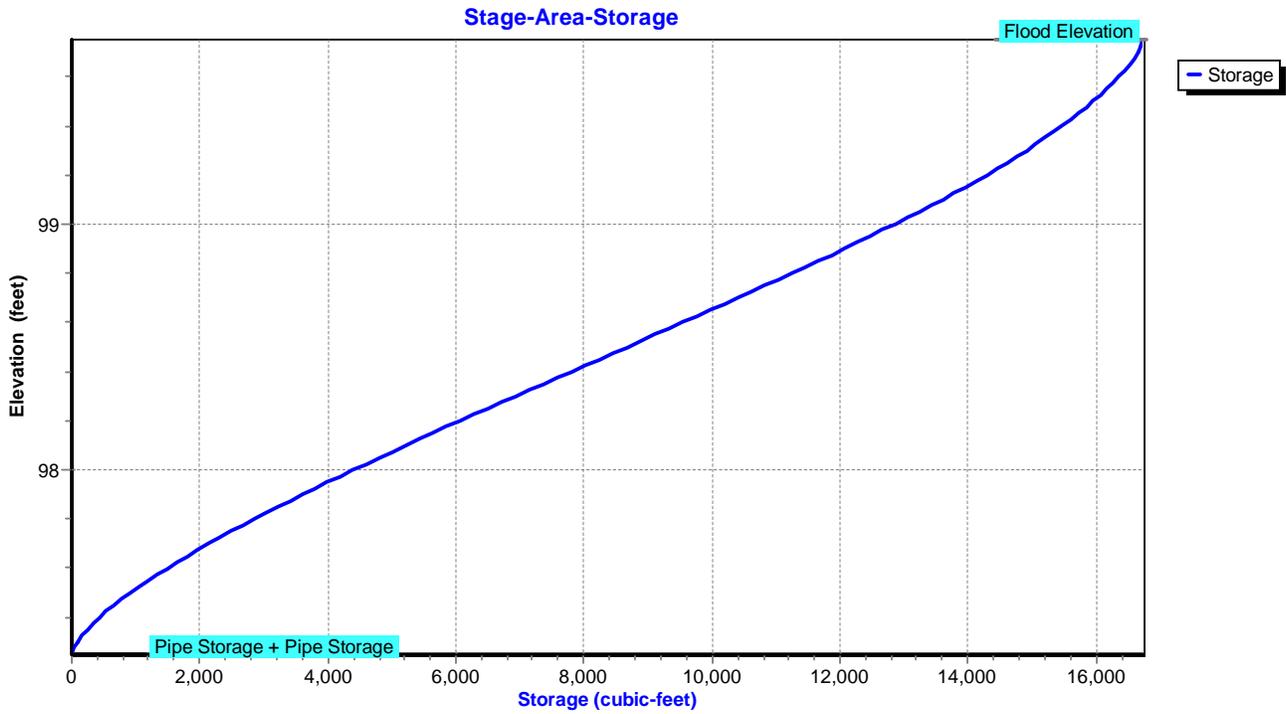
Prepared by DW Smith Associates

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amended site design  
Type III 24-hr 10-yr Rainfall=5.20"

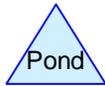
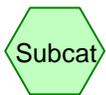
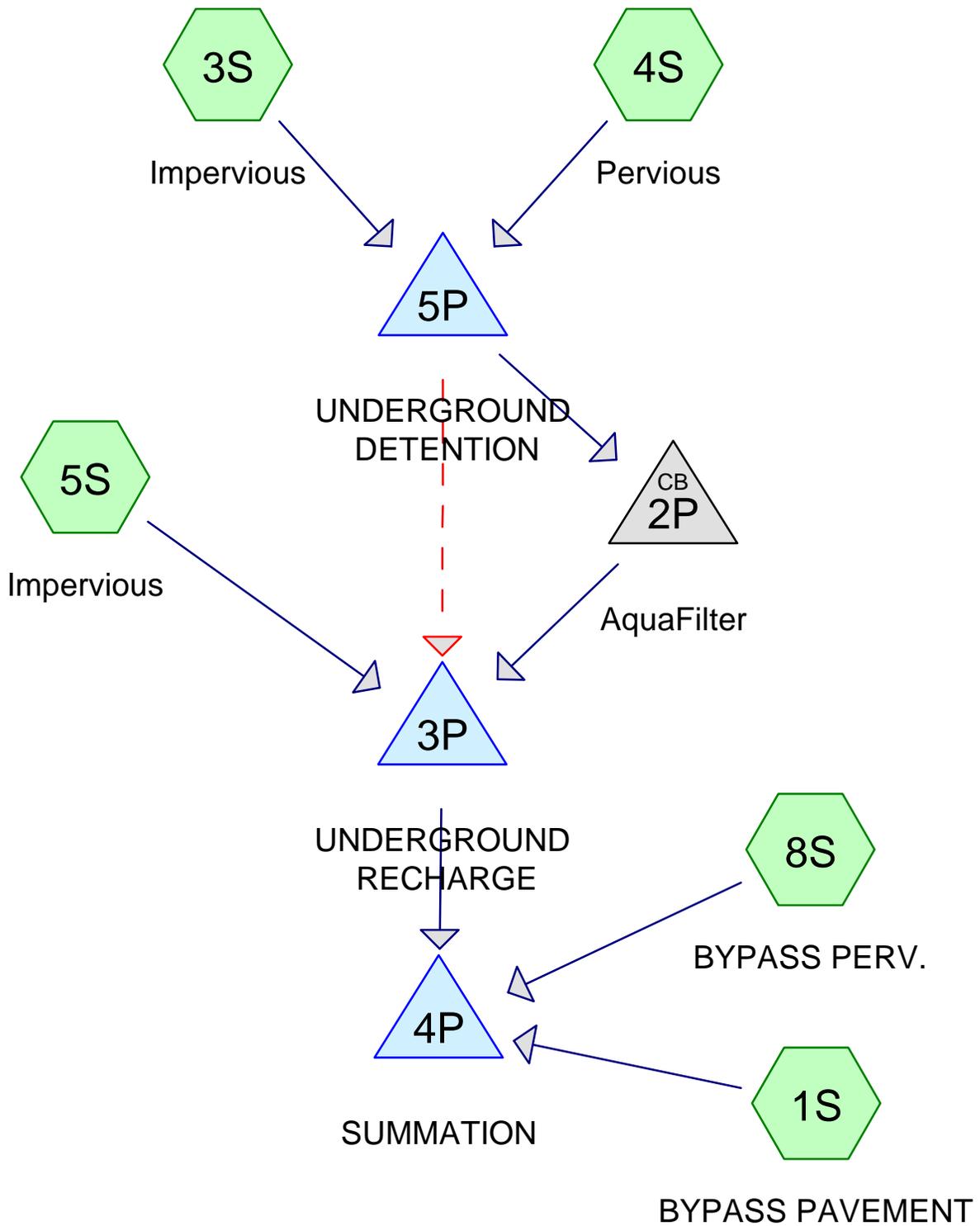
Printed 12/14/2016

**Pond 5P: UNDERGROUND DETENTION**



## **100 Year Storm**

### **Post Development Calculations – Amended Site Plan**



**Drainage Diagram for post-dev-conditions**  
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**post-dev-conditions**

Prepared by DW Smith Associates

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amended site design  
Type III 24-hr 100-yr Rainfall=8.90"

Printed 12/14/2016

Time span=0.00-35.00 hrs, dt=0.05 hrs, 701 points  
Runoff by SCS TR-20 method, UH=SCS  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: BYPASS PAVEMENT** Runoff Area=0.090 ac 100.00% Impervious Runoff Depth=8.66"  
Tc=10.0 min CN=98 Runoff=0.68 cfs 0.065 af

**Subcatchment 3S: Impervious** Runoff Area=2.480 ac 100.00% Impervious Runoff Depth=8.66"  
Tc=10.0 min CN=98 Runoff=18.77 cfs 1.790 af

**Subcatchment 4S: Pervious** Runoff Area=0.290 ac 0.00% Impervious Runoff Depth=4.14"  
Tc=10.0 min CN=61 Runoff=1.21 cfs 0.100 af

**Subcatchment 5S: Impervious** Runoff Area=0.260 ac 100.00% Impervious Runoff Depth=8.66"  
Tc=10.0 min CN=98 Runoff=1.97 cfs 0.188 af

**Subcatchment 8S: BYPASS PERV.** Runoff Area=1.530 ac 0.00% Impervious Runoff Depth=4.51"  
Tc=10.0 min CN=64 Runoff=6.98 cfs 0.575 af

**Pond 2P: AquaFilter** Peak Elev=100.45' Inflow=3.69 cfs 0.999 af  
15.0" Round Culvert n=0.013 L=10.0' S=0.0020 '/' Outflow=3.69 cfs 0.999 af

**Pond 3P: UNDERGROUND RECHARGE** Peak Elev=100.25' Storage=21,863 cf Inflow=14.90 cfs 2.076 af  
Discarded=0.52 cfs 1.137 af Primary=7.56 cfs 0.940 af Outflow=8.08 cfs 2.077 af

**Pond 4P: SUMMATION** Inflow=10.81 cfs 1.580 af  
Primary=10.81 cfs 1.580 af

**Pond 5P: UNDERGROUND DETENTION** Peak Elev=100.33' Storage=16,723 cf Inflow=19.97 cfs 1.890 af  
Primary=3.69 cfs 0.999 af Secondary=10.71 cfs 0.890 af Outflow=13.32 cfs 1.889 af

**Total Runoff Area = 4.650 ac Runoff Volume = 2.718 af Average Runoff Depth = 7.01"**  
**39.14% Pervious = 1.820 ac 60.86% Impervious = 2.830 ac**

**post-dev-conditions**

Prepared by DW Smith Associates

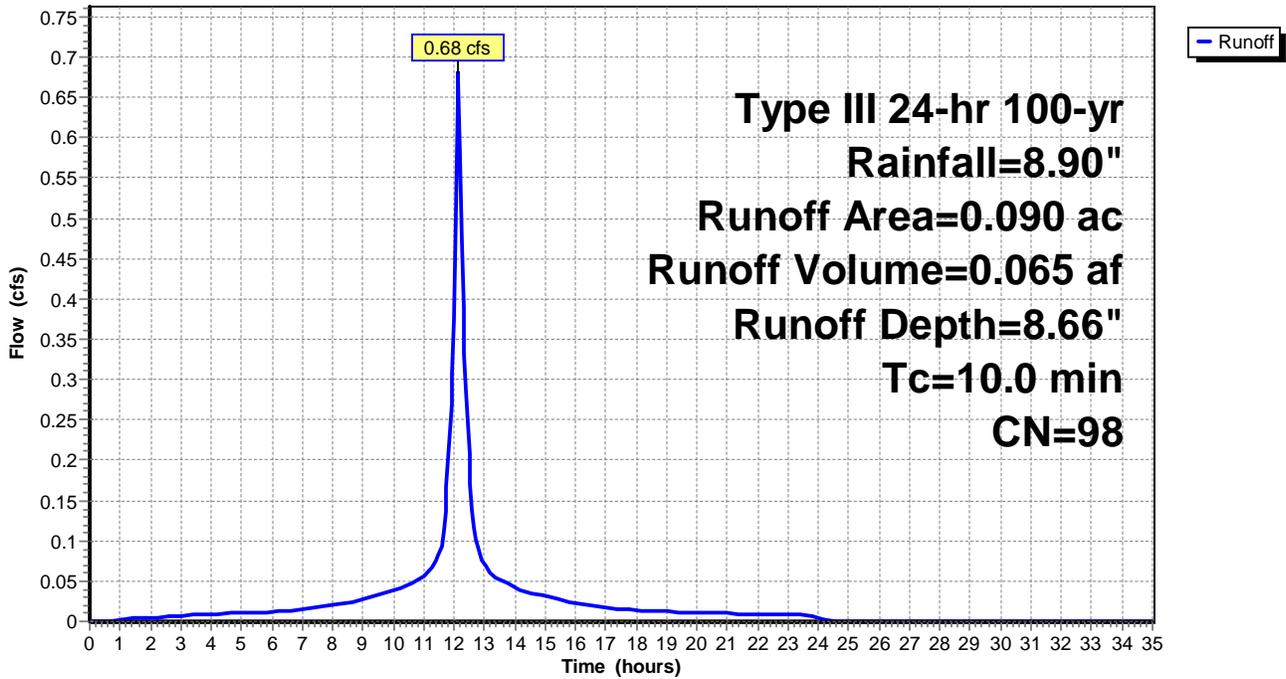
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amended site design  
Type III 24-hr 100-yr Rainfall=8.90"

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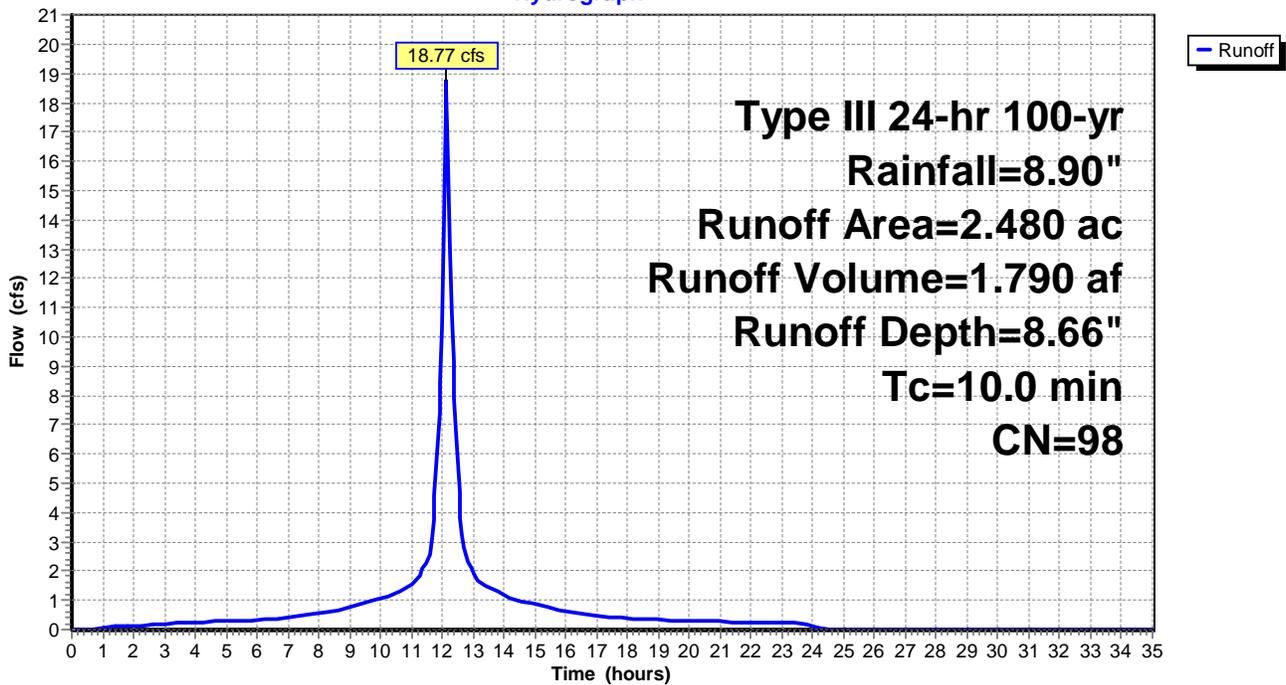
**Subcatchment 1S: BYPASS PAVEMENT**

Hydrograph



**Subcatchment 3S: Impervious**

Hydrograph



**post-dev-conditions**

Prepared by DW Smith Associates

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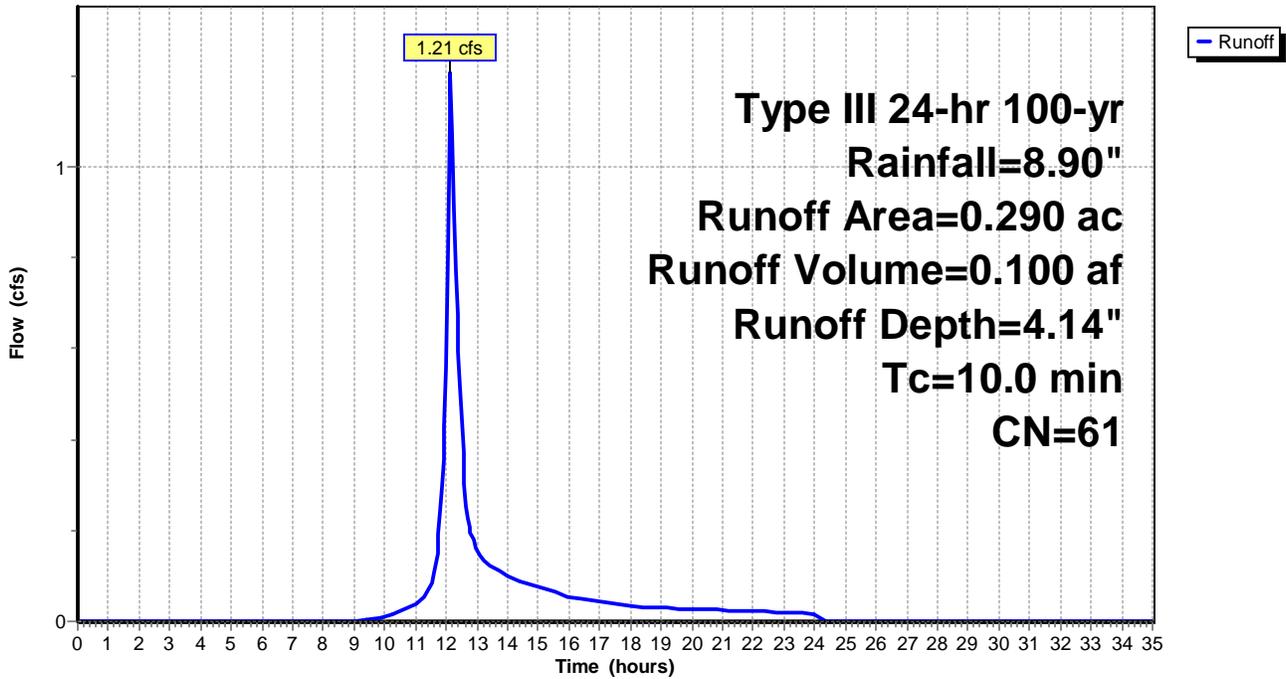
amended site design

Type III 24-hr 100-yr Rainfall=8.90"

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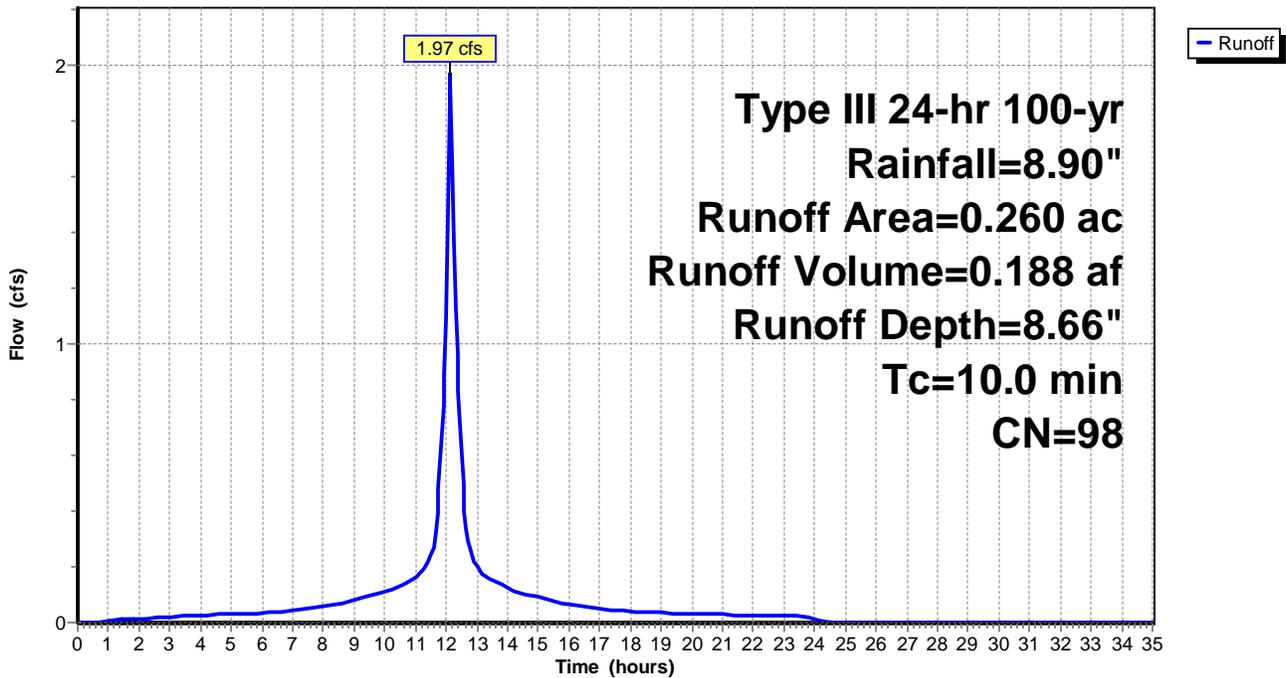
**Subcatchment 4S: Pervious**

Hydrograph



**Subcatchment 5S: Impervious**

Hydrograph



**post-dev-conditions**

Prepared by DW Smith Associates

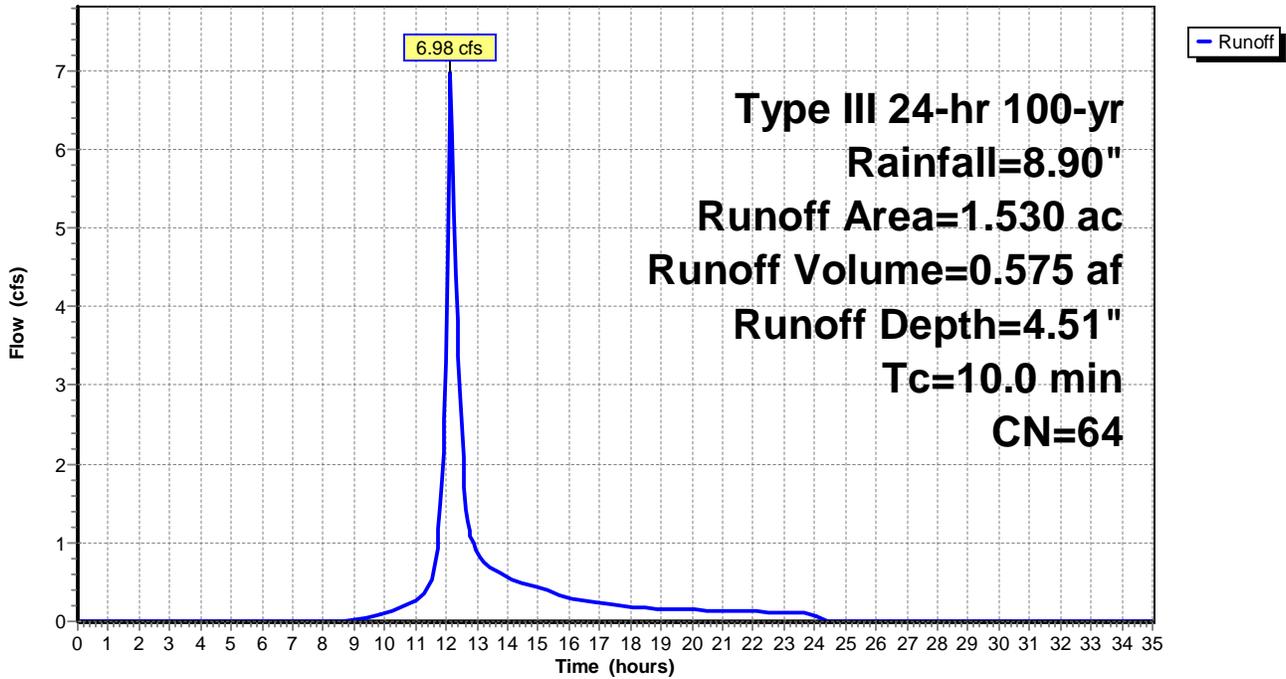
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Type III 24-hr 100-yr Rainfall=8.90"

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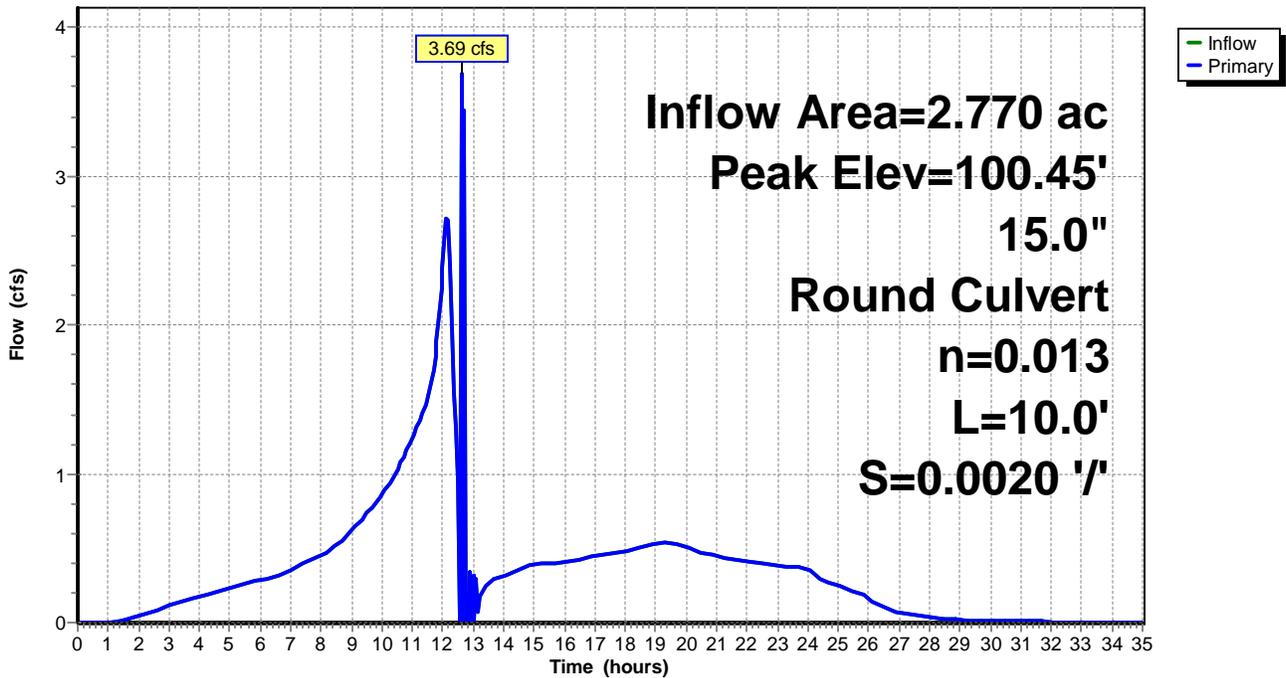
**Subcatchment 8S: BYPASS PERV.**

Hydrograph



**Pond 2P: AquaFilter**

Hydrograph



**post-dev-conditions**

Prepared by DW Smith Associates

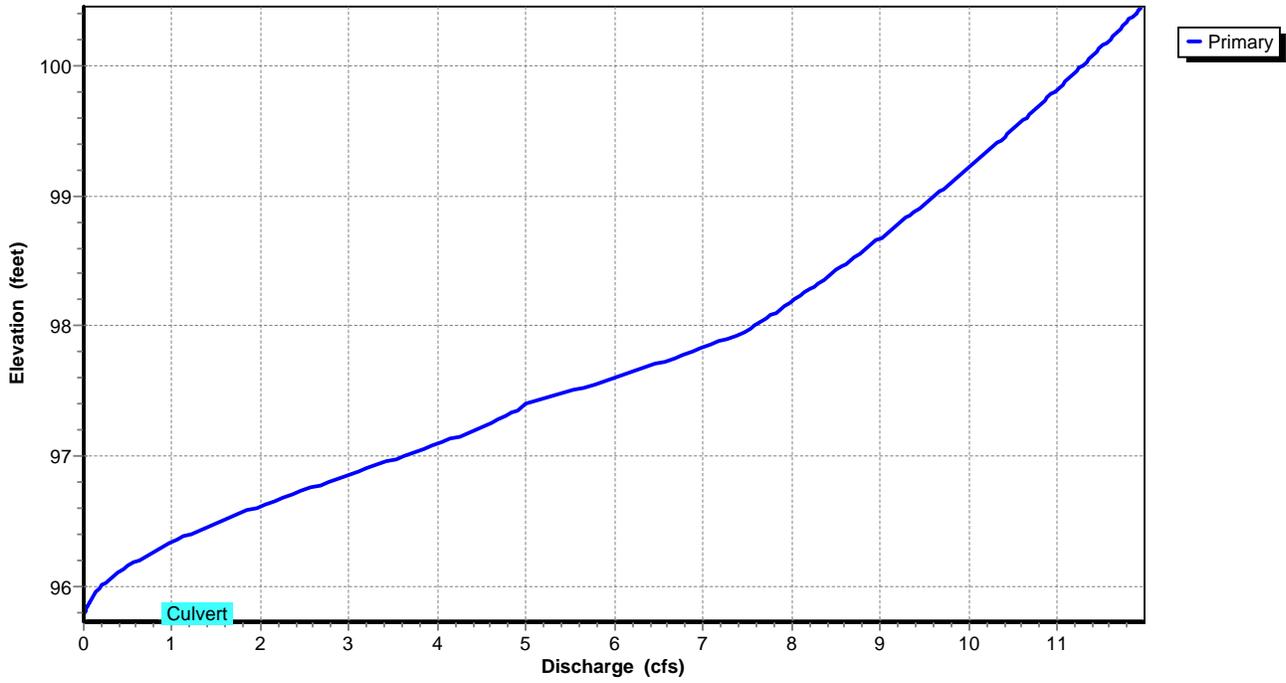
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amended site design  
Type III 24-hr 100-yr Rainfall=8.90"

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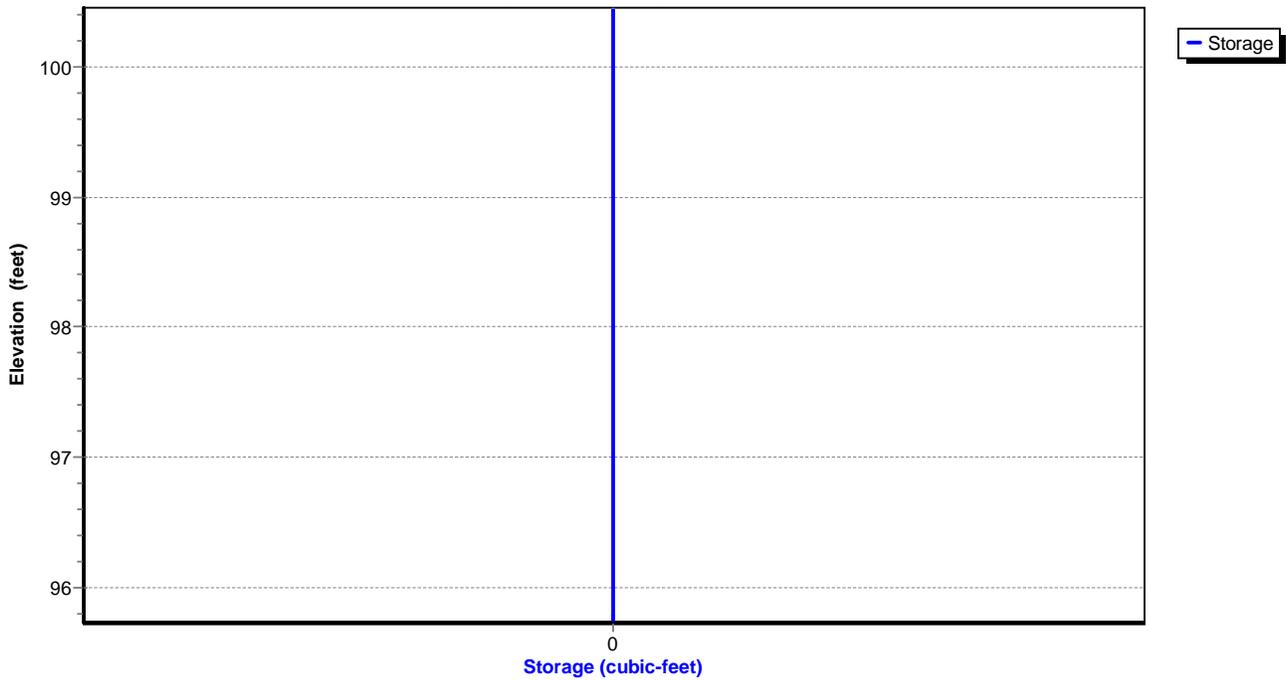
**Pond 2P: AquaFilter**

Stage-Discharge



**Pond 2P: AquaFilter**

Stage-Area-Storage



**post-dev-conditions**

Prepared by DW Smith Associates

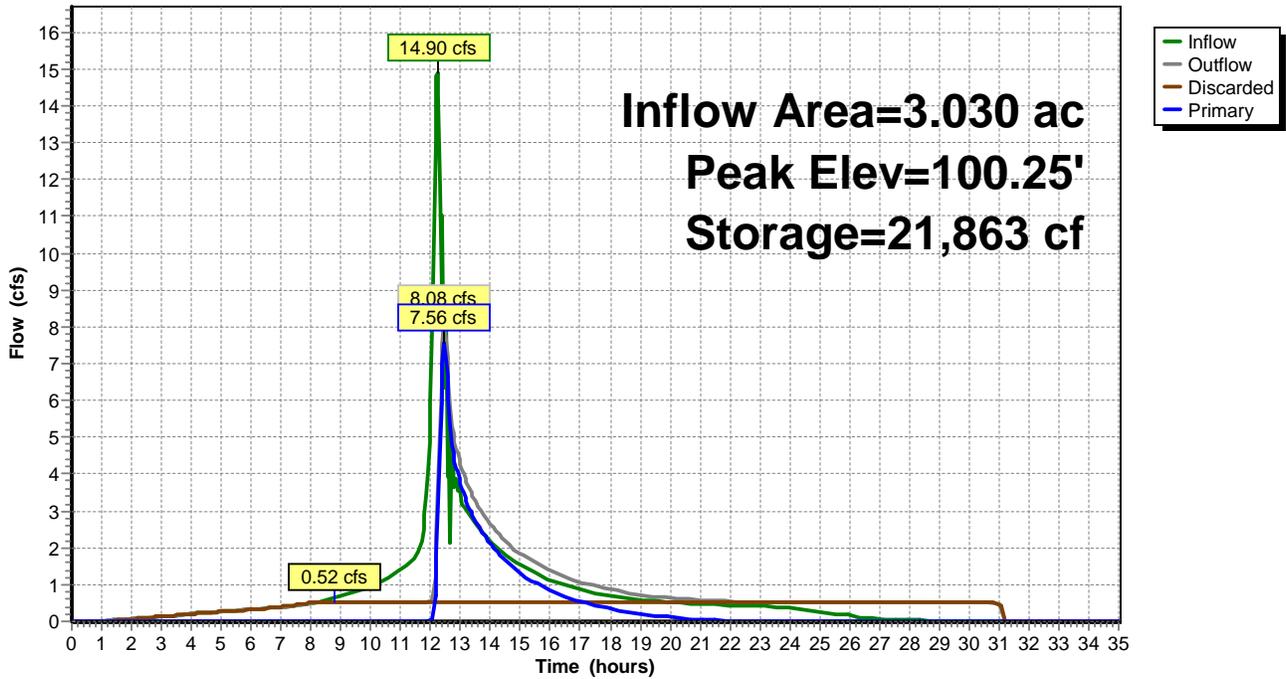
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Type III 24-hr 100-yr Rainfall=8.90"

Printed 12/14/2016

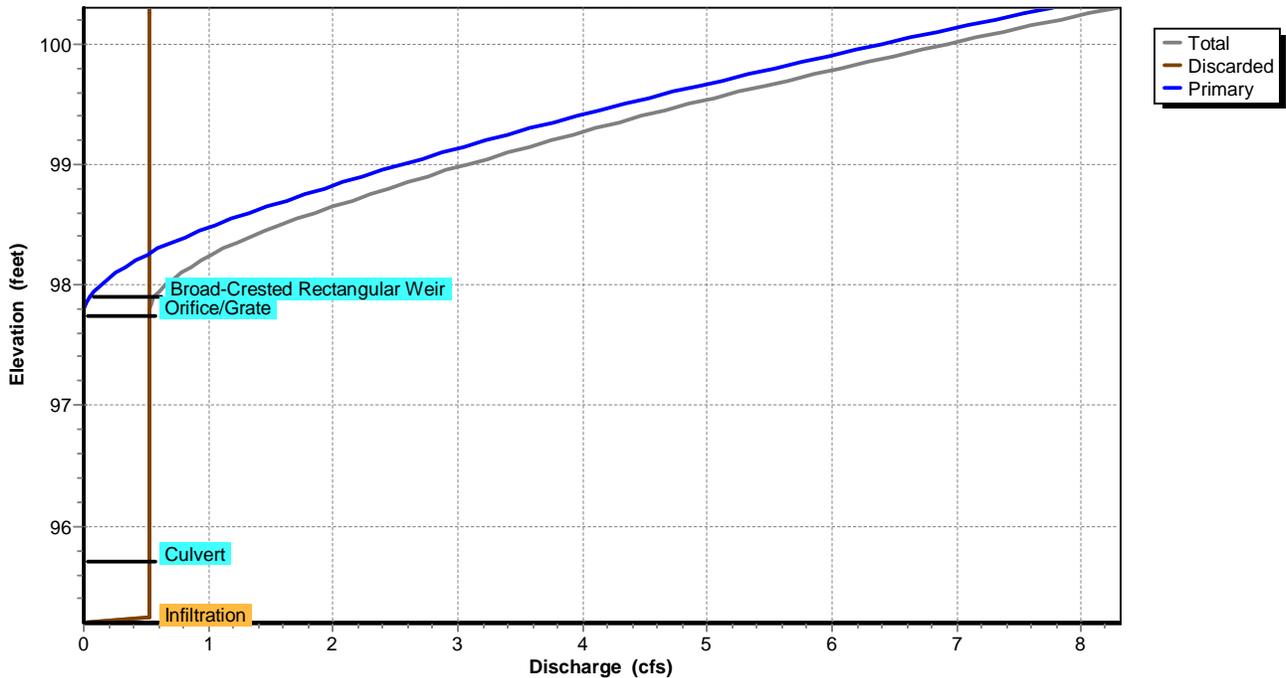
**Pond 3P: UNDERGROUND RECHARGE**

Hydrograph



**Pond 3P: UNDERGROUND RECHARGE**

Stage-Discharge



**post-dev-conditions**

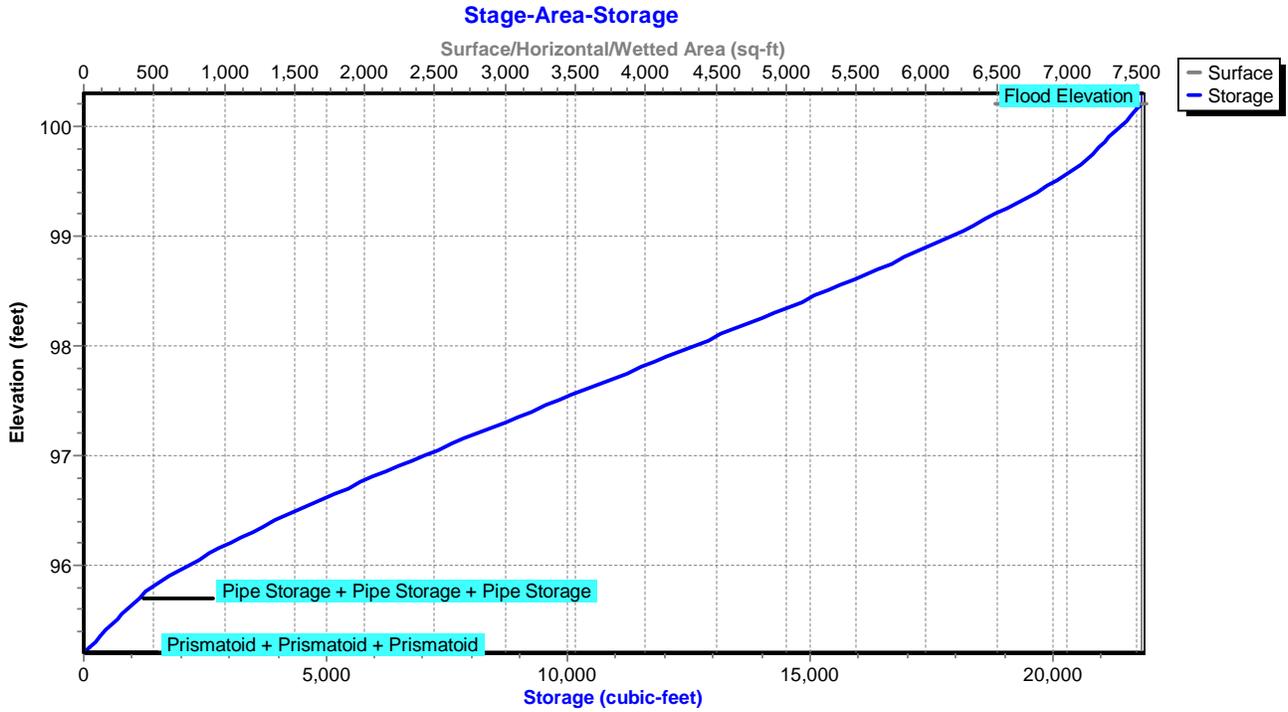
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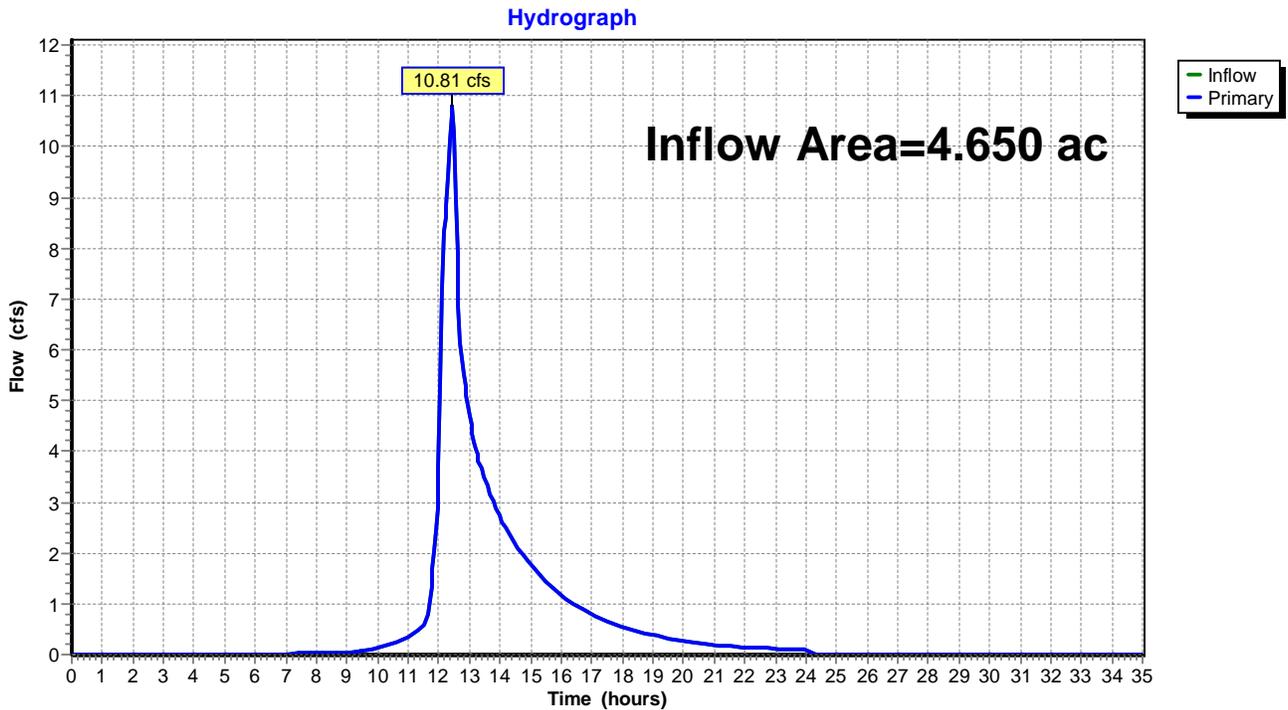
amended site design  
Type III 24-hr 100-yr Rainfall=8.90"

Printed 12/14/2016

**Pond 3P: UNDERGROUND RECHARGE**



**Pond 4P: SUMMATION**



**post-dev-conditions**

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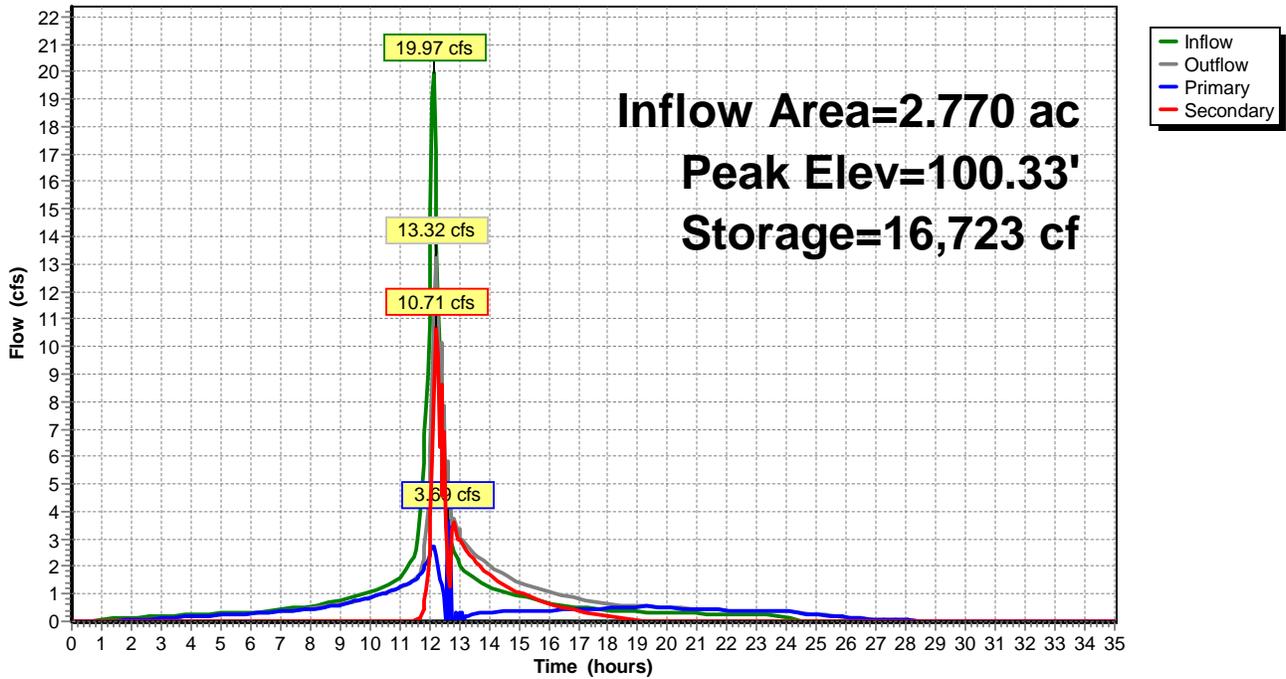
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amended site design  
Type III 24-hr 100-yr Rainfall=8.90"

Printed 12/14/2016

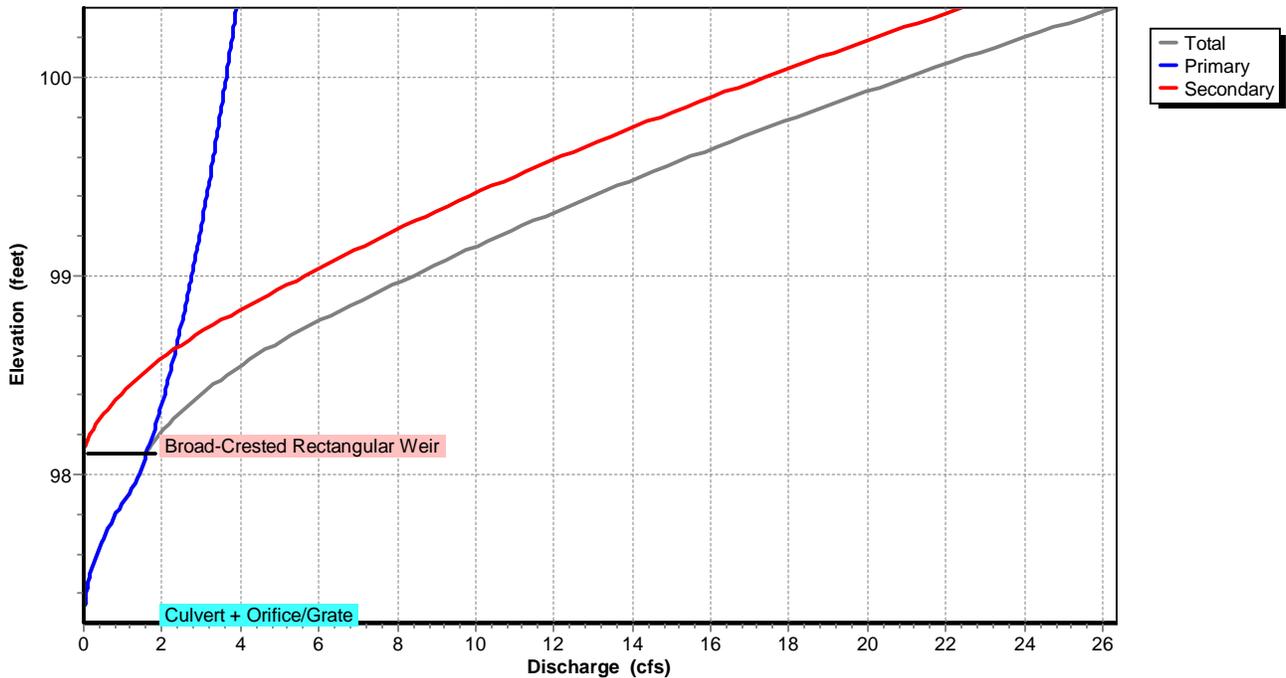
**Pond 5P: UNDERGROUND DETENTION**

Hydrograph



**Pond 5P: UNDERGROUND DETENTION**

Stage-Discharge



**post-dev-conditions**

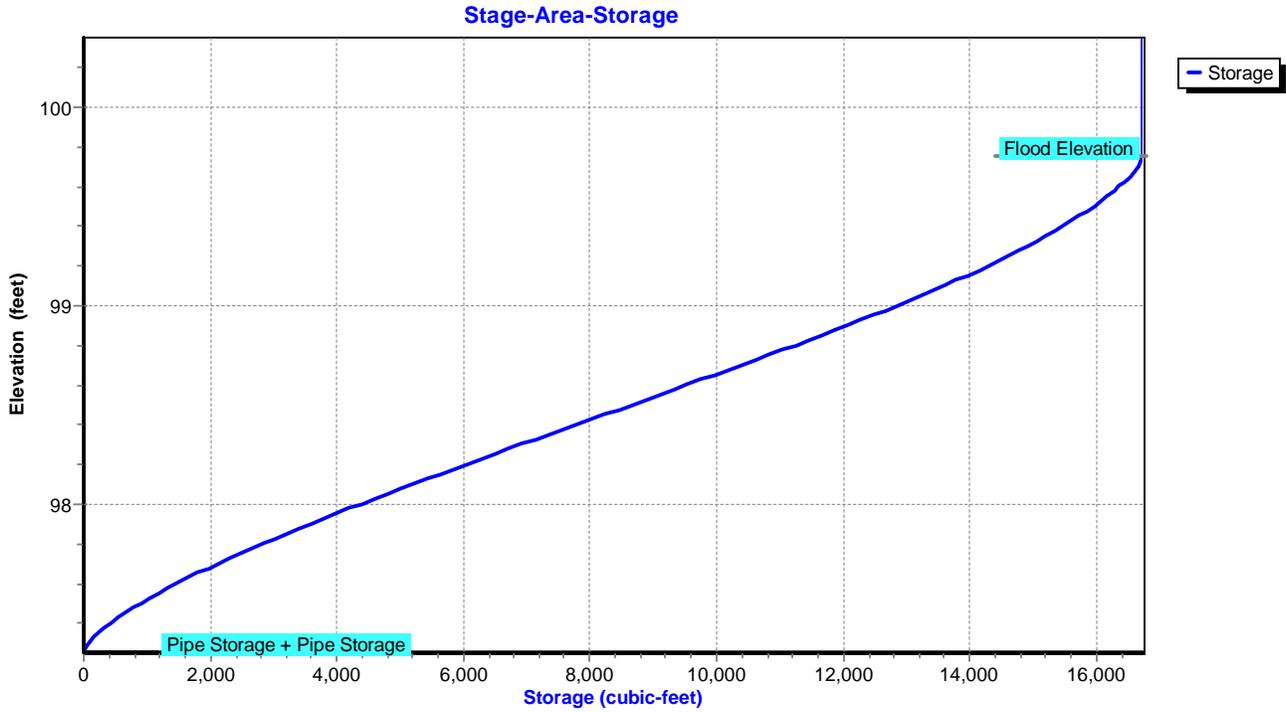
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amended site design  
Type III 24-hr 100-yr Rainfall=8.90"

Printed 12/14/2016

**Pond 5P: UNDERGROUND DETENTION**



## **100 year storm Runoff Volume Calculations**



100 year storm flow analysis

original approved design

$$Q_{100} = 8.57 \text{ cfs}$$

$$Q_{100} \text{ volume} = 1.513 \text{ ac-ft} \\ = 65,906 \text{ cu-ft}$$

allowable runoff reduction flowrate

$$Q_{100} = 9.81 \text{ cfs}$$

$$Q_{100} \text{ volume} = X$$

amended design

$$Q_{100} = 10.81 \text{ cfs}$$

$$Q_{100} \text{ volume} = 1.580 \text{ ac-ft} \\ 68,825 \text{ cu-ft}$$

solve for X (allowable volume)

$$\begin{aligned} 10.81 \text{ cfs} - 8.57 \text{ cfs} &= 68,825 \text{ cu-ft} - 65,906 \text{ cu-ft} \\ 2.24 \text{ cfs} &= 2,919 \text{ cu-ft} \end{aligned}$$

$$\begin{aligned} 10.81 \text{ cfs} - 9.81 \text{ cfs} \\ 1 \text{ cfs} \end{aligned}$$

$$1 \text{ cfs} \times \frac{2,919 \text{ cu-ft}}{2.24 \text{ cfs}} = 1,303 \text{ cu-ft}$$

1,303 cu-ft  
required to be stored

$$\left( \begin{aligned} \therefore X &= 68,825 \text{ cu-ft} - 1,303 \text{ cu-ft} \\ &= 67,522 \text{ cu-ft} \end{aligned} \right)$$