

**Stormwater Management Report  
Vertical Self-Storage  
249 Ellington Road  
South Windsor, Connecticut**

Prepared by:

**Design Professionals, Inc.  
21 Jeffrey Drive  
South Windsor, CT 06074**

October 17, 2022



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## **Introduction**

Highland Capital, LLC. is proposing a climate controlled vertical self storage facility on 249 Ellington Road in South Windsor, Connecticut. The property is referenced on the Town of South Windsor Tax Assessor's Parcel No. 6-3. The proposed development will include the construction of a 99,200 +/- SF self-storage facility. Associated site improvements will include but not be limited to parking areas for vehicles, landscaping, lighting, and stormwater management BMP's.

The total tract area is 3.52 acres. 2.94± acres of this area are proposed to be disturbed during construction. For more information, please refer to the plans entitled "Climate Controlled Vertical Self-Storage" ~ 249 Ellington Road ~ South Windsor, CT" prepared by Design Professionals, Inc., and dated October 17, 2022, as amended.

## **Pre-Development Site Conditions**

The existing surficial characteristics of the area to be developed can primarily be classified as undisturbed woodland area with an interstate highway bordering the southerly portion of the property. The property boundary has a singular frontage section, borders a residential property on the north and Town property to the east.

Review of the site topography indicated that a drainage divide exists onsite that conveys stormwater runoff from the developed portion of the site, dividing the property into two watersheds. One is to the drainage swale on Ellington Road on the western property line (**DP#1**) and other is to the Interstate 291 drainage ditch abutting the southern border of the property (**DP#2**). CT ECO GIS indicated that runoff conveyed in the swale on Ellington Road is part of Local Basin ID No. 4000-00-2-R1 for waters draining directly to Burnham Brook. Runoff underneath Ellington Road via the drainage ditch is part of Local Basin ID No. 4004-05-1 for waters draining to the Podunk River. Existing conditions watershed delineations are identified in the Existing Conditions Drainage Map located in **Appendix G**.

Based on Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG) mapping, soil type C is located on site. See **Appendix C** for The NRCS Soil Map & Data.

An evaluation was performed to quantify the peak rate of stormwater discharge offsite to the design points. The Natural Resources Conservation Service's TR-55 Manual was followed in predicting the peak rates of runoff and volumes. HydroCAD computer modeling software was utilized. Peak rates of stormwater runoff were evaluated for the 2-, 10-, 25-, 50- and 100-year storm events. Rainfall data from NOAA Atlas 14 Point Frequency Estimates was used to generate storm conditions. NOAA Atlas 14 rainfall data is included in **Appendix D** for reference. For more information, please refer to the enclosed Pre-Development Drainage HydroCAD Report located in **Appendix A**.

### **Post-Development Site Conditions**

The proposed development will include the construction of a 99,200 +/- SF self-storage facility. Runoff generated from the proposed roof, parking, and sidewalk areas will be collected in a detention basin (**PP1**) before being discharged into the drainage pipe system in Ellington Road.

The detention pond was designed to attenuate the increase in peak rates induced by the proposed impervious area. An outlet control structure with select orifices are proposed to restrict water flow leaving the chamber system. Controlled discharge from the outlet control structure will be conveyed to the existing stormwater collection system on Ellington Road before draining into the Interstate 291 drainage way. The detention pond will have a bottom elevation of 55.50 and top of 61.2, with a projected 100-yr storm elevation of 60.12. For more information, please refer to the enclosed Post-Development Drainage HydroCAD Report located in **Appendix B**. The proposed conditions watershed delineations and design points are also identified in the Proposed Condition Drainage Map located in **Appendix F**.

### **Analysis of Results**

The pre-development and post-development conditions were analyzed using HydroCAD consistent with National Resource Conservation Service (NRCS) hydrology methods. Two discharge locations (**Design Point #1 and #2**) were identified as points of interest for assessing downstream effects. The following table contains the data generated from the HydroCAD software:

<b>Reach</b>		<b>2-year</b>	<b>10-year</b>	<b>25-year</b>	<b>50-year</b>	<b>100-year</b>
DP#1 – Flow to Ellington Road swale	<b>Pre</b>	0.36	0.87	1.22	1.47	1.76
	<b>Post</b>	0.21	0.41	0.54	0.63	0.74
DP#2 – I-291 Drainage Basin	<b>Pre</b>	4.51	24.18	39.15	52.99	68.51
	<b>Post</b>	3.52	22.23	35.19	45.74	59.04

As seen in the table above, the subject project will result in peak runoff rates in the proposed condition that are either equal to or less than the peak runoff rates of the existing condition for 2-, 10-, 25-, 50- and 100-year design storms to both design points.

### **Storm Sewer Collection System**

The proposed subsurface stormwater collection and conveyance system was designed to adequately convey proposed runoff under the 10-year storm. The design of the storm sewers followed the guidelines set forth in the Connecticut Department of Transportation's Drainage Manual. It is estimated that during a 10-year storm event, all proposed subsurface culverts will convey storm runoff without resulting in any unacceptable flooding. The computations are included as **Appendix F**.

An additional analysis was conducted to determine the suitability of the existing storm drainage in Ellington Road to accept the proposed modifications. Suitable HGL conditions were evaluated based on whether one foot of free board was provided between the observed HGL and TF of the subject catch basin as specified in chapter 11 of the CTDOT Drainage Manual. Results indicated that the proposed modifications will cause no breached conditions as defined by these standards. The computations are included as **Appendix F** as well.

### **Water Quality**

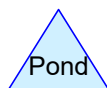
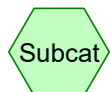
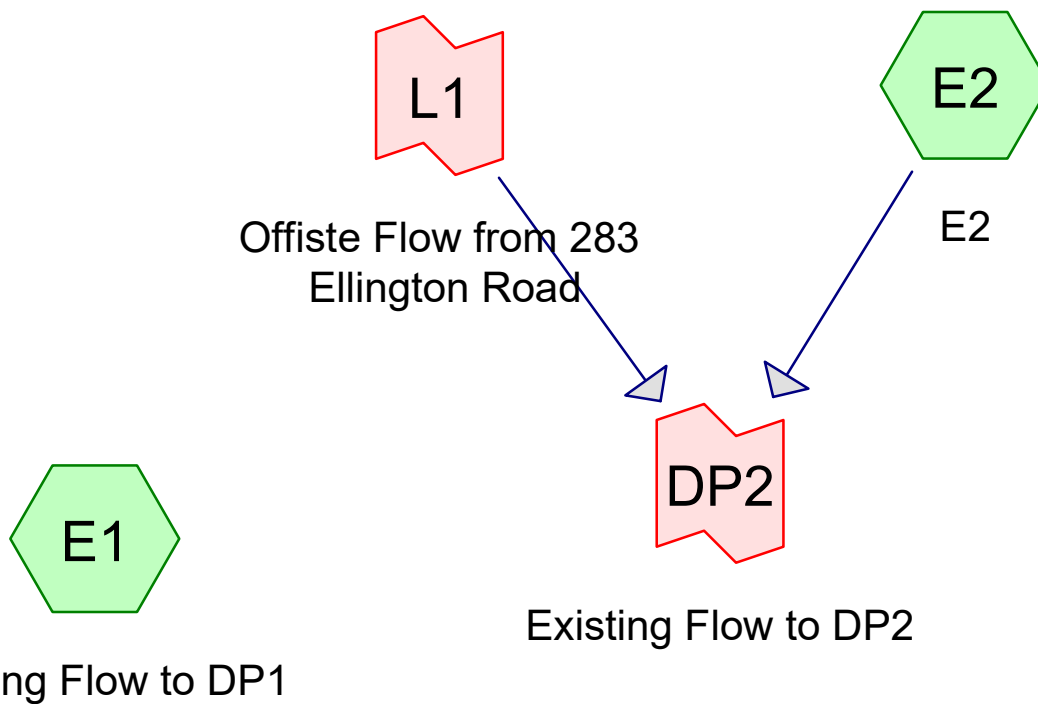
The proposed water quality basin and forebay were sized to store the determined Water Quality Volume as recommended in the 2004 Connecticut Stormwater Quality Manual. The proposed forebay was sized to store over 10% of the water quality volume as recommended by the 2004 Connecticut Stormwater Quality Manual. See **Appendix F** for water quality flow & volume calcs, pond and forebay stage storage reports.

### **Conclusion**

The proposed stormwater management system as discussed herein and shown on the referenced plans is appropriate for the proposed development on the subject site and should not pose any detrimental impacts to the environment.



**APPENDIX A**  
**Watershed Computations**  
**(Pre-Development Drainage HydroCAD Report)**





## 4303.H - HydroCAD

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Existing Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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Page 2

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment E1: Existing Flow to DP1**      Runoff Area=36,902 sf   19.48% Impervious   Runoff Depth=1.08"  
Flow Length=419'   Tc=69.9 min   CN=76   Runoff=0.36 cfs   0.076 af

**Subcatchment E2: E2**      Runoff Area=137,619 sf   0.00% Impervious   Runoff Depth=0.97"  
Flow Length=493'   Tc=60.5 min   CN=74   Runoff=1.30 cfs   0.254 af

**Link DP2: Existing Flow to DP2**      Inflow=4.51 cfs   0.494 af  
Primary=4.51 cfs   0.494 af

**Link L1: Offsite Flow from 283 Ellington Road**      Manual Hydrograph   Inflow=3.44 cfs   0.240 af  
Area= 63.130 ac   29.04% Imperv.   Primary=3.44 cfs   0.240 af

**Total Runoff Area = 4.006 ac   Runoff Volume = 0.330 af   Average Runoff Depth = 0.99"**  
**95.88% Pervious = 3.841 ac   4.12% Impervious = 0.165 ac**

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Existing Conditions  
Type III 24-hr 10-YR Rainfall=4.90"

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Page 3

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment E1: Existing Flow to DP1**      Runoff Area=36,902 sf   19.48% Impervious   Runoff Depth=2.45"  
Flow Length=419'   Tc=69.9 min   CN=76   Runoff=0.87 cfs   0.173 af

**Subcatchment E2: E2**      Runoff Area=137,619 sf   0.00% Impervious   Runoff Depth=2.28"  
Flow Length=493'   Tc=60.5 min   CN=74   Runoff=3.29 cfs   0.602 af

**Link DP2: Existing Flow to DP2**      Inflow=24.18 cfs   3.816 af  
Primary=24.18 cfs   3.816 af

**Link L1: Offsite Flow from 283 Ellington Road**      Manual Hydrograph   Inflow=21.38 cfs   3.214 af  
Area= 63.130 ac   29.04% Imperv.   Primary=21.38 cfs   3.214 af

**Total Runoff Area = 4.006 ac   Runoff Volume = 0.775 af   Average Runoff Depth = 2.32"**  
**95.88% Pervious = 3.841 ac   4.12% Impervious = 0.165 ac**

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Existing Conditions  
Type III 24-hr 25-YR Rainfall=6.03"

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Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment E1: Existing Flow to DP1**      Runoff Area=36,902 sf   19.48% Impervious   Runoff Depth=3.41"  
Flow Length=419'   Tc=69.9 min   CN=76   Runoff=1.22 cfs   0.240 af

**Subcatchment E2: E2**      Runoff Area=137,619 sf   0.00% Impervious   Runoff Depth=3.21"  
Flow Length=493'   Tc=60.5 min   CN=74   Runoff=4.66 cfs   0.845 af

**Link DP2: Existing Flow to DP2**      Inflow=39.15 cfs   6.892 af  
Primary=39.15 cfs   6.892 af

**Link L1: Offsite Flow from 283 Ellington Road**      Manual Hydrograph   Inflow=35.12 cfs   6.047 af  
Area= 63.130 ac   29.04% Imperv.   Primary=35.12 cfs   6.047 af

**Total Runoff Area = 4.006 ac   Runoff Volume = 1.086 af   Average Runoff Depth = 3.25"**  
**95.88% Pervious = 3.841 ac   4.12% Impervious = 0.165 ac**

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Existing Conditions  
Type III 24-hr 50-YR Rainfall=6.85"

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Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment E1: Existing Flow to DP1**      Runoff Area=36,902 sf   19.48% Impervious   Runoff Depth=4.12"  
Flow Length=419'   Tc=69.9 min   CN=76   Runoff=1.47 cfs   0.291 af

**Subcatchment E2: E2**      Runoff Area=137,619 sf   0.00% Impervious   Runoff Depth=3.91"  
Flow Length=493'   Tc=60.5 min   CN=74   Runoff=5.69 cfs   1.030 af

**Link DP2: Existing Flow to DP2**      Inflow=52.99 cfs   9.792 af  
Primary=52.99 cfs   9.792 af

**Link L1: Offsite Flow from 283 Ellington Road**      Manual Hydrograph   Inflow=48.02 cfs   8.762 af  
Area= 63.130 ac   29.04% Imperv.   Primary=48.02 cfs   8.762 af

**Total Runoff Area = 4.006 ac   Runoff Volume = 1.321 af   Average Runoff Depth = 3.96"**  
**95.88% Pervious = 3.841 ac   4.12% Impervious = 0.165 ac**

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Existing Conditions

Type III 24-hr 100-YR Rainfall=7.77"

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Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment E1: Existing Flow to DP1**      Runoff Area=36,902 sf   19.48% Impervious   Runoff Depth=4.95"  
Flow Length=419'   Tc=69.9 min   CN=76   Runoff=1.76 cfs   0.349 af

**Subcatchment E2: E2**      Runoff Area=137,619 sf   0.00% Impervious   Runoff Depth=4.72"  
Flow Length=493'   Tc=60.5 min   CN=74   Runoff=6.86 cfs   1.243 af

**Link DP2: Existing Flow to DP2**      Inflow=68.51 cfs   12.988 af  
Primary=68.51 cfs   12.988 af

**Link L1: Offsite Flow from 283 Ellington Road**      Manual Hydrograph   Inflow=62.47 cfs   11.745 af  
Area= 63.130 ac   29.04% Imperv.   Primary=62.47 cfs   11.745 af

**Total Runoff Area = 4.006 ac   Runoff Volume = 1.592 af   Average Runoff Depth = 4.77"**  
**95.88% Pervious = 3.841 ac   4.12% Impervious = 0.165 ac**

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Existing Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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**Summary for Subcatchment E1: Existing Flow to DP1**

Runoff = 0.36 cfs @ 12.97 hrs, Volume= 0.076 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YR Rainfall=3.09"

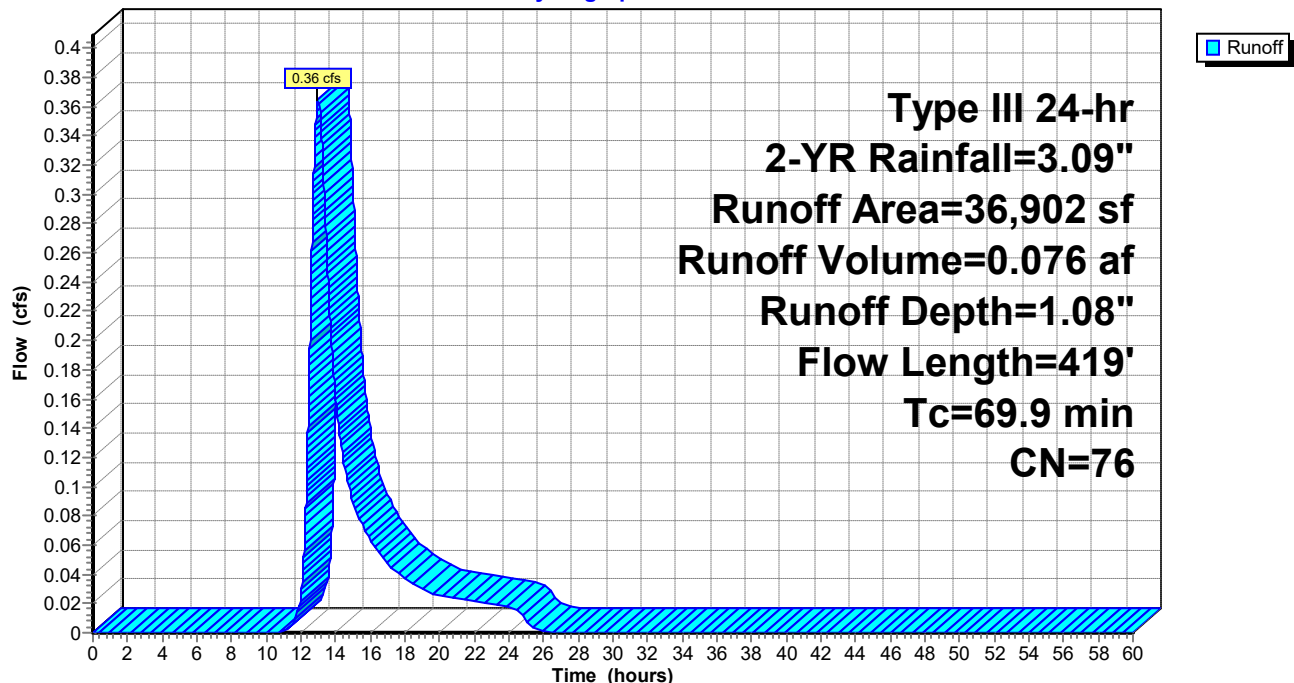
Area (sf)	CN	Description
8,052	74	>75% Grass cover, Good, HSG C
* 7,187	98	IMPERVIOUS
21,663	70	Woods, Good, HSG C
36,902	76	Weighted Average
29,715		80.52% Pervious Area
7,187		19.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
55.7	100	0.0077	0.03		<b>Sheet Flow, Woods Sheet Flow</b>
					Woods: Dense underbrush n= 0.800 P2= 3.09"
14.1	308	0.0053	0.36		<b>Shallow Concentrated Flow, Woods Shallow Flow</b>
					Woodland Kv= 5.0 fps
0.1	11	0.0091	1.43		<b>Shallow Concentrated Flow, Grass Shallow Flow</b>
					Grassed Waterway Kv= 15.0 fps
69.9	419	Total			

**Subcatchment E1: Existing Flow to DP1**

Hydrograph



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Existing Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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**Summary for Subcatchment E2: E2**

Runoff = 1.30 cfs @ 12.85 hrs, Volume= 0.254 af, Depth= 0.97"  
Routed to Link DP2 : Existing Flow to DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YR Rainfall=3.09"

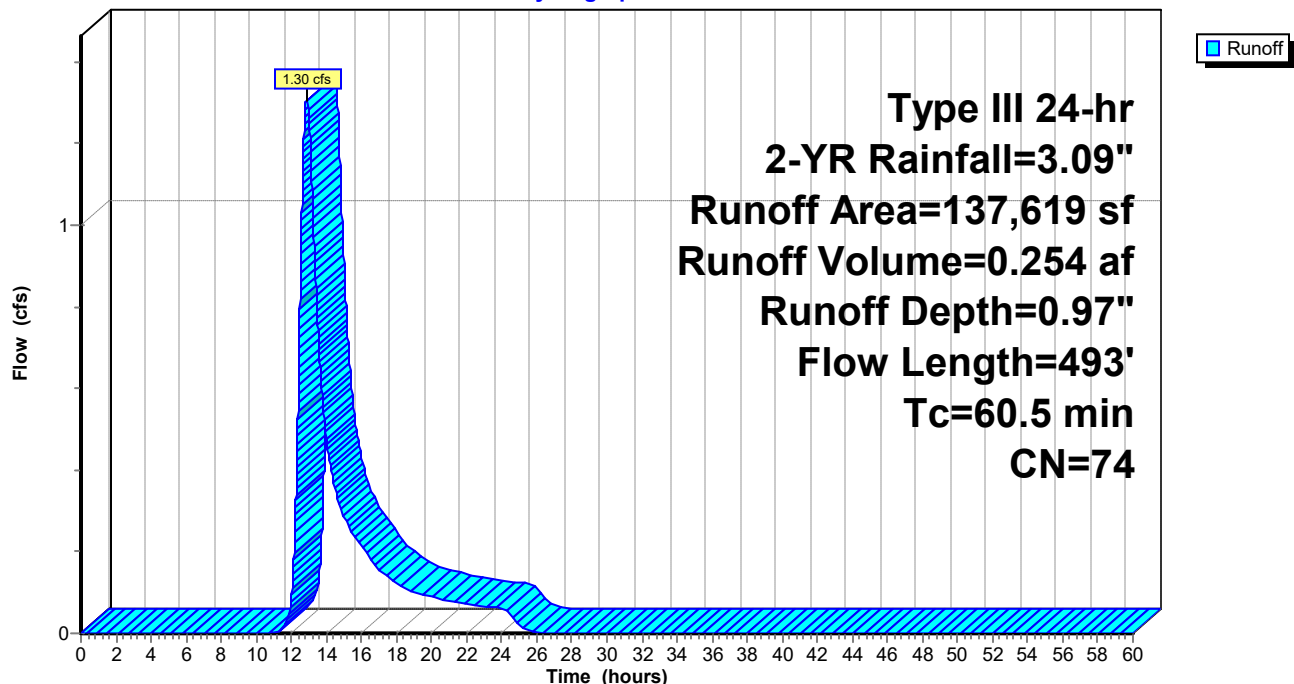
Area (sf)	CN	Description
137,619	74	>75% Grass cover, Good, HSG C
137,619		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
41.6	100	0.0160	0.04		<b>Sheet Flow, Woods Sheet Flow</b>
18.9	393	0.0048	0.35		Woods: Dense underbrush n= 0.800 P2= 3.09"
					<b>Shallow Concentrated Flow, Woods Shallow Flow</b>
					Woodland Kv= 5.0 fps
60.5	493	Total			

**Subcatchment E2: E2**

Hydrograph



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Existing Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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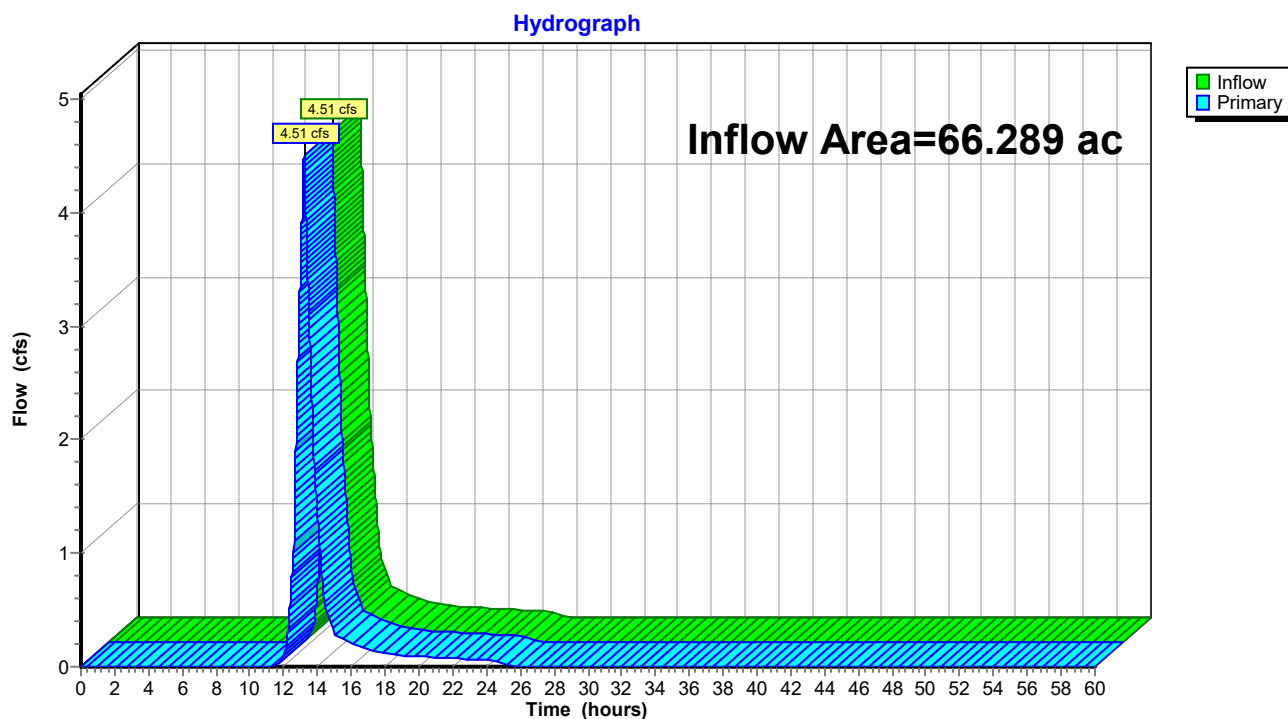
Page 9

### Summary for Link DP2: Existing Flow to DP2

Inflow Area = 66.289 ac, 27.66% Impervious, Inflow Depth = 0.09" for 2-YR event  
Inflow = 4.51 cfs @ 13.20 hrs, Volume= 0.494 af  
Primary = 4.51 cfs @ 13.20 hrs, Volume= 0.494 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

### Link DP2: Existing Flow to DP2





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Existing Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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### Summary for Link L1: Offiste Flow from 283 Ellington Road

Inflow Area = 63.130 ac, 29.04% Impervious, Inflow Depth = 0.05" for 2-YR event  
Inflow = 3.44 cfs @ 13.20 hrs, Volume= 0.240 af  
Primary = 3.44 cfs @ 13.20 hrs, Volume= 0.240 af, Atten= 0%, Lag= 0.0 min  
Routed to Link DP2 : Existing Flow to DP2

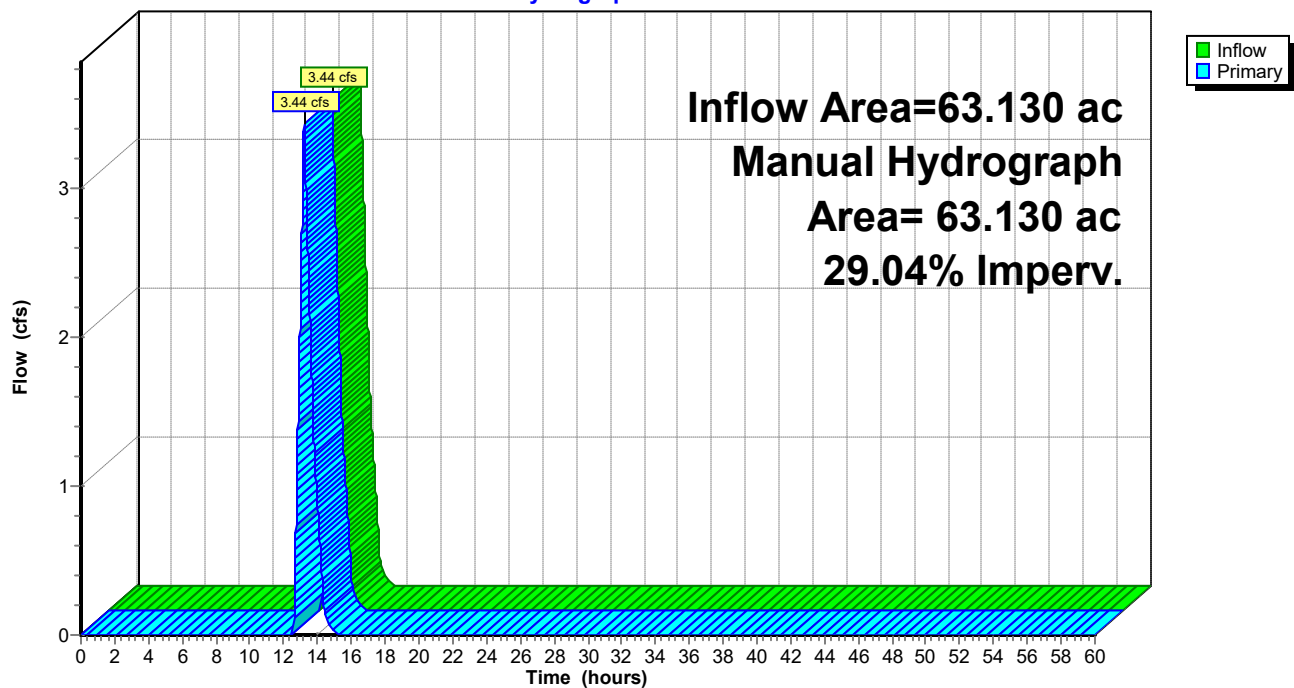
Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

2-YR 59 Point manual hydrograph, To= 0.00 hrs, dt= 0.60 hrs, Area= 63.130 ac, 29.04% Imp., cfs =

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	0.00	3.44	1.23	0.16	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	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

### Link L1: Offiste Flow from 283 Ellington Road

Hydrograph



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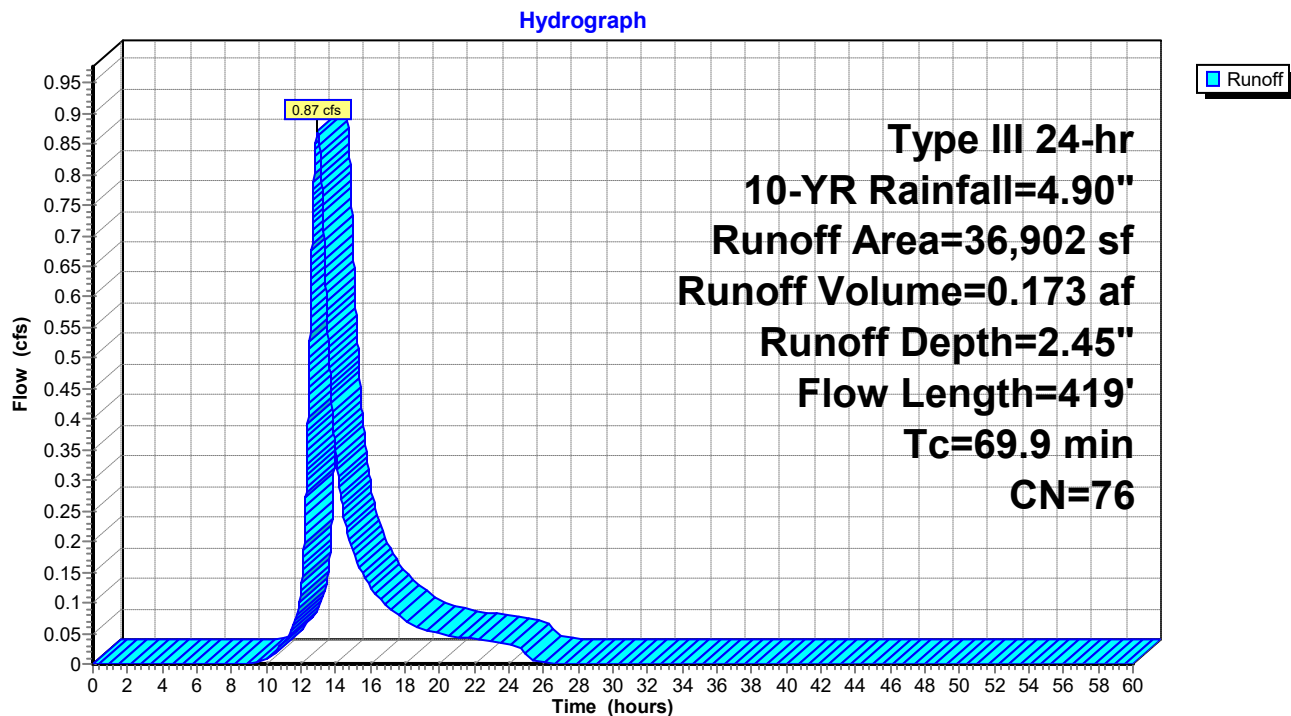
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Existing Conditions  
Type III 24-hr 10-YR Rainfall=4.90"

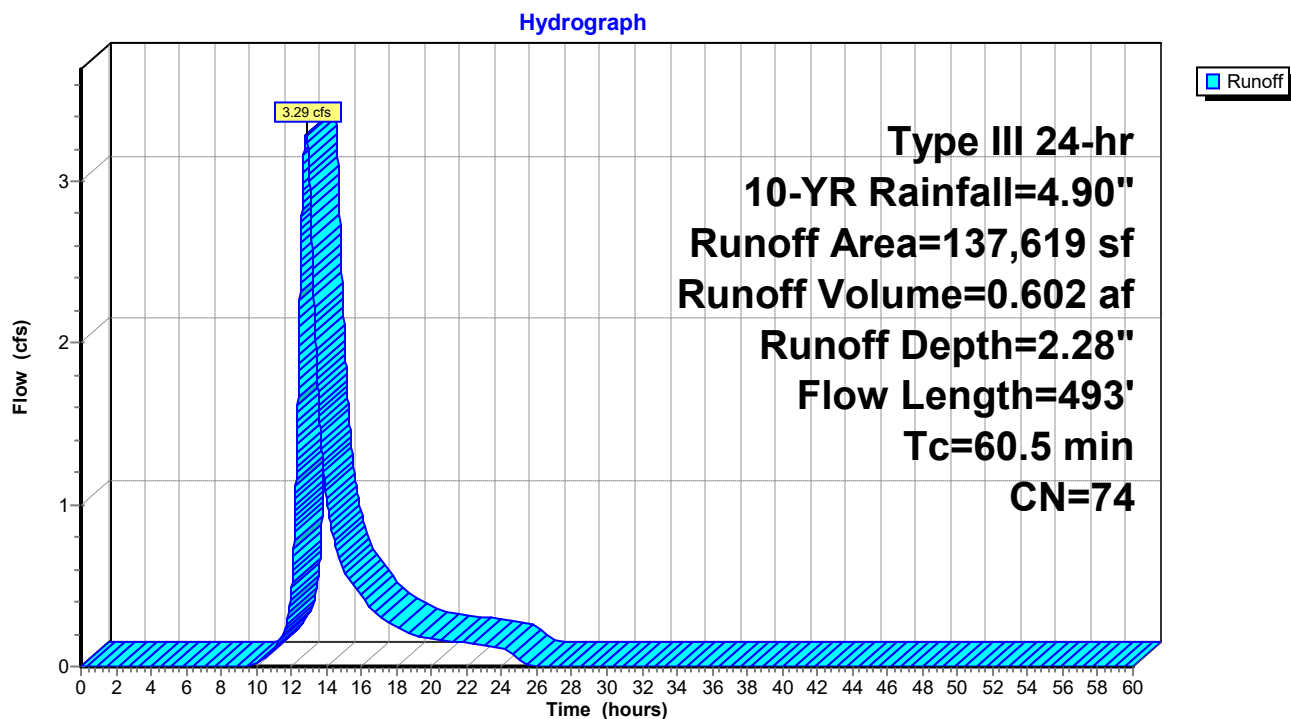
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### Subcatchment E1: Existing Flow to DP1



### Subcatchment E2: E2



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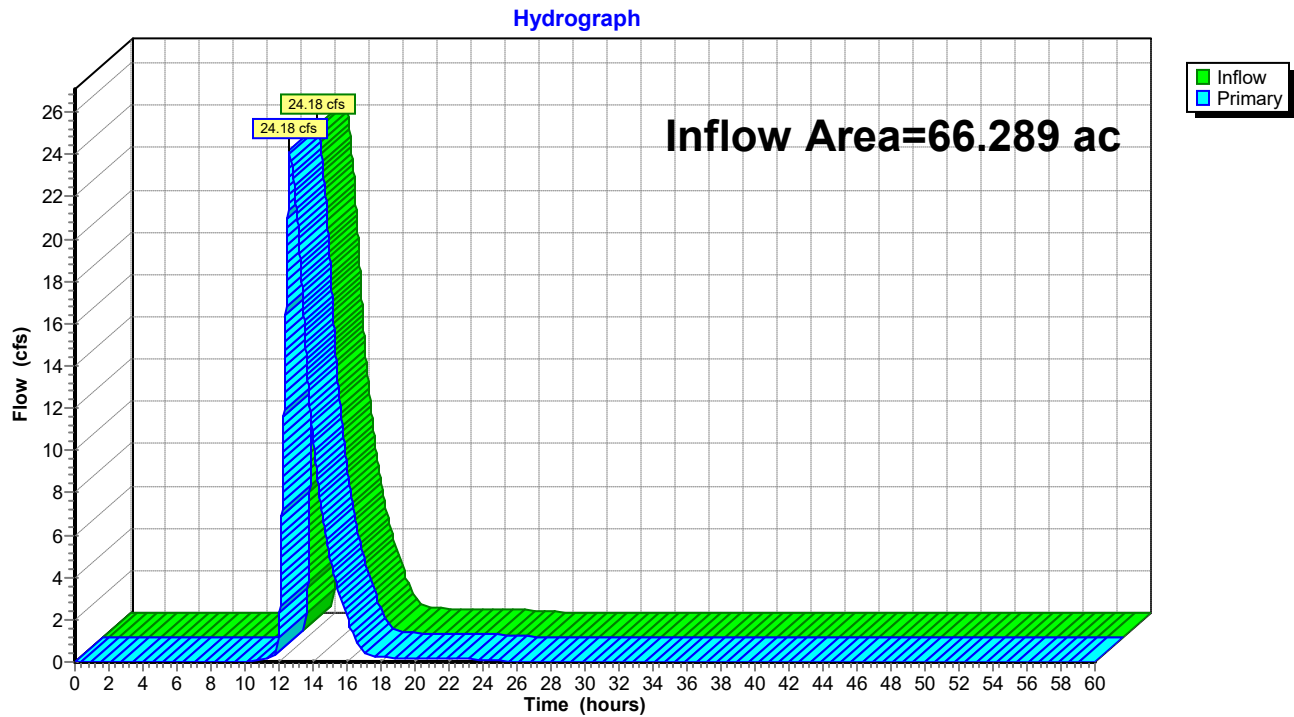
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Existing Conditions  
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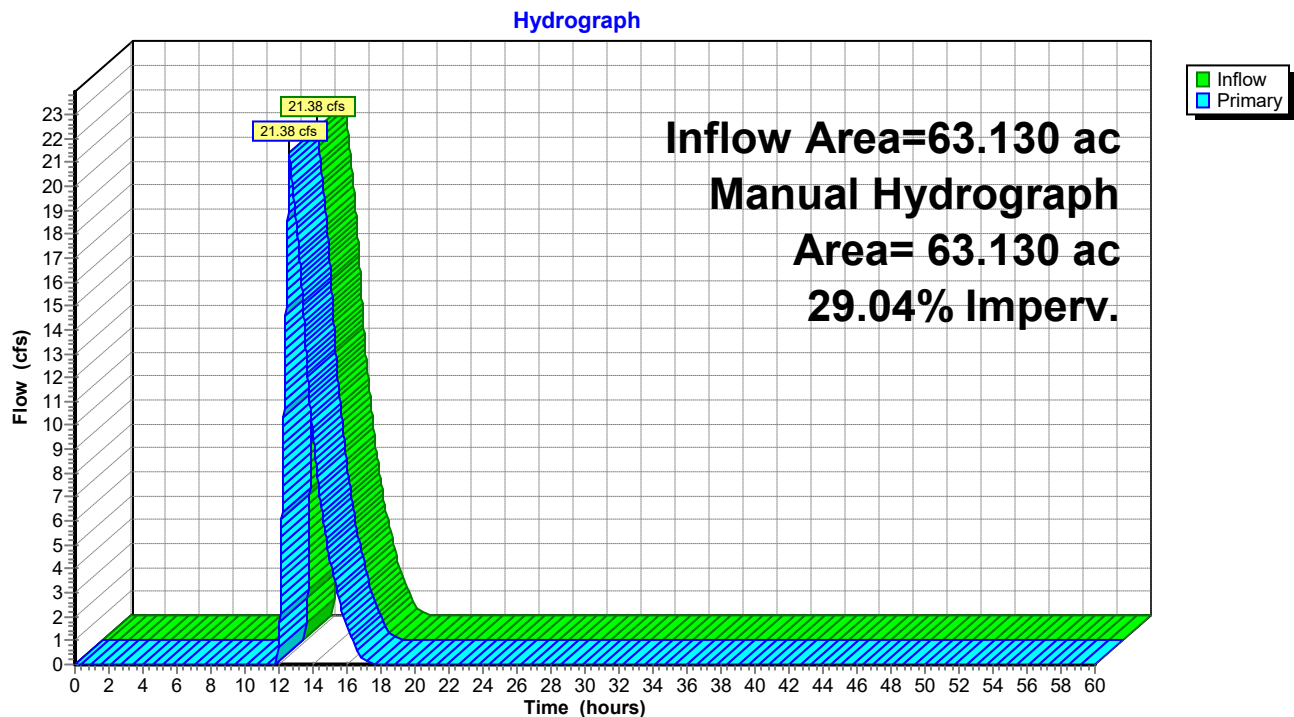
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Page 12

### Link DP2: Existing Flow to DP2



### Link L1: Offsite Flow from 283 Ellington Road



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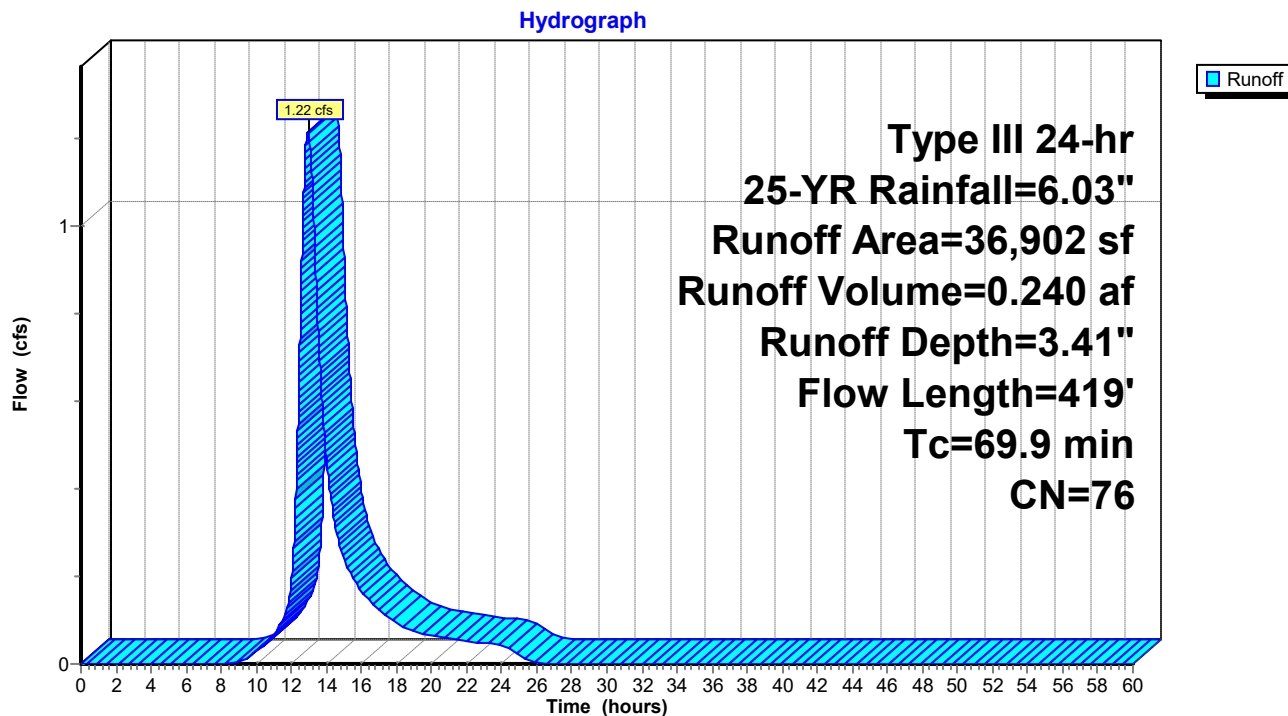
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Existing Conditions  
Type III 24-hr 25-YR Rainfall=6.03"

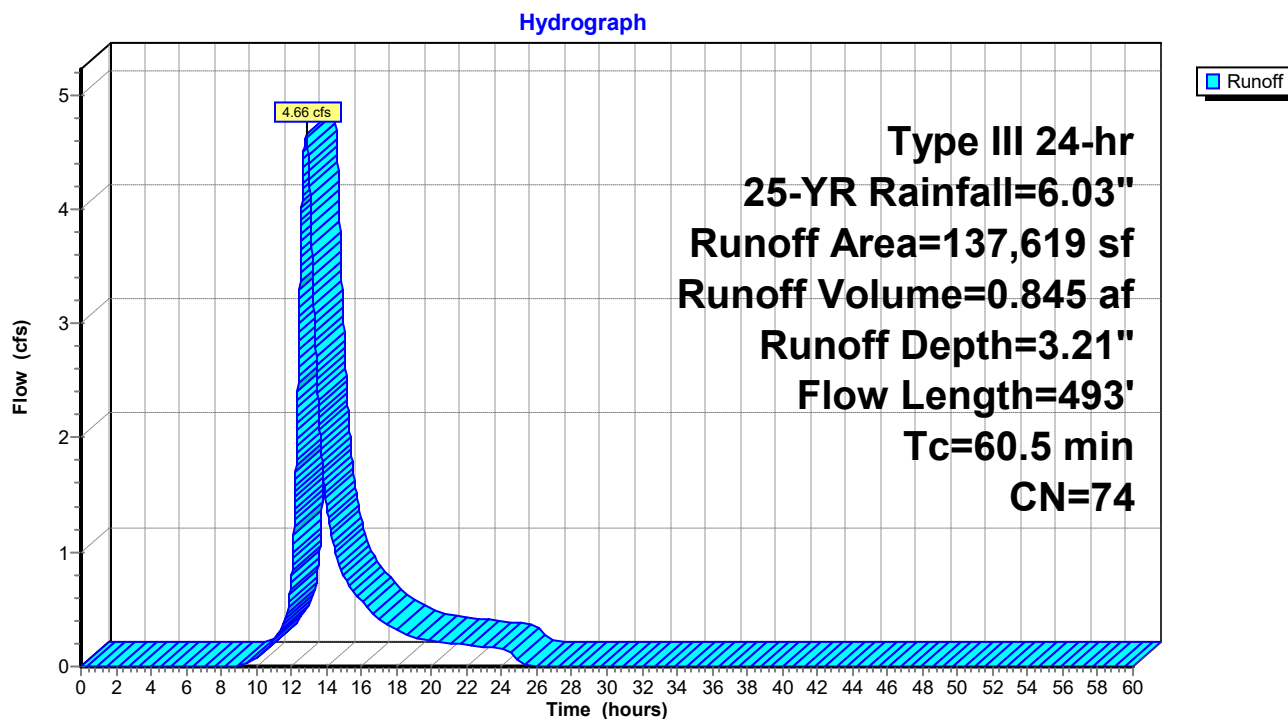
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Page 13

### Subcatchment E1: Existing Flow to DP1



### Subcatchment E2: E2



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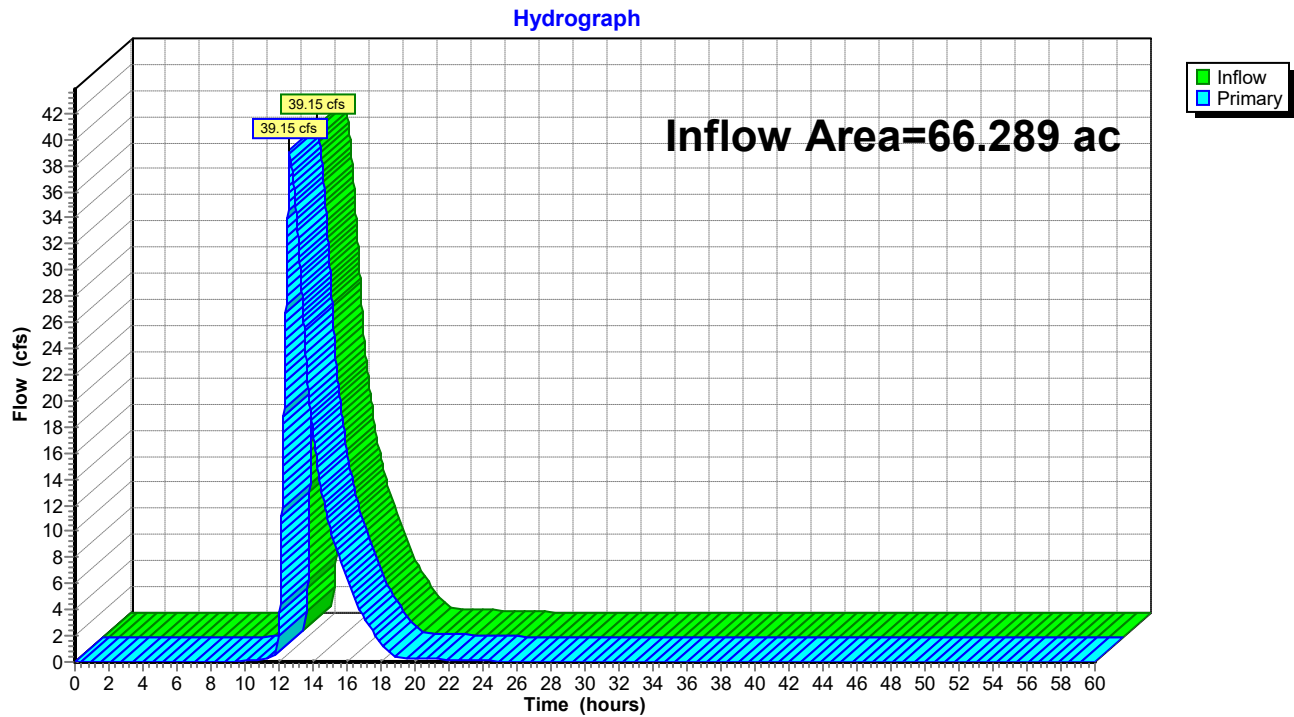
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Existing Conditions  
Type III 24-hr 25-YR Rainfall=6.03"

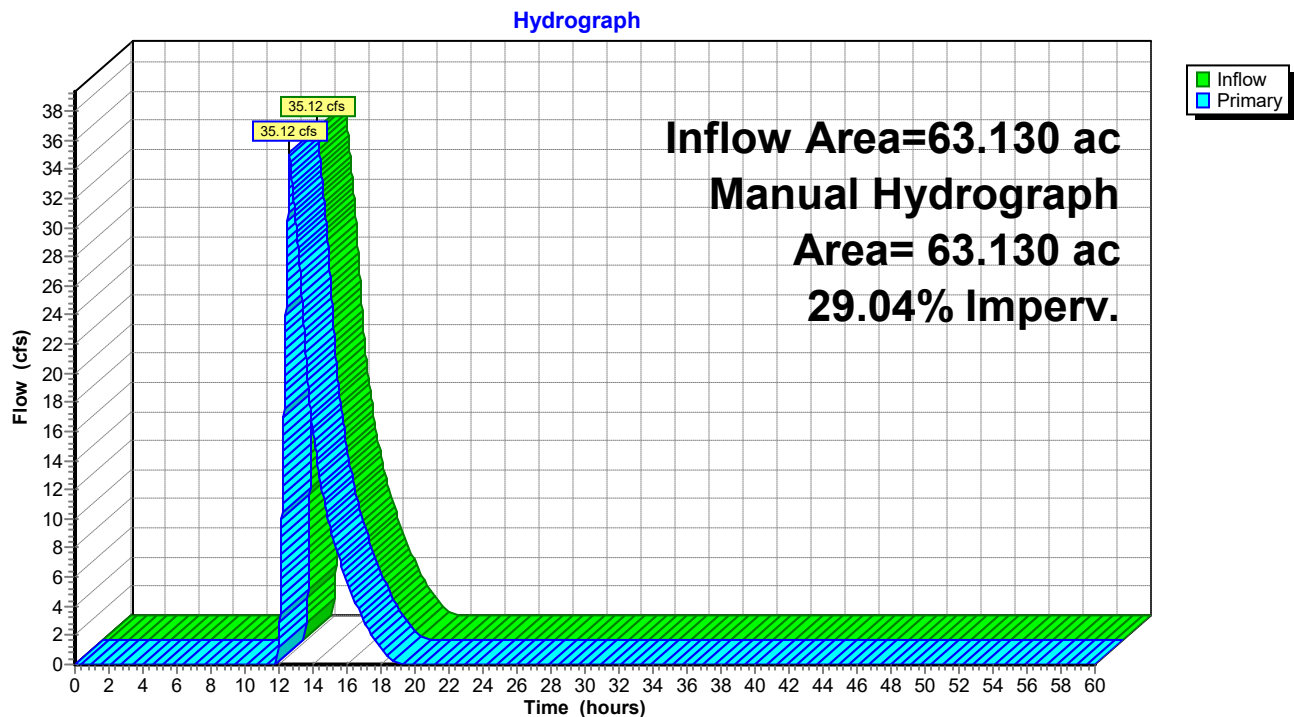
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### Link DP2: Existing Flow to DP2



### Link L1: Offsite Flow from 283 Ellington Road



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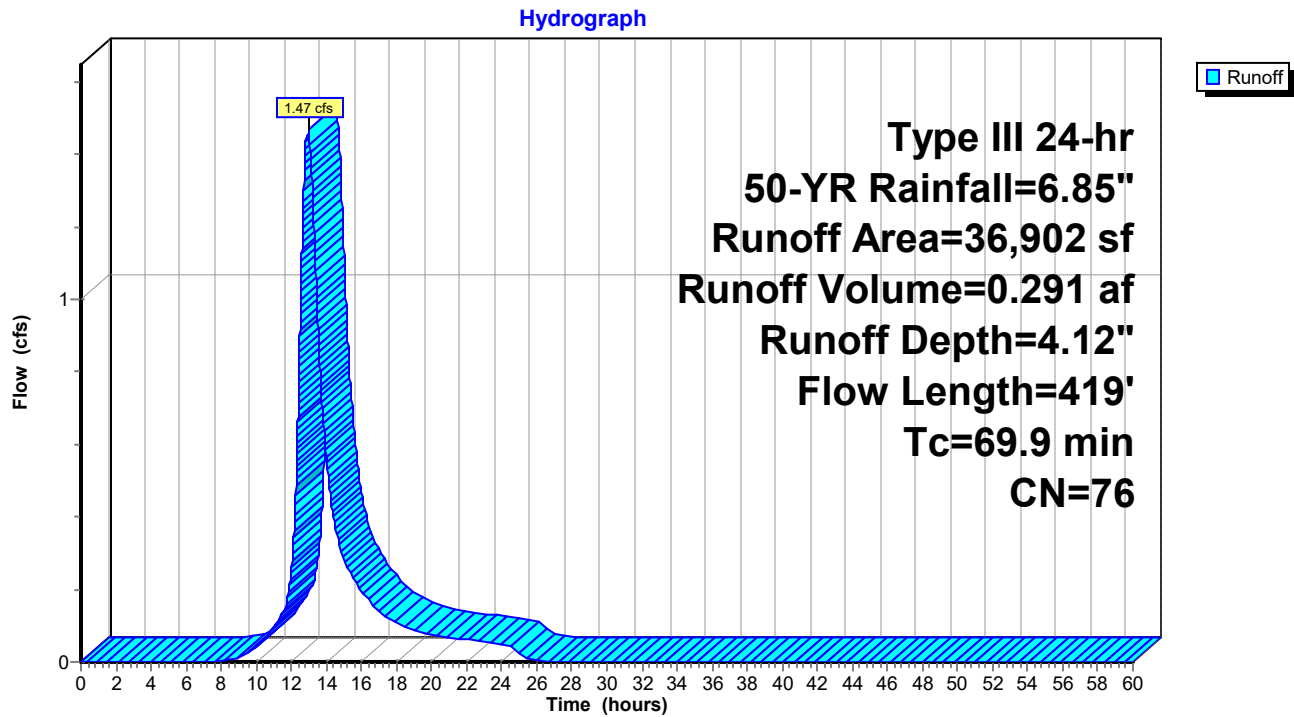
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Existing Conditions  
Type III 24-hr 50-YR Rainfall=6.85"

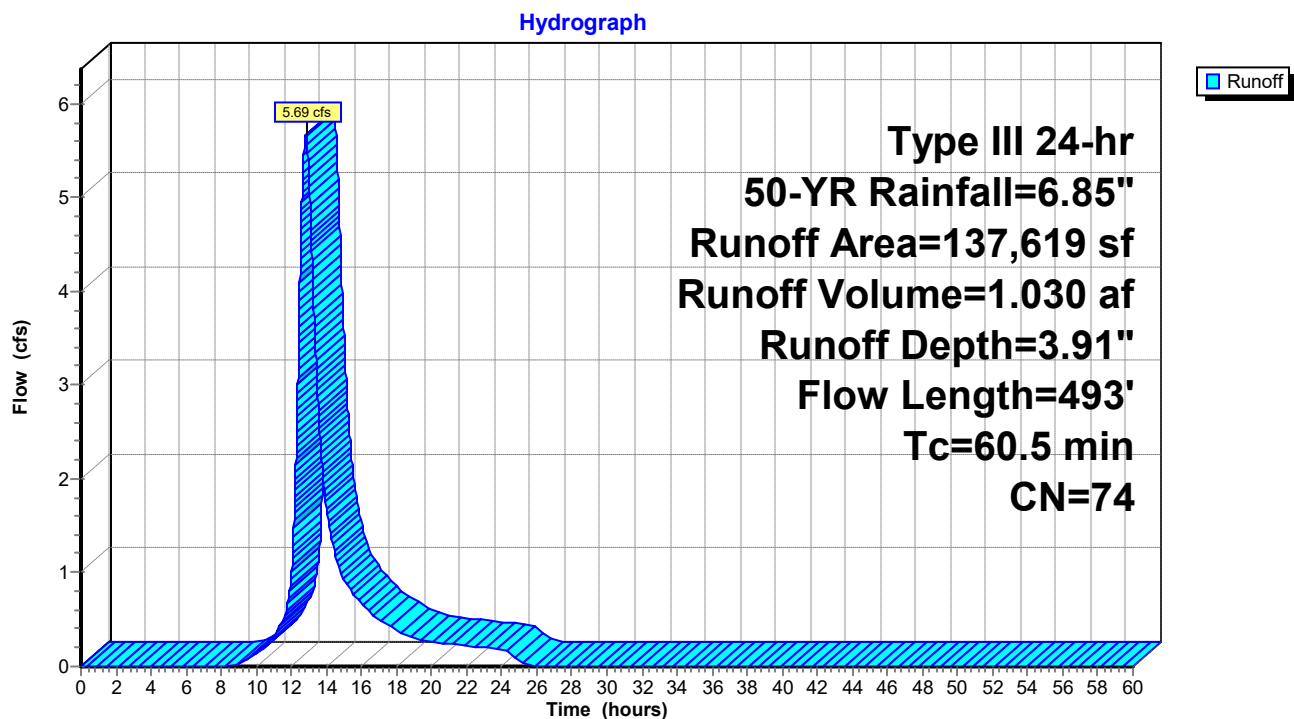
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### Subcatchment E1: Existing Flow to DP1



### Subcatchment E2: E2



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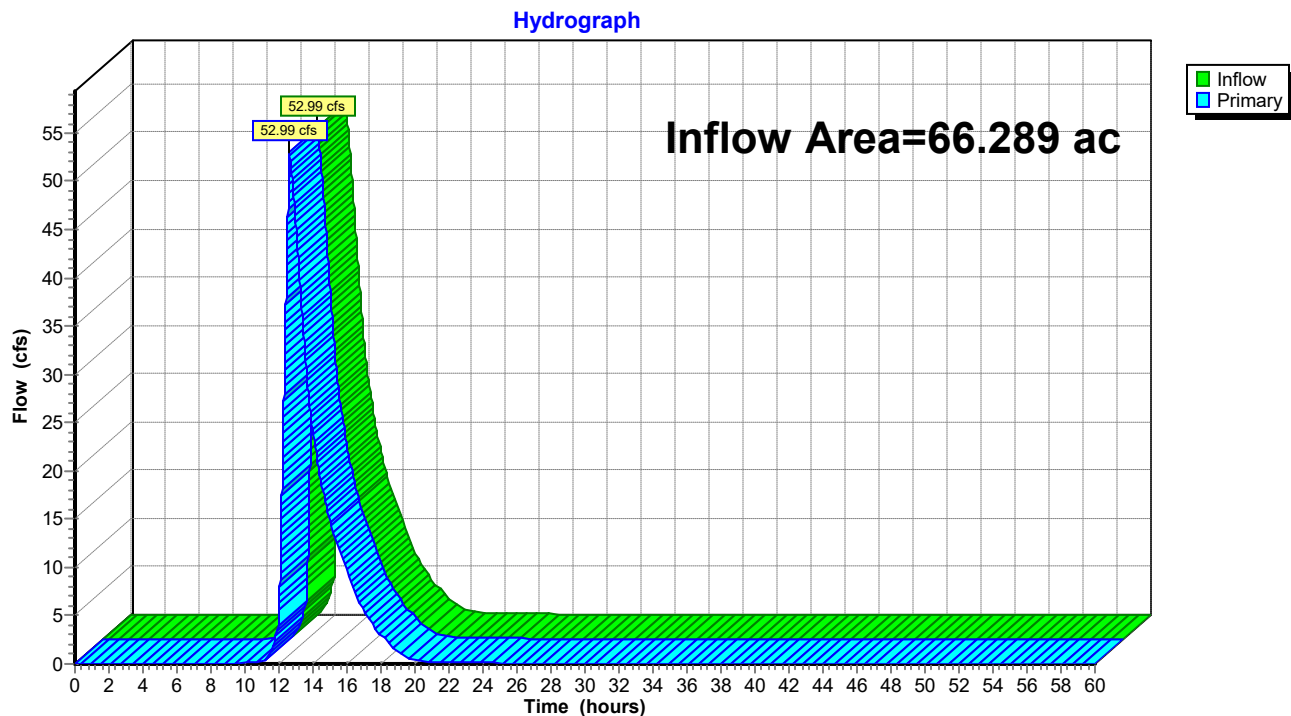
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Existing Conditions  
Type III 24-hr 50-YR Rainfall=6.85"

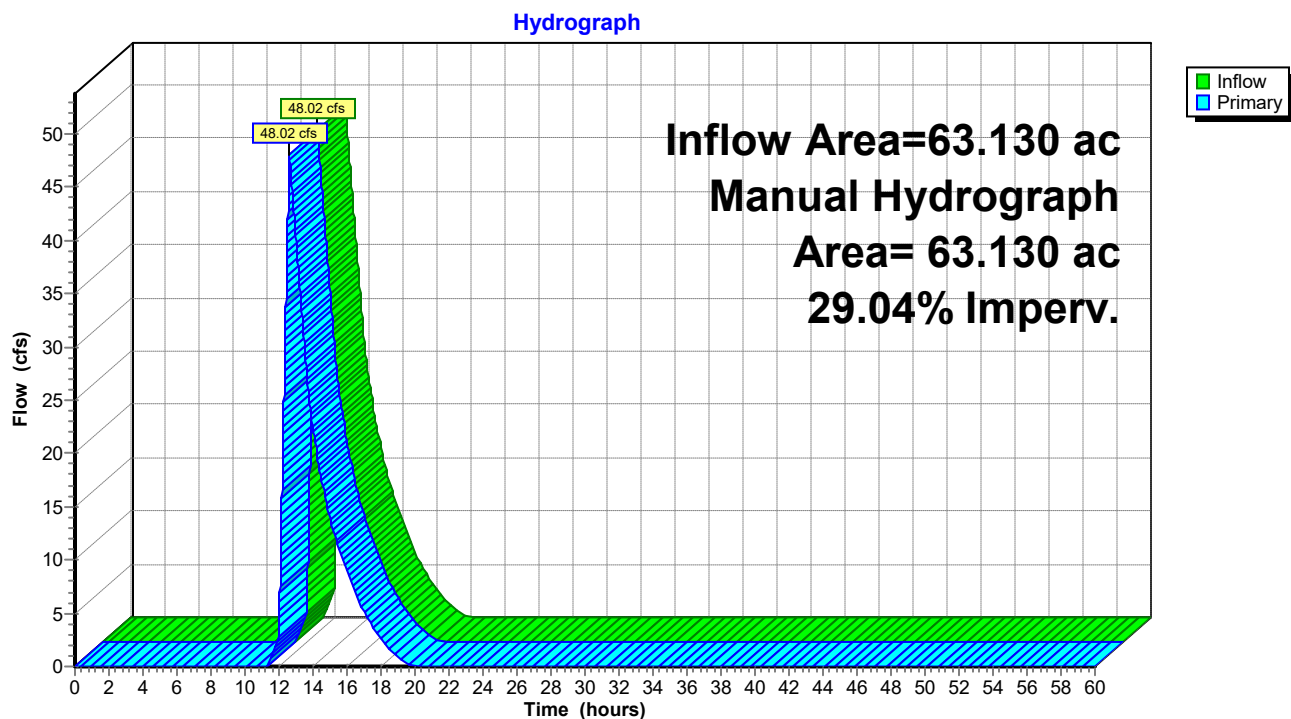
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### Link DP2: Existing Flow to DP2



### Link L1: Offsite Flow from 283 Ellington Road



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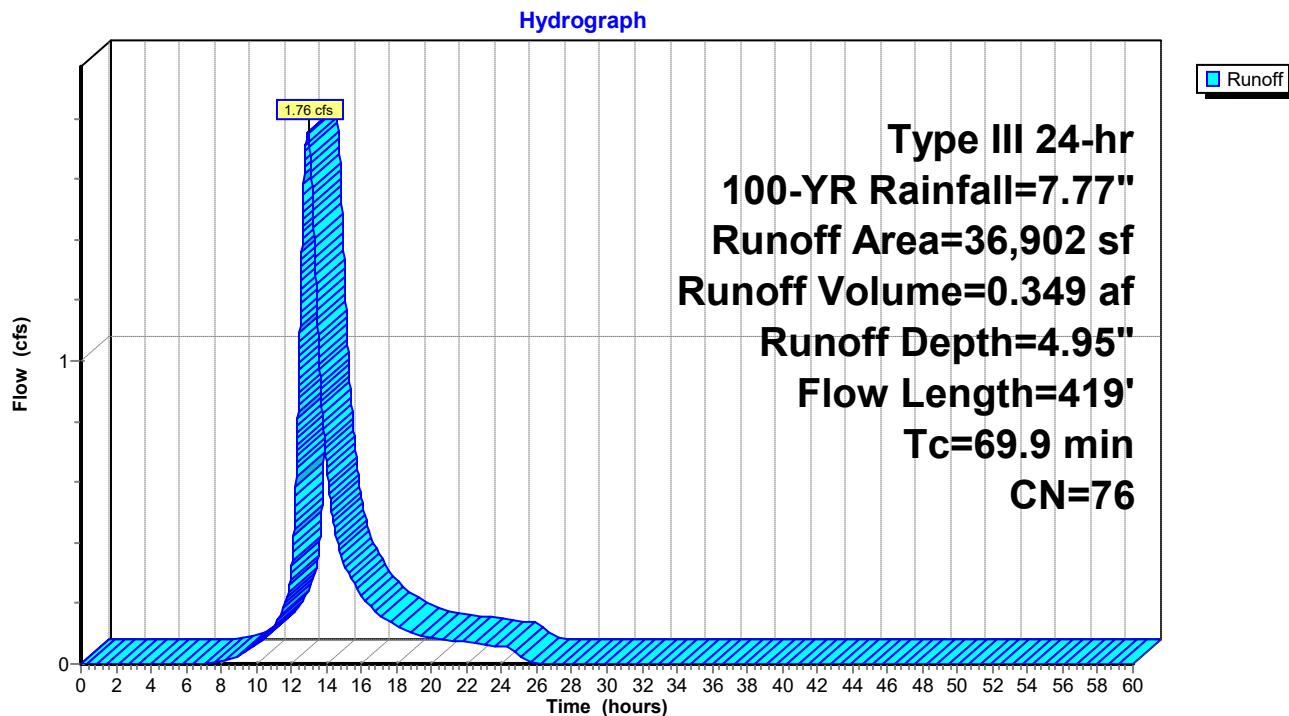
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Existing Conditions  
Type III 24-hr 100-YR Rainfall=7.77"

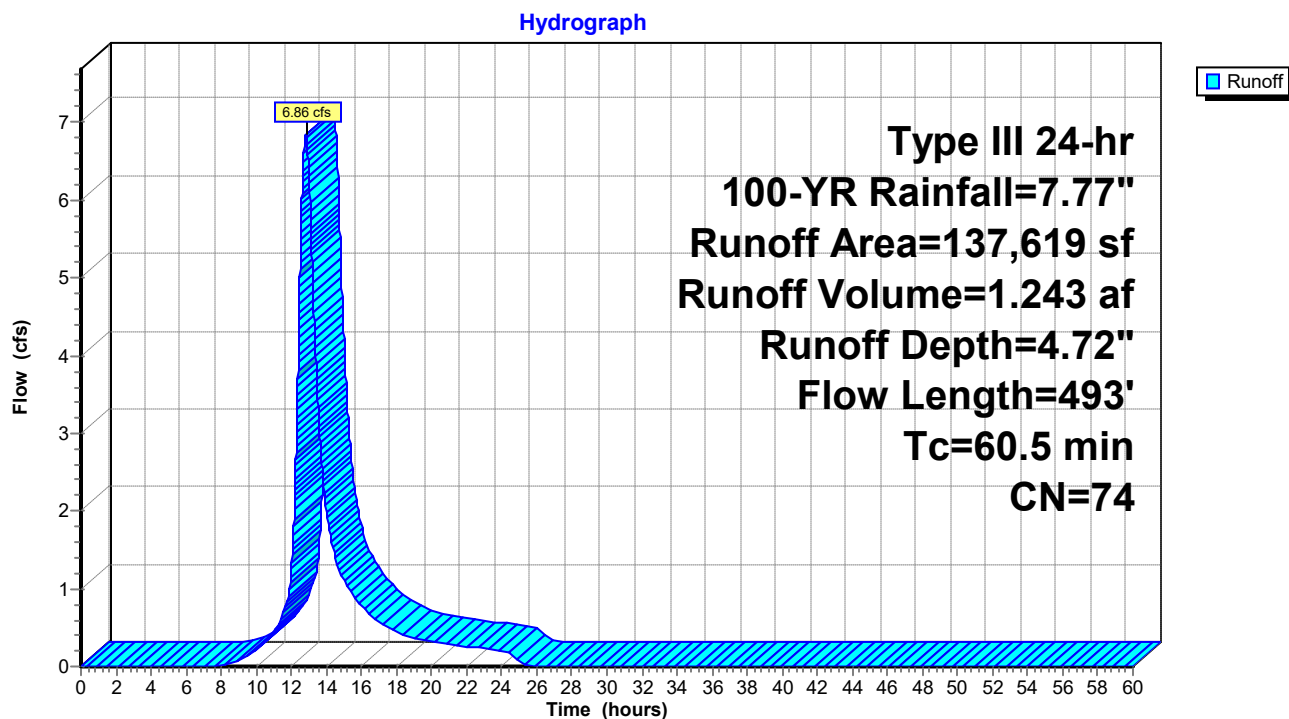
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### Subcatchment E1: Existing Flow to DP1



### Subcatchment E2: E2





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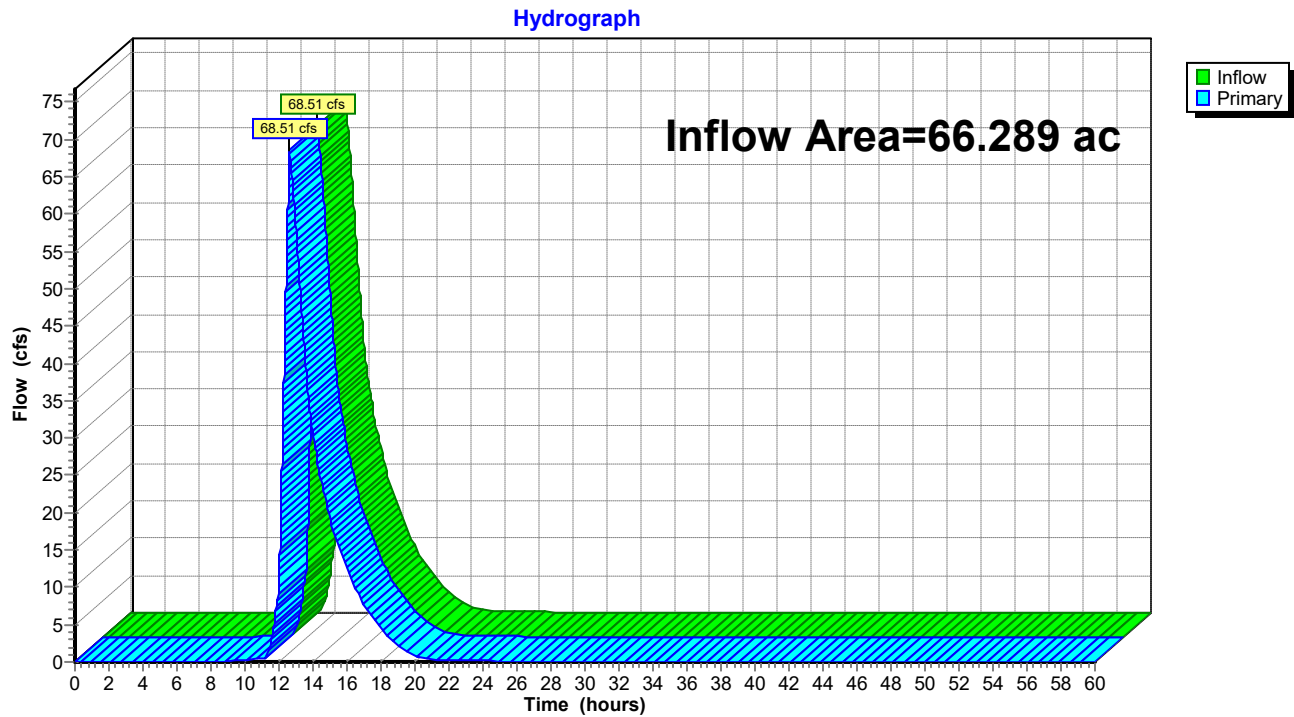
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Existing Conditions  
Type III 24-hr 100-YR Rainfall=7.77"

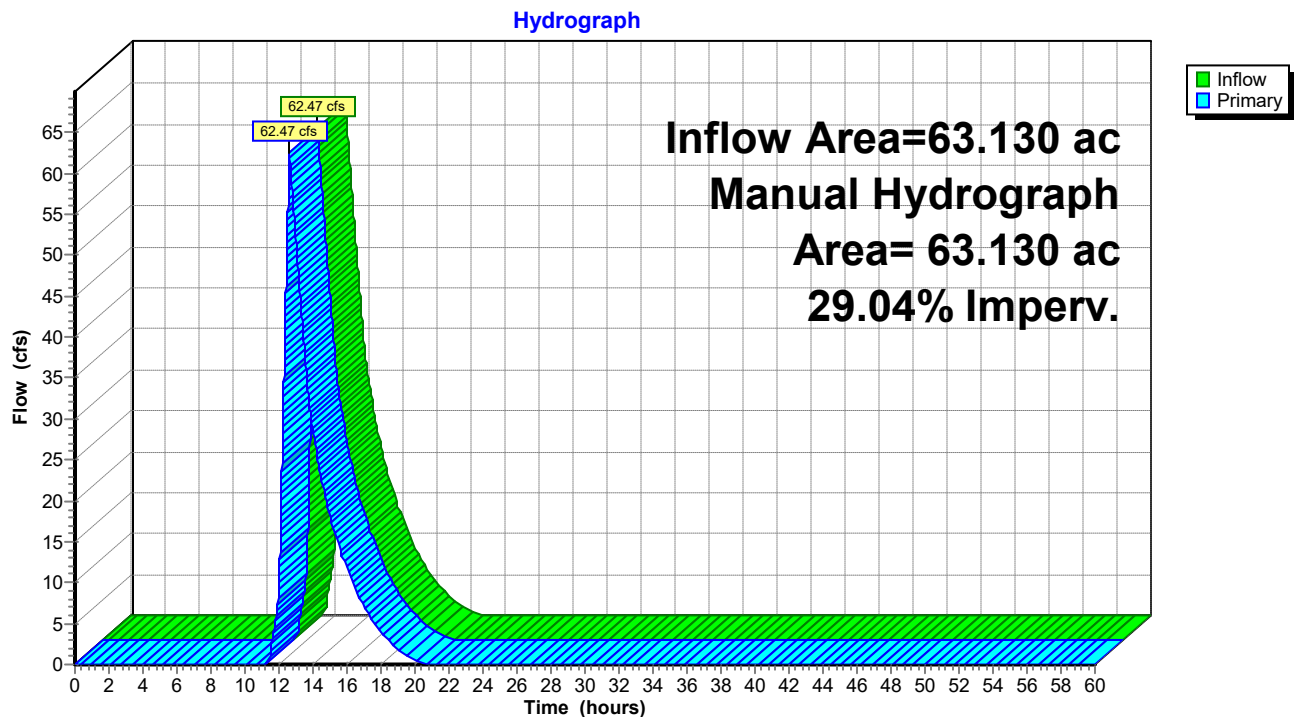
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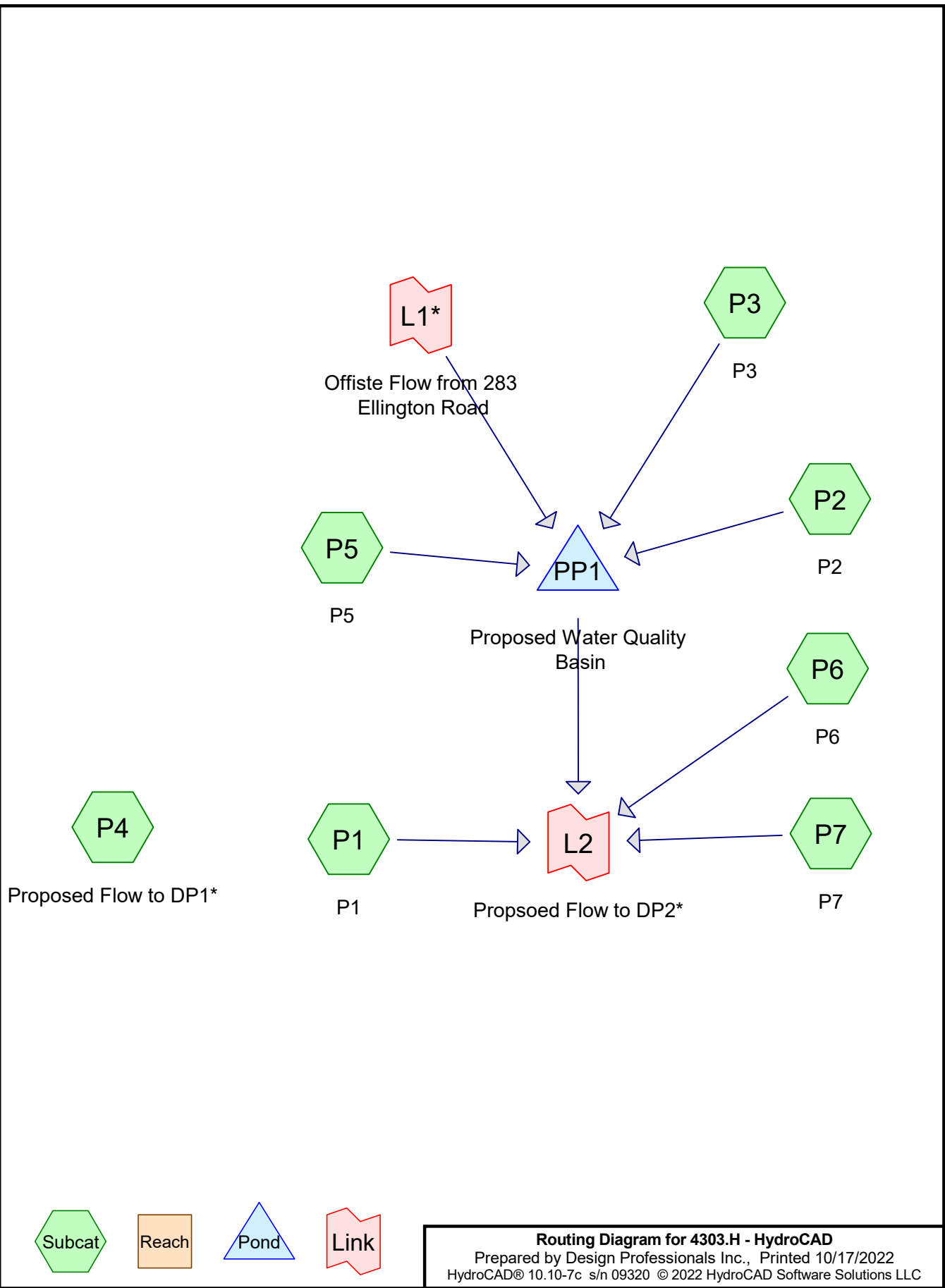
### Link DP2: Existing Flow to DP2



### Link L1: Offsite Flow from 283 Ellington Road



**APPENDIX B**  
**Watershed Computations**  
**(Post-Development Drainage HydroCAD Report)**



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Proposed Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P1: P1** Runoff Area=13,496 sf 0.00% Impervious Runoff Depth=0.81"  
Flow Length=111' Tc=35.2 min CN=71 Runoff=0.14 cfs 0.021 af

**Subcatchment P2: P2** Runoff Area=98,310 sf 37.91% Impervious Runoff Depth=1.45"  
Flow Length=528' Tc=45.8 min CN=82 Runoff=1.75 cfs 0.273 af

**Subcatchment P3: P3** Runoff Area=32,351 sf 42.16% Impervious Runoff Depth=1.59"  
Tc=8.0 min CN=84 Runoff=1.29 cfs 0.098 af

**Subcatchment P4: Proposed Flow to DP1\*** Runoff Area=5,076 sf 47.60% Impervious Runoff Depth=1.66"  
Tc=8.0 min CN=85 Runoff=0.21 cfs 0.016 af

**Subcatchment P5: P5** Runoff Area=24,978 sf 100.00% Impervious Runoff Depth=2.86"  
Tc=6.0 min CN=98 Runoff=1.72 cfs 0.137 af

**Subcatchment P6: P6** Runoff Area=110 sf 0.00% Impervious Runoff Depth=0.97"  
Tc=10.0 min CN=74 Runoff=0.00 cfs 0.000 af

**Subcatchment P7: P7** Runoff Area=70 sf 0.00% Impervious Runoff Depth=0.97"  
Tc=10.0 min CN=74 Runoff=0.00 cfs 0.000 af

**Pond PP1: Proposed Water Quality Basin** Peak Elev=56.33' Storage=8,909 cf Inflow=4.58 cfs 0.747 af  
Outflow=3.48 cfs 0.747 af

**Link L1\*: Offsite Flow from 283 Ellington Road** Manual Hydrograph Inflow=3.44 cfs 0.240 af  
Area= 63.130 ac 29.04% Imperv. Primary=3.44 cfs 0.240 af

**Link L2: Propsoed Flow to DP2\*** Inflow=3.52 cfs 0.768 af  
Primary=3.52 cfs 0.768 af

**Total Runoff Area = 4.003 ac Runoff Volume = 0.545 af Average Runoff Depth = 1.63"**  
**55.10% Pervious = 2.206 ac 44.90% Impervious = 1.798 ac**

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Type III 24-hr 10-YR Rainfall=4.90"

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Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P1: P1**

Runoff Area=13,496 sf 0.00% Impervious Runoff Depth=2.04"  
Flow Length=111' Tc=35.2 min CN=71 Runoff=0.38 cfs 0.053 af

**Subcatchment P2: P2**

Runoff Area=98,310 sf 37.91% Impervious Runoff Depth=2.99"  
Flow Length=528' Tc=45.8 min CN=82 Runoff=3.62 cfs 0.562 af

**Subcatchment P3: P3**

Runoff Area=32,351 sf 42.16% Impervious Runoff Depth=3.18"  
Tc=8.0 min CN=84 Runoff=2.57 cfs 0.197 af

**Subcatchment P4: Proposed Flow to DP1\***

Runoff Area=5,076 sf 47.60% Impervious Runoff Depth=3.28"  
Tc=8.0 min CN=85 Runoff=0.41 cfs 0.032 af

**Subcatchment P5: P5**

Runoff Area=24,978 sf 100.00% Impervious Runoff Depth=4.66"  
Tc=6.0 min CN=98 Runoff=2.75 cfs 0.223 af

**Subcatchment P6: P6**

Runoff Area=110 sf 0.00% Impervious Runoff Depth=2.28"  
Tc=10.0 min CN=74 Runoff=0.01 cfs 0.000 af

**Subcatchment P7: P7**

Runoff Area=70 sf 0.00% Impervious Runoff Depth=2.28"  
Tc=10.0 min CN=74 Runoff=0.00 cfs 0.000 af

**Pond PP1: Proposed Water Quality Basin**

Peak Elev=57.81' Storage=27,455 cf Inflow=25.82 cfs 4.196 af  
Outflow=22.03 cfs 4.195 af

**Link L1\*: Offsite Flow from 283 Ellington Road**

Manual Hydrograph Inflow=21.38 cfs 3.214 af  
Area= 63.130 ac 29.04% Imperv. Primary=21.38 cfs 3.214 af

**Link L2: Propsoed Flow to DP2\***

Inflow=22.23 cfs 4.249 af  
Primary=22.23 cfs 4.249 af

**Total Runoff Area = 4.003 ac Runoff Volume = 1.067 af Average Runoff Depth = 3.20"**  
**55.10% Pervious = 2.206 ac 44.90% Impervious = 1.798 ac**

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Type III 24-hr 25-YR Rainfall=6.03"

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Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P1: P1** Runoff Area=13,496 sf 0.00% Impervious Runoff Depth=2.92"  
Flow Length=111' Tc=35.2 min CN=71 Runoff=0.55 cfs 0.075 af

**Subcatchment P2: P2** Runoff Area=98,310 sf 37.91% Impervious Runoff Depth=4.01"  
Flow Length=528' Tc=45.8 min CN=82 Runoff=4.85 cfs 0.755 af

**Subcatchment P3: P3** Runoff Area=32,351 sf 42.16% Impervious Runoff Depth=4.22"  
Tc=8.0 min CN=84 Runoff=3.38 cfs 0.261 af

**Subcatchment P4: Proposed Flow to DP1\*** Runoff Area=5,076 sf 47.60% Impervious Runoff Depth=4.33"  
Tc=8.0 min CN=85 Runoff=0.54 cfs 0.042 af

**Subcatchment P5: P5** Runoff Area=24,978 sf 100.00% Impervious Runoff Depth=5.79"  
Tc=6.0 min CN=98 Runoff=3.39 cfs 0.277 af

**Subcatchment P6: P6** Runoff Area=110 sf 0.00% Impervious Runoff Depth=3.21"  
Tc=10.0 min CN=74 Runoff=0.01 cfs 0.001 af

**Subcatchment P7: P7** Runoff Area=70 sf 0.00% Impervious Runoff Depth=3.21"  
Tc=10.0 min CN=74 Runoff=0.01 cfs 0.000 af

**Pond PP1: Proposed Water Quality Basin** Peak Elev=58.60' Storage=38,818 cf Inflow=40.99 cfs 7.340 af  
Outflow=34.90 cfs 7.339 af

**Link L1\*: Offsite Flow from 283 Ellington Road** Manual Hydrograph Inflow=35.12 cfs 6.047 af  
Area= 63.130 ac 29.04% Imperv. Primary=35.12 cfs 6.047 af

**Link L2: Propsoed Flow to DP2\*** Inflow=35.19 cfs 7.416 af  
Primary=35.19 cfs 7.416 af

**Total Runoff Area = 4.003 ac Runoff Volume = 1.412 af Average Runoff Depth = 4.23"**  
**55.10% Pervious = 2.206 ac 44.90% Impervious = 1.798 ac**

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Type III 24-hr 50-YR Rainfall=6.85"

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Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P1: P1** Runoff Area=13,496 sf 0.00% Impervious Runoff Depth=3.60"  
Flow Length=111' Tc=35.2 min CN=71 Runoff=0.69 cfs 0.093 af

**Subcatchment P2: P2** Runoff Area=98,310 sf 37.91% Impervious Runoff Depth=4.78"  
Flow Length=528' Tc=45.8 min CN=82 Runoff=5.74 cfs 0.898 af

**Subcatchment P3: P3** Runoff Area=32,351 sf 42.16% Impervious Runoff Depth=5.00"  
Tc=8.0 min CN=84 Runoff=3.97 cfs 0.309 af

**Subcatchment P4: Proposed Flow to DP1\*** Runoff Area=5,076 sf 47.60% Impervious Runoff Depth=5.11"  
Tc=8.0 min CN=85 Runoff=0.63 cfs 0.050 af

**Subcatchment P5: P5** Runoff Area=24,978 sf 100.00% Impervious Runoff Depth=6.61"  
Tc=6.0 min CN=98 Runoff=3.85 cfs 0.316 af

**Subcatchment P6: P6** Runoff Area=110 sf 0.00% Impervious Runoff Depth=3.91"  
Tc=10.0 min CN=74 Runoff=0.01 cfs 0.001 af

**Subcatchment P7: P7** Runoff Area=70 sf 0.00% Impervious Runoff Depth=3.91"  
Tc=10.0 min CN=74 Runoff=0.01 cfs 0.001 af

**Pond PP1: Proposed Water Quality Basin** Peak Elev=59.33' Storage=50,693 cf Inflow=54.94 cfs 10.285 af  
Outflow=45.40 cfs 10.285 af

**Link L1\*: Offsite Flow from 283 Ellington Road** Manual Hydrograph Inflow=48.02 cfs 8.762 af  
Area= 63.130 ac 29.04% Imperv. Primary=48.02 cfs 8.762 af

**Link L2: Propsoed Flow to DP2\*** Inflow=45.74 cfs 10.379 af  
Primary=45.74 cfs 10.379 af

**Total Runoff Area = 4.003 ac Runoff Volume = 1.667 af Average Runoff Depth = 5.00"**  
**55.10% Pervious = 2.206 ac 44.90% Impervious = 1.798 ac**

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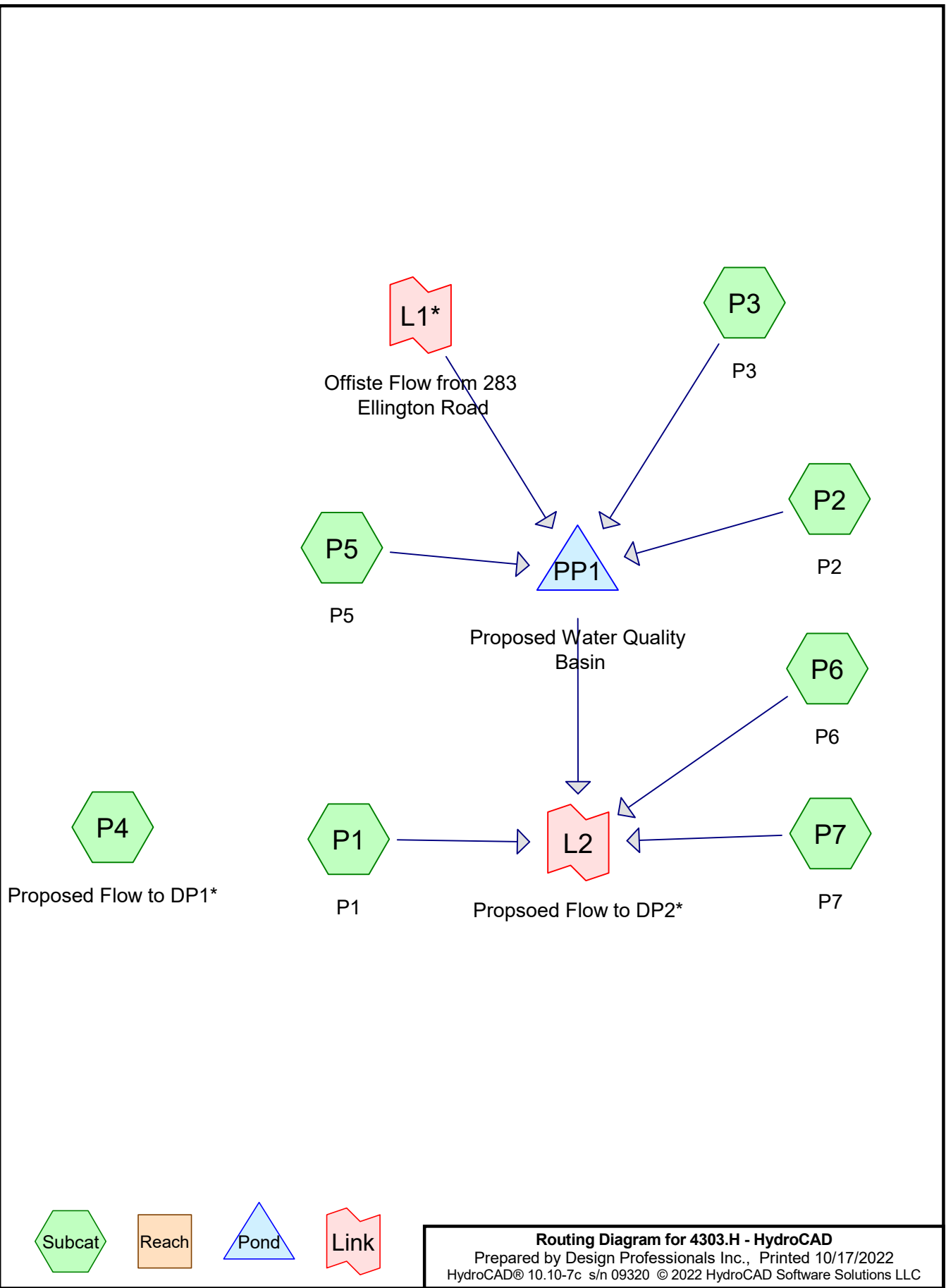
Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P1: P1**Runoff Area=13,496 sf 0.00% Impervious Runoff Depth=4.38"  
Flow Length=111' Tc=35.2 min CN=71 Runoff=0.84 cfs 0.113 af**Subcatchment P2: P2**Runoff Area=98,310 sf 37.91% Impervious Runoff Depth=5.64"  
Flow Length=528' Tc=45.8 min CN=82 Runoff=6.74 cfs 1.061 af**Subcatchment P3: P3**Runoff Area=32,351 sf 42.16% Impervious Runoff Depth=5.87"  
Tc=8.0 min CN=84 Runoff=4.64 cfs 0.364 af**Subcatchment P4: Proposed Flow to DP1\***Runoff Area=5,076 sf 47.60% Impervious Runoff Depth=5.99"  
Tc=8.0 min CN=85 Runoff=0.74 cfs 0.058 af**Subcatchment P5: P5**Runoff Area=24,978 sf 100.00% Impervious Runoff Depth=7.53"  
Tc=6.0 min CN=98 Runoff=4.37 cfs 0.360 af**Subcatchment P6: P6**Runoff Area=110 sf 0.00% Impervious Runoff Depth=4.72"  
Tc=10.0 min CN=74 Runoff=0.01 cfs 0.001 af**Subcatchment P7: P7**Runoff Area=70 sf 0.00% Impervious Runoff Depth=4.72"  
Tc=10.0 min CN=74 Runoff=0.01 cfs 0.001 af**Pond PP1: Proposed Water Quality Basin**Peak Elev=60.12' Storage=65,035 cf Inflow=70.58 cfs 13.530 af  
Outflow=58.62 cfs 13.529 af**Link L1\*: Offsite Flow from 283 Ellington Road**Manual Hydrograph Inflow=62.47 cfs 11.745 af  
Area= 63.130 ac 29.04% Imperv. Primary=62.47 cfs 11.745 af**Link L2: Propsoed Flow to DP2\***Inflow=59.04 cfs 13.644 af  
Primary=59.04 cfs 13.644 af**Total Runoff Area = 4.003 ac Runoff Volume = 1.957 af Average Runoff Depth = 5.87"**  
**55.10% Pervious = 2.206 ac 44.90% Impervious = 1.798 ac**





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**Summary for Subcatchment P1: P1**

Runoff = 0.14 cfs @ 12.55 hrs, Volume= 0.021 af, Depth= 0.81"  
 Routed to Link L2 : Propsoed Flow to DP2\*

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-YR Rainfall=3.09"

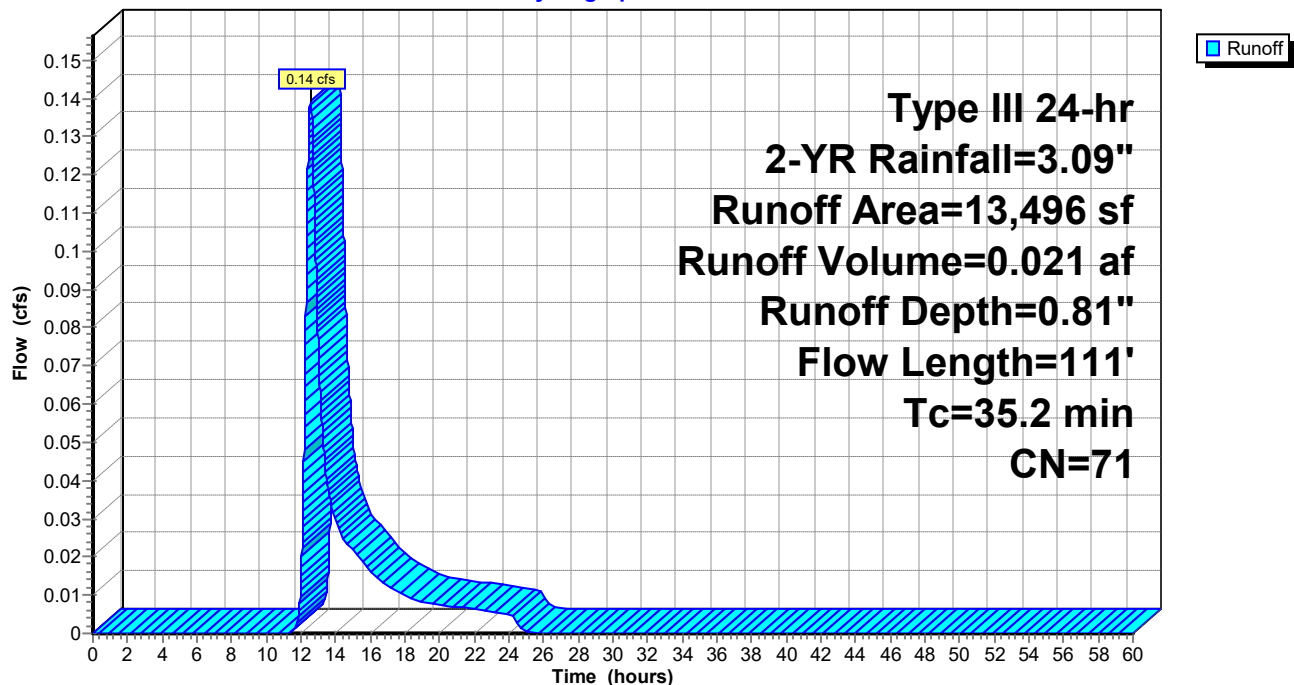
Area (sf)	CN	Description
2,957	74	>75% Grass cover, Good, HSG C
10,539	70	Woods, Good, HSG C
13,496	71	Weighted Average
13,496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	100	0.0320	0.05		<b>Sheet Flow, Woods Sheet Flow</b>
					Woods: Dense underbrush n= 0.800 P2= 3.09"
3.7	11	0.0001	0.05		<b>Shallow Concentrated Flow, Woods Shallow Flow</b>
					Woodland Kv= 5.0 fps
35.2	111	Total			

**Subcatchment P1: P1**

Hydrograph



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**Summary for Subcatchment P2: P2**

Runoff = 1.75 cfs @ 12.67 hrs, Volume= 0.273 af, Depth= 1.45"  
 Routed to Pond PP1 : Proposed Water Quality Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-YR Rainfall=3.09"

	Area (sf)	CN	Description
	43,960	74	>75% Grass cover, Good, HSG C
*	37,272	98	IMPERVIOUS
	17,078	70	Woods, Good, HSG C
	98,310	82	Weighted Average
	61,038		62.09% Pervious Area
	37,272		37.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
42.3	82	0.0103	0.03		<b>Sheet Flow, Woods Sheet Flow</b> Woods: Dense underbrush n= 0.800 P2= 3.09"
1.1	13	0.2100	0.20		<b>Sheet Flow, Grass Sheet Flow</b> Grass: Dense n= 0.240 P2= 3.09"
0.2	6	0.0088	0.55		<b>Sheet Flow, Driveway Sheet Flow</b> Smooth surfaces n= 0.011 P2= 3.09"
0.6	90	0.0179	2.72		<b>Shallow Concentrated Flow, Impervious Shallow Flow</b> Paved Kv= 20.3 fps
1.0	208	0.0050	3.47	2.73	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.5	106	0.0050	3.47	2.73	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.1	23	0.0067	4.02	3.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
45.8	528	Total			

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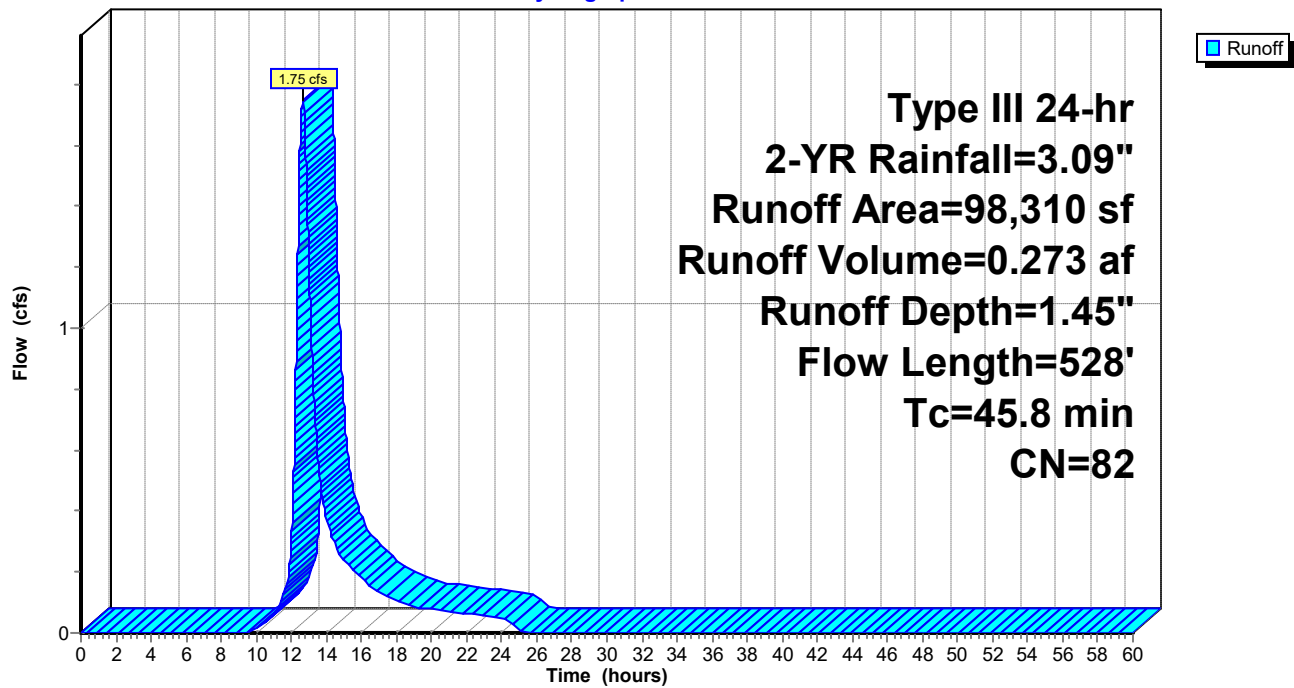
Type III 24-hr 2-YR Rainfall=3.09"

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### Subcatchment P2: P2

Hydrograph



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### Summary for Subcatchment P3: P3

Runoff = 1.29 cfs @ 12.12 hrs, Volume= 0.098 af, Depth= 1.59"  
Routed to Pond PP1 : Proposed Water Quality Basin

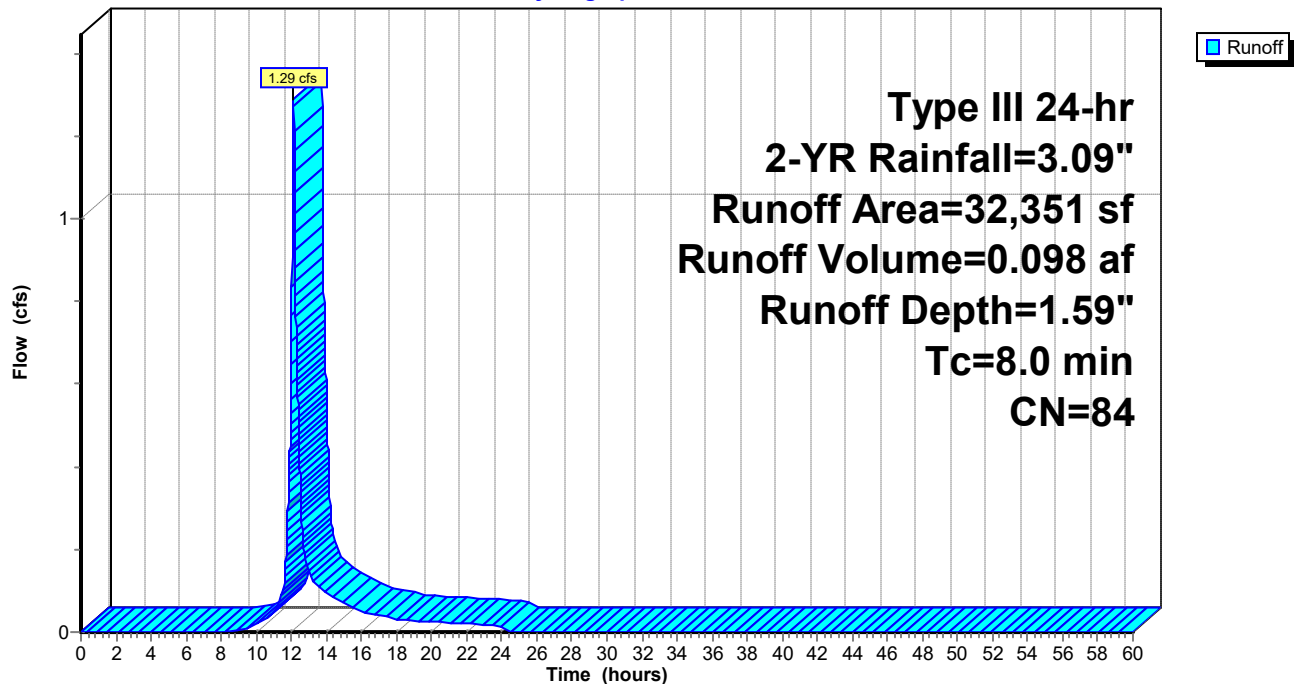
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YR Rainfall=3.09"

	Area (sf)	CN	Description
	15,678	74	>75% Grass cover, Good, HSG C
*	13,639	98	IMPERVIOUS
	3,034	70	Woods, Good, HSG C
	32,351	84	Weighted Average
	18,712		57.84% Pervious Area
	13,639		42.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry,

### Subcatchment P3: P3

Hydrograph



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**Summary for Subcatchment P4: Proposed Flow to DP1\***

Runoff = 0.21 cfs @ 12.12 hrs, Volume= 0.016 af, Depth= 1.66"

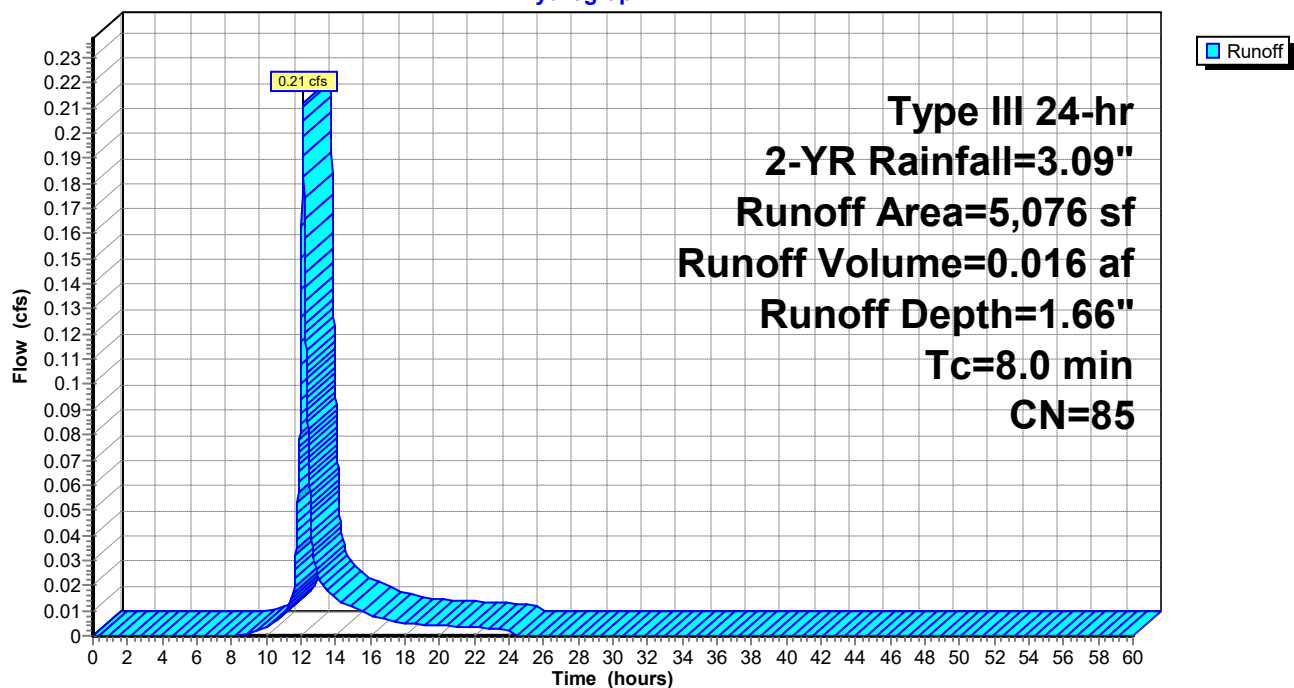
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YR Rainfall=3.09"

	Area (sf)	CN	Description
	2,112	74	>75% Grass cover, Good, HSG C
*	2,416	98	IMPERVIOUS
	548	70	Woods, Good, HSG C
	5,076	85	Weighted Average
	2,660		52.40% Pervious Area
	2,416		47.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry,

**Subcatchment P4: Proposed Flow to DP1\***

Hydrograph



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Type III 24-hr 2-YR Rainfall=3.09"

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### Summary for Subcatchment P5: P5

Runoff = 1.72 cfs @ 12.08 hrs, Volume= 0.137 af, Depth= 2.86"  
Routed to Pond PP1 : Proposed Water Quality Basin

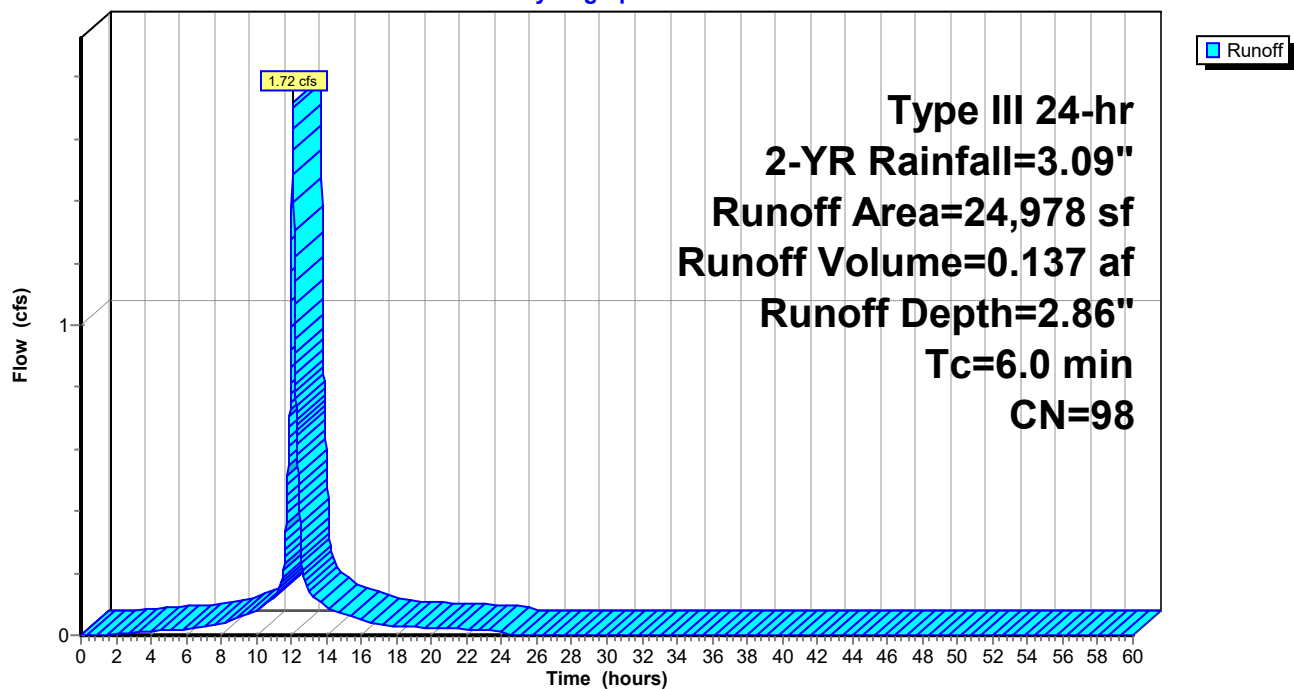
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YR Rainfall=3.09"

	Area (sf)	CN	Description
*	24,978	98	IMPERVIOUS
	24,978		100.00% Impervious Area

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

### Subcatchment P5: P5

Hydrograph



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Type III 24-hr 2-YR Rainfall=3.09"

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### Summary for Subcatchment P6: P6

Runoff = 0.00 cfs @ 12.15 hrs, Volume= 0.000 af, Depth= 0.97"  
Routed to Link L2 : Propsoed Flow to DP2\*

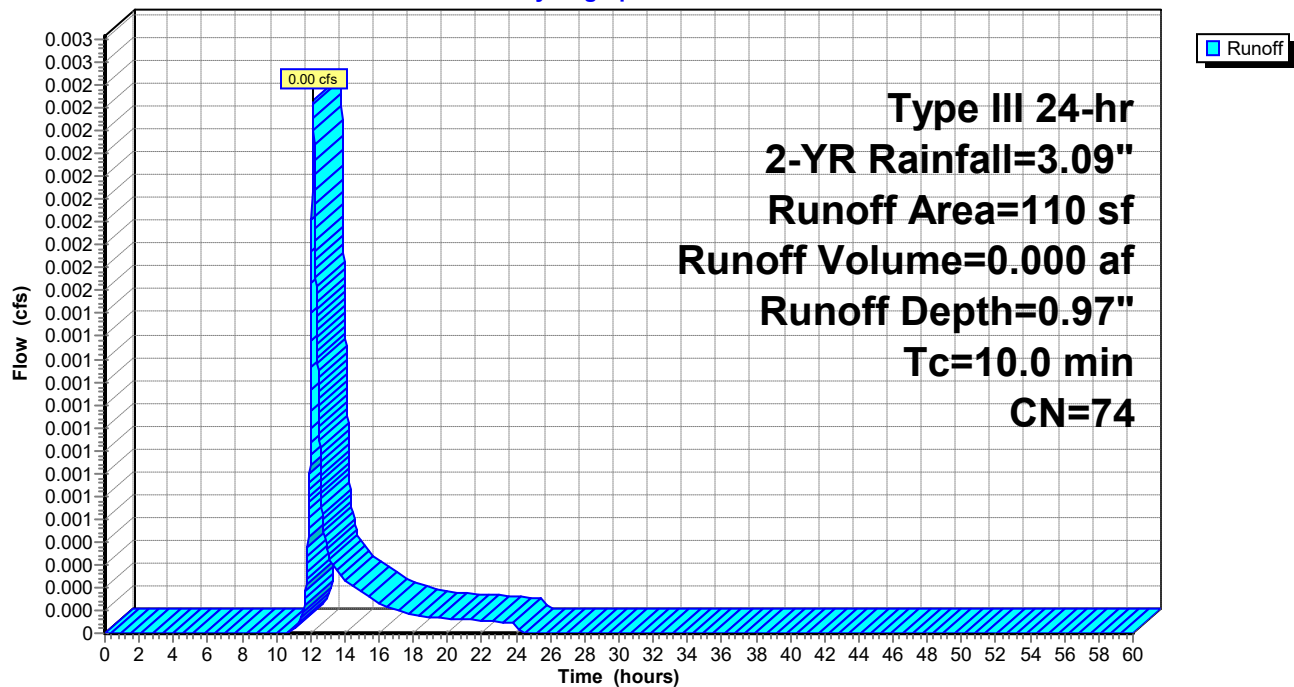
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
110	74	>75% Grass cover, Good, HSG C
110		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

### Subcatchment P6: P6

Hydrograph





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Type III 24-hr 2-YR Rainfall=3.09"

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### Summary for Subcatchment P7: P7

Runoff = 0.00 cfs @ 12.15 hrs, Volume= 0.000 af, Depth= 0.97"  
Routed to Link L2 : Propsoed Flow to DP2\*

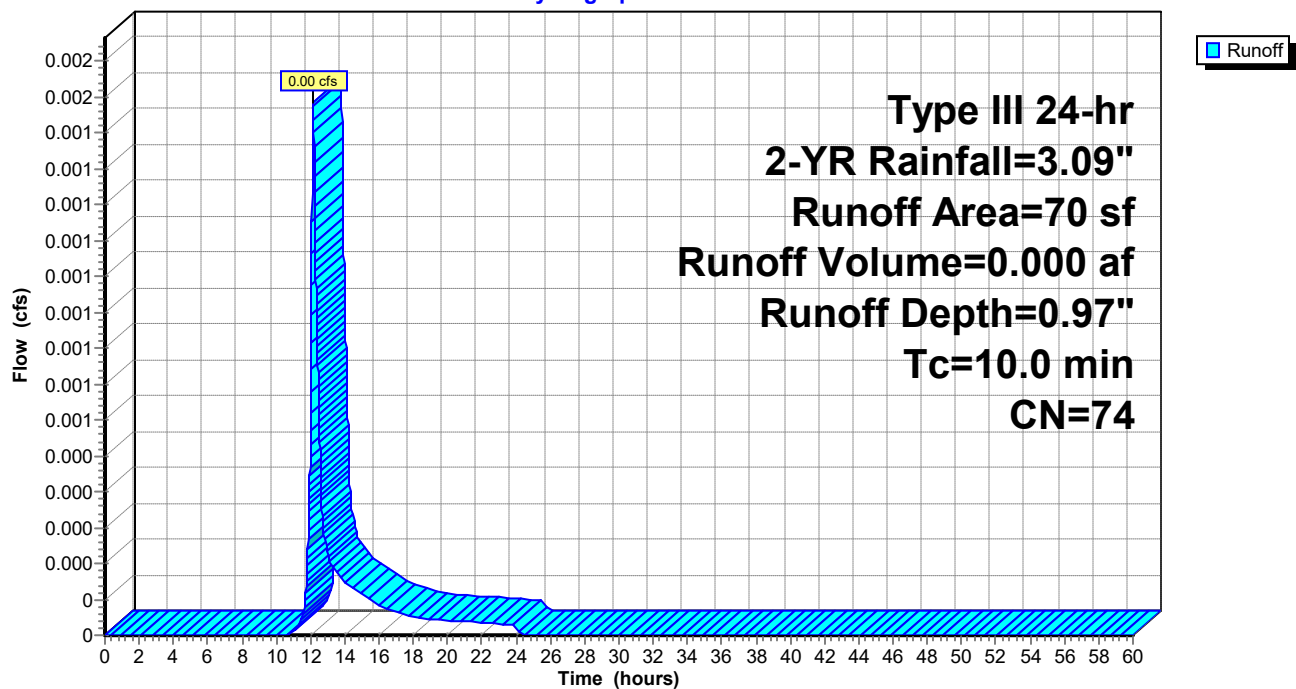
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-YR Rainfall=3.09"

Area (sf)	CN	Description
70	74	>75% Grass cover, Good, HSG C
70		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

### Subcatchment P7: P7

Hydrograph



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Proposed Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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**Summary for Pond PP1: Proposed Water Quality Basin**

Inflow Area = 66.703 ac, 30.10% Impervious, Inflow Depth = 0.13" for 2-YR event  
 Inflow = 4.58 cfs @ 13.20 hrs, Volume= 0.747 af  
 Outflow = 3.48 cfs @ 13.43 hrs, Volume= 0.747 af, Atten= 24%, Lag= 13.6 min  
 Primary = 3.48 cfs @ 13.43 hrs, Volume= 0.747 af  
 Routed to Link L2 : Propsoed Flow to DP2\*

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 56.33' @ 13.43 hrs Surf.Area= 11,371 sf Storage= 8,909 cf

Plug-Flow detention time= 94.9 min calculated for 0.747 af (100% of inflow)  
 Center-of-Mass det. time= 94.4 min ( 919.4 - 825.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	55.50'	82,711 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.50	10,195	0	0
56.00	10,891	5,272	5,272
57.00	12,359	11,625	16,897
58.00	13,916	13,138	30,034
59.00	16,399	15,158	45,192
60.00	18,747	17,573	62,765
61.00	21,145	19,946	82,711

Device	Routing	Invert	Outlet Devices
#1	Primary	55.41'	<b>36.0" Round Culvert</b> L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.41' / 55.30' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf
#2	Device 1	55.50'	<b>36.0" Round Culvert</b> L= 14.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.50' / 55.41' S= 0.0064 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf

**Primary OutFlow** Max=3.48 cfs @ 13.43 hrs HW=56.33' (Free Discharge)

↑ **1=Culvert** (Passes 3.48 cfs of 4.19 cfs potential flow)

↑ **2=Culvert** (Barrel Controls 3.48 cfs @ 3.30 fps)

## 4303.H - HydroCAD

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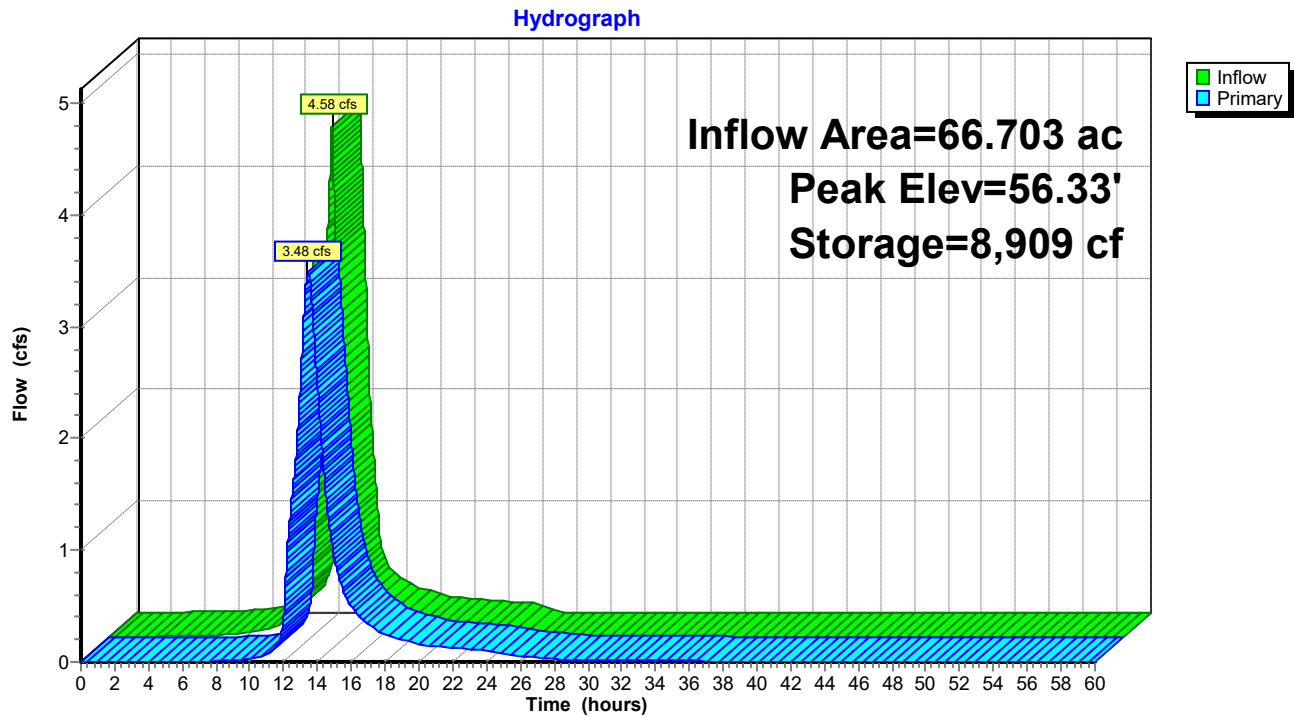
HydroCAD® 10.10-7c s/n 09320 © 2022 HydroCAD Software Solutions LLC

Proposed Conditions  
Type III 24-hr 2-YR Rainfall=3.09"

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### Pond PP1: Proposed Water Quality Basin



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Proposed Conditions

Type III 24-hr 2-YR Rainfall=3.09"

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### Summary for Link L1\*: Offsite Flow from 283 Ellington Road

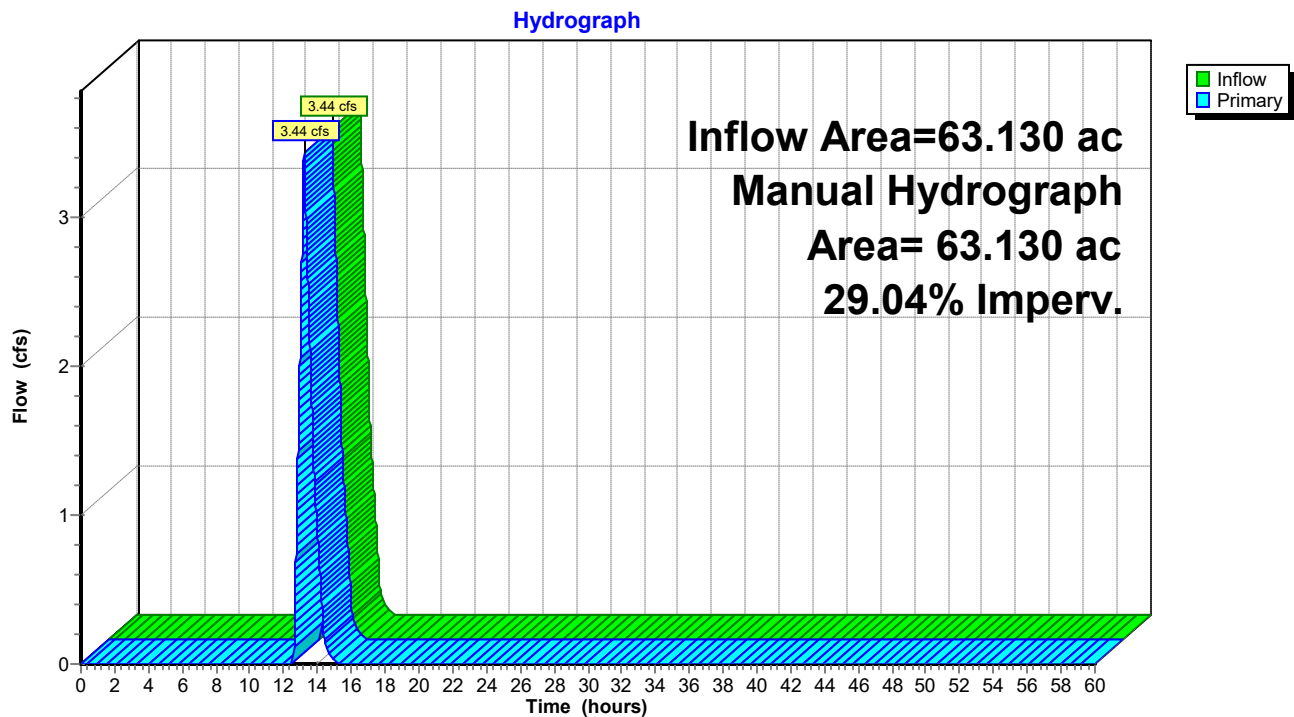
Inflow Area = 63.130 ac, 29.04% Impervious, Inflow Depth = 0.05" for 2-YR event  
Inflow = 3.44 cfs @ 13.20 hrs, Volume= 0.240 af  
Primary = 3.44 cfs @ 13.20 hrs, Volume= 0.240 af, Atten= 0%, Lag= 0.0 min  
Routed to Pond PP1 : Proposed Water Quality Basin

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

2-YR 59 Point manual hydrograph, To= 0.00 hrs, dt= 0.60 hrs, Area= 63.130 ac, 29.04% Imp., cfs =

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	0.00	3.44	1.23	0.16	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	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

### Link L1\*: Offsite Flow from 283 Ellington Road



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Type III 24-hr 2-YR Rainfall=3.09"

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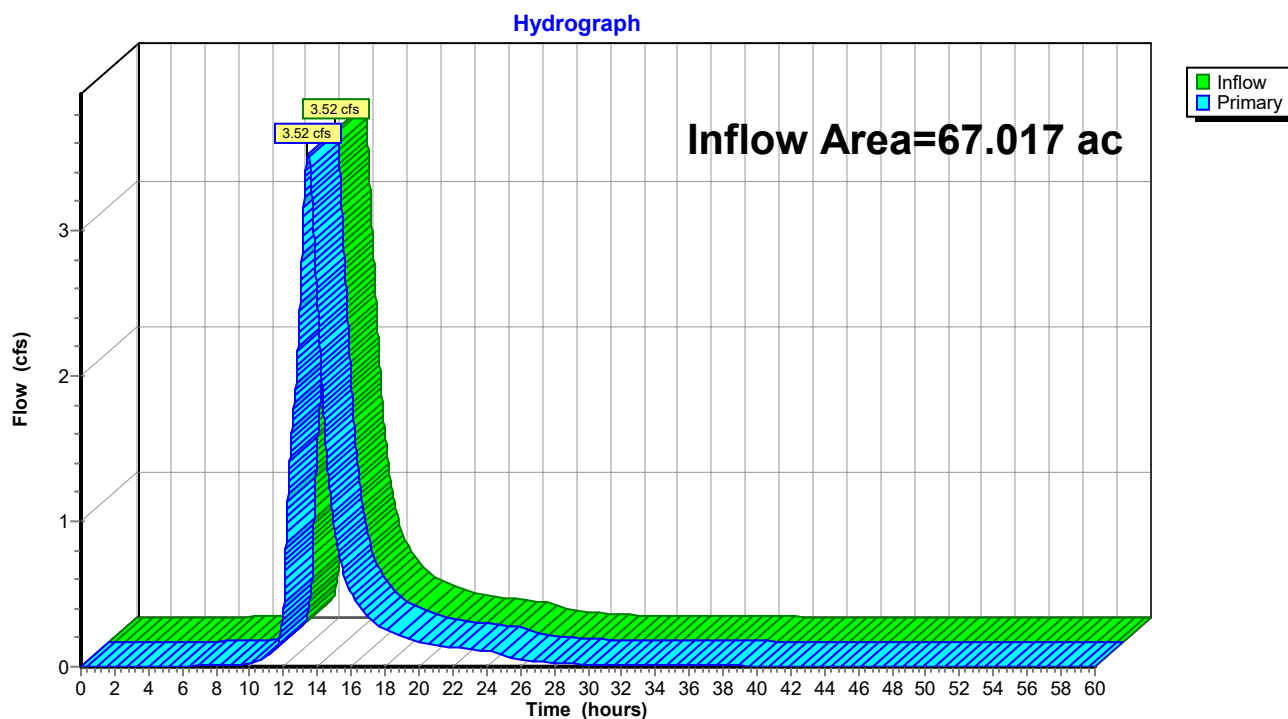
Page 19

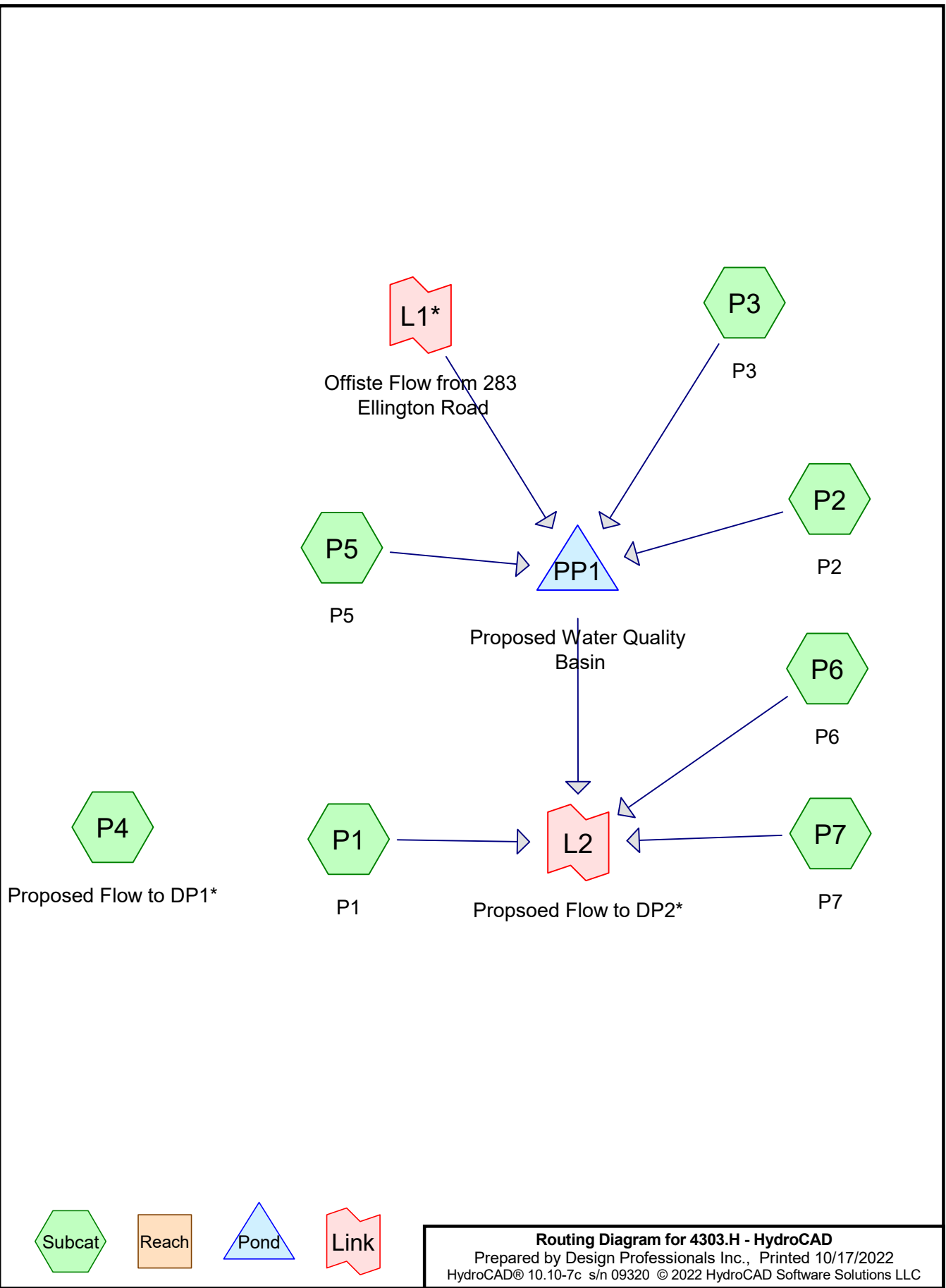
### Summary for Link L2: Propsoed Flow to DP2\*

Inflow Area = 67.017 ac, 29.96% Impervious, Inflow Depth > 0.14" for 2-YR event  
Inflow = 3.52 cfs @ 13.42 hrs, Volume= 0.768 af  
Primary = 3.52 cfs @ 13.42 hrs, Volume= 0.768 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

### Link L2: Propsoed Flow to DP2\*





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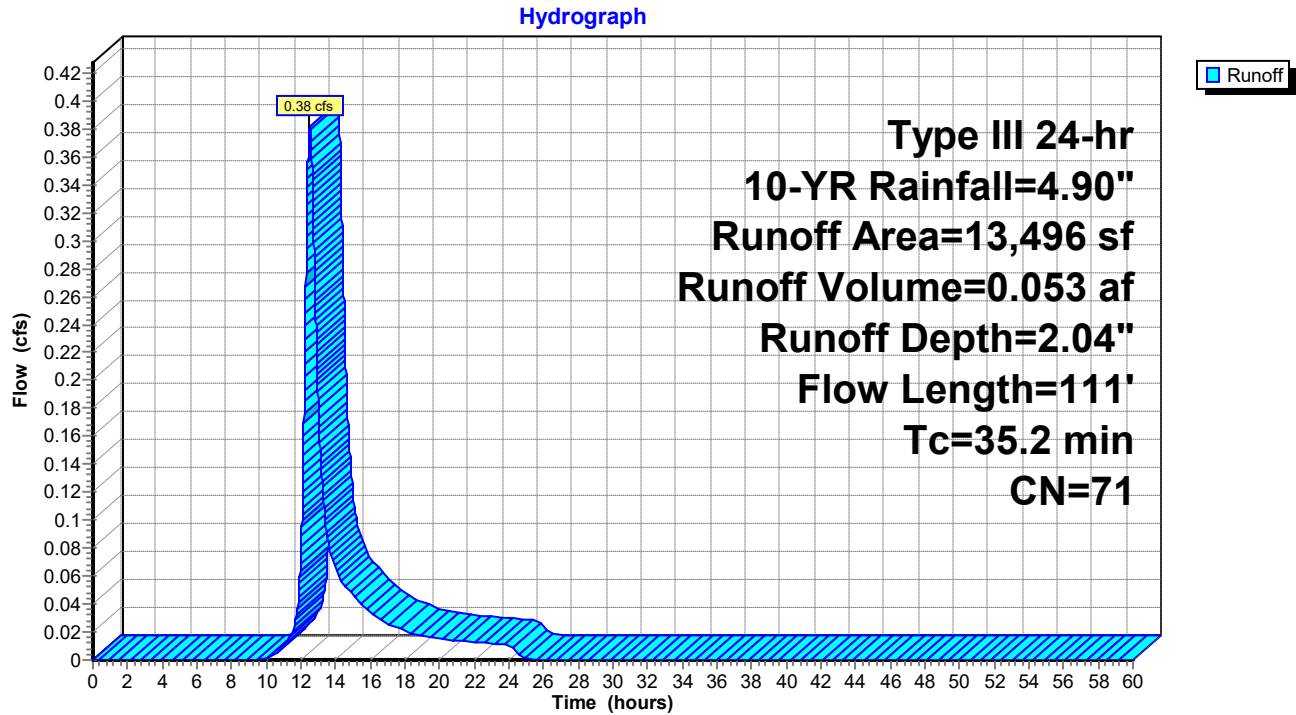
HydroCAD® 10.10-7c s/n 09320 © 2022 HydroCAD Software Solutions LLC

Proposed Conditions  
Type III 24-hr 10-YR Rainfall=4.90"

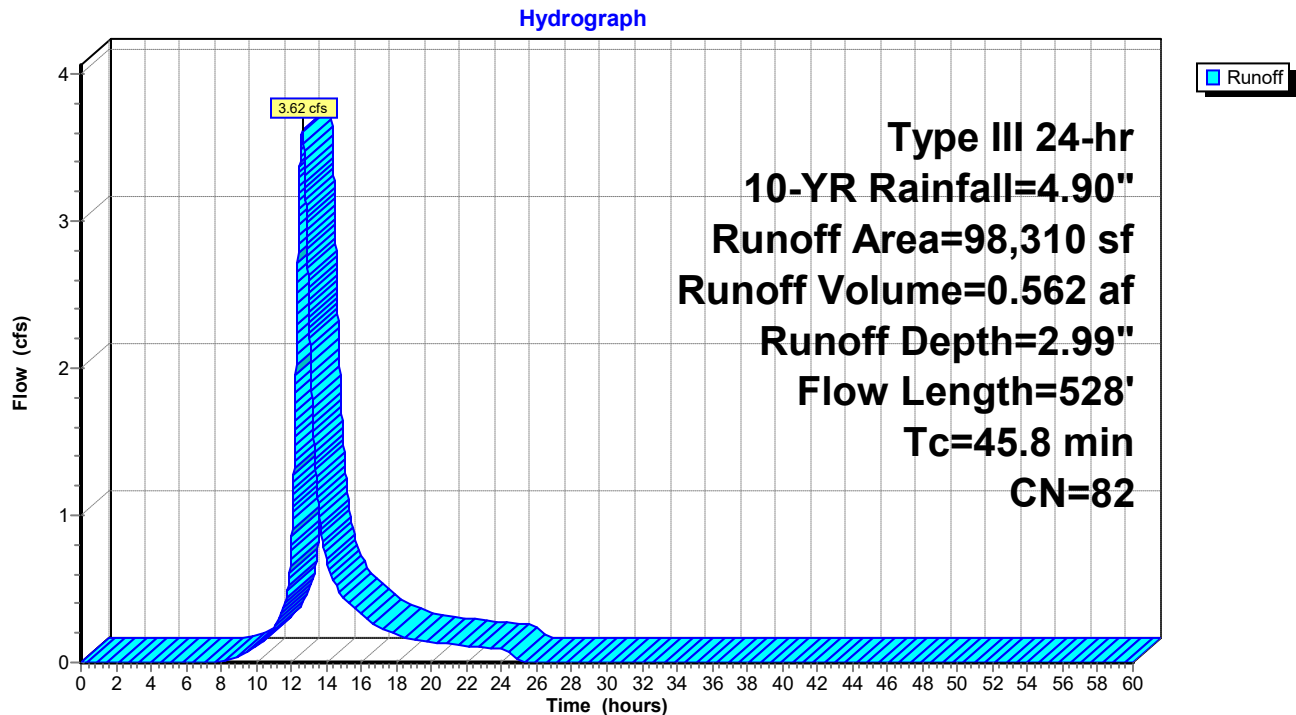
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### Subcatchment P1: P1



### Subcatchment P2: P2



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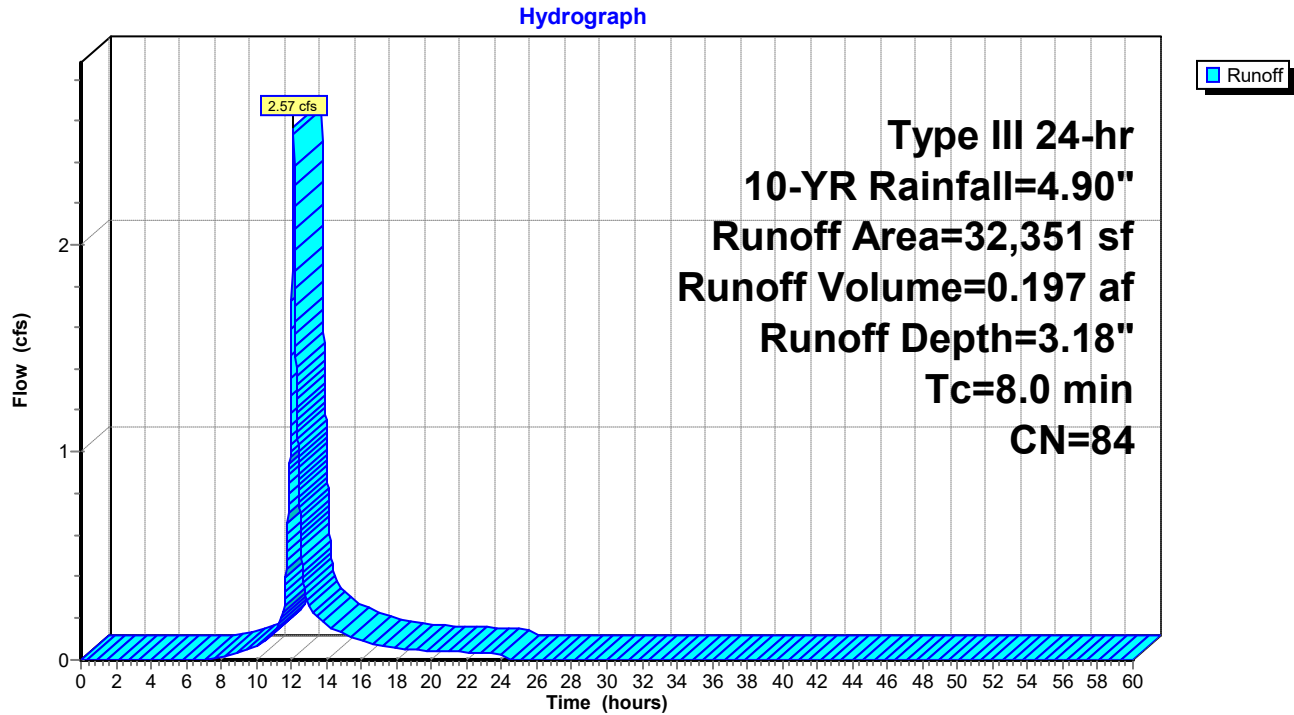
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Proposed Conditions  
Type III 24-hr 10-YR Rainfall=4.90"

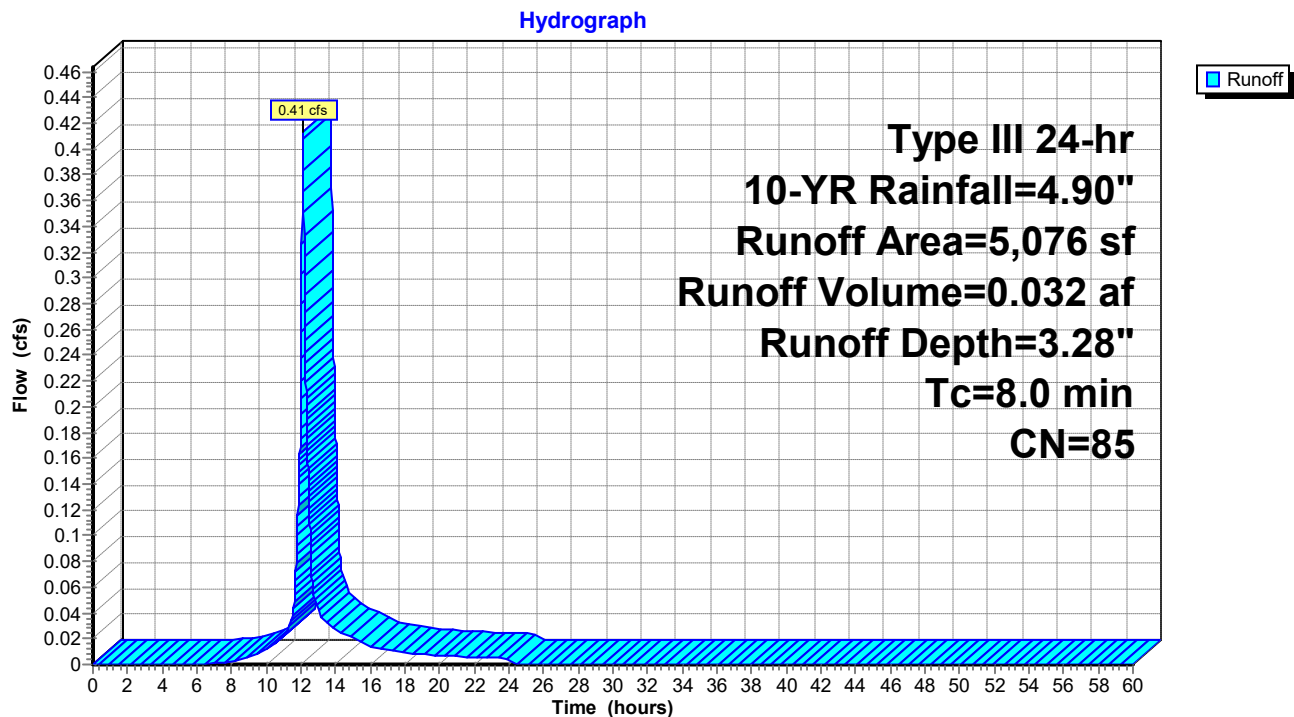
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### Subcatchment P3: P3



### Subcatchment P4: Proposed Flow to DP1\*





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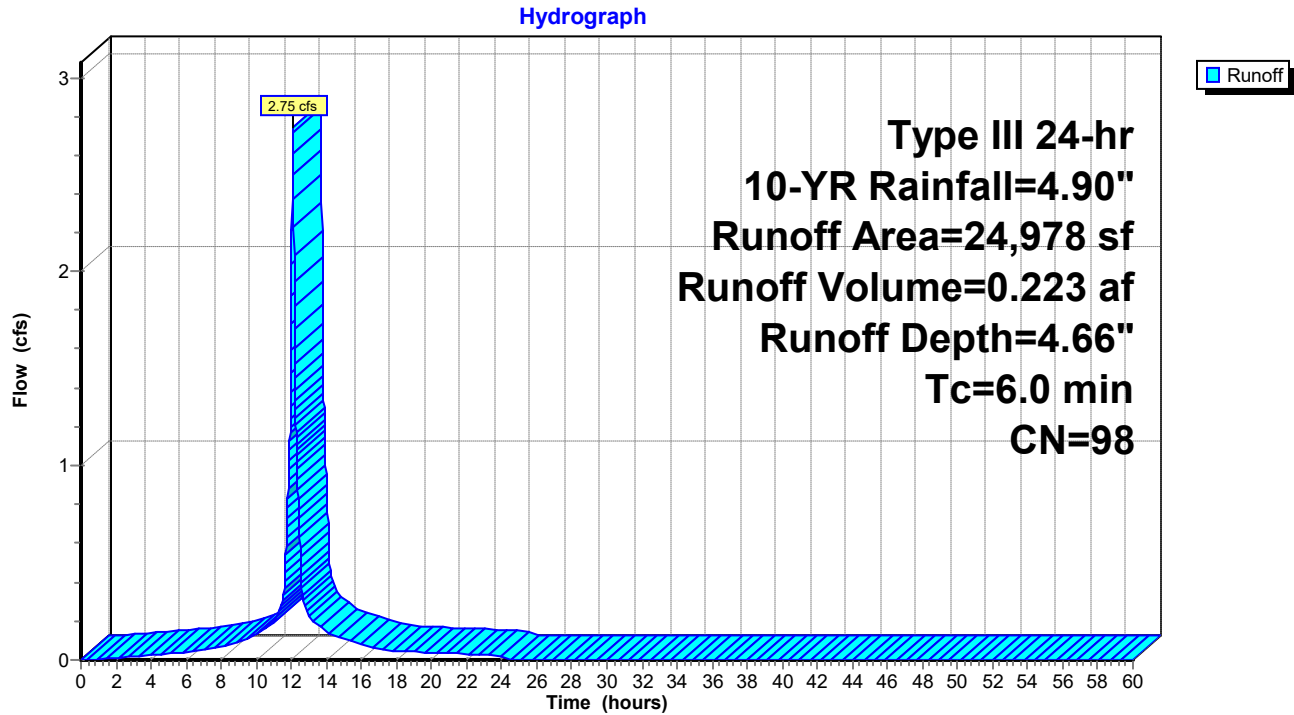
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Type III 24-hr 10-YR Rainfall=4.90"

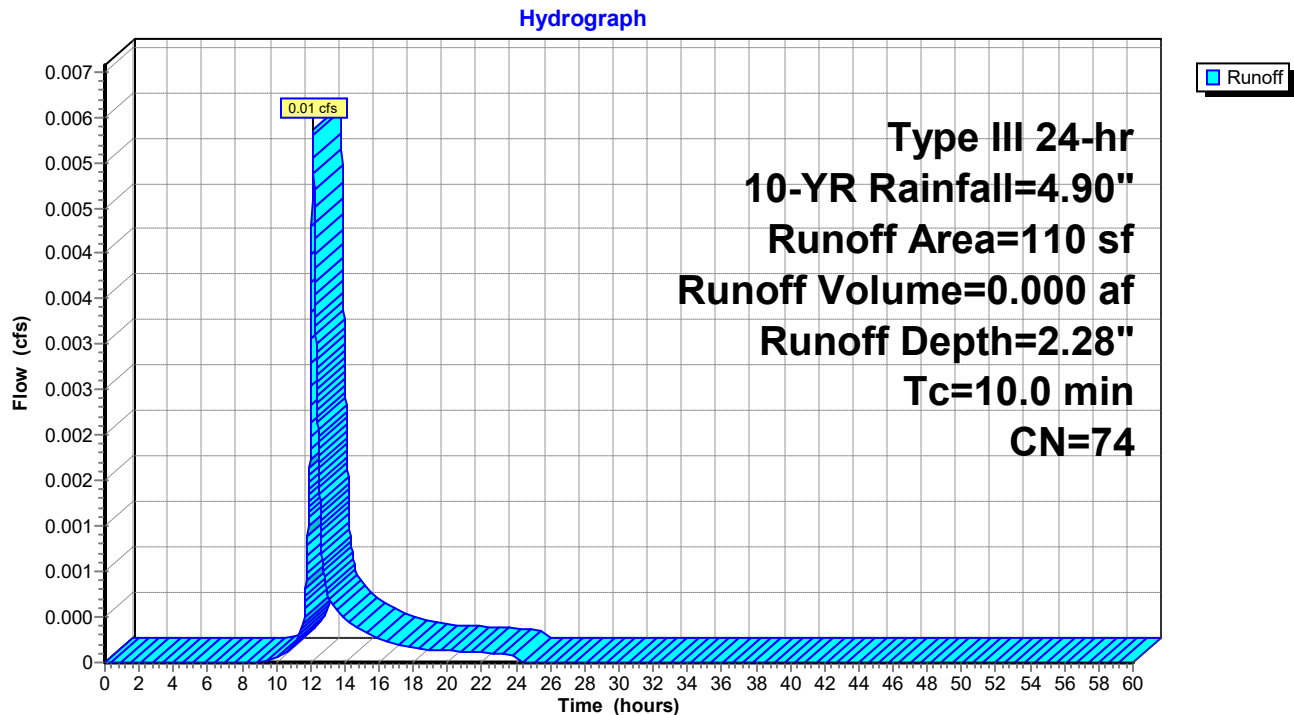
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### Subcatchment P5: P5



### Subcatchment P6: P6



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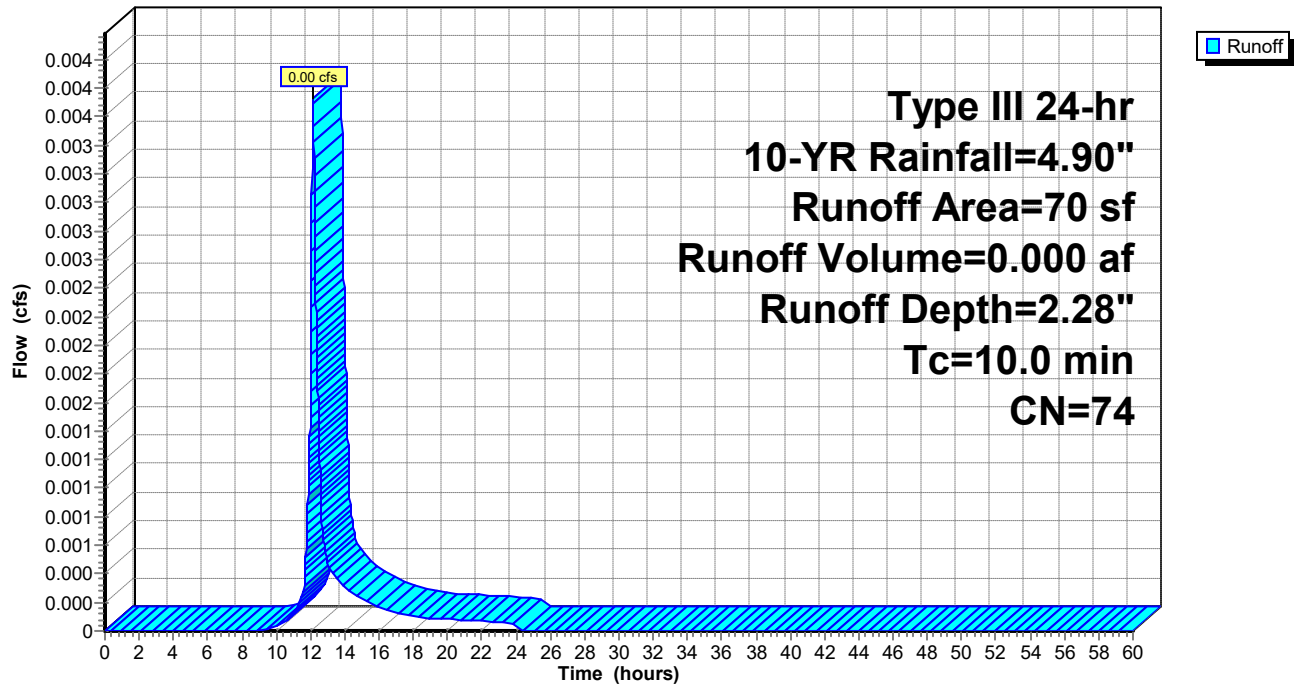
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Type III 24-hr 10-YR Rainfall=4.90"

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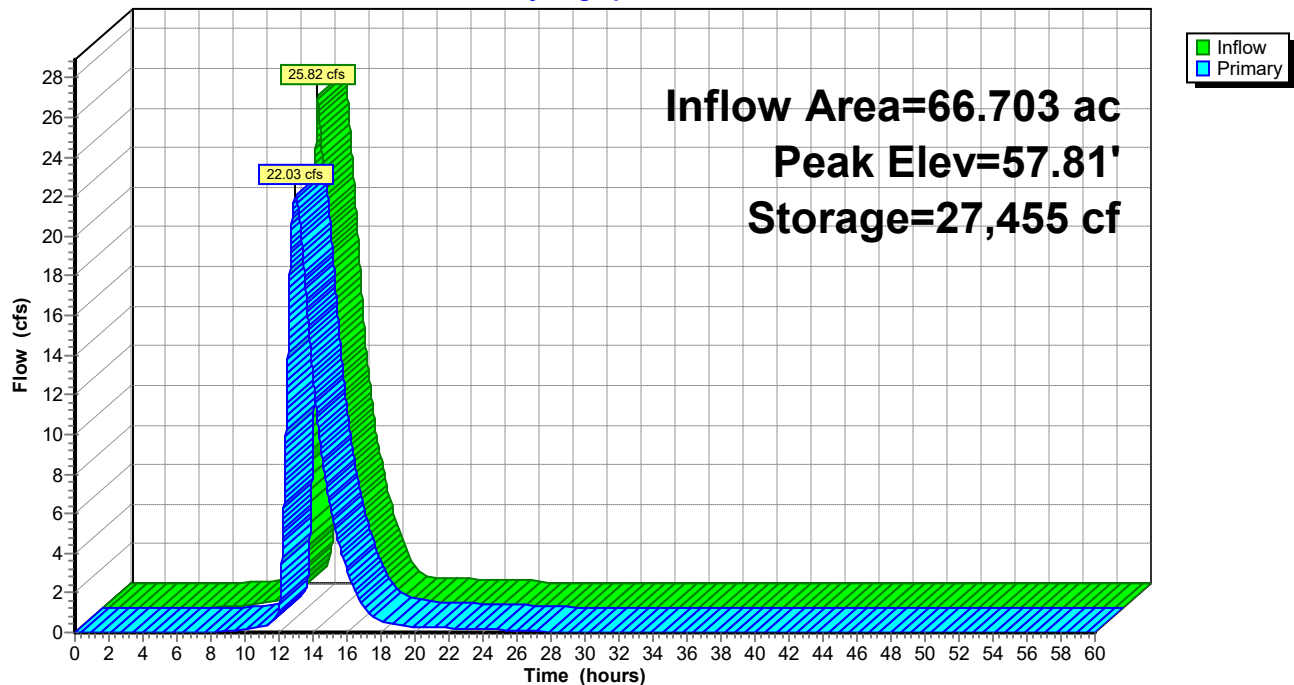
### Subcatchment P7: P7

Hydrograph

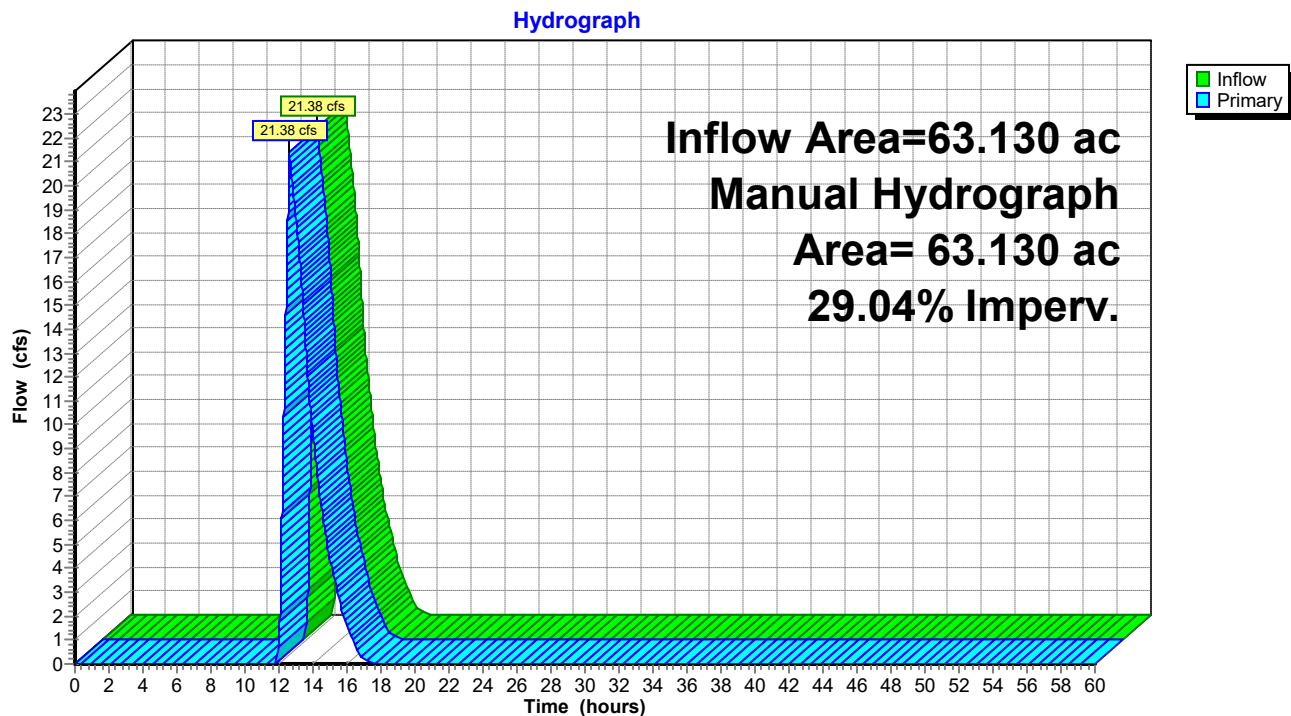


### Pond PP1: Proposed Water Quality Basin

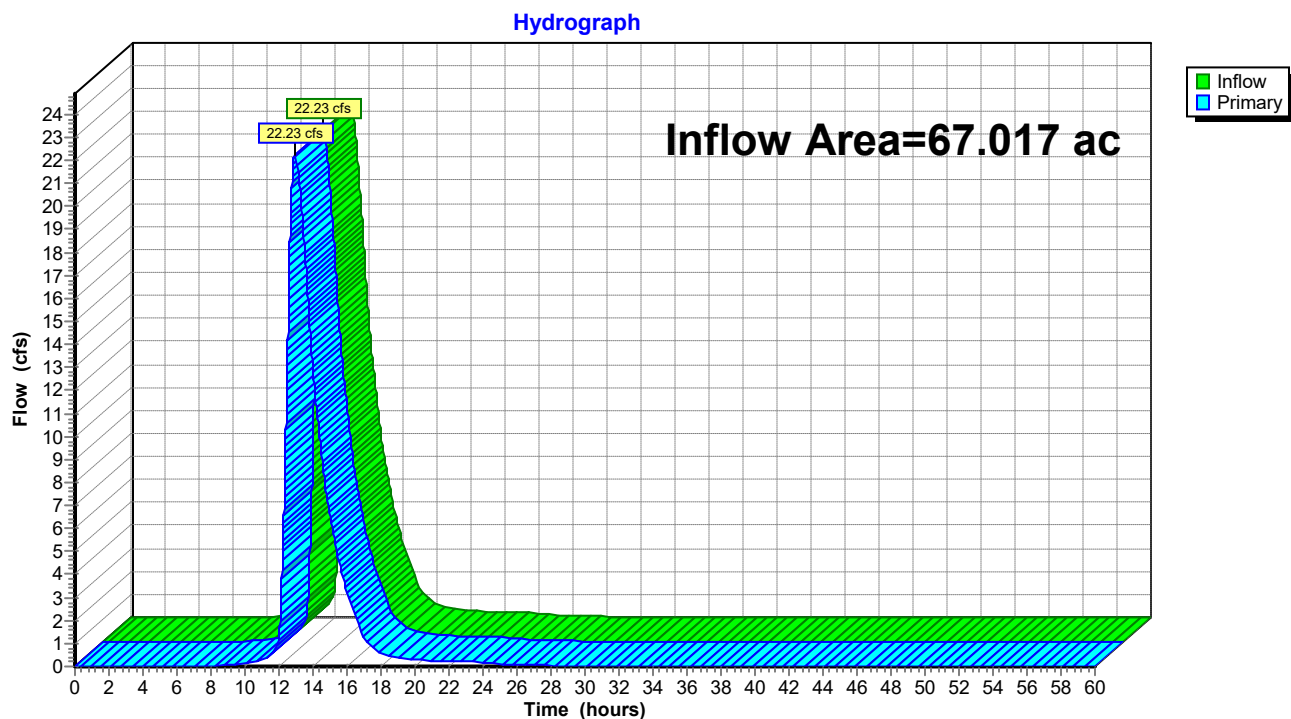
Hydrograph



**Link L1\*: Offsite Flow from 283 Ellington Road**



**Link L2: Propsoed Flow to DP2\***



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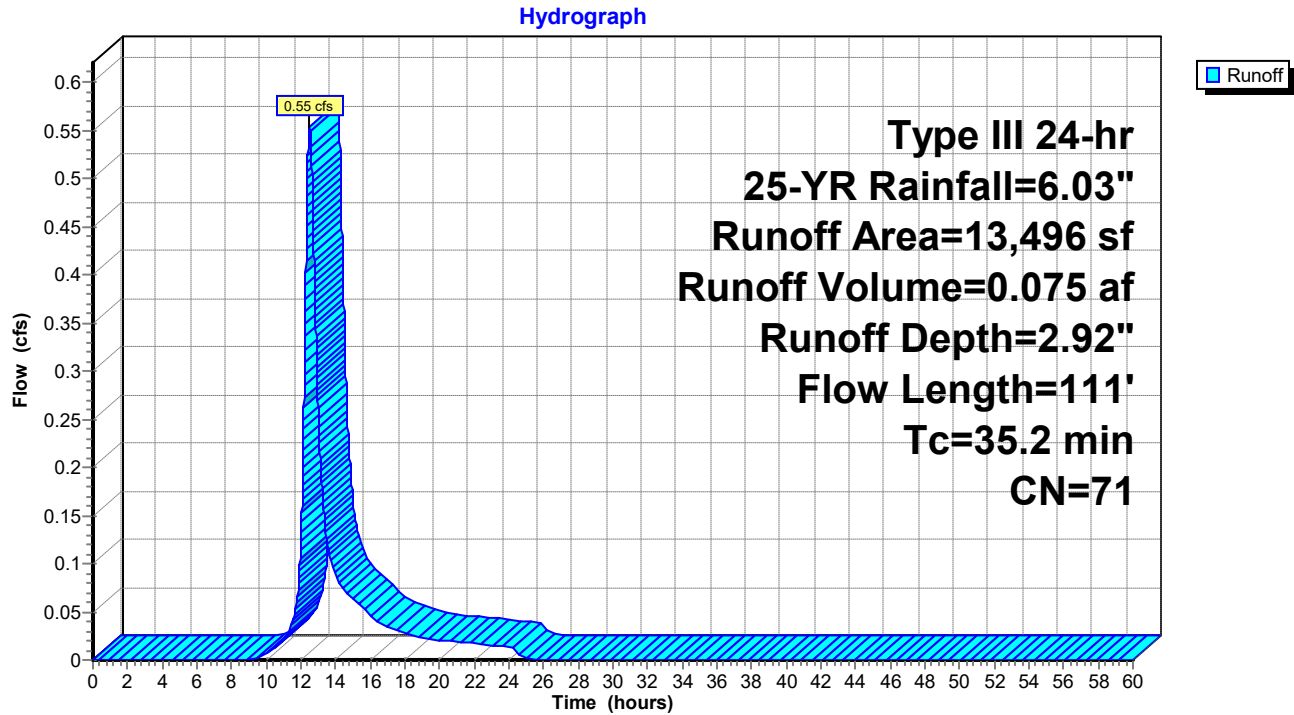
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Proposed Conditions  
Type III 24-hr 25-YR Rainfall=6.03"

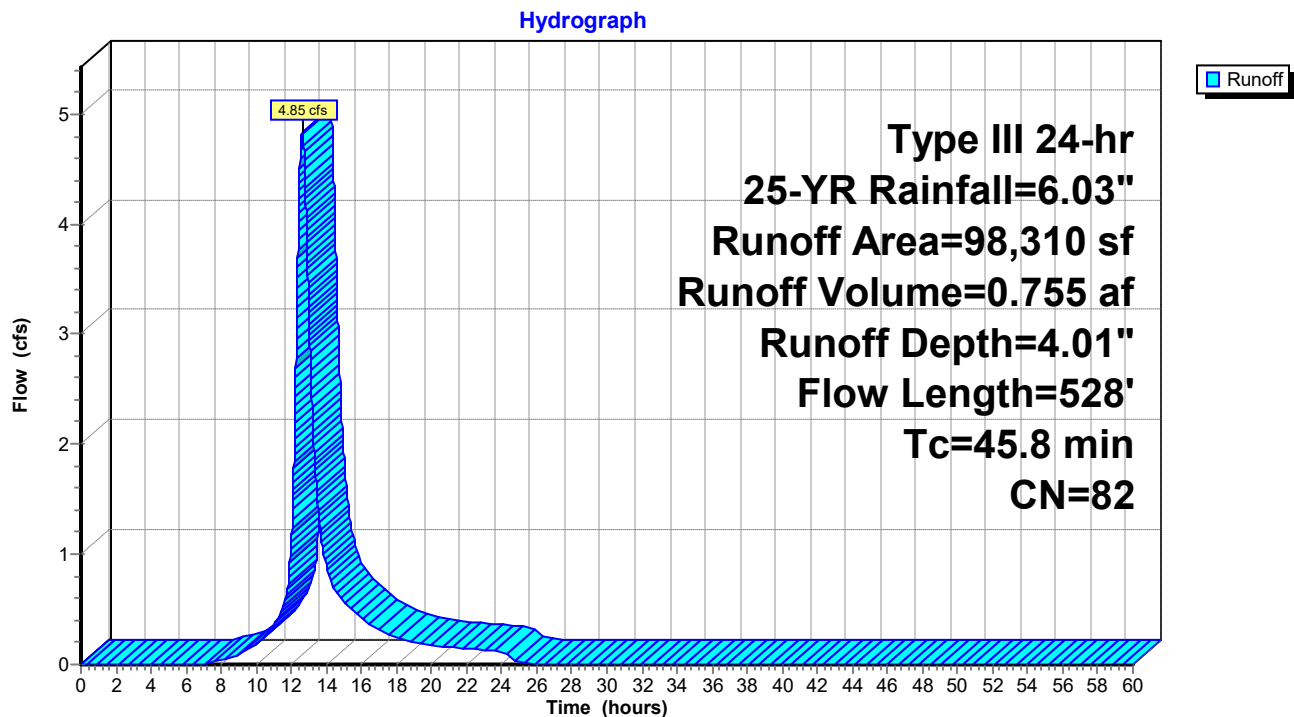
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### Subcatchment P1: P1



### Subcatchment P2: P2



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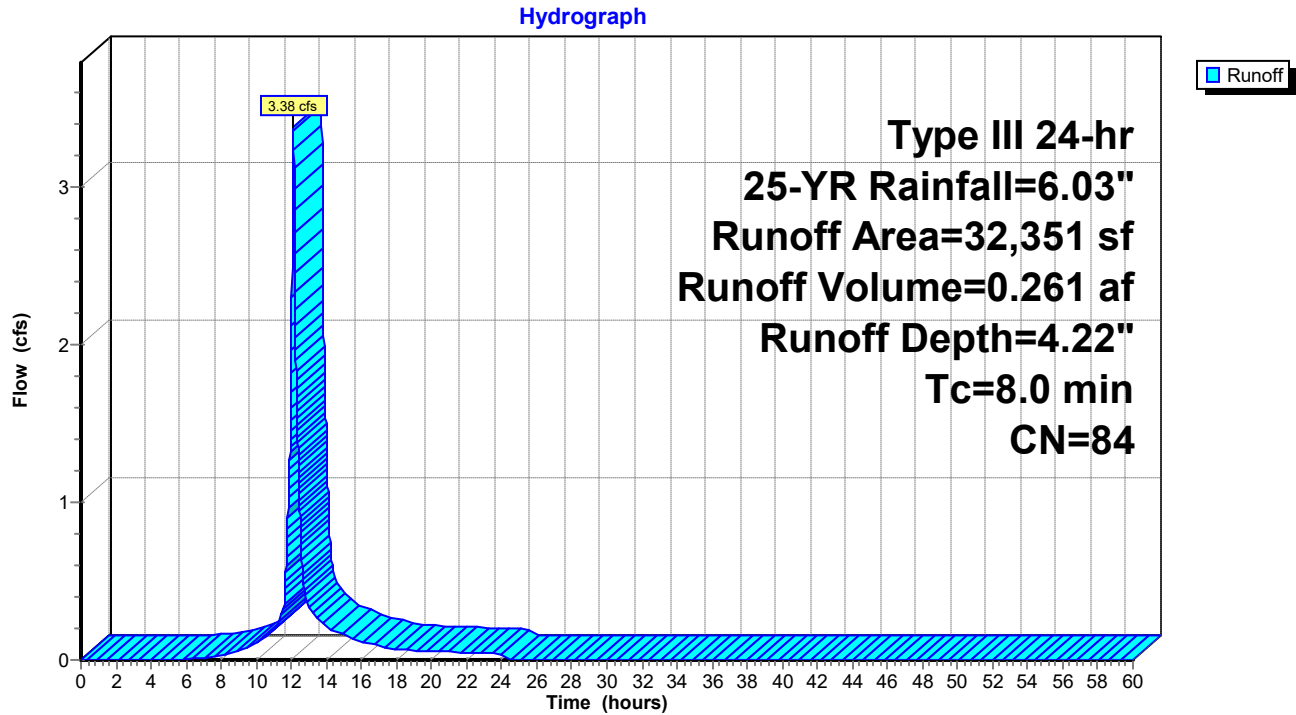
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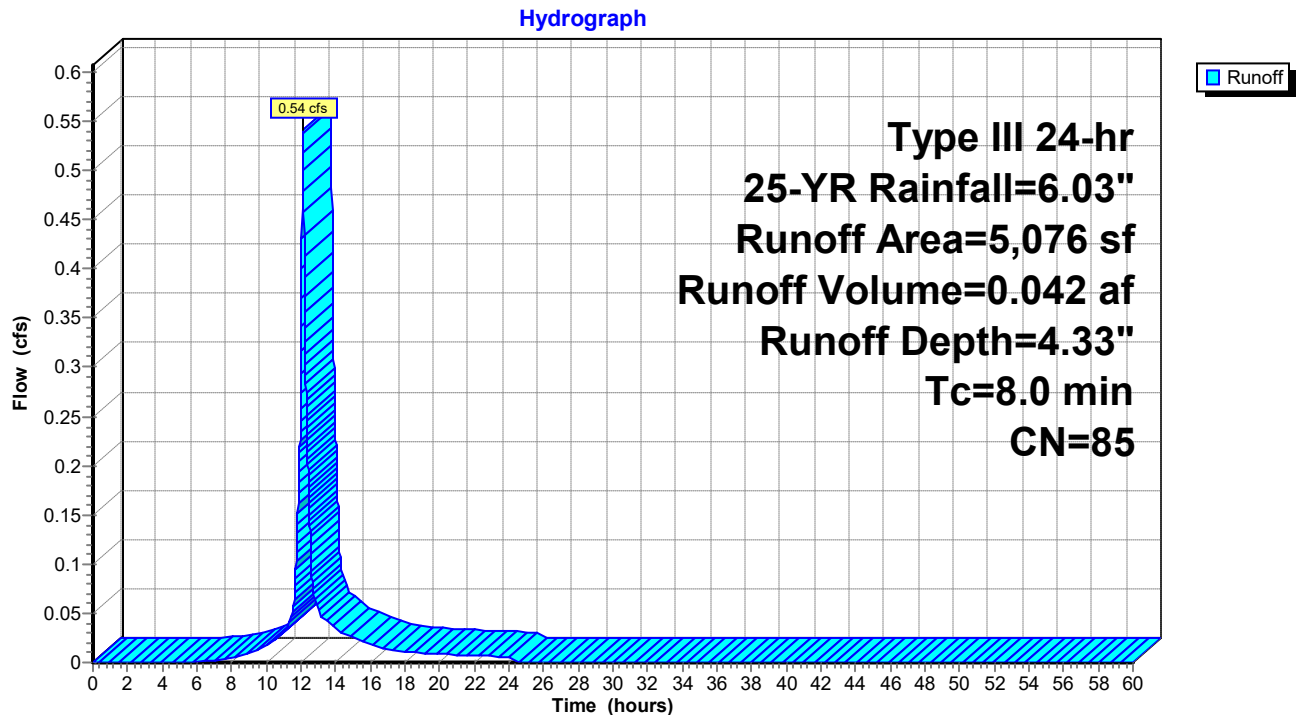
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### Subcatchment P3: P3



### Subcatchment P4: Proposed Flow to DP1\*



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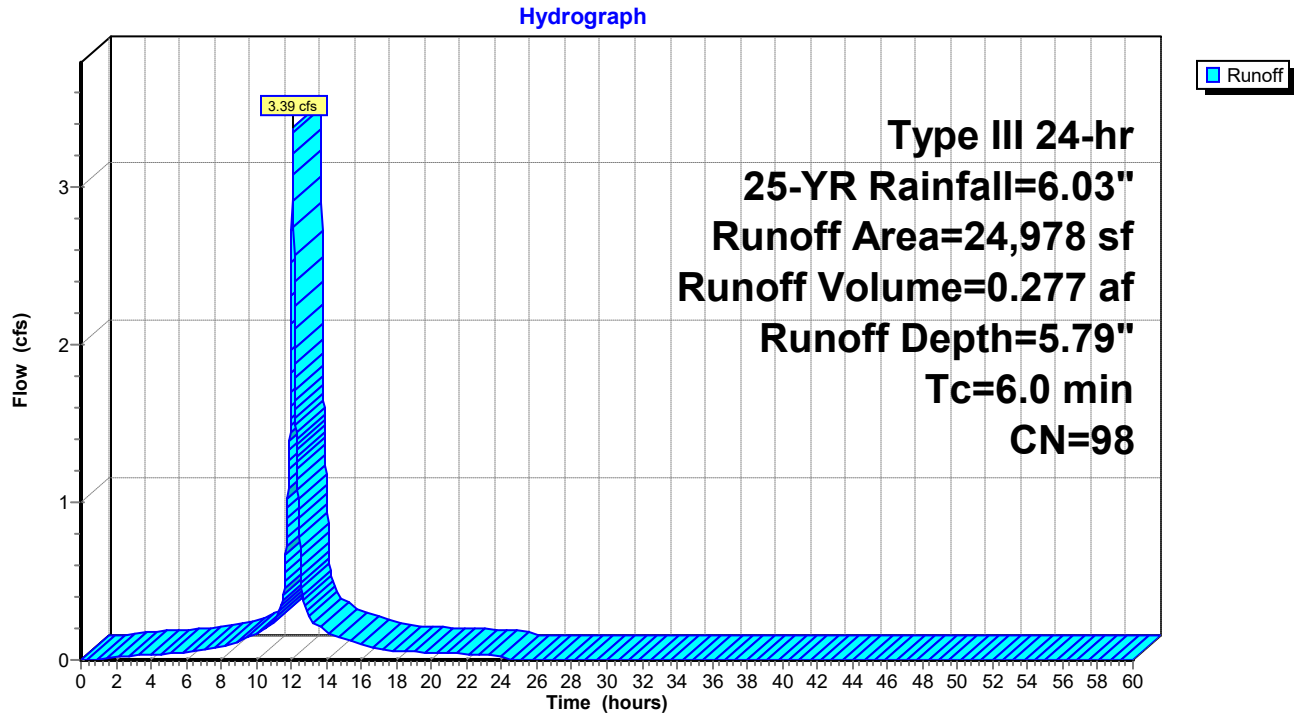
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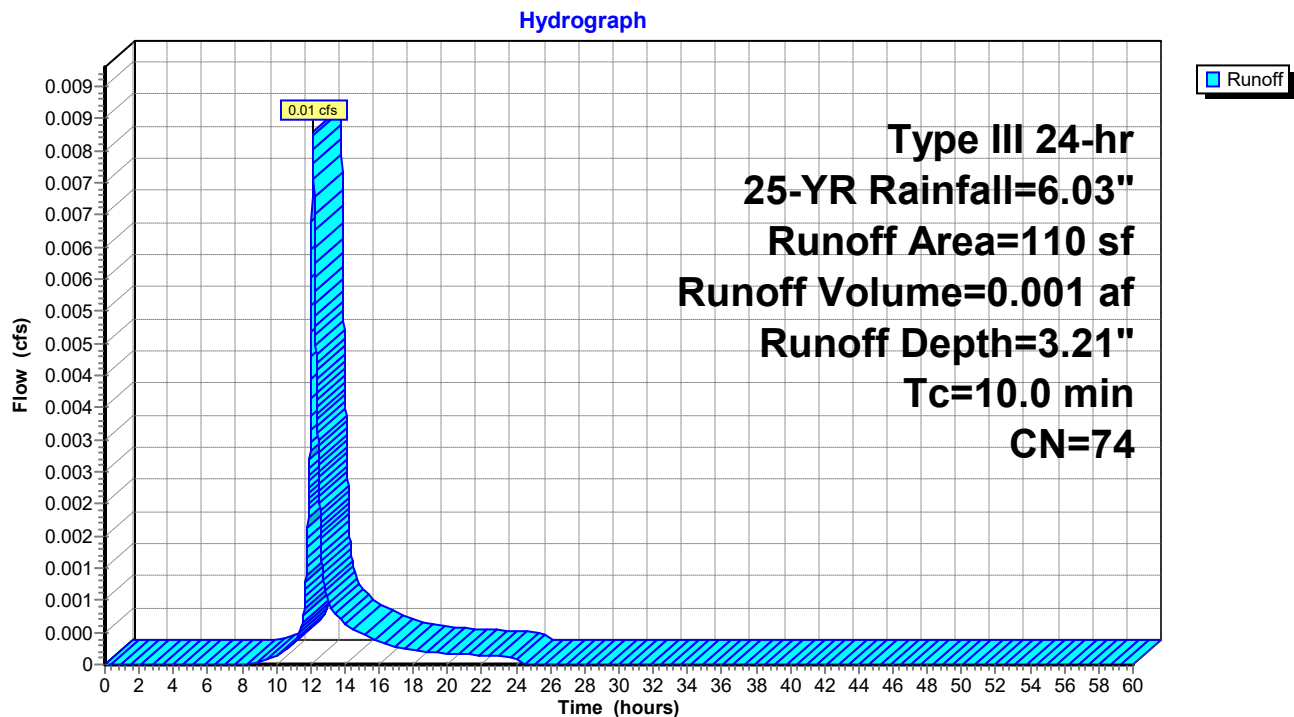
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### Subcatchment P5: P5



### Subcatchment P6: P6



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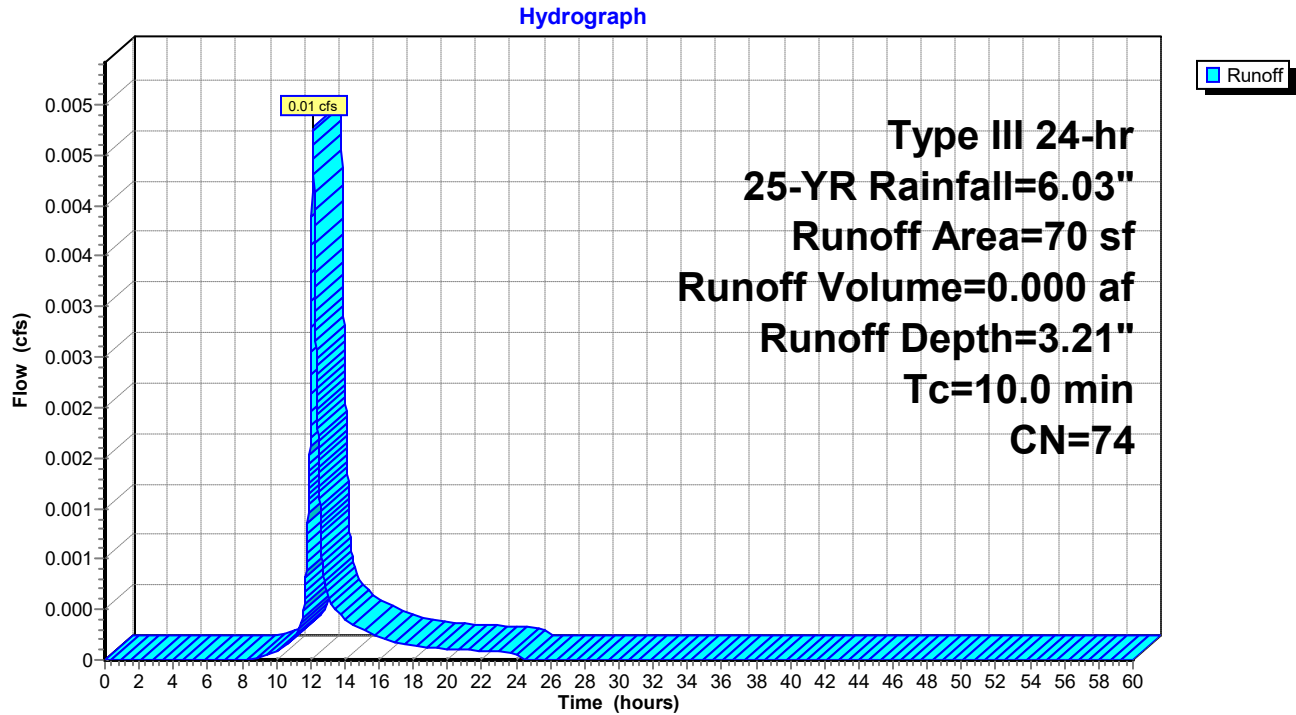
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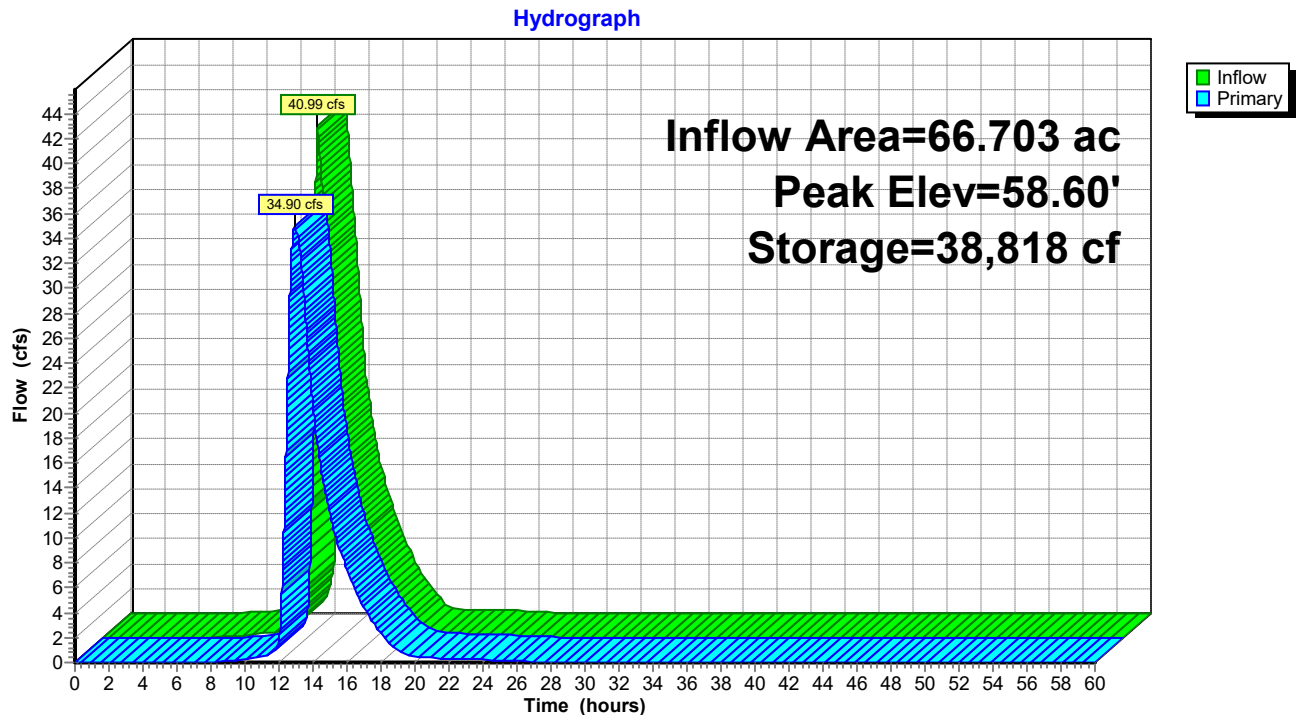
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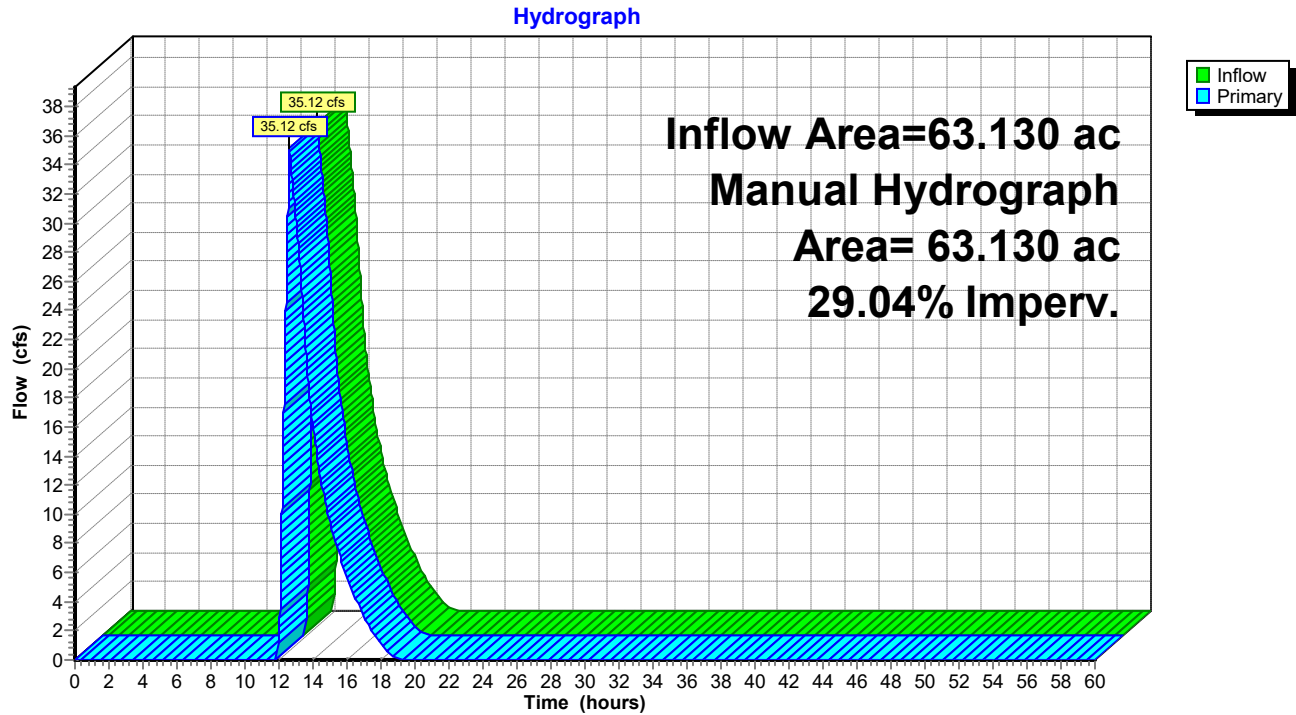
### Subcatchment P7: P7



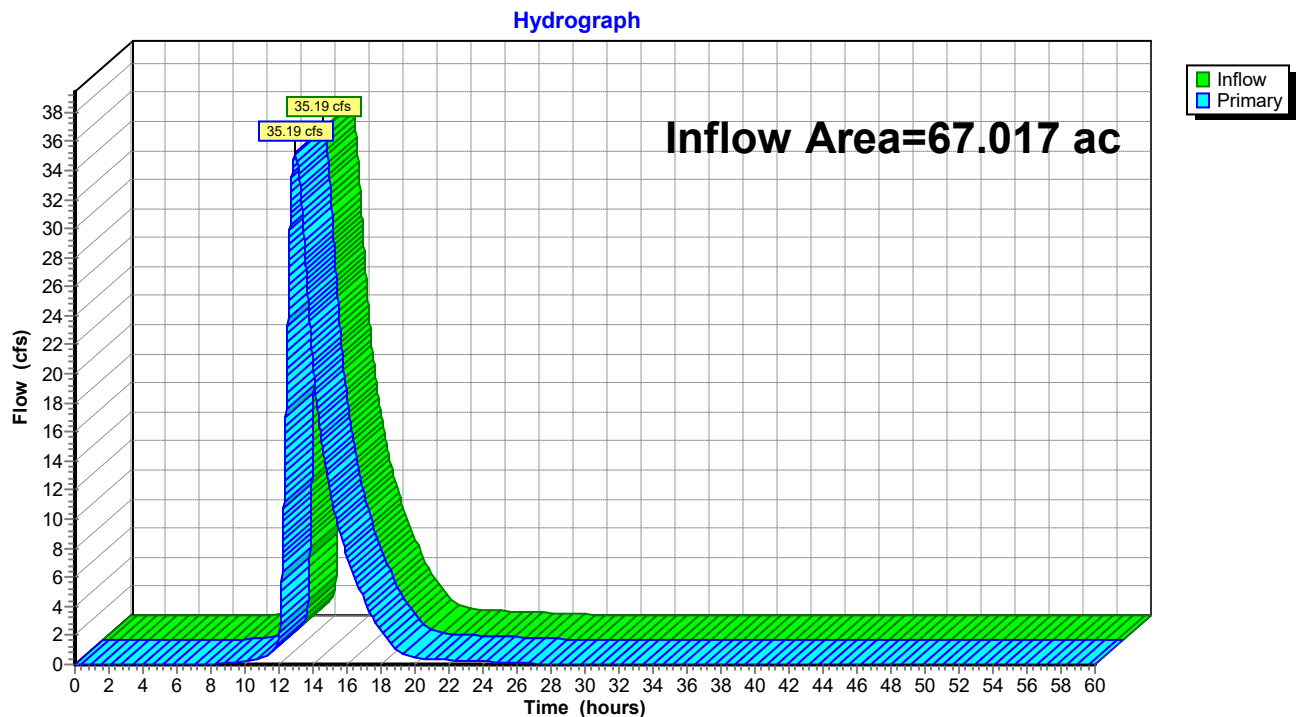
### Pond PP1: Proposed Water Quality Basin



**Link L1\*: Offsite Flow from 283 Ellington Road**



**Link L2: Propsoed Flow to DP2\***





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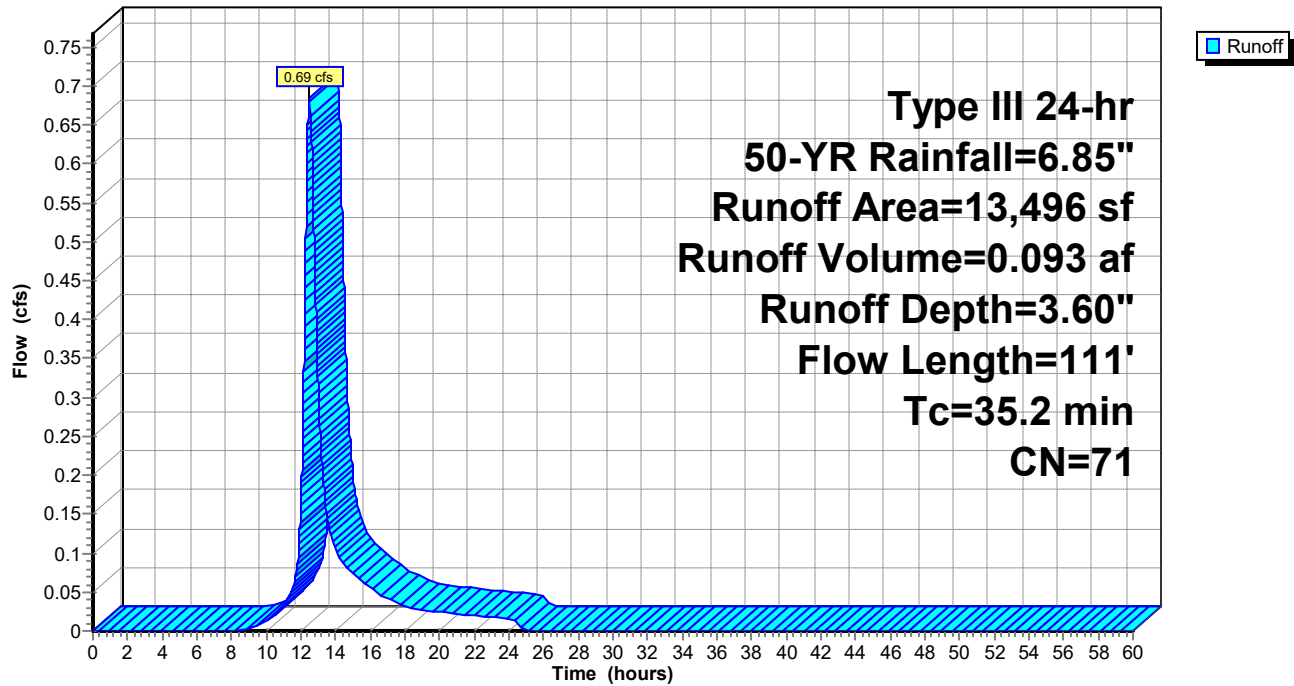
Proposed Conditions  
Type III 24-hr 50-YR Rainfall=6.85"

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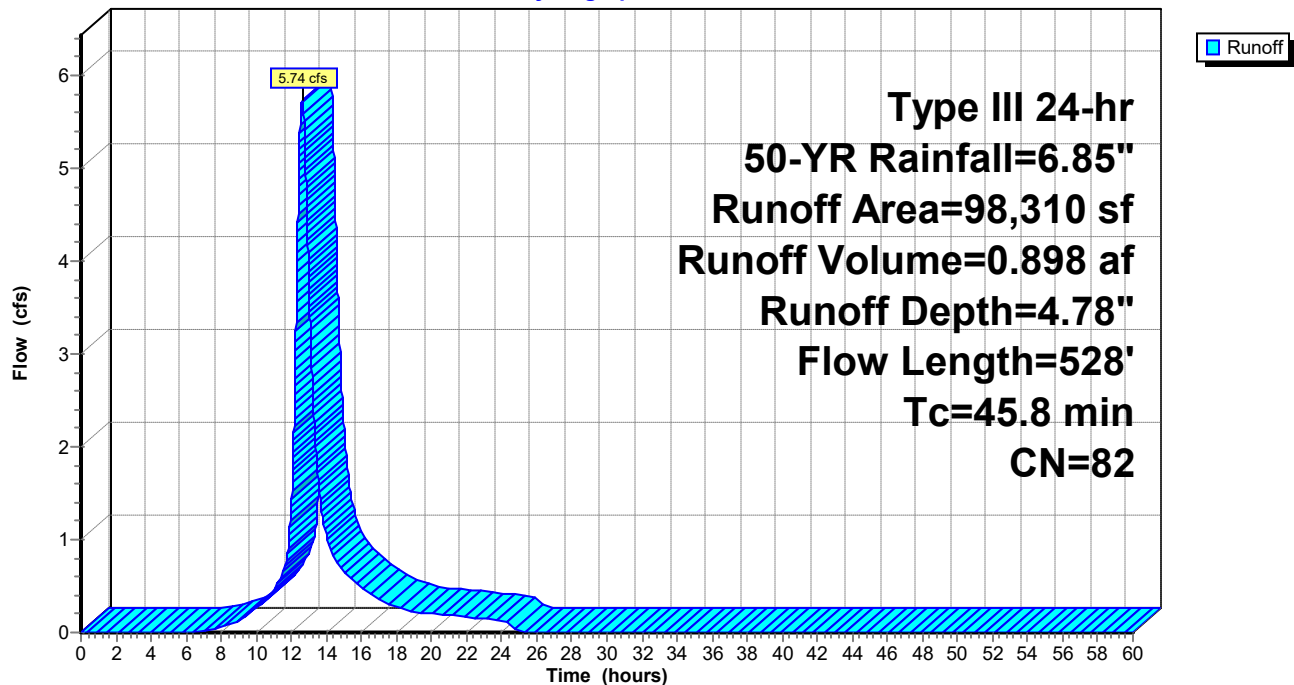
### Subcatchment P1: P1

Hydrograph



### Subcatchment P2: P2

Hydrograph



## 4303.H - HydroCAD

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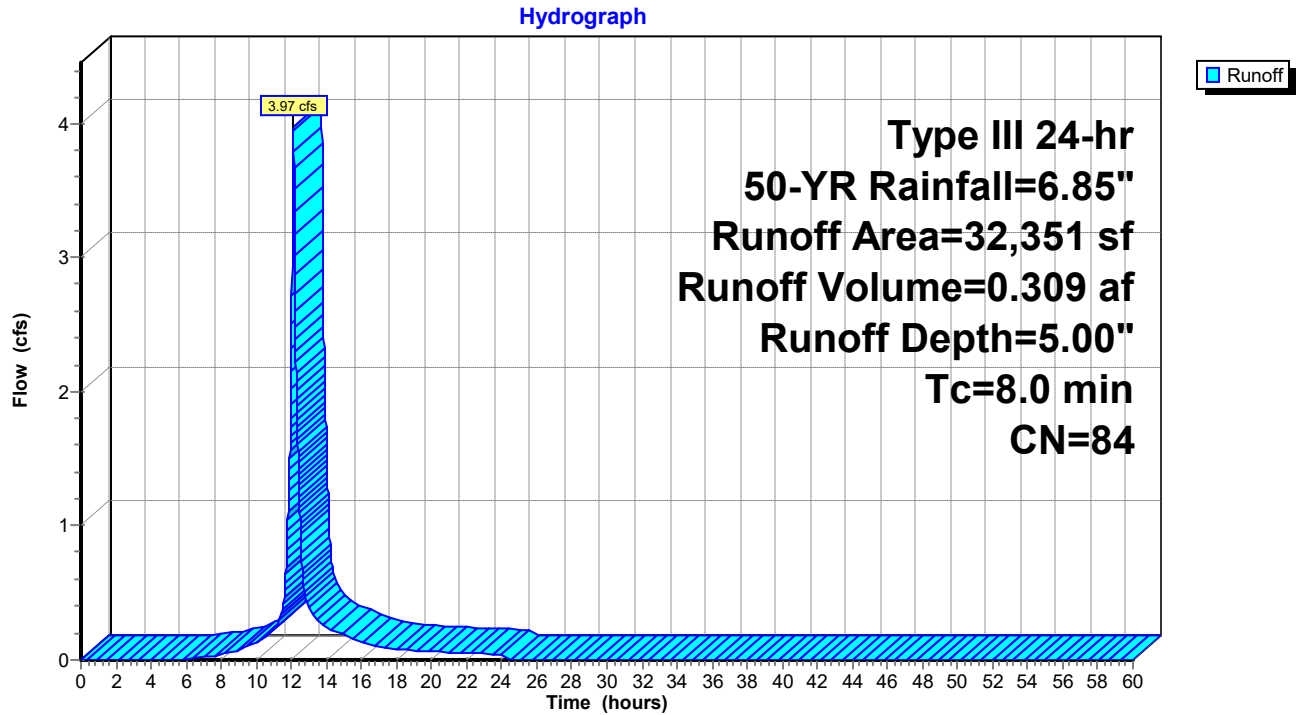
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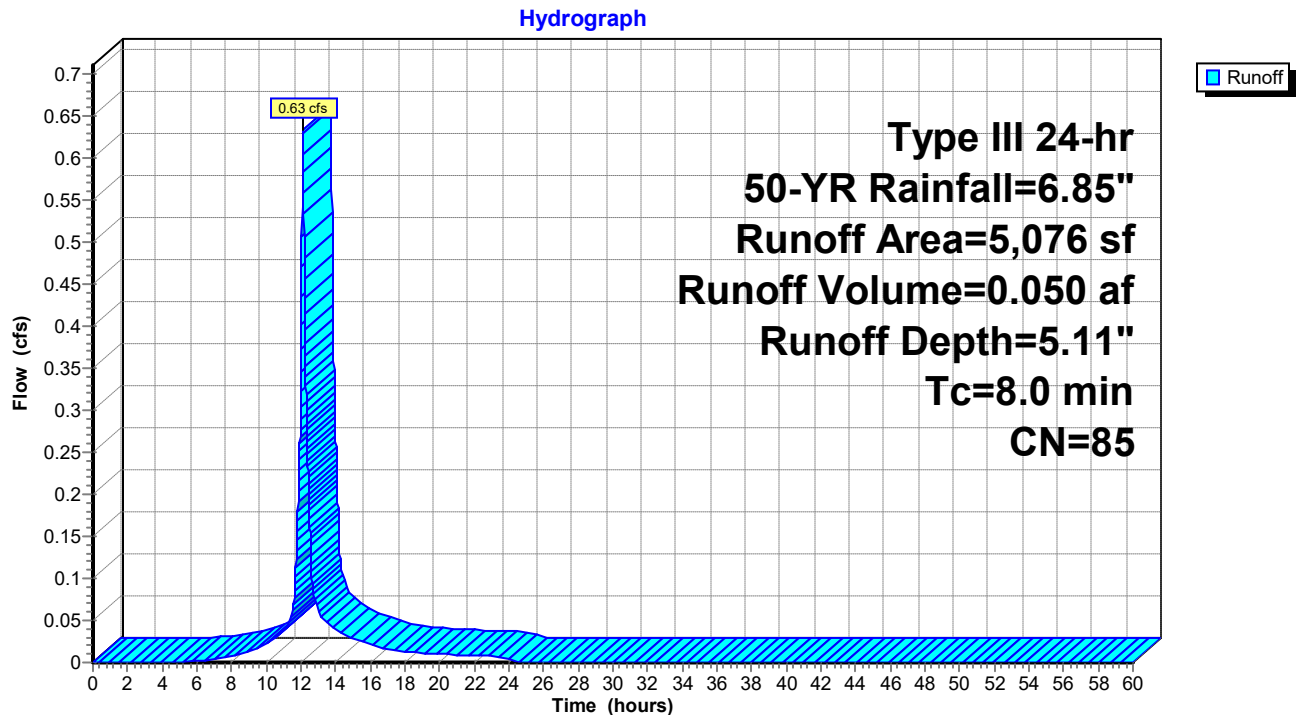
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### Subcatchment P3: P3



### Subcatchment P4: Proposed Flow to DP1\*



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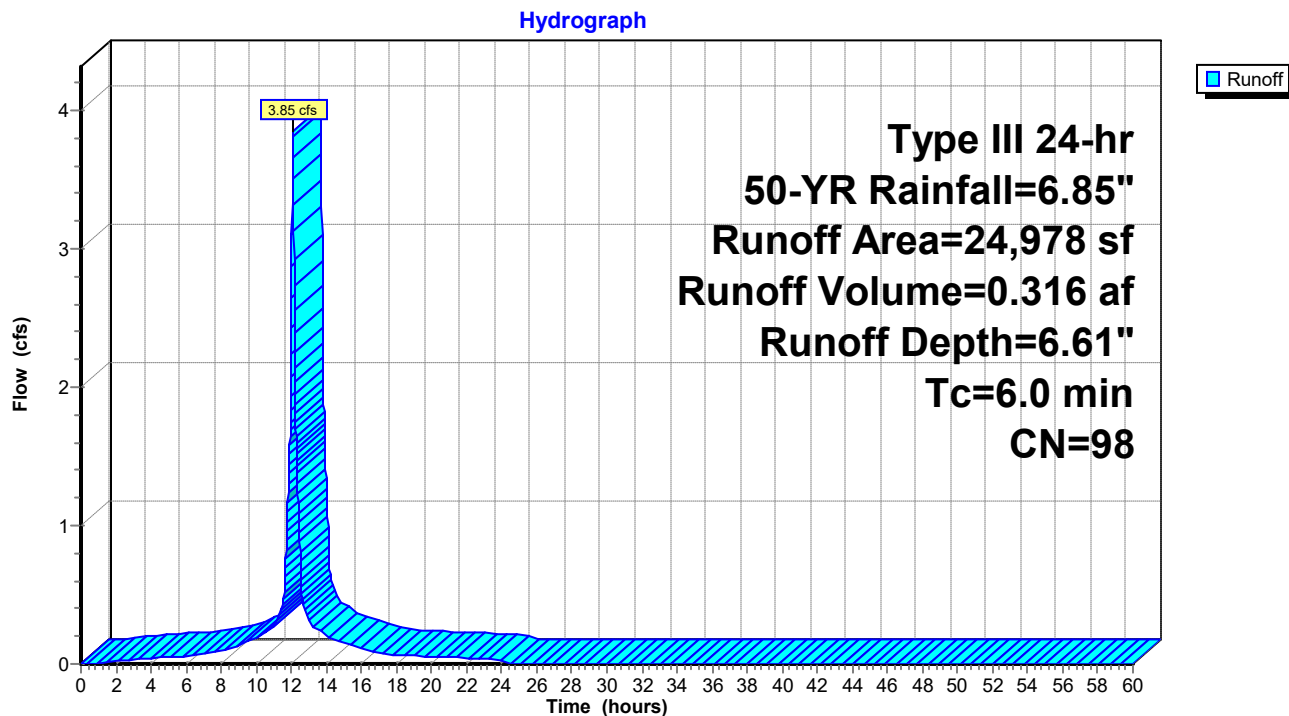
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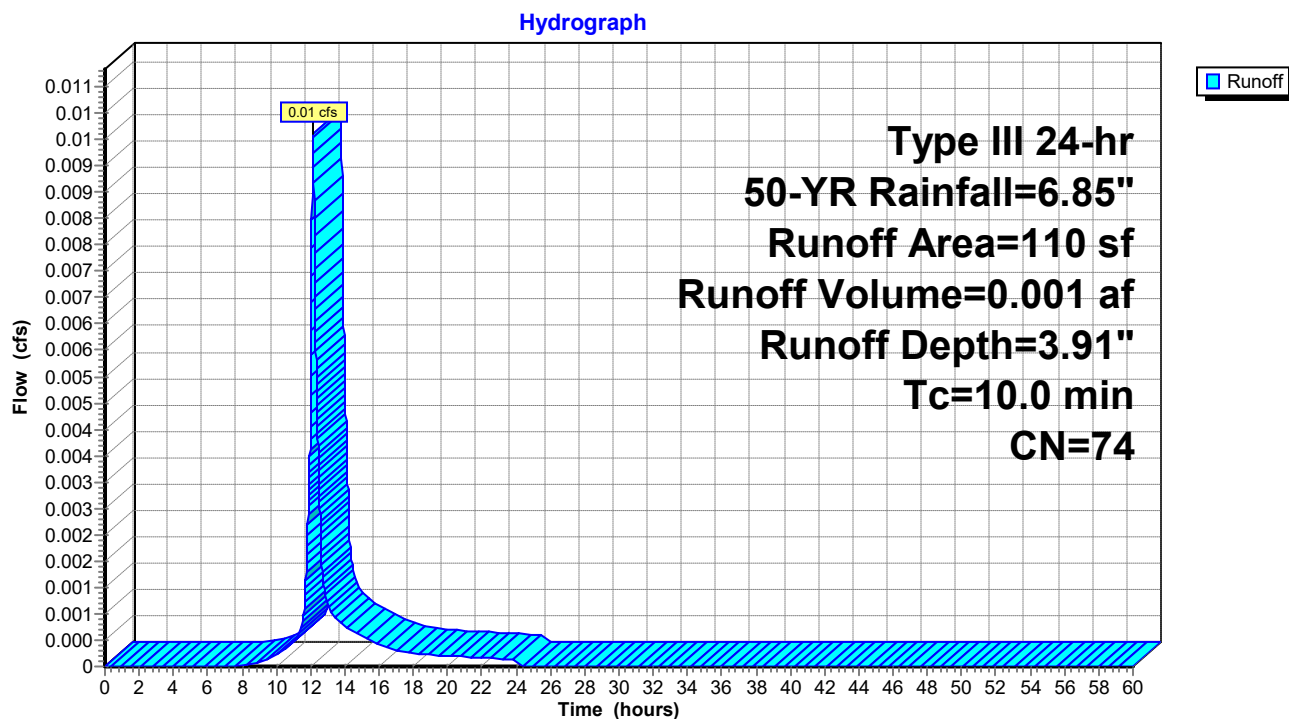
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### Subcatchment P5: P5



### Subcatchment P6: P6



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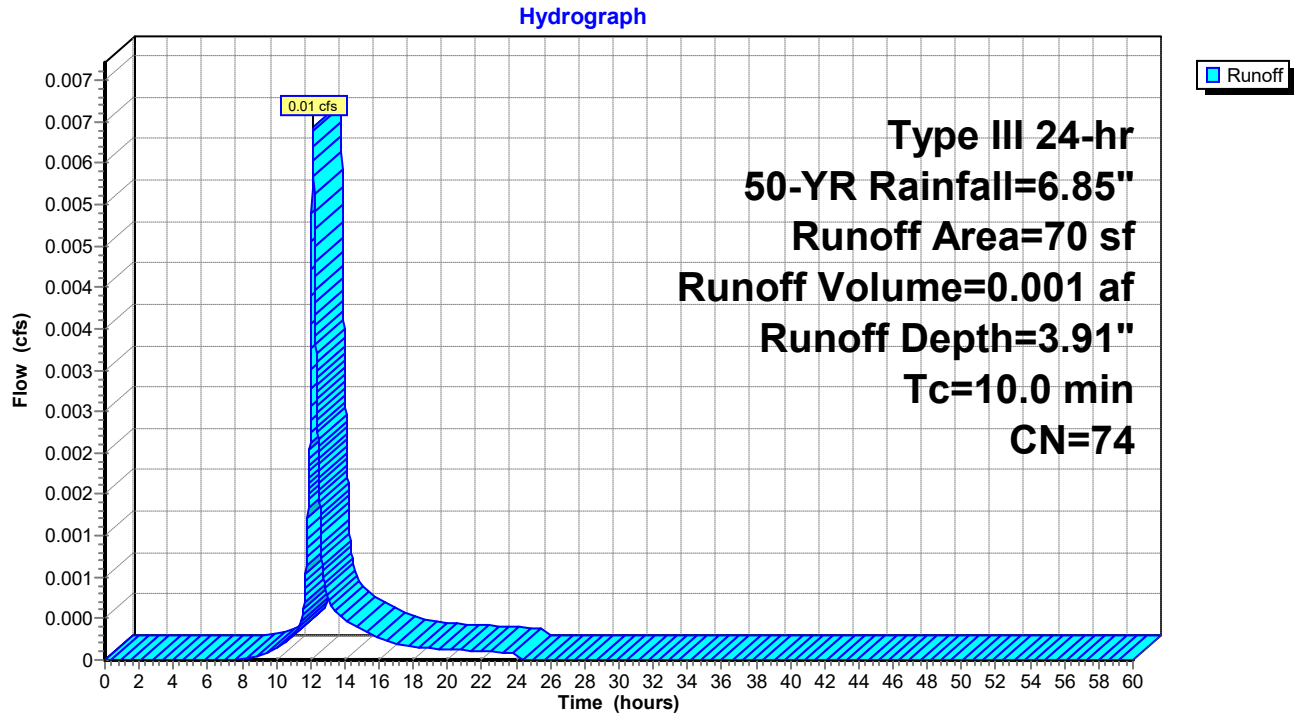
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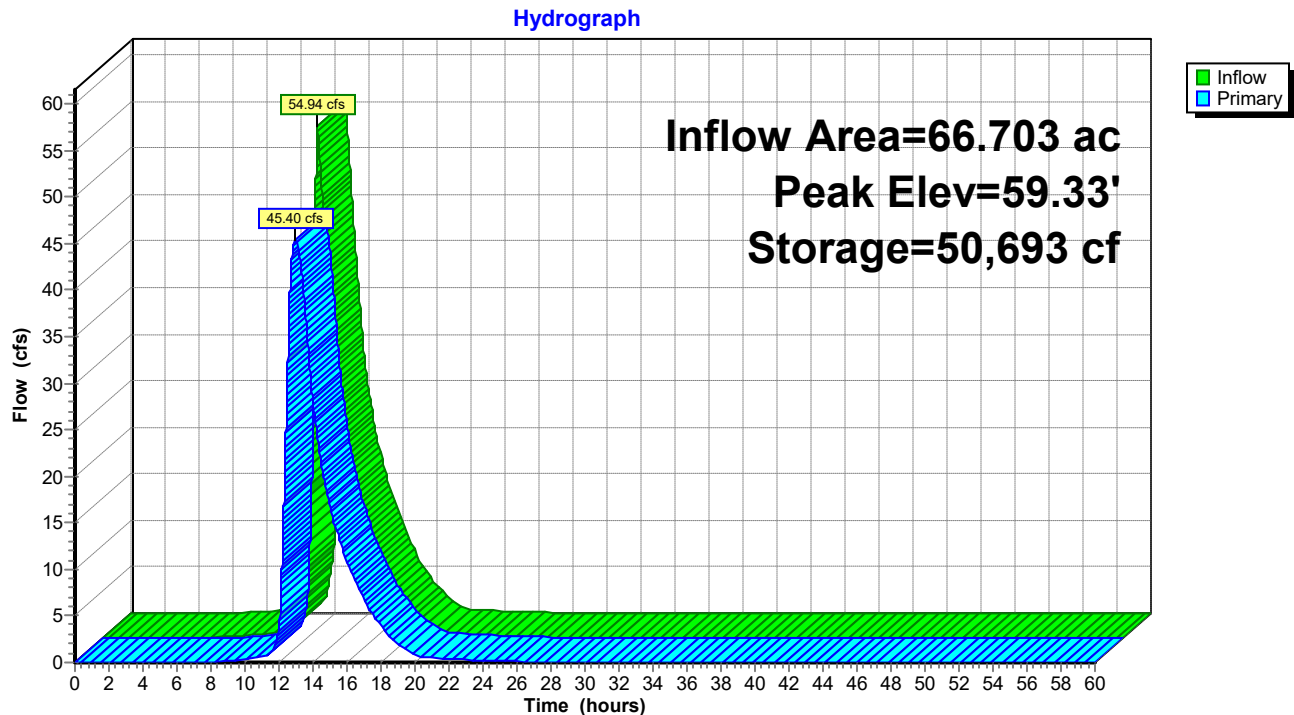
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### Subcatchment P7: P7



### Pond PP1: Proposed Water Quality Basin



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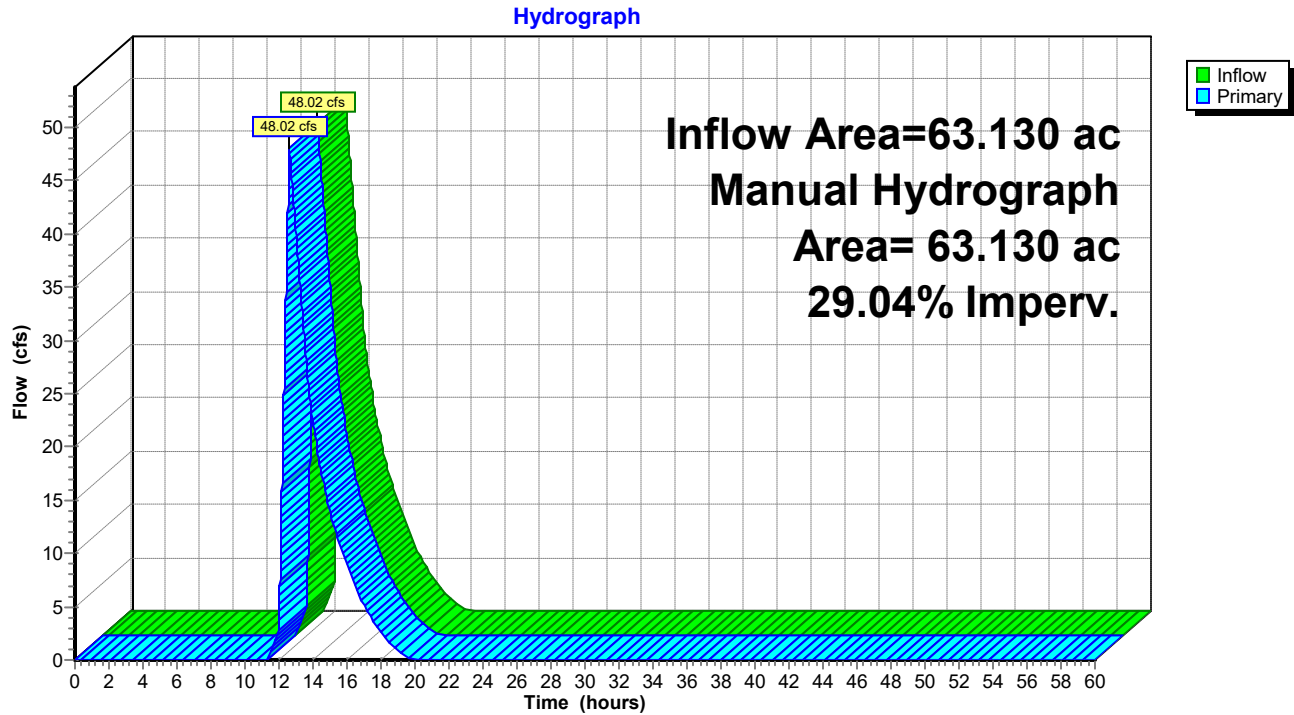
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Type III 24-hr 50-YR Rainfall=6.85"

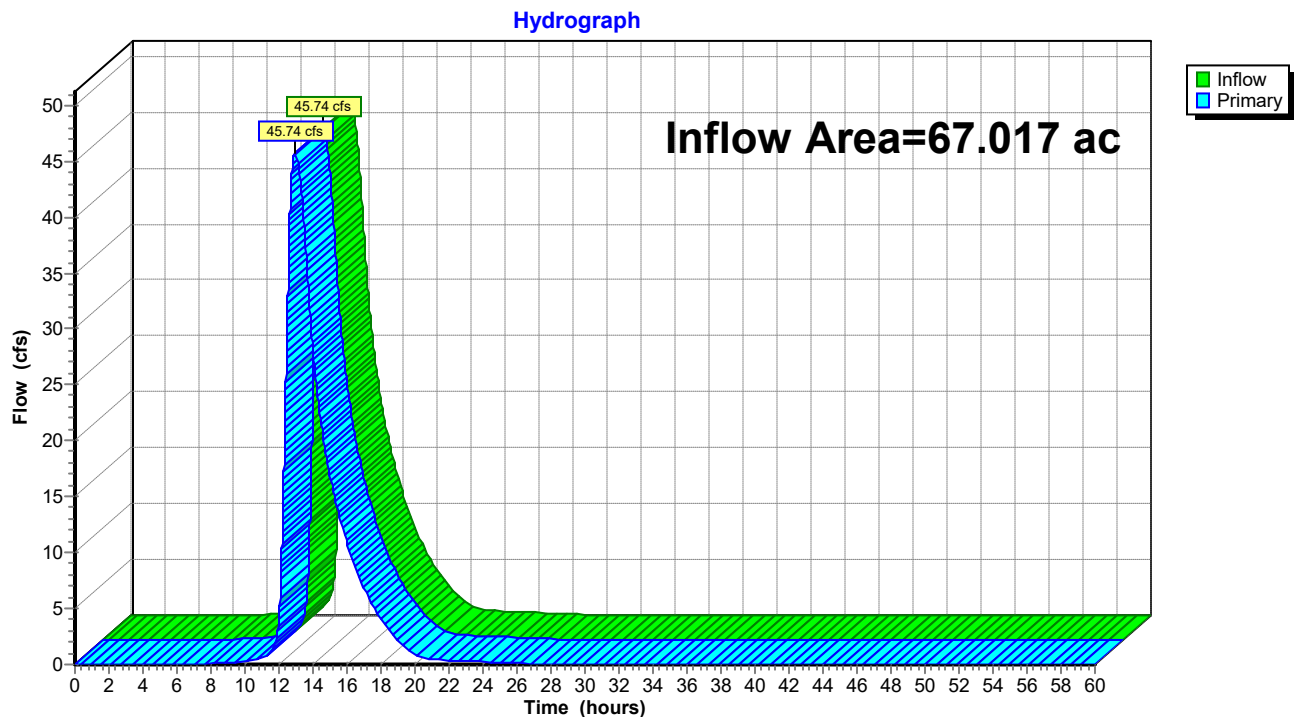
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### Link L1\*: Offsite Flow from 283 Ellington Road



### Link L2: Propsoed Flow to DP2\*



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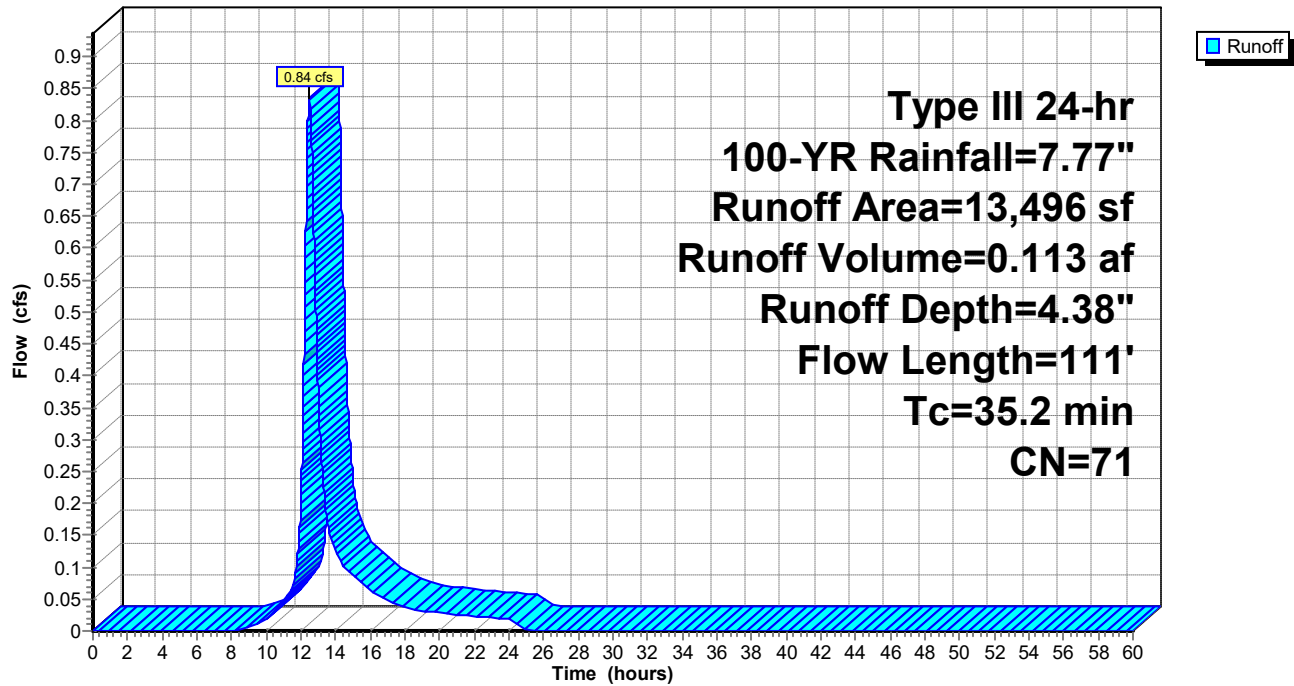
Type III 24-hr 100-YR Rainfall=7.77"

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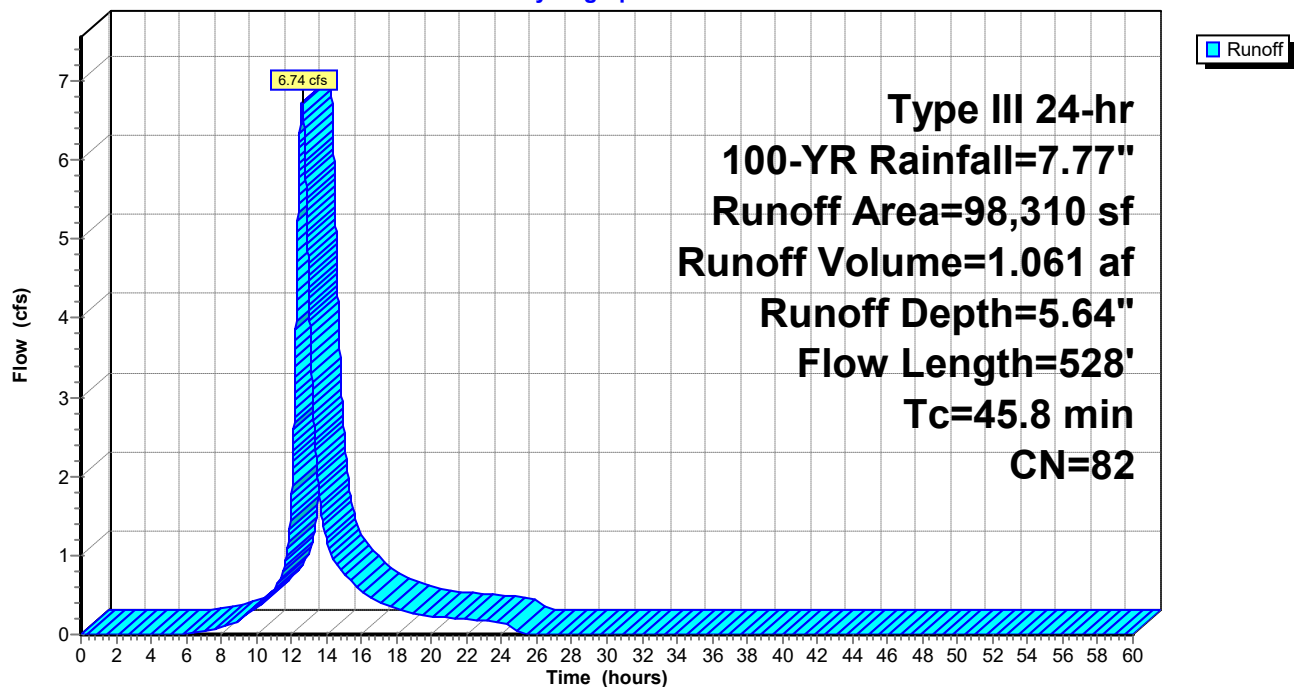
### Subcatchment P1: P1

Hydrograph



### Subcatchment P2: P2

Hydrograph



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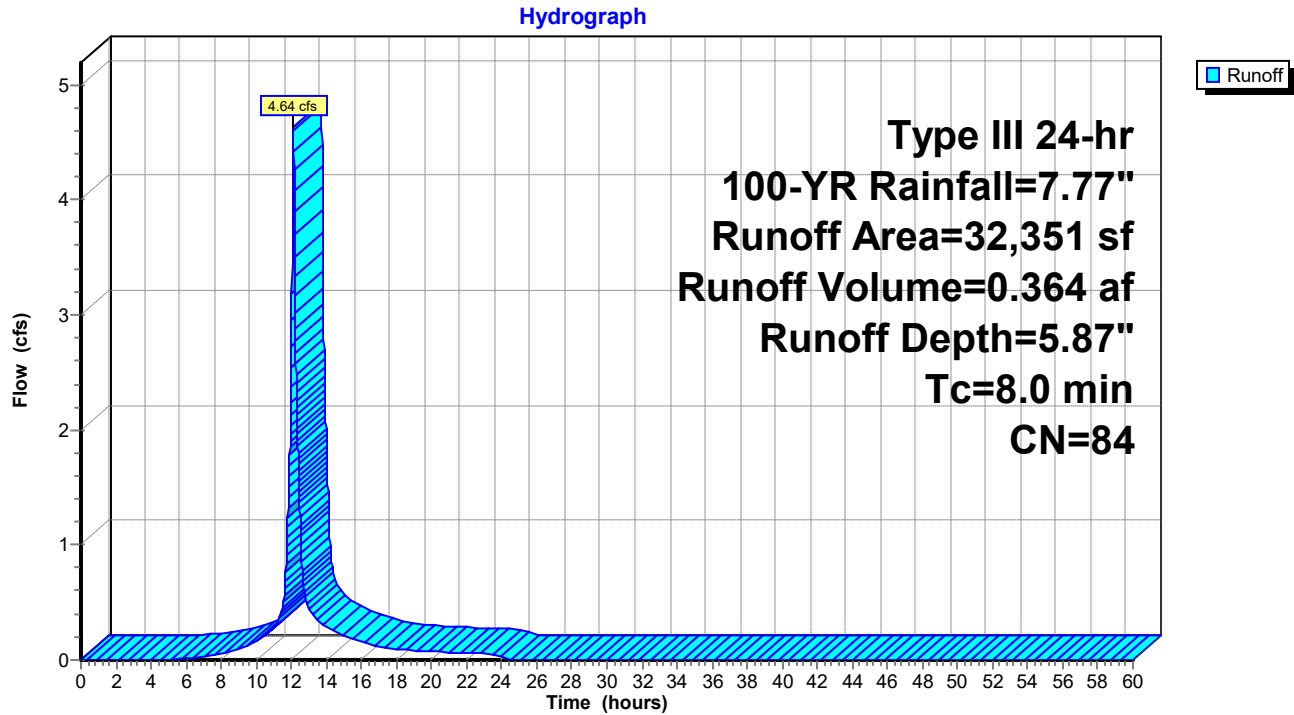
Proposed Conditions

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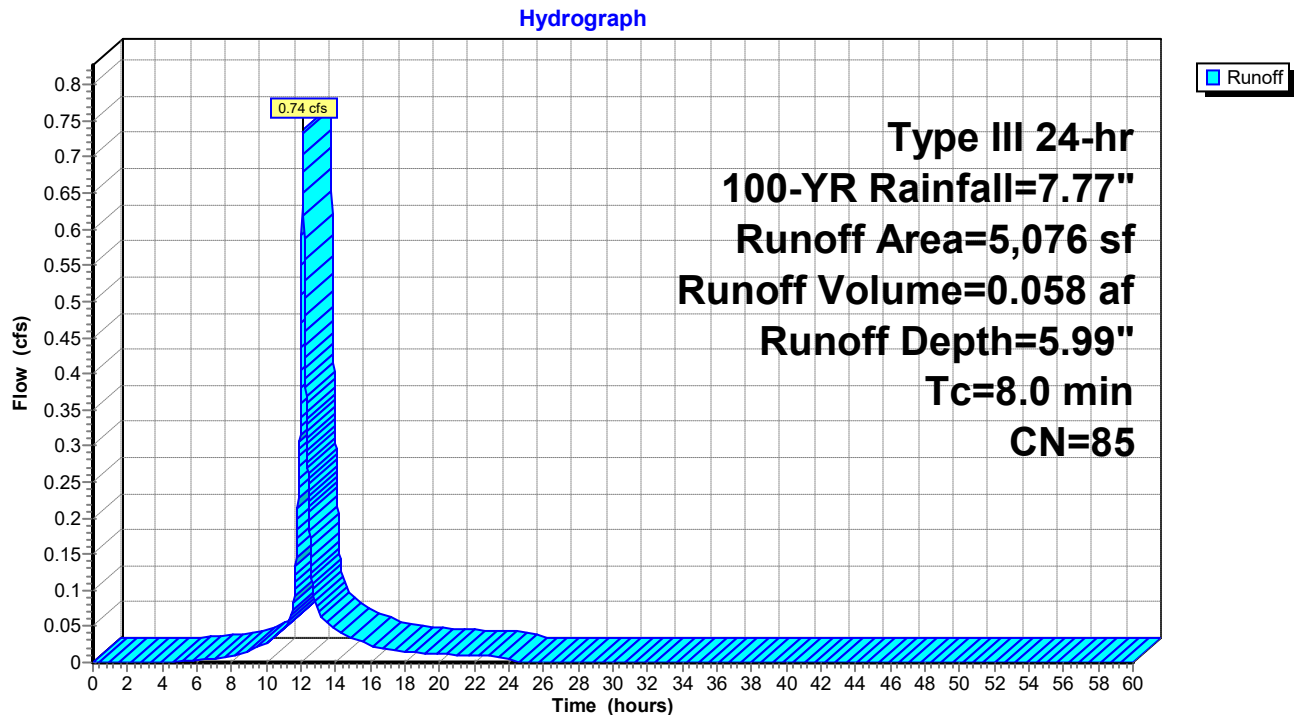
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### Subcatchment P3: P3



### Subcatchment P4: Proposed Flow to DP1\*



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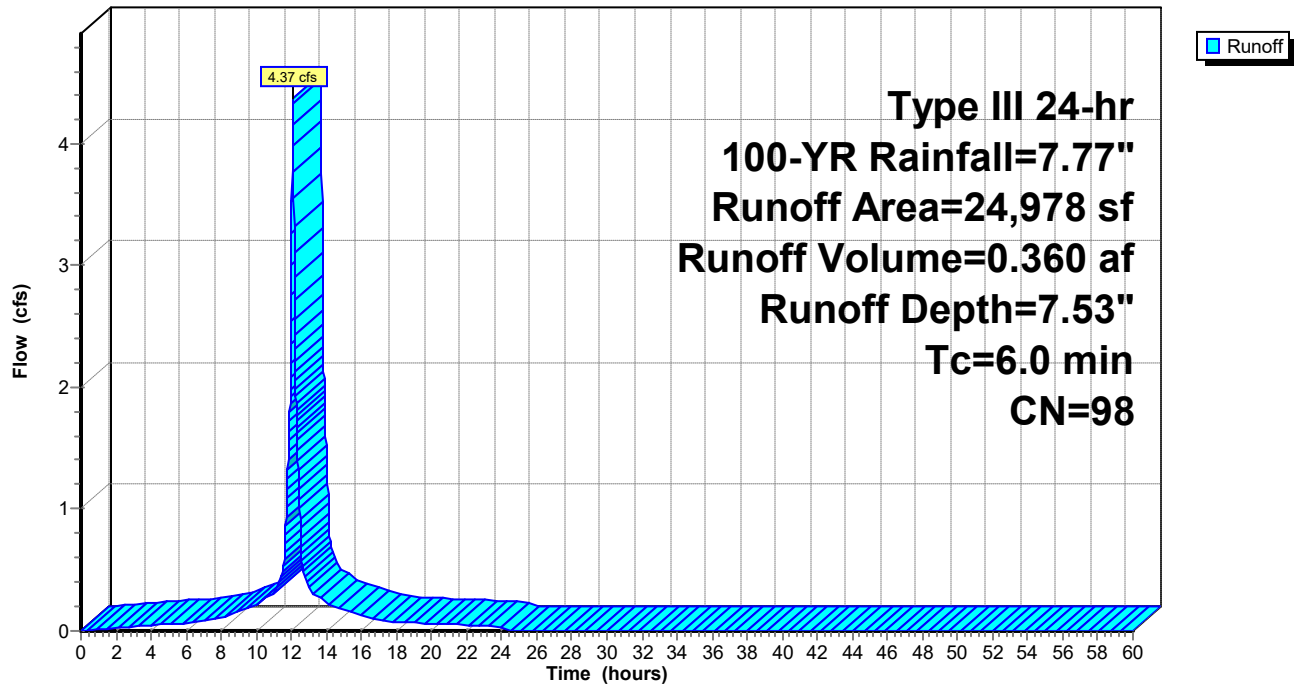
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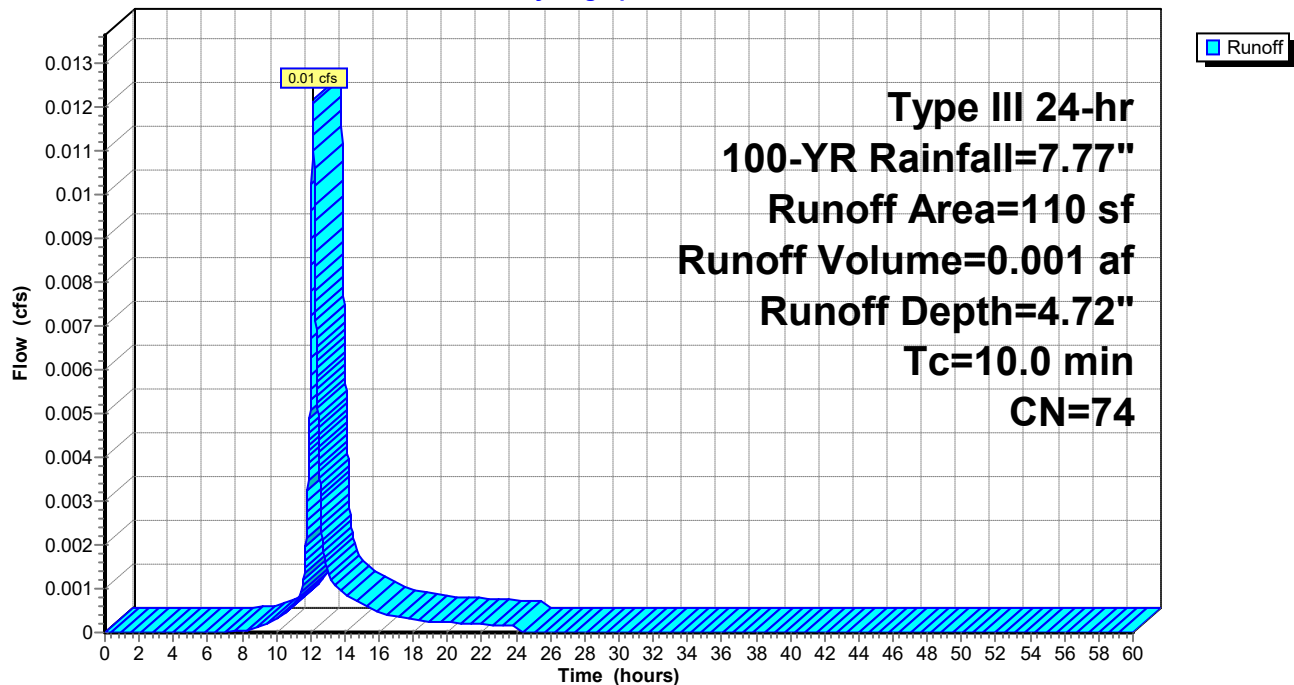
### Subcatchment P5: P5

Hydrograph



### Subcatchment P6: P6

Hydrograph





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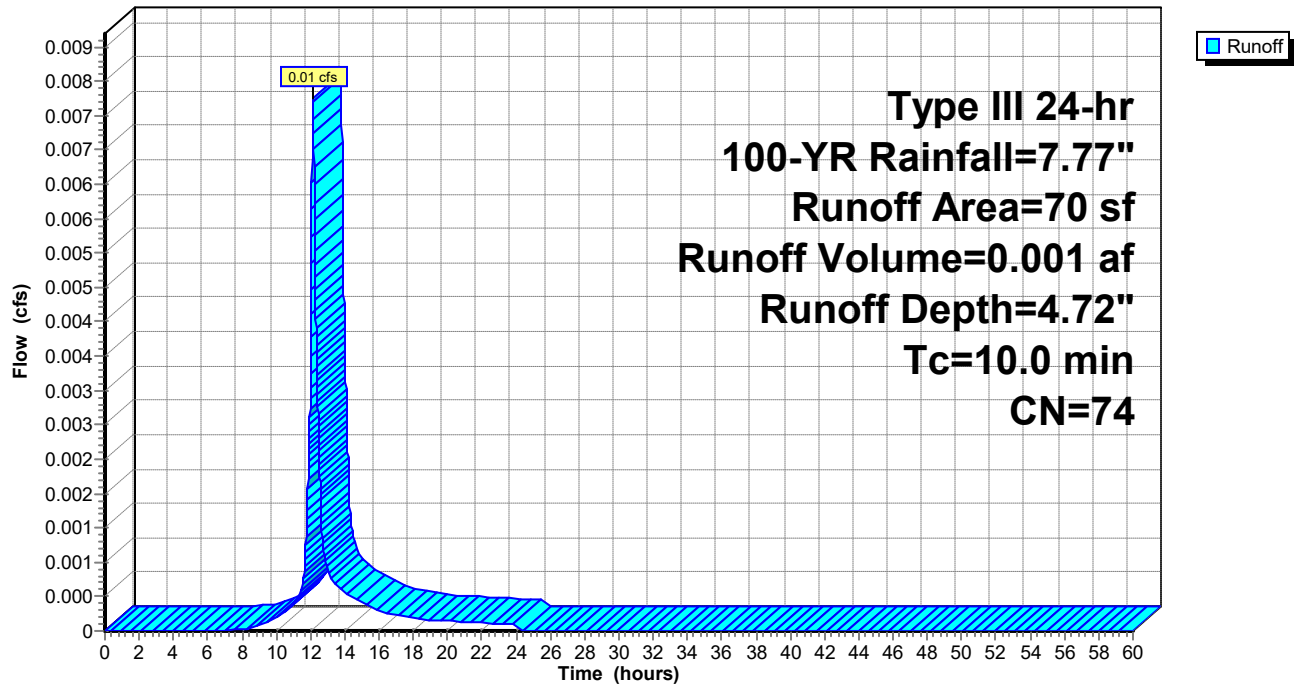
Type III 24-hr 100-YR Rainfall=7.77"

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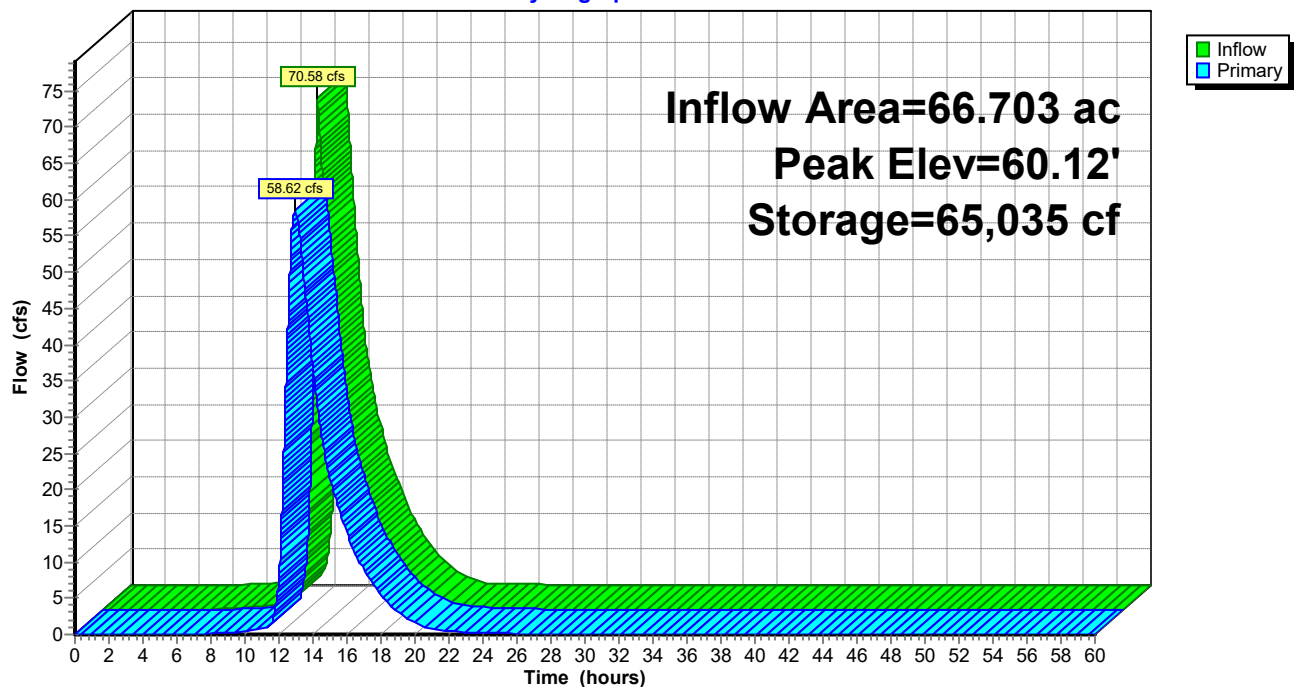
### Subcatchment P7: P7

Hydrograph



### Pond PP1: Proposed Water Quality Basin

Hydrograph



## 4303.H - HydroCAD

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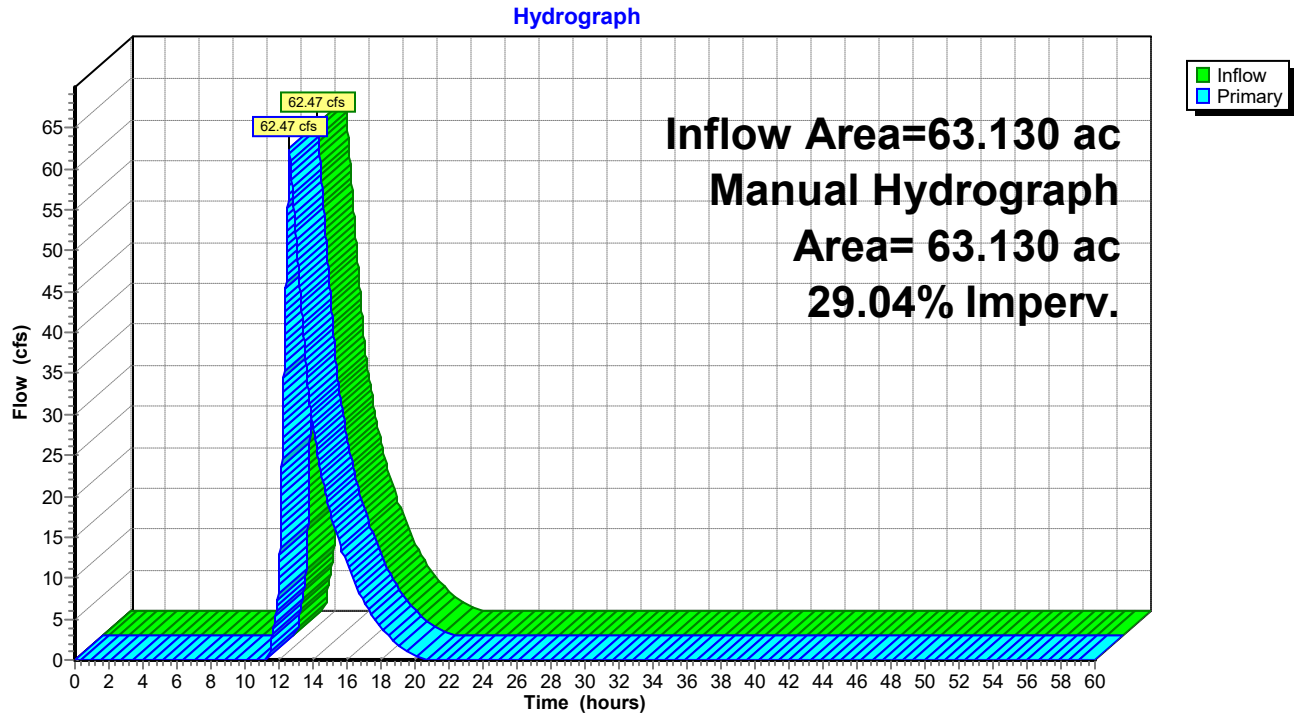
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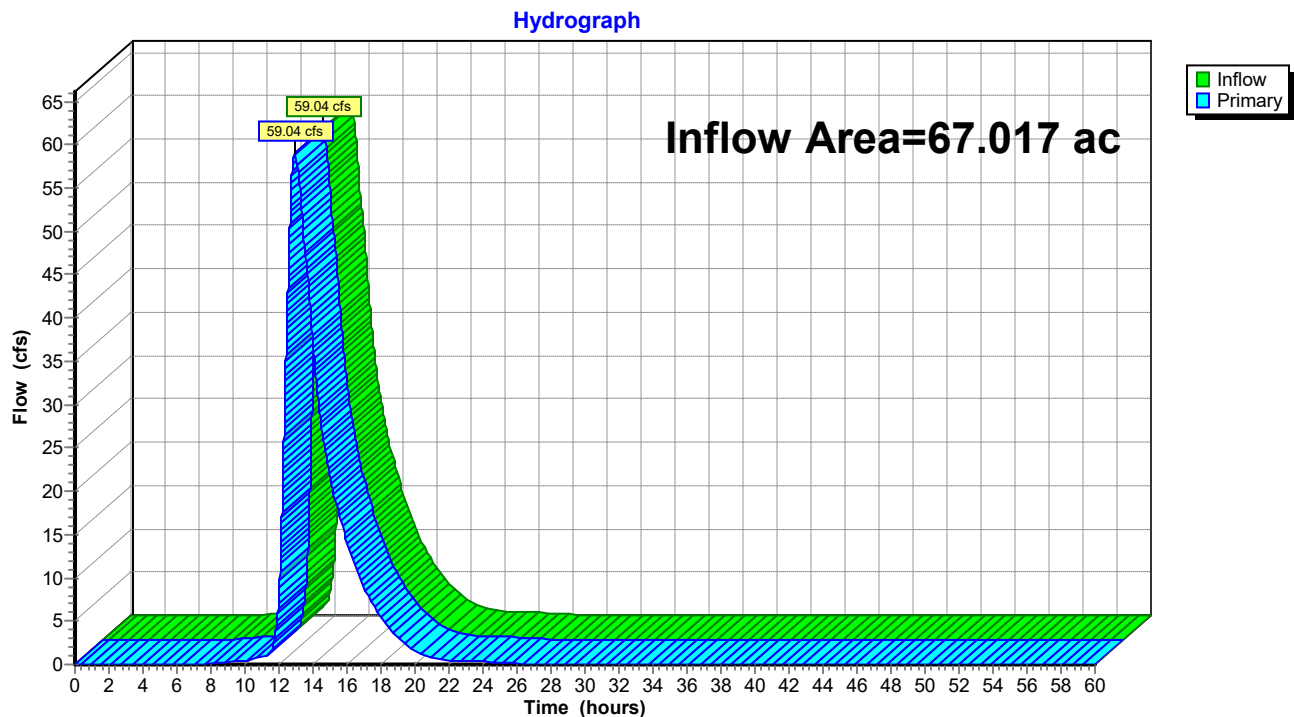
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### Link L1\*: Offsite Flow from 283 Ellington Road



### Link L2: Propsoed Flow to DP2\*



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Proposed Conditions

Type III 24-hr 100-YR Rainfall=7.77"

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**Summary for Pond PP1: Proposed Water Quality Basin**

Inflow Area = 66.703 ac, 30.10% Impervious, Inflow Depth = 2.43" for 100-YR event  
 Inflow = 70.58 cfs @ 12.60 hrs, Volume= 13.530 af  
 Outflow = 58.62 cfs @ 12.95 hrs, Volume= 13.529 af, Atten= 17%, Lag= 20.8 min  
 Primary = 58.62 cfs @ 12.95 hrs, Volume= 13.529 af  
 Routed to Link L2 : Propsoed Flow to DP2\*

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs  
 Peak Elev= 60.12' @ 12.95 hrs Surf.Area= 19,035 sf Storage= 65,035 cf

Plug-Flow detention time= 24.7 min calculated for 13.527 af (100% of inflow)  
 Center-of-Mass det. time= 24.9 min ( 862.8 - 837.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	55.50'	82,711 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.50	10,195	0	0
56.00	10,891	5,272	5,272
57.00	12,359	11,625	16,897
58.00	13,916	13,138	30,034
59.00	16,399	15,158	45,192
60.00	18,747	17,573	62,765
61.00	21,145	19,946	82,711

Device	Routing	Invert	Outlet Devices
#1	Primary	55.41'	<b>36.0" Round Culvert</b> L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.41' / 55.30' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf
#2	Device 1	55.50'	<b>36.0" Round Culvert</b> L= 14.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.50' / 55.41' S= 0.0064 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf

**Primary OutFlow** Max=58.62 cfs @ 12.95 hrs HW=60.12' (Free Discharge)

↑ **1=Culvert** (Passes 58.62 cfs of 59.40 cfs potential flow)

↑ **2=Culvert** (Barrel Controls 58.62 cfs @ 8.29 fps)

**APPENDIX C**  
**NRCS Soil Map & Data**



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 **State of Connecticut**

**249 Ellington Road**



October 13, 2022

# Preface

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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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# Soil Map

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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

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 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

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

### Water Features

 Streams and Canals

### Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: State of Connecticut  
Survey Area Data: Version 22, Sep 12, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 15, 2019—Aug 29, 2019

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
13	Walpole sandy loam, 0 to 3 percent slopes	0.0	0.5%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	7.1	99.5%
<b>Totals for Area of Interest</b>		<b>7.2</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.

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,

## Custom Soil Resource Report

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 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.



## State of Connecticut

### 13—Walpole sandy loam, 0 to 3 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2svkl

*Elevation:* 0 to 1,020 feet

*Mean annual precipitation:* 36 to 71 inches

*Mean annual air temperature:* 39 to 55 degrees F

*Frost-free period:* 140 to 250 days

*Farmland classification:* Farmland of statewide importance

#### Map Unit Composition

*Walpole and similar soils:* 80 percent

*Minor components:* 20 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Walpole

##### Setting

*Landform:* Depressions, outwash plains, outwash terraces, depressions, deltas

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Tread, dip, talf

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Parent material:* Sandy glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

##### Typical profile

*Oe - 0 to 1 inches:* mucky peat

*A - 1 to 7 inches:* sandy loam

*Bg - 7 to 21 inches:* sandy loam

*BC - 21 to 25 inches:* gravelly sandy loam

*C - 25 to 65 inches:* very gravelly sand

##### Properties and qualities

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Poorly drained

*Runoff class:* Very high

*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:* About 0 to 4 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:* Moderate (about 6.4 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4w

*Hydrologic Soil Group:* B/D

*Ecological site:* F144AY028MA - Wet Outwash

*Hydric soil rating:* Yes

## Minor Components

### Sudbury

*Percent of map unit:* 10 percent  
*Landform:* Outwash plains, deltas, terraces  
*Landform position (two-dimensional):* Footslope  
*Landform position (three-dimensional):* Tread, dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

### Scarboro

*Percent of map unit:* 10 percent  
*Landform:* Outwash plains, deltas, outwash terraces  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Tread, dip  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

## 701A—Ninigret fine sandy loam, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 2y07d  
*Elevation:* 0 to 1,260 feet  
*Mean annual precipitation:* 43 to 54 inches  
*Mean annual air temperature:* 45 to 55 degrees F  
*Frost-free period:* 140 to 185 days  
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Ninigret and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Ninigret

#### Setting

*Landform:* Kame terraces, outwash plains, moraines, kames, outwash terraces  
*Landform position (two-dimensional):* Footslope, toeslope  
*Landform position (three-dimensional):* Base slope, tread  
*Down-slope shape:* Convex, linear  
*Across-slope shape:* Convex, concave  
*Parent material:* Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

#### Typical profile

*Ap - 0 to 8 inches:* fine sandy loam  
*Bw1 - 8 to 16 inches:* fine sandy loam  
*Bw2 - 16 to 26 inches:* fine sandy loam

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2C - 26 to 65 inches: stratified loamy sand to loamy fine sand

### Properties and qualities

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* 18 to 38 inches to strongly contrasting textural stratification

*Drainage class:* Moderately well drained

*Runoff class:* Very 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:* About 17 to 39 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):* 2w

*Hydrologic Soil Group:* C

*Ecological site:* F144AY026CT - Moist Silty Outwash

*Hydric soil rating:* No

### Minor Components

#### Merrimac

*Percent of map unit:* 5 percent

*Landform:* Outwash plains, outwash terraces, eskers, kames, moraines

*Landform position (two-dimensional):* Summit, shoulder

*Landform position (three-dimensional):* Side slope, crest, tread

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Hydric soil rating:* No

#### Agawam

*Percent of map unit:* 5 percent

*Landform:* Kame terraces, outwash plains, outwash terraces, moraines, kames

*Landform position (two-dimensional):* Summit, shoulder

*Landform position (three-dimensional):* Side slope, crest, tread

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Hydric soil rating:* No

#### Tisbury

*Percent of map unit:* 3 percent

*Landform:* Outwash terraces, valley trains, deltas, outwash plains

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* No

#### Raypol

*Percent of map unit:* 2 percent

*Landform:* Drainageways, depressions

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes





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**APPENDIX D**  
**NOAA Rainfall Data**



NOAA Atlas 14, Volume 10, Version 3  
Location name: South Windsor, Connecticut, USA\*  
Latitude: 41.8048°, Longitude: -72.609°  
Elevation: 64.58 ft\*\*  
\* source: ESRI Maps  
\*\* source: USGS



## POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

### 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	0.335 (0.262-0.428)	0.406 (0.317-0.520)	0.523 (0.407-0.671)	0.619 (0.480-0.800)	0.753 (0.564-1.02)	0.854 (0.626-1.18)	0.959 (0.683-1.38)	1.08 (0.727-1.59)	1.25 (0.809-1.91)	1.39 (0.877-2.16)
10-min	0.475 (0.371-0.606)	0.576 (0.449-0.737)	0.741 (0.577-0.951)	0.878 (0.679-1.13)	1.07 (0.799-1.44)	1.21 (0.886-1.67)	1.36 (0.967-1.95)	1.53 (1.03-2.25)	1.77 (1.15-2.70)	1.96 (1.24-3.06)
15-min	0.558 (0.436-0.714)	0.677 (0.529-0.867)	0.871 (0.678-1.12)	1.03 (0.799-1.33)	1.25 (0.940-1.70)	1.42 (1.04-1.97)	1.60 (1.14-2.30)	1.80 (1.21-2.64)	2.08 (1.35-3.17)	2.31 (1.46-3.60)
30-min	0.748 (0.585-0.956)	0.910 (0.710-1.16)	1.18 (0.914-1.51)	1.40 (1.08-1.80)	1.70 (1.27-2.30)	1.92 (1.41-2.66)	2.16 (1.54-3.11)	2.43 (1.64-3.58)	2.81 (1.82-4.30)	3.13 (1.98-4.88)
60-min	0.938 (0.733-1.20)	1.14 (0.892-1.46)	1.48 (1.15-1.90)	1.76 (1.36-2.27)	2.14 (1.60-2.89)	2.43 (1.78-3.36)	2.73 (1.94-3.92)	3.07 (2.07-4.51)	3.55 (2.30-5.42)	3.95 (2.50-6.15)
2-hr	1.22 (0.956-1.55)	1.47 (1.16-1.87)	1.89 (1.48-2.42)	2.24 (1.74-2.88)	2.72 (2.05-3.67)	3.08 (2.28-4.25)	3.46 (2.49-4.98)	3.91 (2.64-5.72)	4.58 (2.98-6.95)	5.14 (3.27-7.97)
3-hr	1.40 (1.11-1.78)	1.70 (1.34-2.15)	2.18 (1.71-2.77)	2.58 (2.01-3.30)	3.13 (2.37-4.20)	3.53 (2.62-4.87)	3.97 (2.87-5.71)	4.50 (3.05-6.57)	5.30 (3.45-8.02)	5.99 (3.81-9.24)
6-hr	1.75 (1.39-2.21)	2.13 (1.69-2.68)	2.74 (2.17-3.46)	3.25 (2.55-4.13)	3.95 (3.01-5.29)	4.47 (3.34-6.13)	5.03 (3.66-7.21)	5.72 (3.89-8.29)	6.79 (4.43-10.2)	7.71 (4.92-11.8)
12-hr	2.13 (1.70-2.66)	2.61 (2.08-3.27)	3.40 (2.70-4.27)	4.05 (3.20-5.12)	4.95 (3.79-6.59)	5.61 (4.21-7.66)	6.33 (4.64-9.04)	7.22 (4.93-10.4)	8.62 (5.65-12.9)	9.82 (6.29-15.0)
24-hr	2.48 (1.99-3.09)	3.09 (2.48-3.84)	4.08 (3.26-5.09)	4.90 (3.89-6.15)	6.03 (4.65-8.00)	6.85 (5.19-9.34)	7.77 (5.75-11.1)	8.94 (6.11-12.8)	10.8 (7.09-16.0)	12.4 (7.97-18.8)
2-day	2.80 (2.27-3.46)	3.54 (2.86-4.38)	4.75 (3.82-5.89)	5.75 (4.59-7.17)	7.12 (5.54-9.43)	8.12 (6.20-11.1)	9.24 (6.92-13.2)	10.7 (7.37-15.3)	13.2 (8.69-19.5)	15.4 (9.90-23.1)
3-day	3.05 (2.48-3.76)	3.86 (3.13-4.76)	5.19 (4.18-6.41)	6.29 (5.04-7.82)	7.80 (6.08-10.3)	8.89 (6.82-12.1)	10.1 (7.62-14.5)	11.8 (8.11-16.7)	14.5 (9.60-21.4)	17.0 (11.0-25.5)
4-day	3.27 (2.66-4.02)	4.13 (3.36-5.08)	5.54 (4.48-6.84)	6.71 (5.40-8.33)	8.32 (6.51-11.0)	9.49 (7.29-12.9)	10.8 (8.14-15.4)	12.6 (8.66-17.8)	15.5 (10.3-22.7)	18.1 (11.7-27.1)
7-day	3.87 (3.16-4.72)	4.83 (3.94-5.91)	6.41 (5.21-7.87)	7.72 (6.24-9.53)	9.52 (7.47-12.5)	10.8 (8.35-14.6)	12.3 (9.27-17.4)	14.2 (9.85-20.0)	17.4 (11.6-25.4)	20.3 (13.1-30.1)
10-day	4.48 (3.67-5.45)	5.50 (4.50-6.70)	7.16 (5.84-8.76)	8.54 (6.92-10.5)	10.4 (8.21-13.6)	11.8 (9.12-15.8)	13.4 (10.1-18.7)	15.4 (10.7-21.6)	18.6 (12.4-27.0)	21.5 (13.9-31.8)
20-day	6.44 (5.31-7.79)	7.52 (6.19-9.11)	9.28 (7.61-11.3)	10.7 (8.75-13.1)	12.8 (10.0-16.3)	14.2 (11.0-18.7)	15.8 (11.8-21.7)	17.8 (12.4-24.7)	20.8 (13.9-29.9)	23.3 (15.2-34.3)
30-day	8.14 (6.73-9.81)	9.24 (7.64-11.1)	11.0 (9.09-13.4)	12.5 (10.3-15.3)	14.6 (11.5-18.5)	16.1 (12.4-21.0)	17.8 (13.2-24.0)	19.6 (13.7-27.1)	22.3 (14.9-31.9)	24.5 (16.0-35.8)
45-day	10.3 (8.53-12.3)	11.4 (9.47-13.7)	13.3 (11.0-16.0)	14.8 (12.2-18.0)	16.9 (13.4-21.3)	18.6 (14.3-23.9)	20.2 (15.0-26.9)	21.9 (15.4-30.1)	24.2 (16.3-34.5)	26.0 (17.0-37.9)
60-day	12.1 (10.1-14.5)	13.3 (11.0-15.9)	15.2 (12.6-18.3)	16.8 (13.8-20.3)	19.0 (15.0-23.8)	20.7 (15.9-26.4)	22.4 (16.5-29.4)	24.0 (16.9-32.8)	26.0 (17.5-36.9)	27.4 (17.9-39.8)

<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



NOAA Atlas 14, Volume 10, Version 3  
Location name: South Windsor, Connecticut, USA\*  
Latitude: 41.8048°, Longitude: -72.609°  
Elevation: 64.58 ft\*\*  
\* source: ESRI Maps  
\*\* source: USGS



### POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

### PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.02 (3.14-5.14)	4.87 (3.80-6.24)	6.28 (4.88-8.05)	7.43 (5.76-9.60)	9.04 (6.77-12.2)	10.2 (7.51-14.2)	11.5 (8.20-16.5)	12.9 (8.72-19.0)	15.0 (9.71-22.9)	16.6 (10.5-25.9)
10-min	2.85 (2.23-3.64)	3.46 (2.69-4.42)	4.45 (3.46-5.71)	5.27 (4.07-6.80)	6.40 (4.79-8.66)	7.25 (5.32-10.0)	8.15 (5.80-11.7)	9.16 (6.17-13.5)	10.6 (6.87-16.2)	11.8 (7.46-18.4)
15-min	2.23 (1.74-2.86)	2.71 (2.12-3.47)	3.48 (2.71-4.47)	4.13 (3.20-5.34)	5.02 (3.76-6.79)	5.69 (4.17-7.87)	6.39 (4.55-9.19)	7.18 (4.84-10.6)	8.31 (5.39-12.7)	9.24 (5.85-14.4)
30-min	1.50 (1.17-1.91)	1.82 (1.42-2.33)	2.35 (1.83-3.02)	2.79 (2.16-3.60)	3.39 (2.54-4.59)	3.85 (2.82-5.32)	4.32 (3.08-6.22)	4.86 (3.27-7.15)	5.63 (3.65-8.59)	6.26 (3.96-9.75)
60-min	0.938 (0.733-1.20)	1.14 (0.892-1.46)	1.48 (1.15-1.90)	1.76 (1.36-2.27)	2.14 (1.60-2.89)	2.43 (1.78-3.36)	2.73 (1.94-3.92)	3.07 (2.07-4.51)	3.55 (2.30-5.42)	3.95 (2.50-6.15)
2-hr	0.608 (0.478-0.772)	0.736 (0.578-0.936)	0.946 (0.741-1.21)	1.12 (0.872-1.44)	1.36 (1.03-1.83)	1.54 (1.14-2.12)	1.73 (1.24-2.49)	1.96 (1.32-2.86)	2.29 (1.49-3.48)	2.57 (1.63-3.98)
3-hr	0.467 (0.368-0.591)	0.565 (0.445-0.716)	0.725 (0.569-0.922)	0.858 (0.670-1.10)	1.04 (0.788-1.40)	1.18 (0.873-1.62)	1.32 (0.957-1.90)	1.50 (1.01-2.19)	1.77 (1.15-2.67)	1.99 (1.27-3.08)
6-hr	0.293 (0.232-0.368)	0.355 (0.282-0.448)	0.458 (0.362-0.578)	0.543 (0.426-0.690)	0.659 (0.502-0.883)	0.746 (0.557-1.02)	0.840 (0.612-1.21)	0.955 (0.649-1.39)	1.13 (0.740-1.70)	1.29 (0.821-1.97)
12-hr	0.177 (0.141-0.221)	0.217 (0.173-0.271)	0.282 (0.224-0.354)	0.336 (0.265-0.425)	0.410 (0.314-0.547)	0.465 (0.350-0.635)	0.525 (0.385-0.750)	0.600 (0.409-0.864)	0.715 (0.469-1.07)	0.815 (0.522-1.24)
24-hr	0.103 (0.083-0.129)	0.129 (0.103-0.160)	0.170 (0.136-0.212)	0.204 (0.162-0.256)	0.251 (0.194-0.333)	0.286 (0.216-0.389)	0.324 (0.239-0.462)	0.372 (0.255-0.533)	0.449 (0.295-0.667)	0.517 (0.332-0.782)
2-day	0.058 (0.047-0.072)	0.074 (0.060-0.091)	0.099 (0.079-0.123)	0.120 (0.096-0.149)	0.148 (0.115-0.196)	0.169 (0.129-0.230)	0.193 (0.144-0.276)	0.224 (0.153-0.319)	0.275 (0.181-0.405)	0.320 (0.206-0.481)
3-day	0.042 (0.034-0.052)	0.054 (0.043-0.066)	0.072 (0.058-0.089)	0.087 (0.070-0.109)	0.108 (0.085-0.143)	0.124 (0.095-0.168)	0.141 (0.106-0.201)	0.164 (0.113-0.232)	0.202 (0.133-0.297)	0.236 (0.152-0.354)
4-day	0.034 (0.028-0.042)	0.043 (0.035-0.053)	0.058 (0.047-0.071)	0.070 (0.056-0.087)	0.087 (0.068-0.114)	0.099 (0.076-0.134)	0.113 (0.085-0.160)	0.131 (0.090-0.185)	0.162 (0.107-0.237)	0.189 (0.122-0.282)
7-day	0.023 (0.019-0.028)	0.029 (0.023-0.035)	0.038 (0.031-0.047)	0.046 (0.037-0.057)	0.057 (0.044-0.074)	0.064 (0.050-0.087)	0.073 (0.055-0.103)	0.085 (0.059-0.119)	0.104 (0.069-0.151)	0.121 (0.078-0.179)
10-day	0.019 (0.015-0.023)	0.023 (0.019-0.028)	0.030 (0.024-0.036)	0.036 (0.029-0.044)	0.044 (0.034-0.057)	0.049 (0.038-0.066)	0.056 (0.042-0.078)	0.064 (0.044-0.090)	0.078 (0.052-0.113)	0.090 (0.058-0.132)
20-day	0.013 (0.011-0.016)	0.016 (0.013-0.019)	0.019 (0.016-0.023)	0.022 (0.018-0.027)	0.027 (0.021-0.034)	0.030 (0.023-0.039)	0.033 (0.025-0.045)	0.037 (0.026-0.052)	0.043 (0.029-0.062)	0.049 (0.032-0.071)
30-day	0.011 (0.009-0.014)	0.013 (0.011-0.015)	0.015 (0.013-0.019)	0.017 (0.014-0.021)	0.020 (0.016-0.026)	0.022 (0.017-0.029)	0.025 (0.018-0.033)	0.027 (0.019-0.038)	0.031 (0.021-0.044)	0.034 (0.022-0.050)
45-day	0.010 (0.008-0.011)	0.011 (0.009-0.013)	0.012 (0.010-0.015)	0.014 (0.011-0.017)	0.016 (0.012-0.020)	0.017 (0.013-0.022)	0.019 (0.014-0.025)	0.020 (0.014-0.028)	0.022 (0.015-0.032)	0.024 (0.016-0.035)
60-day	0.008 (0.007-0.010)	0.009 (0.008-0.011)	0.011 (0.009-0.013)	0.012 (0.010-0.014)	0.013 (0.010-0.017)	0.014 (0.011-0.018)	0.016 (0.011-0.020)	0.017 (0.012-0.023)	0.018 (0.012-0.026)	0.019 (0.012-0.028)

<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.

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### PF graphical

**APPENDIX E**  
**Storm Sewer Analysis Results**

Stormwater HGL/EGL Analysis

Line #	Struct. ID	D (ft)	Q (cu. ft/sec)	L (ft)	V (ft/s)	d (ft).1	dc (ft)	v^2/2g (ft)	EGLo (ft)	HGLo (ft)	Sf	EGLi (ft)	HGLi (ft)	Ea (ft)	EGLa (ft)	U/S TOC (ft)	Surface Elev. (ft)	Freeboard (ft)	Step4*	Step7*	Step14*
1	CB-1	2.5	22.85	92.35	4.65	2.50	n/a	0.34	58.95	58.61	0.003	59.19	58.86	3.27	59.35	58.58	60.90	1.55	Case B	N/A	Case A
2	CB-2	3	24.35	23.78	7.14	1.46	1.59	0.79	58.81	58.52	0.000	58.81	58.02	3.19	58.81	57.33	60.00	1.19	N/A	Case E	N/A
3	CB-3	1	1.33	105.42	1.69	1.00	n/a	0.04	58.83	58.79	0.001	58.96	58.91	2.14	59.00	57.96	60.00	1.00	Case B	N/A	Case A
4	CB-4	1	0.35	207.71	0.44	1.00	n/a	0.00	59.00	59.00	0.000	59.02	59.02	1.02	59.02	---	60.40	1.38	Case B	N/A	Case A
5	CB-5	1.25	0.40	184.60	0.33	1.25	n/a	0.00	60.07	60.07	0.000	60.08	60.08	2.08	60.08	---	60.70	0.62	Case B	N/A	Case A
6	CB-6	2.5	22.30	167.82	4.54	2.50	n/a	0.32	59.48	59.16	0.003	59.98	59.66	3.15	60.07	58.33	60.80	0.73	Case B	N/A	Case A
7	DMH-1 (36" PLAS	1	0.90	28.18	1.14	1.00	n/a	0.02	60.08	60.06	0.001	60.10	60.08	2.28	60.11	58.50	61.60	1.49	Case B	N/A	Case A
8	DMH-2 (36" PLAS	1	1.79	45.79	2.28	0.44	0.57	0.08	59.04	58.95	0.002	59.13	59.05	0.96	59.18	59.22	62.30	3.12	Case B	N/A	Case B
9	FE-1								57.73	57.73						58.50	59.06				
10	RL-2	0.67	0.92	9.96	8.81	0.23	0.45	1.21	60.25	60.14	0.005	61.53	60.33	1.43	61.53	---	61.66	0.13	Case B	N/A	Case D
11	RL-3	0.67	0.92	9.93	5.31	0.33	0.45	0.44	60.57	60.45	0.000	60.87	60.43	0.77	60.87	---	61.25	0.38	N/A	Case F	N/A
12	RL-4	0.67	0.92	9.93	11.98	0.18	0.45	2.23	59.22	59.11	0.005	62.51	60.28	2.41	62.51	---	61.66	-0.85	Case B	N/A	Case D
13	Structure - (32)	1	0.92	124.43	4.49	0.31	0.40	0.31	59.19	59.17	0.000	60.52	60.21	0.62	60.52	60.57	61.60	1.08	N/A	Case F	N/A
14	WYE-2	1	0.92	124.95	1.17	0.32	0.40	0.02	60.12	60.10	0.001	60.19	60.17	0.91	60.21	59.97	61.60	1.39	Case B	N/A	Case B
15	YD-1	1	0.43	69.46	0.55	1.00	n/a	0.00	59.35	59.35	0.000	59.36	59.36	2.77	59.36	---	62.00	2.64	Case B	N/A	Case A
16	YD-2	1	0.10	47.63	0.13	1.00	n/a	0.00	60.07	60.07	0.000	60.07	60.07	2.76	60.07	---	61.00	0.93	Case B	N/A	Case A



Stormwater Pipe Analysis

Line #	Pipe	From	To	Pipe Dia. (ft)	2D	Invert	Invert	Slope	Drainage	Drainage	Runoff Coeff "C"	Area X	Area X	TOC Inlet (min)	TOC	Rain "I"	Runoff	Known Q	Total Q	Full Q	Velo.		
					Length (ft)	Elev. U/S (ft)	Elev. D/S (ft)		Area Inc (sq. ft)	Area Total (sq. ft)		"C" Inc (sq. ft)	"C" Total (sq. ft)		System (min)	(inch/hr)	"Q" (cu. ft/sec)	(cu. ft/sec)	(cu. ft/sec)	(cu. ft/sec)	Velo. Full (ft/s)	Design (ft/s)	Sec Time (min)
1	CB2-FE1	CB-2	FE-1	3	24	55.62	55.5	0.5%	5,799	117,125	0.71	4,135	64,431	7.0	42.0	2.00	2.99	0.00	24.35	51.14	7.235	7.141	0.06
2	CB3-CB2	CB-3	CB-2	1	105	56.86	56.33	0.5%	16,002	45,972	0.62	9,953	28,370	8.0	41.5	2.02	1.33	0.00	1.33	2.73	3.478	3.45	0.51
3	CB4-CB3	CB-4	CB-3	1	208	58	56.96	0.5%	17,570	17,570	0.41	7,257	7,257	40.0	40.0	2.06	0.35	0.00	0.35	2.73	3.478	2.381	1.45
4	CB5-CB6	CB-5	CB-6	1.25	185	58	57.08	0.5%	23,986	23,986	0.35	8,443	8,443	40.0	40.0	2.06	0.40	0.00	0.40	4.95	4.03	2.424	1.27
5	CB6-CB1	CB-6	CB-1	2.5	168	56.92	56.08	0.5%	8,369	41,565	0.62	5,222	19,998	7.0	41.3	2.02	0.94	21.36	22.30	29.03	5.914	6.516	0.43
6	Pipe - (13)	CB-1	CB-2	2.5	92	56.08	55.62	0.5%	14,064	65,354	0.62	8,720	31,927	8.0	41.7	2.01	1.49	0.00	22.85	31.45	6.407	6.981	0.22
7	Pipe - (20)	DMH-1 (36"	CB-6	1	28	57.83	57.5	1.2%	0	6,200	0.00	0	5,580	0.0	6.5	6.93	0.90	0.00	0.90	4.19	5.333	4.24	0.11
8	Pipe - (22)	RL-3	Structure - (	0.67	10	60.1	59.9	2.0%	6,200	6,200	0.90	5,580	5,580	6.0	6.0	7.10	0.92	0.00	0.92	1.86	5.326	5.305	0.03
9	Pipe - (23)	Structure - (	DMH-2 (36"	1	124	59.9	58.22	1.4%	0	6,200	0.00	0	5,580	0.0	6.0	7.09	0.92	0.00	0.92	4.49	5.718	4.486	0.46
10	Pipe - (24)	DMH-2 (36"	CB-3	1	46	58.22	57.6	1.4%	0	12,400	0.00	0	11,160	0.0	6.5	6.94	1.79	0.00	1.79	4.49	5.718	5.392	0.14
11	Pipe - (25)	RL-4	DMH-2 (36"	0.67	10	60.1	58.22	18.9%	6,200	6,200	0.90	5,580	5,580	6.0	6.0	7.10	0.92	0.00	0.92	5.70	16.332	11.977	0.01
12	Pipe - (26)	YD-1	CB-1	1	69	56.59	56.24	0.5%	9,725	9,725	0.33	3,209	3,209	10.0	10.0	5.78	0.43	0.00	0.43	2.75	3.505	2.548	0.45
13	Pipe - (27)	YD-2	CB-6	1	48	57.32	57.08	0.5%	3,010	3,010	0.25	753	753	10.0	10.0	5.78	0.10	0.00	0.10	2.73	3.477	1.654	0.40
14	RL2-HDPE BIRL-2		WYE-2	0.67	10	60.1	59.3	8.0%	6,200	6,200	0.90	5,580	5,580	6.0	6.0	7.10	0.92	0.00	0.92	3.71	10.639	8.807	0.02
15	RL2BEND-TII	WYE-2	DMH-1 (36"	1	125	59.3	57.83	1.2%	0	6,200	0.00	0	5,580	0.0	6.0	7.09	0.92	0.00	0.92	4.19	5.333	4.268	0.49

# Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	42.055	0.01	2.21	0.90	0.01	1.63	6.0	32.9	2.6	30.28	82.92	6.58	36	1.55	54.30	54.95	56.25	56.73	58.63	60.11	CB-8 TO OUT
2	1	52.000	0.01	2.20	0.90	0.01	1.62	6.0	32.8	2.6	30.27	52.32	6.92	36	0.62	54.95	55.27	56.73	57.05	60.11	60.95	CB-7 TO CB-8
3	2	299.000	0.01	2.19	0.90	0.01	1.61	6.0	31.8	2.7	8.30	7.75	4.91	18	0.55	57.07	58.70	58.44	60.07	60.95	63.08	EXCB-2 TO CB-7
4	3	328.870	0.00	0.36	0.00	0.00	0.18	0.0	30.3	2.8	4.48	3.87	3.65	15	0.36	58.70	59.88	60.63	62.21	63.08	64.02	BLIND T TO CB-2
5	4	112.550	0.01	0.36	0.90	0.01	0.18	6.0	25.7	3.1	0.56	3.99	0.46	15	0.38	59.88	60.31	62.42	62.43	64.02	64.96	CB-4 TO BLIND T
6	5	449.740	0.01	0.34	0.90	0.01	0.17	6.0	15.7	4.2	0.69	3.69	0.74	15	0.33	60.31	61.78	62.43	62.51	64.96	66.75	CB-6 TO CB-4
7	6	548.825	0.01	0.32	0.90	0.01	0.15	6.0	12.1	4.8	0.71	4.19	2.38	15	0.42	62.12	64.43	62.53	64.76	66.75	69.85	CB-8 TO CB-6
8	7	35.483	0.01	0.01	0.90	0.01	0.01	6.0	6.0	6.9	0.06	5.45	1.13	12	2.34	64.60	65.43	64.76	65.53	69.85	69.78	CB-9 TO CB-8
9	7	551.484	0.30	0.30	0.43	0.13	0.13	8.0	8.0	6.0	0.77	3.76	2.42	15	0.34	64.43	66.30	64.81	66.68	69.85	70.73	CB-10 TO CB-8
10	6	32.180	0.01	0.01	0.90	0.01	0.01	6.0	6.0	6.9	0.06	3.44	0.81	12	0.93	61.95	62.25	62.53	62.35	66.75	67.19	CB-7 TO CB-6
11	5	33.810	0.01	0.01	0.90	0.01	0.01	6.0	6.0	6.9	0.06	4.74	0.08	12	1.77	60.56	61.16	62.43	62.43	64.96	64.71	CB-5 TO CB-4
12	3	31.152	1.82	1.82	0.78	1.42	1.42	8.0	8.0	6.0	8.52	5.18	10.84	12	2.12	58.70	59.36	60.63	62.41	63.08	62.39	CB-3 TO CB-2
13	4	10.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.97	8.09	5.06	12	4.40	59.88	60.32	62.42	62.52	64.02	61.32	12 IN. PIPE TO B
Project File: 4303.H - Ellington Road Storm Sewers.stm																Number of lines: 13				Run Date: 10/17/2022		
NOTES:Intensity = 35.57 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

**APPENDIX F**  
**Water Quality Calculations**

## **Marlborough Multi-Family - DPI No. 4303.H**

October 17, 2022

### **Water Quality Volume Calculations**

Per 2004 Connecticut Stormwater Quality Manual, Section 7.4.1:

Areas for Calculation: On Site to Forebay (P3)

	P2, P3, & P5
Impervious	1.742
Pervious	1.831
Total Area	3.573
% Impervious	48.76%

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = unitless volumetric runoff coefficient =  $0.05 + 0.009(I)$ , where:

I = percent impervious cover of drainage area = 48.76%

$R = 0.05 + 0.009(I)$

$R = 0.05 + 0.009(48.76)$

$R = \underline{0.488}$

A = drainage area in acres = 3.573 acres

$WQV = (1")(R)(A \text{ acres})/12 \text{ inches per foot}$

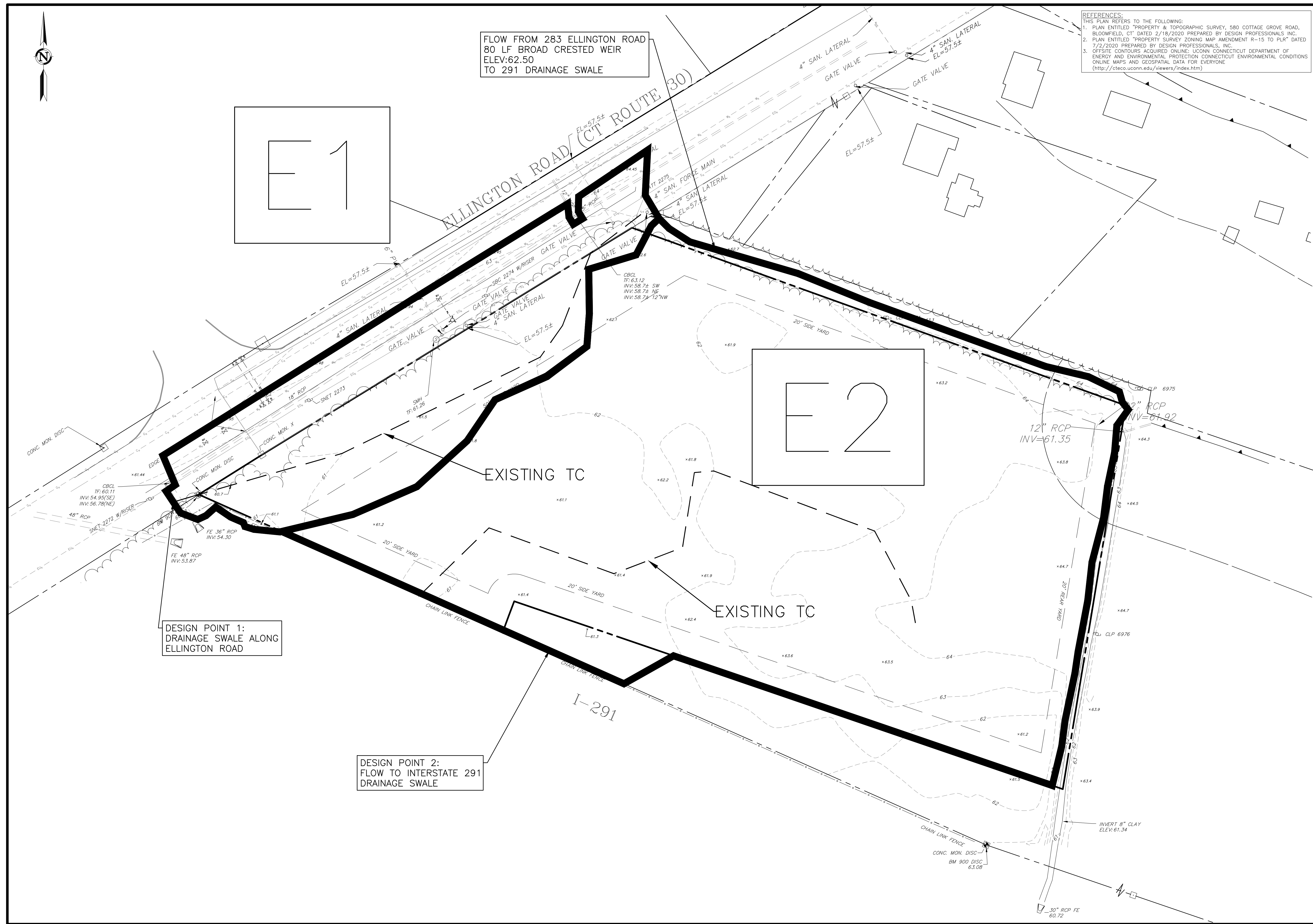
$WQV = (1")(0.488)(\underline{3.573} \text{ acres})/12 \text{ inches per foot}$

**$WQV = \underline{0.145} \text{ acre-feet required} = 6316.20 \text{ cft}$**

### **Proposed BMP**

The proposed water quality basin and forebay are proposed to provide **17,409 cft** (below basin outlet FE-2 @ Elev. 55.64) and **3,463 cft+** (below spillway at Elev. 55.64) of water quality storage, respectively. The forebay will provide storage for more than 10% of the determined water quality volume draining to the basin. The forebay in combination with the proposed wet pool of the water quality basin will provide a total water quality storage volume of **20,872 cft**; more than 100% of the water quality volume. Water quality basin and forebay stage storage reports are included as a part of this appendix.

**APPENDIX G**  
**Drainage Area Map**



**REFERENCES:**

THIS PLAN REFERS TO THE FOLLOWING:

1. PLAN ENTITLED "PROPERTY & TOPOGRAPHIC SURVEY, 580 COTTAGE GROVE ROAD, BLOOMFIELD, CT DATED 2/18/2020 PREPARED BY DESIGN PROFESSIONALS INC.
2. PLAN ENTITLED "PROPERTY SURVEY ZONING MAP AMENDMENT R-15 TO PLR" DATED 7/2/2020 PREPARED BY DESIGN PROFESSIONALS, INC.
3. OFFSITE CONTOURS ACQUIRED ONLINE: UCONN CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION CONNECTICUT ENVIRONMENTAL CONDITIONS ONLINE MAPS AND GEOSPATIAL DATA FOR EVERYONE (<http://cteco.uconn.edu/viewers/index.htm>)



