

**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



Table of Contents

<u>Section</u>	<u>Page</u>
Introduction	2
Pre-Development Site Conditions	2
Post-Development Site Conditions	3
Analysis of Results	3
Storm Sewer Collection System	3
Water Quality	4
Conclusion	4

Appendices

A	Pre-Development Drainage HydroCAD Report
B	Post-Development Drainage HydroCAD Report
C	NRCS Soil Map & Data
D	NOAA Rainfall Data
E	Storm Sewer Analysis Results
	Onsite Analysis Results
	Ellington Road Analysis Results
F	Water Quality Calculations
	Water Quality Volume Calculation
G	Drainage Area Maps
	Existing Condition Drainage Area Map
	Proposed Condition Drainage Area Map

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:

Reach		2-year	10-year	25-year	50-year	100-year
DP#1 – Flow to Ellington Road swale	Pre	0.36	0.87	1.22	1.47	1.76
	Post	0.21	0.41	0.54	0.63	0.74
DP#2 – I-291 Drainage Basin	Pre	4.51	24.18	39.15	52.99	68.51
	Post	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.

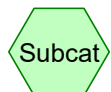
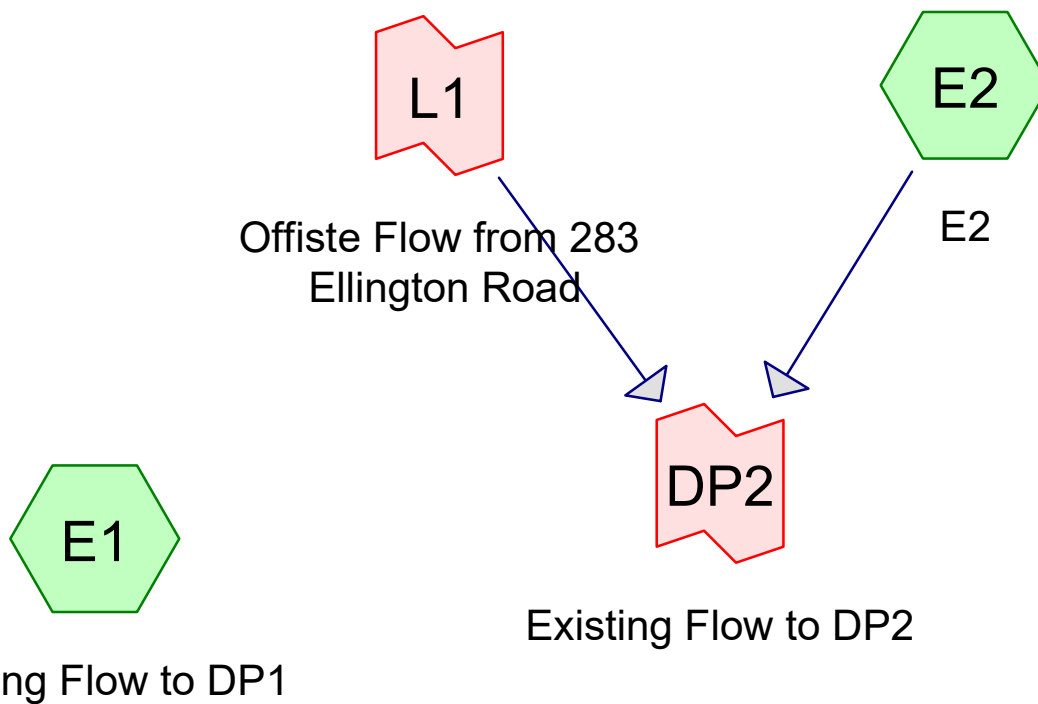
Water Quality

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.

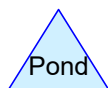
APPENDIX A
Watershed Computations
(Pre-Development Drainage HydroCAD Report)



Subcat



Reach



Pond



Link

Routing Diagram for 4303.H - HydroCAD

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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

4303.H - HydroCAD

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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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Page 4

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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Page 5

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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Page 6

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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Page 7

Summary for Subcatchment E1: Existing Flow to DP1

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

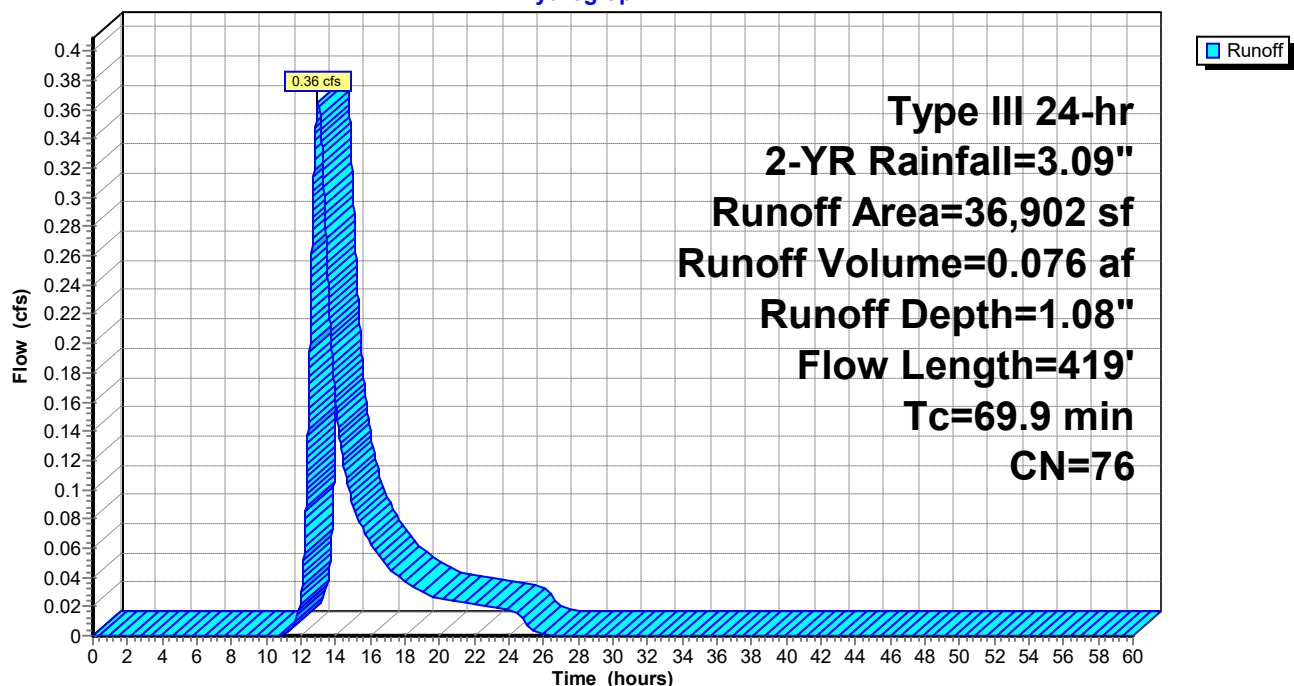
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

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		Sheet Flow, Woods Sheet Flow
					Woods: Dense underbrush n= 0.800 P2= 3.09"
14.1	308	0.0053	0.36		Shallow Concentrated Flow, Woods Shallow Flow
					Woodland Kv= 5.0 fps
0.1	11	0.0091	1.43		Shallow Concentrated Flow, Grass Shallow Flow
					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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Page 8

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

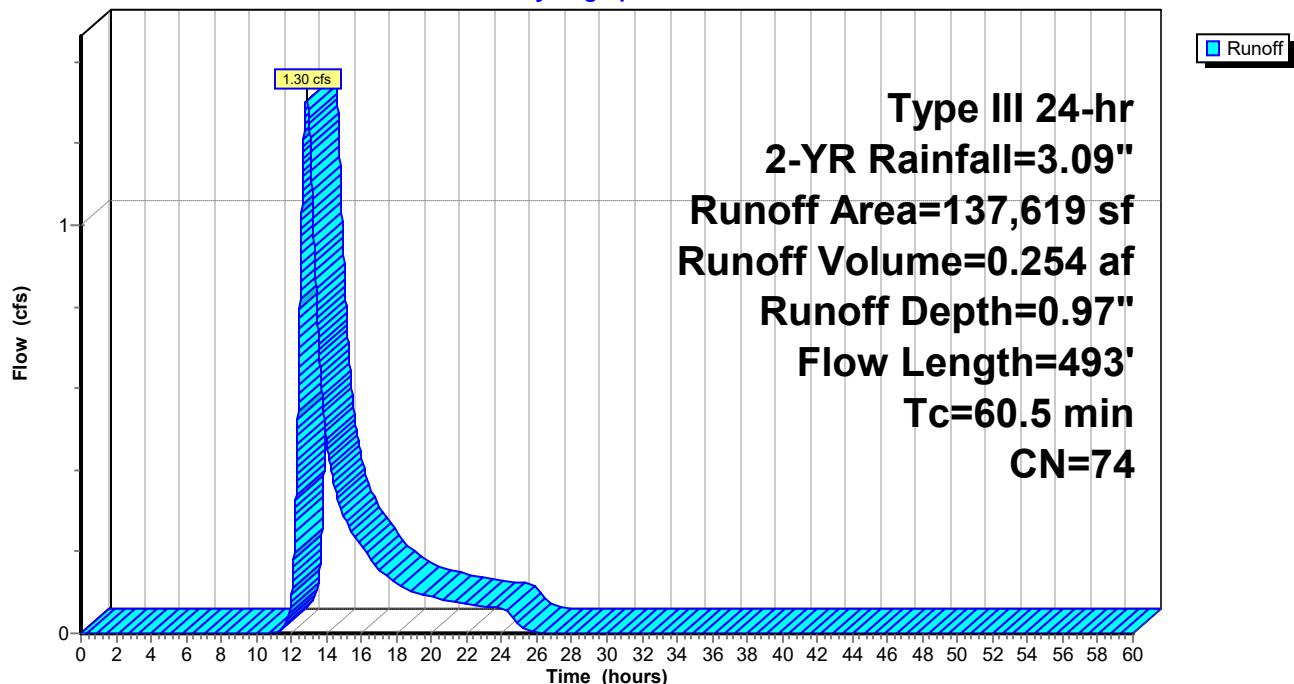
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

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		Sheet Flow, Woods Sheet Flow
					Woods: Dense underbrush n= 0.800 P2= 3.09"
18.9	393	0.0048	0.35		Shallow Concentrated Flow, Woods Shallow Flow
					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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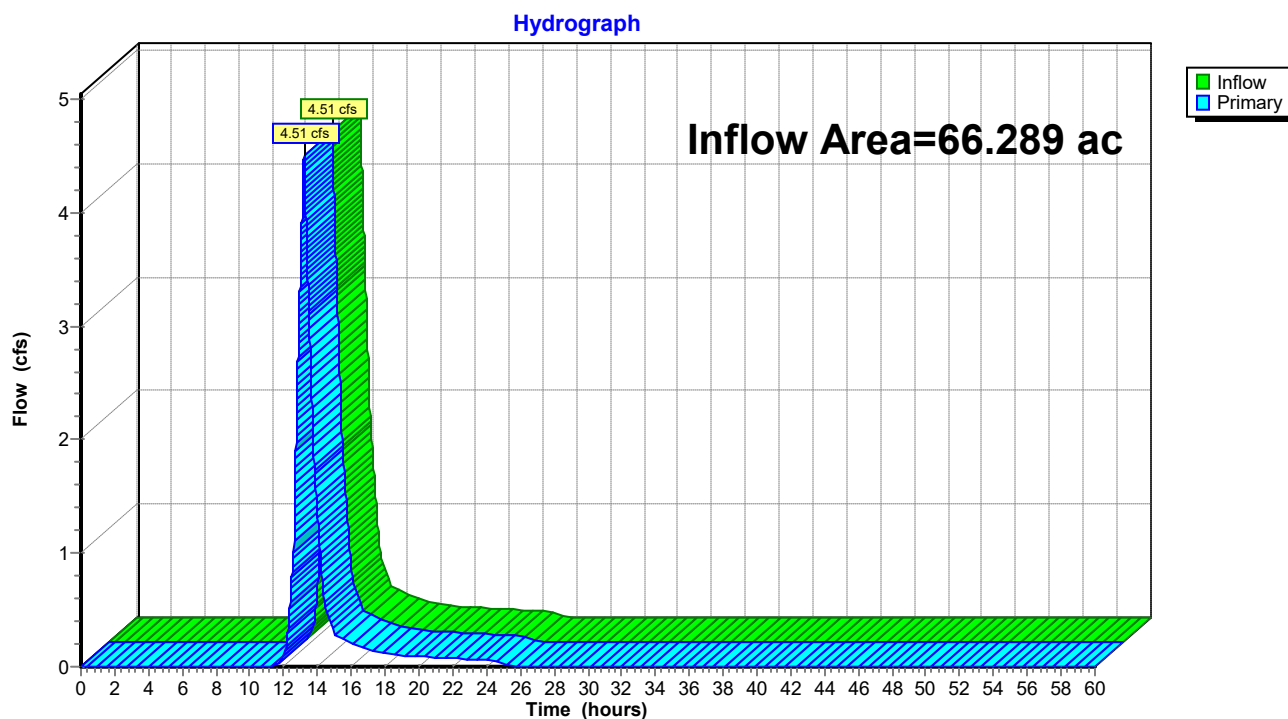
Page 9

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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Page 10

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

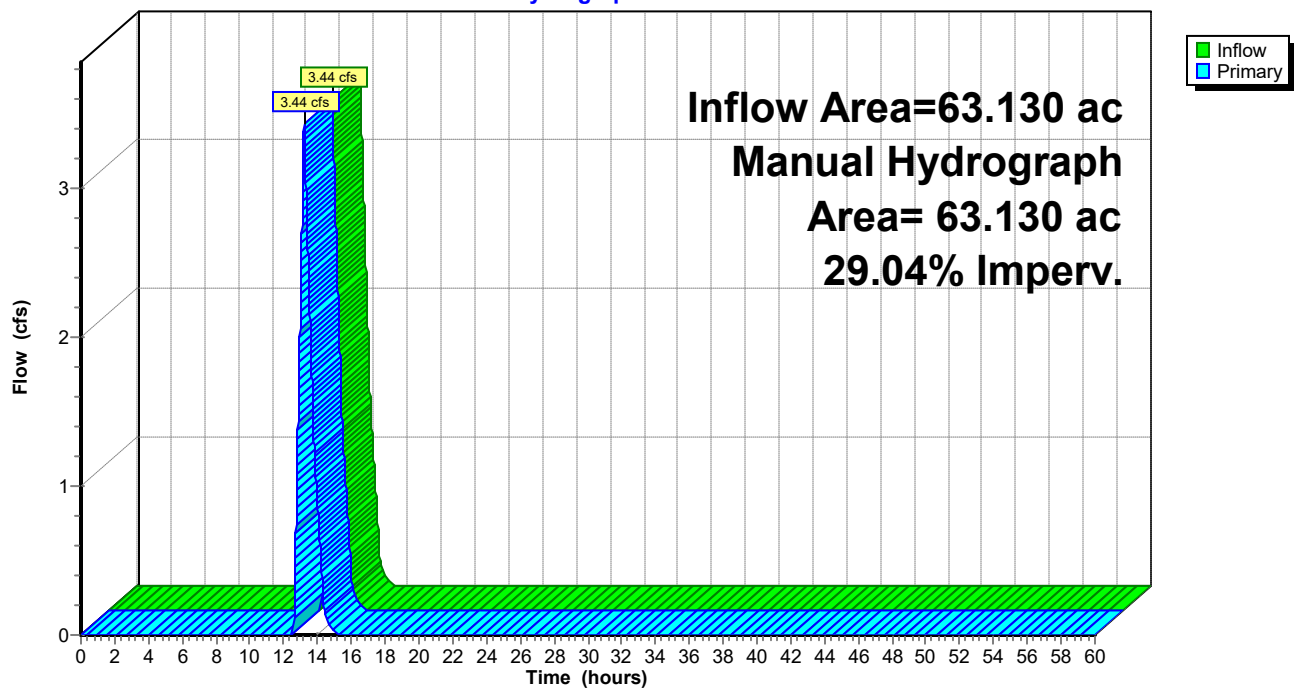
Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

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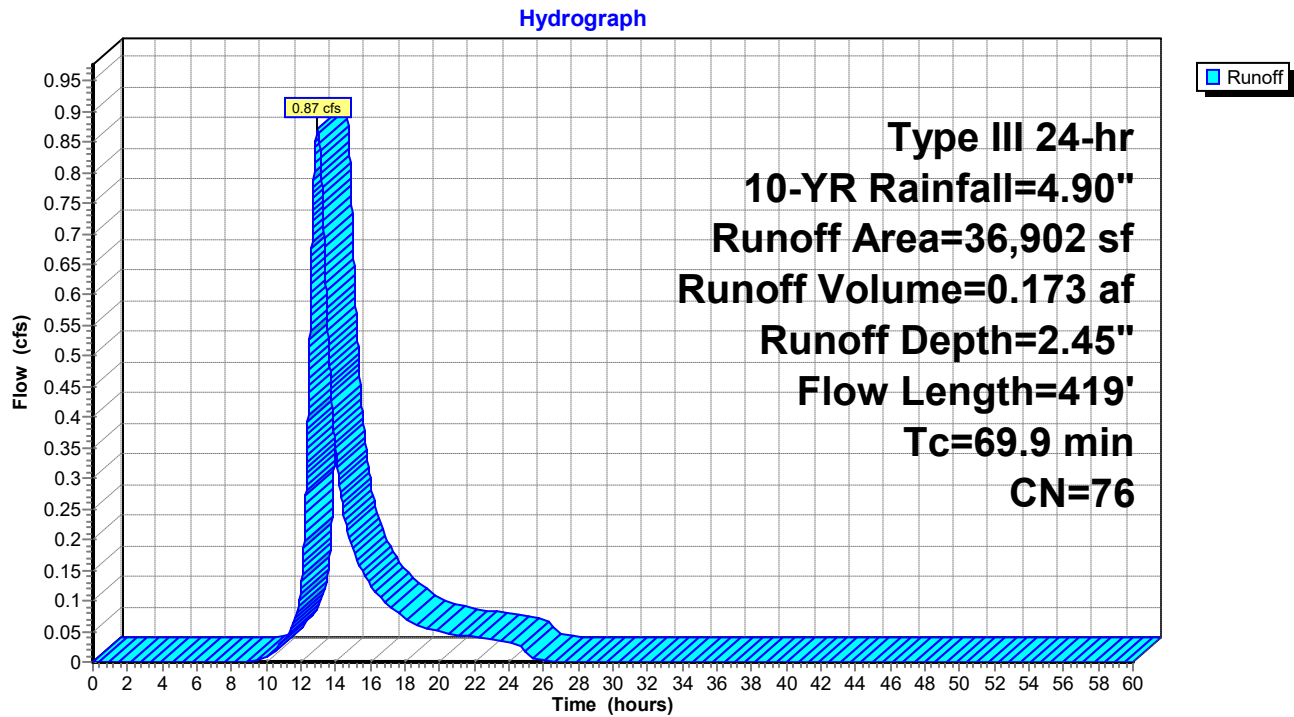
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Existing Conditions
Type III 24-hr 10-YR Rainfall=4.90"

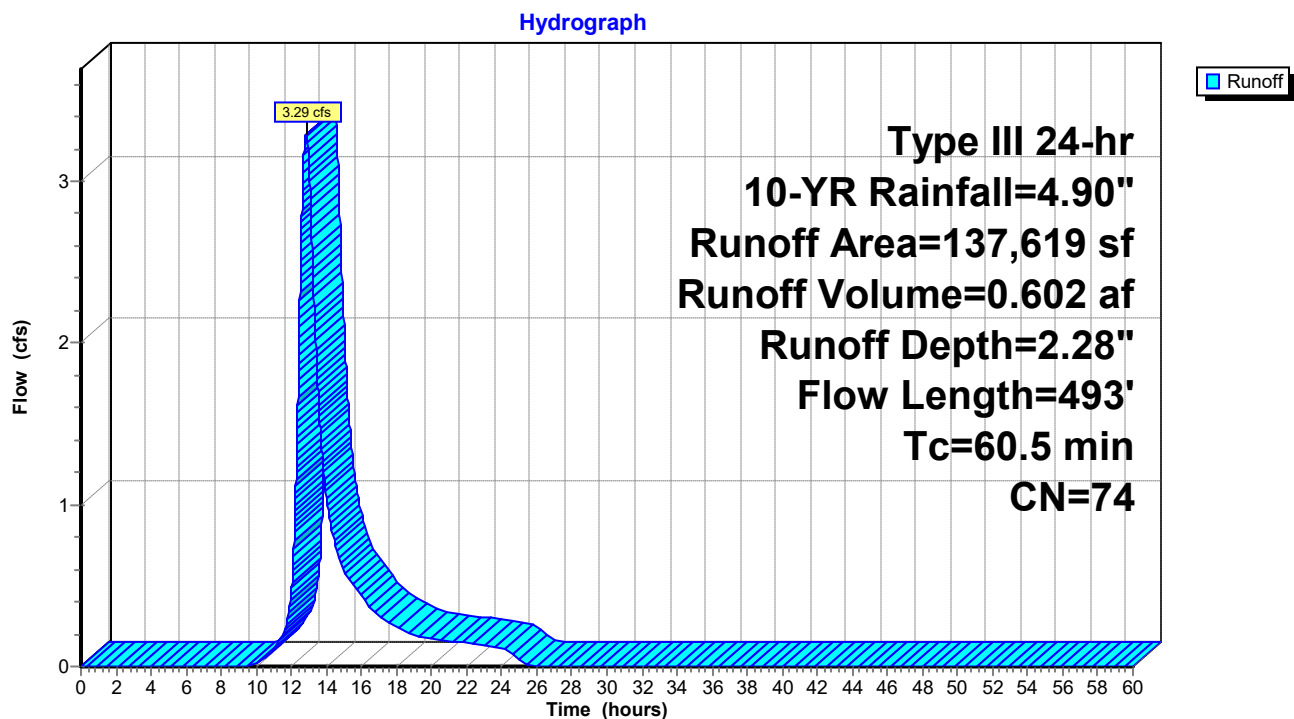
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Page 11

Subcatchment E1: Existing Flow to DP1



Subcatchment E2: E2



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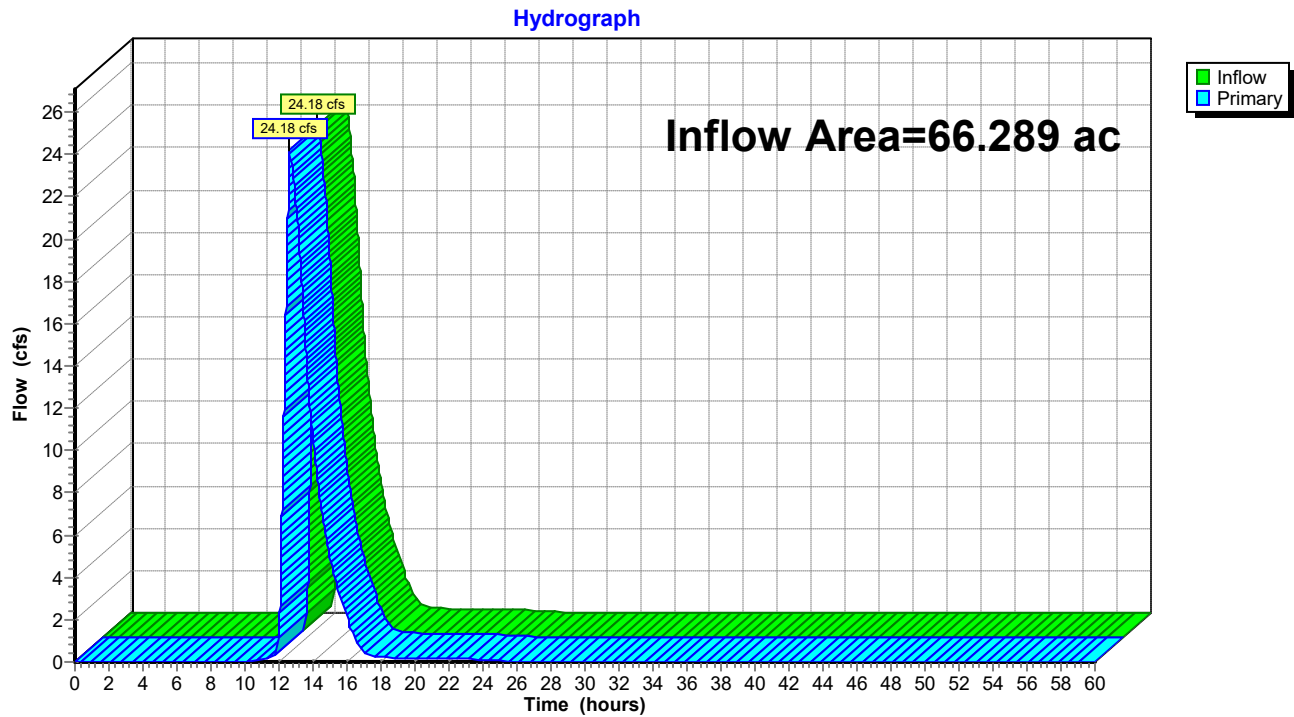
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Existing Conditions
Type III 24-hr 10-YR Rainfall=4.90"

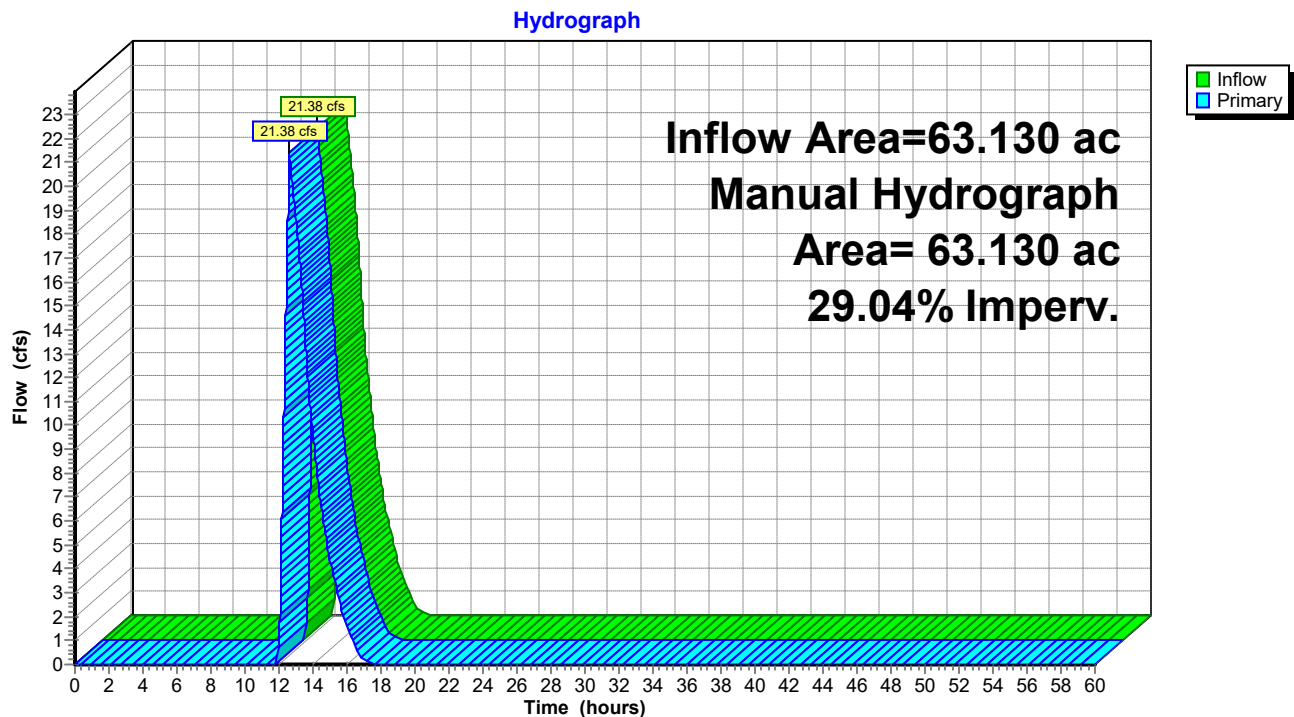
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Page 12

Link DP2: Existing Flow to DP2



Link L1: Offsite Flow from 283 Ellington Road



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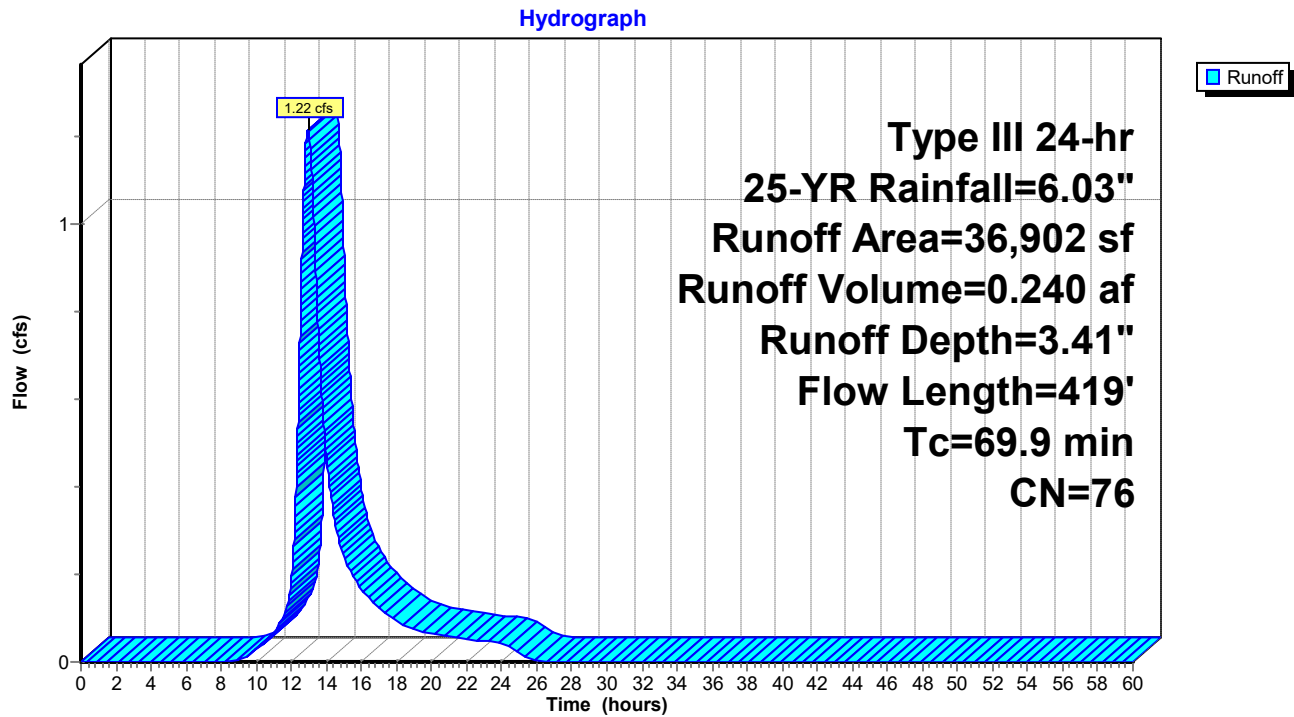
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Existing Conditions
Type III 24-hr 25-YR Rainfall=6.03"

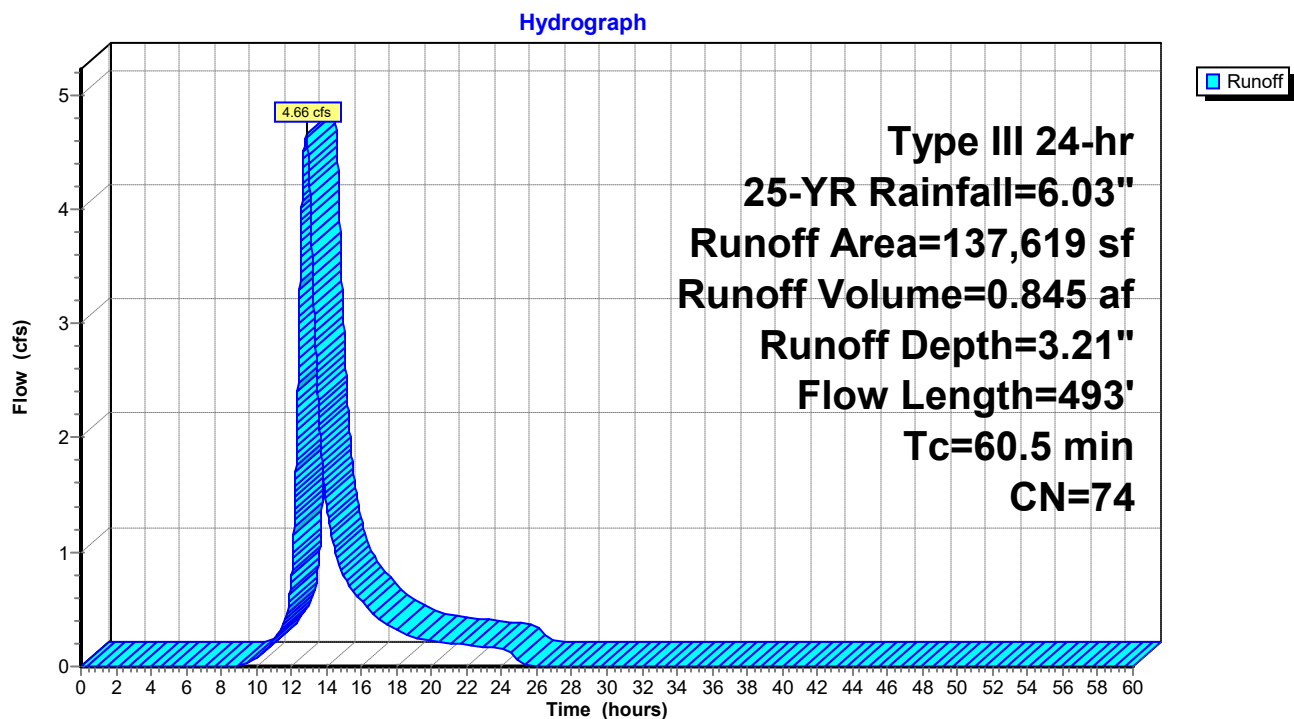
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Page 13

Subcatchment E1: Existing Flow to DP1



Subcatchment E2: E2



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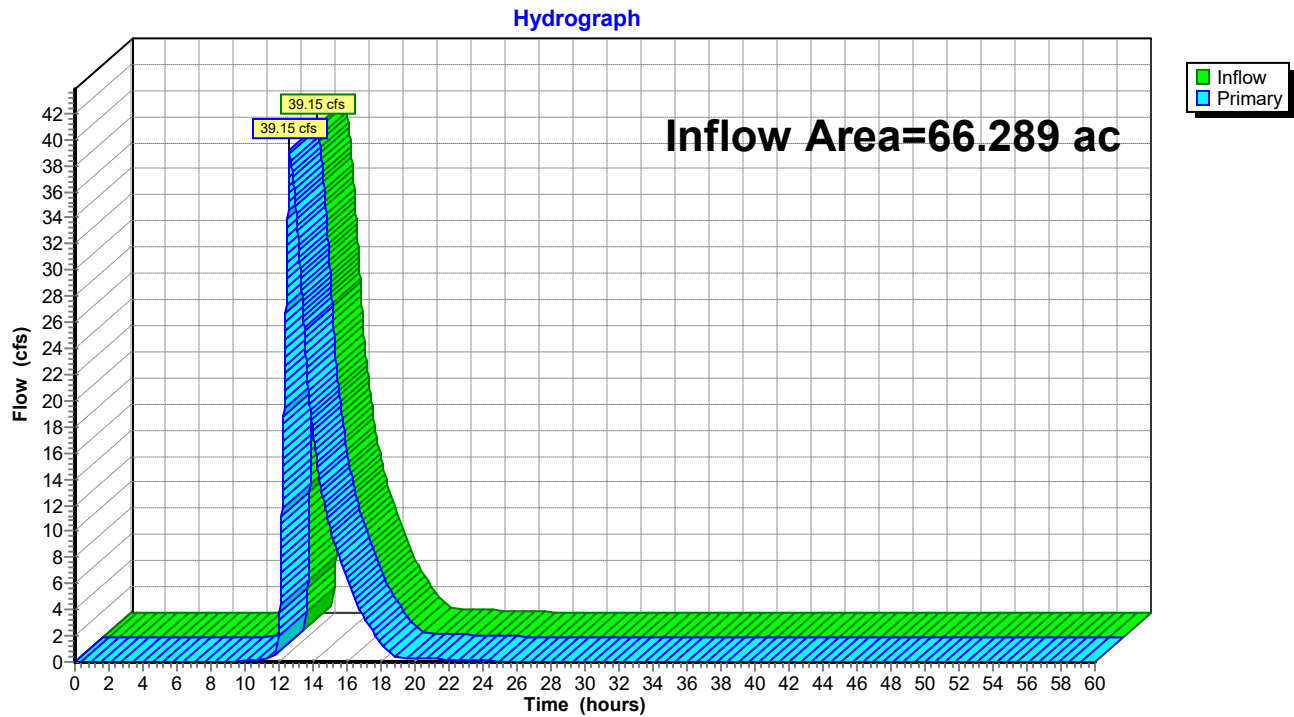
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Existing Conditions
Type III 24-hr 25-YR Rainfall=6.03"

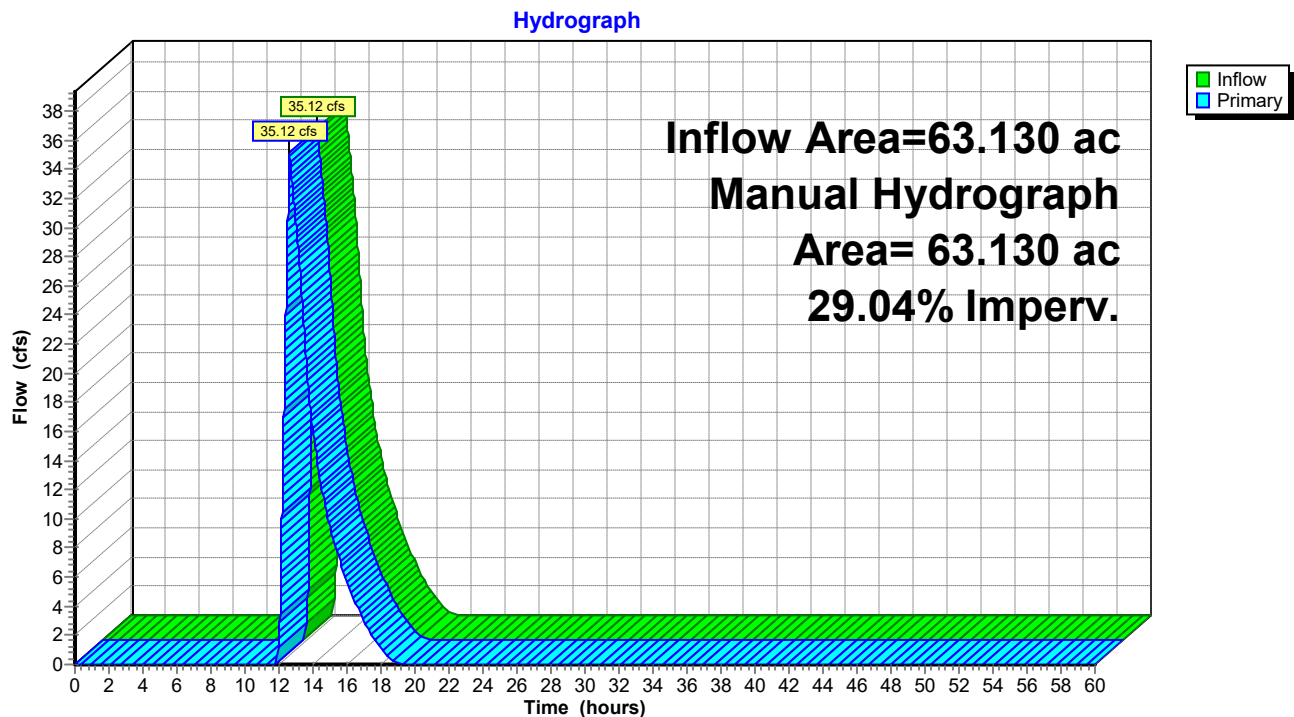
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Page 14

Link DP2: Existing Flow to DP2



Link L1: Offsite Flow from 283 Ellington Road



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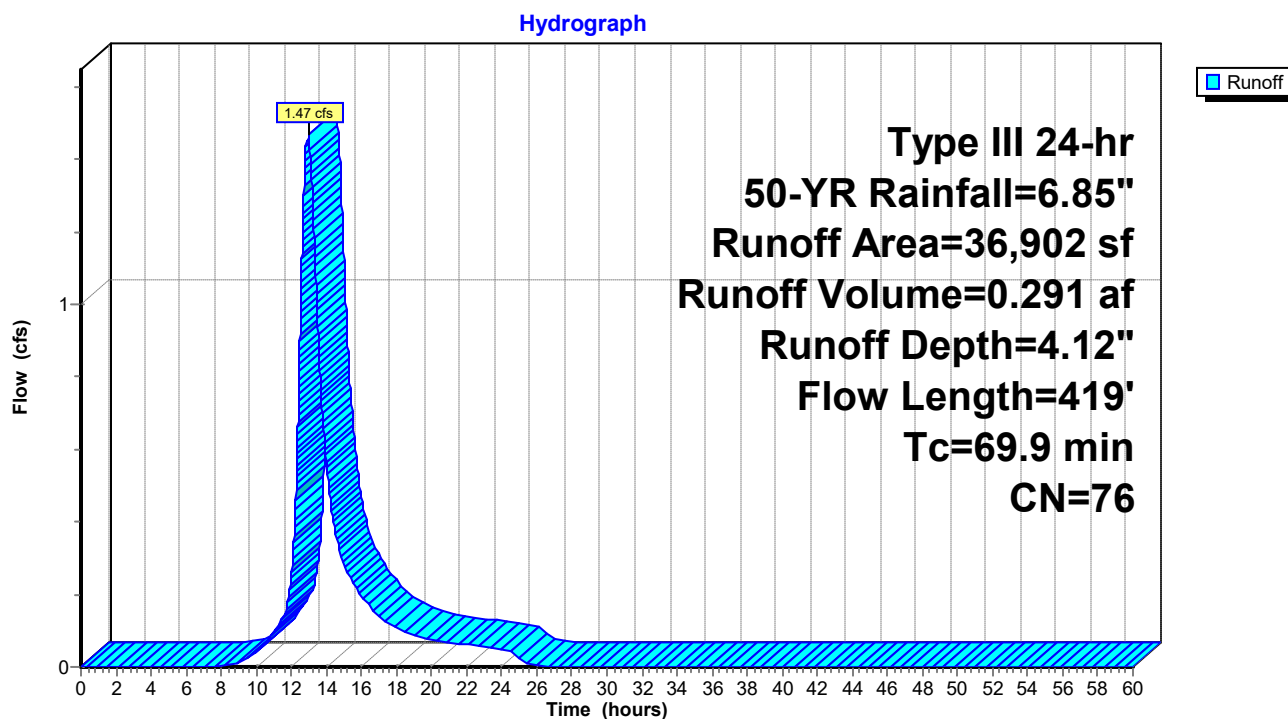
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Existing Conditions
Type III 24-hr 50-YR Rainfall=6.85"

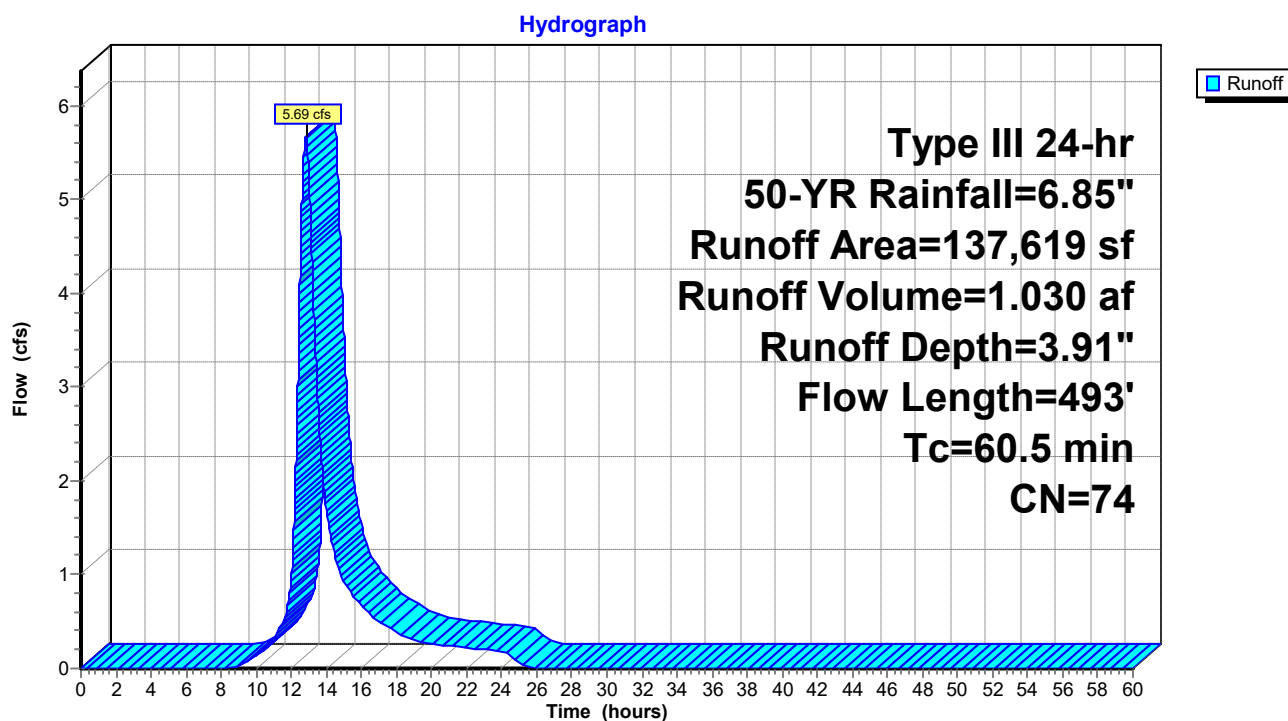
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Page 15

Subcatchment E1: Existing Flow to DP1



Subcatchment E2: E2



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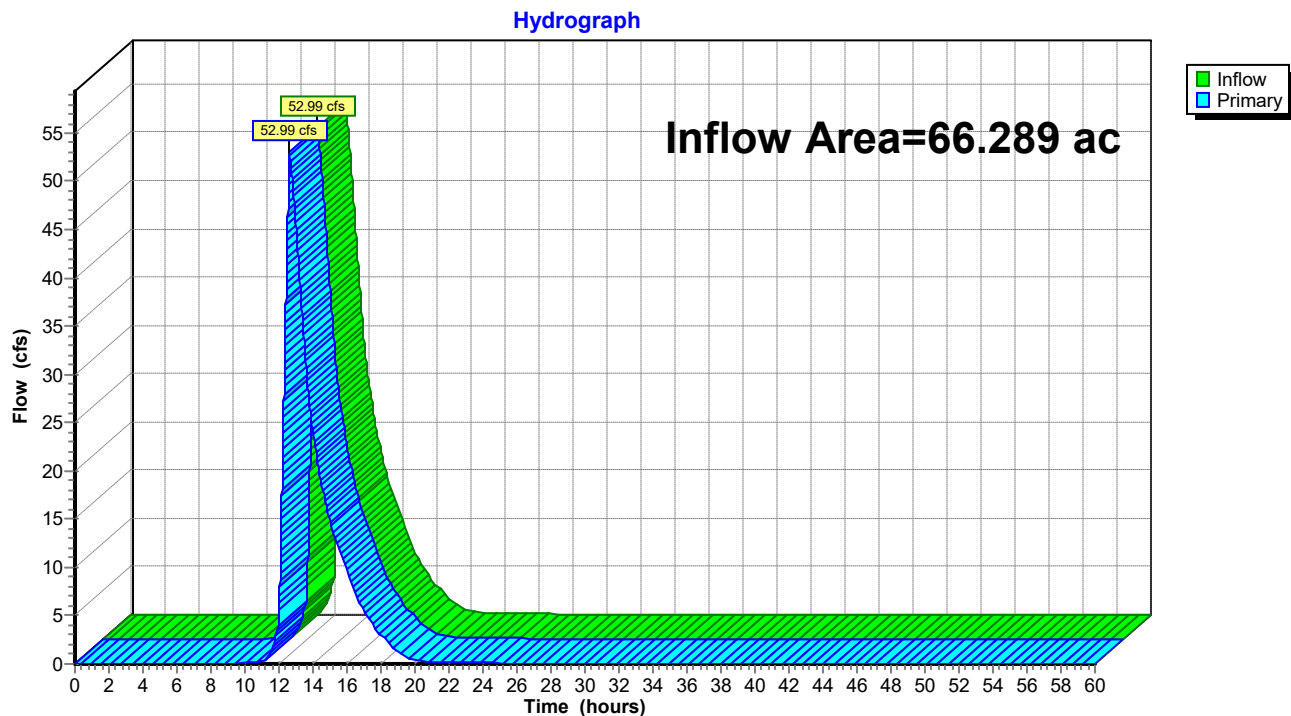
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Existing Conditions
Type III 24-hr 50-YR Rainfall=6.85"

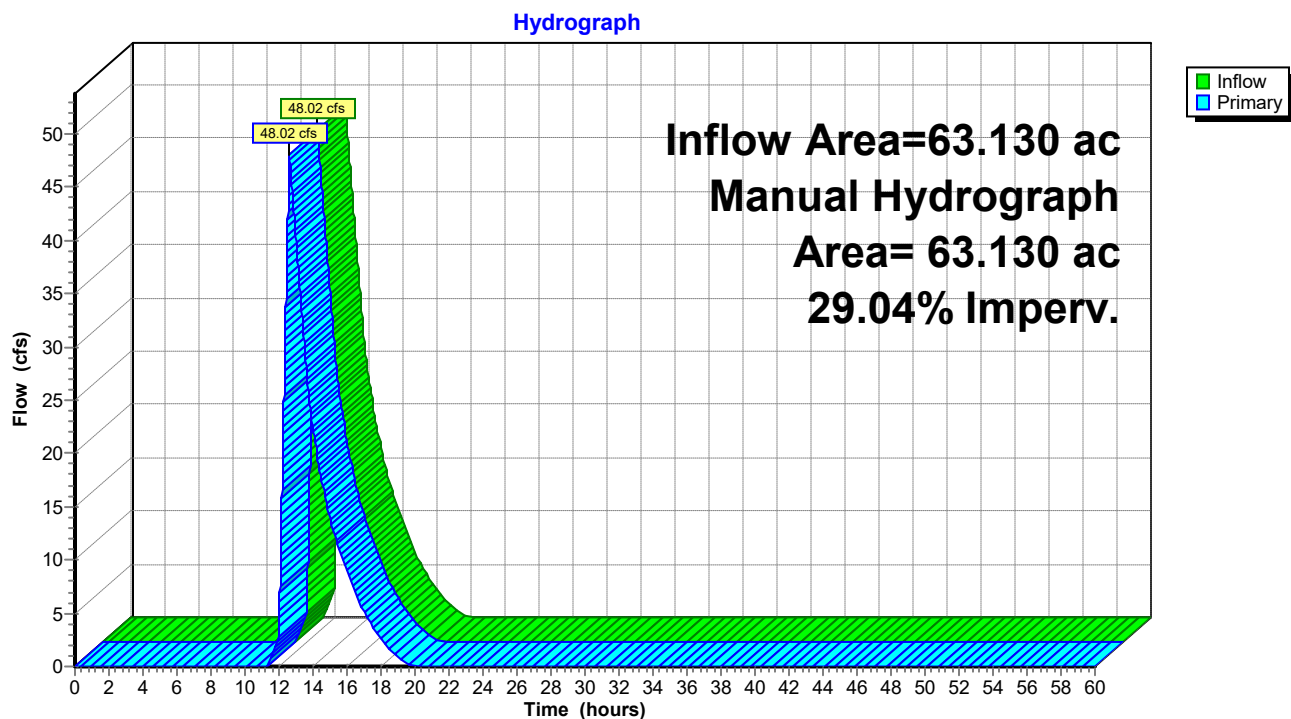
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Page 16

Link DP2: Existing Flow to DP2



Link L1: Offsite Flow from 283 Ellington Road



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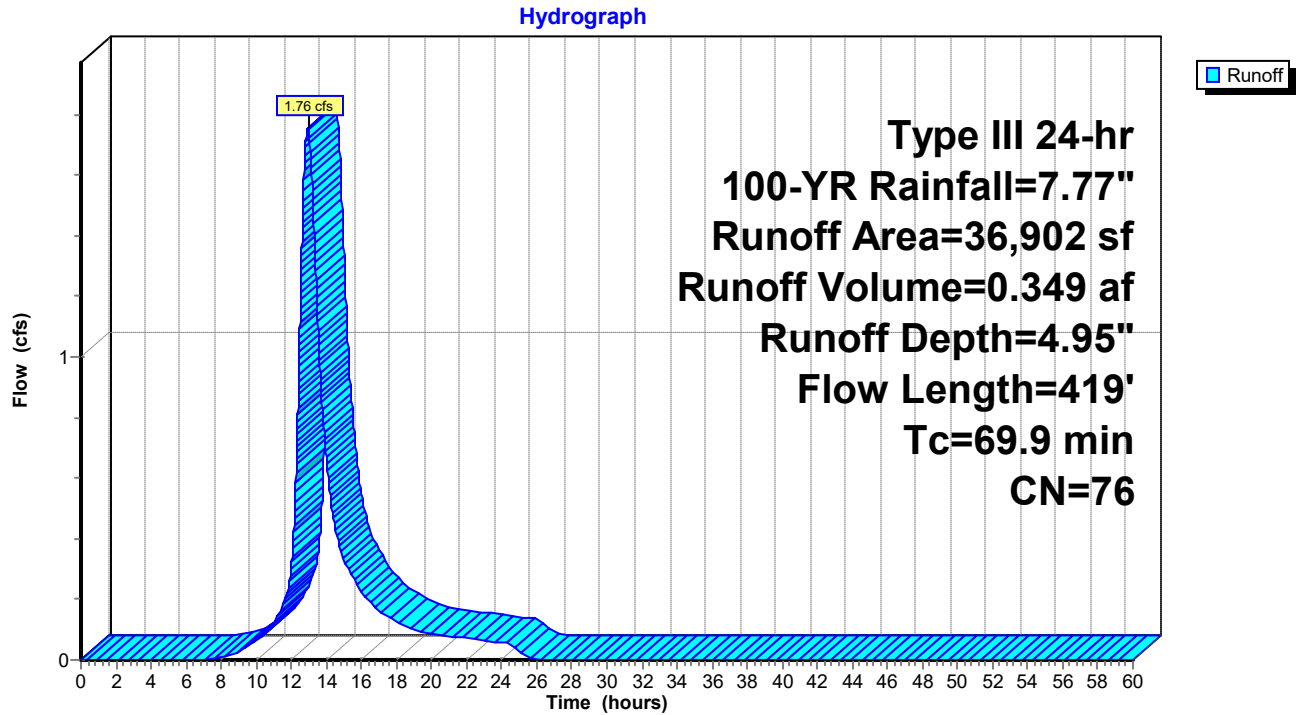
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Existing Conditions
Type III 24-hr 100-YR Rainfall=7.77"

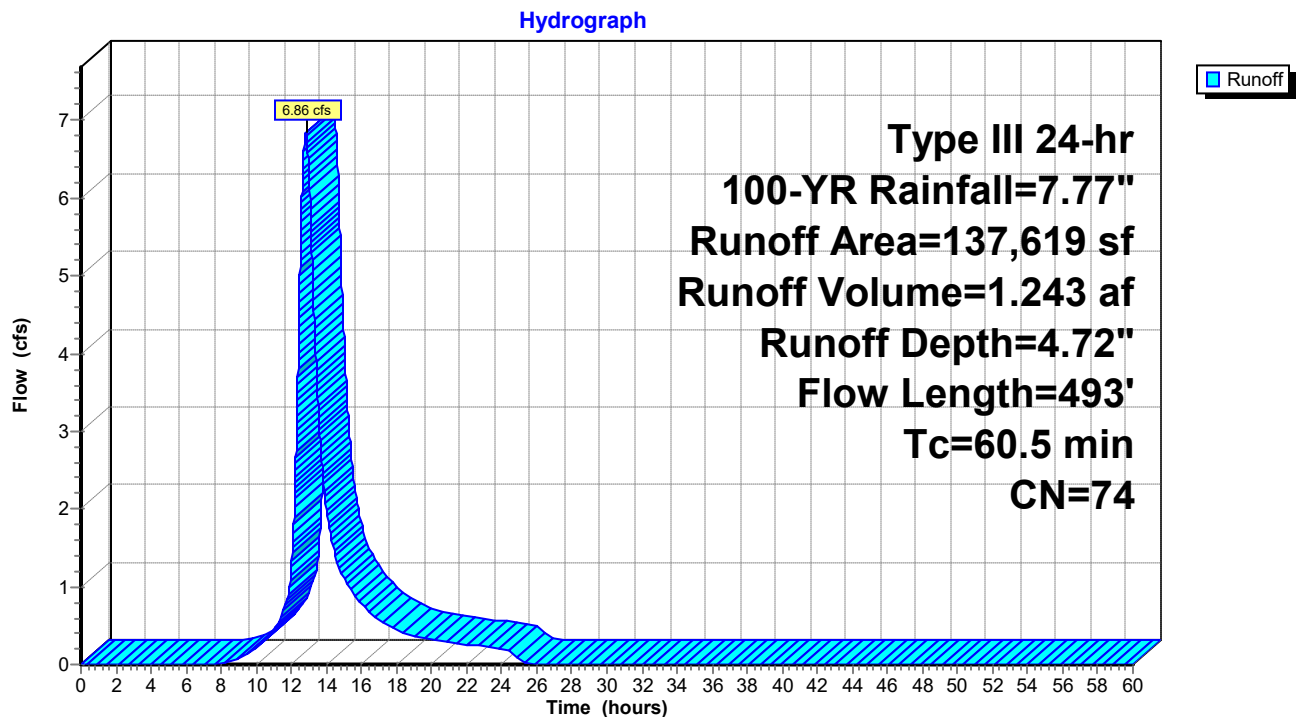
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Page 17

Subcatchment E1: Existing Flow to DP1



Subcatchment E2: E2



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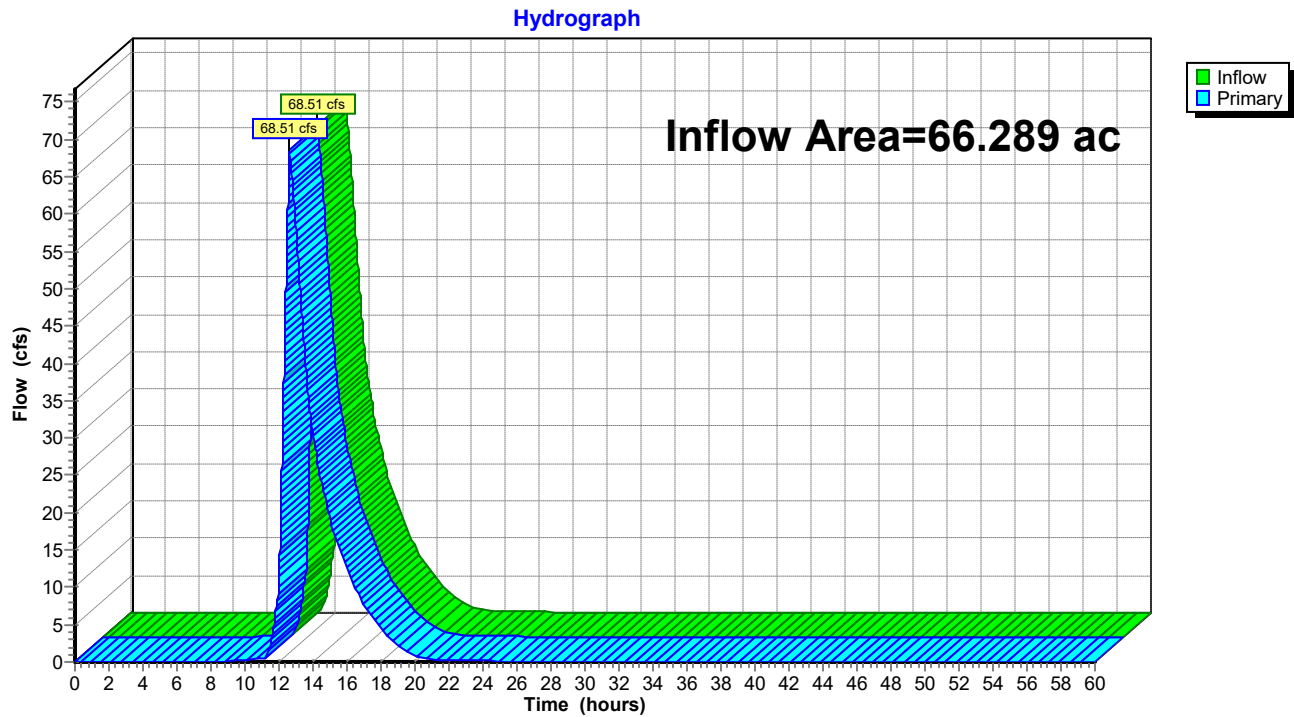
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Existing Conditions
Type III 24-hr 100-YR Rainfall=7.77"

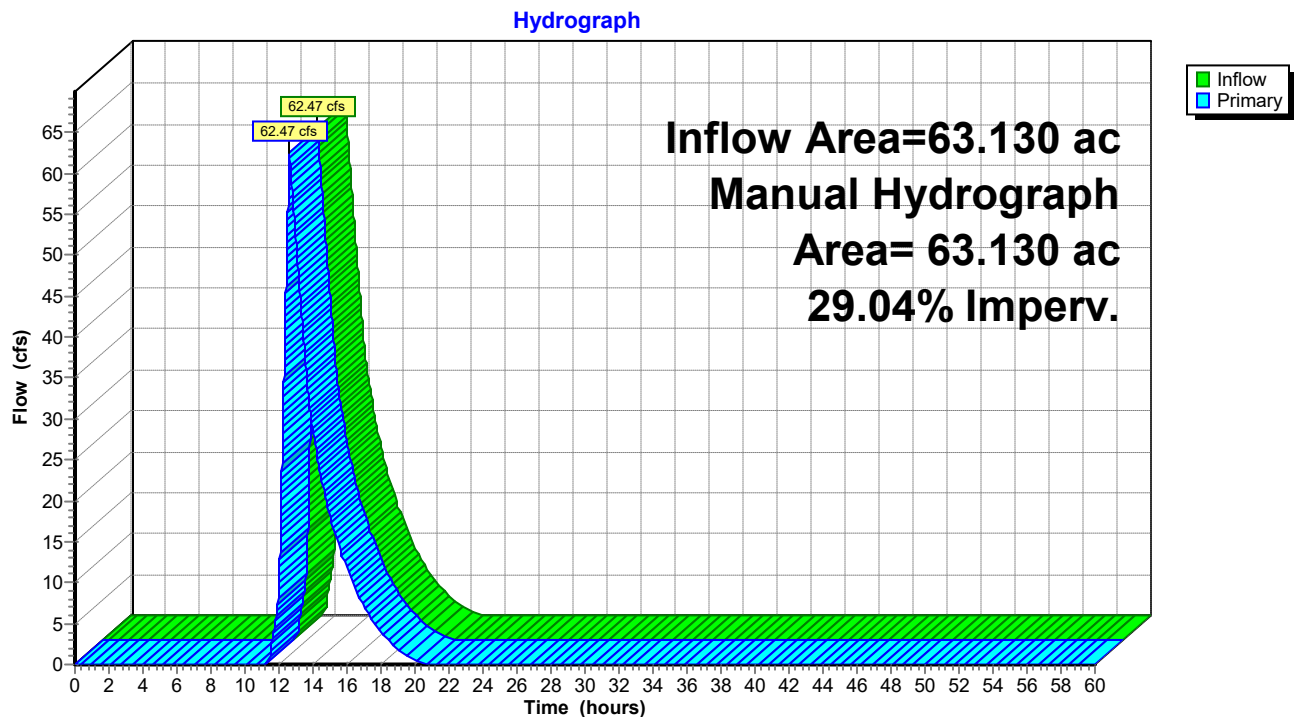
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Page 18

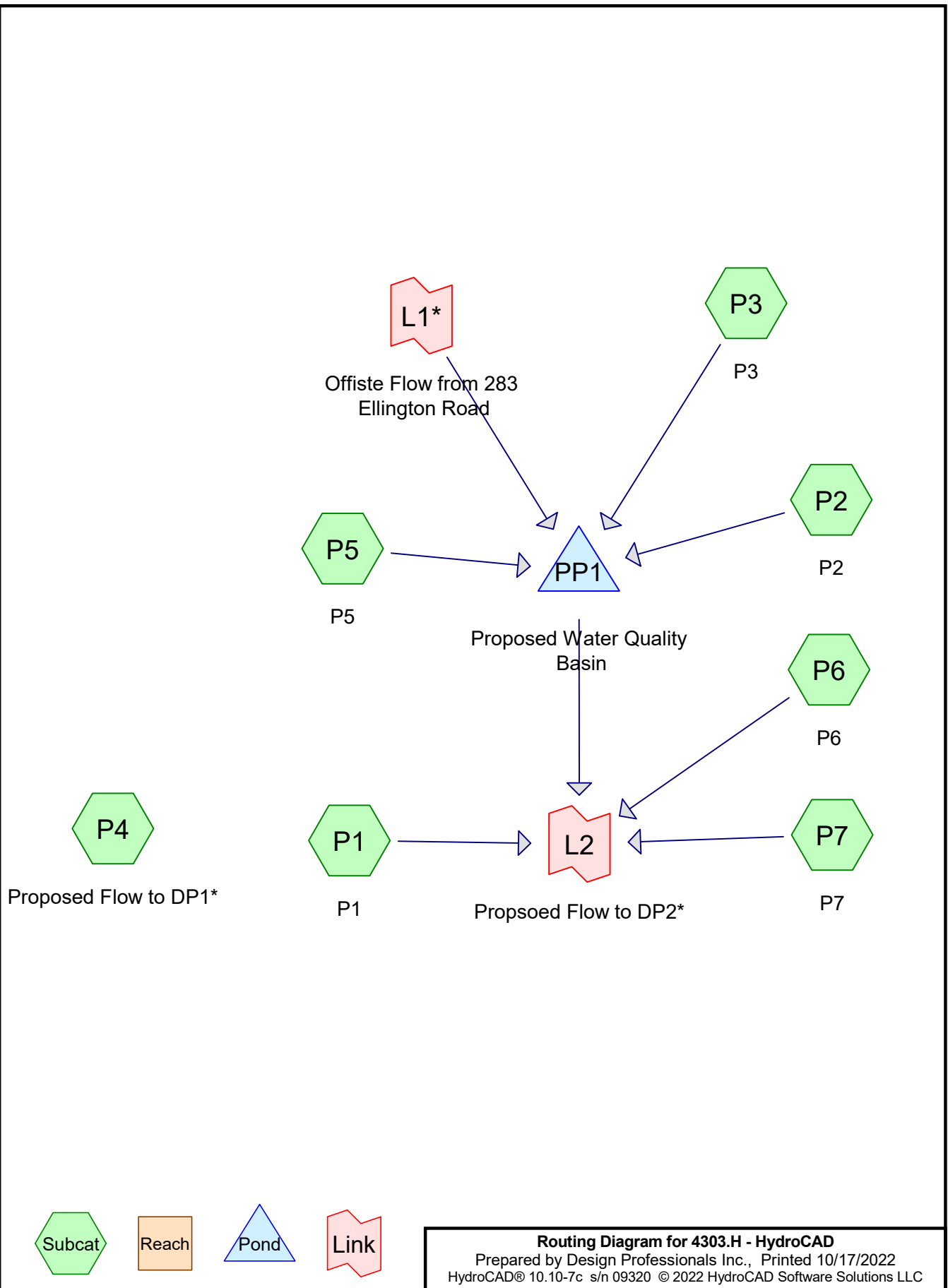
Link DP2: Existing Flow to DP2



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

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Page 4

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

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Page 5

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

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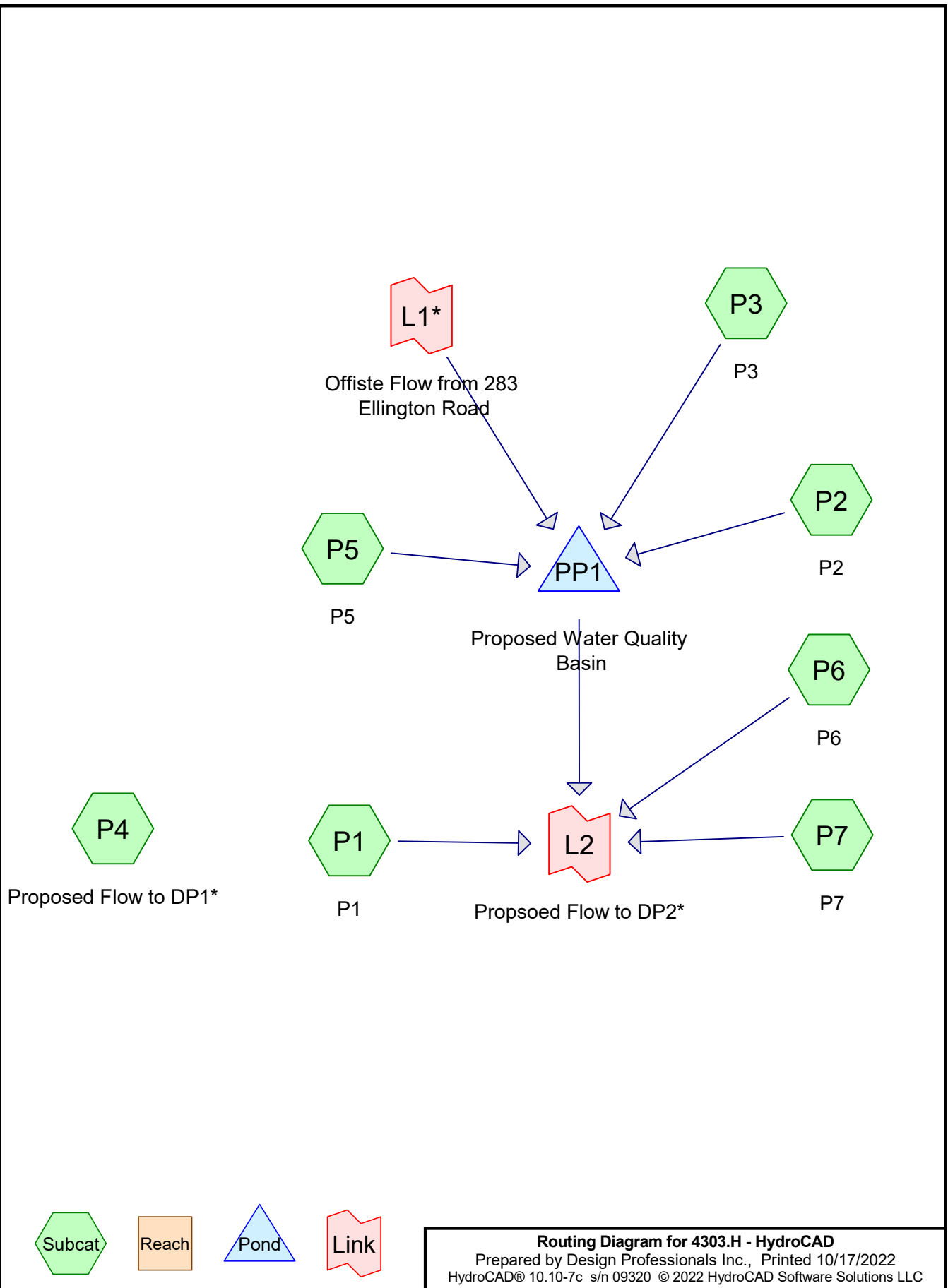
Page 6

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: P1Runoff 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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Type III 24-hr 2-YR Rainfall=3.09"

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Page 8

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*

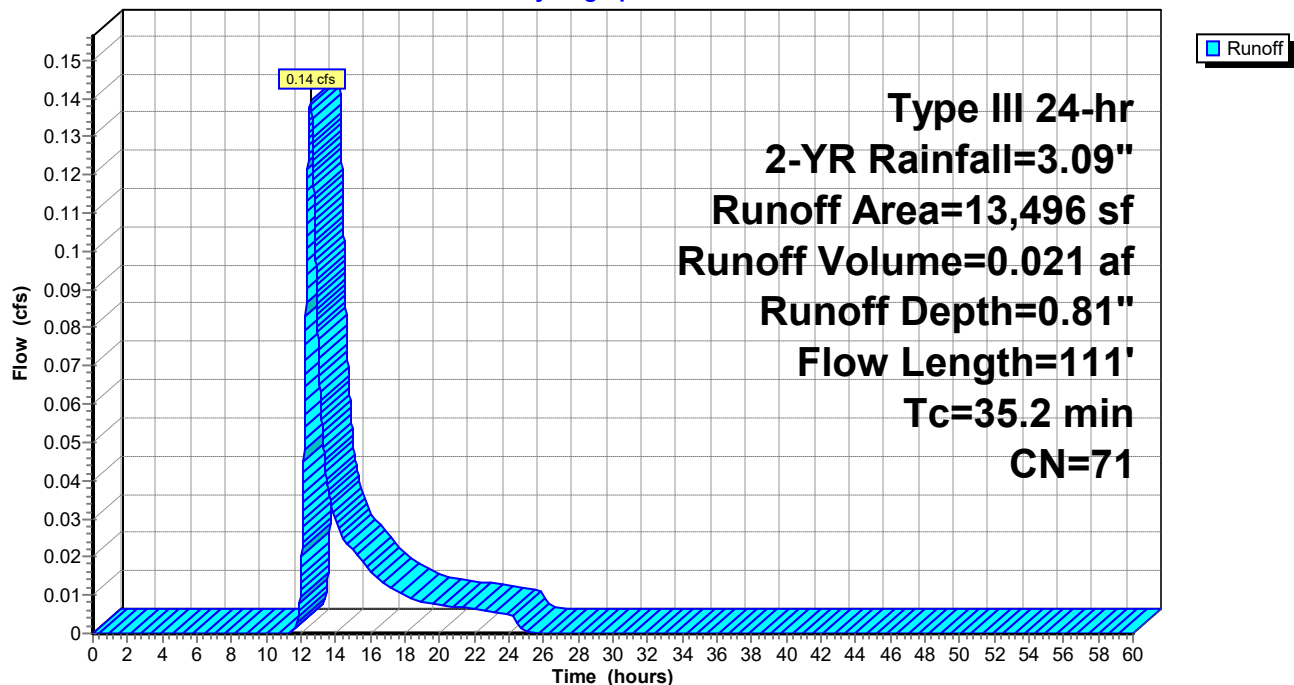
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

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		Sheet Flow, Woods Sheet Flow
					Woods: Dense underbrush n= 0.800 P2= 3.09"
3.7	11	0.0001	0.05		Shallow Concentrated Flow, Woods Shallow Flow
					Woodland Kv= 5.0 fps
35.2	111	Total			

Subcatchment P1: P1

Hydrograph



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

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Page 9

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		Sheet Flow, Woods Sheet Flow Woods: Dense underbrush n= 0.800 P2= 3.09"
1.1	13	0.2100	0.20		Sheet Flow, Grass Sheet Flow Grass: Dense n= 0.240 P2= 3.09"
0.2	6	0.0088	0.55		Sheet Flow, Driveway Sheet Flow Smooth surfaces n= 0.011 P2= 3.09"
0.6	90	0.0179	2.72		Shallow Concentrated Flow, Impervious Shallow Flow Paved Kv= 20.3 fps
1.0	208	0.0050	3.47	2.73	Pipe Channel, 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	Pipe Channel, 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	Pipe Channel, 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
45.8	528	Total			

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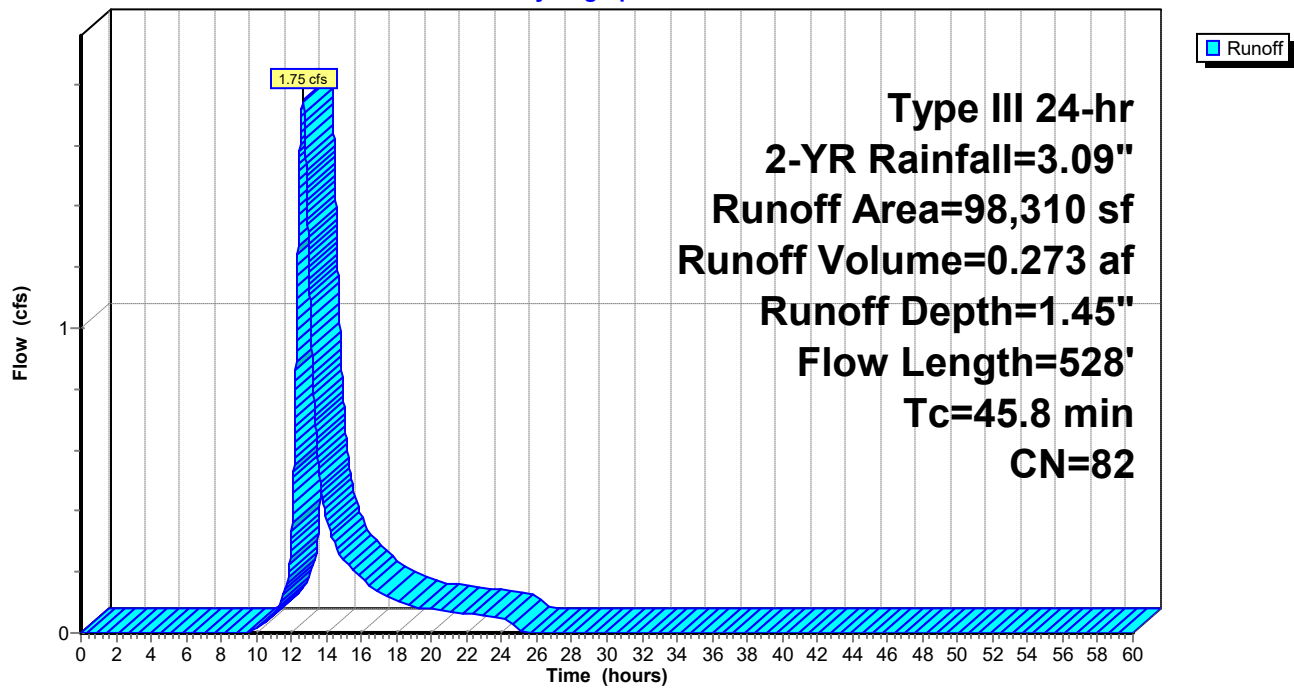
Type III 24-hr 2-YR Rainfall=3.09"

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Page 10

Subcatchment P2: P2

Hydrograph



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

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Page 11

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

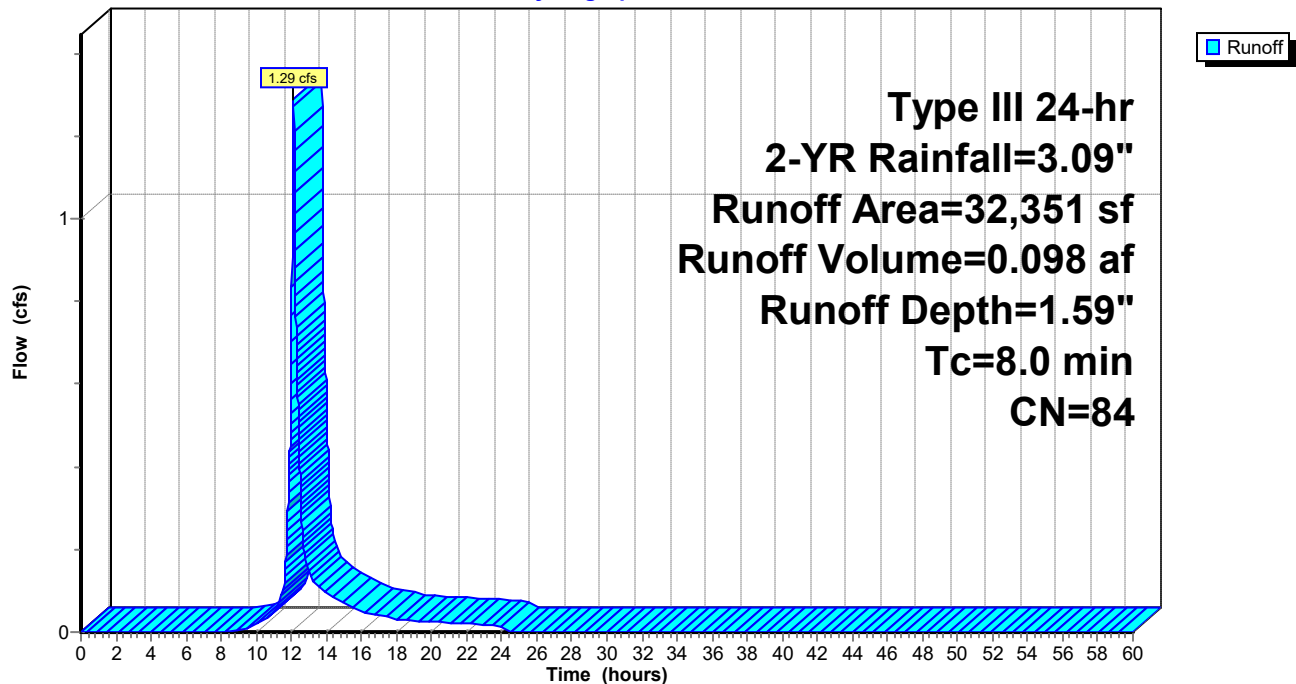
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

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

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Page 12

Summary for Subcatchment P4: Proposed Flow to DP1*

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

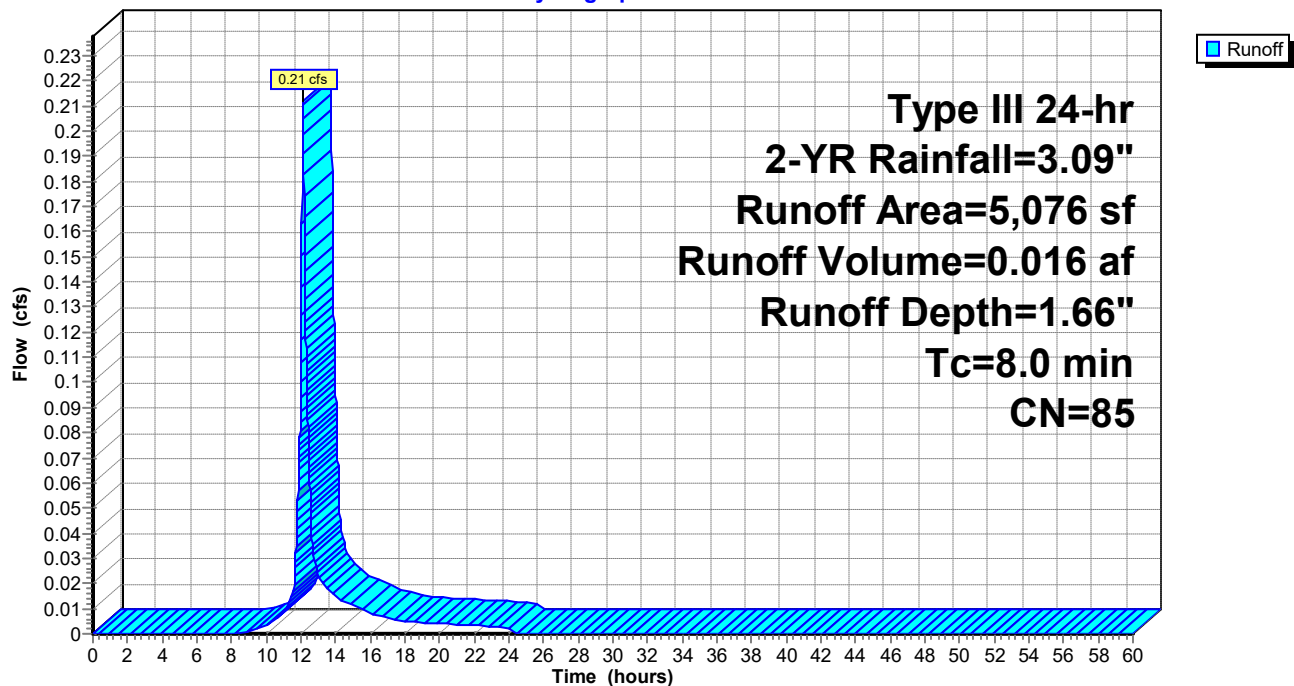
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

	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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Page 13

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

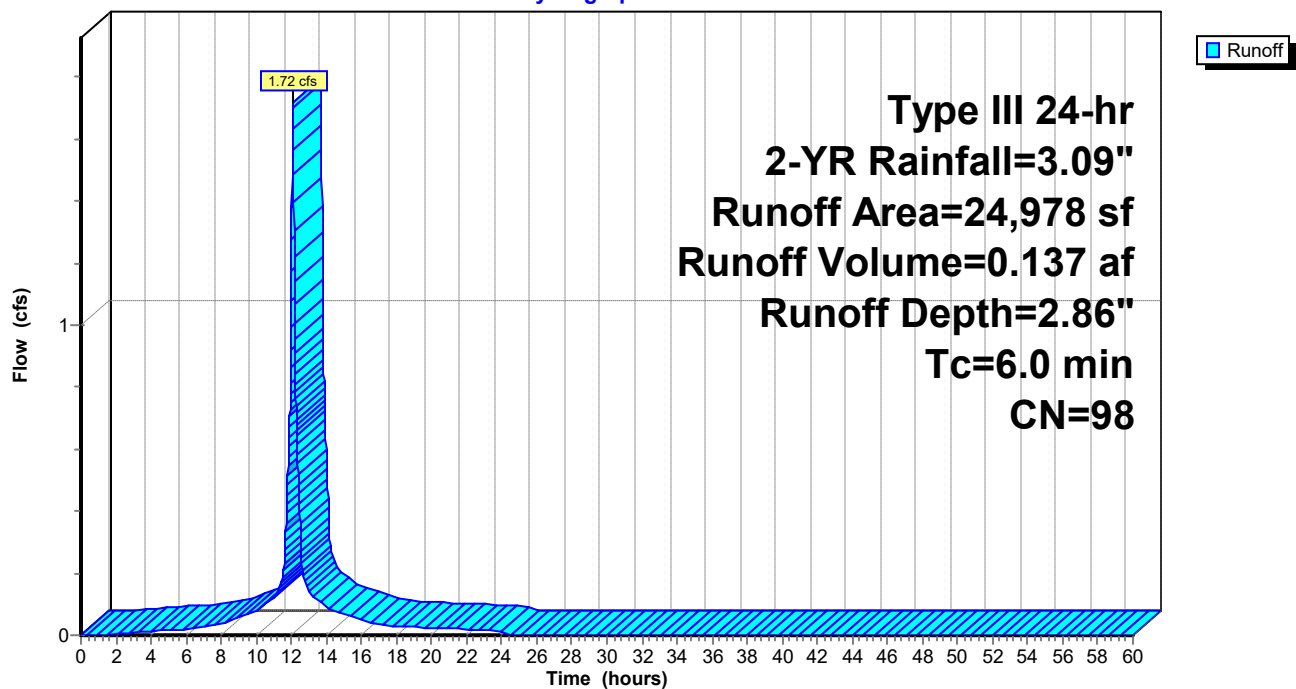
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

	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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Page 14

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*

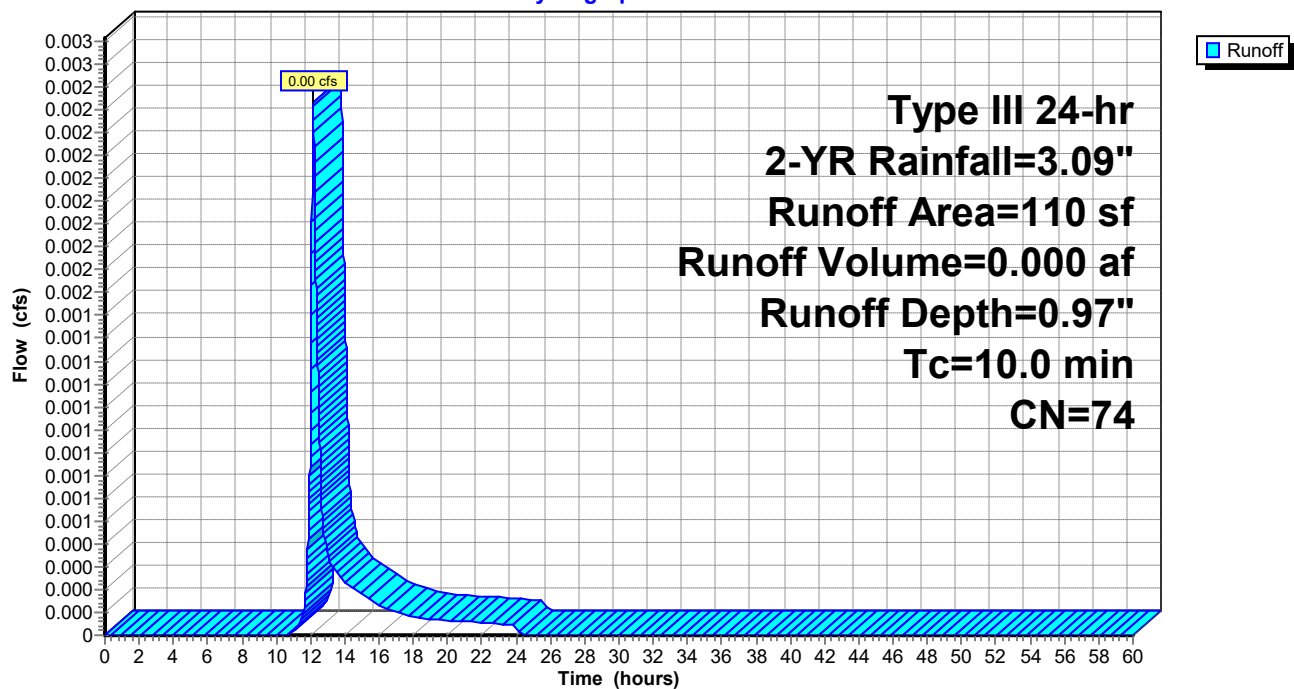
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

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

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Page 15

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*

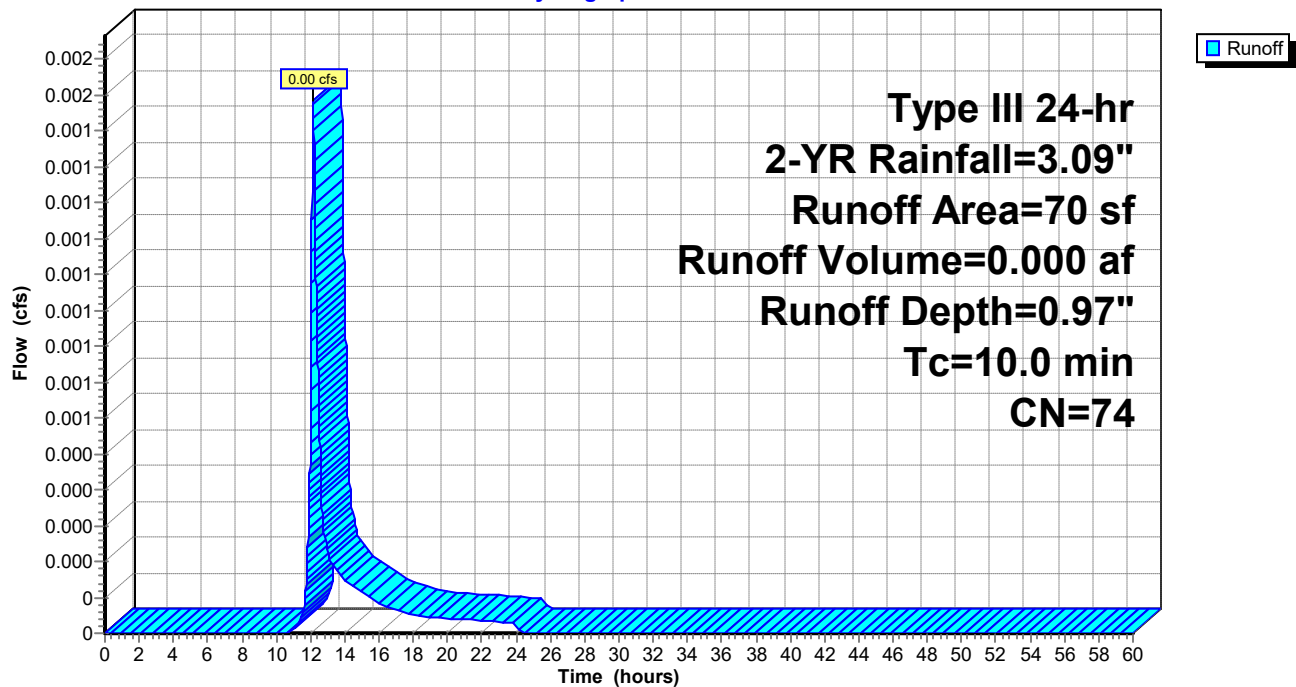
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.09"

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

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Page 16

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	Custom Stage Data (Prismatic) 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'	36.0" Round Culvert 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'	36.0" Round Culvert 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)

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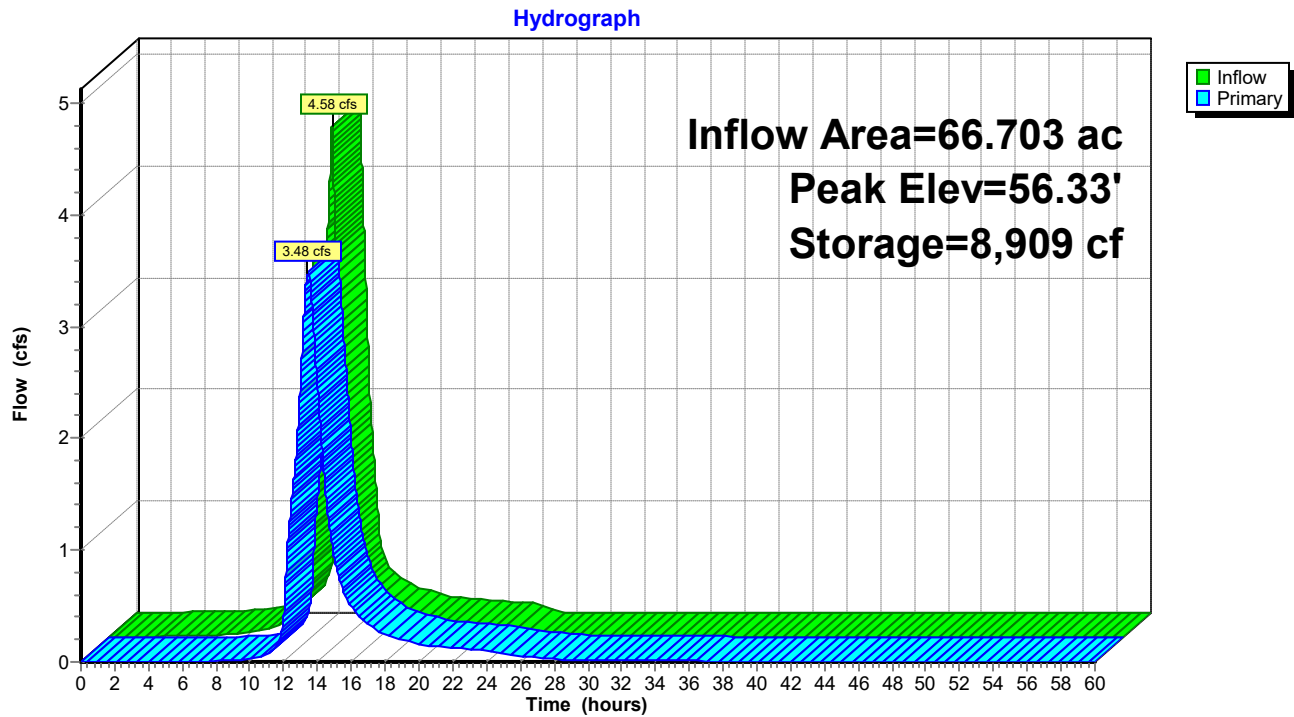
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Proposed Conditions
Type III 24-hr 2-YR Rainfall=3.09"

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Page 17

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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Page 18

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

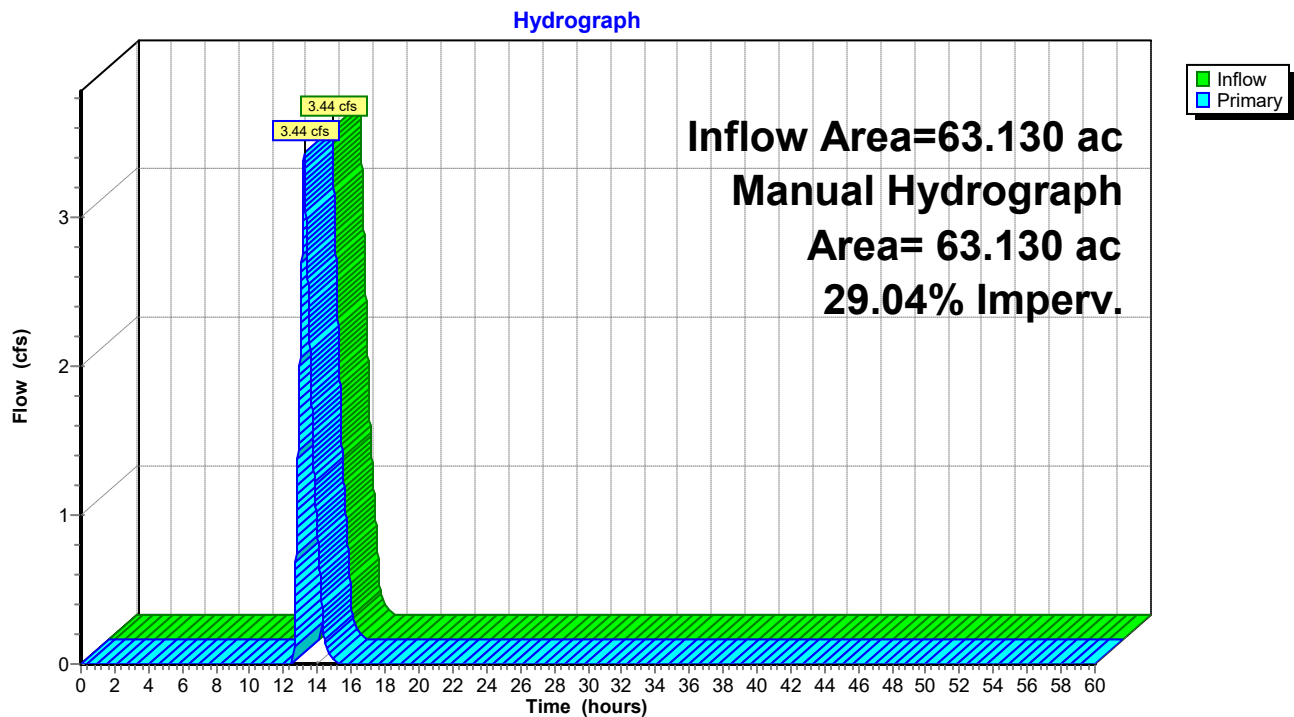
Inflow Area = 63.130 ac, 29.04% Impervious, Inflow Depth = 0.05" for 2-YR event
Inflow = 3.44 cfs @ 13.20 hrs, Volume= 0.240 af
Primary = 3.44 cfs @ 13.20 hrs, Volume= 0.240 af, Atten= 0%, Lag= 0.0 min
Routed to Pond PP1 : Proposed Water Quality Basin

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

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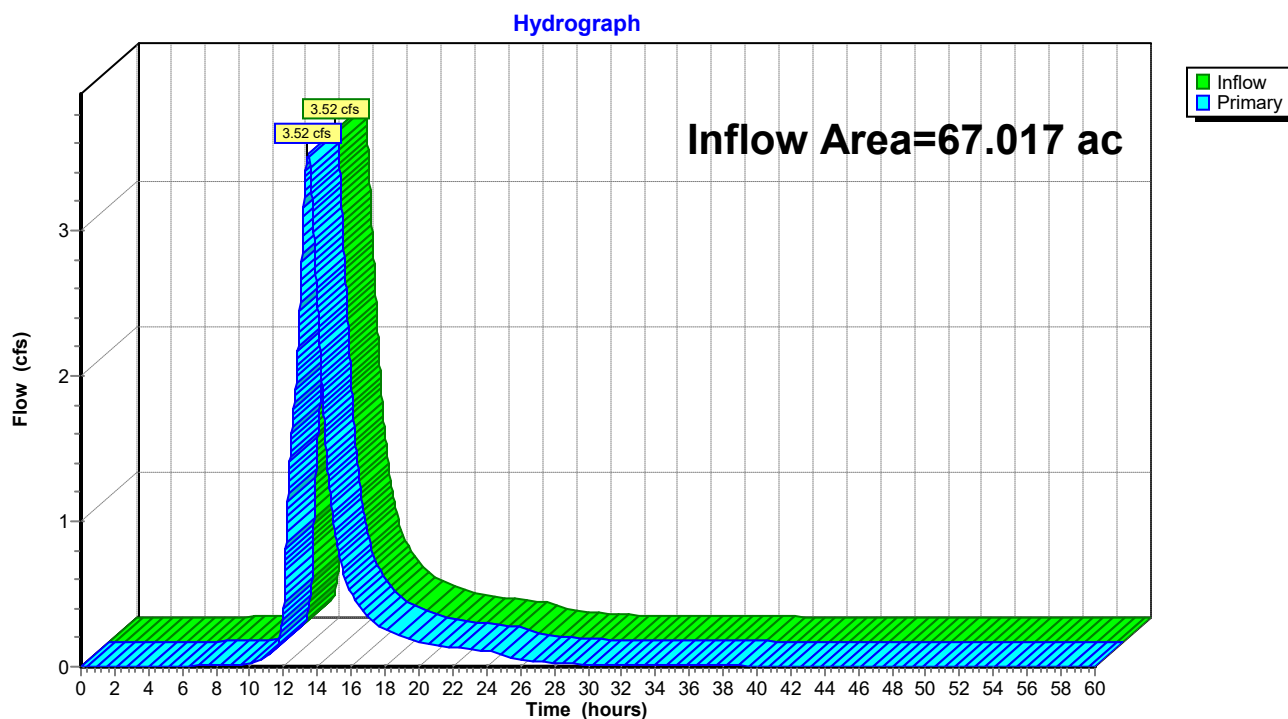
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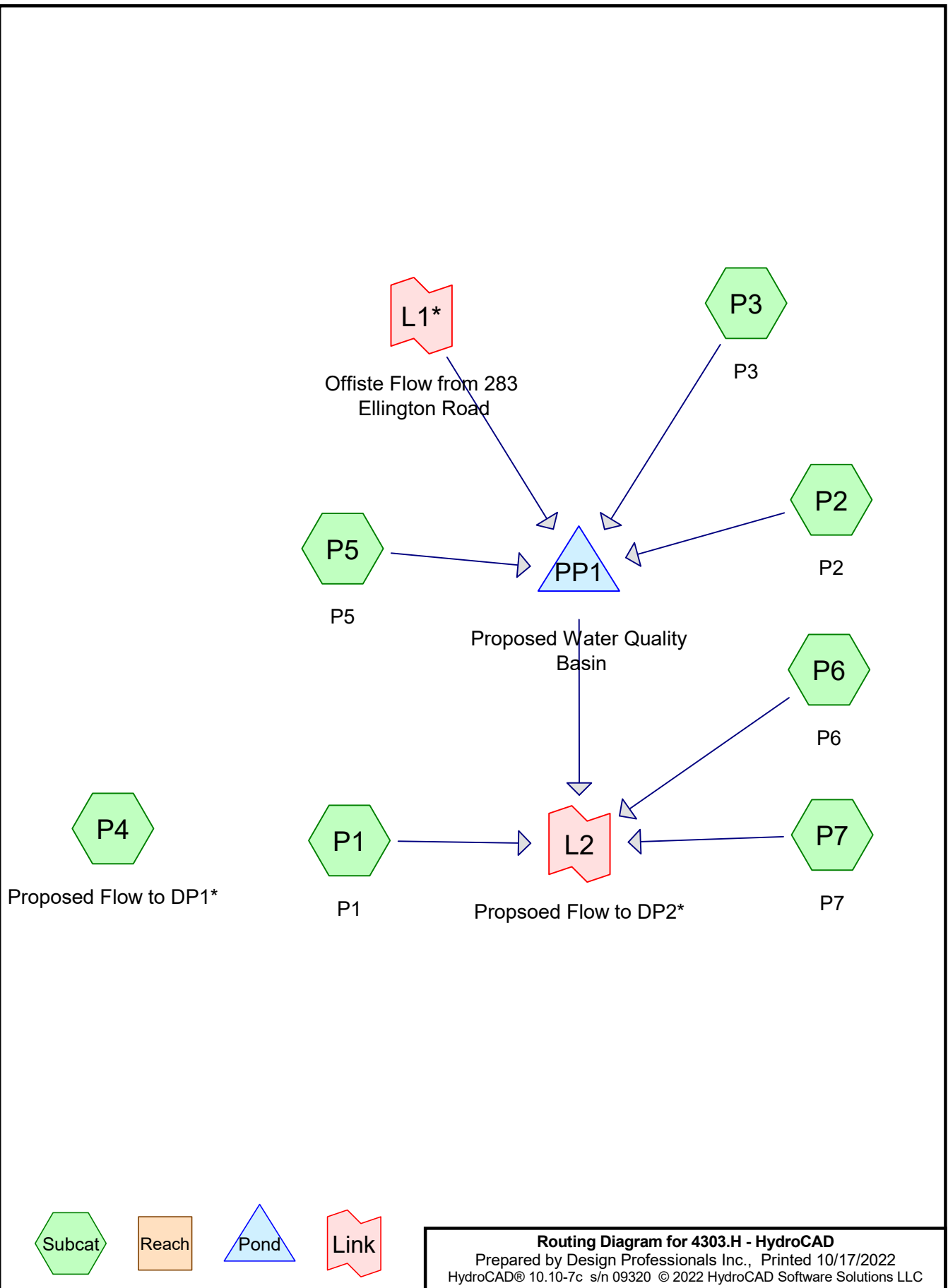
Summary for Link L2: Propsoed Flow to DP2*

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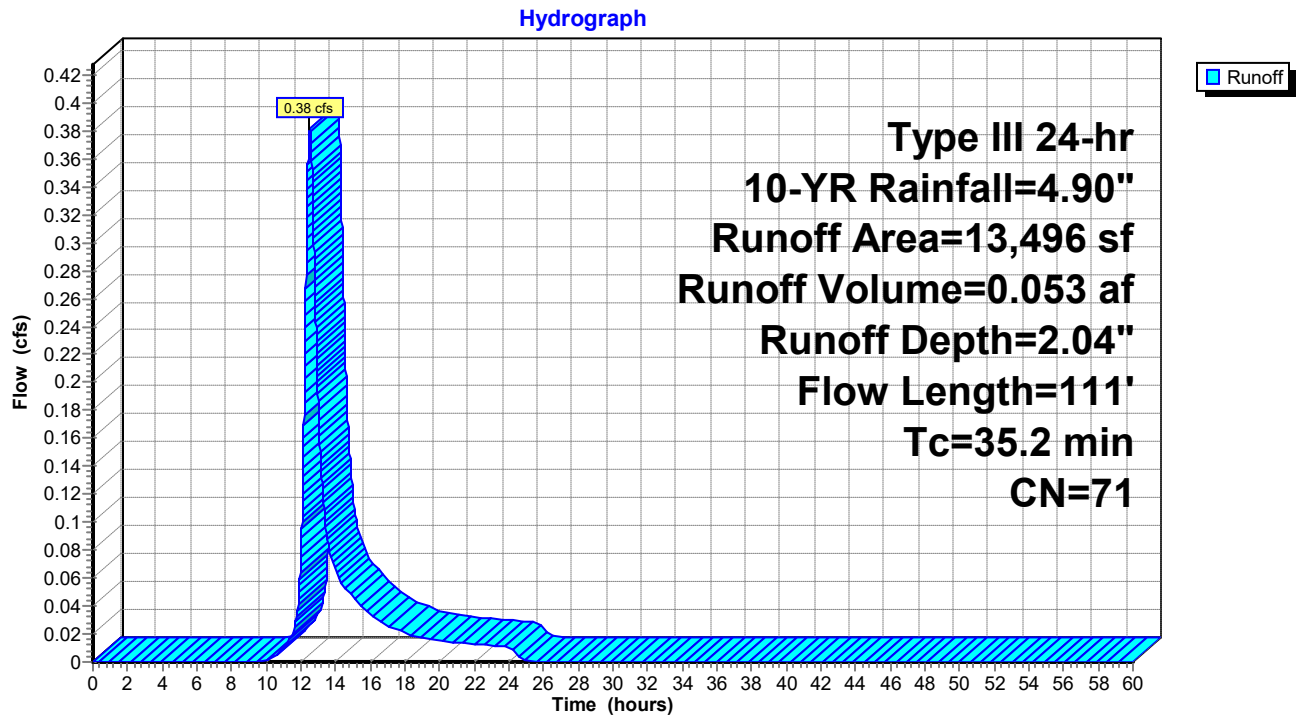
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Proposed Conditions
Type III 24-hr 10-YR Rainfall=4.90"

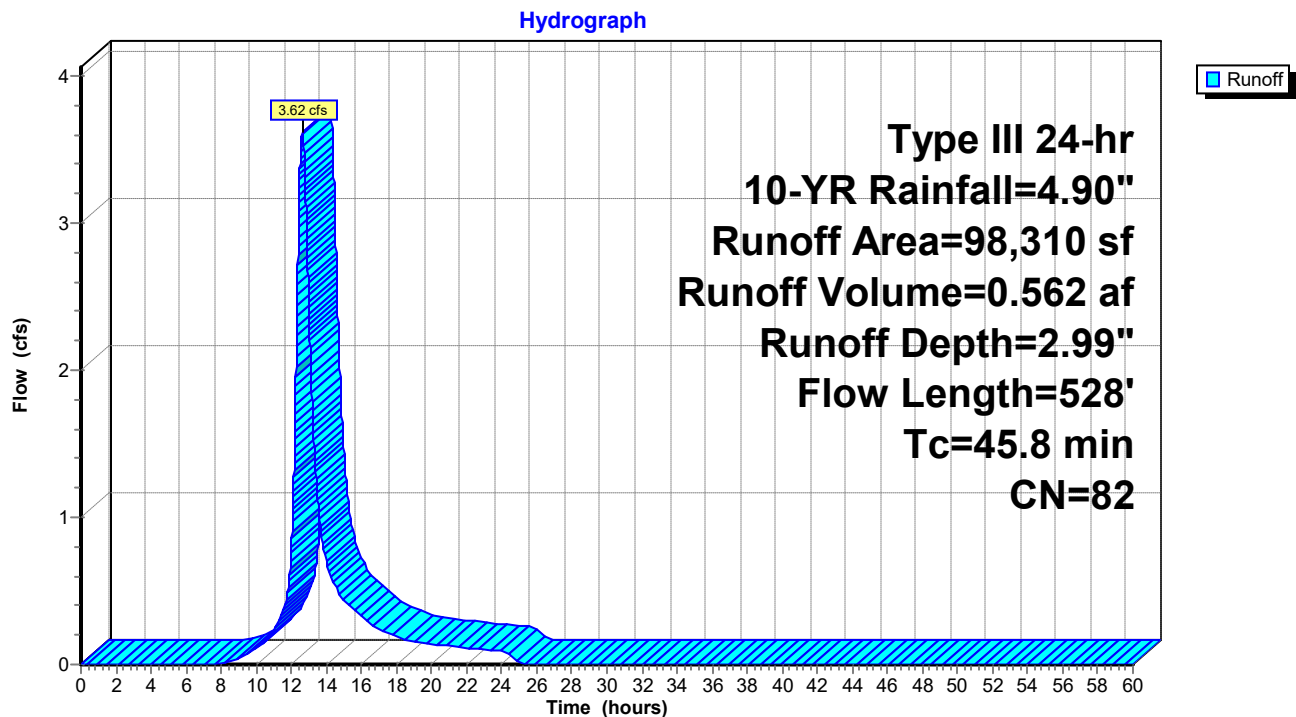
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Page 21

Subcatchment P1: P1



Subcatchment P2: P2



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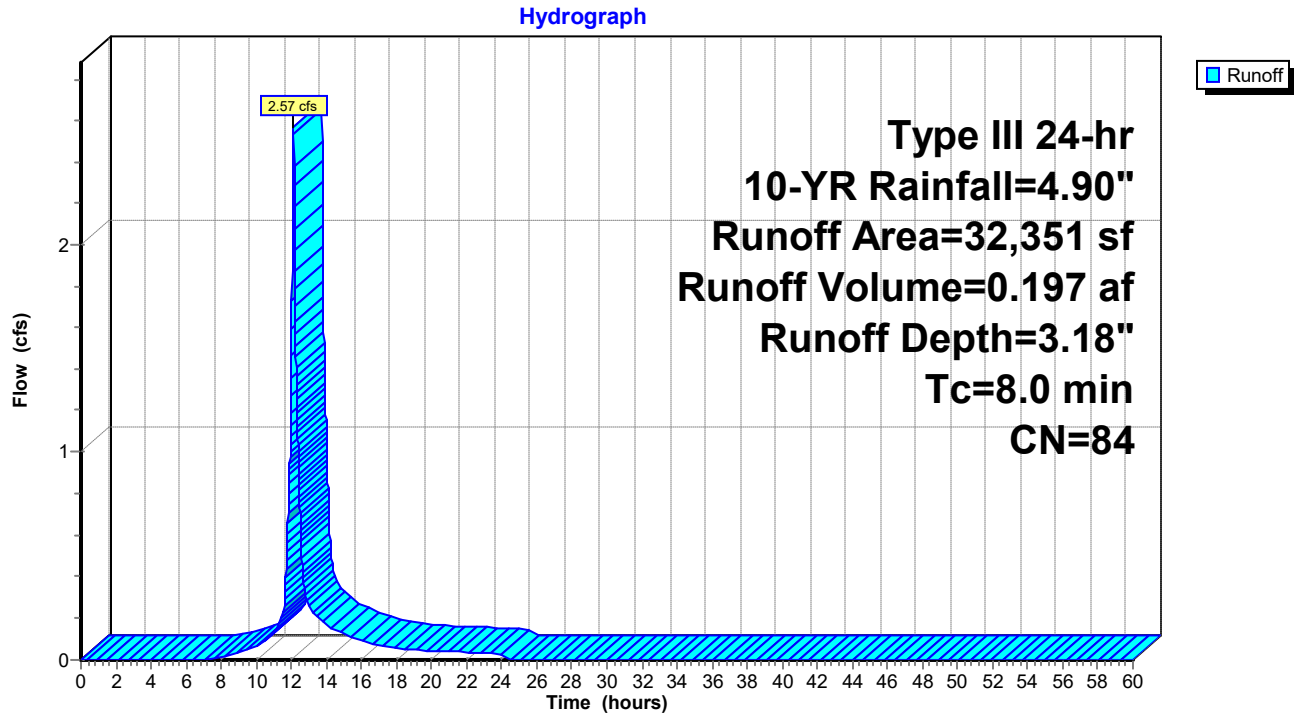
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Proposed Conditions
Type III 24-hr 10-YR Rainfall=4.90"

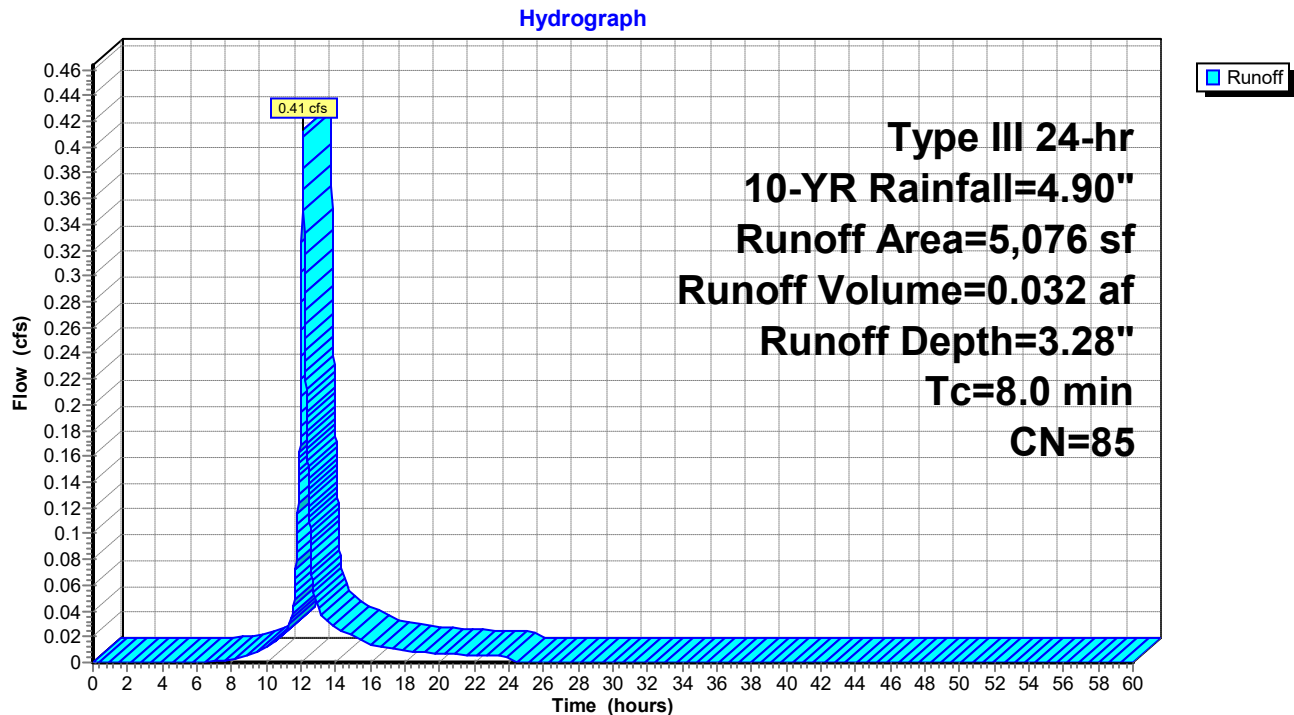
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Page 22

Subcatchment P3: P3



Subcatchment P4: Proposed Flow to DP1*



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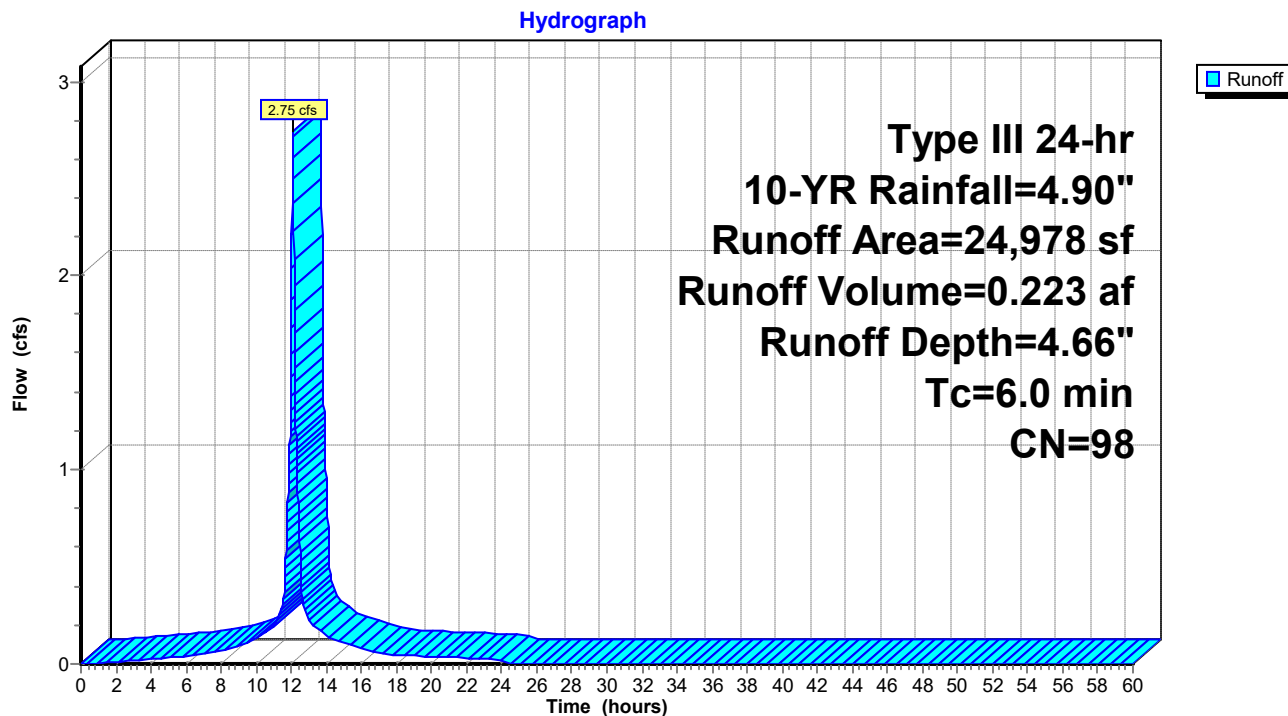
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Proposed Conditions
Type III 24-hr 10-YR Rainfall=4.90"

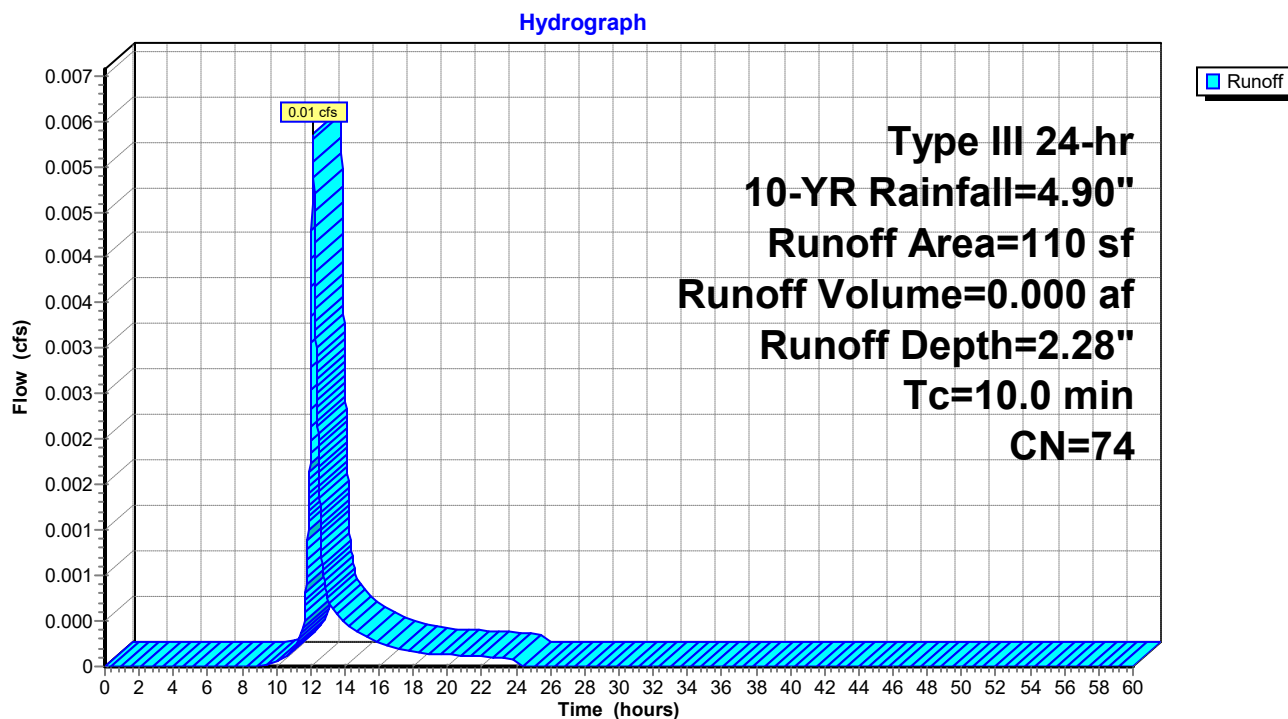
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Page 23

Subcatchment P5: P5



Subcatchment P6: P6



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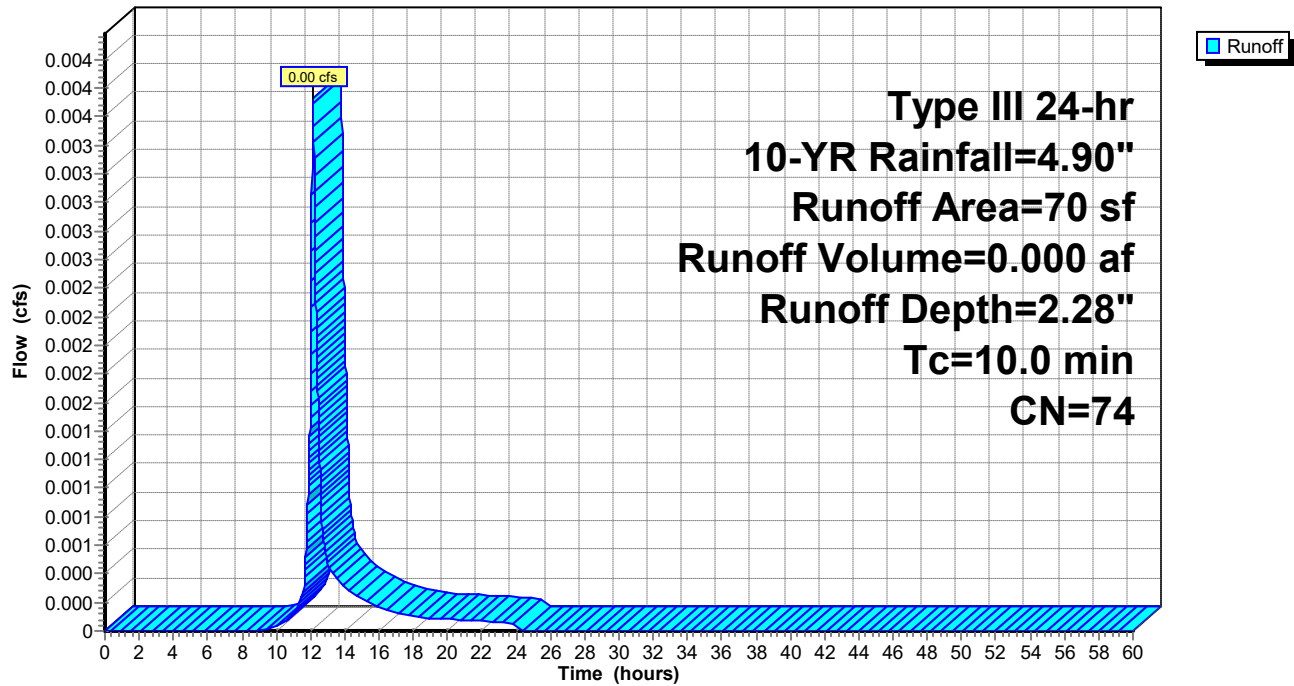
Proposed Conditions
Type III 24-hr 10-YR Rainfall=4.90"

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Page 24

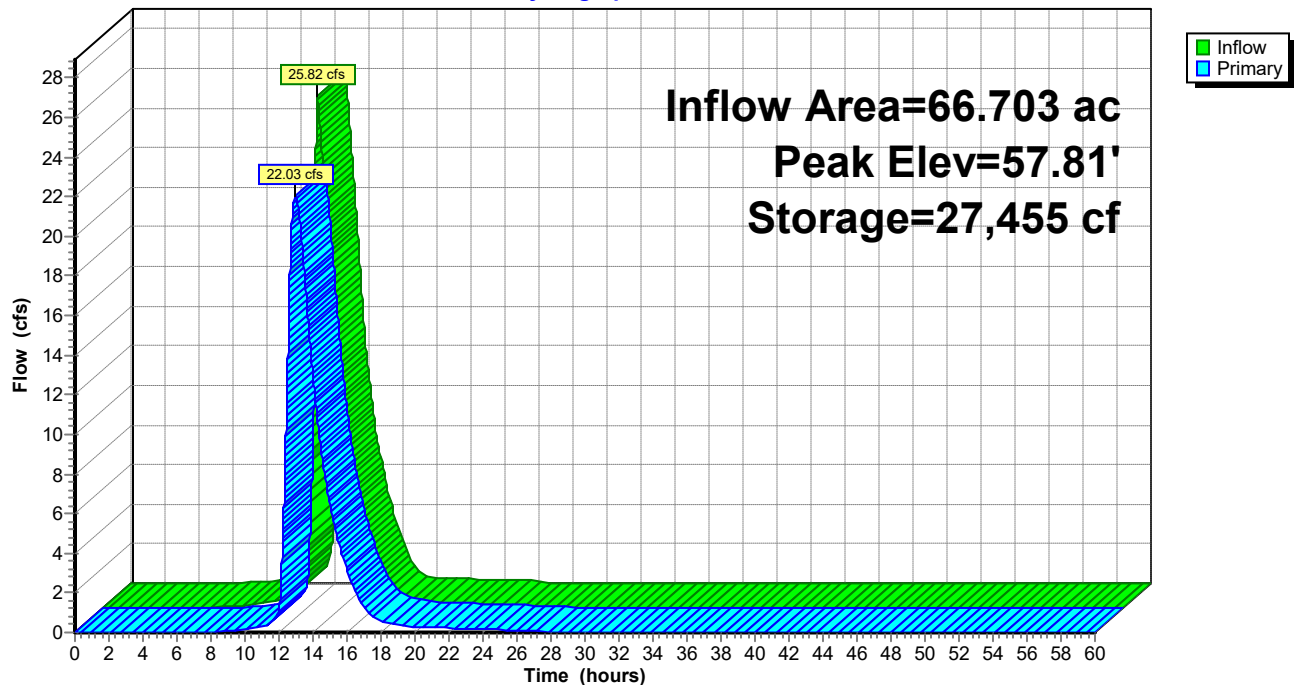
Subcatchment P7: P7

Hydrograph



Pond PP1: Proposed Water Quality Basin

Hydrograph



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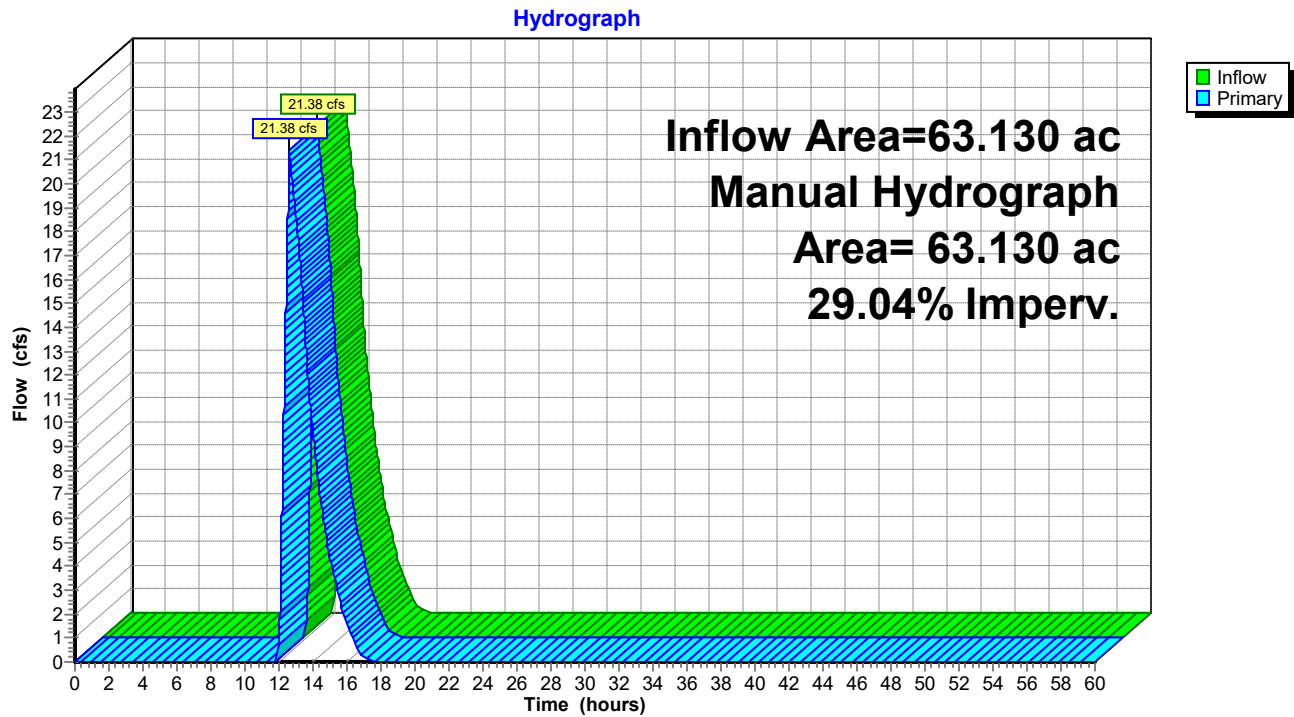
HydroCAD® 10.10-7c s/n 09320 © 2022 HydroCAD Software Solutions LLC

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

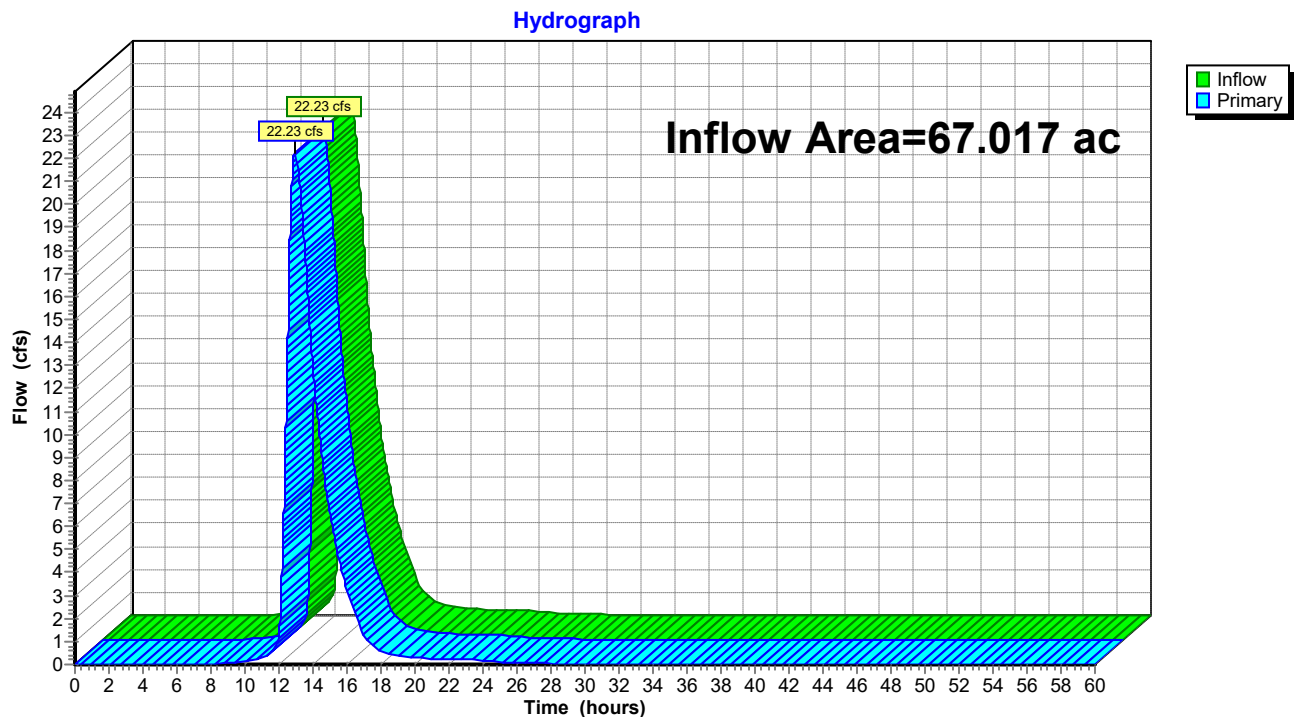
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Page 25

Link L1*: Offsite Flow from 283 Ellington Road



Link L2: Propsoed Flow to DP2*



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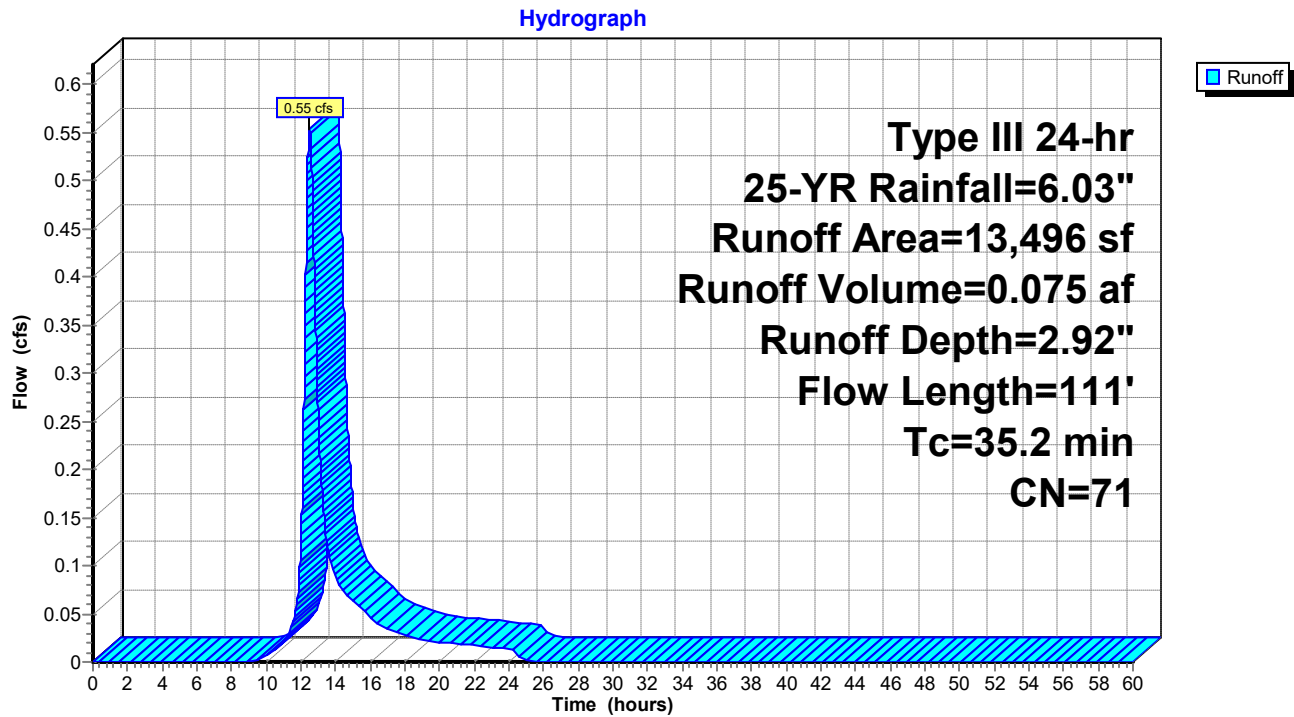
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Proposed Conditions
Type III 24-hr 25-YR Rainfall=6.03"

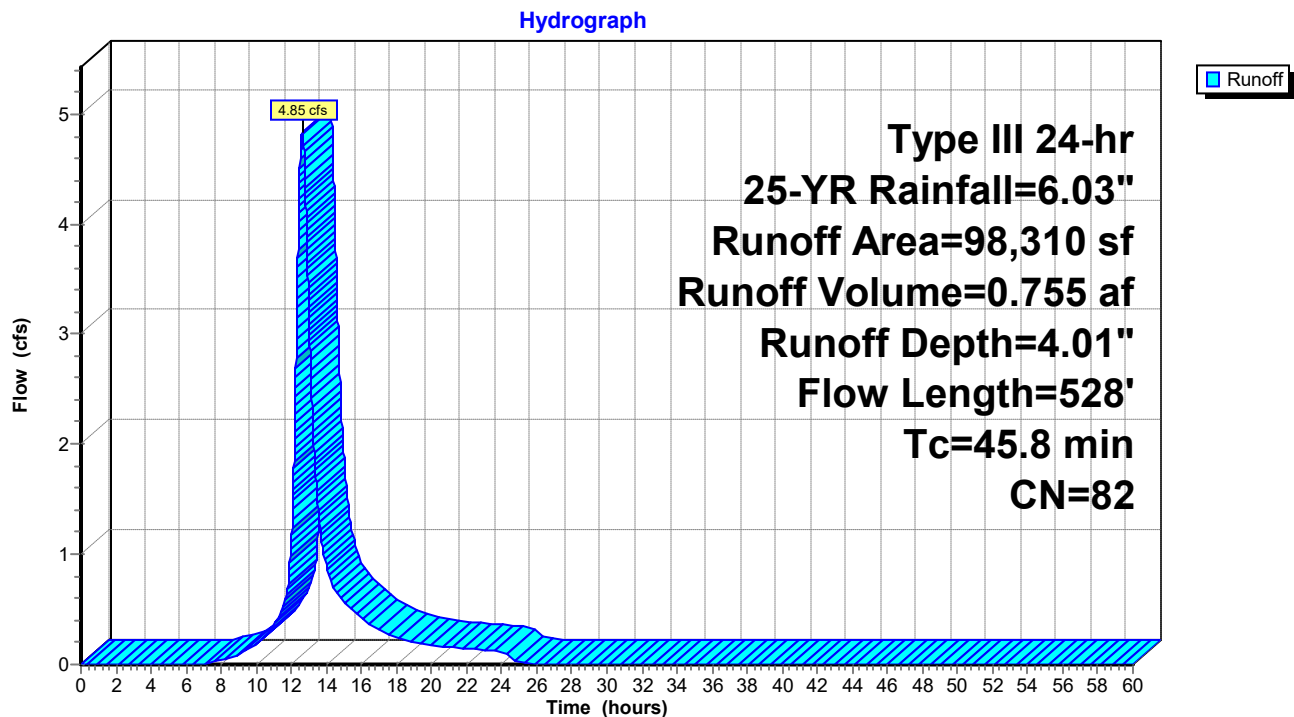
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Page 26

Subcatchment P1: P1



Subcatchment P2: P2



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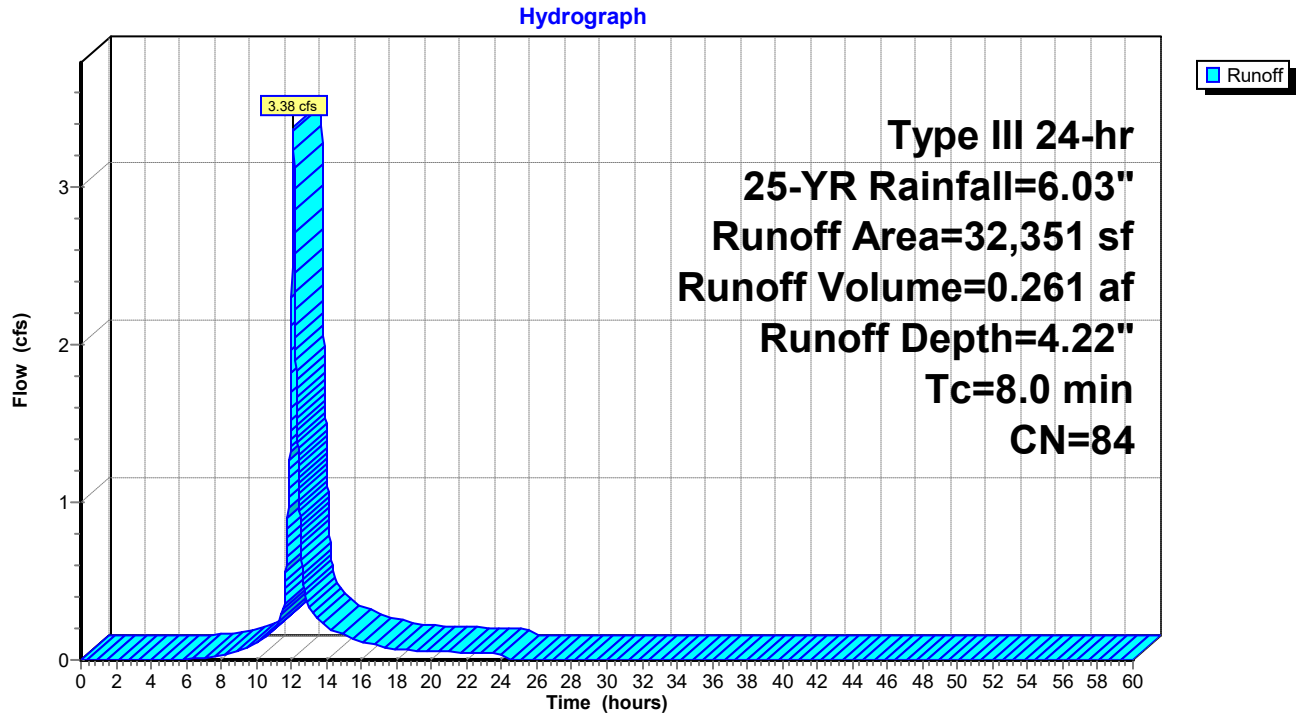
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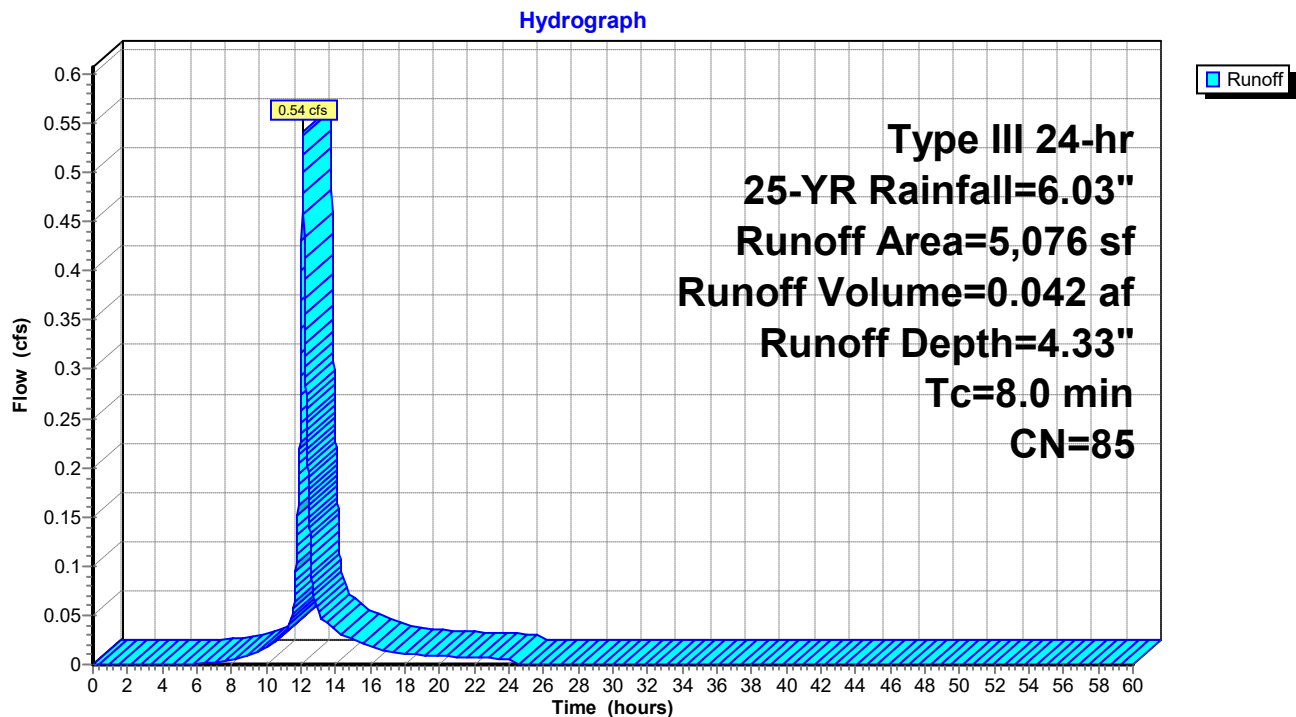
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Page 27

Subcatchment P3: P3



Subcatchment P4: Proposed Flow to DP1*



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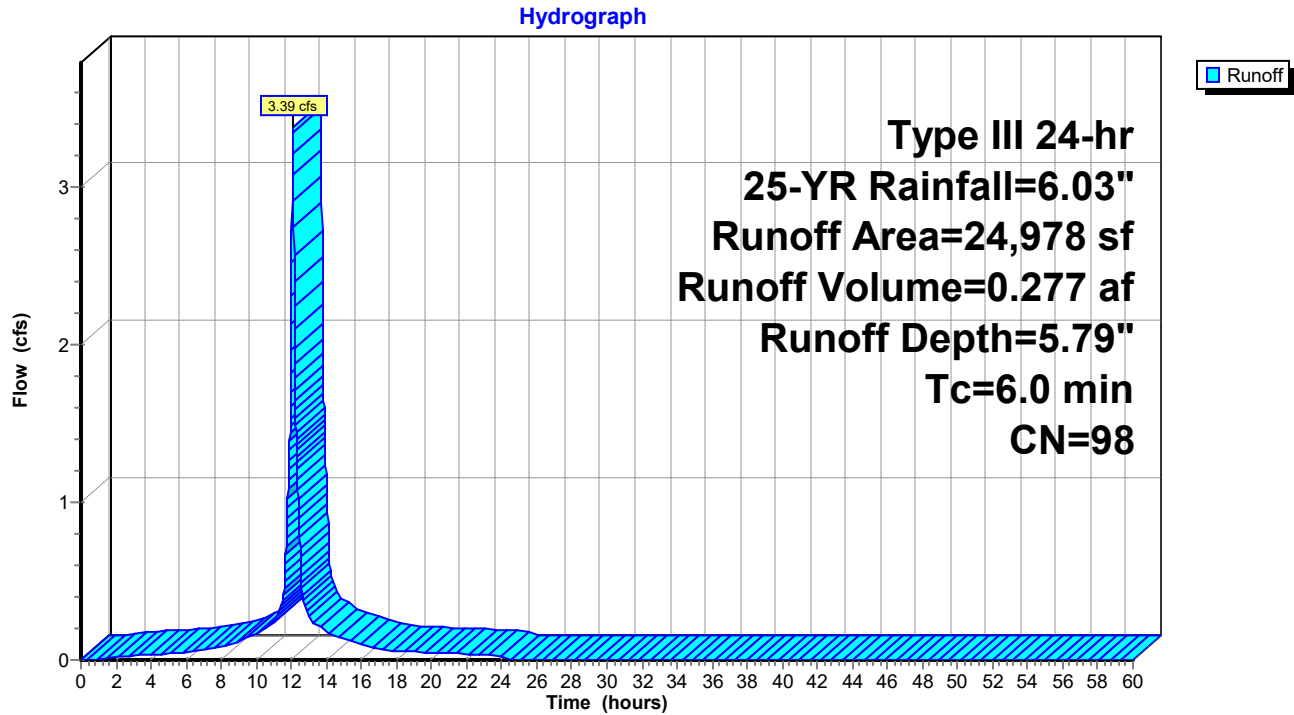
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Proposed Conditions
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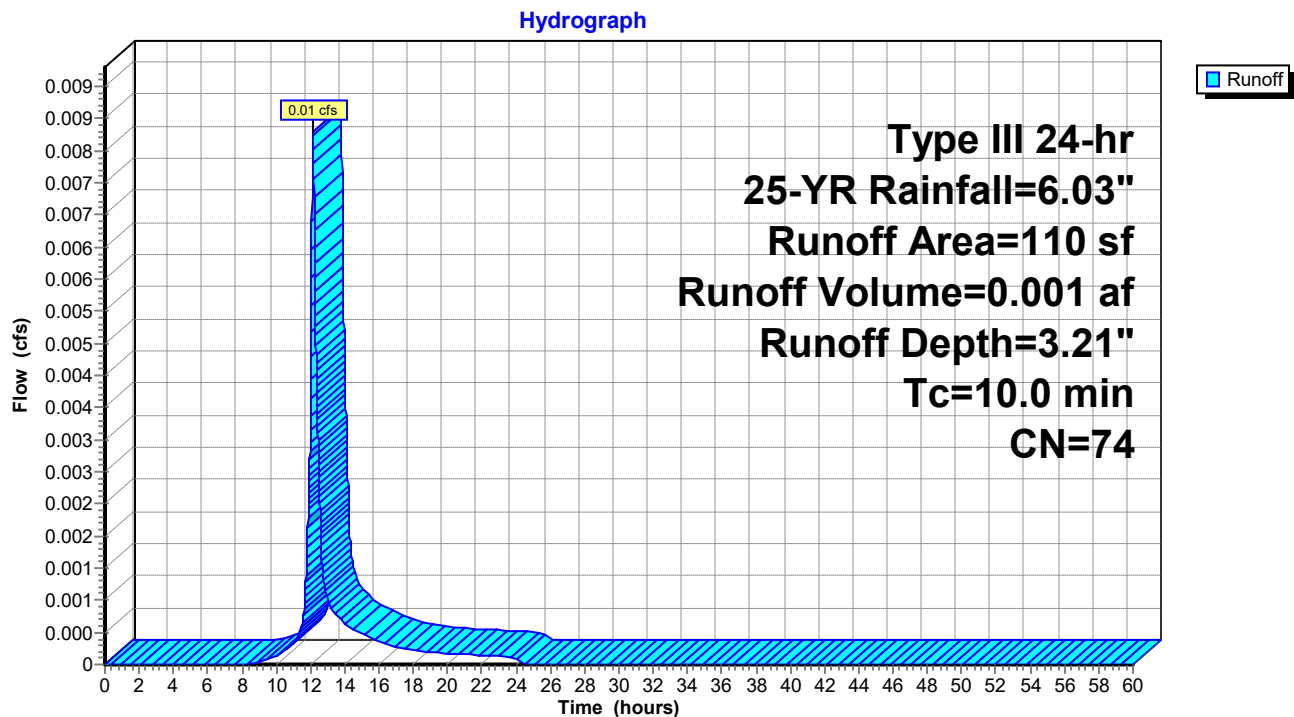
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Page 28

Subcatchment P5: P5



Subcatchment P6: P6



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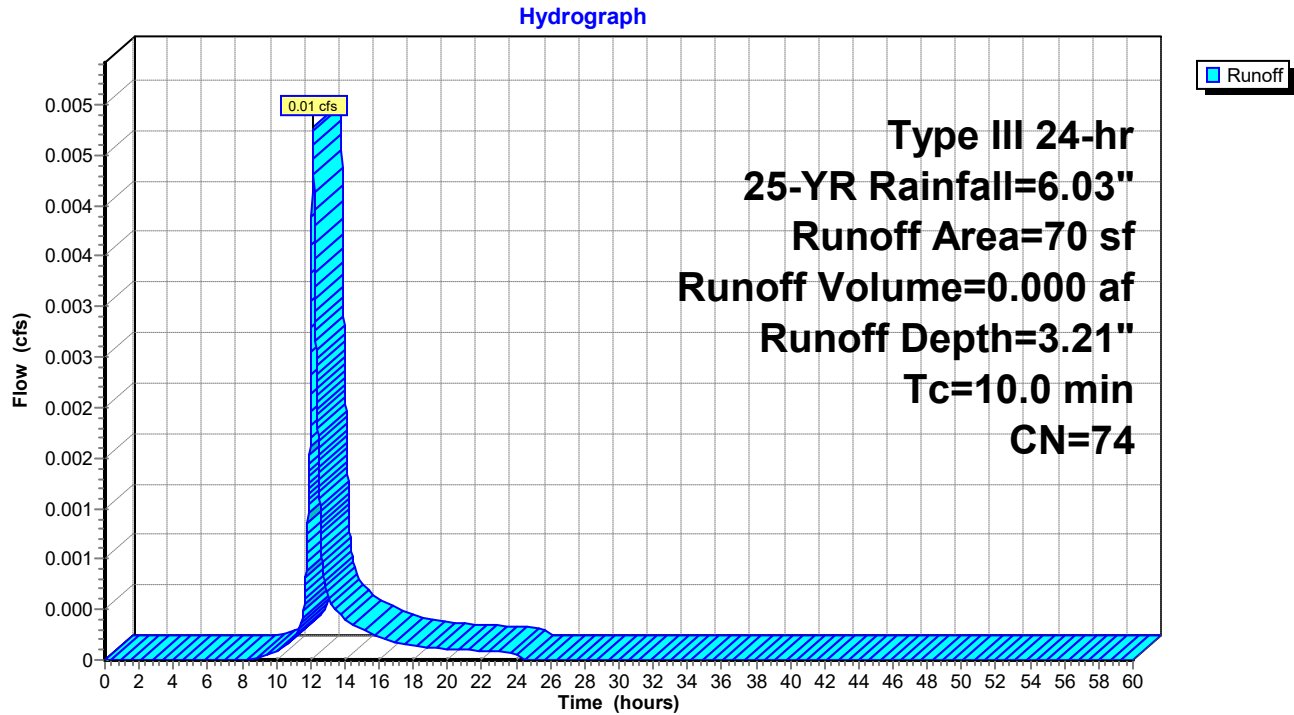
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Proposed Conditions
Type III 24-hr 25-YR Rainfall=6.03"

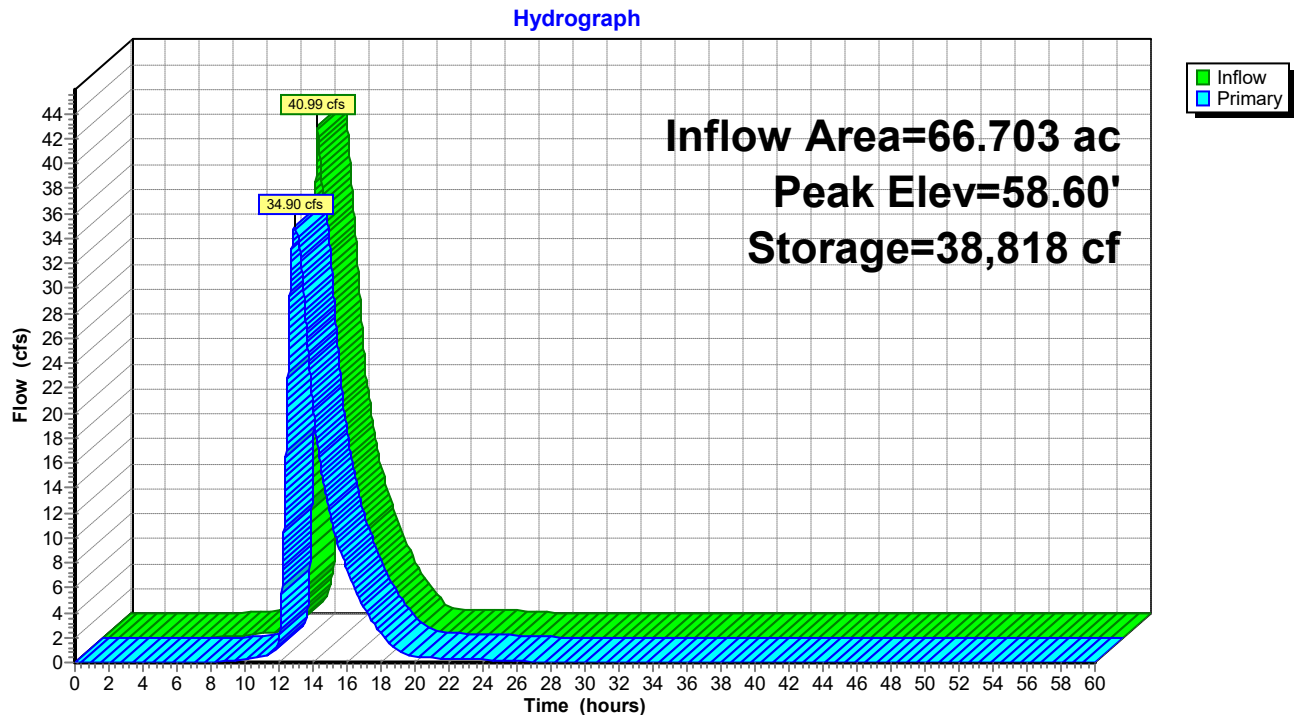
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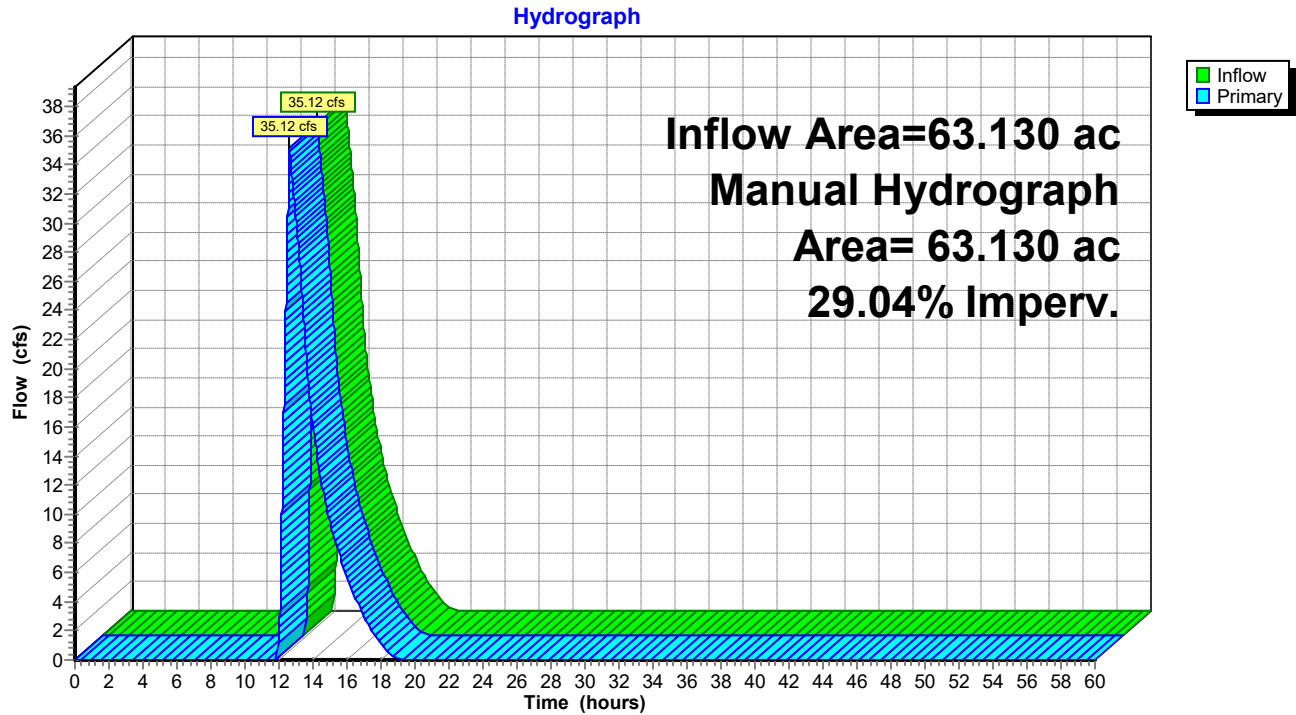
Subcatchment P7: P7



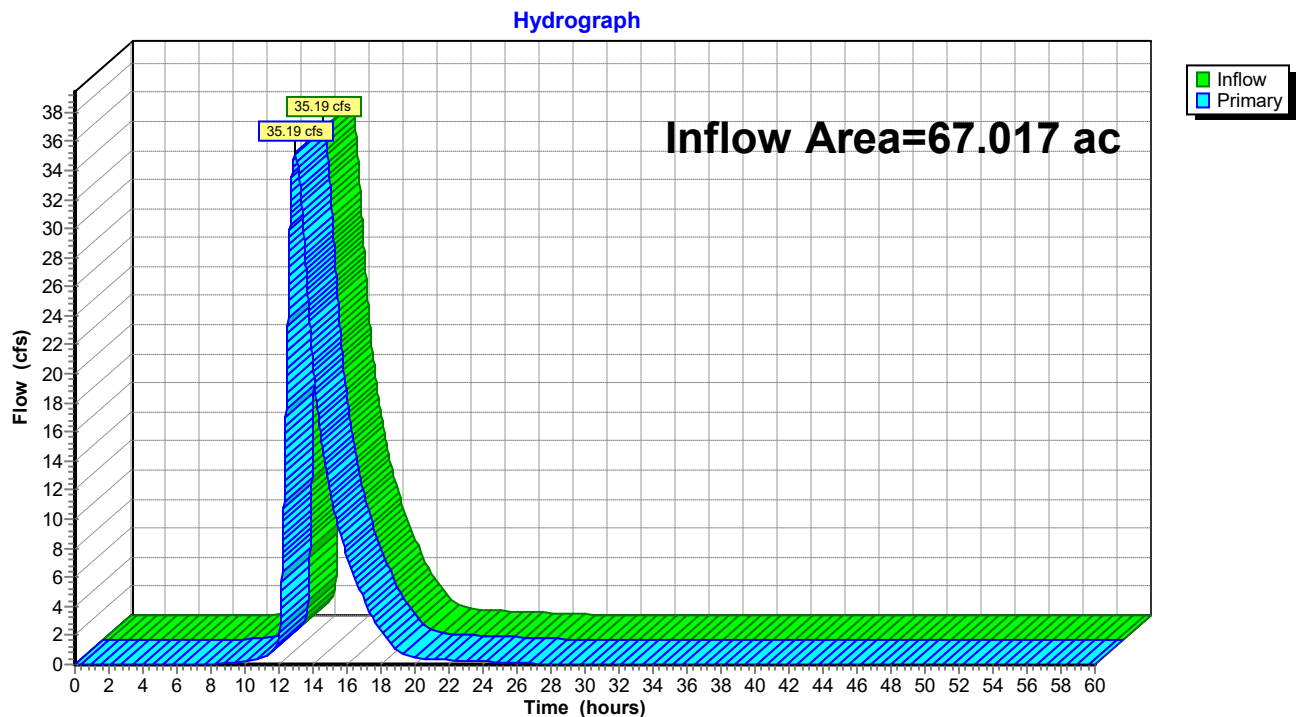
Pond PP1: Proposed Water Quality Basin



Link L1*: Offsite Flow from 283 Ellington Road



Link L2: Propsoed Flow to DP2*



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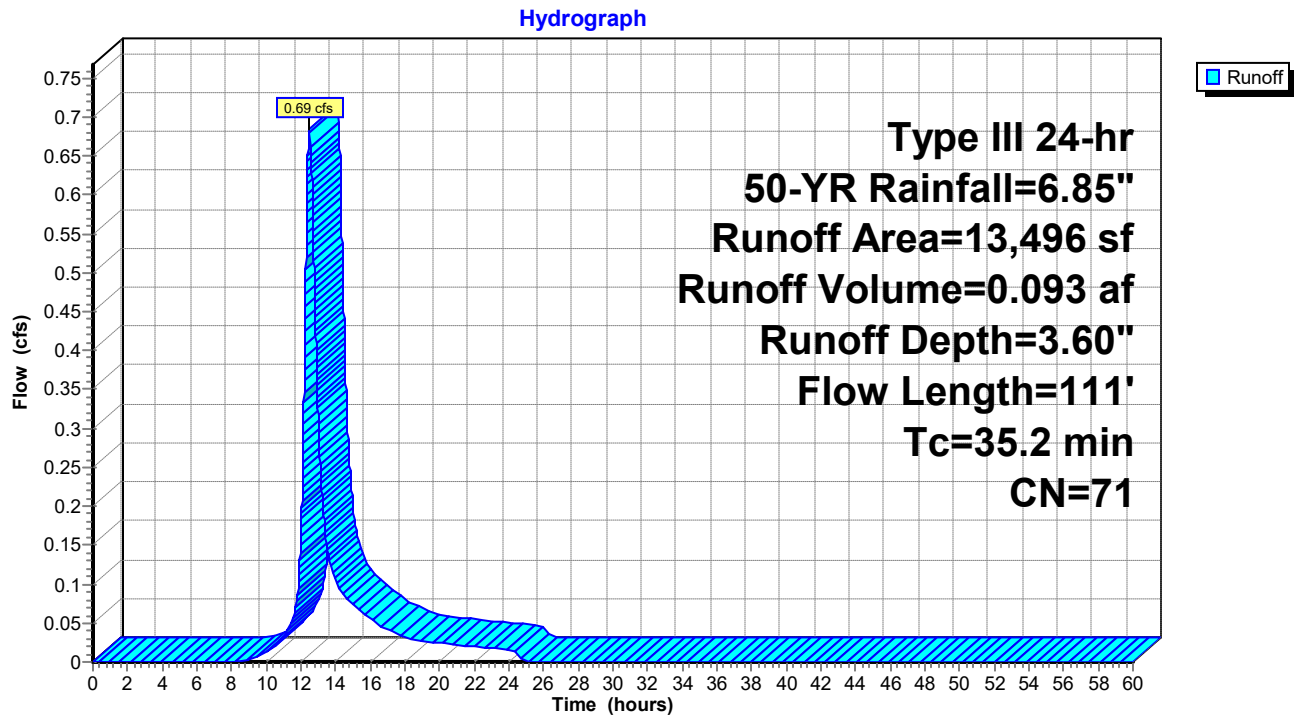
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Proposed Conditions
Type III 24-hr 50-YR Rainfall=6.85"

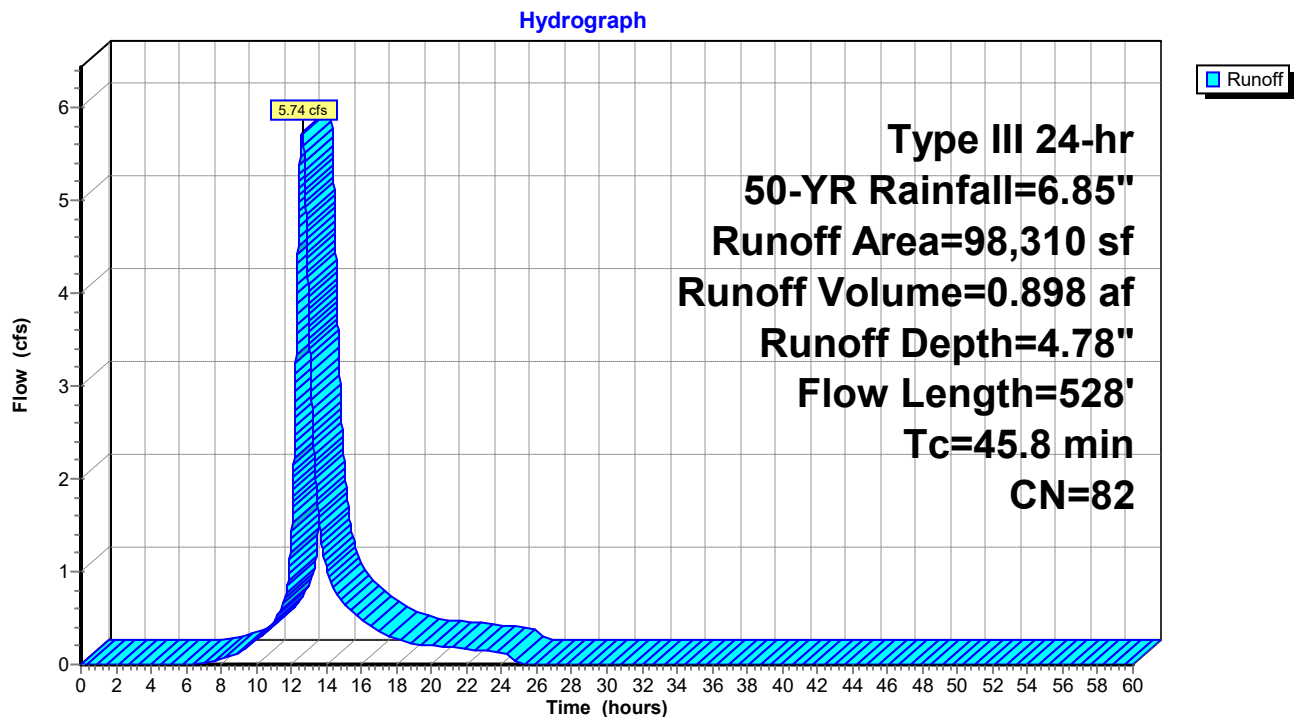
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Page 31

Subcatchment P1: P1



Subcatchment P2: P2



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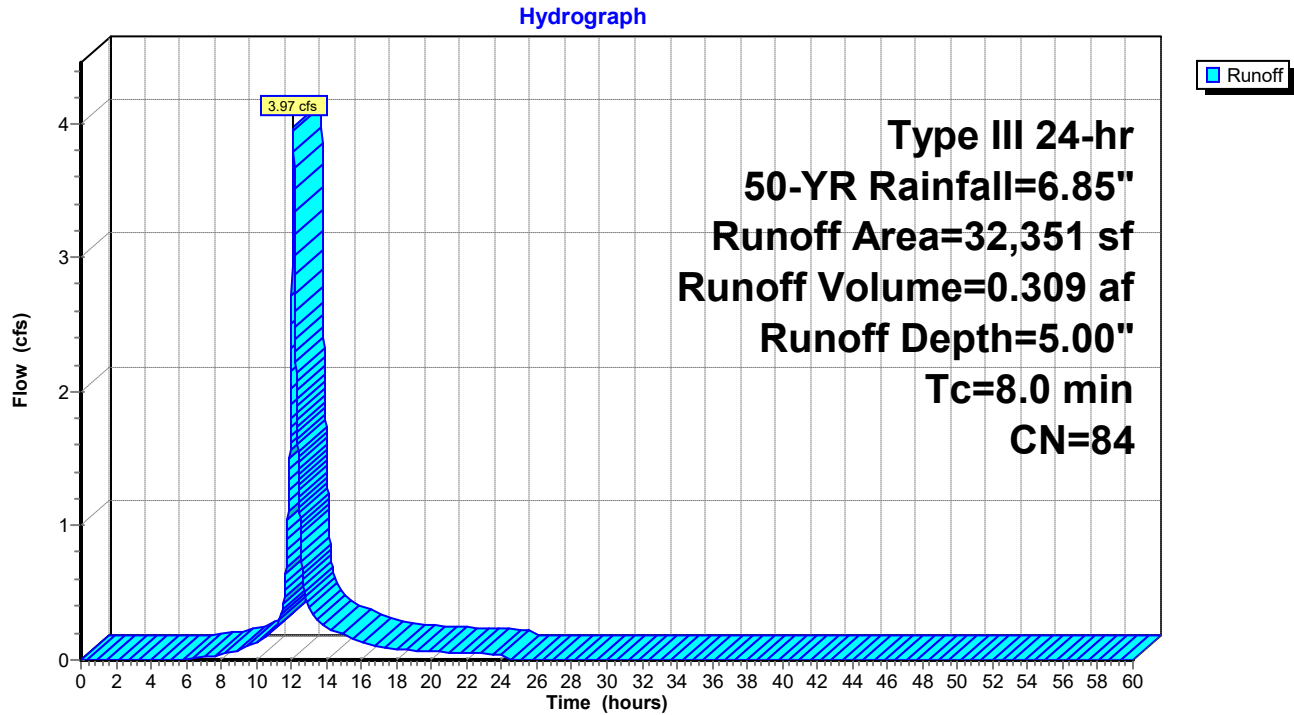
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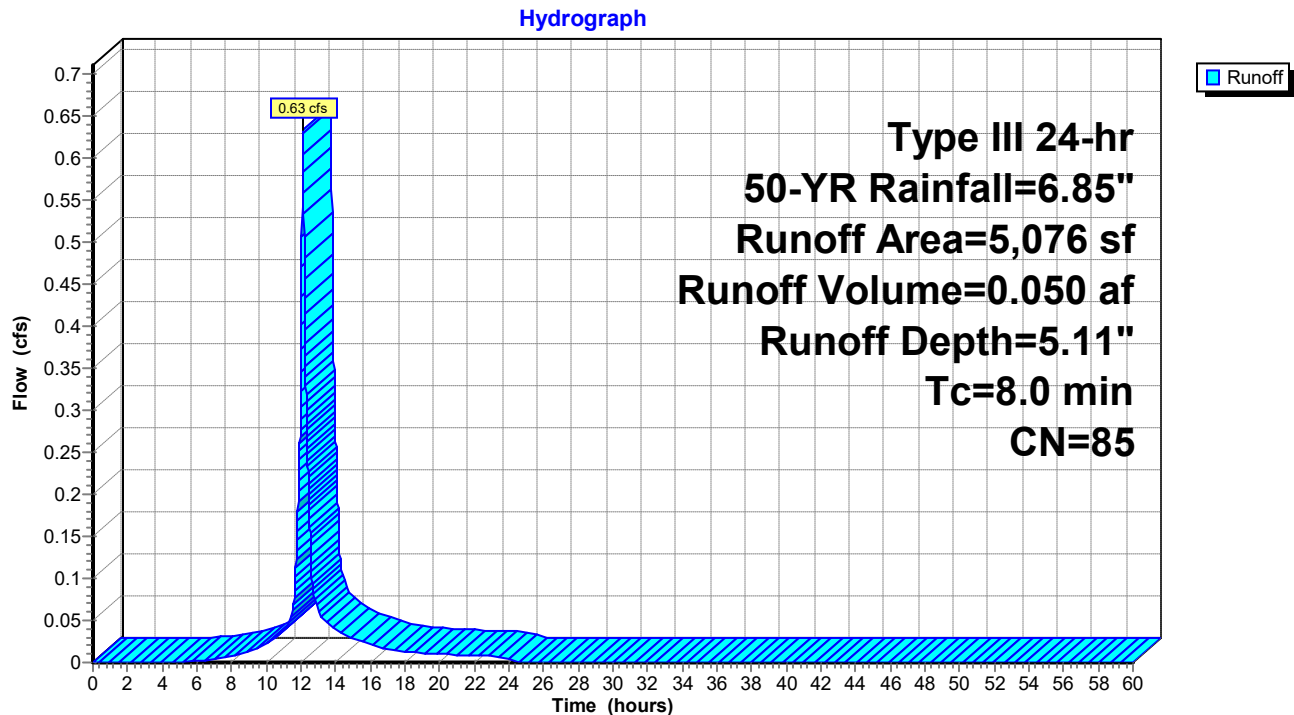
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Page 32

Subcatchment P3: P3



Subcatchment P4: Proposed Flow to DP1*



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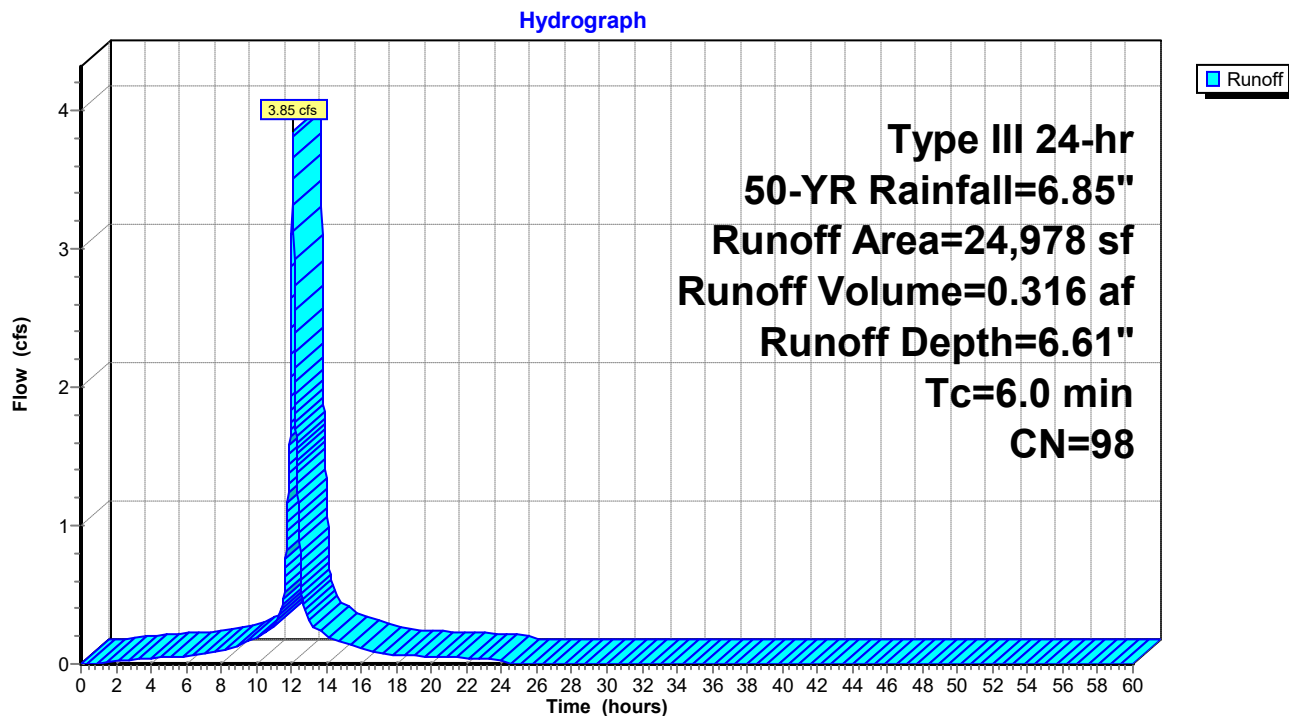
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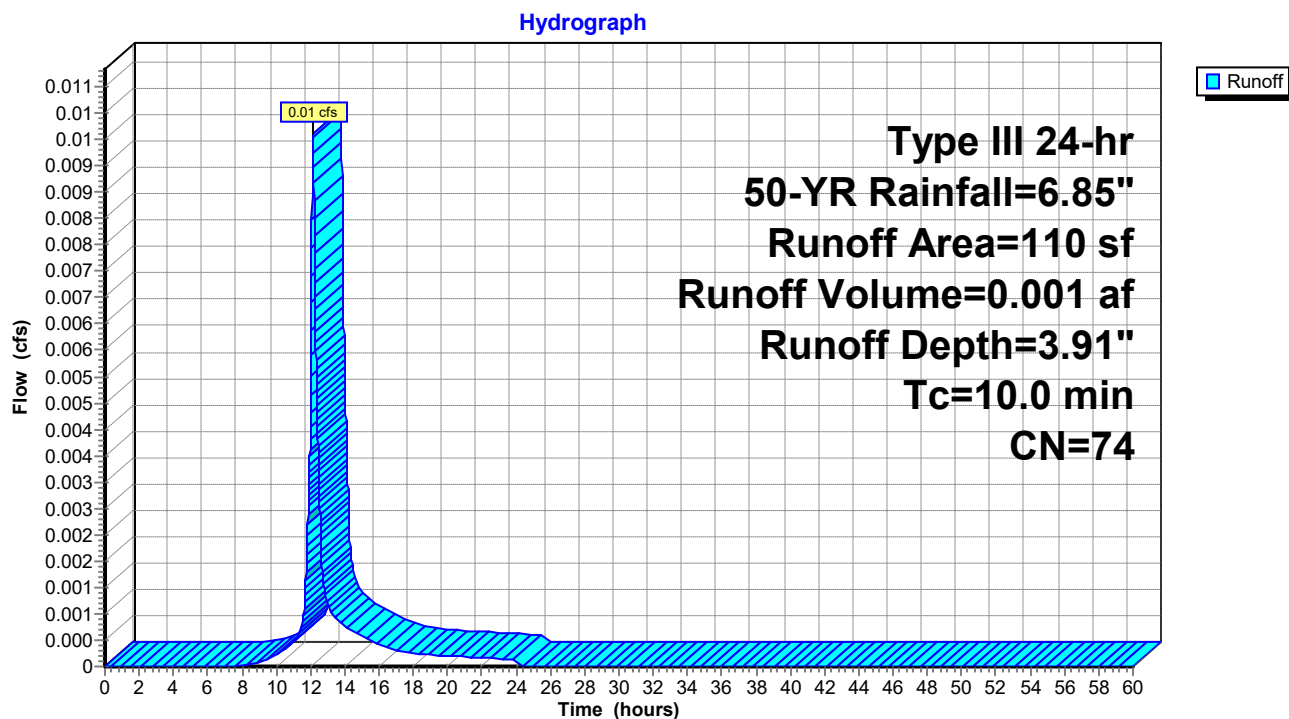
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Page 33

Subcatchment P5: P5



Subcatchment P6: P6



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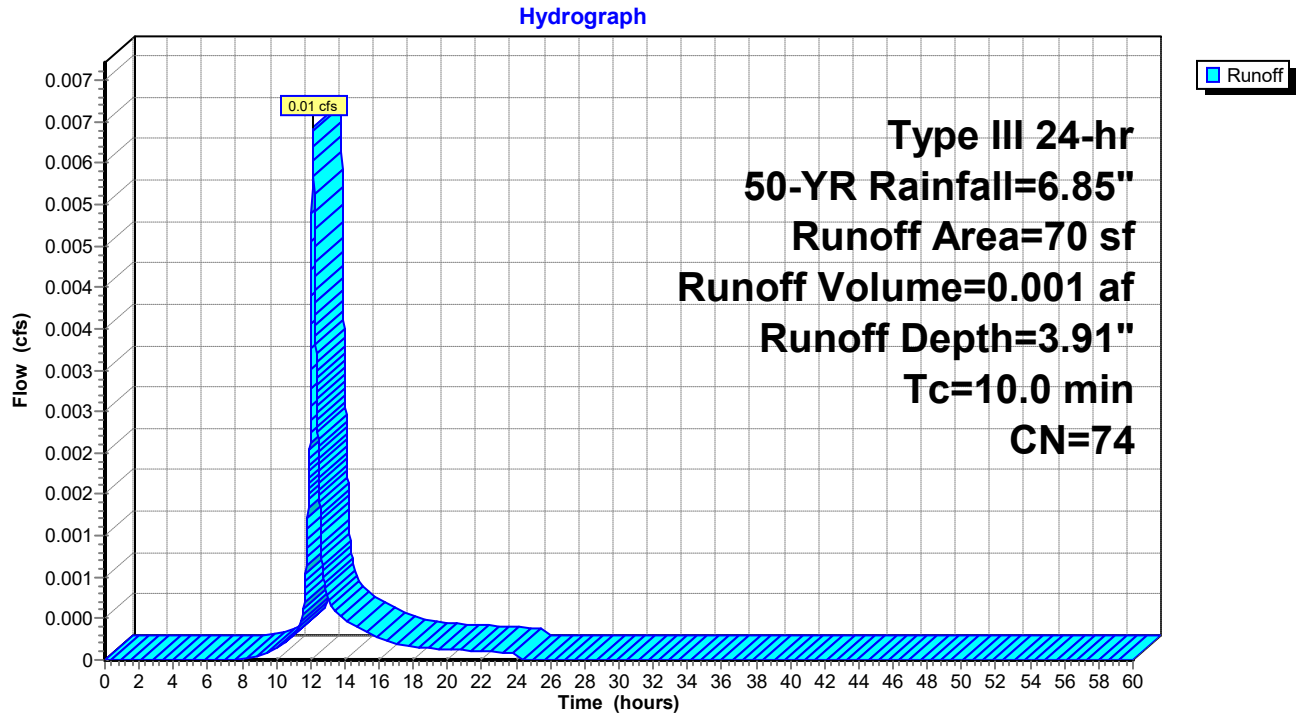
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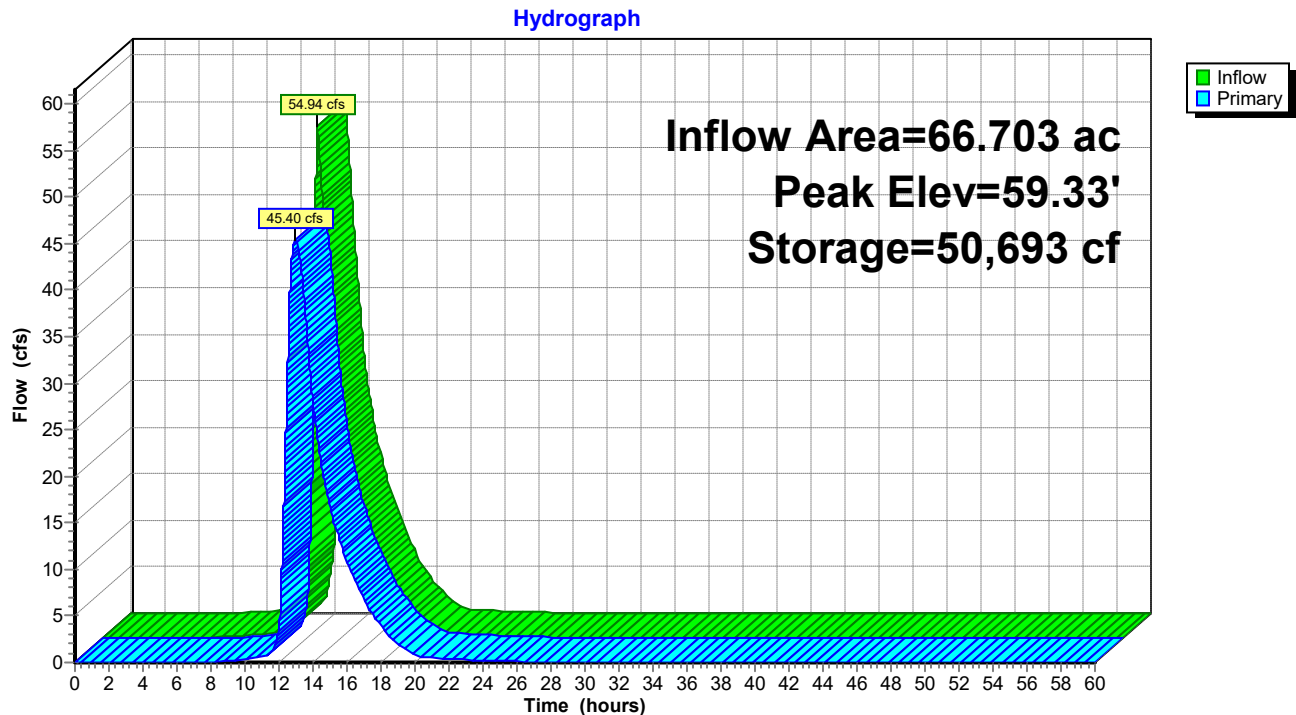
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Page 34

Subcatchment P7: P7



Pond PP1: Proposed Water Quality Basin



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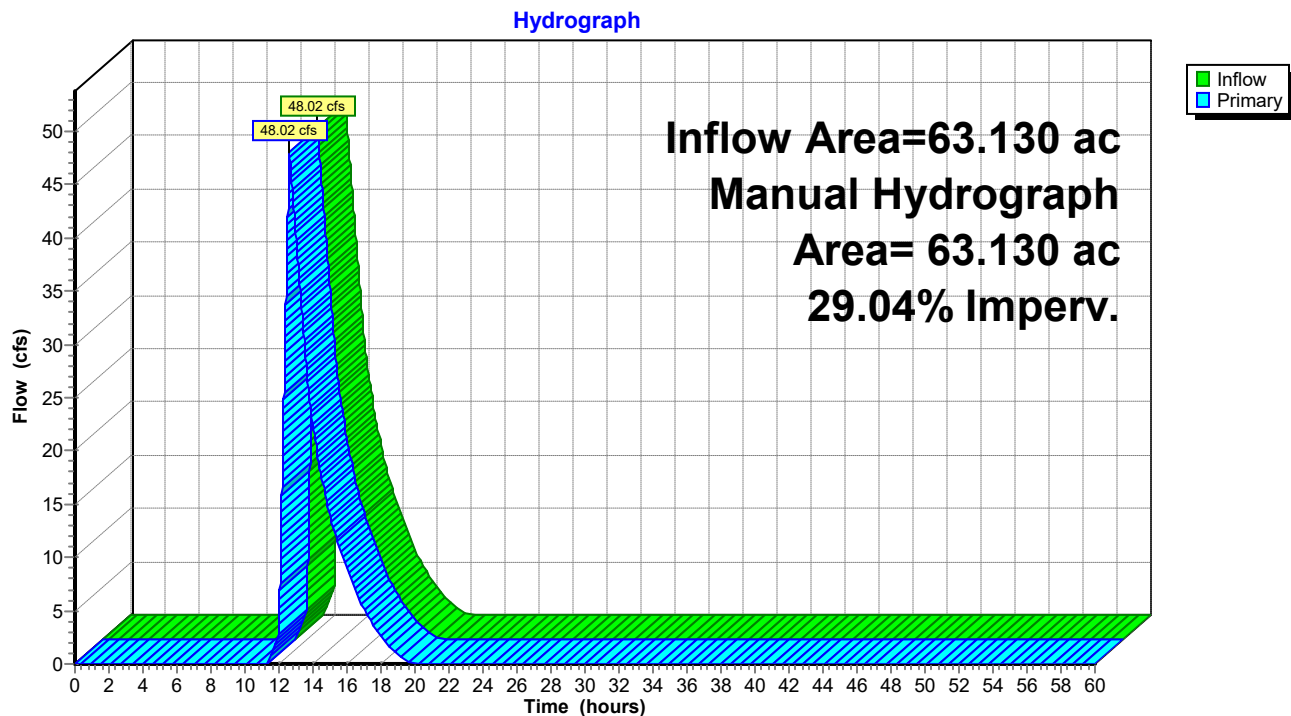
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Proposed Conditions
Type III 24-hr 50-YR Rainfall=6.85"

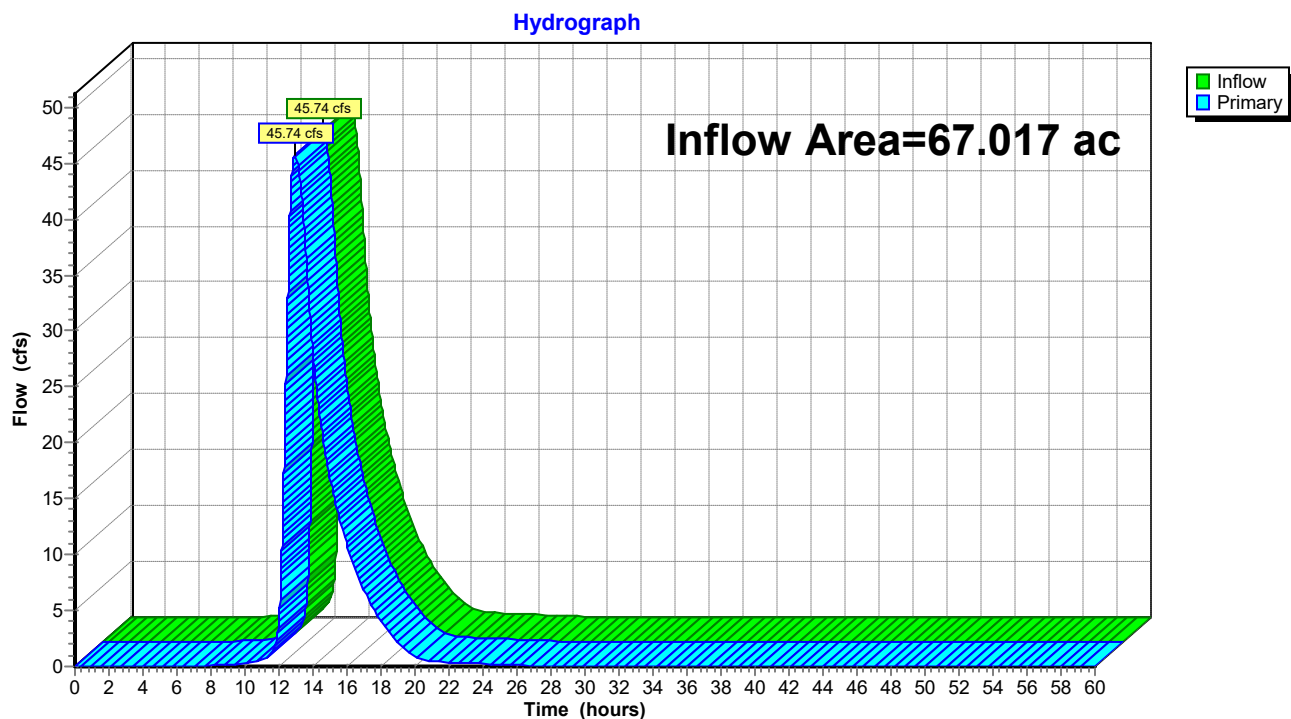
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Page 35

Link L1*: Offsite Flow from 283 Ellington Road



Link L2: Propsoed Flow to DP2*



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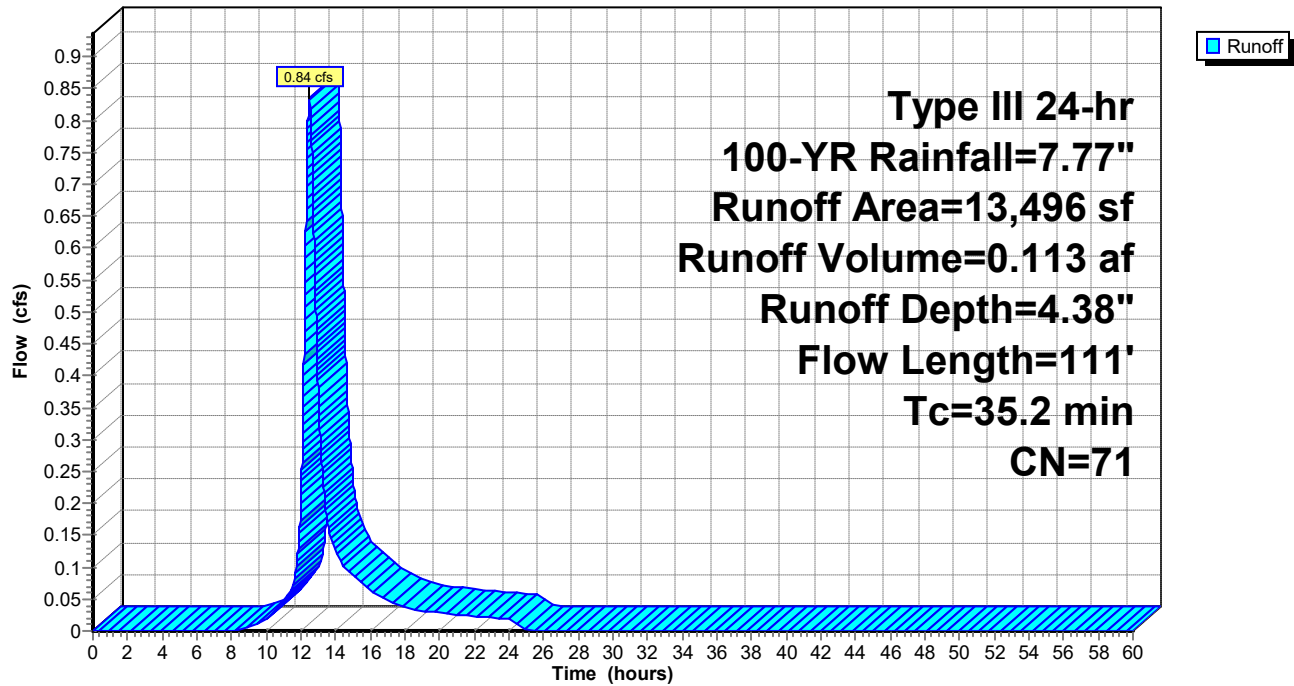
Type III 24-hr 100-YR Rainfall=7.77"

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Page 36

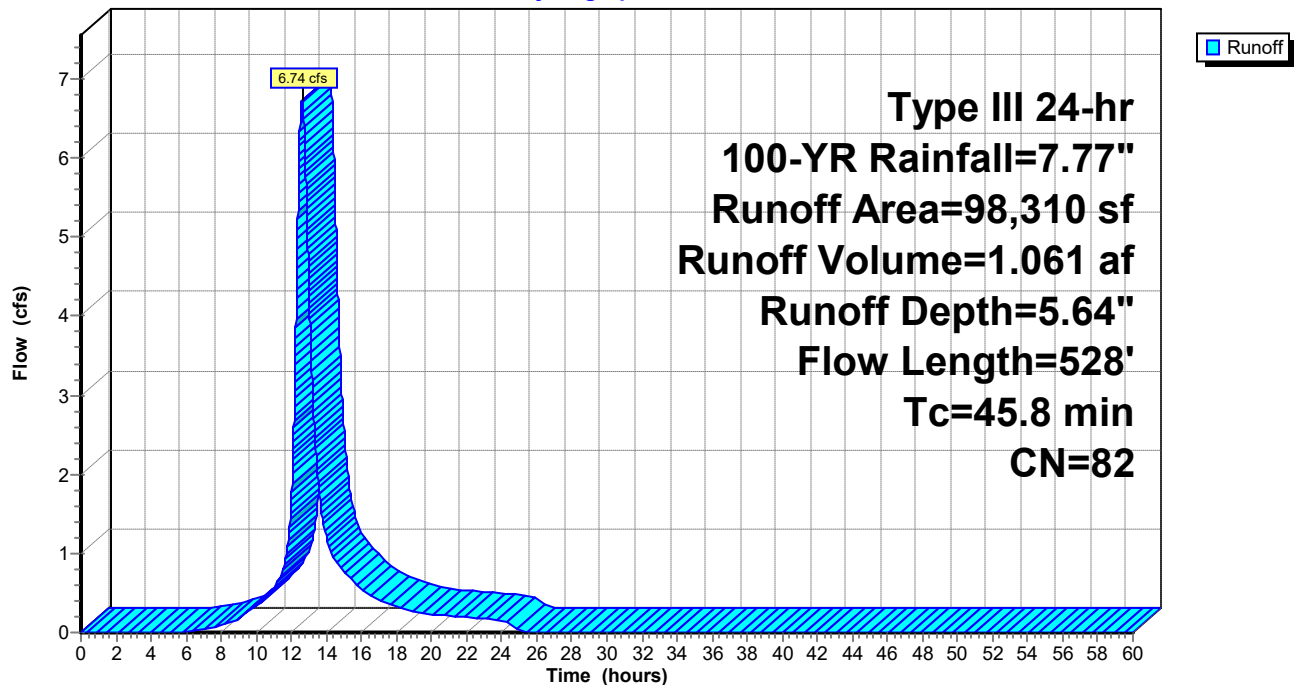
Subcatchment P1: P1

Hydrograph



Subcatchment P2: P2

Hydrograph



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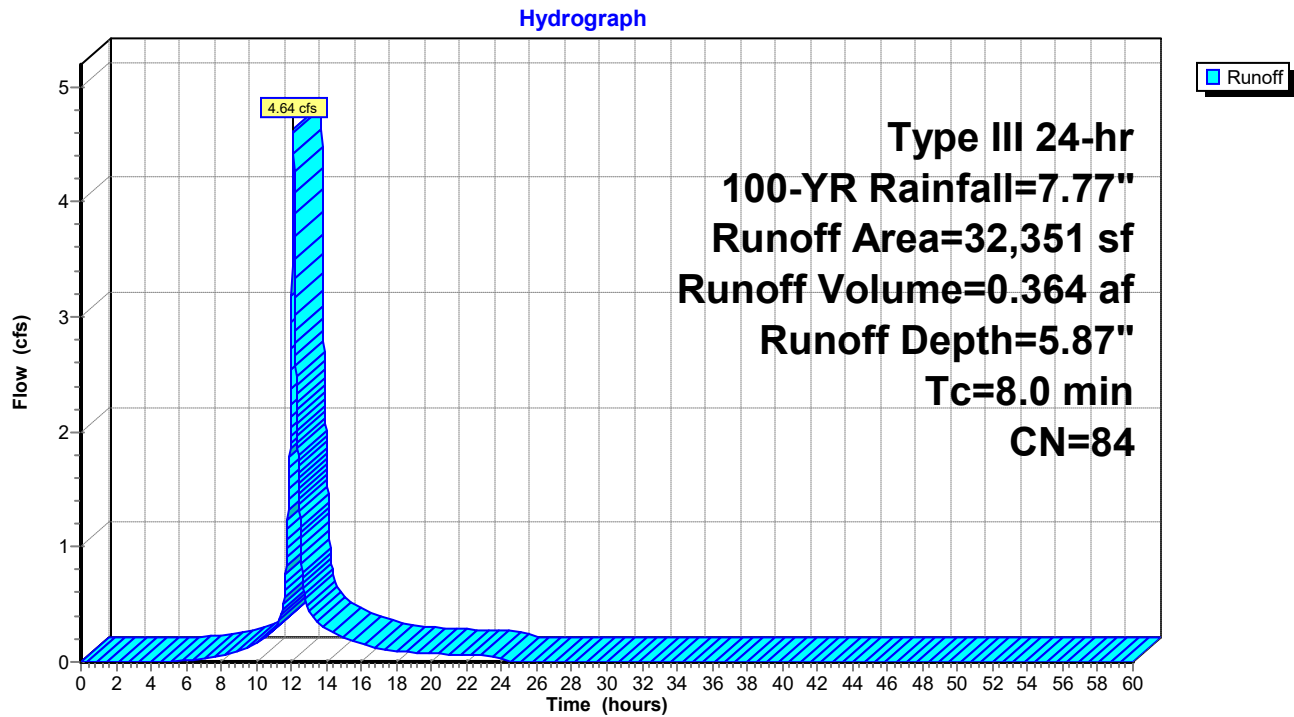
Proposed Conditions

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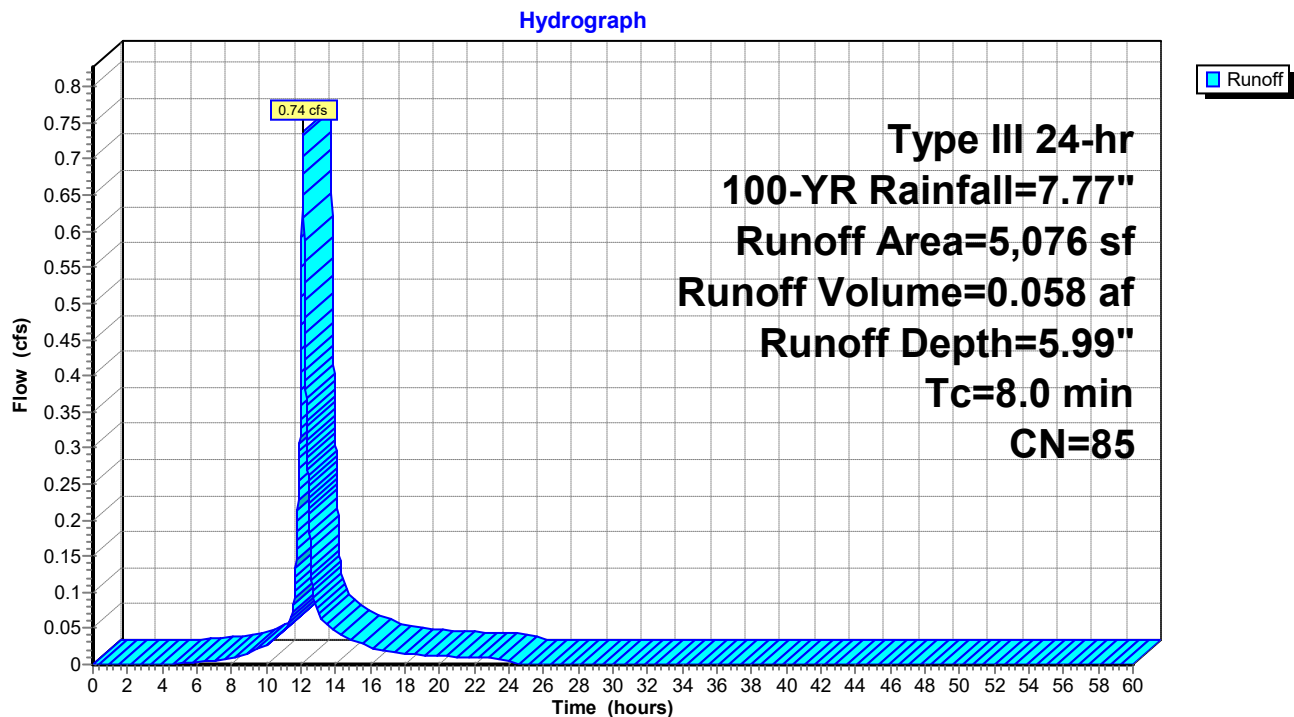
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Page 37

Subcatchment P3: P3



Subcatchment P4: Proposed Flow to DP1*



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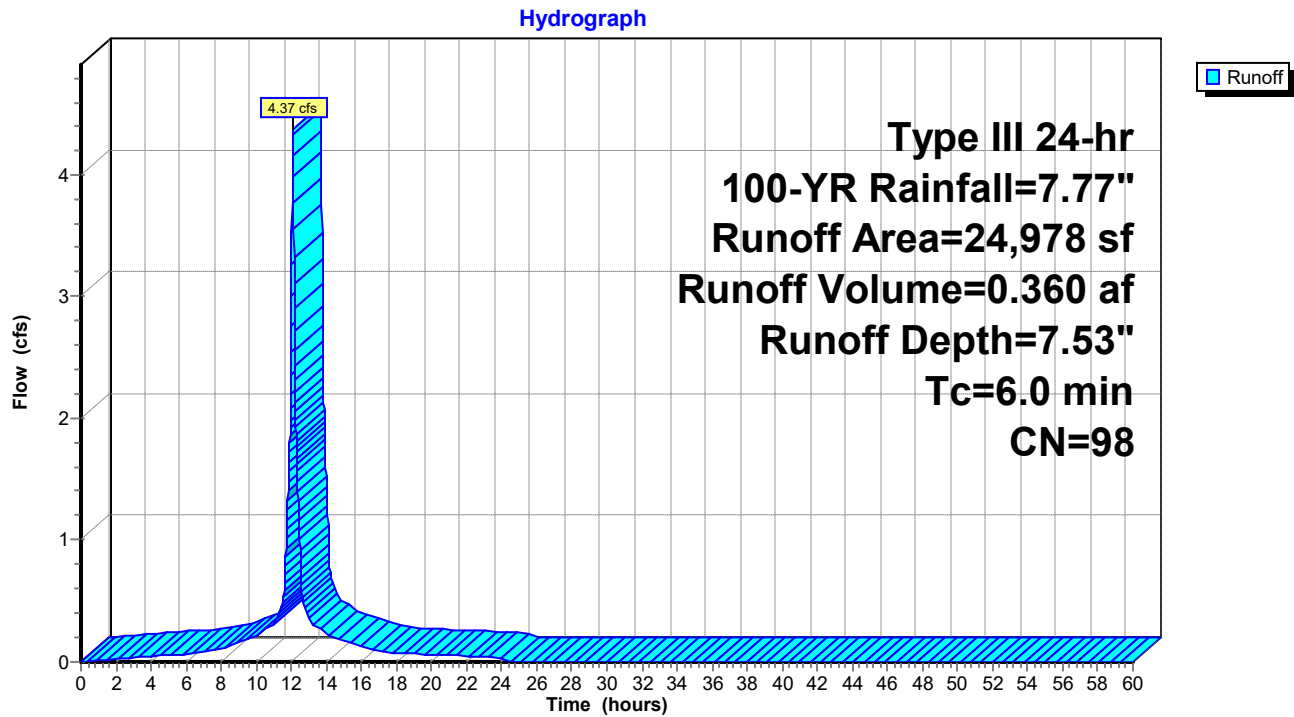
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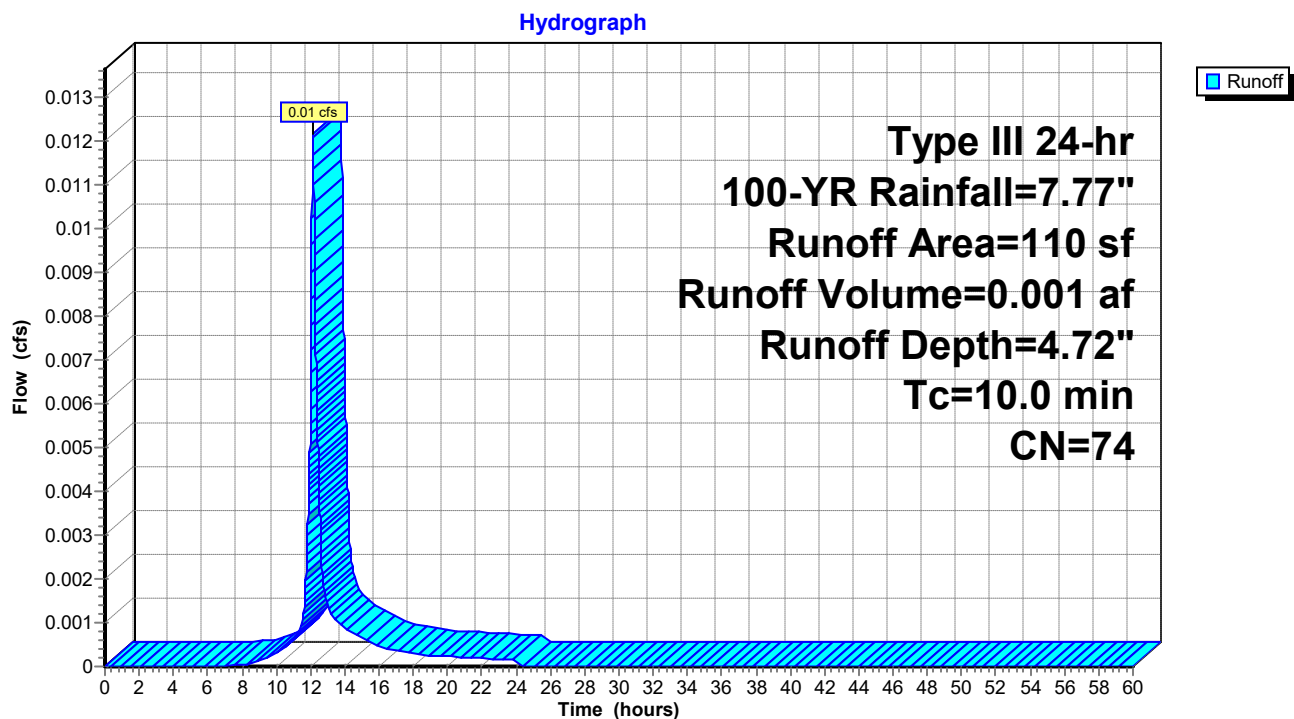
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Page 38

Subcatchment P5: P5



Subcatchment P6: P6



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Proposed Conditions

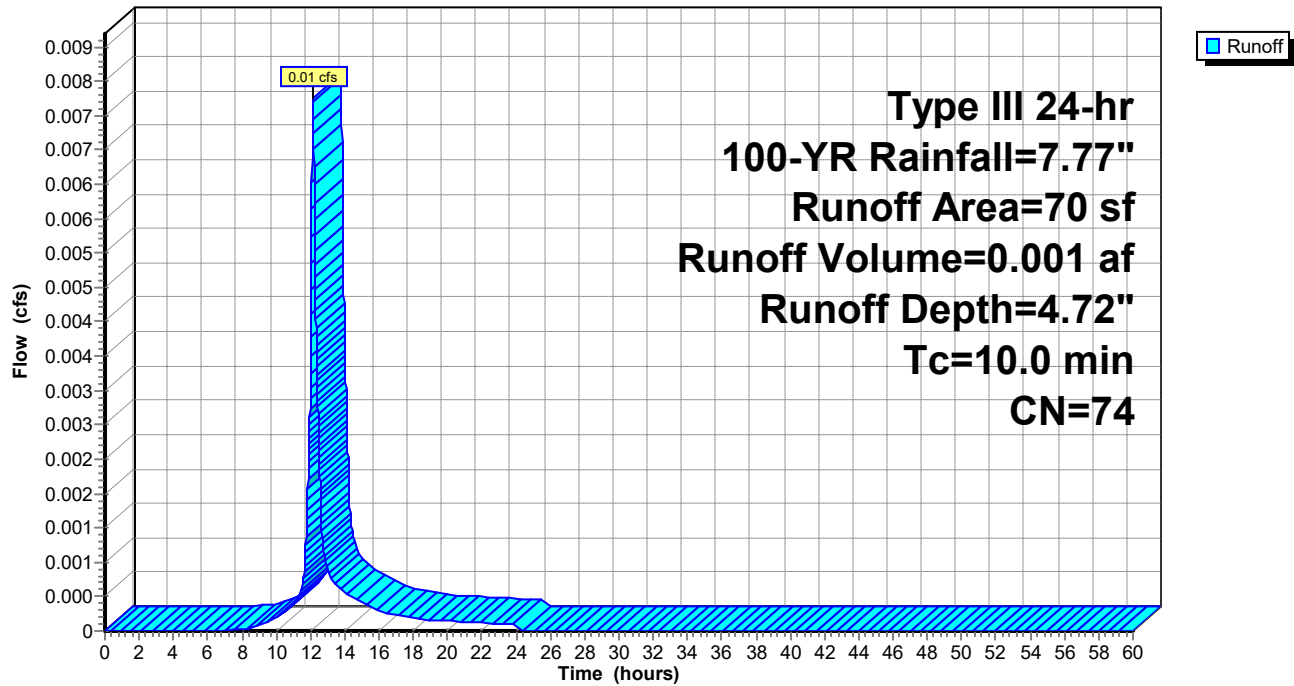
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Page 39

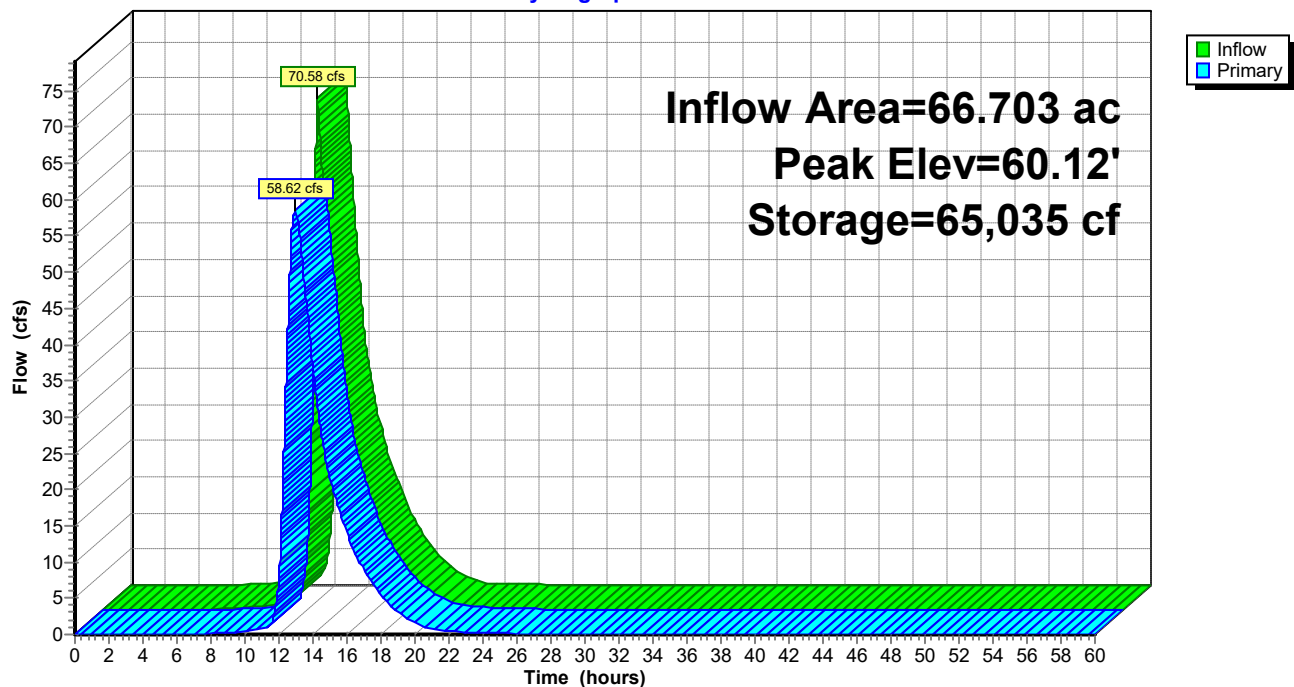
Subcatchment P7: P7

Hydrograph



Pond PP1: Proposed Water Quality Basin

Hydrograph



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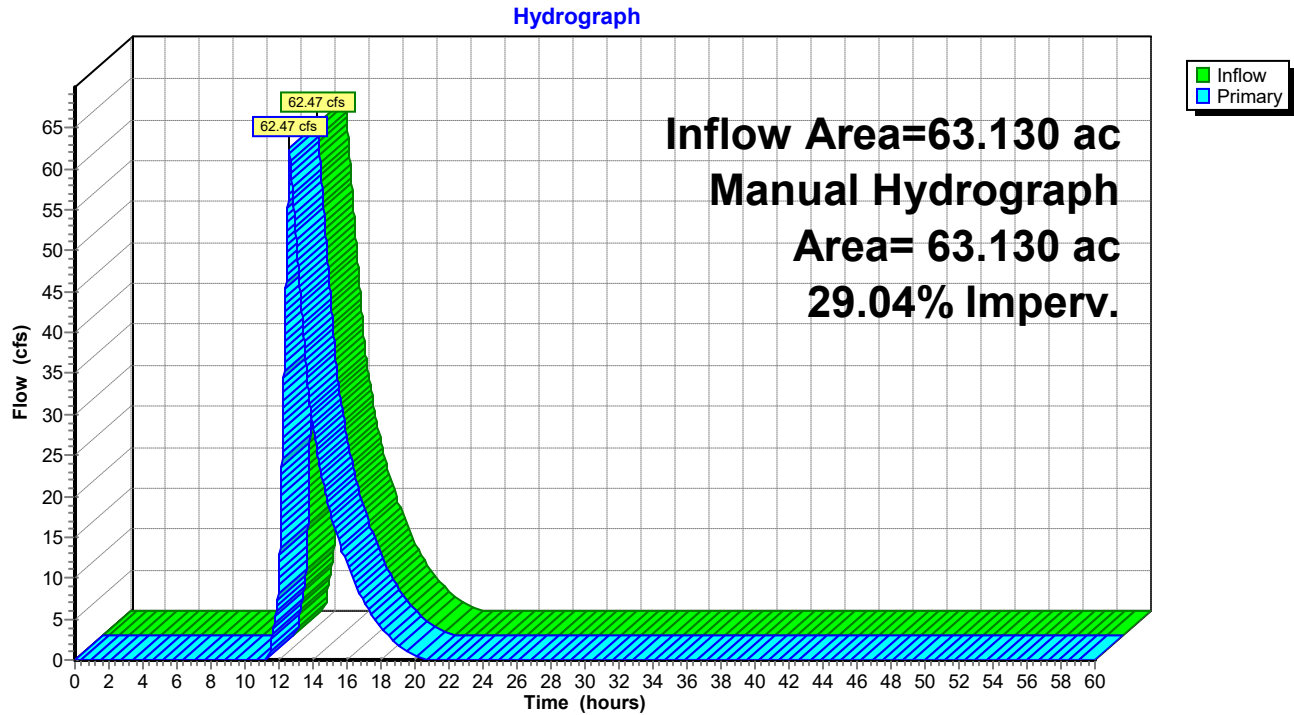
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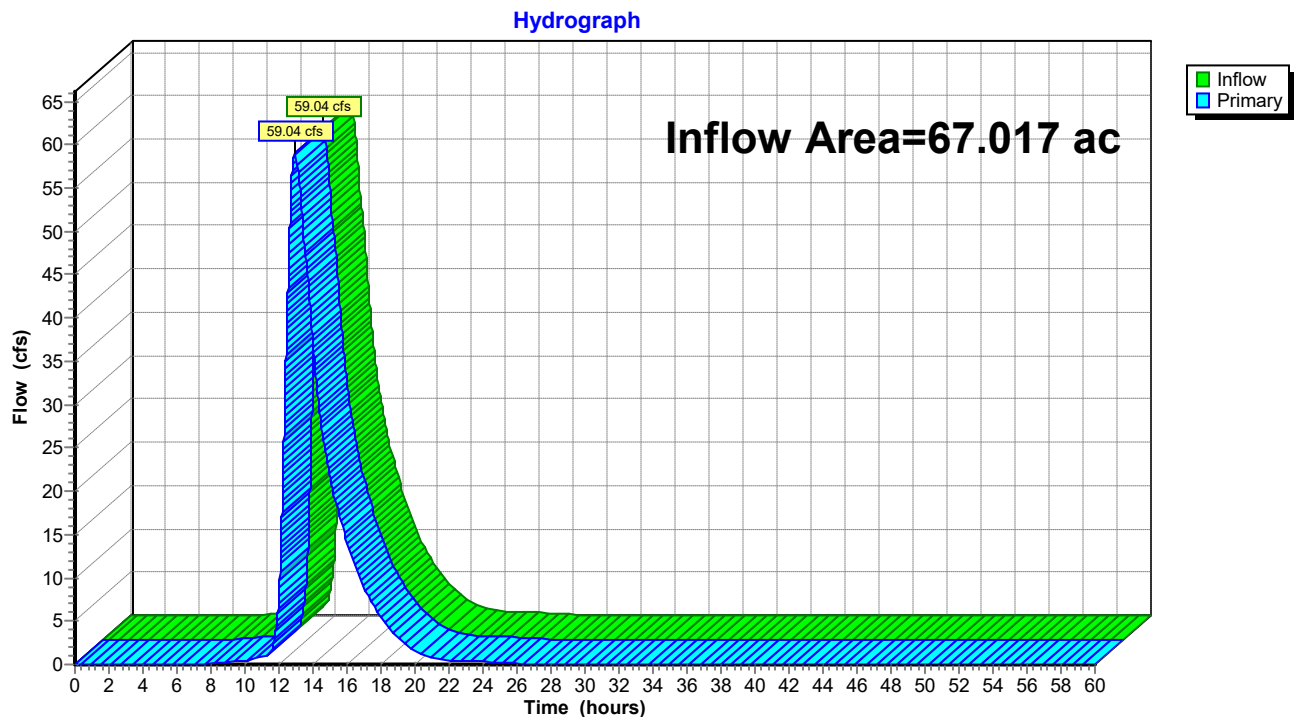
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Page 40

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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Page 41

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	Custom Stage Data (Prismatic) 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'	36.0" Round Culvert 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'	36.0" Round Culvert 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

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).

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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Contents

Preface	2
Soil Map	5
Soil Map.....	6
Legend.....	7
Map Unit Legend.....	8
Map Unit Descriptions.....	8
State of Connecticut.....	10
13—Walpole sandy loam, 0 to 3 percent slopes.....	10
701A—Ninigret fine sandy loam, 0 to 3 percent slopes.....	11
References	14

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

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%
Totals for Area of Interest		7.2	100.0%

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

Custom Soil Resource Report

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



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) ¹										
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)

¹ 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.

[Back to Top](#)

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) ¹										
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)

¹ 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.

[Back to Top](#)

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)	System (min)	Rain "I" (inch/hr)	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)				"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 (l)	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

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

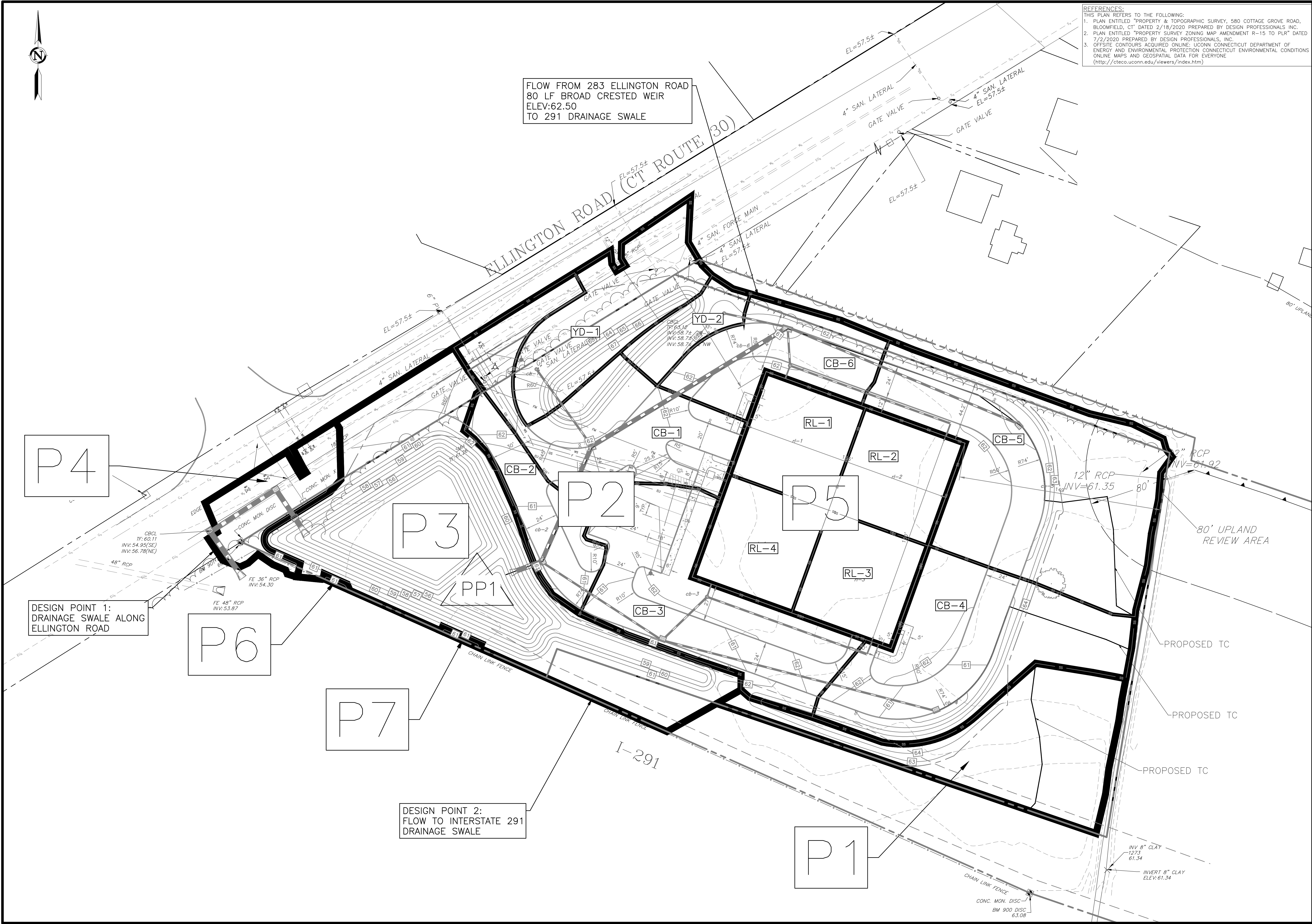
$WQV = (1")(0.488)(\underline{3.573} \text{ acres})/12 \text{ inches per foot}$

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

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://ctecdc.uconn.edu/viewers/index.htm>)

CLIMATE CONTROLLED
VERTICAL SELF
STORAGE FACILITY
249 ELLINGTON ROAD
SOUTH WINDSOR, CT 06074

NO.	DATE	REVISIONS	BY

PROPOSED
DRAINAGE AREA
MAP

SCALE: 0 50' 100' 200'
1" = 100'

SHEET
C-DA2
SHEET 2 OF 2

PREPARED FOR
Mr. Scott Spindler
Capital Holdings, LLC
Highland P.O. Box 172
Rochester, NY 03886

DESIGNED BY
MPV

CHECKED BY
DHL

21 EFFEY DRIVE
P.O. BOX 1167
SOUTH WINDSOR, CT 06074
860-291-9257 - F
www.designprofessionals.com

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