

September 9, 2016

Eric Randall, PE  
City of Smyrna Public Works – City Engineer  
2190 Atlanta Road  
Smyrna, GA 30080  
[erandall@smyrnaga.gov](mailto:erandall@smyrnaga.gov)

**RE: Preliminary Analysis of Existing Storm-Drain System Surrounding Bell Drive Development**

This letter serves to provide information for the preliminary analysis performed on the existing storm drain surrounding the Bell Drive Development. The reason for this study is to provide additional information to the city and developer on how the proposed development being considered may affect these existing systems, and what special provisions may need to be taken to ensure the development doesn't exacerbate problems related to stormwater. An exhibit is provided that shows existing structures analyzed with basin delineation to each structure.

**Approach:**

Basins were delineated using Cobb GIS. For the purpose of this study, the existing ponds located to the east of our project were ignored as their affect was assumed to be negligible to the size of area treated in relation to entire area. Flows were developed using SCS method. As shown in the attached model report, a min. Tc of 5 minutes were assumed for all basins except for the larger Basin 10, which had a calculated Tc of 11.1 minutes.

Using "Hydroflow Storm Sewers", the existing storm systems were modeled, inputting known tops and invert elevations to provide correct slopes for pipes. Materials were modeled with appropriate n-values (0.024 for metal pipes and 0.012 for concrete and dual wall HDPE).

Hydroflow, using the mannings equations, calculates the full-flow capacity of each pipe, taking into account the slope and mannings roughness coefficients (n-values. Below is a summary of the 25-year actual flows (developed from SCS model) vs. the full-flow capacity of each pipe.

Pipe	Actual Flow (cfs)	Design Full-Flow Capacity (cfs)	Extra Capacity (Full-flow - actual flow) (cfs)
2-1	225.18	96.53	-128.65
3-2	149.24	41.66	-107.58
4-3	140.52	29.2	-111.32
6-5	33.5	18.82	-14.68
7-6	70.59	20.55	-50.04
9-8	77.48	16.05	-61.43
10-9	70.59	20.55	-50.04

Based on this analysis, every pipe studied is considerably undersized, especially the pipe system from structure 1 to 4, showing over 100 cfs over design capacity for these pipes.

Please feel free to call to discuss further. Thanks,

A handwritten signature in black ink, appearing to read "Kelly Davis". The signature is fluid and cursive, with the first name "Kelly" and last name "Davis" clearly distinguishable.

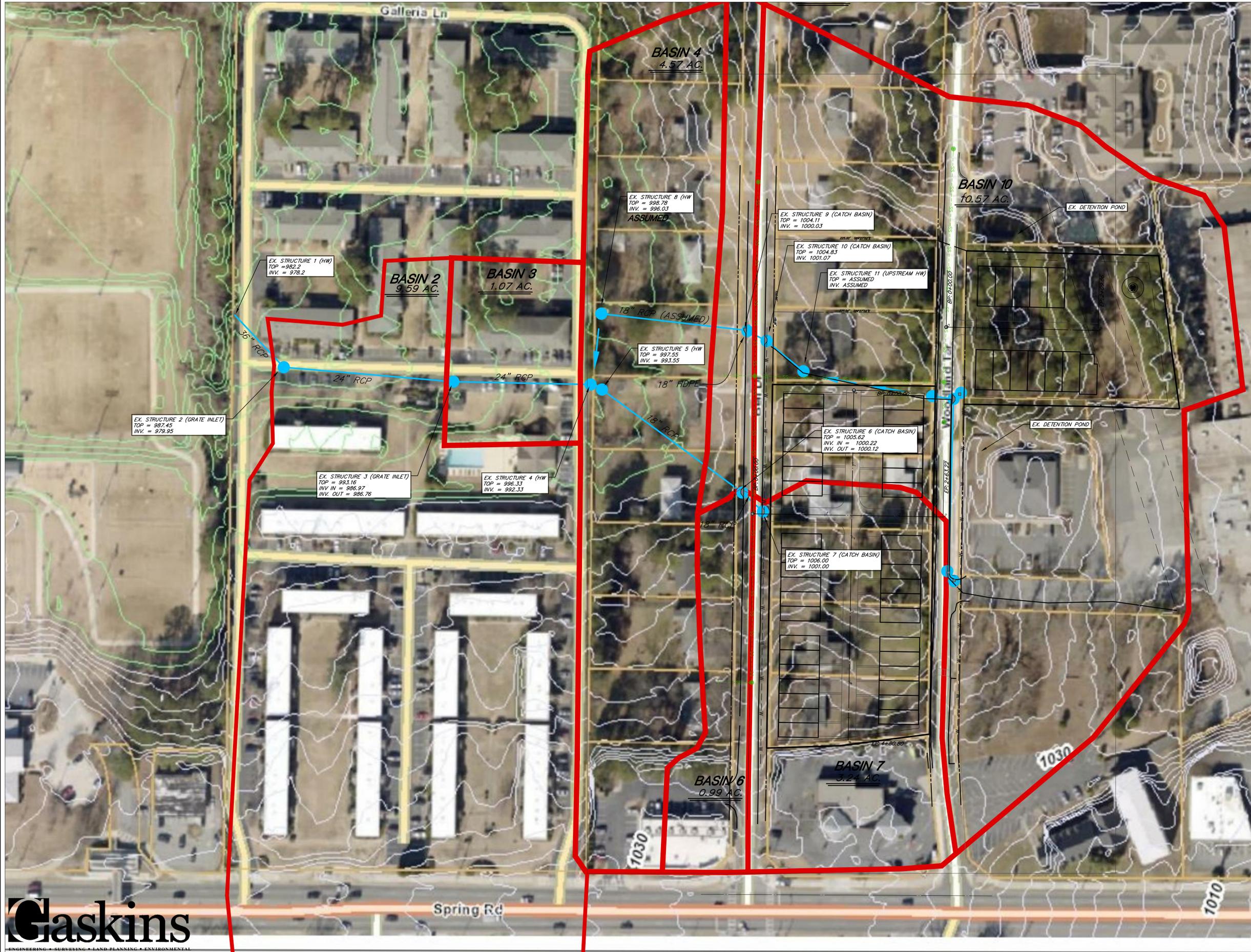
**Kelly Davis, PE**



*Confidential Information*

# BELL DR DEVELOPMENT

## HYDROLOGY STUDY MAP



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# Hydrograph Return Period Recap

Hydranow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	32.82	42.76	-----	52.73	62.70	75.94	85.83	95.69	BASIN 2 (structure 2)
2	SCS Runoff	-----	3.923	5.036	-----	6.147	7.254	8.723	9.819	10.91	BASIN 3 (structure 3)
3	SCS Runoff	-----	15.64	20.38	-----	25.13	29.88	36.19	40.90	45.60	Basin 4
4	SCS Runoff	-----	3.388	4.414	-----	5.444	6.472	7.839	8.861	9.878	Basin 6 (structure 6)
5	SCS Runoff	-----	11.09	14.45	-----	17.82	21.18	25.66	29.00	32.33	Basin 7 (structure 7)
6	SCS Runoff	-----	2.978	3.879	-----	4.784	5.688	6.889	7.787	8.681	Basin 9
7	SCS Runoff	-----	28.90	38.40	-----	48.02	57.69	70.59	80.24	89.88	Basin 10
8	Combine	3, 4, 5, 6, 7	59.31	77.91	-----	96.67	115.48	140.52	159.25	177.93	Structure 4

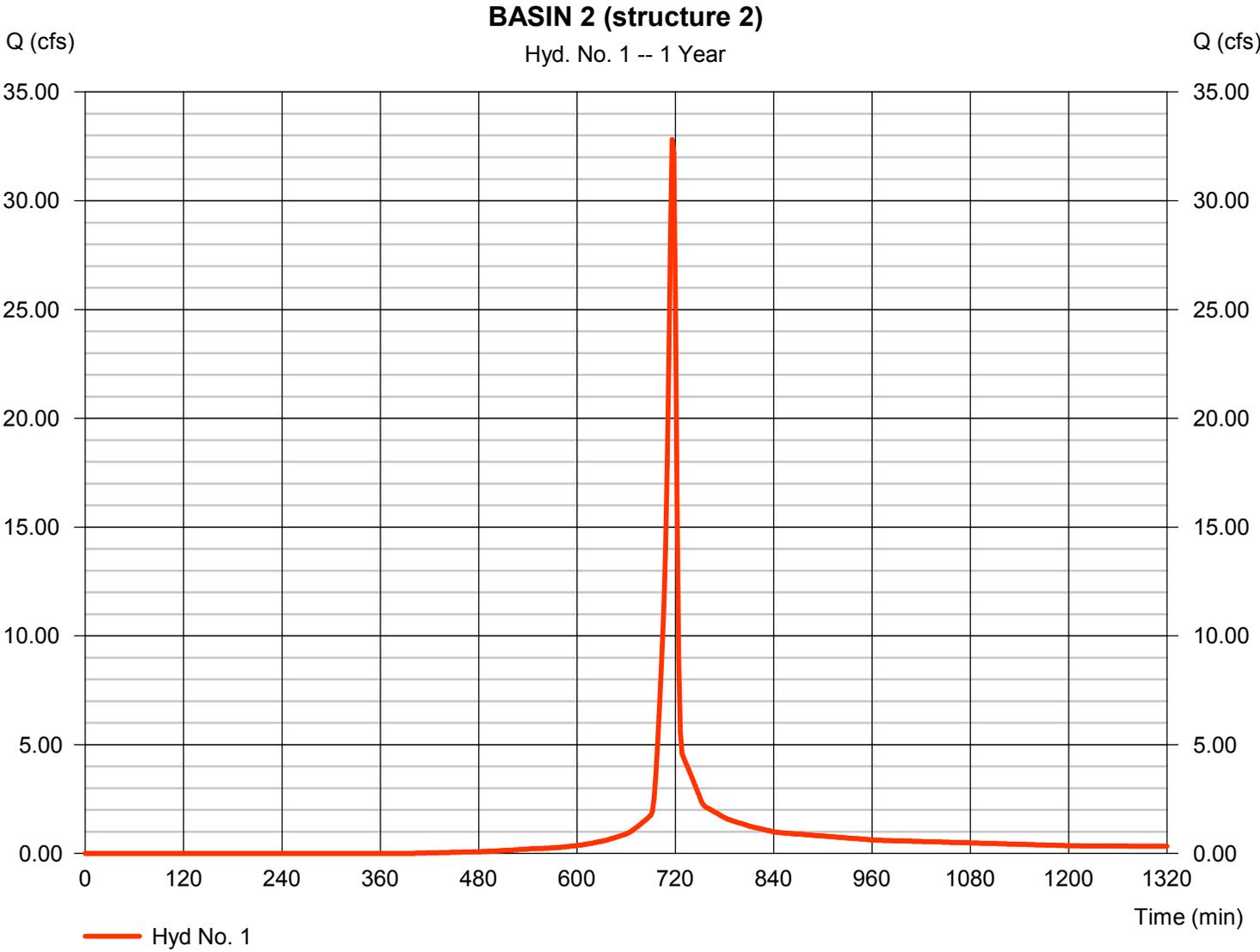


# Hydrograph Report

## Hyd. No. 1

### BASIN 2 (structure 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 32.82 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.541 acft
Drainage area	= 9.590 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

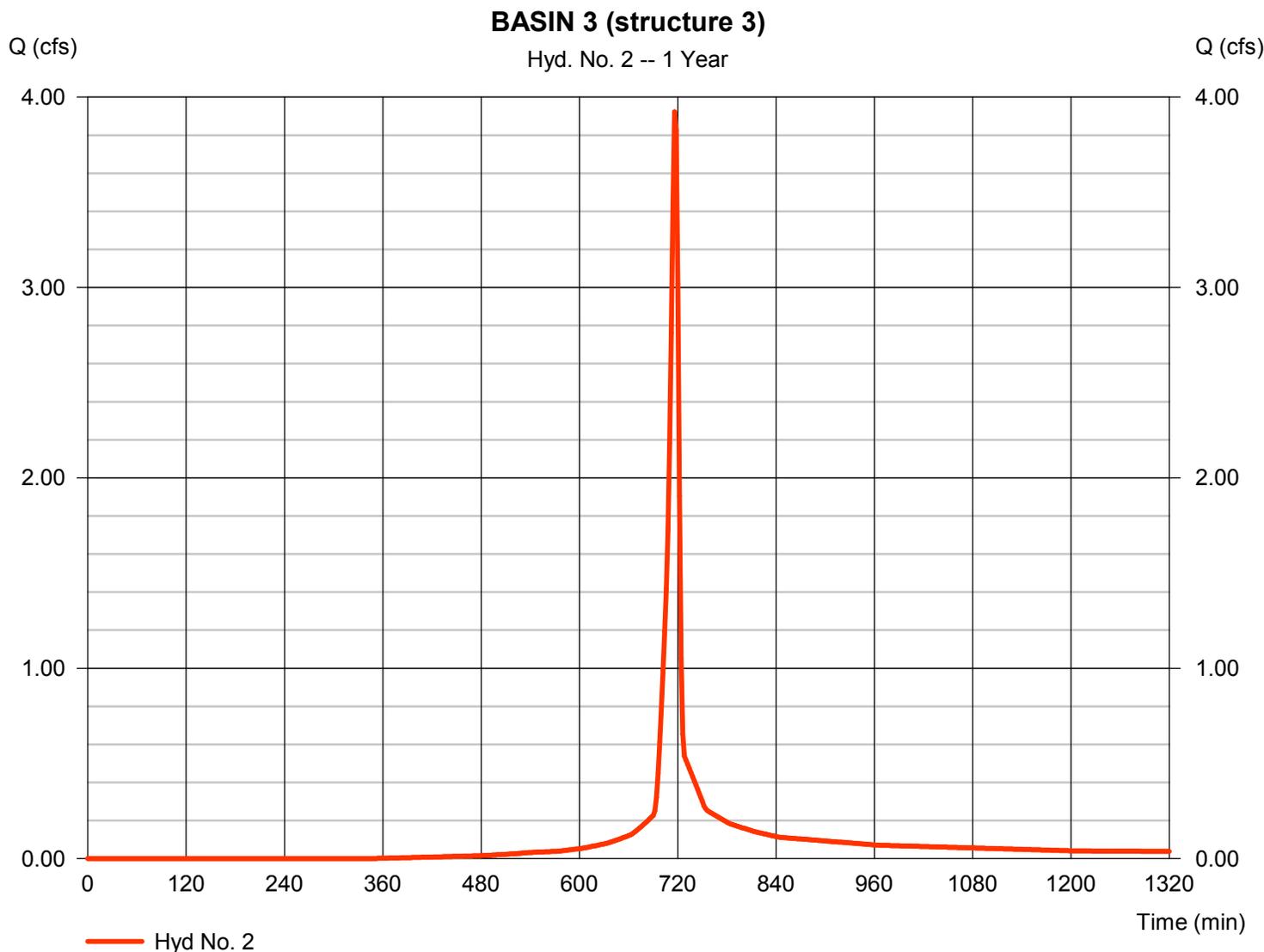


# Hydrograph Report

## Hyd. No. 2

BASIN 3 (structure 3)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.923 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.186 acft
Drainage area	= 1.070 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

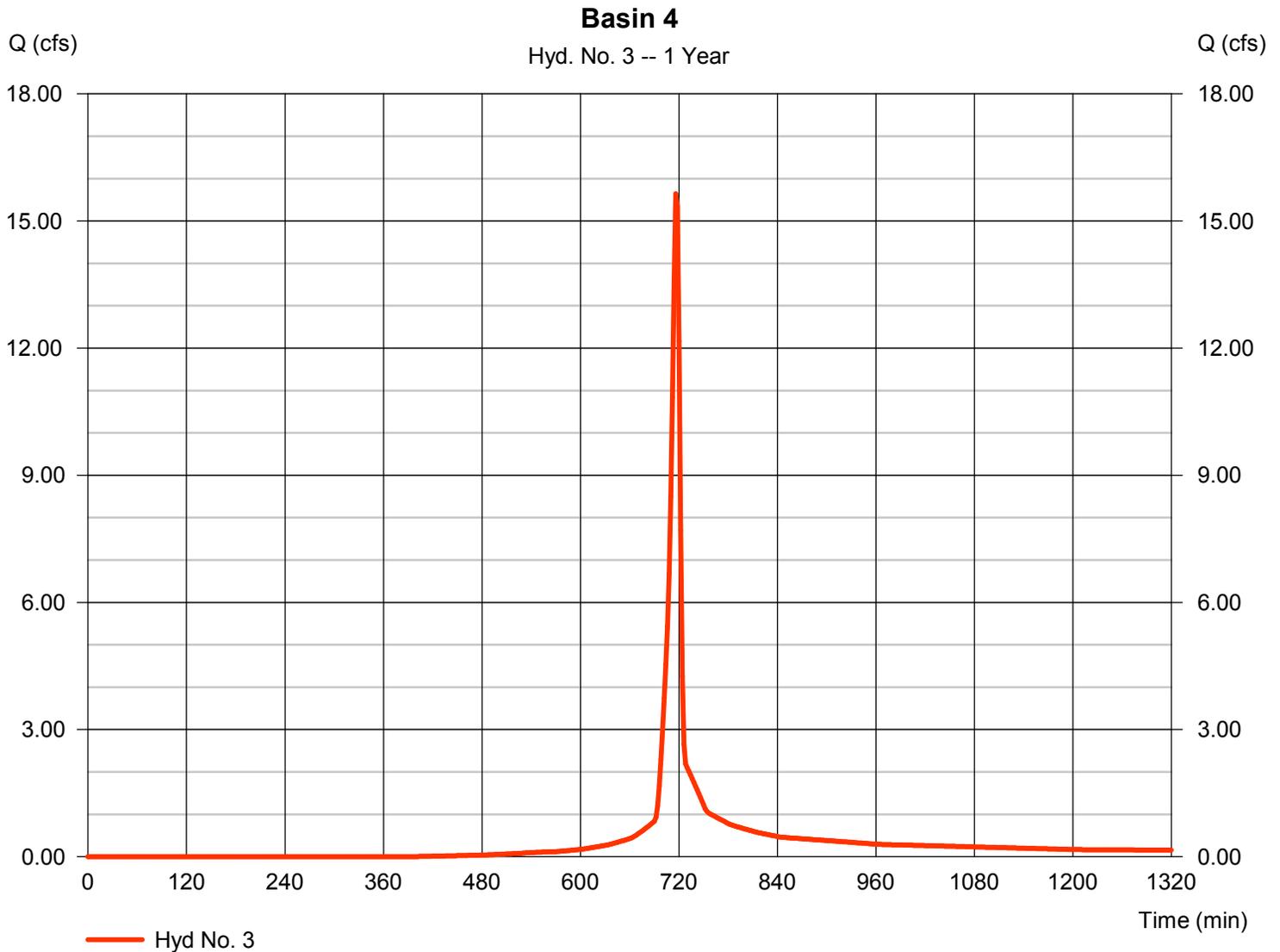


# Hydrograph Report

## Hyd. No. 3

### Basin 4

Hydrograph type	= SCS Runoff	Peak discharge	= 15.64 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.734 acft
Drainage area	= 4.570 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

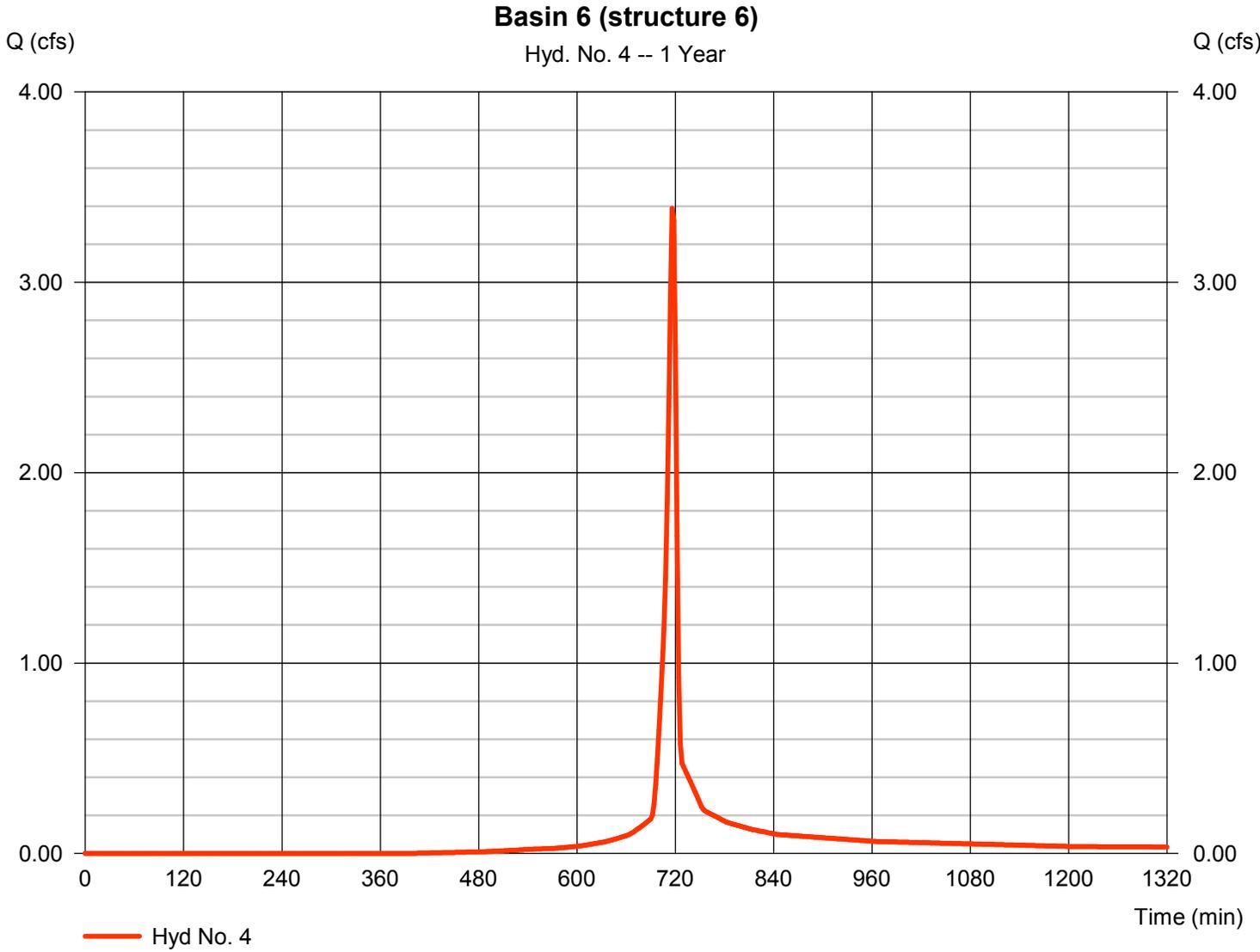


# Hydrograph Report

## Hyd. No. 4

Basin 6 (structure 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.388 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.159 acft
Drainage area	= 0.990 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

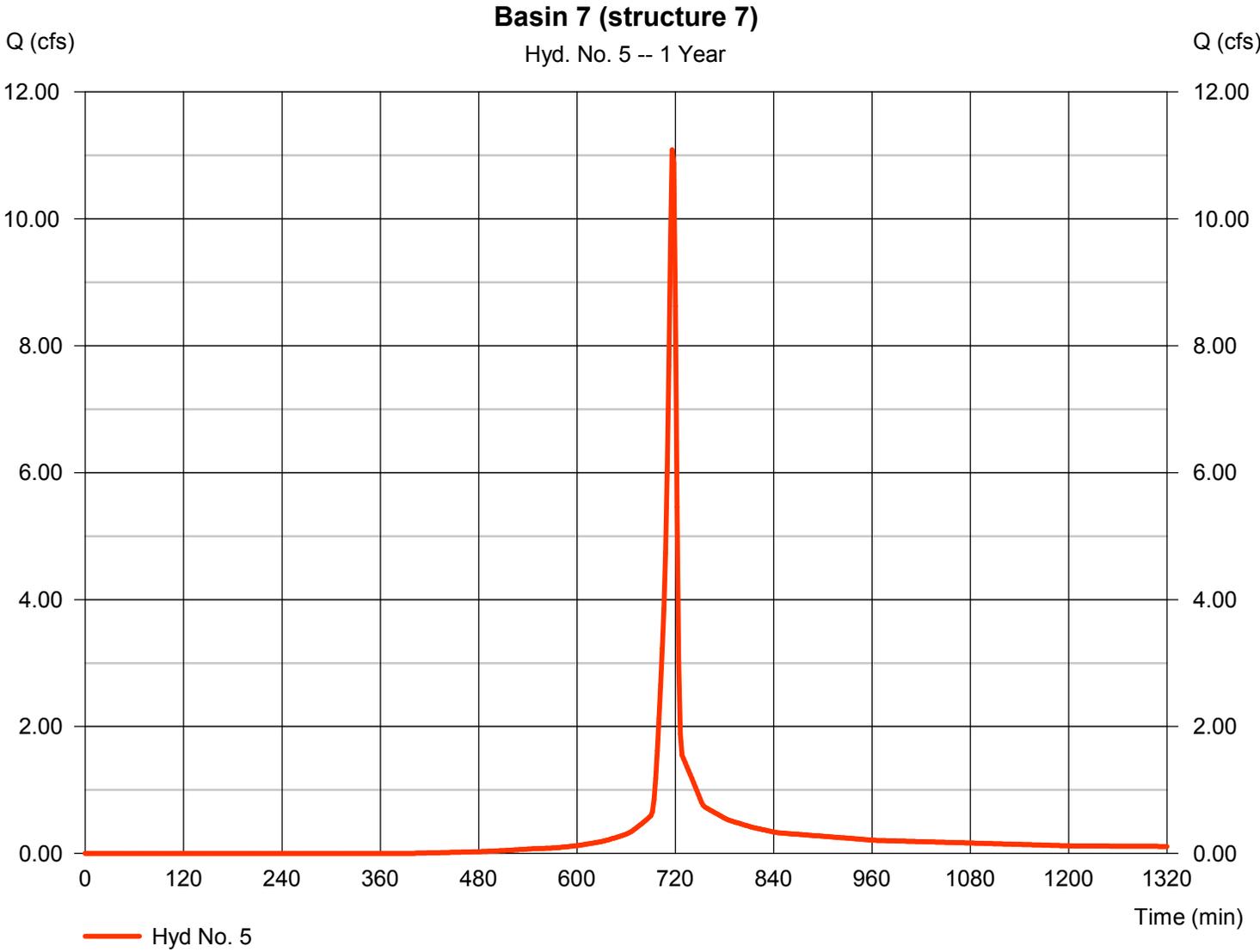


# Hydrograph Report

## Hyd. No. 5

Basin 7 (structure 7)

Hydrograph type	= SCS Runoff	Peak discharge	= 11.09 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.521 acft
Drainage area	= 3.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

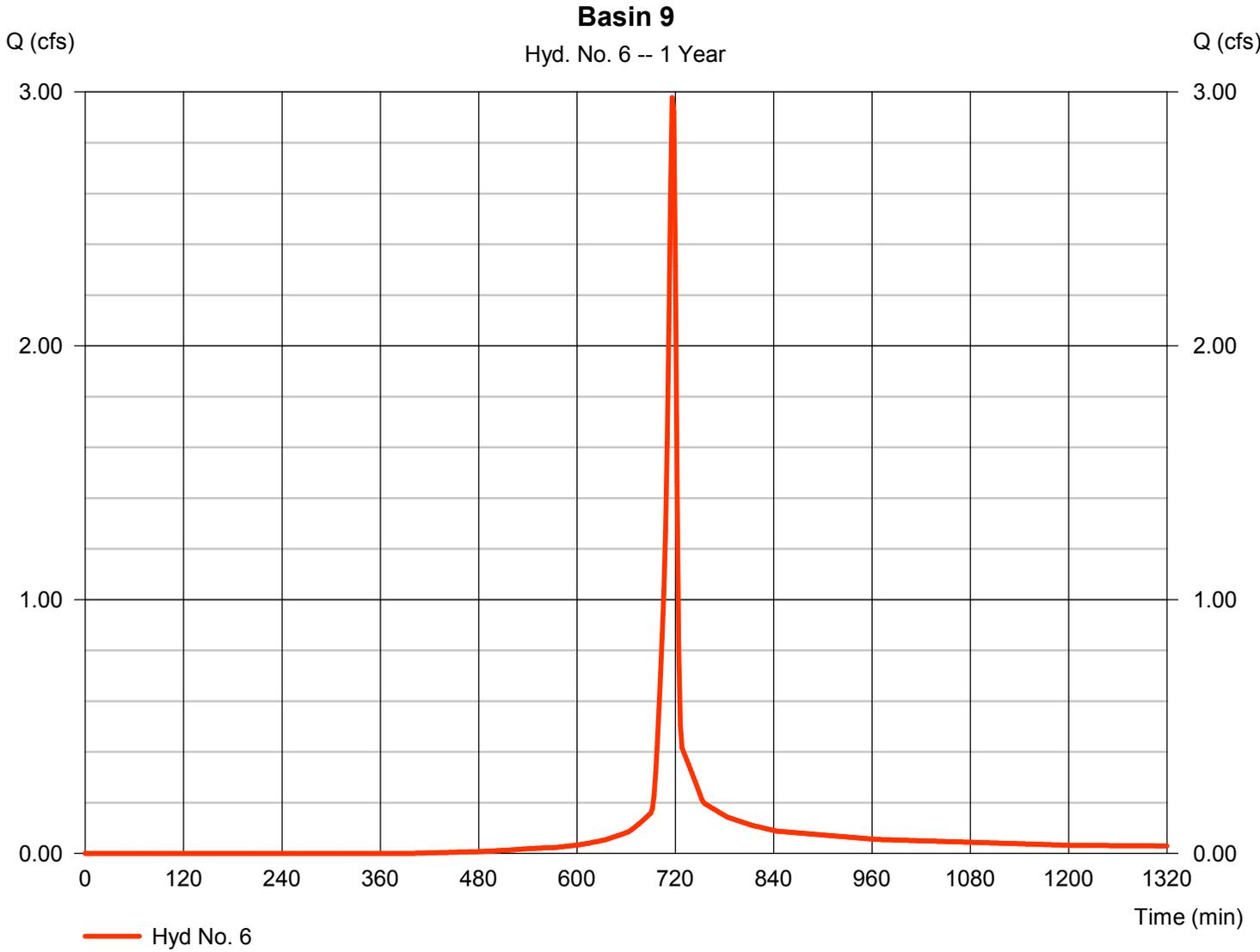


# Hydrograph Report

## Hyd. No. 6

### Basin 9

Hydrograph type	= SCS Runoff	Peak discharge	= 2.978 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.140 acft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

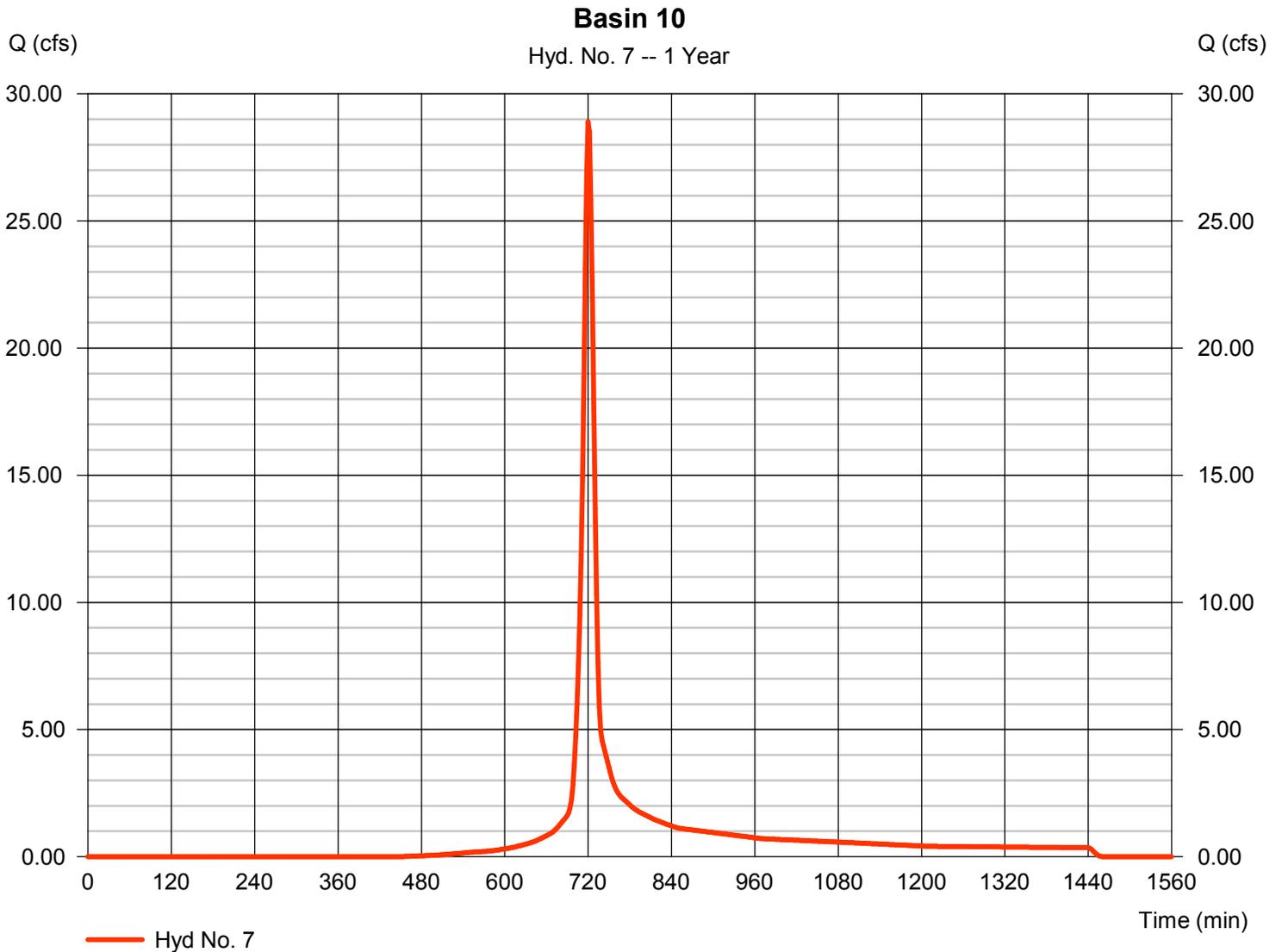
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## Hyd. No. 7

Basin 10

Hydrograph type	= SCS Runoff	Peak discharge	= 28.90 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 1.721 acft
Drainage area	= 10.570 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.10 min
Total precip.	= 3.36 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

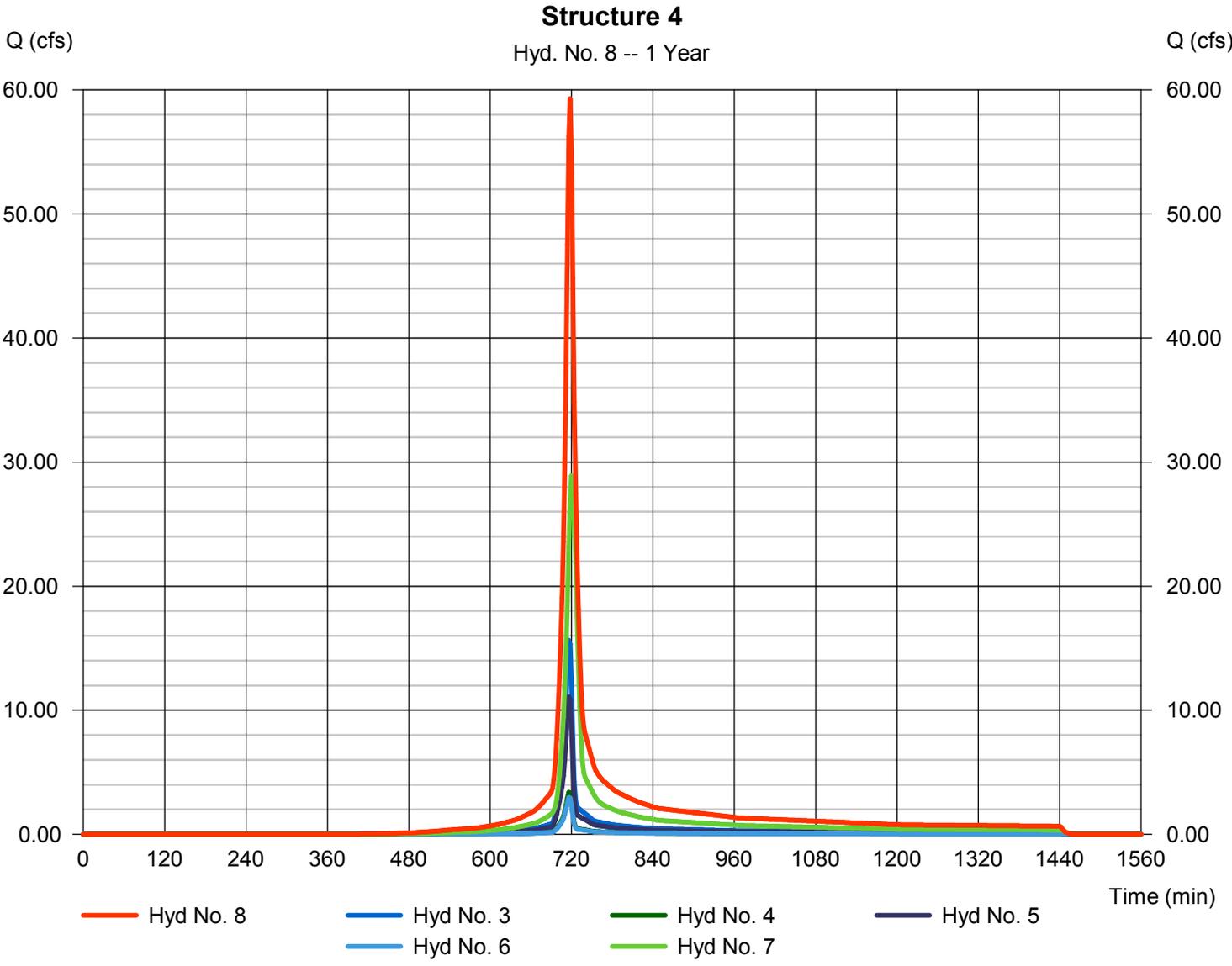


# Hydrograph Report

## Hyd. No. 8

Structure 4

Hydrograph type	= Combine	Peak discharge	= 59.31 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3.275 acft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 20.240 ac



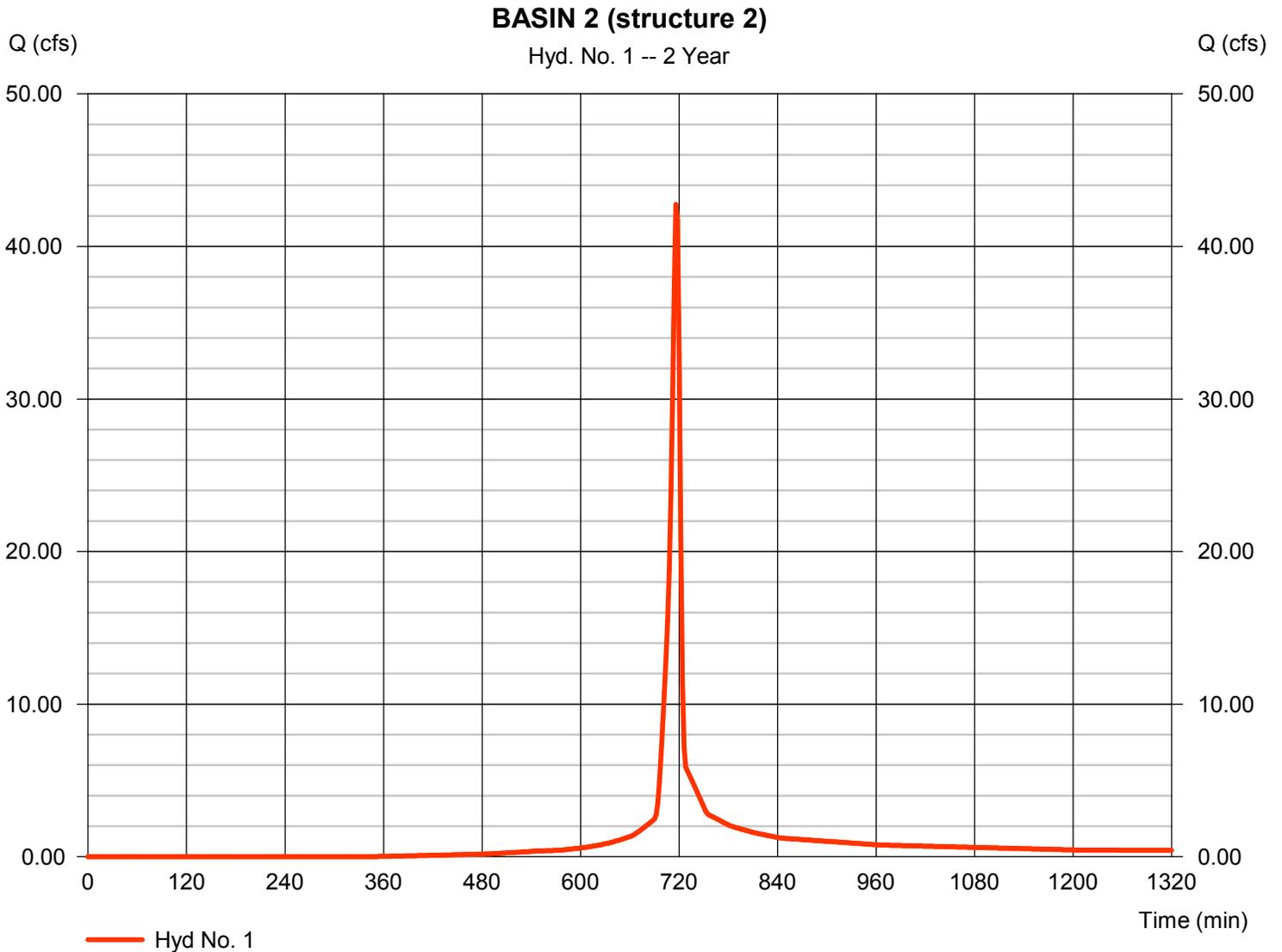


# Hydrograph Report

## Hyd. No. 1

### BASIN 2 (structure 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 42.76 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 2.030 acft
Drainage area	= 9.590 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

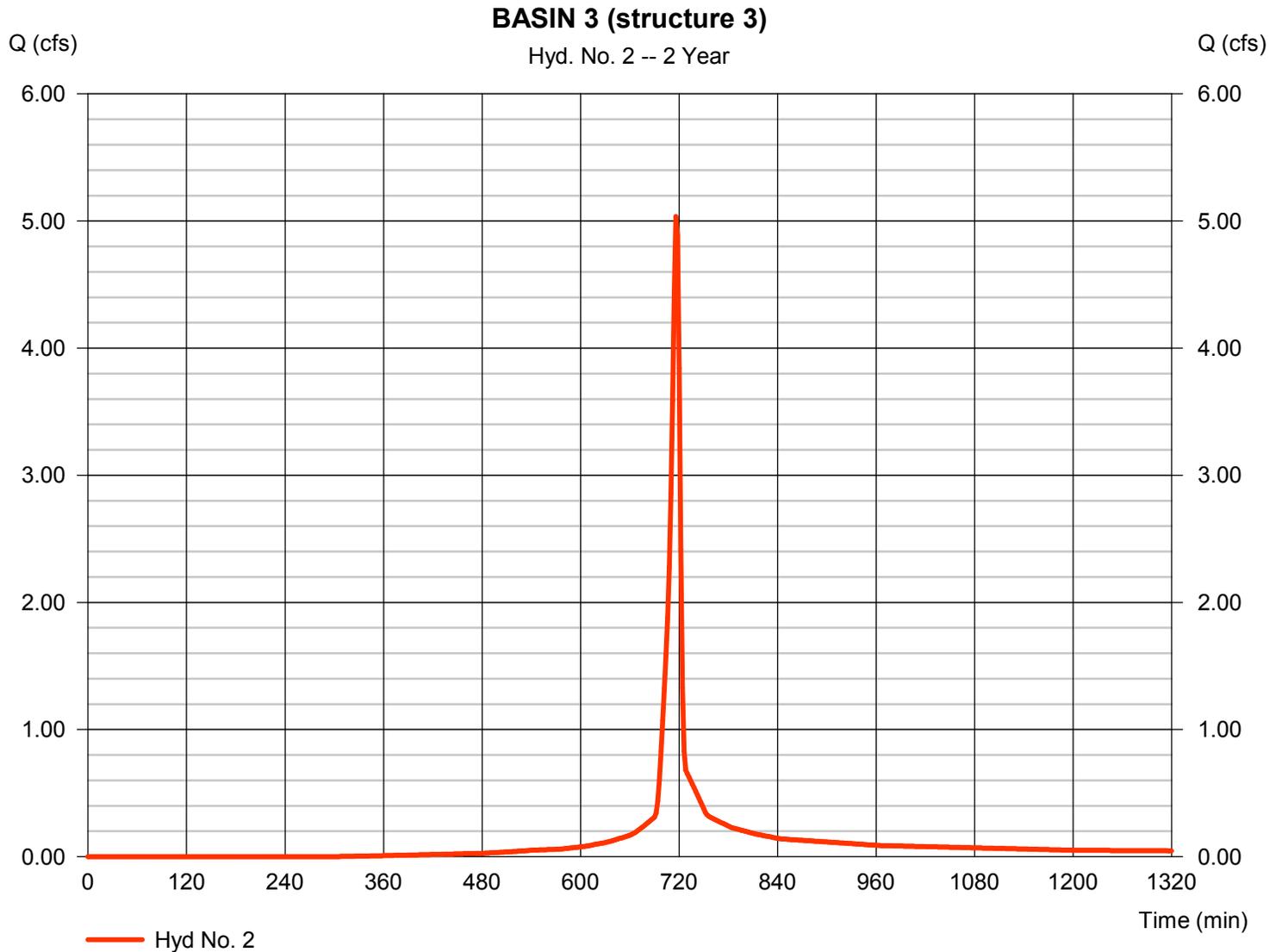


# Hydrograph Report

## Hyd. No. 2

BASIN 3 (structure 3)

Hydrograph type	= SCS Runoff	Peak discharge	= 5.036 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.242 acft
Drainage area	= 1.070 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

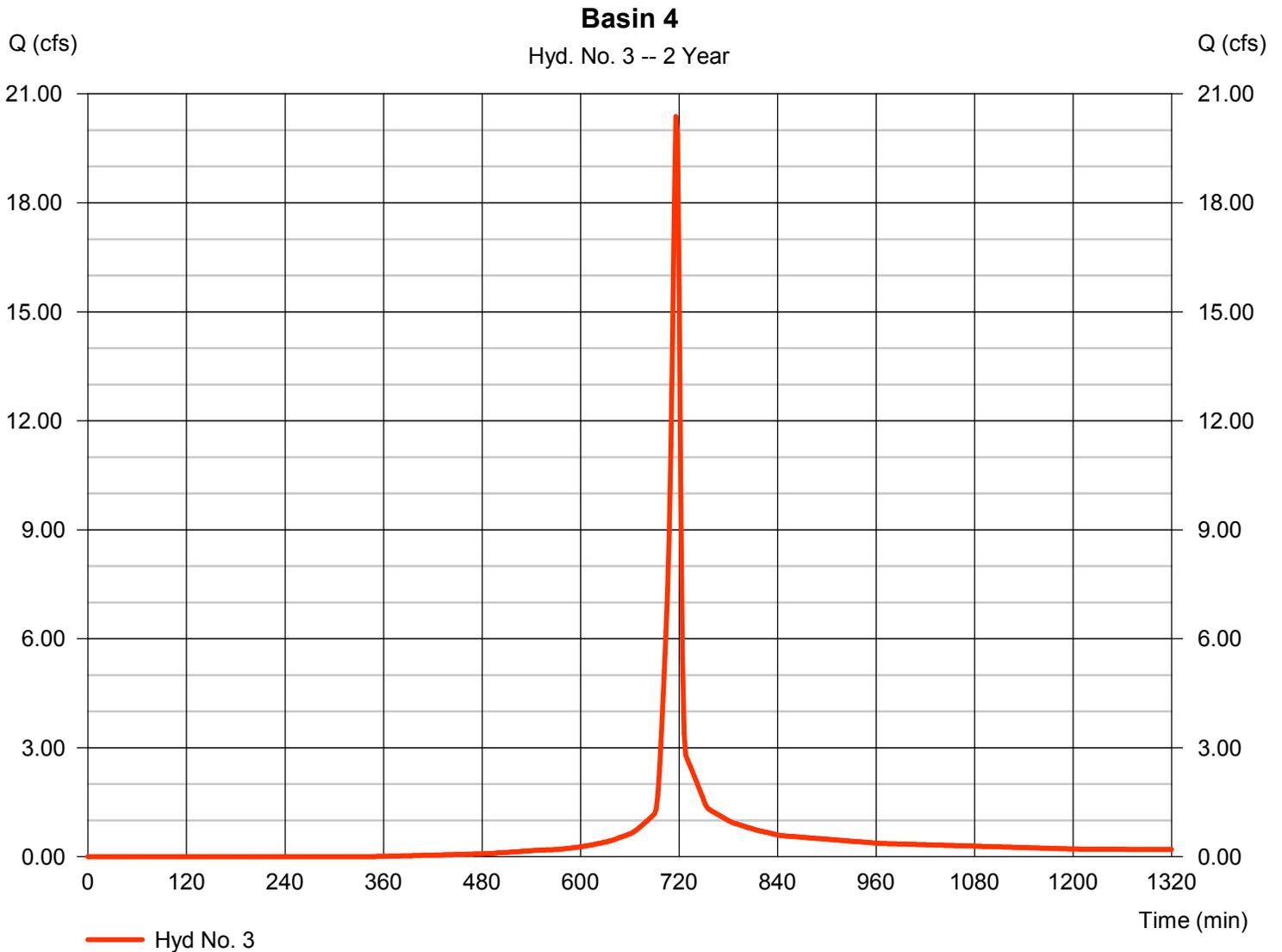
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## Hyd. No. 3

### Basin 4

Hydrograph type	= SCS Runoff	Peak discharge	= 20.38 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.968 acft
Drainage area	= 4.570 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

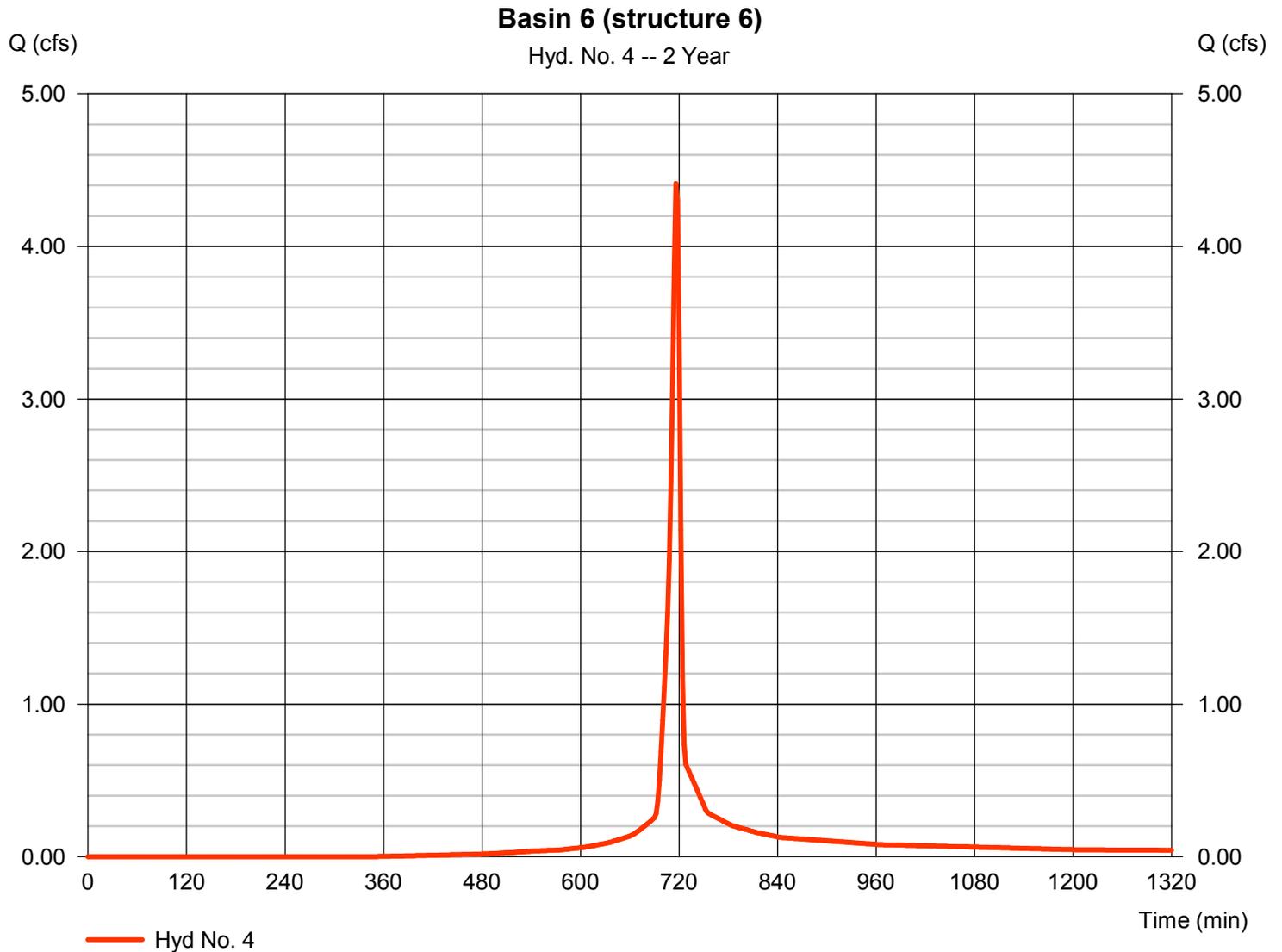


# Hydrograph Report

## Hyd. No. 4

Basin 6 (structure 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.414 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.210 acft
Drainage area	= 0.990 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

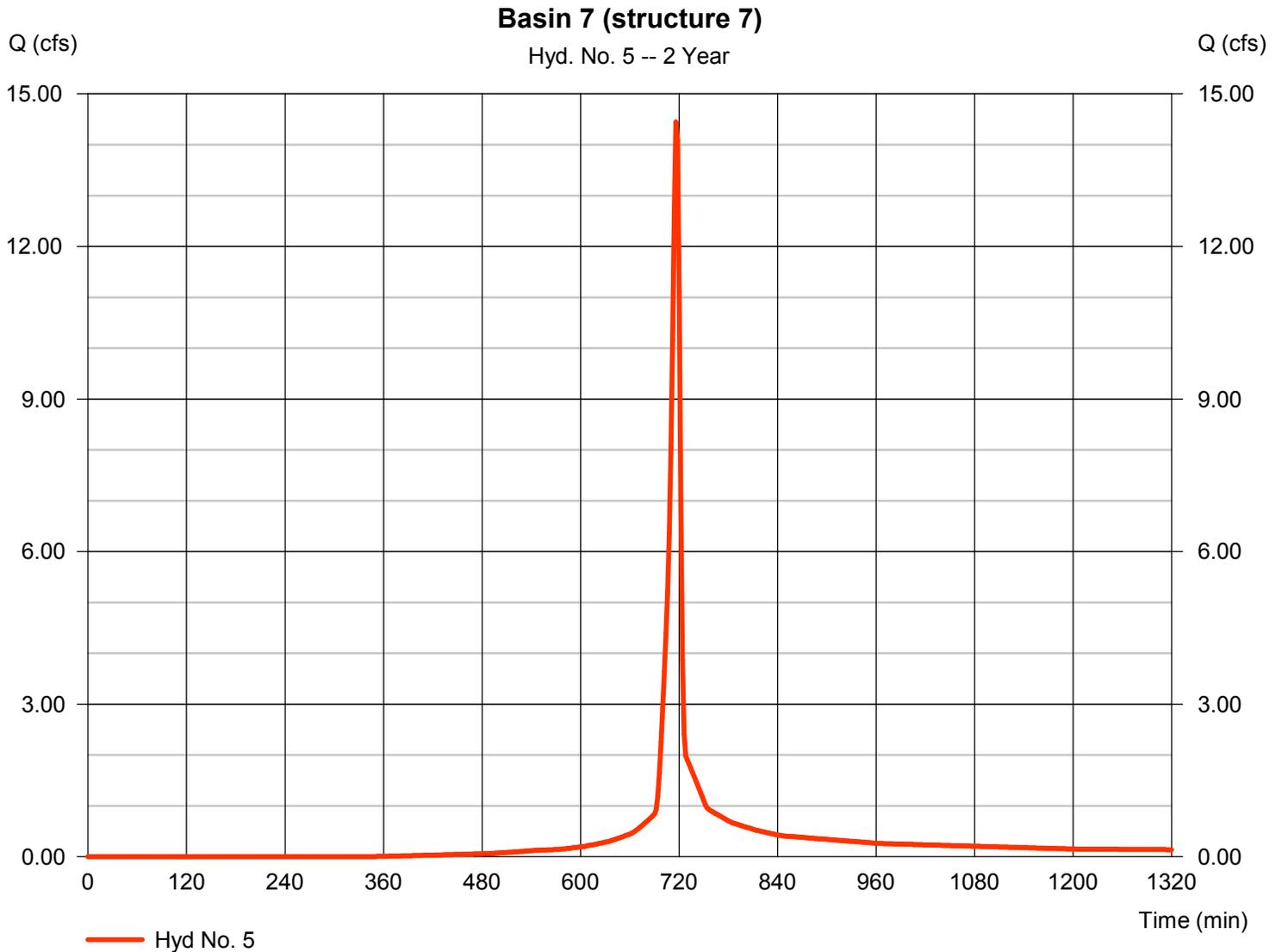


# Hydrograph Report

## Hyd. No. 5

Basin 7 (structure 7)

Hydrograph type	= SCS Runoff	Peak discharge	= 14.45 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.686 acft
Drainage area	= 3.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

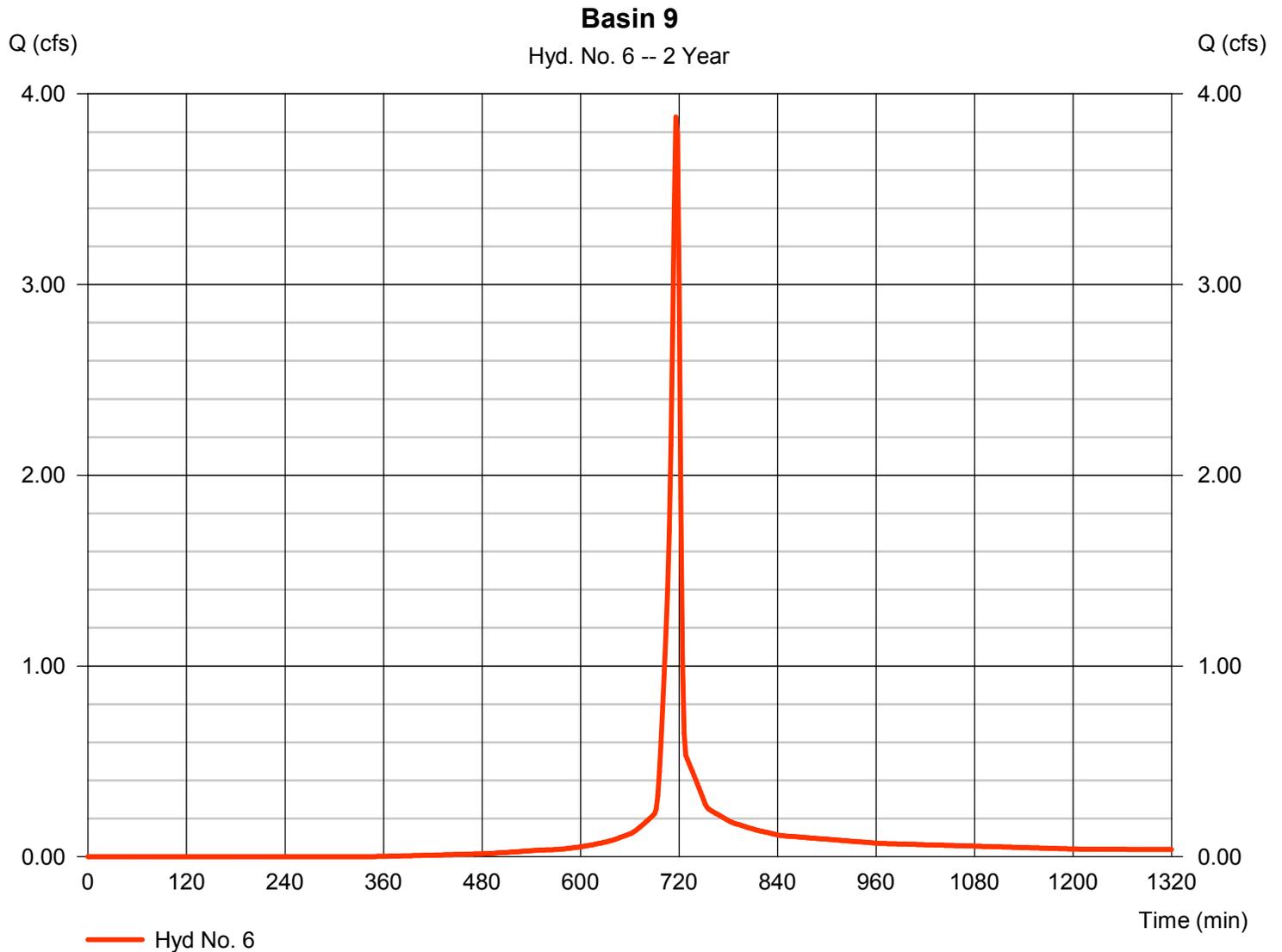
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## Hyd. No. 6

Basin 9

Hydrograph type	= SCS Runoff	Peak discharge	= 3.879 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.184 acft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

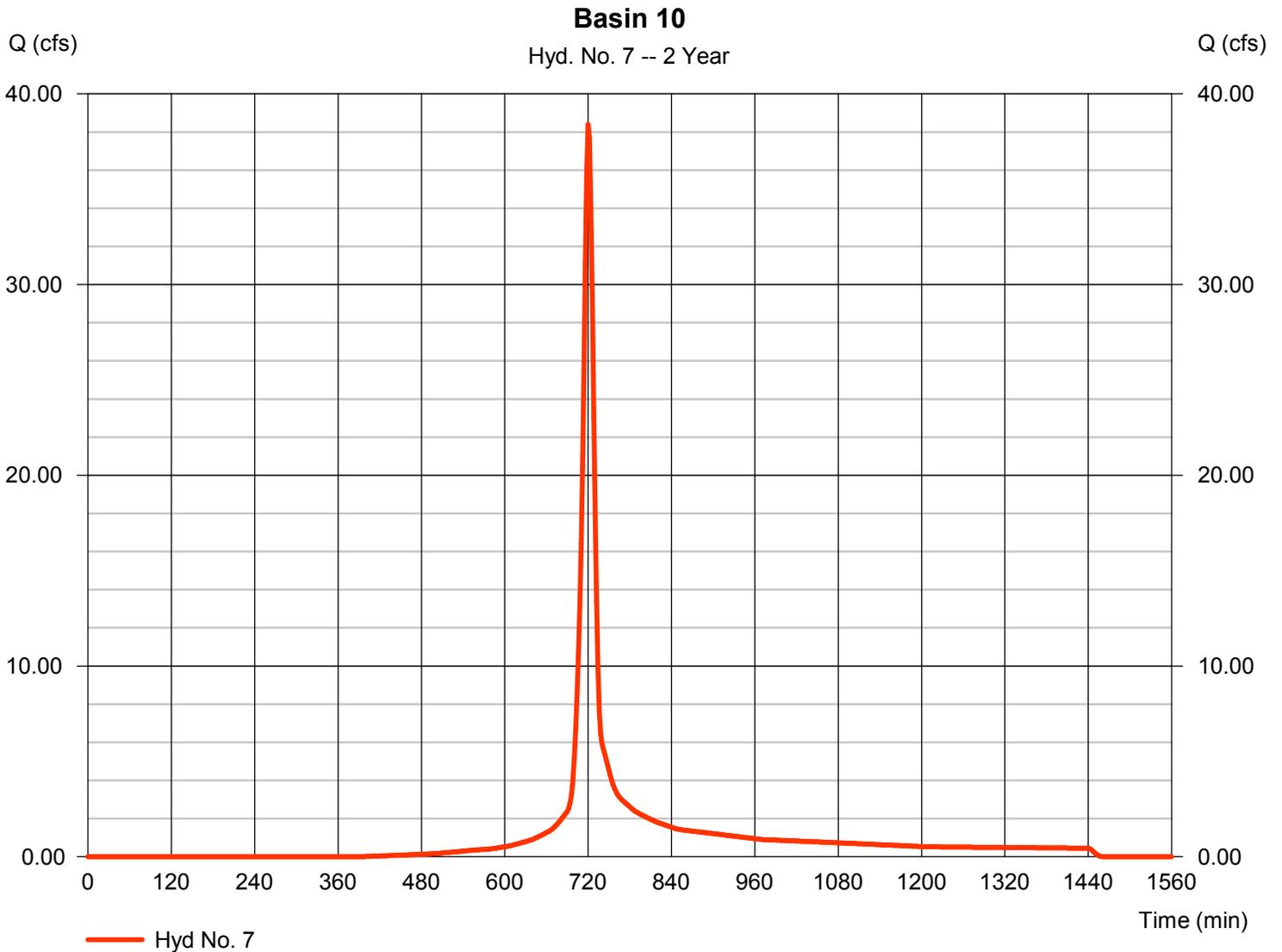
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## Hyd. No. 7

Basin 10

Hydrograph type	= SCS Runoff	Peak discharge	= 38.40 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2.298 acft
Drainage area	= 10.570 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.10 min
Total precip.	= 4.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

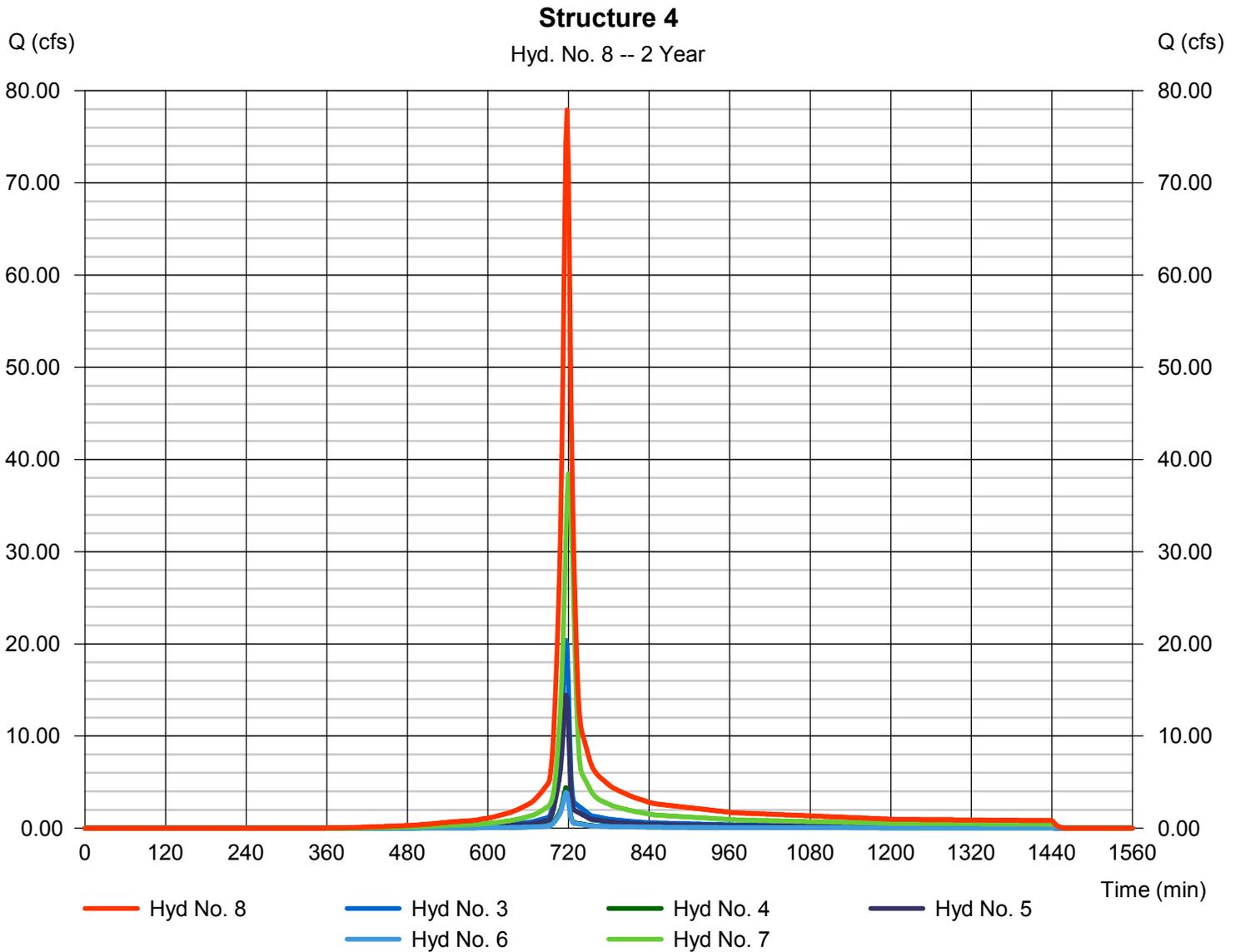
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## Hyd. No. 8

Structure 4

Hydrograph type	= Combine	Peak discharge	= 77.91 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4.345 acft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 20.240 ac



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

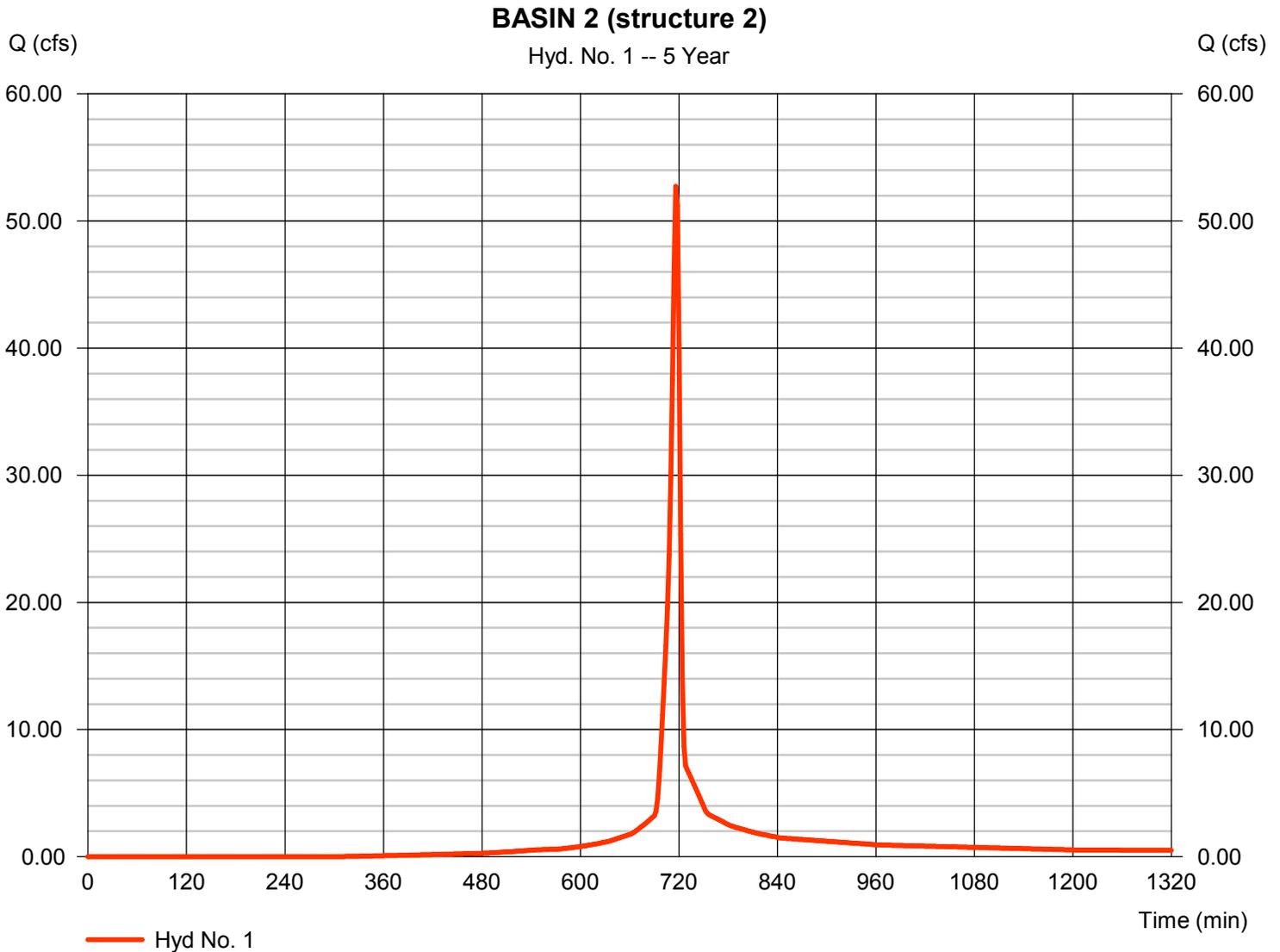
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	52.73	2	716	2.532	----	----	----	BASIN 2 (structure 2)
2	SCS Runoff	6.147	2	716	0.299	----	----	----	BASIN 3 (structure 3)
3	SCS Runoff	25.13	2	716	1.207	----	----	----	Basin 4
4	SCS Runoff	5.444	2	716	0.261	----	----	----	Basin 6 (structure 6)
5	SCS Runoff	17.82	2	716	0.855	----	----	----	Basin 7 (structure 7)
6	SCS Runoff	4.784	2	716	0.230	----	----	----	Basin 9
7	SCS Runoff	48.02	2	720	2.892	----	----	----	Basin 10
8	Combine	96.67	2	718	5.445	3, 4, 5, 6, 7	----	----	Structure 4
P:\T113 (Traton)\_DUE DILIGENCE\Bell Drive Development\Bell Ave Hydro					P:\T113 (Traton)\_DUE DILIGENCE\Bell Drive Development\Bell Ave Hydro\Bell Ave Hydro Analysis (9.1.16).gpw				

# Hydrograph Report

## Hyd. No. 1

### BASIN 2 (structure 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 52.73 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 2.532 acft
Drainage area	= 9.590 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

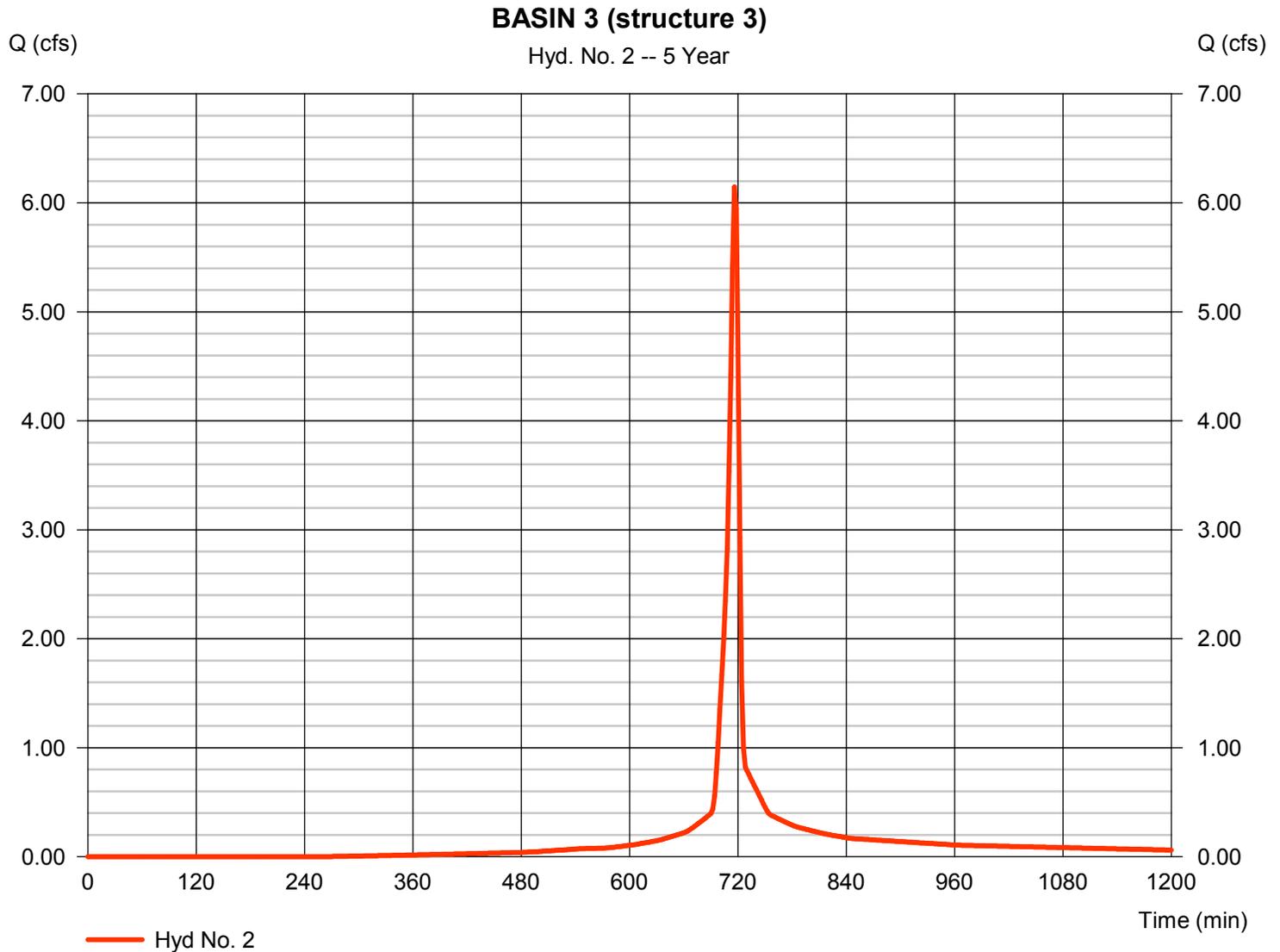
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## Hyd. No. 2

BASIN 3 (structure 3)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.147 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.299 acft
Drainage area	= 1.070 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

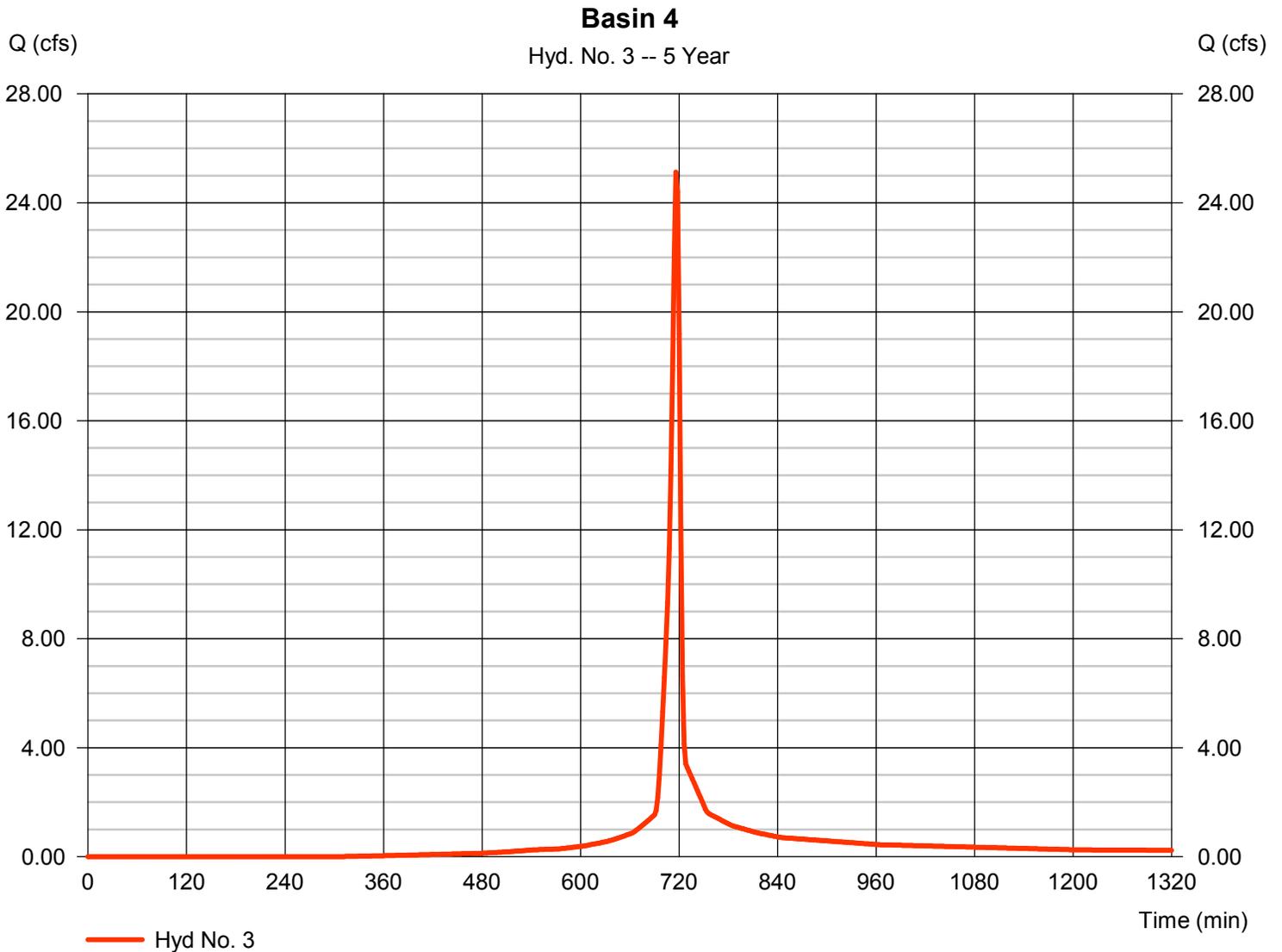
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 3

### Basin 4

Hydrograph type	= SCS Runoff	Peak discharge	= 25.13 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.207 acft
Drainage area	= 4.570 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

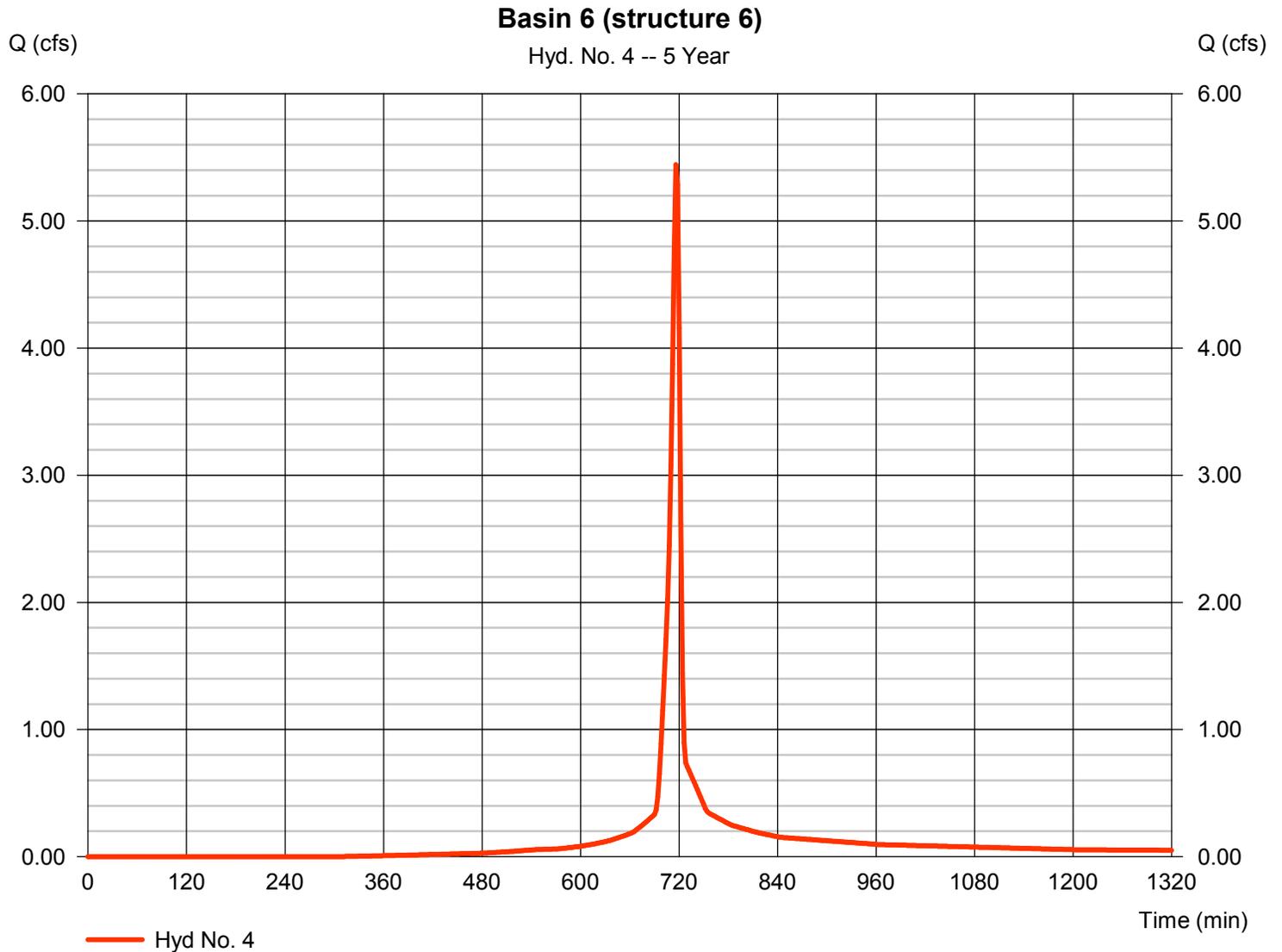
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 4

Basin 6 (structure 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 5.444 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.261 acft
Drainage area	= 0.990 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

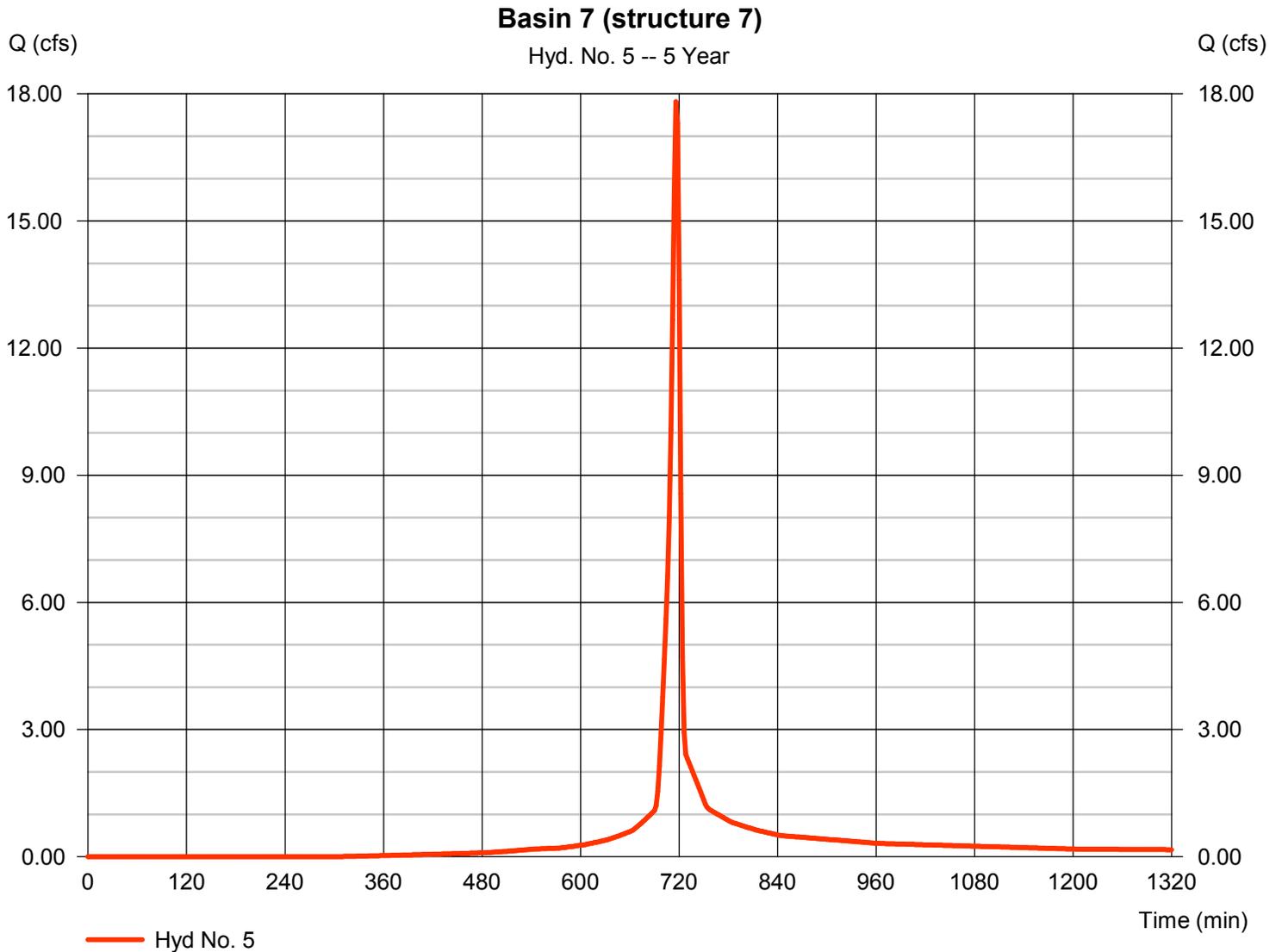
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 5

Basin 7 (structure 7)

Hydrograph type	= SCS Runoff	Peak discharge	= 17.82 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.855 acft
Drainage area	= 3.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

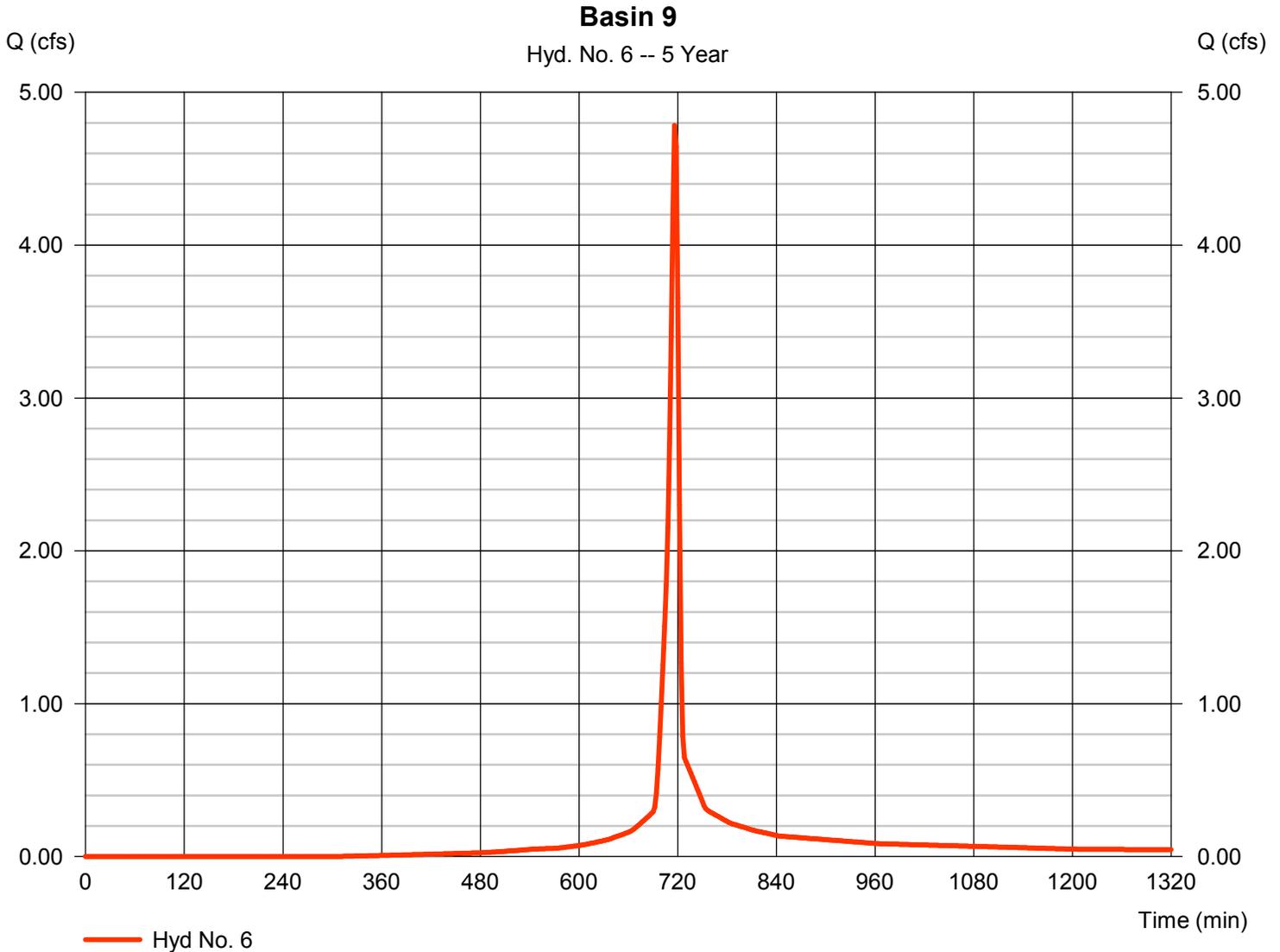


# Hydrograph Report

## Hyd. No. 6

### Basin 9

Hydrograph type	= SCS Runoff	Peak discharge	= 4.784 cfs
Storm frequency	= 5 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.230 acft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

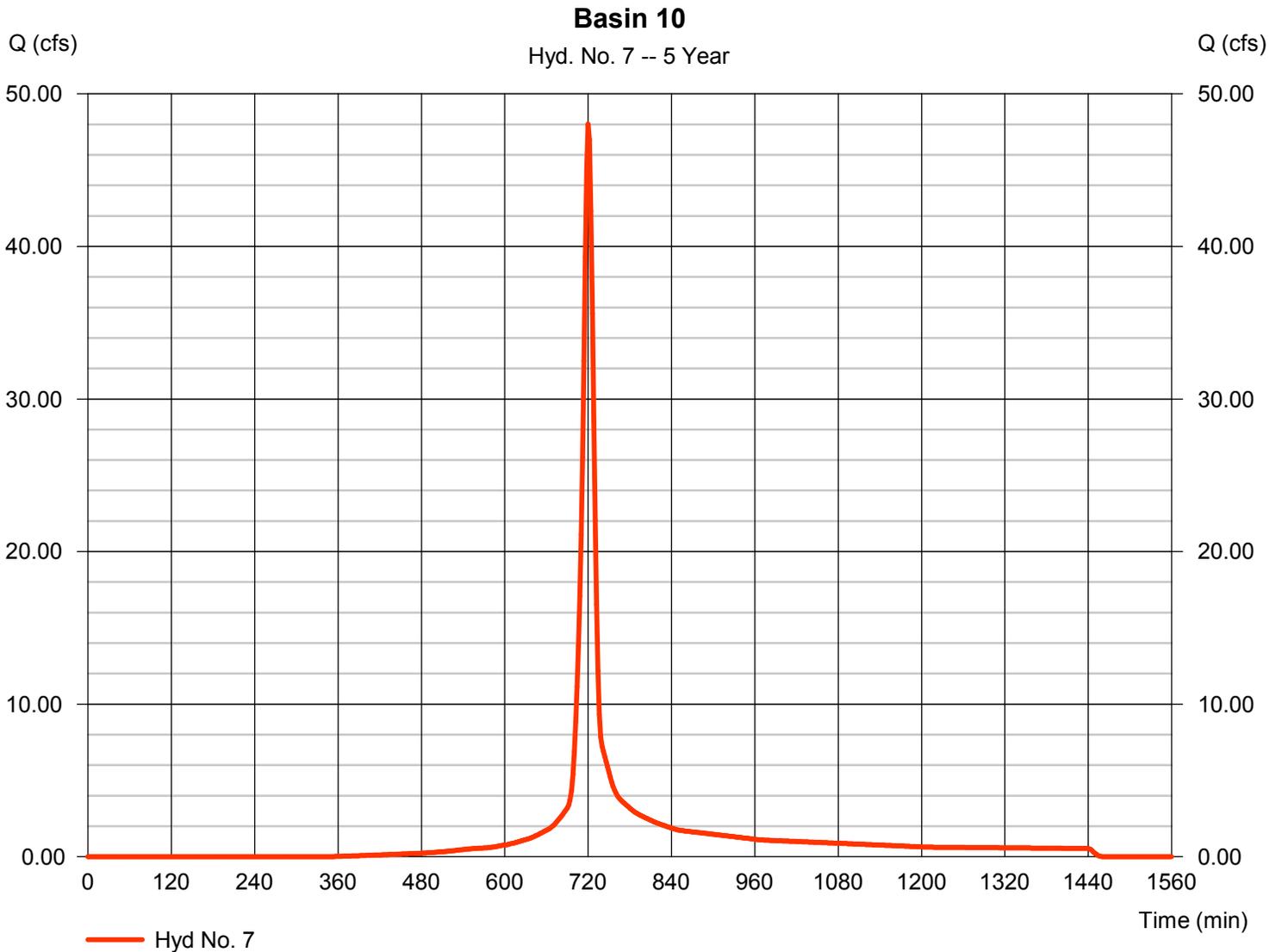
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 7

Basin 10

Hydrograph type	= SCS Runoff	Peak discharge	= 48.02 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2.892 acft
Drainage area	= 10.570 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.10 min
Total precip.	= 4.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

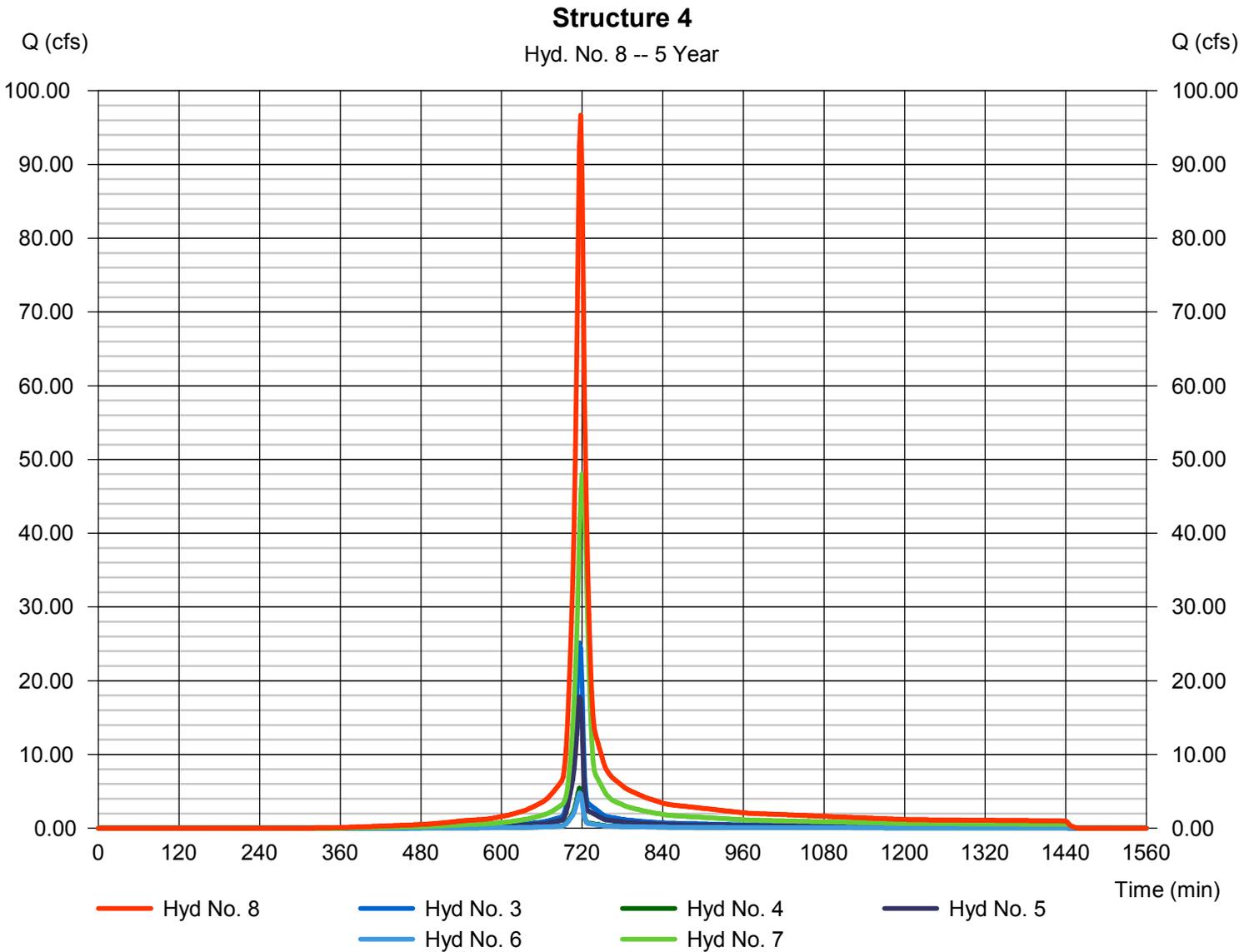
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 8

Structure 4

Hydrograph type	= Combine	Peak discharge	= 96.67 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 5.445 acft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 20.240 ac



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

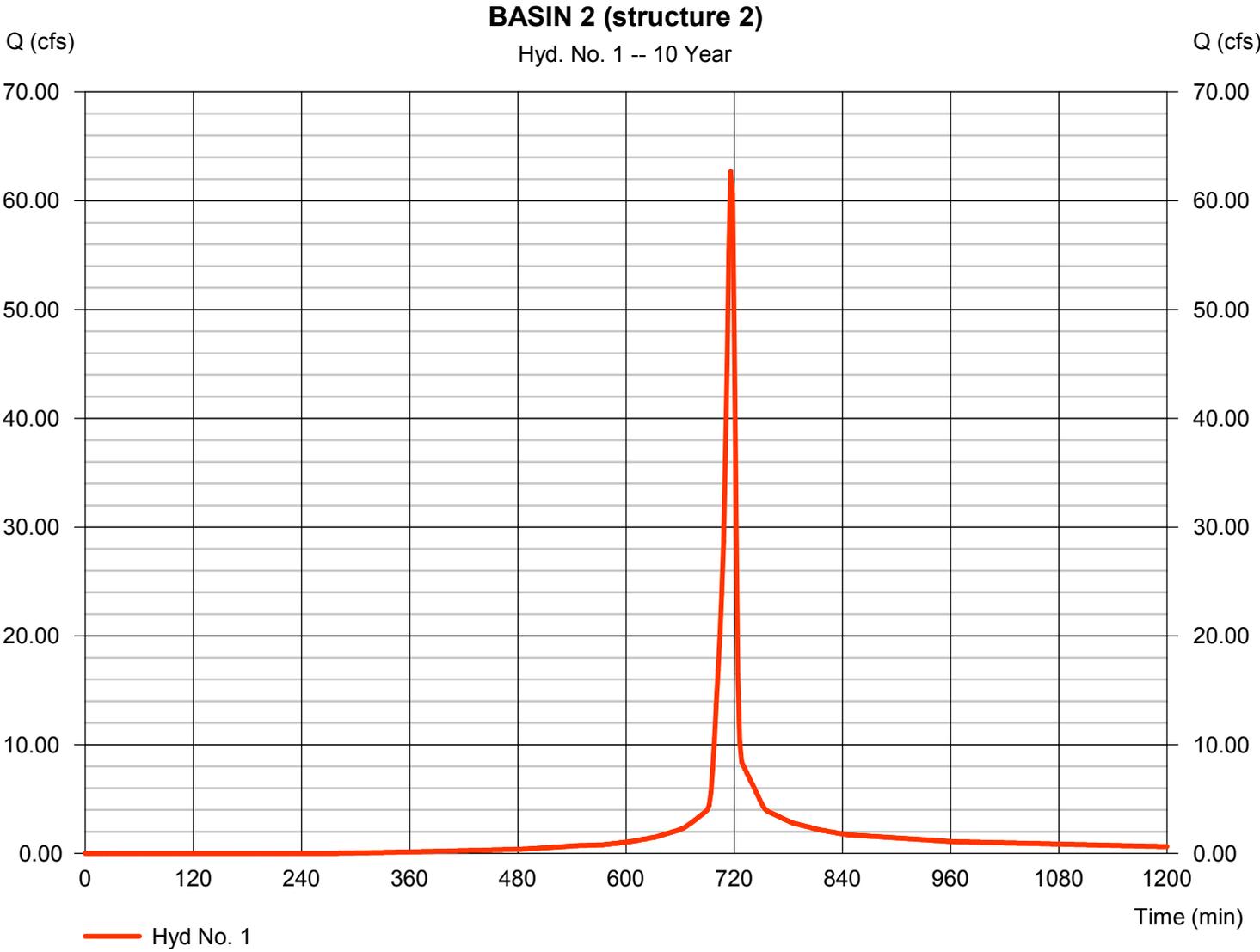
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	62.70	2	716	3.041	----	----	----	BASIN 2 (structure 2)
2	SCS Runoff	7.254	2	716	0.357	----	----	----	BASIN 3 (structure 3)
3	SCS Runoff	29.88	2	716	1.449	----	----	----	Basin 4
4	SCS Runoff	6.472	2	716	0.314	----	----	----	Basin 6 (structure 6)
5	SCS Runoff	21.18	2	716	1.028	----	----	----	Basin 7 (structure 7)
6	SCS Runoff	5.688	2	716	0.276	----	----	----	Basin 9
7	SCS Runoff	57.69	2	720	3.499	----	----	----	Basin 10
8	Combine	115.48	2	718	6.565	3, 4, 5, 6, 7	----	----	Structure 4
P:\T113 (Traton)\_DUE DILIGENCE\Bell Drive Development\Bell Ave Hydro					Develop Period File Year Hydro\Bell Ave Hydro\Bell Ave Hydro Analysis (9.1.16).gpw				

# Hydrograph Report

## Hyd. No. 1

### BASIN 2 (structure 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 62.70 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 3.041 acft
Drainage area	= 9.590 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

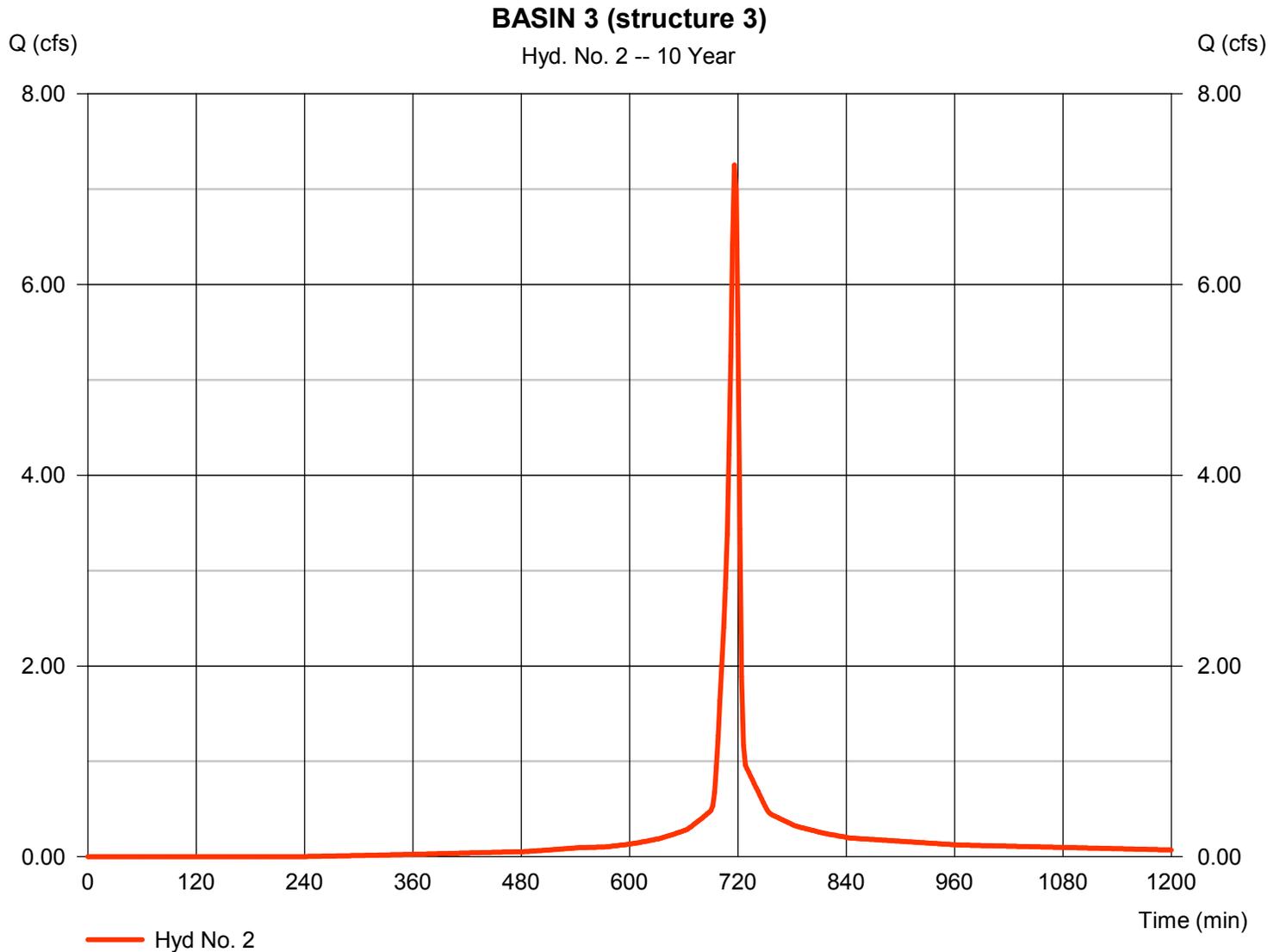


# Hydrograph Report

## Hyd. No. 2

BASIN 3 (structure 3)

Hydrograph type	= SCS Runoff	Peak discharge	= 7.254 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.357 acft
Drainage area	= 1.070 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

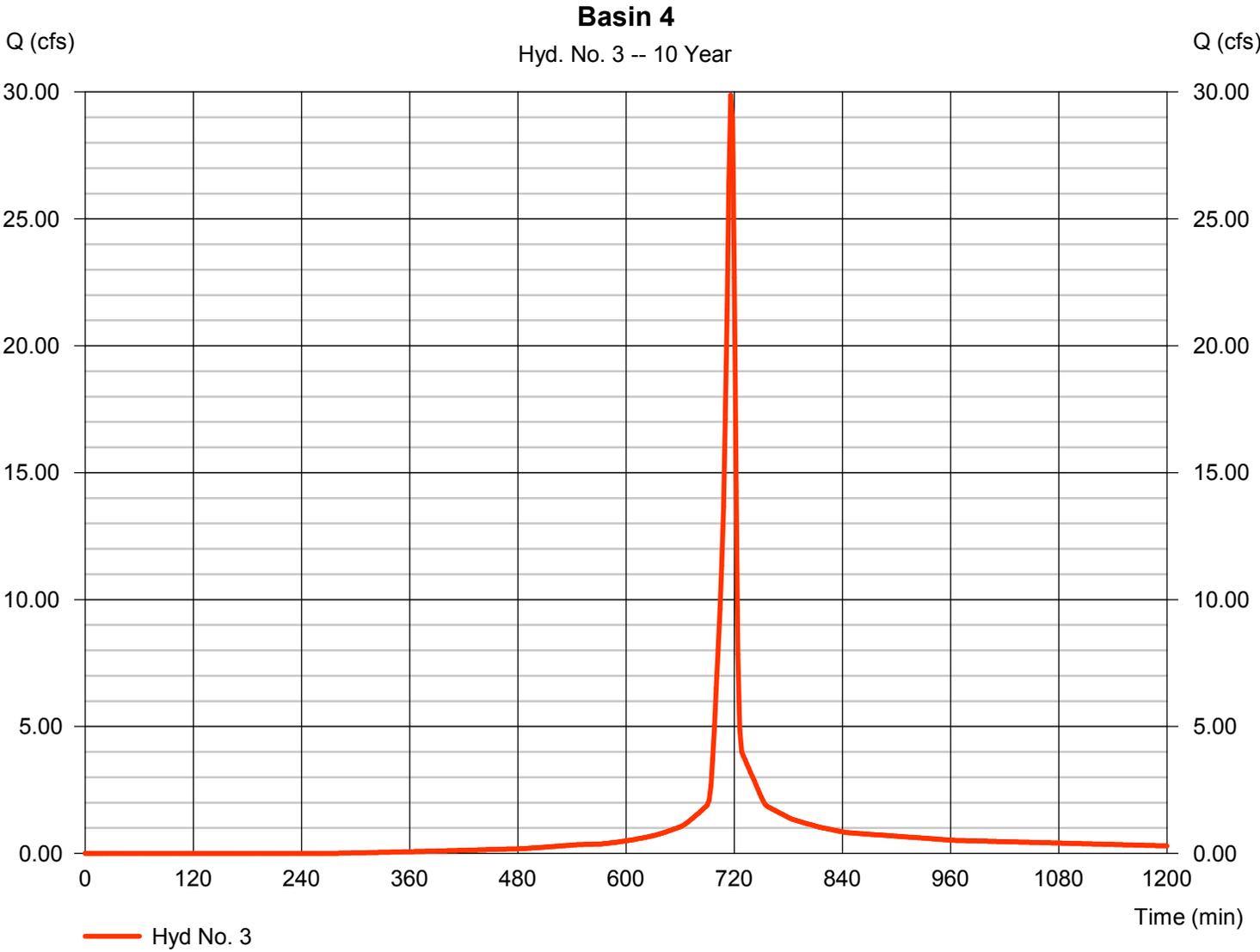


# Hydrograph Report

## Hyd. No. 3

### Basin 4

Hydrograph type	= SCS Runoff	Peak discharge	= 29.88 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.449 acft
Drainage area	= 4.570 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

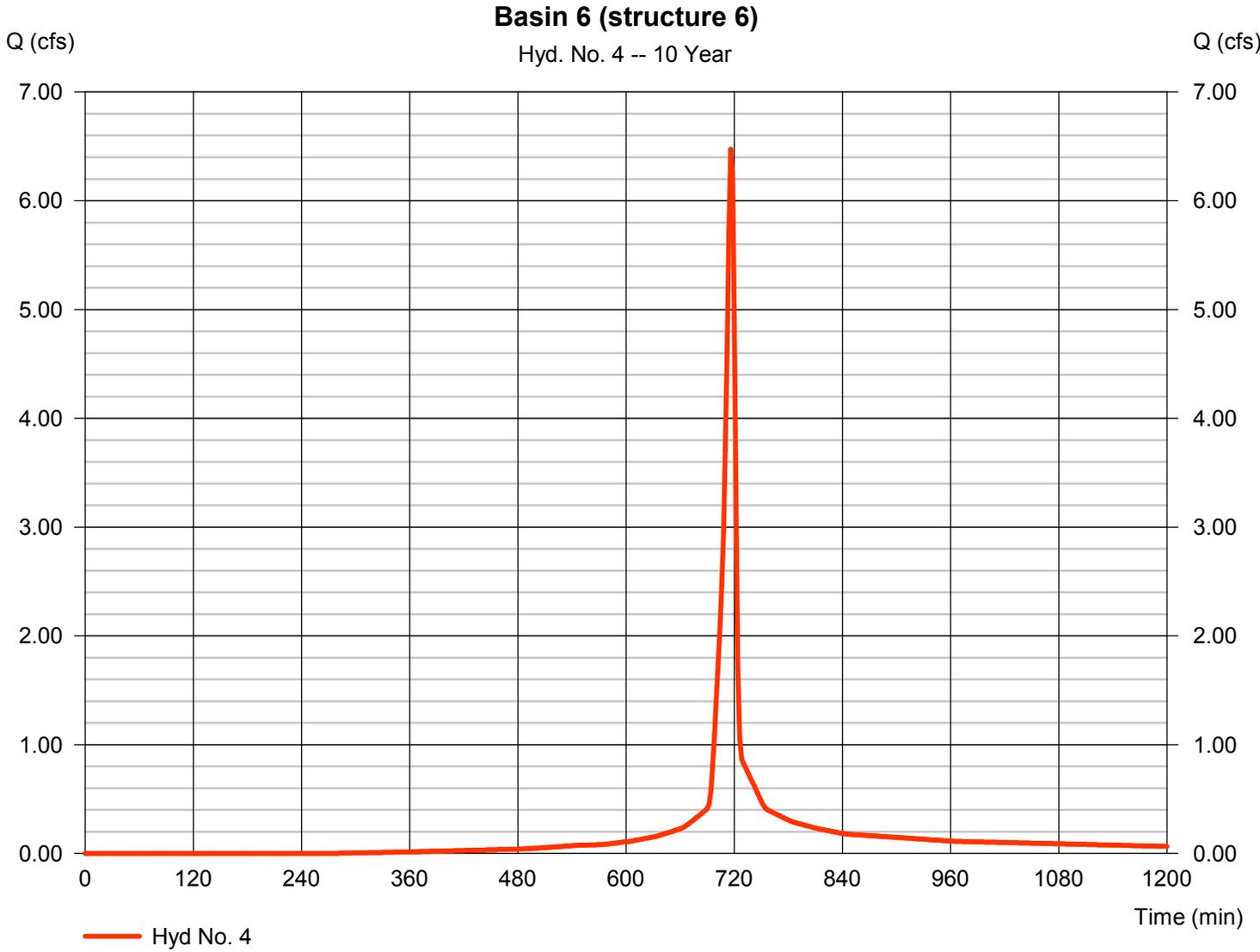


# Hydrograph Report

## Hyd. No. 4

Basin 6 (structure 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.472 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.314 acft
Drainage area	= 0.990 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

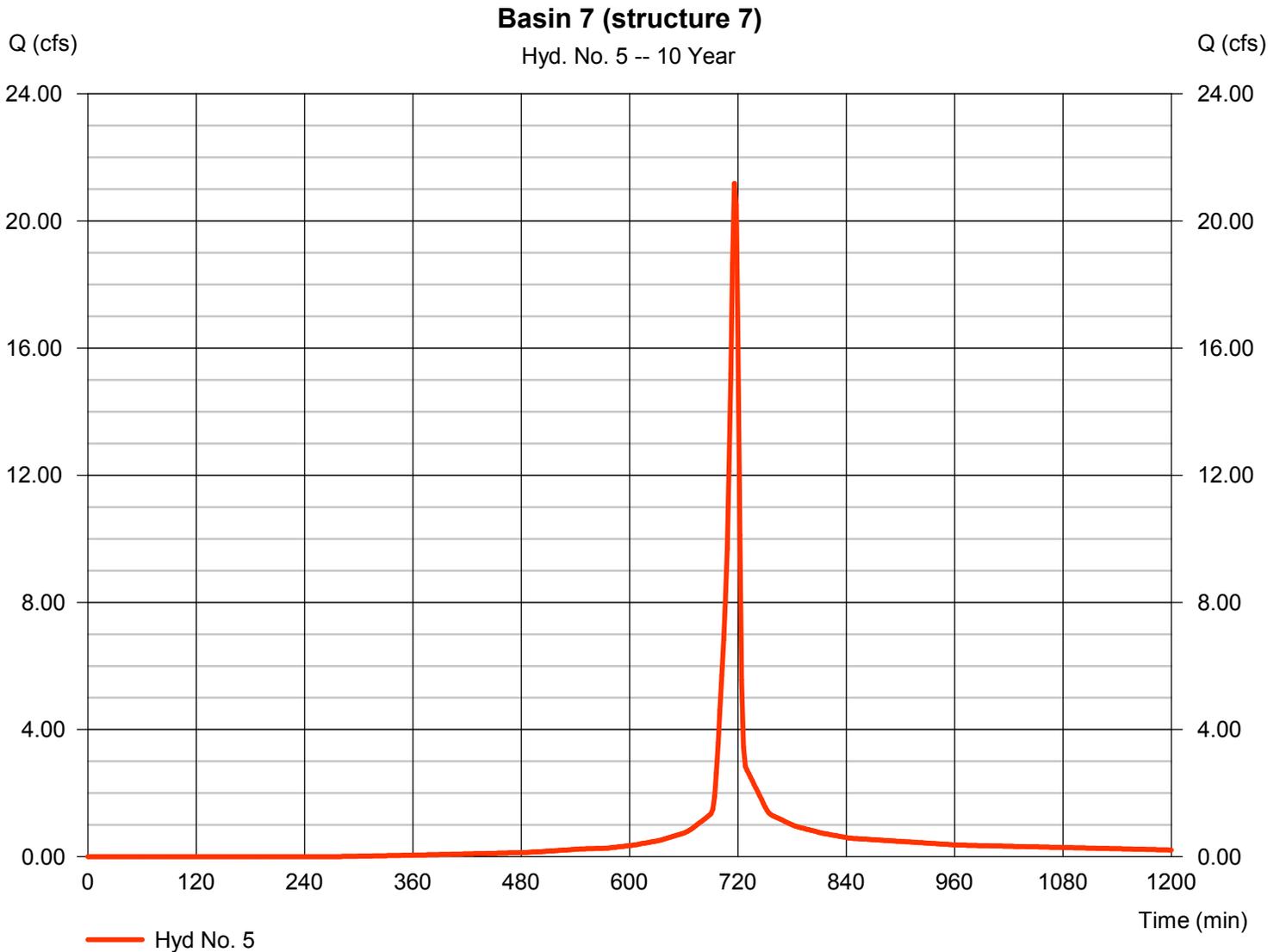


# Hydrograph Report

## Hyd. No. 5

Basin 7 (structure 7)

Hydrograph type	= SCS Runoff	Peak discharge	= 21.18 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.028 acft
Drainage area	= 3.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

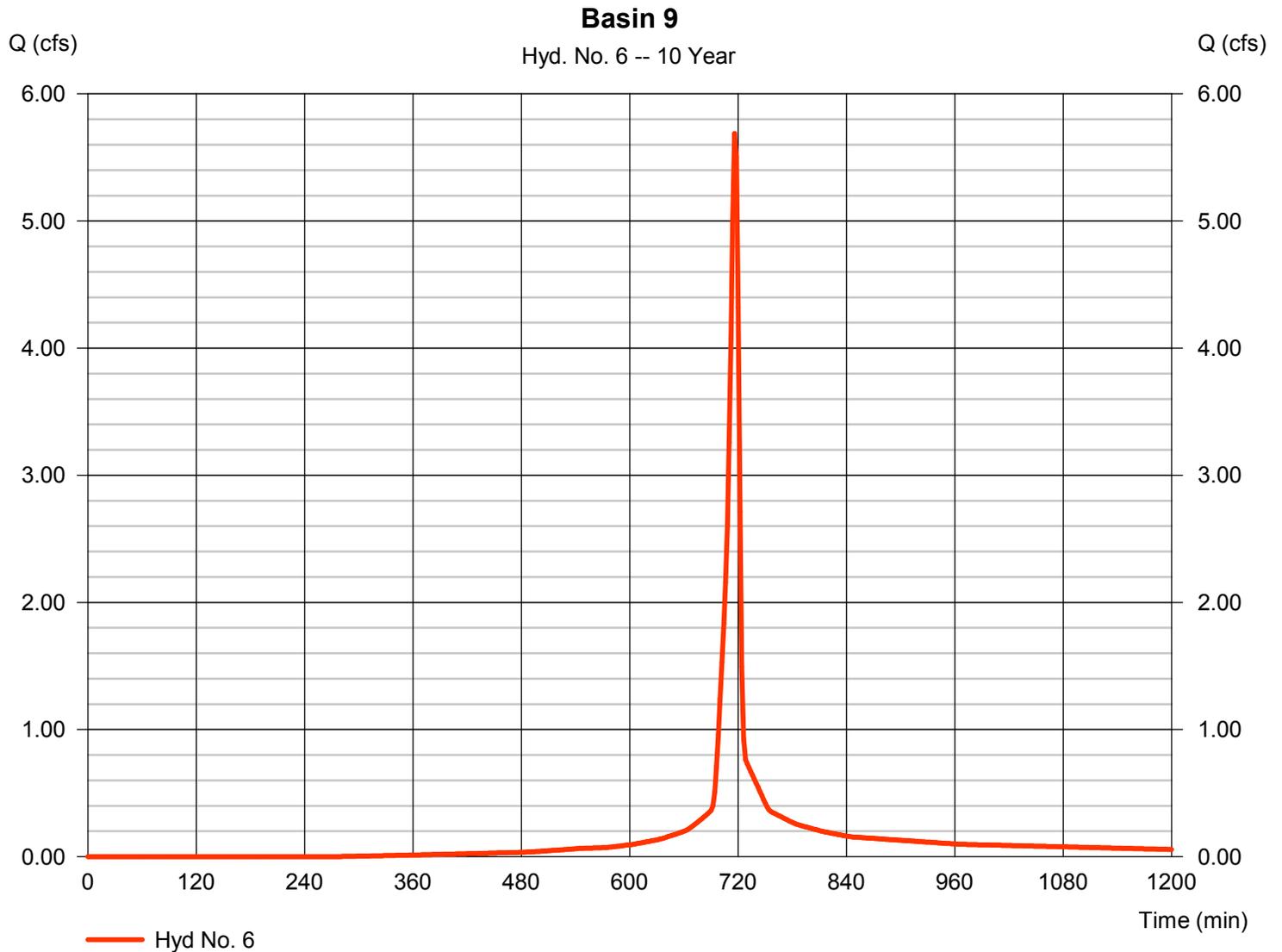
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 6

Basin 9

Hydrograph type	= SCS Runoff	Peak discharge	= 5.688 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.276 acft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

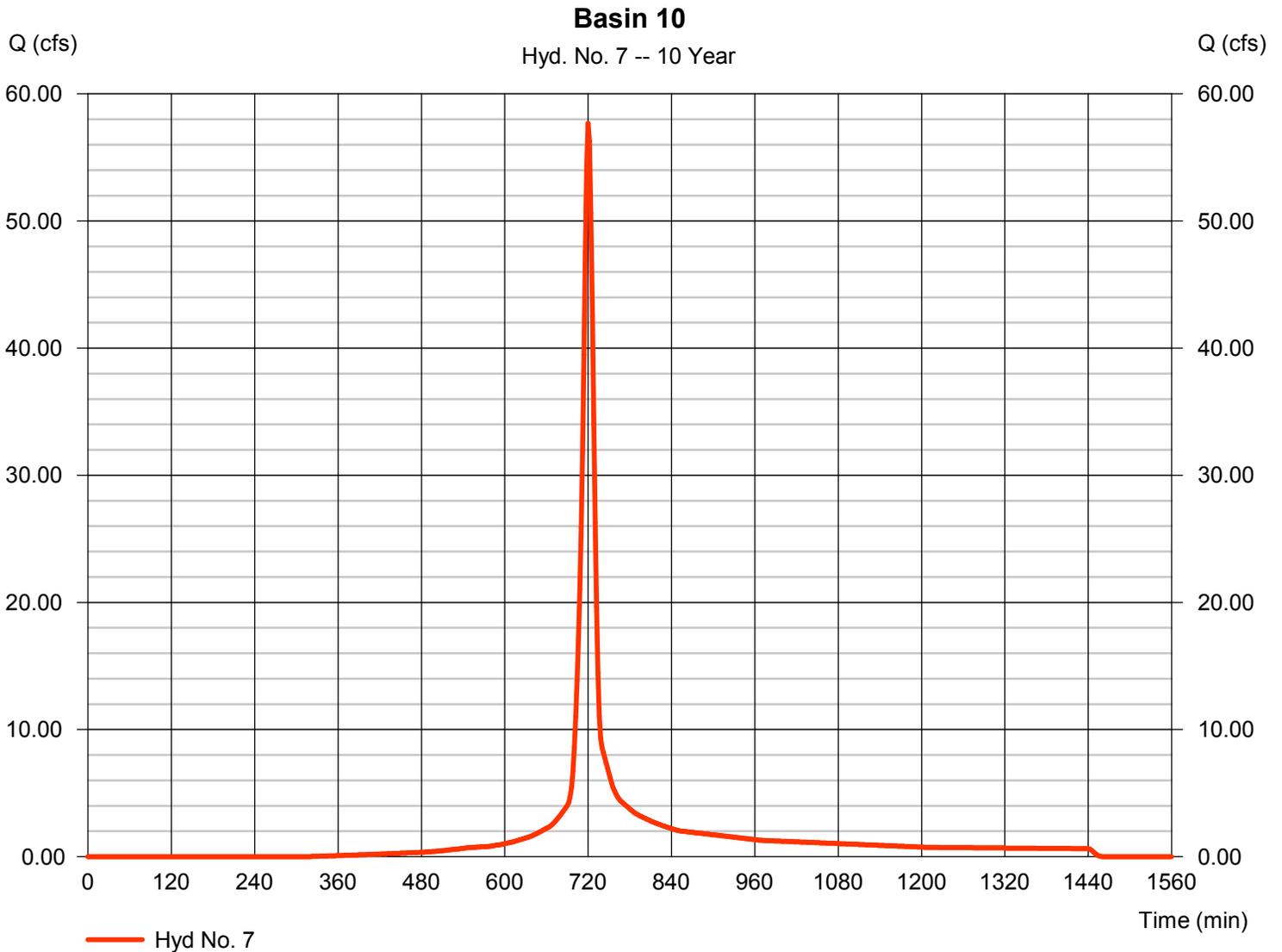
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 7

Basin 10

Hydrograph type	= SCS Runoff	Peak discharge	= 57.69 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 3.499 acft
Drainage area	= 10.570 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.10 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

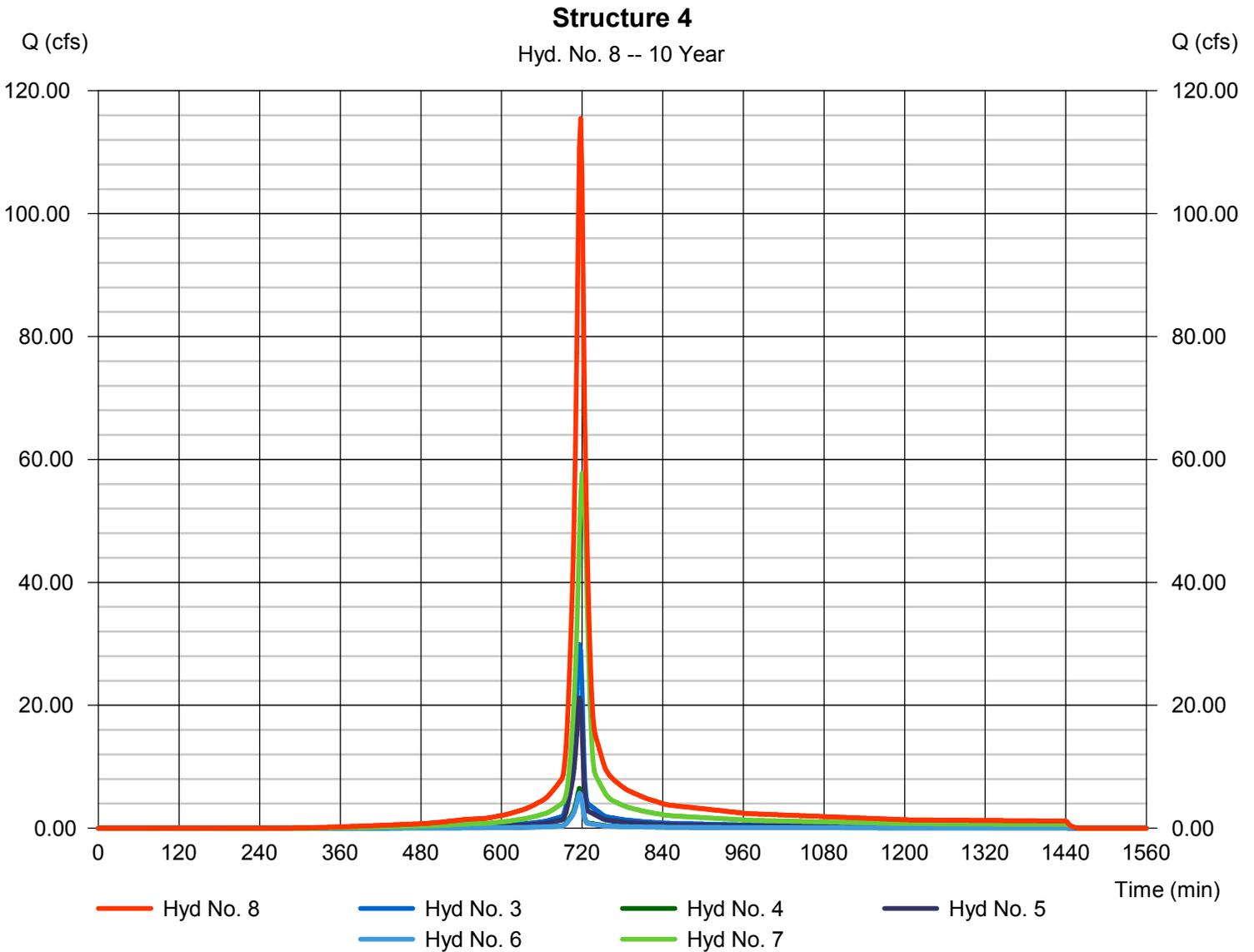
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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## Hyd. No. 8

Structure 4

Hydrograph type	= Combine	Peak discharge	= 115.48 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 6.565 acft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 20.240 ac



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

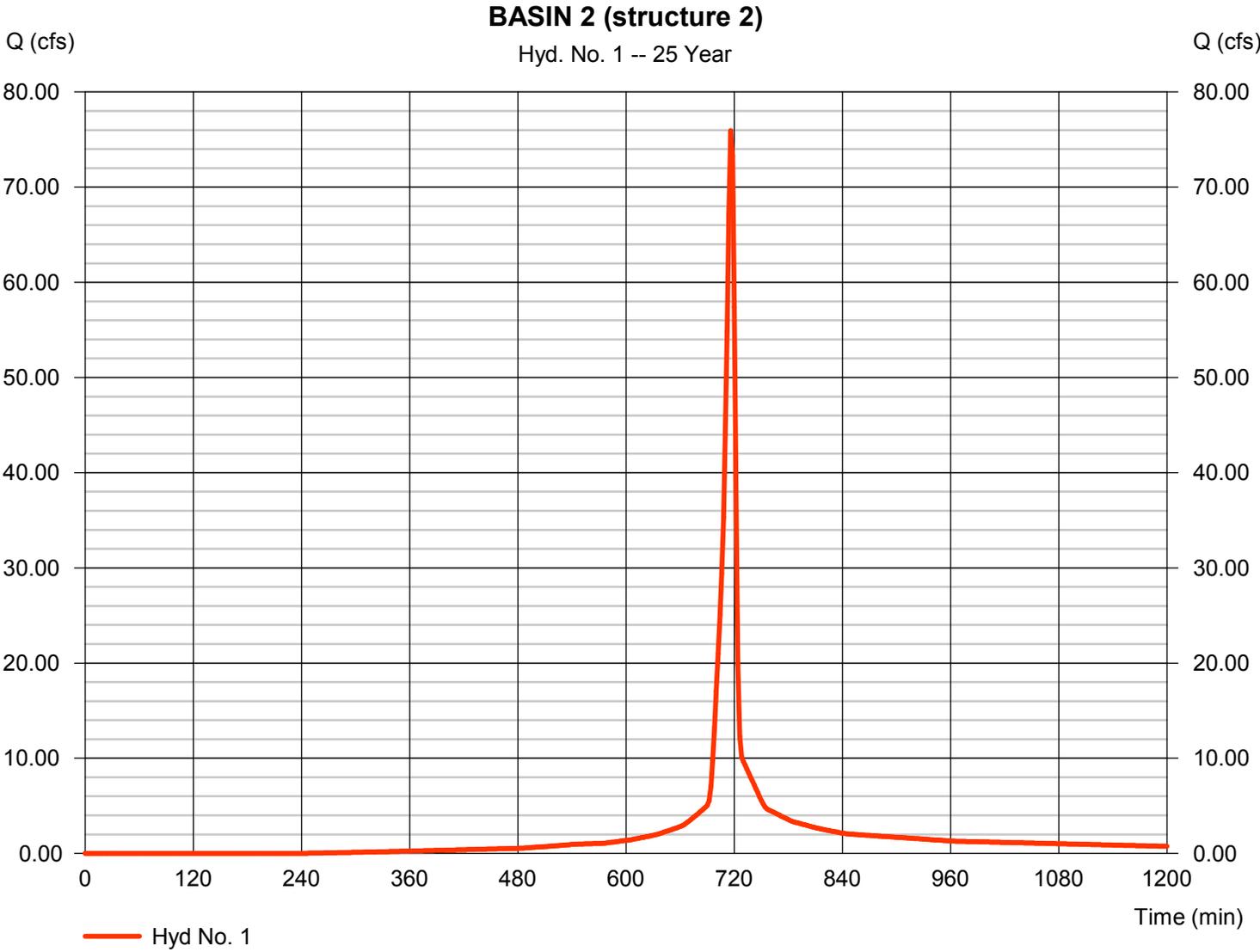
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	75.94	2	716	3.729	----	----	----	BASIN 2 (structure 2)
2	SCS Runoff	8.723	2	716	0.435	----	----	----	BASIN 3 (structure 3)
3	SCS Runoff	36.19	2	716	1.777	----	----	----	Basin 4
4	SCS Runoff	7.839	2	716	0.385	----	----	----	Basin 6 (structure 6)
5	SCS Runoff	25.66	2	716	1.260	----	----	----	Basin 7 (structure 7)
6	SCS Runoff	6.889	2	716	0.338	----	----	----	Basin 9
7	SCS Runoff	70.59	2	720	4.321	----	----	----	Basin 10
8	Combine	140.52	2	718	8.082	3, 4, 5, 6, 7	----	----	Structure 4
P:\T113 (Traton)\_DUE DILIGENCE\Bell Drive\Develop\Bell Ave\Bell Ave Hydro\Bell Ave Hydro					Develop Period 25 Year Hydro\Bell Ave Hydro\Bell Ave Hydro Analysis (9.1.16).gpw				

# Hydrograph Report

## Hyd. No. 1

### BASIN 2 (structure 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 75.94 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 3.729 acft
Drainage area	= 9.590 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

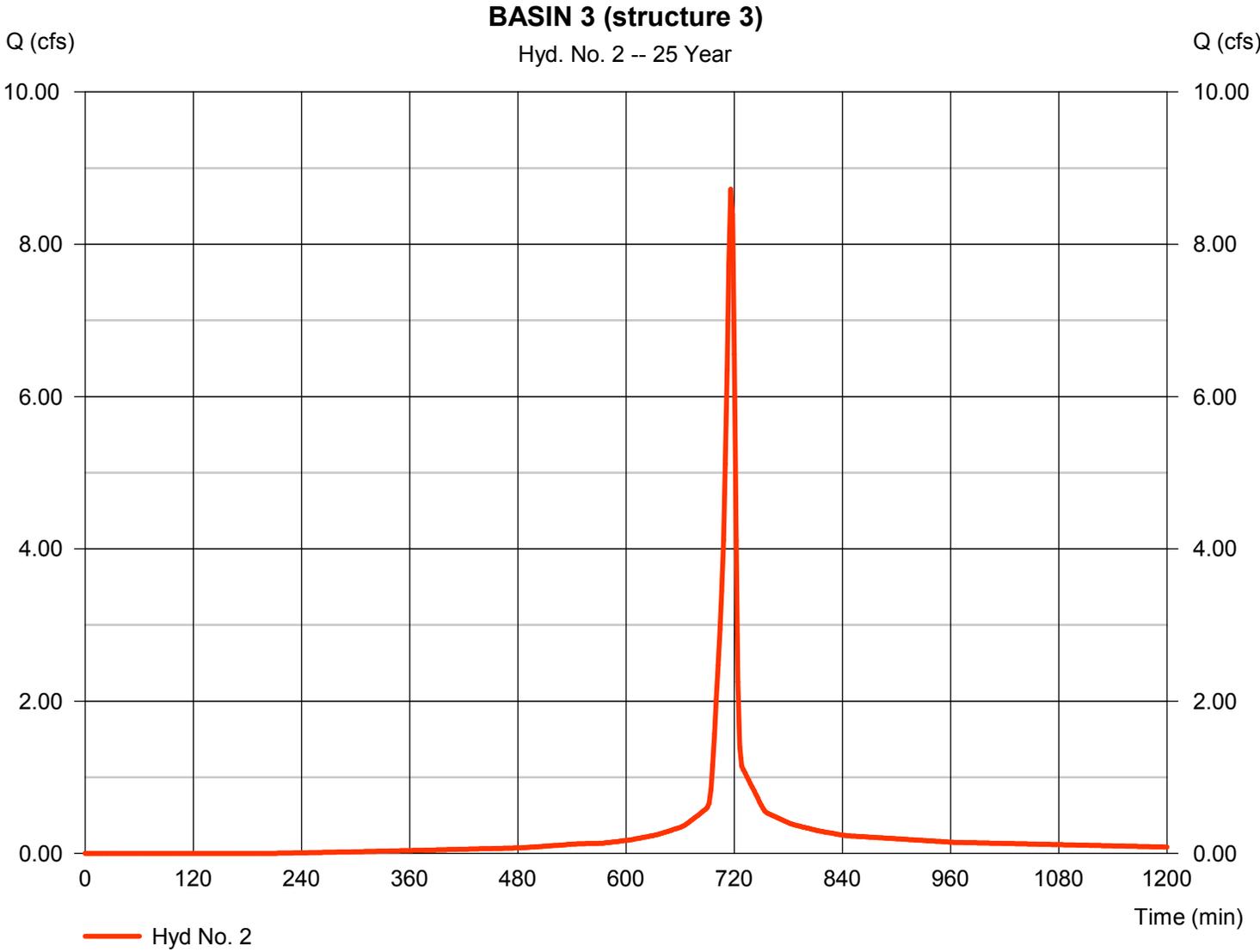


# Hydrograph Report

## Hyd. No. 2

BASIN 3 (structure 3)

Hydrograph type	= SCS Runoff	Peak discharge	= 8.723 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.435 acft
Drainage area	= 1.070 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

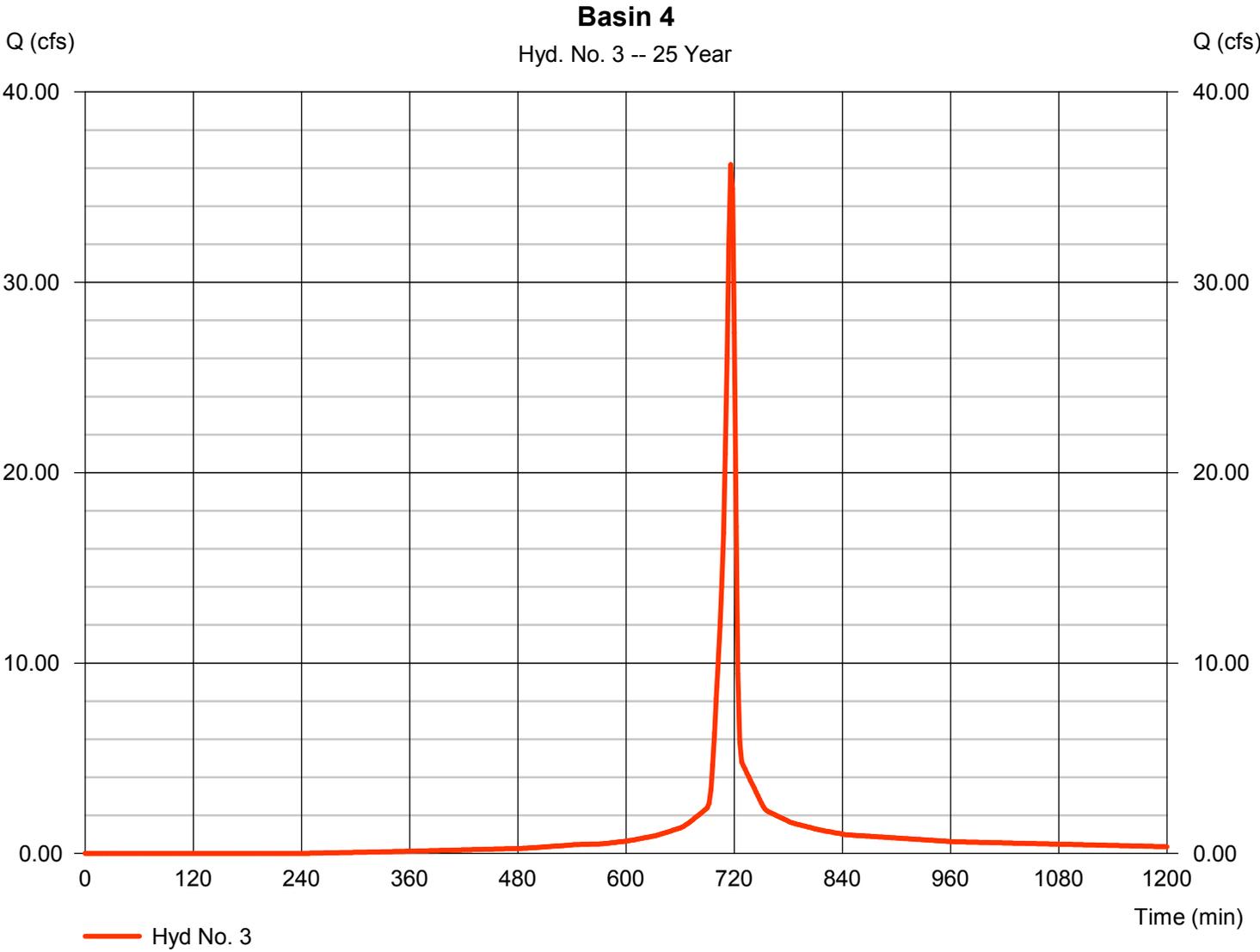


# Hydrograph Report

## Hyd. No. 3

### Basin 4

Hydrograph type	= SCS Runoff	Peak discharge	= 36.19 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.777 acft
Drainage area	= 4.570 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

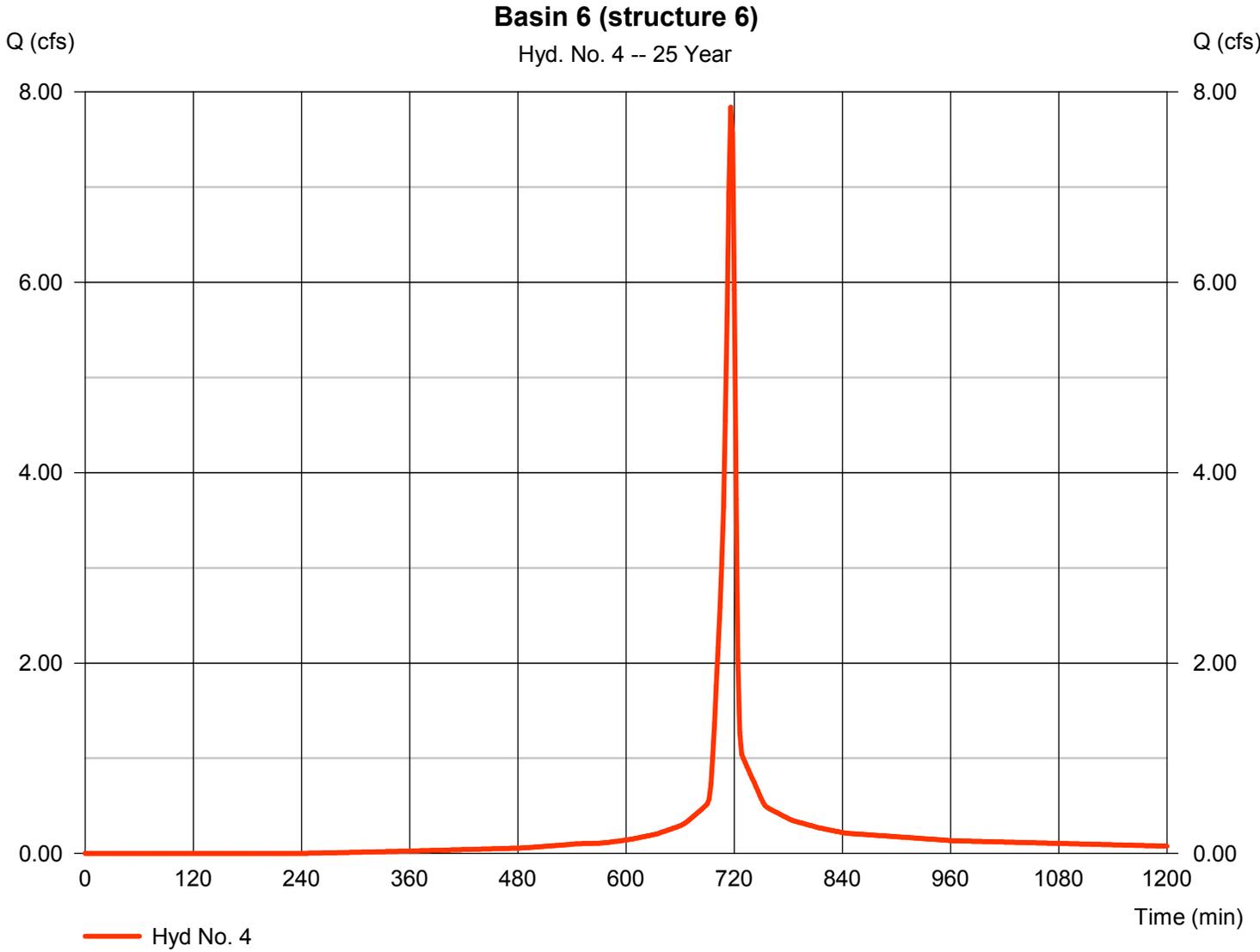


# Hydrograph Report

## Hyd. No. 4

Basin 6 (structure 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 7.839 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.385 acft
Drainage area	= 0.990 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

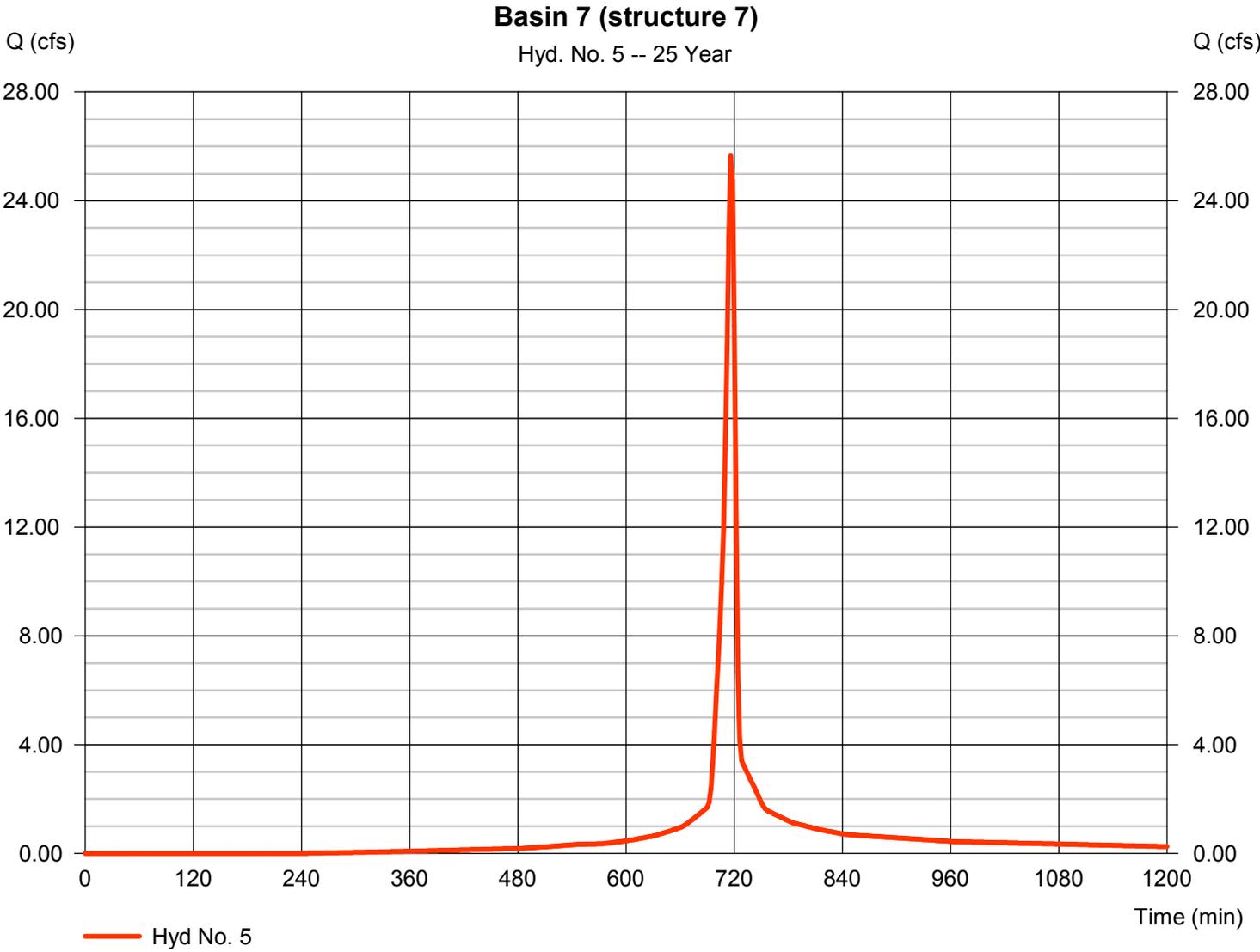


# Hydrograph Report

## Hyd. No. 5

Basin 7 (structure 7)

Hydrograph type	= SCS Runoff	Peak discharge	= 25.66 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.260 acft
Drainage area	= 3.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

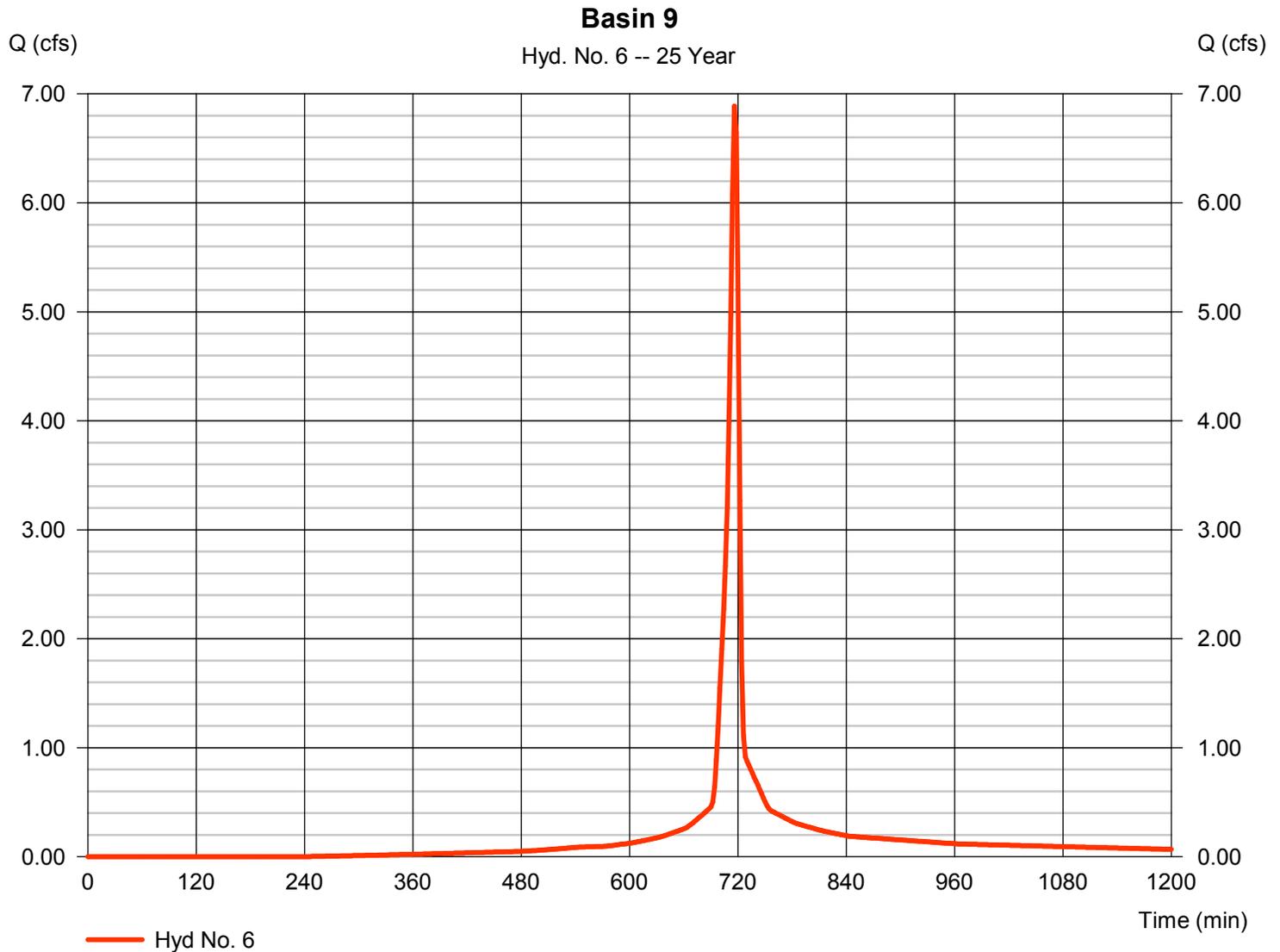
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Thursday, 09 / 1 / 2016

## Hyd. No. 6

Basin 9

Hydrograph type	= SCS Runoff	Peak discharge	= 6.889 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.338 acft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

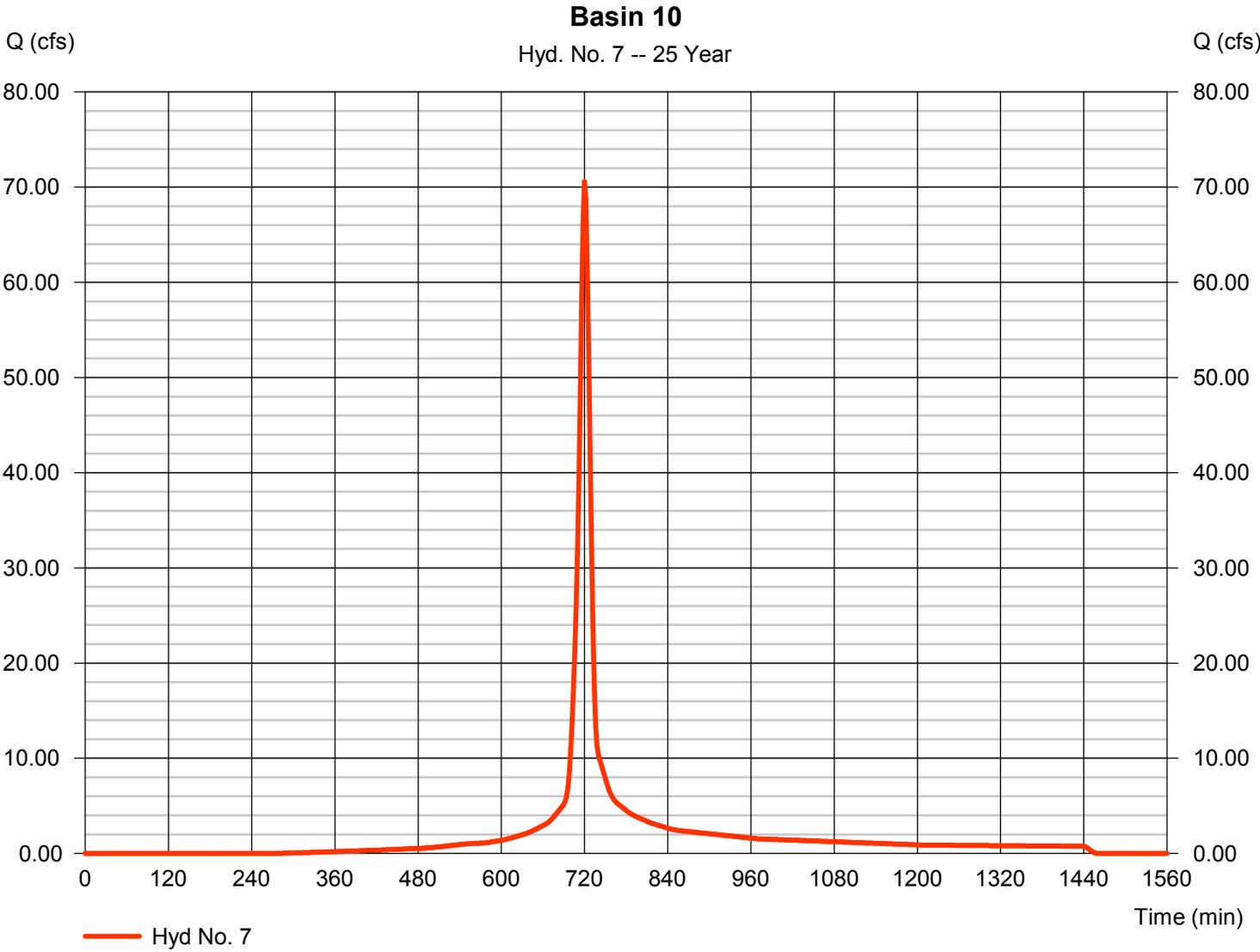


# Hydrograph Report

## Hyd. No. 7

Basin 10

Hydrograph type	= SCS Runoff	Peak discharge	= 70.59 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 4.321 acft
Drainage area	= 10.570 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.10 min
Total precip.	= 6.48 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

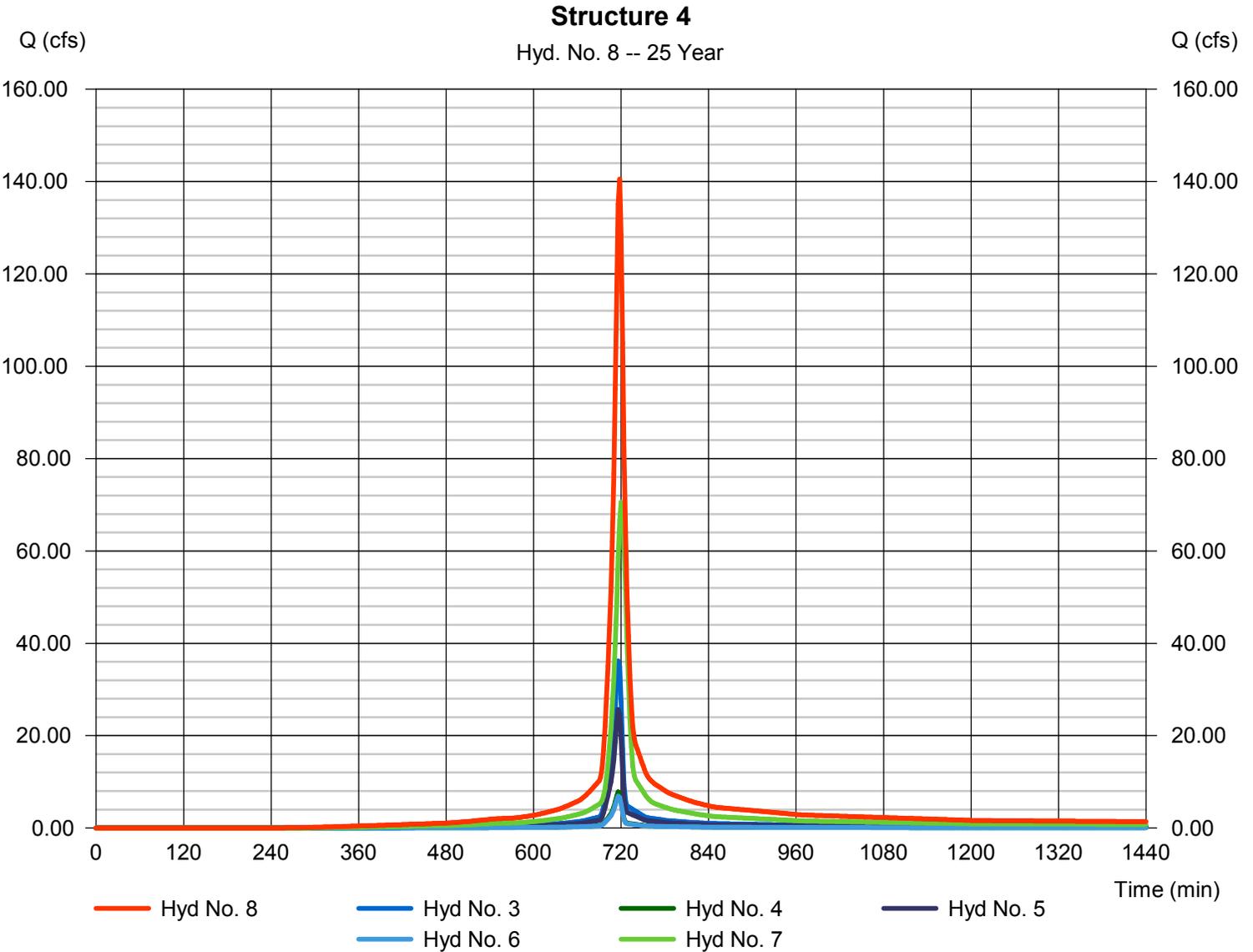
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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## Hyd. No. 8

Structure 4

Hydrograph type	= Combine	Peak discharge	= 140.52 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 8.082 acft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 20.240 ac



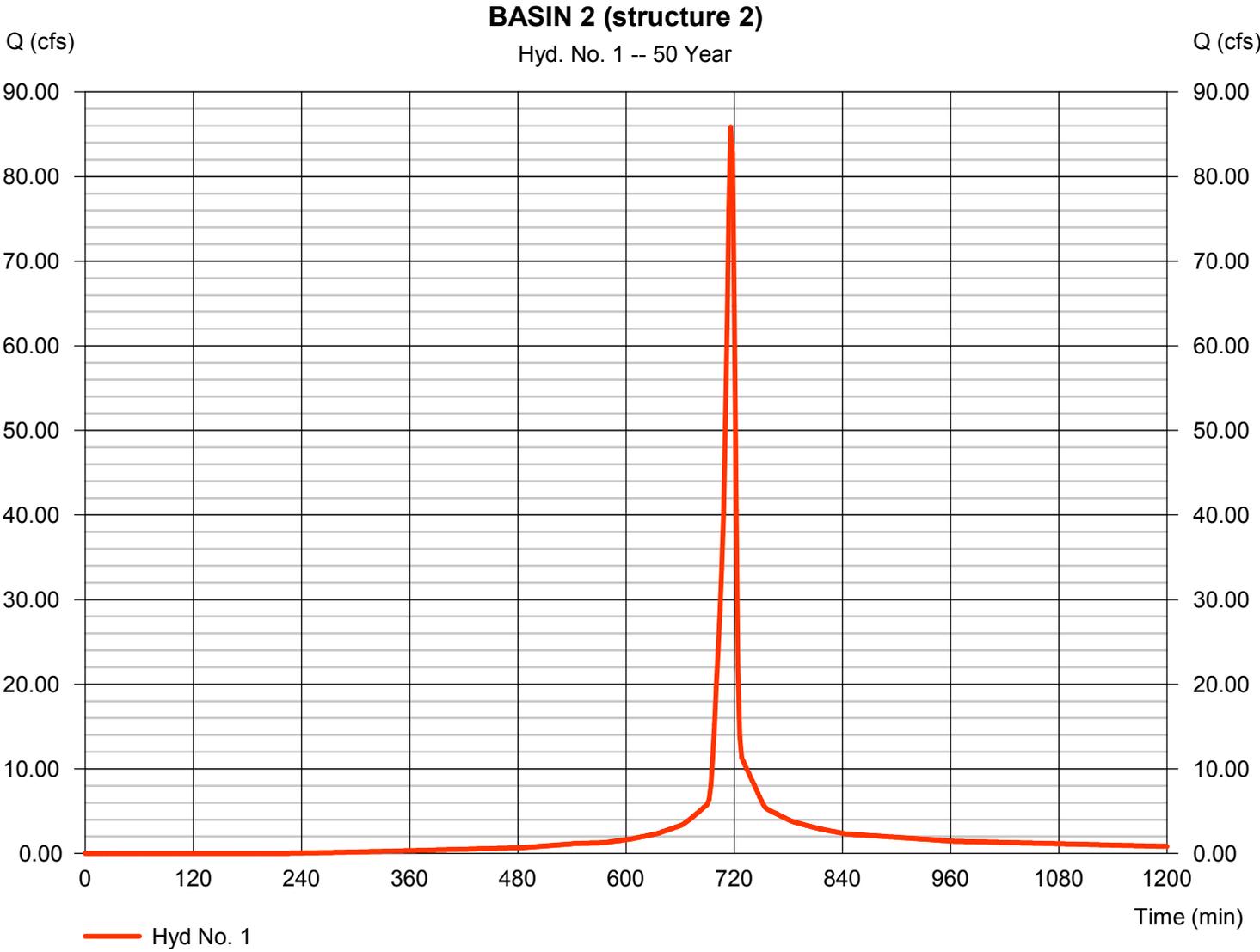


# Hydrograph Report

## Hyd. No. 1

### BASIN 2 (structure 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 85.83 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 4.250 acft
Drainage area	= 9.590 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

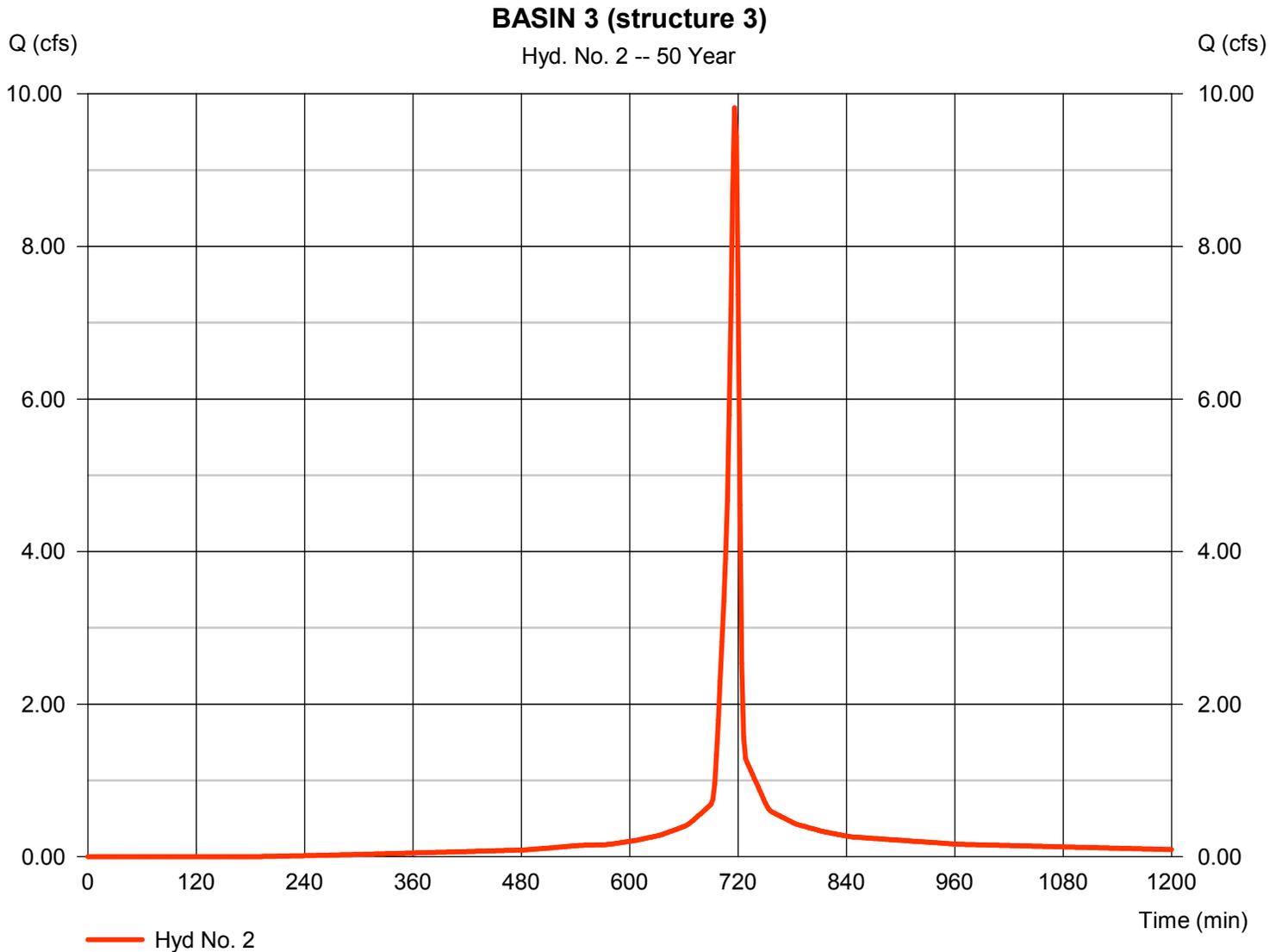
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Thursday, 09 / 1 / 2016

## Hyd. No. 2

BASIN 3 (structure 3)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.819 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.493 acft
Drainage area	= 1.070 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

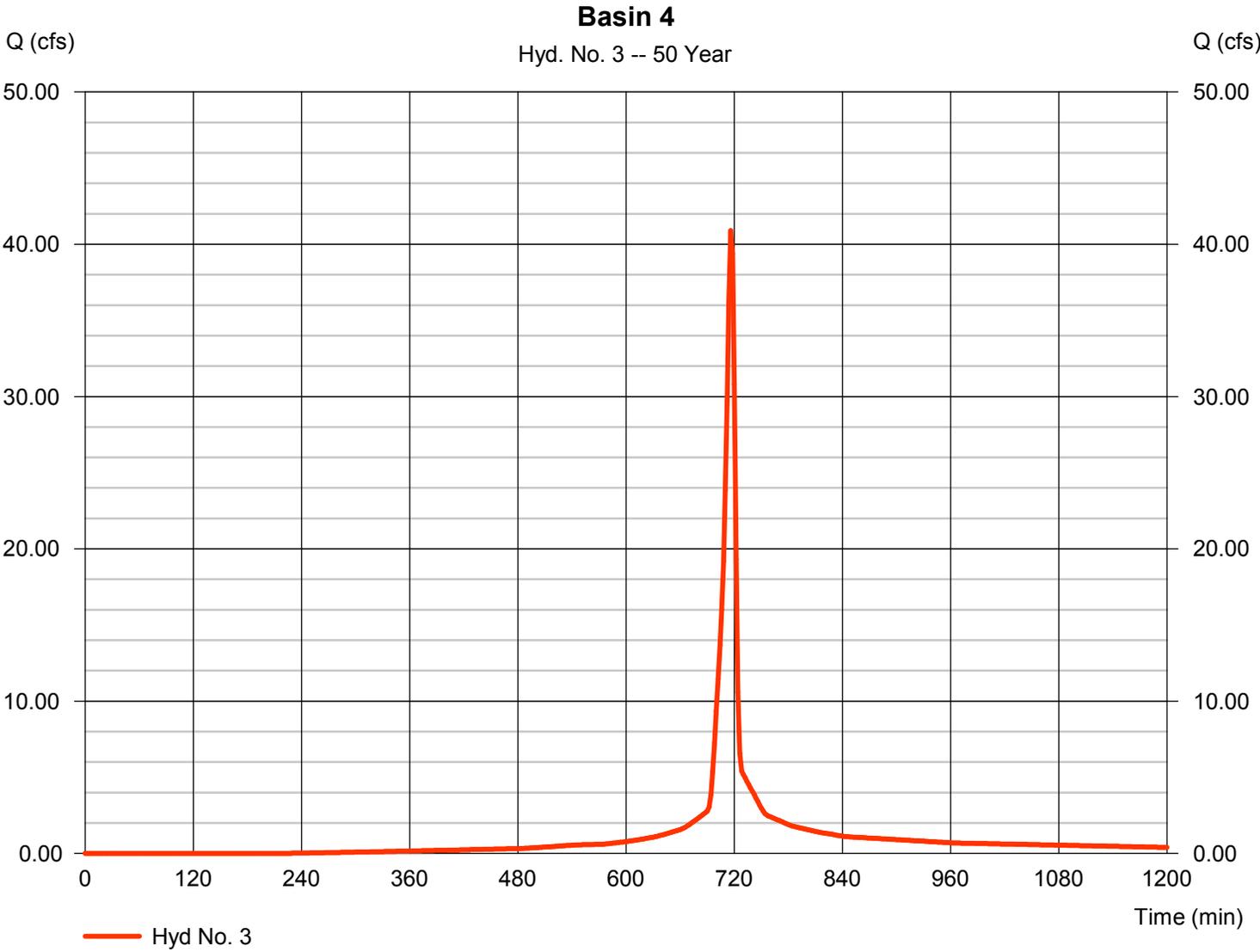


# Hydrograph Report

## Hyd. No. 3

### Basin 4

Hydrograph type	= SCS Runoff	Peak discharge	= 40.90 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 2.025 acft
Drainage area	= 4.570 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

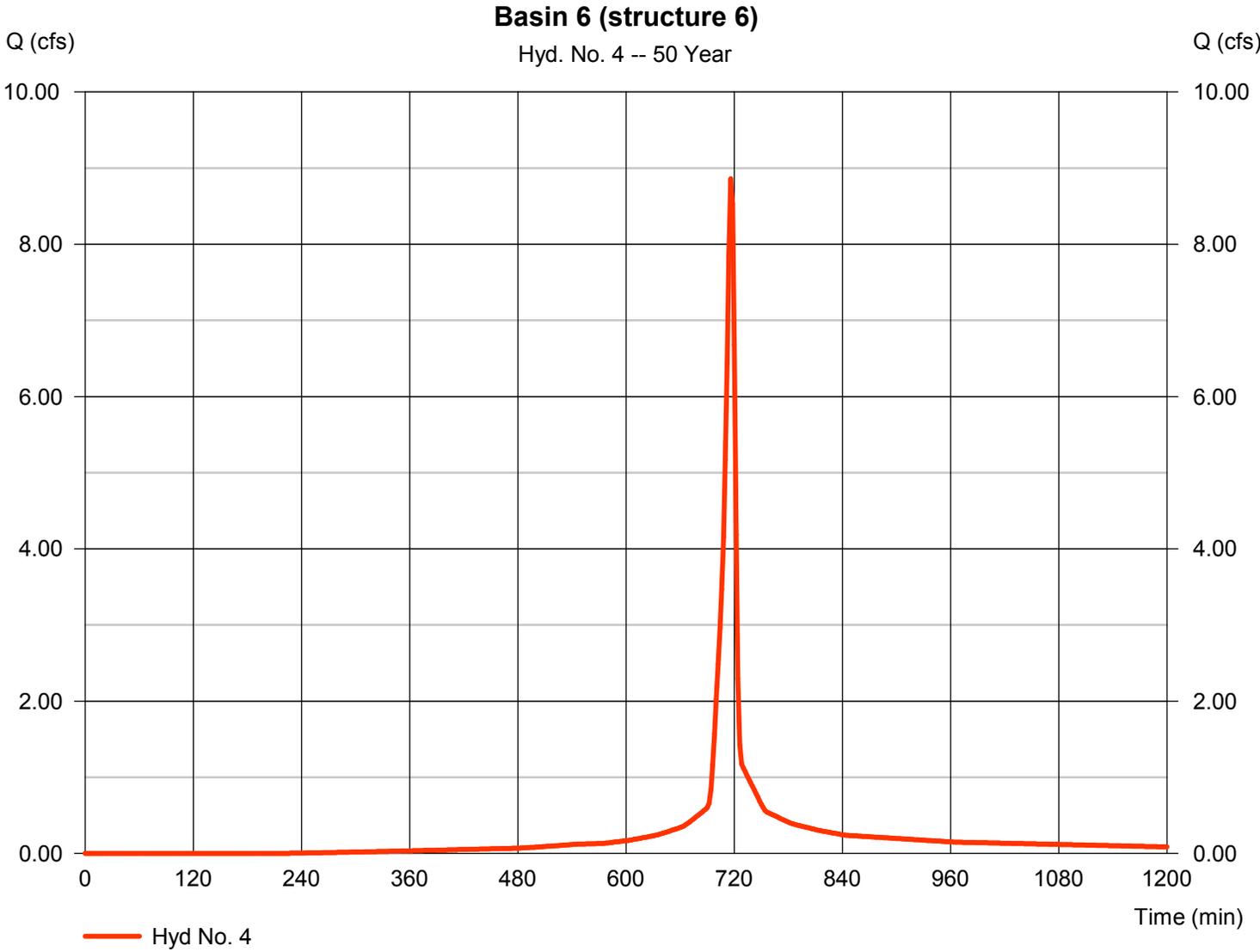


# Hydrograph Report

## Hyd. No. 4

Basin 6 (structure 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 8.861 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.439 acft
Drainage area	= 0.990 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

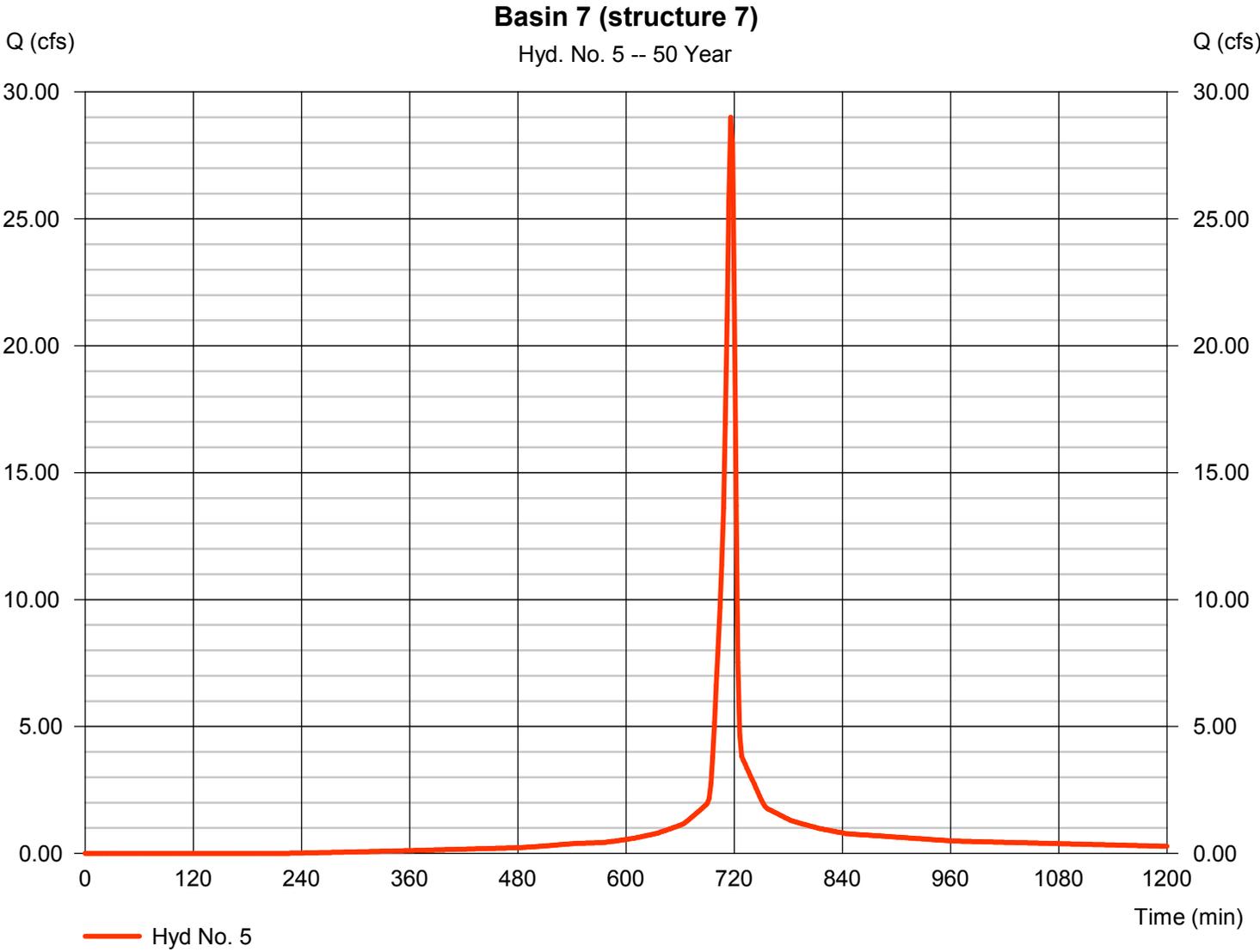


# Hydrograph Report

## Hyd. No. 5

Basin 7 (structure 7)

Hydrograph type	= SCS Runoff	Peak discharge	= 29.00 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.436 acft
Drainage area	= 3.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

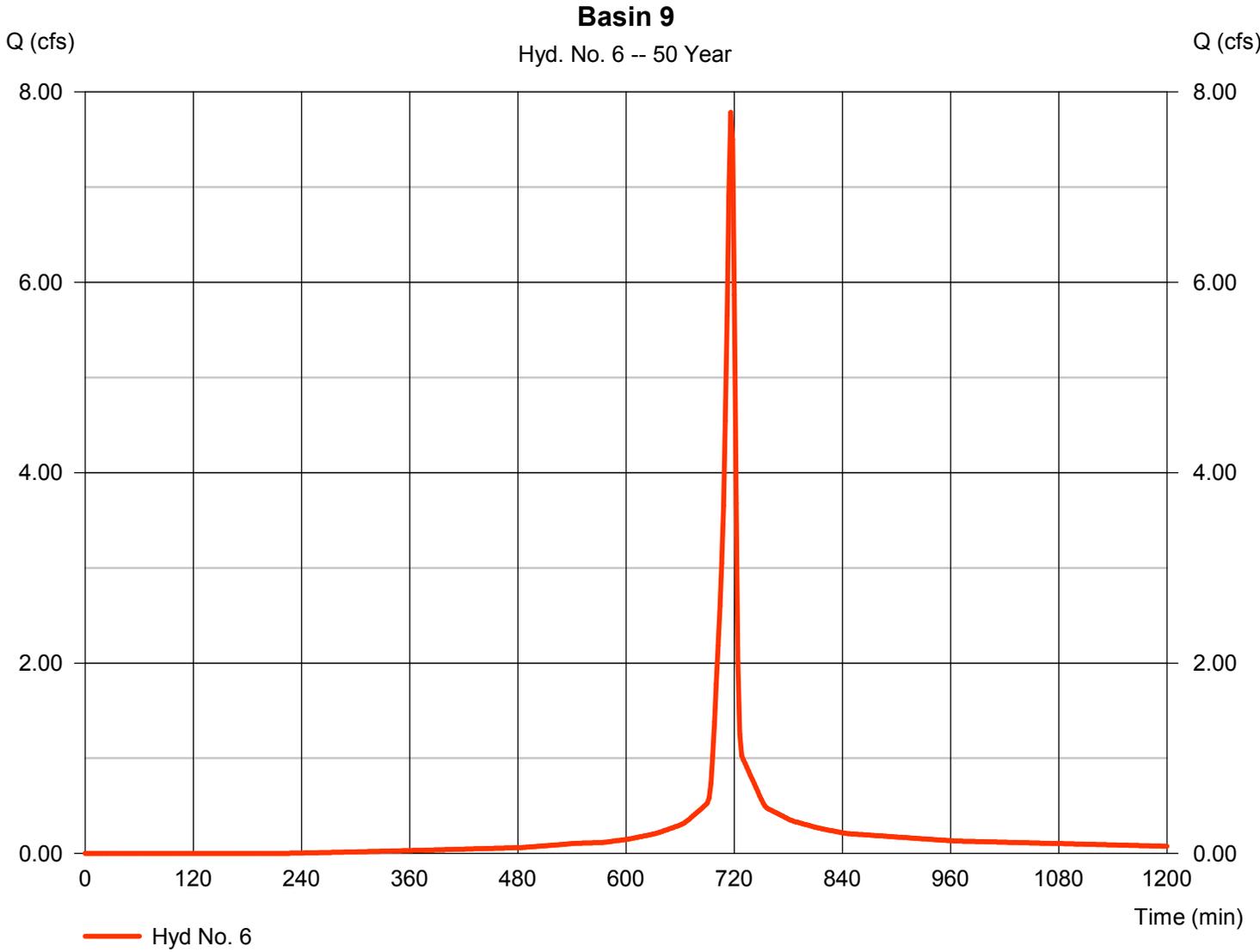


# Hydrograph Report

## Hyd. No. 6

Basin 9

Hydrograph type	= SCS Runoff	Peak discharge	= 7.787 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.386 acft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

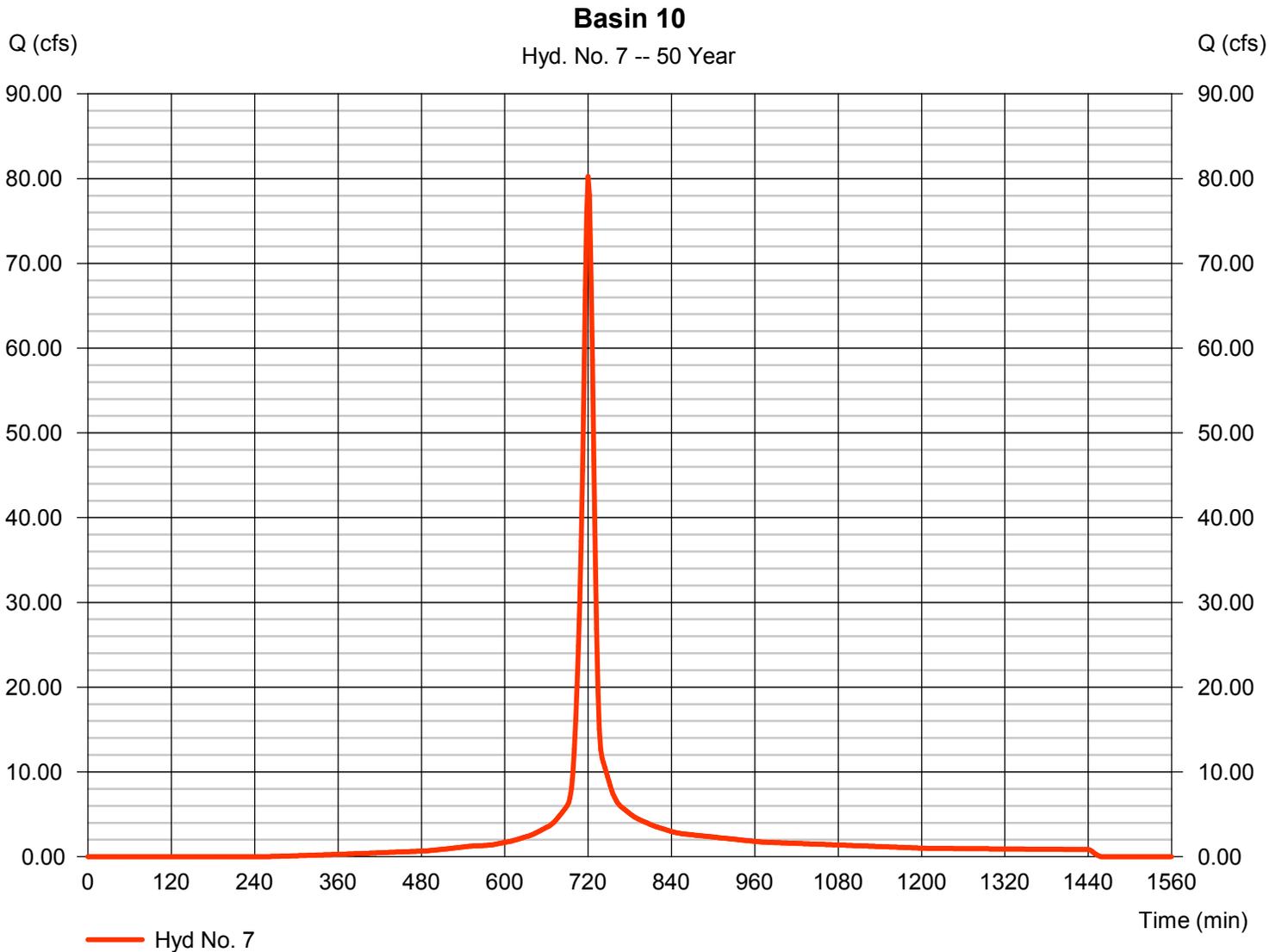
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## Hyd. No. 7

Basin 10

Hydrograph type	= SCS Runoff	Peak discharge	= 80.24 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 4.945 acft
Drainage area	= 10.570 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.10 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

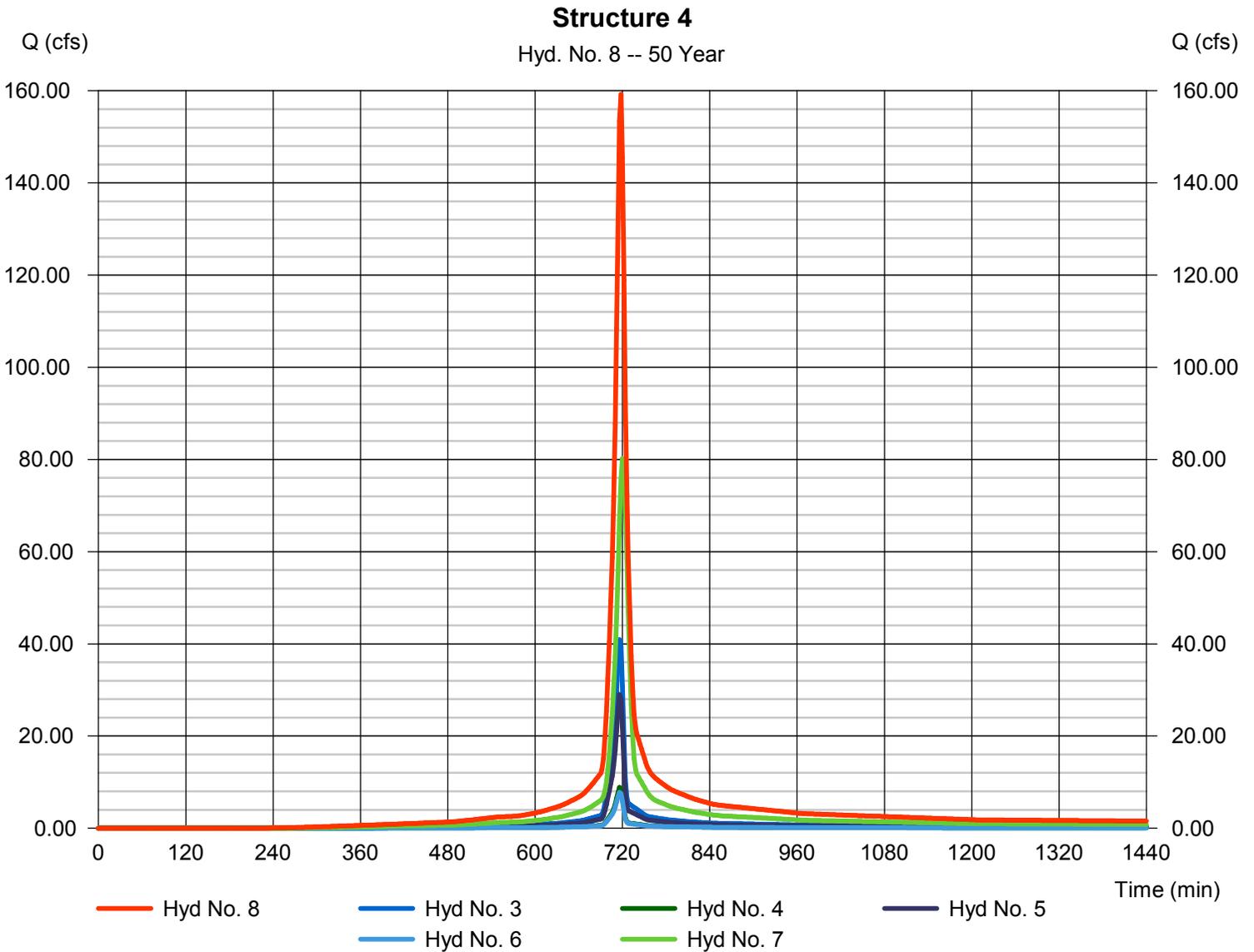
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## Hyd. No. 8

Structure 4

Hydrograph type	= Combine	Peak discharge	= 159.25 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 9.231 acft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 20.240 ac



# Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	95.69	2	716	4.774	----	----	----	BASIN 2 (structure 2)
2	SCS Runoff	10.91	2	716	0.552	----	----	----	BASIN 3 (structure 3)
3	SCS Runoff	45.60	2	716	2.275	----	----	----	Basin 4
4	SCS Runoff	9.878	2	716	0.493	----	----	----	Basin 6 (structure 6)
5	SCS Runoff	32.33	2	716	1.613	----	----	----	Basin 7 (structure 7)
6	SCS Runoff	8.681	2	716	0.433	----	----	----	Basin 9
7	SCS Runoff	89.88	2	720	5.574	----	----	----	Basin 10
8	Combine	177.93	2	718	10.387	3, 4, 5, 6, 7	----	----	Structure 4
P:\T113 (Traton)\_DUE DILIGENCE\Bell Drive Development\100 Year Hydro\Bell Avenue Storm Analysis (9.1.16).gpw									

# Hydrograph Report

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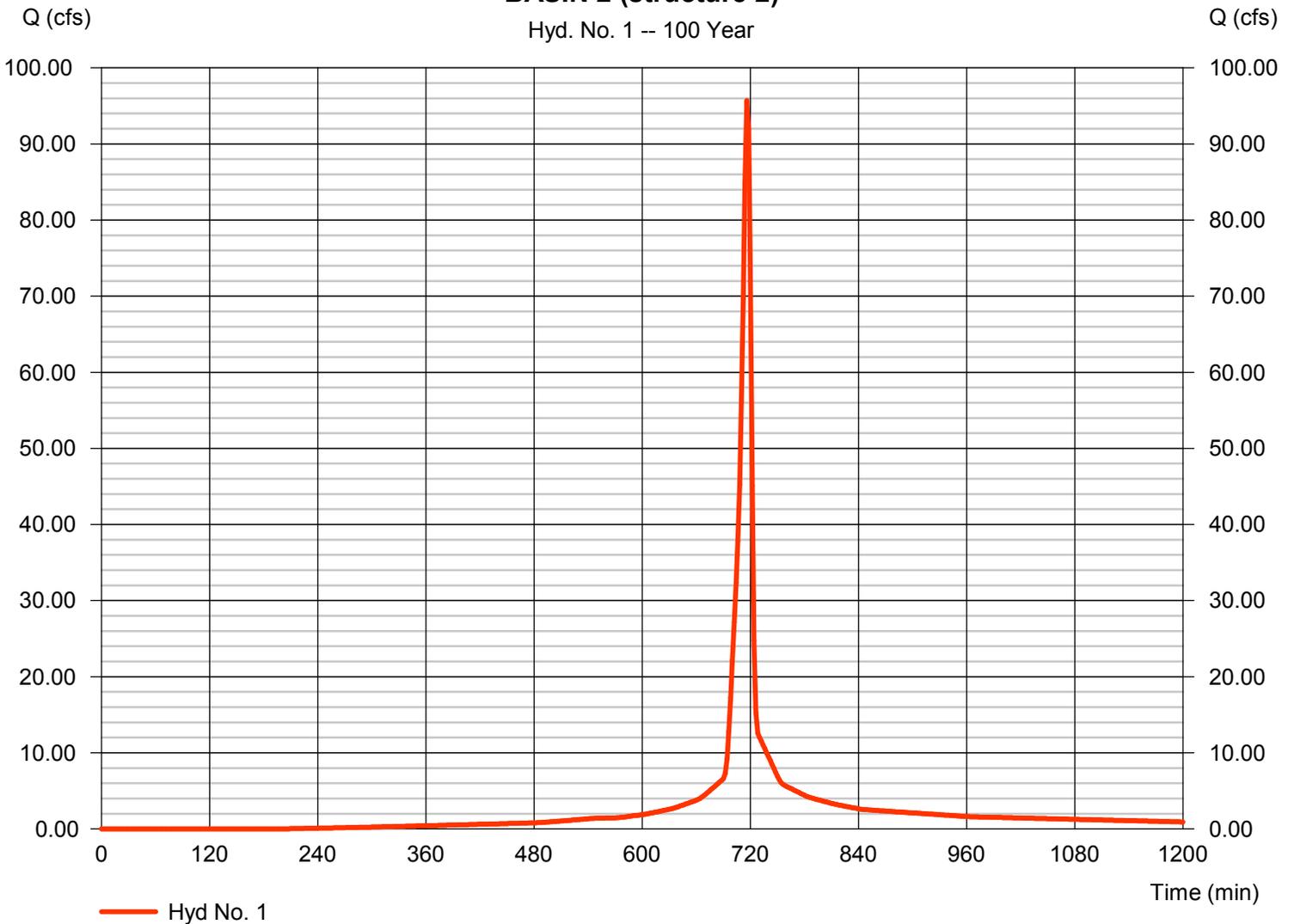
## Hyd. No. 1

### BASIN 2 (structure 2)

Hydrograph type	= SCS Runoff	Peak discharge	= 95.69 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 4.774 acft
Drainage area	= 9.590 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

### BASIN 2 (structure 2)

Hyd. No. 1 -- 100 Year

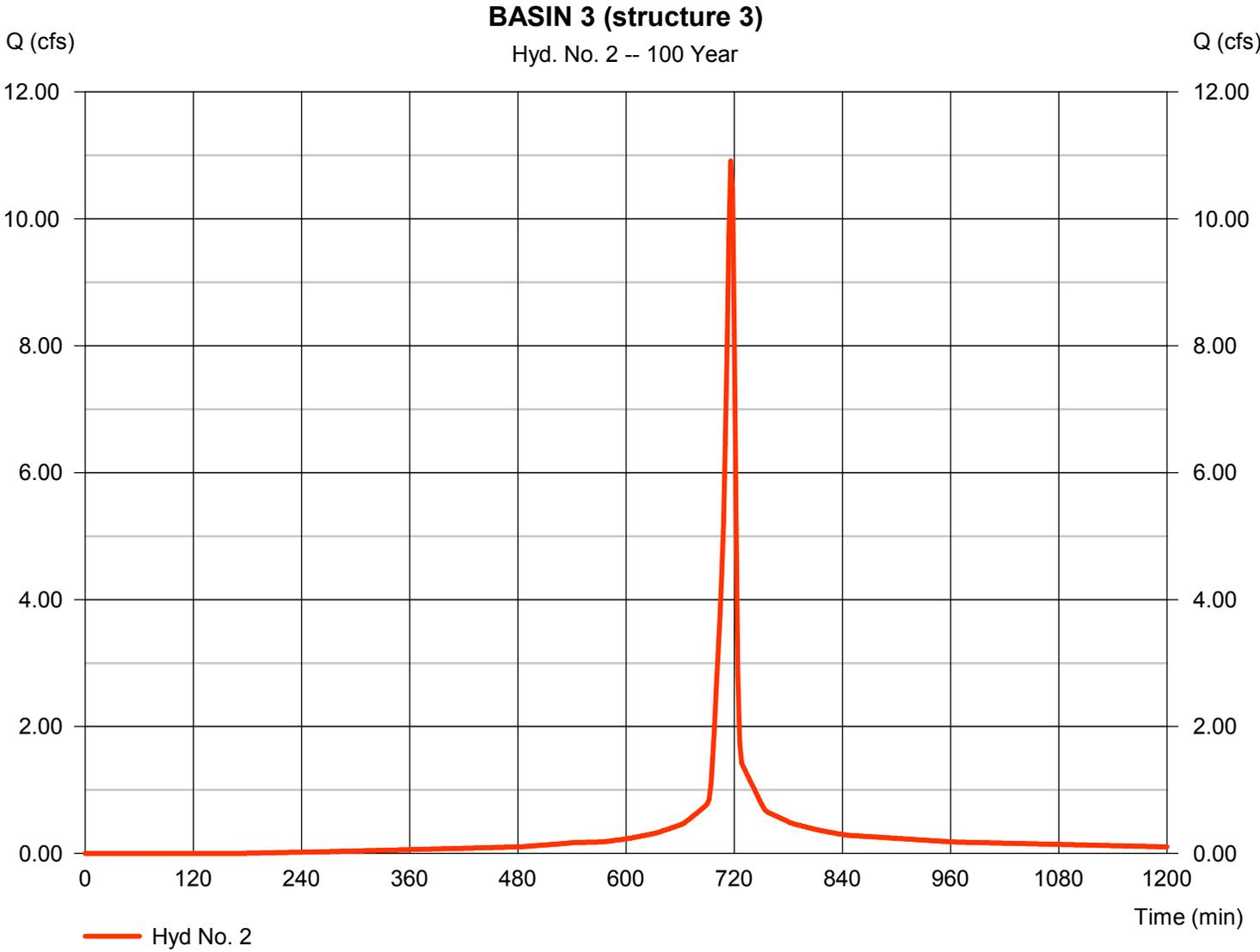


# Hydrograph Report

## Hyd. No. 2

BASIN 3 (structure 3)

Hydrograph type	= SCS Runoff	Peak discharge	= 10.91 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.552 acft
Drainage area	= 1.070 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

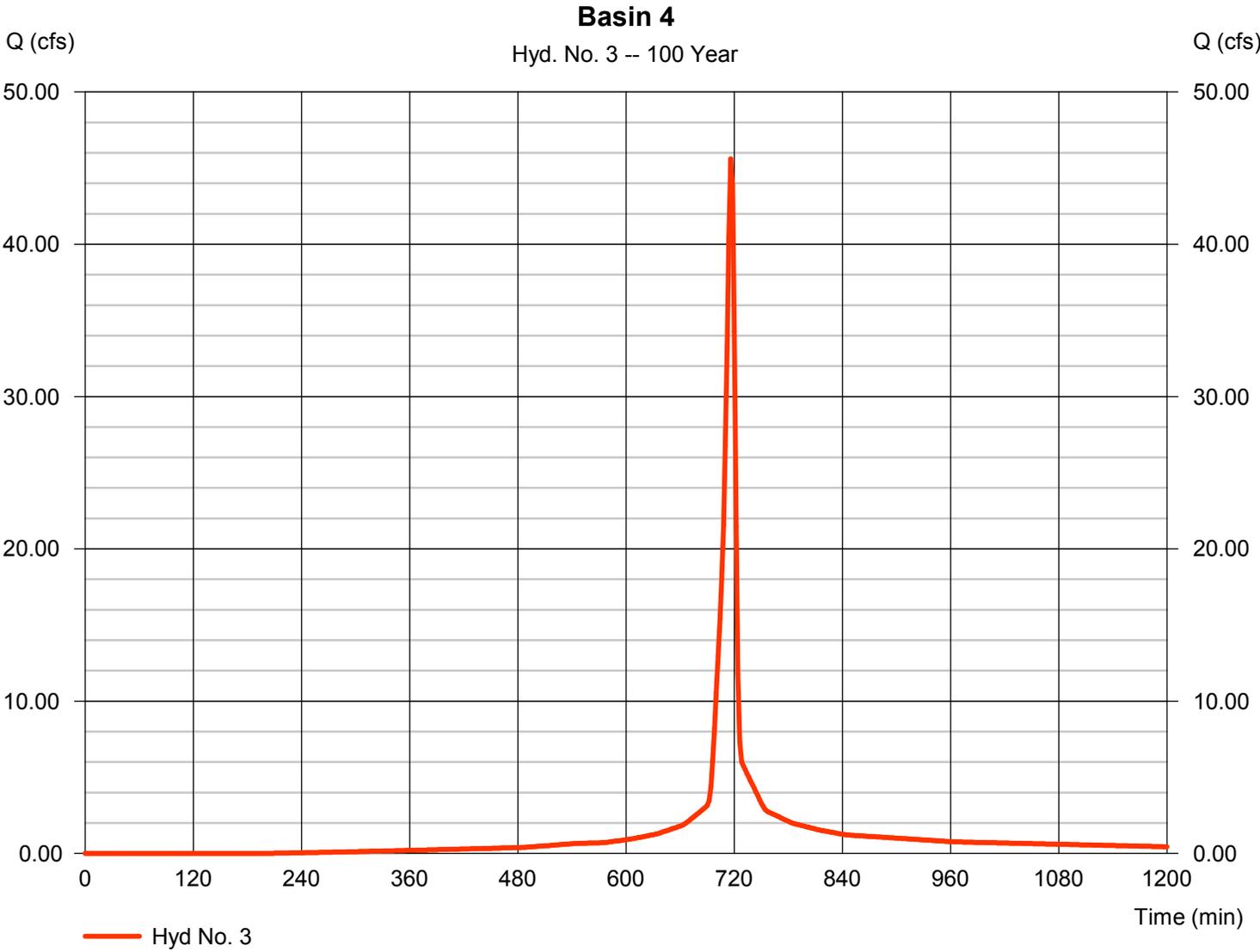


# Hydrograph Report

## Hyd. No. 3

### Basin 4

Hydrograph type	= SCS Runoff	Peak discharge	= 45.60 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 2.275 acft
Drainage area	= 4.570 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

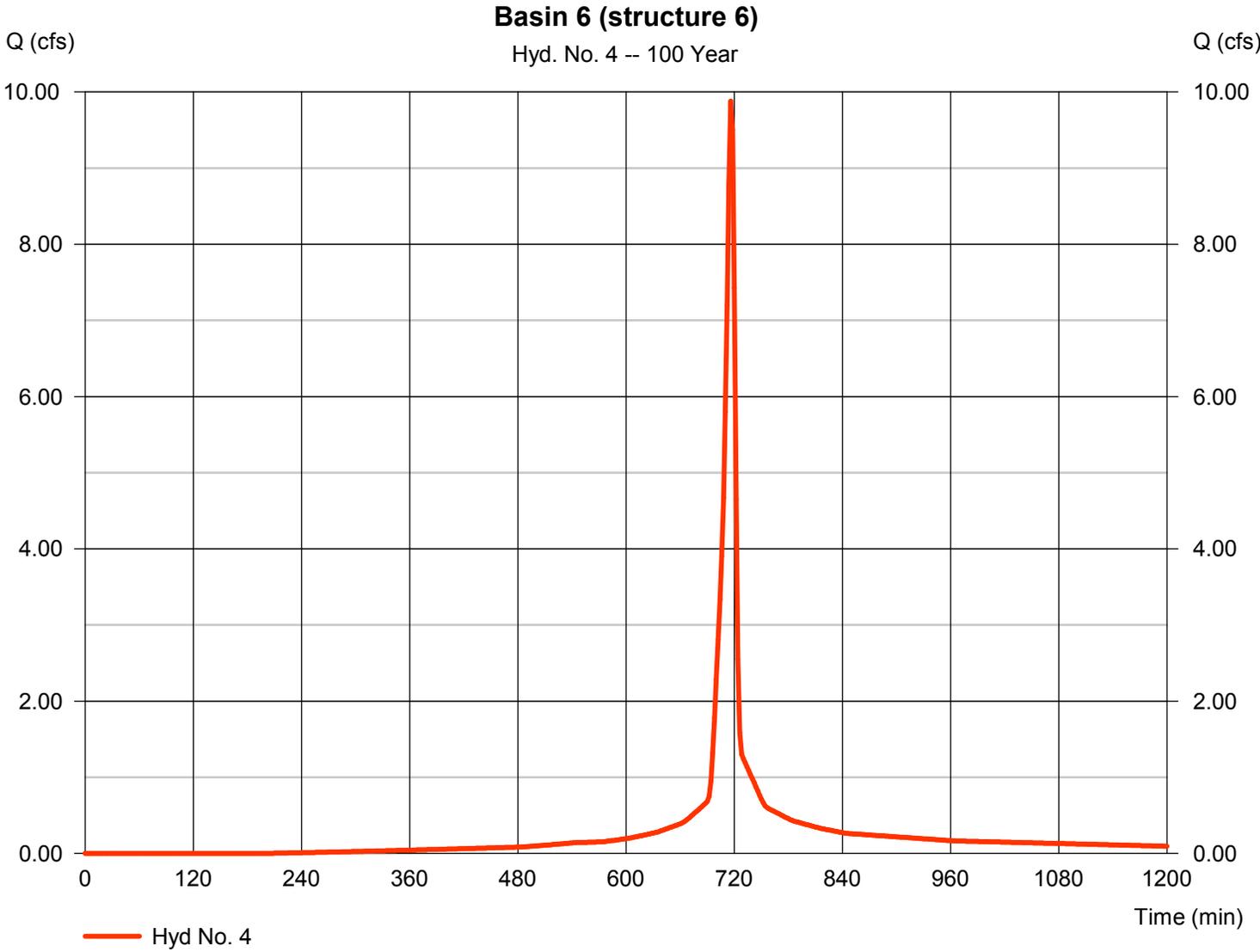


# Hydrograph Report

## Hyd. No. 4

Basin 6 (structure 6)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.878 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.493 acft
Drainage area	= 0.990 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

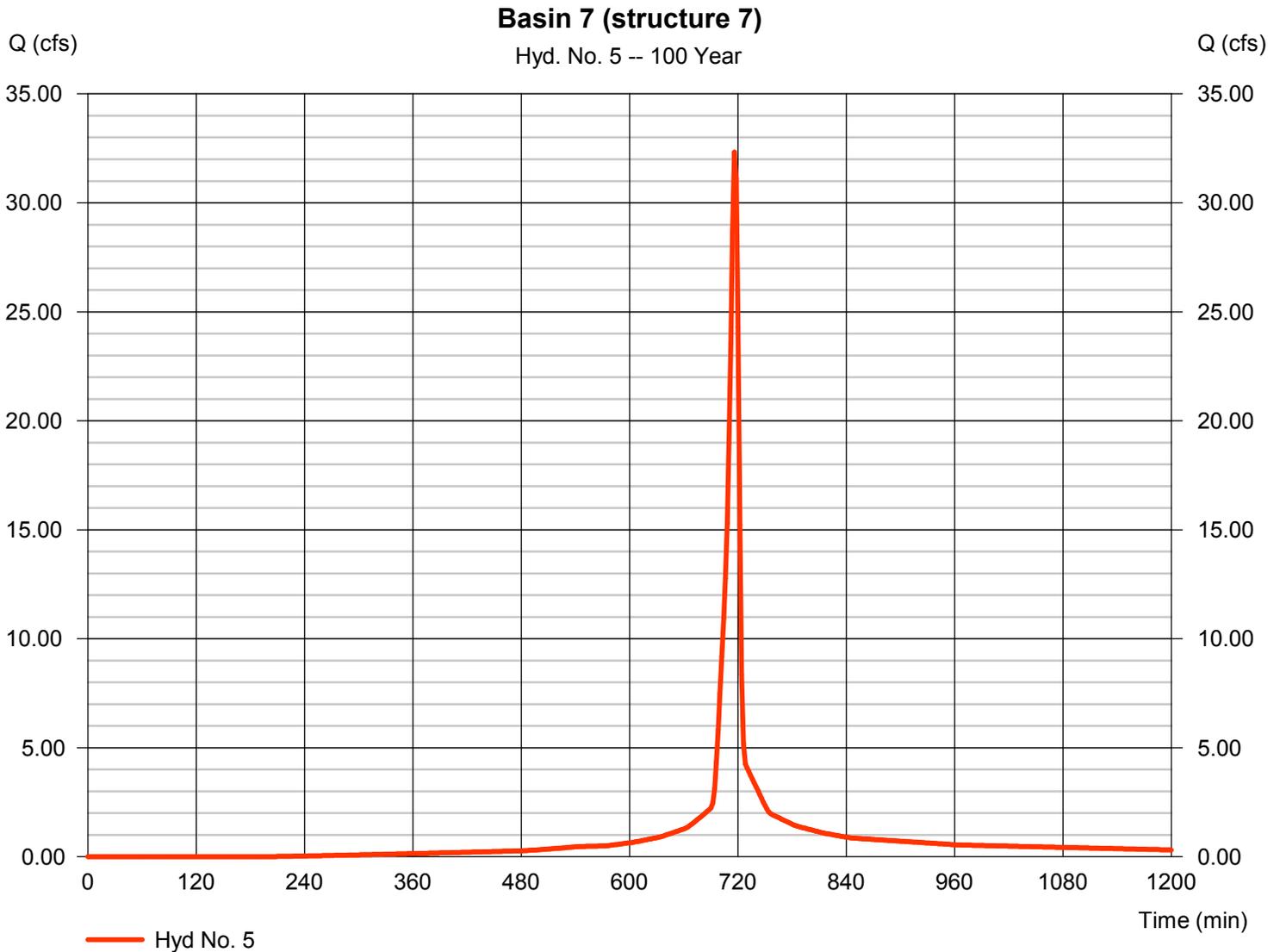
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## Hyd. No. 5

Basin 7 (structure 7)

Hydrograph type	= SCS Runoff	Peak discharge	= 32.33 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1.613 acft
Drainage area	= 3.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

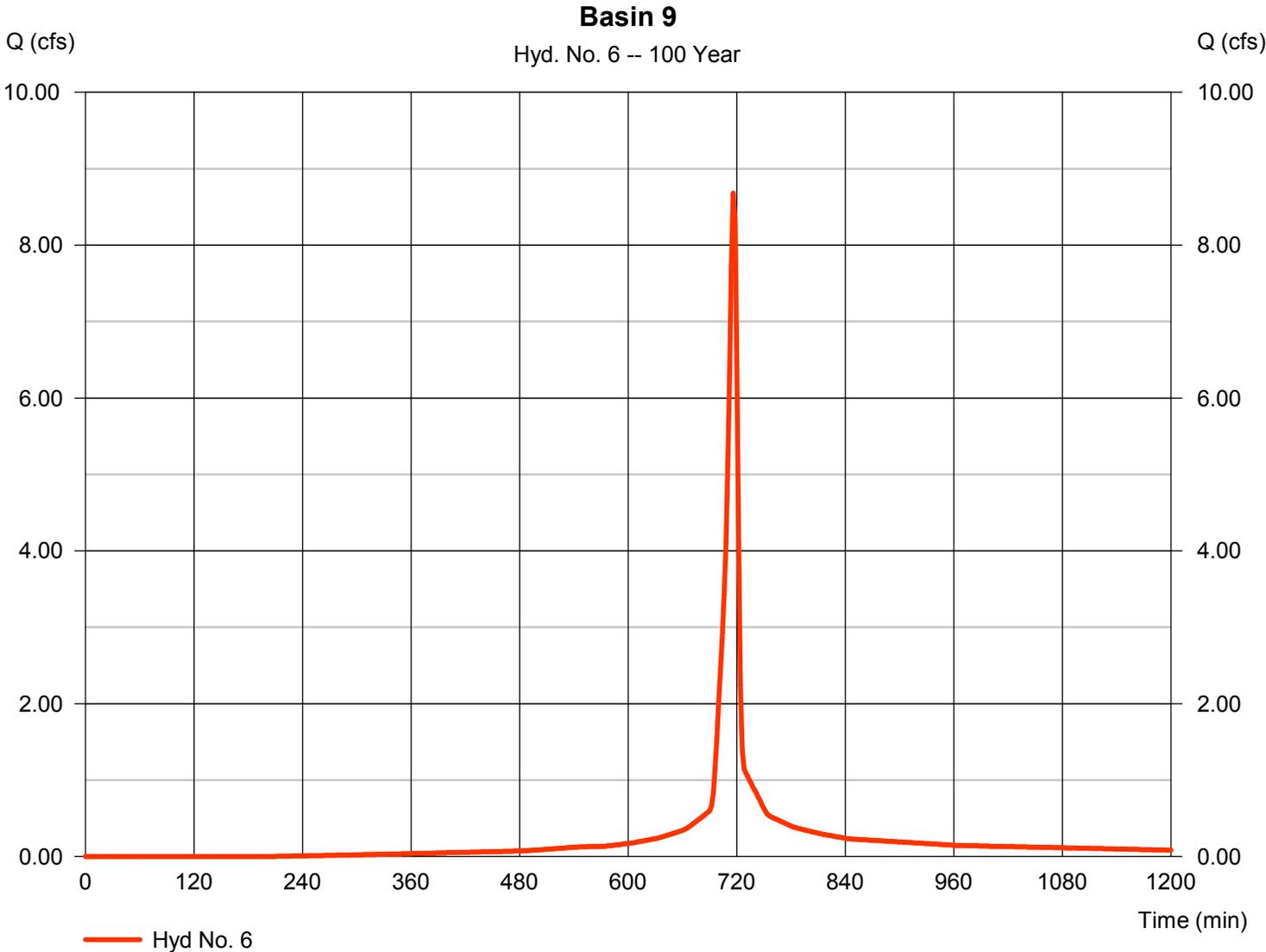


# Hydrograph Report

## Hyd. No. 6

Basin 9

Hydrograph type	= SCS Runoff	Peak discharge	= 8.681 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 0.433 acft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

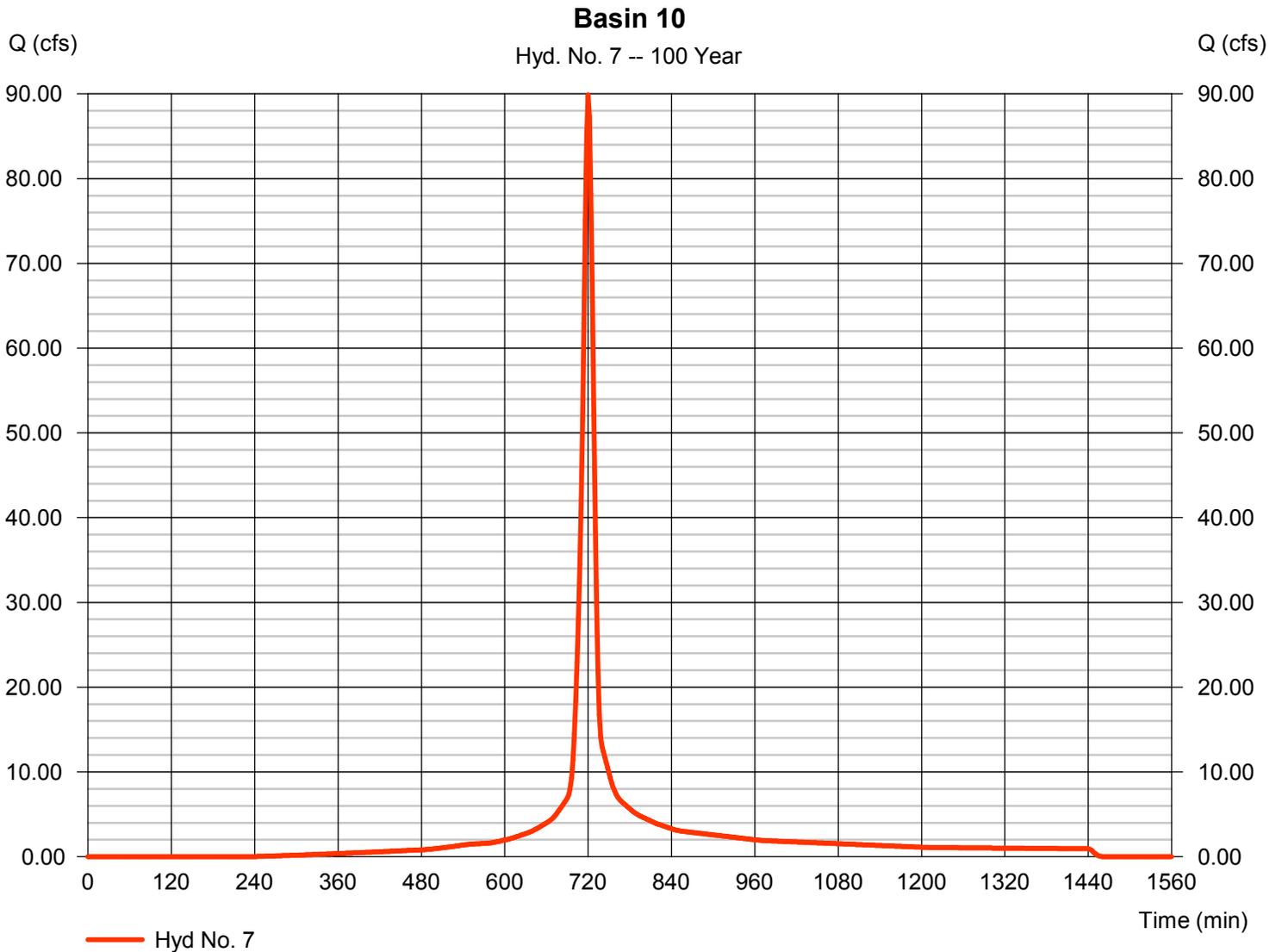
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## Hyd. No. 7

Basin 10

Hydrograph type	= SCS Runoff	Peak discharge	= 89.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5.574 acft
Drainage area	= 10.570 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.10 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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## Hyd. No. 8

Structure 4

Hydrograph type	= Combine	Peak discharge	= 177.93 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 10.387 acft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 20.240 ac

