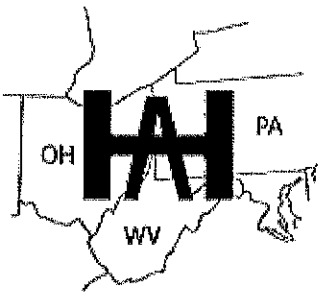
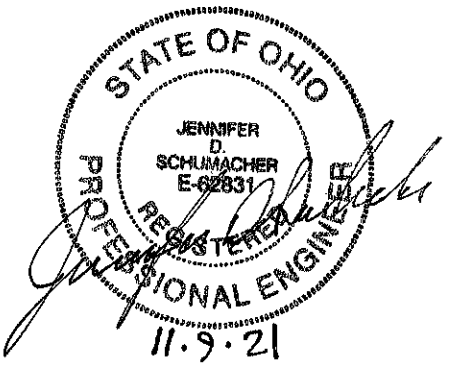
Post Construction Storm Water Management Report
GD Fab & Welding – New Building

Located in the
City of Massillon, Stark County, Ohio

November 2021





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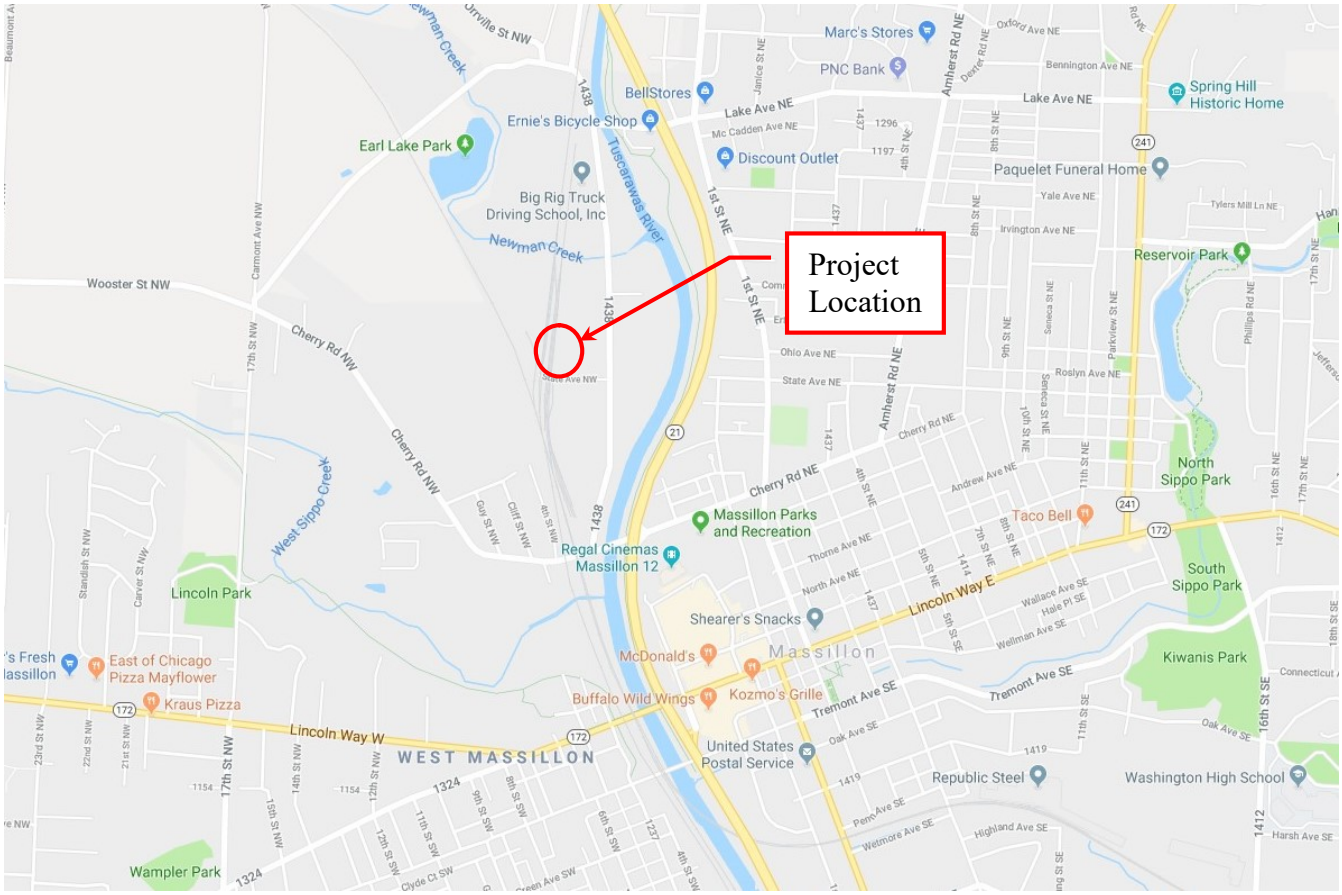
Location Map



Section 1: Drainage Narrative

Overview

Location: State Ave NW, Massillon, Ohio 44647; in the City of Massillon, Stark County

Current: Existing 4,000 SF building, and gravel drives.

Proposed: Industrial Fabrication and Welding Facility – 6,000 SF Building.

Point/Line of Analysis: Runoff from this property generally runs in three different directions. The majority of the site flows toward State Ave, while the northeast portion of the site flows to the north and east and eventually to 3rd St. A smaller portion of the site flows west toward the railroad tracks. Following construction, the storm water will continue this general pattern. As part of the development of this property, a larger detention basin will be installed which will collect and detain the runoff from the developed portion of the property. The remainder of the property will continue to flow in its current pattern.

Summary: City of Massillon Storm water regulations require all storm discharges for the 2-year through the 100-year storms be limited to the pre-development peak flow runoff of the same storm event.

The developed site will be routed through the proposed detention basin. The remaining areas of the property will continue to flow in their existing drainage patterns.

Drainage Maps

Three drainage maps are provided in Section 4.

1. Pre-Development
2. Post-Development

Detention Basin Calculations Methodology

The enclosed flood routing calculations for the detention basin were computed using the computer program Hydraflow Hydrographs by Intelisolve. Below is a brief explanation of the enclosed calculations.

Inflow Hydrographs

The inflow hydrographs were developed using the SCS method. The rainfall intensity values are based on current data from the NOAA website.

Curve Number – CN

Curve Numbers used for this project are based on standard Curve Number values as follows:

Area description	*CN*
Impervious/ Pavement	98
Grass/Lawn Areas, HSG C	79
Brush, HSG C	70
Gravel	89

Pre-developed Runoff to "Line" of Analysis

	Area (Acres)	CN	Tc (min)
Pre-Dev to Northeast	0.77	89	10
Pre-Dev to West	0.26	82	10
Pre-Dev to State Ave	1.18	88	10

Post Developed Runoff to "Line" of Analysis

	Area (Acres)	CN	Tc (min)
Post-Dev to Northeast	0.55	89	10
Post-Dev to West	0.26	82	10
Post-Dev Bypass to State Ave	0.51	86	10
Post-Dev to Basin	0.89	87	10

Allowable Discharge

The City of Massillon requires that the peak discharge from post-developed storms from the 2-year to the 100-year design storms be limited to the peak rate of runoff from the pre-developed conditions for the 2-year to the 100-year design storms, respectively.

Storage Volumes

Description	Elevation	Storage Volume (cf)
Bottom of Basin	936.00	0
Top of Basin	938.00	4,948

Outlet Structure

Principal Outlet Structure:

CB Type 2-2B – Top of Grate Elevation 937.27
Primary Discharge Orifice – 8" Diameter Orifice, Invert 935.45
12" Diameter Discharge Pipe – Invert 935.35

Emergency Spillway: 8' Wide Grass Lined Spillway – Invert 937.54

Flood Routing

Flood routing table was computed for the site using the available storage and outlet structures. Post developed bypass and detention structure hydrographs were combined to determine the peak rates of runoff to the "Line" of analysis. A summary of the results is listed below.

Pre-Development Peak Discharge Rates (cfs)

Description	Storm Return Period					
	2	5	10	25	50	100
1. Pre-Dev to Northeast	1.56	2.14	2.64	3.41	4.06	4.78
2. Pre-Dev to West	0.35	0.53	0.69	0.94	1.15	1.40
3. Pre-Dev to State Ave and Basin	2.27	3.15	3.92	5.09	6.09	7.20

Post-Development Peak Discharge Rates (cfs)

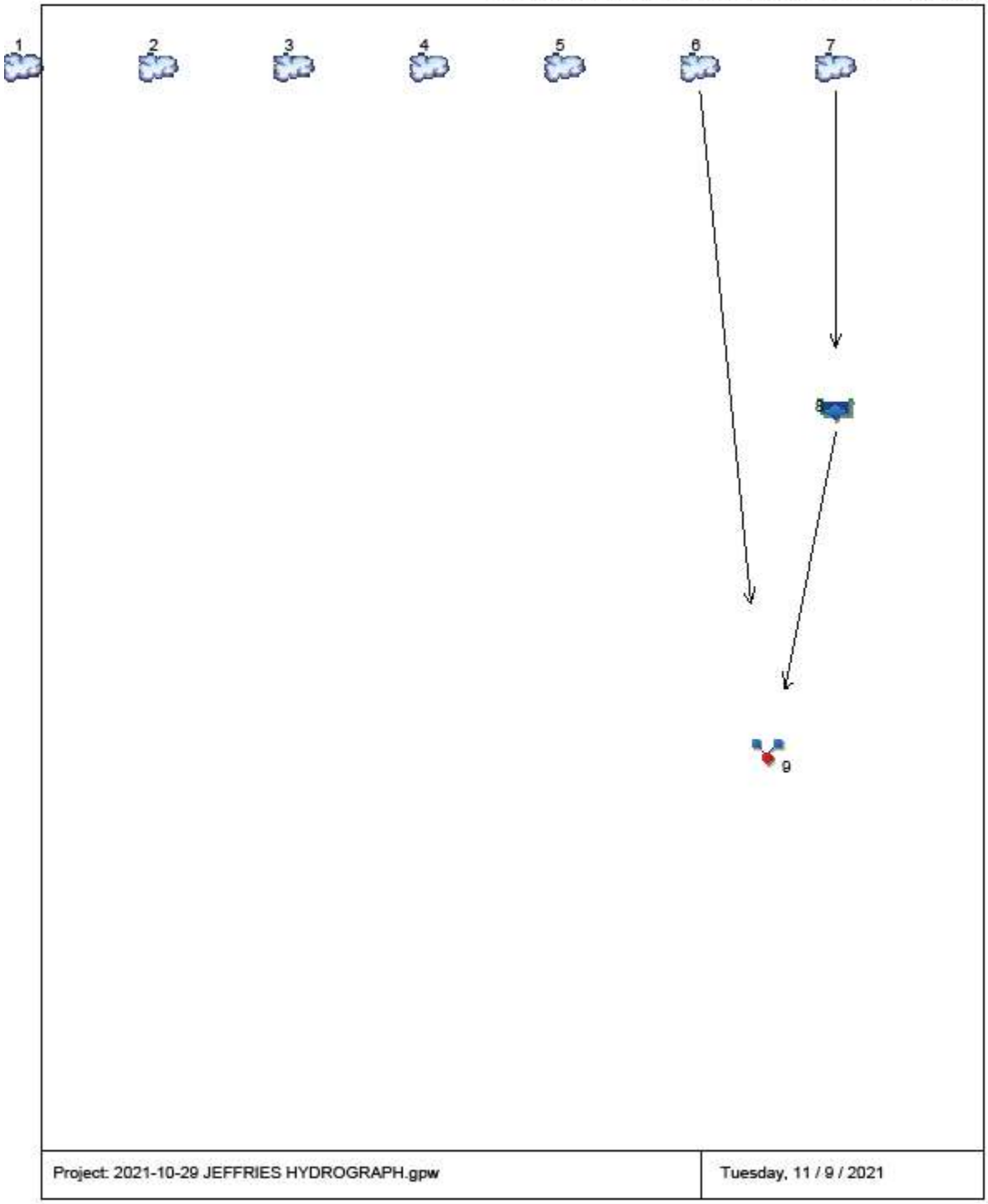
Description	Storm Return Period					
	2	5	10	25	50	100
5. Post-Dev to Northeast	0.66	1.00	1.33	1.85	2.30	2.81
6. Post-Dev to West	0.35	0.53	0.69	0.94	1.15	1.40
7. Post-Dev Bypass to State Ave (undetained)	0.88	1.25	1.58	2.08	2.51	2.99
8. Post-Dev to Basin	1.62	2.28	2.86	3.74	4.49	5.33
10. Post-Dev Retention Pond	1.02	1.30	1.52	1.73	2.05	3.19
12. Total Post-Dev to State Ave (7+10)	1.62	2.40	2.90	3.63	4.17	5.23

Based on the results of the runoff model, the post-development peak flow rates for each design storm are less than the pre-development peak flow rates of the respective storm.

Section 2: Pre- vs. Post-Development Runoff Analysis

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020



Project: 2021-10-29 JEFFRIES HYDROGRAPH.gpw	Tuesday, 11 / 9 / 2021

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

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	----	----	1.557	----	2.136	2.644	3.407	4.062	4.783	PRE-DEV TO NE
2	SCS Runoff	----	----	0.354	----	0.528	0.688	0.936	1.154	1.397	PRE-DEV TO W
3	SCS Runoff	----	----	2.267	----	3.146	3.920	5.088	6.093	7.201	PRE-DEV TO BASIN & STATE AVE
4	SCS Runoff	----	----	0.658	----	1.007	1.334	1.847	2.301	2.810	POST DEV TO NE
5	SCS Runoff	----	----	0.354	----	0.528	0.688	0.936	1.154	1.397	POST DEV TO W
6	SCS Runoff	----	----	0.878	----	1.249	1.579	2.081	2.514	2.994	POST DEV TO STATE AVE
7	SCS Runoff	----	----	1.620	----	2.276	2.856	3.735	4.493	5.330	POST DEV TO BASIN
8	Reservoir	7	----	1.023	----	1.301	1.515	1.726	2.051	3.190	DETENTION POND
9	Combine	6, 8	----	1.796	----	2.393	2.903	3.630	4.172	5.233	combined outflow to State Ave

Proj. file: 2021-10-29 JEFFRIES HYDROGRAPH.gpw | Tuesday, 11 / 9 / 2021

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.557	2	720	4,042	—	—	—	PRE-DEV TO NE
2	SCS Runoff	0.354	2	722	929	—	—	—	PRE-DEV TO W
3	SCS Runoff	2.267	2	720	5,676	—	—	—	PRE-DEV TO BASIN & STATE AVE
4	SCS Runoff	0.658	2	722	1,745	—	—	—	POST DEV TO NE
5	SCS Runoff	0.354	2	722	929	—	—	—	POST DEV TO W
6	SCS Runoff	0.878	2	720	2,281	—	—	—	POST DEV TO STATE AVE
7	SCS Runoff	1.620	2	720	4,201	—	—	—	POST DEV TO BASIN
8	Reservoir	1.023	2	728	4,201	7	936.37	663	DETENTION POND
9	Combine	1.796	2	722	6,482	6, 8	—	—	combined outflow to State Ave

2021-10-29 JEFFRIES HYDROGRAPH.gpw | Return Period: 2 Year | Tuesday, 11 / 9 / 2021

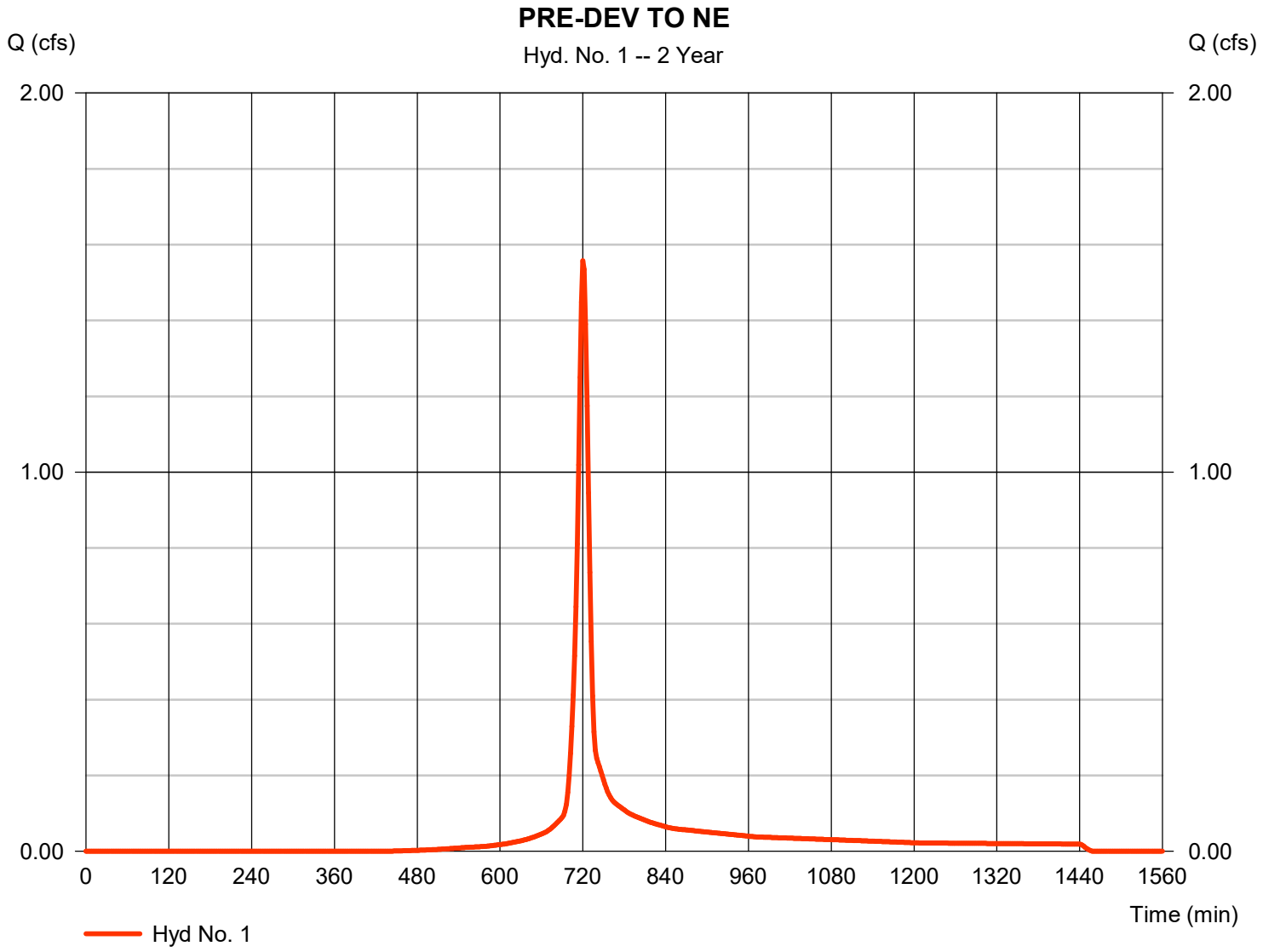
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 11 / 9 / 2021

Hyd. No. 1

PRE-DEV TO NE

Hydrograph type	= SCS Runoff	Peak discharge	= 1.557 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 4,042 cuft
Drainage area	= 0.770 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



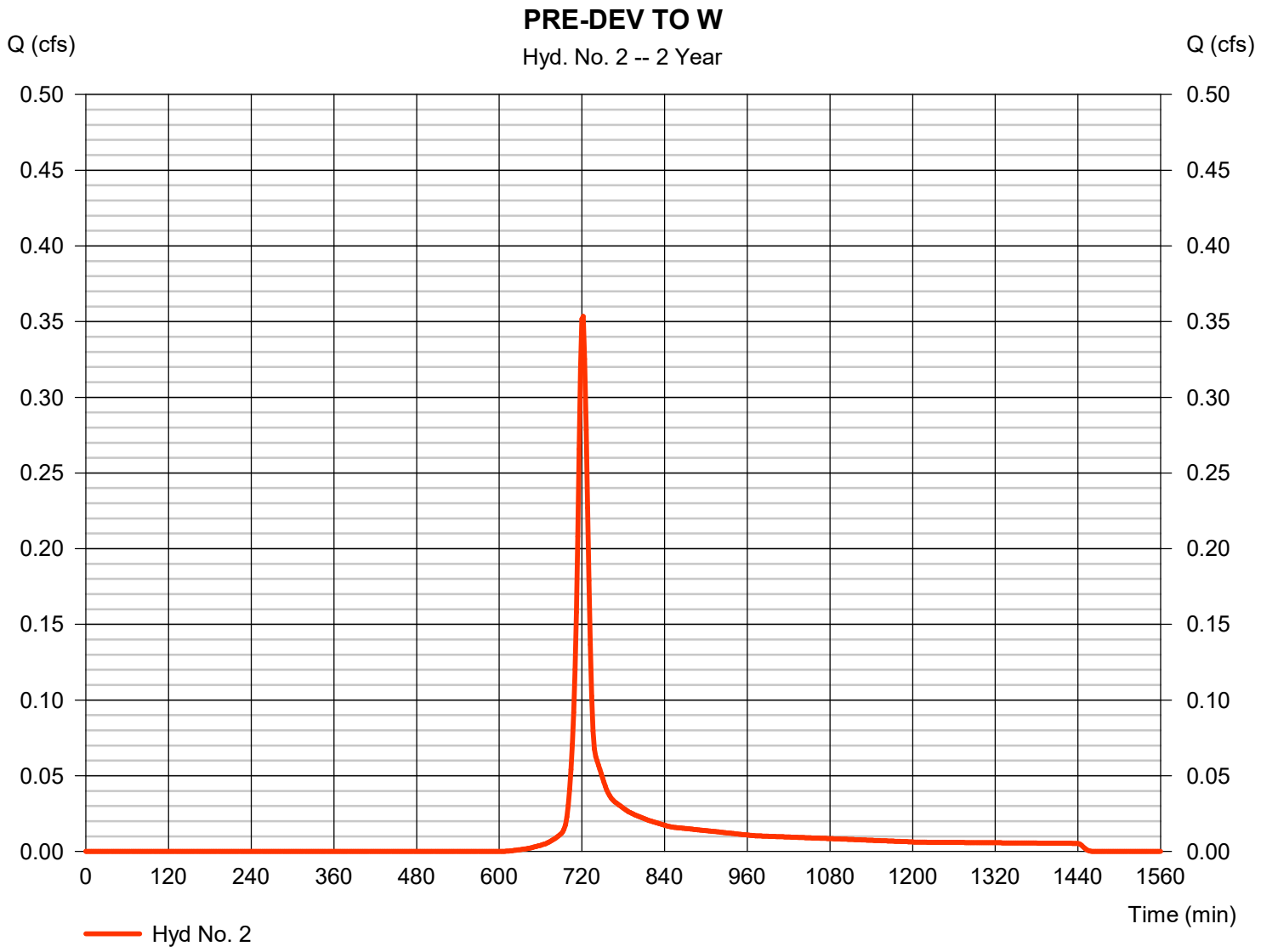
Hydrograph Report

Hyd. No. 2

PRE-DEV TO W

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.354 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	929 cuft
Drainage area	=	0.260 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	2.44 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



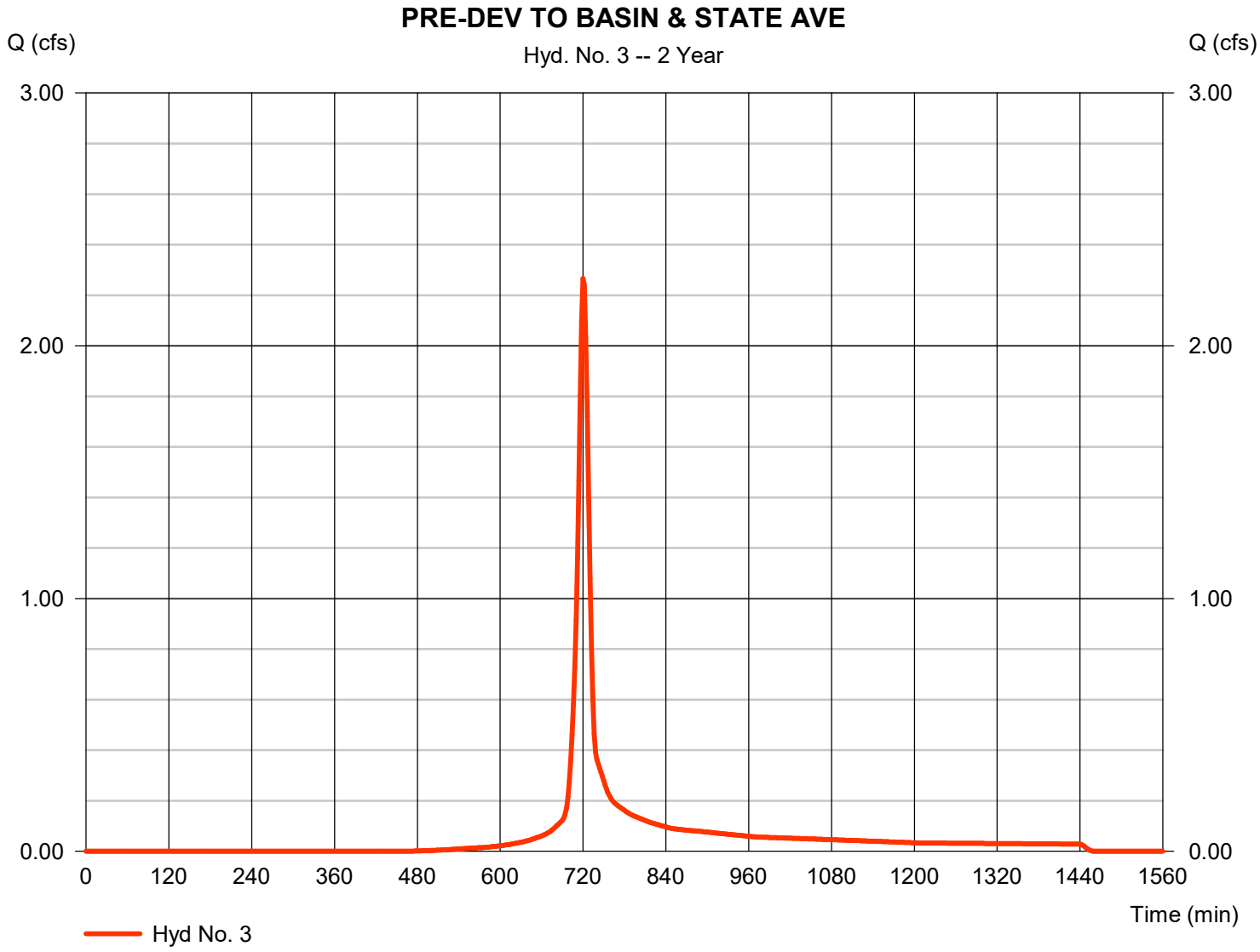
Hydrograph Report

Hyd. No. 3

PRE-DEV TO BASIN & STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.267 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,876 cuft
Drainage area	= 1.180 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.580 x 92) + (0.260 x 79)] / 1.180

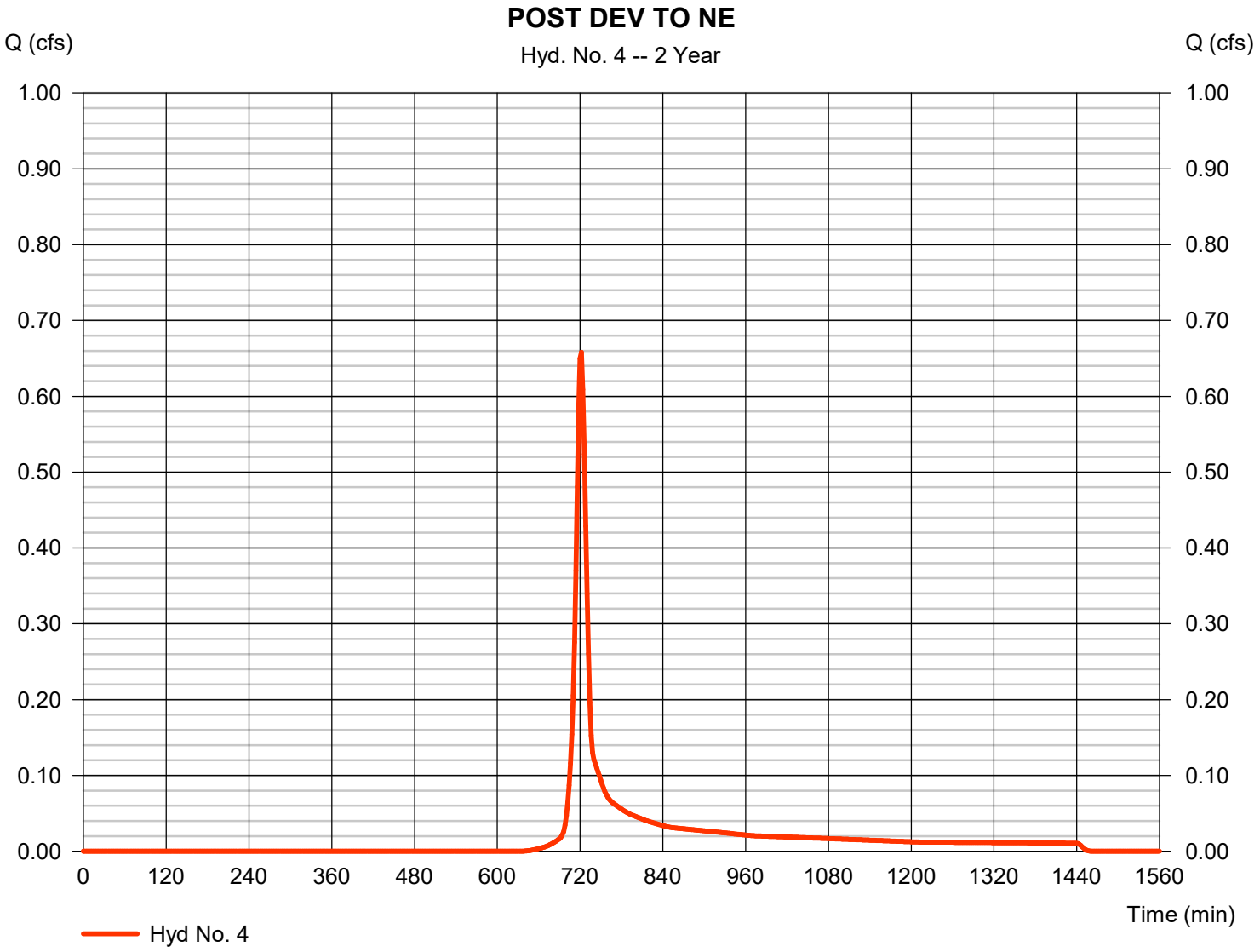


Hydrograph Report

Hyd. No. 4

POST DEV TO NE

Hydrograph type	= SCS Runoff	Peak discharge	= 0.658 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 1,745 cuft
Drainage area	= 0.550 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



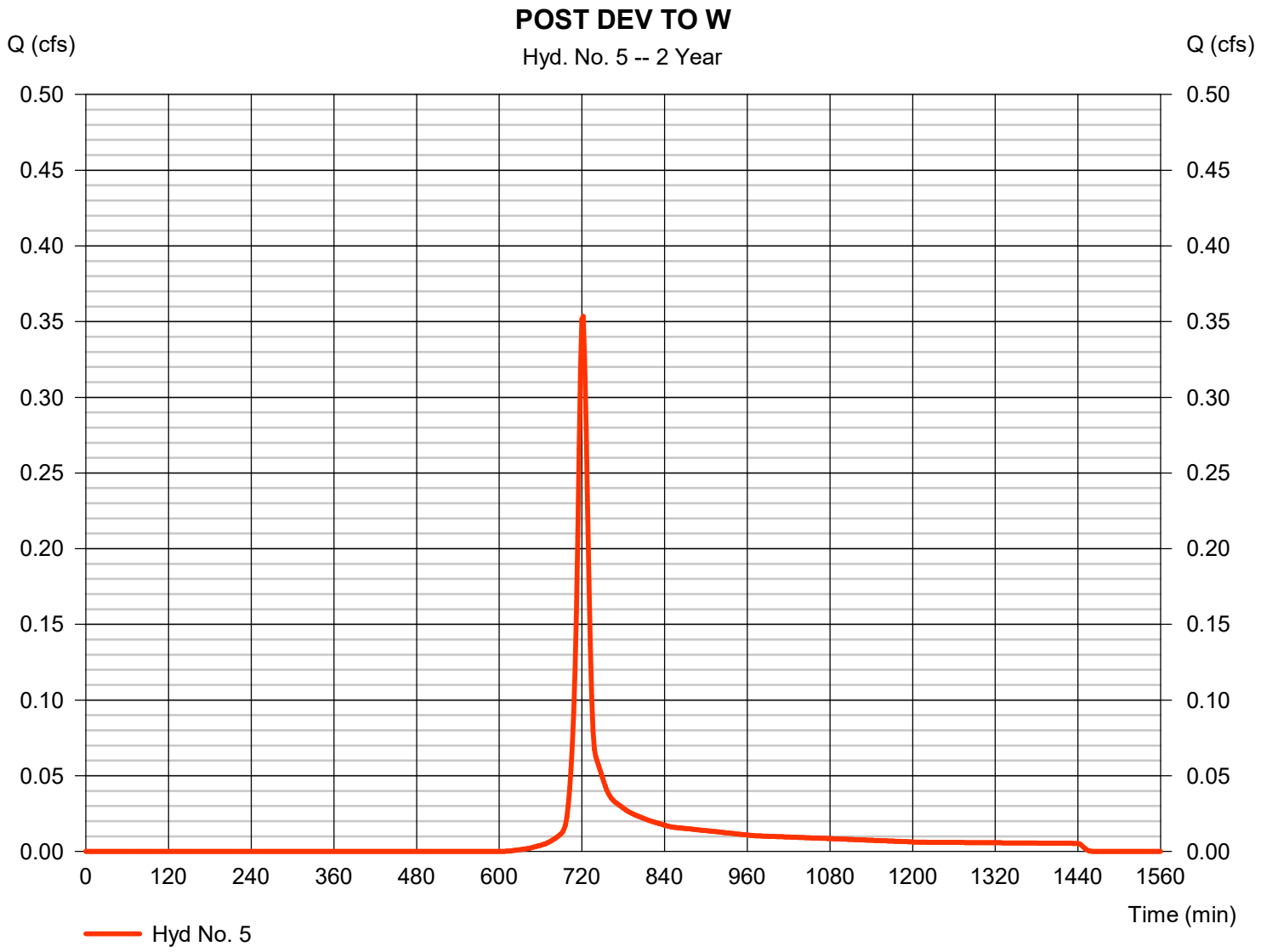
Hydrograph Report

Hyd. No. 5

POST DEV TO W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.354 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 929 cuft
Drainage area	= 0.260 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



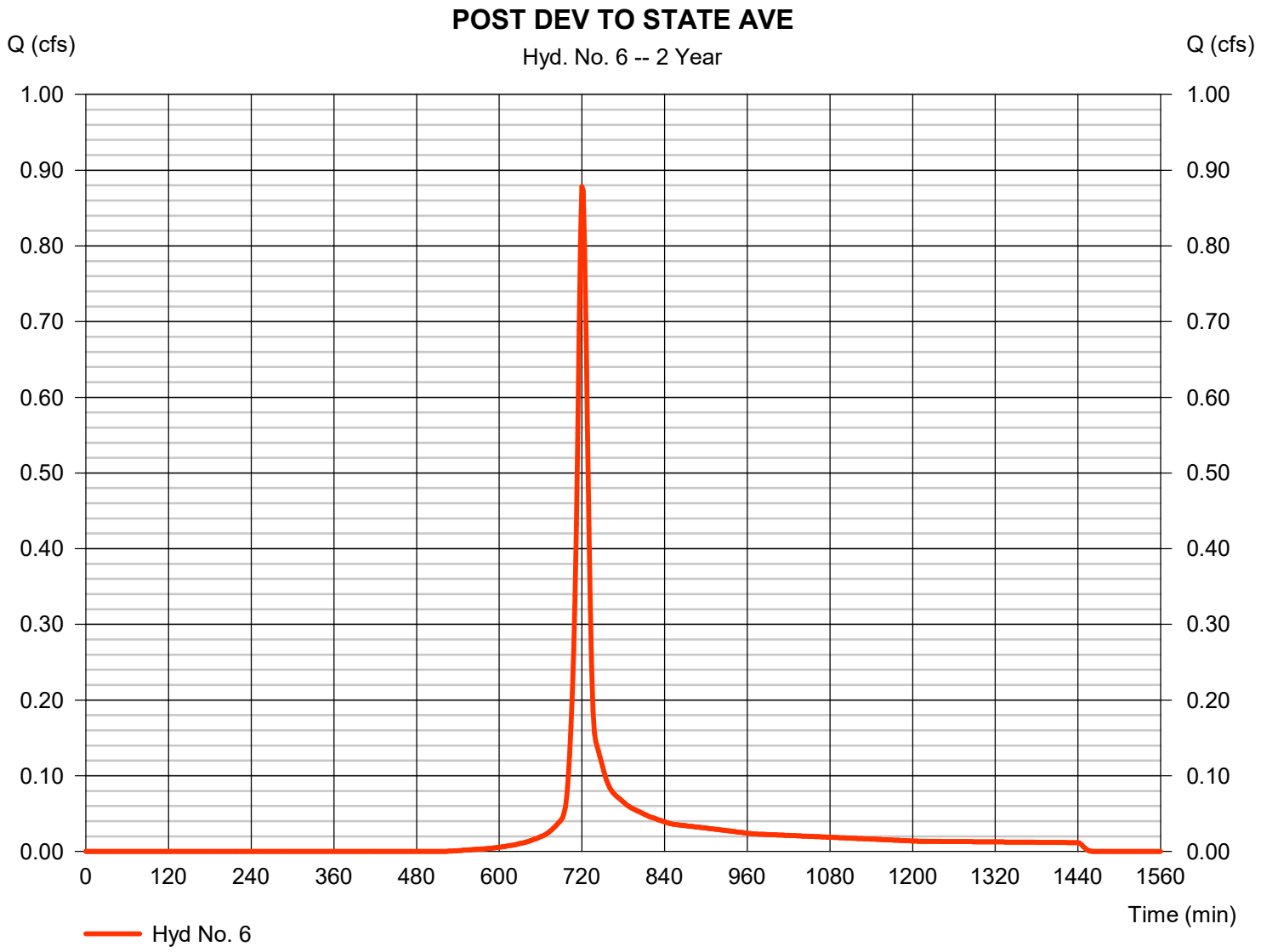
Hydrograph Report

Hyd. No. 6

POST DEV TO STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 0.878 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2,281 cuft
Drainage area	= 0.510 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.170 x 79)] / 0.510



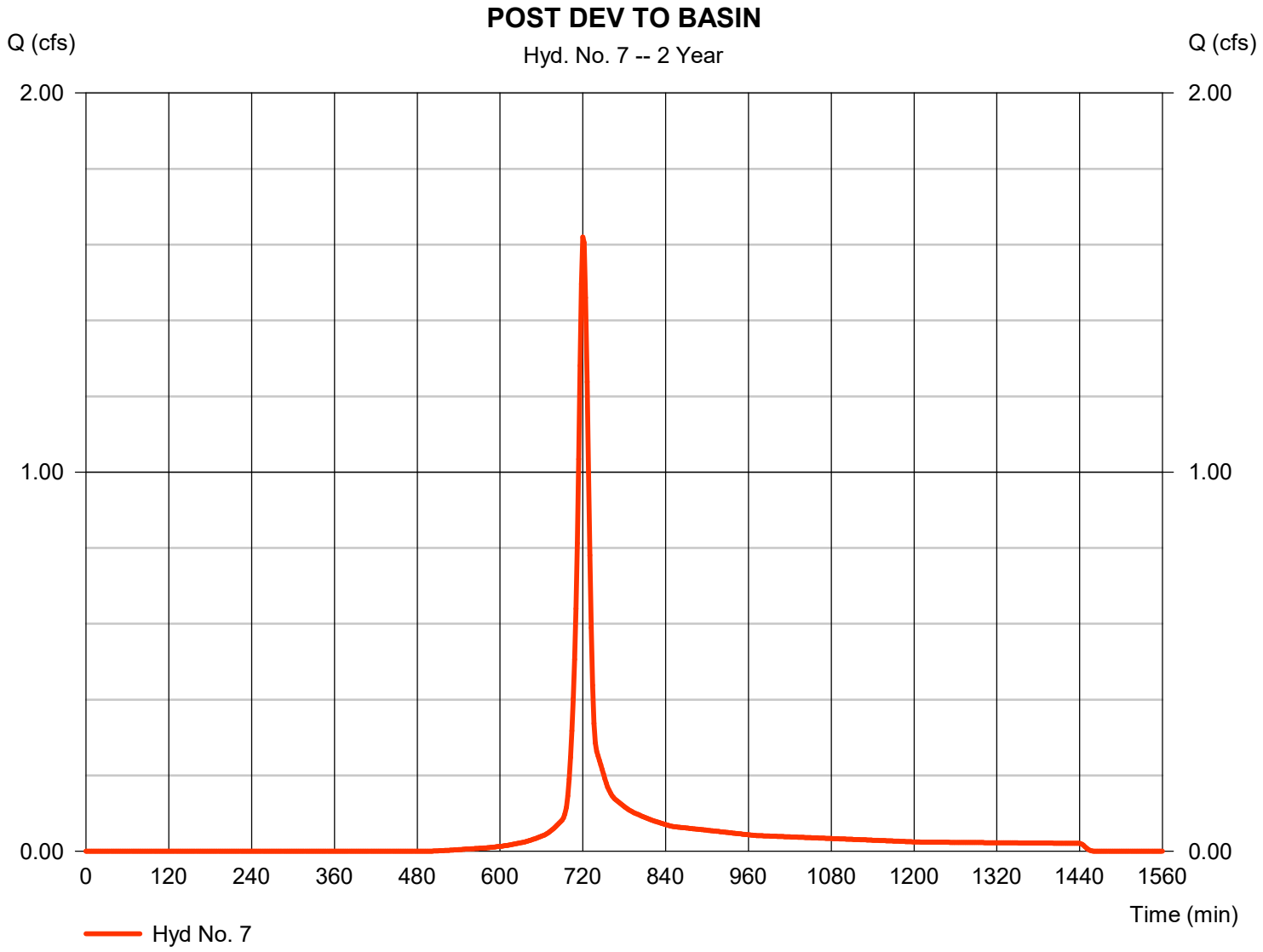
Hydrograph Report

Hyd. No. 7

POST DEV TO BASIN

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.620 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	4,201 cuft
Drainage area	=	0.890 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	2.44 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.720 x 89) + (0.170 x 79)] / 0.890



Hydrograph Report

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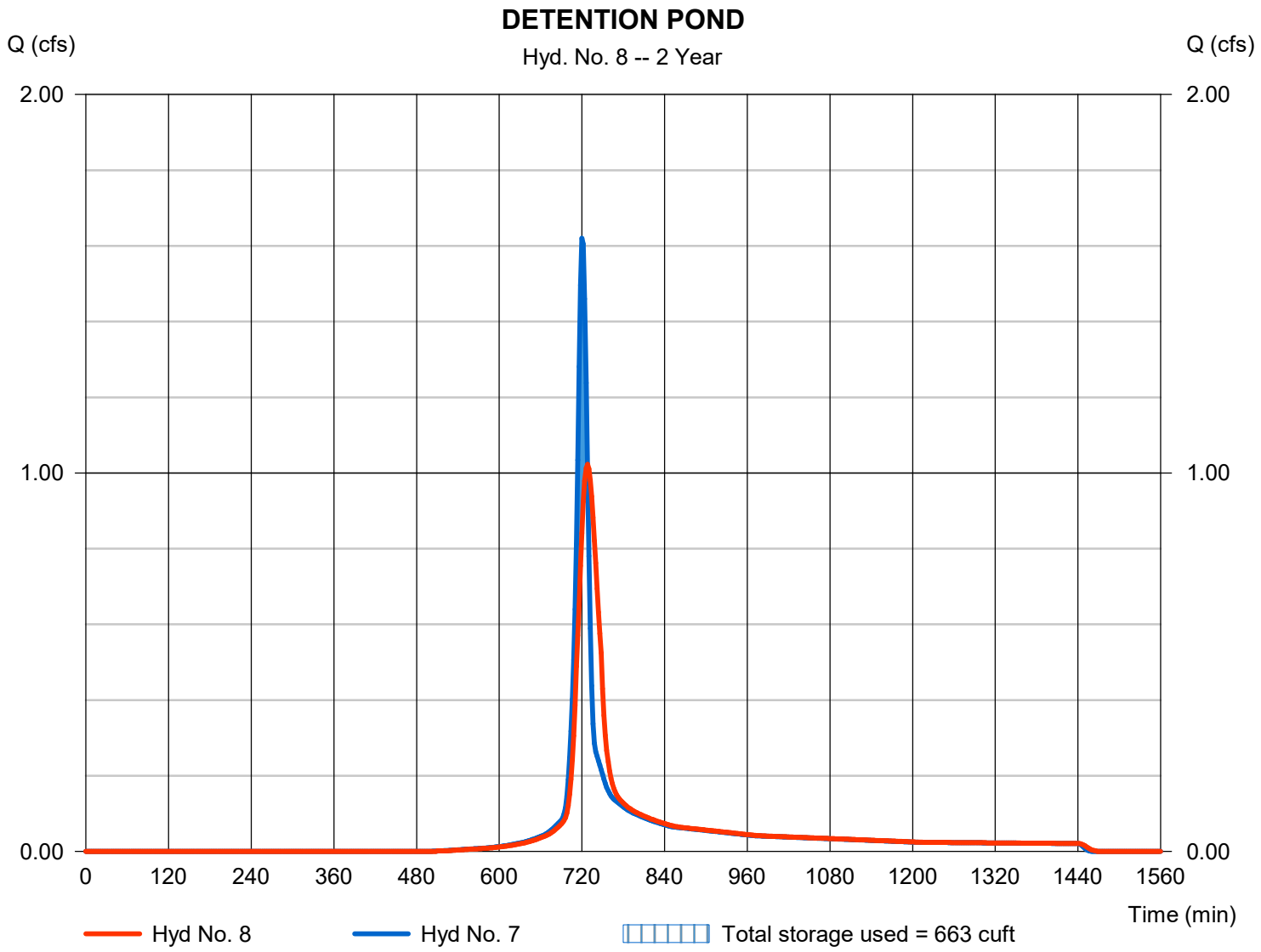
Hyd. No. 8

DETENTION POND

Hydrograph type	=	Reservoir	Peak discharge	=	1.023 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	4,201 cuft
Inflow hyd. No.	=	7 - POST DEV TO BASIN	Max. Elevation	=	936.37 ft
Reservoir name	=	POST POND	Max. Storage	=	663 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - POST POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 936.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	936.00	941	0	0
1.00	937.00	2,791	1,784	1,784
2.00	938.00	3,553	3,164	4,948

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	8.00	0.00	0.00
Span (in)	= 12.00	8.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 935.35	935.45	0.00	0.00
Length (ft)	= 24.00	0.00	0.00	0.00
Slope (%)	= 1.70	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

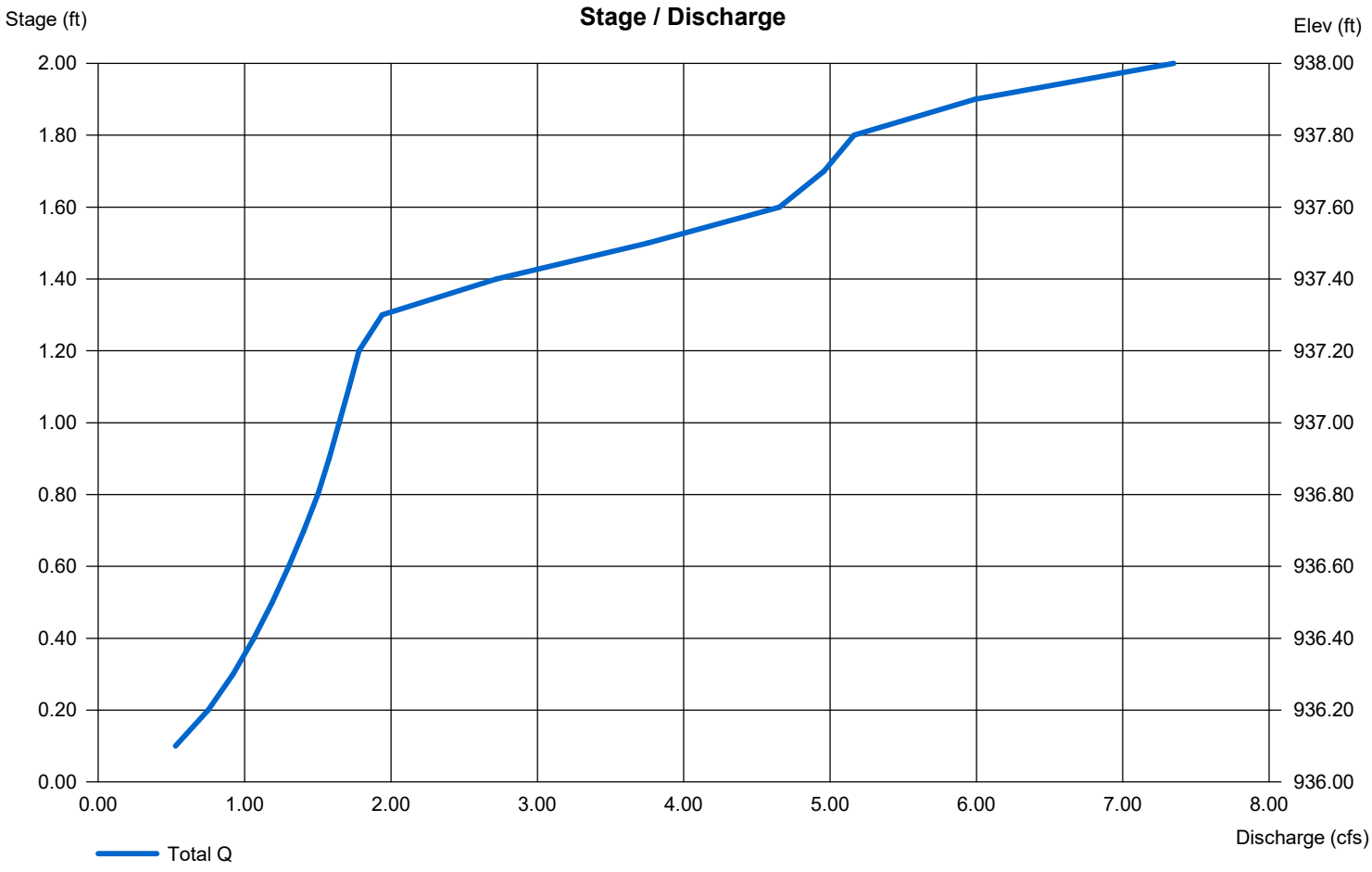
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.50	8.00	0.00	0.00
Crest El. (ft)	= 937.27	937.80	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

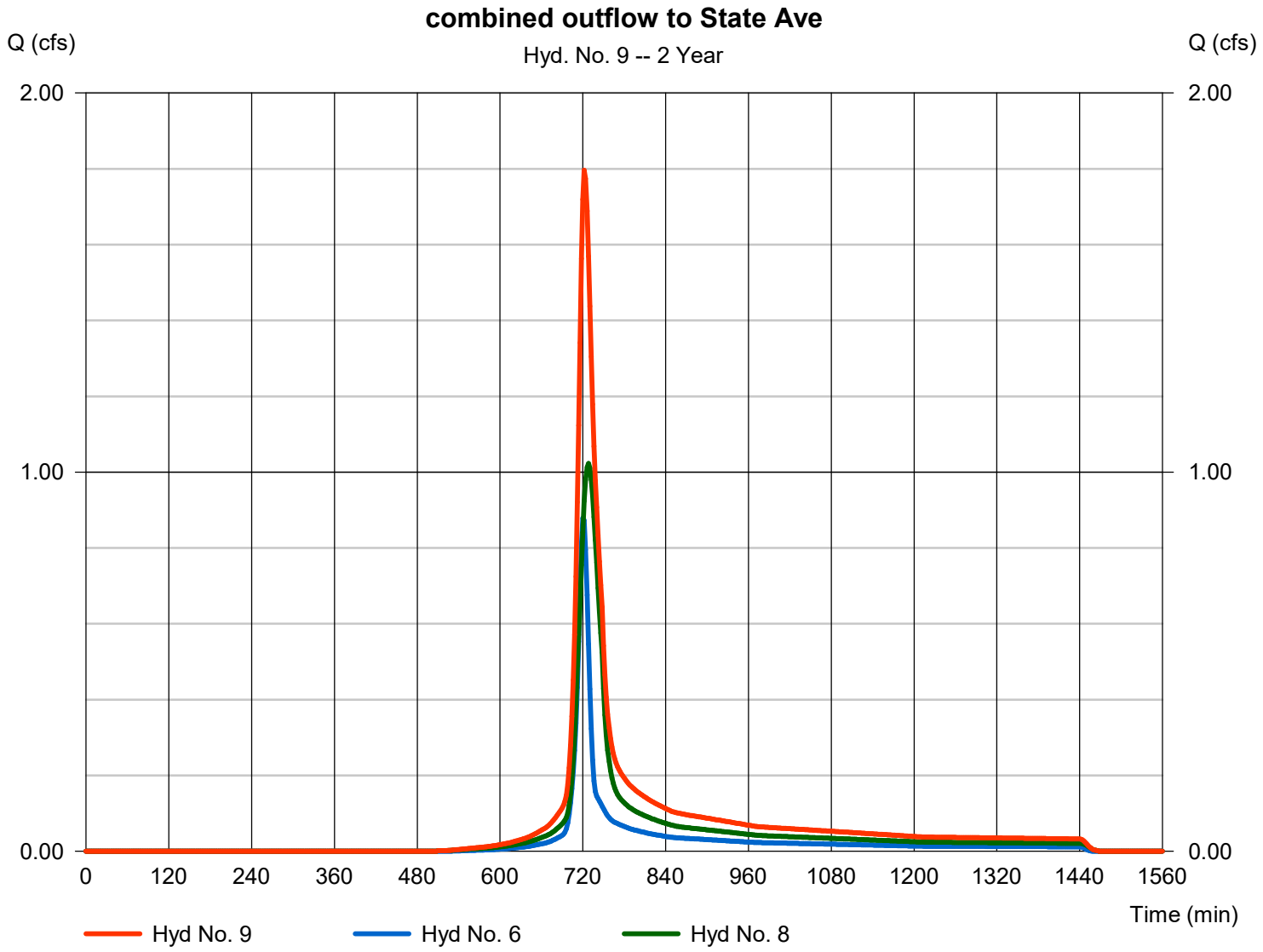


Hydrograph Report

Hyd. No. 9

combined outflow to State Ave

Hydrograph type	= Combine	Peak discharge	= 1.796 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 6,482 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.510 ac

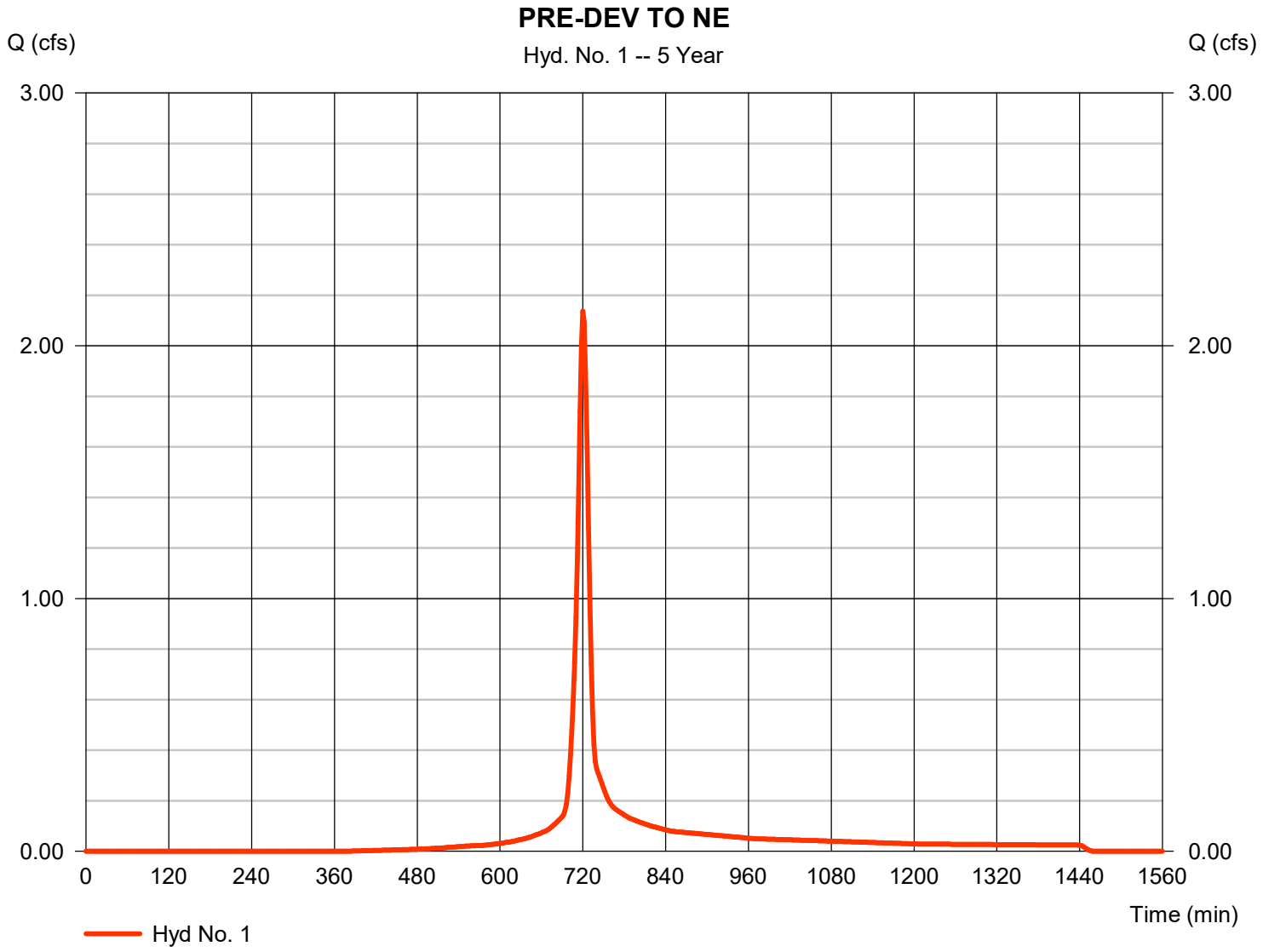


Hydrograph Report

Hyd. No. 1

PRE-DEV TO NE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.136 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,580 cuft
Drainage area	= 0.770 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



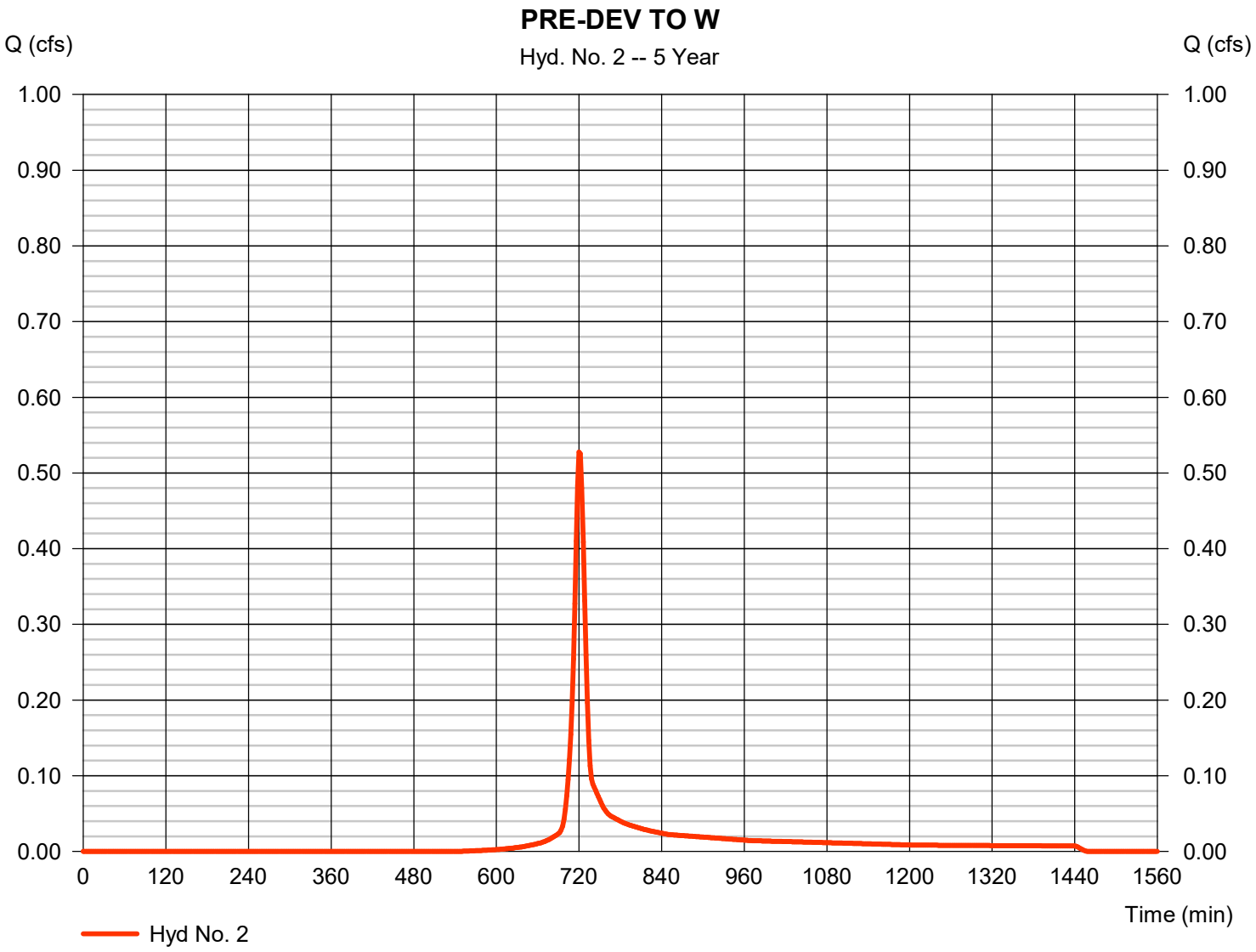
Hydrograph Report

Hyd. No. 2

PRE-DEV TO W

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.528 cfs
Storm frequency	=	5 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	1,373 cuft
Drainage area	=	0.260 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.04 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



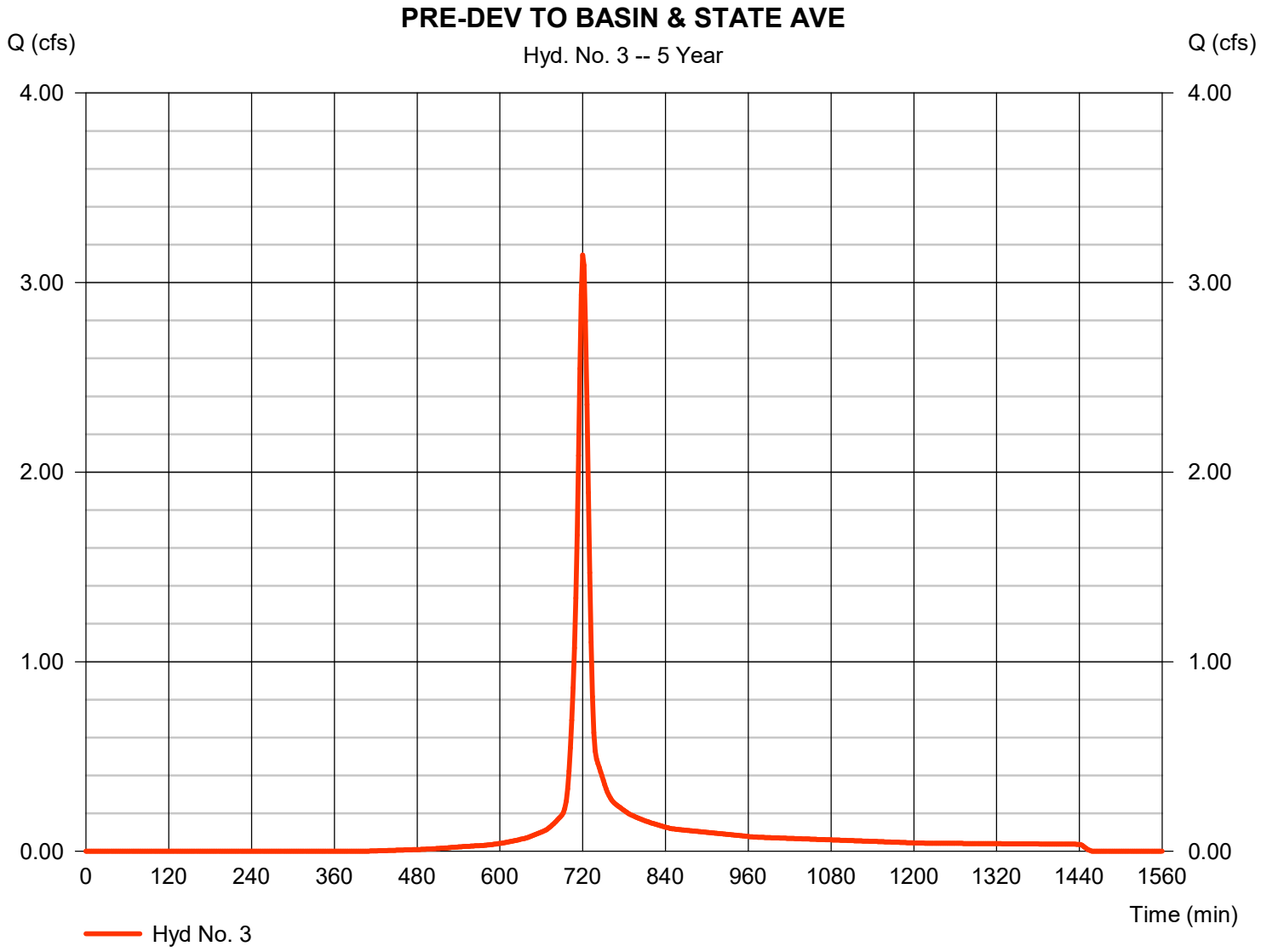
Hydrograph Report

Hyd. No. 3

PRE-DEV TO BASIN & STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 3.146 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 8,189 cuft
Drainage area	= 1.180 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.580 x 92) + (0.260 x 79)] / 1.180

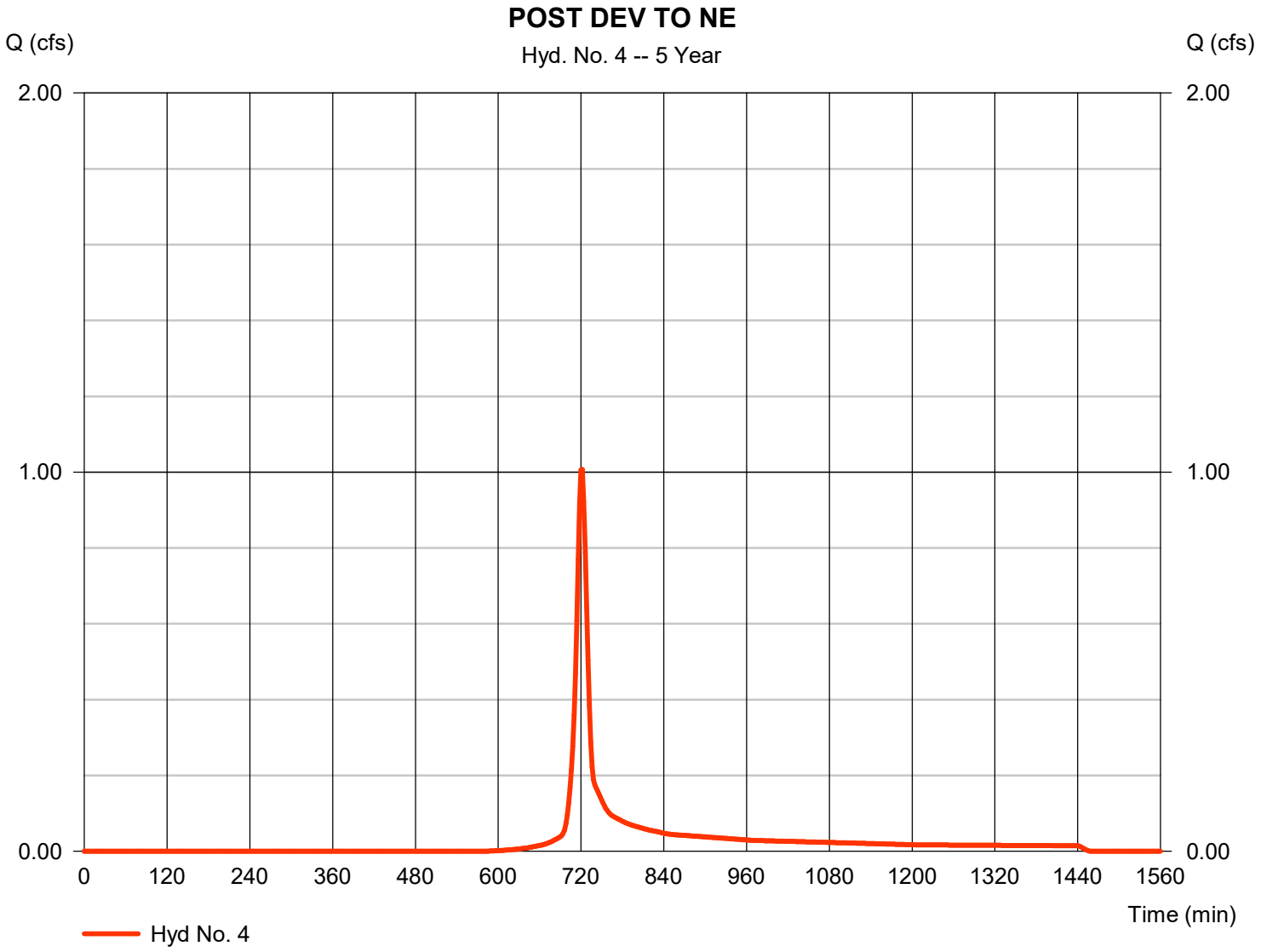


Hydrograph Report

Hyd. No. 4

POST DEV TO NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.007 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	2,636 cuft
Drainage area	=	0.550 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.04 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



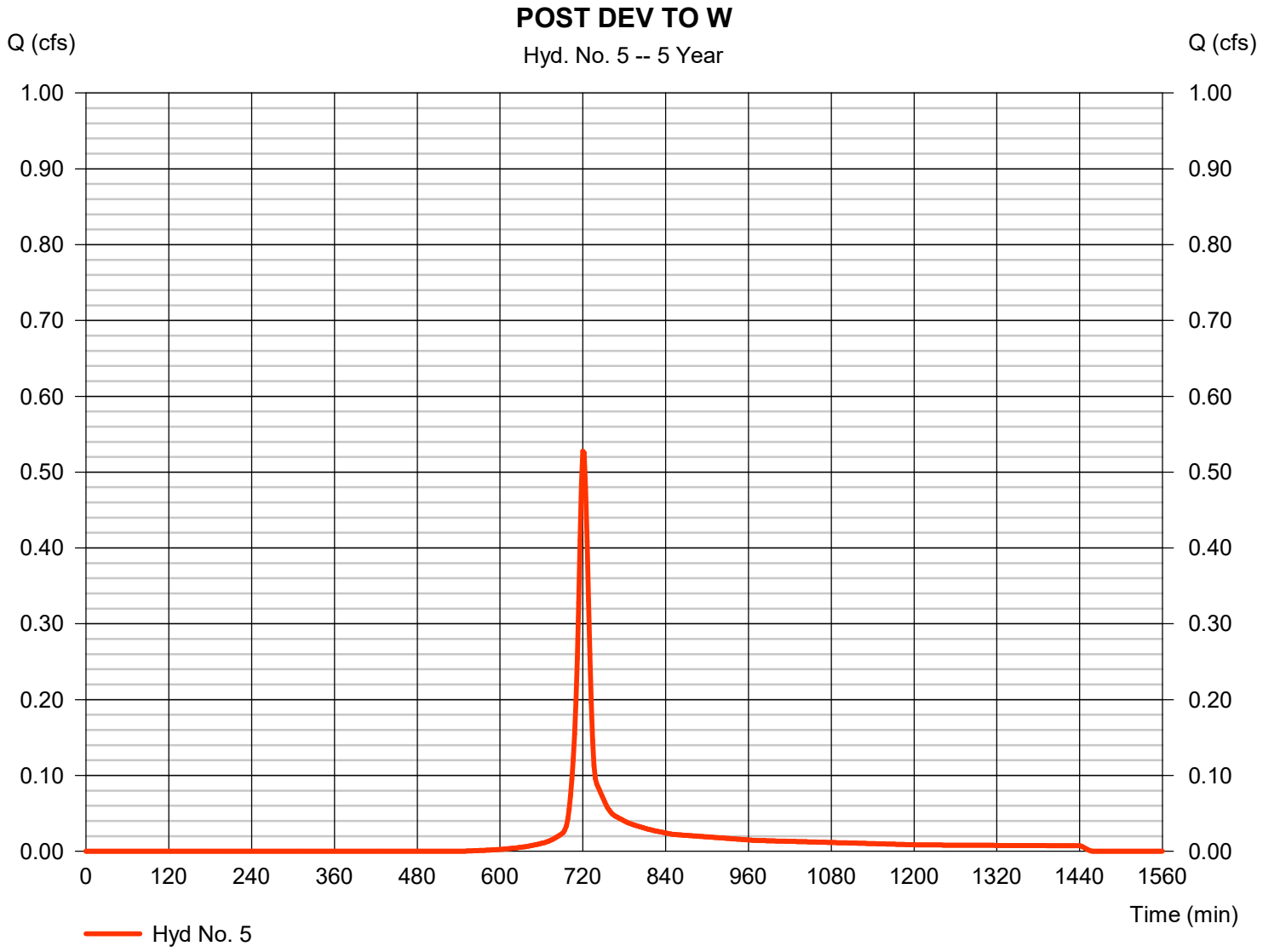
Hydrograph Report

Hyd. No. 5

POST DEV TO W

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.528 cfs
Storm frequency	=	5 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	1,373 cuft
Drainage area	=	0.260 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.04 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



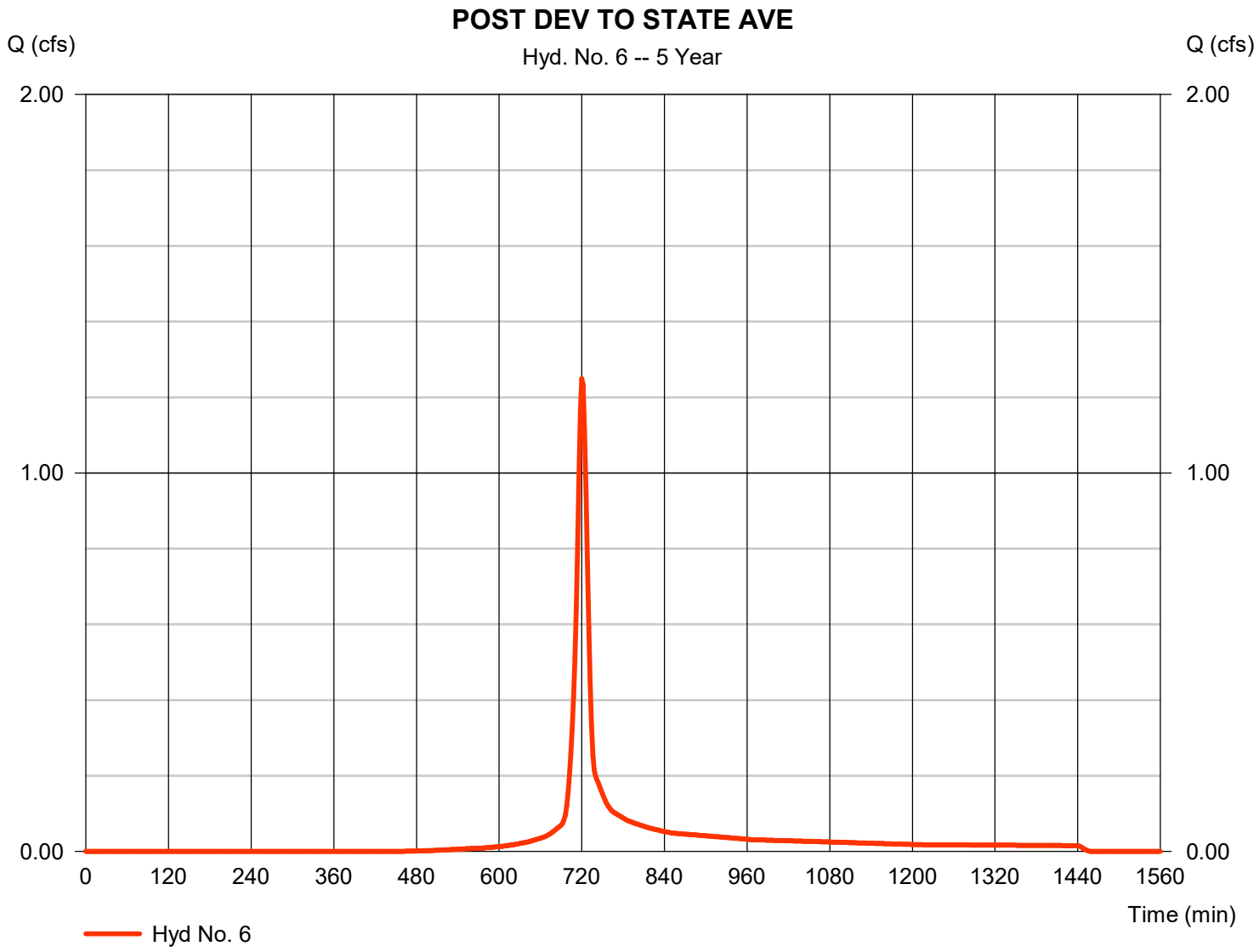
Hydrograph Report

Hyd. No. 6

POST DEV TO STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 1.249 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 3,239 cuft
Drainage area	= 0.510 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.170 x 79)] / 0.510



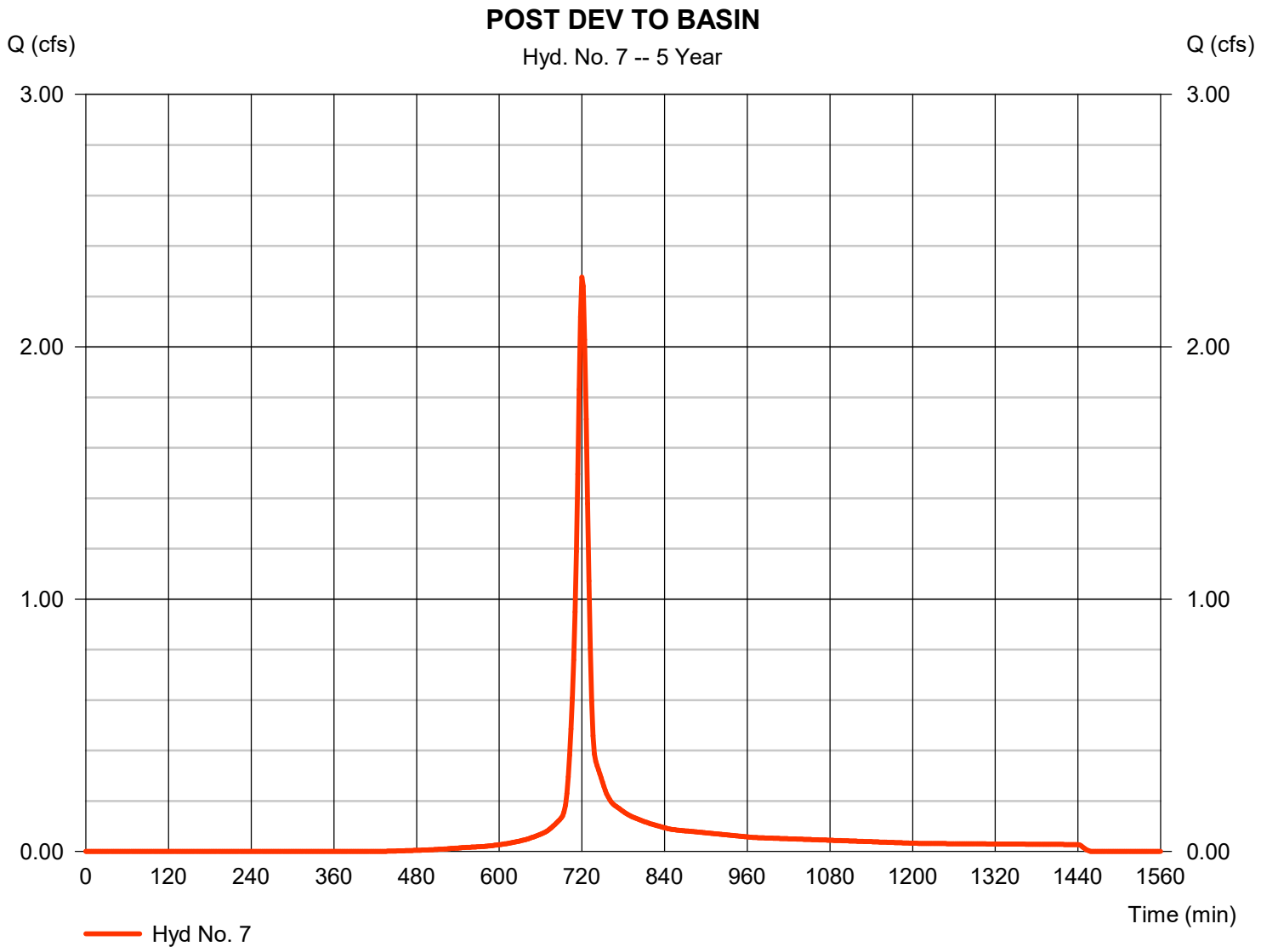
Hydrograph Report

Hyd. No. 7

POST DEV TO BASIN

Hydrograph type	= SCS Runoff	Peak discharge	= 2.276 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,911 cuft
Drainage area	= 0.890 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.720 x 89) + (0.170 x 79)] / 0.890



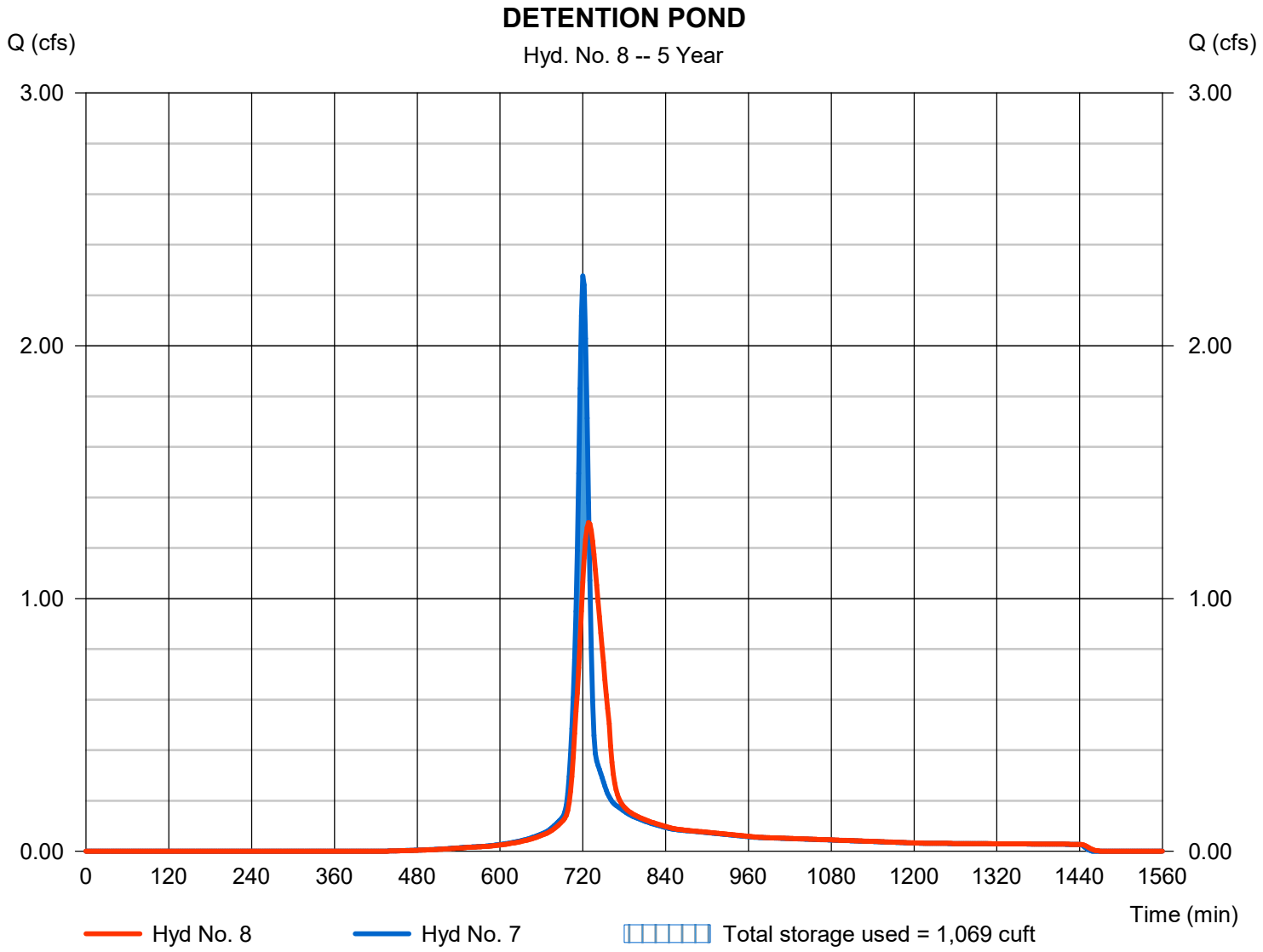
Hydrograph Report

Hyd. No. 8

DETENTION POND

Hydrograph type	=	Reservoir	Peak discharge	=	1.301 cfs
Storm frequency	=	5 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	5,910 cuft
Inflow hyd. No.	=	7 - POST DEV TO BASIN	Max. Elevation	=	936.60 ft
Reservoir name	=	POST POND	Max. Storage	=	1,069 cuft

Storage Indication method used.

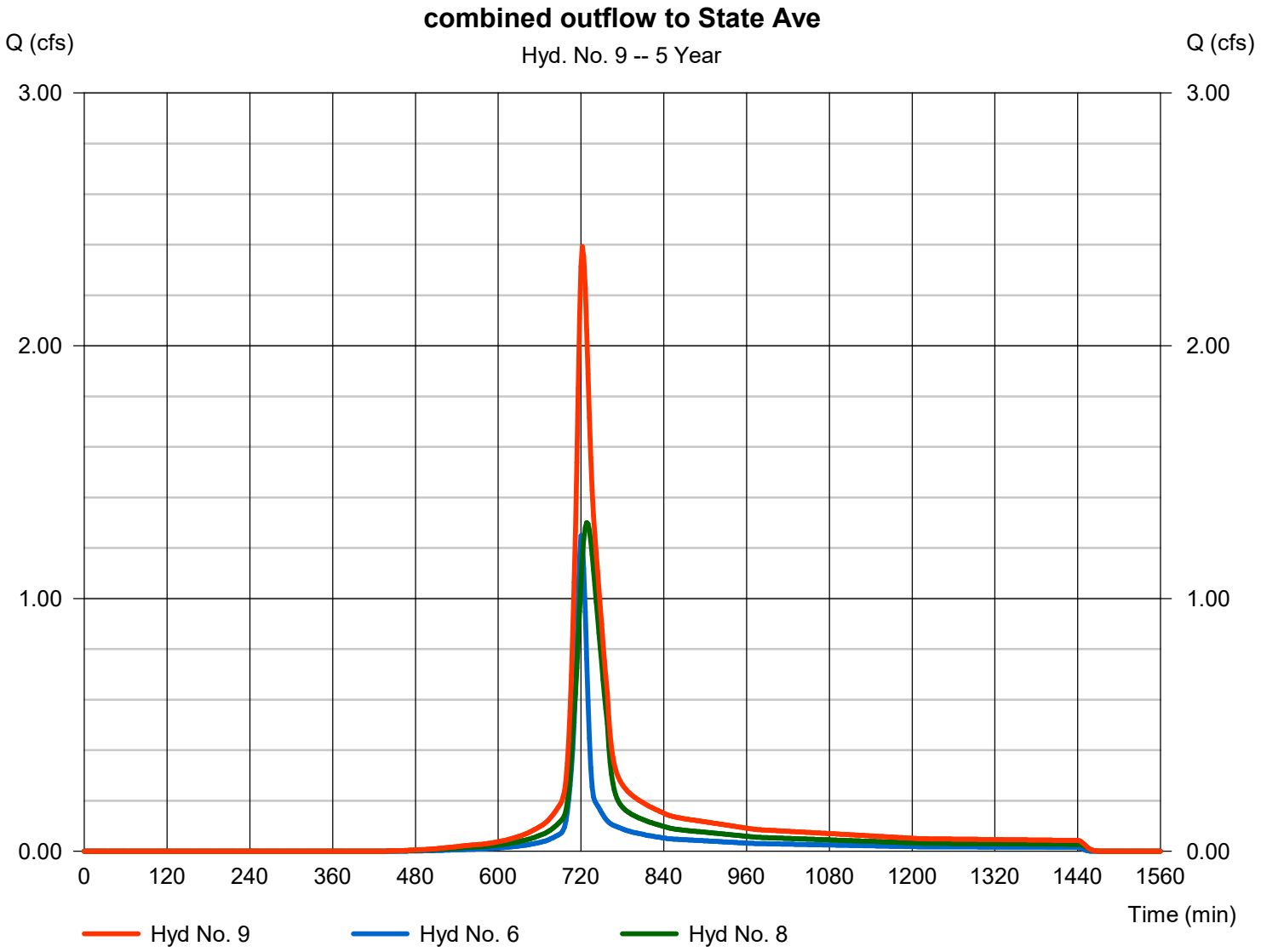


Hydrograph Report

Hyd. No. 9

combined outflow to State Ave

Hydrograph type	=	Combine	Peak discharge	=	2.393 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	9,150 cuft
Inflow hyds.	=	6, 8	Contrib. drain. area	=	0.510 ac

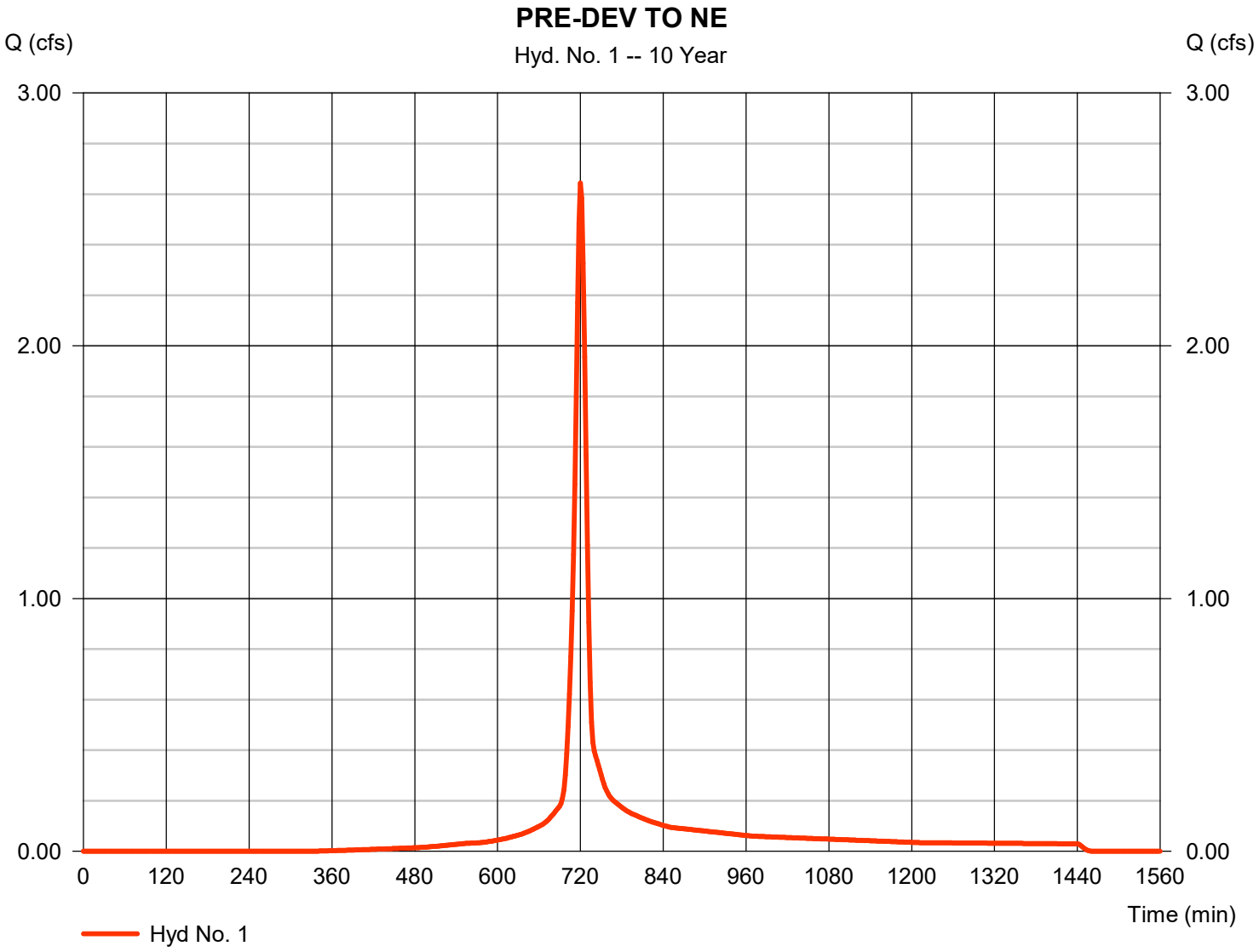


Hydrograph Report

Hyd. No. 1

PRE-DEV TO NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.644 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	6,954 cuft
Drainage area	=	0.770 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.56 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



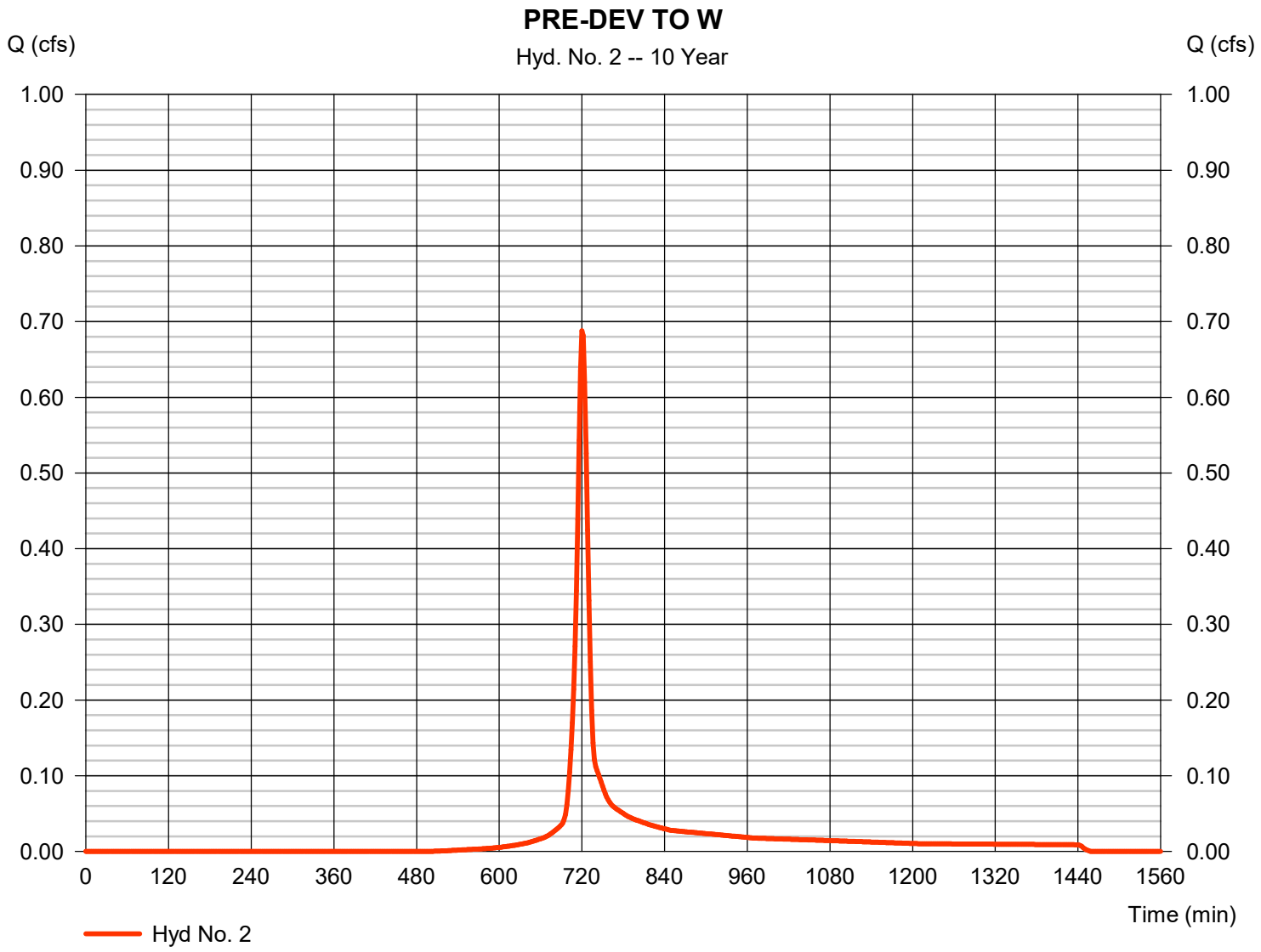
Hydrograph Report

Hyd. No. 2

PRE-DEV TO W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.688 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 1,783 cuft
Drainage area	= 0.260 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



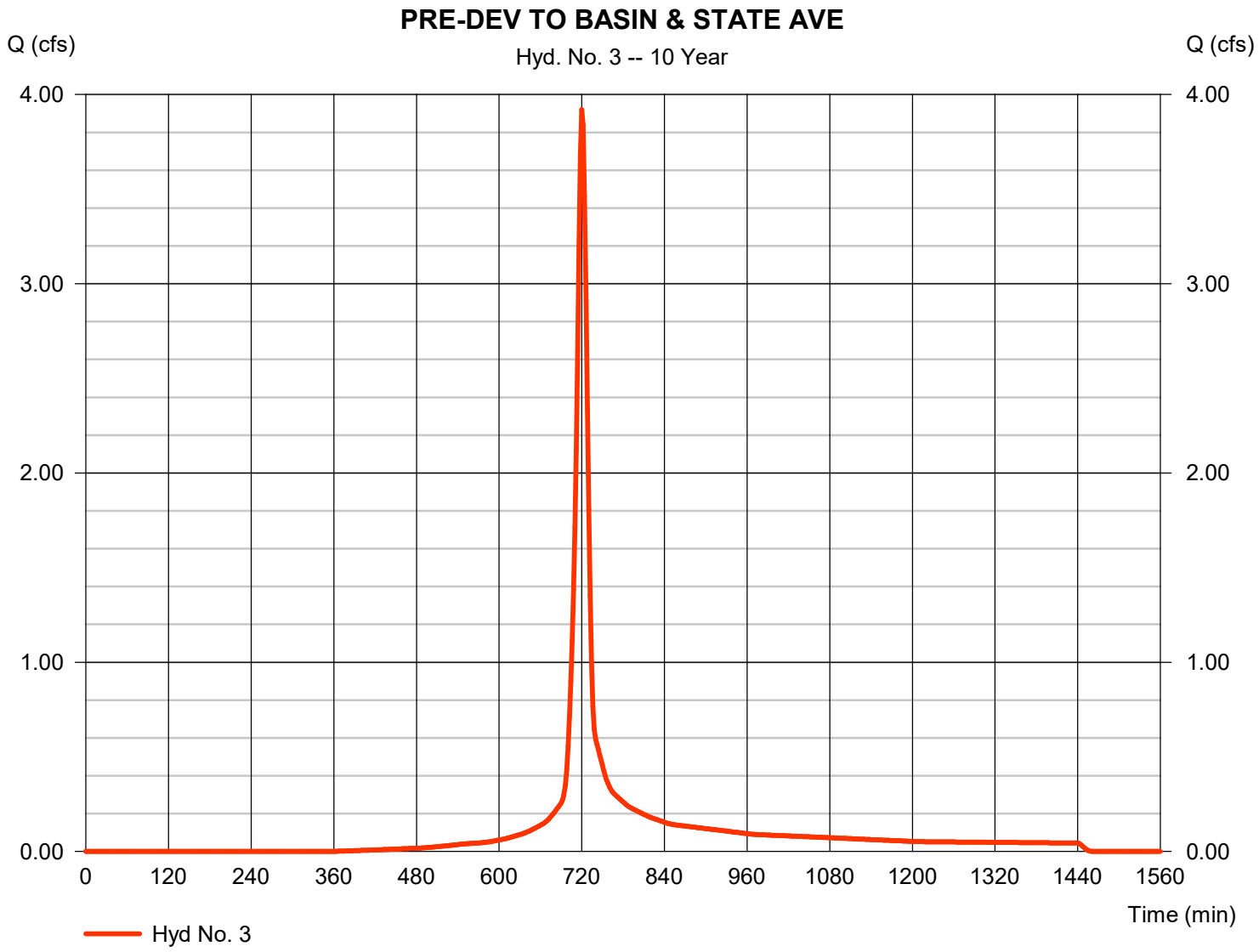
Hydrograph Report

Hyd. No. 3

PRE-DEV TO BASIN & STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 3.920 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 10,263 cuft
Drainage area	= 1.180 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.580 x 92) + (0.260 x 79)] / 1.180

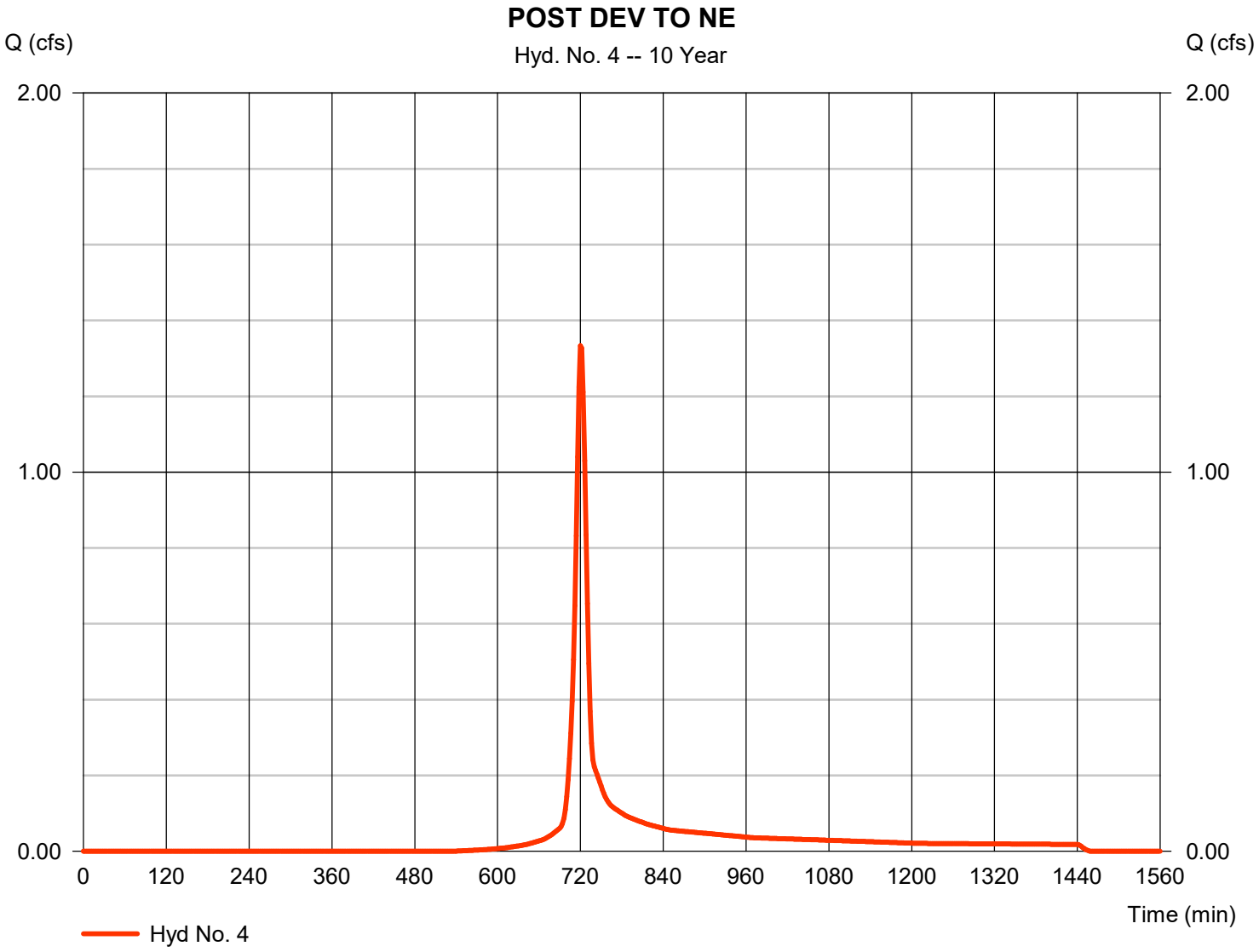


Hydrograph Report

Hyd. No. 4

POST DEV TO NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.334 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	3,467 cuft
Drainage area	=	0.550 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.56 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



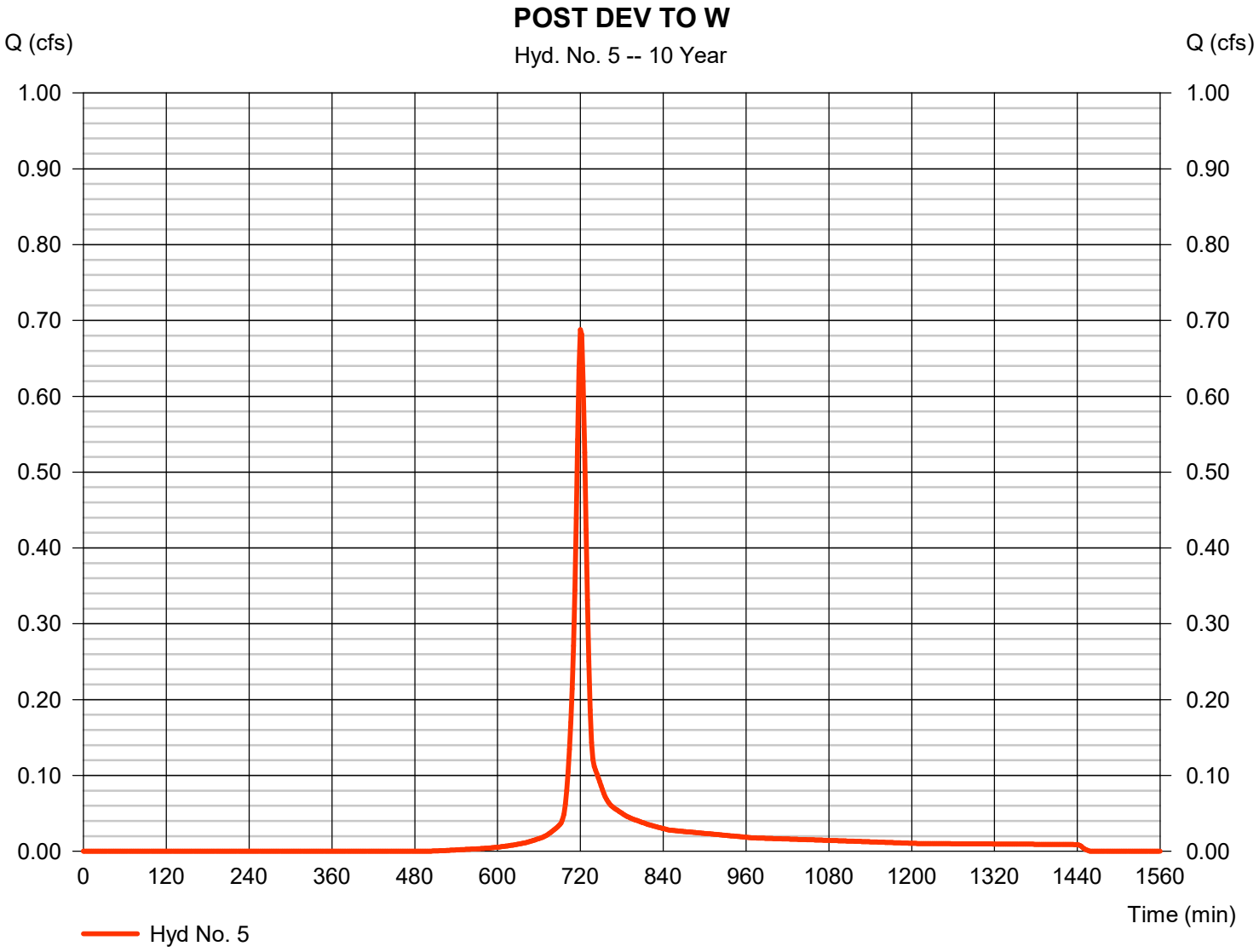
Hydrograph Report

Hyd. No. 5

POST DEV TO W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.688 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 1,783 cuft
Drainage area	= 0.260 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



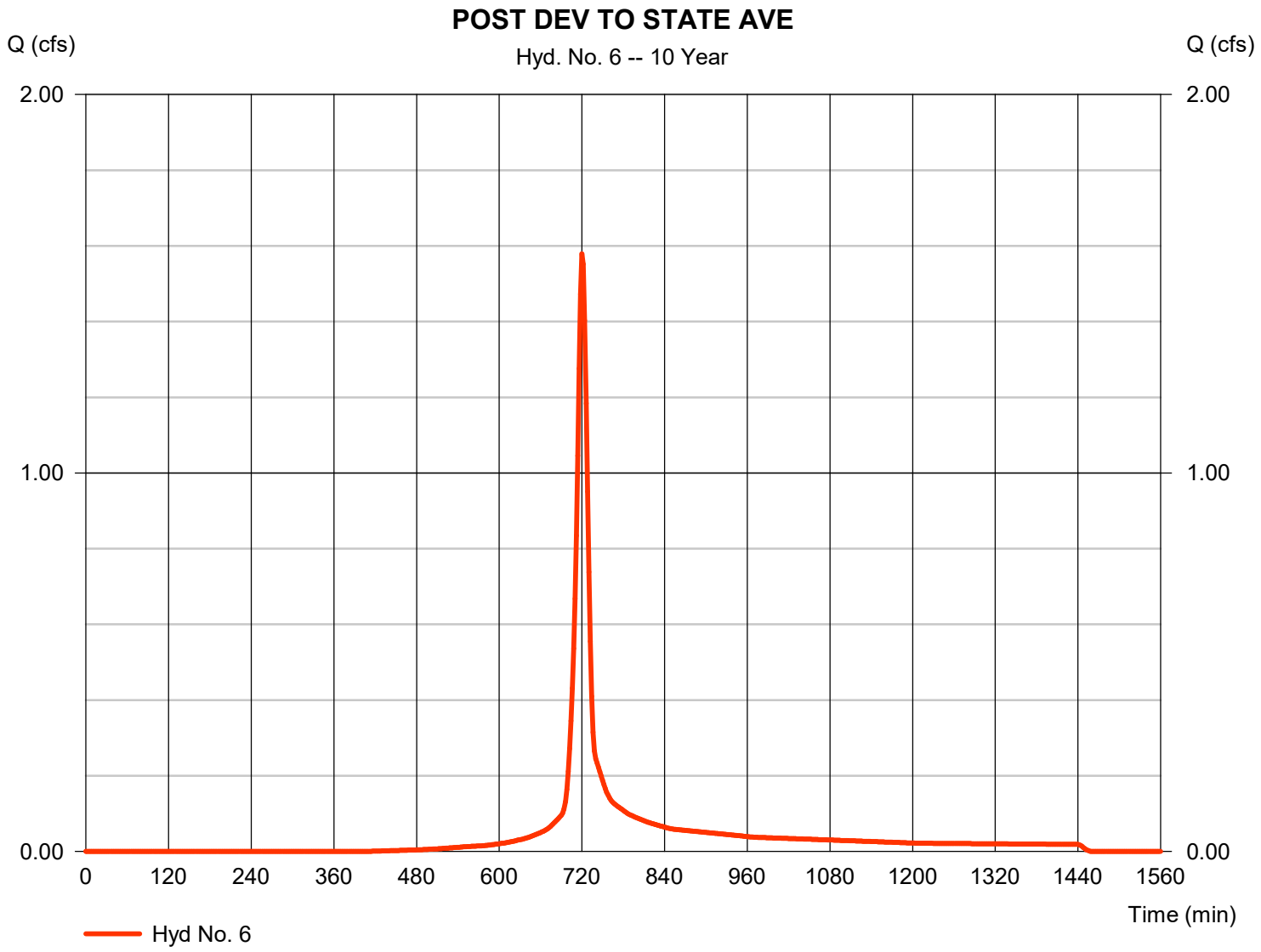
Hydrograph Report

Hyd. No. 6

POST DEV TO STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 1.579 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 4,108 cuft
Drainage area	= 0.510 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.170 x 79)] / 0.510



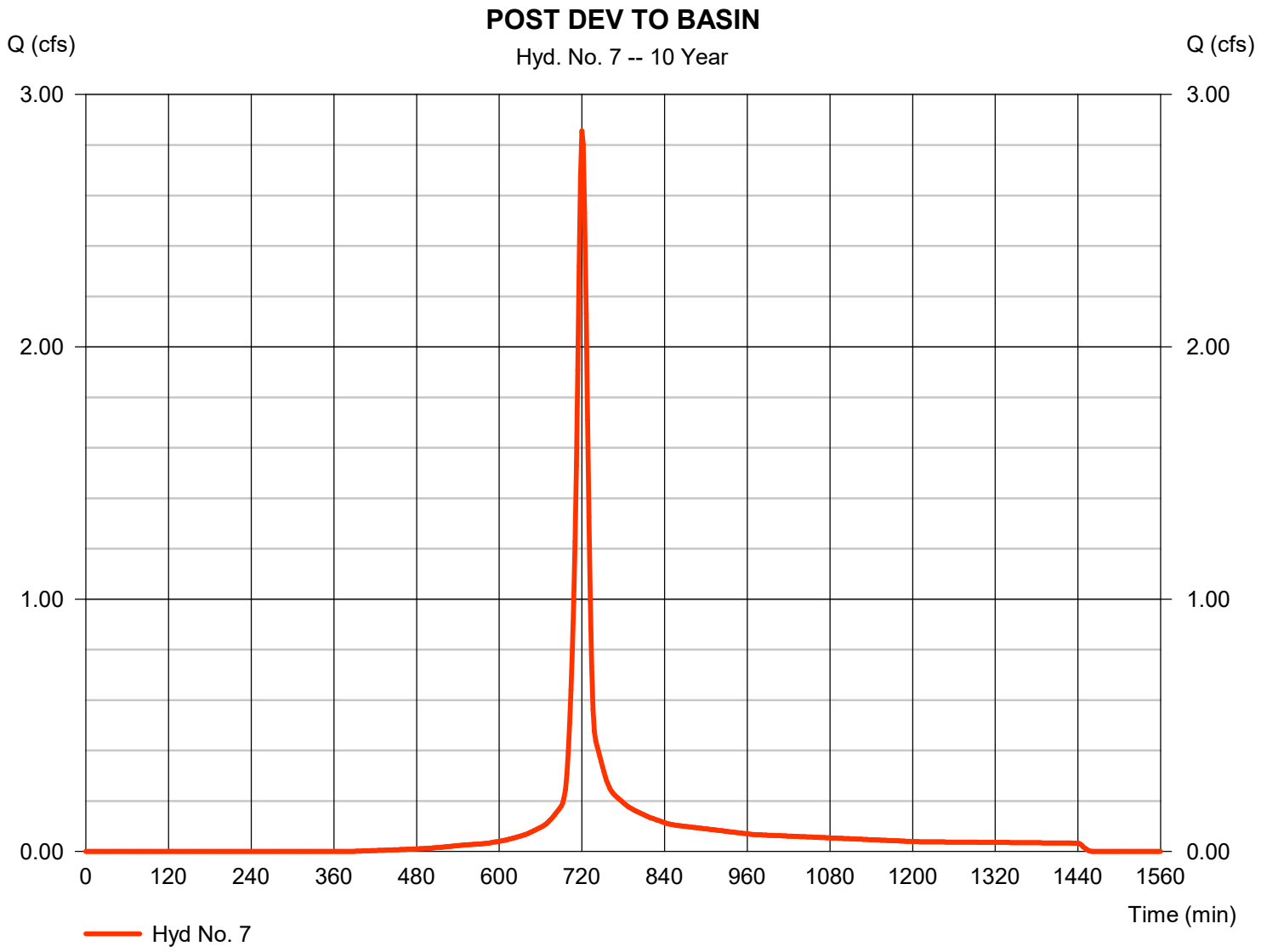
Hydrograph Report

Hyd. No. 7

POST DEV TO BASIN

Hydrograph type	= SCS Runoff	Peak discharge	= 2.856 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 7,451 cuft
Drainage area	= 0.890 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.720 x 89) + (0.170 x 79)] / 0.890



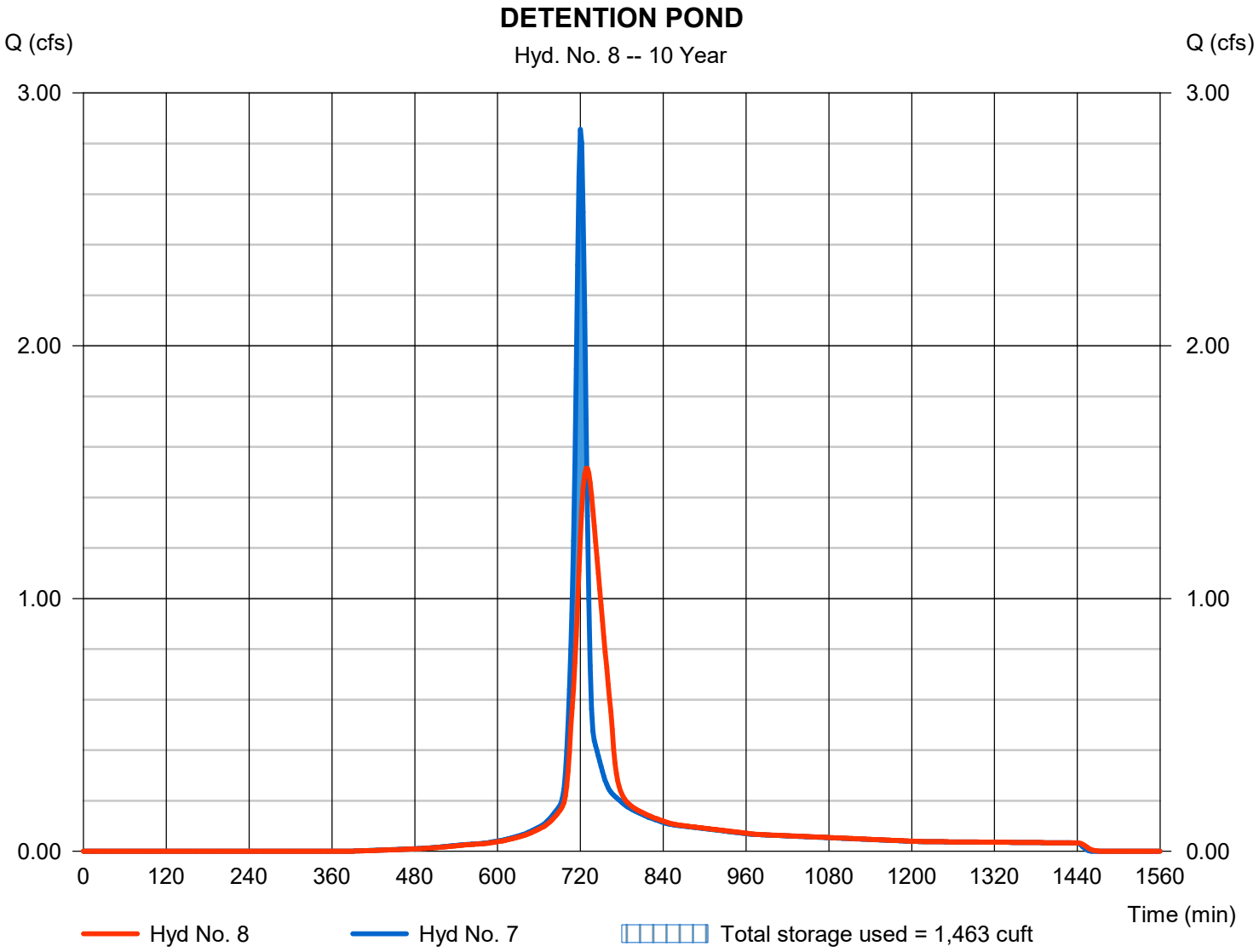
Hydrograph Report

Hyd. No. 8

DETENTION POND

Hydrograph type	=	Reservoir	Peak discharge	=	1.515 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	7,451 cuft
Inflow hyd. No.	=	7 - POST DEV TO BASIN	Max. Elevation	=	936.82 ft
Reservoir name	=	POST POND	Max. Storage	=	1,463 cuft

Storage Indication method used.

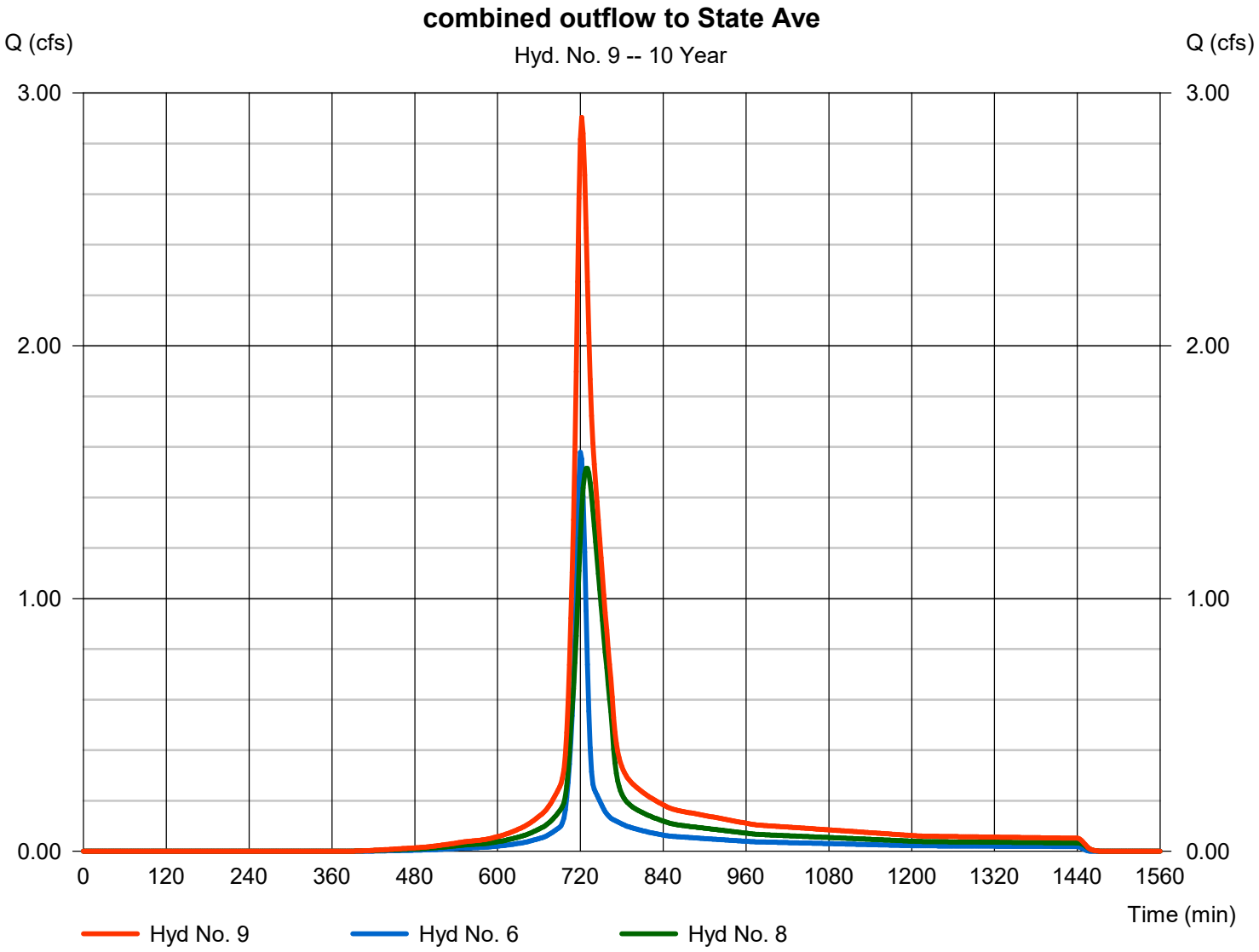


Hydrograph Report

Hyd. No. 9

combined outflow to State Ave

Hydrograph type	= Combine	Peak discharge	= 2.903 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 11,558 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.510 ac

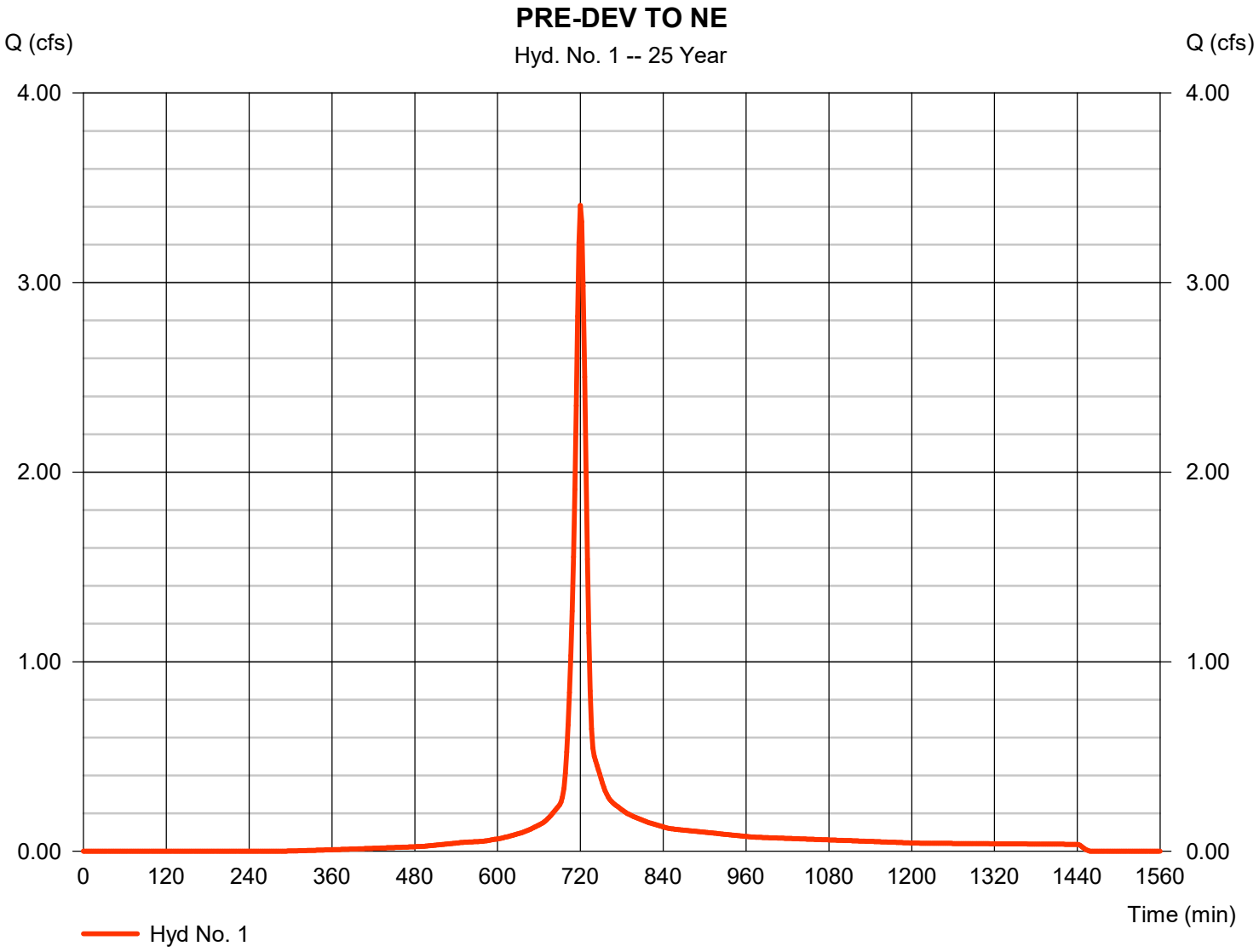


Hydrograph Report

Hyd. No. 1

PRE-DEV TO NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.407 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	9,061 cuft
Drainage area	=	0.770 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	4.34 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



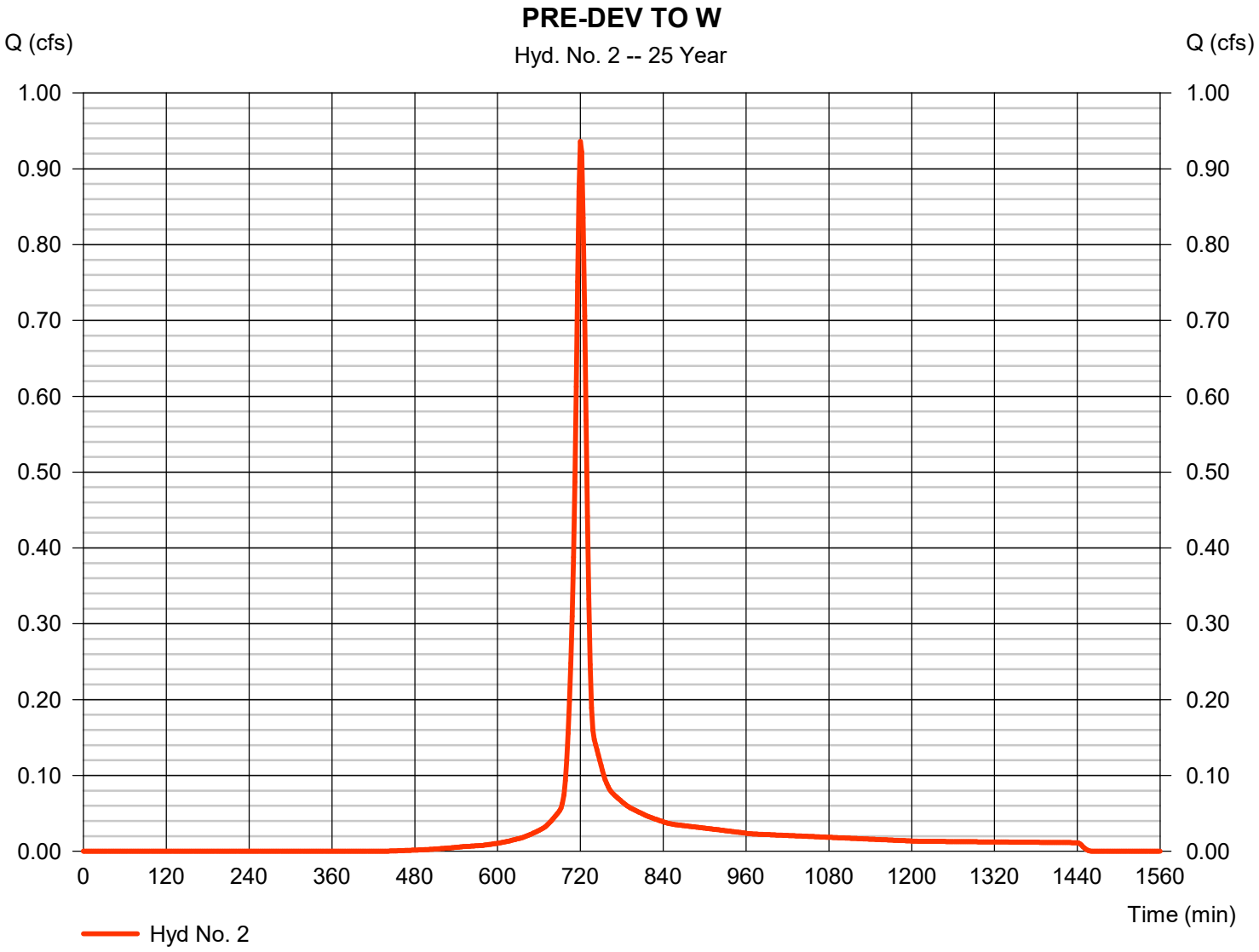
Hydrograph Report

Hyd. No. 2

PRE-DEV TO W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.936 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2,430 cuft
Drainage area	= 0.260 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



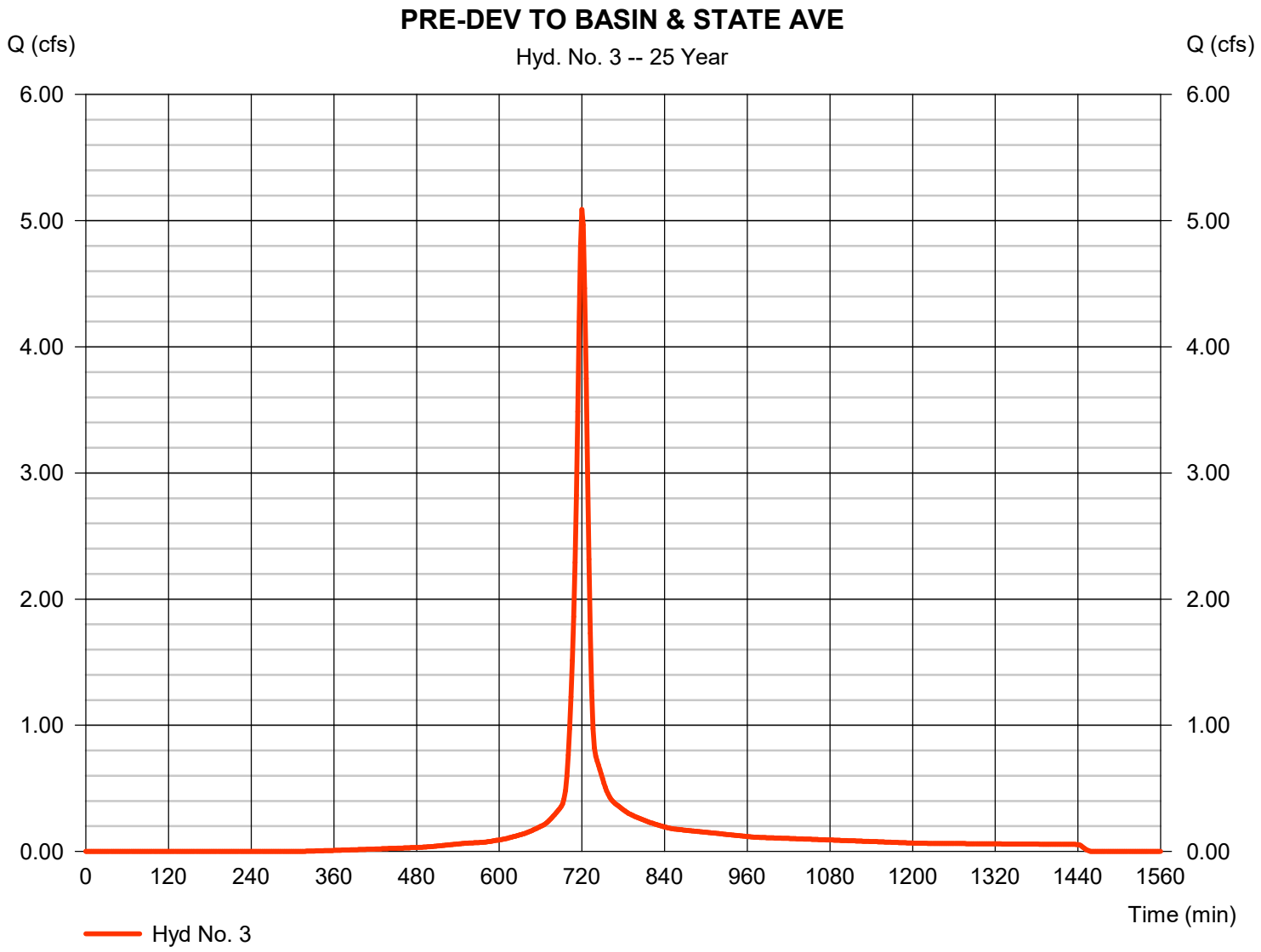
Hydrograph Report

Hyd. No. 3

PRE-DEV TO BASIN & STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 5.088 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 13,455 cuft
Drainage area	= 1.180 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.580 x 92) + (0.260 x 79)] / 1.180

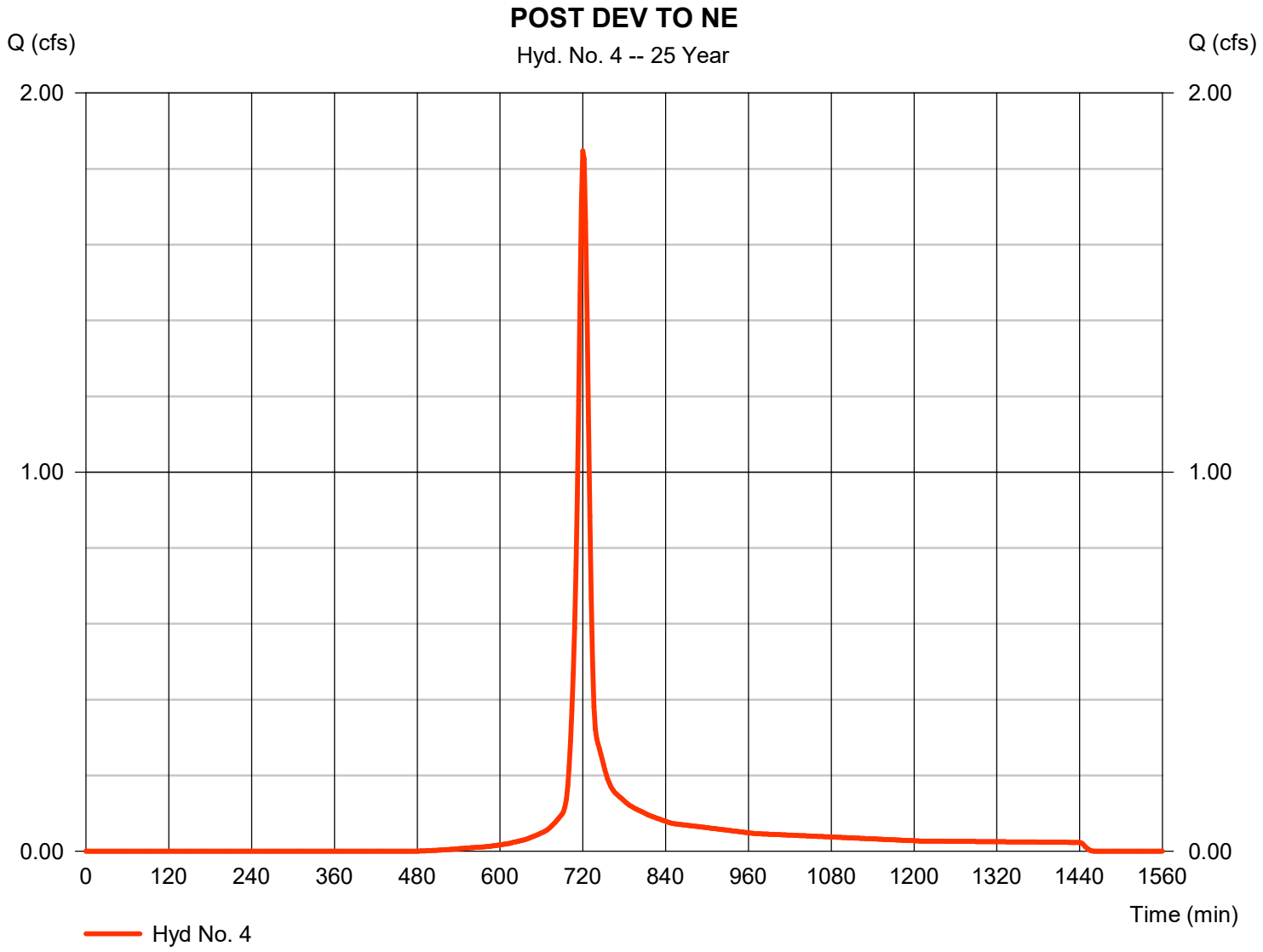


Hydrograph Report

Hyd. No. 4

POST DEV TO NE

Hydrograph type	= SCS Runoff	Peak discharge	= 1.847 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 4,789 cuft
Drainage area	= 0.550 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



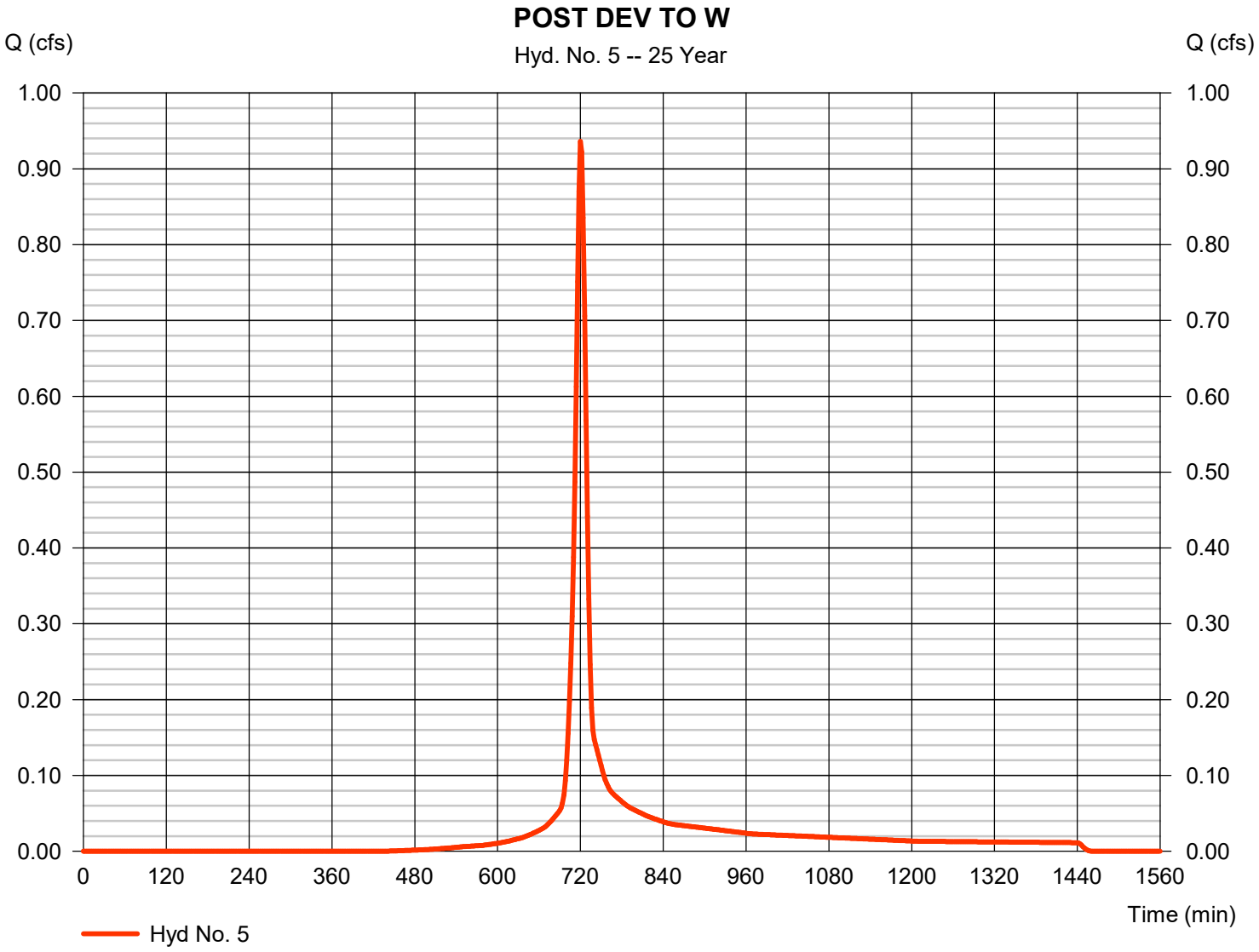
Hydrograph Report

Hyd. No. 5

POST DEV TO W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.936 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2,430 cuft
Drainage area	= 0.260 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



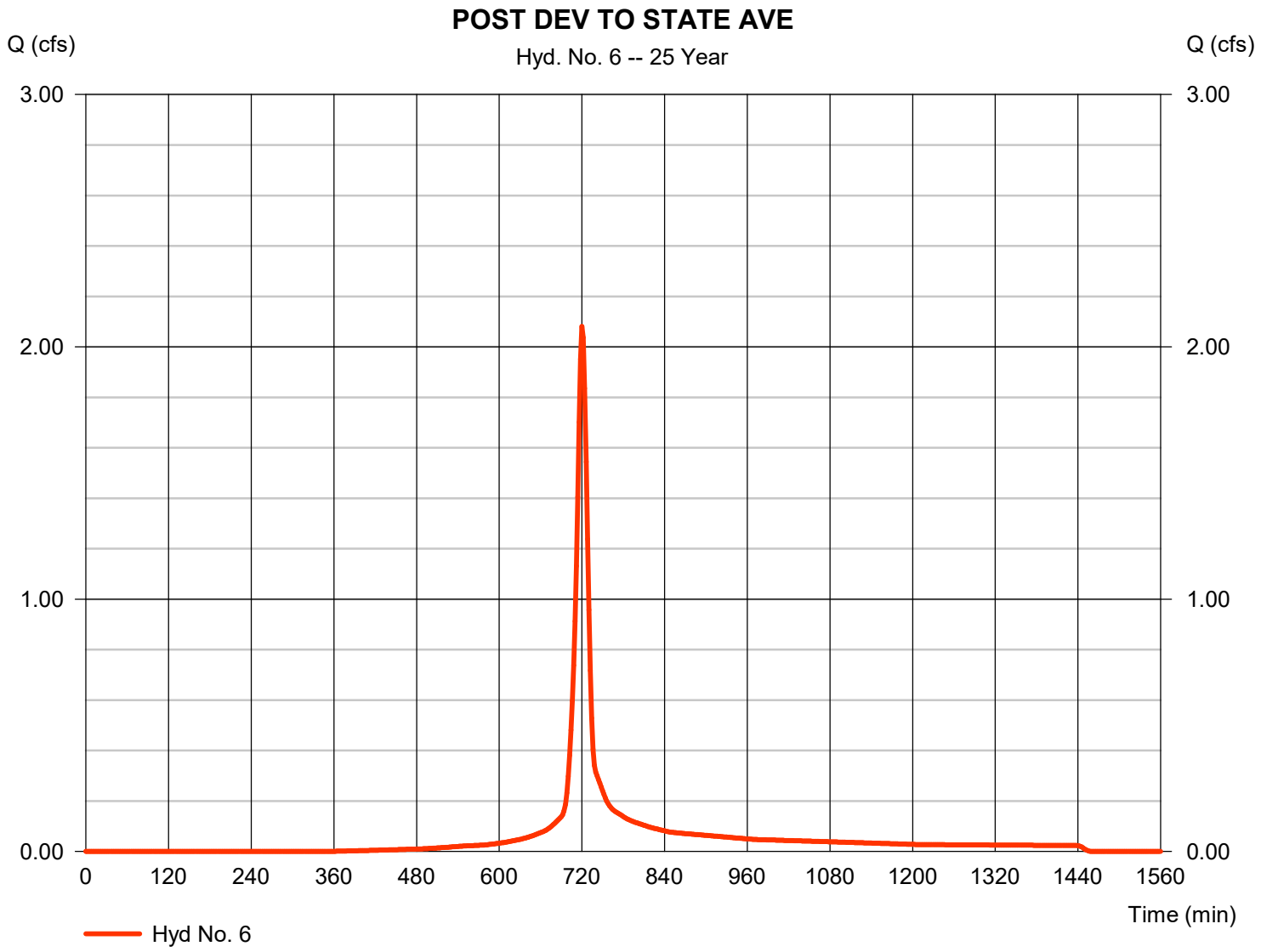
Hydrograph Report

Hyd. No. 6

POST DEV TO STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.081 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,453 cuft
Drainage area	= 0.510 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.170 x 79)] / 0.510



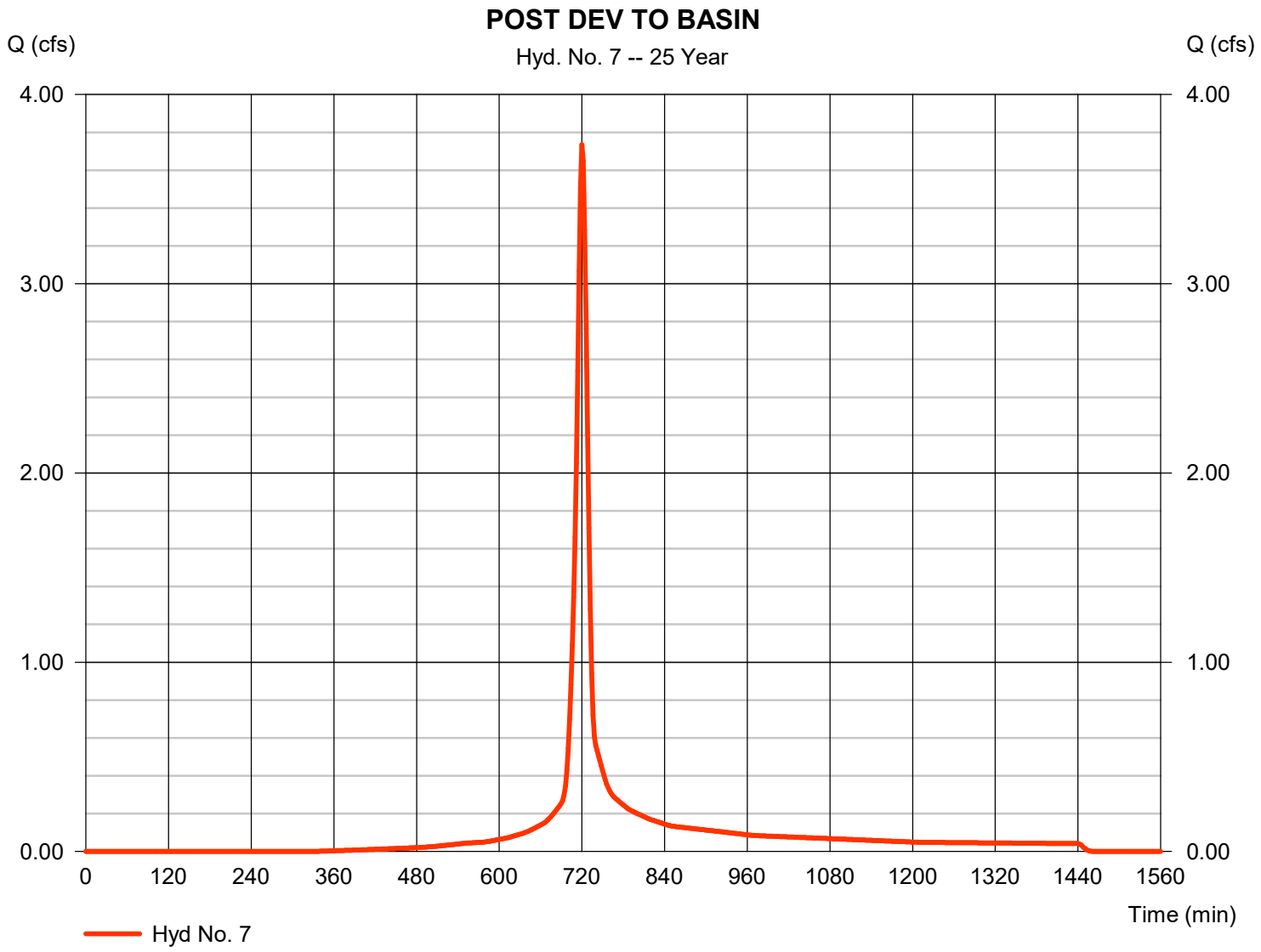
Hydrograph Report

Hyd. No. 7

POST DEV TO BASIN

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.735 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	9,829 cuft
Drainage area	=	0.890 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	4.34 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.720 x 89) + (0.170 x 79)] / 0.890



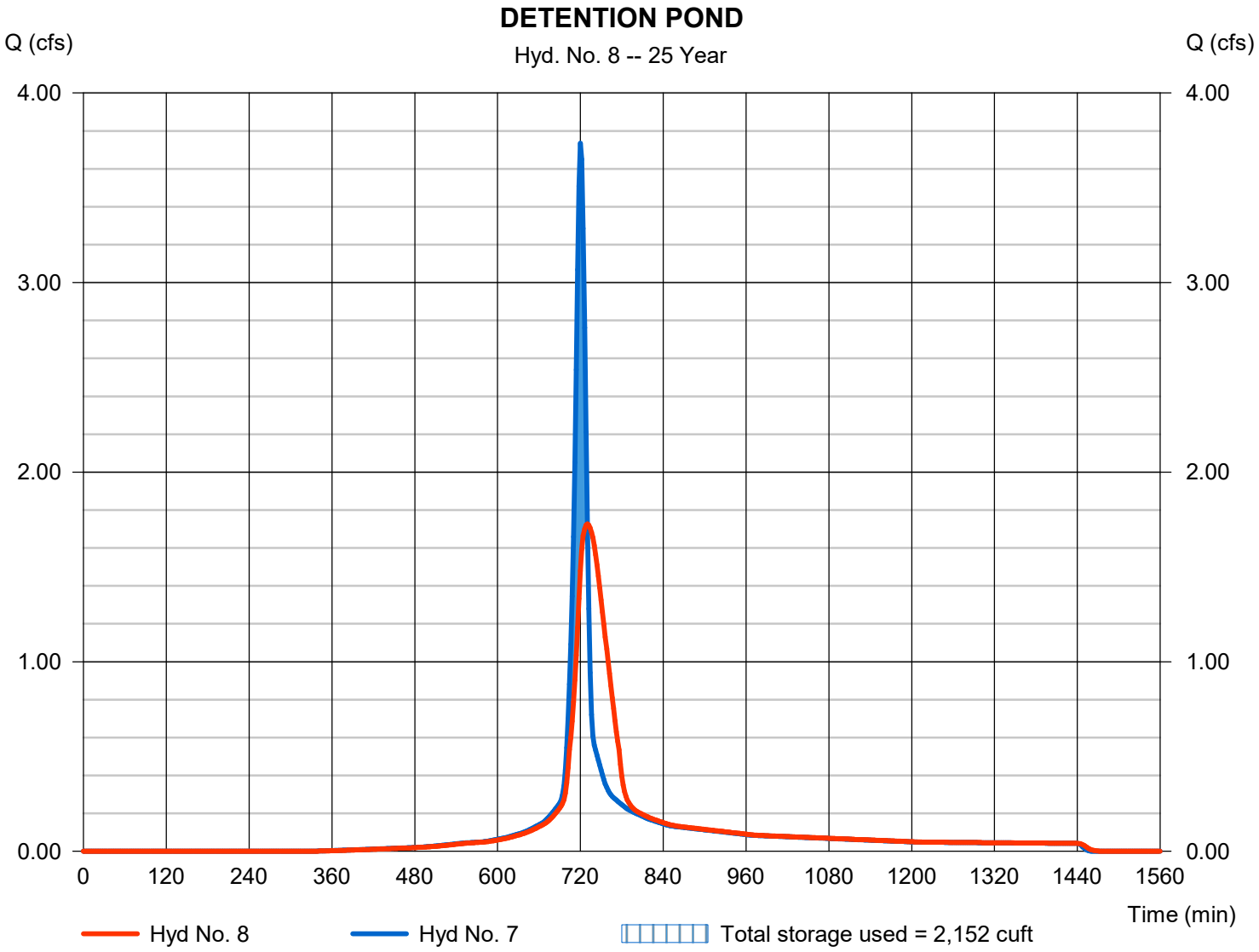
Hydrograph Report

Hyd. No. 8

DETENTION POND

Hydrograph type	=	Reservoir	Peak discharge	=	1.726 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	9,829 cuft
Inflow hyd. No.	=	7 - POST DEV TO BASIN	Max. Elevation	=	937.12 ft
Reservoir name	=	POST POND	Max. Storage	=	2,152 cuft

Storage Indication method used.

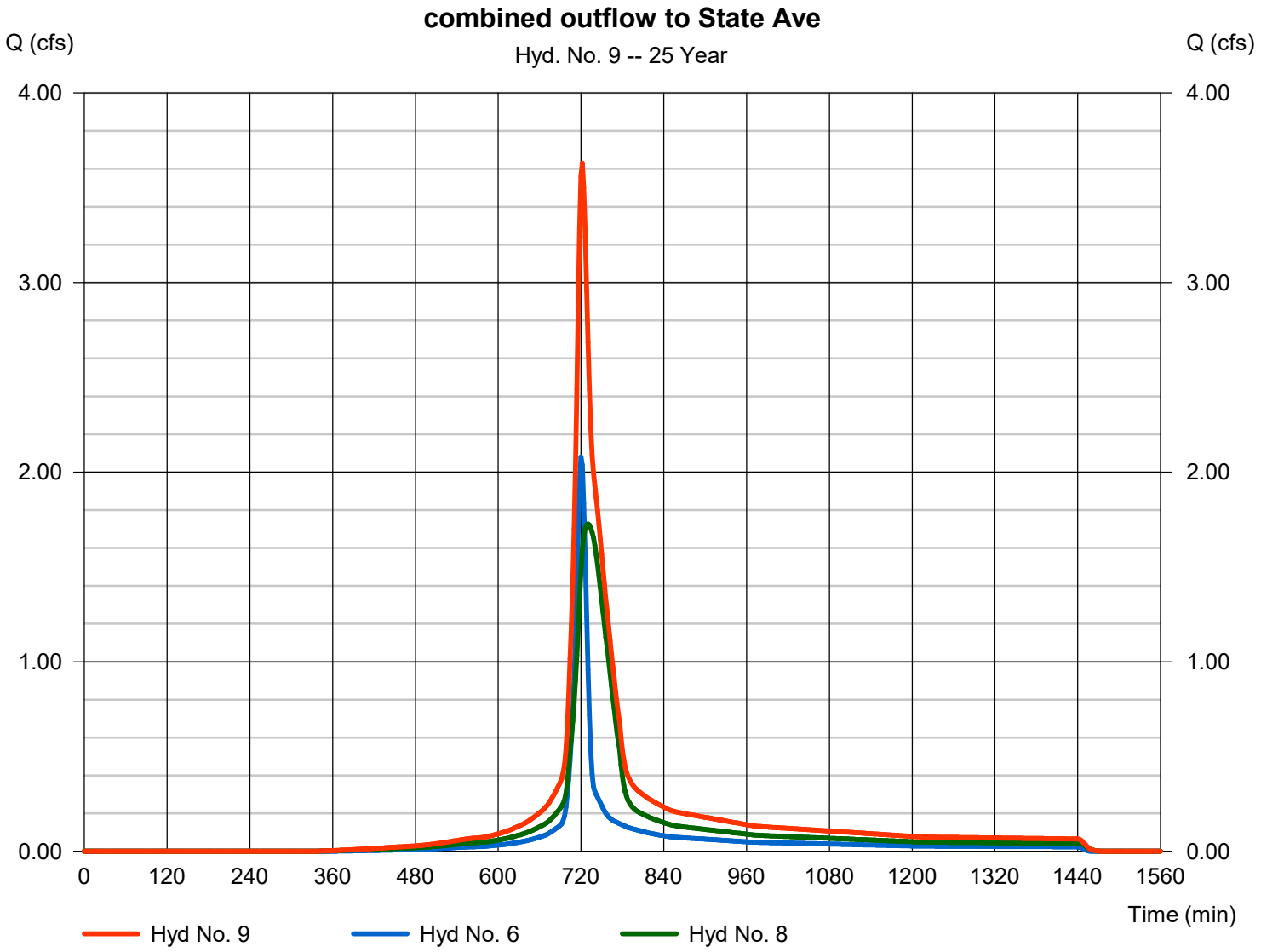


Hydrograph Report

Hyd. No. 9

combined outflow to State Ave

Hydrograph type	=	Combine	Peak discharge	=	3.630 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	15,282 cuft
Inflow hyds.	=	6, 8	Contrib. drain. area	=	0.510 ac

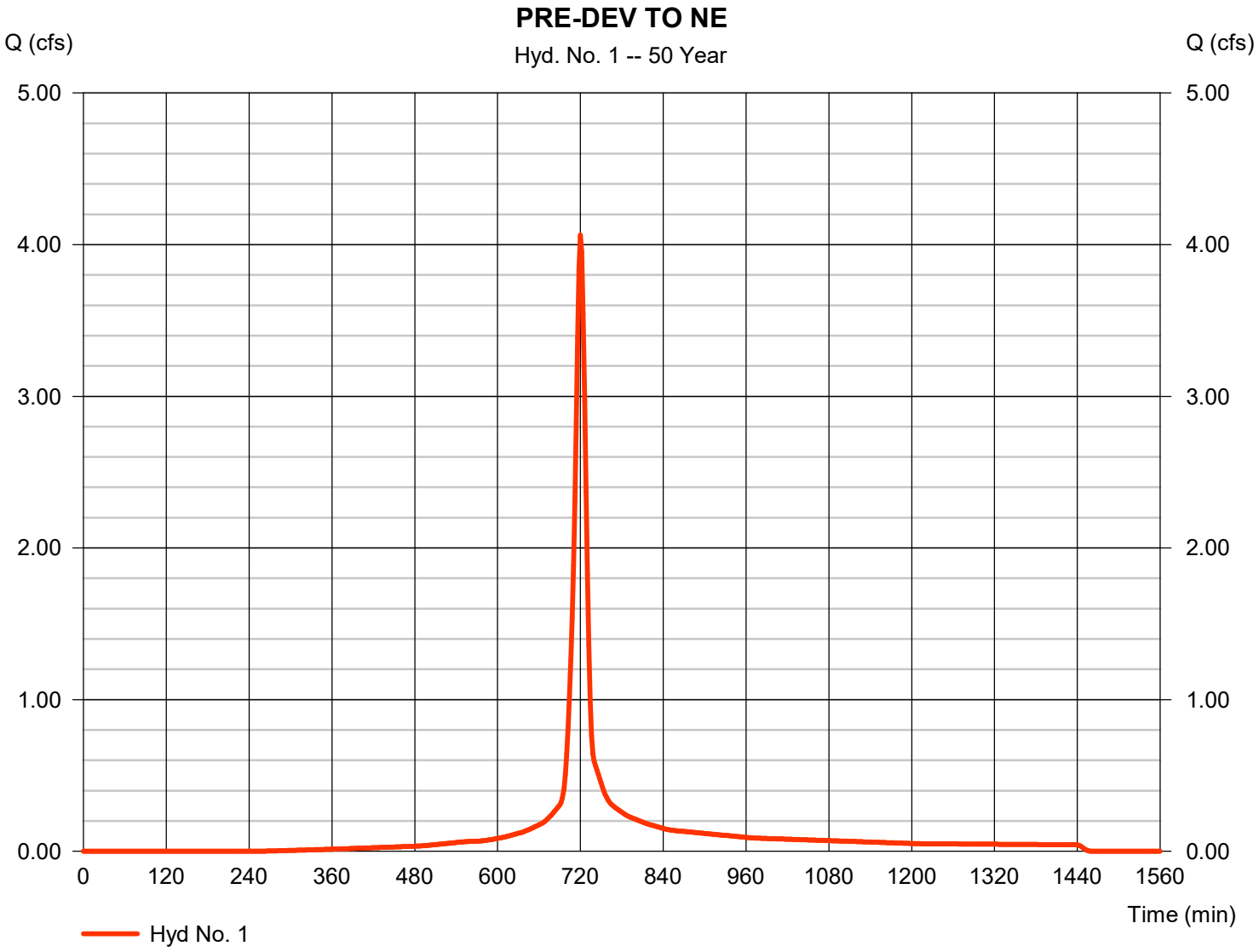


Hydrograph Report

Hyd. No. 1

PRE-DEV TO NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.062 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,900 cuft
Drainage area	=	0.770 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



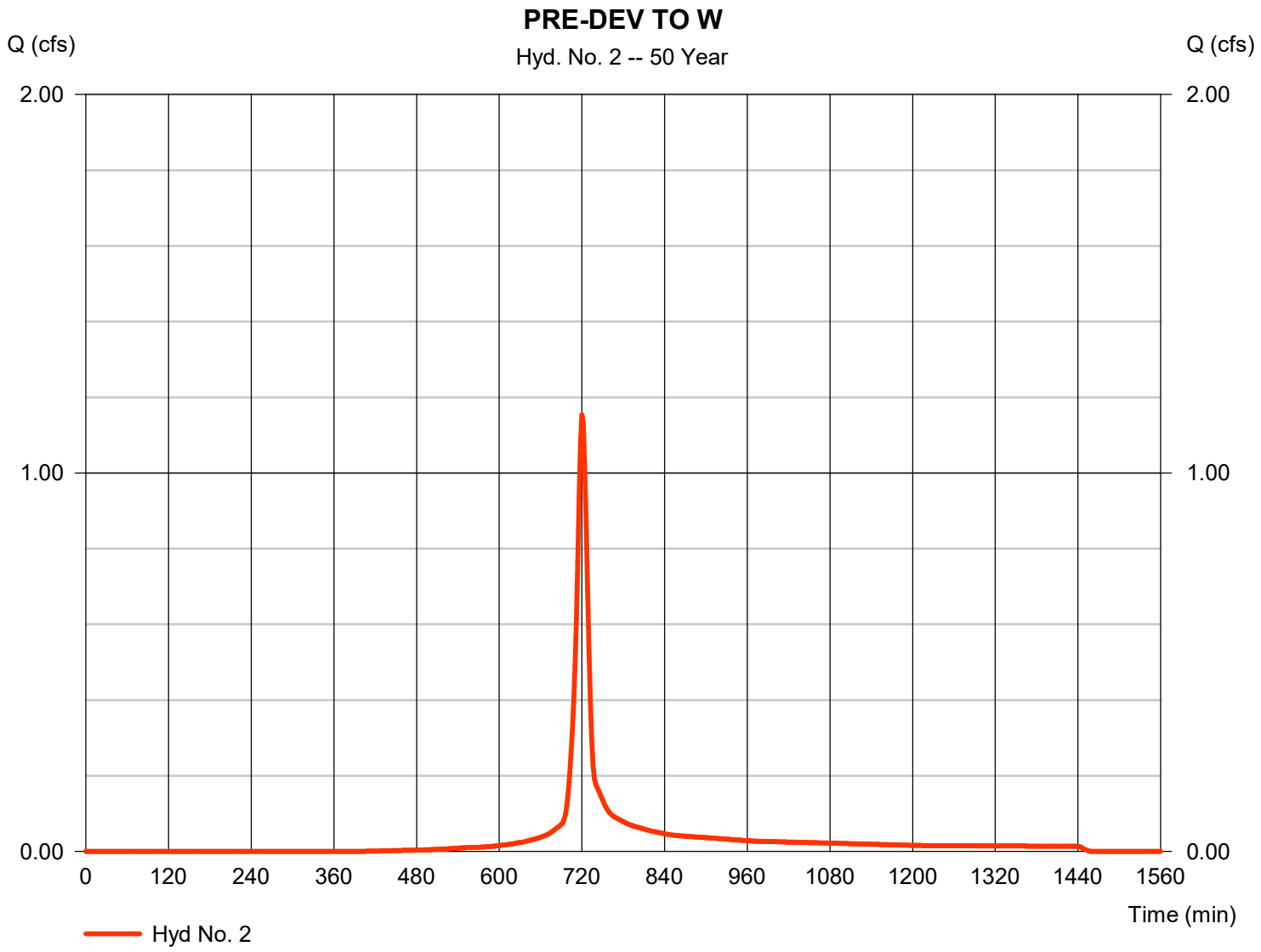
Hydrograph Report

Hyd. No. 2

PRE-DEV TO W

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.154 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	3,006 cuft
Drainage area	=	0.260 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



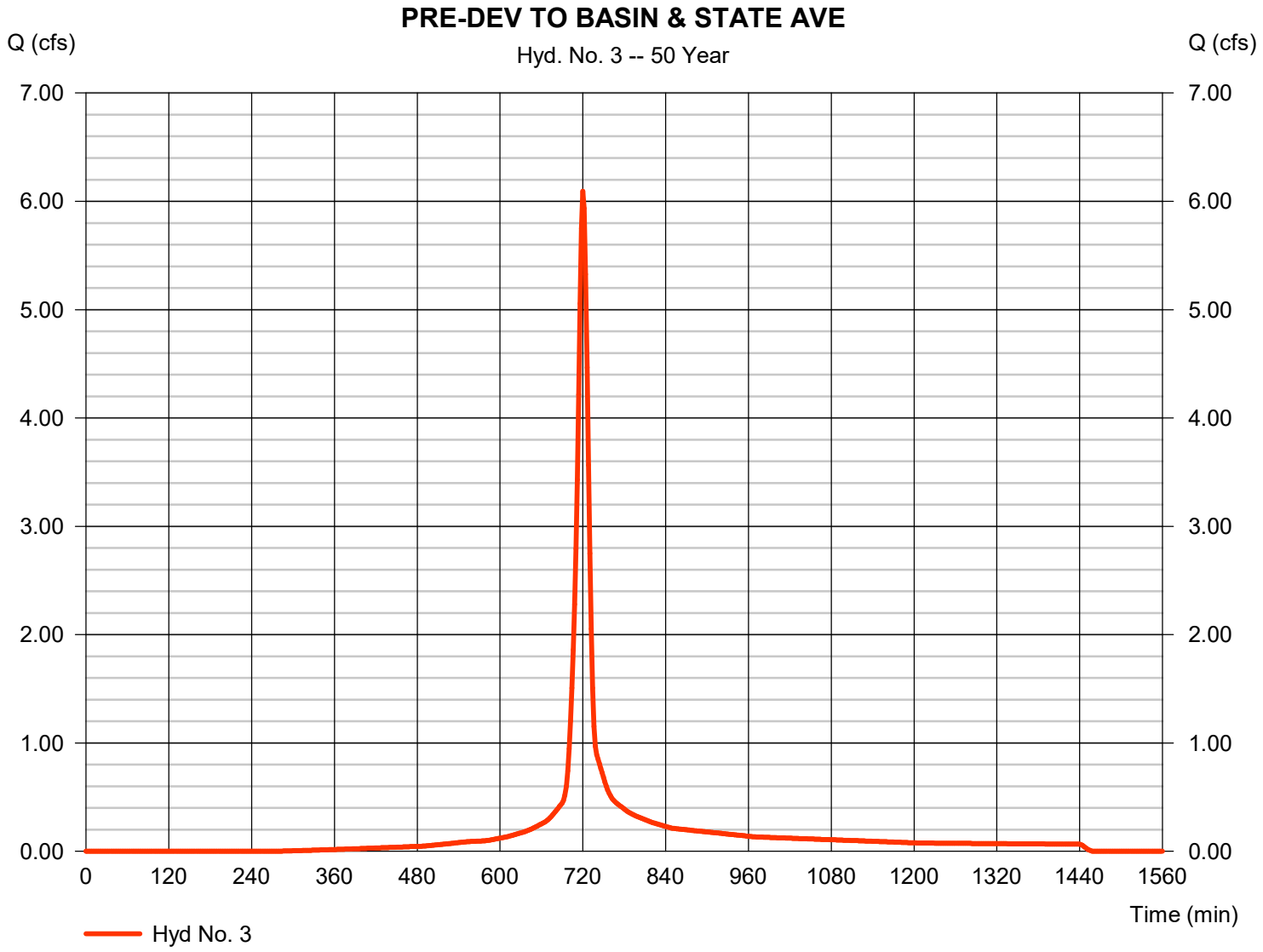
Hydrograph Report

Hyd. No. 3

PRE-DEV TO BASIN & STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 6.093 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 16,249 cuft
Drainage area	= 1.180 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.580 x 92) + (0.260 x 79)] / 1.180

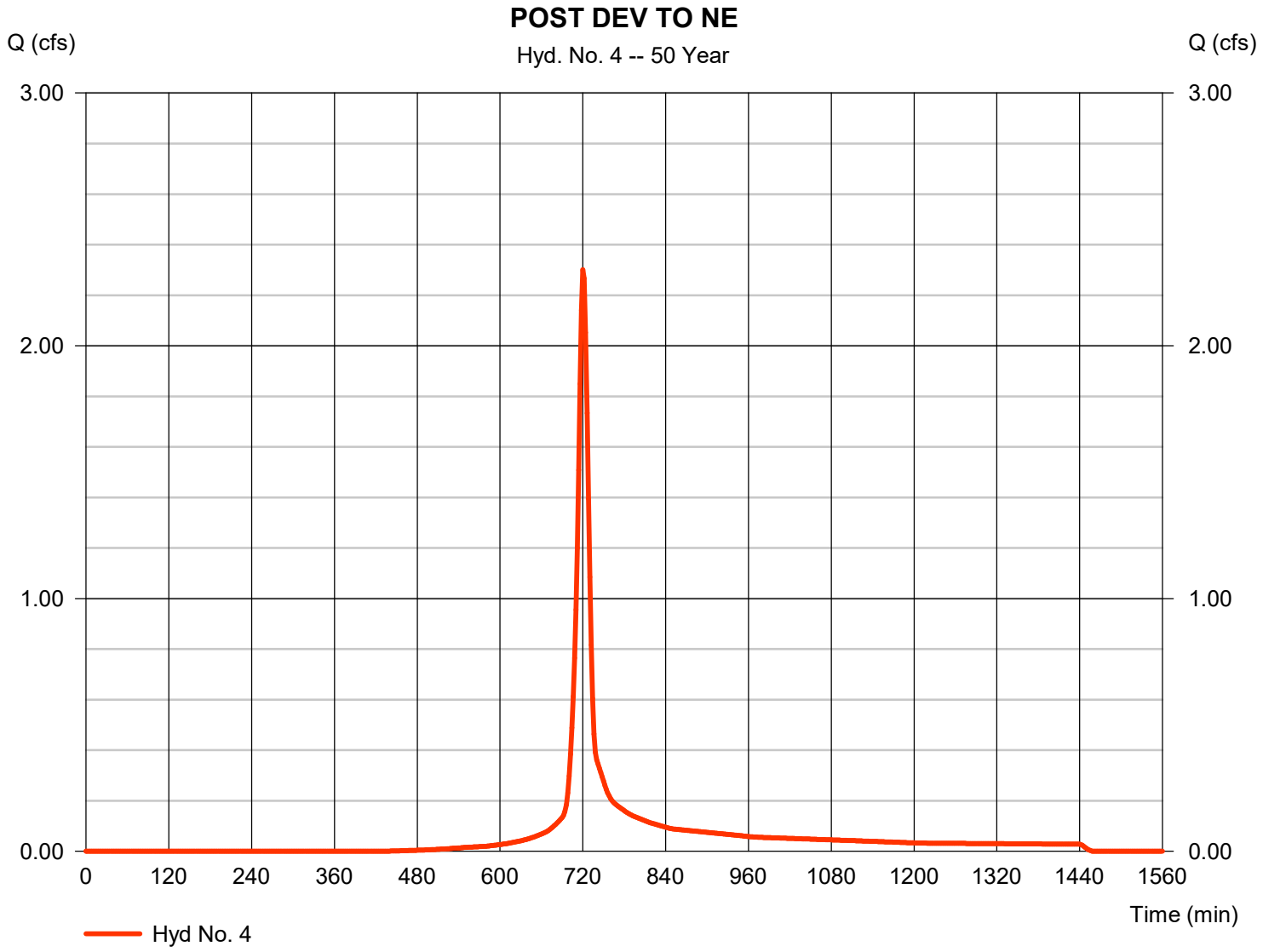


Hydrograph Report

Hyd. No. 4

POST DEV TO NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.301 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	5,974 cuft
Drainage area	=	0.550 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



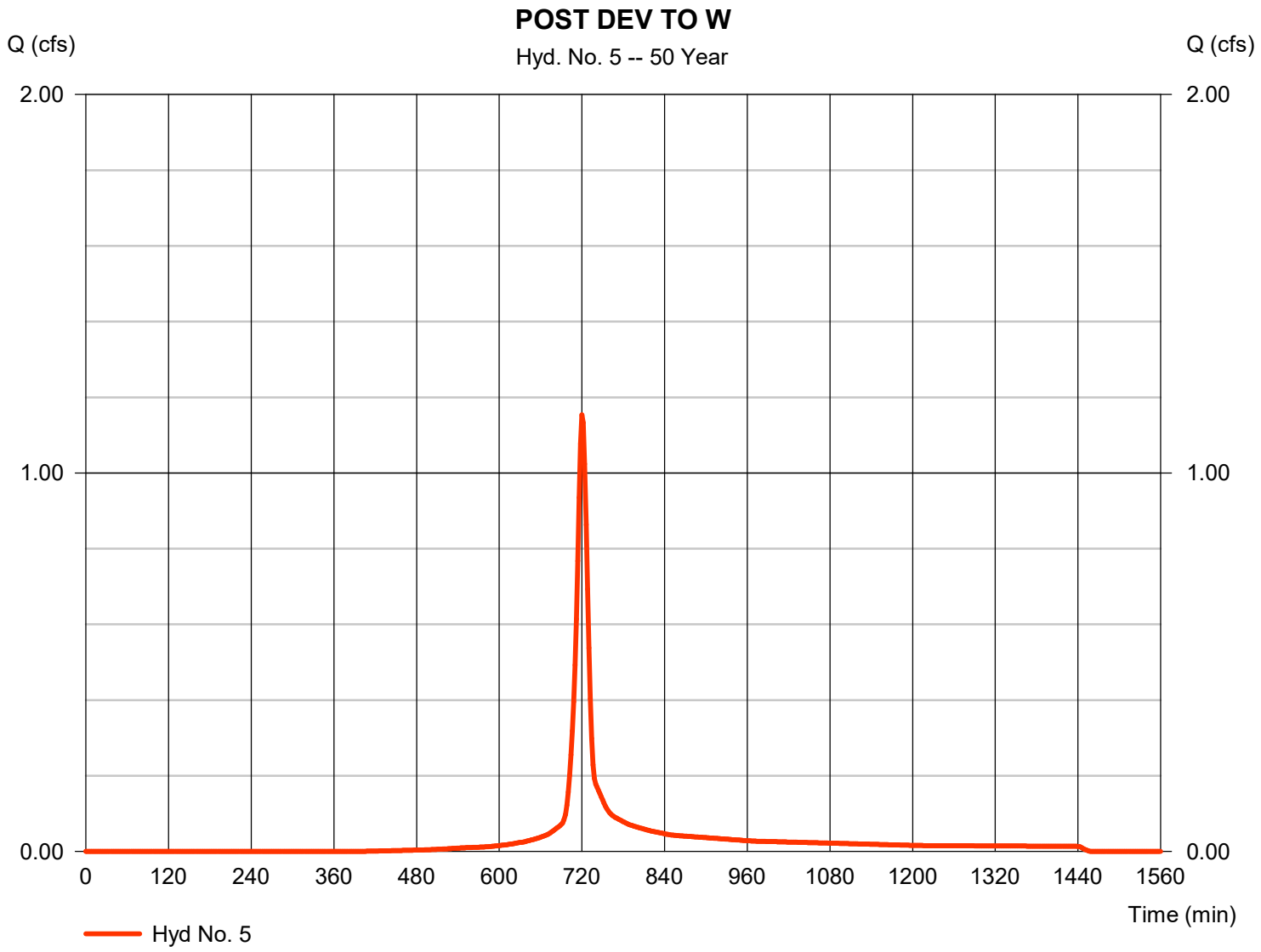
Hydrograph Report

Hyd. No. 5

POST DEV TO W

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.154 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	3,006 cuft
Drainage area	=	0.260 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



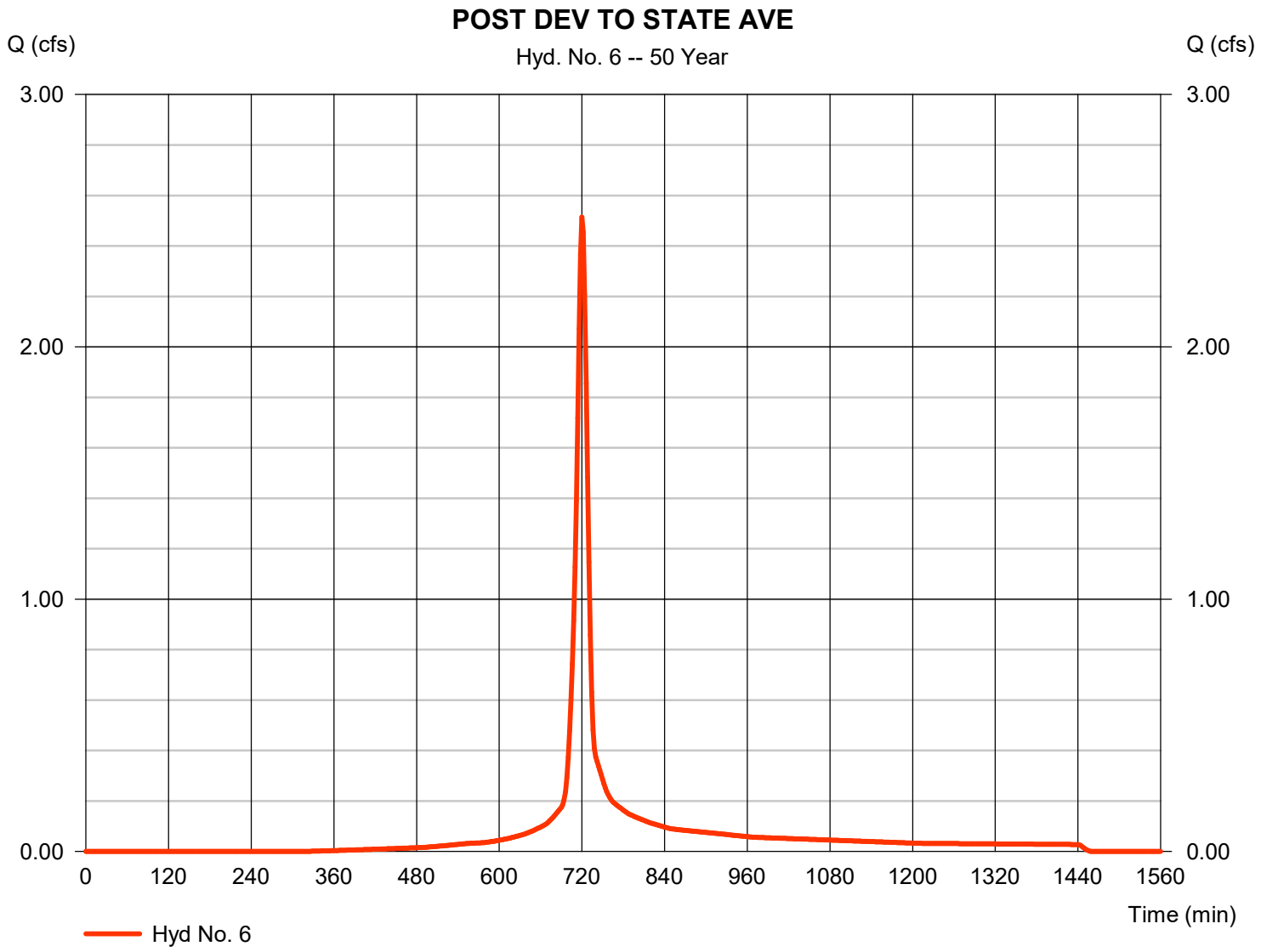
Hydrograph Report

Hyd. No. 6

POST DEV TO STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.514 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 6,637 cuft
Drainage area	= 0.510 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.01 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.170 x 79)] / 0.510



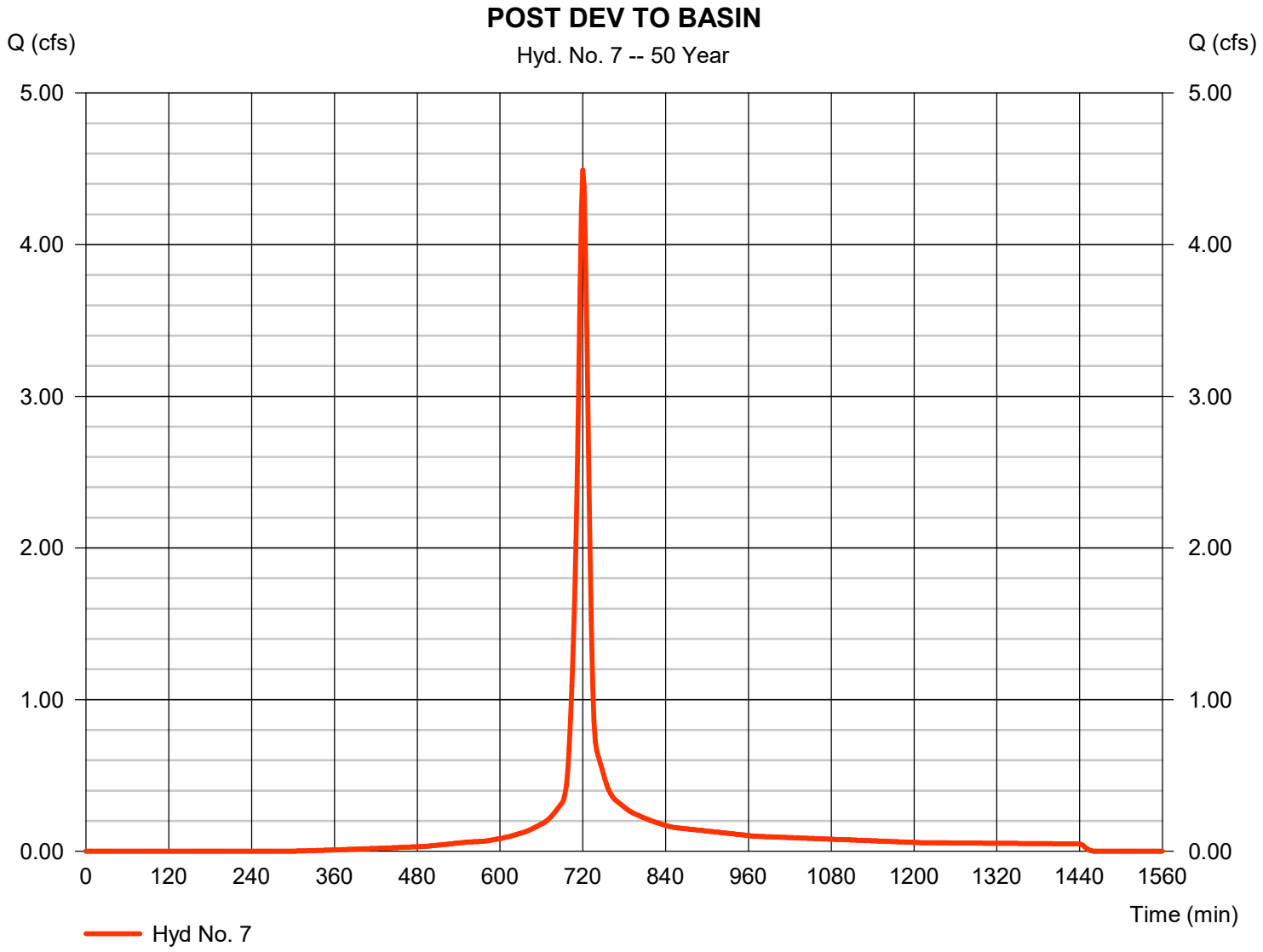
Hydrograph Report

Hyd. No. 7

POST DEV TO BASIN

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.493 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	11,916 cuft
Drainage area	=	0.890 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.720 x 89) + (0.170 x 79)] / 0.890



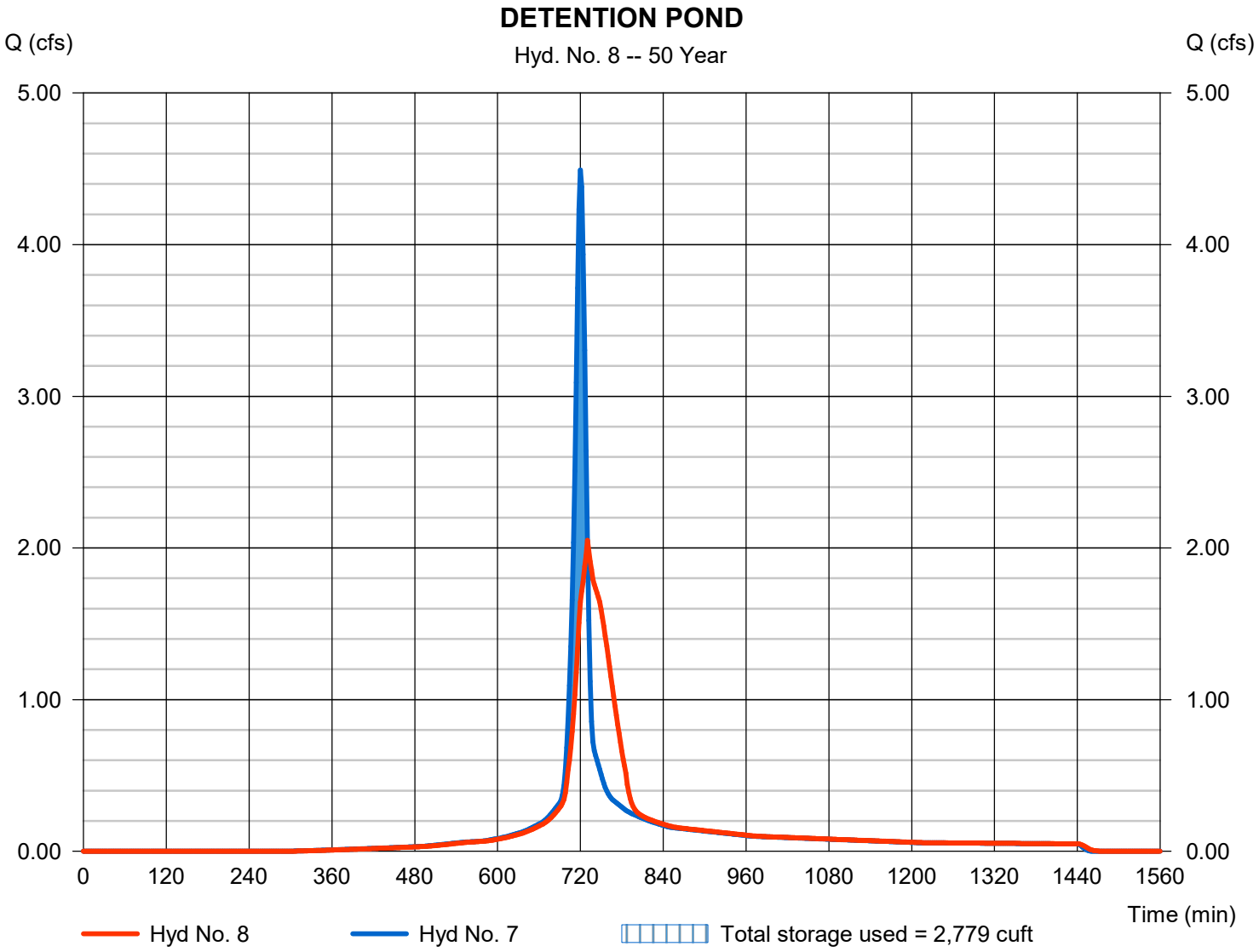
Hydrograph Report

Hyd. No. 8

DETENTION POND

Hydrograph type	=	Reservoir	Peak discharge	=	2.051 cfs
Storm frequency	=	50 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	11,916 cuft
Inflow hyd. No.	=	7 - POST DEV TO BASIN	Max. Elevation	=	937.31 ft
Reservoir name	=	POST POND	Max. Storage	=	2,779 cuft

Storage Indication method used.

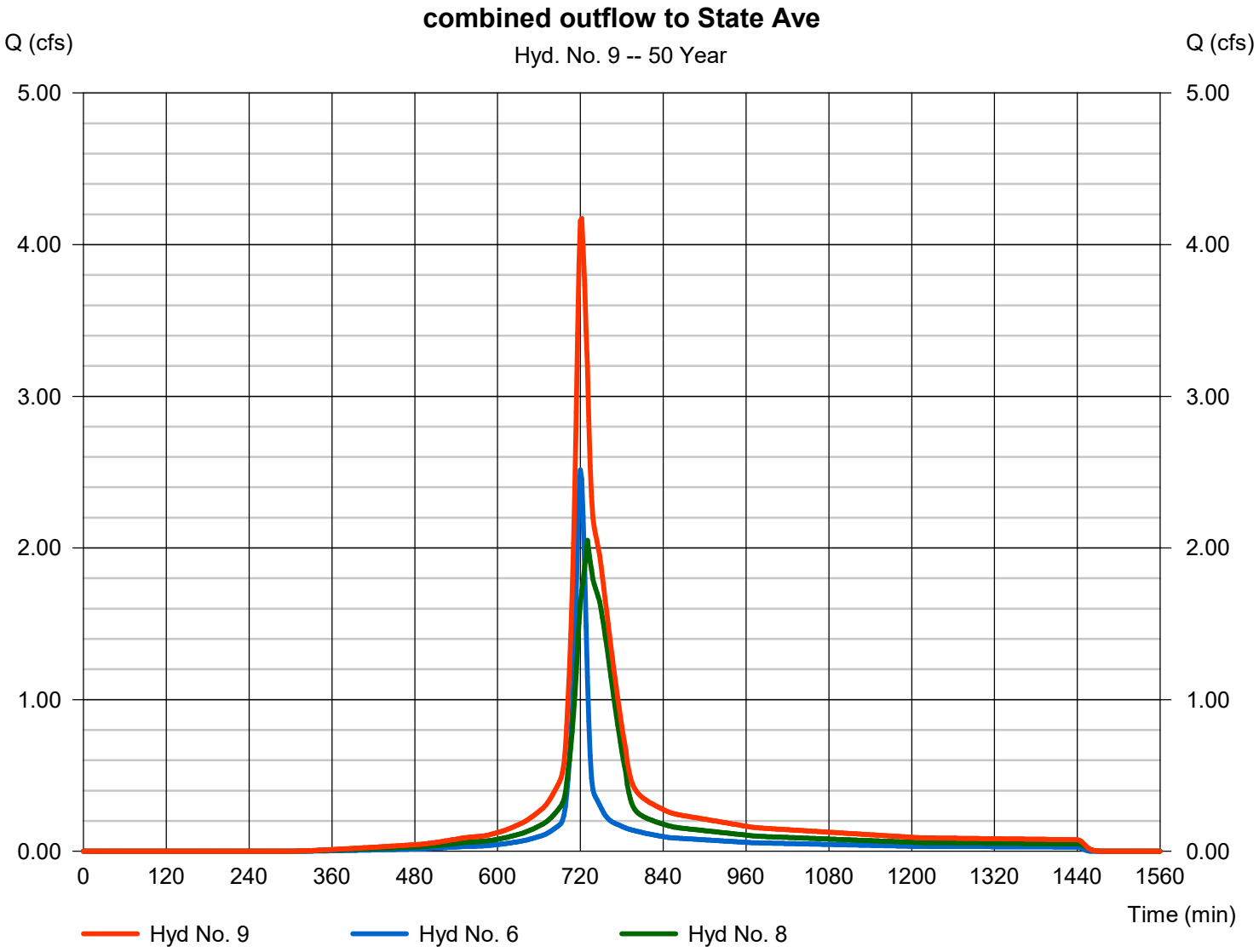


Hydrograph Report

Hyd. No. 9

combined outflow to State Ave

Hydrograph type	= Combine	Peak discharge	= 4.172 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 18,553 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.510 ac

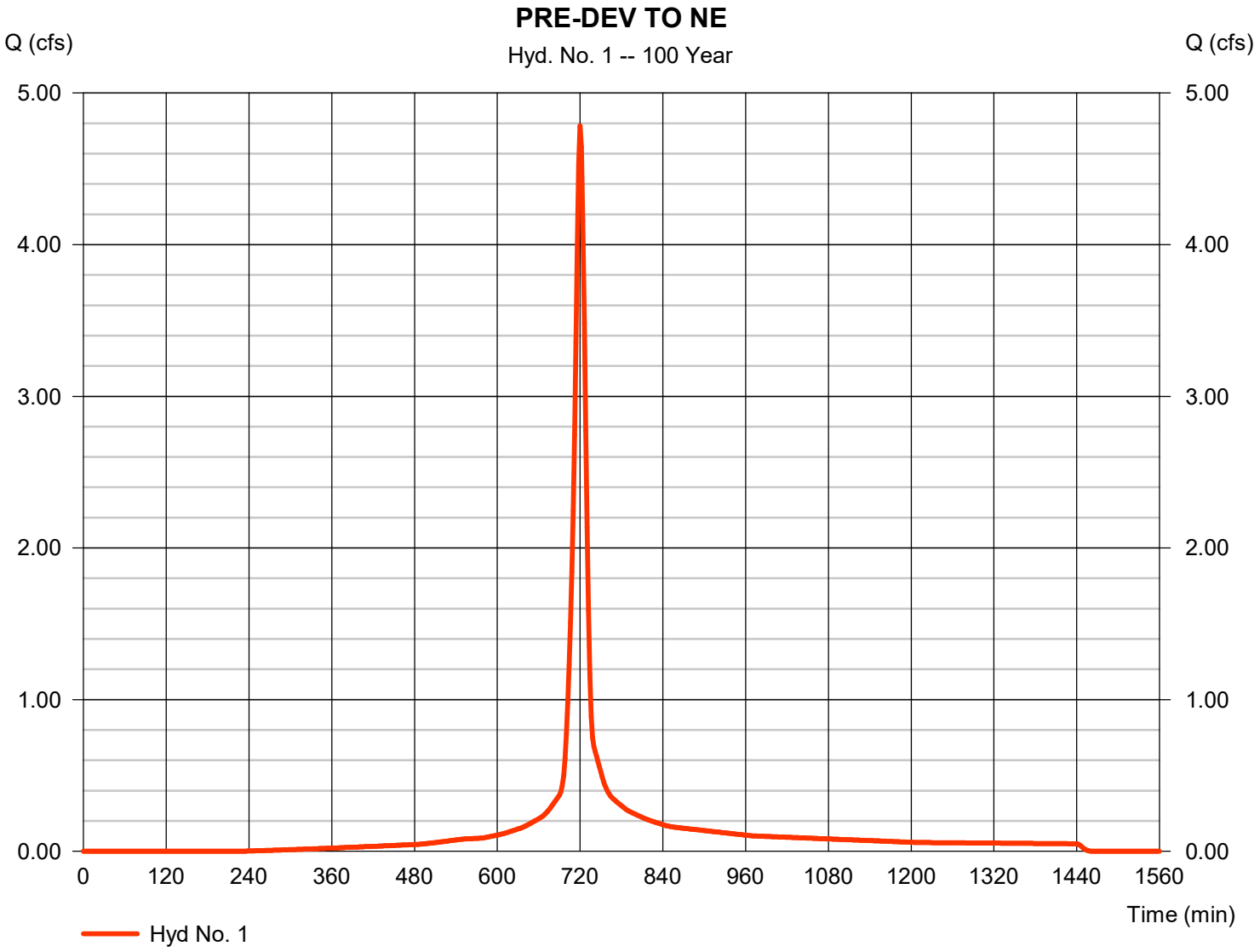


Hydrograph Report

Hyd. No. 1

PRE-DEV TO NE

Hydrograph type	= SCS Runoff	Peak discharge	= 4.783 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 12,952 cuft
Drainage area	= 0.770 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



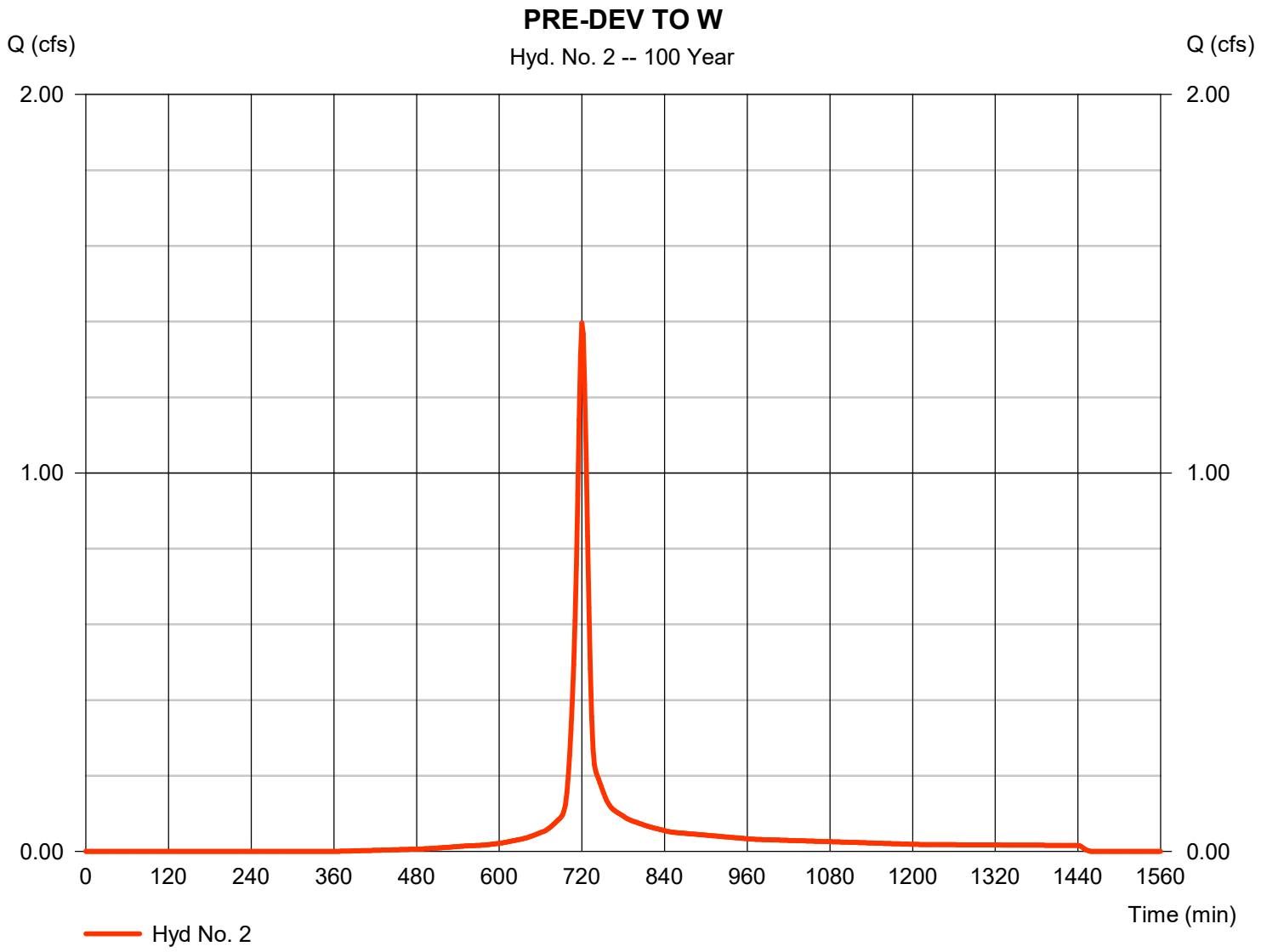
Hydrograph Report

Hyd. No. 2

PRE-DEV TO W

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.397 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	3,657 cuft
Drainage area	=	0.260 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.75 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



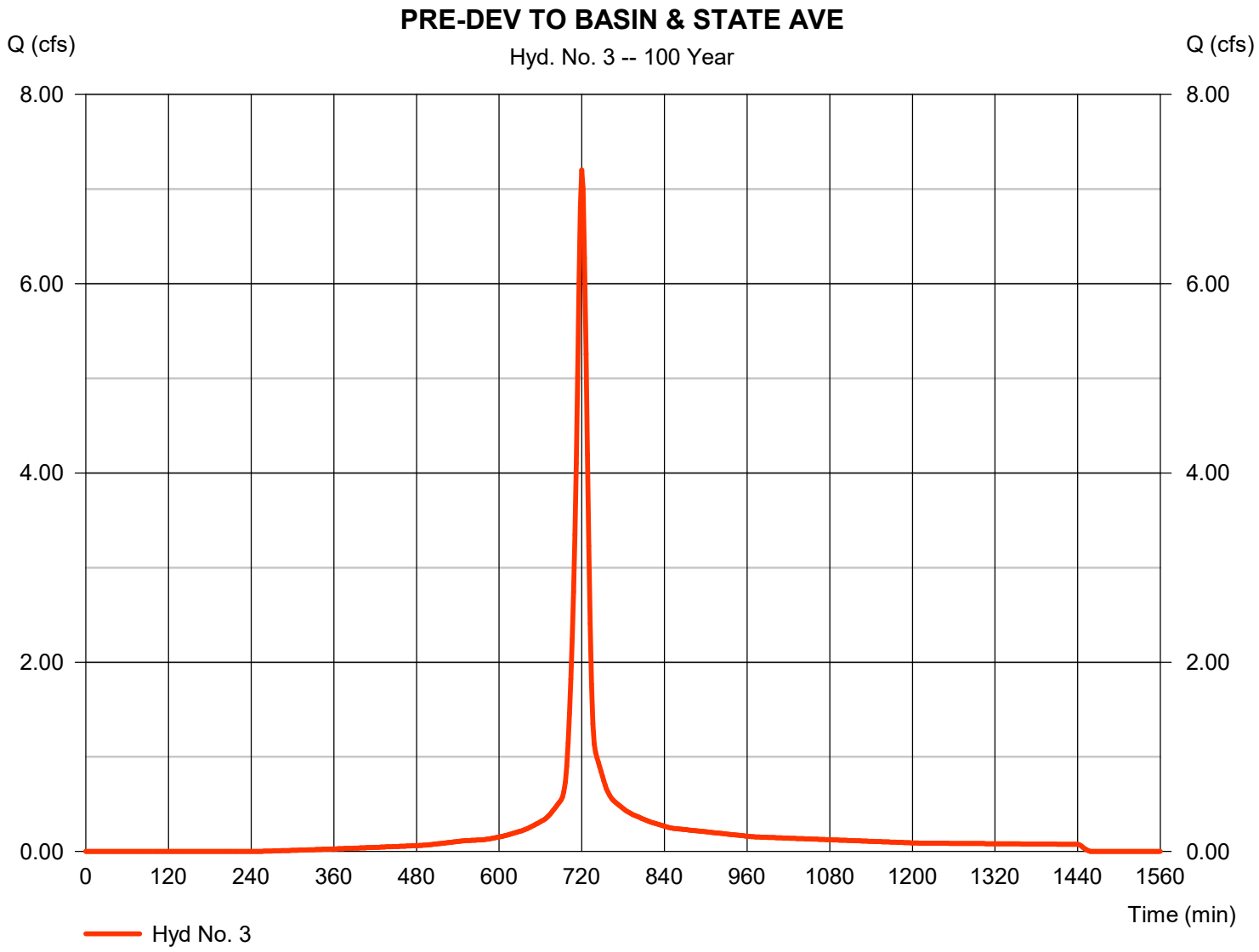
Hydrograph Report

Hyd. No. 3

PRE-DEV TO BASIN & STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 7.201 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 19,372 cuft
Drainage area	= 1.180 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.580 x 92) + (0.260 x 79)] / 1.180

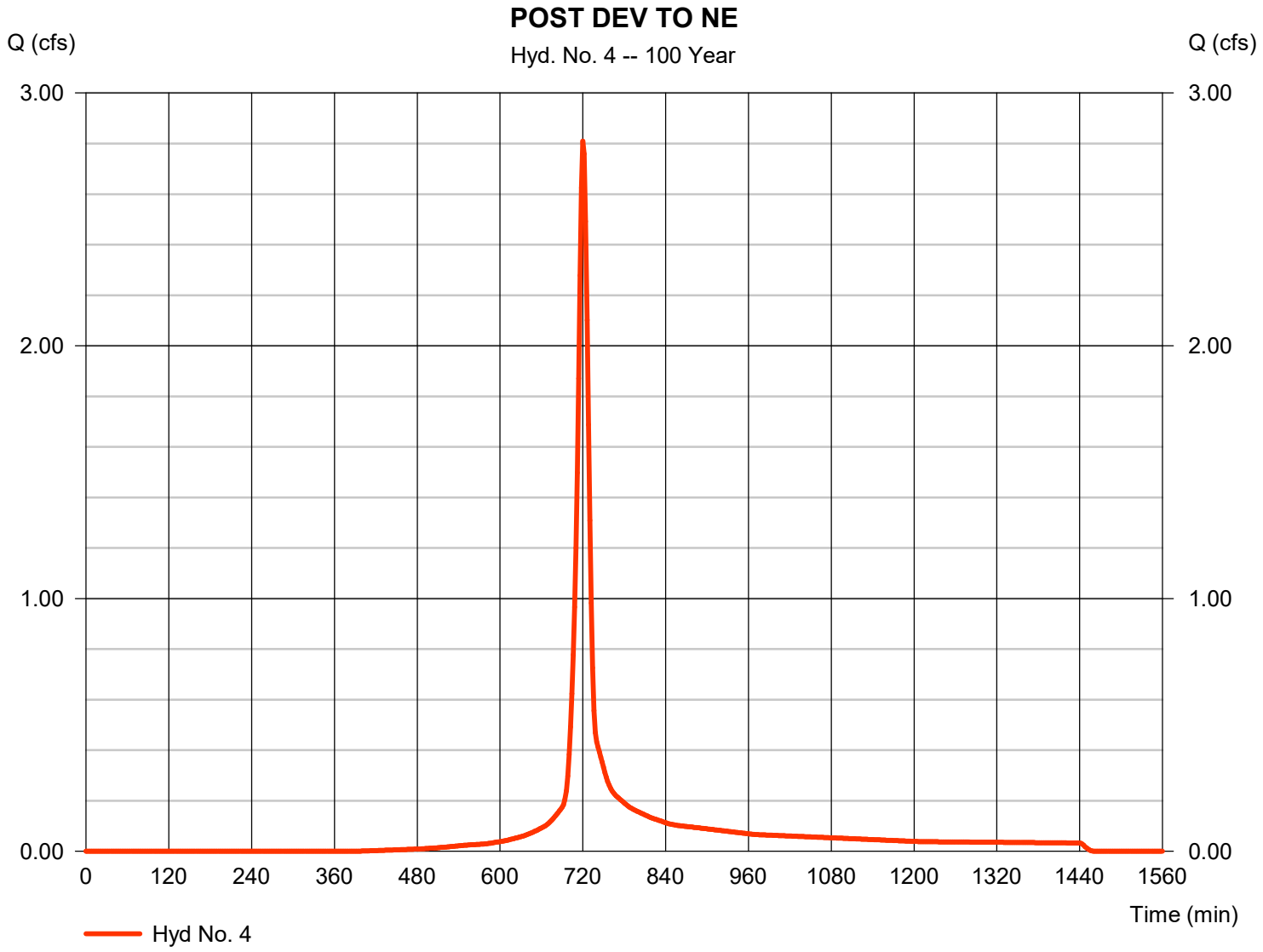


Hydrograph Report

Hyd. No. 4

POST DEV TO NE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.810 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 7,322 cuft
Drainage area	= 0.550 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



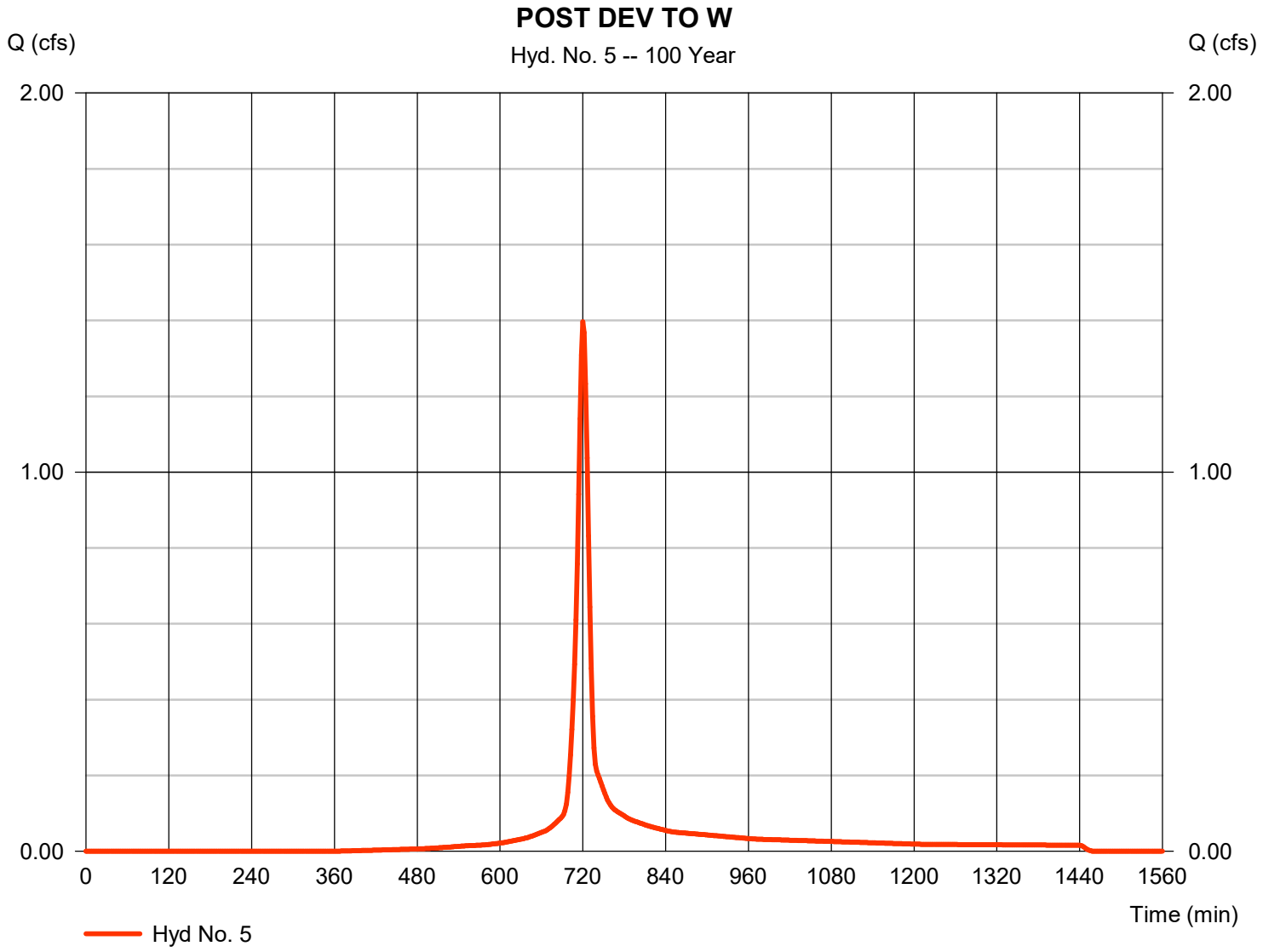
Hydrograph Report

Hyd. No. 5

POST DEV TO W

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.397 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	3,657 cuft
Drainage area	=	0.260 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.75 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.160 x 89) + (0.100 x 70)] / 0.260



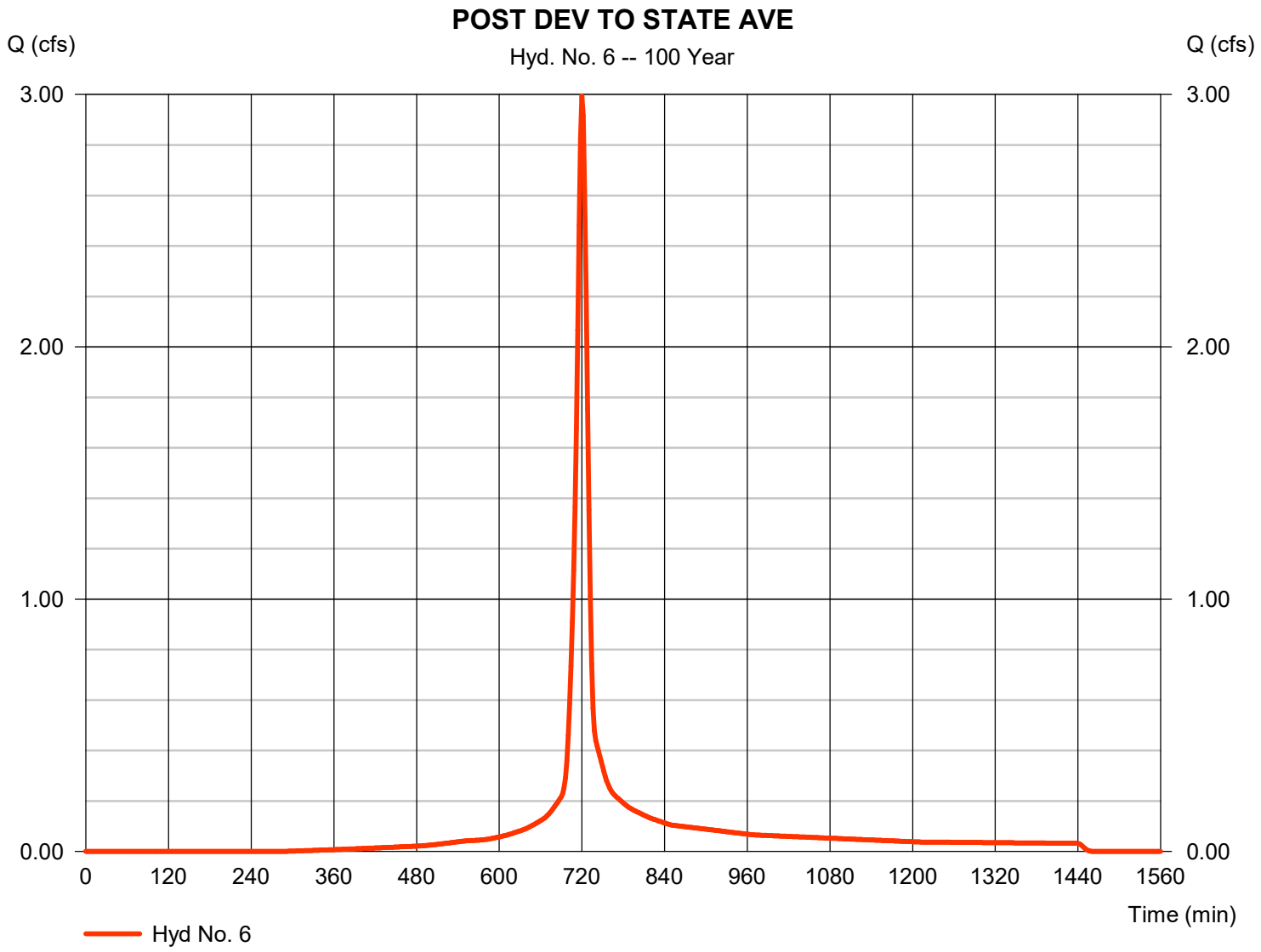
Hydrograph Report

Hyd. No. 6

POST DEV TO STATE AVE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.994 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 7,966 cuft
Drainage area	= 0.510 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 89) + (0.170 x 79)] / 0.510



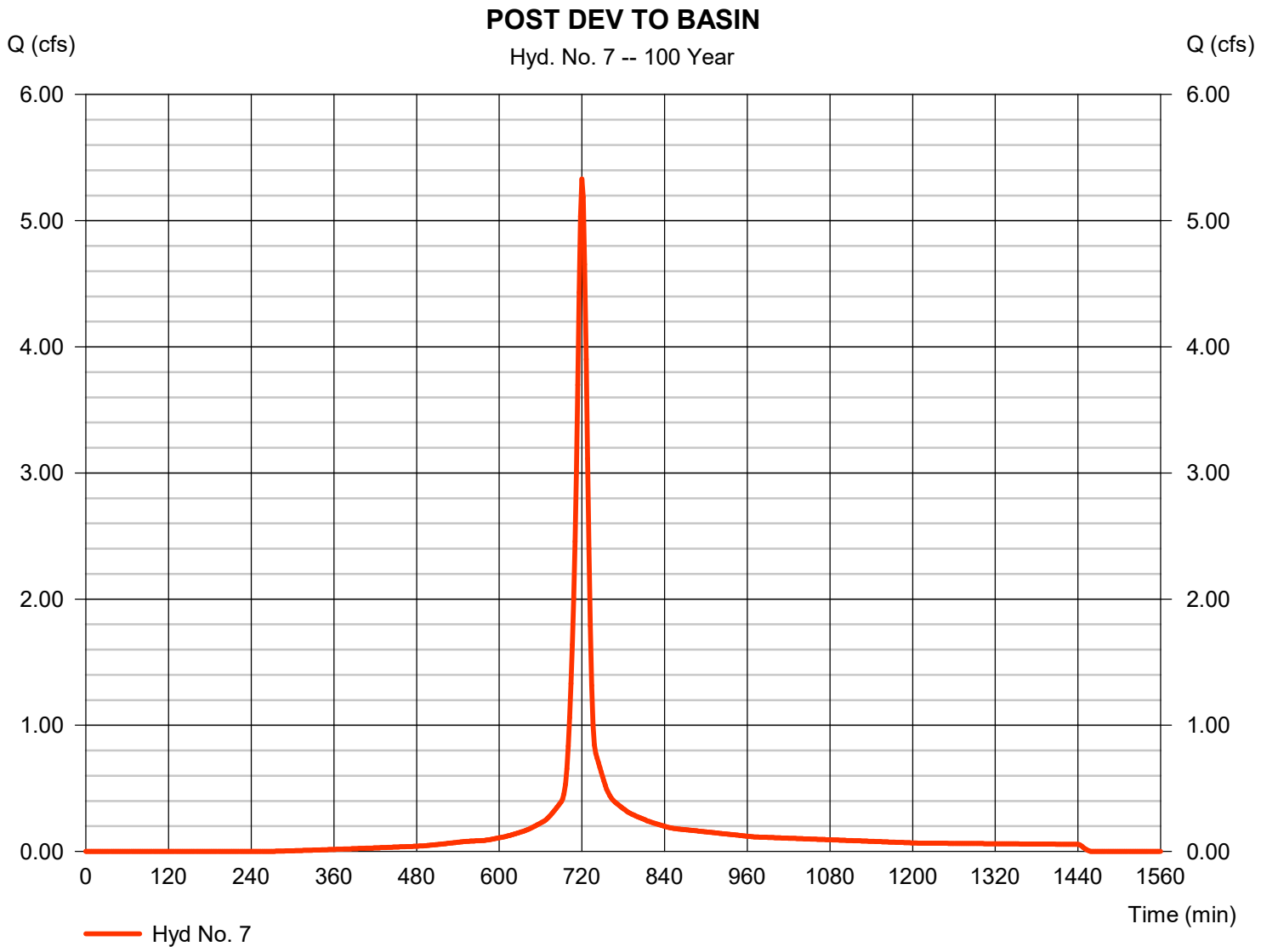
Hydrograph Report

Hyd. No. 7

POST DEV TO BASIN

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.330 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	14,254 cuft
Drainage area	=	0.890 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.75 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.720 x 89) + (0.170 x 79)] / 0.890



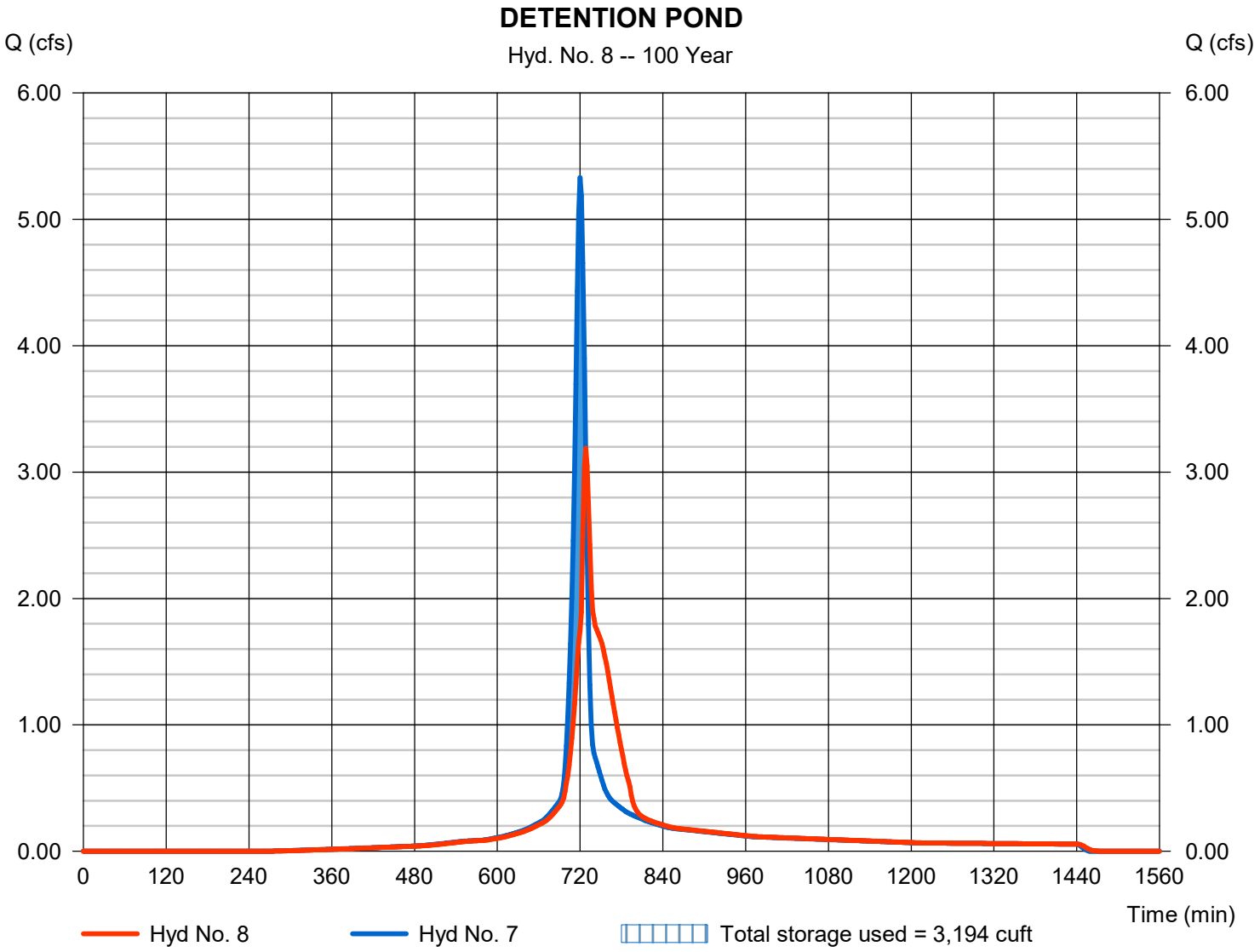
Hydrograph Report

Hyd. No. 8

DETENTION POND

Hydrograph type	=	Reservoir	Peak discharge	=	3.190 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	14,254 cuft
Inflow hyd. No.	=	7 - POST DEV TO BASIN	Max. Elevation	=	937.45 ft
Reservoir name	=	POST POND	Max. Storage	=	3,194 cuft

Storage Indication method used.

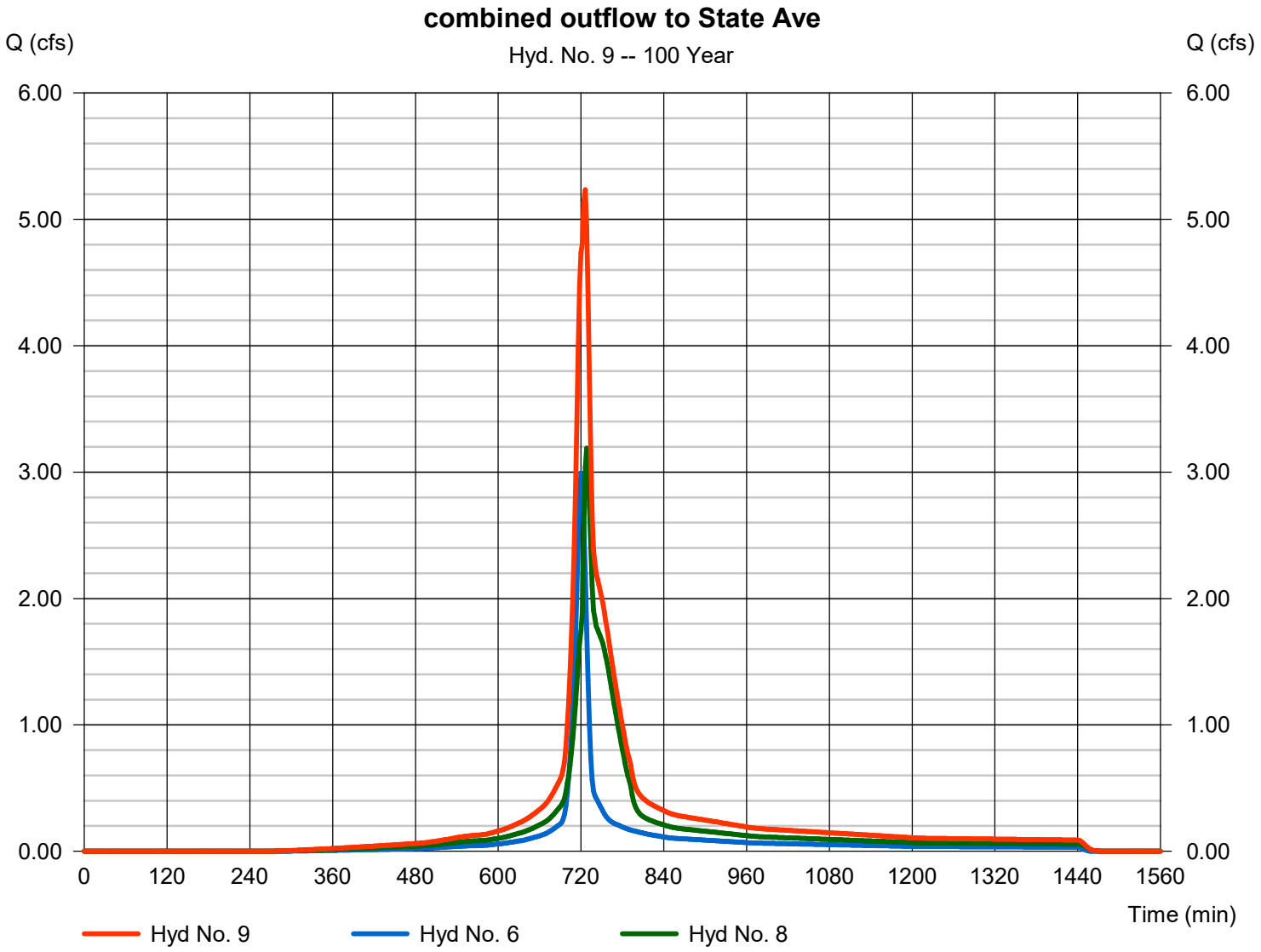


Hydrograph Report

Hyd. No. 9

combined outflow to State Ave

Hydrograph type	= Combine	Peak discharge	= 5.233 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 22,219 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.510 ac



Section 3: Curve Number Calculations

Location: City of Massillon, Stark Co., Ohio

Curve Number Calculation

Pre-Development Curve Number:

To Northeast

Description	Area (ac)	CN	A x C	
Gravel	0.77	89	68.53	HSG C
Total	0.77		68.53	

CN = 89

To West

Description	Area (ac)	CN	A x C	
Gravel:	0.16	89	14.24	HSG C
Brush:	0.10	70	7.00	Brush, Fair Condition, HSG C
Total	0.26		21.24	

CN = 82

Bypass to State Ave

Description	Area (ac)	CN	A x C	
Gravel:	0.34	89	30.26	HSG C
Grass:	0.26	79	20.54	Grass, Fair Condition, HSG C
Total	0.60		50.80	

CN = 85

To Basin

Description	Area (ac)	CN	A x C	
Pavement:	0.41	98	40.18	Impervious
Grass:	0.17	79	13.43	Grass, Fair Condition, HSG C
Total	0.58		53.61	

CN = 92

Post-Development Curve Number:

To Northeast

Description	Area (ac)	CN	A x C	
Gravel:	0.55	89	48.95	HSG C
Total	0.55		48.95	

CN = 89

To West

Description	Area (ac)	CN	A x C	
Gravel:	0.16	89	14.24	HSG C
Brush:	0.10	70	7.00	Brush, Fair Condition, HSG C
Total	0.26		21.24	

CN = 82

Bypass to State Ave

Description	Area (ac)	CN	A x C	
Gravel:	0.34	89	30.26	HSG C
Grass:	0.17	79	13.43	Grass, Fair Condition, HSG C
Total	0.51		43.69	

CN = 86

To Basin

Description	Area (ac)	CN	A x C	
Gravel:	0.72	89	64.08	HSG C
Grass:	0.17	79	13.43	Grass, Fair Condition, HSG C
Total	0.89		77.51	

CN = 87

Section 4: Drainage Area Maps

ENGINEERS PLANNERS SURVEYORS

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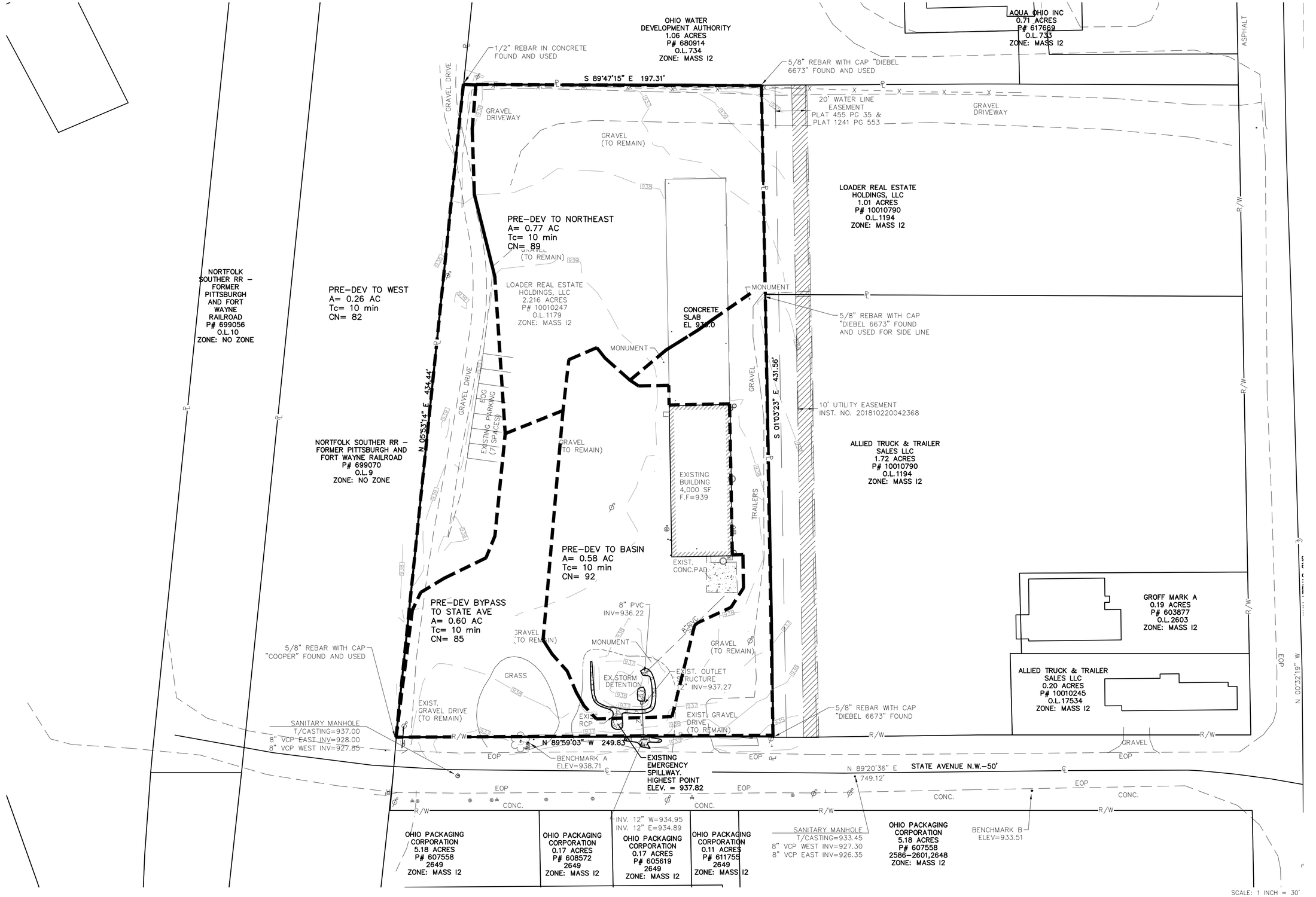

SCALE: 1 INCH = 30'
0 15' 30' 60'

HAMMONTREE & ASSOCIATES, LIMITED
ENGINEERS, PLANNERS, SURVEYORS
5233 STONEHAM RD. NORTH CANTON, OH 44720
PHN: (330) 499-8817 FAX: (330) 499-0149
TOLL FREE: 1-800-394-8817
www.hammontree-engineers.com

REV. BY: ____ DATE: ____
REV. BY: ____ DATE: ____
REV. BY: ____ DATE: ____
REV. BY: ____ DATE: ____
REV. BY: ____ DATE: ____

DESN BY: XXX
DRWN BY: HLC
RVWD BY: JDS
FLD BK: 100
BK PG: XXX
DATE: 10/29/21

SCALES
HORZ: X
VERT: X
CONTOUR INT: X

PRE-DEVELOPMENT DRAINAGE AREA MAP
G&D BUILDING ADDITION
FOR: JOSEPH A. JEFFRIES
LOCATED IN THE OUT LOT #179, THE CITY OF MASSILLON
STARK COUNTY, OH

PRE

ENGINEERS PLANNERS SURVEYORS

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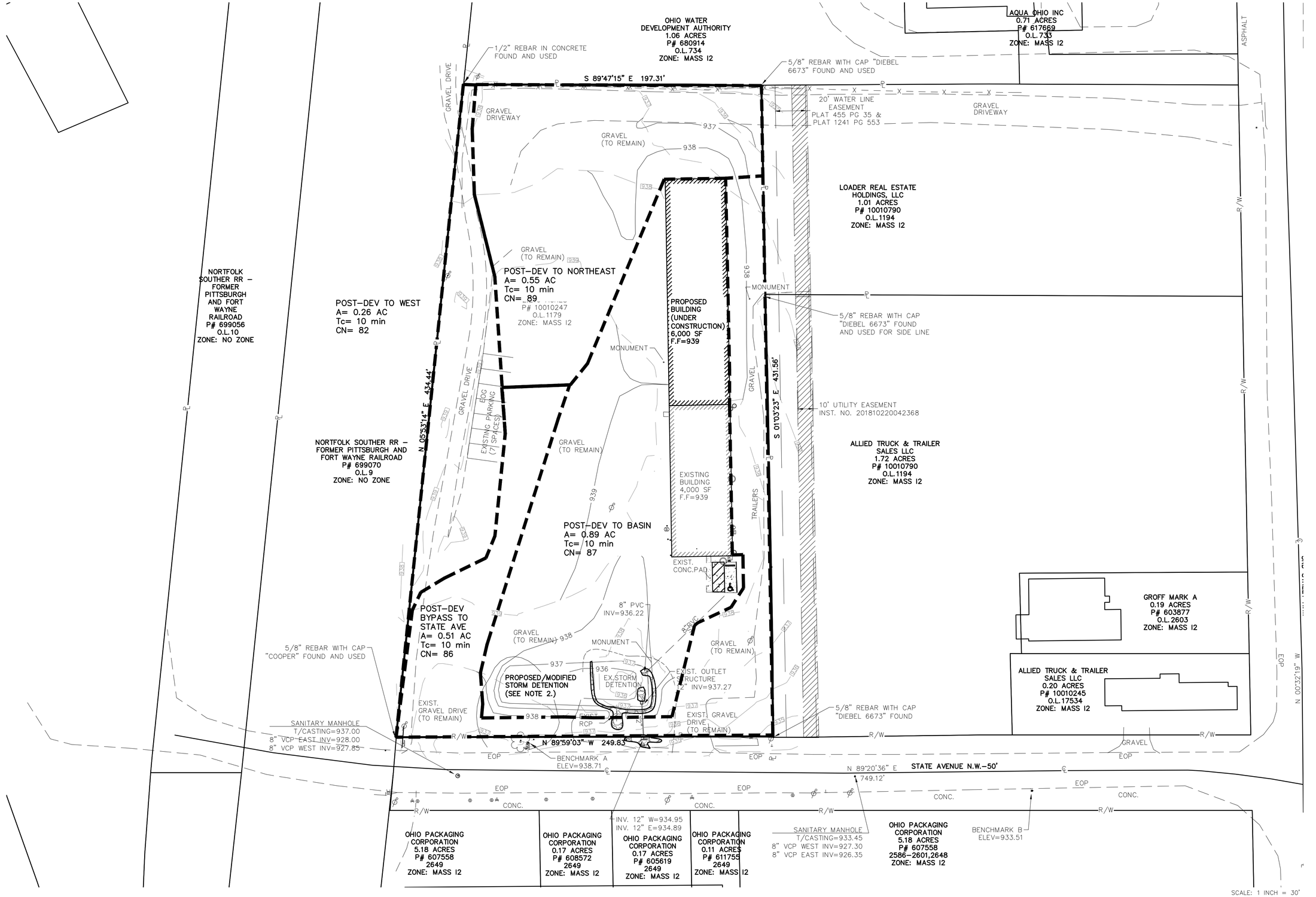

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REV. BY:	DATE:	REV. BY:	DATE:	REV. BY:	DATE:
DESN BY: XXX	DRWN BY: HLC	RVWD BY: JDS	FLD BK: 100	BK PG: XXX	DATE: 10/29/21

SCALES
HORZ: X
VERT: X
CONTOUR INT: X

POST-DEVELOPMENT DRAINAGE AREA MAP

G&D BUILDING ADDITION

FOR: JOSEPH A. JEFFRIES

LOCATED IN THE OUT LOT #179, THE CITY OF MASSILLON
STARK COUNTY, OH

POST