

A-13

**Post Construction
Stormwater Management Analysis**

**Hamilton Estate
Strafford Avenue**

Radnor Township, Delaware County

Date: May 15, 2023

Revised: January 31, 2024

Plan Prepared For:

**Haverford Properties
551 W. Lancaster Avenue, Suite 307
Haverford, PA 19041**

Plan Prepared By:

**Site Engineering Concepts, LLC
P.O. Box 1992
Southeastern, PA 19399**



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Executive Summary

The applicant proposes to remove all existing improvements on 208 and 228 Strafford Avenue and 18 Forrest Lane. Proposed is the construction of 38 Townhouses with 2 new drives, related parking and walkways. 2 main entrance will be located on Strafford Avenue.

Five stormwater management systems are proposed, a combination of pipe storages and ACO stormBrixx. The stormwater runoff rates are controlled per the township ordinance using different size orifices within the outlet structure at the outlet of each bed. The beds are used for storm water volume, quality and runoff rate control.

During construction erosion and sediment control will be accomplished through limited disturbance, immediate stabilization, a stabilized construction entrance, sediment basin and compost filter sock. The total limit of disturbance is approximately 7.0 acres.

STRAFFORD AVENUE

Stormwater Management Summary-Post Construction

Radnor Township Stormwater District A

Stormwater Management Summary - POI A							
Yr	Pre-Development				Post Development	Compliance	Percentage Reduction
	On-Site		Allowable Release Rate*		Total Post Developed Flow		
1	0.344		0.344		0.110	-0.23	-68%
2	1.273		0.344		0.306	-0.04	-11%
5	3.403		3.403		1.186	-2.22	-65%
10	5.645		5.645		2.396	-3.25	-58%
25	9.242		9.242		4.692	-4.55	-49%
50	12.580		12.580		6.948	-5.63	-45%
100	16.390		16.390		10.070	-6.32	-39%

Design Storm Proposed Conditions	Reduce to	Design Storm Existing Conditions
1yr		1 yr
2 yr		1 yr
5 yr		5 yr
10 yr		10 yr
25 yr		25 yr
50 yr		50 yr
100 yr		100 yr

Bed 1 Size	108 x 40 x 4 x 0.95	16,416 CF
Bed 2 Size	90 x 45 x 5 x 0.95	19,237 CF
Bed 3 Size	3372 x 5 x 0.95	16,018 CF
Bed 5 Size	80 x 4 x 4 x 0.95	1,216 CF

Dewatering Calculations

Bed #1 Dewatering

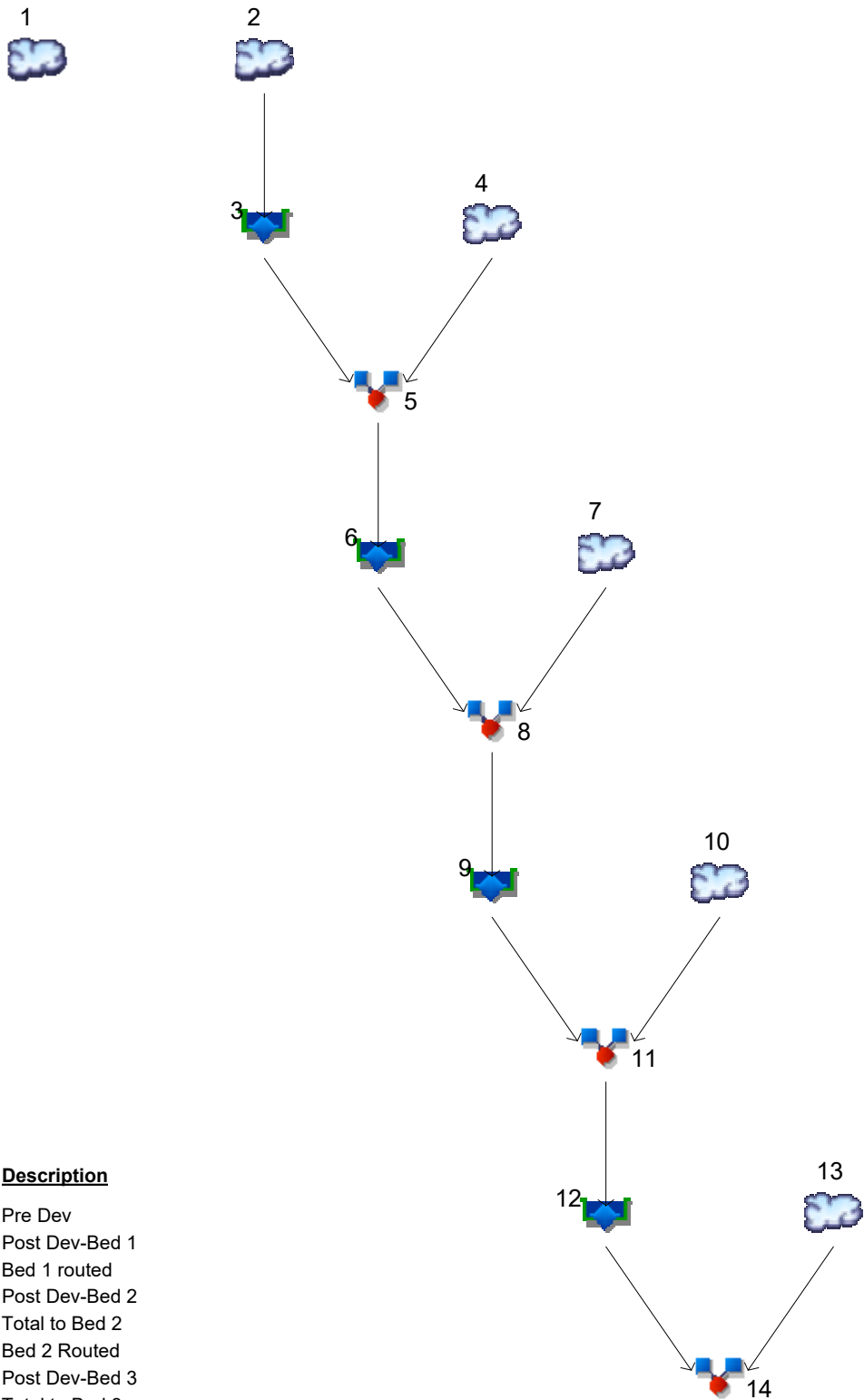
Bed Depth	Permeability Rate	Drain Down
44.4	1.75	25
in	in/hr	hrs

Bed #2 Dewatering

Bed Depth	Permeability Rate	Drain Down
42	1.06	40
in	in/hr	hrs

Max required dewatering time = 72 hrs per PABMP Manual

POI A - NO STONE



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre Dev
2	SCS Runoff	Post Dev-Bed 1
3	Reservoir	Bed 1 routed
4	SCS Runoff	Post Dev-Bed 2
5	Combine	Total to Bed 2
6	Reservoir	Bed 2 Routed
7	SCS Runoff	Post Dev-Bed 3
8	Combine	Total to Bed 3
9	Reservoir	Bed 3 Routed
10	SCS Runoff	Post Dev-Bed 5
11	Combine	Total to Bed 5
12	Reservoir	Bed 5 Routed
13	SCS Runoff	Bypass
14	Combine	Total Post Dev

Hydrograph Return Period Recap

Hydratflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

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	-----	0.344	1.273	-----	3.403	5.645	9.242	12.58	16.39	Pre Dev
2	SCS Runoff	-----	1.155	1.735	-----	2.677	3.516	4.783	5.896	7.108	Post Dev-Bed 1
3	Reservoir	2	0.000	0.000	-----	0.000	0.000	0.000	0.000	0.000	Bed 1 routed
4	SCS Runoff	-----	2.978	4.546	-----	7.108	9.401	12.85	15.91	19.25	Post Dev-Bed 2
5	Combine	3, 4	2.978	4.546	-----	7.108	9.401	12.85	15.91	19.25	Total to Bed 2
6	Reservoir	5	0.000	0.000	-----	0.121	0.358	1.614	6.547	10.52	Bed 2 Routed
7	SCS Runoff	-----	2.120	3.354	-----	5.397	7.246	10.00	12.49	15.23	Post Dev-Bed 3
8	Combine	6, 7	2.120	3.354	-----	5.397	7.246	10.00	14.27	23.75	Total to Bed 3
9	Reservoir	8	0.119	0.360	-----	1.146	2.108	3.592	6.739	9.872	Bed 3 Routed
10	SCS Runoff	-----	0.021	0.052	-----	0.109	0.163	0.248	0.325	0.412	Post Dev-Bed 5
11	Combine	9, 10	0.121	0.367	-----	1.169	2.159	3.668	6.789	9.935	Total to Bed 5
12	Reservoir	11	0.102	0.292	-----	1.133	2.299	4.093	6.794	9.892	Bed 5 Routed
13	SCS Runoff	-----	0.104	0.196	-----	0.356	0.505	0.734	0.939	1.167	Bypass
14	Combine	12, 13	0.110	0.306	-----	1.186	2.396	4.692	6.948	10.07	Total Post Dev
Proj. file: POI-A-Hydro.gpw										Wednesday, 01 / 31 / 2024	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

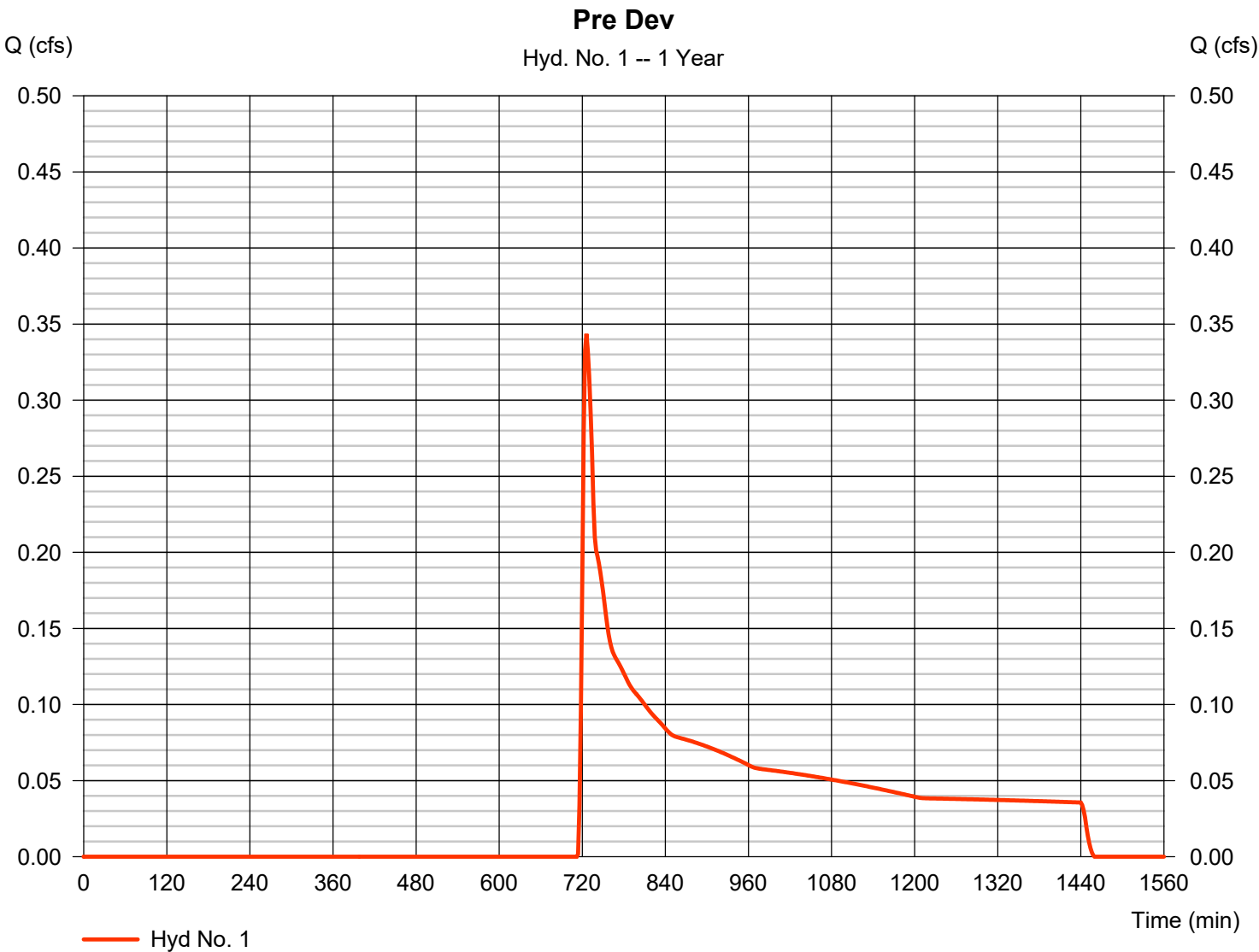
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.344	2	726	2,883	-----	-----	-----	Pre Dev
2	SCS Runoff	1.155	2	718	2,346	-----	-----	-----	Post Dev-Bed 1
3	Reservoir	0.000	2	n/a	0	2	437.57	2,346	Bed 1 routed
4	SCS Runoff	2.978	2	718	6,095	-----	-----	-----	Post Dev-Bed 2
5	Combine	2.978	2	718	6,095	3, 4	-----	-----	Total to Bed 2
6	Reservoir	0.000	2	n/a	0	5	432.08	6,095	Bed 2 Routed
7	SCS Runoff	2.120	2	718	4,429	-----	-----	-----	Post Dev-Bed 3
8	Combine	2.120	2	718	4,429	6, 7	-----	-----	Total to Bed 3
9	Reservoir	0.119	2	808	4,407	8	423.59	1,900	Bed 3 Routed
10	SCS Runoff	0.021	2	720	69	-----	-----	-----	Post Dev-Bed 5
11	Combine	0.121	2	808	4,476	9, 10	-----	-----	Total to Bed 5
12	Reservoir	0.102	2	900	4,474	11	423.09	332	Bed 5 Routed
13	SCS Runoff	0.104	2	718	253	-----	-----	-----	Bypass
14	Combine	0.110	2	718	4,727	12, 13	-----	-----	Total Post Dev
POI-A-Hydro.gpw					Return Period: 1 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.344 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	2,883 cuft
Drainage area	=	4.250 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.10 min
Total precip.	=	2.69 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



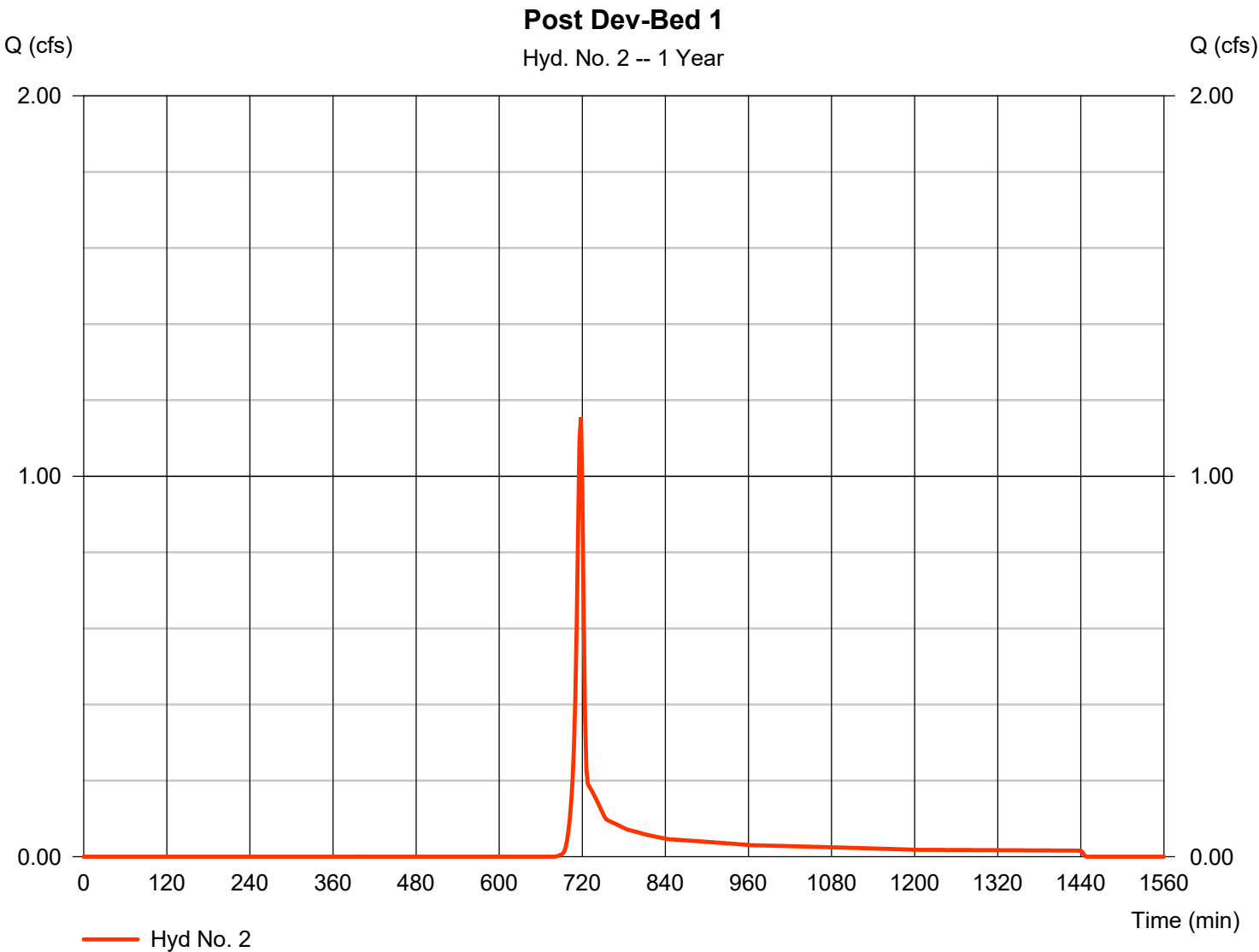
Hydrograph Report

Hyd. No. 2

Post Dev-Bed 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.155 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 2,346 cuft
Drainage area	= 0.960 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.69 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 98) + (0.620 x 61)] / 0.960



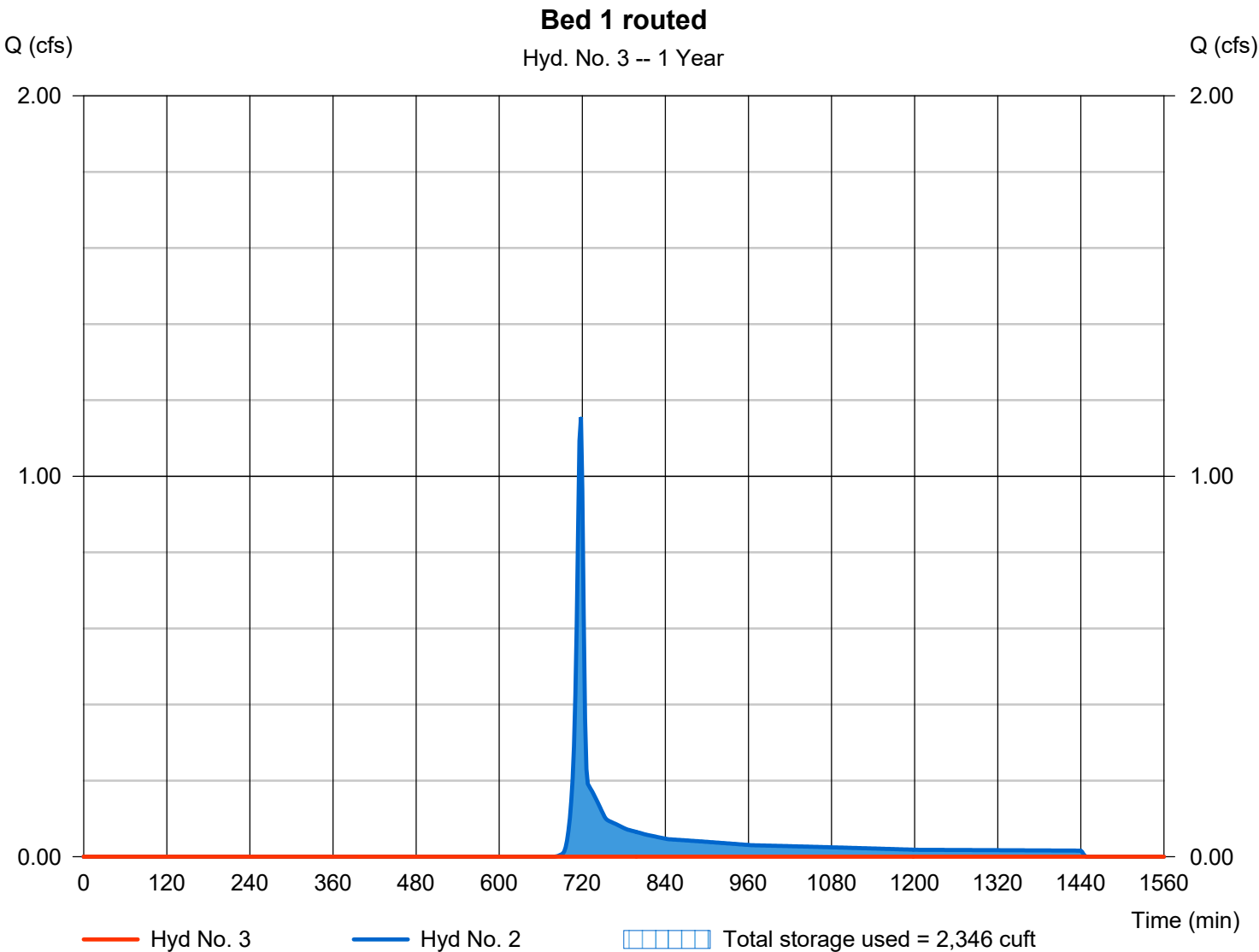
Hydrograph Report

Hyd. No. 3

Bed 1 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post Dev-Bed 1	Max. Elevation	= 437.57 ft
Reservoir name	= Bed 1	Max. Storage	= 2,346 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Wednesday, 01 / 31 / 2024

Pond No. 1 - Bed 1

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	437.00	n/a	0	0
1.00	438.00	n/a	4,104	4,104
2.00	439.00	n/a	4,104	8,208
3.00	440.00	n/a	4,104	12,312
4.00	441.00	n/a	4,104	16,416

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 437.00	440.70	0.00	0.00
Length (ft)	= 25.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 440.90	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	437.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	410	437.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.20	821	437.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.30	1,231	437.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.40	1,642	437.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.50	2,052	437.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.60	2,462	437.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.70	2,873	437.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.80	3,283	437.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.90	3,694	437.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.00	4,104	438.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.10	4,514	438.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.20	4,925	438.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.30	5,335	438.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.40	5,746	438.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.50	6,156	438.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.60	6,566	438.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.70	6,977	438.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.80	7,387	438.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.90	7,798	438.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.00	8,208	439.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.10	8,618	439.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.20	9,029	439.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.30	9,439	439.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.40	9,850	439.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.50	10,260	439.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.60	10,670	439.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.70	11,081	439.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.80	11,491	439.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.90	11,902	439.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.00	12,312	440.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.10	12,722	440.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.20	13,133	440.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.30	13,543	440.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.40	13,954	440.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.50	14,364	440.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.60	14,774	440.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.70	15,185	440.70	0.00 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.000
3.80	15,595	440.80	0.01 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.015

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Bed 1

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.90	16,006	440.90	0.04 ic	0.04 ic	---	---	0.00	---	---	---	---	---	0.036
4.00	16,416	441.00	0.48 ic	0.05 ic	---	---	0.42	---	---	---	---	---	0.470

...End

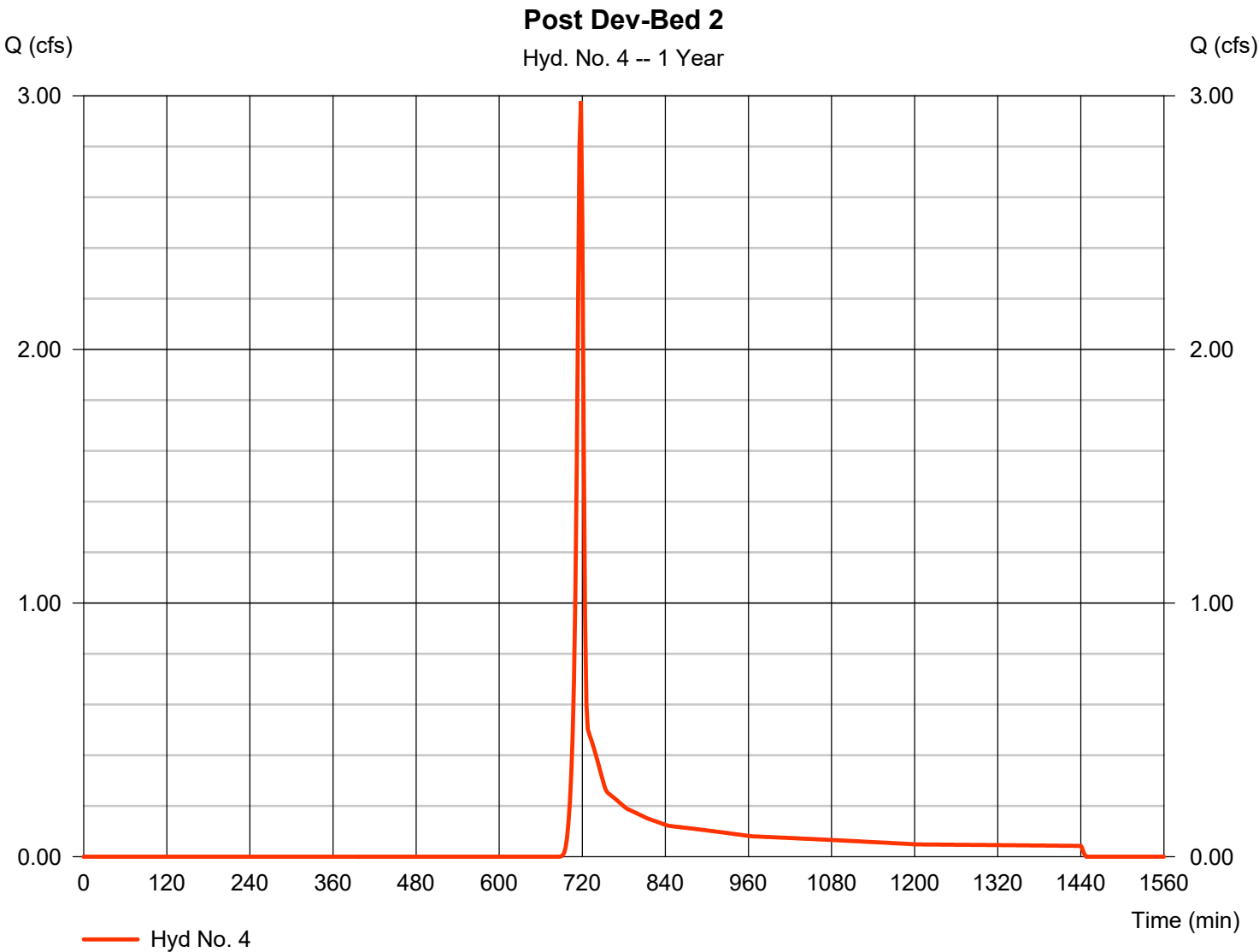
Hydrograph Report

Hyd. No. 4

Post Dev-Bed 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.978 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	6,095 cuft
Drainage area	=	2.660 ac	Curve number	=	73*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.69 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.840 x 98) + (1.820 x 61)] / 2.660

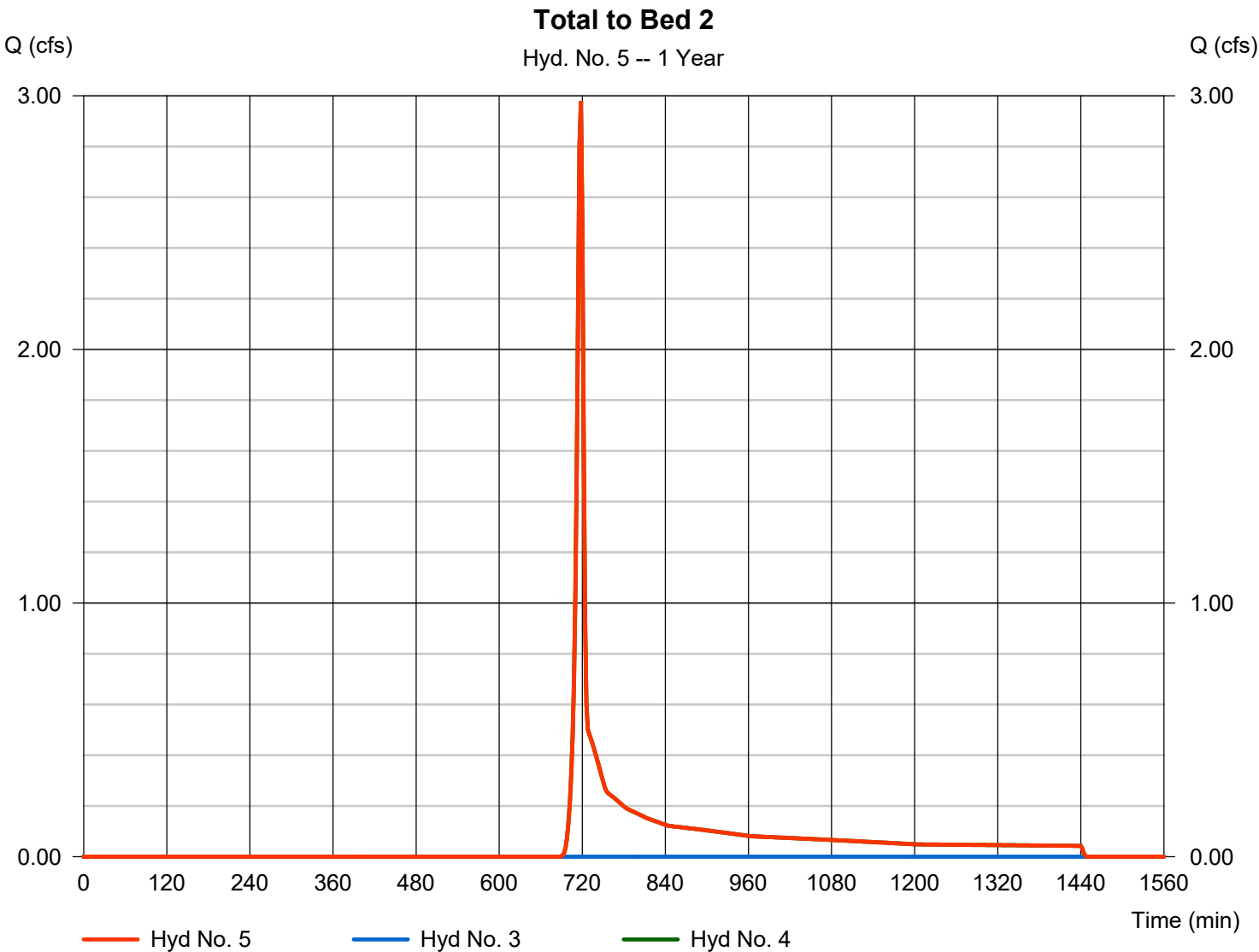


Hydrograph Report

Hyd. No. 5

Total to Bed 2

Hydrograph type	= Combine	Peak discharge	= 2.978 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 6,095 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.660 ac



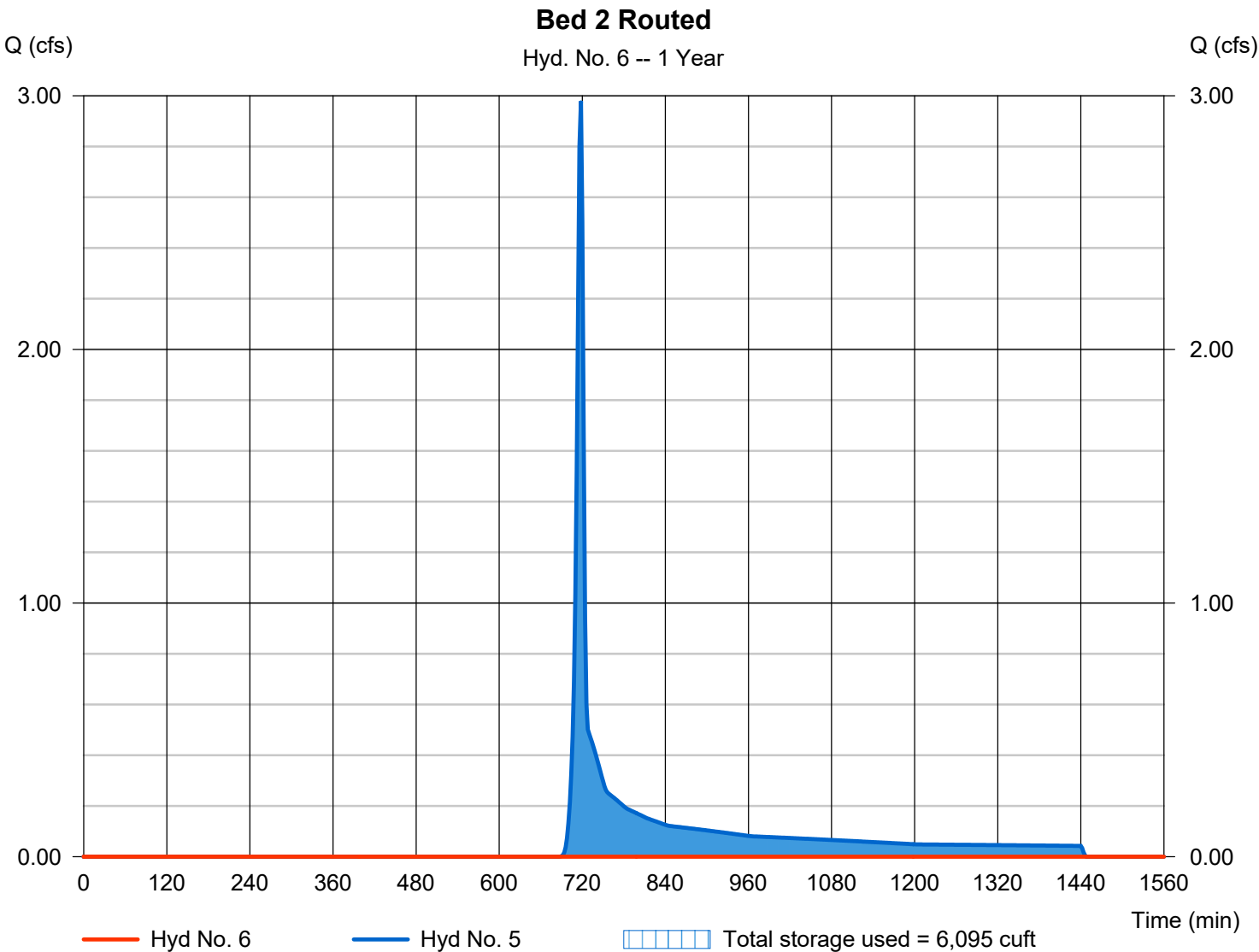
Hydrograph Report

Hyd. No. 6

Bed 2 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 5 - Total to Bed 2	Max. Elevation	= 432.08 ft
Reservoir name	= Bed 2	Max. Storage	= 6,095 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Wednesday, 01 / 31 / 2024

Pond No. 3 - Bed 2

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	430.50	n/a	0	0
1.00	431.50	n/a	3,848	3,848
2.00	432.50	n/a	3,847	7,695
3.00	433.50	n/a	3,848	11,543
4.00	434.50	n/a	3,847	15,390
5.00	435.50	n/a	3,847	19,237

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 430.50	433.50	0.00	0.00
Length (ft)	= 25.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 433.60	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	430.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	385	430.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.20	770	430.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.30	1,154	430.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.40	1,539	430.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.50	1,924	431.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.60	2,309	431.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.70	2,694	431.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.80	3,078	431.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.90	3,463	431.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.00	3,848	431.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.10	4,233	431.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.20	4,617	431.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.30	5,002	431.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.40	5,387	431.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.50	5,772	432.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.60	6,156	432.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.70	6,541	432.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.80	6,926	432.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.90	7,310	432.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.00	7,695	432.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.10	8,080	432.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.20	8,465	432.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.30	8,849	432.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.40	9,234	432.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.50	9,619	433.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.60	10,004	433.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.70	10,389	433.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.80	10,773	433.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
2.90	11,158	433.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.00	11,543	433.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
3.10	11,928	433.60	0.01 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.015
3.20	12,312	433.70	0.46 ic	0.04 ic	---	---	0.42	---	---	---	---	---	0.457
3.30	12,697	433.80	1.25 ic	0.05 ic	---	---	1.19	---	---	---	---	---	1.240
3.40	13,082	433.90	2.26 oc	0.06 ic	---	---	2.19	---	---	---	---	---	2.248
3.50	13,467	434.00	3.44 oc	0.07 ic	---	---	3.37	---	---	---	---	---	3.438
3.60	13,851	434.10	4.79 oc	0.08 ic	---	---	4.71	---	---	---	---	---	4.785
3.70	14,236	434.20	6.27 oc	0.08 ic	---	---	6.19	---	---	---	---	---	6.274

Continues on next page...

Bed 2

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.80	14,621	434.30	7.89 ic	0.09 ic	---	---	7.80	---	---	---	---	---	7.891
3.90	15,005	434.40	9.47 ic	0.09 ic	---	---	9.38 s	---	---	---	---	---	9.470
4.00	15,390	434.50	10.02 ic	0.07 ic	---	---	9.94 s	---	---	---	---	---	10.01
4.10	15,775	434.60	10.39 ic	0.07 ic	---	---	10.32 s	---	---	---	---	---	10.39
4.20	16,159	434.70	10.69 ic	0.06 ic	---	---	10.63 s	---	---	---	---	---	10.69
4.30	16,544	434.80	10.94 ic	0.05 ic	---	---	10.89 s	---	---	---	---	---	10.94
4.40	16,929	434.90	11.17 ic	0.05 ic	---	---	11.12 s	---	---	---	---	---	11.17
4.50	17,314	435.00	11.37 ic	0.04 ic	---	---	11.33 s	---	---	---	---	---	11.37
4.60	17,698	435.10	11.56 ic	0.04 ic	---	---	11.52 s	---	---	---	---	---	11.56
4.70	18,083	435.20	11.74 ic	0.04 ic	---	---	11.70 s	---	---	---	---	---	11.74
4.80	18,468	435.30	11.91 ic	0.03 ic	---	---	11.88 s	---	---	---	---	---	11.91
4.90	18,852	435.40	12.08 ic	0.03 ic	---	---	12.05 s	---	---	---	---	---	12.08
5.00	19,237	435.50	12.24 ic	0.03 ic	---	---	12.21 s	---	---	---	---	---	12.24

...End

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

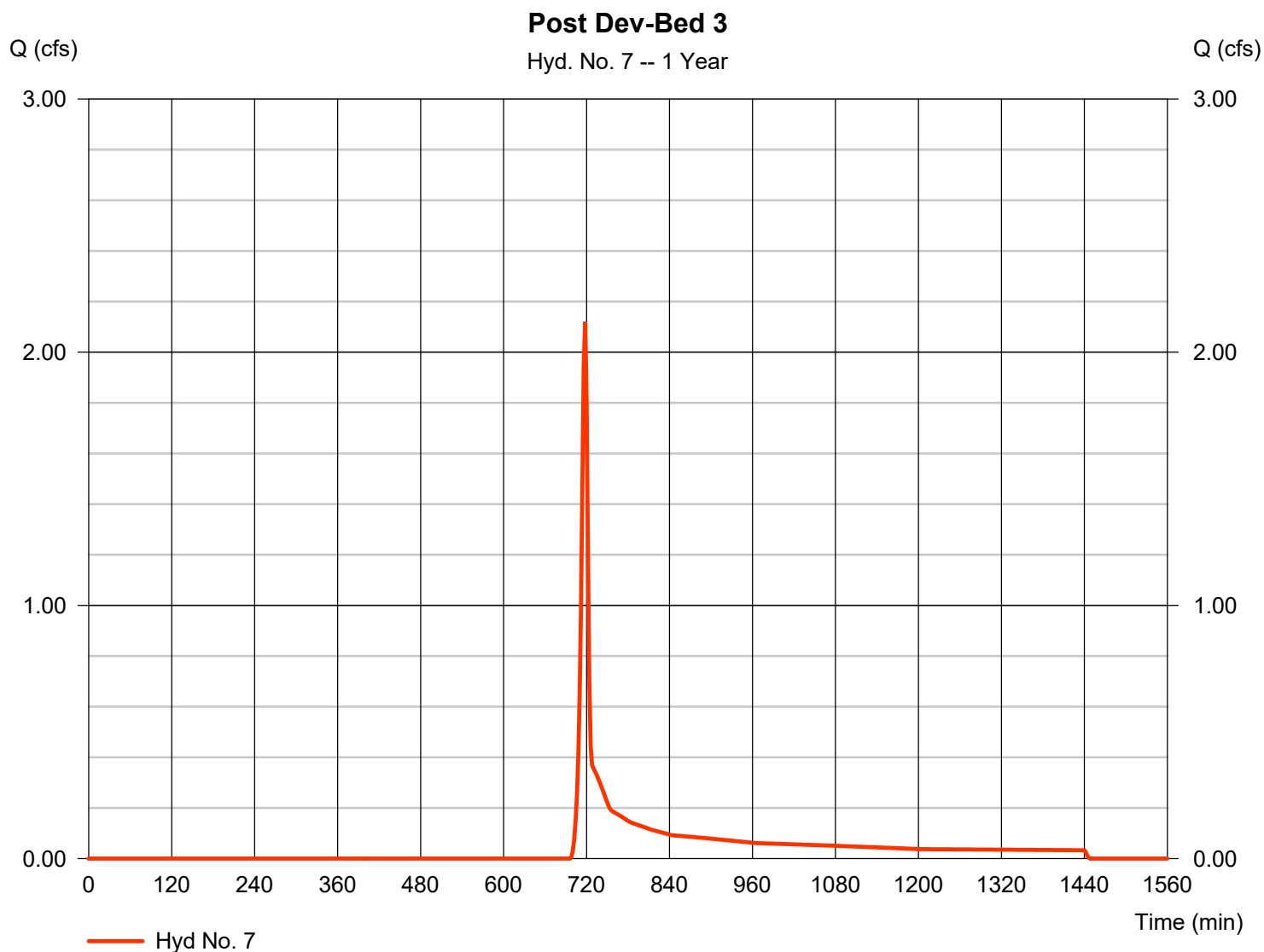
Wednesday, 01 / 31 / 2024

Hyd. No. 7

Post Dev-Bed 3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.120 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,429 cuft
Drainage area	= 2.210 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.69 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.620 \times 98) + (1.590 \times 61)] / 2.210$

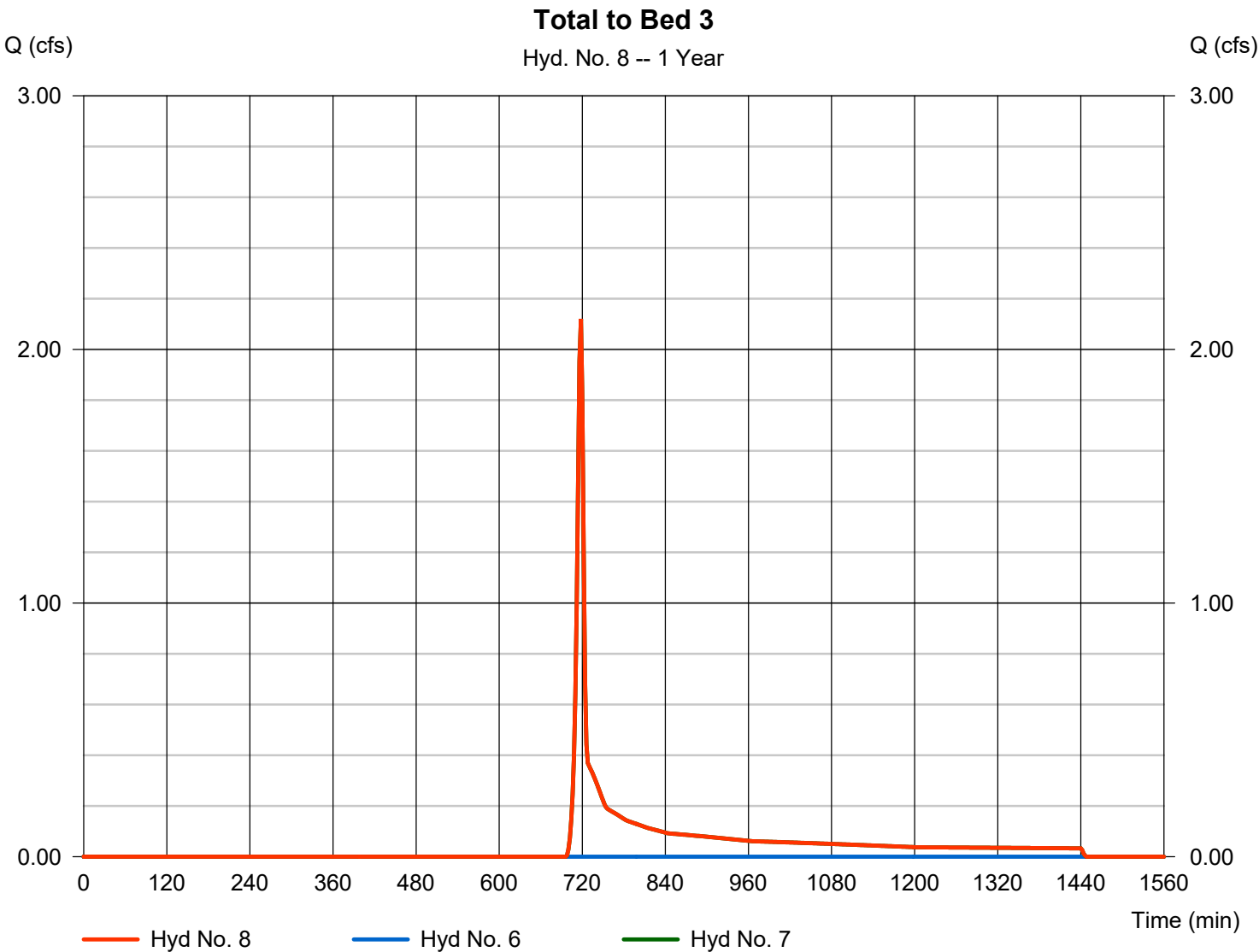


Hydrograph Report

Hyd. No. 8

Total to Bed 3

Hydrograph type	= Combine	Peak discharge	= 2.120 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,429 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 2.210 ac



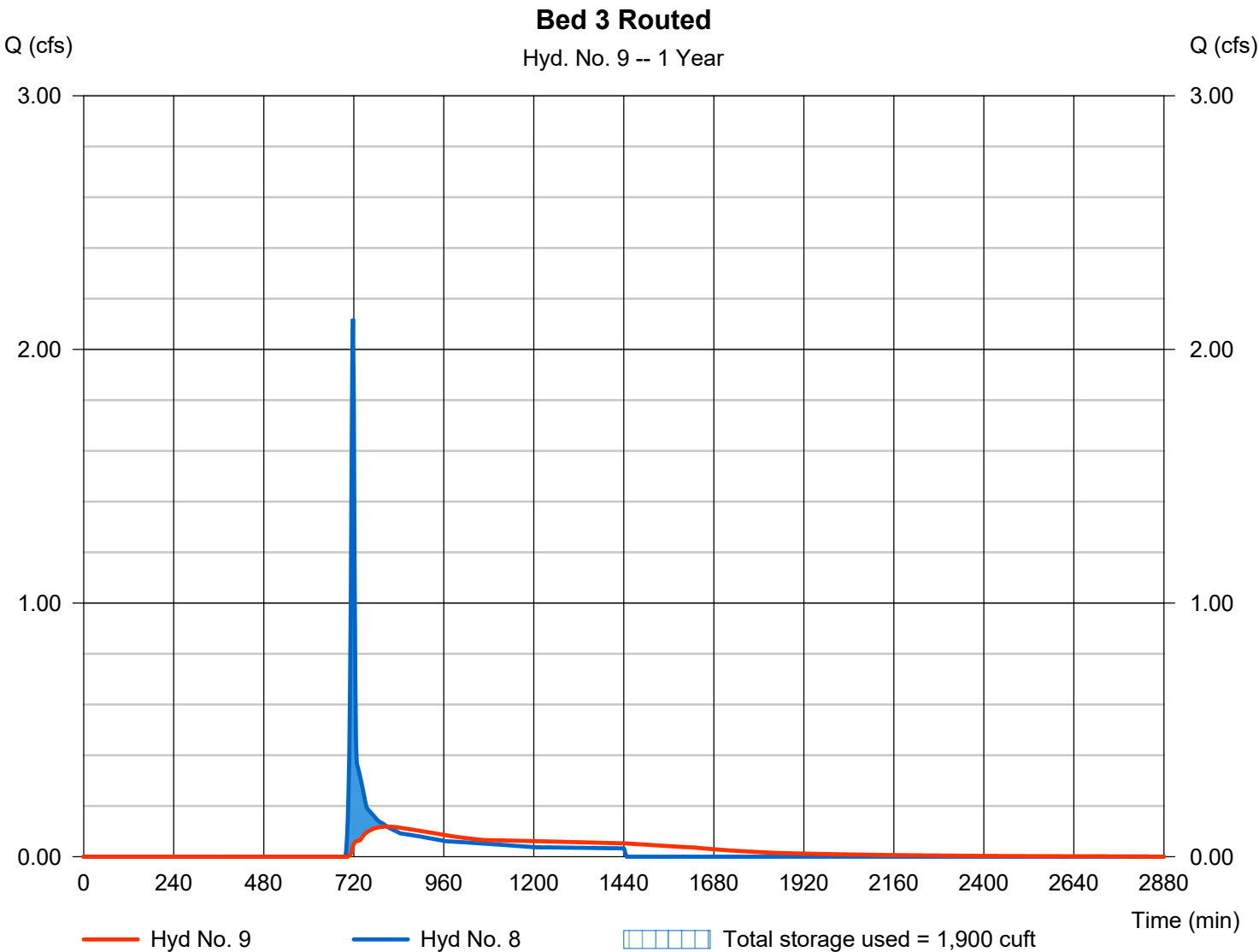
Hydrograph Report

Hyd. No. 9

Bed 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.119 cfs
Storm frequency	= 1 yrs	Time to peak	= 808 min
Time interval	= 2 min	Hyd. volume	= 4,407 cuft
Inflow hyd. No.	= 8 - Total to Bed 3	Max. Elevation	= 423.59 ft
Reservoir name	= Bed 3	Max. Storage	= 1,900 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Wednesday, 01 / 31 / 2024

Pond No. 4 - Bed 3

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	423.00	n/a	0	0
1.00	424.00	n/a	3,203	3,203
2.00	425.00	n/a	3,204	6,407
3.00	426.00	n/a	3,203	9,610
4.00	427.00	n/a	3,204	12,814
5.00	428.00	n/a	3,204	16,018

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 423.00	423.00	0.00	0.00
Length (ft)	= 25.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 0.50	0.00	0.00	0.00
Crest El. (ft)	= 423.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	423.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	320	423.10	0.01 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.015
0.20	641	423.20	0.04 ic	0.04 ic	---	---	0.00	---	---	---	---	---	0.036
0.30	961	423.30	0.05 ic	0.05 ic	---	---	0.00	---	---	---	---	---	0.047
0.40	1,281	423.40	0.06 ic	0.06 ic	---	---	0.00	---	---	---	---	---	0.057
0.50	1,602	423.50	0.07 ic	0.07 ic	---	---	0.00	---	---	---	---	---	0.065
0.60	1,922	423.60	0.13 ic	0.07 ic	---	---	0.05	---	---	---	---	---	0.123
0.70	2,242	423.70	0.23 ic	0.07 ic	---	---	0.15	---	---	---	---	---	0.222
0.80	2,562	423.80	0.35 ic	0.08 ic	---	---	0.27	---	---	---	---	---	0.350
0.90	2,883	423.90	0.51 ic	0.08 ic	---	---	0.42	---	---	---	---	---	0.501
1.00	3,203	424.00	0.67 ic	0.08 ic	---	---	0.59	---	---	---	---	---	0.672
1.10	3,523	424.10	0.87 ic	0.09 ic	---	---	0.77	---	---	---	---	---	0.860
1.20	3,844	424.20	1.09 ic	0.09 ic	---	---	0.98	---	---	---	---	---	1.064
1.30	4,164	424.30	1.29 ic	0.09 ic	---	---	1.19 s	---	---	---	---	---	1.279
1.40	4,485	424.40	1.50 ic	0.09 ic	---	---	1.41 s	---	---	---	---	---	1.500
1.50	4,805	424.50	1.73 ic	0.10 ic	---	---	1.63 s	---	---	---	---	---	1.731
1.60	5,125	424.60	1.97 oc	0.10 ic	---	---	1.87 s	---	---	---	---	---	1.969
1.70	5,446	424.70	2.22 oc	0.10 ic	---	---	2.11 s	---	---	---	---	---	2.208
1.80	5,766	424.80	2.46 oc	0.10 ic	---	---	2.35 s	---	---	---	---	---	2.453
1.90	6,087	424.90	2.71 oc	0.11 ic	---	---	2.59 s	---	---	---	---	---	2.699
2.00	6,407	425.00	2.96 oc	0.11 ic	---	---	2.84 s	---	---	---	---	---	2.948
2.10	6,727	425.10	3.19 oc	0.11 ic	---	---	3.08 s	---	---	---	---	---	3.192
2.20	7,048	425.20	3.42 oc	0.11 ic	---	---	3.31 s	---	---	---	---	---	3.416
2.30	7,368	425.30	3.64 oc	0.11 ic	---	---	3.53 s	---	---	---	---	---	3.636
2.40	7,688	425.40	3.93 oc	0.11 ic	---	---	3.82 s	---	---	---	---	---	3.932
2.50	8,008	425.50	4.23 oc	0.11 ic	---	---	4.12 s	---	---	---	---	---	4.231
2.60	8,329	425.60	4.53 oc	0.11 ic	---	---	4.42 s	---	---	---	---	---	4.532
2.70	8,649	425.70	4.83 oc	0.12 ic	---	---	4.72 s	---	---	---	---	---	4.834
2.80	8,969	425.80	5.14 oc	0.12 ic	---	---	5.02 s	---	---	---	---	---	5.137
2.90	9,290	425.90	5.44 oc	0.12 ic	---	---	5.32 s	---	---	---	---	---	5.441
3.00	9,610	426.00	5.74 oc	0.12 ic	---	---	5.62 s	---	---	---	---	---	5.744
3.10	9,930	426.10	6.05 oc	0.12 ic	---	---	5.93 s	---	---	---	---	---	6.046
3.20	10,251	426.20	6.35 oc	0.12 ic	---	---	6.23 s	---	---	---	---	---	6.348
3.30	10,571	426.30	6.65 oc	0.12 ic	---	---	6.53 s	---	---	---	---	---	6.648
3.40	10,892	426.40	6.95 oc	0.12 ic	---	---	6.82 s	---	---	---	---	---	6.945
3.50	11,212	426.50	7.24 ic	0.12 ic	---	---	7.11 s	---	---	---	---	---	7.236
3.60	11,532	426.60	7.50 ic	0.12 ic	---	---	7.37 s	---	---	---	---	---	7.497
3.70	11,853	426.70	7.75 ic	0.12 ic	---	---	7.63 s	---	---	---	---	---	7.754

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Bed 3

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.80	12,173	426.80	8.01 ic	0.12 ic	---	---	7.88 s	---	---	---	---	---	8.005
3.90	12,494	426.90	8.25 ic	0.12 ic	---	---	8.13 s	---	---	---	---	---	8.253
4.00	12,814	427.00	8.50 ic	0.12 ic	---	---	8.38 s	---	---	---	---	---	8.495
4.10	13,134	427.10	8.73 ic	0.12 ic	---	---	8.61 s	---	---	---	---	---	8.733
4.20	13,455	427.20	8.97 ic	0.12 ic	---	---	8.85 s	---	---	---	---	---	8.967
4.30	13,775	427.30	9.20 ic	0.12 ic	---	---	9.08 s	---	---	---	---	---	9.195
4.40	14,096	427.40	9.42 ic	0.12 ic	---	---	9.30 s	---	---	---	---	---	9.420
4.50	14,416	427.50	9.64 ic	0.12 ic	---	---	9.52 s	---	---	---	---	---	9.640
4.60	14,736	427.60	9.86 ic	0.11 ic	---	---	9.74 s	---	---	---	---	---	9.855
4.70	15,057	427.70	10.07 ic	0.11 ic	---	---	9.95 s	---	---	---	---	---	10.07
4.80	15,377	427.80	10.27 ic	0.11 ic	---	---	10.16 s	---	---	---	---	---	10.27
4.90	15,698	427.90	10.48 ic	0.11 ic	---	---	10.36 s	---	---	---	---	---	10.48
5.00	16,018	428.00	10.68 ic	0.11 ic	---	---	10.56 s	---	---	---	---	---	10.68

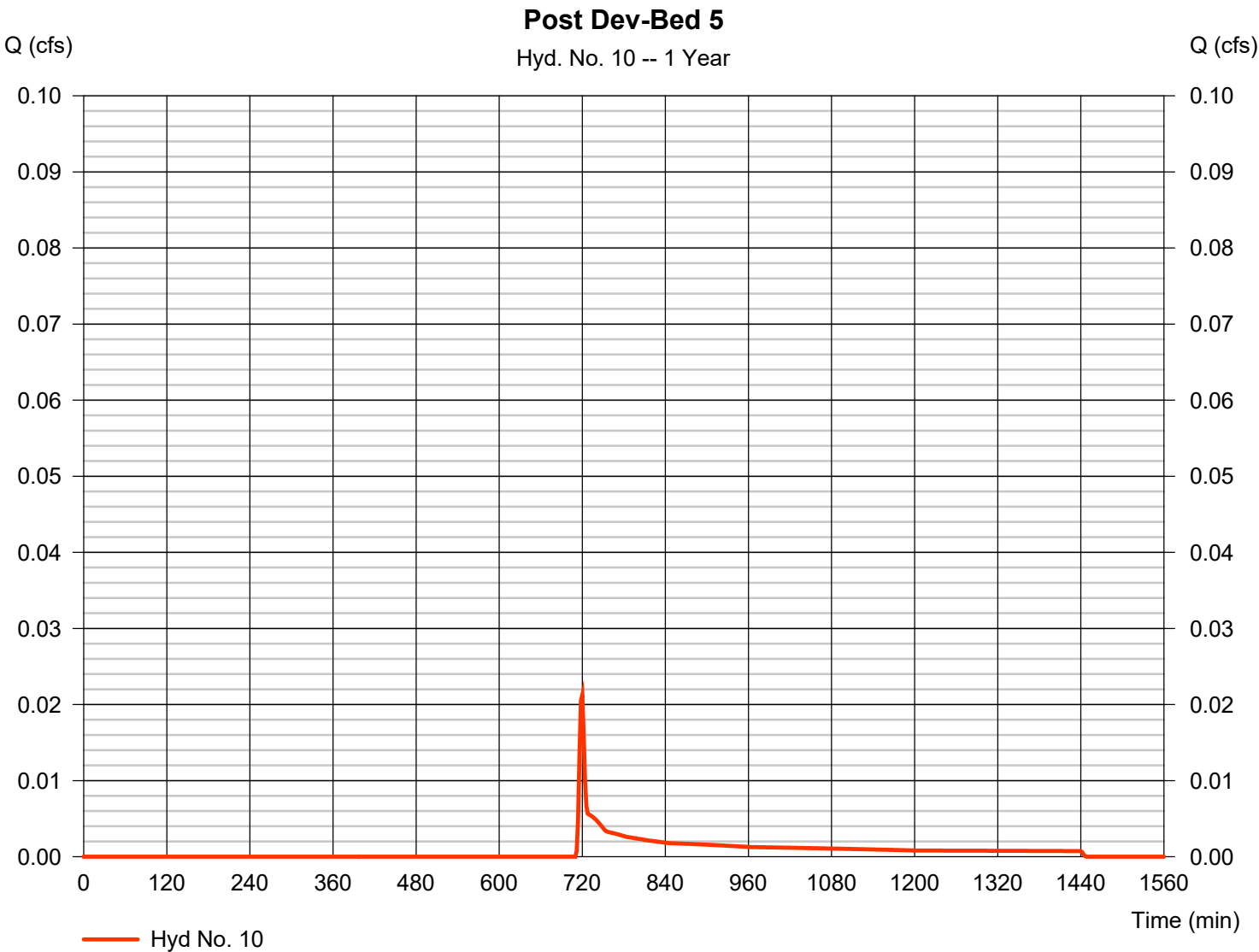
...End

Hydrograph Report

Hyd. No. 10

Post Dev-Bed 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.021 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 69 cuft
Drainage area	= 0.080 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.69 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

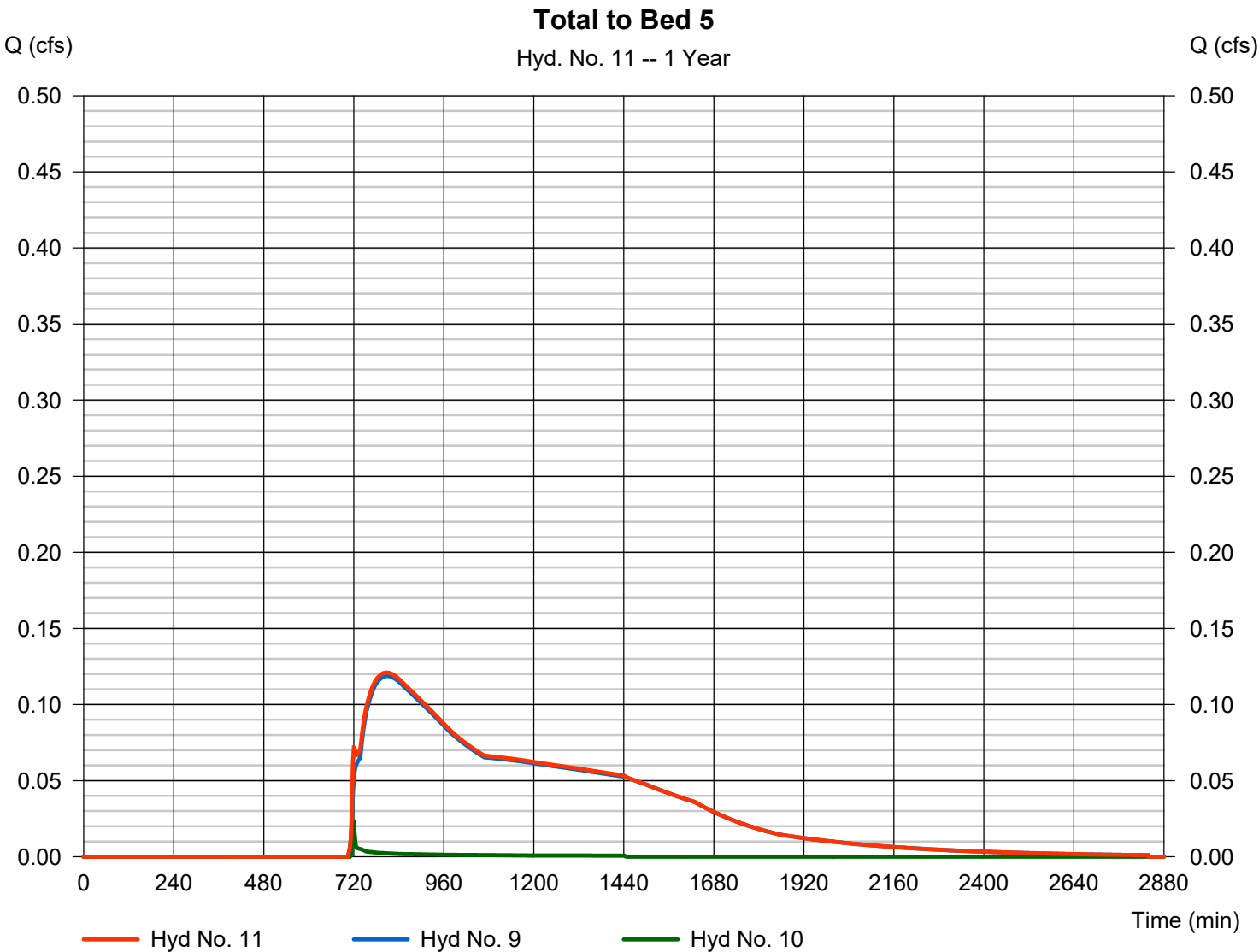


Hydrograph Report

Hyd. No. 11

Total to Bed 5

Hydrograph type	= Combine	Peak discharge	= 0.121 cfs
Storm frequency	= 1 yrs	Time to peak	= 808 min
Time interval	= 2 min	Hyd. volume	= 4,476 cuft
Inflow hyds.	= 9, 10	Contrib. drain. area	= 0.080 ac



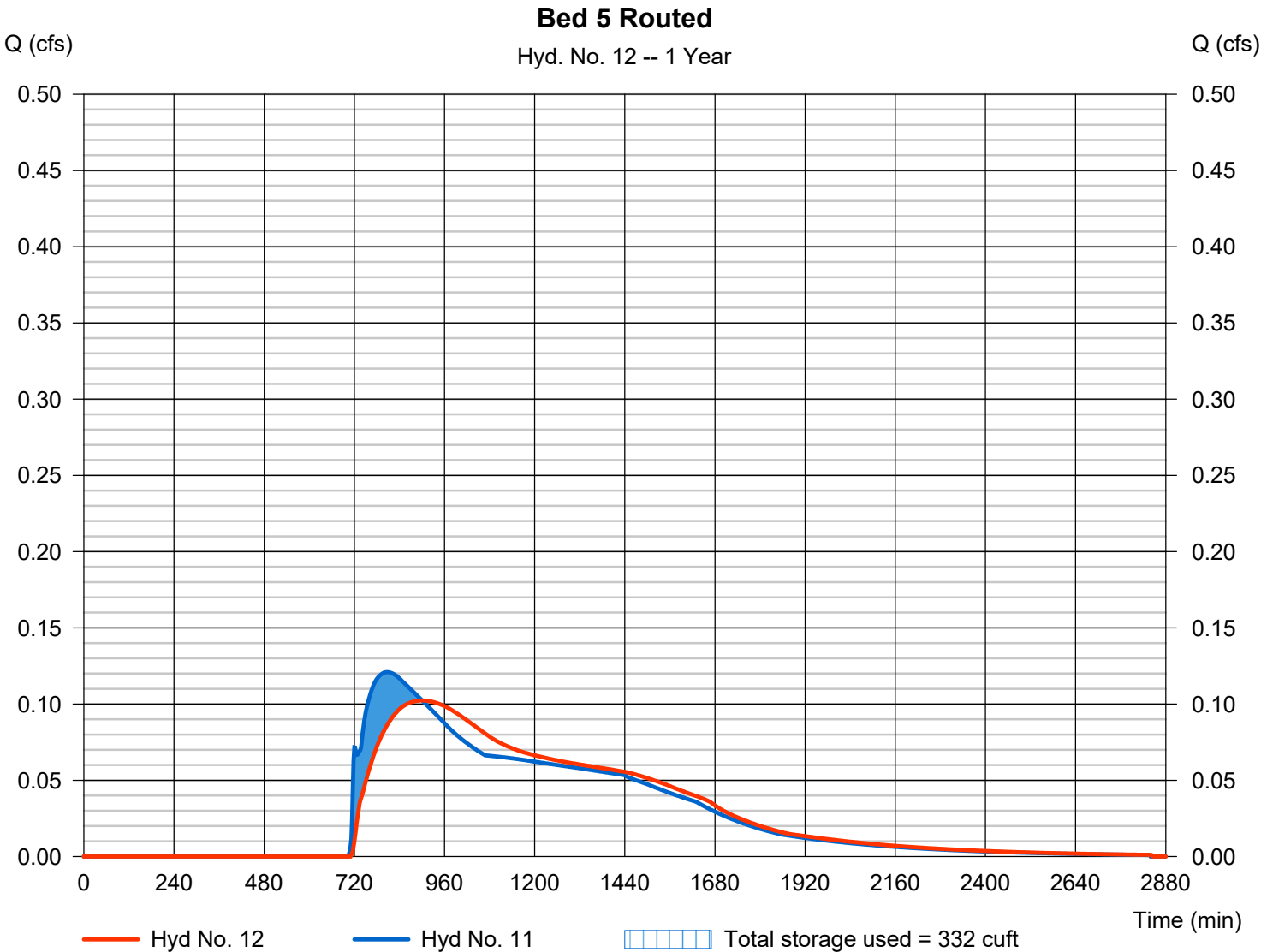
Hydrograph Report

Hyd. No. 12

Bed 5 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.102 cfs
Storm frequency	= 1 yrs	Time to peak	= 900 min
Time interval	= 2 min	Hyd. volume	= 4,474 cuft
Inflow hyd. No.	= 11 - Total to Bed 5	Max. Elevation	= 423.09 ft
Reservoir name	= Bed 5	Max. Storage	= 332 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Wednesday, 01 / 31 / 2024

Pond No. 5 - Bed 5

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	422.00	n/a	0	0
1.00	423.00	n/a	304	304
2.00	424.00	n/a	304	608
3.00	425.00	n/a	304	912
4.00	426.00	n/a	304	1,216

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 422.00	422.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 424.80	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	422.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	30	422.10	0.01 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.015
0.20	61	422.20	0.04 ic	0.04 ic	---	---	0.00	---	---	---	---	---	0.036
0.30	91	422.30	0.05 ic	0.05 ic	---	---	0.00	---	---	---	---	---	0.047
0.40	122	422.40	0.06 ic	0.06 ic	---	---	0.00	---	---	---	---	---	0.057
0.50	152	422.50	0.07 ic	0.07 ic	---	---	0.00	---	---	---	---	---	0.065
0.60	182	422.60	0.08 ic	0.07 ic	---	---	0.00	---	---	---	---	---	0.073
0.70	213	422.70	0.08 ic	0.08 ic	---	---	0.00	---	---	---	---	---	0.080
0.80	243	422.80	0.09 ic	0.09 ic	---	---	0.00	---	---	---	---	---	0.086
0.90	274	422.90	0.09 ic	0.09 ic	---	---	0.00	---	---	---	---	---	0.092
1.00	304	423.00	0.10 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.098
1.10	334	423.10	0.11 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.103
1.20	365	423.20	0.11 ic	0.11 ic	---	---	0.00	---	---	---	---	---	0.108
1.30	395	423.30	0.12 ic	0.11 ic	---	---	0.00	---	---	---	---	---	0.113
1.40	426	423.40	0.12 ic	0.12 ic	---	---	0.00	---	---	---	---	---	0.117
1.50	456	423.50	0.13 ic	0.12 ic	---	---	0.00	---	---	---	---	---	0.122
1.60	486	423.60	0.13 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.126
1.70	517	423.70	0.14 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.130
1.80	547	423.80	0.14 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.134
1.90	578	423.90	0.14 ic	0.14 ic	---	---	0.00	---	---	---	---	---	0.138
2.00	608	424.00	0.15 ic	0.14 ic	---	---	0.00	---	---	---	---	---	0.142
2.10	638	424.10	0.15 ic	0.15 ic	---	---	0.00	---	---	---	---	---	0.146
2.20	669	424.20	0.15 ic	0.15 ic	---	---	0.00	---	---	---	---	---	0.150
2.30	699	424.30	0.16 ic	0.15 ic	---	---	0.00	---	---	---	---	---	0.153
2.40	730	424.40	0.16 ic	0.16 ic	---	---	0.00	---	---	---	---	---	0.157
2.50	760	424.50	0.16 ic	0.16 ic	---	---	0.00	---	---	---	---	---	0.160
2.60	790	424.60	0.17 ic	0.16 ic	---	---	0.00	---	---	---	---	---	0.163
2.70	821	424.70	0.17 ic	0.17 ic	---	---	0.00	---	---	---	---	---	0.167
2.80	851	424.80	0.17 ic	0.17 ic	---	---	0.00	---	---	---	---	---	0.170
2.90	882	424.90	0.59 ic	0.17 ic	---	---	0.42	---	---	---	---	---	0.589
3.00	912	425.00	1.37 ic	0.16 ic	---	---	1.19	---	---	---	---	---	1.356
3.10	942	425.10	2.36 ic	0.16 ic	---	---	2.19	---	---	---	---	---	2.350
3.20	973	425.20	3.53 ic	0.16 ic	---	---	3.37	---	---	---	---	---	3.526
3.30	1,003	425.30	4.86 oc	0.14 ic	---	---	4.71	---	---	---	---	---	4.855
3.40	1,034	425.40	6.32 oc	0.13 ic	---	---	6.19	---	---	---	---	---	6.322
3.50	1,064	425.50	7.91 oc	0.11 ic	---	---	7.80	---	---	---	---	---	7.909
3.60	1,094	425.60	9.09 oc	0.08 ic	---	---	9.01 s	---	---	---	---	---	9.093
3.70	1,125	425.70	9.59 oc	0.07 ic	---	---	9.52 s	---	---	---	---	---	9.588
3.80	1,155	425.80	9.95 ic	0.06 ic	---	---	9.89 s	---	---	---	---	---	9.951

Continues on next page...

Bed 5

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.90	1,186	425.90	10.24 ic	0.05 ic	---	---	10.19 s	---	---	---	---	---	10.24
4.00	1,216	426.00	10.50 ic	0.05 ic	---	---	10.44 s	---	---	---	---	---	10.49

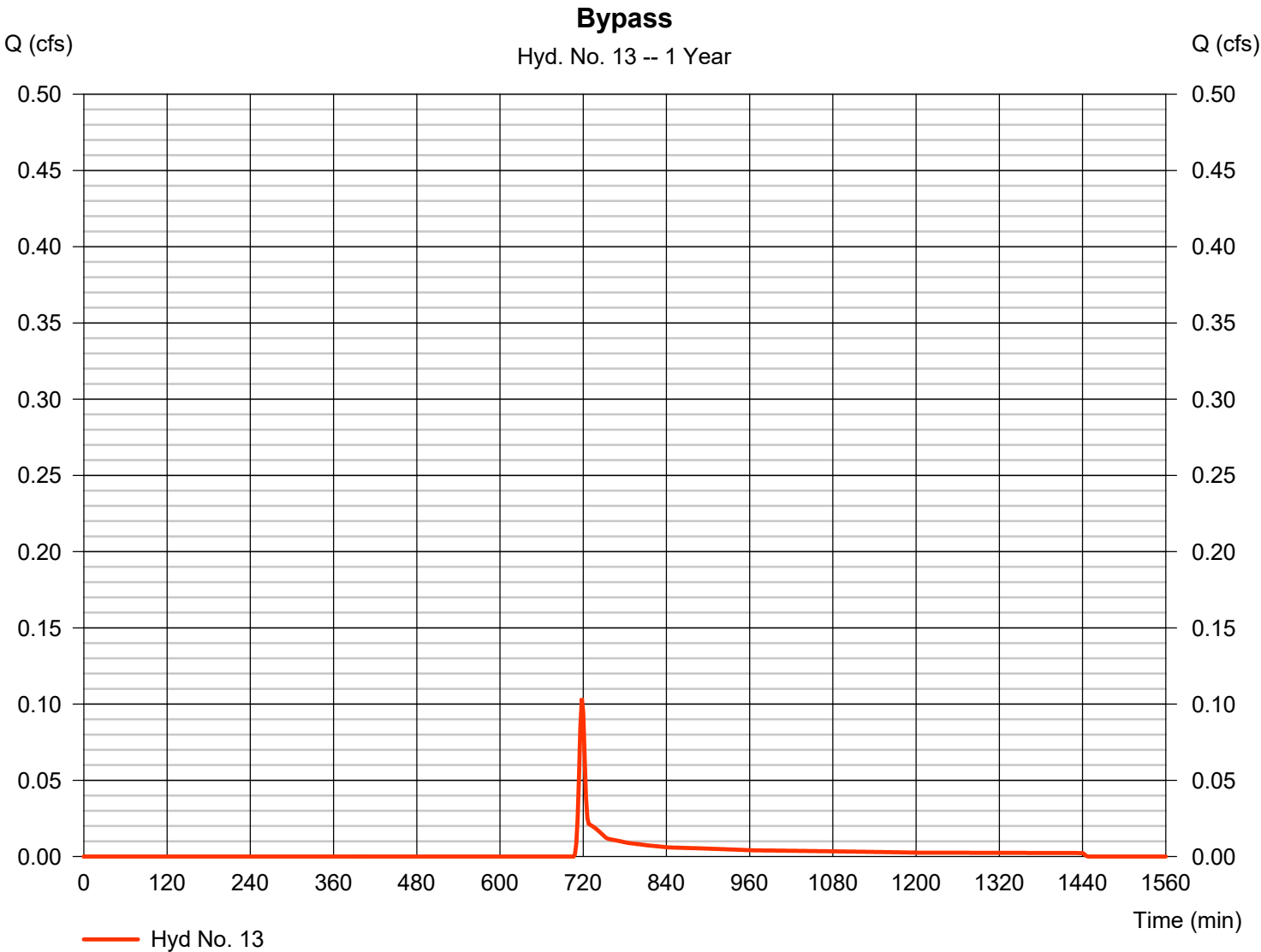
...End

Hydrograph Report

Hyd. No. 13

Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.104 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	253 cuft
Drainage area	=	0.200 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.69 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

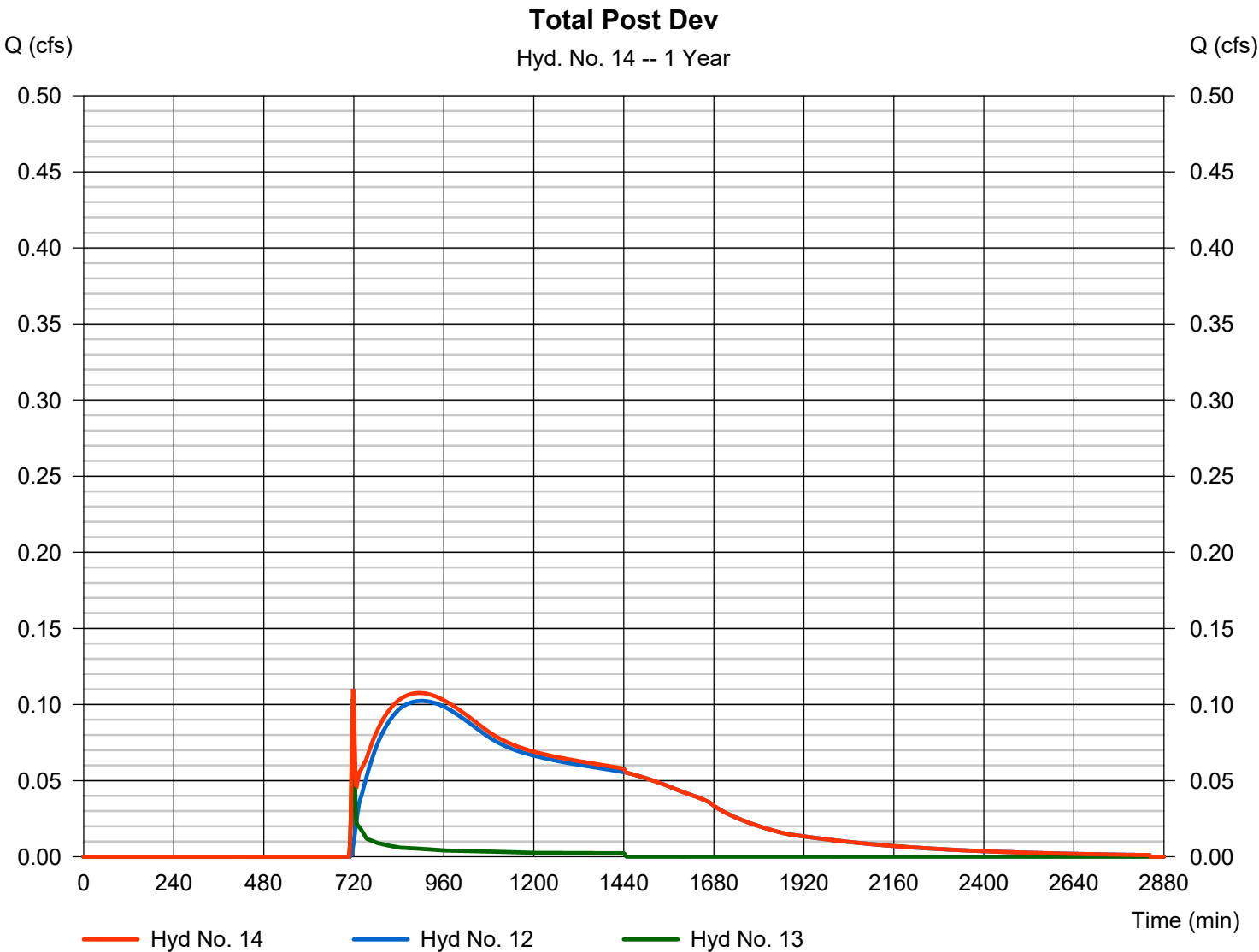


Hydrograph Report

Hyd. No. 14

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 0.110 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,727 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.200 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

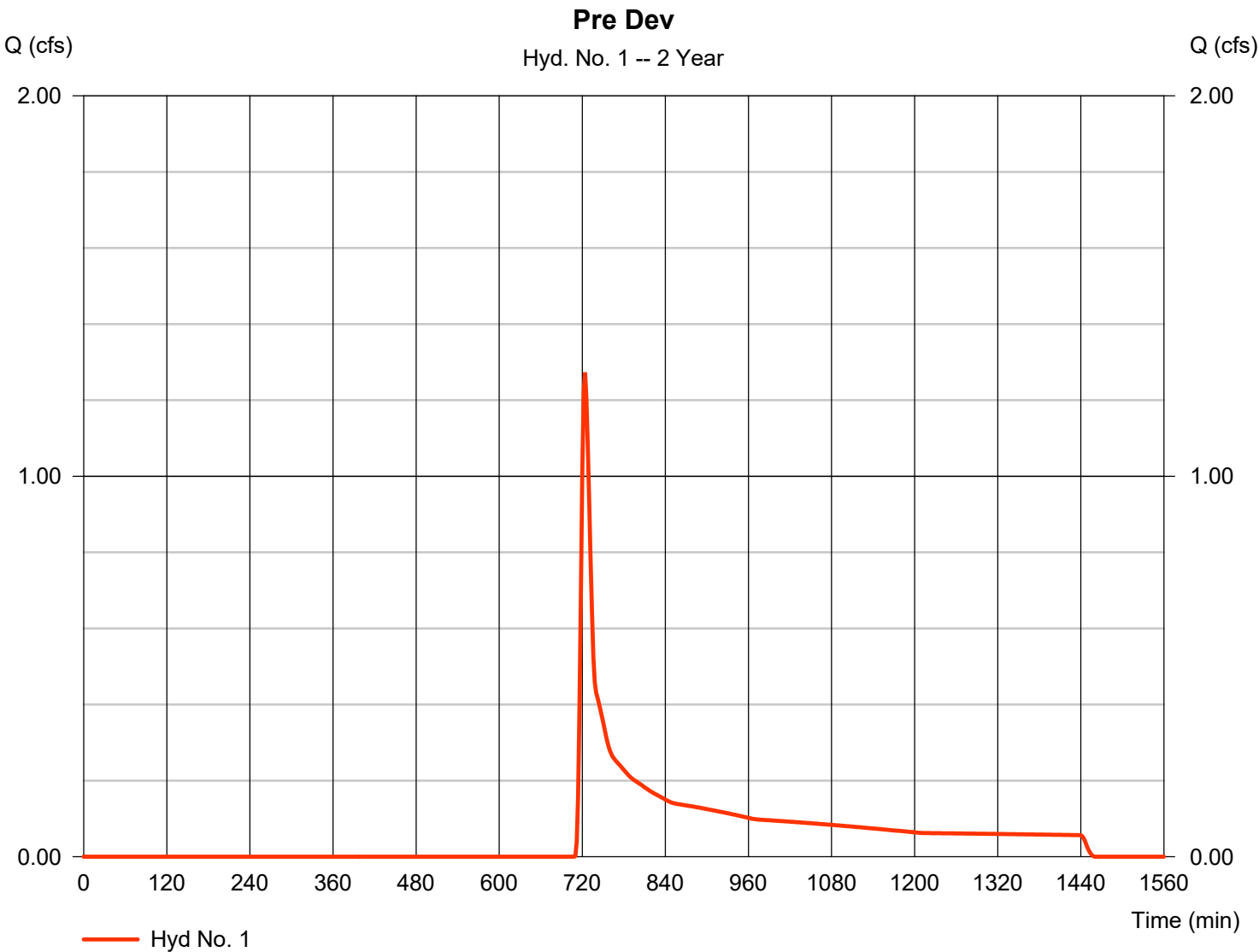
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.273	2	724	5,648	-----	-----	-----	Pre Dev
2	SCS Runoff	1.735	2	718	3,476	-----	-----	-----	Post Dev-Bed 1
3	Reservoir	0.000	2	n/a	0	2	437.85	3,476	Bed 1 routed
4	SCS Runoff	4.546	2	718	9,129	-----	-----	-----	Post Dev-Bed 2
5	Combine	4.546	2	718	9,129	3, 4	-----	-----	Total to Bed 2
6	Reservoir	0.000	2	n/a	0	5	432.87	9,129	Bed 2 Routed
7	SCS Runoff	3.354	2	718	6,786	-----	-----	-----	Post Dev-Bed 3
8	Combine	3.354	2	718	6,786	6, 7	-----	-----	Total to Bed 3
9	Reservoir	0.360	2	746	6,764	8	423.81	2,583	Bed 3 Routed
10	SCS Runoff	0.052	2	718	125	-----	-----	-----	Post Dev-Bed 5
11	Combine	0.367	2	746	6,889	9, 10	-----	-----	Total to Bed 5
12	Reservoir	0.292	2	788	6,887	11	424.83	860	Bed 5 Routed
13	SCS Runoff	0.196	2	718	422	-----	-----	-----	Bypass
14	Combine	0.306	2	788	7,309	12, 13	-----	-----	Total Post Dev
POI-A-Hydro.gpw					Return Period: 2 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.273 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	5,648 cuft
Drainage area	=	4.250 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.10 min
Total precip.	=	3.24 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



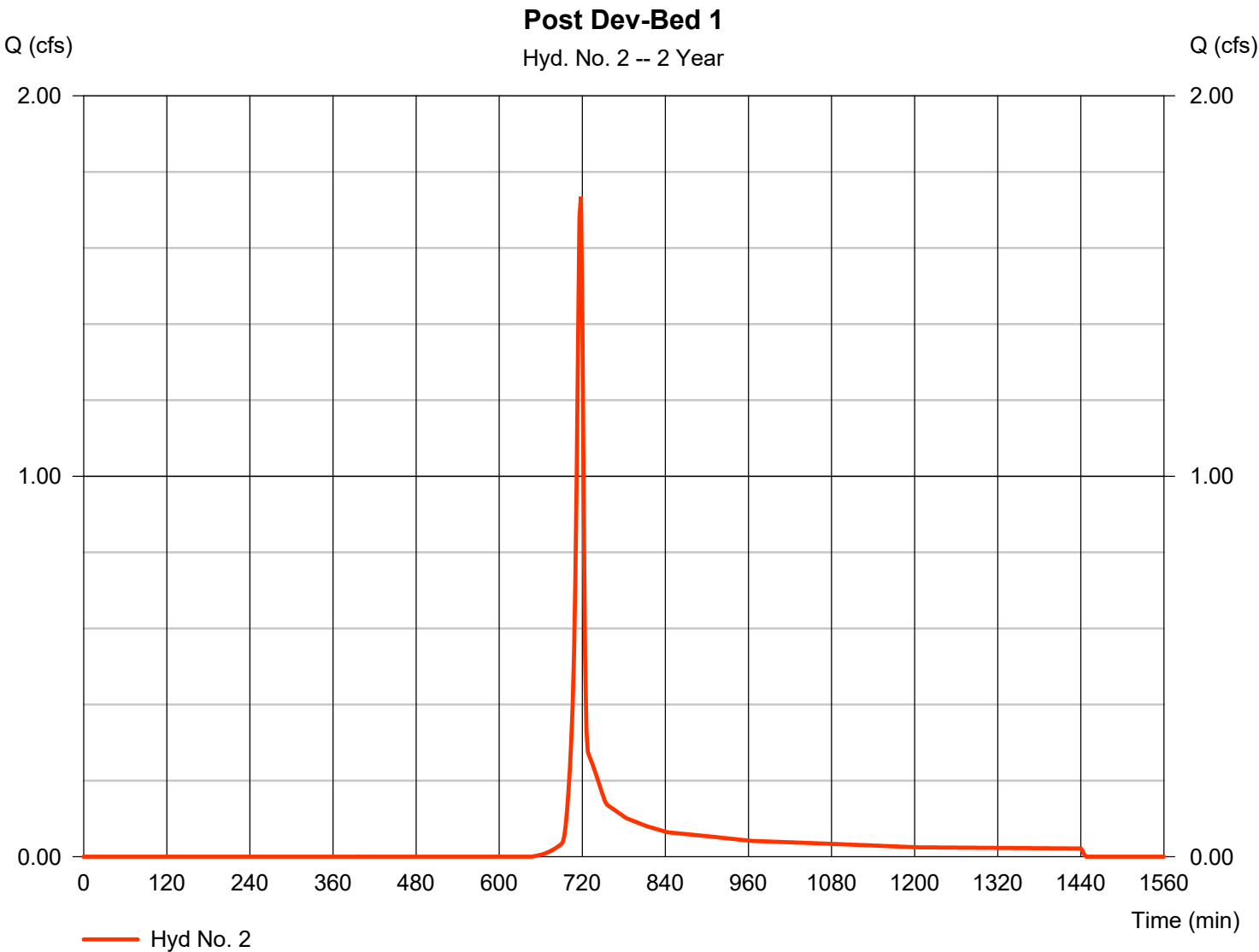
Hydrograph Report

Hyd. No. 2

Post Dev-Bed 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.735 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,476 cuft
Drainage area	= 0.960 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 98) + (0.620 x 61)] / 0.960



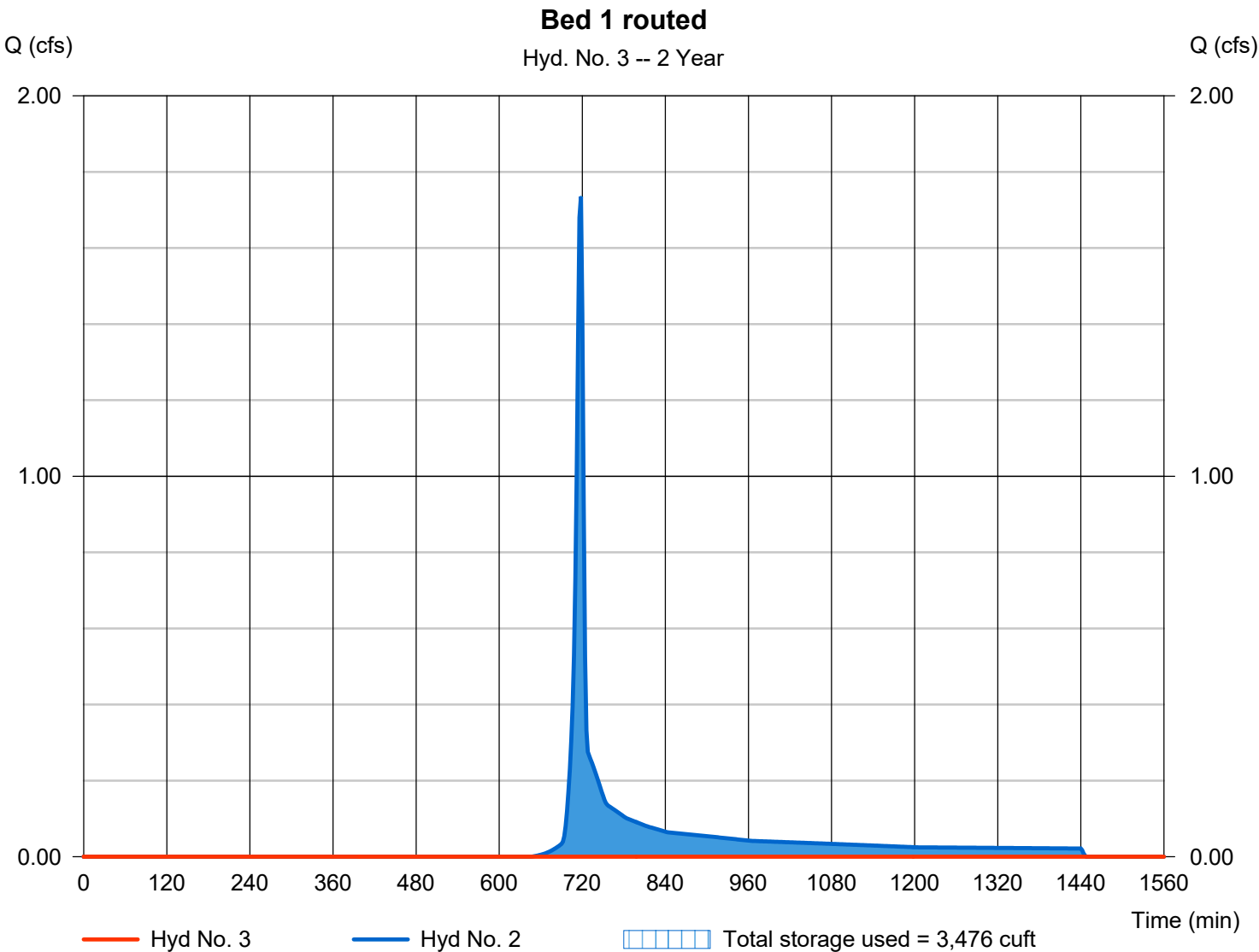
Hydrograph Report

Hyd. No. 3

Bed 1 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post Dev-Bed 1	Max. Elevation	= 437.85 ft
Reservoir name	= Bed 1	Max. Storage	= 3,476 cuft

Storage Indication method used.



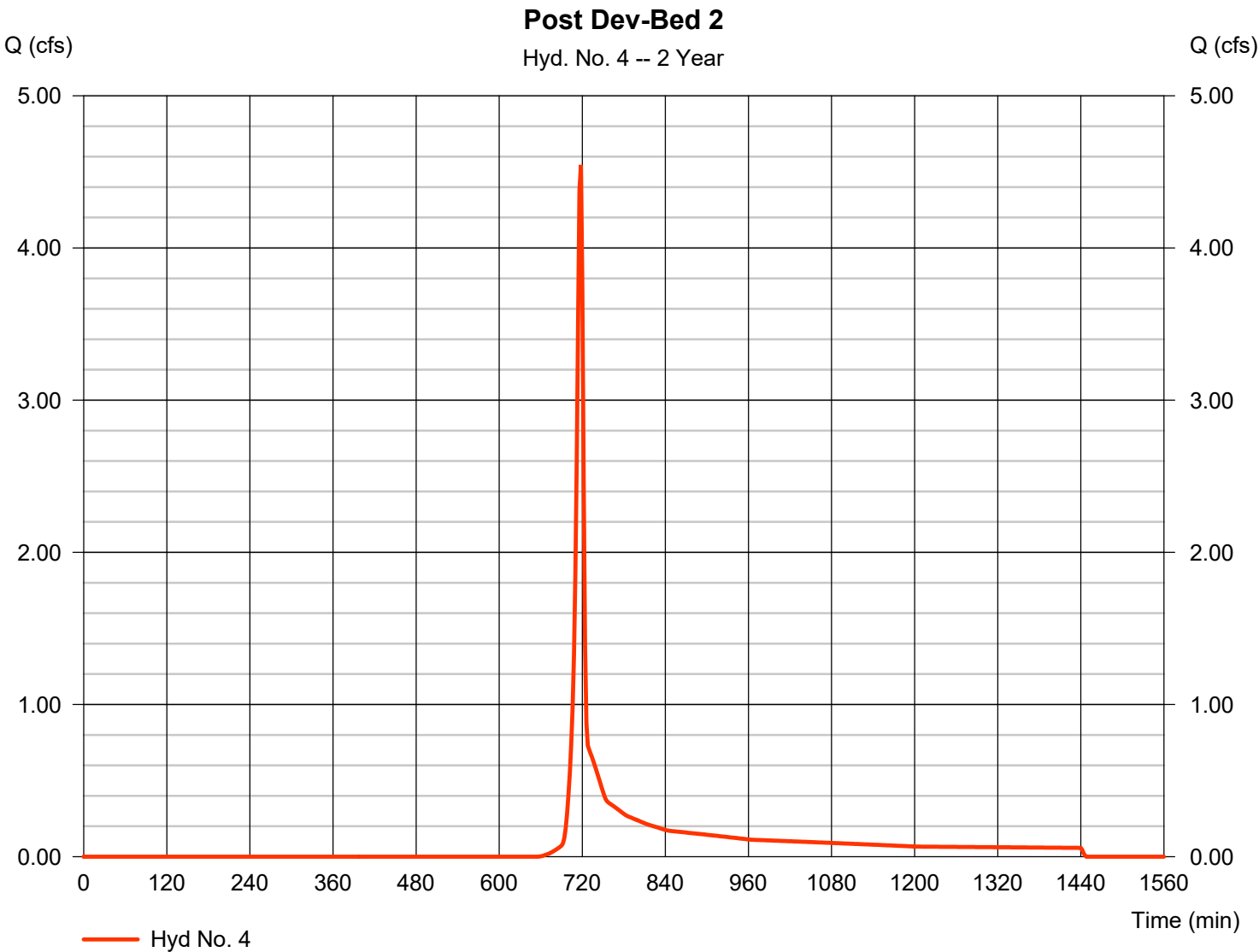
Hydrograph Report

Hyd. No. 4

Post Dev-Bed 2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.546 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 9,129 cuft
Drainage area	= 2.660 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 98) + (1.820 x 61)] / 2.660

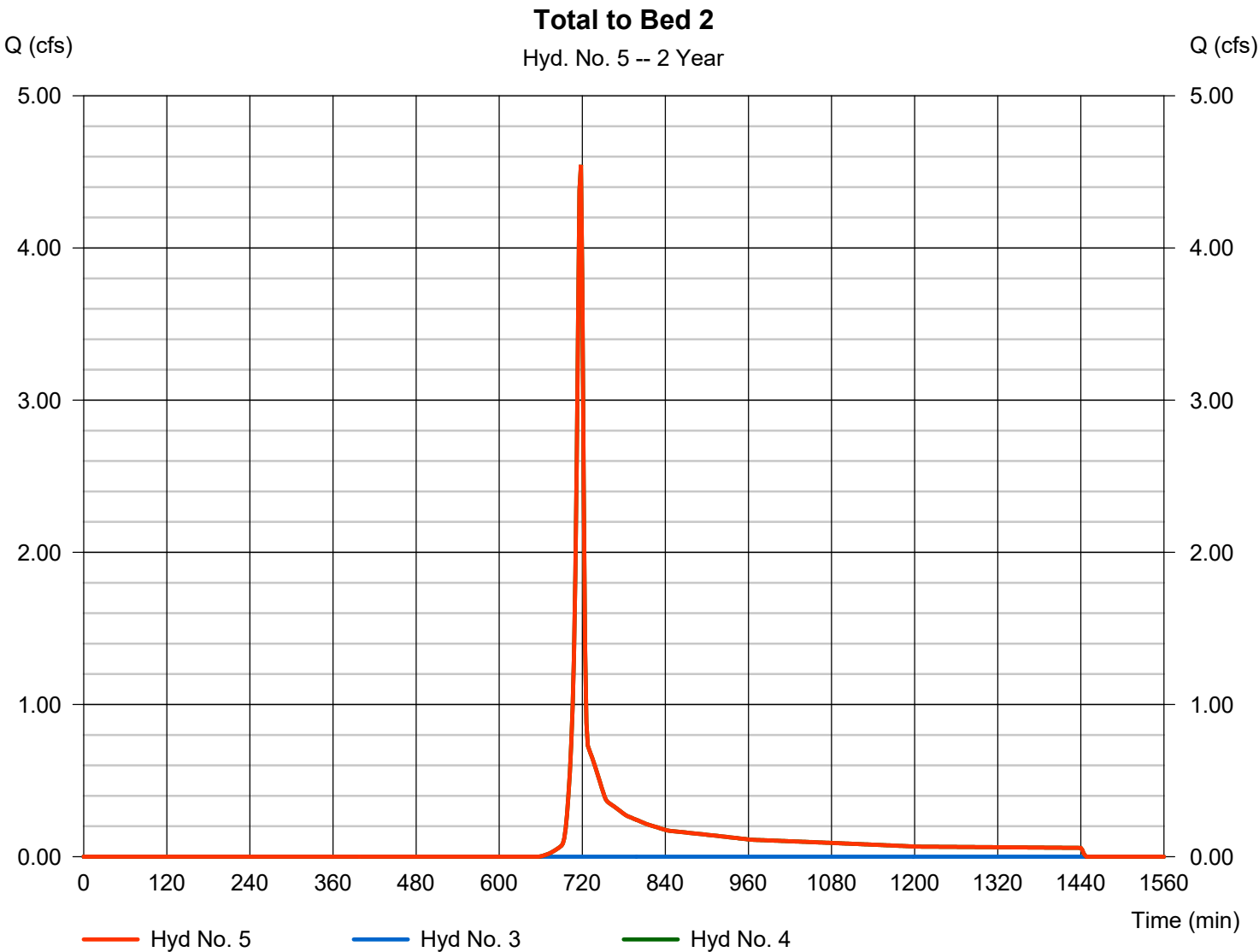


Hydrograph Report

Hyd. No. 5

Total to Bed 2

Hydrograph type	= Combine	Peak discharge	= 4.546 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 9,129 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.660 ac



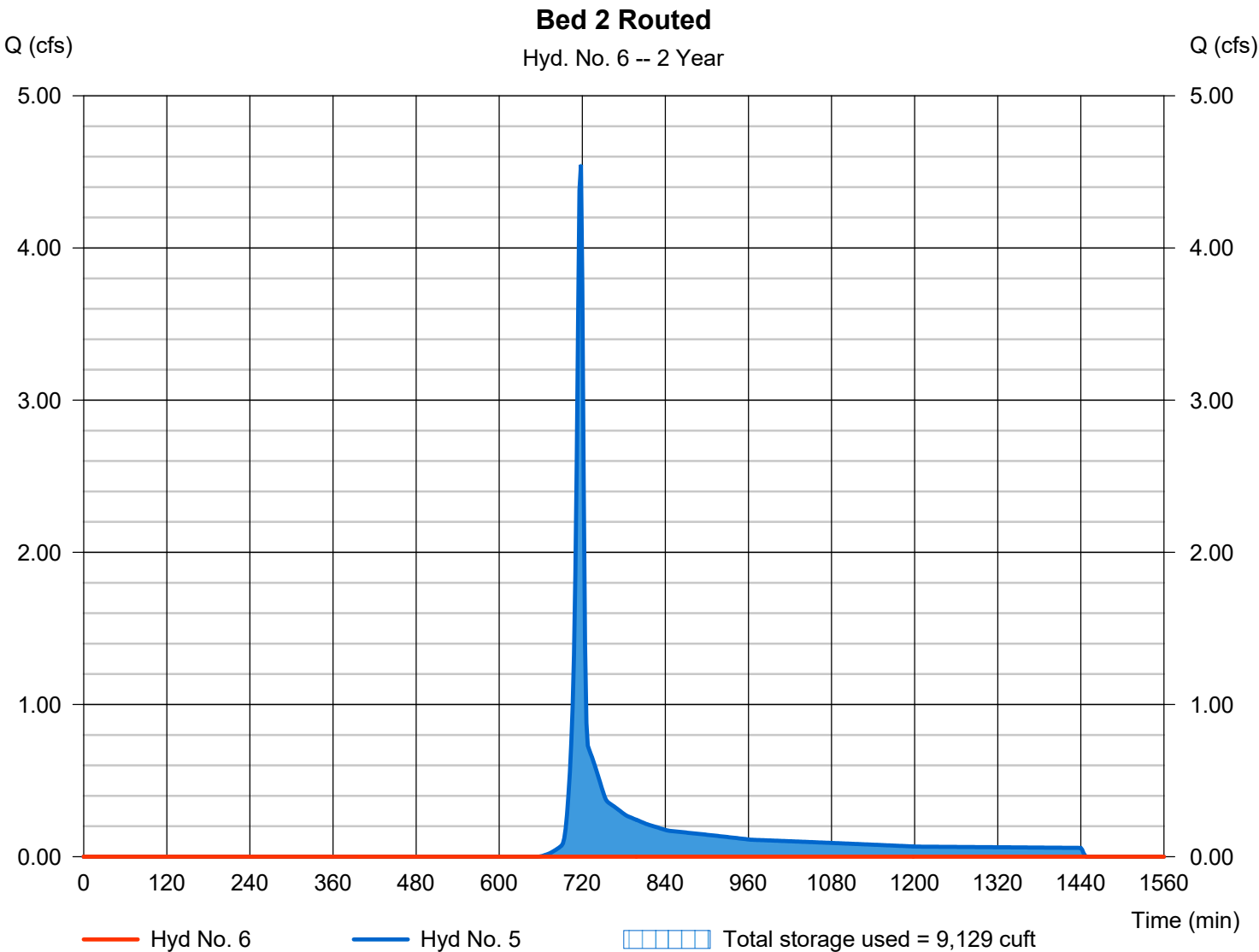
Hydrograph Report

Hyd. No. 6

Bed 2 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 5 - Total to Bed 2	Max. Elevation	= 432.87 ft
Reservoir name	= Bed 2	Max. Storage	= 9,129 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

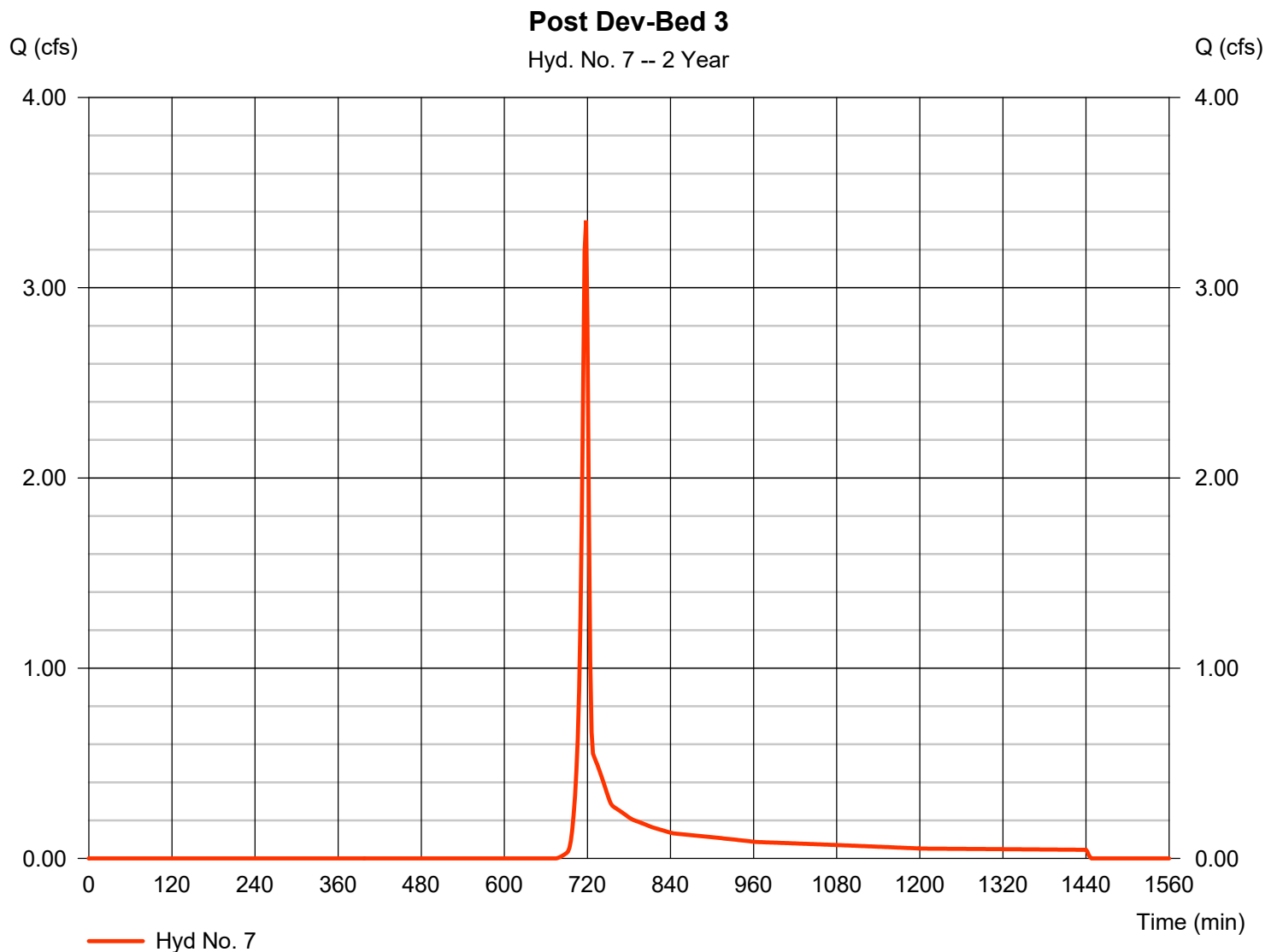
Wednesday, 01 / 31 / 2024

Hyd. No. 7

Post Dev-Bed 3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.354 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 6,786 cuft
Drainage area	= 2.210 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.620 \times 98) + (1.590 \times 61)] / 2.210$

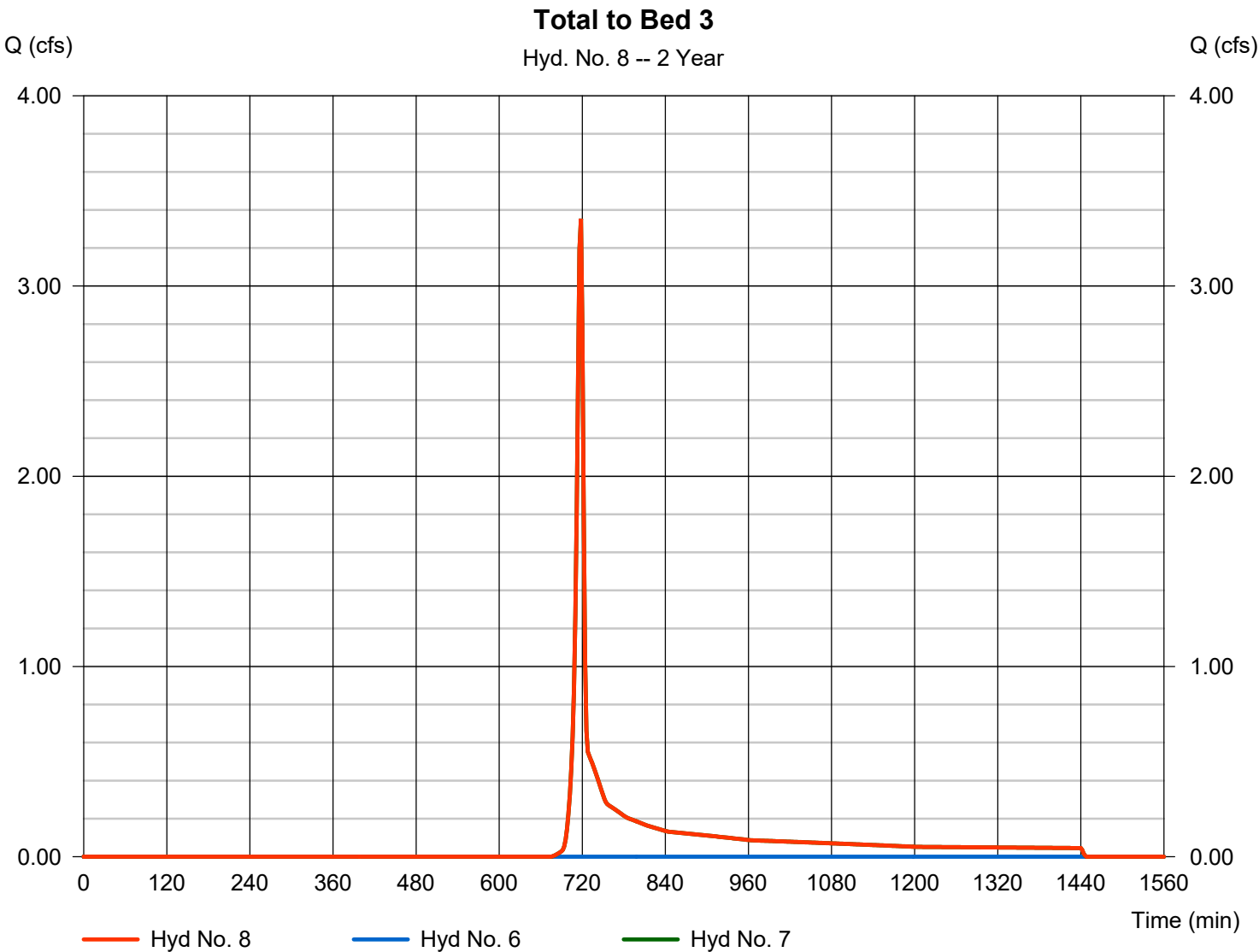


Hydrograph Report

Hyd. No. 8

Total to Bed 3

Hydrograph type	= Combine	Peak discharge	= 3.354 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 6,786 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 2.210 ac



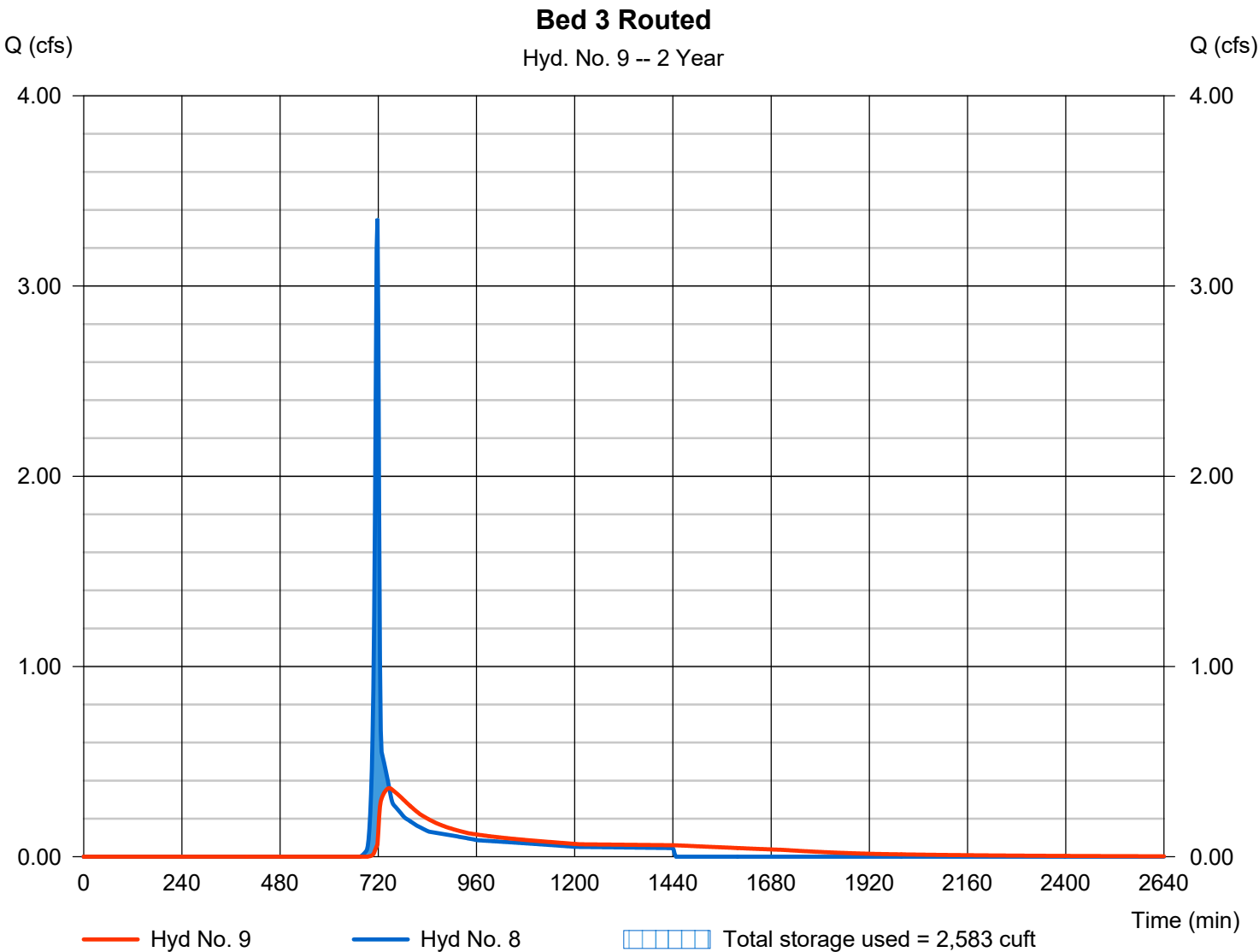
Hydrograph Report

Hyd. No. 9

Bed 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.360 cfs
Storm frequency	= 2 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 6,764 cuft
Inflow hyd. No.	= 8 - Total to Bed 3	Max. Elevation	= 423.81 ft
Reservoir name	= Bed 3	Max. Storage	= 2,583 cuft

Storage Indication method used.

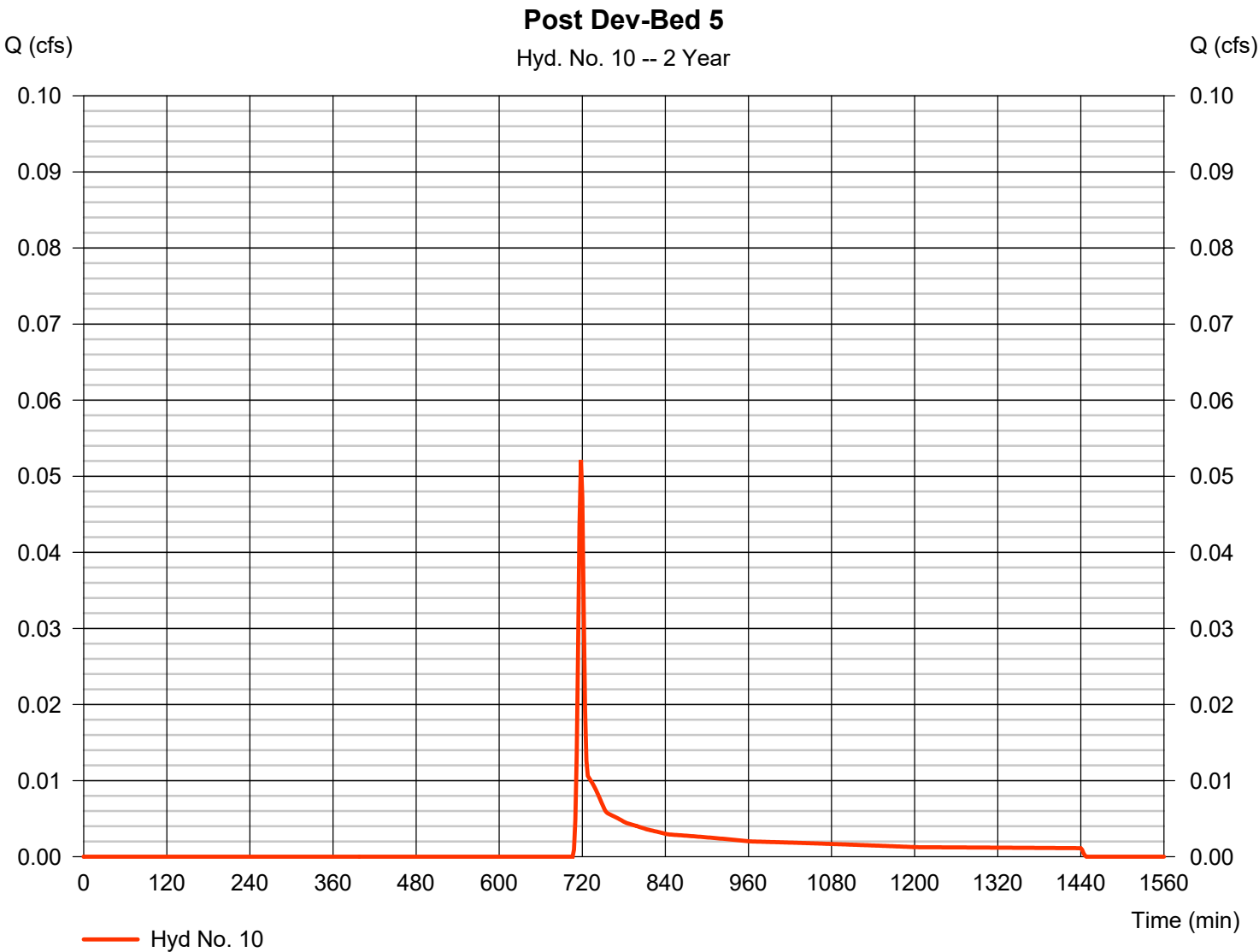


Hydrograph Report

Hyd. No. 10

Post Dev-Bed 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.052 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 125 cuft
Drainage area	= 0.080 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

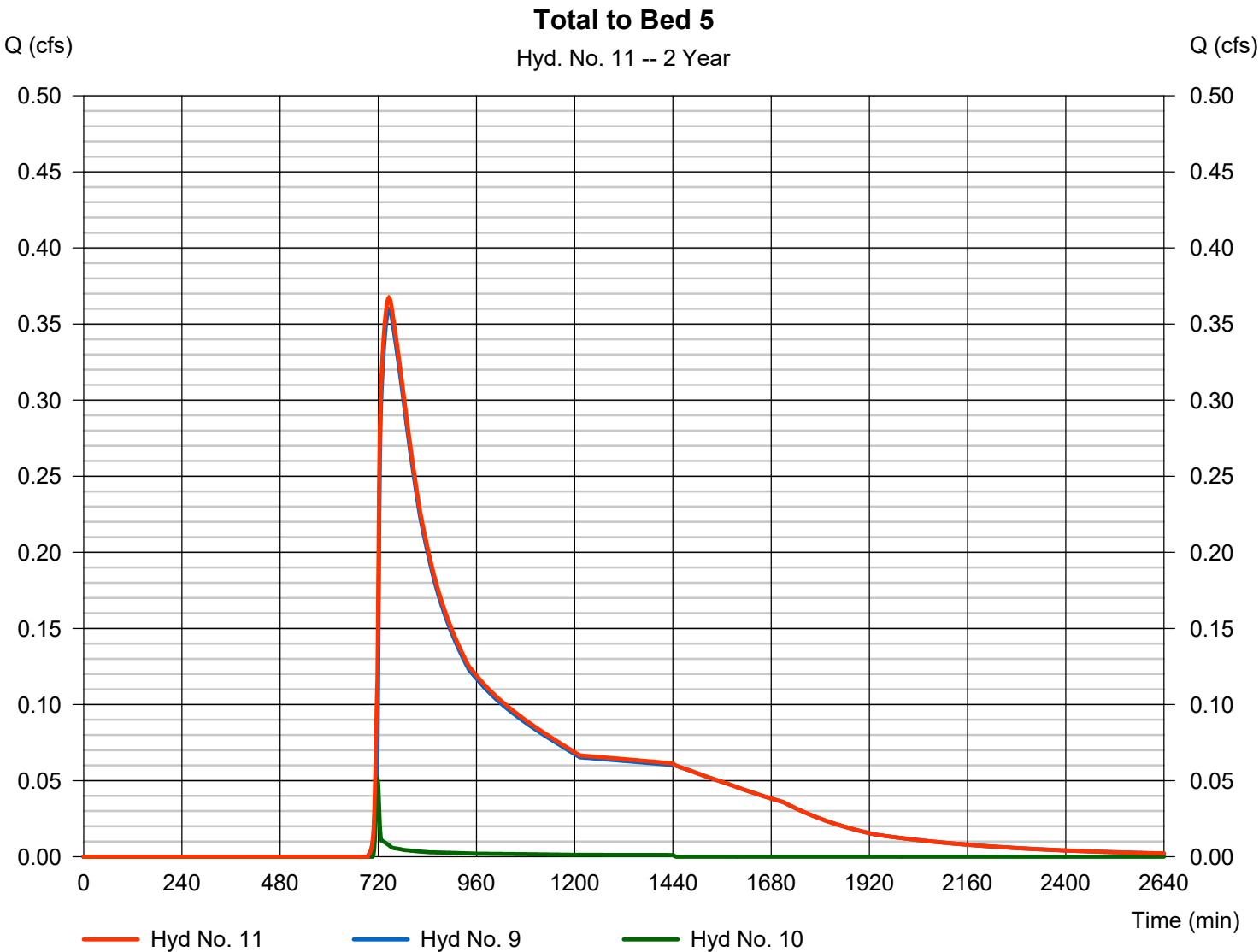


Hydrograph Report

Hyd. No. 11

Total to Bed 5

Hydrograph type	= Combine	Peak discharge	= 0.367 cfs
Storm frequency	= 2 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 6,889 cuft
Inflow hyds.	= 9, 10	Contrib. drain. area	= 0.080 ac



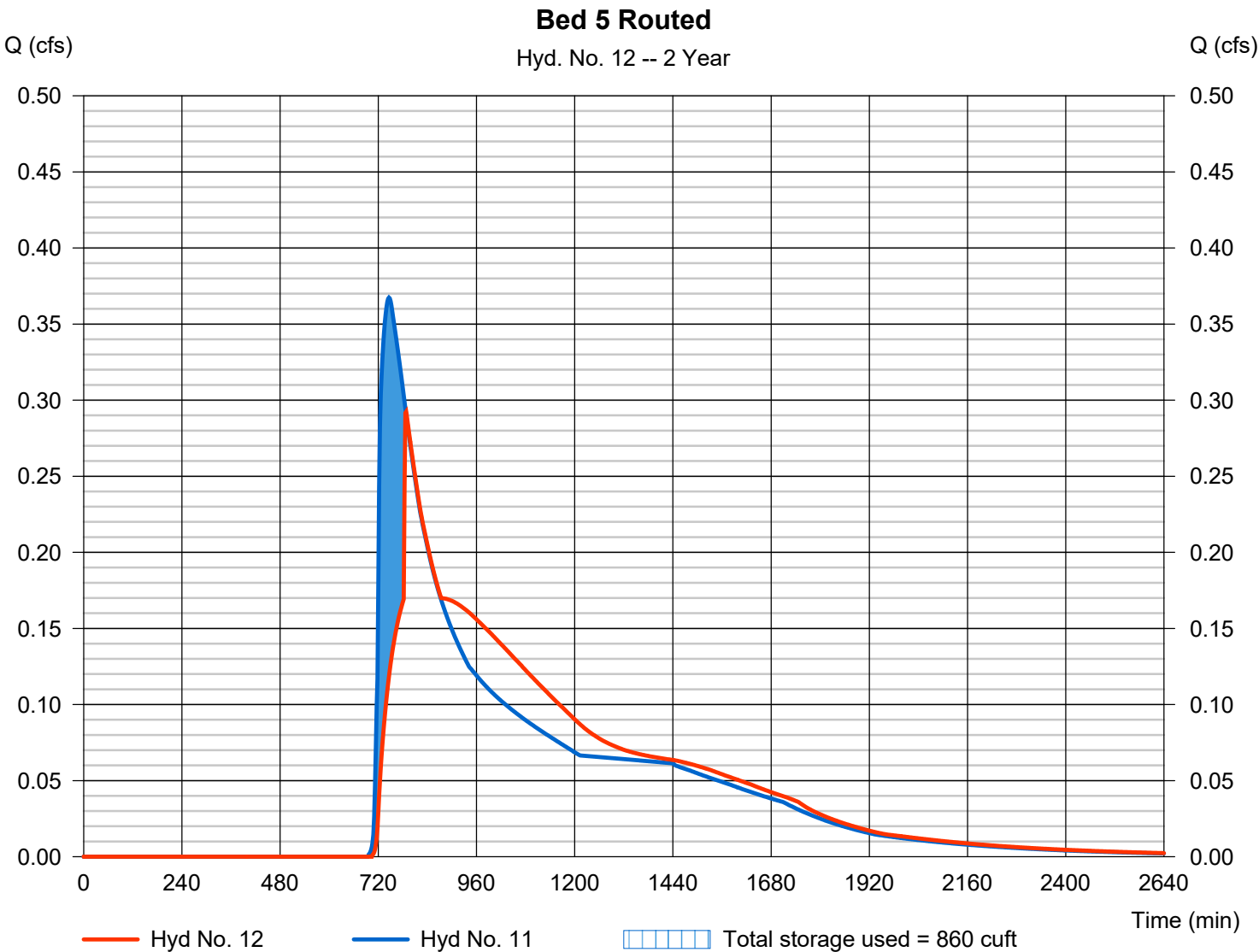
Hydrograph Report

Hyd. No. 12

Bed 5 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.292 cfs
Storm frequency	= 2 yrs	Time to peak	= 788 min
Time interval	= 2 min	Hyd. volume	= 6,887 cuft
Inflow hyd. No.	= 11 - Total to Bed 5	Max. Elevation	= 424.83 ft
Reservoir name	= Bed 5	Max. Storage	= 860 cuft

Storage Indication method used.

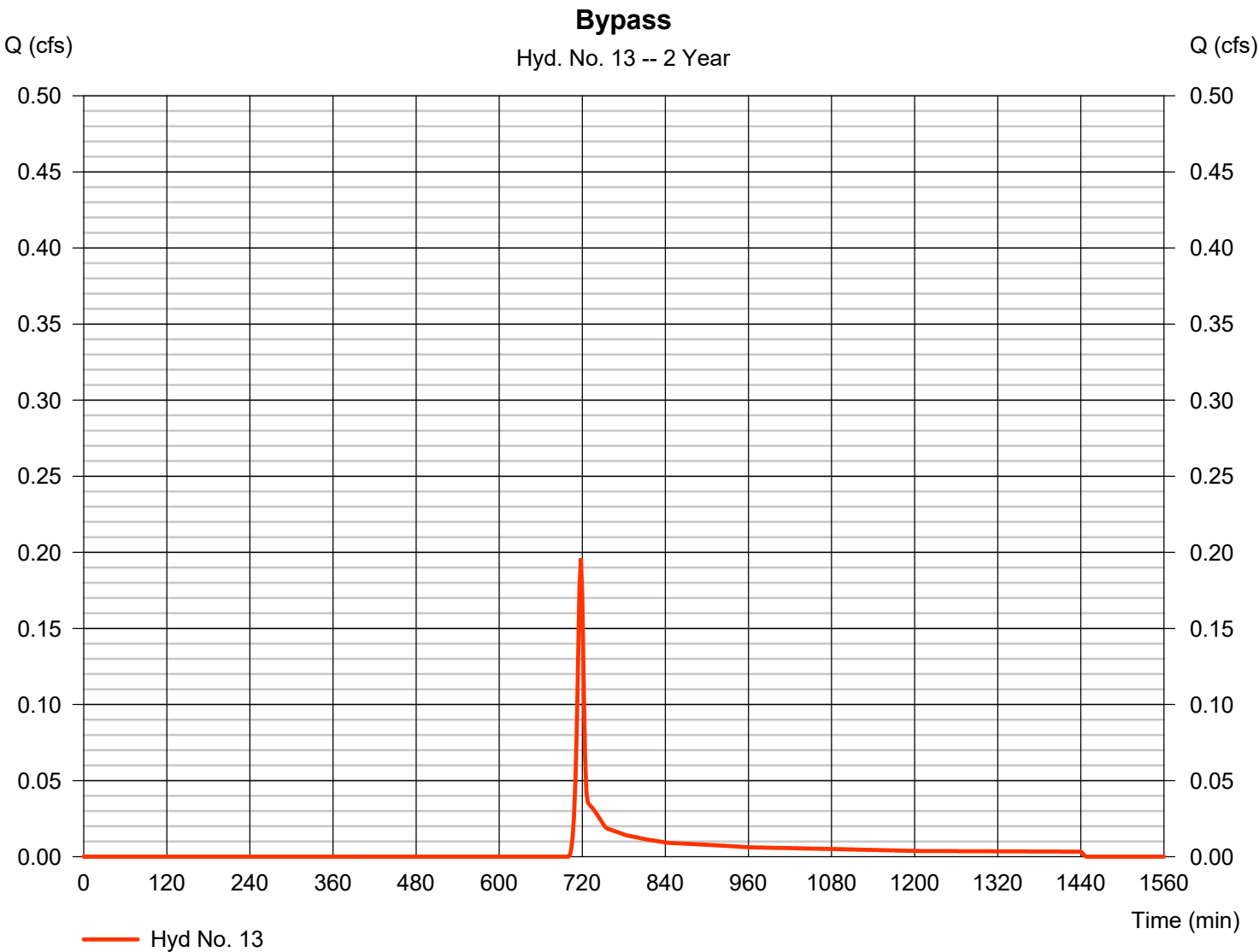


Hydrograph Report

Hyd. No. 13

Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.196 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	422 cuft
Drainage area	=	0.200 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.24 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

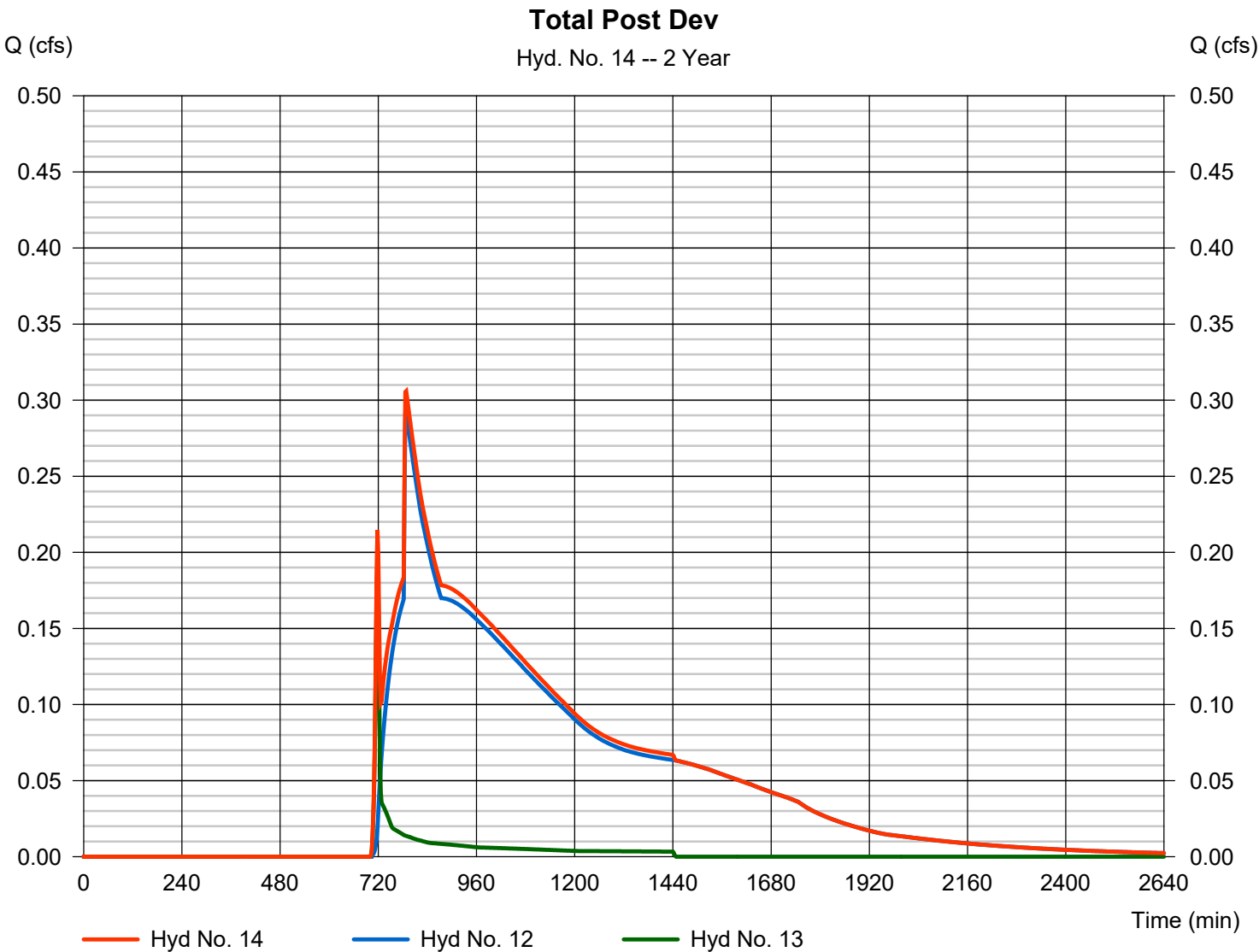


Hydrograph Report

Hyd. No. 14

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 0.306 cfs
Storm frequency	= 2 yrs	Time to peak	= 788 min
Time interval	= 2 min	Hyd. volume	= 7,309 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.200 ac



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

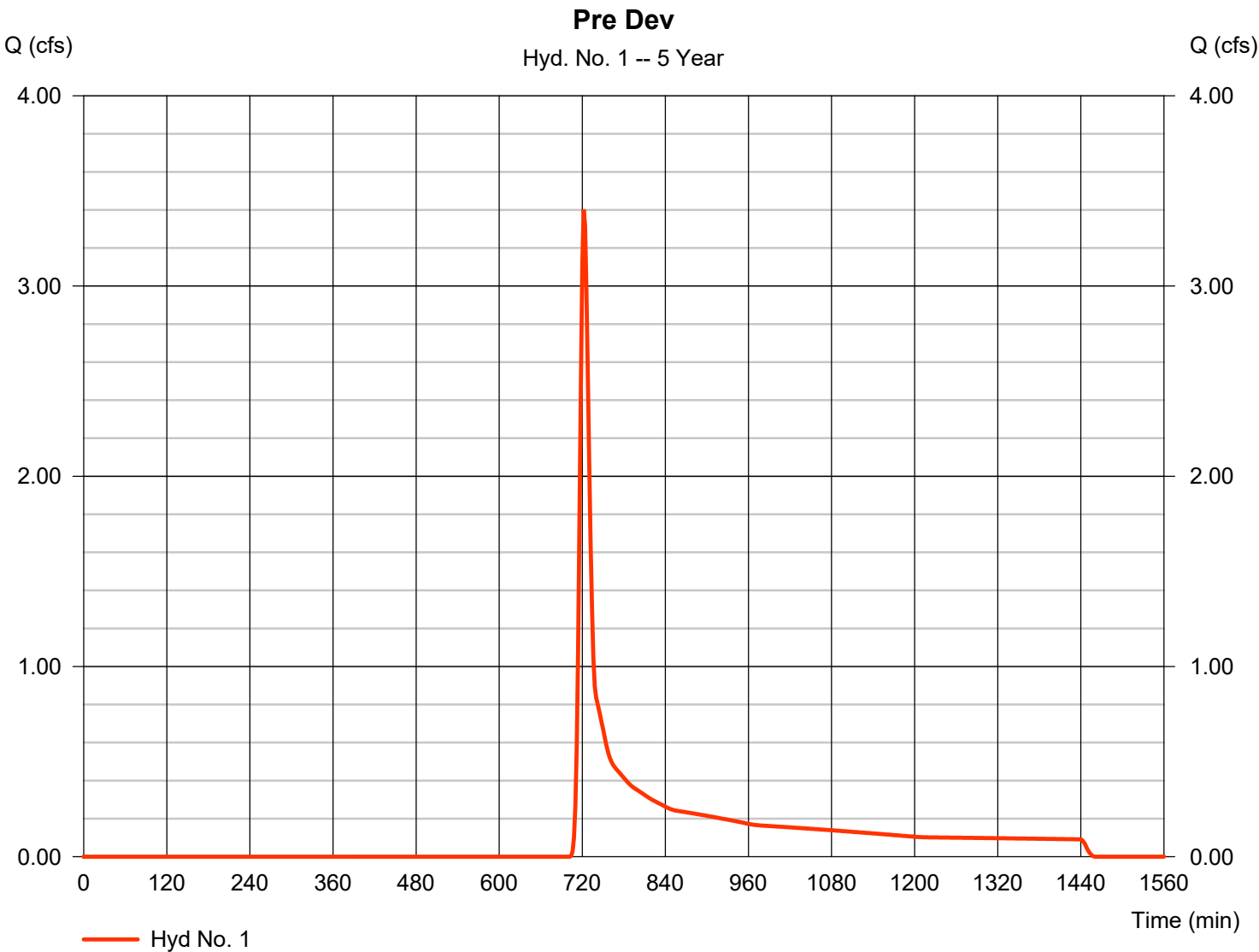
45

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.403 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	11,014 cuft
Drainage area	=	4.250 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.10 min
Total precip.	=	4.06 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



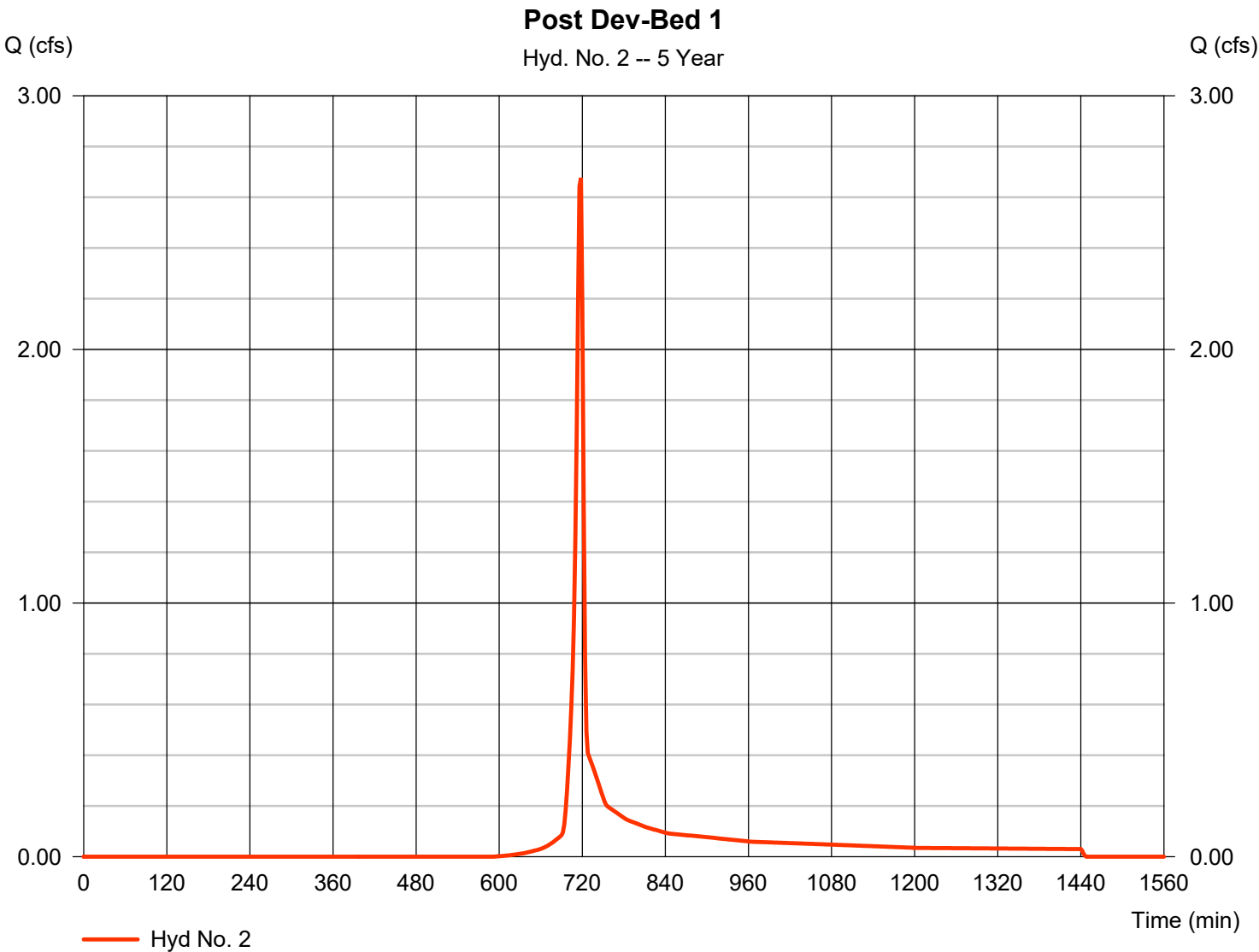
Hydrograph Report

Hyd. No. 2

Post Dev-Bed 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.677 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 5,359 cuft
Drainage area	= 0.960 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.06 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 98) + (0.620 x 61)] / 0.960



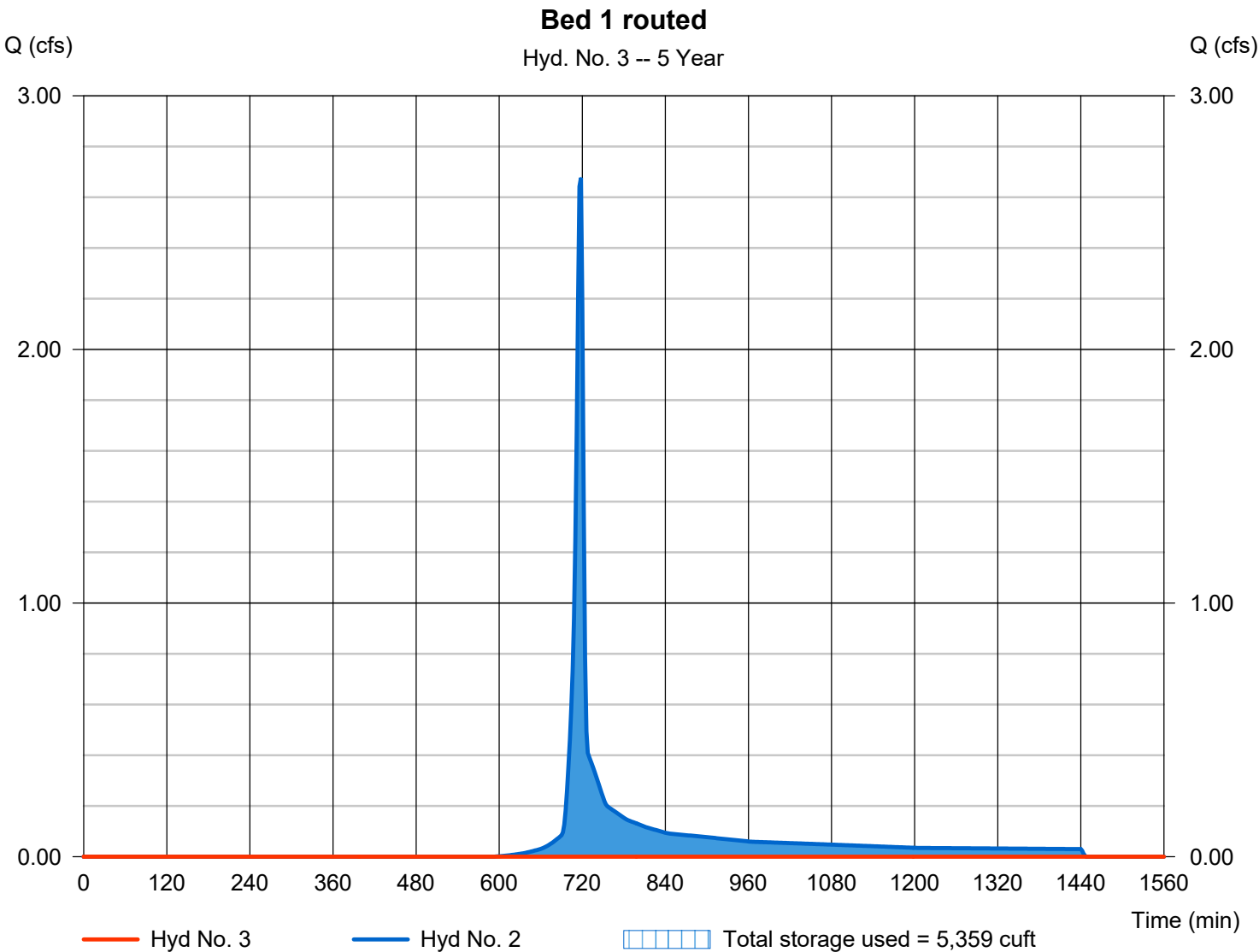
Hydrograph Report

Hyd. No. 3

Bed 1 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 5 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post Dev-Bed 1	Max. Elevation	= 438.31 ft
Reservoir name	= Bed 1	Max. Storage	= 5,359 cuft

Storage Indication method used.



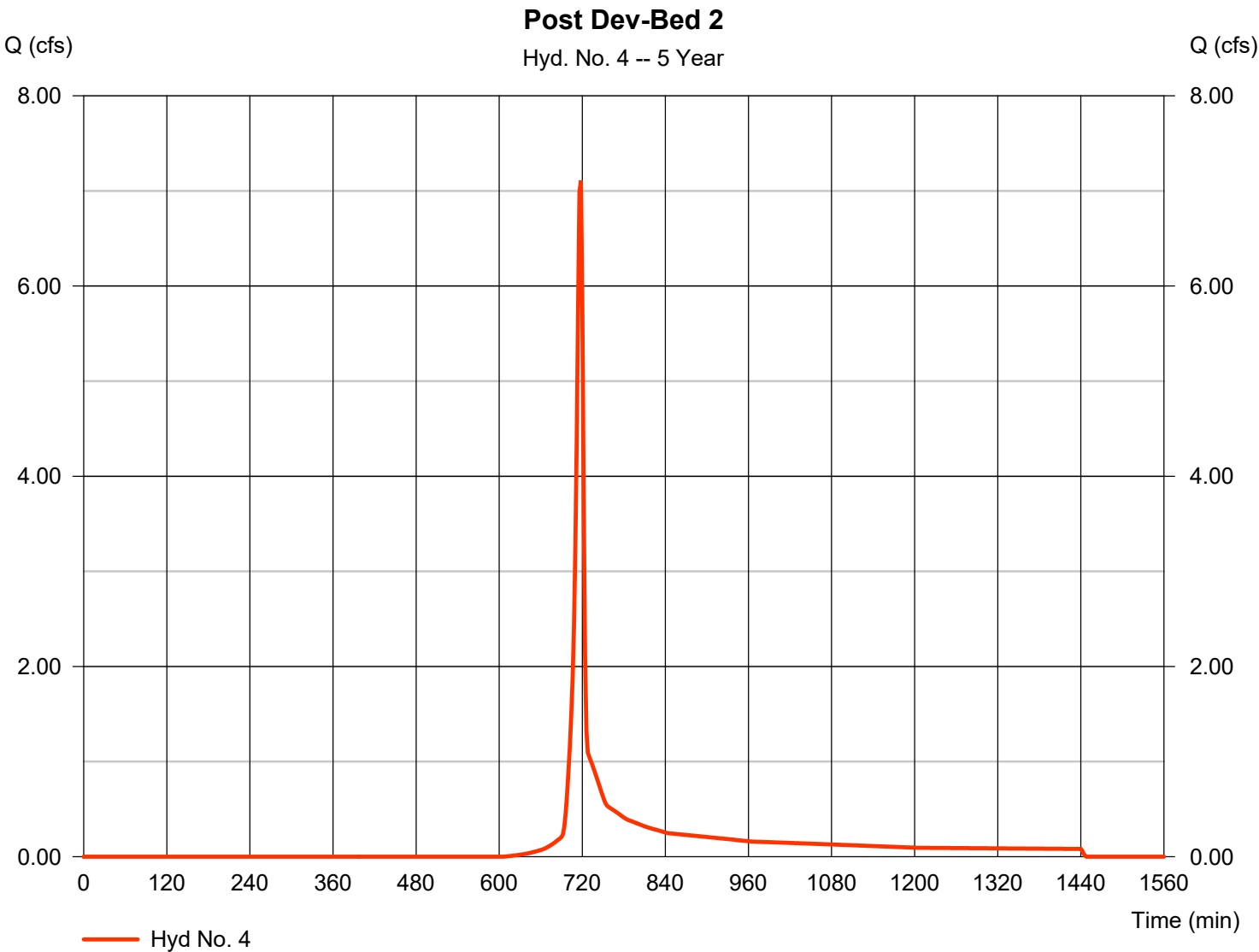
Hydrograph Report

Hyd. No. 4

Post Dev-Bed 2

Hydrograph type	= SCS Runoff	Peak discharge	= 7.108 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 14,218 cuft
Drainage area	= 2.660 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.06 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 98) + (1.820 x 61)] / 2.660

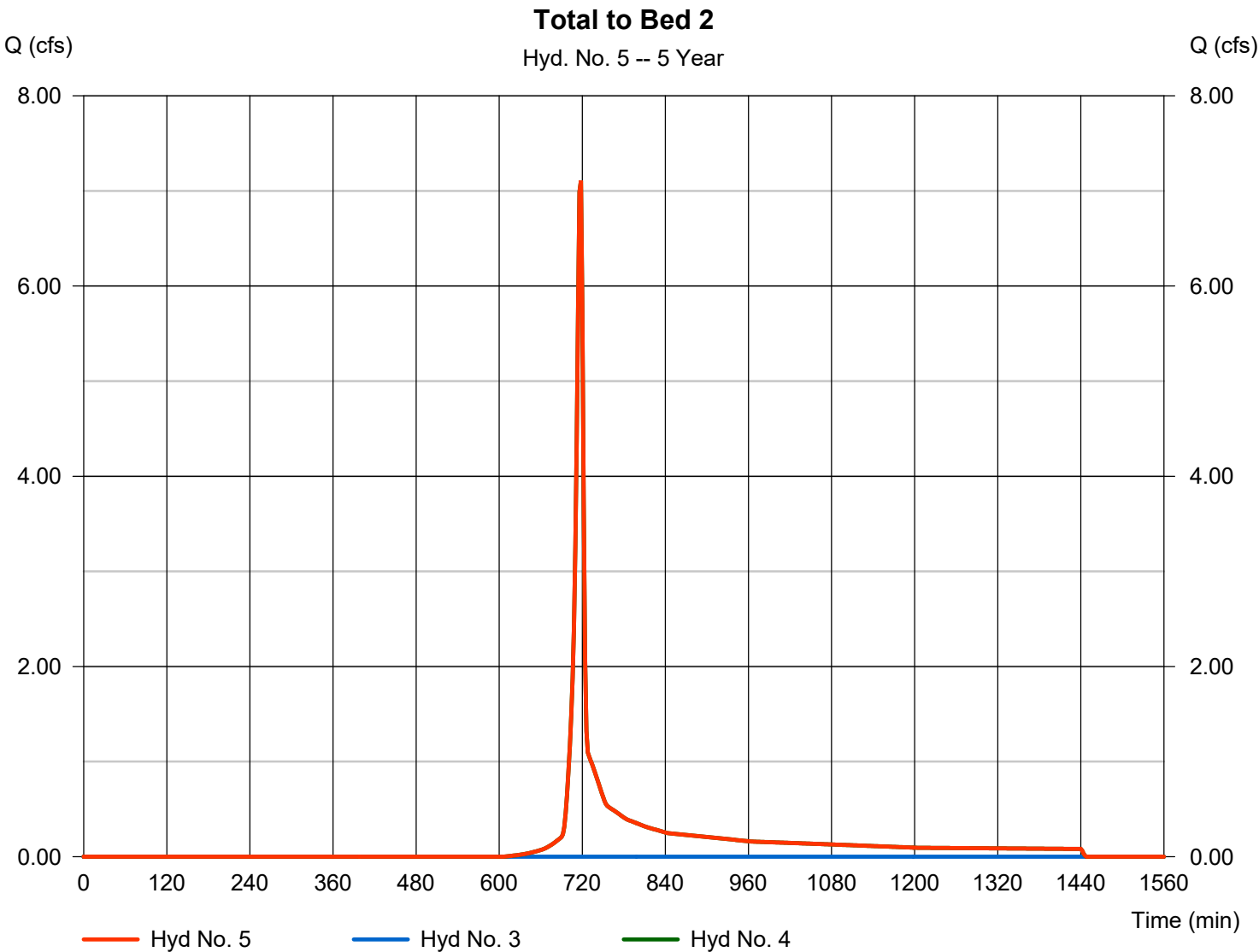


Hydrograph Report

Hyd. No. 5

Total to Bed 2

Hydrograph type	= Combine	Peak discharge	= 7.108 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 14,218 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.660 ac



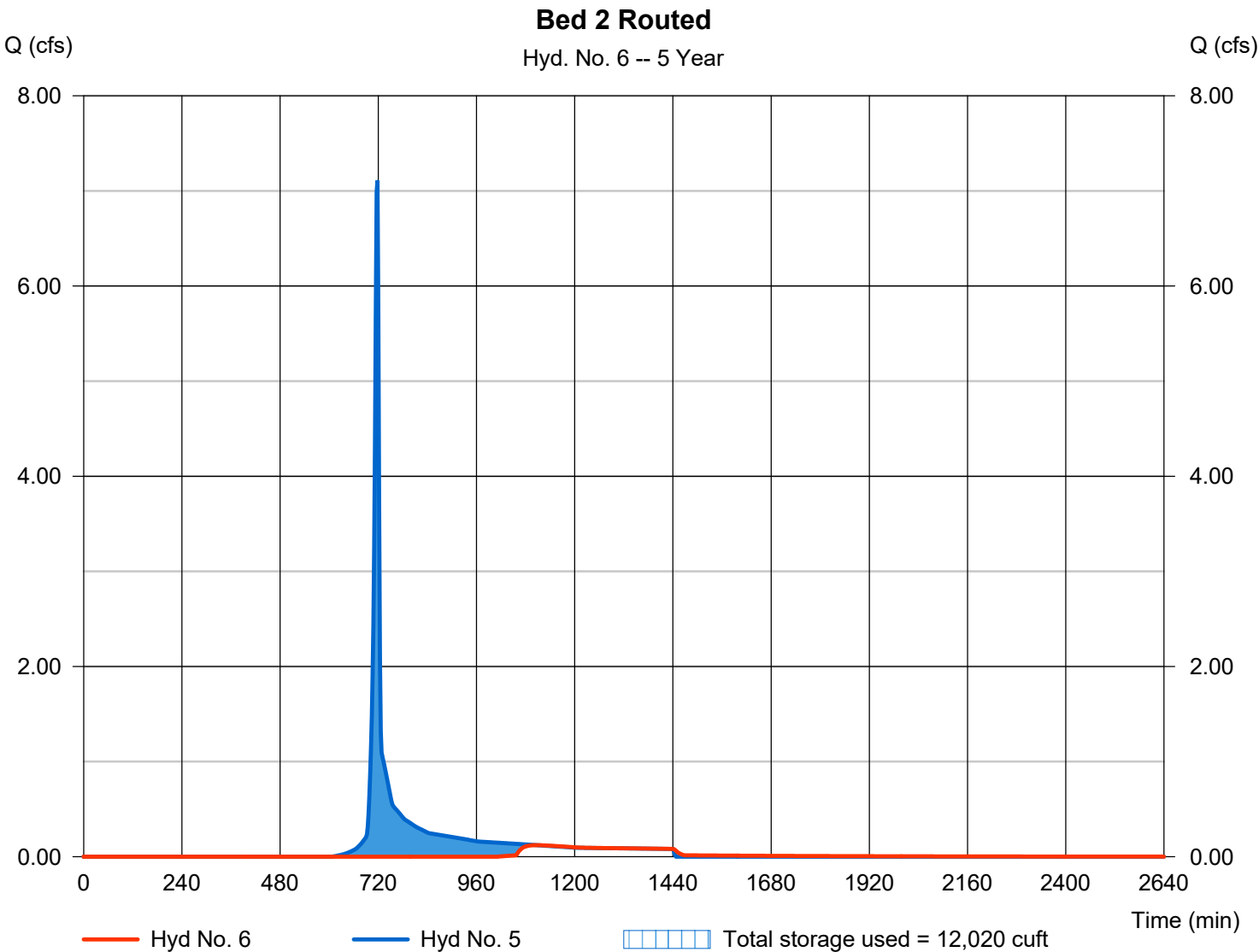
Hydrograph Report

Hyd. No. 6

Bed 2 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.121 cfs
Storm frequency	= 5 yrs	Time to peak	= 1106 min
Time interval	= 2 min	Hyd. volume	= 2,649 cuft
Inflow hyd. No.	= 5 - Total to Bed 2	Max. Elevation	= 433.62 ft
Reservoir name	= Bed 2	Max. Storage	= 12,020 cuft

Storage Indication method used.



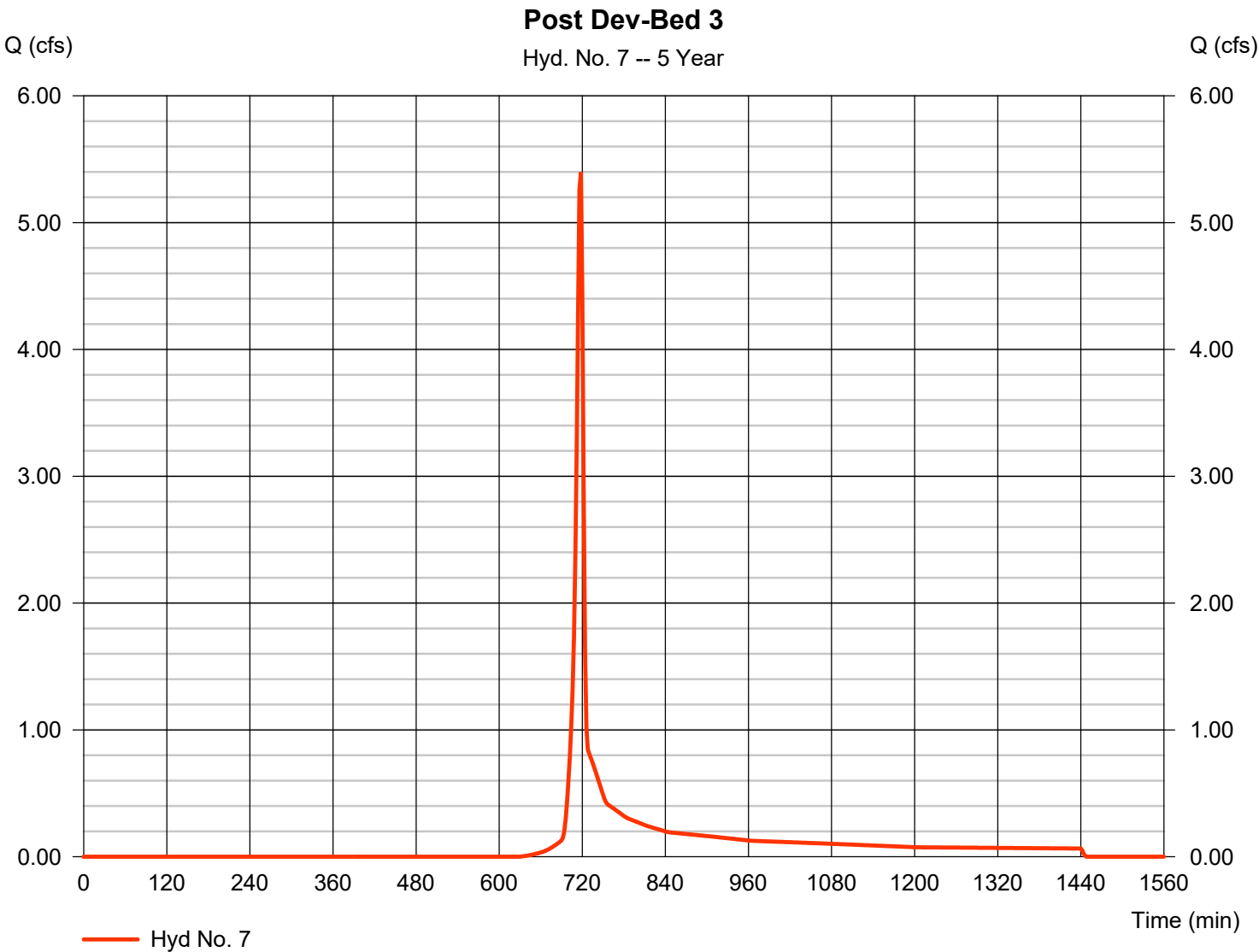
Hydrograph Report

Hyd. No. 7

Post Dev-Bed 3

Hydrograph type	= SCS Runoff	Peak discharge	= 5.397 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 10,795 cuft
Drainage area	= 2.210 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.06 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 98) + (1.590 x 61)] / 2.210

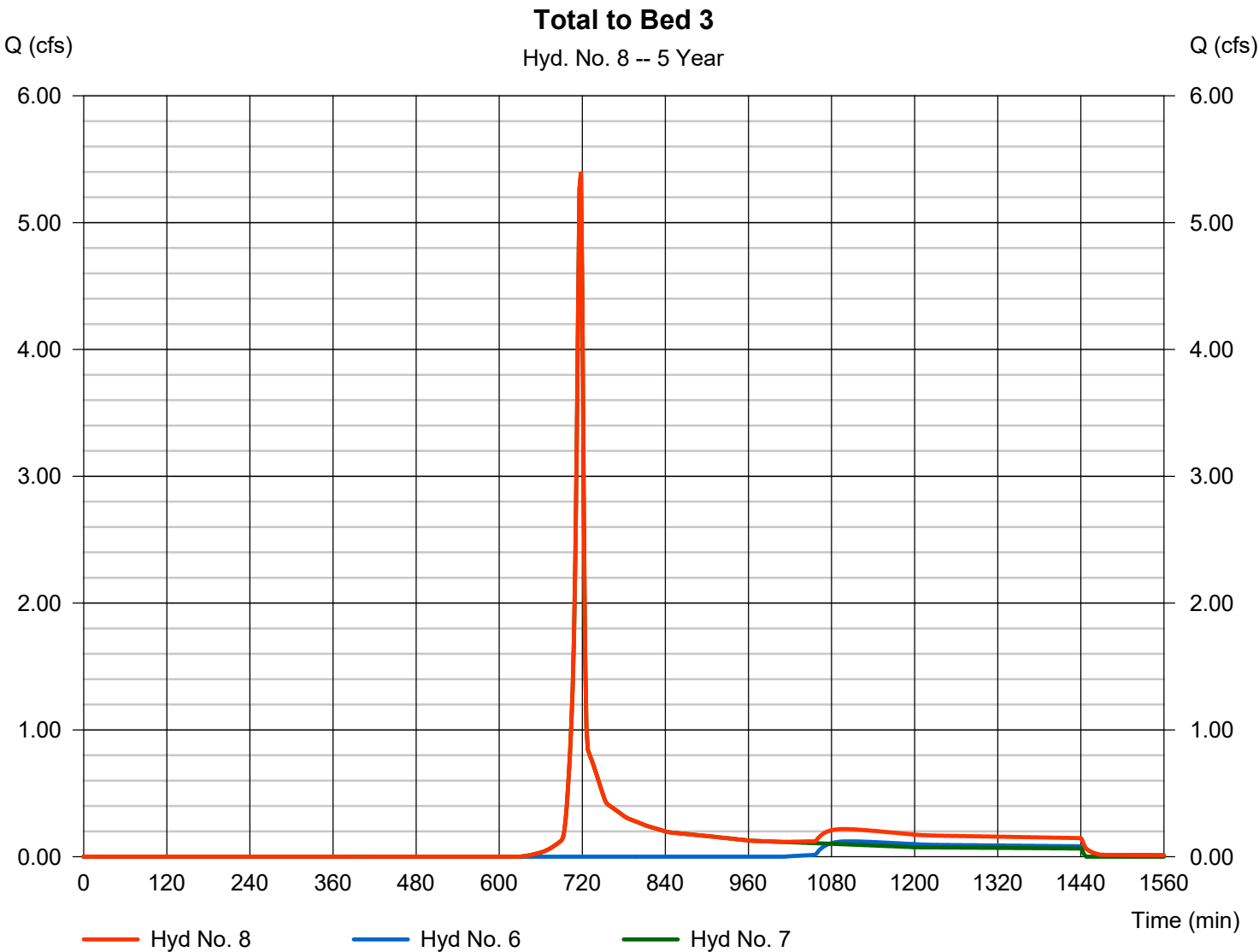


Hydrograph Report

Hyd. No. 8

Total to Bed 3

Hydrograph type	= Combine	Peak discharge	= 5.397 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 13,444 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 2.210 ac



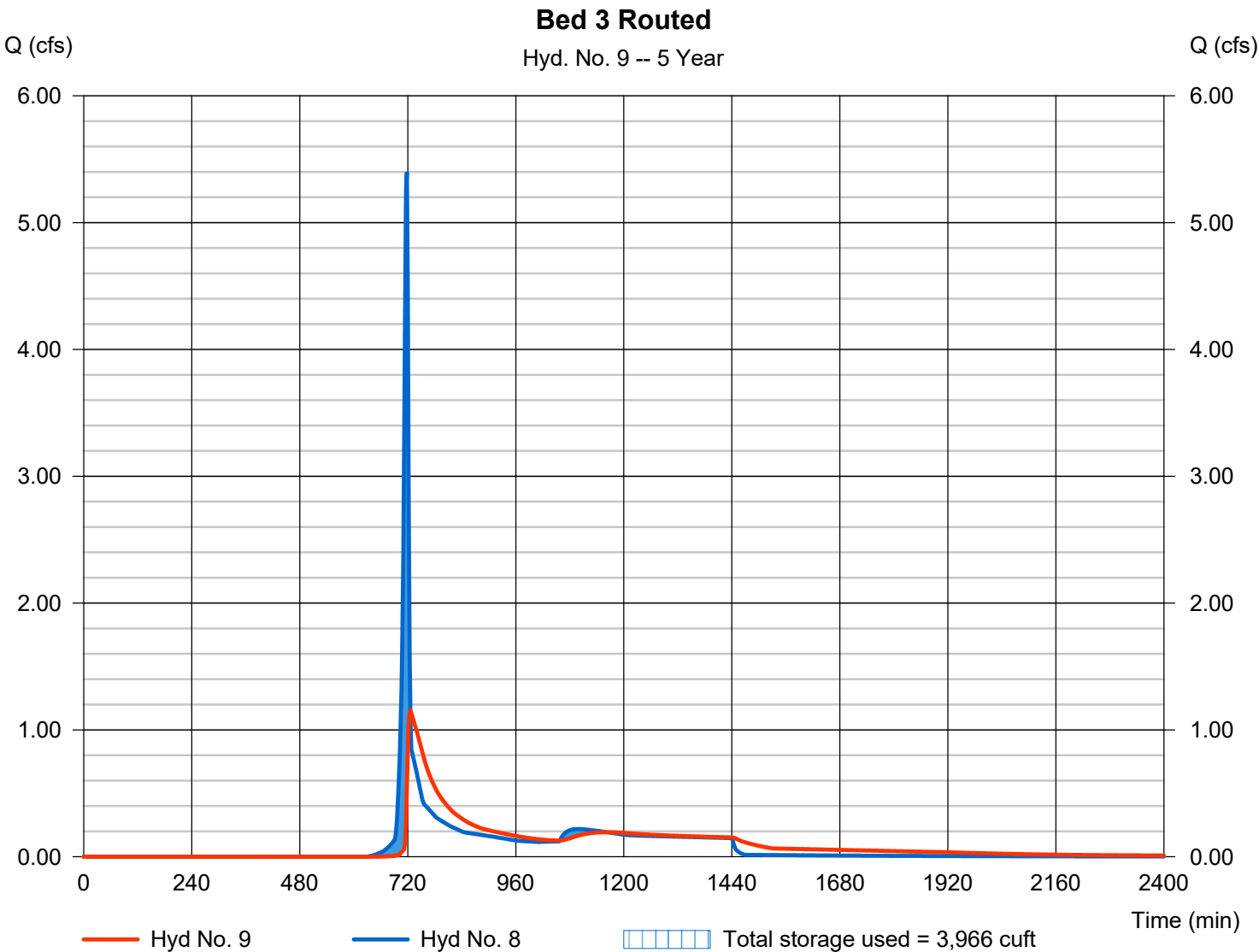
Hydrograph Report

Hyd. No. 9

Bed 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.146 cfs
Storm frequency	= 5 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 13,422 cuft
Inflow hyd. No.	= 8 - Total to Bed 3	Max. Elevation	= 424.24 ft
Reservoir name	= Bed 3	Max. Storage	= 3,966 cuft

Storage Indication method used.

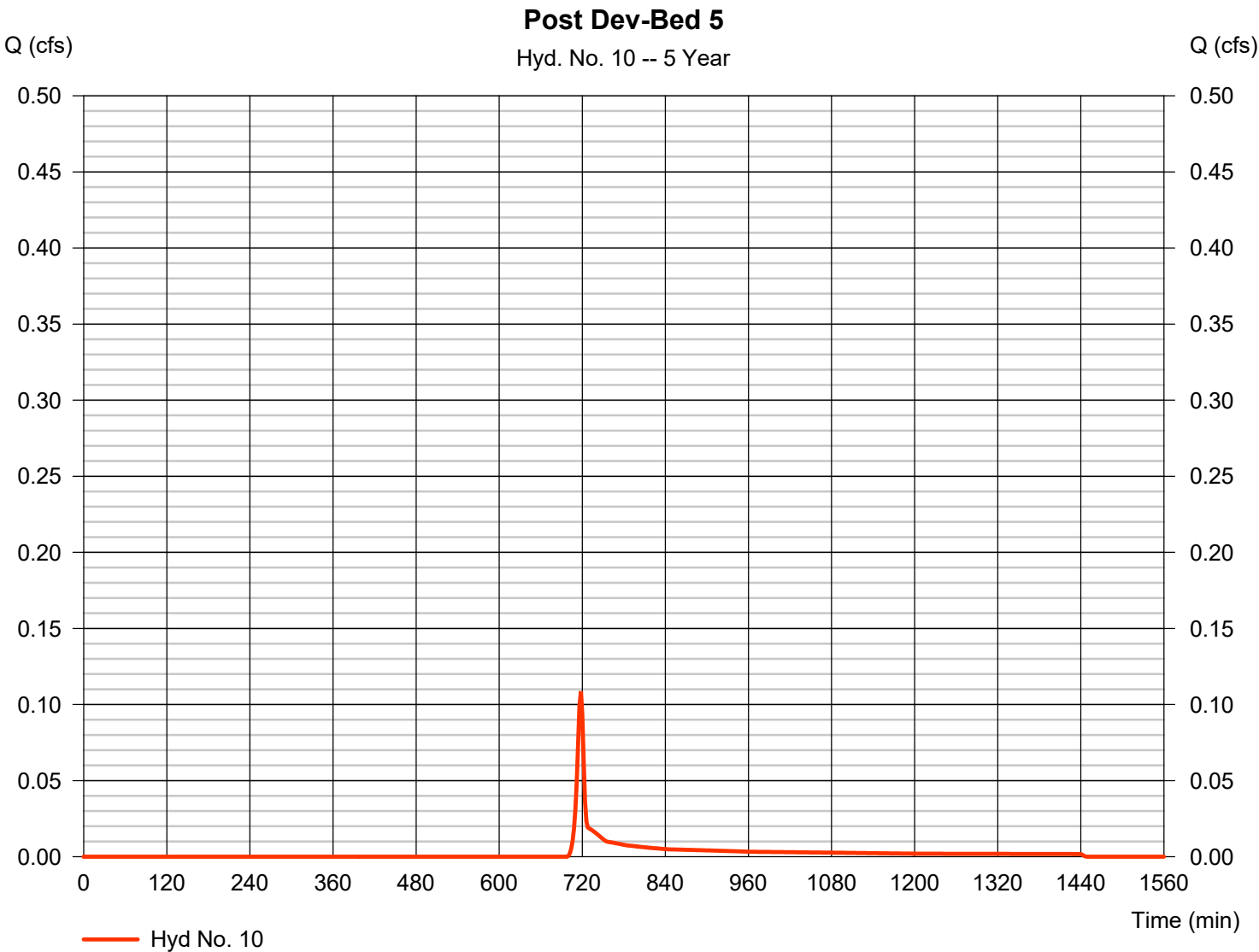


Hydrograph Report

Hyd. No. 10

Post Dev-Bed 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.109 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 230 cuft
Drainage area	= 0.080 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.06 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

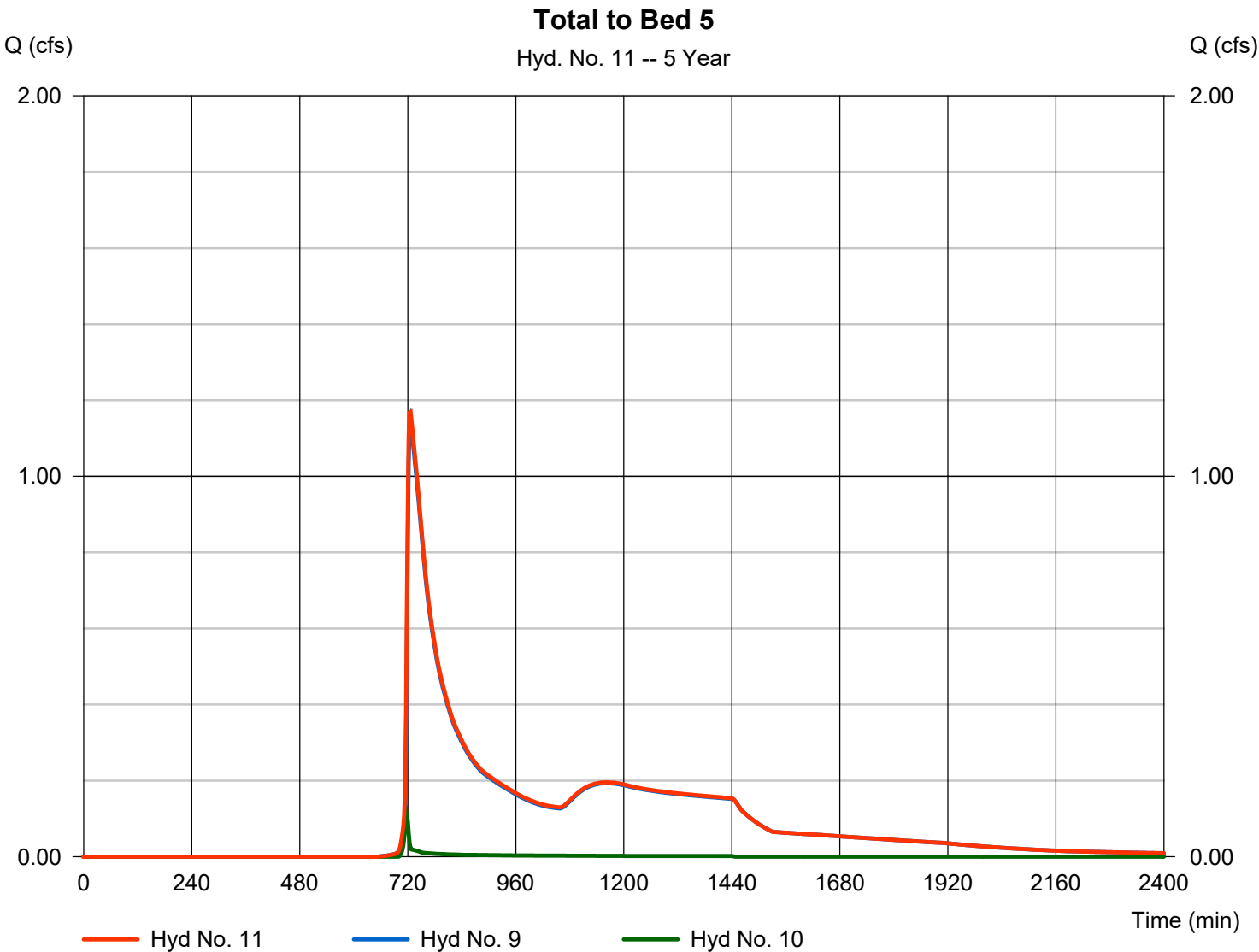


Hydrograph Report

Hyd. No. 11

Total to Bed 5

Hydrograph type	= Combine	Peak discharge	= 1.169 cfs
Storm frequency	= 5 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 13,652 cuft
Inflow hyds.	= 9, 10	Contrib. drain. area	= 0.080 ac



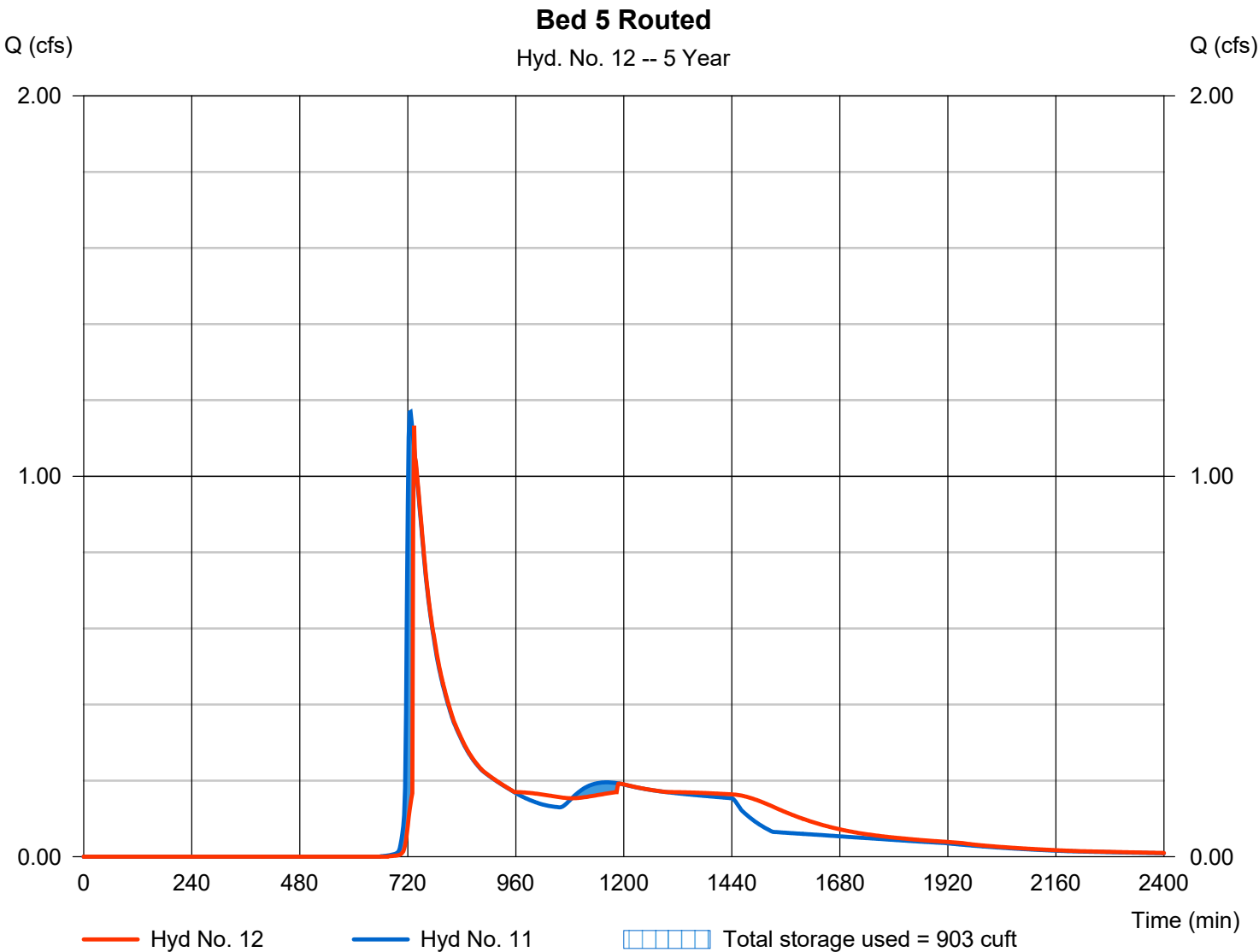
Hydrograph Report

Hyd. No. 12

Bed 5 Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.133 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 13,649 cuft
Inflow hyd. No.	= 11 - Total to Bed 5	Max. Elevation	= 424.98 ft
Reservoir name	= Bed 5	Max. Storage	= 903 cuft

Storage Indication method used.



Hydrograph Report

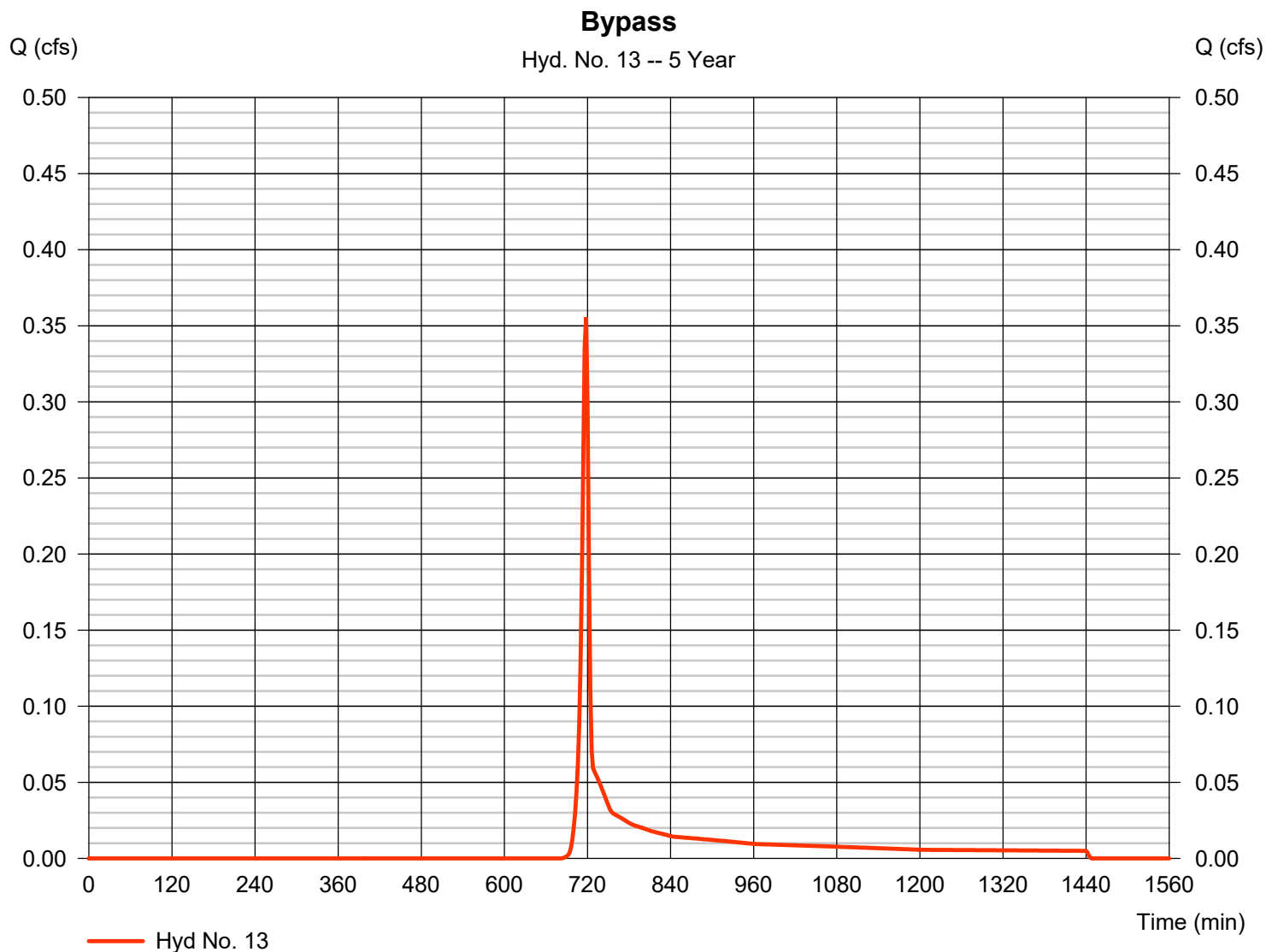
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Wednesday, 01 / 31 / 2024

Hyd. No. 13

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.356 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 724 cuft
Drainage area	= 0.200 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.06 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

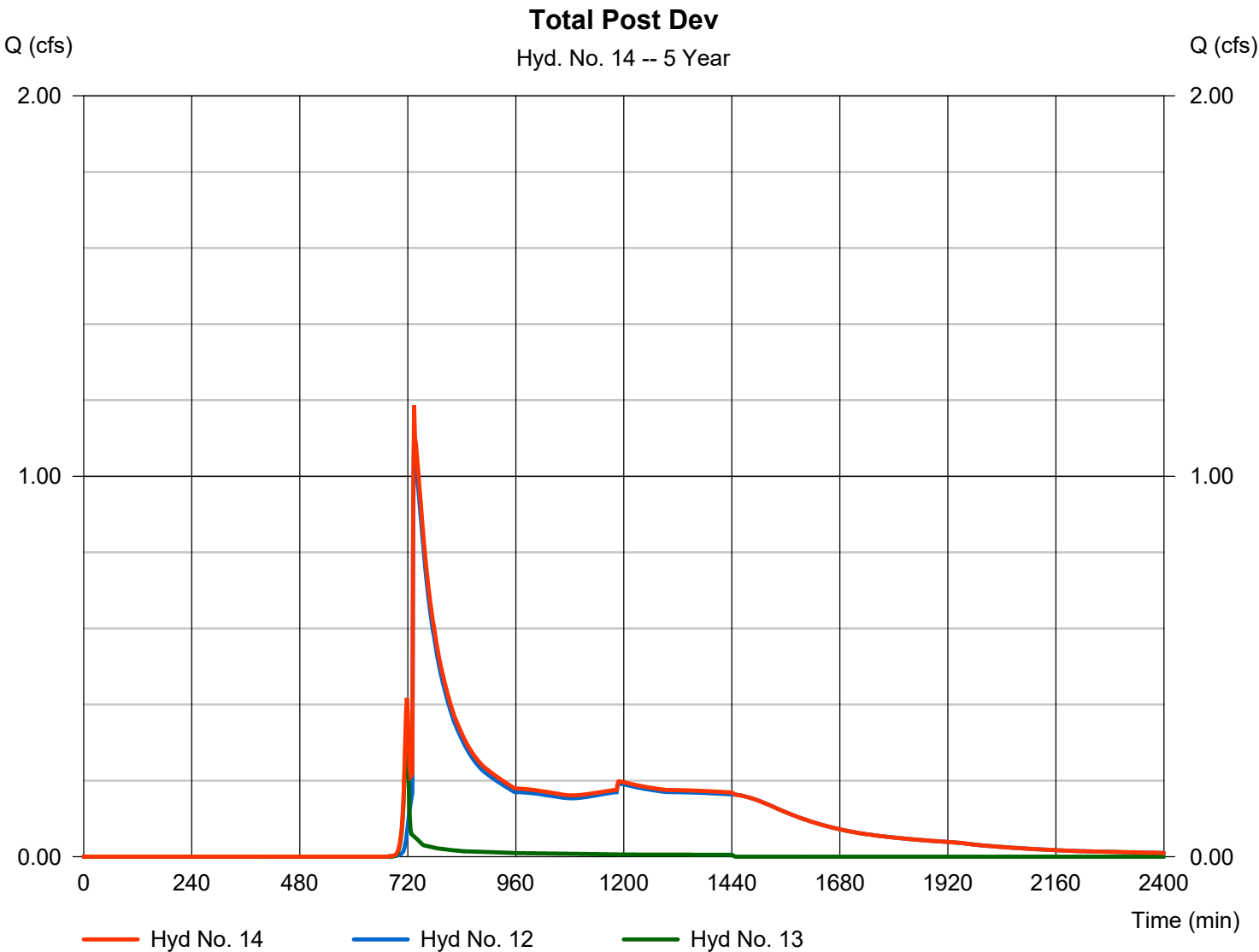


Hydrograph Report

Hyd. No. 14

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 1.186 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 14,373 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.200 ac



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

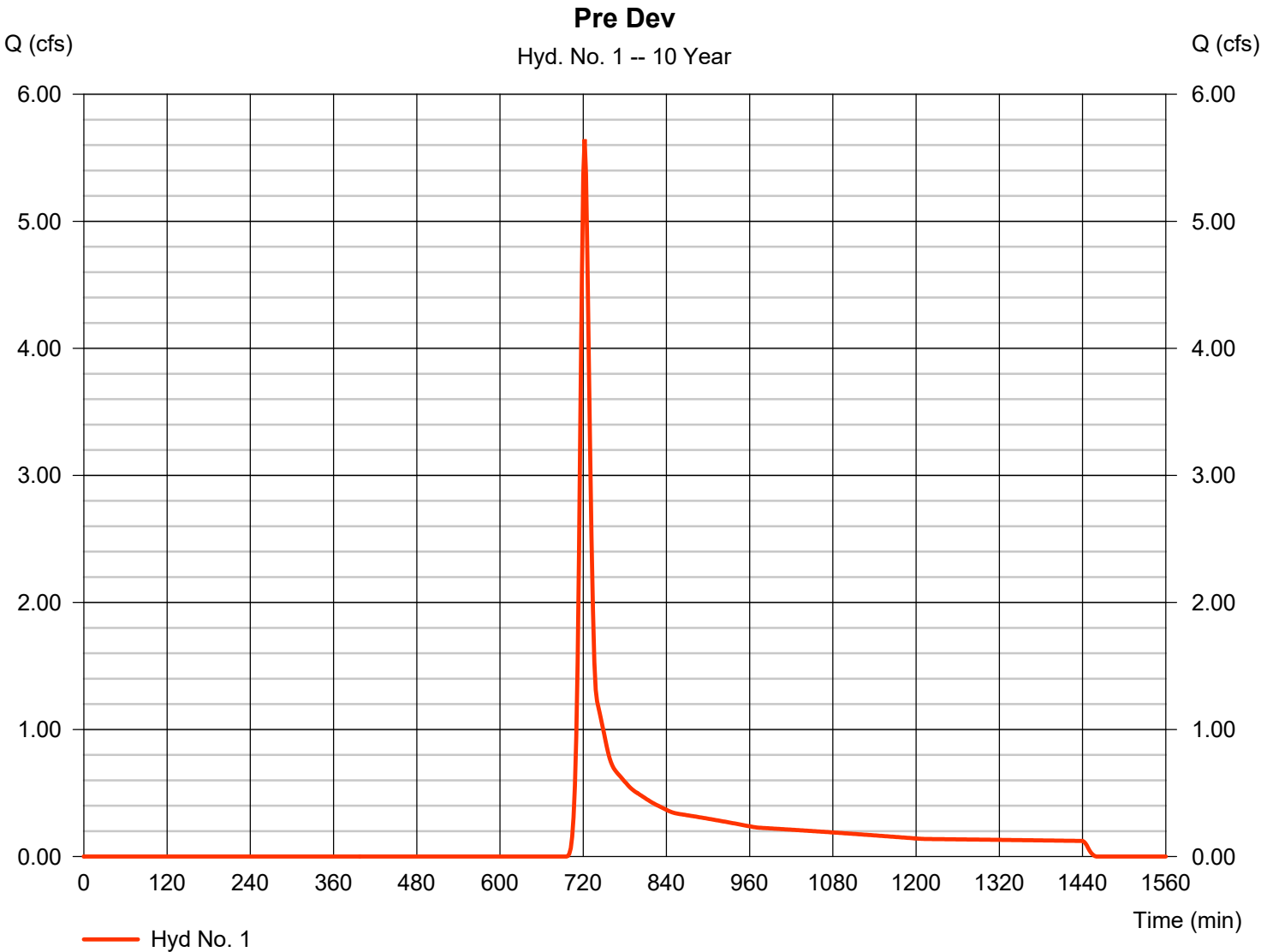
60

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 5.645 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 16,450 cuft
Drainage area	= 4.250 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.10 min
Total precip.	= 4.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

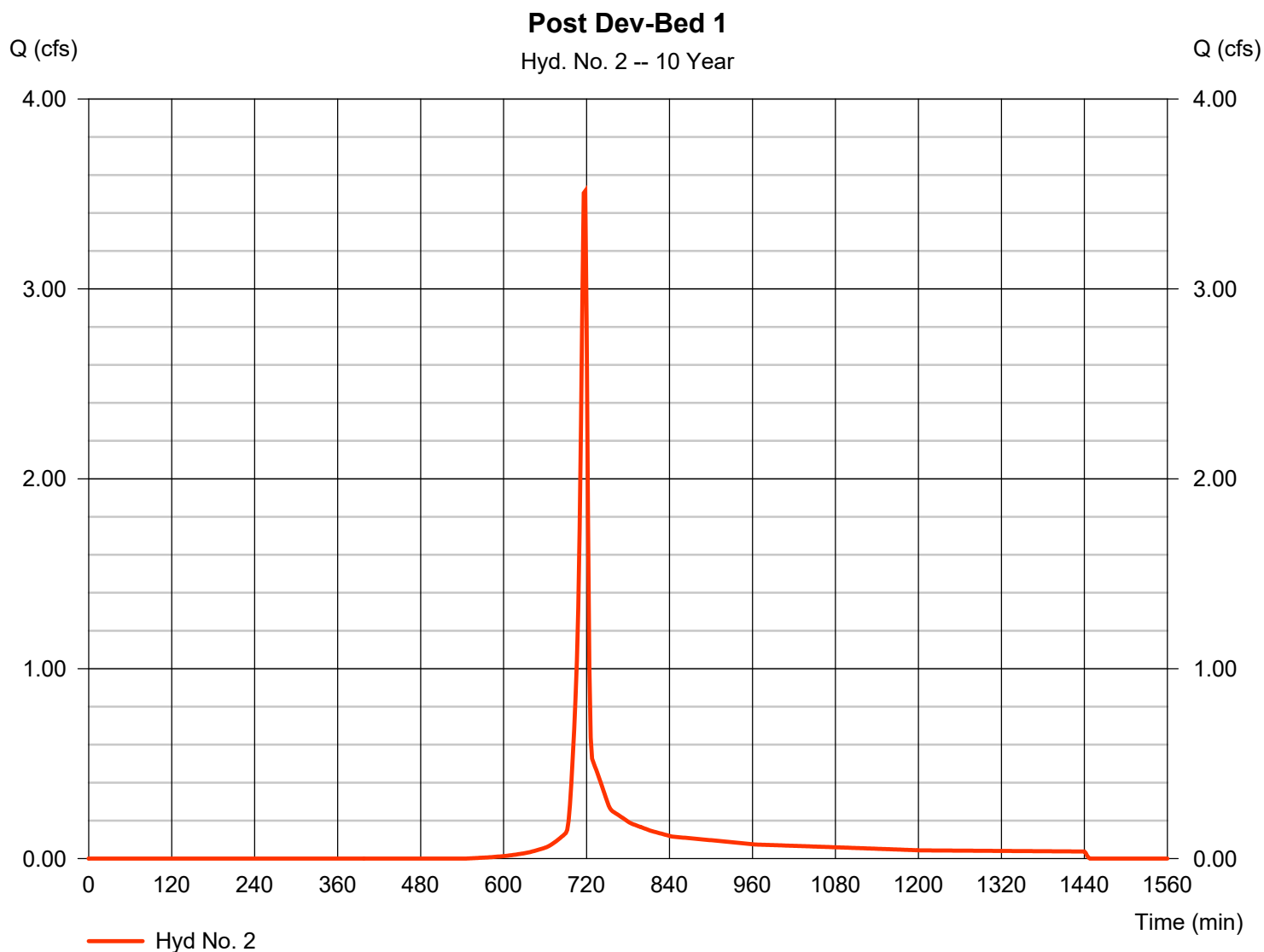
Wednesday, 01 / 31 / 2024

Hyd. No. 2

Post Dev-Bed 1

Hydrograph type	= SCS Runoff	Peak discharge	= 3.516 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 7,078 cuft
Drainage area	= 0.960 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.340 \times 98) + (0.620 \times 61)] / 0.960$



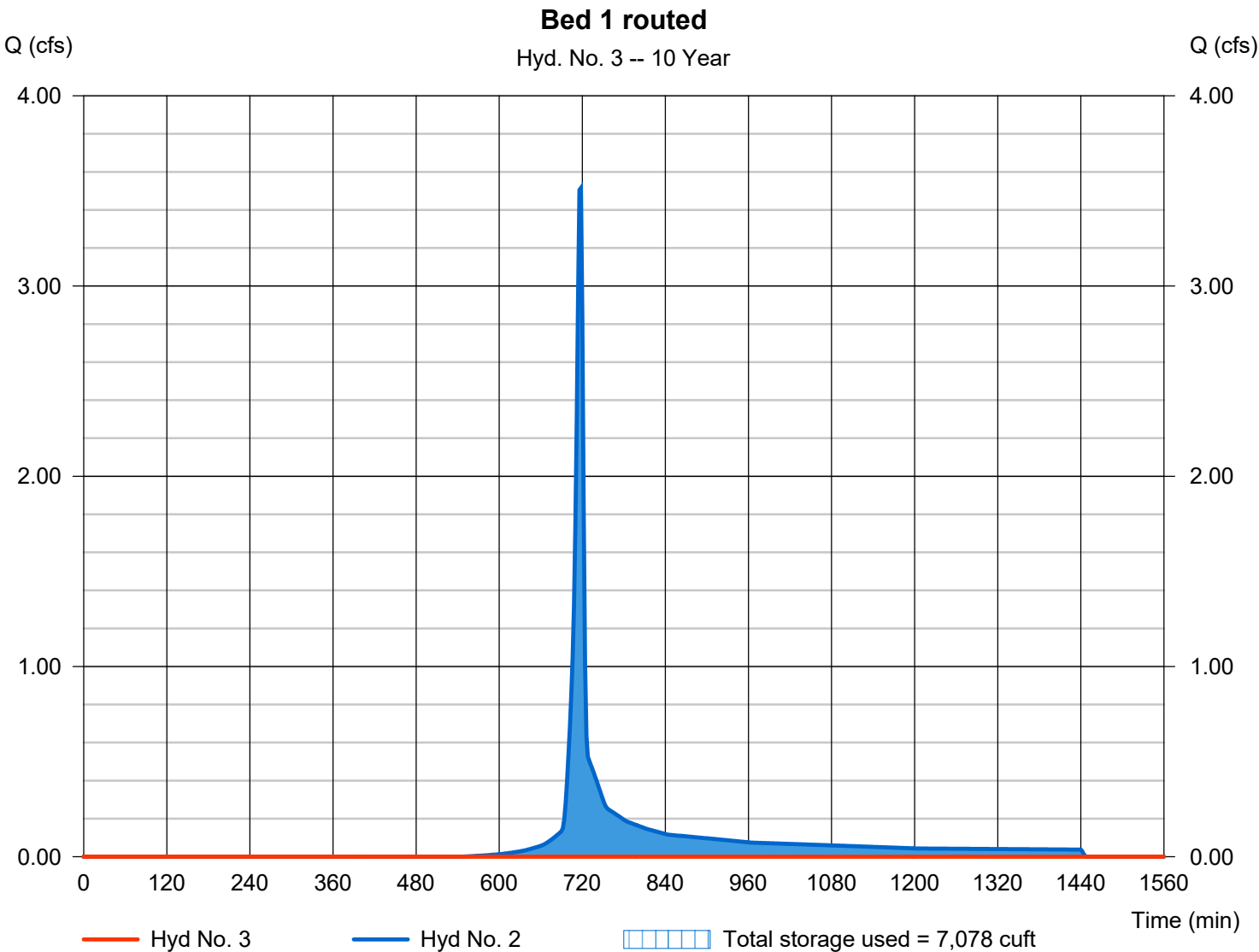
Hydrograph Report

Hyd. No. 3

Bed 1 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post Dev-Bed 1	Max. Elevation	= 438.72 ft
Reservoir name	= Bed 1	Max. Storage	= 7,078 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

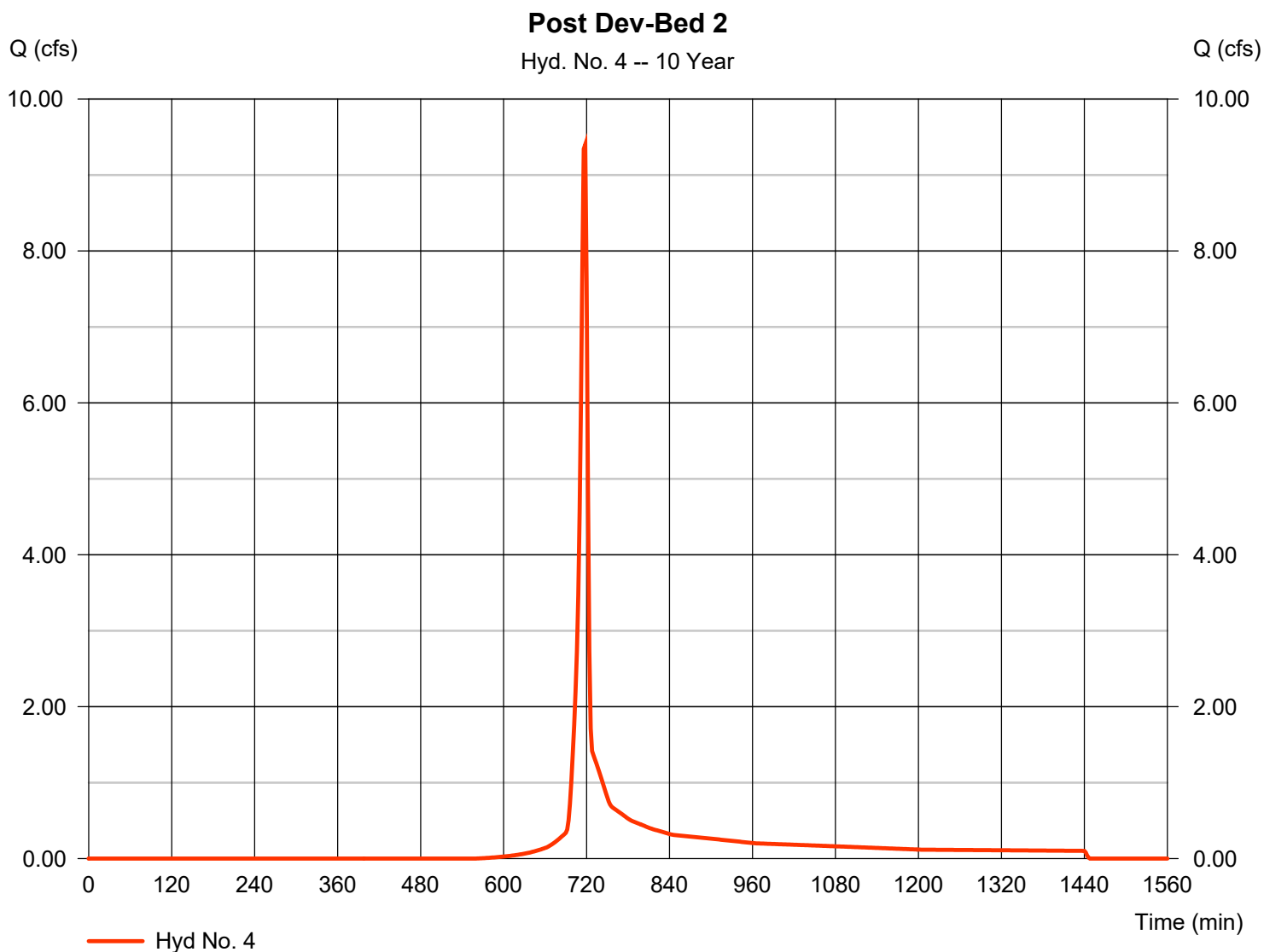
Wednesday, 01 / 31 / 2024

Hyd. No. 4

Post Dev-Bed 2

Hydrograph type	= SCS Runoff	Peak discharge	= 9.401 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 18,885 cuft
Drainage area	= 2.660 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.840 \times 98) + (1.820 \times 61)] / 2.660$

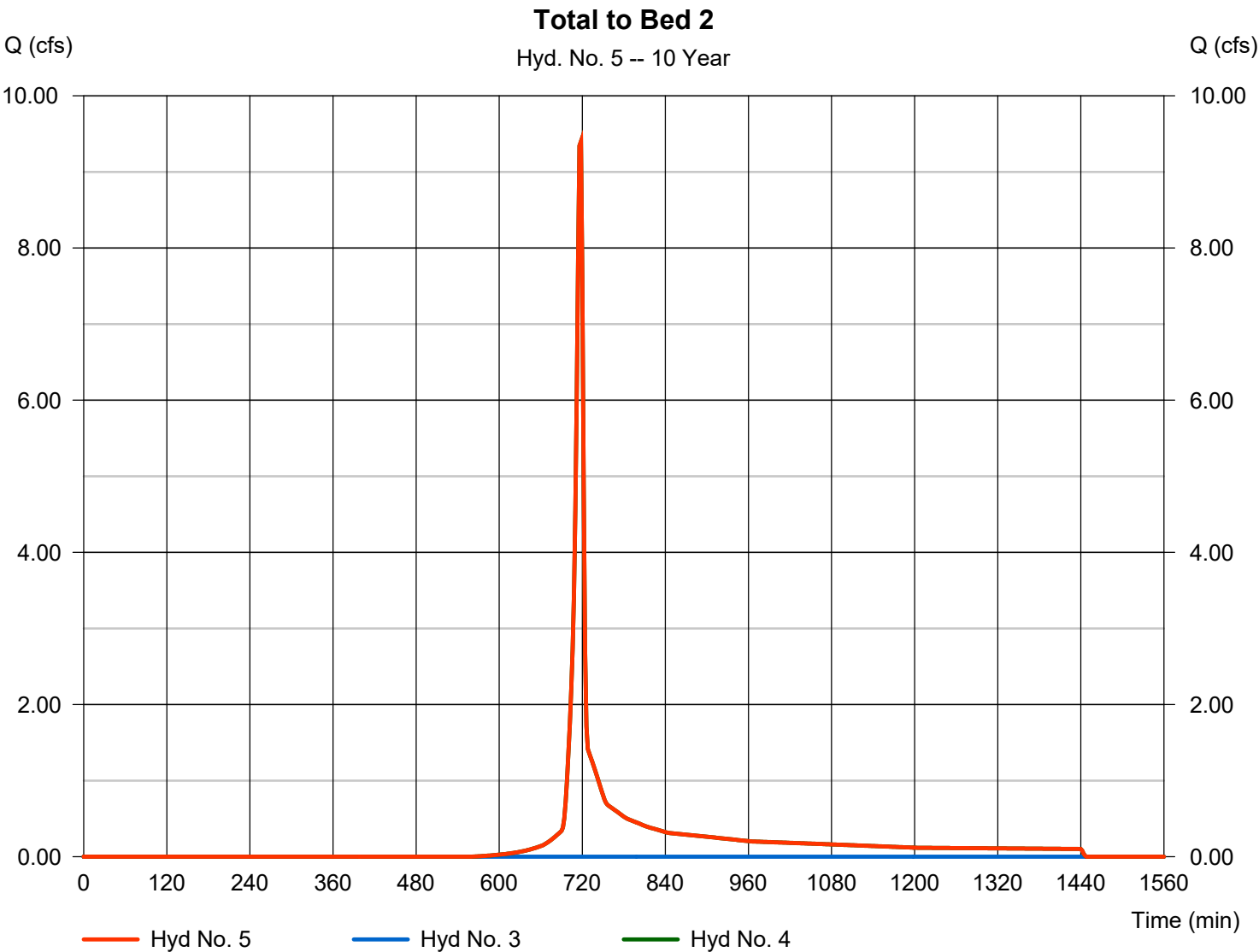


Hydrograph Report

Hyd. No. 5

Total to Bed 2

Hydrograph type	= Combine	Peak discharge	= 9.401 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 18,885 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.660 ac



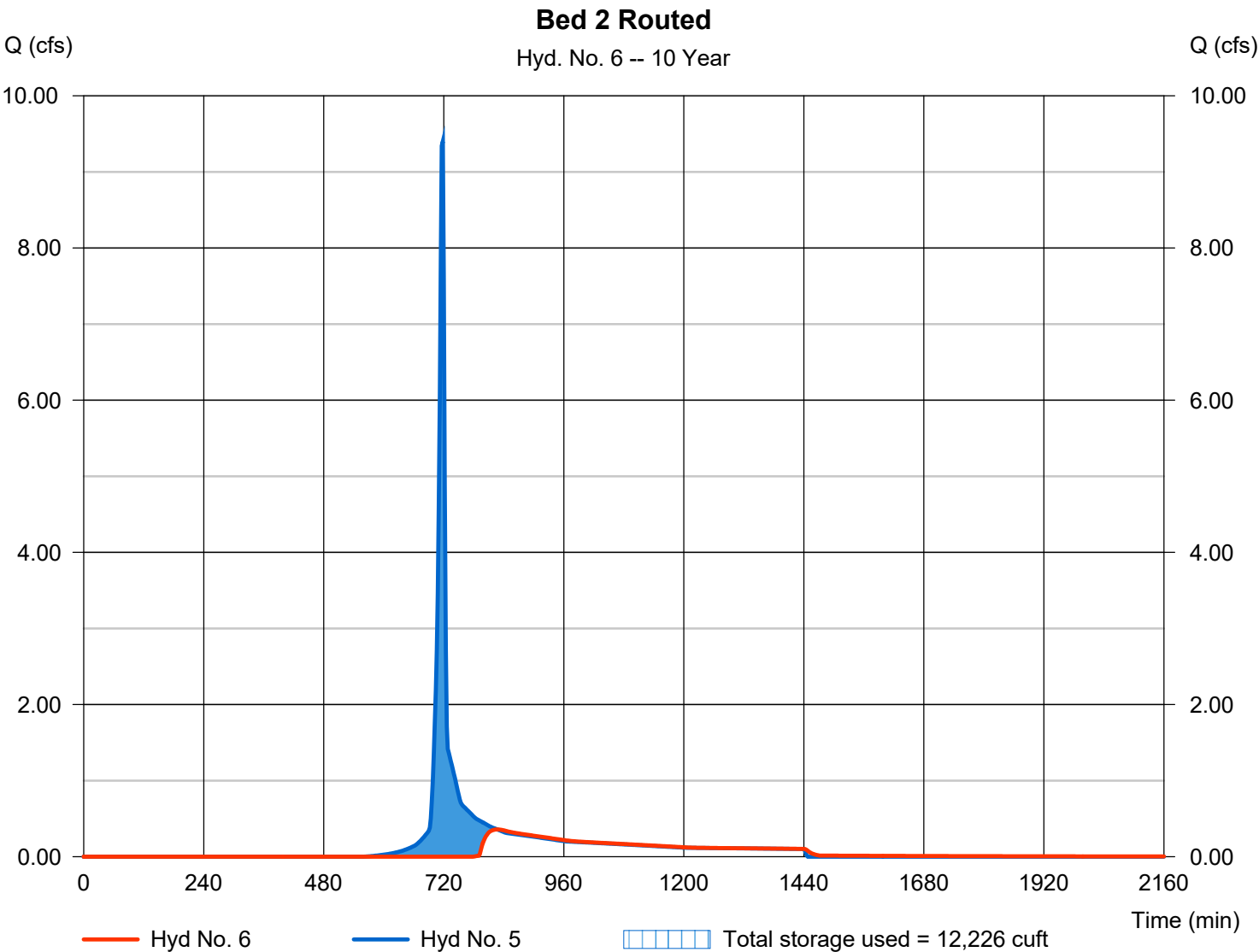
Hydrograph Report

Hyd. No. 6

Bed 2 Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.358 cfs
Storm frequency	= 10 yrs	Time to peak	= 826 min
Time interval	= 2 min	Hyd. volume	= 7,316 cuft
Inflow hyd. No.	= 5 - Total to Bed 2	Max. Elevation	= 433.68 ft
Reservoir name	= Bed 2	Max. Storage	= 12,226 cuft

Storage Indication method used.



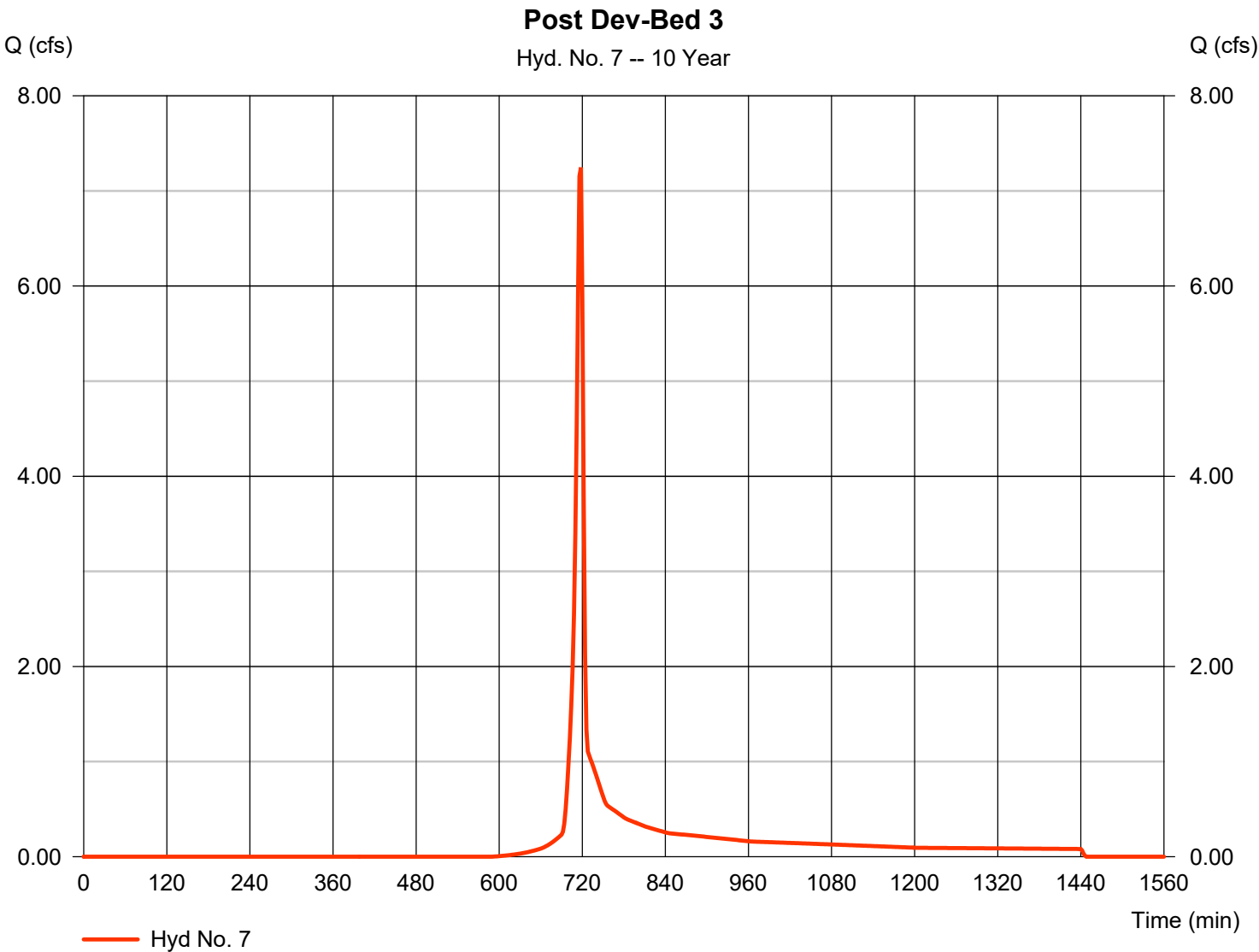
Hydrograph Report

Hyd. No. 7

Post Dev-Bed 3

Hydrograph type	= SCS Runoff	Peak discharge	= 7.246 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 14,511 cuft
Drainage area	= 2.210 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 98) + (1.590 x 61)] / 2.210

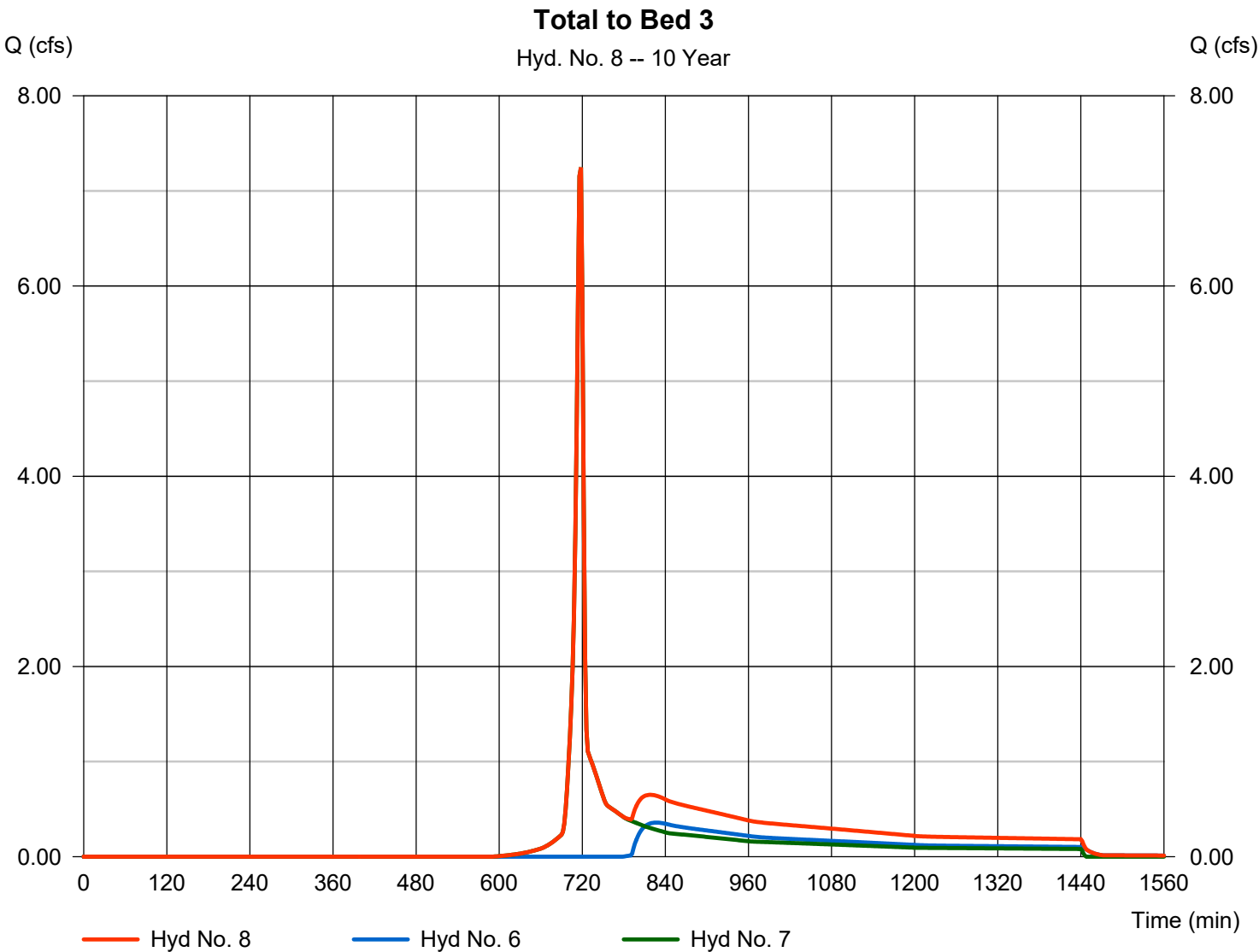


Hydrograph Report

Hyd. No. 8

Total to Bed 3

Hydrograph type	= Combine	Peak discharge	= 7.246 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 21,827 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 2.210 ac



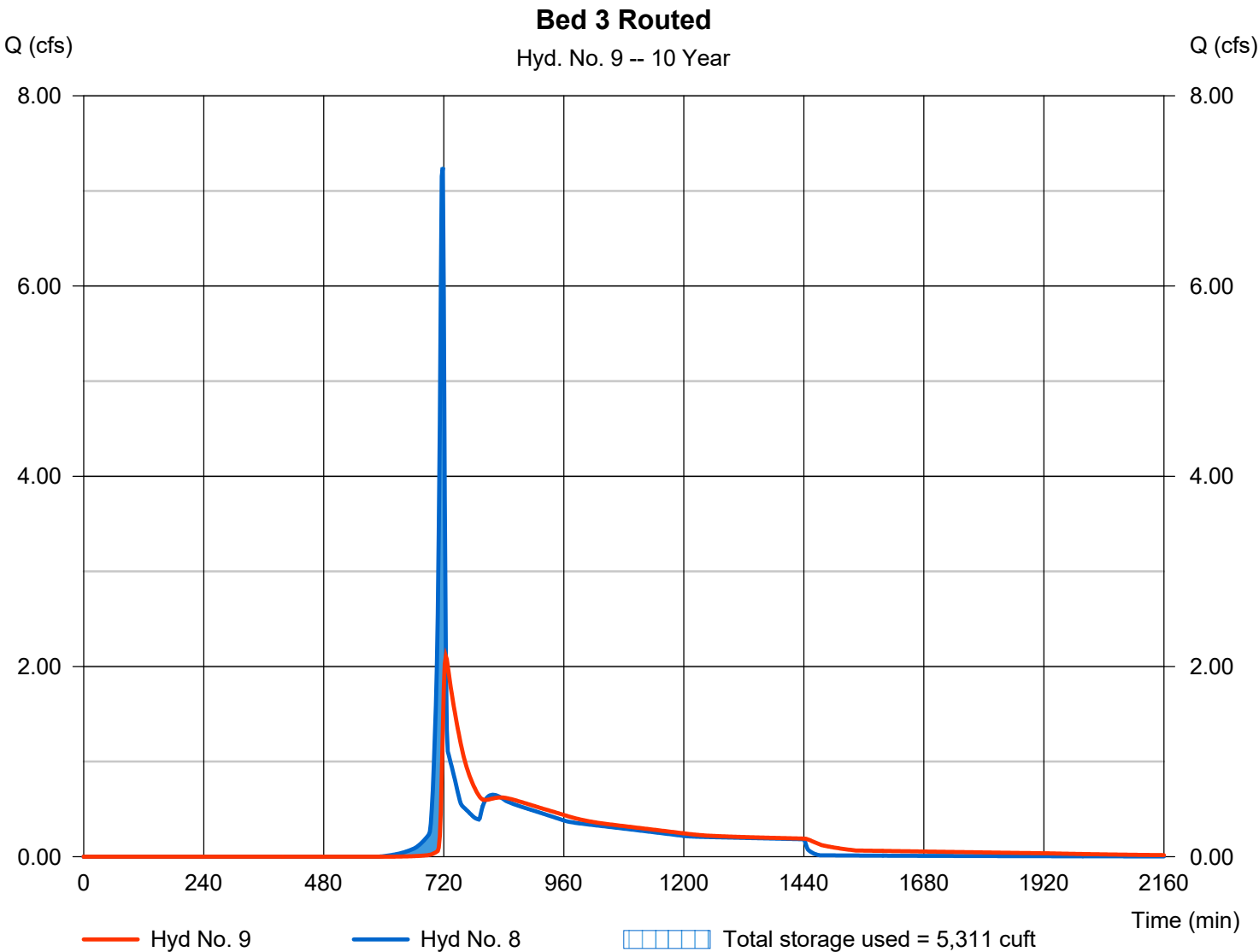
Hydrograph Report

Hyd. No. 9

Bed 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 2.108 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 21,805 cuft
Inflow hyd. No.	= 8 - Total to Bed 3	Max. Elevation	= 424.66 ft
Reservoir name	= Bed 3	Max. Storage	= 5,311 cuft

Storage Indication method used.

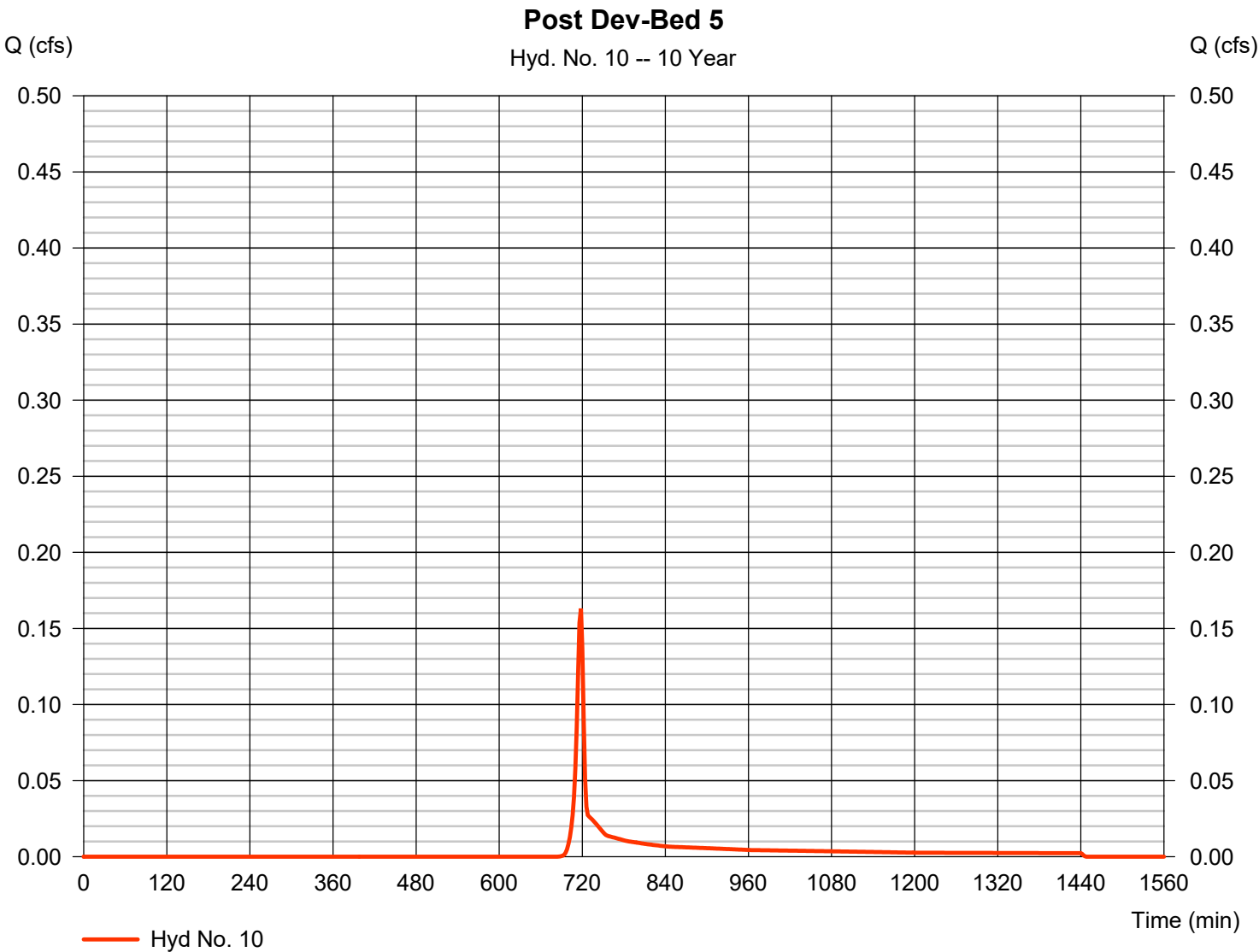


Hydrograph Report

Hyd. No. 10

Post Dev-Bed 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.163 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 333 cuft
Drainage area	= 0.080 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

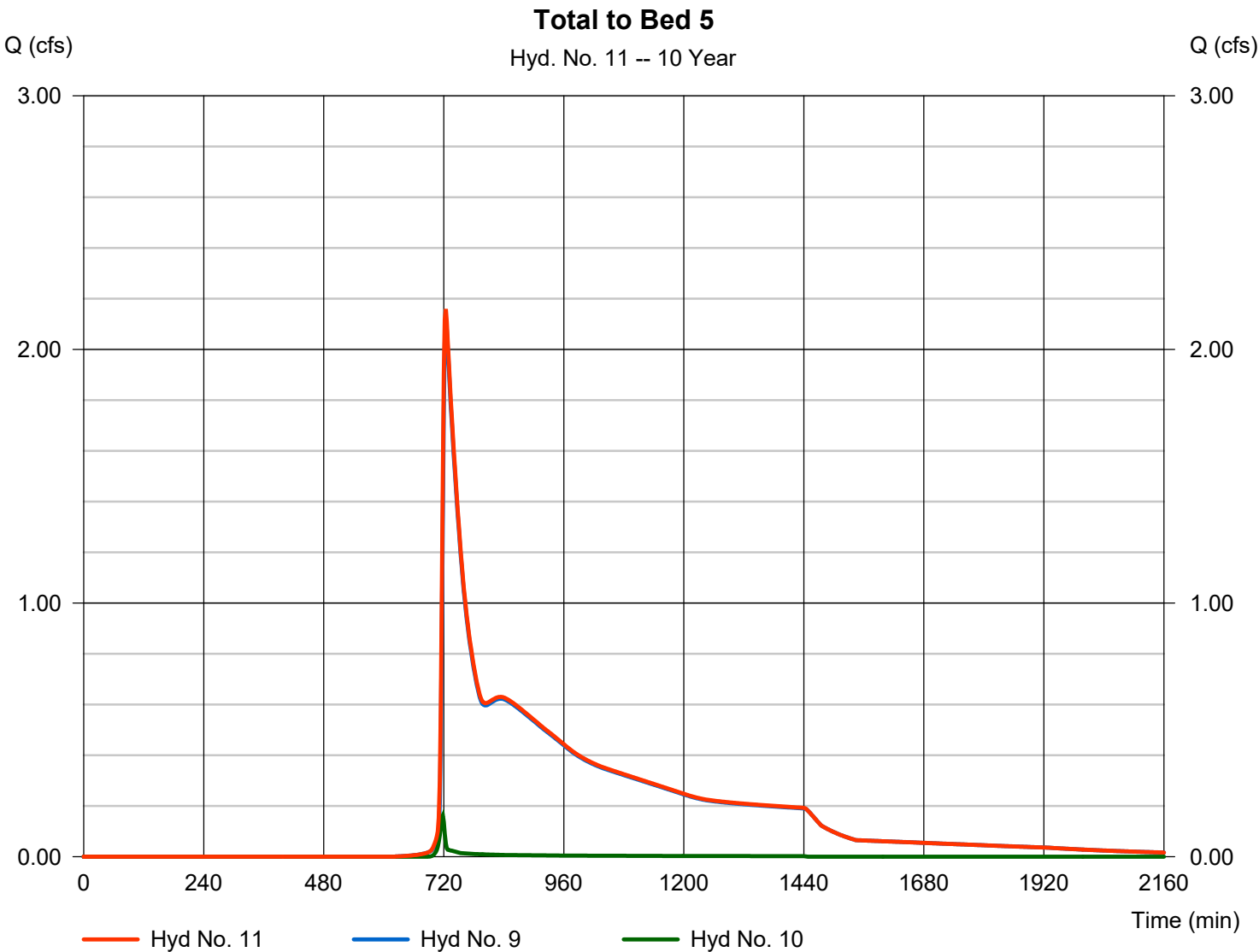


Hydrograph Report

Hyd. No. 11

Total to Bed 5

Hydrograph type	= Combine	Peak discharge	= 2.159 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 22,137 cuft
Inflow hyds.	= 9, 10	Contrib. drain. area	= 0.080 ac



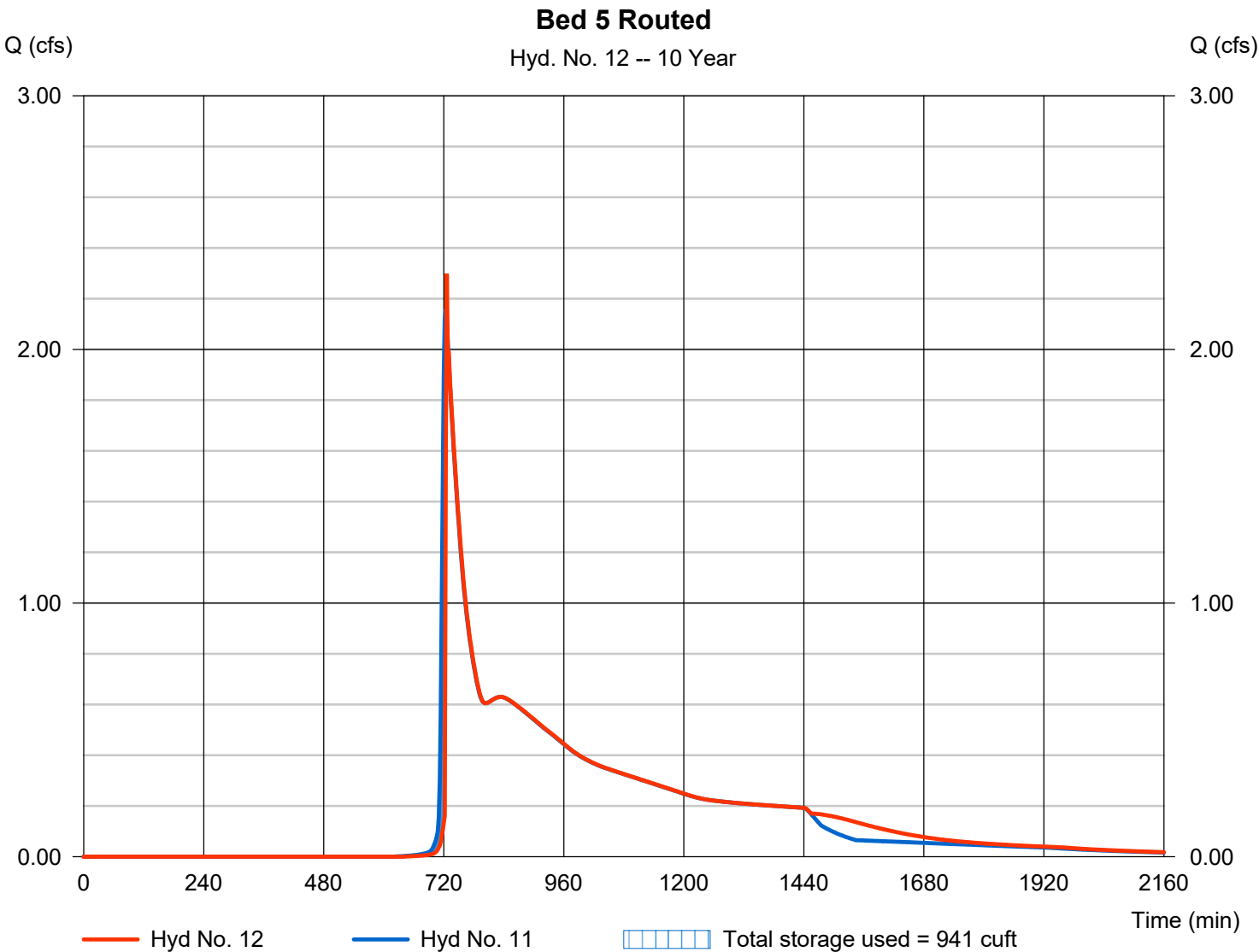
Hydrograph Report

Hyd. No. 12

Bed 5 Routed

Hydrograph type	= Reservoir	Peak discharge	= 2.299 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 22,135 cuft
Inflow hyd. No.	= 11 - Total to Bed 5	Max. Elevation	= 425.13 ft
Reservoir name	= Bed 5	Max. Storage	= 941 cuft

Storage Indication method used.

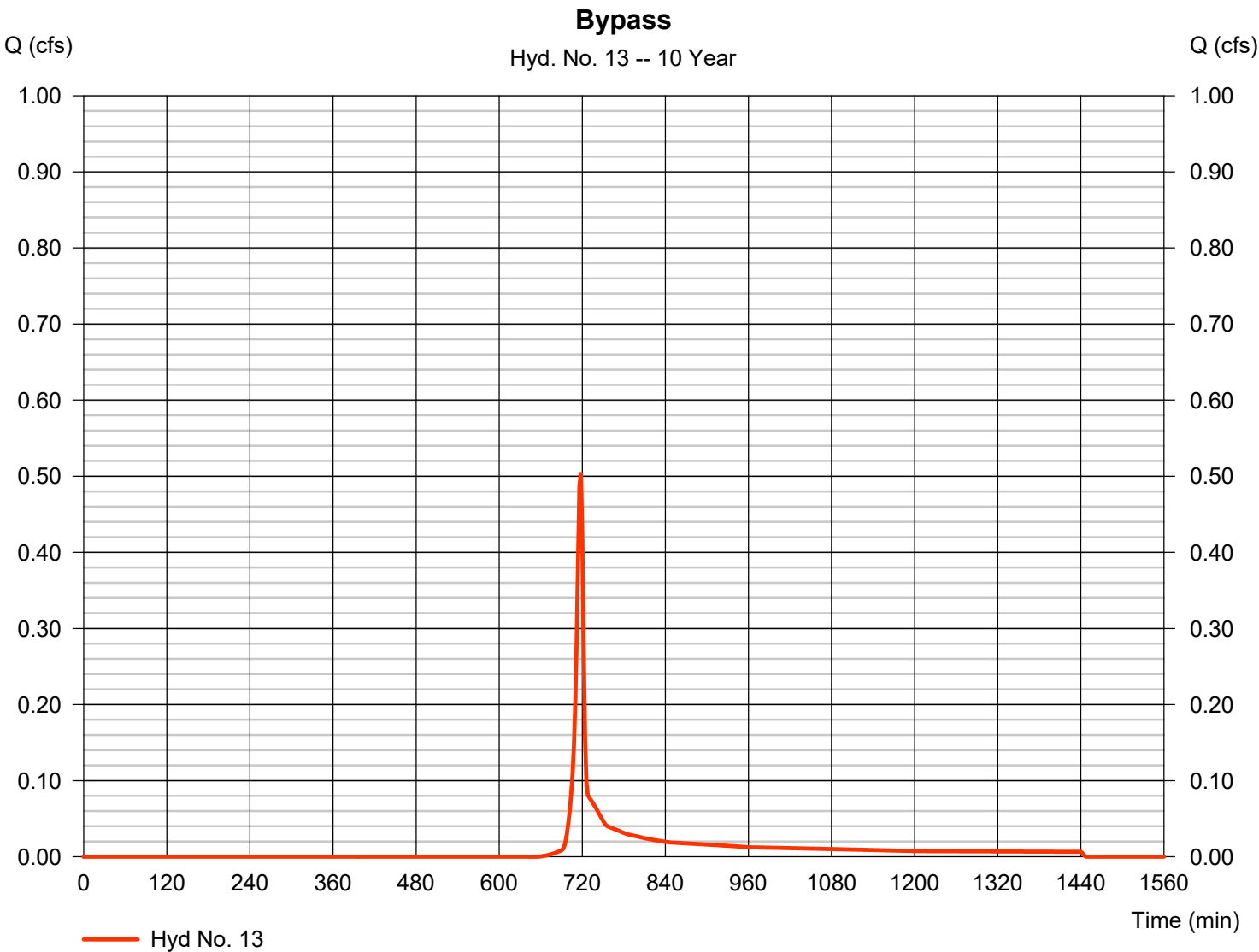


Hydrograph Report

Hyd. No. 13

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.505 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,014 cuft
Drainage area	= 0.200 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

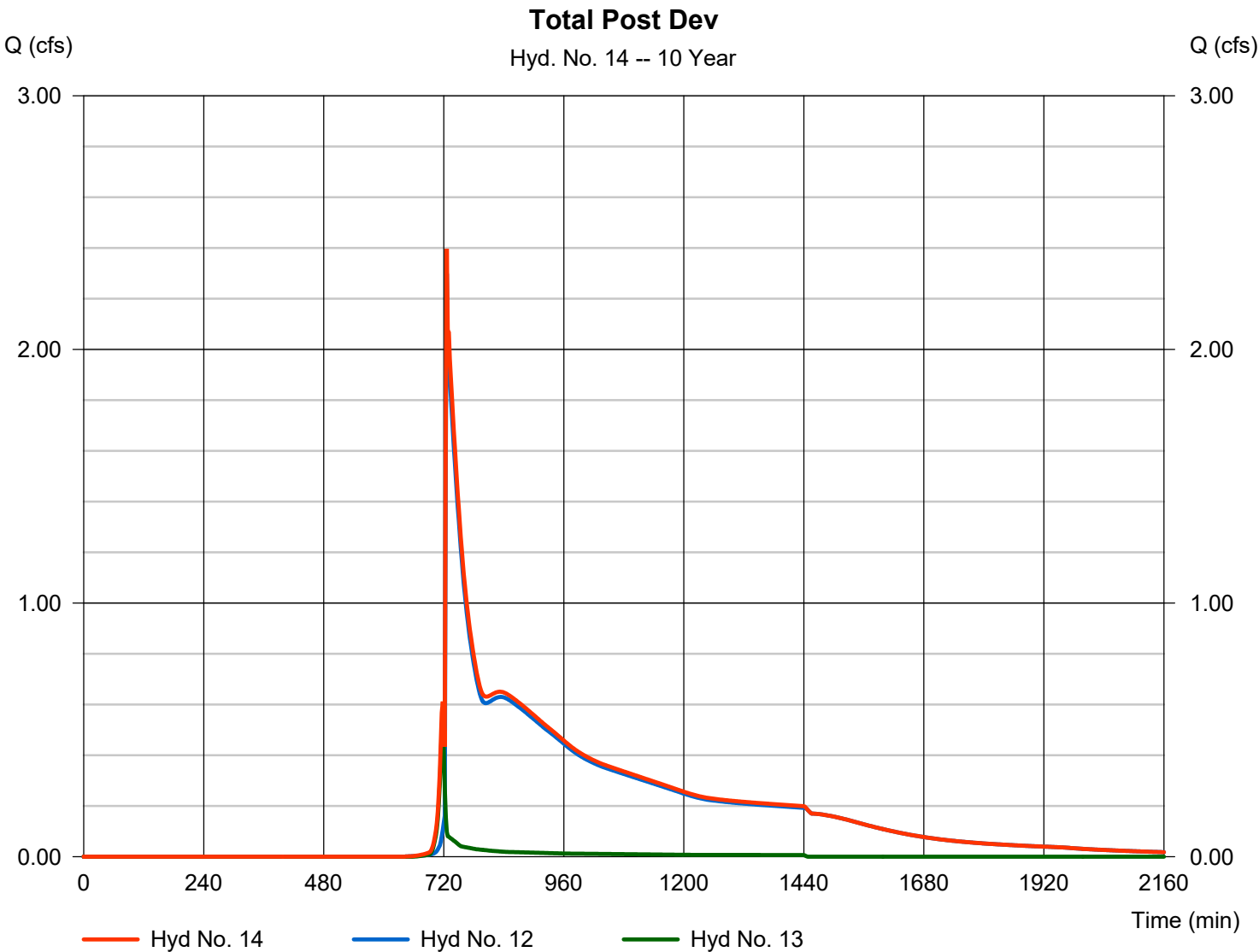


Hydrograph Report

Hyd. No. 14

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 2.396 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 23,149 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.200 ac



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

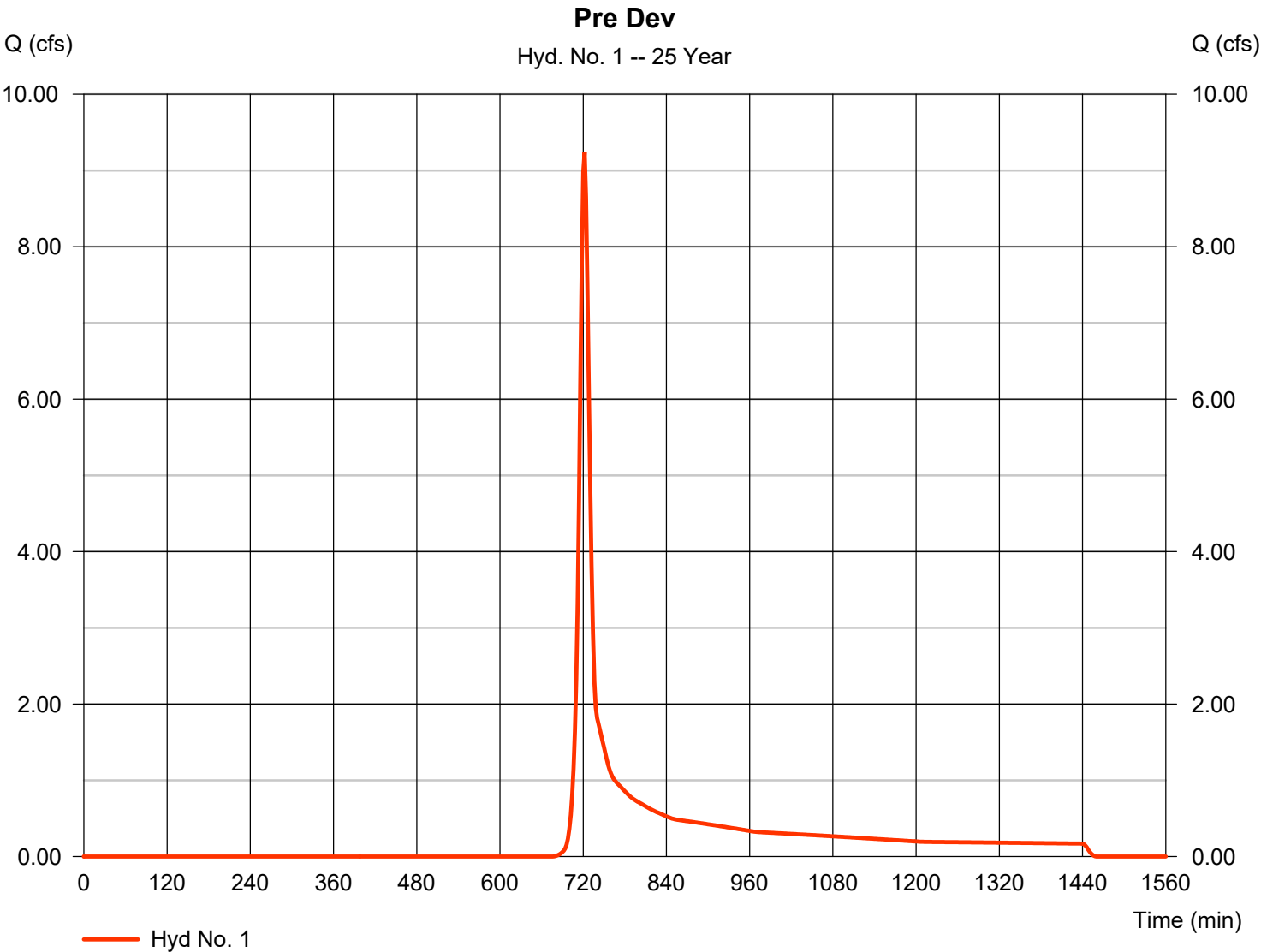
75

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 9.242 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 25,312 cuft
Drainage area	= 4.250 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.10 min
Total precip.	= 5.73 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



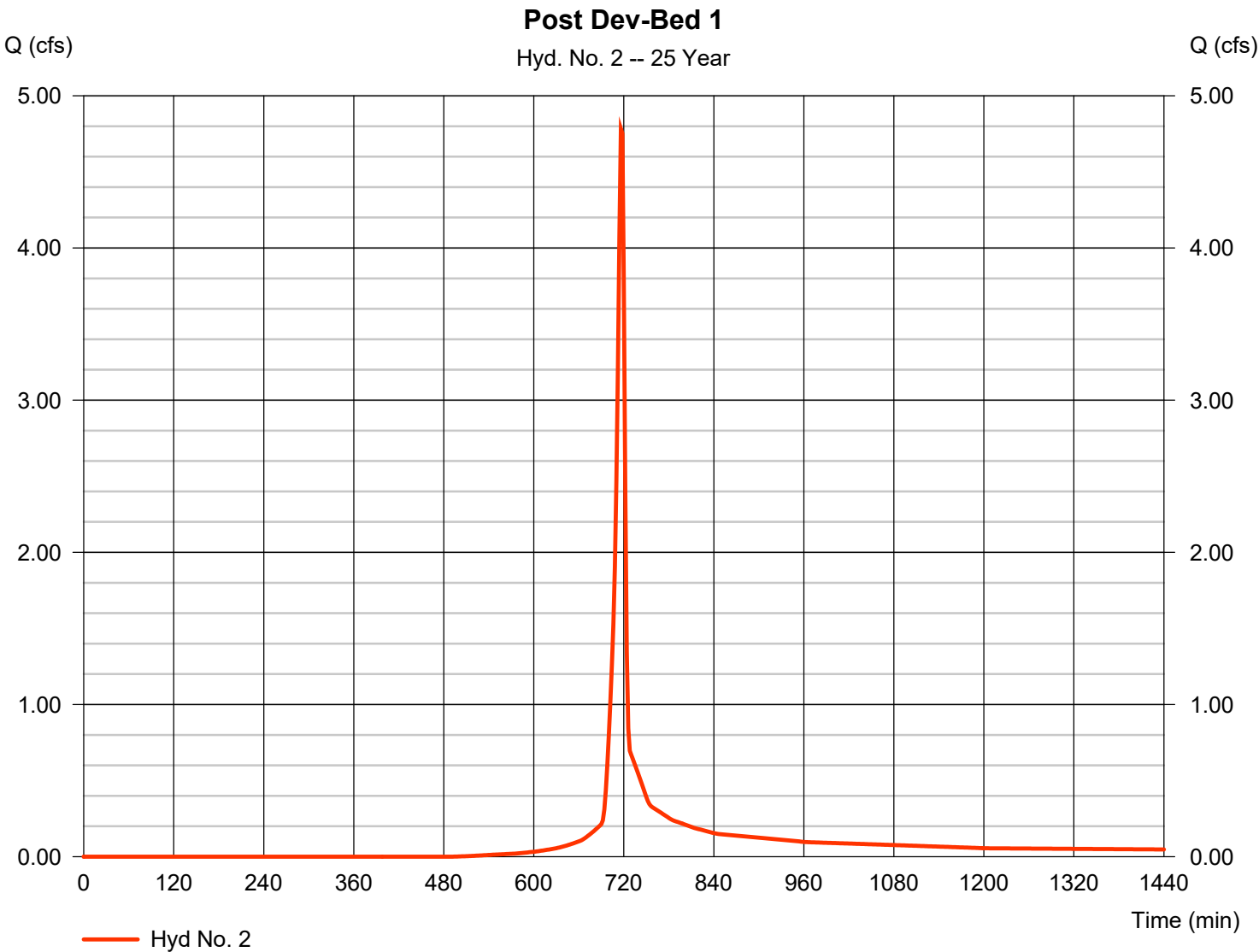
Hydrograph Report

Hyd. No. 2

Post Dev-Bed 1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.783 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 9,668 cuft
Drainage area	= 0.960 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.73 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 98) + (0.620 x 61)] / 0.960



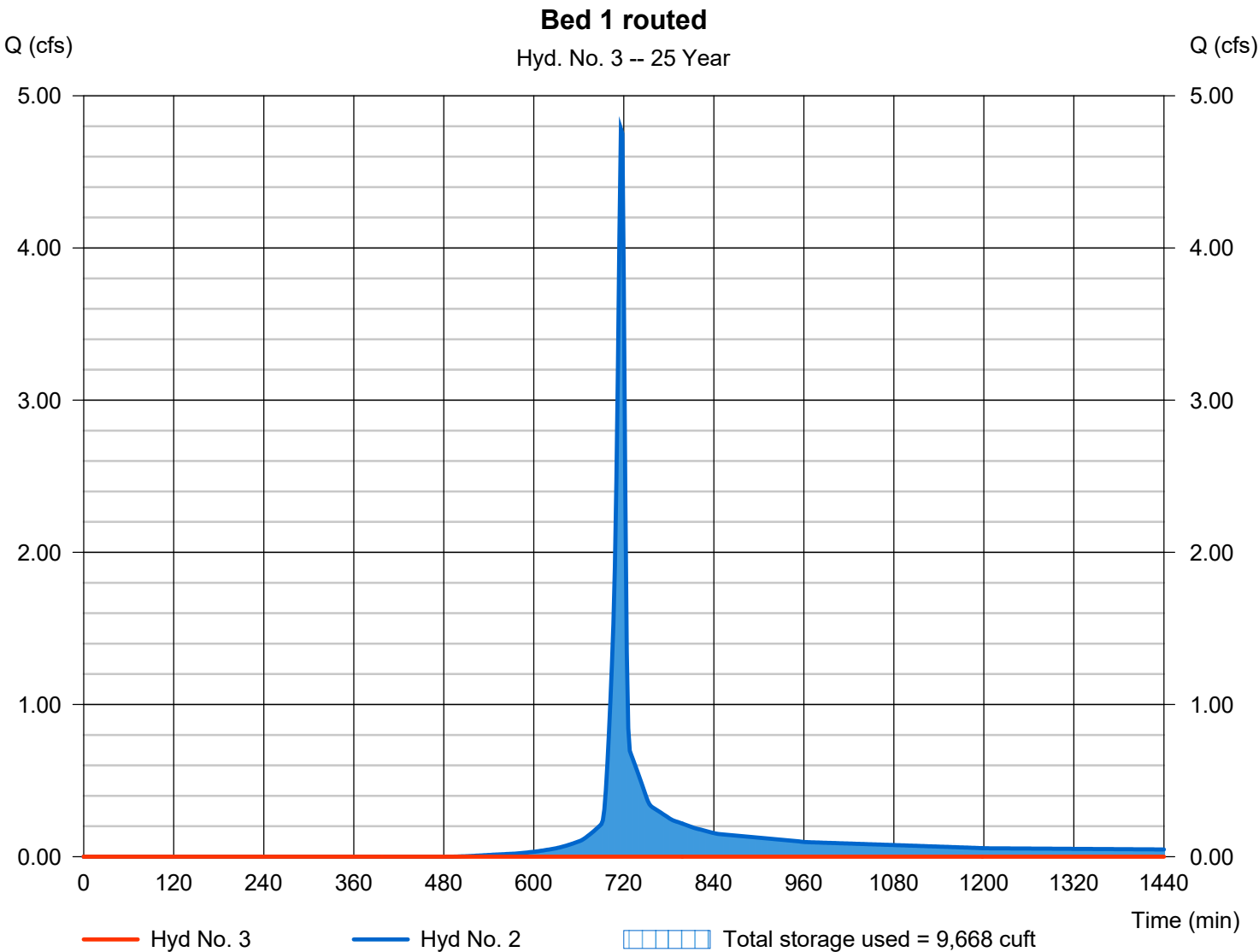
Hydrograph Report

Hyd. No. 3

Bed 1 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 25 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post Dev-Bed 1	Max. Elevation	= 439.36 ft
Reservoir name	= Bed 1	Max. Storage	= 9,668 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

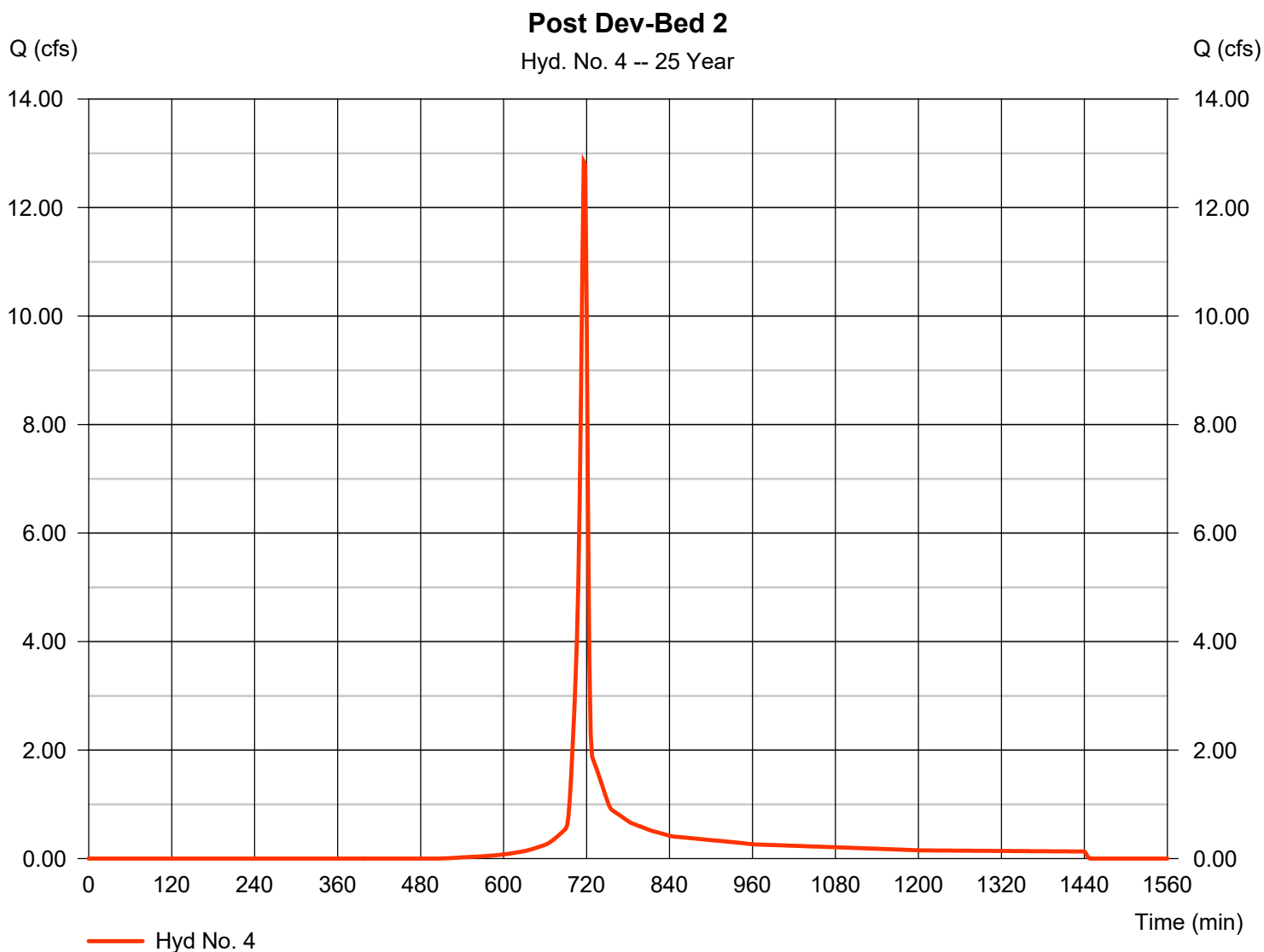
Wednesday, 01 / 31 / 2024

Hyd. No. 4

Post Dev-Bed 2

Hydrograph type	= SCS Runoff	Peak discharge	= 12.85 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 25,944 cuft
Drainage area	= 2.660 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.73 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.840 \times 98) + (1.820 \times 61)] / 2.660$

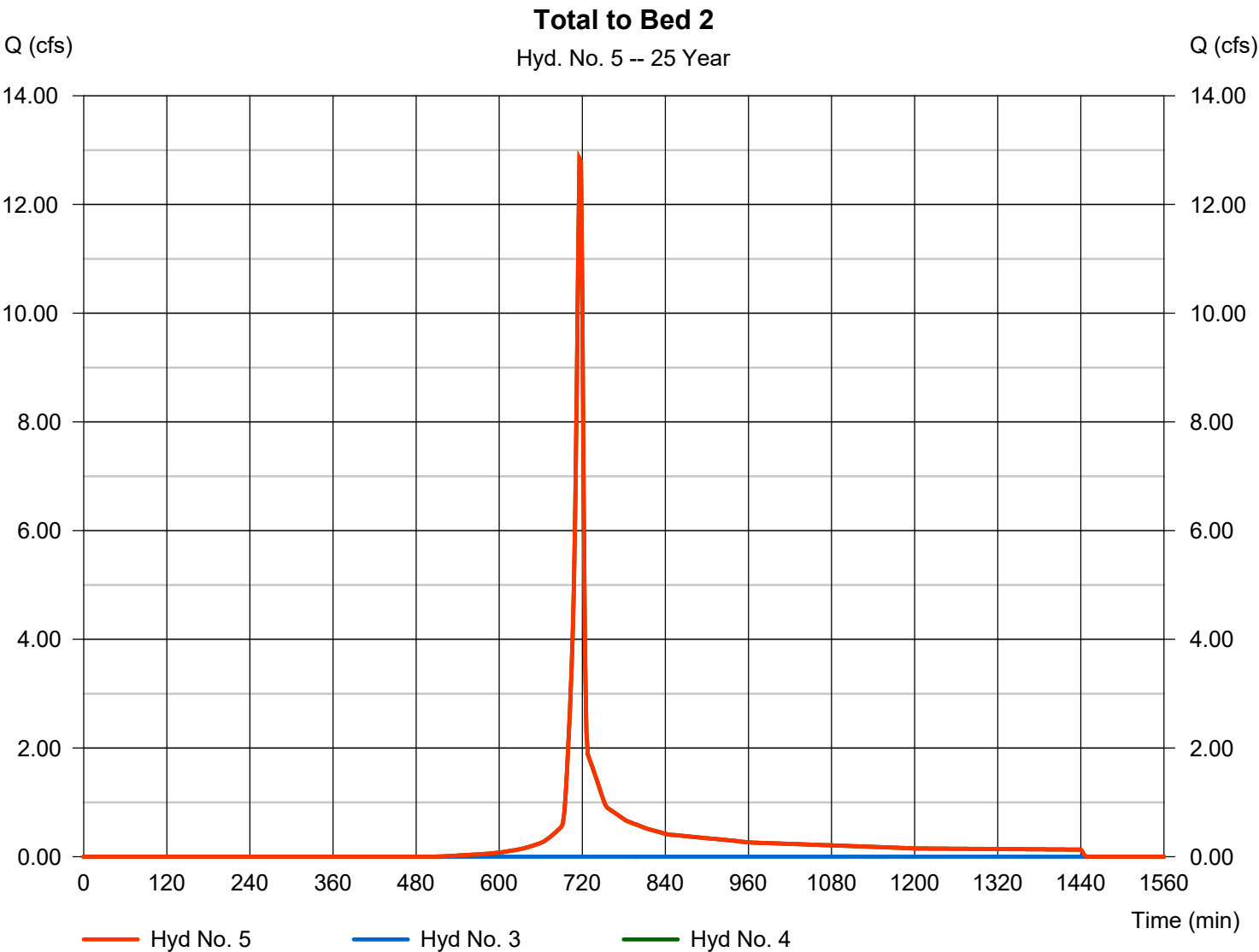


Hydrograph Report

Hyd. No. 5

Total to Bed 2

Hydrograph type	= Combine	Peak discharge	= 12.85 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 25,944 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.660 ac



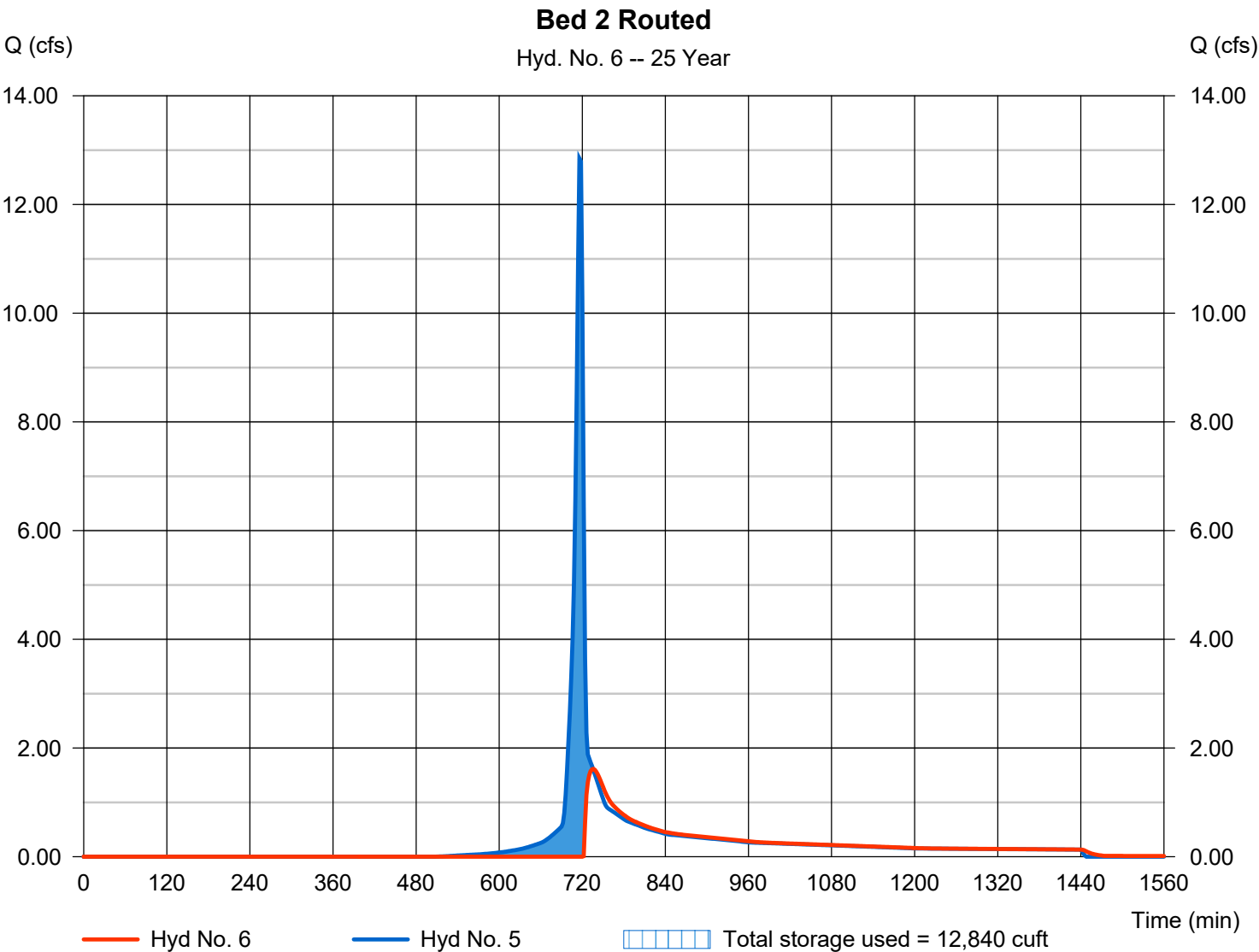
Hydrograph Report

Hyd. No. 6

Bed 2 Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.614 cfs
Storm frequency	= 25 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 14,375 cuft
Inflow hyd. No.	= 5 - Total to Bed 2	Max. Elevation	= 433.84 ft
Reservoir name	= Bed 2	Max. Storage	= 12,840 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

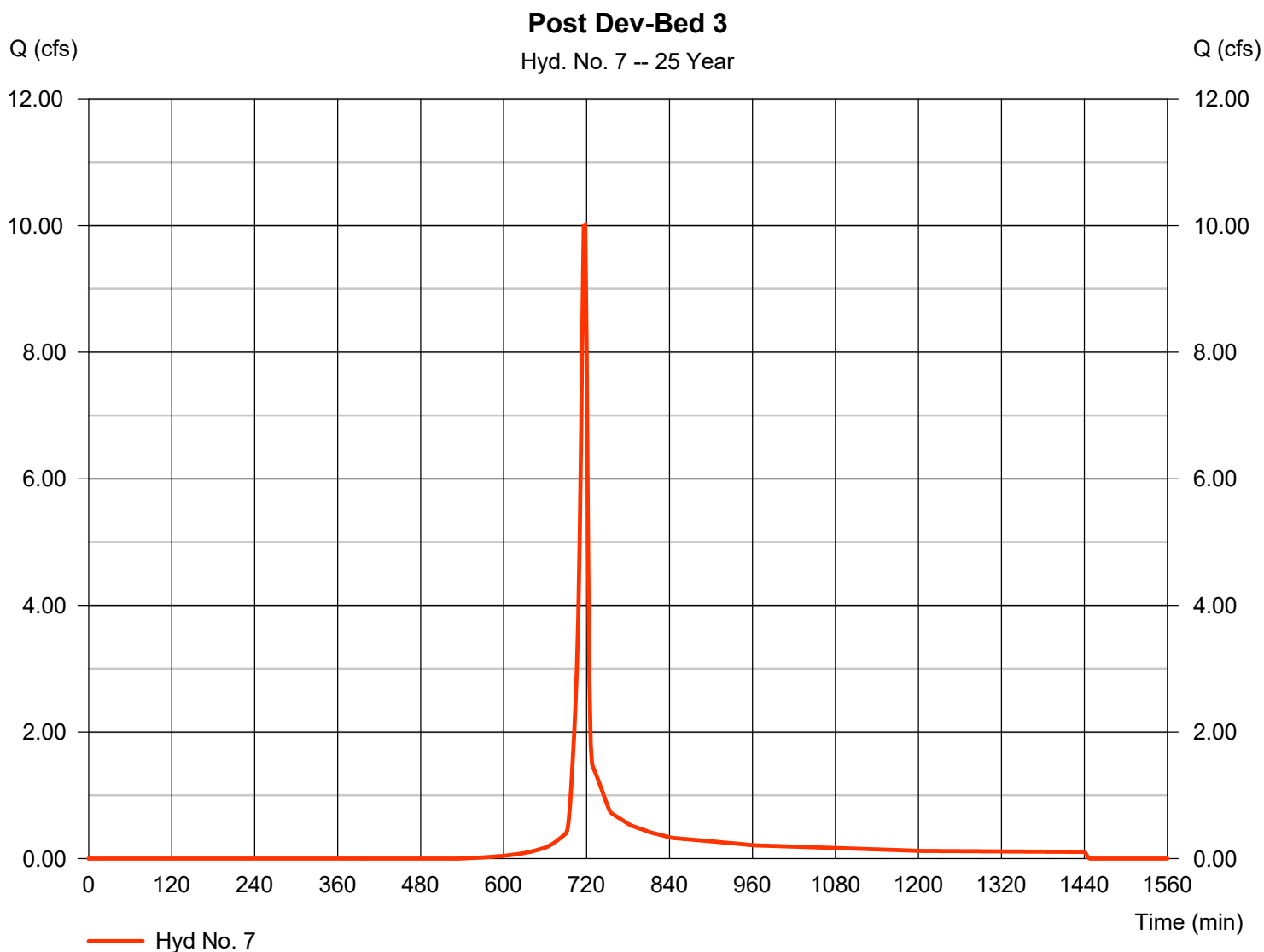
Wednesday, 01 / 31 / 2024

Hyd. No. 7

Post Dev-Bed 3

Hydrograph type	= SCS Runoff	Peak discharge	= 10.00 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 20,177 cuft
Drainage area	= 2.210 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.73 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.620 \times 98) + (1.590 \times 61)] / 2.210$

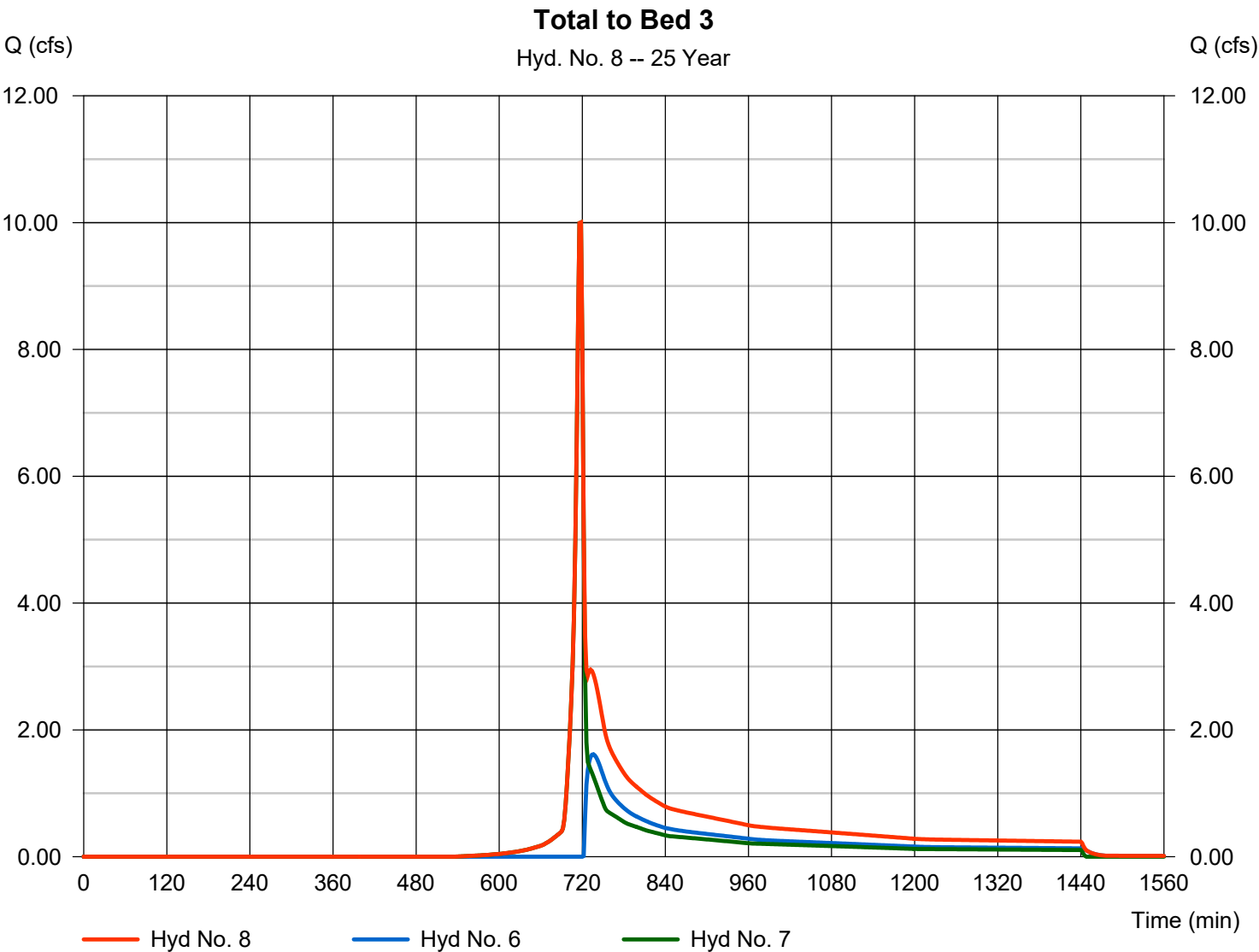


Hydrograph Report

Hyd. No. 8

Total to Bed 3

Hydrograph type	= Combine	Peak discharge	= 10.00 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 34,552 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 2.210 ac



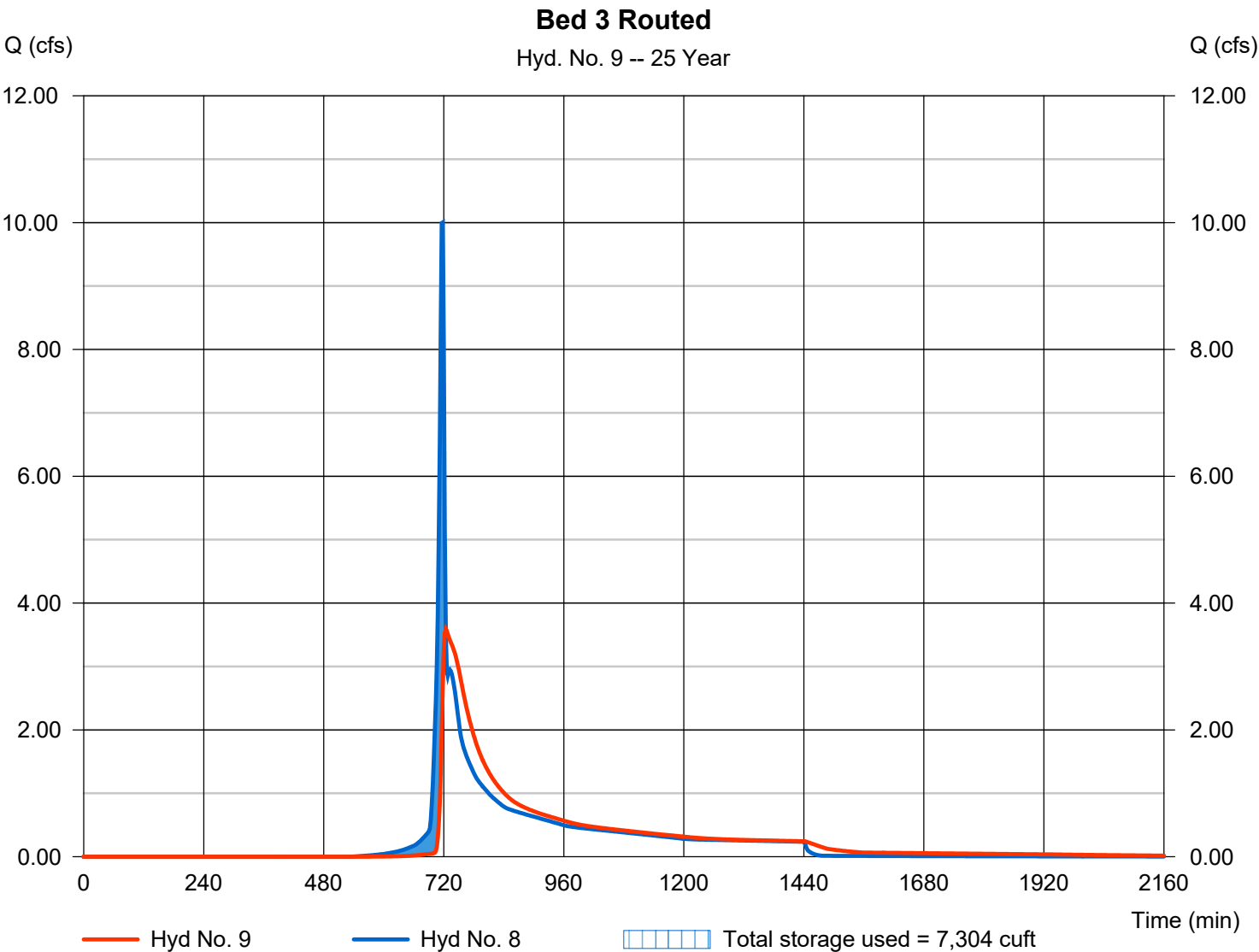
Hydrograph Report

Hyd. No. 9

Bed 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 3.592 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 34,530 cuft
Inflow hyd. No.	= 8 - Total to Bed 3	Max. Elevation	= 425.28 ft
Reservoir name	= Bed 3	Max. Storage	= 7,304 cuft

Storage Indication method used.

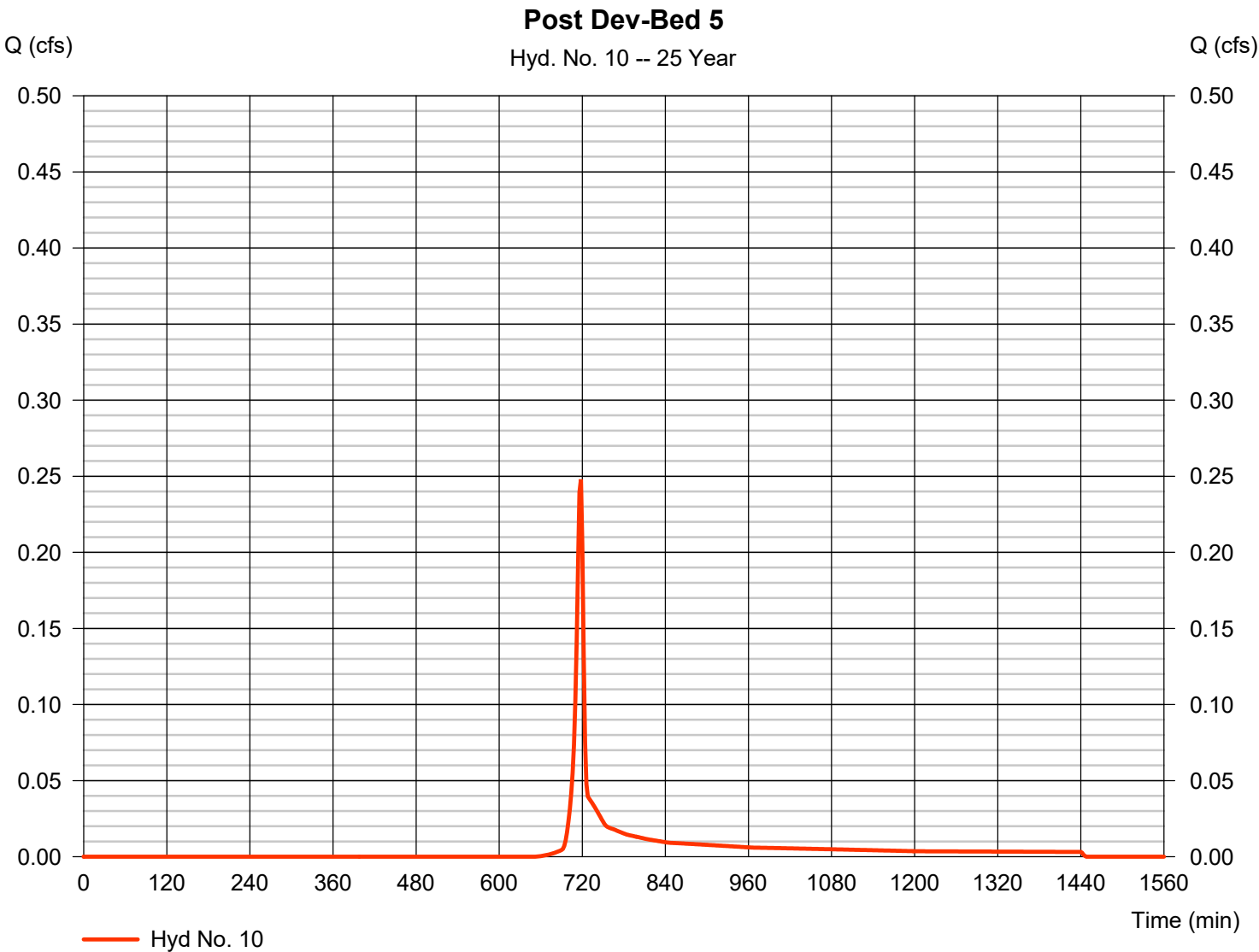


Hydrograph Report

Hyd. No. 10

Post Dev-Bed 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.248 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 497 cuft
Drainage area	= 0.080 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.73 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

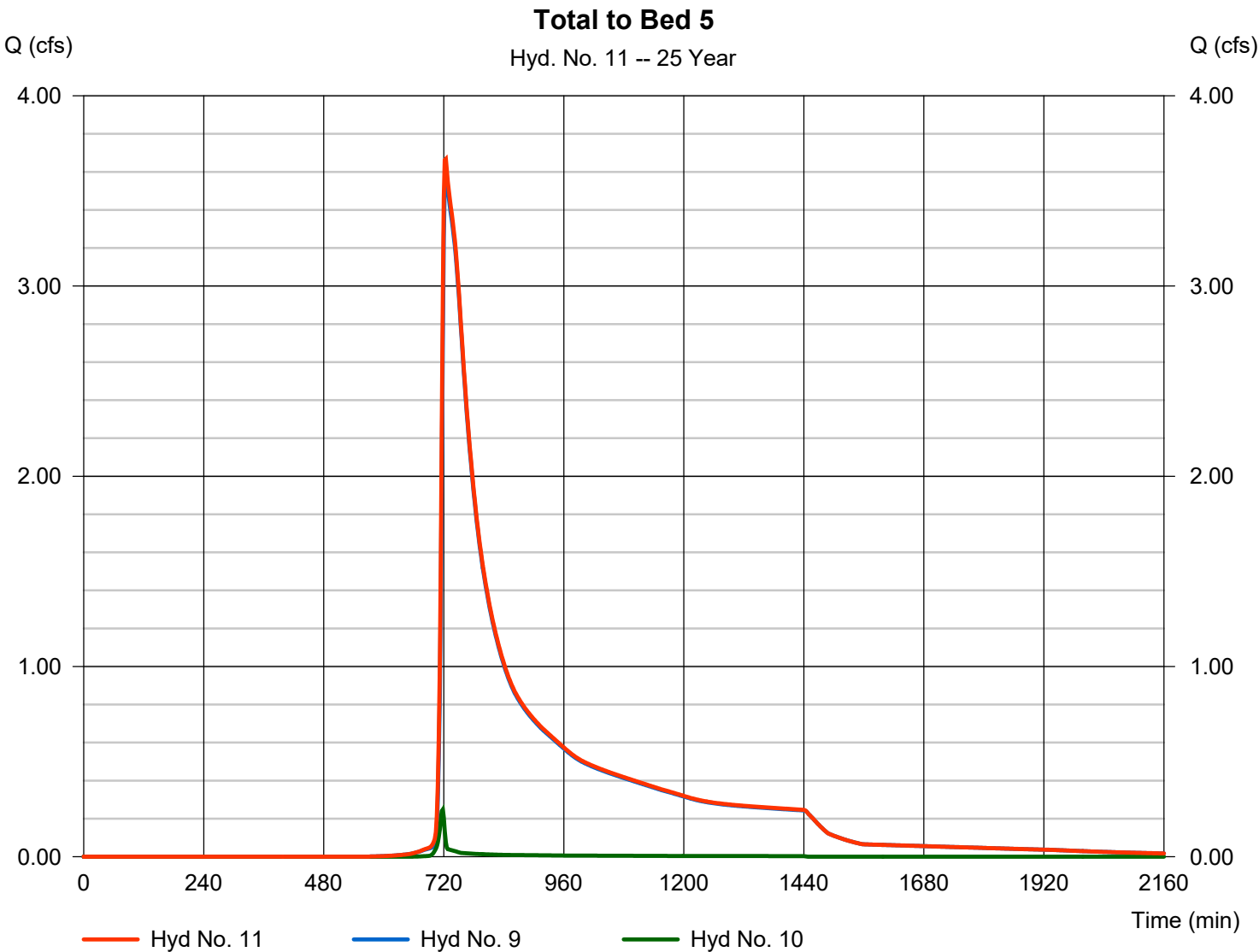


Hydrograph Report

Hyd. No. 11

Total to Bed 5

Hydrograph type	= Combine	Peak discharge	= 3.668 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 35,028 cuft
Inflow hyds.	= 9, 10	Contrib. drain. area	= 0.080 ac



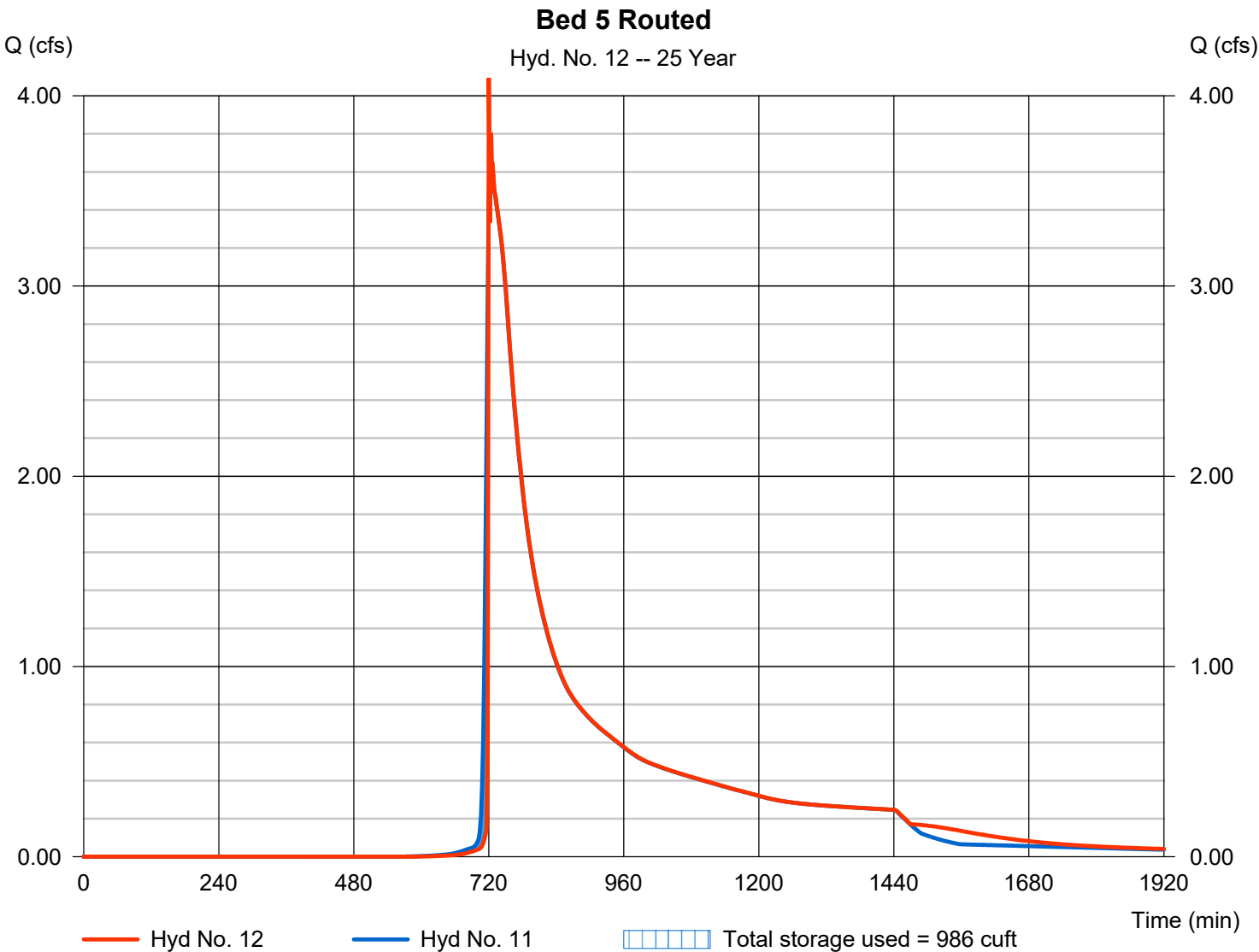
Hydrograph Report

Hyd. No. 12

Bed 5 Routed

Hydrograph type	= Reservoir	Peak discharge	= 4.093 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 35,026 cuft
Inflow hyd. No.	= 11 - Total to Bed 5	Max. Elevation	= 425.37 ft
Reservoir name	= Bed 5	Max. Storage	= 986 cuft

Storage Indication method used.

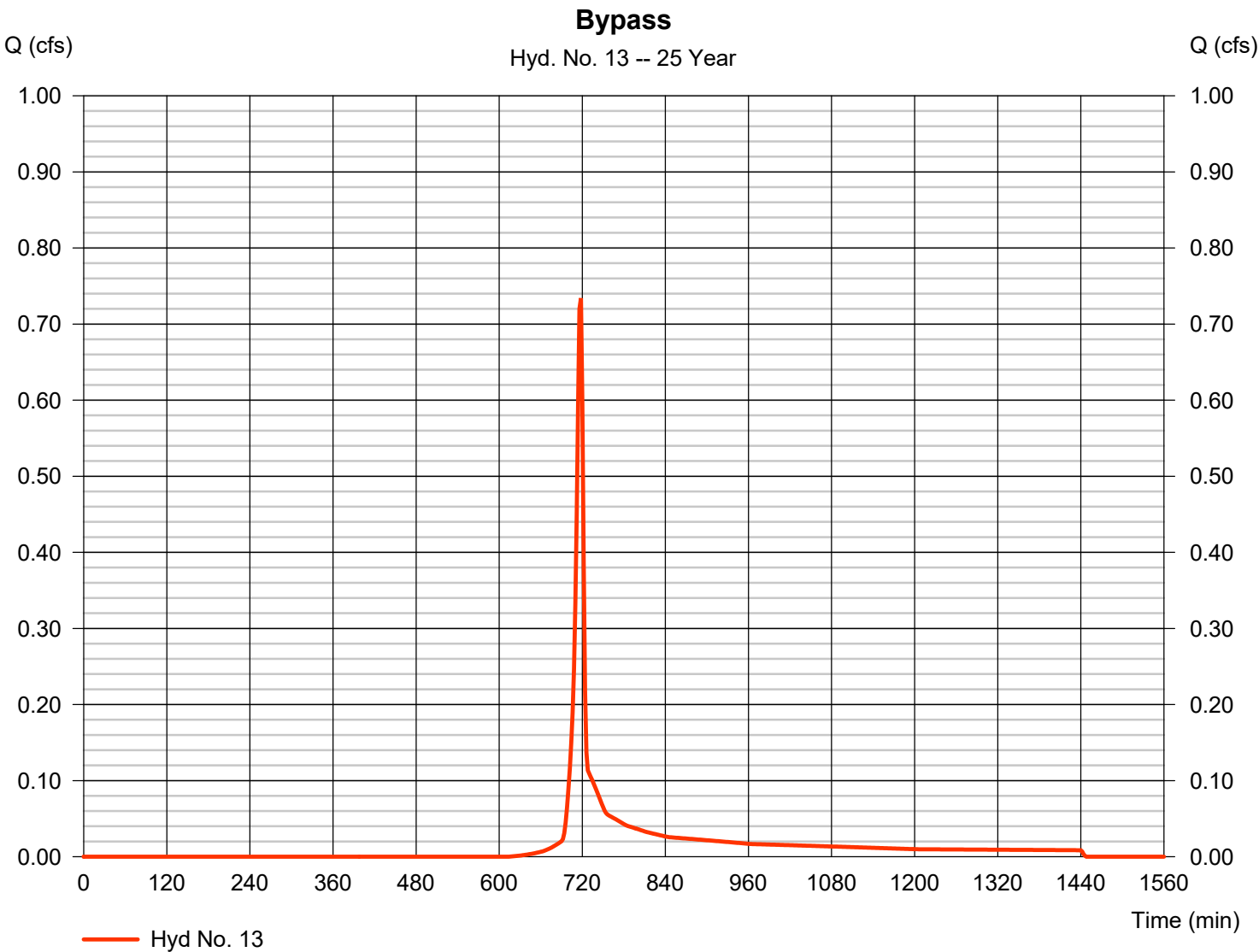


Hydrograph Report

Hyd. No. 13

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.734 cfs
Storm frequency	= 25 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,468 cuft
Drainage area	= 0.200 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.73 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

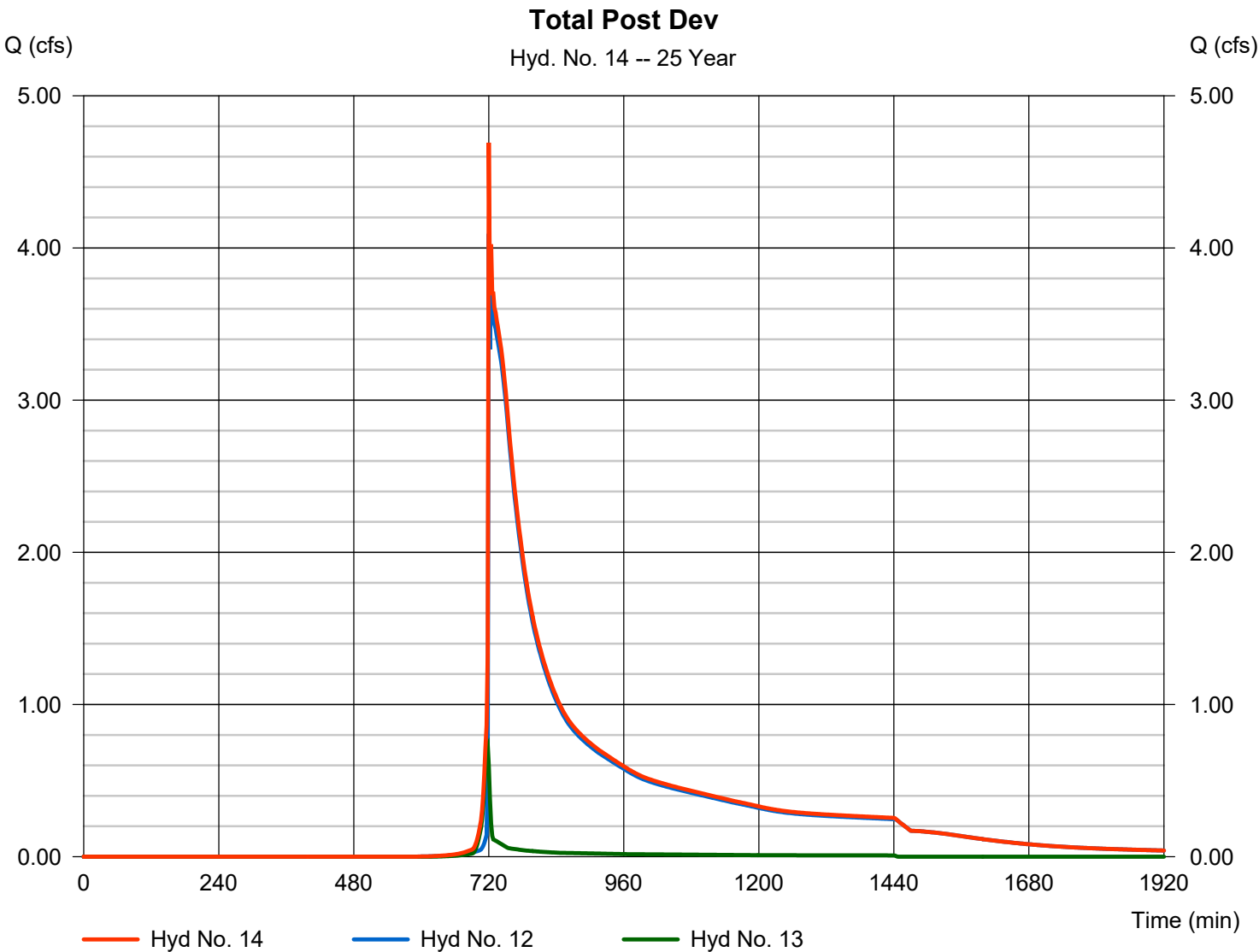


Hydrograph Report

Hyd. No. 14

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 4.692 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 36,494 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.200 ac



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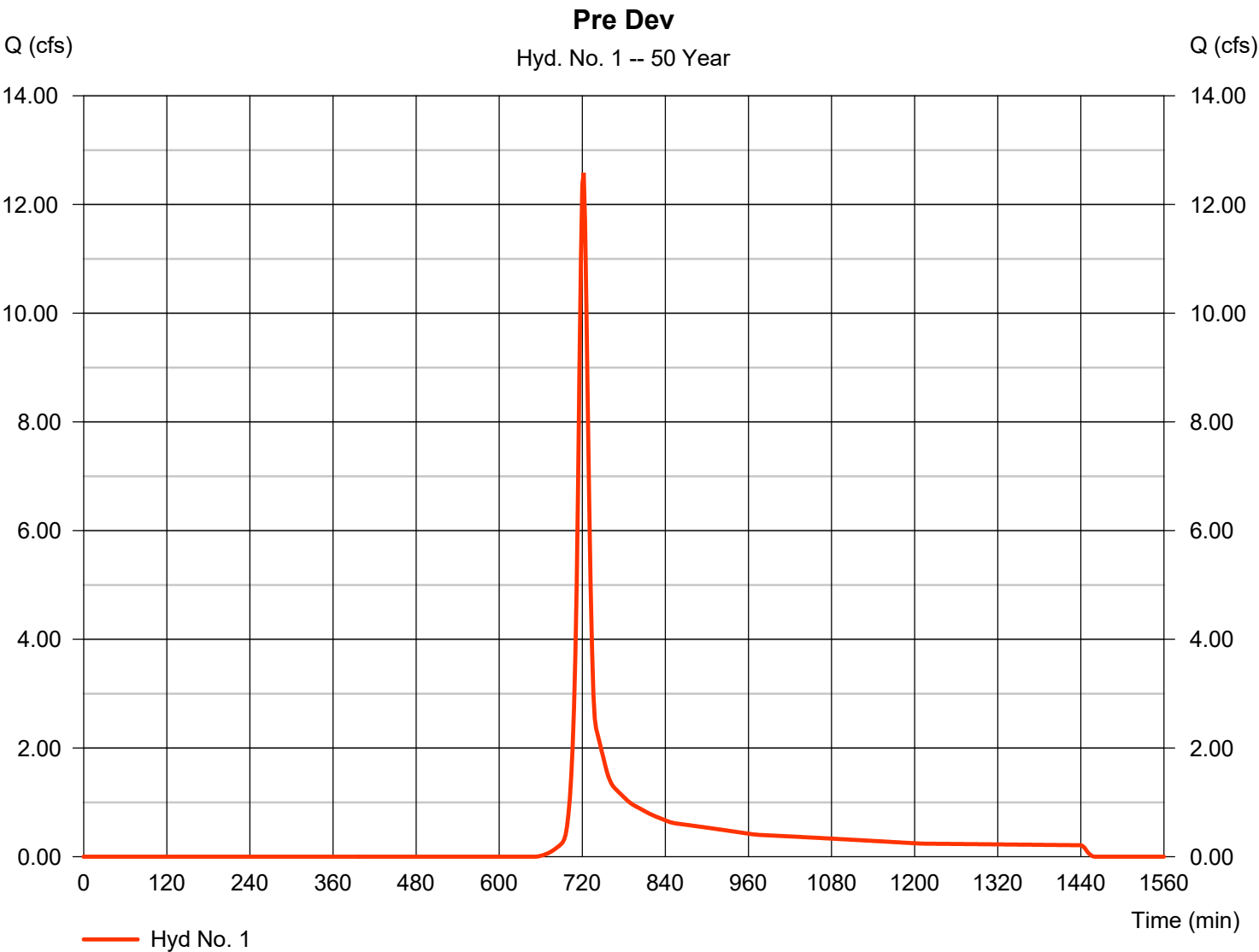
90

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.58 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	33,653 cuft
Drainage area	=	4.250 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.10 min
Total precip.	=	6.56 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



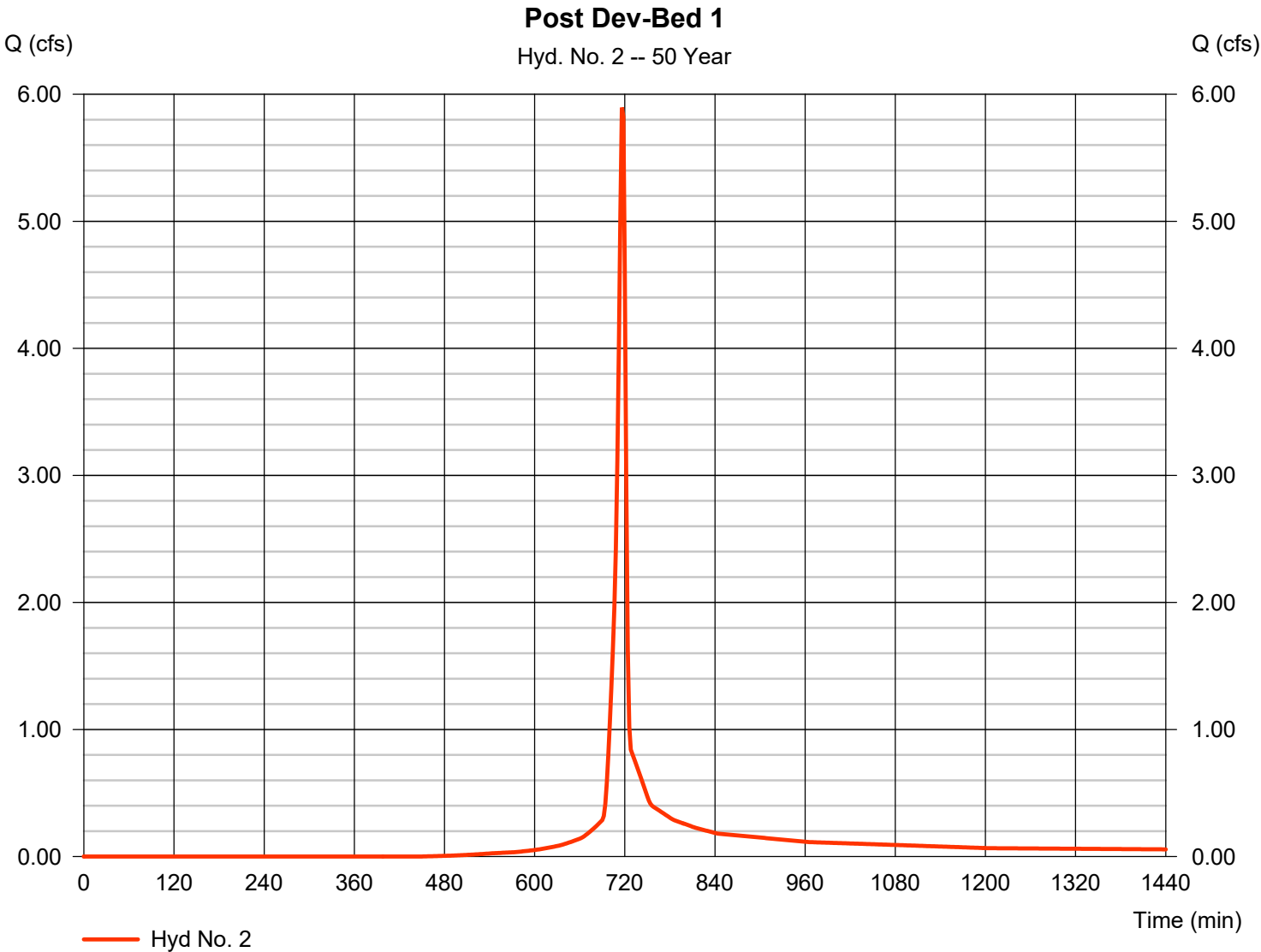
Hydrograph Report

Hyd. No. 2

Post Dev-Bed 1

Hydrograph type	= SCS Runoff	Peak discharge	= 5.896 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 11,961 cuft
Drainage area	= 0.960 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 98) + (0.620 x 61)] / 0.960



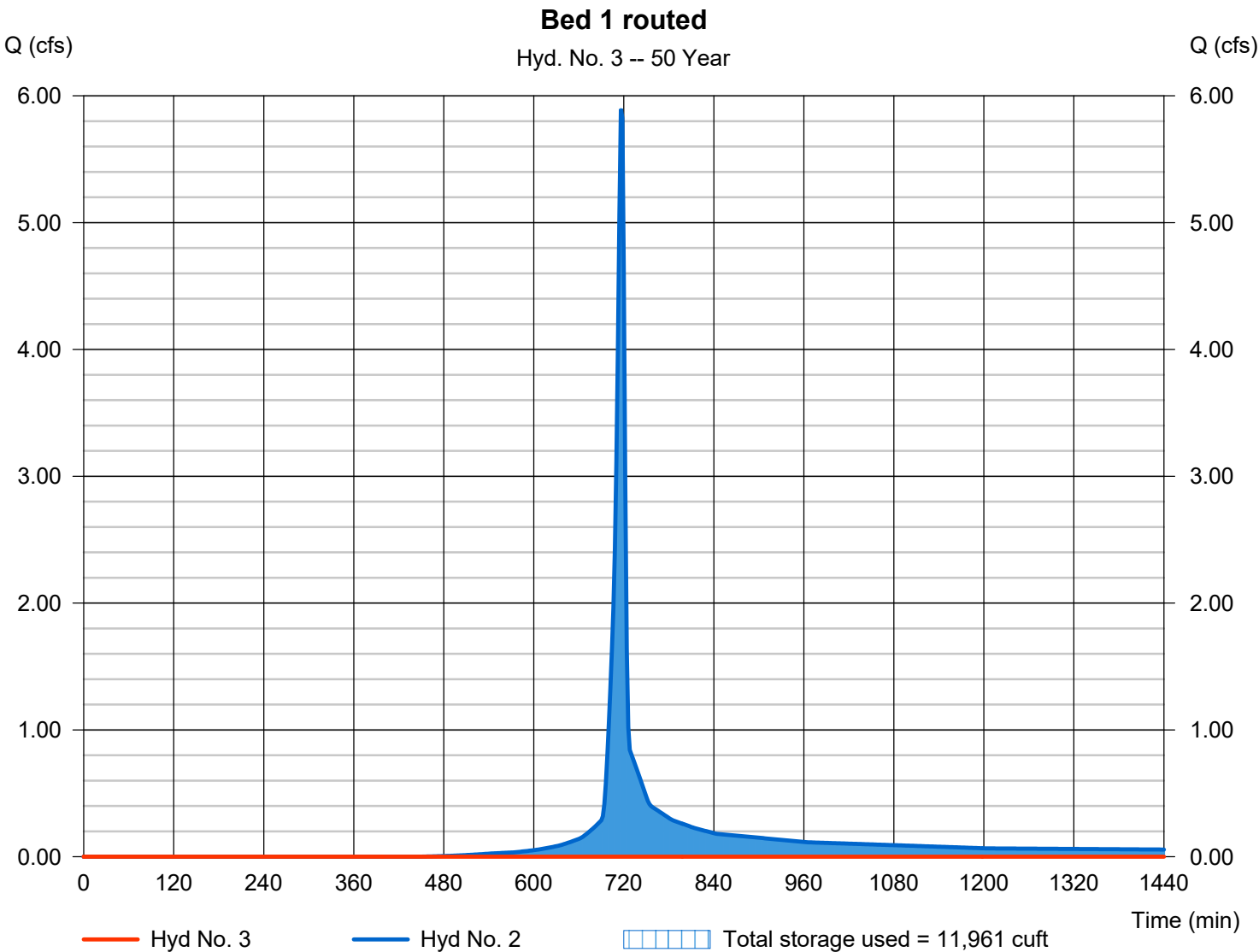
Hydrograph Report

Hyd. No. 3

Bed 1 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 50 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post Dev-Bed 1	Max. Elevation	= 439.91 ft
Reservoir name	= Bed 1	Max. Storage	= 11,961 cuft

Storage Indication method used.



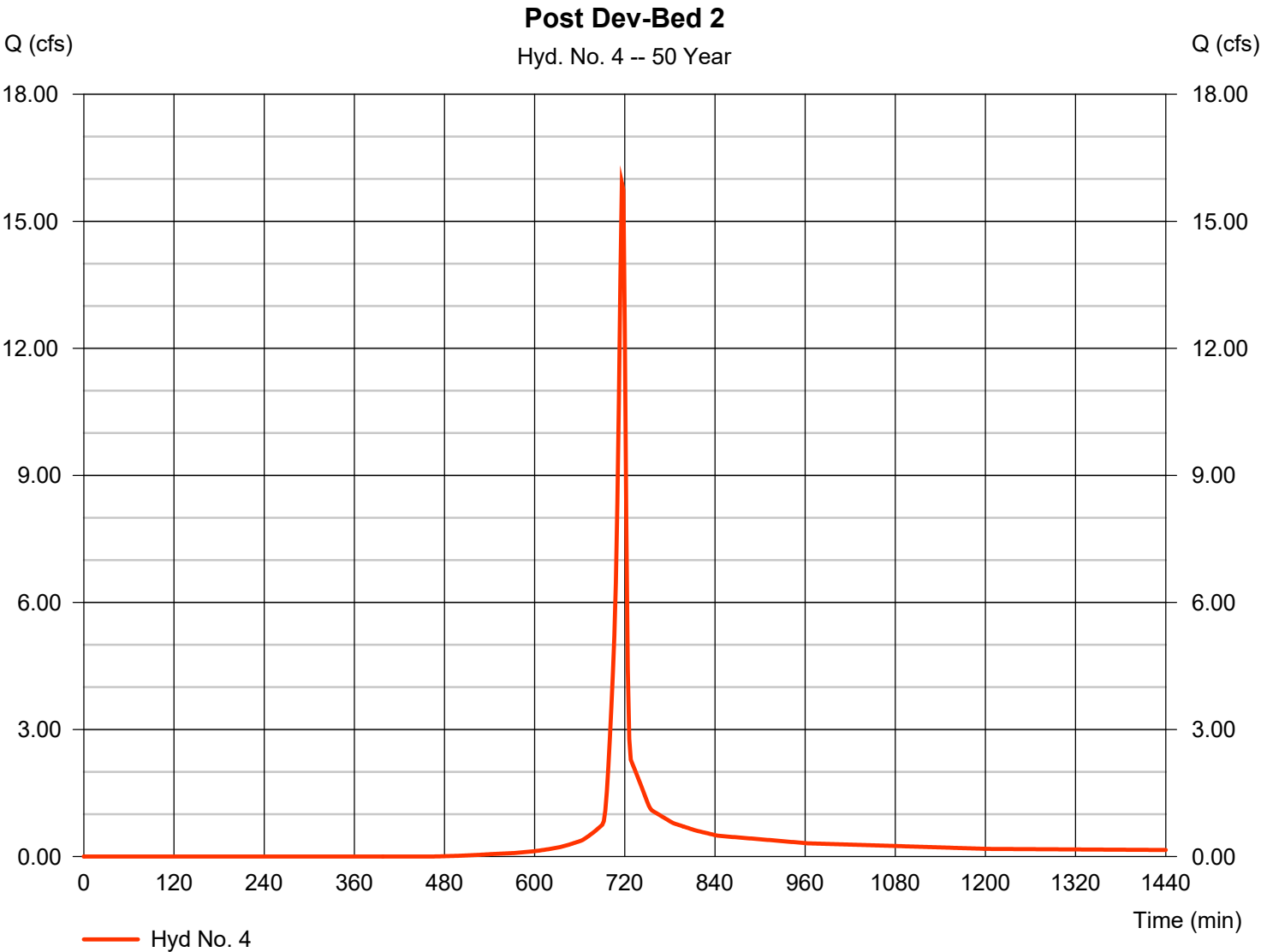
Hydrograph Report

Hyd. No. 4

Post Dev-Bed 2

Hydrograph type	= SCS Runoff	Peak discharge	= 15.91 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 32,215 cuft
Drainage area	= 2.660 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 98) + (1.820 x 61)] / 2.660

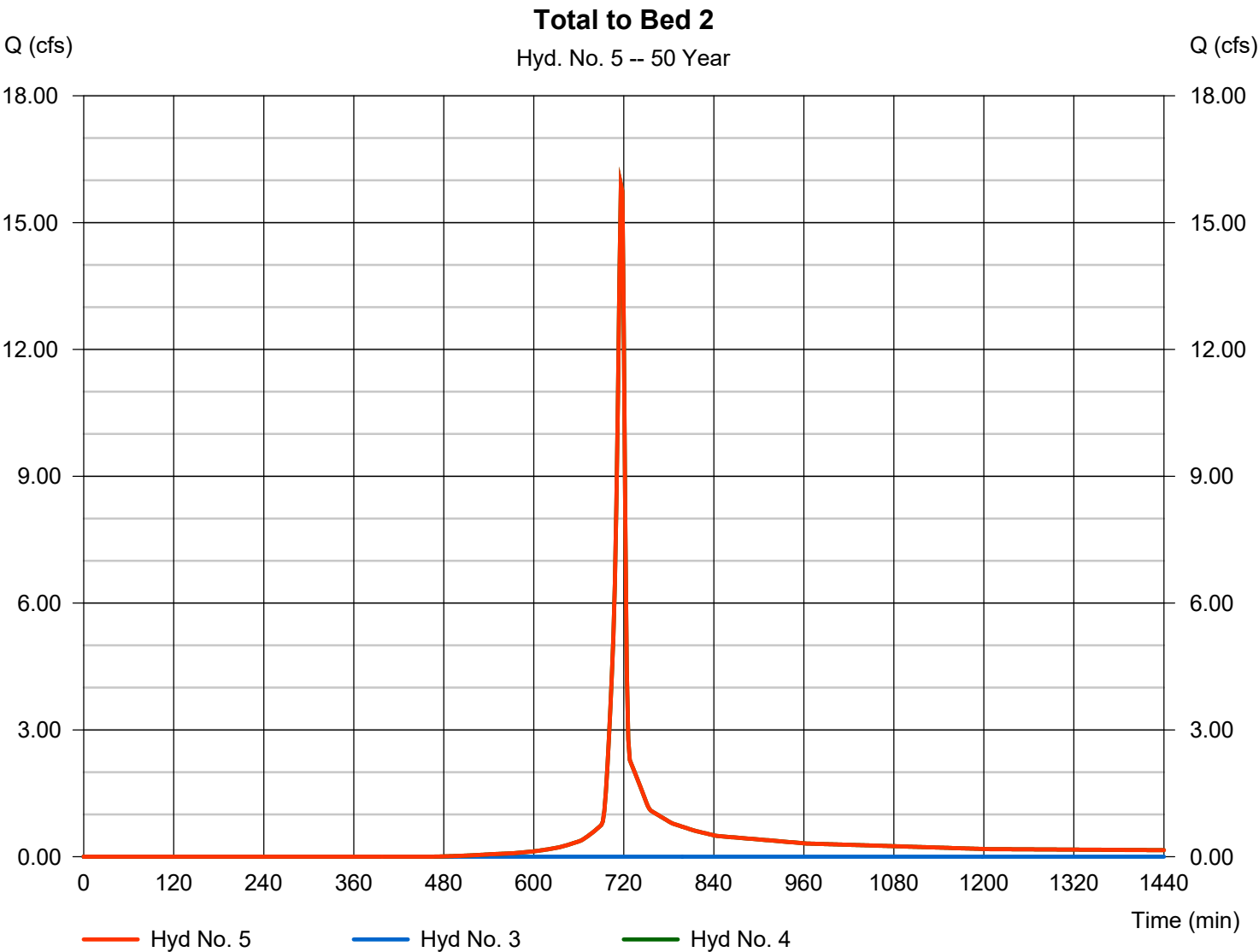


Hydrograph Report

Hyd. No. 5

Total to Bed 2

Hydrograph type	= Combine	Peak discharge	= 15.91 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 32,215 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.660 ac



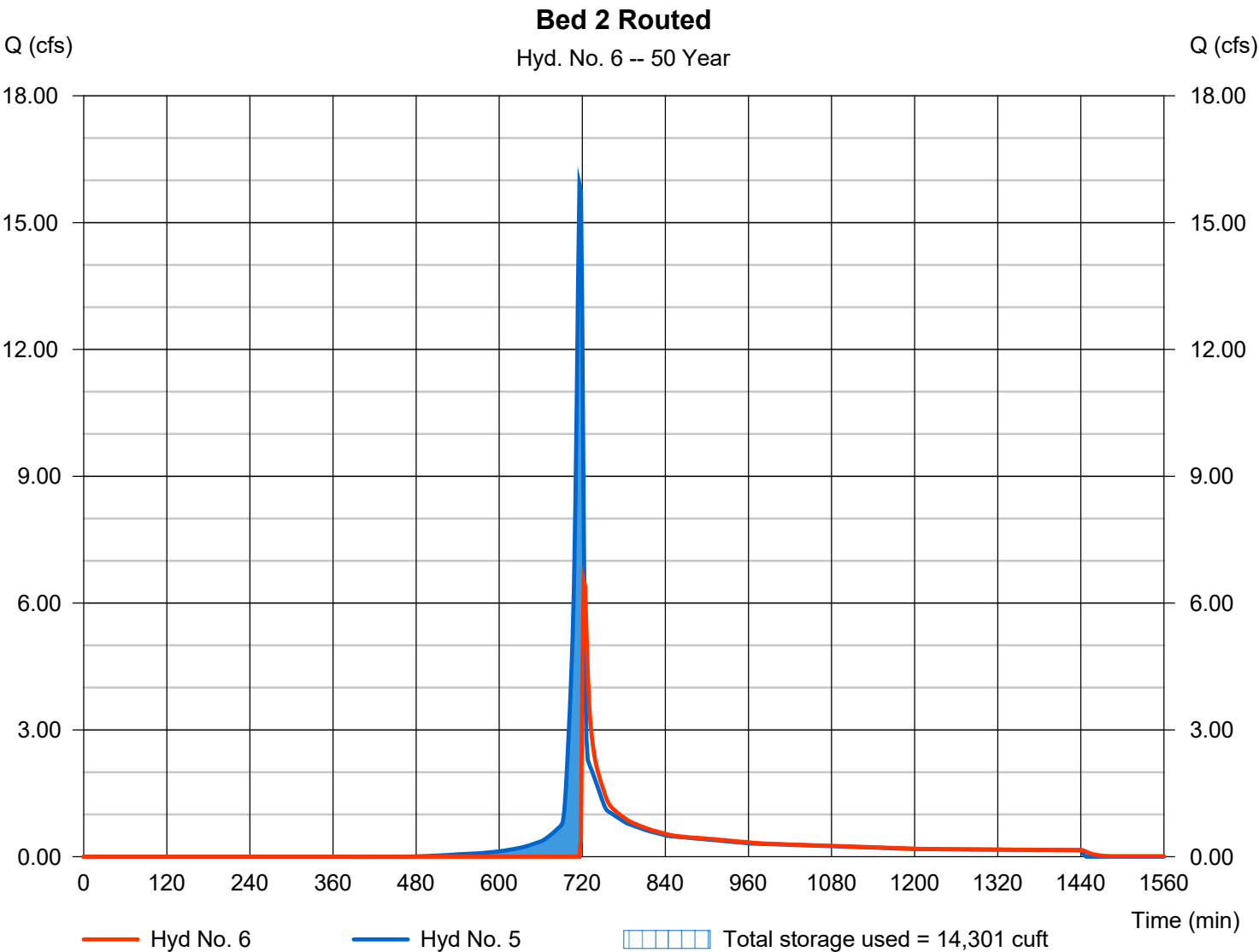
Hydrograph Report

Hyd. No. 6

Bed 2 Routed

Hydrograph type	= Reservoir	Peak discharge	= 6.547 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 20,646 cuft
Inflow hyd. No.	= 5 - Total to Bed 2	Max. Elevation	= 434.24 ft
Reservoir name	= Bed 2	Max. Storage	= 14,301 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

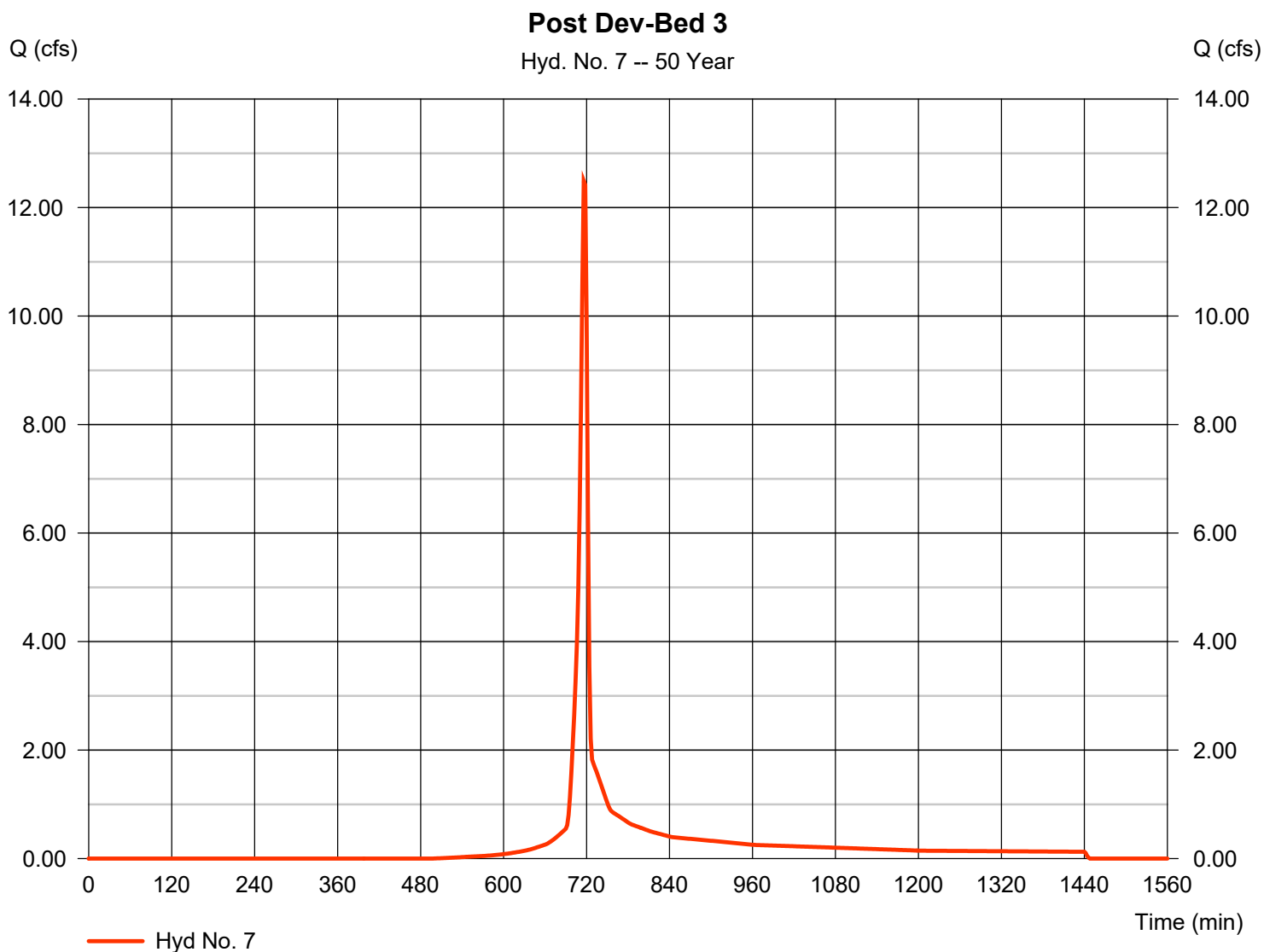
Wednesday, 01 / 31 / 2024

Hyd. No. 7

Post Dev-Bed 3

Hydrograph type	= SCS Runoff	Peak discharge	= 12.49 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 25,241 cuft
Drainage area	= 2.210 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.620 \times 98) + (1.590 \times 61)] / 2.210$

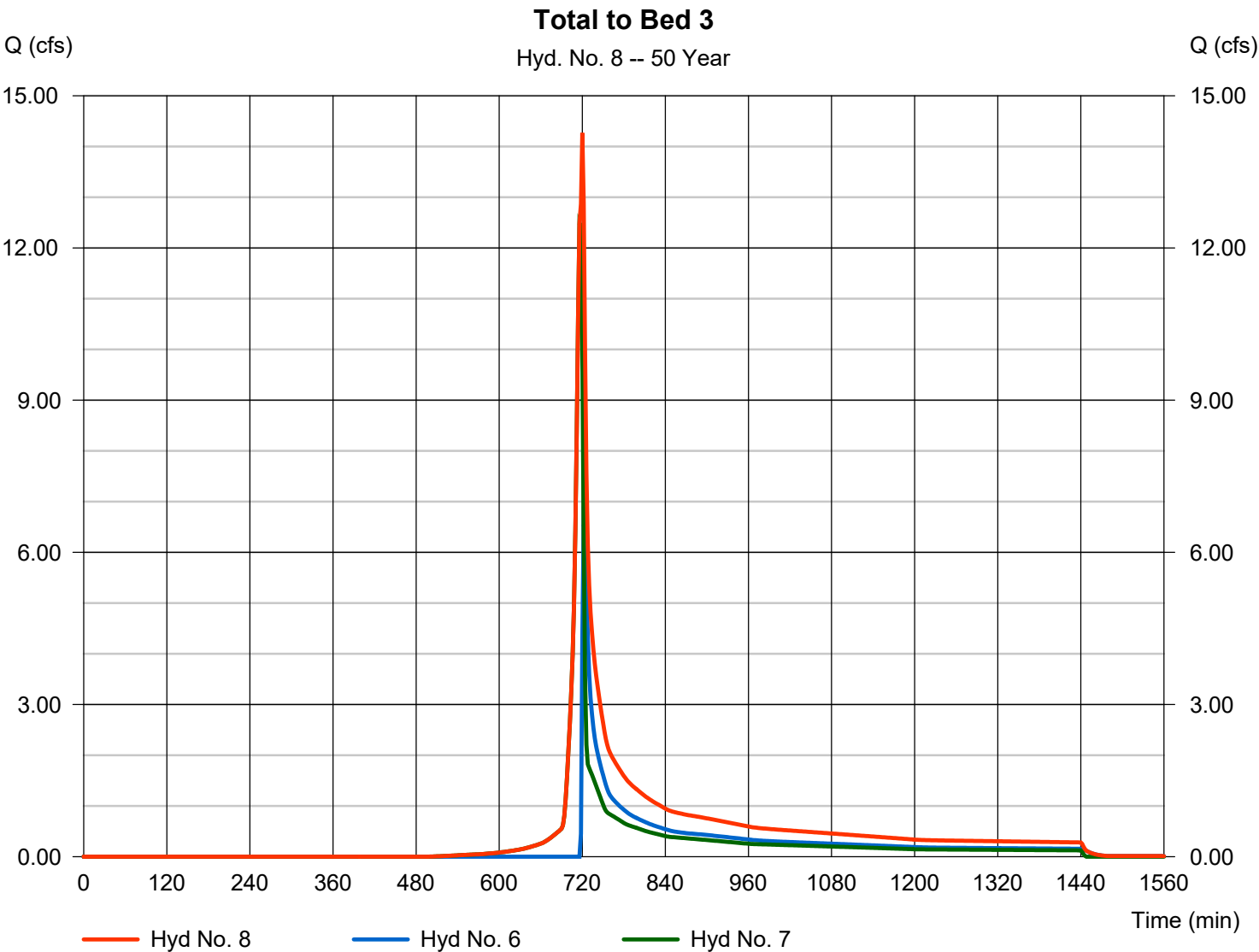


Hydrograph Report

Hyd. No. 8

Total to Bed 3

Hydrograph type	= Combine	Peak discharge	= 14.27 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 45,887 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 2.210 ac



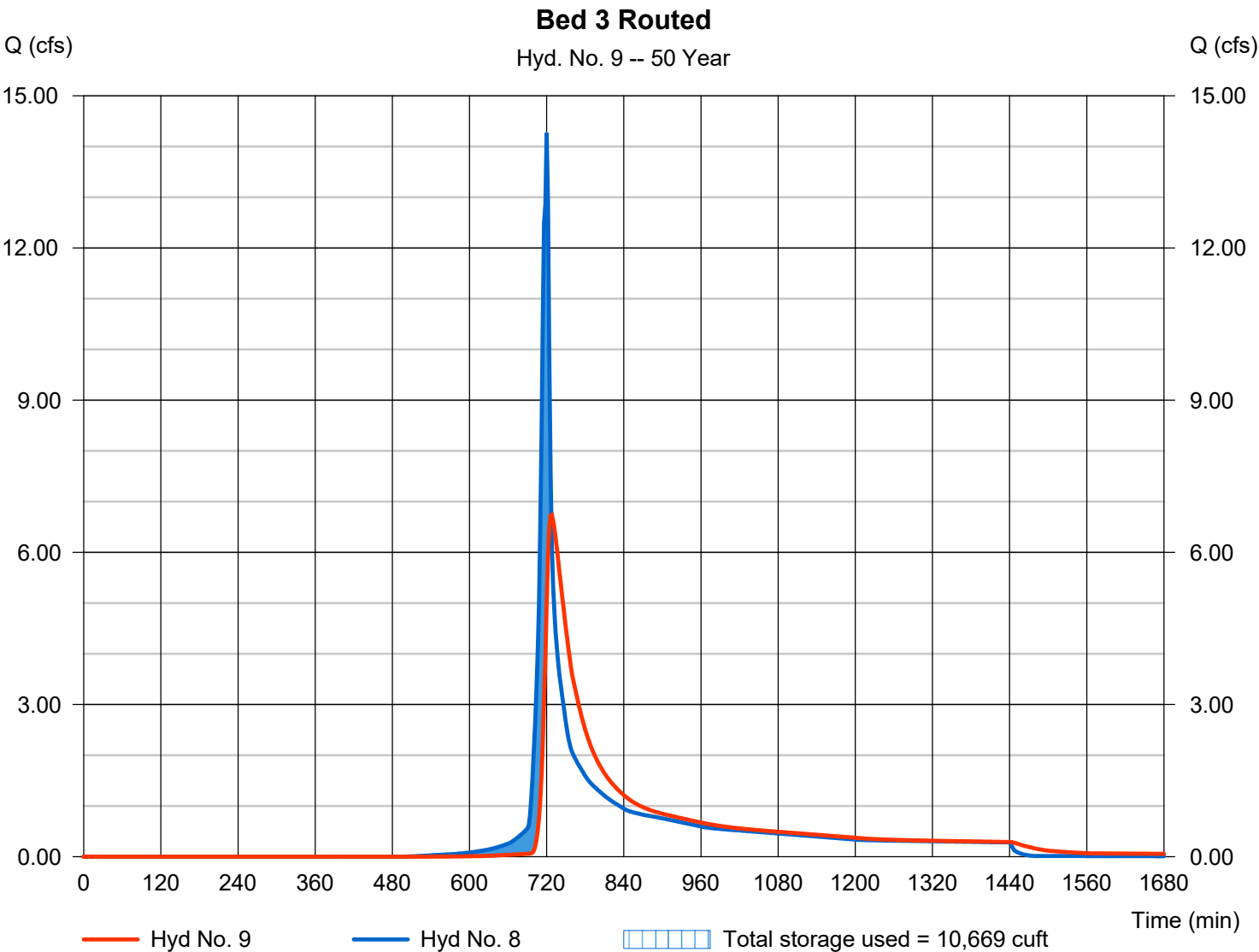
Hydrograph Report

Hyd. No. 9

Bed 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 6.739 cfs
Storm frequency	= 50 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 45,866 cuft
Inflow hyd. No.	= 8 - Total to Bed 3	Max. Elevation	= 426.34 ft
Reservoir name	= Bed 3	Max. Storage	= 10,669 cuft

Storage Indication method used.

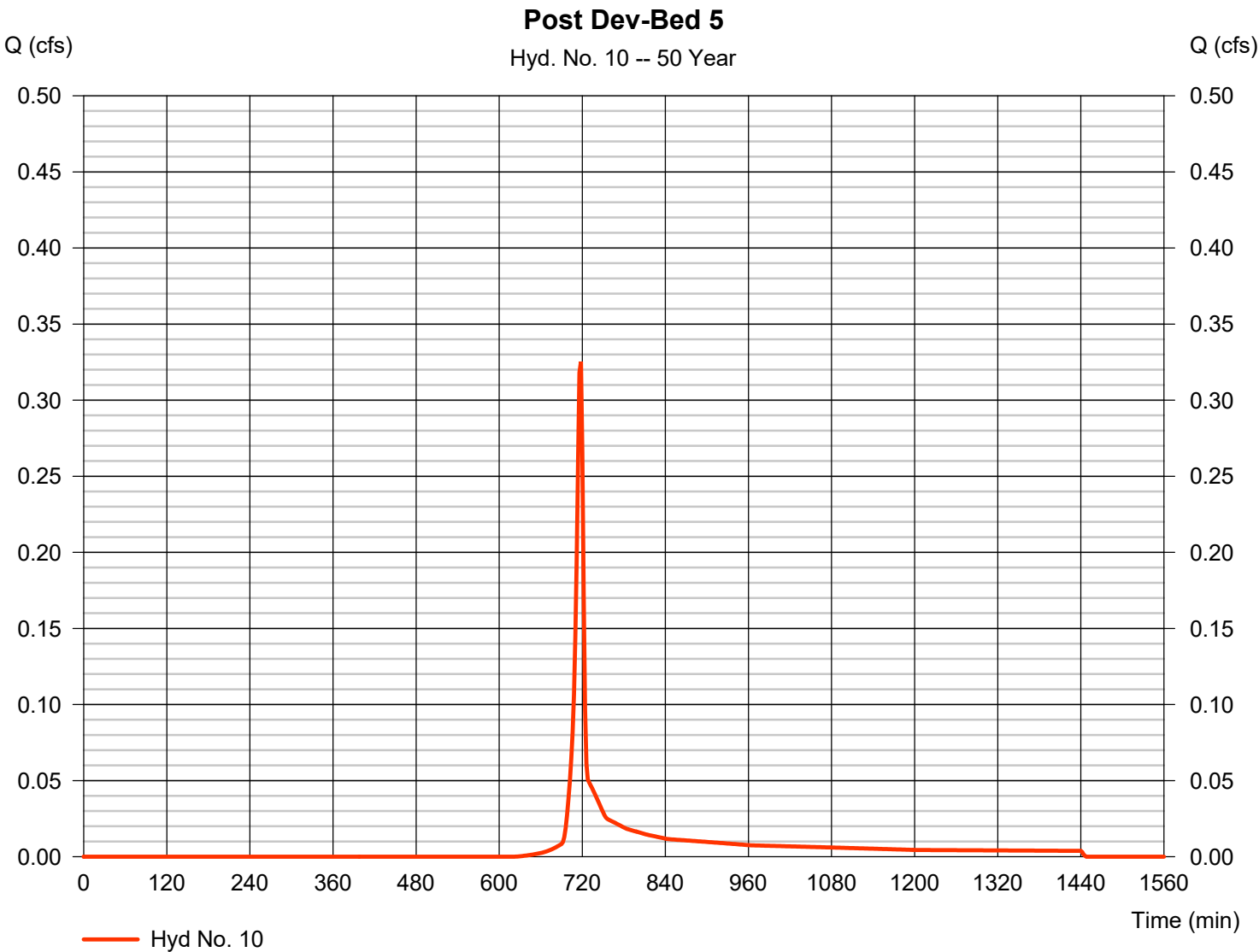


Hydrograph Report

Hyd. No. 10

Post Dev-Bed 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.325 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 650 cuft
Drainage area	= 0.080 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

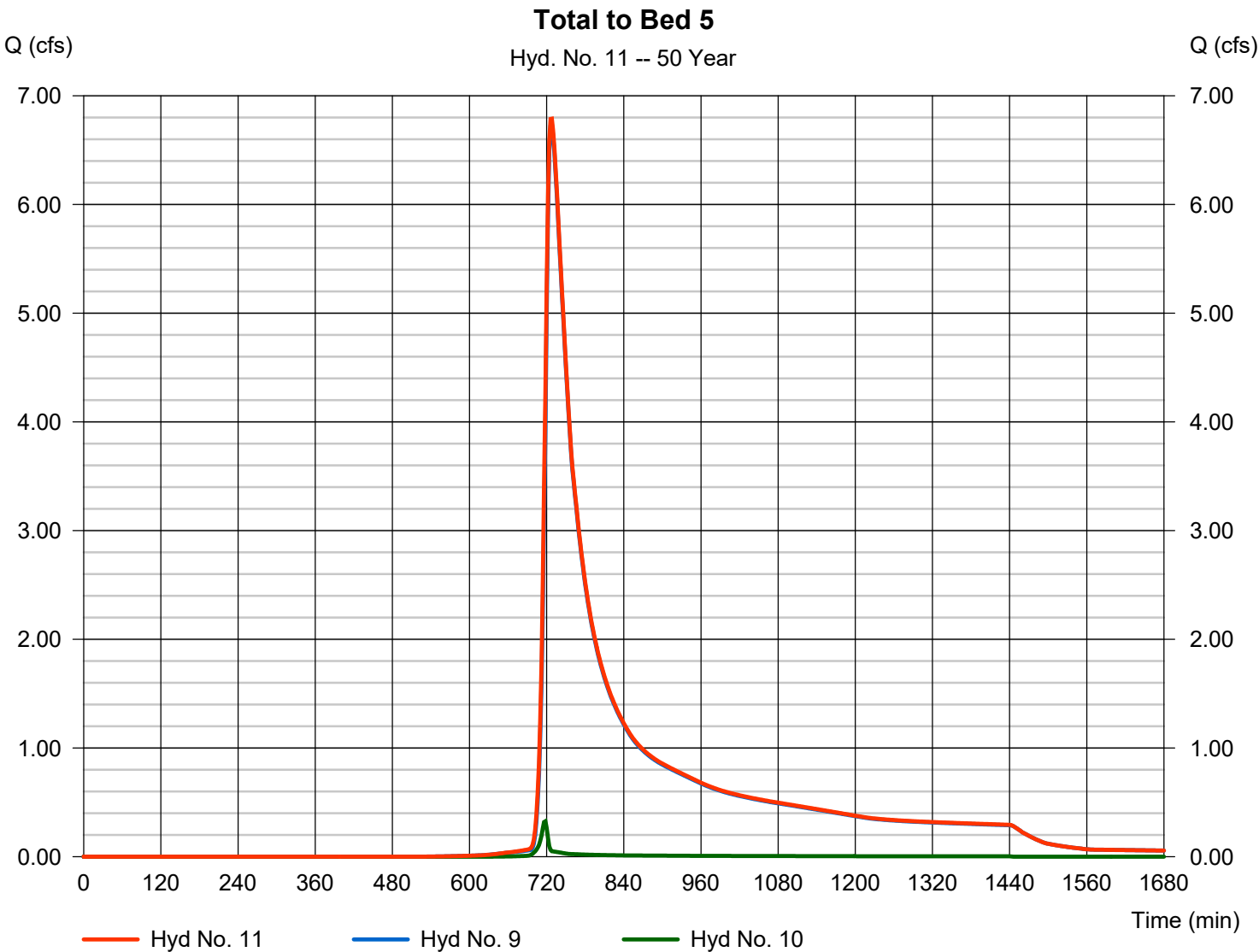


Hydrograph Report

Hyd. No. 11

Total to Bed 5

Hydrograph type	= Combine	Peak discharge	= 6.789 cfs
Storm frequency	= 50 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 46,516 cuft
Inflow hyds.	= 9, 10	Contrib. drain. area	= 0.080 ac



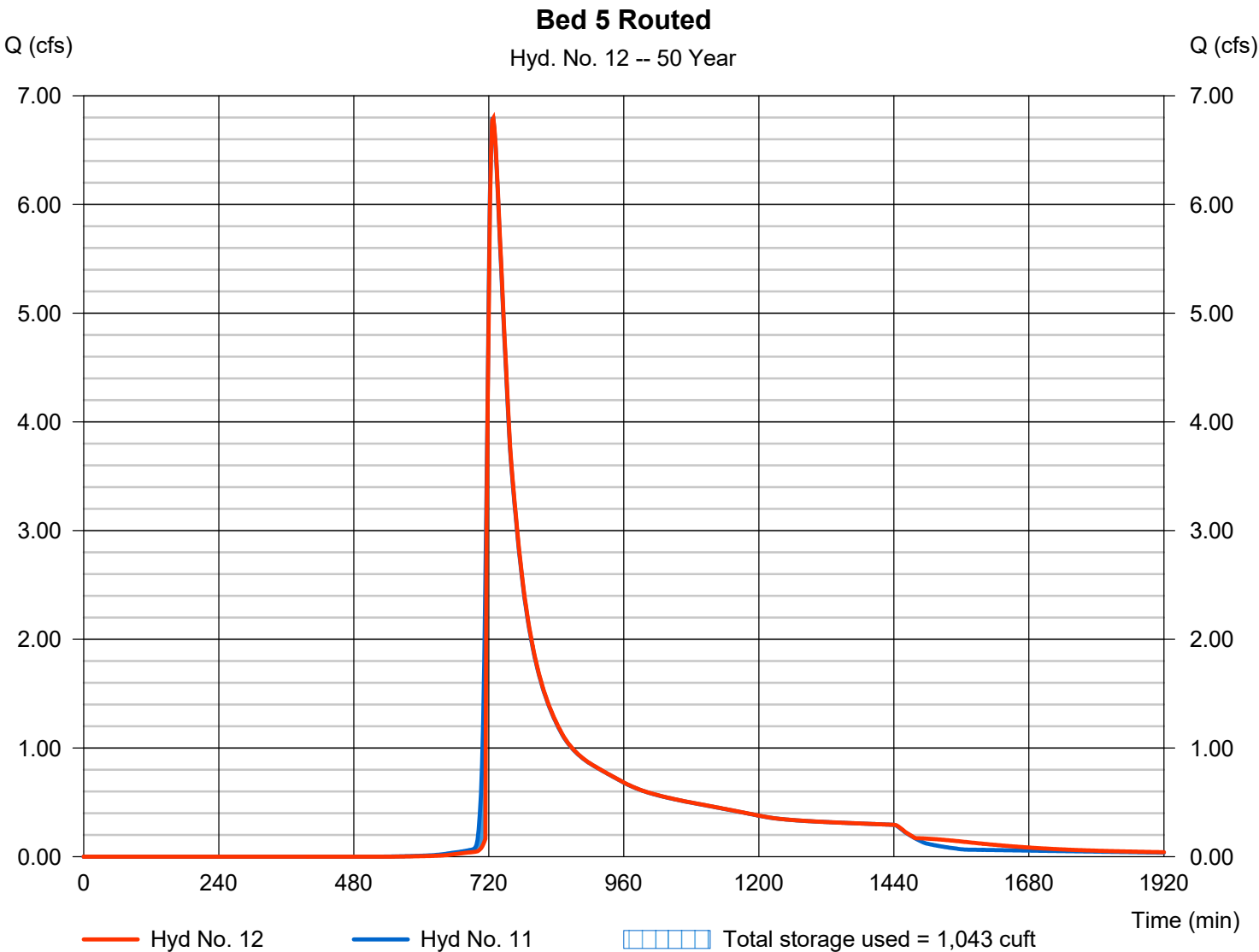
Hydrograph Report

Hyd. No. 12

Bed 5 Routed

Hydrograph type	= Reservoir	Peak discharge	= 6.794 cfs
Storm frequency	= 50 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 46,514 cuft
Inflow hyd. No.	= 11 - Total to Bed 5	Max. Elevation	= 425.43 ft
Reservoir name	= Bed 5	Max. Storage	= 1,043 cuft

Storage Indication method used.

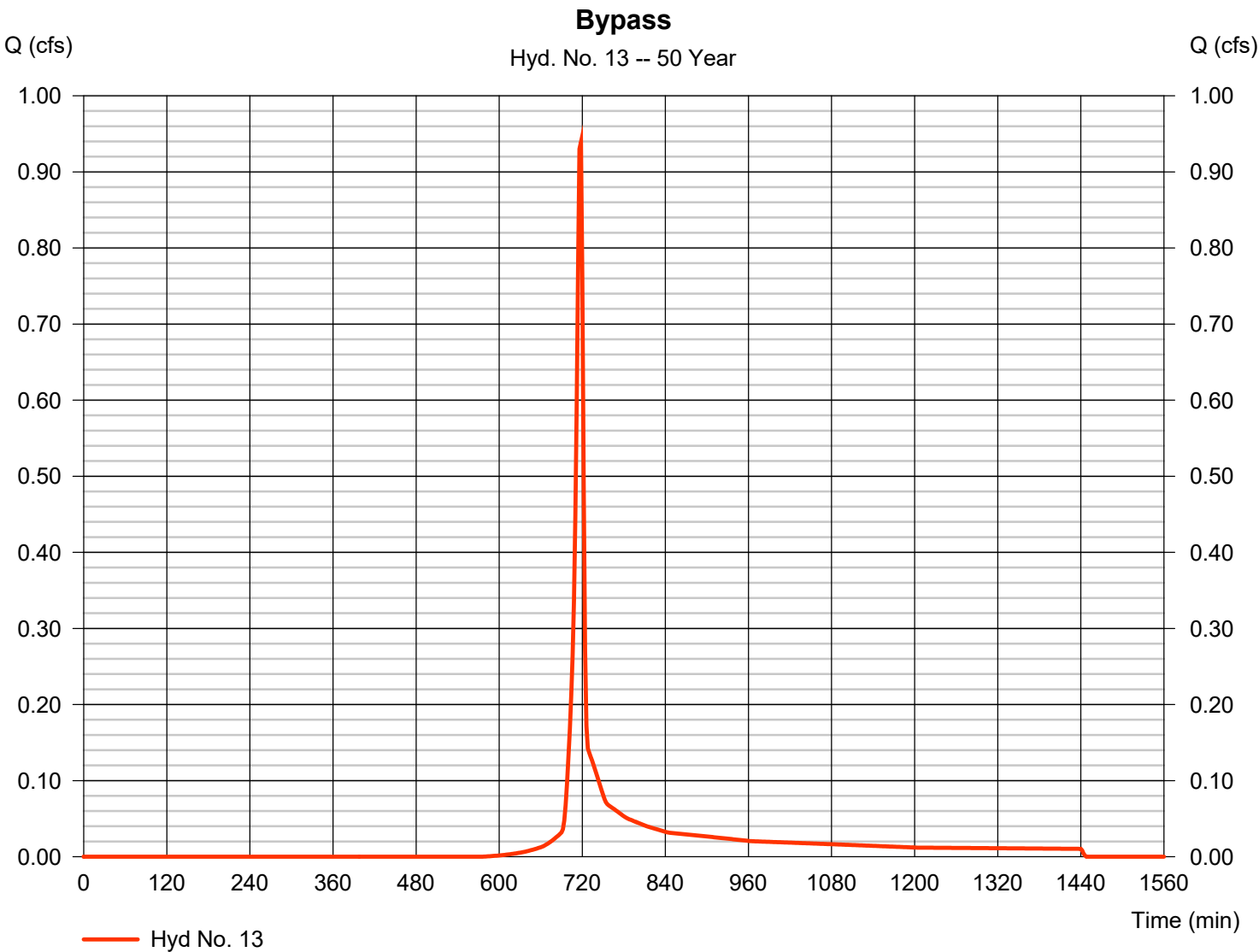


Hydrograph Report

Hyd. No. 13

Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.939 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,883 cuft
Drainage area	= 0.200 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

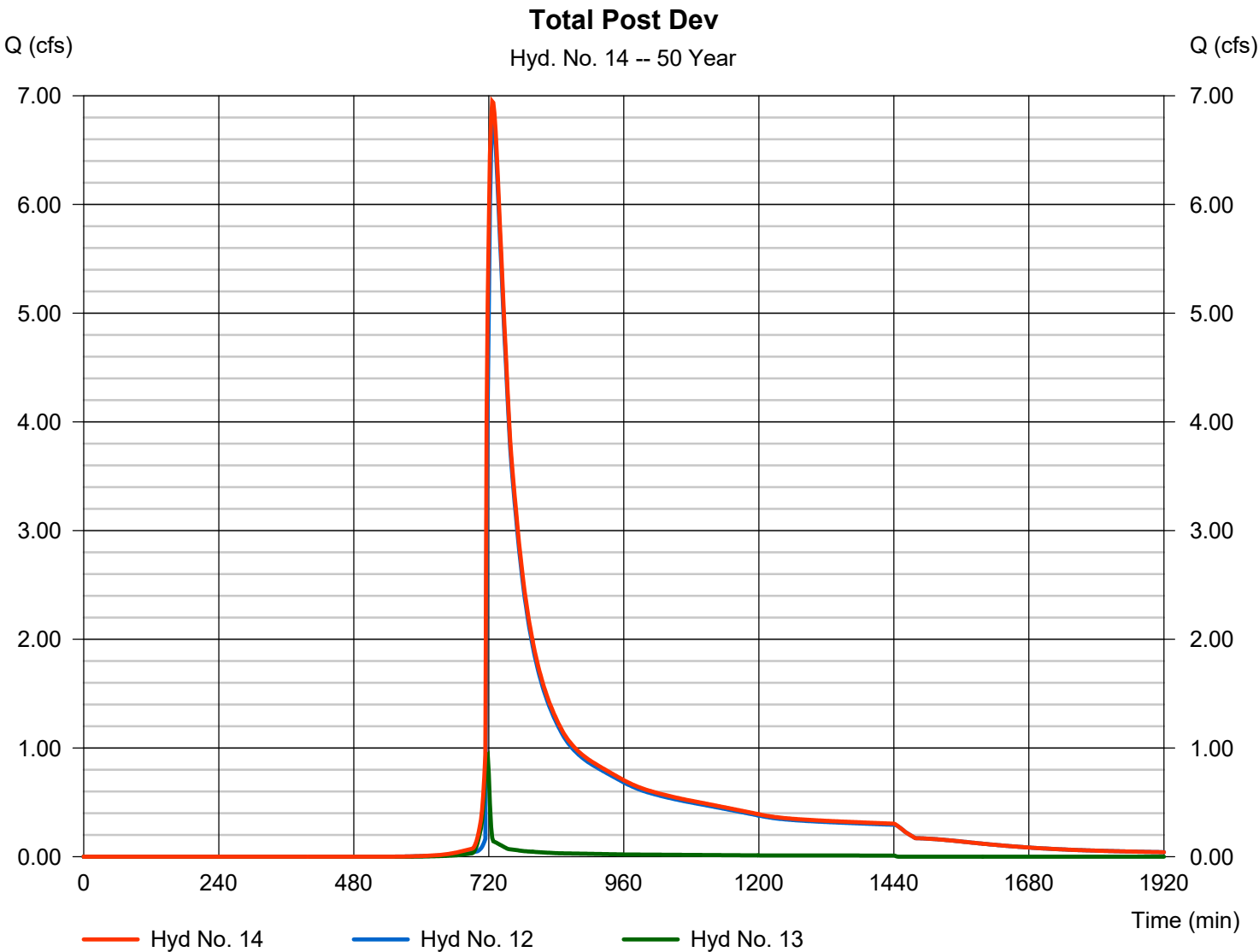


Hydrograph Report

Hyd. No. 14

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 6.948 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 48,397 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.200 ac



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

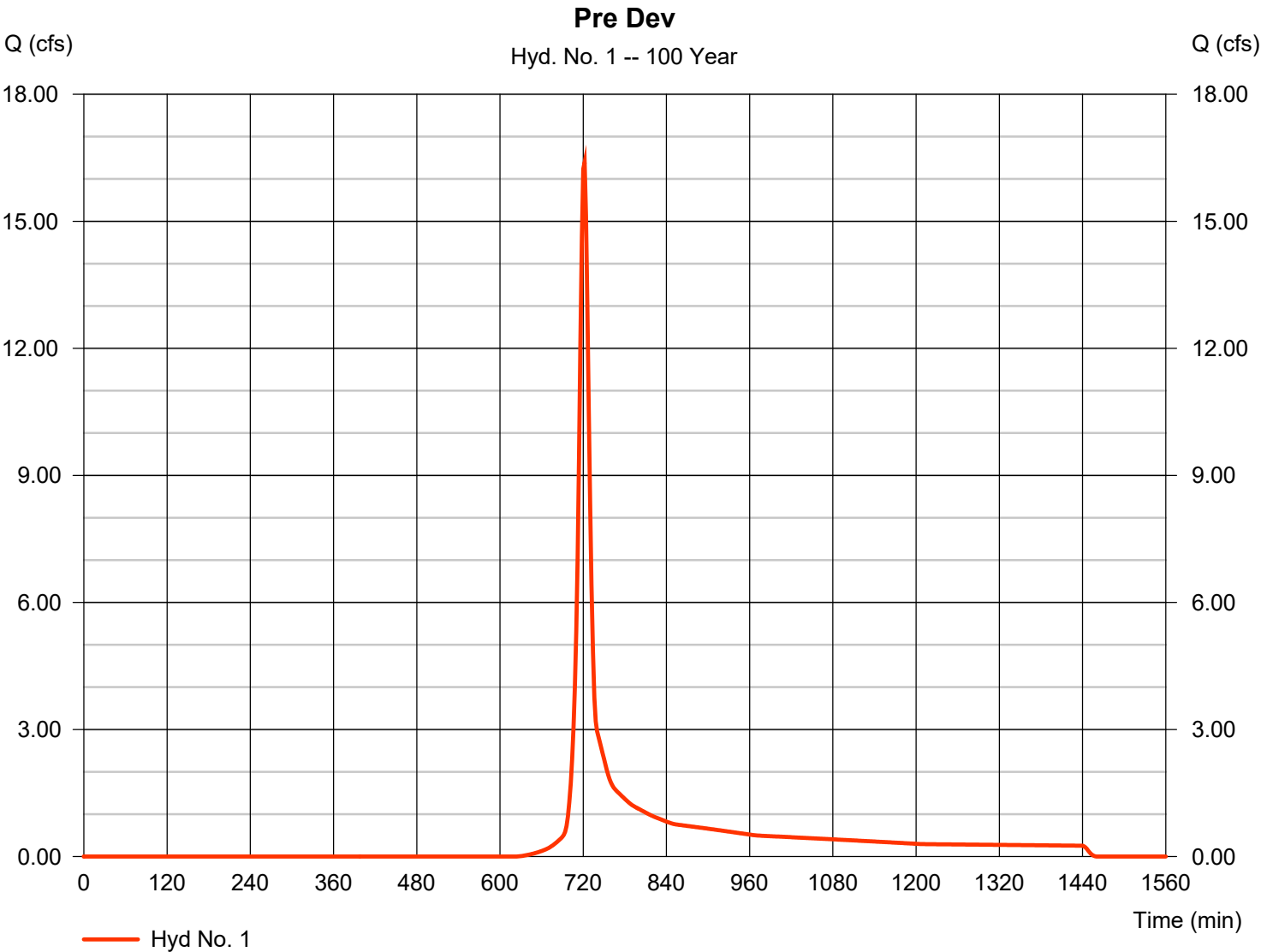
105

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.39 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	43,273 cuft
Drainage area	=	4.250 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.10 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



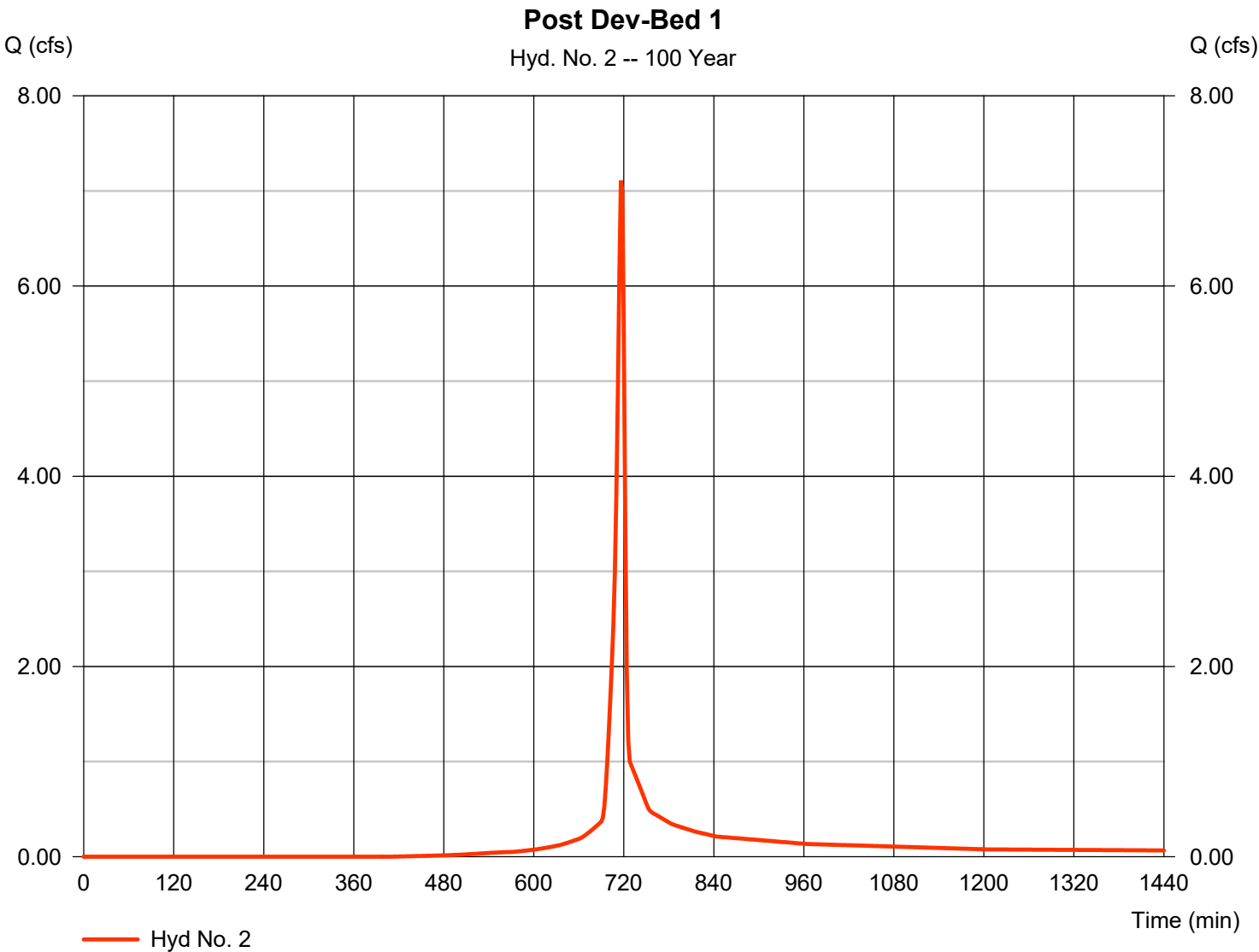
Hydrograph Report

Hyd. No. 2

Post Dev-Bed 1

Hydrograph type	= SCS Runoff	Peak discharge	= 7.108 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 14,495 cuft
Drainage area	= 0.960 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.340 x 98) + (0.620 x 61)] / 0.960



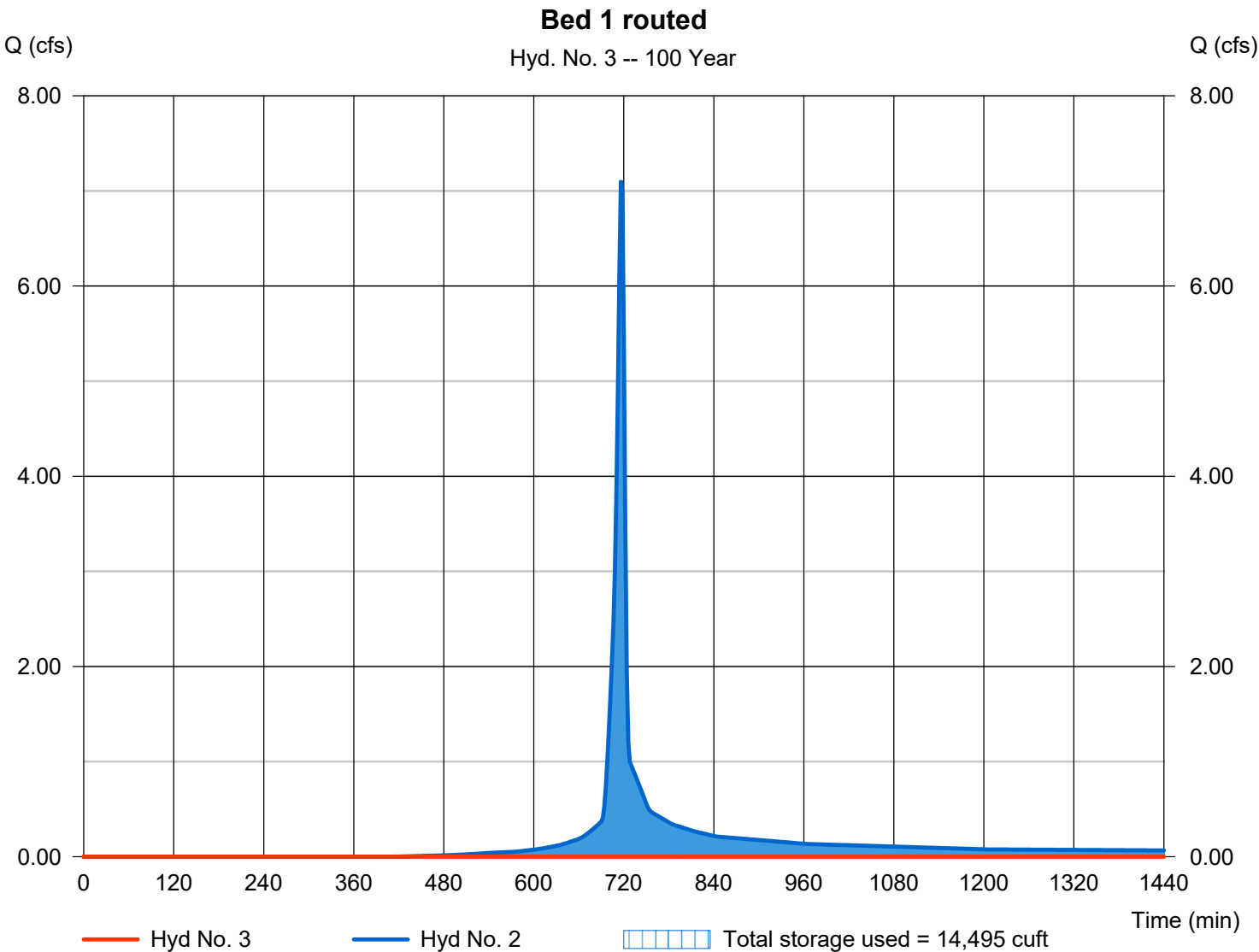
Hydrograph Report

Hyd. No. 3

Bed 1 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post Dev-Bed 1	Max. Elevation	= 440.53 ft
Reservoir name	= Bed 1	Max. Storage	= 14,495 cuft

Storage Indication method used.



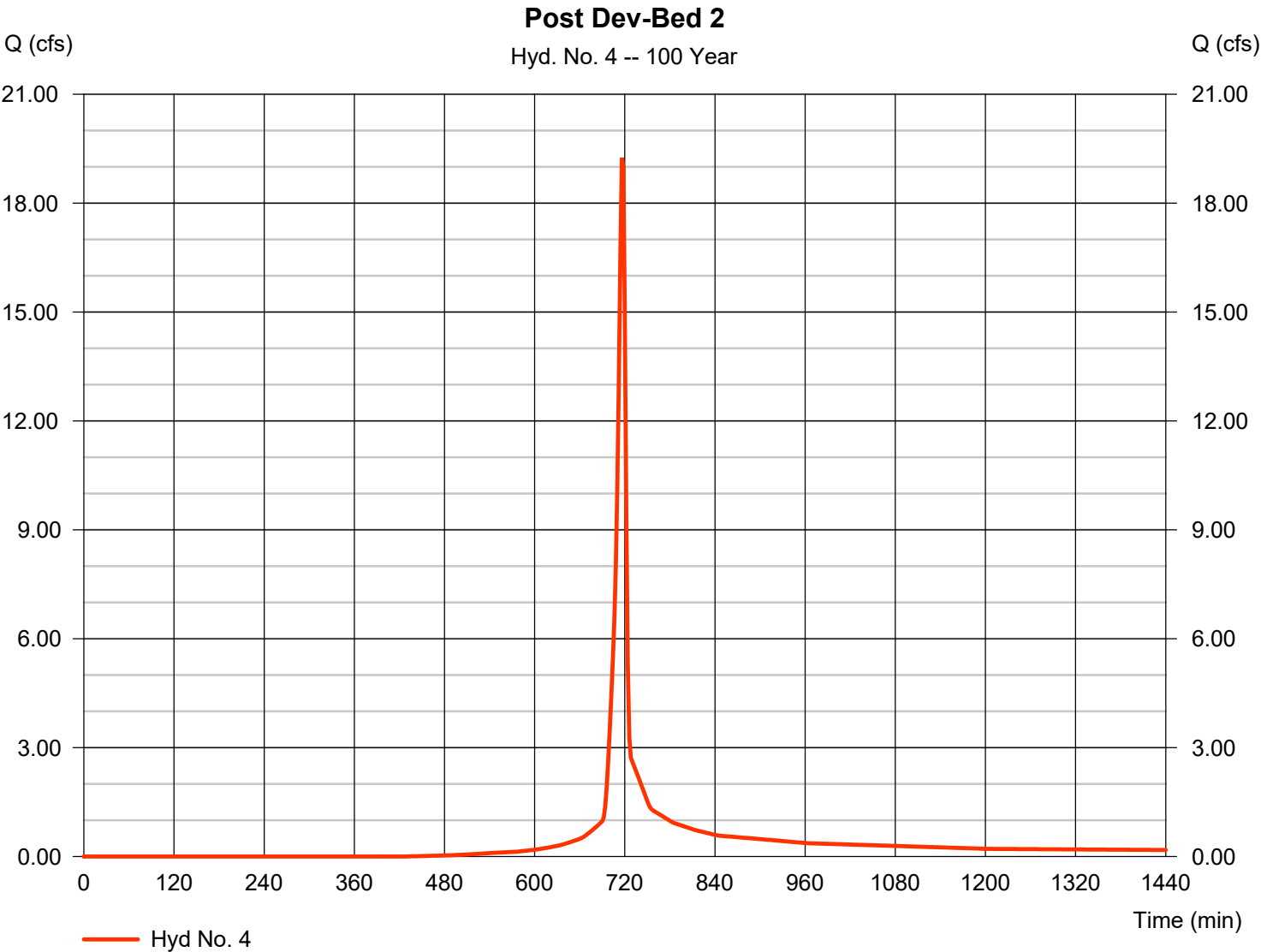
Hydrograph Report

Hyd. No. 4

Post Dev-Bed 2

Hydrograph type	= SCS Runoff	Peak discharge	= 19.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 39,159 cuft
Drainage area	= 2.660 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 98) + (1.820 x 61)] / 2.660

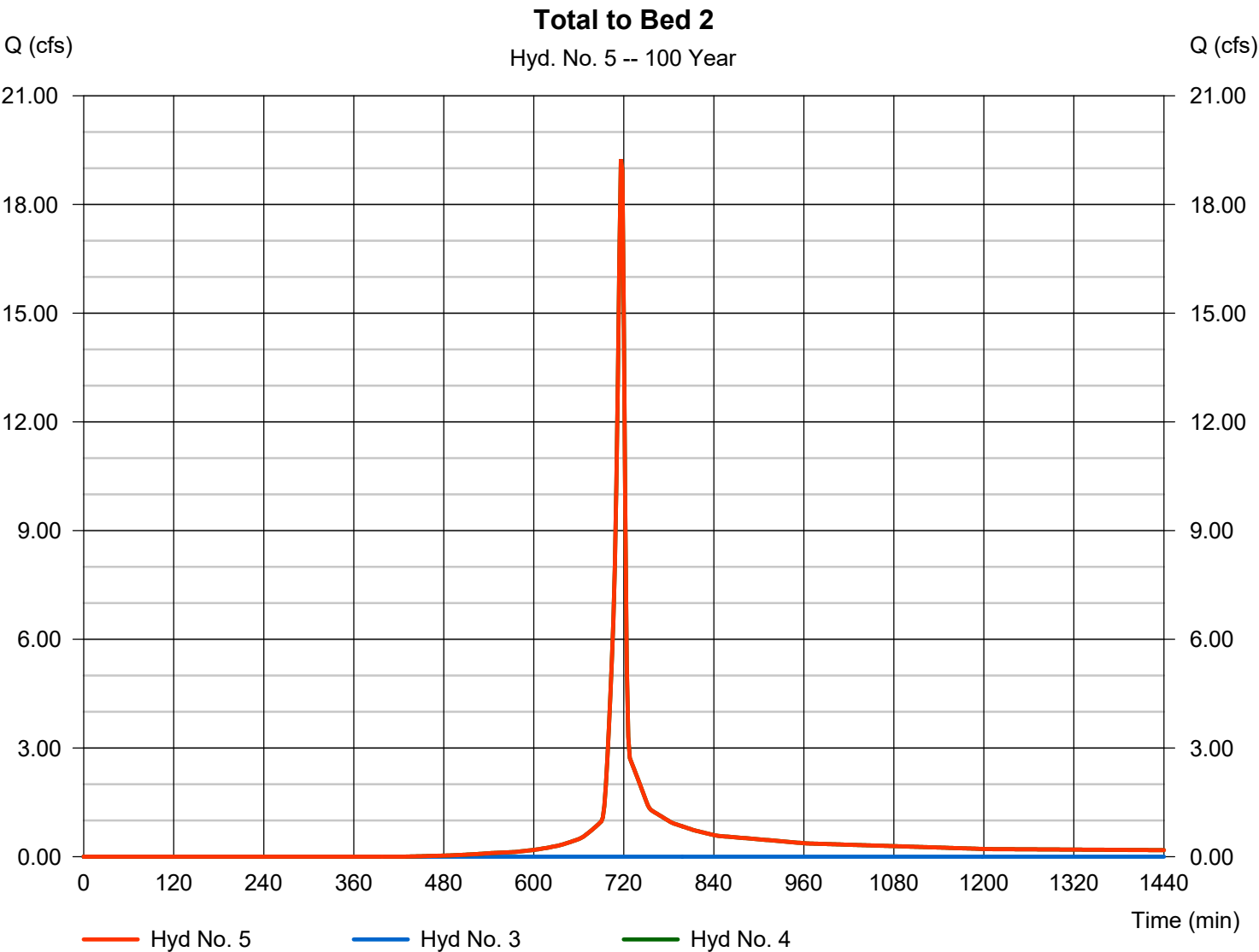


Hydrograph Report

Hyd. No. 5

Total to Bed 2

Hydrograph type	= Combine	Peak discharge	= 19.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 39,159 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.660 ac



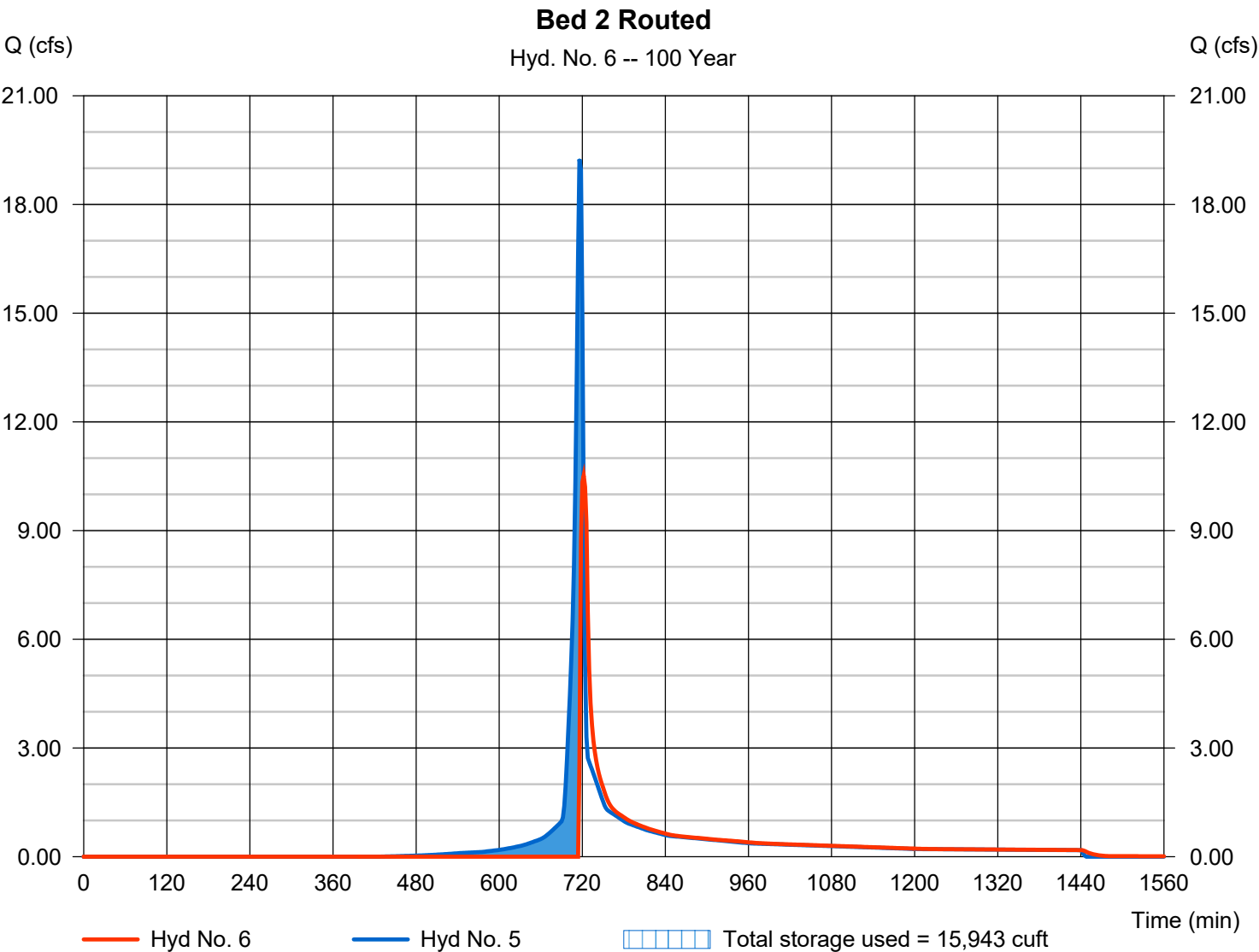
Hydrograph Report

Hyd. No. 6

Bed 2 Routed

Hydrograph type	= Reservoir	Peak discharge	= 10.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 27,590 cuft
Inflow hyd. No.	= 5 - Total to Bed 2	Max. Elevation	= 434.66 ft
Reservoir name	= Bed 2	Max. Storage	= 15,943 cuft

Storage Indication method used.



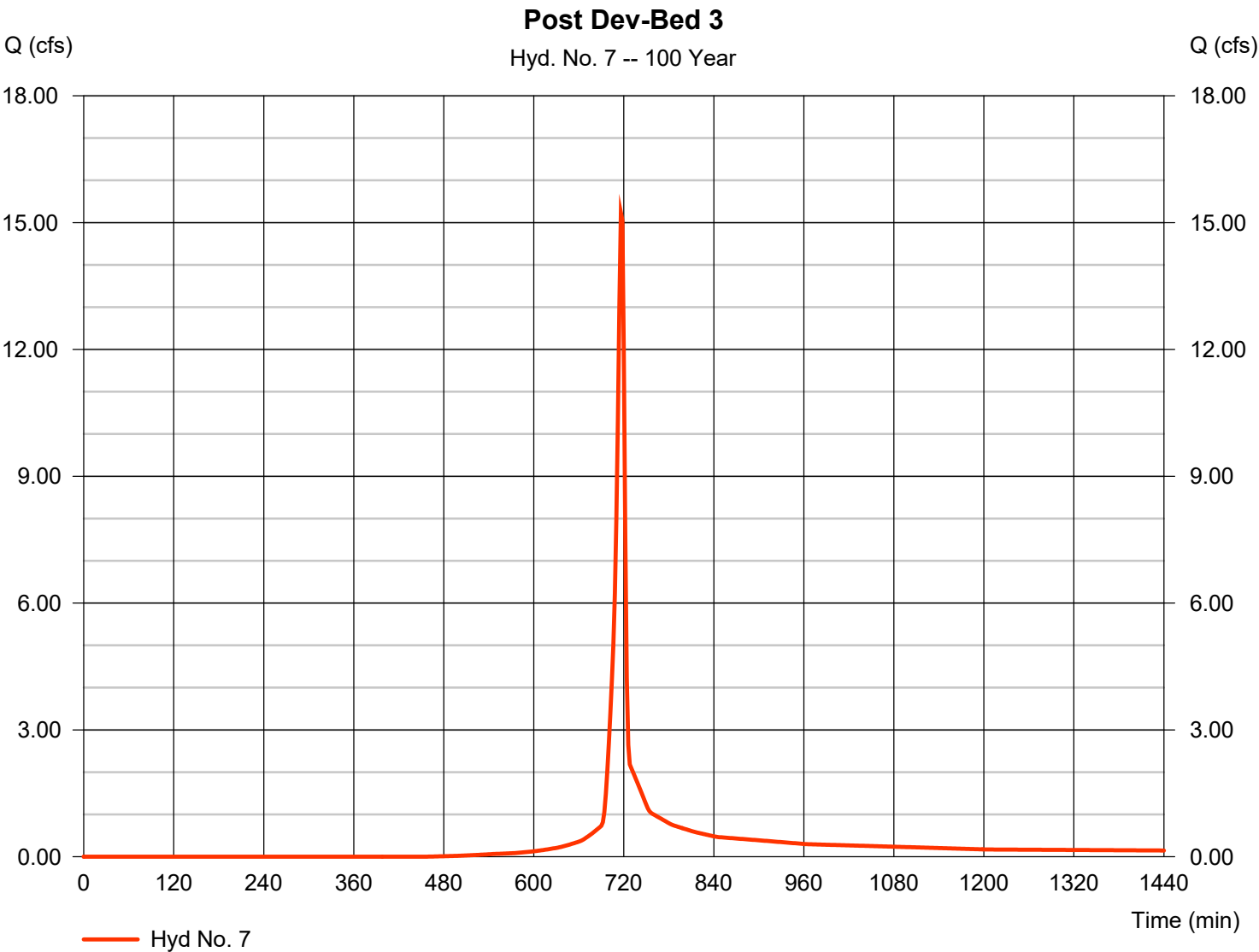
Hydrograph Report

Hyd. No. 7

Post Dev-Bed 3

Hydrograph type	= SCS Runoff	Peak discharge	= 15.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 30,875 cuft
Drainage area	= 2.210 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 98) + (1.590 x 61)] / 2.210

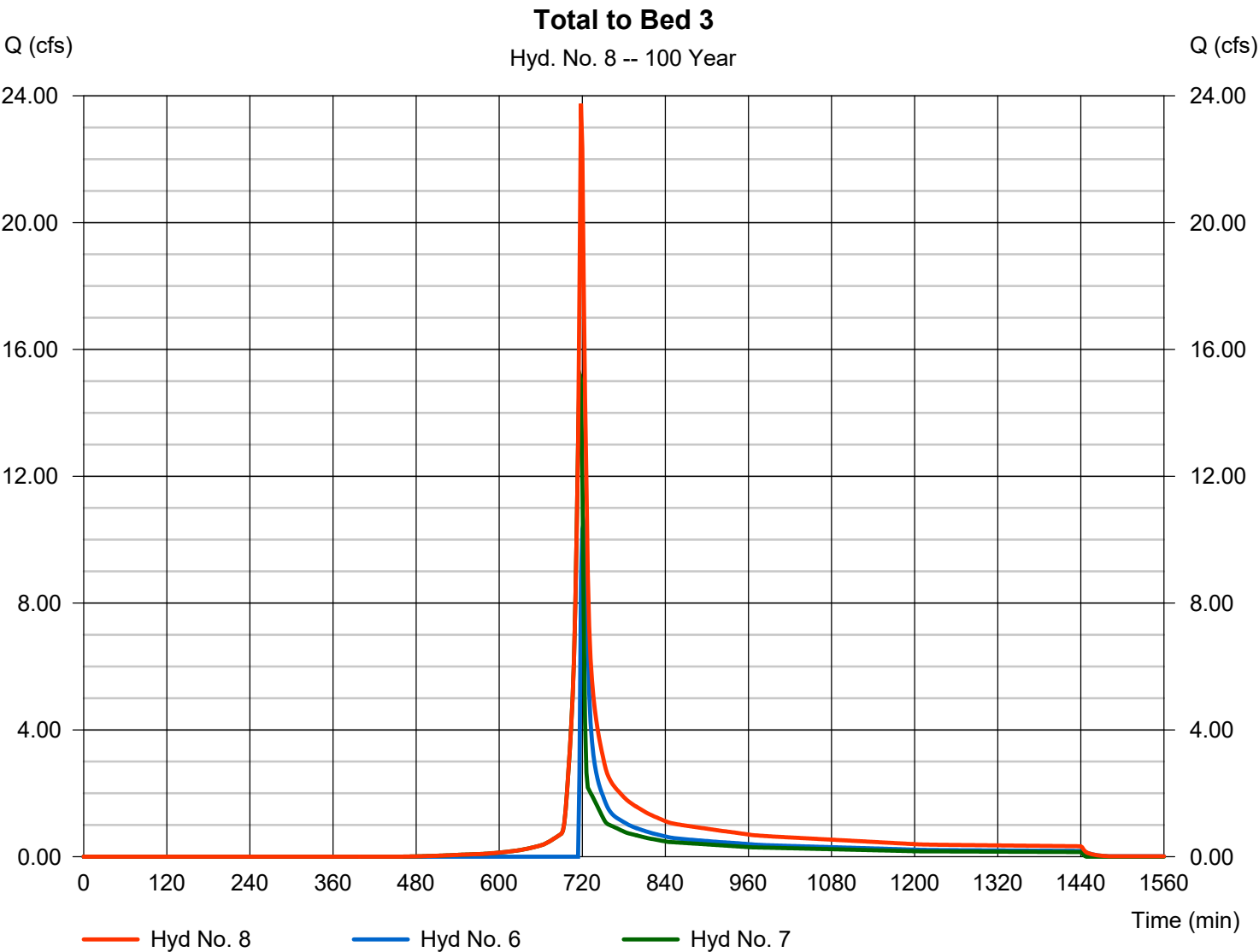


Hydrograph Report

Hyd. No. 8

Total to Bed 3

Hydrograph type	= Combine	Peak discharge	= 23.75 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 58,465 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 2.210 ac



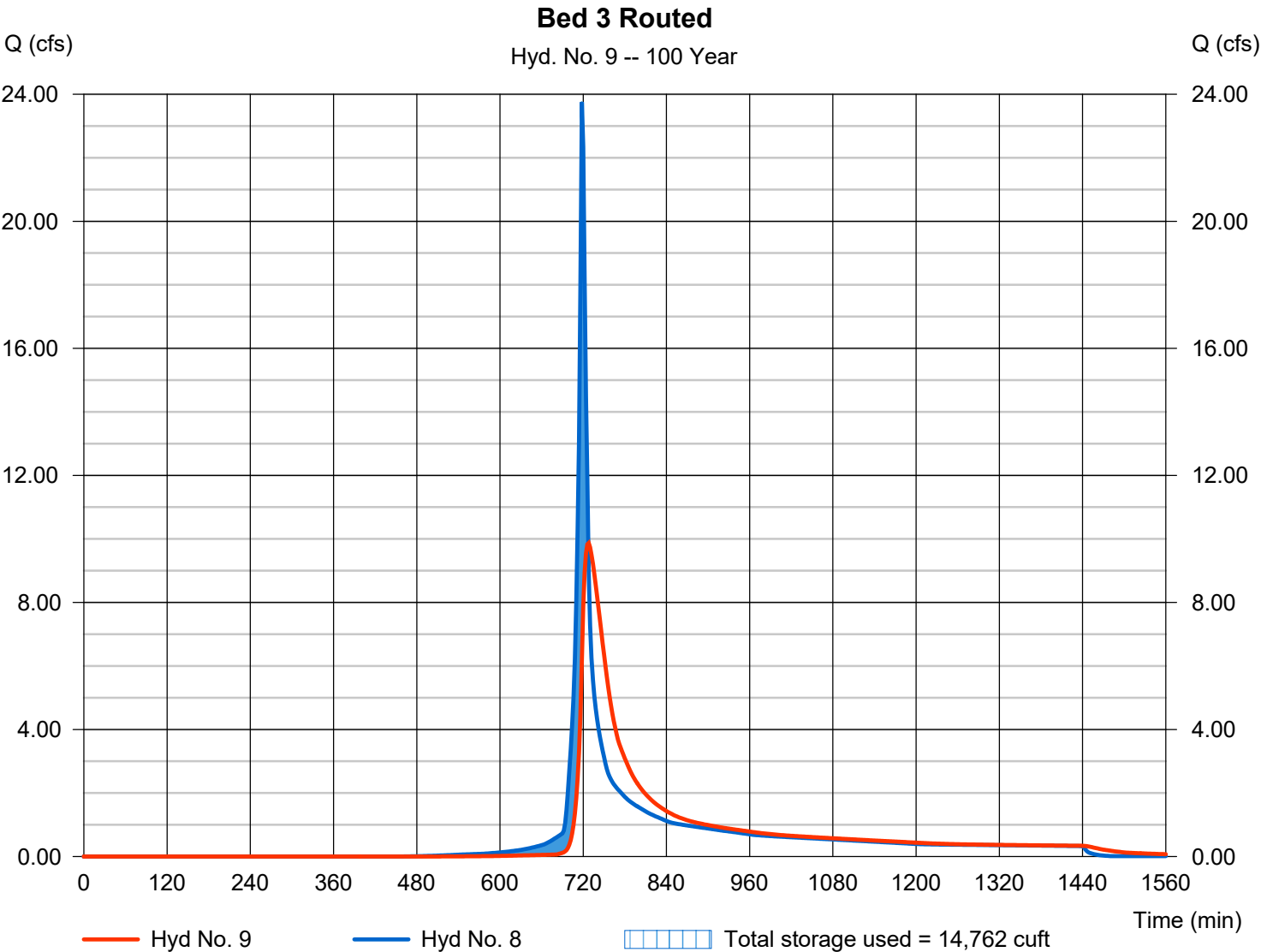
Hydrograph Report

Hyd. No. 9

Bed 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 9.872 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 58,443 cuft
Inflow hyd. No.	= 8 - Total to Bed 3	Max. Elevation	= 427.63 ft
Reservoir name	= Bed 3	Max. Storage	= 14,762 cuft

Storage Indication method used.

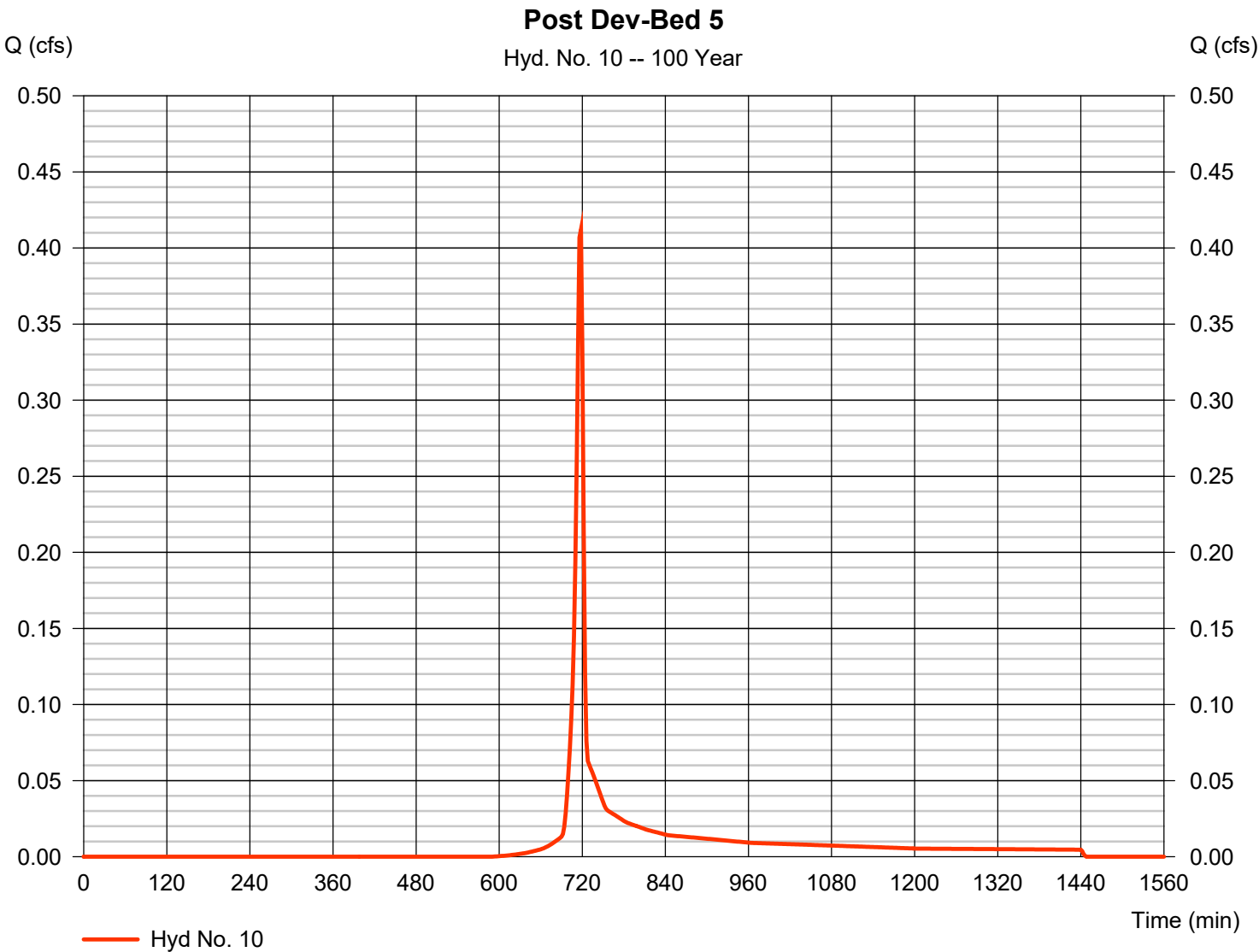


Hydrograph Report

Hyd. No. 10

Post Dev-Bed 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.412 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 825 cuft
Drainage area	= 0.080 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

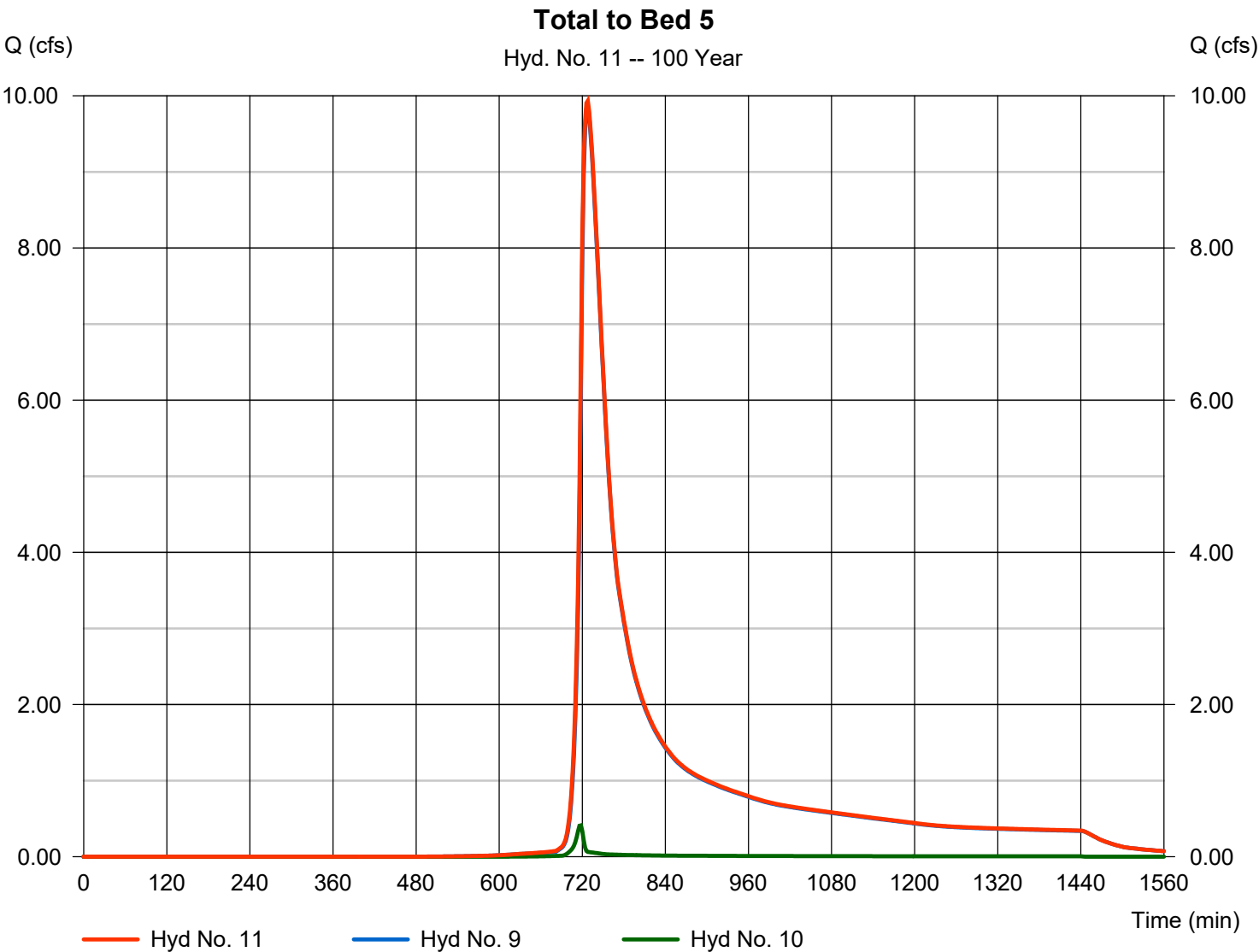


Hydrograph Report

Hyd. No. 11

Total to Bed 5

Hydrograph type	= Combine	Peak discharge	= 9.935 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 59,268 cuft
Inflow hyds.	= 9, 10	Contrib. drain. area	= 0.080 ac



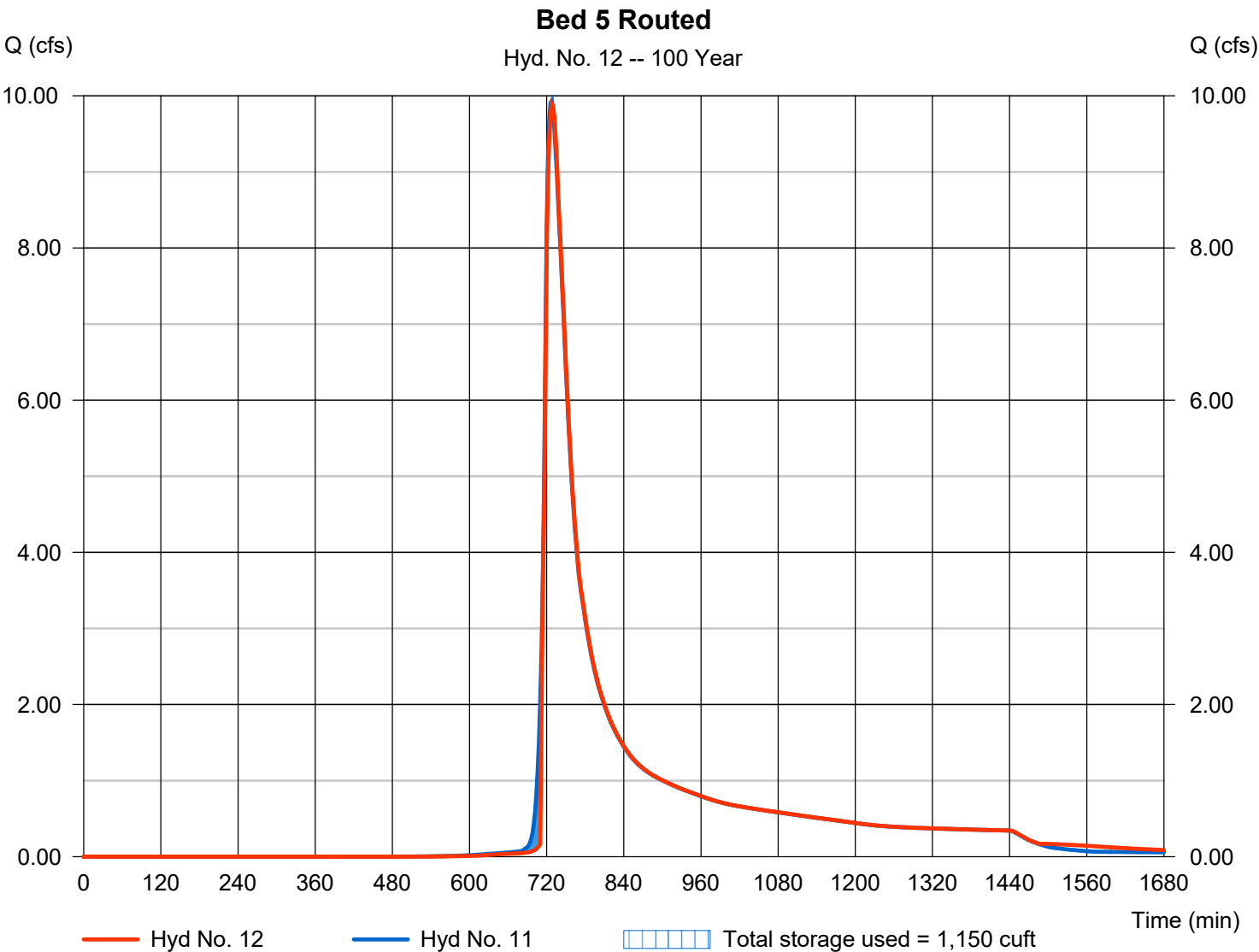
Hydrograph Report

Hyd. No. 12

Bed 5 Routed

Hydrograph type	= Reservoir	Peak discharge	= 9.892 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 59,266 cuft
Inflow hyd. No.	= 11 - Total to Bed 5	Max. Elevation	= 425.79 ft
Reservoir name	= Bed 5	Max. Storage	= 1,150 cuft

Storage Indication method used.

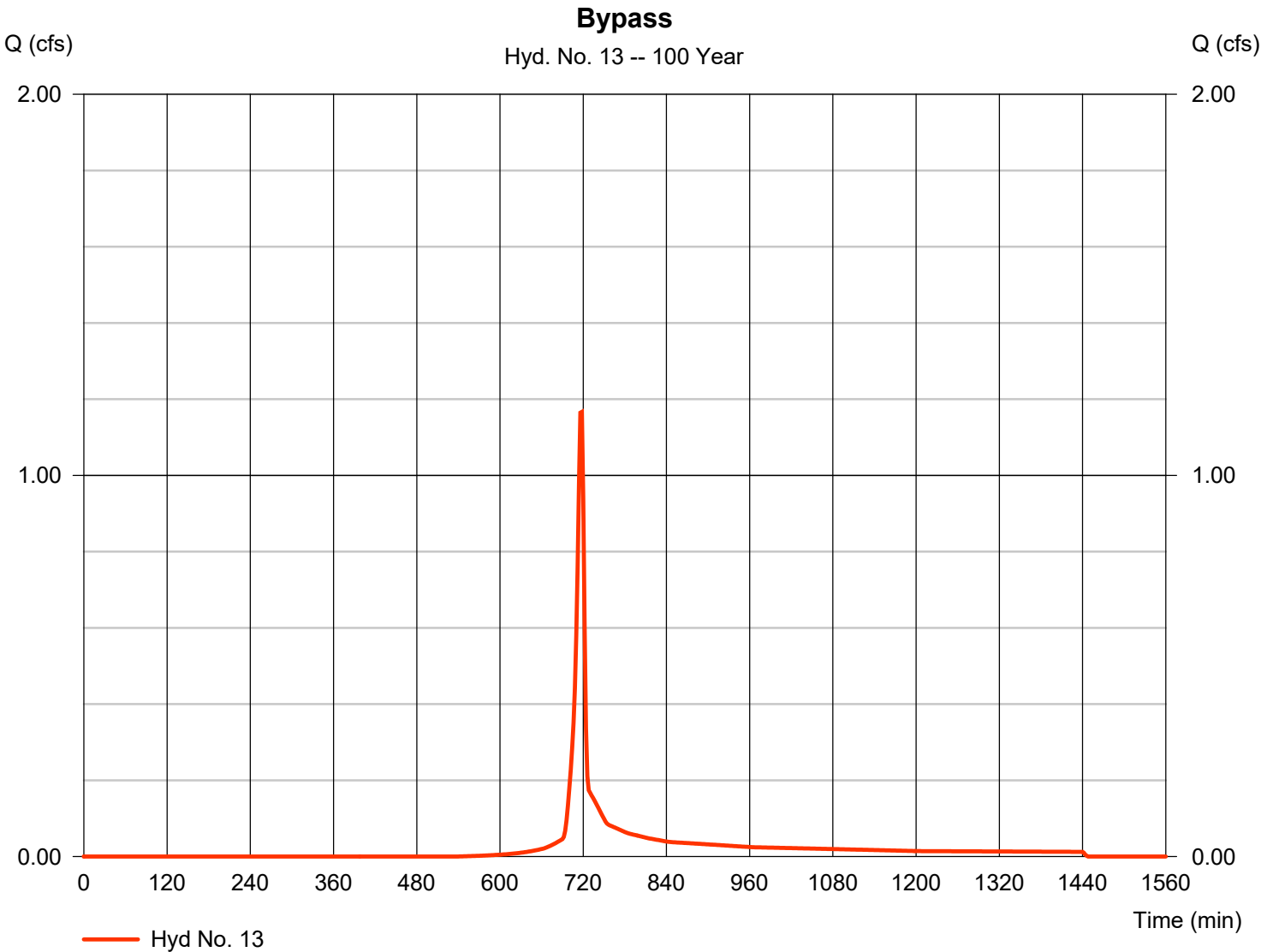


Hydrograph Report

Hyd. No. 13

Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.167 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	2,351 cuft
Drainage area	=	0.200 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

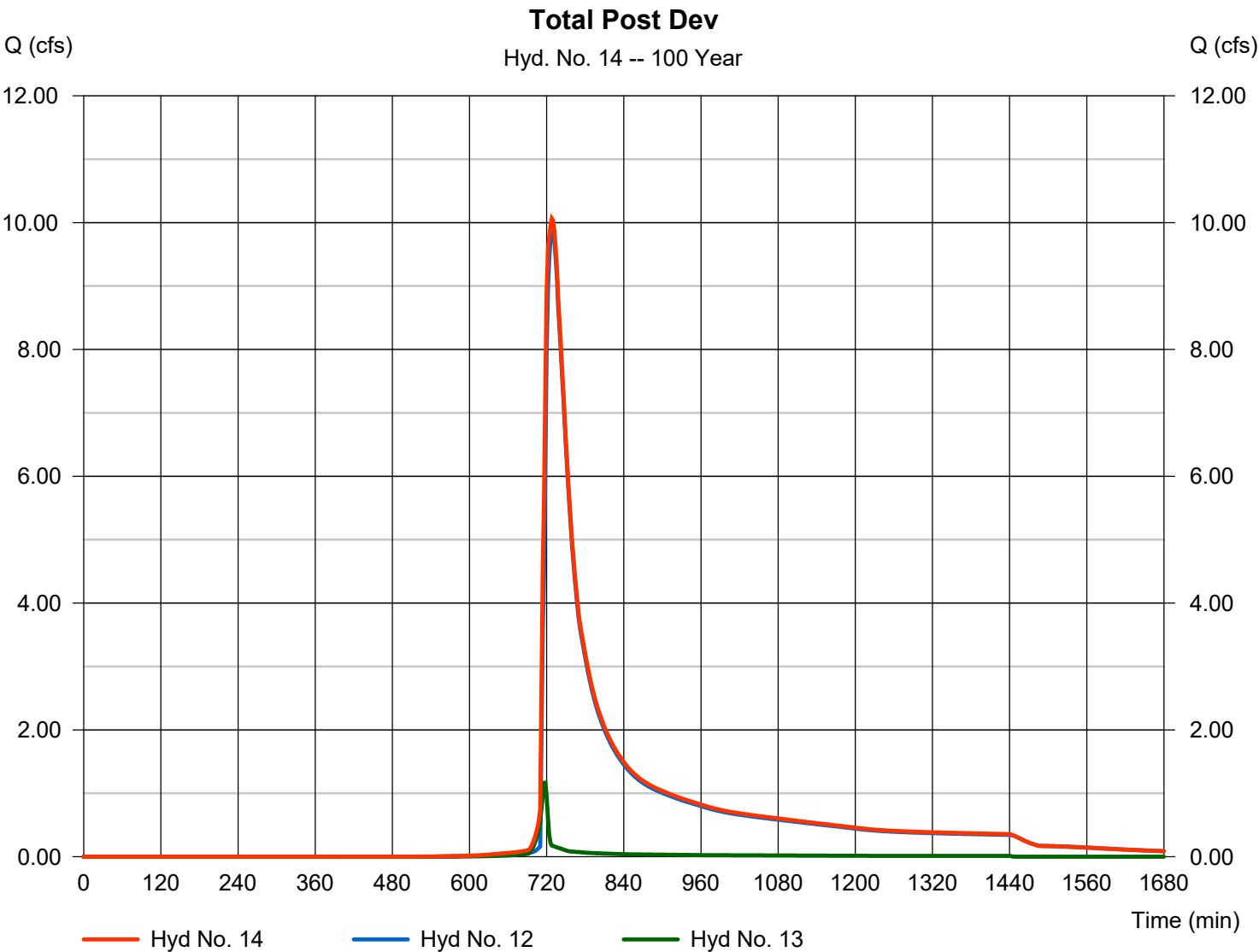


Hydrograph Report

Hyd. No. 14

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 10.07 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 61,617 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.200 ac



STRAFFORD AVENUE

Stormwater Management Summary-Post Construction

Radnor Township Stormwater District A

Stormwater Management Summary - POI B							
Yr	Pre-Development				Post Development	Compliance	Percentage Reduction
	On-Site		Allowable Release Rate*		Total Post Developed Flow		
1	0.172		0.172		0.008	-0.16	-95%
2	0.593		0.172		0.068	-0.10	-60%
5	1.491		1.491		0.218	-1.27	-85%
10	2.372		2.372		0.359	-2.01	-85%
25	3.772		3.772		0.842	-2.93	-78%
50	5.063		5.063		3.009	-2.05	-41%
100	6.527		6.527		6.487	-0.04	-1%

Design Storm Proposed Conditions	Reduce to	Design Storm Existing Conditions
1yr		1 yr
2 yr		1 yr
5 yr		5 yr
10 yr		10 yr
25 yr		25 yr
50 yr		50 yr
100 yr		100 yr

Dewatering Calculations

Bed #4 Dewatering

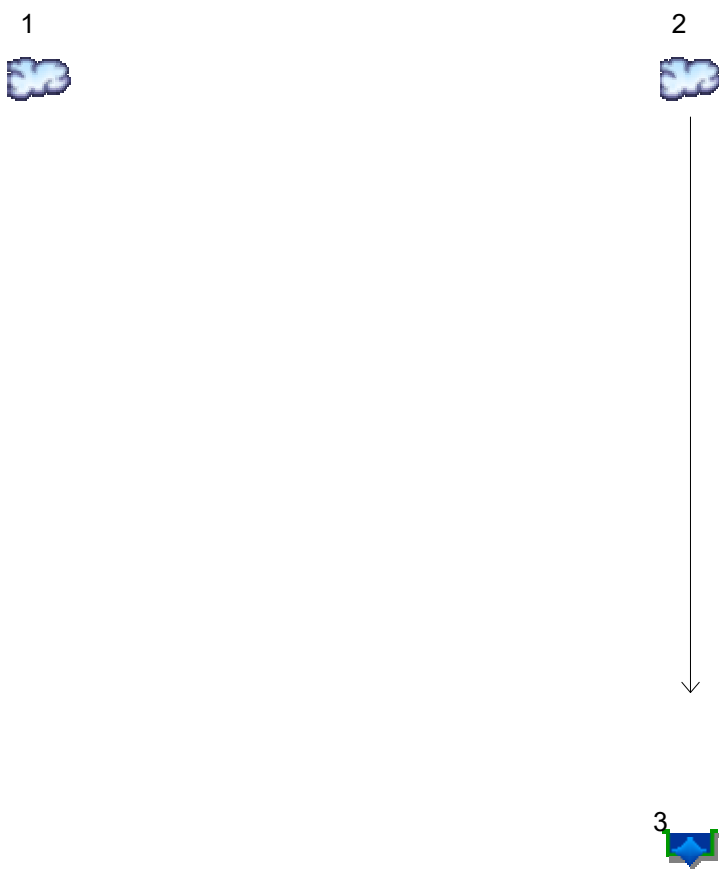
Bed Depth	Permeability Rate	Drain Down
18	1.26	14
in	in/hr	hrs

Max required dewatering time = 72 hrs per PABMP Manual

POI B

INFILTRATION BED 4		
Pipe Diameter =	48	inches
Pipe Length =	972	ft
Stone Bed Length	144	ft
Stone Bed Width =	80.0	ft
Stone Depth =	5.0	ft
<i>Pipe Volume =</i>	<i>12215</i>	<i>ft²</i>
<i>+ Stone Voids Volume =</i>	<i>0</i>	<i>ft</i>
Provided V_t = 12215 ft³		

Dead Storage Depth = 1.5
Infiltration Bed Dead Storage Provided = 4,580



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre Dev
2	SCS Runoff	Post Dev
3	Reservoir	Bed 4 routed

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

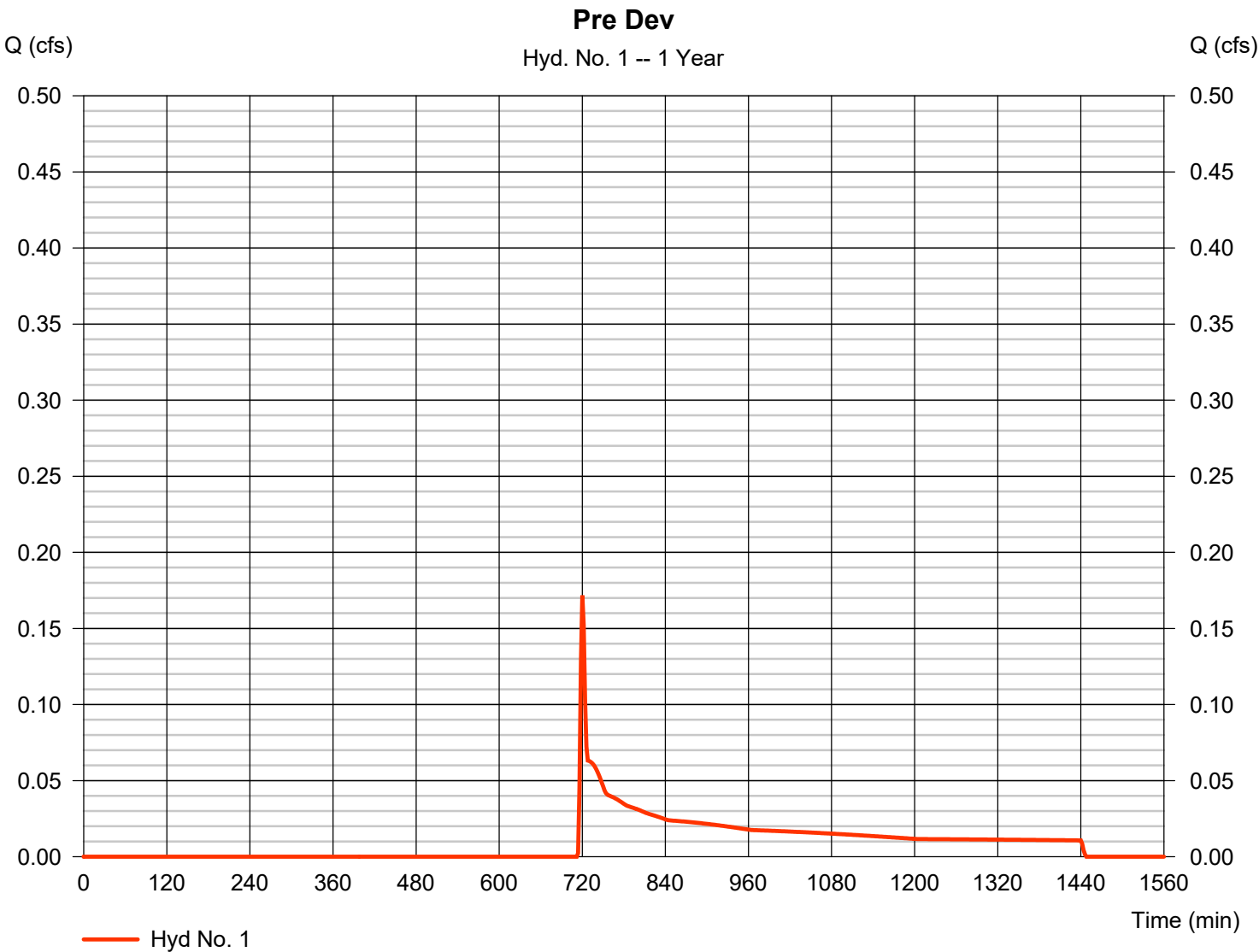
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.172	2	720	869	-----	-----	-----	Pre Dev
2	SCS Runoff	2.336	2	718	4,699	-----	-----	-----	Post Dev
3	Reservoir	0.008	2	1446	105	2	438.03	4,682	Bed 4 routed
POI-B-Hydro.gpw					Return Period: 1 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.172 cfs
Storm frequency	=	1 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	869 cuft
Drainage area	=	1.410 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.69 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



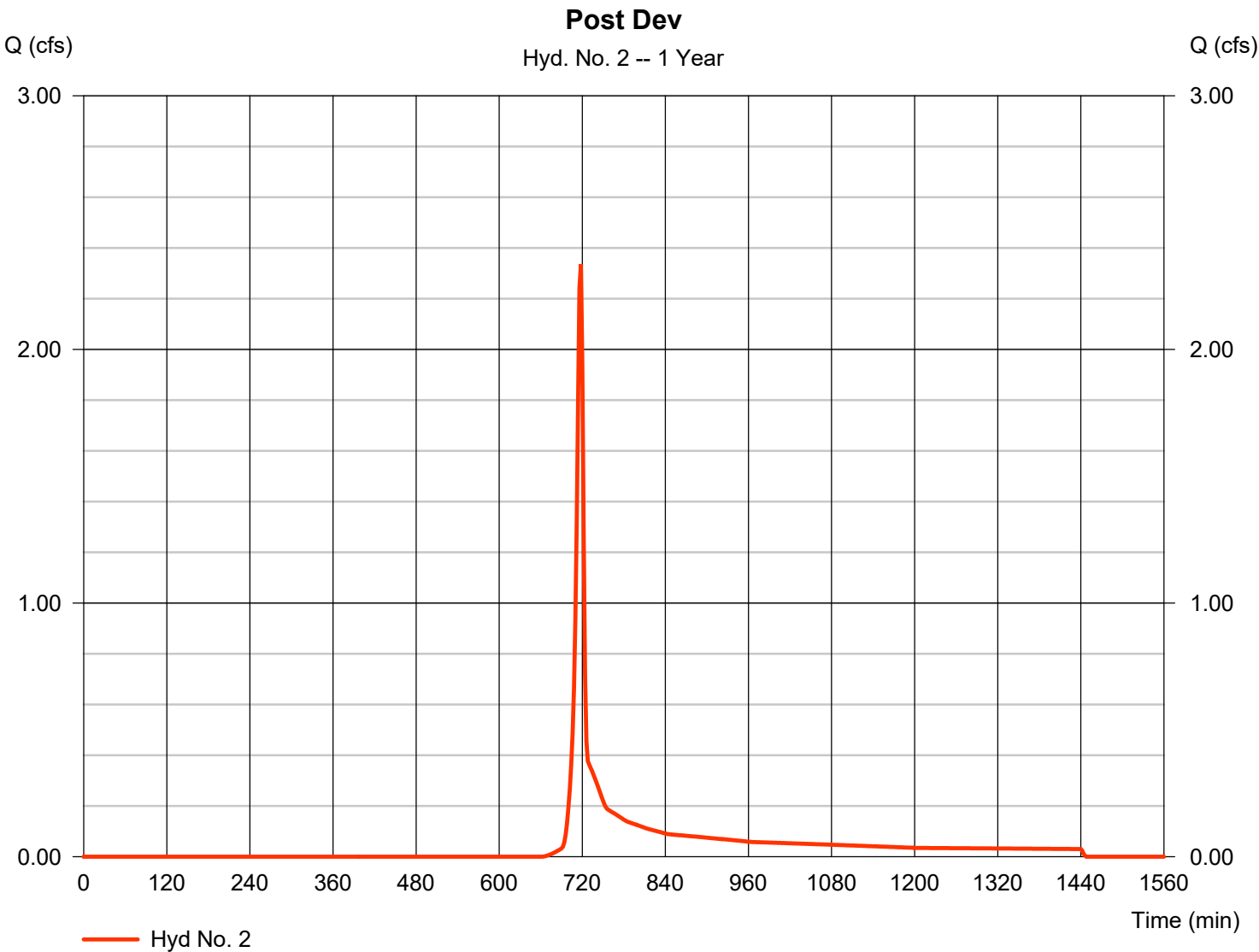
Hydrograph Report

Hyd. No. 2

Post Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.336 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	4,699 cuft
Drainage area	=	1.700 ac	Curve number	=	76*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.69 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 98) + (1.000 x 61)] / 1.700



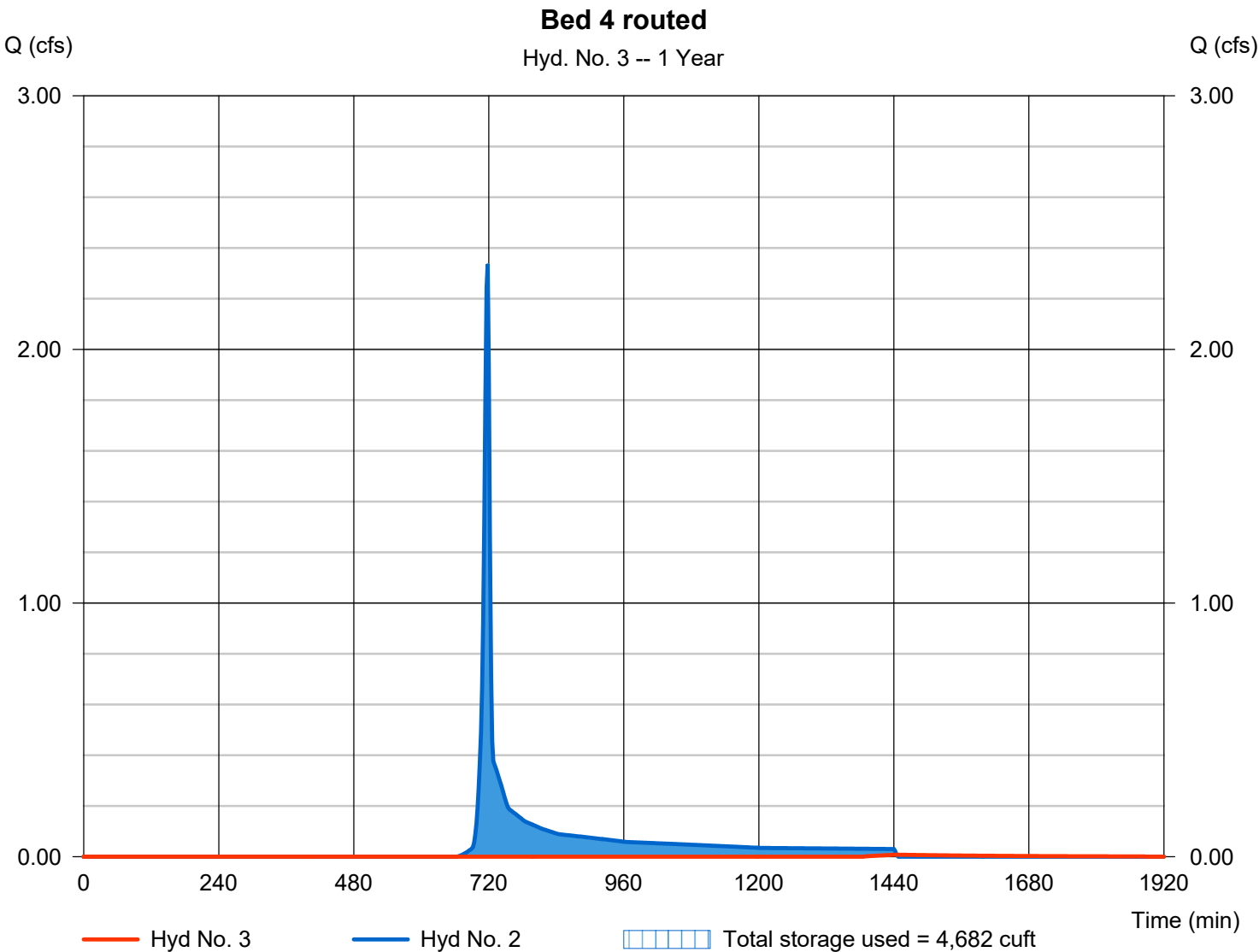
Hydrograph Report

Hyd. No. 3

Bed 4 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.008 cfs
Storm frequency	= 1 yrs	Time to peak	= 1446 min
Time interval	= 2 min	Hyd. volume	= 105 cuft
Inflow hyd. No.	= 2 - Post Dev	Max. Elevation	= 438.03 ft
Reservoir name	= Bed 4	Max. Storage	= 4,682 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Wednesday, 01 / 31 / 2024

Pond No. 1 - Bed 4

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	436.50	n/a	0	0
1.00	437.50	n/a	3,054	3,054
2.00	438.50	n/a	3,054	6,108
3.00	439.50	n/a	3,054	9,162
4.00	440.50	n/a	3,054	12,216

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	4.00	0.00	0.00
Span (in)	= 15.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 436.50	438.00	0.00	0.00
Length (ft)	= 25.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 2.00	0.00	0.00	0.00
Crest El. (ft)	= 439.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	436.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	305	436.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.20	611	436.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.30	916	436.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.40	1,222	436.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.50	1,527	437.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.60	1,832	437.10	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.70	2,138	437.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.80	2,443	437.30	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.90	2,749	437.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.00	3,054	437.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.10	3,359	437.60	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.20	3,665	437.70	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.30	3,970	437.80	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.40	4,276	437.90	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.50	4,581	438.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
1.60	4,886	438.10	0.03 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.024
1.70	5,192	438.20	0.08 ic	0.08 ic	---	---	0.00	---	---	---	---	---	0.083
1.80	5,497	438.30	0.16 ic	0.15 ic	---	---	0.00	---	---	---	---	---	0.155
1.90	5,803	438.40	0.21 ic	0.20 ic	---	---	0.00	---	---	---	---	---	0.203
2.00	6,108	438.50	0.24 ic	0.24 ic	---	---	0.00	---	---	---	---	---	0.243
2.10	6,413	438.60	0.28 ic	0.28 ic	---	---	0.00	---	---	---	---	---	0.277
2.20	6,719	438.70	0.31 ic	0.31 ic	---	---	0.00	---	---	---	---	---	0.307
2.30	7,024	438.80	0.35 ic	0.33 ic	---	---	0.00	---	---	---	---	---	0.334
2.40	7,330	438.90	0.37 ic	0.36 ic	---	---	0.00	---	---	---	---	---	0.360
2.50	7,635	439.00	0.39 ic	0.38 ic	---	---	0.00	---	---	---	---	---	0.384
2.60	7,940	439.10	0.41 ic	0.41 ic	---	---	0.00	---	---	---	---	---	0.406
2.70	8,246	439.20	0.43 ic	0.43 ic	---	---	0.00	---	---	---	---	---	0.427
2.80	8,551	439.30	0.46 ic	0.45 ic	---	---	0.00	---	---	---	---	---	0.447
2.90	8,857	439.40	0.48 ic	0.47 ic	---	---	0.00	---	---	---	---	---	0.467
3.00	9,162	439.50	0.49 ic	0.49 ic	---	---	0.00	---	---	---	---	---	0.485
3.10	9,467	439.60	0.73 ic	0.50 ic	---	---	0.21	---	---	---	---	---	0.714
3.20	9,773	439.70	1.12 ic	0.52 ic	---	---	0.60	---	---	---	---	---	1.116
3.30	10,078	439.80	1.64 ic	0.54 ic	---	---	1.09	---	---	---	---	---	1.631
3.40	10,384	439.90	2.26 oc	0.55 ic	---	---	1.68	---	---	---	---	---	2.238
3.50	10,689	440.00	2.93 oc	0.57 ic	---	---	2.35	---	---	---	---	---	2.924
3.60	10,994	440.10	3.68 oc	0.58 ic	---	---	3.10	---	---	---	---	---	3.680
3.70	11,300	440.20	4.50 oc	0.60 ic	---	---	3.90	---	---	---	---	---	4.500
3.80	11,605	440.30	5.38 oc	0.61 ic	---	---	4.77	---	---	---	---	---	5.379

Continues on next page...

Bed 4

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.90	11,911	440.40	6.29 oc	0.60 ic	---	---	5.69	---	---	---	---	---	6.289
4.00	12,216	440.50	7.24 ic	0.58 ic	---	---	6.66	---	---	---	---	---	7.235

...End

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

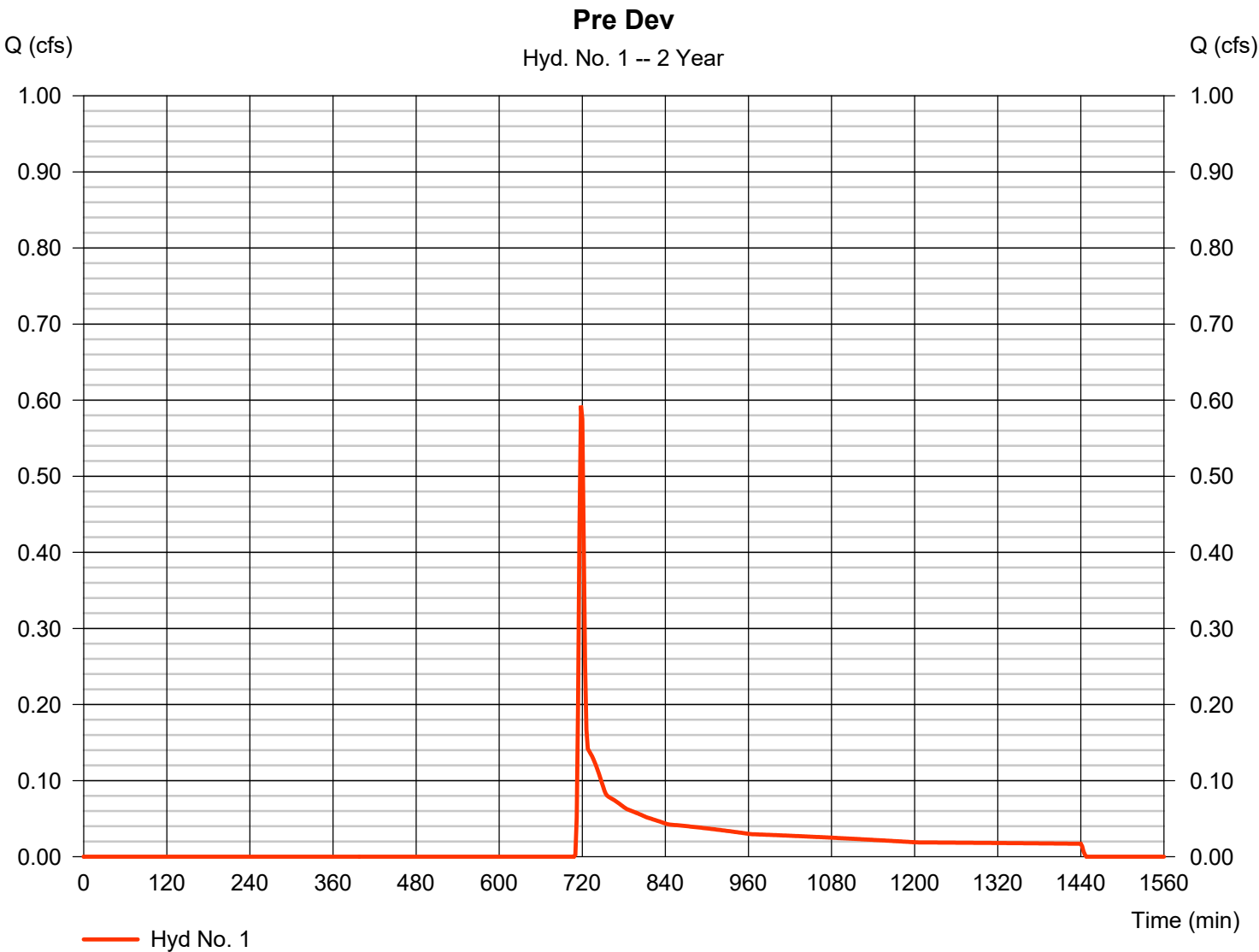
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.593	2	718	1,703	-----	-----	-----	Pre Dev
2	SCS Runoff	3.414	2	718	6,826	-----	-----	-----	Post Dev
3	Reservoir	0.068	2	1048	2,233	2	438.17	5,111	Bed 4 routed
POI-B-Hydro.gpw					Return Period: 2 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.593 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	1,703 cuft
Drainage area	=	1.410 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.24 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

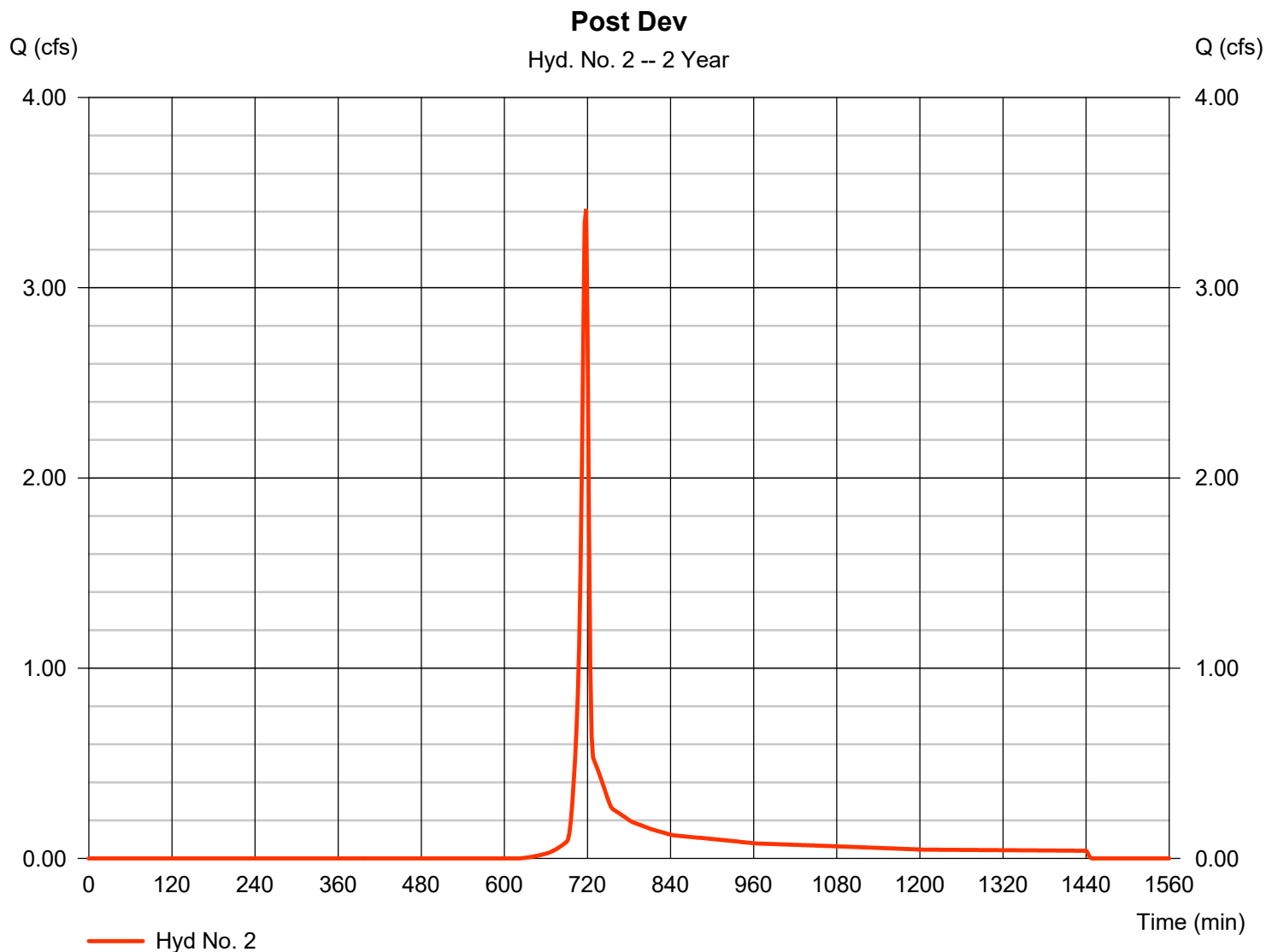
Wednesday, 01 / 31 / 2024

Hyd. No. 2

Post Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 3.414 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 6,826 cuft
Drainage area	= 1.700 ac	Curve number	= 76*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.700 \times 98) + (1.000 \times 61)] / 1.700$



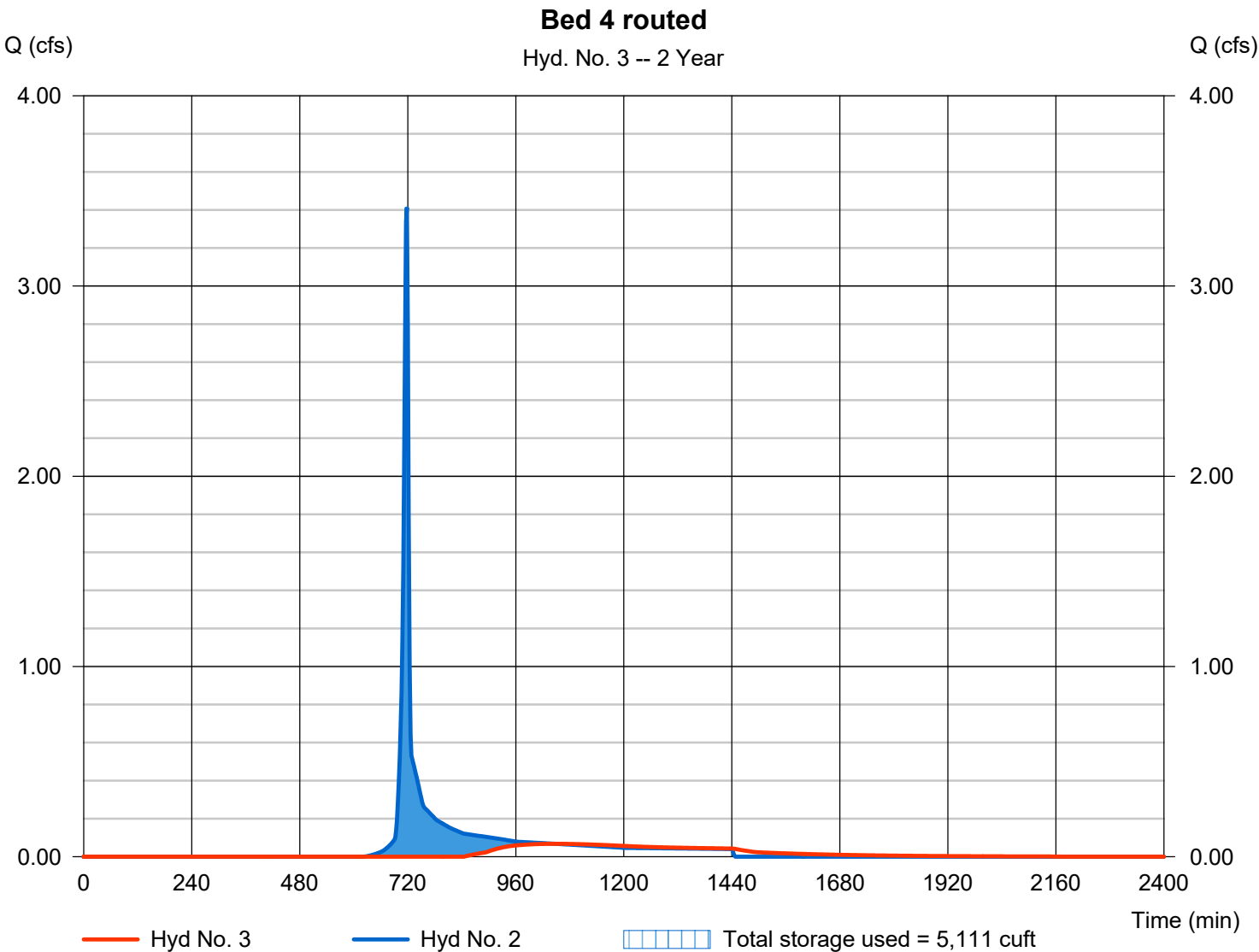
Hydrograph Report

Hyd. No. 3

Bed 4 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.068 cfs
Storm frequency	= 2 yrs	Time to peak	= 1048 min
Time interval	= 2 min	Hyd. volume	= 2,233 cuft
Inflow hyd. No.	= 2 - Post Dev	Max. Elevation	= 438.17 ft
Reservoir name	= Bed 4	Max. Storage	= 5,111 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

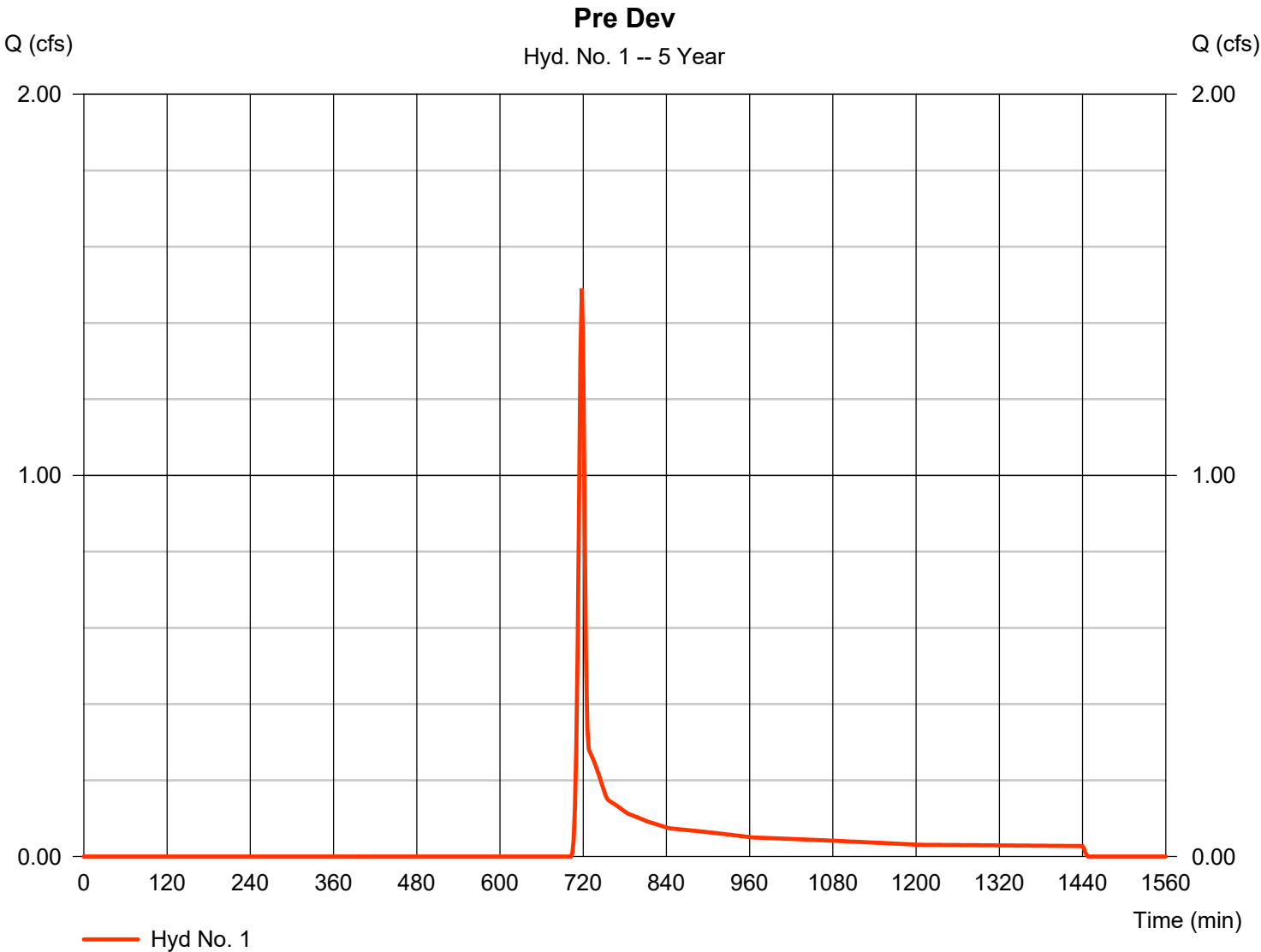
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.491	2	718	3,322	-----	-----	-----	Pre Dev
2	SCS Runoff	5.139	2	718	10,325	-----	-----	-----	Post Dev
3	Reservoir	0.218	2	812	5,731	2	438.44	5,916	Bed 4 routed
POI-B-Hydro.gpw					Return Period: 5 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 1.491 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 3,322 cuft
Drainage area	= 1.410 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.06 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



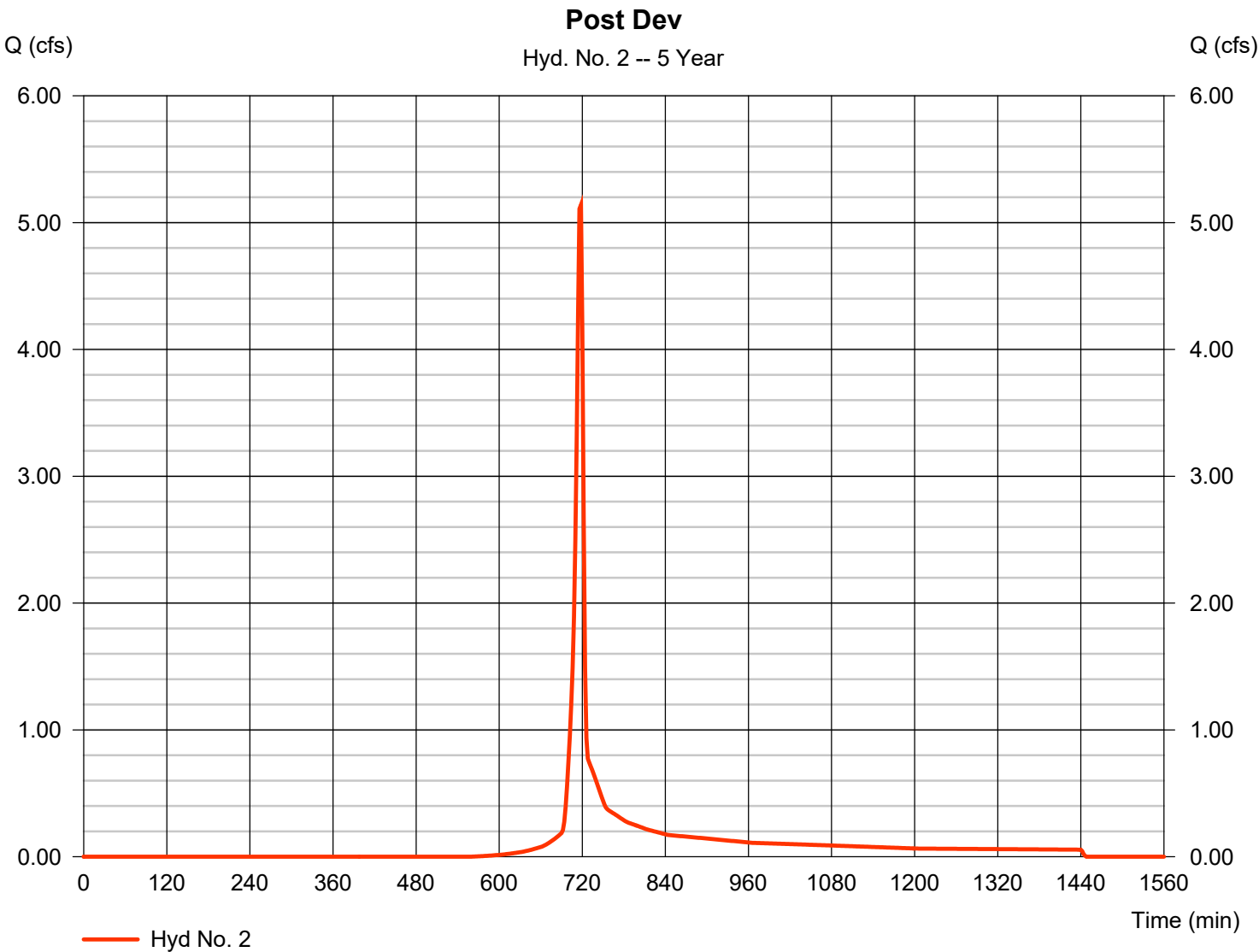
Hydrograph Report

Hyd. No. 2

Post Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 5.139 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 10,325 cuft
Drainage area	= 1.700 ac	Curve number	= 76*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.06 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.700 x 98) + (1.000 x 61)] / 1.700



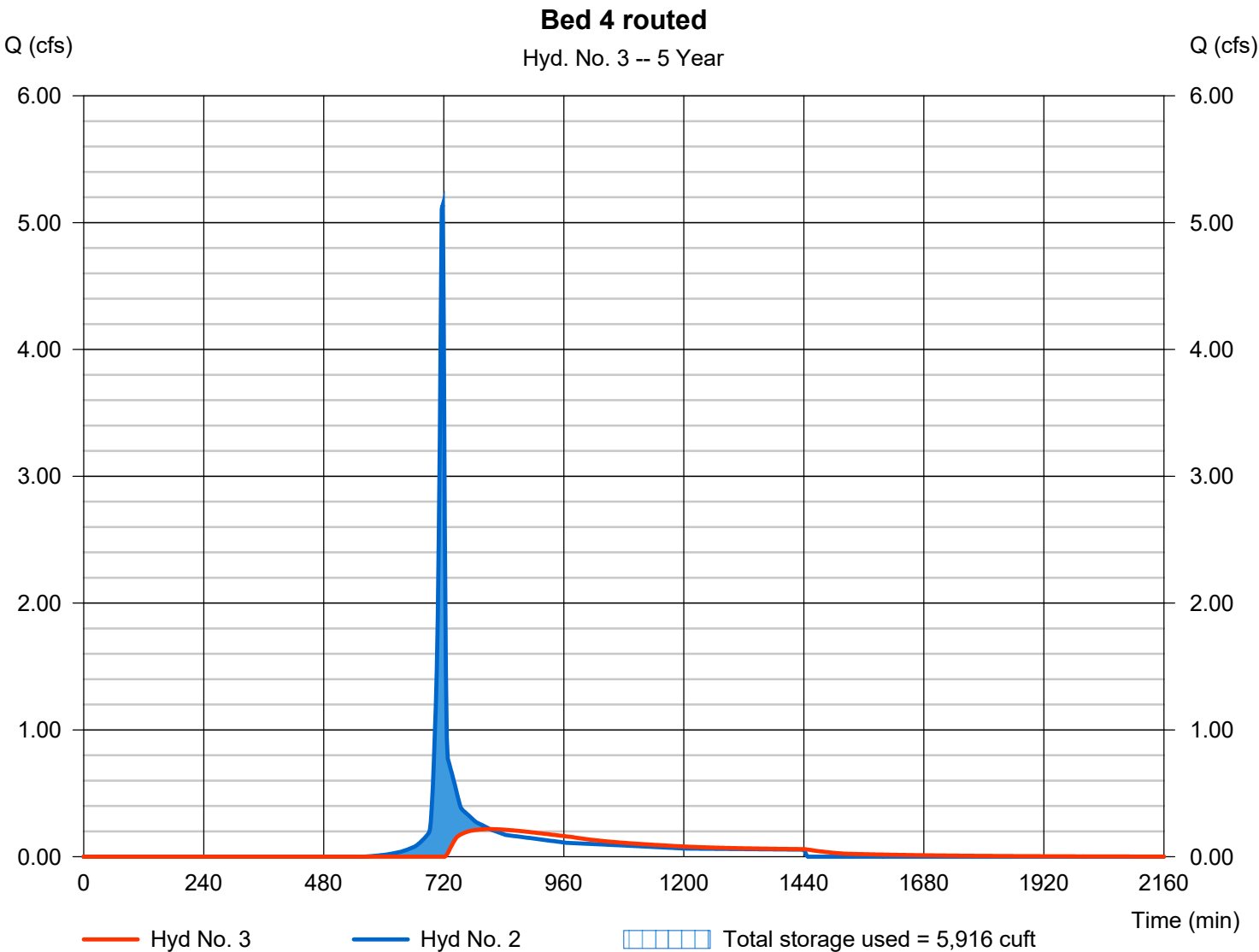
Hydrograph Report

Hyd. No. 3

Bed 4 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.218 cfs
Storm frequency	= 5 yrs	Time to peak	= 812 min
Time interval	= 2 min	Hyd. volume	= 5,731 cuft
Inflow hyd. No.	= 2 - Post Dev	Max. Elevation	= 438.44 ft
Reservoir name	= Bed 4	Max. Storage	= 5,916 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

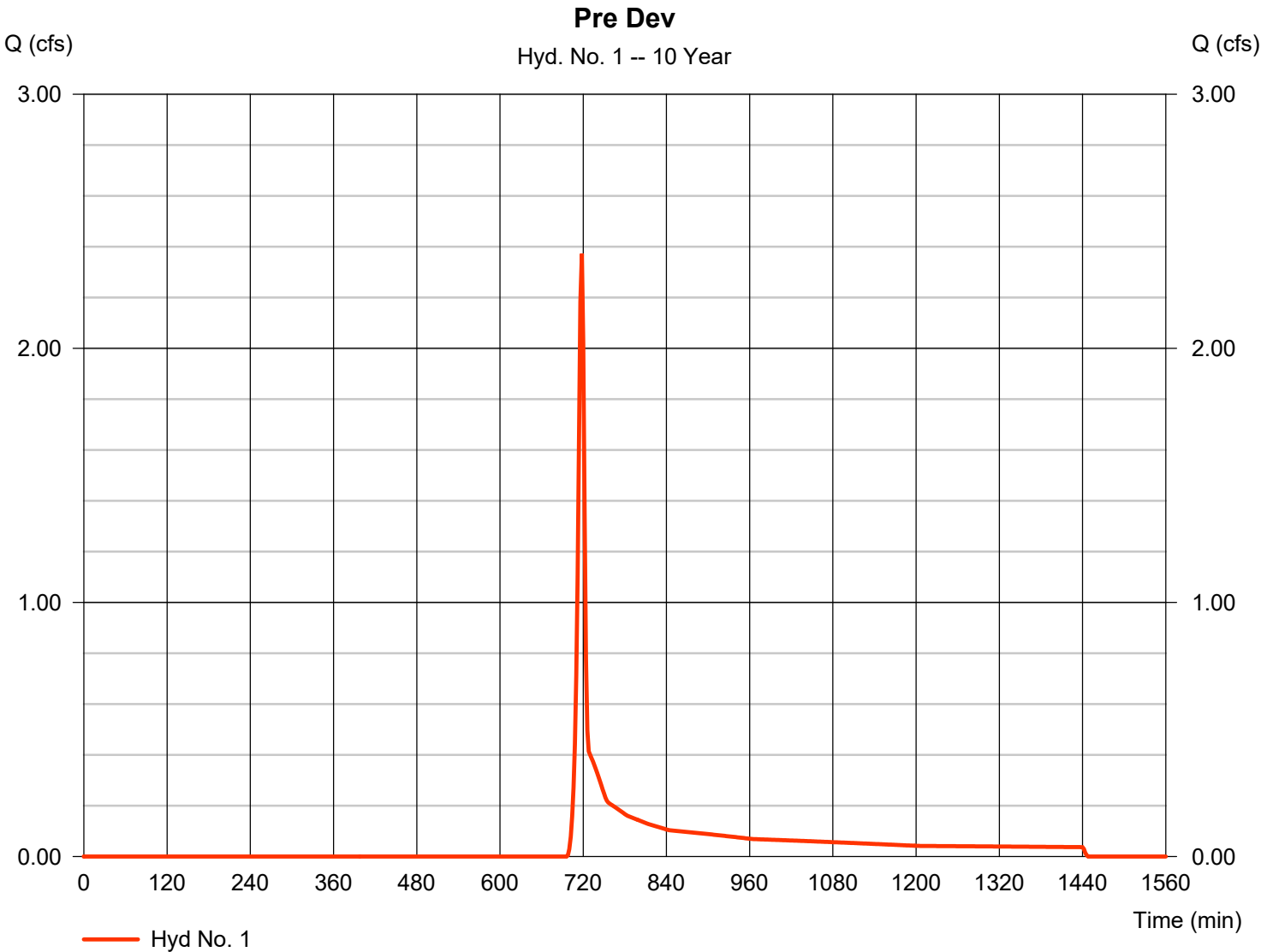
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.372	2	718	4,961	-----	-----	-----	Pre Dev
2	SCS Runoff	6.679	2	716	13,486	-----	-----	-----	Post Dev
3	Reservoir	0.359	2	780	8,892	2	438.90	7,324	Bed 4 routed
POI-B-Hydro.gpw					Return Period: 10 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 2.372 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 4,961 cuft
Drainage area	= 1.410 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.75 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



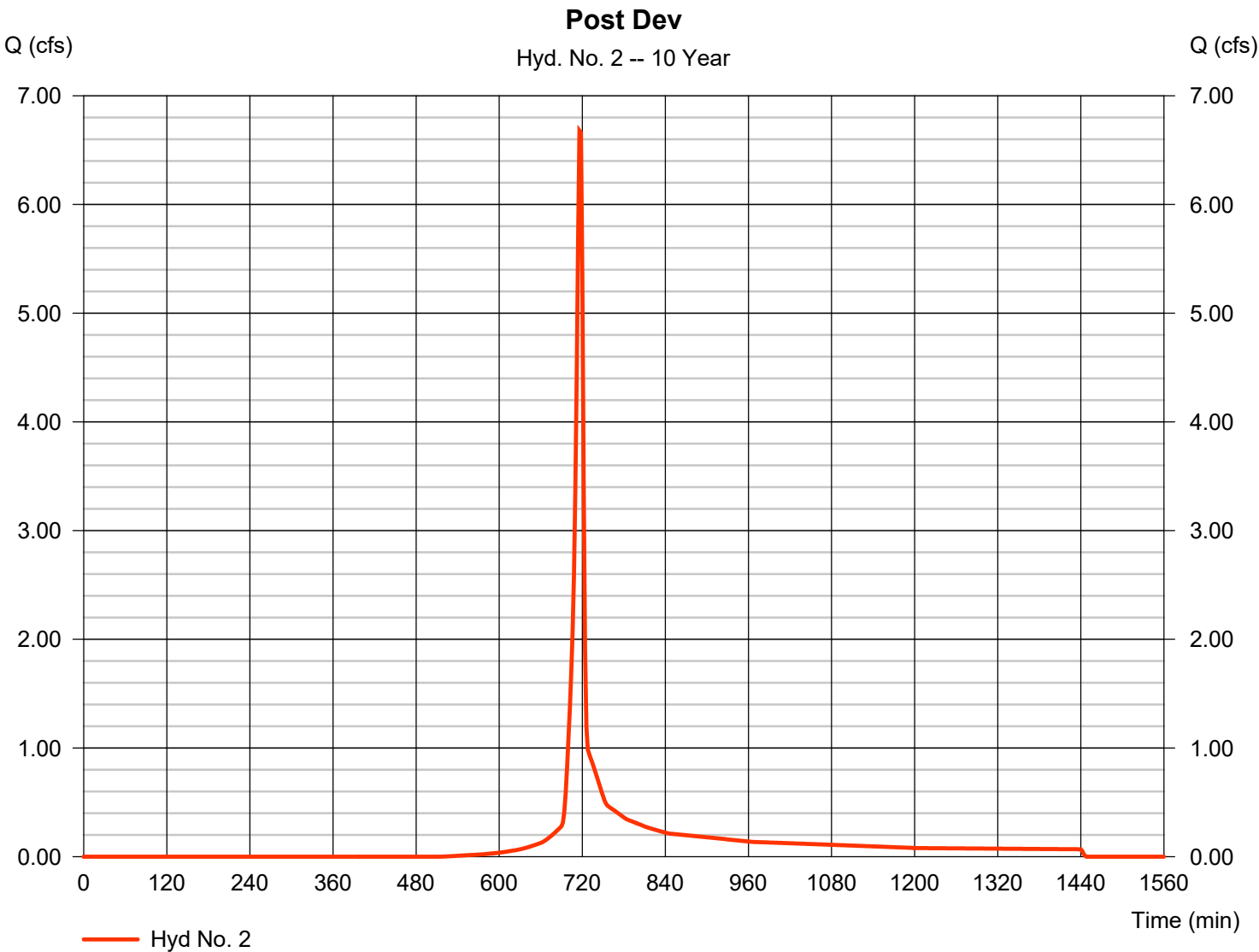
Hydrograph Report

Hyd. No. 2

Post Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.679 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	13,486 cuft
Drainage area	=	1.700 ac	Curve number	=	76*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.75 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 98) + (1.000 x 61)] / 1.700



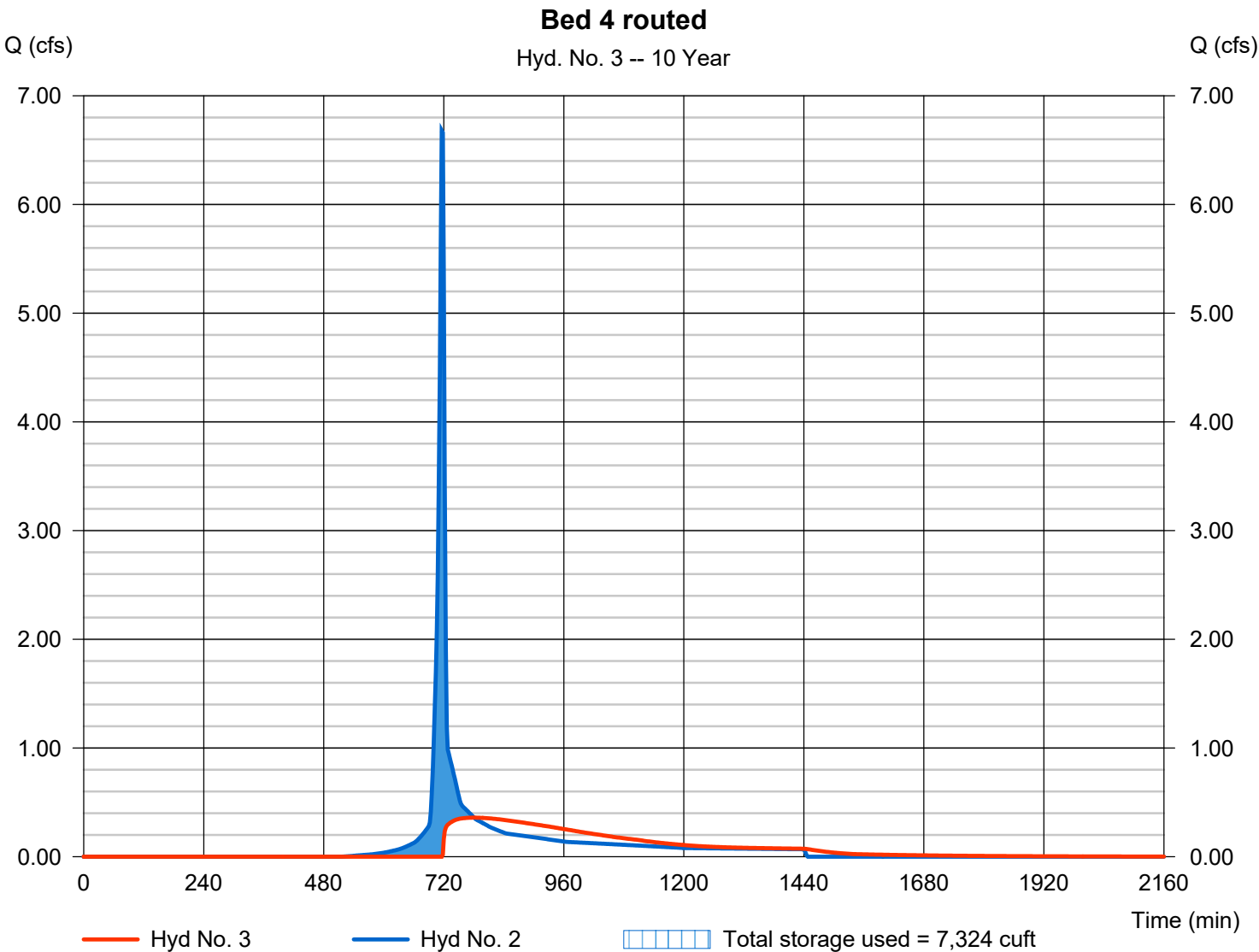
Hydrograph Report

Hyd. No. 3

Bed 4 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.359 cfs
Storm frequency	= 10 yrs	Time to peak	= 780 min
Time interval	= 2 min	Hyd. volume	= 8,892 cuft
Inflow hyd. No.	= 2 - Post Dev	Max. Elevation	= 438.90 ft
Reservoir name	= Bed 4	Max. Storage	= 7,324 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

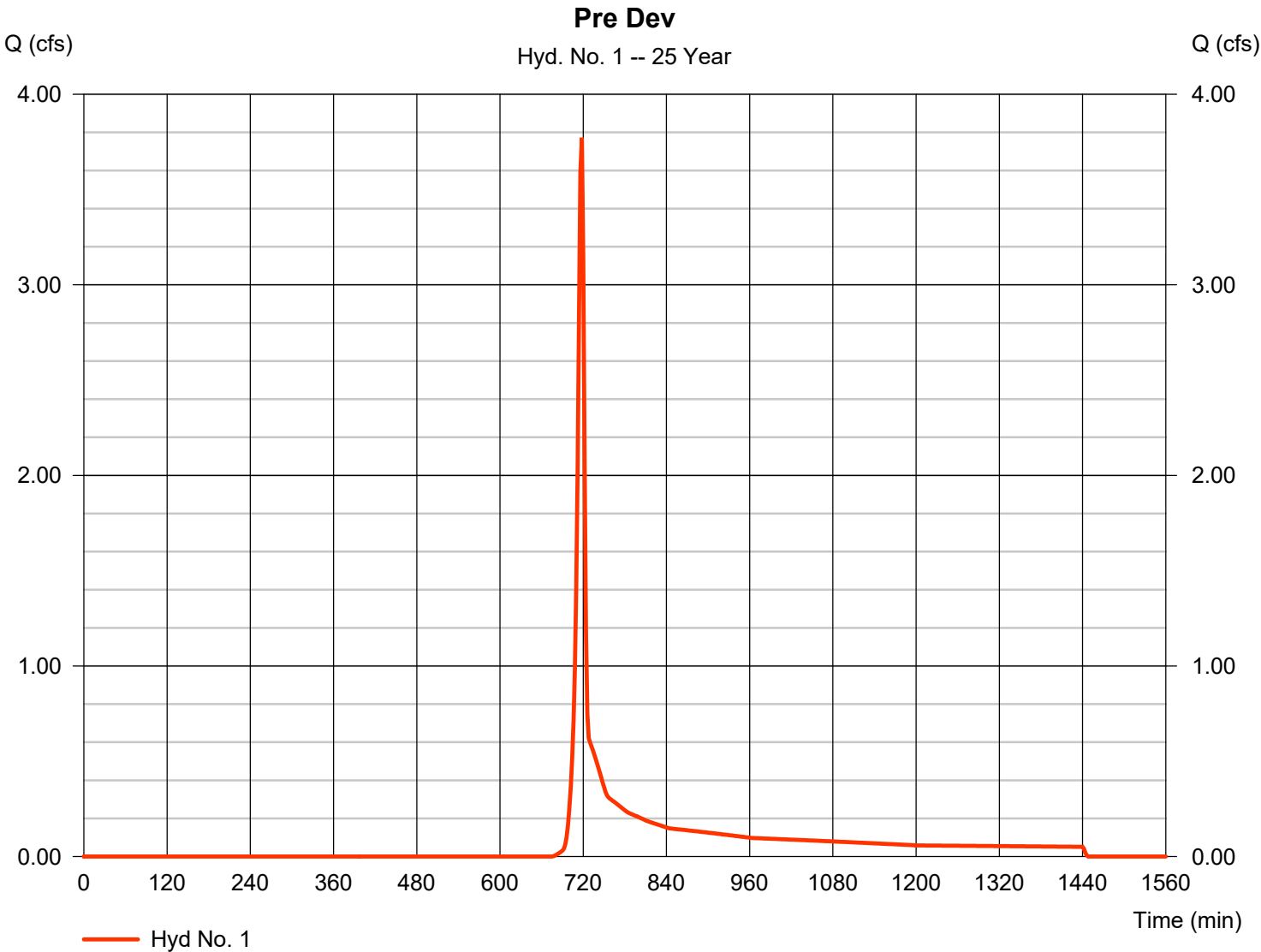
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	3.772	2	718	7,634	-----	-----	-----	Pre Dev
2	SCS Runoff	8.986	2	716	18,214	-----	-----	-----	Post Dev
3	Reservoir	0.842	2	746	13,620	2	439.63	9,565	Bed 4 routed
POI-B-Hydro.gpw					Return Period: 25 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.772 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	7,634 cuft
Drainage area	=	1.410 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.73 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



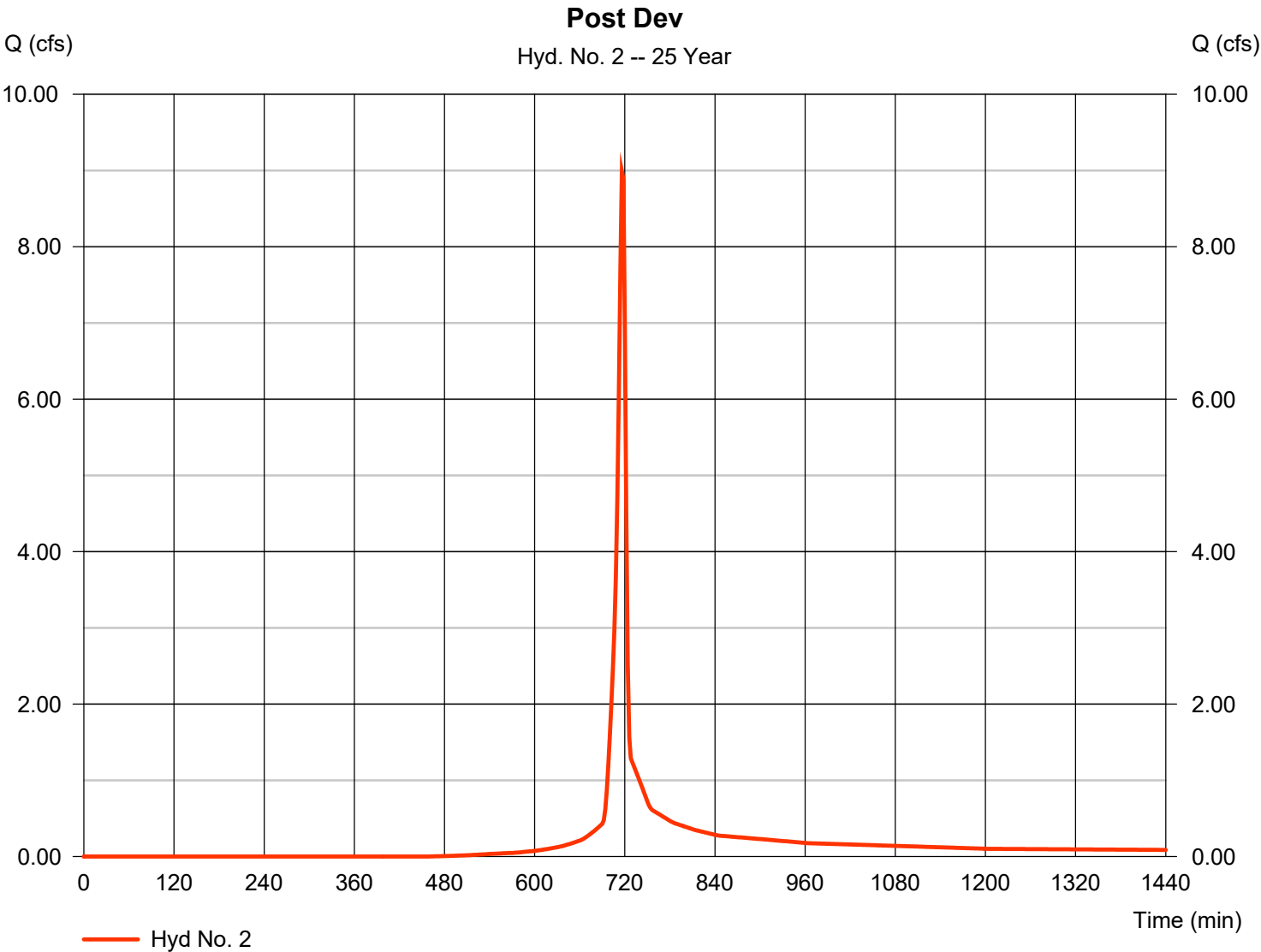
Hydrograph Report

Hyd. No. 2

Post Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.986 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	18,214 cuft
Drainage area	=	1.700 ac	Curve number	=	76*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.73 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 98) + (1.000 x 61)] / 1.700



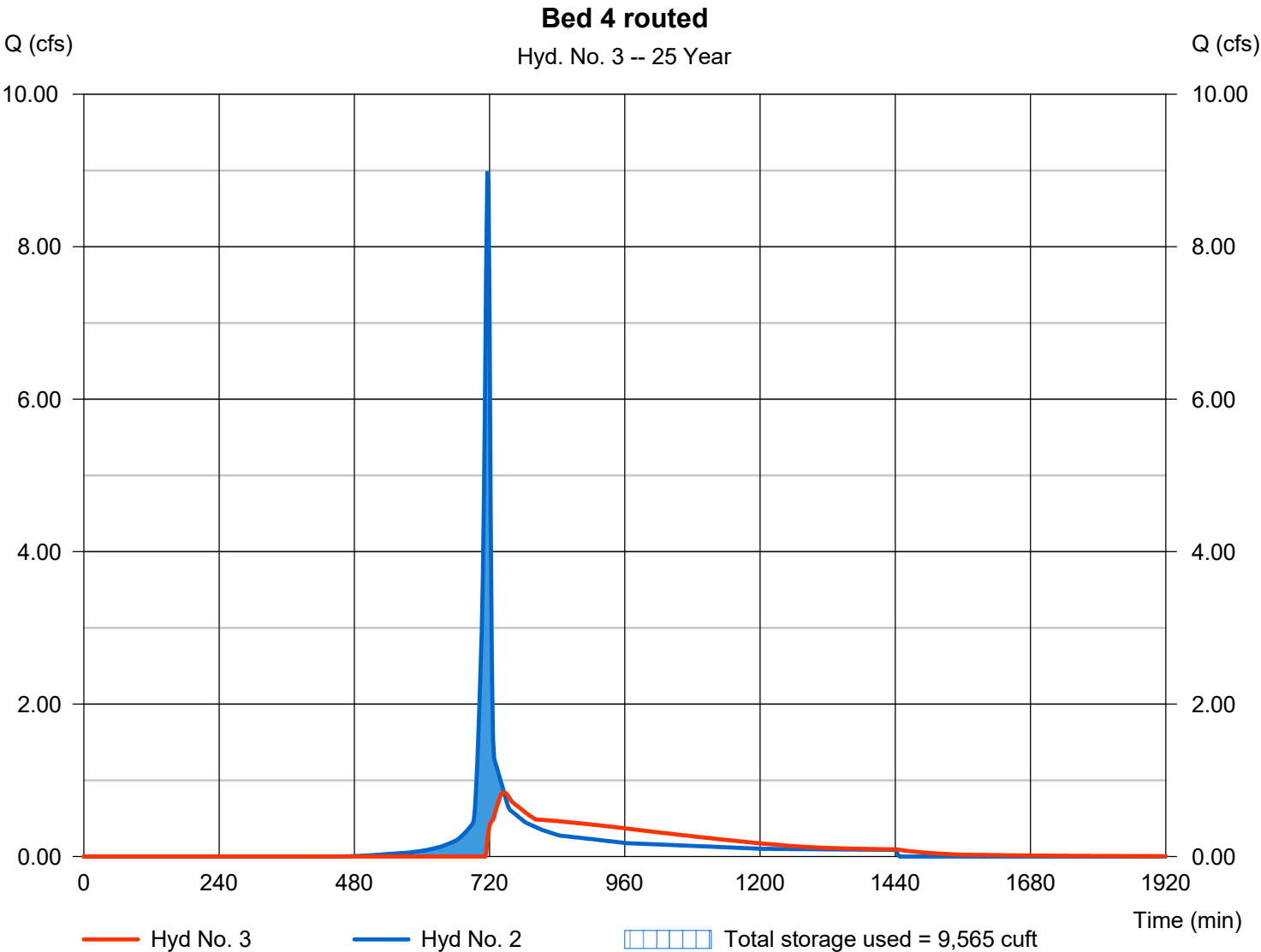
Hydrograph Report

Hyd. No. 3

Bed 4 routed

Hydrograph type	= Reservoir	Peak discharge	= 0.842 cfs
Storm frequency	= 25 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 13,620 cuft
Inflow hyd. No.	= 2 - Post Dev	Max. Elevation	= 439.63 ft
Reservoir name	= Bed 4	Max. Storage	= 9,565 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

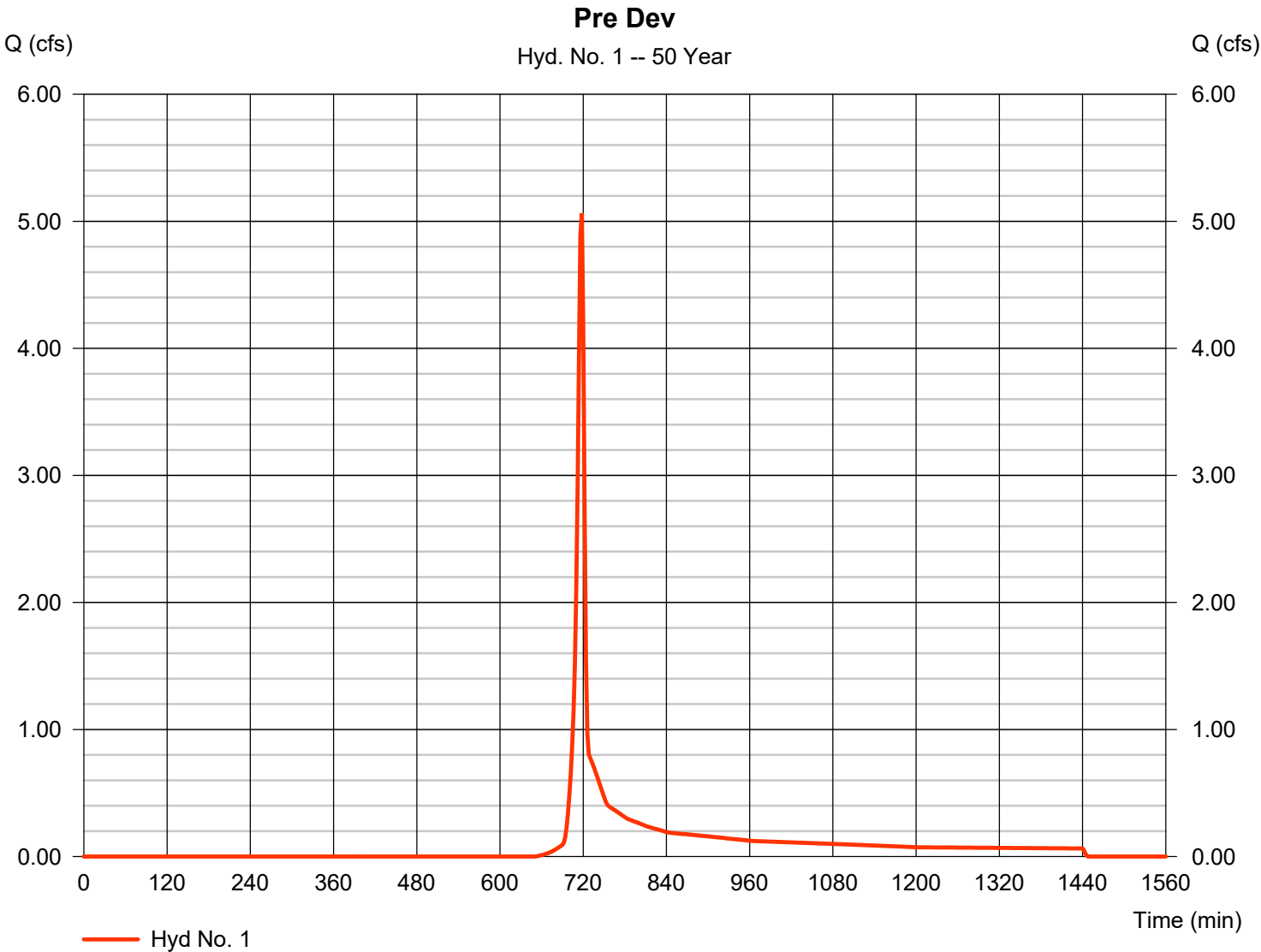
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	5.063	2	718	10,150	-----	-----	-----	Pre Dev
2	SCS Runoff	10.98	2	716	22,378	-----	-----	-----	Post Dev
3	Reservoir	3.009	2	724	17,784	2	440.01	10,724	Bed 4 routed
POI-B-Hydro.gpw					Return Period: 50 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 5.063 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 10,150 cuft
Drainage area	= 1.410 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



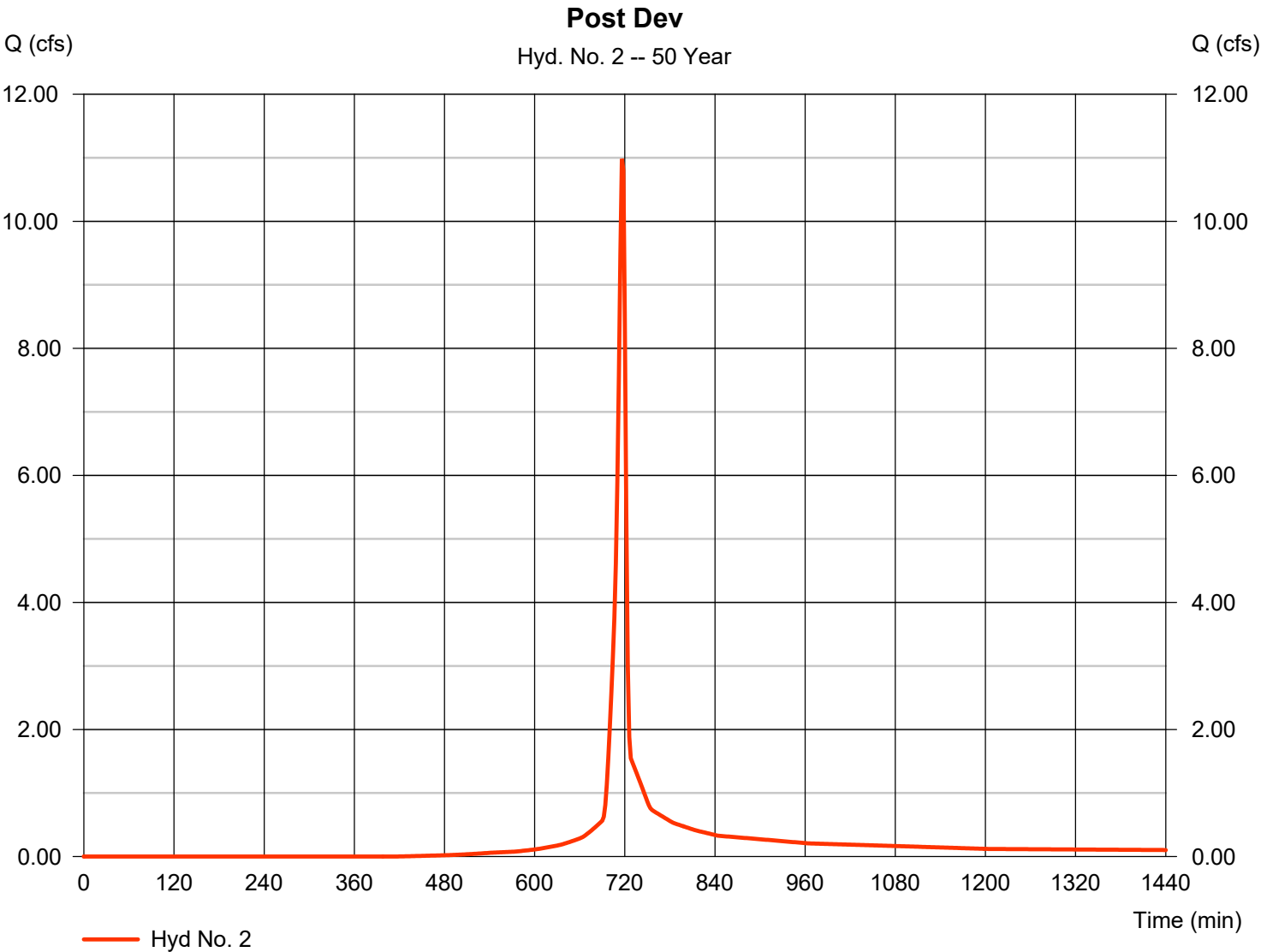
Hydrograph Report

Hyd. No. 2

Post Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 10.98 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 22,378 cuft
Drainage area	= 1.700 ac	Curve number	= 76*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.56 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.700 x 98) + (1.000 x 61)] / 1.700



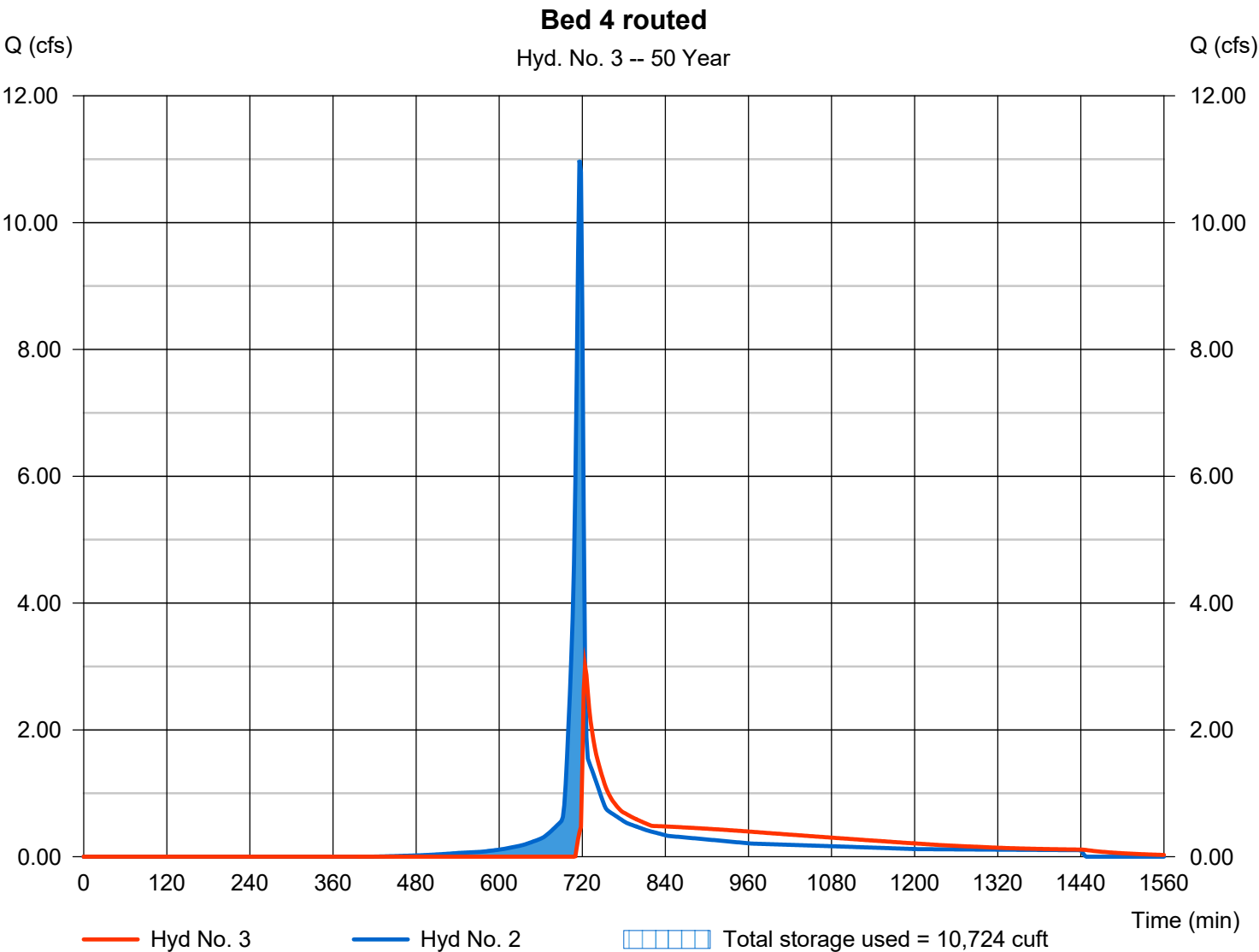
Hydrograph Report

Hyd. No. 3

Bed 4 routed

Hydrograph type	= Reservoir	Peak discharge	= 3.009 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 17,784 cuft
Inflow hyd. No.	= 2 - Post Dev	Max. Elevation	= 440.01 ft
Reservoir name	= Bed 4	Max. Storage	= 10,724 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

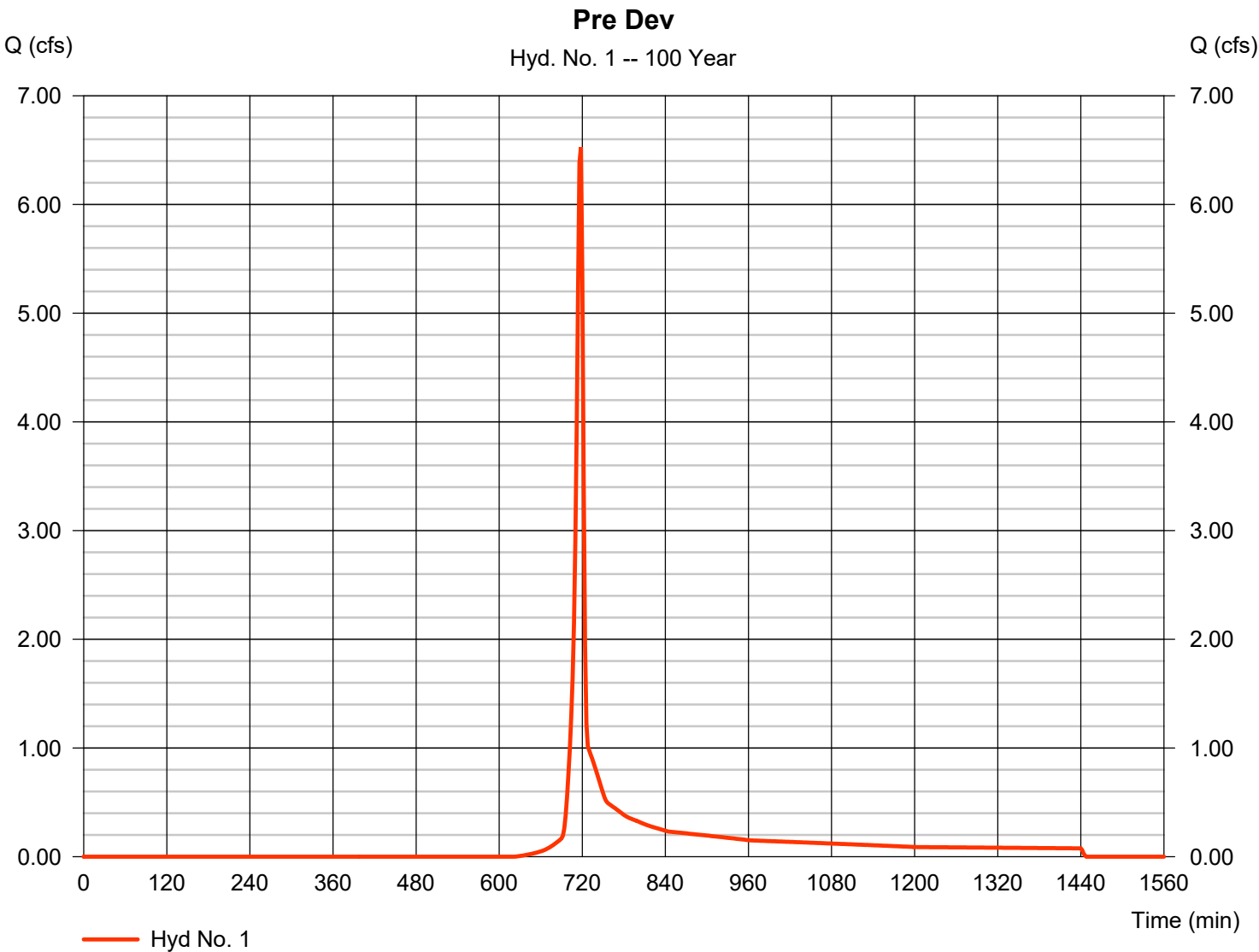
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.527	2	718	13,051	-----	-----	-----	Pre Dev
2	SCS Runoff	13.15	2	716	26,960	-----	-----	-----	Post Dev
3	Reservoir	6.487	2	722	22,366	2	440.42	11,975	Bed 4 routed
POI-B-Hydro.gpw					Return Period: 100 Year			Wednesday, 01 / 31 / 2024	

Hydrograph Report

Hyd. No. 1

Pre Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 6.527 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 13,051 cuft
Drainage area	= 1.410 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



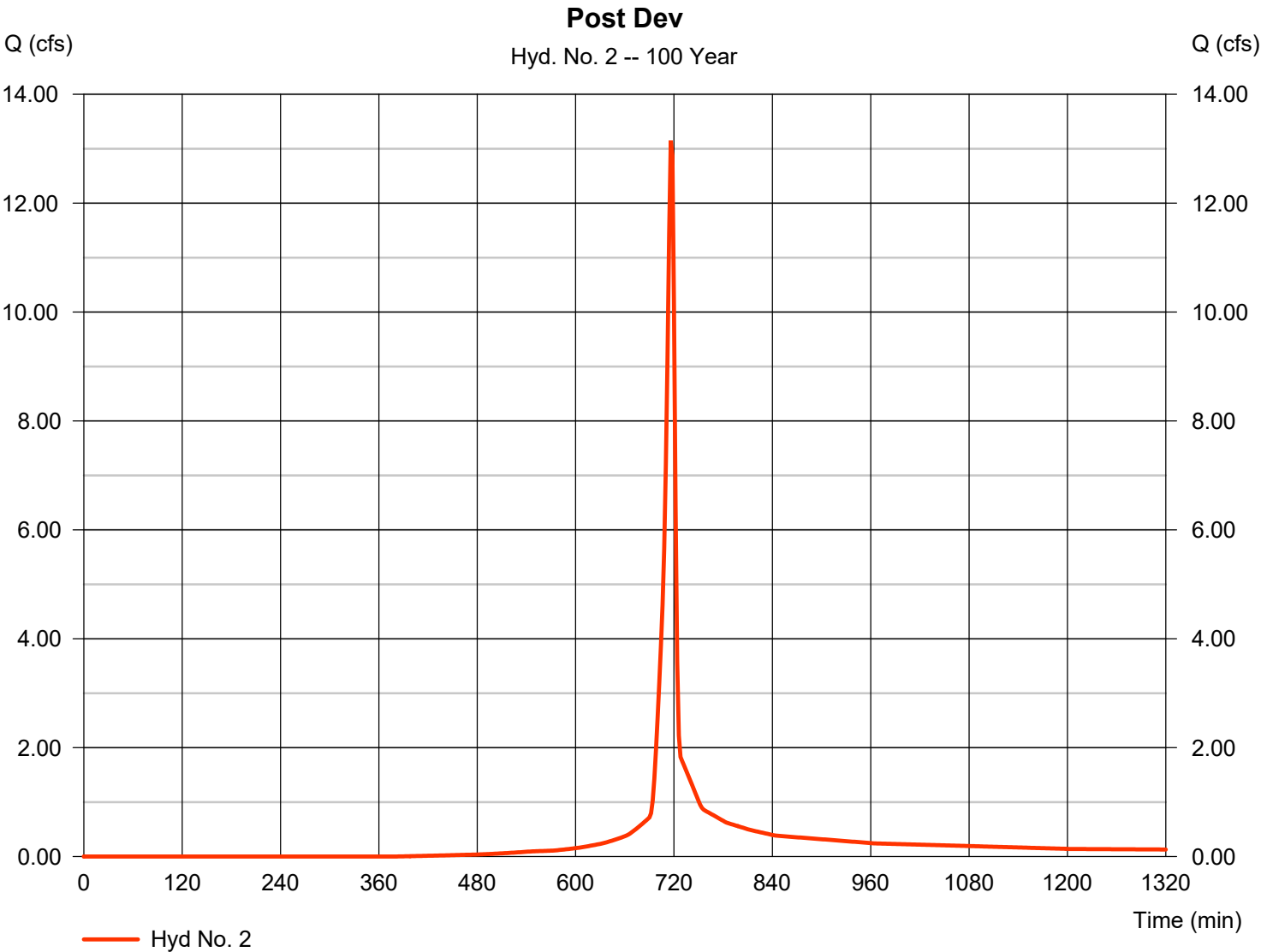
Hydrograph Report

Hyd. No. 2

Post Dev

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	26,960 cuft
Drainage area	=	1.700 ac	Curve number	=	76*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 98) + (1.000 x 61)] / 1.700



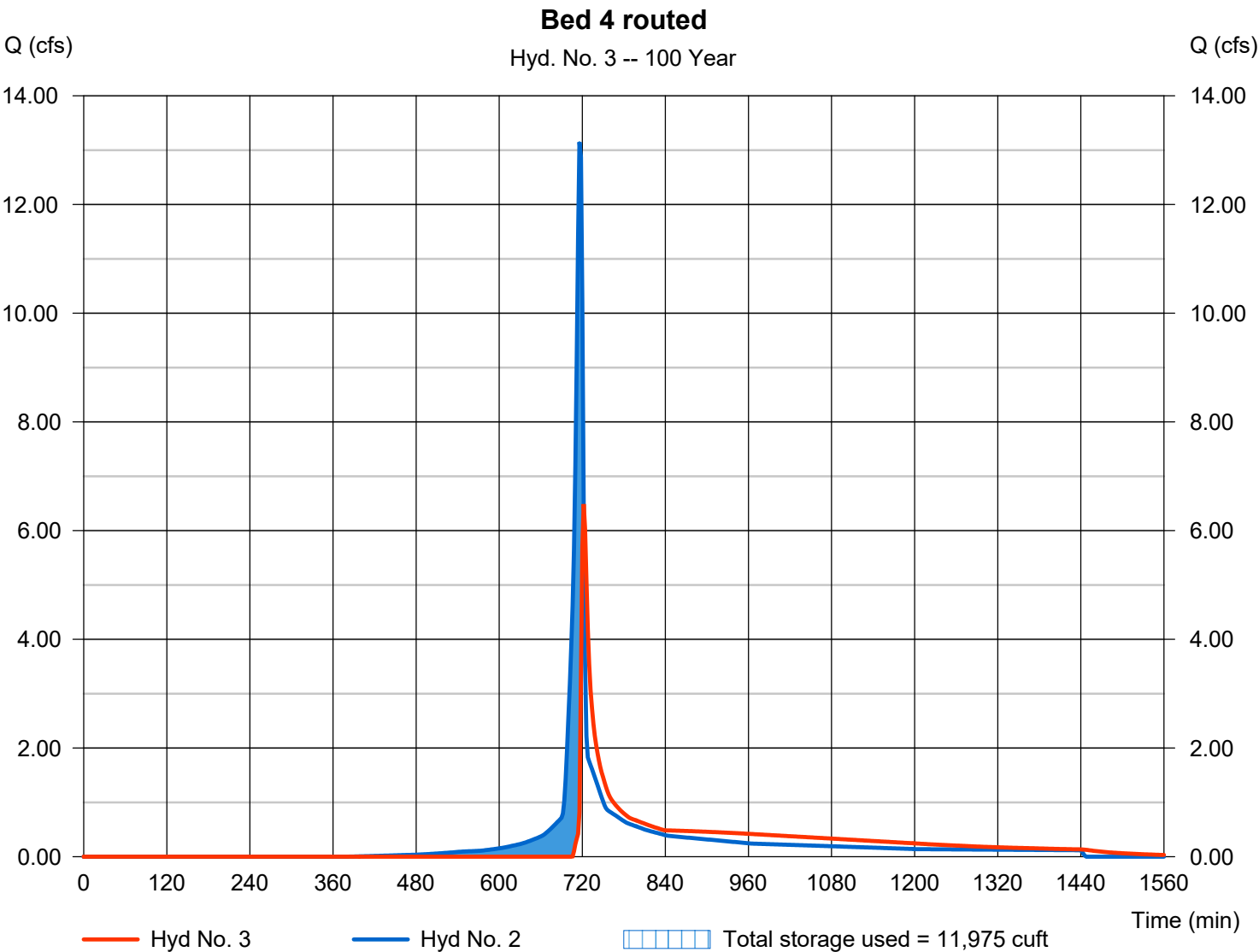
Hydrograph Report

Hyd. No. 3

Bed 4 routed

Hydrograph type	= Reservoir	Peak discharge	= 6.487 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 22,366 cuft
Inflow hyd. No.	= 2 - Post Dev	Max. Elevation	= 440.42 ft
Reservoir name	= Bed 4	Max. Storage	= 11,975 cuft

Storage Indication method used.



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Wastewater * Stormwater * Hydrogeology * Environmental * Testing & Design

September 30, 2019

Site Engineering Concepts, LLC

Mr. David J. Sanders, P.E.

PO Box 1992

Southeastern, PA 19399

Re: Stormwater Soil Evaluation
Hamilton: 228 Strafford Avenue
Radnor Township, Delaware County

Dear Mr. Sanders:

On September 17 & 18, 2019, I conducted soil evaluations for proposed stormwater management systems at the above noted property. A backhoe was used to excavate test pits to determine the most suitable depth to conduct permeability testing within the soil horizons. Test holes are typically excavated to the limits of the reach of the machine, bedrock, or a depth where water may be encountered entering the excavation.

Due to the size of some of the proposed drain fields, soil evaluations were conducted at either end. Existing utilities and sensitive vegetation required adjustment of the pit locations to limit damage to the area.

Test pit #SWM-01A and #SWM-01B were similar, with no observed limiting conditions to approximately 9 feet. Although the soil at depth was somewhat friable to firm, the permeability testing indicated that any applied water would be infiltrated.

Test pit #SWM-02A and #SWM-02B were similar, with no observed limiting conditions to approximately 10 feet. Below a slightly plastic horizon near three feet, the underlying soils were friable. Existing utilities consisting of water, an old terra cotta tile field, and electric wiring were observed and damaged, all above a depth of 42".

Test #SWM-03 was located just below the pool area and situated to minimize damage to the existing sensitive vegetation. The soil was friable below 64". Due to the length of the test pit for safety access, a drain pipe was uncovered well south and west of the proposed field.

Test #SWM-04 indicated redoximorphic features (formerly called mottles) from 10" to 30". However, the redox features are a result of a textural discontinuity rather than an indication of a high-water table. Although no limiting horizons were noted, the second permeability test was done at 42" to account for the variations in the topography. This shallower test at 42" failed. A drainage pipe was observed in the scrape for the shallow permeability test #PS4-B above 42" and leading away from the area.

A Guelph Permeameter was used to determine the permeability of the soil. The Guelph is a constant head borehole permeameter using the principle of the Mariotte Siphon to supply a constant level of water in the hole; unlike a percolation falling head test. The depth of the holes from existing grade level were adjusted to account for topographic variations.

The Guelph allows the Field Saturated Permeability (K_{fs}) to be determined by running the test twice, at two different heads. Two tests are run at different heads or water elevations in order to provide the “gradient” portion of the required calculations. The gradient is used to measure the flux or water movement within the soil. A fluid bulb quickly forms and allows the stabilized hydraulic conductivity to be calculated. Errors inherent in other types of permeability tests that are minimized or eliminated by the Guelph Permeameter are soil fracturing, varying heads, silted in holes, estimated readings due to scale, and leaking clay seals.

Permeability tests assume that homogeneous soil conditions exist at and below the test zone, which is why the central portions of one soil horizon are typically chosen for the test depths. However, soil suitability, PA DEP guidelines, and proposed system design may alter that test parameter. Even within a consistent soil, unseen heterogeneous soil conditions can exist and may consist of:

1. Changing soil horizons across or near the test zone
2. Rock or stony soil beneath the bottom of the test hole
3. Roots, animal burrows
4. Soil fractures & thinly laminated soils

The consistency of the soil can be estimated by comparing the assumed and calculated alpha value. The alpha value is a soil parameter that depends primarily upon the soil texture and structure. By definition, it is the ratio of gravity to capillary soil-water forces. The value of typical fine to coarse-grained soils ranges between 0.01 and 0.5 cm^{-1} . Values considerably outside of this range (and negative values) suggest that heterogeneous soil conditions, such as in stony areas, may be encountered. Large alpha values suggest coarse textured or highly structured soils. Low alpha values suggest finer grained soils or a fine matrix. The geometric mean of the single head tests can be used in place of the two head approach to provide the permeability values if heterogeneous soil conditions cannot be avoided, such as in rocky areas.

A summary of the test results is noted in the table below. The base of all stormwater systems must adhere to the 24” isolation distance to any limiting horizon or pit base as required by the PA DEP guidance. Based on the observed soil in the test pits, the following tolerances are suggested:

Test ID	Test Probe #	Test Depth (inches)	Result (in/hr)	Geometric Mean
PS1-A	SWM-01A	84”	2.47	1.75
PS1-B	SWM-01B	84”	1.23	
PS2-A	SWM-02A	96”	0.88	1.06
PS2-B	SWM-02B	96”	1.27	
PS-3A	SWM-03	96”	0.53	1.26
PS-3B		96”	2.99	
PS4-A	SWM-04	84”	0.51	0.0
PS4-B		42”	Zero	

Test Pit ID	Limiting Depth	Upper Installation Limit	Lower Installation Limit
SWM-01A	110" Pit Base	44"	86"
SWM-01B	109" Pit Base	37"	85"
SWM-02A	120" Pit Base	59"	96"
SWM-02B	120" Pit Base	43"	96"
SWM-03	120" Pit Base	64"	96"
SWM-04	122" Pit Base	45" (perm Test Fail @ 42")	98"

The base of the stormwater systems should be kept between the upper and lower limits of the testing as measured from existing grade while using the respective permeability test results. The base of the system could vary due to design conditions but the base should be kept as close to the test depths as possible. The base of the excavation should be scarified so as not to clog the void spaces.

The permeability test data indicates that the soil can infiltrate the applied stormwater assuming that a properly dimensioned and constructed stormwater system is provided (except for test area #SWM-04). No safety factor needs to be applied to the test results as this is a true permeability test, other than any additional safety factor the designer may choose to add. The rock underlying this site and within the test probes is not a carbonate material.

I have directly performed and/or supervised the test procedures and preparation of this report. All information contained herein is accurate to the best of my knowledge and all test procedures have been performed using accepted practices. HILBEC Engineering & Geosciences, LLC cannot and does not make claim, warranty or guarantee that surface and sub-surface site conditions other than described herein, either natural or as altered by construction activities, may be different at some time in the future and thus may affect these findings.

Please refer to the attached test logs, permeability test data, and location map of the test areas. If you have any further questions, please contact our office.

Very truly yours,

For HILBEC Engineering & Geosciences, LLC


Kevin R. Sech, P.G., P.E.

SOIL DESCRIPTIONS

Project Name:	Hamilton: 228 Strafford Ave	Probe #:	SWM-01A
Municipality:	Radnor Township	Test Date:	September 18, 2019
Soil Profile Description Prepared By:	Kevin R. Sech, P.G., P.E.	Soil Profile Limitation:	None
General Location of the Test Pit:	Westerly side of test area near greenhouse		No water or bedrock observed

Project Name:	<i>Hamilton: 228 Strafford Ave</i>
Municipality:	<i>Radnor Township</i>
Soil Profile Description Prepared By:	<i>Kevin R. Sech, P.G., P.E.</i>
General Location of the Test Pit:	<i>Westerly side of test area near greenhouse</i>

Method of Excavation:	Backhoe/Trackhoe	Remarks:
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PROJECT LIMITATIONS:

I state that I have visited the site and directly performed and/or supervised all test procedures and/or preparation of this report. All information contained herein is accurate to the best of my knowledge and all test procedures have been performed using accepted practices. HILBEC Engineering & Geosciences, LLC cannot and does not make claim, warranty, or guarantee that surface and sub-surface site conditions or test results, other than described or conducted at the time of the test, may be different at some time in the future and thus may affect these findings herein.

Kevin R. Sech
Kevin R. Sech, P.G., P.E.



Project Name:	Hamilton: 228 Strafford Ave			Probe #:	SWM-01B		
Municipality:	Radnor Township			Test Date:	September 18, 2019		
Soil Profile Description Prepared By:	Kevin R. Sech, P.G., P.E.			Soil Profile Limitation:	None		
General Location of the Test Pit:	Easterly side of the test area near Strafford Ave.				No water or bedrock observed		

Horizon	Up	Low	Color	Texture	Structure			Consistence		CF%	Boundary		Roots	Coats	Redox
					Medium	Moderate	Granular	Friable	Avg Moisture		Abrupt	Smooth			
Ap	0	11	10YR 3/3 Dark Brown	Silt Loam						<10%			Yes	---	---
Bt 1	11	23	10YR 5/8 Yellowish Brown	Loam	Medium	Moderate	SBK	Friable to Firm	Avg Moisture	10%	Clear	Wavy	Few	---	---
Bt 2	23	37	10YR 5/6 Yellowish Brown	Silt Loam	Fine	Weak	SBK	Friable to Firm	Avg Moisture	20%	Clear	Wavy	No	---	---
C	37	109	10YR 5/4 Variegated Yellowish Brown	Silt Loam	---	Massive	Structureless	Friable	Avg Moisture	20%	Pit Base	---	No	---	---
Method of Excavation:	Backhoe/Trackhoe		Remarks:												

PROJECT LIMITATIONS:

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Kevin R. Sech
Kevin R. Sech, P.G., P.E.



Project Name:	Hamilton: 228 Strafford Ave		
Municipality:	Radnor Township		
Soil Profile Description Prepared By:	Kevin R. Sech, P.G., P.E.		
General Location of the Test Pit:	Easterly side of the test area near the pool		

Probe #:	SWM-02A
Test Date:	September 17, 2019
Soil Profile Limitation:	None No water or bedrock observed

Horizon	Up	Low	Color	Texture	Structure			Consistence		CF%	Boundary		Roots	Coats	Redox
					Fine	Weak	Granular	Friable	Avg Moisture		Abrupt	Smooth			
Ap	0	25	10YR 3/3 Dark Brown	Silt Loam						30%			Yes	---	---
Historic Fill															
Bt	25	39	10YR 4/6 Dk Yellowish Brown	Silty Clay Loam	Medium	Moderate	SBK	SI Plastic	Avg Moisture	10%	Clear	Wavy	Few	---	---
Uncovered 1" water pipe @ 32" and terra cotta tile field at 42"															
BC	39	59	10YR 4/6 Variegated Dk Yellowish Brown	Silt Loam	Fine	Weak	SBK	Friable	Avg Moisture	20%	Clear	Wavy	No	---	---
C	59	120	10YR 4/6 Variegated Dk Yellowish Brown	Silt Loam	---	Massive	Structureless	Friable	Avg Moisture	35%	Pit Base	---	No	---	---
Method of Excavation:	Backhoe/Trackhoe			Remarks: This test pit was slid to the south to avoid further damage to buried electric											

PROJECT LIMITATIONS:

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Kevin R. Sech

Kevin R. Sech, P.G., P.E.



Project Name:	Hamilton: 228 Stafford Ave		
Municipality:	Radnor Township		
Soil Profile Description Prepared By:	Kevin R. Sech, P.G., P.E.		
General Location of the Test Pit:	Westerly side of the test area near Stafford Ave.		

Probe #:	SWM-02B
Test Date:	September 17, 2019
Soil Profile Limitation:	None No water or bedrock observed

Horizon	Up	Low	Color	Texture	Structure			Consistence		CF%	Boundary		Roots	Coats	Redox
					Medium	Moderate	Granular	Friable	Avg Moisture		Abrupt	Smooth			
Ap	0	12	10YR 3/3 Dark Brown	Silt Loam						<10%			Yes	---	---
Bt	12	33	10YR 4/6 Dk Yellowish Brown	Silty Clay Loam	Medium	Moderate	SBK	SI Plastic	Avg Moisture	10%	Clear	Wavy	Few	---	---
BC	33	43	10YR 4/6 Variegated Dk Yellowish Brown	Silt Loam	Fine	Weak	SBK	Friable	Avg Moisture	15%	Clear	Wavy	Few	---	---
C	43	120	10YR 4/6 Variegated Dk Yellowish Brown	Silt Loam	---	Massive	Structureless	Friable	Avg Moisture	25%	Pit Base	---	No	---	---
Method of Excavation:	Backhoe/Trackhoe		Remarks:												

PROJECT LIMITATIONS:

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Kevin R. Sech

Kevin R. Sech, P.G., P.E.



Project Name:	Hamilton: 228 Strafford Ave		
Municipality:	Radnor Township		
Soil Profile Description Prepared By:	Kevin R. Sech, P.G., P.E.		
General Location of the Test Pit:	Lower side of the pool		

Probe #:	SWM-03
Test Date:	September 17, 2019
Soil Profile Limitation:	None No water or bedrock observed Redox not a high or perched water table

Horizon	Up	Low	Color	Texture	Structure			Consistence		CF%	Boundary		Roots	Coats	Redox
					Medium	Moderate	Granular	Friable	Avg Moisture		Abrupt	Smooth			
Ap	0	12	10YR 3/3 Dark Brown	Silt Loam						<10%			Yes	---	---
Bt	12	42	10YR 5/8 Yellowish Brown	Silty Clay Loam	Medium	Moderate	SBK	SI Plastic	Avg Moisture	10%	Clear	Wavy	Few	---	Prom
Textural difference - not a high water table															
BC	42	64	10YR 4/6 Dk Yellowish Brown	Silt Loam Heavy In-Part	---	Massive	Structureless	Friable to SI Plastic	Avg Moisture	15%	Clear	Wavy	No	---	---
C	64	120	10YR 4/2 Variegated Dark Grey Brown	Silt Loam	---	Massive	Structureless	Friable	Avg Moisture	30%	Pit Base	---	No	---	---
Method of Excavation:	Backhoe/Trackhoe		Remarks:												

PROJECT LIMITATIONS:

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Kevin R. Sech
Kevin R. Sech, P.G., P.E.



Project Name:	Hamilton: 228 Strafford Ave		Probe #:	SWM-04
Municipality:	Radnor Township		Test Date:	September 17, 2019
Soil Profile Description Prepared By:	Kevin R. Sech, P.G., P.E.		Soil Profile Limitation:	None No water or bedrock observed Redox not a high or perched water table
General Location of the Test Pit:	WNW Property Corner			

Horizon	Up	Low	Color	Texture	Structure			Consistence		CF%	Boundary		Roots	Coats	Redox	
					Medium	Moderate	Granular	Friable	Avg Moisture		Abrupt	Smooth			---	---
Ap	0	10	10YR 3/3 Dark Brown	Silt Loam						<10%			Yes	---	---	---
Bt 1	10	30	10YR 5/8 Yellowish Brown	Silty Clay Loam	Medium	Moderate	SBK	V Firm	Avg Moisture	10%	Clear	Wavy	Few	---	Few	Faint
Textural difference - not a high water table																
Bt 2	30	45	10YR 5/8 Dk Yellowish Brown	Silt Loam	Fine	Weak	SBK	Friable	Avg Moisture	10%	Clear	Irregular	No	---	---	---
BC	45	97	10YR 4/6 Variegated Dk Yellowish Brown	Silt Loam Heavy In-Part	---	Massive	Structureless	Friable	Avg Moisture	10%	Clear	Irregular	No	---	---	---
C	97	122	10YR 4/4 Variegated Dk Yellowish Brown	Silt Loam Sandy In-Part	---	Massive	Structureless	Friable	Avg Moisture	20%	Pit Base	---	No	---	---	---

Method of Excavation:	Backhoe/Trackhoe	Remarks:	Old trench drain found in the scrape for the permeability test at the low corner of the site.
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PROJECT LIMITATIONS:

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Kevin R. Sech
Kevin R. Sech, P.G., P.E.



**PERMEABILITY TEST RESULTS
AND CALCULATIONS**

CONSTANT HEAD PERMEAMETER TEST

PROJECT NAME: Hamilton: 228 Strafford Ave
 TEST ID: PSI-A
 TEST DEPTH: 84"
 NEAR SOIL PROBE #: SWM-01A

TEST DATE: September 18, 2019
 WEATHER / TEMP: Sunny / 70 Degrees
 HOLE DIAMETER: 6.0 cm or inch 2 3/8
 SIDE OF TEST AREA: Westerly Side

1st Level at 5 cm					Number of Tubes (1 or 2)
Time Interval (seconds)	Water Level Reading (cm)	Previous Water Level (cm)	Change in Level (cm)		
Stabilized with 3 consecutive equal readings					
30	3.4	1.7	1.7	2	1
30	4.8	3.4	1.4	2	2
30	6.0	4.8	1.2	2	3
30	7.2	6.0	1.2	2	4
30	8.3	7.2	1.1	2	5
30	9.6	8.3	1.3	2	6
30	10.5	9.6	0.9	2	7
30	11.7	10.5	1.2	2	8
30	12.7	11.7	1.0	2	9
30	13.7	12.7	1.0	2	10
30	14.7	13.7	1.0	2	11
					12
					13
					14
					15
					16
					17
					18
					19
					20
					21
					22
					23
					24
					25
					26
					27
					28
Stabilized At:					1.0 cm

2nd Level at 10 cm					Number of Tubes (1 or 2)
Time Interval (seconds)	Water Level Reading (cm)	Previous Water Level (cm)	Change in Level (cm)		
Stabilized with 3 consecutive equal readings					
30	21.9	19.9	2.0	2	1
30	23.4	21.9	1.5	2	2
30	25.0	23.4	1.6	2	3
30	26.5	25.0	1.5	2	4
30	28.1	26.5	1.6	2	5
30	29.6	28.1	1.5	2	6
30	31.2	29.6	1.6	2	7
30	32.8	31.2	1.6	2	8
30	34.4	32.8	1.6	2	9
					10
					11
					12
					13
					14
					15
					16
					17
					18
					19
					20
					21
					22
					23
					24
					25
					26
					27
					28
Stabilized At:					1.6 cm

CONSTANT HEAD BOREHOLE PERMEAMETER ANALYSIS

Guelph Permeameter

RANGE OF TYPICAL TEXTURAL DATA (ALPHA VALUES)
 0.36 cm-1 Sands, Gravels, Coarse Grained Saprolite, Soil Fractures
 0.12 cm-1 Structured Soils from Clays to Loams
 0.04 cm-1 Fine & Very Fine Textured Silts and Clay
 0.01 cm-1 Compacted and Structureless Clay, Landfill Caps, etc.

TEST PARAMETERS: RUN OF FIRST APPLIED HEAD

First Applied Head (H)
 5 cm
 Cross Sectional Area of Reservoir (35.22 or 2.15)
 Time Interval Of Readings (T)
 30 seconds
 Stabilized Reading
 1.0 cm
 Average Rate of Fall (R_f)
 3.33E-02 cm/sec
 First Head Matric Flux Potential
 1.77E-02 cm²/sec
 First Head Kfs
 2.13E-03 cm/sec
 First Head Kfs (in/hr)
 3.01 in/hr

TEST PARAMETERS: RUN OF SECOND APPLIED HEAD

Second Applied Head (H)
 10 cm
 Cross Sectional Area of Reservoir (35.22 or 2.15)
 Time Interval Of Readings (T)
 30 seconds
 Stabilized Reading
 1.6 cm
 Average Rate of Fall (R_f)
 5.33E-02 cm/sec
 Second Head Matric Flux Potential
 2.84E-02 cm²/sec
 Second Head Kfs
 2.03E-03 cm/sec
 Second Head Kfs (in/hr)
 2.87 in/hr

HYDRAULIC CONDUCTIVITY ANALYSIS

Geometric Mean of Matric Flux Potential For Single Head Methods
 2.24E-02 cm²/sec
 Geometric Mean of Field Saturated Hydraulic
 2.08E-03 cm/sec
 Calculated Matric Flux Potential Over Gradient (µm)
 1.99E-02 cm²/sec
 Calculated Alpha Value (α*)
 0.09 cm-1
 Calculated Field Saturated Conductivity
 1.74E-03 cm/sec

Geometric Mean Conductivity For Single Head Analysis (Kfs)
 2.94 inches/hour
Hydraulic Conductivity Over Gradient (Kfs)
 2.47 inches/hour

The Single Head Geometric Mean is used when
 1. The Matrix Flux Potential, Alpha, or the Kfs values are Negative, a Heterogeneous soil likely exists
 2. The second rate is not greater than the first rate

FINAL CONDUCTIVITY RATE

2.47 inches/hour

CONSTANT HEAD PERMEAMETER TEST

PROJECT NAME:	Hamilton: 228 Strafford Ave
TEST ID:	PS2-A
TEST DEPTH:	96"
NEAR SOIL PROBE #:	SWM-02A

TEST DATE:	September 17, 2019
WEATHER / TEMP:	Sunny / 70 Degrees
HOLE DIAMETER:	6.0 cm or inch 2 3/8
SIDE OF TEST AREA:	Westerly Side

CONSTANT HEAD BOREHOLE PERMEAMETER ANALYSIS

Guelph Permeameter

RANGE OF TYPICAL TEXTURAL DATA (ALPHA VALUES)	
Sands, Gravels, Coarse Grained Saprolite, Soil Fractures	0.36 cm-1
Structured Soils from Clays to Loams	0.12 cm-1
Fine & Very Fine Textured Silts and Clay	0.04 cm-1
Compacted and Structureless Clay, Landfill Caps, etc.	0.01 cm-1

TEST PARAMETERS: RUN OF FIRST APPLIED HEAD

5 cm	First Applied Head (H)
35.22 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
30 seconds	Time Interval of Readings (T)
0.3 cm	Stabilized Reading
1.00E-02 cm/sec	Average Rate of Fall (R _n)
5.32E-03 cm ² /sec	First Head Matrix Flux Potential
6.38E-04 cm/sec	First Head Kfs
0.90 in/hr	First Head Kfs (in/hr)

TEST PARAMETERS: RUN OF SECOND APPLIED HEAD

10 cm	Second Applied Head (H)
35.22 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
30 seconds	Time Interval Of Readings (T)
0.5 cm	Stabilized Reading
1.67E-02 cm/sec	Average Rate of Fall (R _c)
1.08E-02 cm ² /sec	Second Head Matric Flux Potential
6.34E-04 cm/sec	Second Head Kfs
0.90 in/hr	Second Head Kfs (in/hr)

HYDRAULIC CONDUCTIVITY ANALYSIS

Geometric Mean of Matrix Flux Potential For Single Head Methods	7.59E-03 cm ² /sec
Geometric Mean of Field Saturated Hydraulic	6.36E-04 cm/sec
Calculated Matrix Flux Potential Over Gradient (μm)	5.41E-03 cm ² /sec
Calculated Alpha Value (α*)	0.11 cm-1
Calculated Field Saturated Conductivity	6.21E-04 cm/sec

0.90 inches/hour	Geometric Mean Conductivity For Single Head Analysis (Kfs)
0.88 inches/hour	Hydraulic Conductivity Over Gradient (Kfs)

The Single Head Geometric Mean is used when

1. The Matrix Flux Potential, Alpha, or the Kfs values are Negative, a Heterogeneous soil likely exists
2. The second rate is not greater than the first rate

FINAL CONDUCTIVITY RATE

0.88 inches/hour

1st Level at 5 cm					
<i>Time Interval (seconds)</i>	<i>Water Level Reading (cm)</i>	<i>Previous Water Level (cm)</i>	<i>Change in Level (cm)</i>	<i>Number of Tubes (1 or 2)</i>	
Stabilized with 3 consecutive equal readings					
30	1.5	0.9	0.6	2	
30	2.0	1.5	0.5	2	
30	2.2	2.0	0.2	2	
30	2.7	2.2	0.5	2	
30	3.0	2.7	0.3	2	
30	3.3	3.0	0.3	2	
30	7.3	3.3	4.0	2	
30	7.6	7.3	0.3	2	
30	7.9	7.6	0.3	2	
30	8.3	7.9	0.4	2	
30	8.6	8.3	0.3	2	
30	8.9	8.6	0.3	2	
30	9.2	8.9	0.3	2	
<i>Stabilized At:</i>					<i>0.3 cm</i>

2nd Level at 10 cm					
<i>Time Interval (seconds)</i>	<i>Water Level Reading (cm)</i>	<i>Previous Water Level (cm)</i>	<i>Change in Level (cm)</i>	<i>Number of Tubes (1 or 2)</i>	
Stabilized with 3 consecutive equal readings					
30	9.5	8.8	0.7	2	
30	10.0	9.5	0.5	2	
30	10.6	10.0	0.6	2	
30	11.1	10.6	0.5	2	
30	11.6	11.1	0.5	2	
30	12.2	11.6	0.6	2	
30	12.6	12.2	0.4	2	
30	13.3	12.6	0.7	2	
30	13.8	13.3	0.5	2	
30	14.3	13.8	0.5	2	
30	14.8	14.3	0.5	2	
Stabilized At:					0.5 cm

CONSTANT HEAD PERMEAMETER TEST

PROJECT NAME:	Hamilton: 228 Strafford Ave	TEST DATE:	September 17, 2019
TEST ID:	PS2-B	WEATHER / TEMP:	Sunny / 70 Deg
TEST DEPTH:	96"	HOLE DIAMETER:	6.0 cm or inch 2
NEAR SOIL PROBE #:	SWM-02B	SIDE OF TEST AREA:	Easterly Side

[illegible][illegible]

CONSTANT HEAD BOREHOLE PERMEAMETER ANALYSIS

Guelph Permeameter

RANGE OF TYPICAL TEXTURAL DATA (ALPHA VALUES)	
0.36 cm-1	Sands, Gravels, Coarse Grained Saprolite, Soil Fractures
0.12 cm-1	Structured Soils from Clays to Loams
0.04 cm-1	Fine & Very Fine Textured Silts and Clay
0.01 cm-1	Compacted and Structureless Clay, Landfill Caps, etc.
TEST PARAMETERS: RUN OF FIRST APPLIED HEAD	
5 cm	First Applied Head (H)
35.22 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
30 seconds	Time Interval Of Readings (I)
0.5 cm	Stabilized Reading
1.67E-02 cm/sec	Average Rate of Fall (R ₁)
8.86E-03 cm ² /sec	First Head Matric Flux Potential
1.06E-03 cm/sec	First Head Kfs
1.51 in/hr	First Head Kfs (in/hr)
TEST PARAMETERS: RUN OF SECOND APPLIED HEAD	
10 cm	Second Applied Head (H)
35.22 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
30 seconds	Time Interval Of Readings (I)
0.6 cm	Stabilized Reading
2.00E-02 cm/sec	Average Rate of Fall (R ₂)
1.22E-02 cm ² /sec	Second Head Matric Flux Potential
7.60E-04 cm/sec	Second Head Kfs
1.08 in/hr	Second Head Kfs (in/hr)
HYDRAULIC CONDUCTIVITY ANALYSIS	
1.04E-02 cm ² /sec	Geometric Mean of Matric Flux Potential For Single Head Methods
8.99E-04 cm/sec	Geometric Mean of Field Saturated Hydraulic
1.56E-02 cm ² /sec	Calculated Matric Flux Potential Over Gradient (qm)
See Below cm-1	Calculated Alpha Value (α*)
-1.17E-04 cm/sec	Calculated Field Saturated Conductivity
1.27 inches/hour	Geometric Mean Conductivity For Single Head Analysis (Kfs)
See 1 Below	Gradient Head Does Not Apply For This Case

The **Single Head Geometric Mean** is used when

- The Matrix Flux Potential, Alpha, or the Kfs values are Negative, a Heterogeneous soil likely exists
- The second rate is not greater than the first rate

1.27	inches/hour	FINAL CONDUCTIVITY RATE
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CONSTANT HEAD PERMEAMETER TEST

PROJECT NAME:	Hamilton: 228 Stratford Ave	TEST DATE:	September 17, 2019
TEST ID:	PS4-A	WEATHER / TEMP:	Sunny / 75 Deg
TEST DEPTH:	84"	HOLE DIAMETER:	6.0 cm or inch 2
NEAR SOIL PROBE #:	SWM-04	SIDE OF TEST AREA:	Easterly Side

TEST DATE:	September 17, 2019	
WEATHER / TEMP:	Sunny /	75 Degrees
HOLE DIAMETER:	6.0 cm or inch 2 3/8	
SIDE OF TEST AREA:	Easterly Side	

CONSTANT HEAD BOREHOLE PERMEAMETER ANALYSIS

RANGE OF TYPICAL TEXTURAL DATA (ALPHA VALUES)	
Sands, Gravels, Coarse Grained Saprolite, Soil Fractures	0.36 cm-1
Structured Soils from Clays to Loams	0.12 cm-1
Fine & Very Fine Textured Silts and Clay	0.04 cm-1
Compacted and Structureless Clay, Landfill Caps, etc.	0.01 cm-1

First Applied Head (H)

2.15 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
30 seconds	Time Interval Of Readings (1)
2.6 cm	Stabilized Reading
8.67E-02 cm/sec	Average Rate of Fall (R _f)
2.81E-03 cm ² /sec	First Head Matric Flux Potential
3.37E-04 cm/sec	First Head K _f s
0.48 in/hr	First Head K _f s (in/hr)

TEST PARAMETERS: RUN OF SECOND APPLIED HEAD

10 cm	Second Applied Head (H)
35.22 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
60 seconds	Time Interval Of Readings (T)
0.6 cm	Stabilized Reading
1.00E-02 cm/sec	Average Rate of Fall (R ₂)
3.75E-03 cm ² /sec	Second Head Matric Flux Potential
3.80E-04 cm/sec	Second Head Kfs
0.54 in/hr	Second Head Kfs (in/hr)

HYDRAULIC CONDUCTIVITY ANALYSIS

Geometric Mean of Matrix Flux Potential For Single Head Methods
3.22E-03 cm²/sec
Geometric Mean of Field Saturated Hydraulic
3.58E-04 cm/sec
Calculated Matrix Flux Potential Over Gradient (µm)
1.86E-03 cm²/sec
Calculated Alpha Value (α*)
see Below cm-1
Calculated Field Saturated Conductivity
see 2 Below cm/sec

Geometric Mean Conductivity For Single Head Analysis (Kfs)
Gradient Head Does Not Apply For This Case

The Single Head Geometric Mean is used when

1. The Matrix Flux Potential, Alpha, or the Kfs values are Negative, a Heterogeneous soil likely exists
2. The second rate is not greater than the first rate

SECONDARY FIBRE IN 100% Q^2 CARBON FIBRE REINFORCED POLYESTER

CONSTANT HEAD PERMEAMETER TEST

PROJECT NAME:	Hamilton: 228 Stratford Ave	TEST DATE:	September 17, 2019
TEST ID:	PS4-A	WEATHER / TEMP:	Sunny / 75 Deg
TEST DEPTH:	84"	HOLE DIAMETER:	6.0 cm or inch 2
NEAR SOIL PROBE #:	SWM-04	SIDE OF TEST AREA:	Easterly Side

TEST DATE:	September 17, 2019	
WEATHER / TEMP:	Sunny /	75 Degrees
HOLE DIAMETER:	6.0 cm or inch 2 3/8	
SIDE OF TEST AREA:	Easterly Side	

CONSTANT HEAD BOREHOLE PERMEAMETER ANALYSIS

RANGE OF TYPICAL TEXTURAL DATA (ALPHA VALUES)	
Sands, Gravels, Coarse Grained Saprolite, Soil Fractures	0.36 cm-1
Structured Soils from Clays to Loams	0.12 cm-1
Fine & Very Fine Textured Silts and Clay	0.04 cm-1
Compacted and Structureless Clay, Landfill Caps, etc.	0.01 cm-1

First Applied Head (H)

2.15 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
30 seconds	Time Interval Of Readings (1)
2.6 cm	Stabilized Reading
8.67E-02 cm/sec	Average Rate of Fall (R _f)
2.81E-03 cm ² /sec	First Head Matric Flux Potential
3.37E-04 cm/sec	First Head K _f s
0.48 in/hr	First Head K _f s (in/hr)

TEST PARAMETERS: RUN OF SECOND APPLIED HEAD

10 cm	Second Applied Head (H)
35.22 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
60 seconds	Time Interval Of Readings (T)
0.6 cm	Stabilized Reading
1.00E-02 cm/sec	Average Rate of Fall (R ₂)
3.75E-03 cm ² /sec	Second Head Matric Flux Potential
3.80E-04 cm/sec	Second Head Kfs
0.54 in/hr	Second Head Kfs (in/hr)

HYDRAULIC CONDUCTIVITY ANALYSIS

Geometric Mean of Matrix Flux Potential For Single Head Methods
3.22E-03 cm²/sec
Geometric Mean of Field Saturated Hydraulic
3.58E-04 cm/sec
Calculated Matrix Flux Potential Over Gradient (µm)
1.86E-03 cm²/sec
Calculated Alpha Value (α*)
see Below cm-1
Calculated Field Saturated Conductivity
see 2 Below cm/sec

Geometric Mean Conductivity For Single Head Analysis (Kfs)
Gradient Head Does Not Apply For This Case

The Single Head Geometric Mean is used when

1. The Matrix Flux Potential, Alpha, or the Kfs values are Negative, a Heterogeneous soil likely exists
2. The second rate is not greater than the first rate

SECONDARY FIBRE IN 100% Q^2 CARBON FIBRE REINFORCED POLYESTER

CONSTANT HEAD PERMEAMETER TEST

PROJECT NAME:	Hamilton: 228 Strafford Ave		
TEST ID:	PS+B		
TEST DEPTH:	42"		
NEAR SOIL PROBE #:	SWM-04		
TEST DATE:	September 17, 2019		
WEATHER / TEMP:	Sunny /	75	Deg
HOLE DIAMETER:	6.0 cm or inch 2		
SIDE OF TEST AREA:	Westerb Side		

[illegible]

2nd Level at 10 cm				
<i>Time Interval (seconds)</i>	<i>Water Level Reading (cm)</i>	<i>Previous Water Level (cm)</i>	<i>Change in Level (cm)</i>	<i>Number of Trials (1 or 2)</i>
600	19.5	19.5	0.0	2
		<i>Stabilized At:</i>		
		<i>0.0 cm</i>		

CONSTANT HEAD BOREHOLE PERMEAMETER ANALYSIS

Guelph Permeameter

RANGE OF TYPICAL TEXTURAL DATA (ALPHA VALUES)	
0.36 cm-1	Sands, Gravels, Coarse Grained Saprolite, Soil Fractures
0.12 cm-1	Structured Soils from Clays to Loams
0.04 cm-1	Fine & Very Fine Textured Silts and Clay
0.01 cm-1	Compacted and Structureless Clay, Landfill Caps, etc.

TEST PARAMETERS: RUN OF FIRST APPLIED HEAD

5 cm	First Applied Head (H)
2.15 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
600 seconds	Time Interval Of Readings (T)
0.0 cm	Stabilized Reading
0.00E+00 cm/sec	Average Rate of Fall (R _c)
0.00E+00 cm ² /sec	First Head Matric Flux Potential
0.00E+00 cm/sec	First Head Kfs
0.00 in/hr	First Head Kfs (in/hr)

TEST PARAMETERS: RUN OF SECOND APPLIED HEAD

10 cm	Second Applied Head (H)
35.22 cm ²	Cross Sectional Area of Reservoir (35.22 or 2.15)
600 seconds	Time Interval Of Readings (T)
0.0 cm	Stabilized Reading
0.00E+00 cm/sec	Average Rate of Fall (R ₂)
0.00E+00 cm ² /sec	Second Head Matrix Flux Potential
0.00E+00 cm/sec	Second Head Kfs
0.00 in/hr	Second Head Kfs (in/hr)

HYDRAULIC CONDUCTIVITY ANALYSIS

#NUM!	cm ² /sec	Geometric Mean of Matrix Flux Potential For Single Head Methods
#NUM!	cm/sec	Geometric Mean of Field Saturated Hydraulic
0.00E+00	cm ² /sec	Calculated Matrix Flux Potential Over Gradient (µm)
#DIV/0!	cm-1	Calculated Alpha Value (α*)
0.00E+00	cm/sec	Calculated Field Saturated Conductivity

#NUM!	inches/hour	Geometric Mean Conductivity For Single Head Analysis (Kfs)
0.00	inches/hour	Hydraulic Conductivity Over Gradient (Kfs)

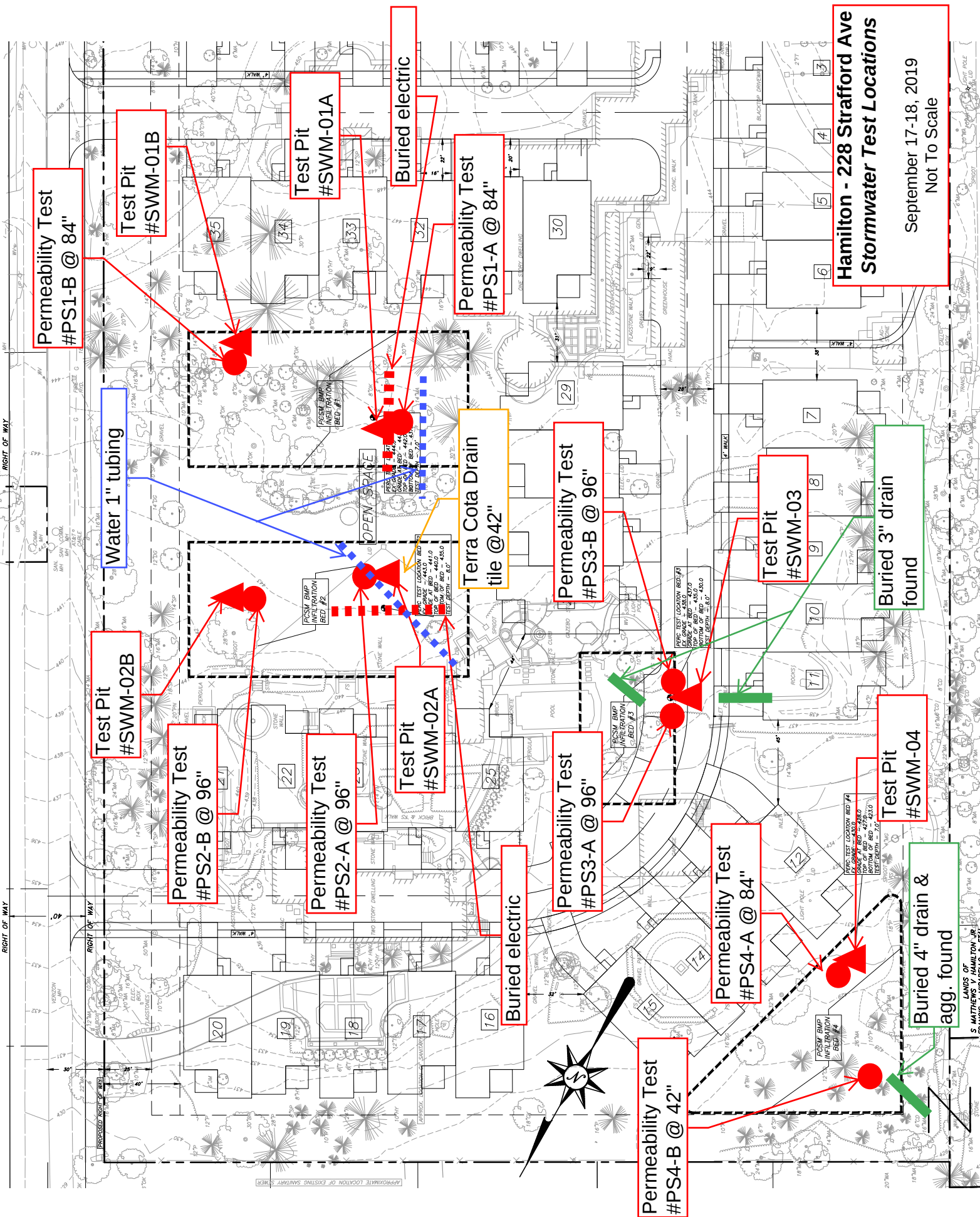
The Single Head Geometric Mean is used when

1. The Matrix Flux Potential, Alpha, or the K_f values are Negative, a Heterogeneous soil likely exists
2. The second rate is not greater than the first rate

FINAL CONDUCTIVITY RATE

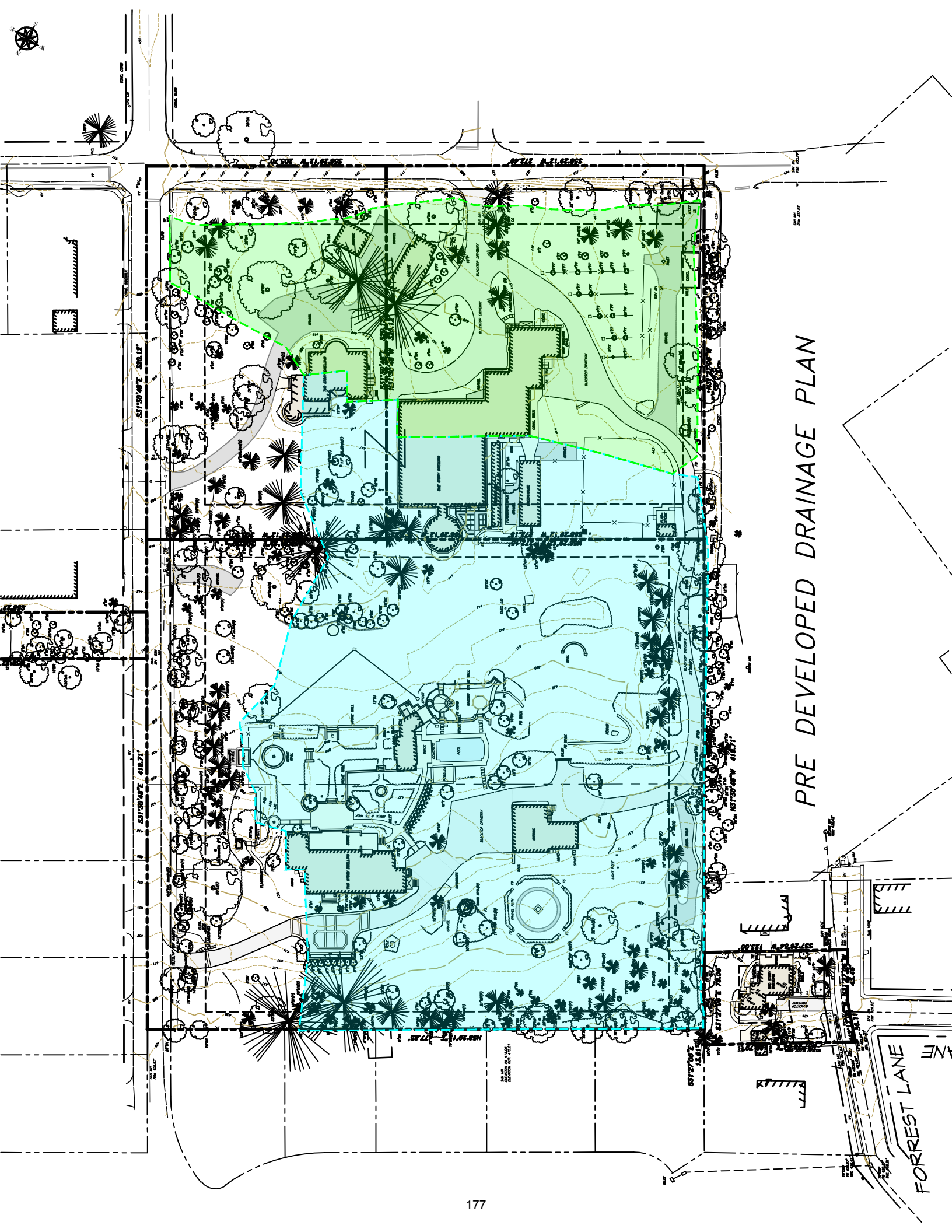
0.00 inches/hour
SECOND RATE IS NOT GRANTING YOUR REQUEST FOR A RATE

TEST LOCATION PLAN



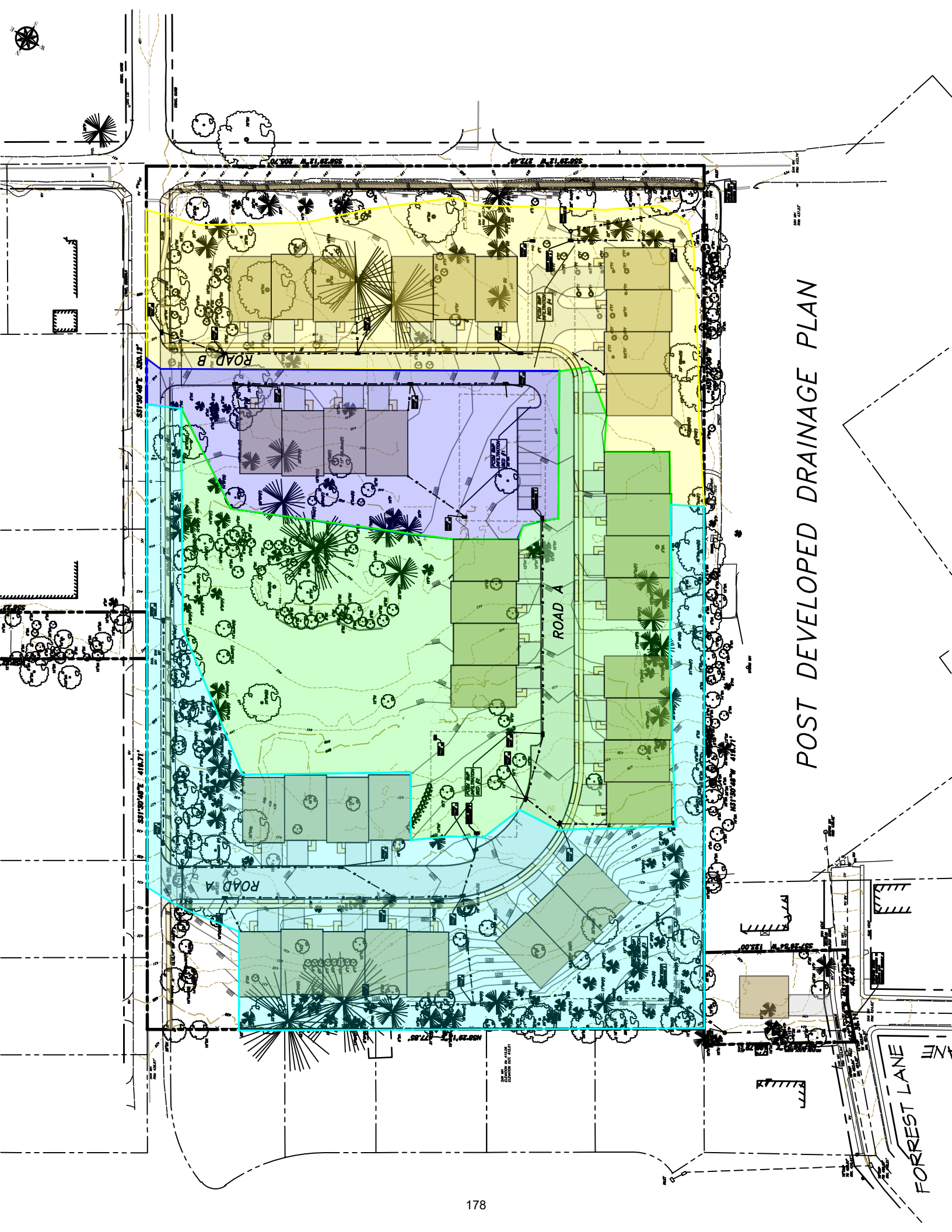
**Hamilton - 228 Strafford Ave
Stormwater Test Locations**

September 17-18, 2019
Not To Scale



PRE DEVELOPED DRAINAGE PLAN

FOREST LANE



POST DEVELOPED DRAINAGE PLAN