



T R U N O R T H

HYDROMODIFICATION ANALYSIS (TR-55)



VINEYARD
ECP

OWNER INFORMATION:

LANDS OF MISTY
MOUNTAIN
PROPERTIES LLC

SITE INFORMATION:

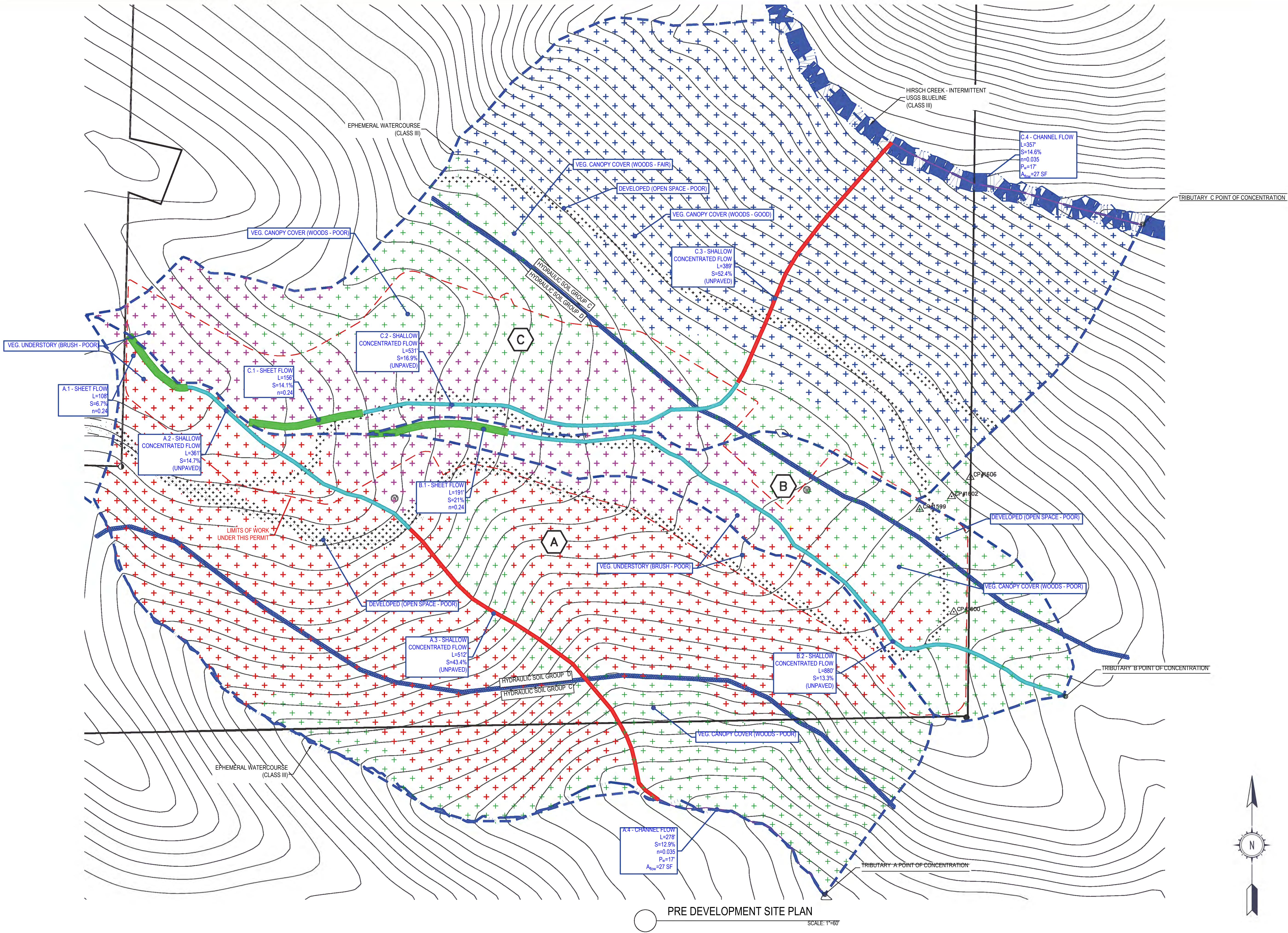
SPRING MOUNTAIN RD.
ST. HELENA, CA
APN:022-140-054-000

PUBLISHED: 8/19/2025

SHEET TITLE:

PRE
DEVELOPMENT
HYDROLOGY
MAP

SHEET NUMBER:



PRE DEVELOPMENT SITE PLAN
SCALE: 1"=60'



OWNER INFORMATION:

LANDS OF MISTY
MOUNTAIN
PROPERTIES LLC

ITE INFORMATION:

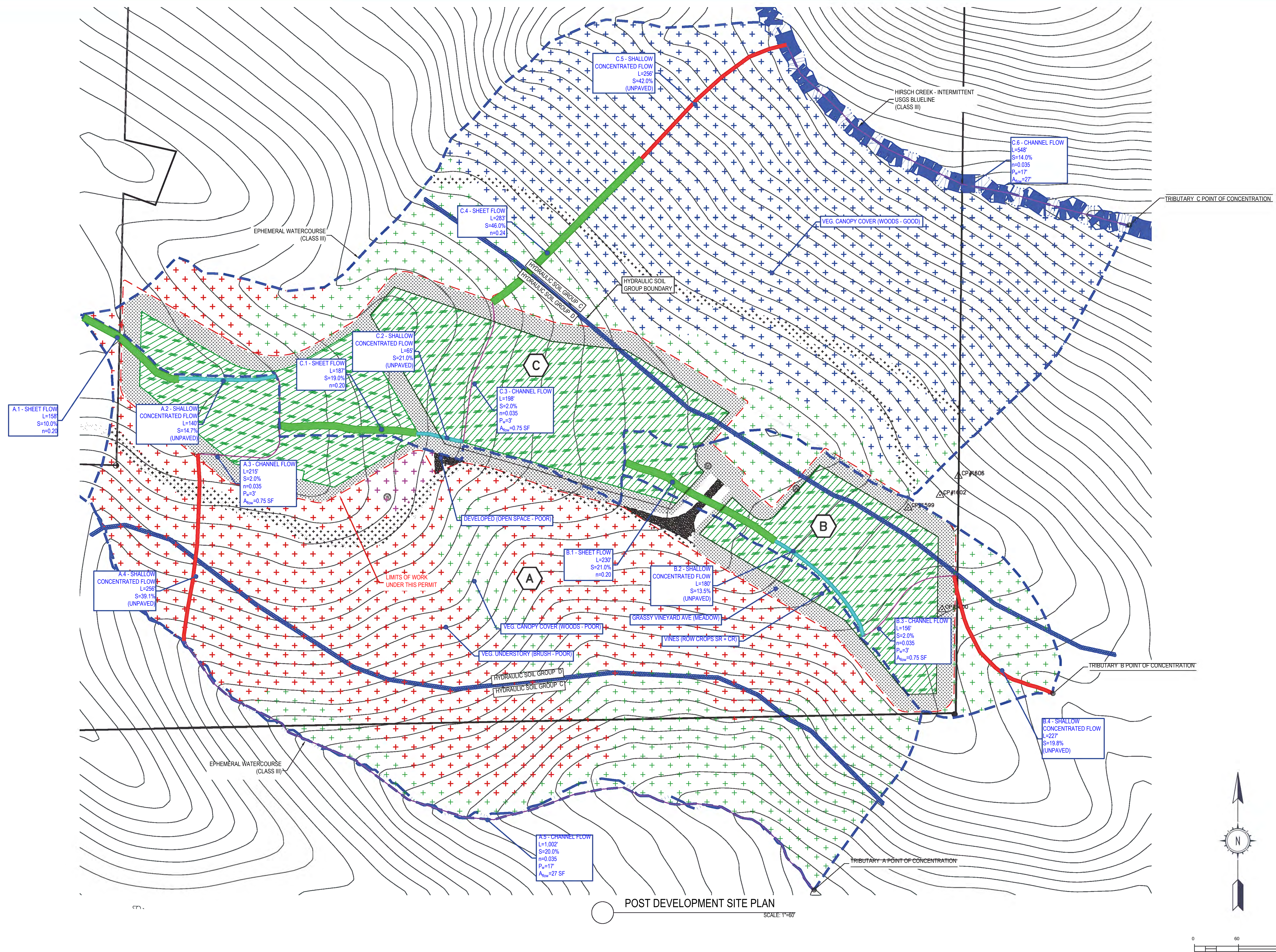
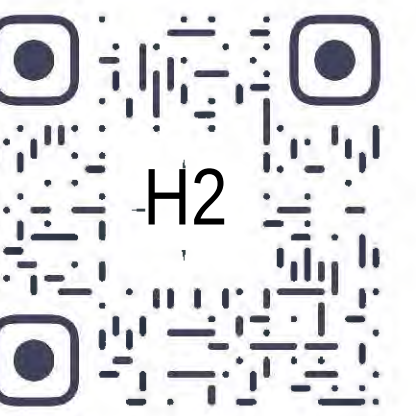
SPRING MOUNTAIN RD.
ST. HELENA, CA
APN:022-140-054-000

8/18/2025

SHEET TITLE:

POST DEVELOPMENT HYDROLOGY MAP

SHEET NUMBER:





Pre-Development					
Tributary Name		A	Tributary Area		444,840
Hydraulic Soil Group	Cover Type/Description	Curve Number	Area	Area %	CN * Area
D	Developed (Open Space - Poor)	89	22,068	0.05	4.4
	Veg. Understory (Brush - Poor)	83	226,440	0.51	42.2
	Veg. Canopy Cover (Woods - Fair)	83	37,742	0.08	7.0
C	Veg. Understory (Brush - Poor)	77	80,037	0.18	13.9
	Veg. Canopy Cover (Woods - Fair)	73	78,553	0.18	12.9
Total			444,840	100%	80.5

Tributary Name		B	Tributary Area		113,123
Hydraulic Soil Group	Cover Type/Description	Curve Number	Area	Area %	CN * Area
D	Developed (Open Space - Poor)	89	3,382	0.03	2.7
	Veg. Understory (Brush - Poor)	83	38,615	0.34	28.3
	Veg. Canopy Cover (Woods - Fair)	83	50,862	0.45	37.3
C	Developed (Open Space - Poor)	86	681	0.01	0.5
	Veg. Canopy Cover (Woods - Fair)	73	19,582	0.17	12.6
Total			113,123	100%	81.5

Tributary Name		C	Tributary Area		492,637
Hydraulic Soil Group	Cover Type/Description	Curve Number	Area	Area %	CN * Area
D	Developed (Open Space - Poor)	89	3,364	0.01	0.6
	Veg. Understory (Brush - Poor)	83	79,687	0.16	13.4
	Veg. Canopy Cover (Woods - Fair)	83	63,953	0.13	10.8
C	Developed (Open Space - Poor)	86	11,293	0.02	2.0
	Veg. Understory (Brush - Poor)	77	758	0.00	0.1
	Veg. Canopy Cover (Woods - Good)	70	286,533	0.58	40.7
	Veg. Canopy Cover (Woods - Fair)	73	47,047	0.10	7.0
Total			492,637	100%	74.6



Post-Developmpent					
Tributary Name		A	Tributary Area		447,184
Hydraulic Soil Group	Cover Type/Description	Curve Number	Area	Area %	CN * Area
D	Developed (Open Space - Poor)	89	16,864	0.04	3.4
	Veg. Understory (Brush - Poor)	83	178,674	0.40	33.2
	Veg. Canopy Cover (Woods - Fair)	83	36,361	0.08	6.7
	Vines (Row crops SR + CR)	85	33,232	0.07	6.3
	Grassy Vineyard Ave (Meadow)	78	23,463	0.05	4.1
C	Veg. Understory (Brush - Poor)	77	80,037	0.18	13.8
	Veg. Canopy Cover (Woods - Fair)	73	78,553	0.18	12.8
		Total	447,184	100%	80.3

Tributary Name		B	Tributary Area		100,016
Hydraulic Soil Group	Cover Type/Description	Curve Number	Area	Area %	CN * Area
D	Developed (Open Space - Poor)	89	481	0.00	0.4
	Veg. Canopy Cover (Woods - Fair)	83	27,692	0.28	23.0
	Vines (Row crops SR + CR)	85	41,944	0.42	35.6
	Grassy Vineyard Ave (Meadow)	78	9,619	0.10	7.5
C	Vines (Row crops SR + CR)	82	4,359	0.04	3.6
	Vineyard Alley (Meadow)	71	5,191	0.05	3.7
	Veg. Canopy Cover (Woods - Fair)	73	10,730	0.11	7.8
		Total	100,016	100%	81.6

Tributary Name		C	Tributary Area		503,400
Hydraulic Soil Group	Cover Type/Description	Curve Number	Area	Area %	CN * Area
D	Veg. Understory (Brush - Poor)	83	13,243	0.03	2.2
	Veg. Canopy Cover (Woods - Fair)	83	33,498	0.07	5.5
	Vines (Row crops SR + CR)	85	89,578	0.18	15.1
	Vineyard Alley (Meadow)	78	21,390	0.04	3.3
C	Developed (Open Space - Poor)	86	11,103	0.02	1.9
	Veg. Canopy Cover (Woods - Good)	70	286,847	0.57	39.9
	Veg. Canopy Cover (Woods - Fair)	73	39,463	0.08	5.7
	Vines (Row crops SR + CR)	82	2,715	0.01	0.4
	Vineyard Alley (Meadow)	71	5,562	0.01	0.8
		Total	503,400	100%	74.9



SHEET FLOW LENGTH ANALYSIS (McCUEN & SPIESS 1955)

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n ^{1/}
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses ^{2/}	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods: ^{3/}	
Light underbrush	0.40
Dense underbrush	0.80

Pre Development

¹ The n values are a composite of information compiled by Engman (1986).

² Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.

³ When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

TABLE 4.—Manning's Roughness Values for Various Field Conditions (10)

Field condition (1)	n-value (2)
Fallow	
smooth, rain packed	0.01–0.03
medium, freshly disked	0.1–0.3
rough turn plowed	0.4–0.7
Cropped	
grass and pasture	0.05–0.15
clover	0.08–0.25
small grain	0.1–0.4
row crops	0.07–0.2

Post Development w/ Cover Crop



T R U N O R T H

707 Hahman Drive #2774
 Santa Rosa, CA 95405
 707.308.8638
 www.TruNorth.co

ESTIMATED SHEET FLOW LENGTH - PRE DEVELOPMENT (McCuen and Spiess (1955))

Segment ID	AVG. SLOPE, s	SURFACE TYPE	MANNINGS, n	LENGTH, L	$nL/\sqrt{s}$	FLOW REGIME
SHEET FLOW PATH 1						
A.1	6.7%	Dense Grasses	0.24	108	100	SHEETFLOW
B.1	21.0%	Dense Grasses	0.24	191	100	SHEETFLOW
C.1	14.1%	Dense Grasses	0.24	156	100	SHEETFLOW



T R U N O R T H

707 Hahman Drive #2774
 Santa Rosa, CA 95405
 707.308.8638
 www.TruNorth.co

ESTIMATED SHEET FLOW LENGTH - POST DEVELOPMENT (McCuen and Spiess (1955))

Segment ID	AVG. SLOPE, s	SURFACE TYPE	MANNINGS, n	LENGTH, L	$nL/\sqrt{s}$	FLOW REGIME
SHEET FLOW PATH 1						
A.1	10.0%	Row Crops w/ Cover Crop	0.2	158	100	SHEETFLOW
B.1	21.0%	Row Crops w/ Cover Crop	0.2	230	100	SHEETFLOW
C.1	19.0%	Row Crops w/ Cover Crop	0.2	187	86	SHEETFLOW (<100 ok)
C.4	46.0%	Dense Grasses	0.24	283	100	SHEETFLOW



T R U N O R T H

NOAA ATLAS 14
IDF RAINFALL
DISTRIBUTION



General Information

Homepage
Progress Reports
FAQ
Glossary

Precipitation Frequency

Data Server
GIS Grids
Maps
Time Series
Temporals
Documents

Probable Maximum
Precipitation
Documents

Miscellaneous

Publications
Storm Analysis
Record Precipitation

Contact Us

Inquiries



NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth Units: English Time series type: Partial duration

Select location

1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: Longitude:

b) By station (list of CA stations): Select station

c) By address

2) Use map:



POINT PRECIPITATION FREQUENCY (PF) ESTIMATES
WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

PF tabular

PF graphical

Supplementary information

Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.156 (0.139-0.177)	0.187 (0.166-0.213)	0.229 (0.202-0.261)	0.262 (0.230-0.302)	0.309 (0.260-0.369)	0.344 (0.284-0.422)	0.381 (0.305-0.481)	0.420 (0.326-0.546)	0.473 (0.350-0.645)	0.514 (0.366-0.730)
10-min	0.224 (0.199-0.254)	0.269 (0.239-0.306)	0.328 (0.290-0.374)	0.376 (0.330-0.433)	0.442 (0.373-0.529)	0.494 (0.407-0.605)	0.546 (0.438-0.689)	0.601 (0.467-0.783)	0.677 (0.501-0.924)	0.737 (0.525-1.05)
15-min	0.271 (0.241-0.307)	0.325 (0.289-0.369)	0.396 (0.351-0.452)	0.455 (0.399-0.524)	0.535 (0.451-0.640)	0.597 (0.492-0.732)	0.661 (0.529-0.833)	0.727 (0.564-0.947)	0.819 (0.606-1.12)	0.892 (0.635-1.26)
30-min	0.399 (0.355-0.453)	0.479 (0.425-0.544)	0.584 (0.517-0.666)	0.670 (0.588-0.772)	0.788 (0.665-0.943)	0.880 (0.725-1.08)	0.974 (0.780-1.23)	1.07 (0.832-1.40)	1.21 (0.893-1.65)	1.31 (0.935-1.86)
60-min	0.585 (0.521-0.665)	0.702 (0.624-0.799)	0.857 (0.758-0.977)	0.993 (0.862-1.13)	1.16 (0.976-1.38)	1.29 (1.06-1.58)	1.43 (1.14-1.80)	1.57 (1.22-2.05)	1.77 (1.31-2.42)	1.93 (1.37-2.74)
2-hr	0.882 (0.784-1.00)	1.06 (0.942-1.21)	1.29 (1.14-1.47)	1.47 (1.29-1.70)	1.72 (1.45-2.06)	1.90 (1.57-2.33)	2.09 (1.67-2.63)	2.27 (1.76-2.96)	2.52 (1.87-3.44)	2.71 (1.93-3.85)
3-hr	1.13 (1.01-1.29)	1.36 (1.21-1.55)	1.66 (1.46-1.89)	1.89 (1.66-2.17)	2.19 (1.85-2.62)	2.42 (1.99-2.97)	2.65 (2.12-3.34)	2.88 (2.23-3.74)	3.18 (2.35-4.34)	3.40 (2.42-4.83)
6-hr	1.72 (1.52-1.95)	2.06 (1.83-2.35)	2.50 (2.22-2.86)	2.85 (2.50-3.28)	3.30 (2.79-3.95)	3.64 (3.00-4.46)	3.97 (3.18-5.01)	4.30 (3.34-5.60)	4.74 (3.51-6.47)	5.06 (3.60-7.18)
12-hr	2.50 (2.22-2.84)	3.02 (2.68-3.43)	3.68 (3.26-4.20)	4.21 (3.70-4.85)	4.92 (4.15-5.88)	5.44 (4.48-6.67)	5.96 (4.78-7.52)	6.49 (5.04-8.45)	7.19 (5.32-9.81)	7.72 (5.49-11.0)
24-hr	3.59 (3.23-4.08)	4.38 (3.93-4.98)	5.40 (4.84-6.15)	6.22 (5.54-7.13)	7.32 (6.34-8.62)	8.15 (6.94-9.77)	8.98 (7.49-11.0)	9.83 (8.01-12.3)	11.0 (8.63-14.2)	11.8 (9.05-15.8)
2-day	4.60 (4.14-5.23)	5.74 (5.15-6.52)	7.18 (6.43-8.18)	8.32 (7.41-9.54)	9.83 (8.51-11.6)	10.9 (9.32-13.1)	12.1 (10.1-14.8)	13.2 (10.7-16.5)	14.6 (11.5-19.0)	15.7 (12.0-21.0)
3-day	5.28 (4.75-6.00)	6.67 (5.99-7.58)	8.42 (7.54-9.59)	9.79 (8.72-11.2)	11.6 (10.0-13.7)	12.9 (11.0-15.5)	14.2 (11.9-17.4)	15.5 (12.6-19.4)	17.2 (13.5-22.3)	18.5 (14.1-24.6)
4-day	5.86 (5.26-6.65)	7.44 (6.68-8.45)	9.42 (8.44-10.7)	11.0 (9.76-12.6)	13.0 (11.2-15.3)	14.5 (12.3-17.3)	15.9 (13.3-19.5)	17.3 (14.1-21.7)	19.2 (15.1-24.9)	20.6 (15.8-27.5)

PF Map: Contiguous US

7-day	7.24 (6.51-8.22)	9.19 (8.25-10.4)	11.6 (10.4-13.2)	13.5 (12.0-15.5)	16.0 (13.8-18.8)	17.8 (15.1-21.3)	19.5 (16.3-23.9)	21.3 (17.3-26.6)	23.5 (18.5-30.5)	25.2 (19.2-33.6)
10-day	8.27 (7.44-9.39)	10.5 (9.41-11.9)	13.2 (11.8-15.1)	15.4 (13.7-17.6)	18.1 (15.7-21.3)	20.1 (17.1-24.1)	22.1 (18.4-27.0)	24.0 (19.5-30.0)	26.5 (20.8-34.3)	28.3 (21.6-37.8)
20-day	10.9 (9.80-12.4)	13.8 (12.4-15.7)	17.5 (15.6-19.9)	20.2 (18.0-23.2)	23.7 (20.5-27.9)	26.2 (22.3-31.4)	28.6 (23.9-35.0)	30.9 (25.2-38.7)	33.9 (26.7-43.9)	36.0 (27.6-48.1)
30-day	13.1 (11.7-14.8)	16.6 (14.9-18.9)	20.9 (18.7-23.8)	24.1 (21.4-27.6)	28.1 (24.4-33.1)	31.0 (26.4-37.2)	33.7 (28.1-41.2)	36.3 (29.6-45.5)	39.6 (31.2-51.3)	41.9 (32.0-55.9)
45-day	15.9 (14.3-18.0)	20.1 (18.1-22.9)	25.2 (22.5-28.7)	28.9 (25.7-33.2)	33.6 (29.1-39.6)	36.8 (31.3-44.2)	39.9 (33.3-48.8)	42.8 (34.9-53.6)	46.3 (36.5-60.1)	48.9 (37.4-65.2)
60-day	18.7 (16.8-21.3)	23.6 (21.2-26.8)	29.3 (26.3-33.4)	33.6 (29.9-38.5)	38.8 (33.6-45.7)	42.4 (36.0-50.8)	45.7 (38.1-55.9)	48.8 (39.8-61.1)	52.7 (41.4-68.3)	55.3 (42.3-73.8)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Main Link Categories:
[Home](#) | [OWP](#)

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: [HDSC webmaster](#)
Page last modified: August 4th, 2025 07:27:16 AM

Map Disclaimer
Disclaimer
Credits
Glossary

Privacy Policy
About Us
Career Opportunities

Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	69.8703	13.1000	0.8658	-----
3	0.0000	0.0000	0.0000	-----
5	79.2597	14.6000	0.8369	-----
10	88.2351	15.5000	0.8279	-----
25	102.6072	16.5000	0.8217	-----
50	114.8193	17.2000	0.8199	-----
100	127.1596	17.8000	0.8186	-----

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

TruNorth\1 PROJECTS\Fehrenbach- Spring Mountain Road\SHIRE\EC\HYDRO\IDF Chart Shire NOAA Atlas 14.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	4.38	0.00	3.30	6.22	5.77	8.15	8.98
SCS 6-Hr	0.00	2.06	0.00	0.00	2.85	0.00	3.64	3.97
Huff-1st	0.00	0.00	0.00	2.75	0.00	5.38	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	2.80	0.00	5.25	0.00	0.00



T R U N O R T H

TR-55 TIME OF
CONCENTRATION
REF. TR-55 CHAPTER 3

[illegible]

Manning's n-value	= 0.240	0.011	0.011
Flow length (ft)	= 108.0	0.0	0.0
Two-year 24-hr precip. (in)	= 4.38	0.00	0.00
Land slope (%)	= 6.70	0.00	0.00

Travel Time (min) = 8.00 + 0.00 + 0.00 = 8.00

Flow length (ft)	=	361.00	512.00	0.00
Watercourse slope (%)	=	14.70	43.40	0.00
Surface description	=	Unpaved	Unpaved	Paved
Average velocity (ft/s)	=	6.19	10.63	0.00

Travel Time (min) = 0.97 + 0.80 + 0.00 = 1.78

X sectional flow area (sqft)	= 27.00	0.00	0.00
Wetted perimeter (ft)	= 17.00	0.00	0.00
Channel slope (%)	= 12.90	0.00	0.00
Manning's n-value	= 0.035	0.015	0.015
Velocity (ft/s)	=20.85	0.00	0.00

Flow length (ft)	{0}278.0	0.0	0.0
------------------	----------	-----	-----

Travel Time (min) = 0.22 + 0.00 + 0.00 = 0.22

Total Travel Time, Tc 10.00 min

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No. 2

Trib. A - POST

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.200	0.011	0.011				
Flow length (ft)	= 158.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 4.38	0.00	0.00				
Land slope (%)	= 10.00	0.00	0.00				
Travel Time (min)	= 7.98	+	0.00	+	0.00	=	7.98
Shallow Concentrated Flow							
Flow length (ft)	= 140.00	256.00	0.00				
Watercourse slope (%)	= 14.70	39.10	0.00				
Surface description	= Unpaved	Unpaved	Paved				
Average velocity (ft/s)	=6.19	10.09	0.00				
Travel Time (min)	= 0.38	+	0.42	+	0.00	=	0.80
Channel Flow							
X sectional flow area (sqft)	= 0.75	27.00	0.00				
Wetted perimeter (ft)	= 3.00	17.00	0.00				
Channel slope (%)	= 2.00	20.00	0.00				
Manning's n-value	= 0.035	0.035	0.015				
Velocity (ft/s)	=2.38	25.96	0.00				
Flow length (ft)	(0)215.0	1002.0	0.0				
Travel Time (min)	= 1.51	+	0.64	+	0.00	=	2.15
Total Travel Time, Tc					10.90 min		

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No. 3

Trib. B - PRE

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 191.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 4.38	0.00	0.00	
Land slope (%)	= 21.00	0.00	0.00	
Travel Time (min)	= 7.99	+	0.00	+
			0.00	= 7.99
Shallow Concentrated Flow				
Flow length (ft)	= 880.00	0.00	0.00	
Watercourse slope (%)	= 13.30	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=5.88	0.00	0.00	
Travel Time (min)	= 2.49	+	0.00	+
			0.00	= 2.49
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	(0)0.0	0.0	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				10.50 min

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No. 5

Trib. C - PRE

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.240	0.011	0.011				
Flow length (ft)	= 156.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 4.38	0.00	0.00				
Land slope (%)	= 14.10	0.00	0.00				
Travel Time (min)	= 7.97	+	0.00	+	0.00	=	7.97
Shallow Concentrated Flow							
Flow length (ft)	= 531.00	389.00	0.00				
Watercourse slope (%)	= 16.90	52.40	0.00				
Surface description	= Unpaved	Unpaved	Paved				
Average velocity (ft/s)	=6.63	11.68	0.00				
Travel Time (min)	= 1.33	+	0.56	+	0.00	=	1.89
Channel Flow							
X sectional flow area (sqft)	= 27.00	0.00	0.00				
Wetted perimeter (ft)	= 17.00	0.00	0.00				
Channel slope (%)	= 14.60	0.00	0.00				
Manning's n-value	= 0.035	0.015	0.015				
Velocity (ft/s)	=22.18	0.00	0.00				
Flow length (ft)	(0)357.0	0.0	0.0				
Travel Time (min)	= 0.27	+	0.00	+	0.00	=	0.27
Total Travel Time, Tc					10.10 min		

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No. 6

Trib. C - POST

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.200	0.240	0.011	
Flow length (ft)	= 187.0	283.0	0.0	
Two-year 24-hr precip. (in)	= 4.38	4.38	0.00	
Land slope (%)	= 19.00	46.00	0.00	
Travel Time (min)	= 7.07	+	8.00	+
			0.00	= 15.07
Shallow Concentrated Flow				
Flow length (ft)	= 65.00	256.00	0.00	
Watercourse slope (%)	= 21.00	42.00	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	=7.39	10.46	0.00	
Travel Time (min)	= 0.15	+	0.41	+
			0.00	= 0.55
Channel Flow				
X sectional flow area (sqft)	= 0.75	27.00	0.00	
Wetted perimeter (ft)	= 3.00	17.00	0.00	
Channel slope (%)	= 2.00	14.00	0.00	
Manning's n-value	= 0.035	0.035	0.015	
Velocity (ft/s)	=2.38	21.72	0.00	
Flow length (ft)	(0)197.7	548.0	0.0	
Travel Time (min)	= 1.39	+	0.42	+
			0.00	= 1.81
Total Travel Time, Tc				17.40 min

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

C:\Users\danie\OneDrive - TruNorth\TruNorth Return Period\2 Year PROJECTS\Felton Road\08 Spring 2025\Felton Road\SHIRE\ECP\HYD



T R U N O R T H

HYDROGRAPHS

Hydrograph Report

2-YEAR

2

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

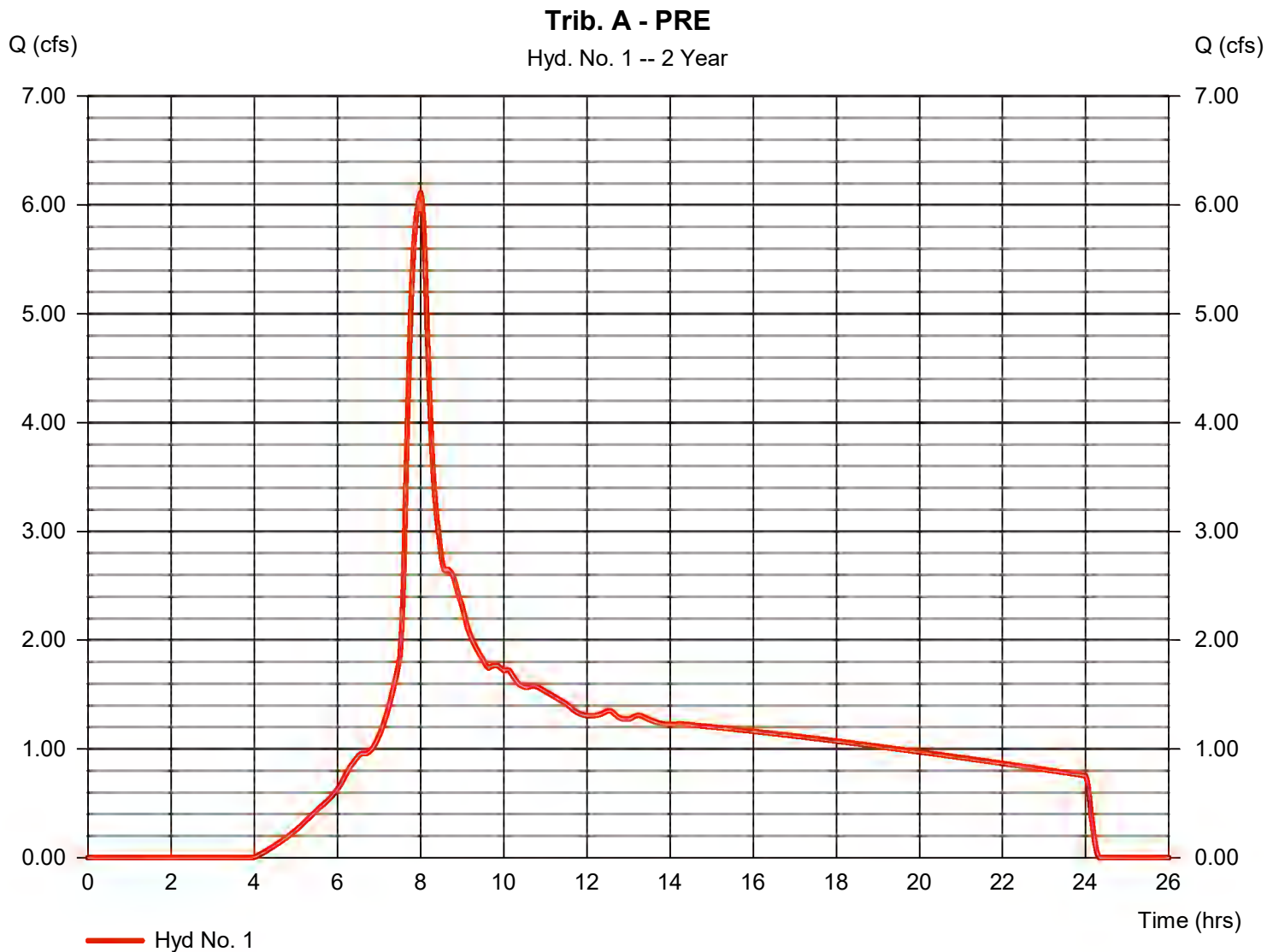
Tuesday, 08 / 5 / 2025

Hyd. No. 1

Trib. A - PRE

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 10.220 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 4.38 in
Storm duration = 24 hrs

Peak discharge = 6.114 cfs
Time to peak = 8.00 hrs
Hyd. volume = 91,893 cuft
Curve number = 80.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

2-YEAR

4

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

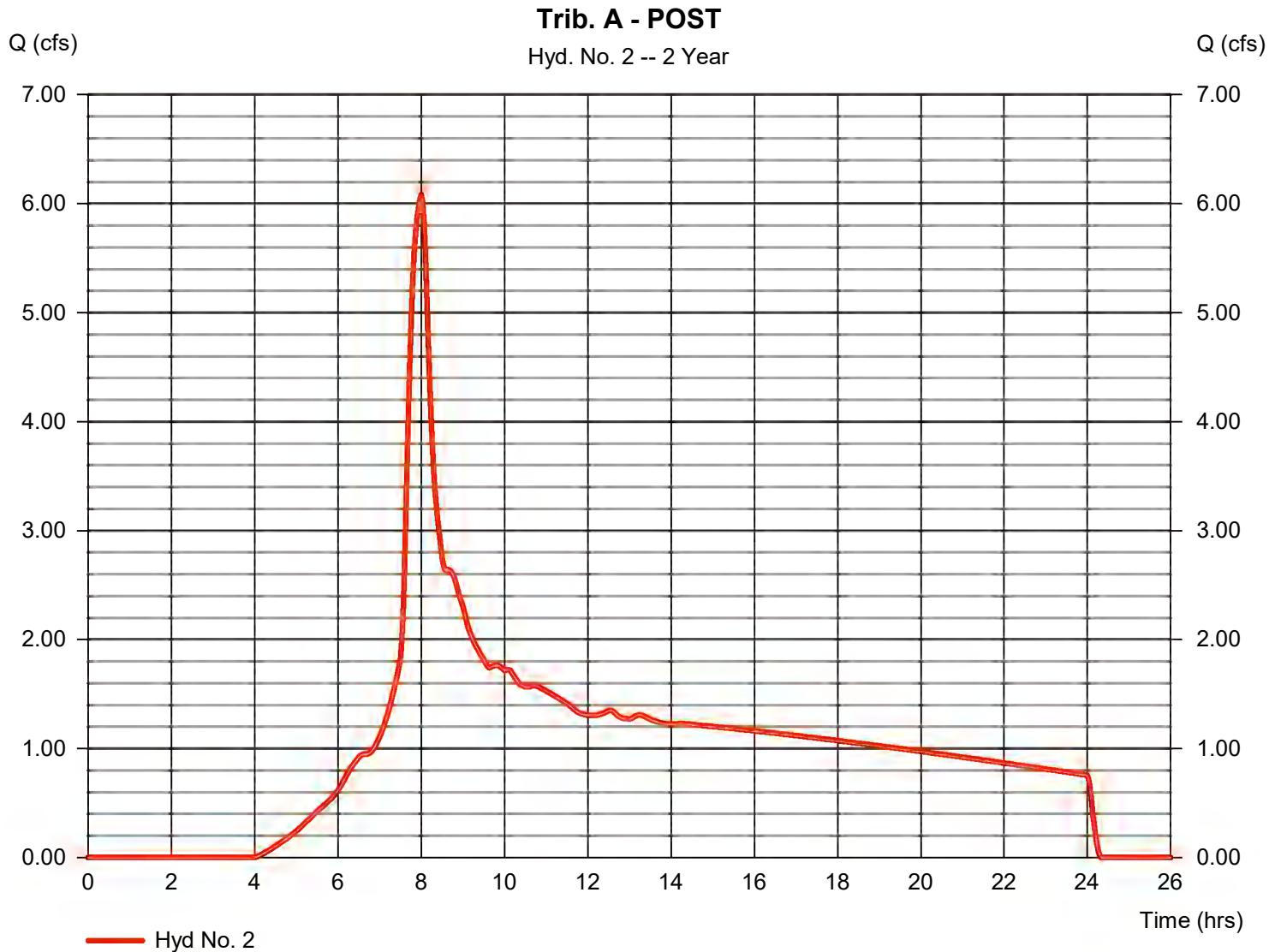
Tuesday, 08 / 5 / 2025

Hyd. No. 2

Trib. A - POST

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 10.265 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 4.38 in
Storm duration = 24 hrs

Peak discharge = 6.083 cfs
Time to peak = 8.00 hrs
Hyd. volume = 91,646 cuft
Curve number = 80.3
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.90 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

2-YEAR

6

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

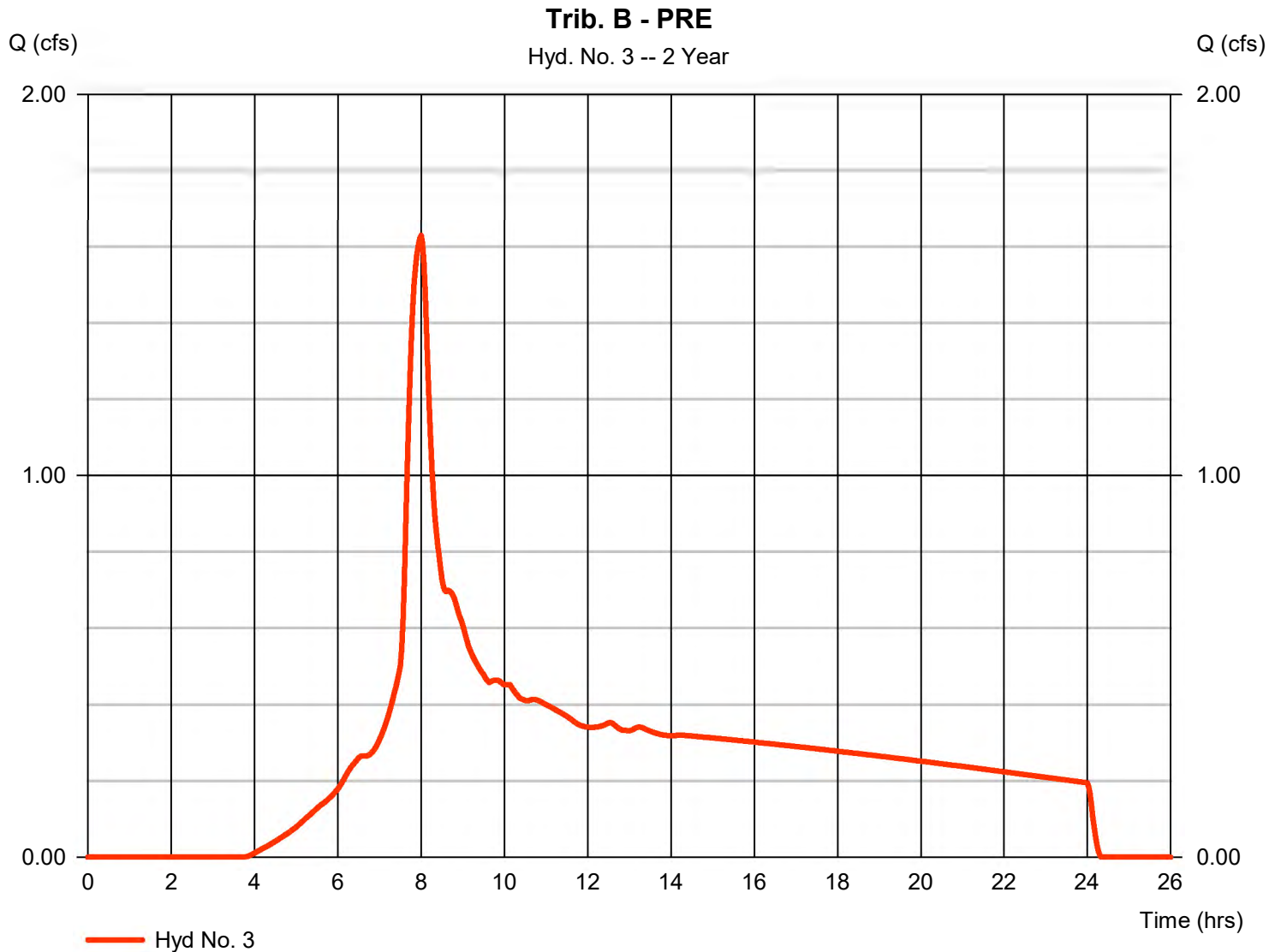
Tuesday, 08 / 5 / 2025

Hyd. No. 3

Trib. B - PRE

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 2.600 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 4.38 in
Storm duration = 24 hrs

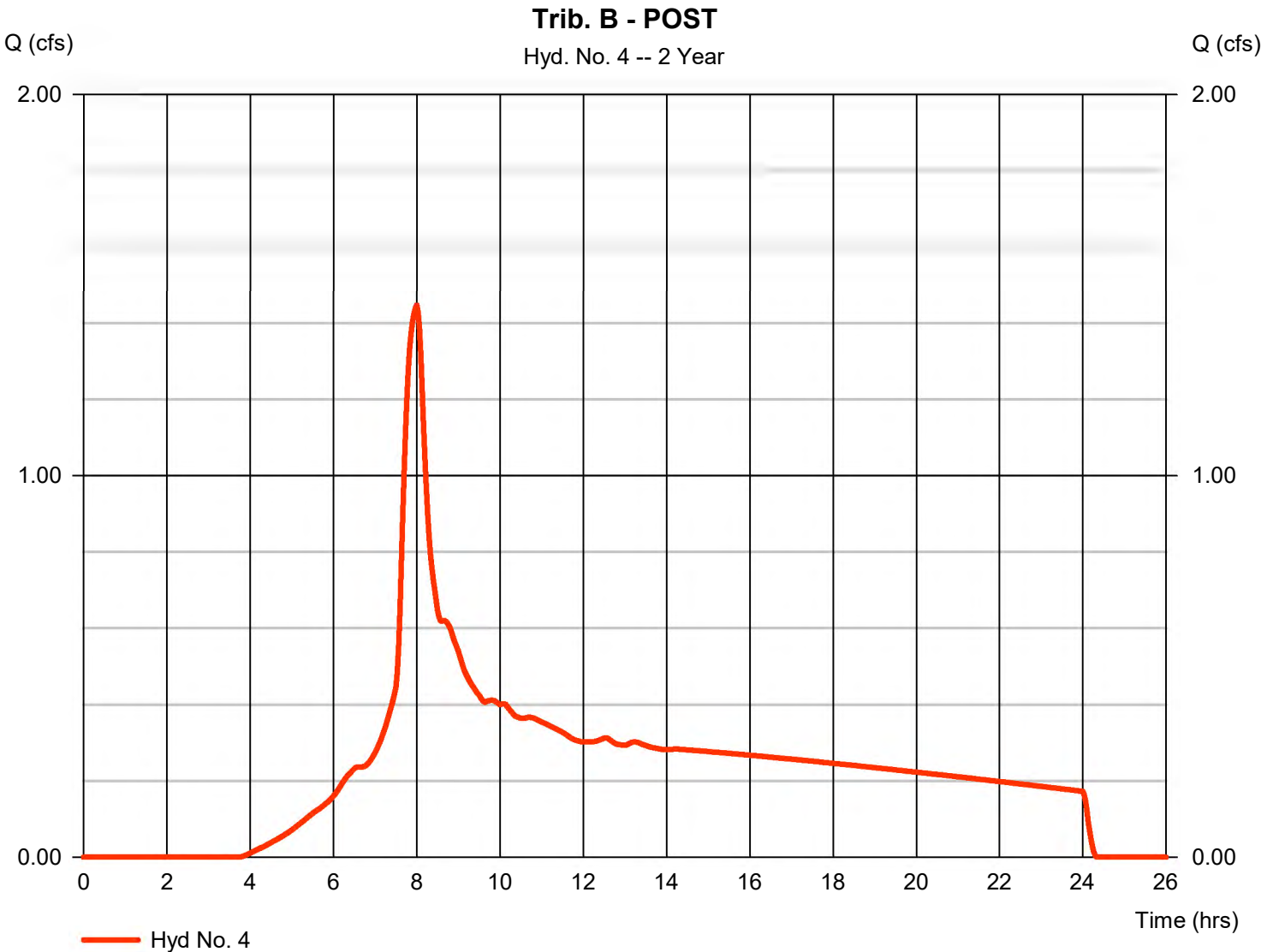
Peak discharge = 1.629 cfs
Time to peak = 8.00 hrs
Hyd. volume = 24,212 cuft
Curve number = 81.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.50 min
Distribution = Type IA
Shape factor = 484



Hyd. No. 4

Trib. B - POST

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.448 cfs
Storm frequency	=	2 yrs	Time to peak	=	8.00 hrs
Time interval	=	2 min	Hyd. volume	=	21,493 cuft
Drainage area	=	2.300 ac	Curve number	=	81.6
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.10 min
Total precip.	=	4.38 in	Distribution	=	Type IA
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

2-YEAR

10

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

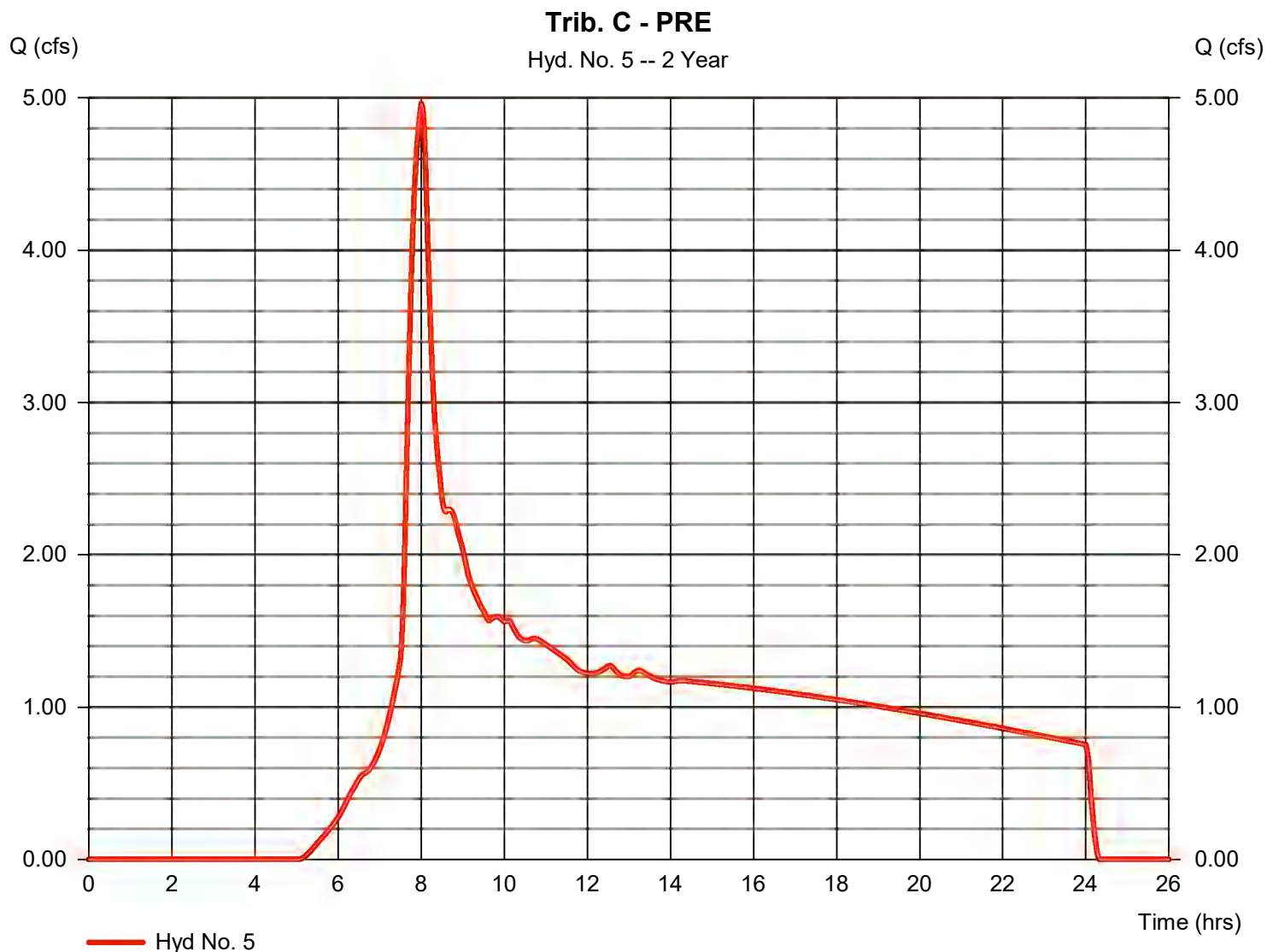
Tuesday, 08 / 5 / 2025

Hyd. No. 5

Trib. C - PRE

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 11.310 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 4.38 in
Storm duration = 24 hrs

Peak discharge = 4.963 cfs
Time to peak = 8.00 hrs
Hyd. volume = 81,548 cuft
Curve number = 74.6
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.10 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

2-YEAR

12

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

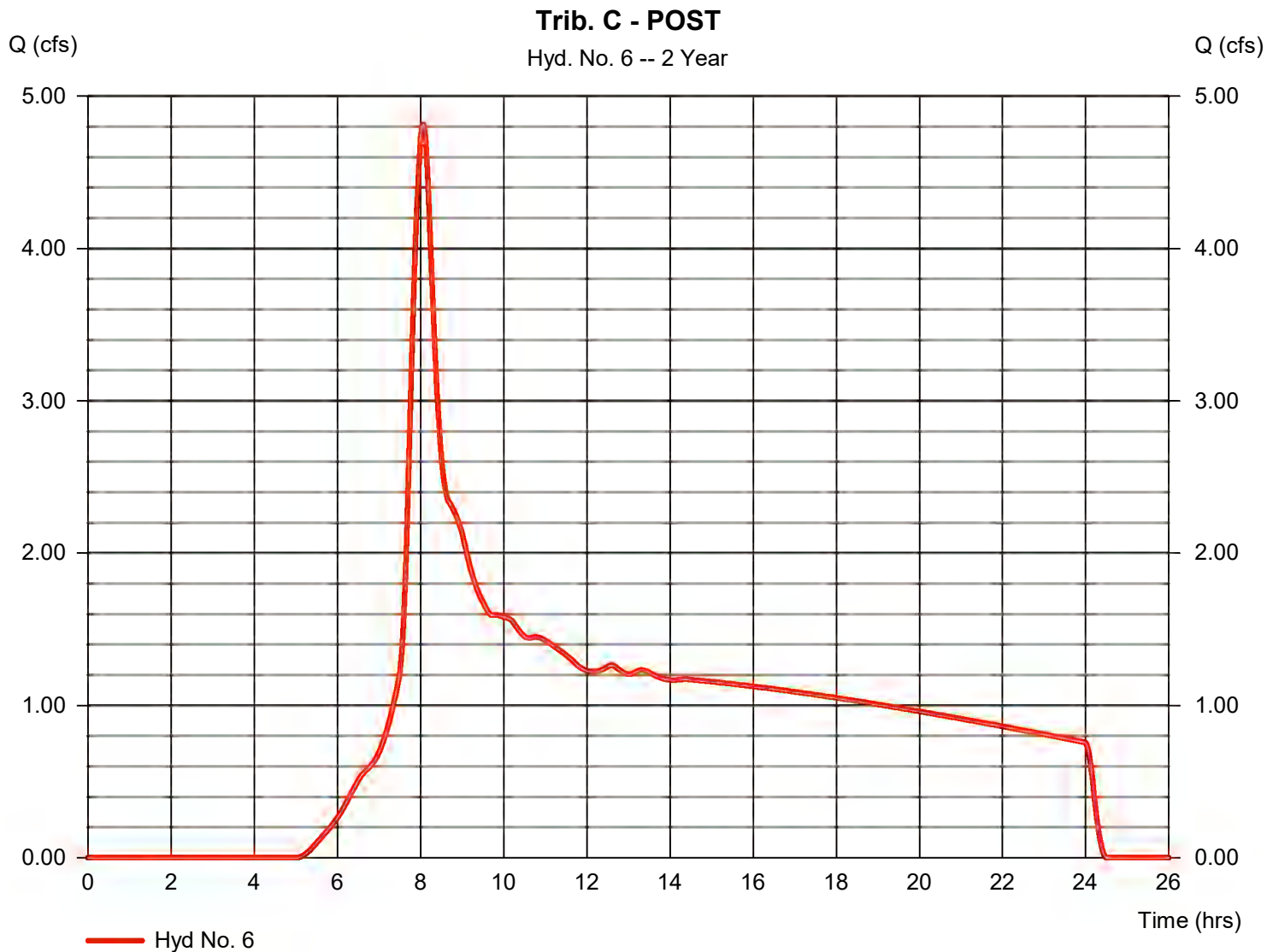
Tuesday, 08 / 5 / 2025

Hyd. No. 6

Trib. C - POST

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 11.560 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 4.38 in
Storm duration = 24 hrs

Peak discharge = 4.816 cfs
Time to peak = 8.07 hrs
Hyd. volume = 81,790 cuft
Curve number = 74.9
Hydraulic length = 0 ft
Time of conc. (Tc) = 17.40 min
Distribution = Type IA
Shape factor = 484



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

[illegible]

Hydrograph Report

10-YEAR

15

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

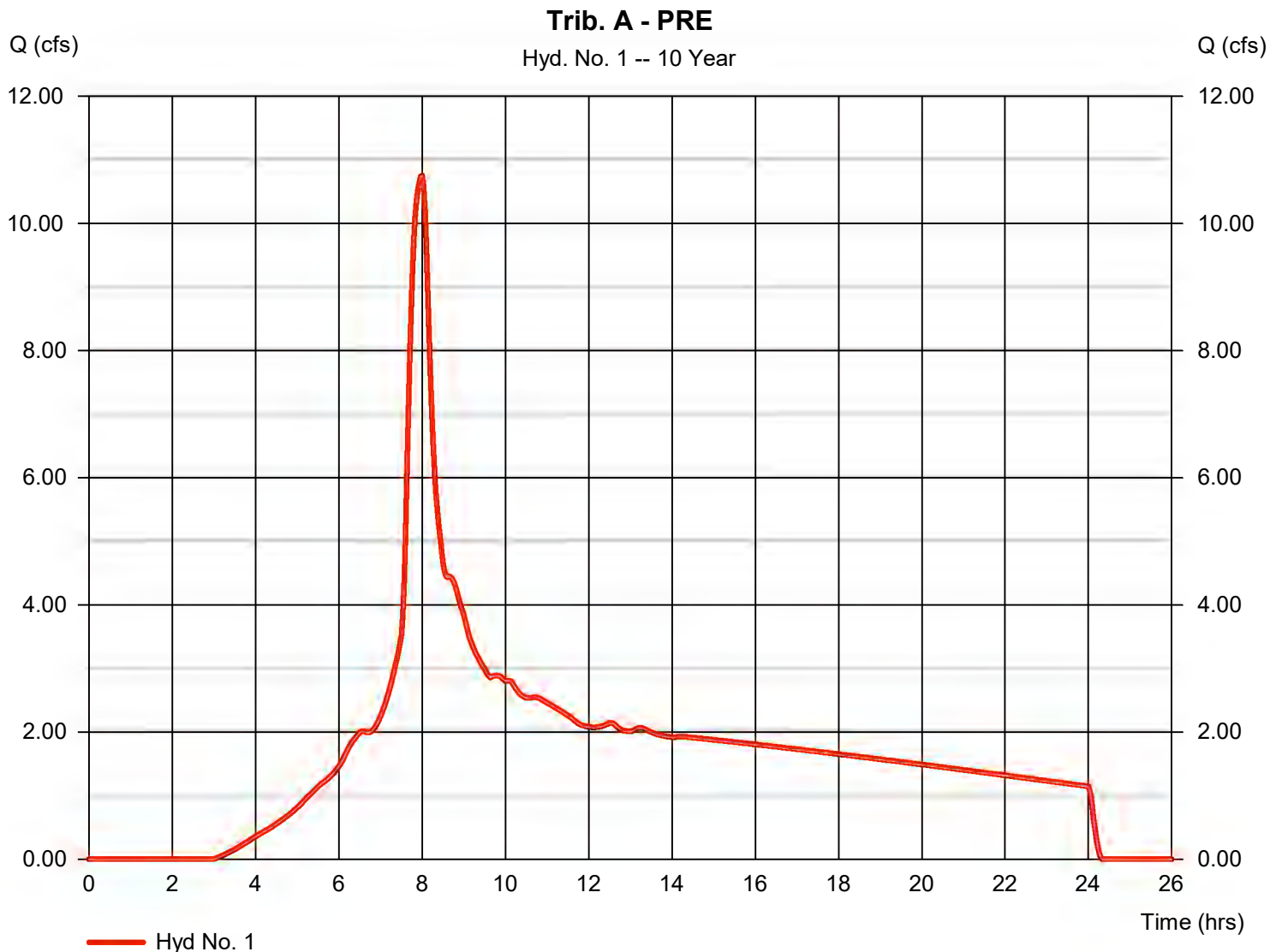
Tuesday, 08 / 5 / 2025

Hyd. No. 1

Trib. A - PRE

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 10.220 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 6.22 in
Storm duration = 24 hrs

Peak discharge = 10.75 cfs
Time to peak = 8.00 hrs
Hyd. volume = 154,273 cuft
Curve number = 80.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

10-YEAR

16

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

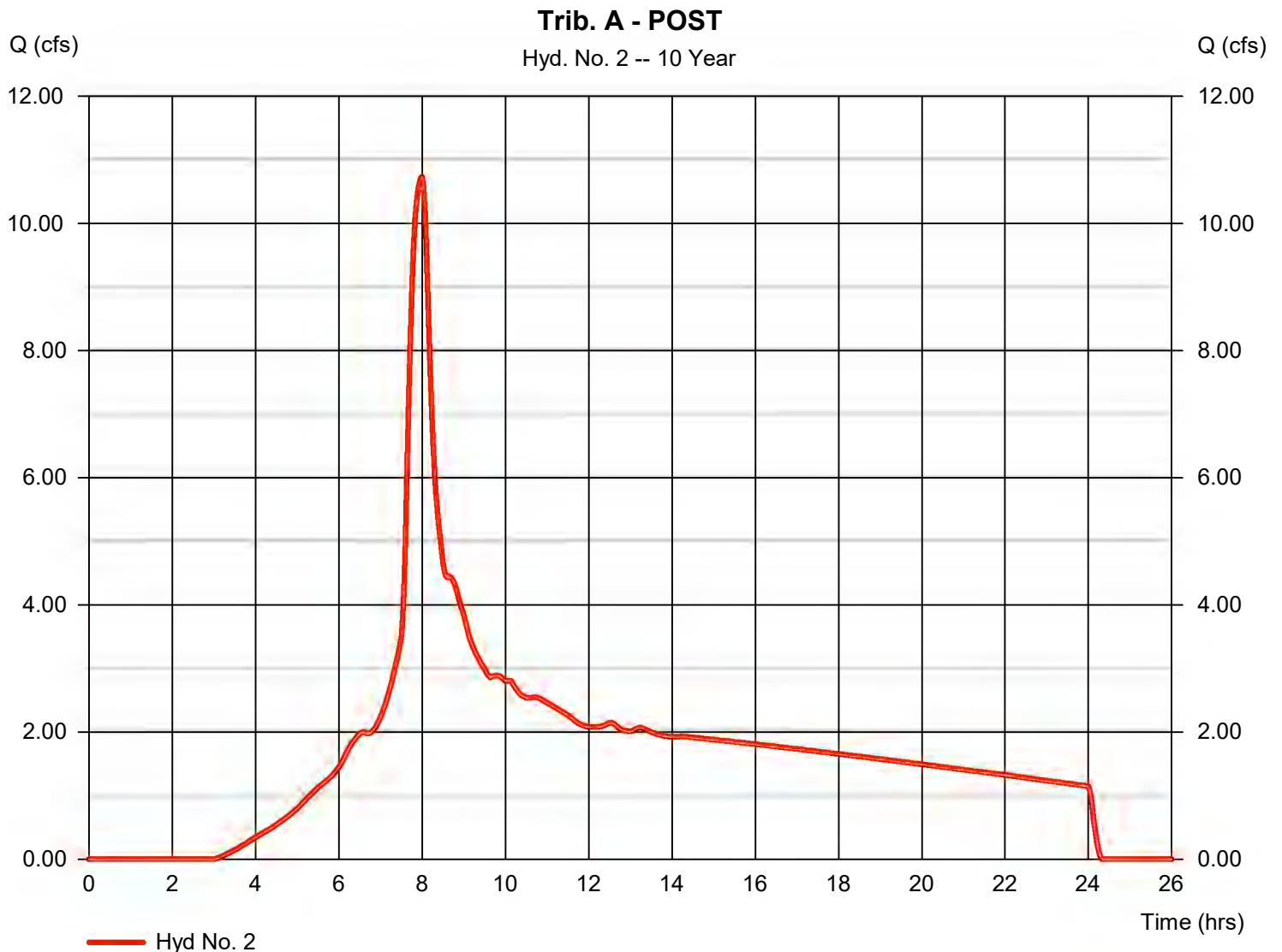
Tuesday, 08 / 5 / 2025

Hyd. No. 2

Trib. A - POST

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 10.265 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 6.22 in
Storm duration = 24 hrs

Peak discharge = 10.73 cfs
Time to peak = 8.00 hrs
Hyd. volume = 154,151 cuft
Curve number = 80.3
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.90 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

10-YEAR

17

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

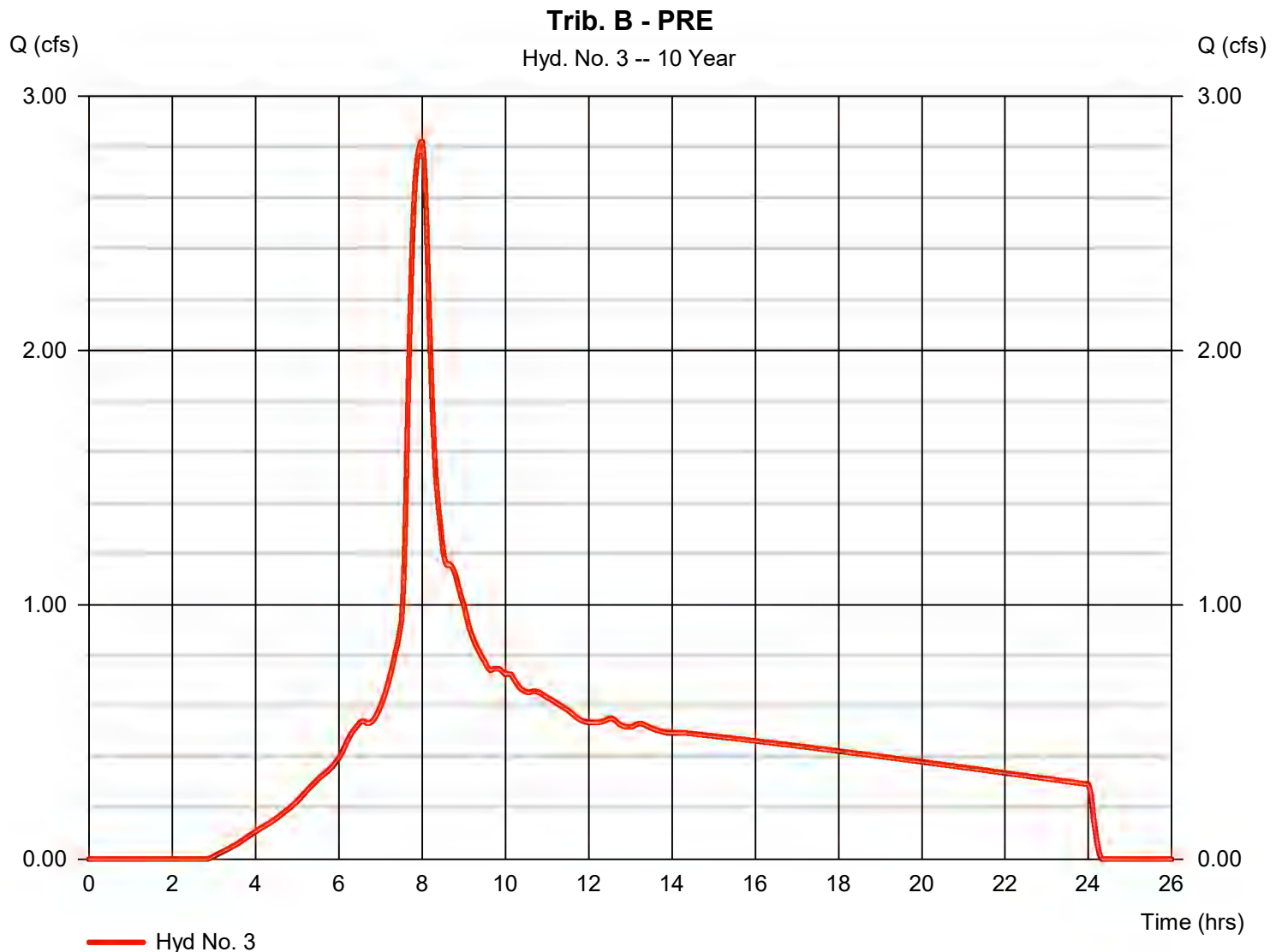
Tuesday, 08 / 5 / 2025

Hyd. No. 3

Trib. B - PRE

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 2.600 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 6.22 in
Storm duration = 24 hrs

Peak discharge = 2.822 cfs
Time to peak = 8.00 hrs
Hyd. volume = 40,268 cuft
Curve number = 81.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.50 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

10-YEAR

18

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

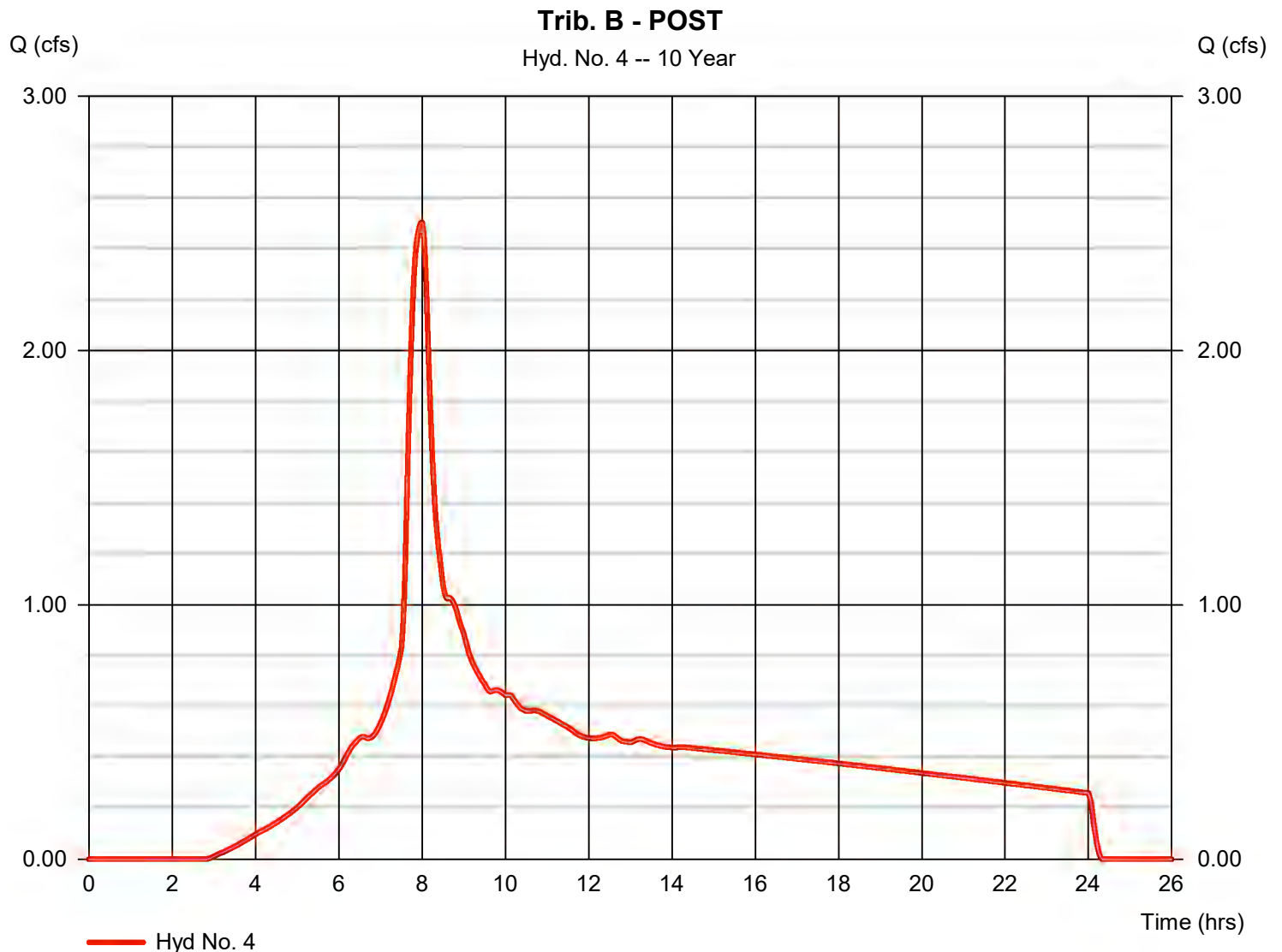
Tuesday, 08 / 5 / 2025

Hyd. No. 4

Trib. B - POST

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 2.300 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 6.22 in
Storm duration = 24 hrs

Peak discharge = 2.504 cfs
Time to peak = 8.00 hrs
Hyd. volume = 35,712 cuft
Curve number = 81.6
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.10 min
Distribution = Type IA
Shape factor = 484

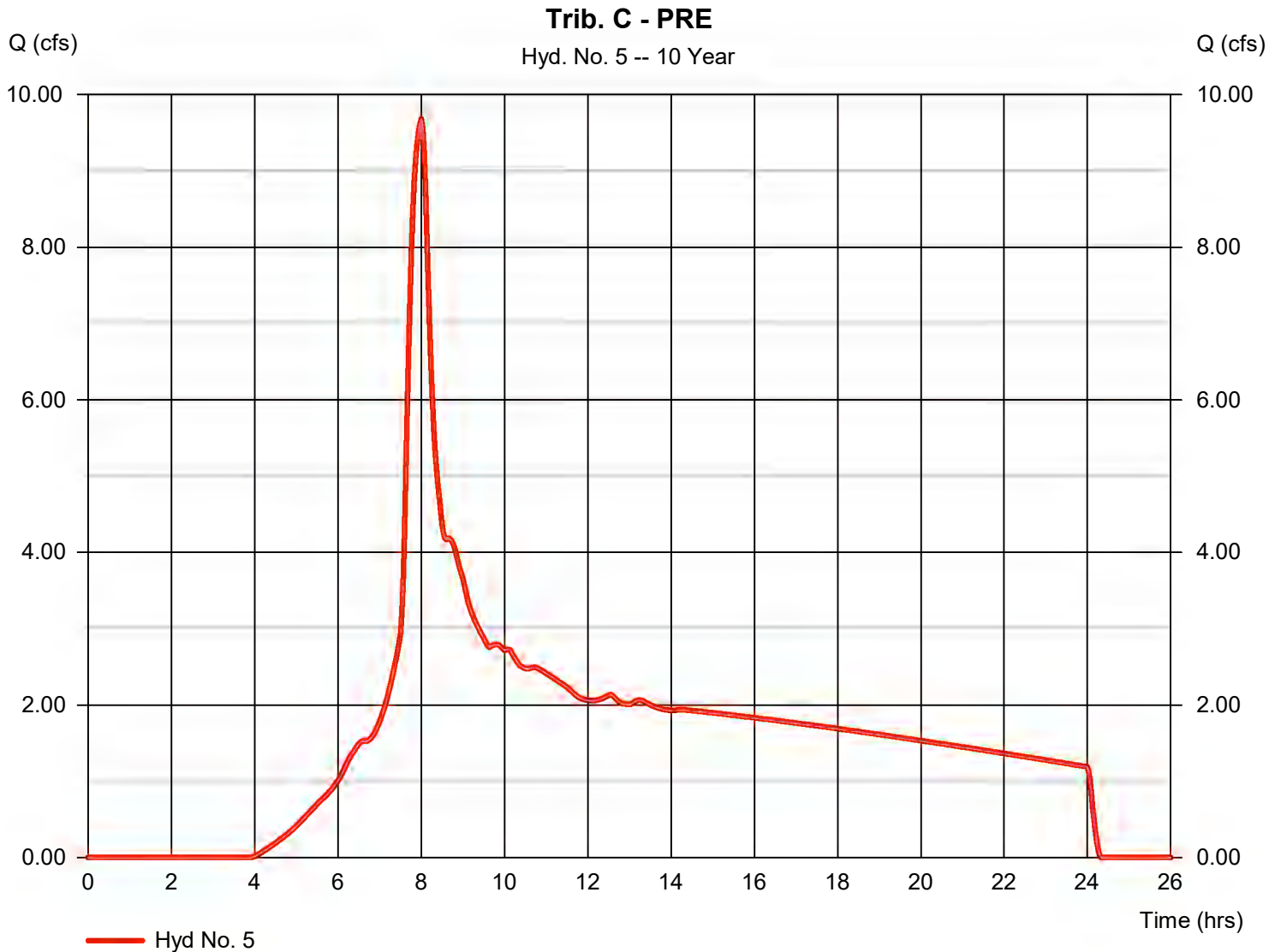


Hyd. No. 5

Trib. C - PRE

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 11.310 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 6.22 in
 Storm duration = 24 hrs

Peak discharge = 9.681 cfs
 Time to peak = 8.00 hrs
 Hyd. volume = 145,237 cuft
 Curve number = 74.6
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.10 min
 Distribution = Type IA
 Shape factor = 484



Hydrograph Report

10-YEAR

20

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

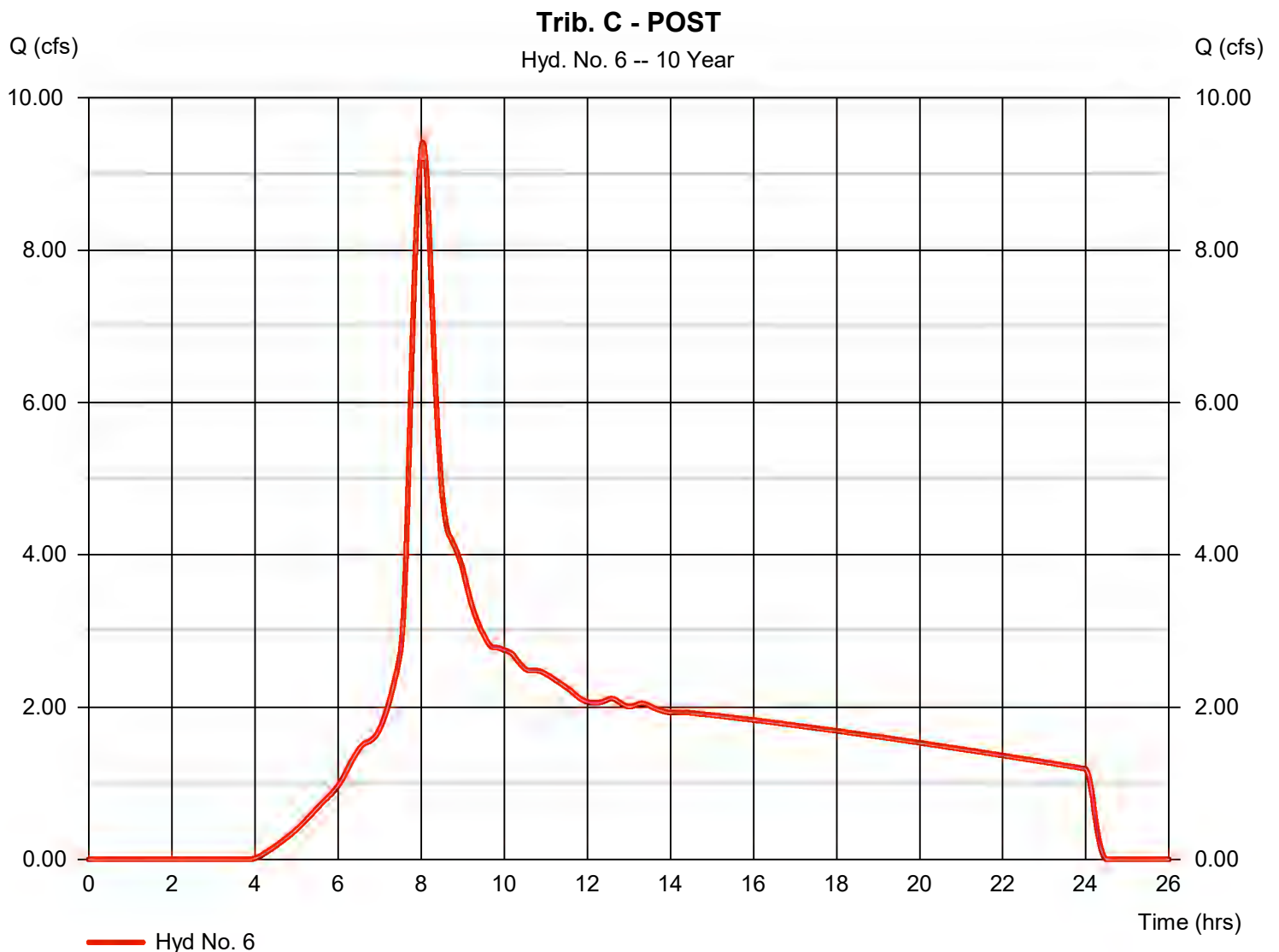
Tuesday, 08 / 5 / 2025

Hyd. No. 6

Trib. C - POST

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 11.560 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 6.22 in
Storm duration = 24 hrs

Peak discharge = 9.416 cfs
Time to peak = 8.03 hrs
Hyd. volume = 145,205 cuft
Curve number = 74.9
Hydraulic length = 0 ft
Time of conc. (Tc) = 17.40 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

50-YEAR

22

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

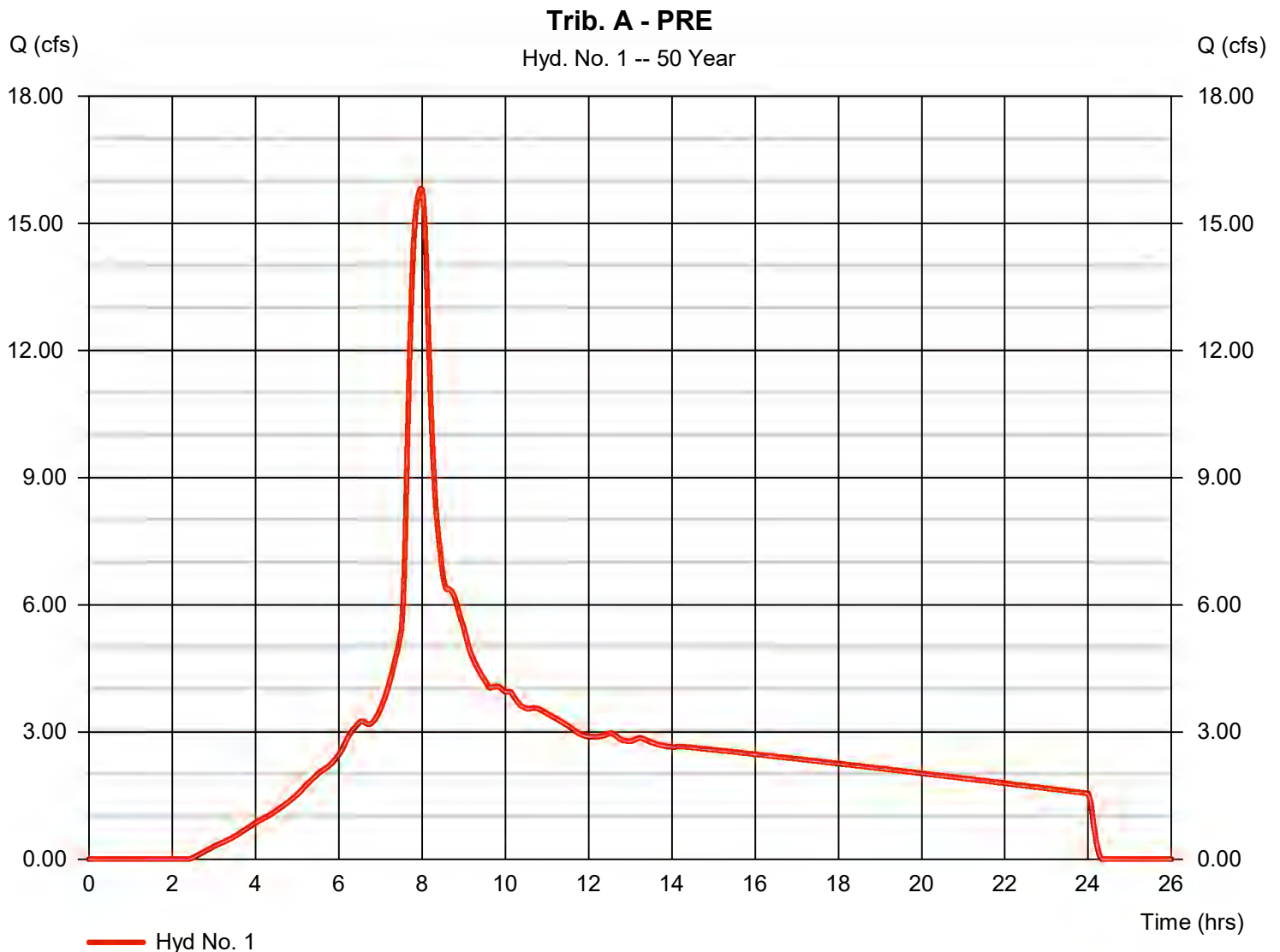
Tuesday, 08 / 5 / 2025

Hyd. No. 1

Trib. A - PRE

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 2 min
Drainage area = 10.220 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.15 in
Storm duration = 24 hrs

Peak discharge = 15.83 cfs
Time to peak = 7.97 hrs
Hyd. volume = 222,846 cuft
Curve number = 80.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

50-YEAR

23

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

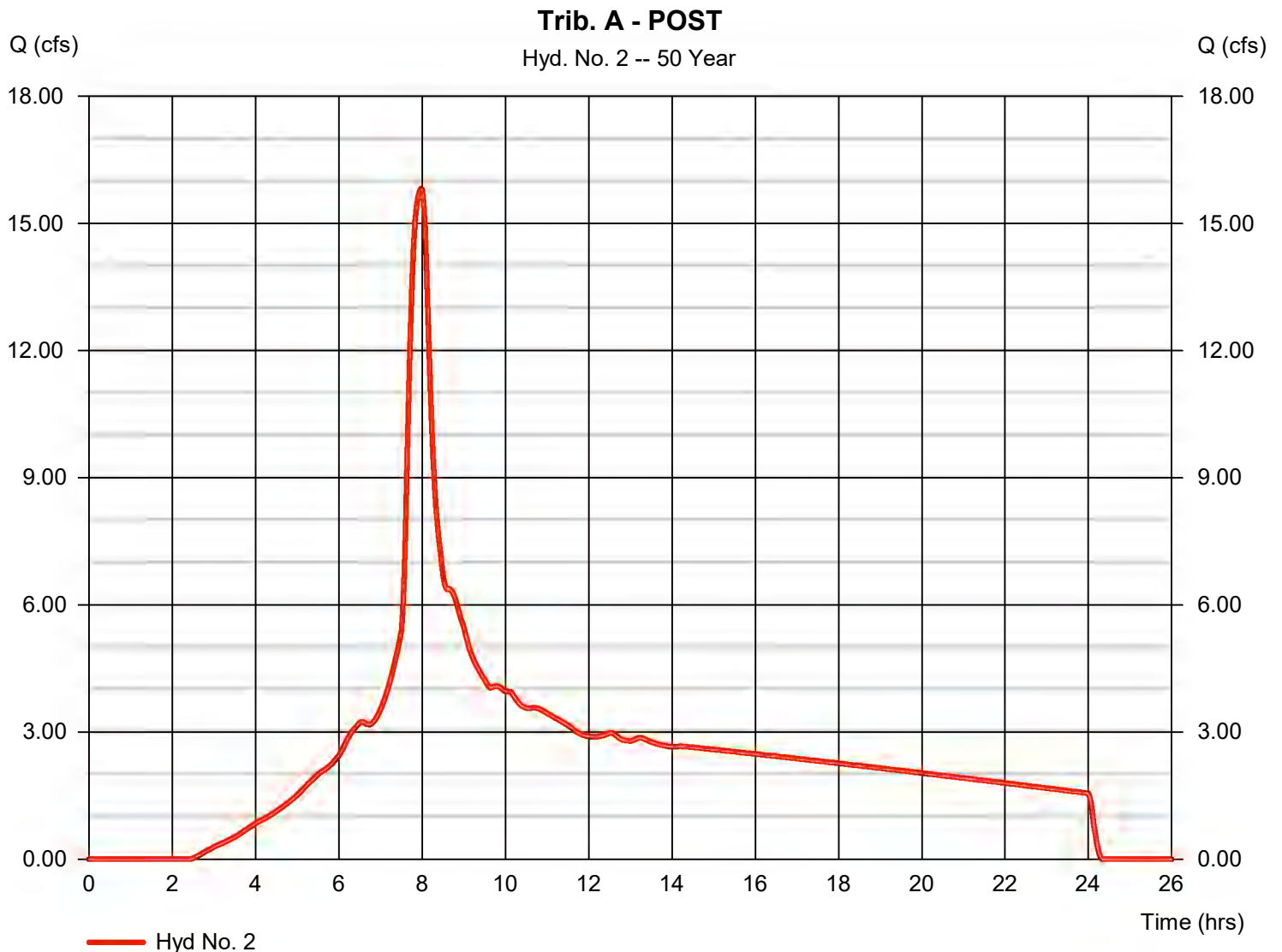
Tuesday, 08 / 5 / 2025

Hyd. No. 2

Trib. A - POST

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 2 min
Drainage area = 10.265 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.15 in
Storm duration = 24 hrs

Peak discharge = 15.83 cfs
Time to peak = 7.97 hrs
Hyd. volume = 222,919 cuft
Curve number = 80.3
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.90 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

50-YEAR

24

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

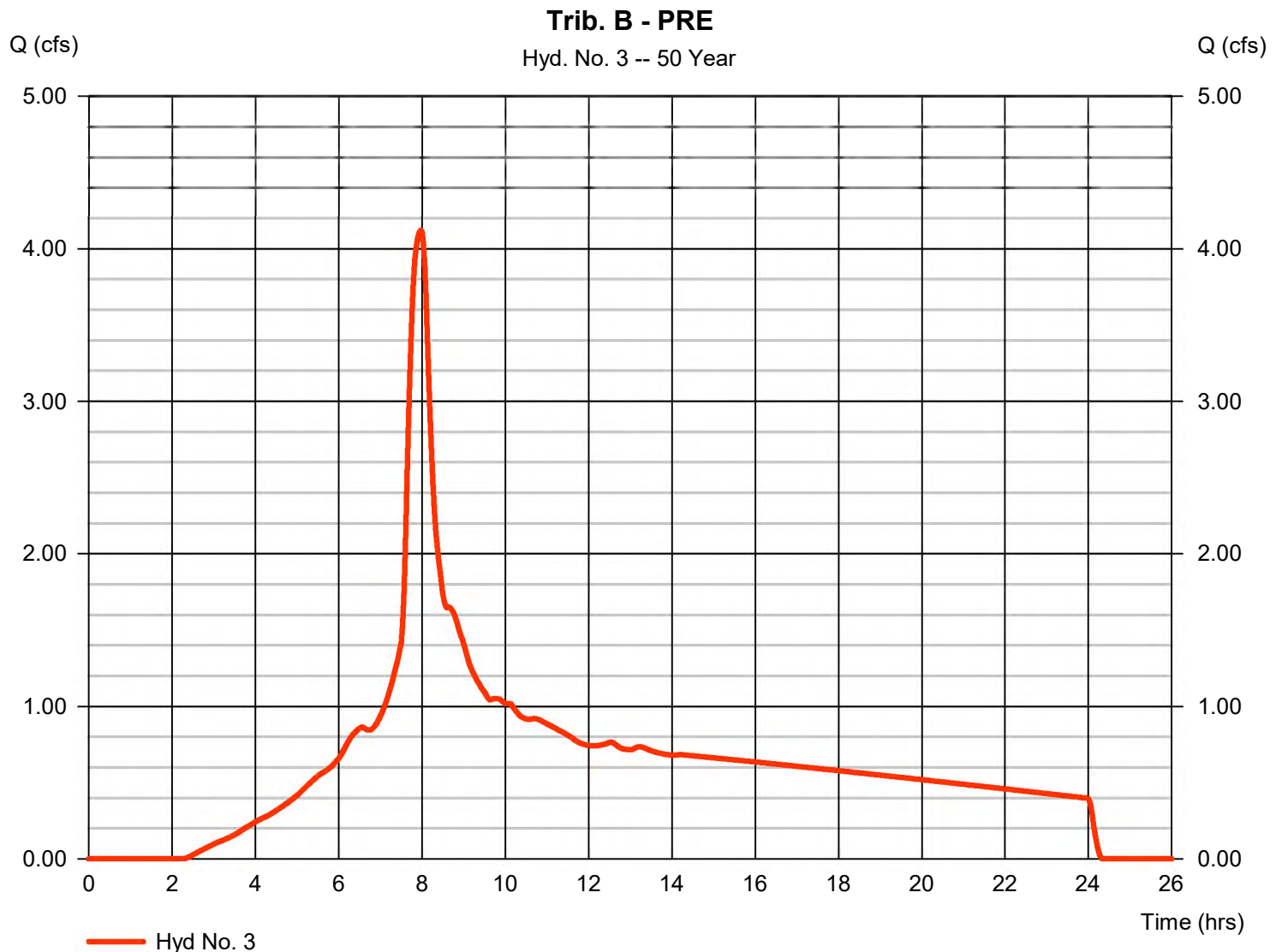
Tuesday, 08 / 5 / 2025

Hyd. No. 3

Trib. B - PRE

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 2 min
Drainage area = 2.600 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.15 in
Storm duration = 24 hrs

Peak discharge = 4.121 cfs
Time to peak = 7.97 hrs
Hyd. volume = 57,844 cuft
Curve number = 81.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.50 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

50-YEAR

25

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

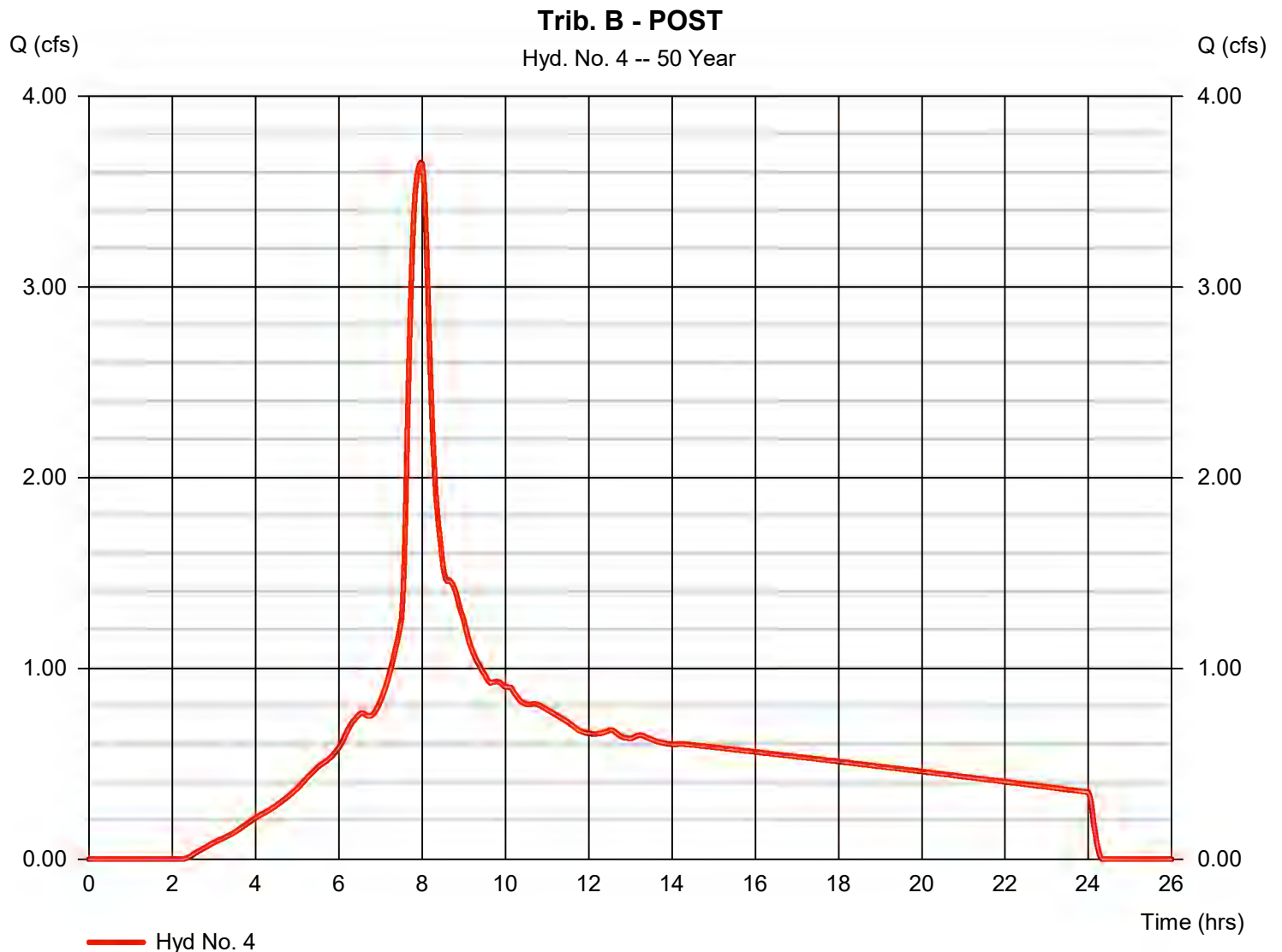
Tuesday, 08 / 5 / 2025

Hyd. No. 4

Trib. B - POST

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 2 min
Drainage area = 2.300 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.15 in
Storm duration = 24 hrs

Peak discharge = 3.654 cfs
Time to peak = 7.97 hrs
Hyd. volume = 51,271 cuft
Curve number = 81.6
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.10 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

50-YEAR

26

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

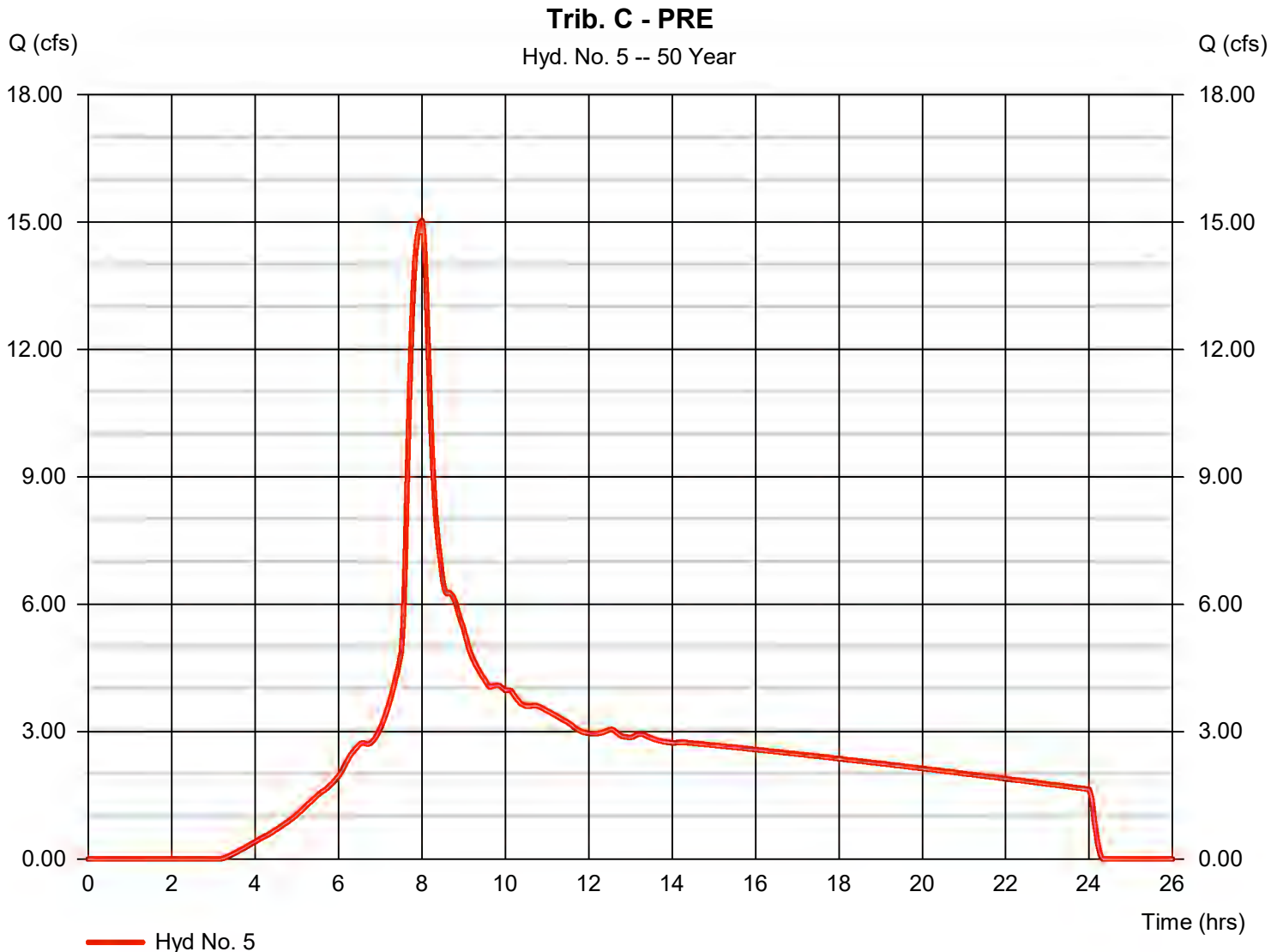
Tuesday, 08 / 5 / 2025

Hyd. No. 5

Trib. C - PRE

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 2 min
Drainage area = 11.310 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.15 in
Storm duration = 24 hrs

Peak discharge = 15.04 cfs
Time to peak = 8.00 hrs
Hyd. volume = 217,209 cuft
Curve number = 74.6
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.10 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

50-YEAR

27

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

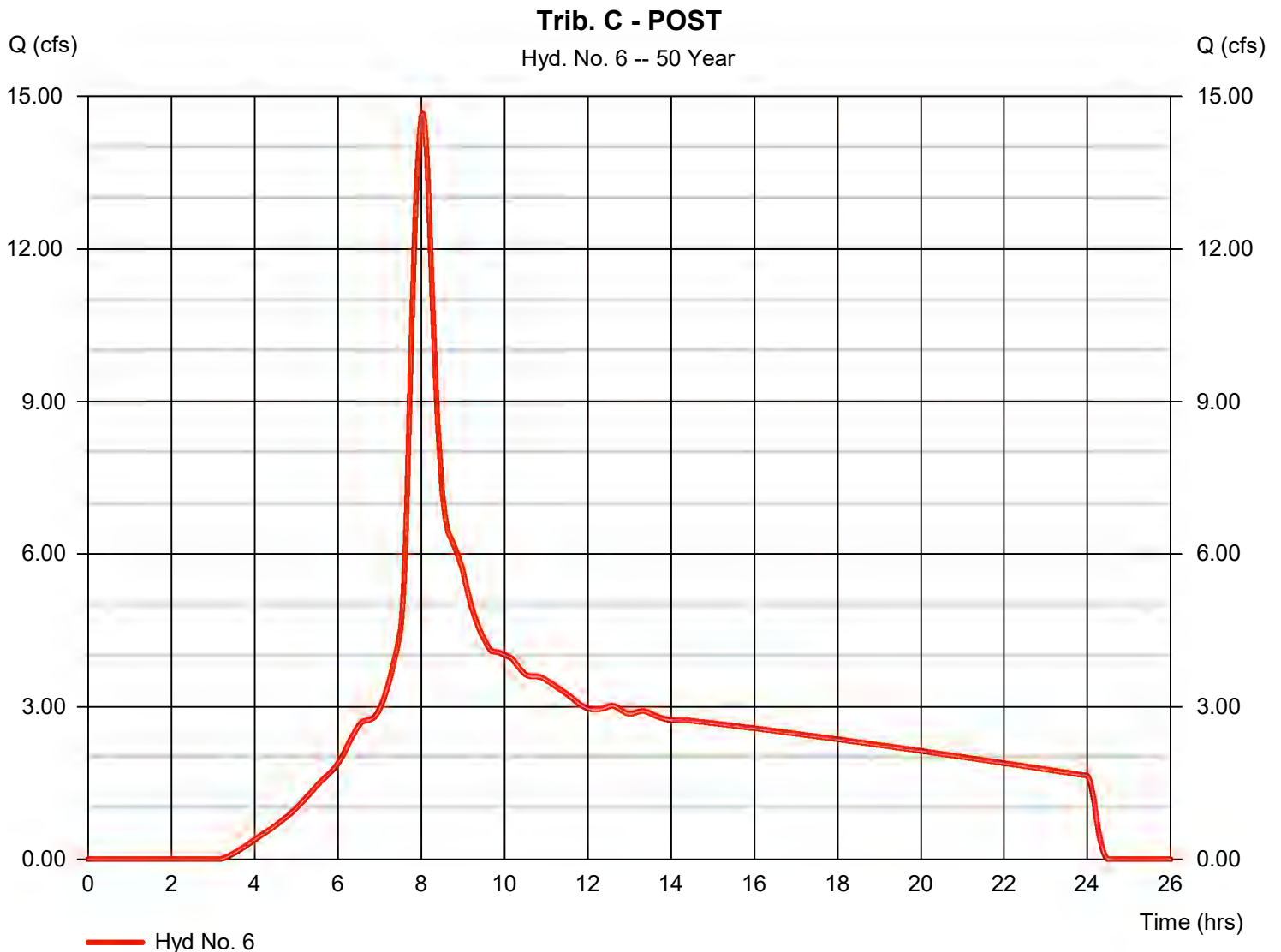
Tuesday, 08 / 5 / 2025

Hyd. No. 6

Trib. C - POST

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 2 min
Drainage area = 11.560 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.15 in
Storm duration = 24 hrs

Peak discharge = 14.67 cfs
Time to peak = 8.03 hrs
Hyd. volume = 216,759 cuft
Curve number = 74.9
Hydraulic length = 0 ft
Time of conc. (Tc) = 17.40 min
Distribution = Type IA
Shape factor = 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

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	18.04	2	478	252,909	-----	-----	-----	Trib. A - PRE
2	SCS Runoff	18.04	2	478	253,078	-----	-----	-----	Trib. A - POST
3	SCS Runoff	4.684	2	478	65,535	-----	-----	-----	Trib. B - PRE
4	SCS Runoff	4.152	2	478	58,079	-----	-----	-----	Trib. B - POST
5	SCS Runoff	17.41	2	480	249,149	-----	-----	-----	Trib. C - PRE
6	SCS Runoff	16.99	2	482	248,491	-----	-----	-----	Trib. C - POST
C:\Users\danie\OneDrive - TruNorth\TruNorth Return Period 100 Year Projects\Fellowsch-08pr5-2025\Mountain Road\SHIRE\ECPI\HYD									

Hydrograph Report

100-YEAR

29

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

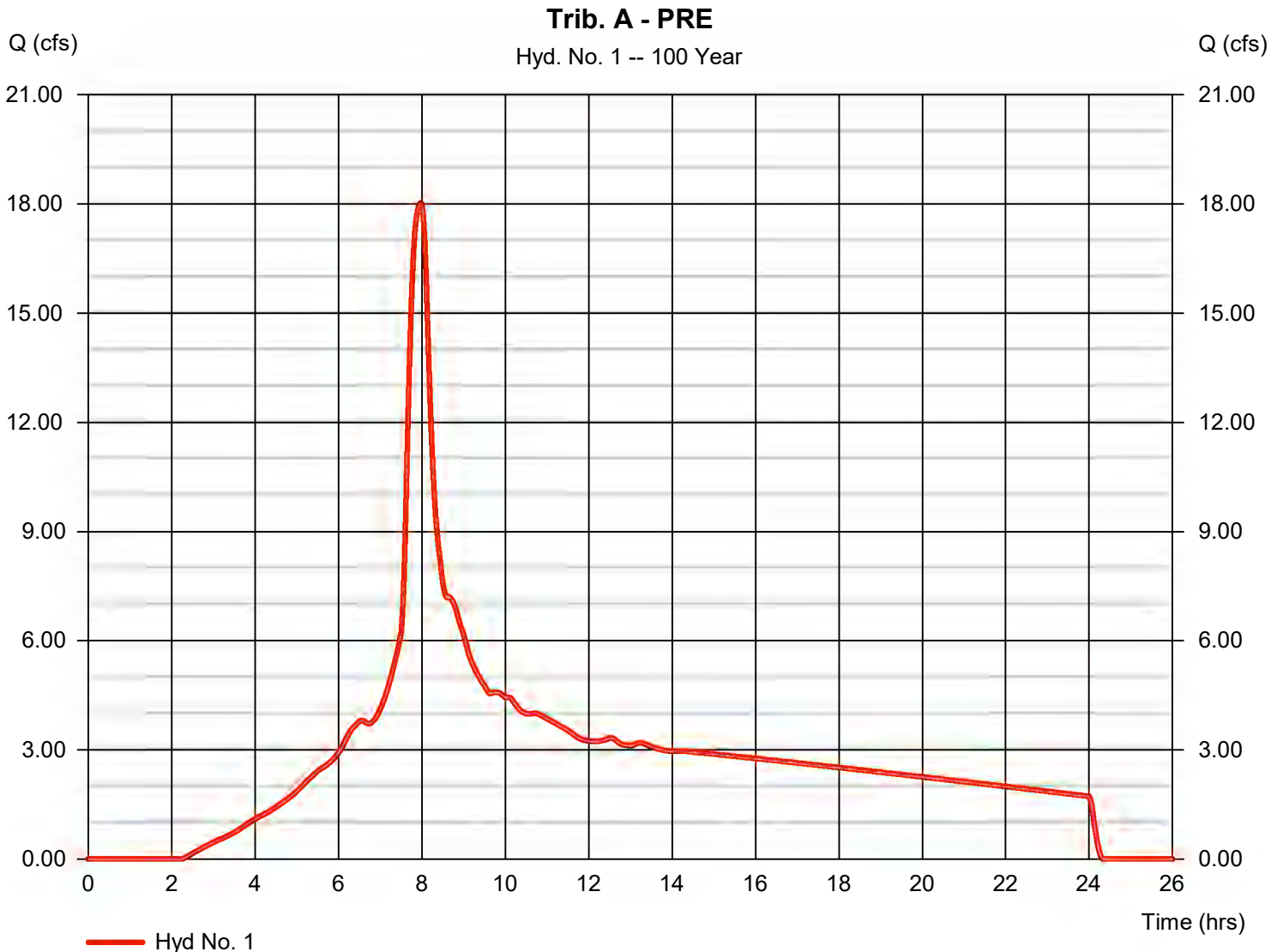
Tuesday, 08 / 5 / 2025

Hyd. No. 1

Trib. A - PRE

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 10.220 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.98 in
Storm duration = 24 hrs

Peak discharge = 18.04 cfs
Time to peak = 7.97 hrs
Hyd. volume = 252,909 cuft
Curve number = 80.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

100-YEAR

30

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

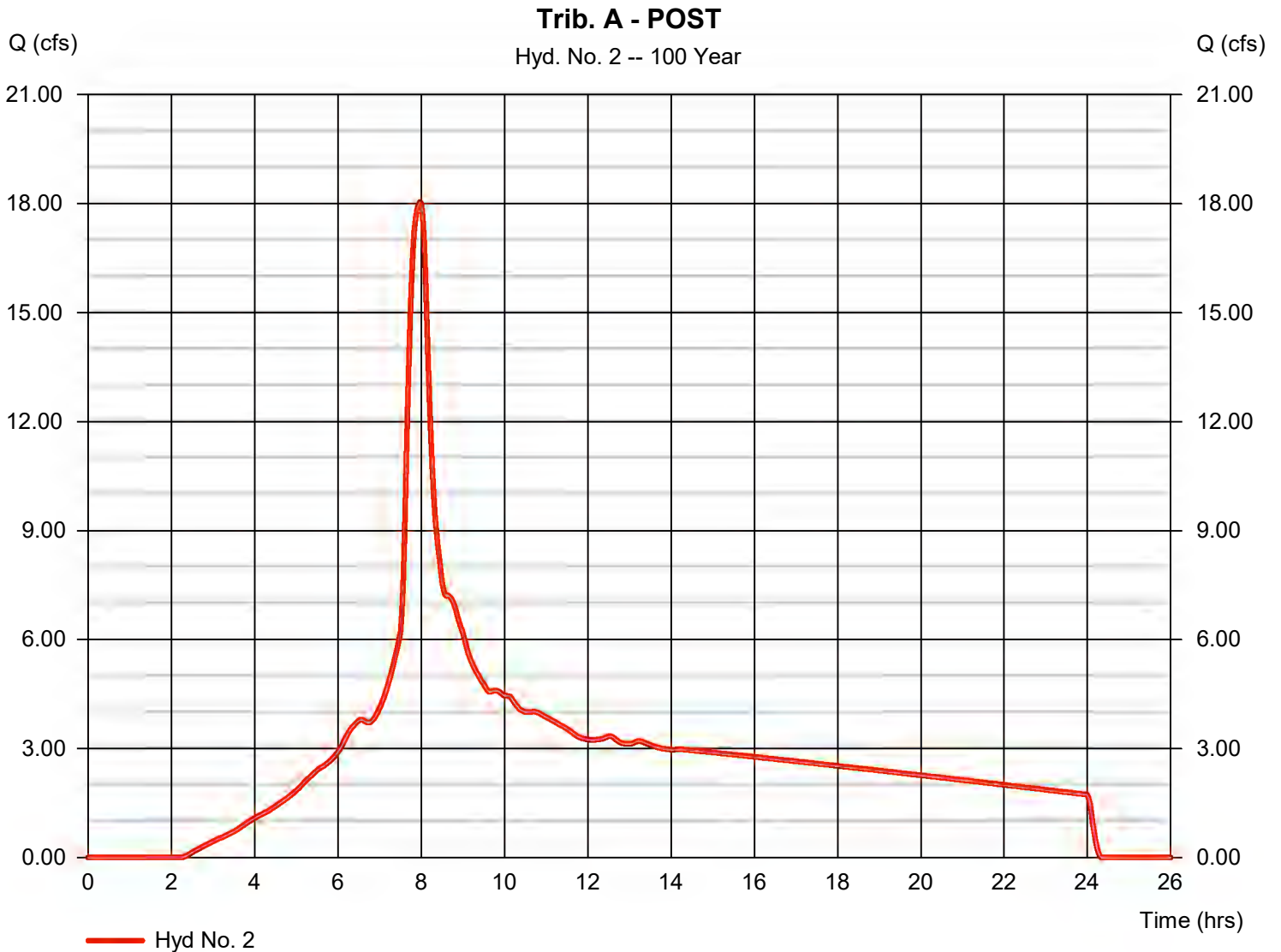
Tuesday, 08 / 5 / 2025

Hyd. No. 2

Trib. A - POST

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 10.265 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.98 in
Storm duration = 24 hrs

Peak discharge = 18.04 cfs
Time to peak = 7.97 hrs
Hyd. volume = 253,078 cuft
Curve number = 80.3
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.90 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

100-YEAR

31

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

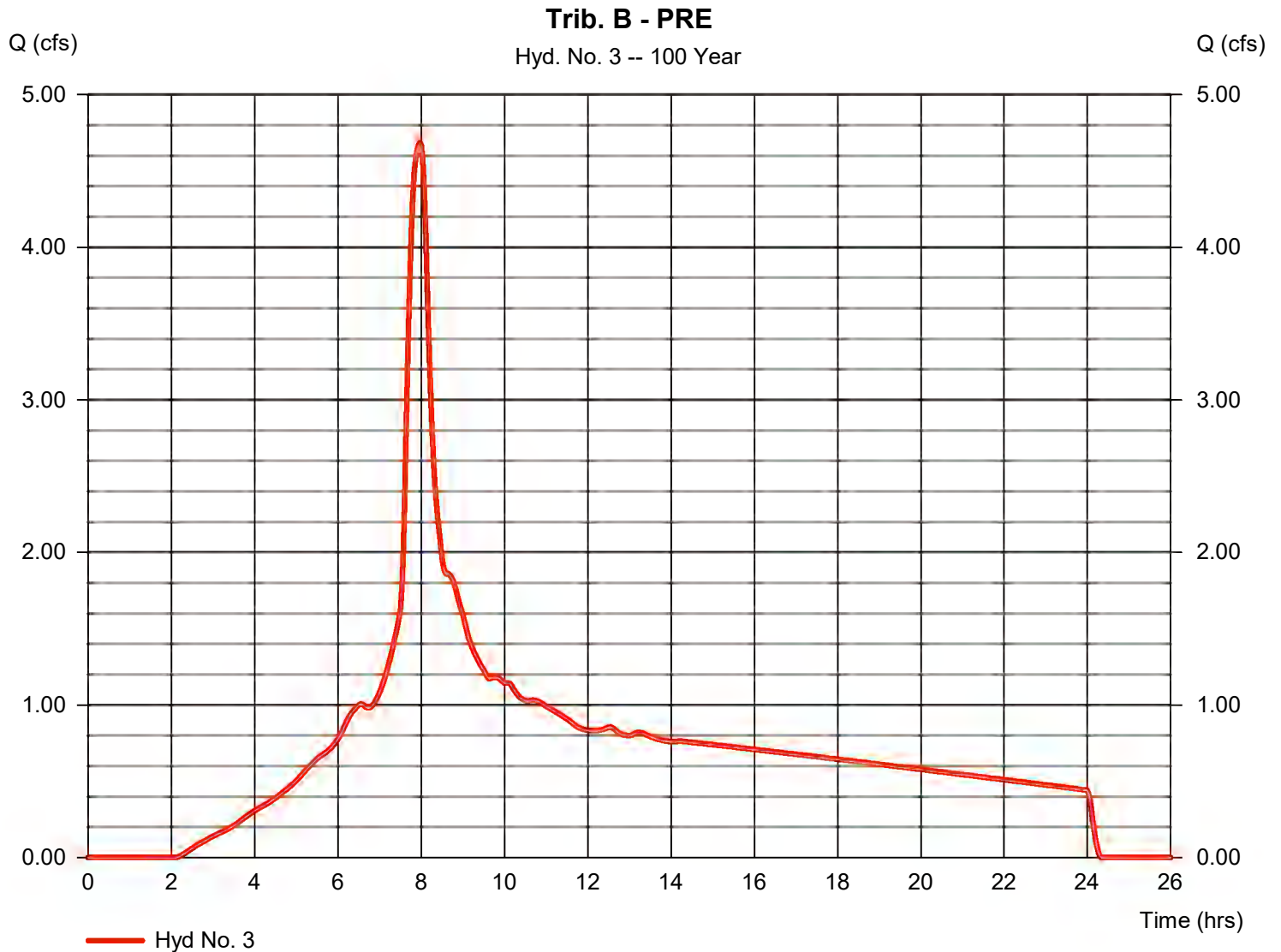
Tuesday, 08 / 5 / 2025

Hyd. No. 3

Trib. B - PRE

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 2.600 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.98 in
Storm duration = 24 hrs

Peak discharge = 4.684 cfs
Time to peak = 7.97 hrs
Hyd. volume = 65,535 cuft
Curve number = 81.5
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.50 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

100-YEAR

32

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

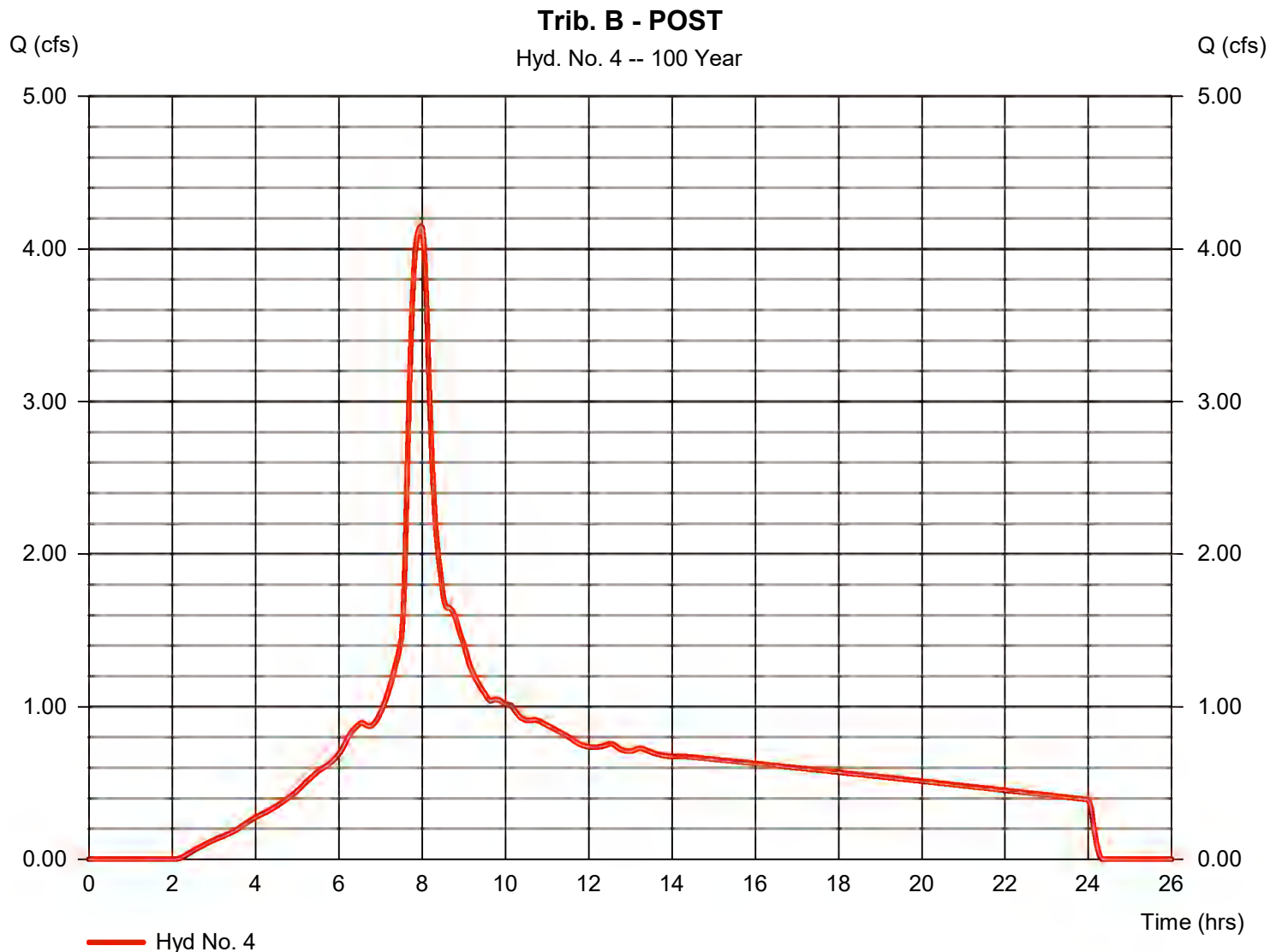
Tuesday, 08 / 5 / 2025

Hyd. No. 4

Trib. B - POST

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 2.300 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.98 in
Storm duration = 24 hrs

Peak discharge = 4.152 cfs
Time to peak = 7.97 hrs
Hyd. volume = 58,079 cuft
Curve number = 81.6
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.10 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

100-YEAR

33

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

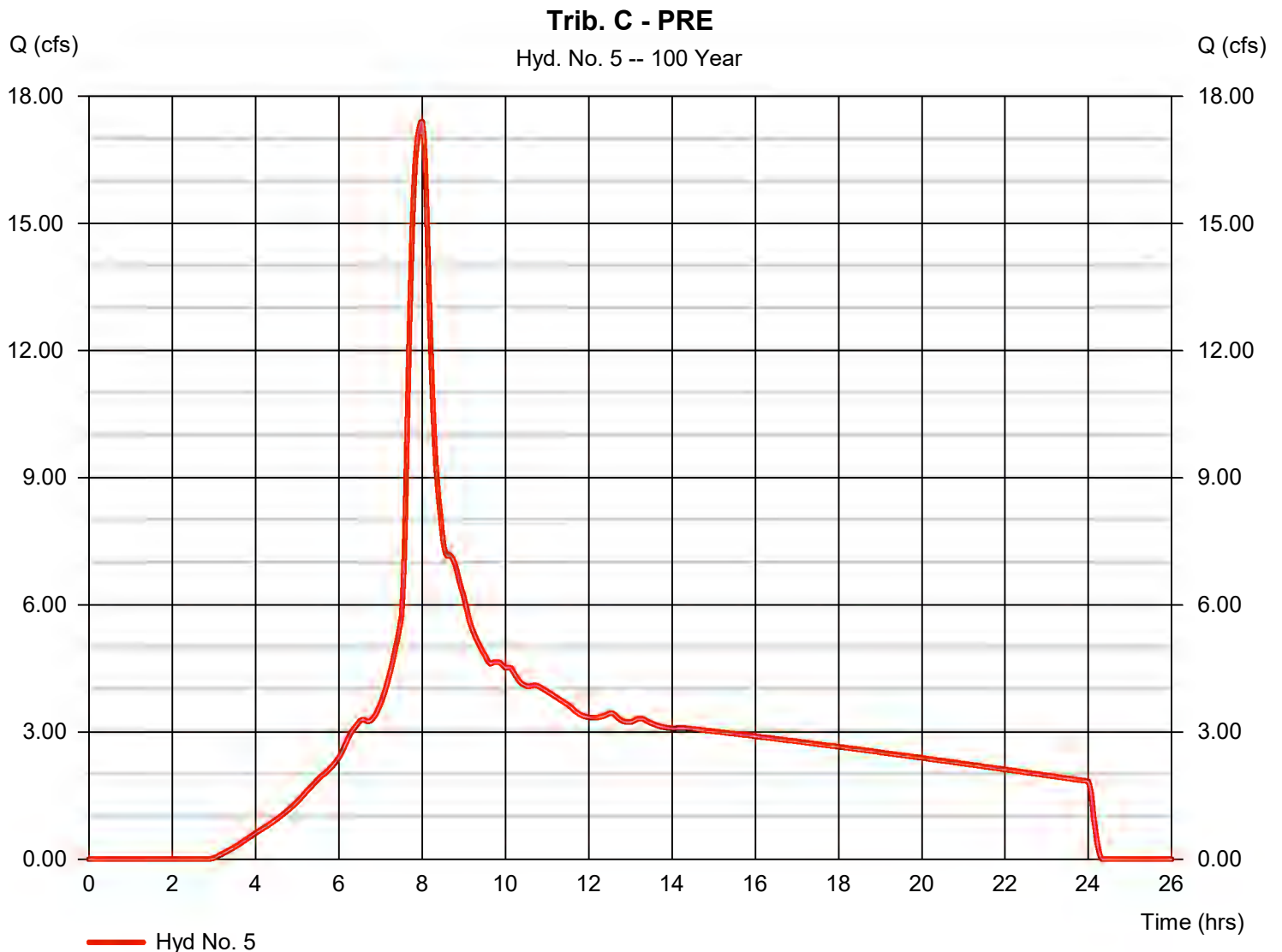
Tuesday, 08 / 5 / 2025

Hyd. No. 5

Trib. C - PRE

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 11.310 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 8.98 in
Storm duration = 24 hrs

Peak discharge = 17.41 cfs
Time to peak = 8.00 hrs
Hyd. volume = 249,149 cuft
Curve number = 74.6
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.10 min
Distribution = Type IA
Shape factor = 484



Hydrograph Report

100-YEAR

Hyd. No. 6

Trib. C - POST

Hydrograph type	= SCS Runoff	Peak discharge	= 16.99 cfs
Storm frequency	= 100 yrs	Time to peak	= 8.03 hrs
Time interval	= 2 min	Hyd. volume	= 248,491 cuft
Drainage area	= 11.560 ac	Curve number	= 74.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.40 min
Total precip.	= 8.98 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484

