Bryant Highschool Addition

Stormwater Management Report

City of Bryant, Saline County, Arkansas

Original Submittal:
April 10, 2024

Revised:
April 26, 2024

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I. Pre-Development Conditions

This project involves constructing an addition to the Bryant High School, on the south side of the main classroom building. The existing conditions comprise of parking lots, sidewalks, buildings and green spaces. The site generally slopes from north east to south west.

An area on the east side of the existing high school building currently drains west, along the south side of the auditorium and ends up in an existing detention pond on Boswell (this water will be re-routed south under this project). The remainder of the site drains south to NW 4th Street.

II. Post-Development Conditions

The new classroom wing will extend south from the existing classroom building. The existing building (bldg. #3) will be demolished to make room for a new parking lot, parking will also be added on the south east. All of the stormwater will drain south to NW 4th street, this includes the area that is currently draining to the detention pond on Boswell. A detention pond will be constructed on the south side of the new addition to handle the additional drainage area as well as the increase in hard surface area.

III. Design Considerations

The detention for this project was designed using the rational method. The pre-development flow, post development flow and detention volume were determined by the attached calculations are summarized below. The calculations were compiled using Autodesk Hydraflow, information used is attached to this report.

Summary Table:

Description	Pre-Development	Post-Development	Pond Elevation
2-Year Storm	26.50 cfs	25.22 cfs	421.18
5-Year Storm	30.69 cfs	28.49 cfs	421.36
10-Year Storm	33.86 cfs	30.95 cfs	421.50
25-Year Storm	38.60 cfs	34.37 cfs	421.72
50-Year Storm	42.36 cfs	37.05 cfs	421.90
100-Year Storm	46.13 cfs	39.75 cfs	422.07

IV. Conclusion

Post-development flow will be less than the pre-development flow for the 2-100 year storm events. The pond will detain the 100-yr storm by utilizing a storage volume of 5,535 CF. The pond has an available volume of 10,086 CF and will store the 100-year storm w/ 1' of freeboard available. The outlet structure will utilize an 18" storm pipe.

Please consider this report and let me know if any additional information is required.

DRC Comments (4/18/24):

Attached to the back of this report pipe sizing and inlet calculations have been included.

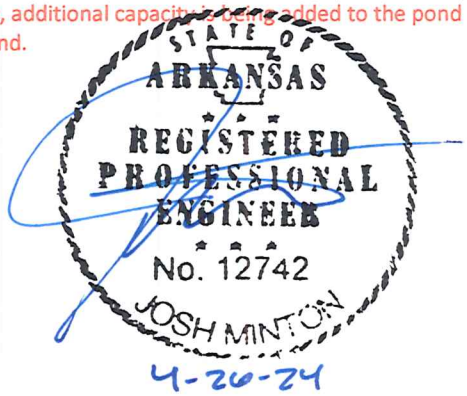
The Bryant Stormwater Ordinance requires this application of storm drainage to be sized to the 10-year storm, however the Arkansas Public School Facilities requires 25-year storm design, so this was used. The majority of the stormwater for this site will leave the campus through an 18" pipe that heads south to NW 4th street. With the added detention pond, this pipe has the capacity to handle the 25-year storm.

A smaller portion of the stormwater enters two existing inlets at the NE corner of Boswell and N. Pine. This water heads west and runs through the school's detention pond on Boswell, and will handle the 25-year storm.

All storm events will be reduced in post-development conditions. Also, additional capacity is being added to the pond on Boswell since a portion of that water is re-directed into the new pond.

Sincerely,

Josh Minton, PE



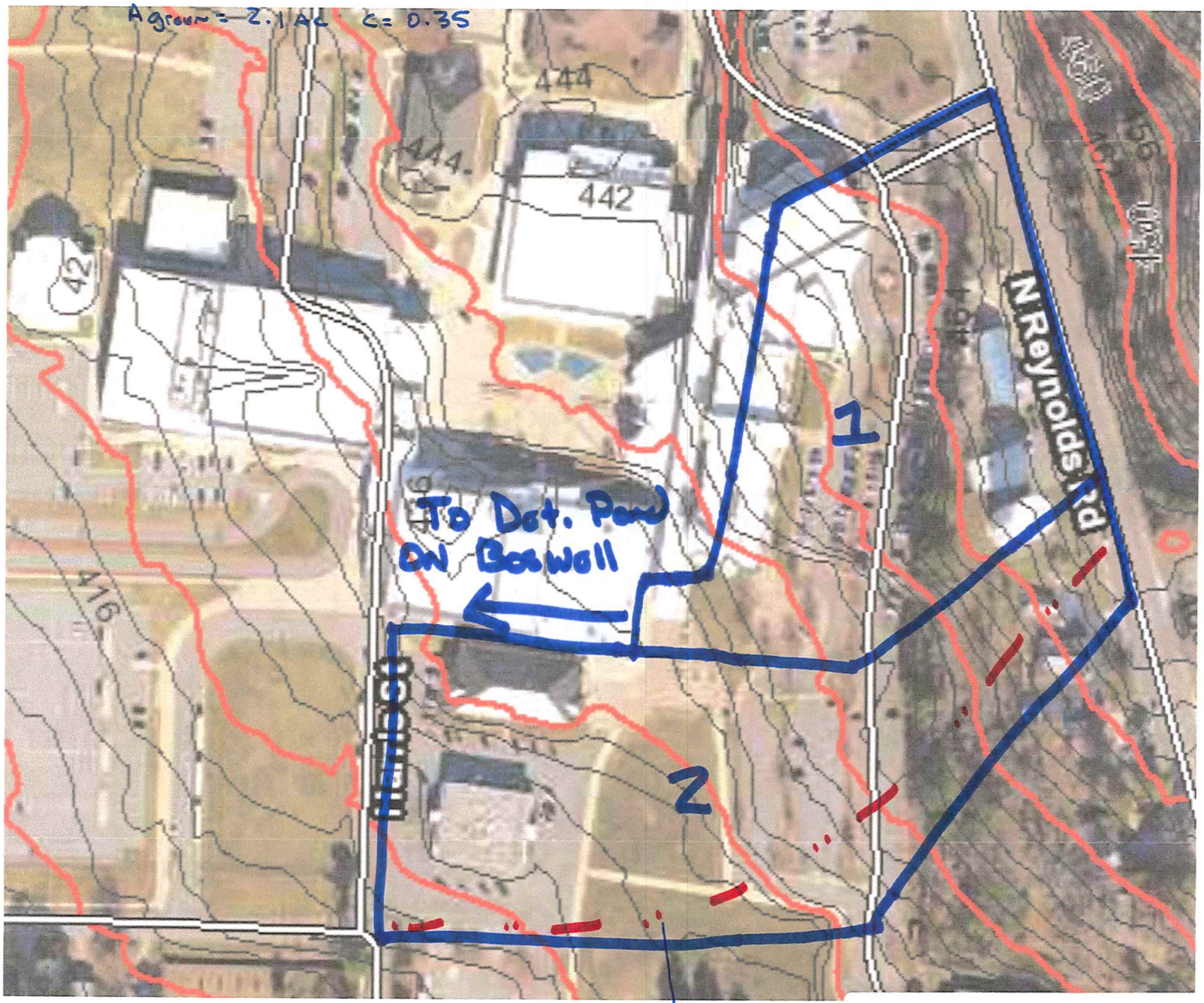
HYDRAULIC CALCULATIONS

Pre - Development Worksheet

* Note: Area 1 not included in Pre-Dev. flow - it drains to Det. pond on Boswell

D.A. 1: Total Area = 4.4 Acres

D.A. 2: Total Area = 5.8 Acres
$A_{H.S.}$ = 3.7 ac $C = 0.95$
A_{grass} = 2.1 ac $C = 0.35$



$L = 1005'$
Sheet Flow = 300' $S = 6.5\%$
Shallow Conc. = 150' $S = 6.5\%$
Pipe / HS. = 555' $S = 3.0\%$

Post - Development Worksheet

D.A. 1 : Total Area = 7.5 Acres
A H.S. = 5.0 Ac C = 0.95
A green = 2.5 Ac C = 0.35

D.A. 2 : Total Area = 2.7 Ac
A H.S. = 2.7 Ac C = 0.95

* Note : Area 1 passes through new Det. Pond - Area 2 bypasses pond.

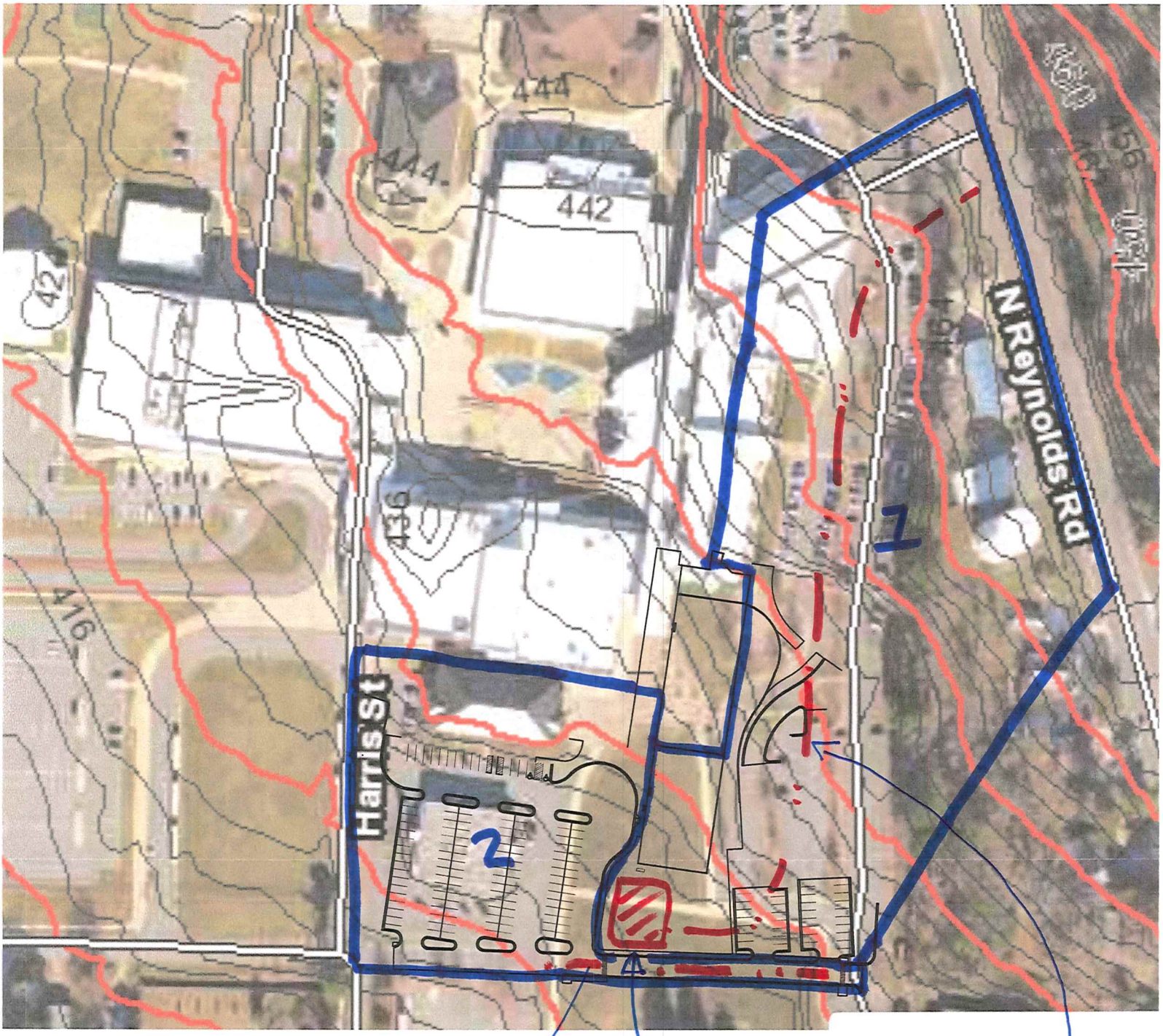


TABLE 400-2

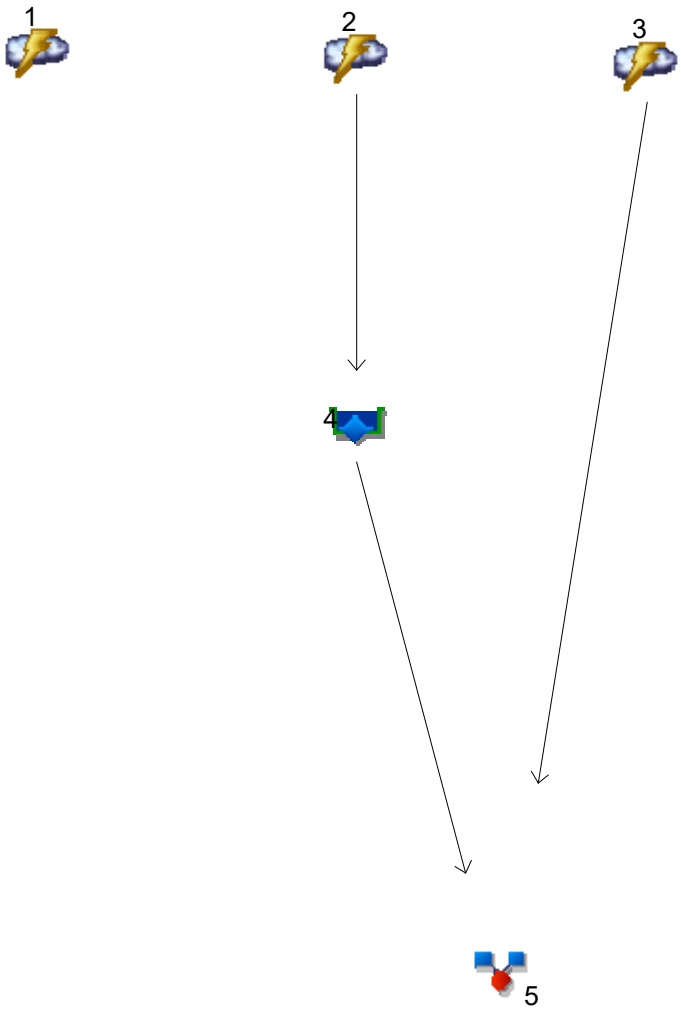
Runoff Coefficients for Rational Method Composite Analysis

Land Use Types	Frequency 10	25	100
Undeveloped Areas			
Historic Flow Analysis, Greenbelts			
Agricultural, Natural Vegetation			
Clay Soil			
Flat, 2%	0.3	0.33	0.37
Average, 2-7%	0.4	0.44	0.5
Steep, 7%	0.5	0.55	0.62
Sandy Soil			
Flat, 2%	0.12	0.13	0.15
Average, 2-7%	0.2	0.22	0.25
Steep, 7%	0.3	0.33	0.37
Streets			
Paved	0.9	0.92	0.95
Gravel	0.35	0.5	0.65
Miscellaneous			
Drives and Walks	0.9	0.91	0.92
Roofs	0.9	0.92	0.95
Lawns			
Clay Soil			
Flat, 2%	0.18	0.2	0.25
Average, 2-7%	0.22	0.28	0.35
Steep, 7%	0.35	0.45	0.6
Sandy Soil			
Flat, 2%	0.1	0.25	0.4
Average, 2-7%	0.15	0.3	0.45
Steep, 7%	0.2	0.35	0.5

Source: City of Little Rock Stormwater Management & Drainage Design Manual

The design engineer shall use the preceding values as a rule of thumb. Areas not conforming to the preceding descriptions will be evaluated by calculating a composite runoff coefficient. Areas will be evaluated based upon the ultimate development for the area under consideration.

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Total Pre-Dev
2	Rational	Post DA 1
3	Rational	Post DA 2
4	Reservoir	Det. Pond
5	Combine	Total Post Dev

Hydrograph Return Period Recap

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	Rational	------	-------	26.50	-------	30.69	33.86	38.60	42.36	46.13	Total Pre-Dev
2	Rational	------	-------	37.06	-------	42.76	47.10	53.60	58.75	63.94	Post DA 1
3	Rational	------	-------	16.90	-------	19.50	21.48	24.44	26.79	29.15	Post DA 2
4	Reservoir	2	-------	10.19	-------	10.78	11.25	11.95	12.47	12.95	Det. Pond
5	Combine	3, 4	-------	25.22	-------	28.49	30.95	34.37	37.05	39.75	Total Post Dev

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	Rational	26.50	1	3	4,770	------	------	------	Total Pre-Dev
2	Rational	37.06	1	2	4,448	------	------	------	Post DA 1
3	Rational	16.90	1	2	2,028	------	------	------	Post DA 2
4	Reservoir	10.19	1	3	4,447	2	421.18	2,822	Det. Pond
5	Combine	25.22	1	2	6,475	3, 4	------	------	Total Post Dev

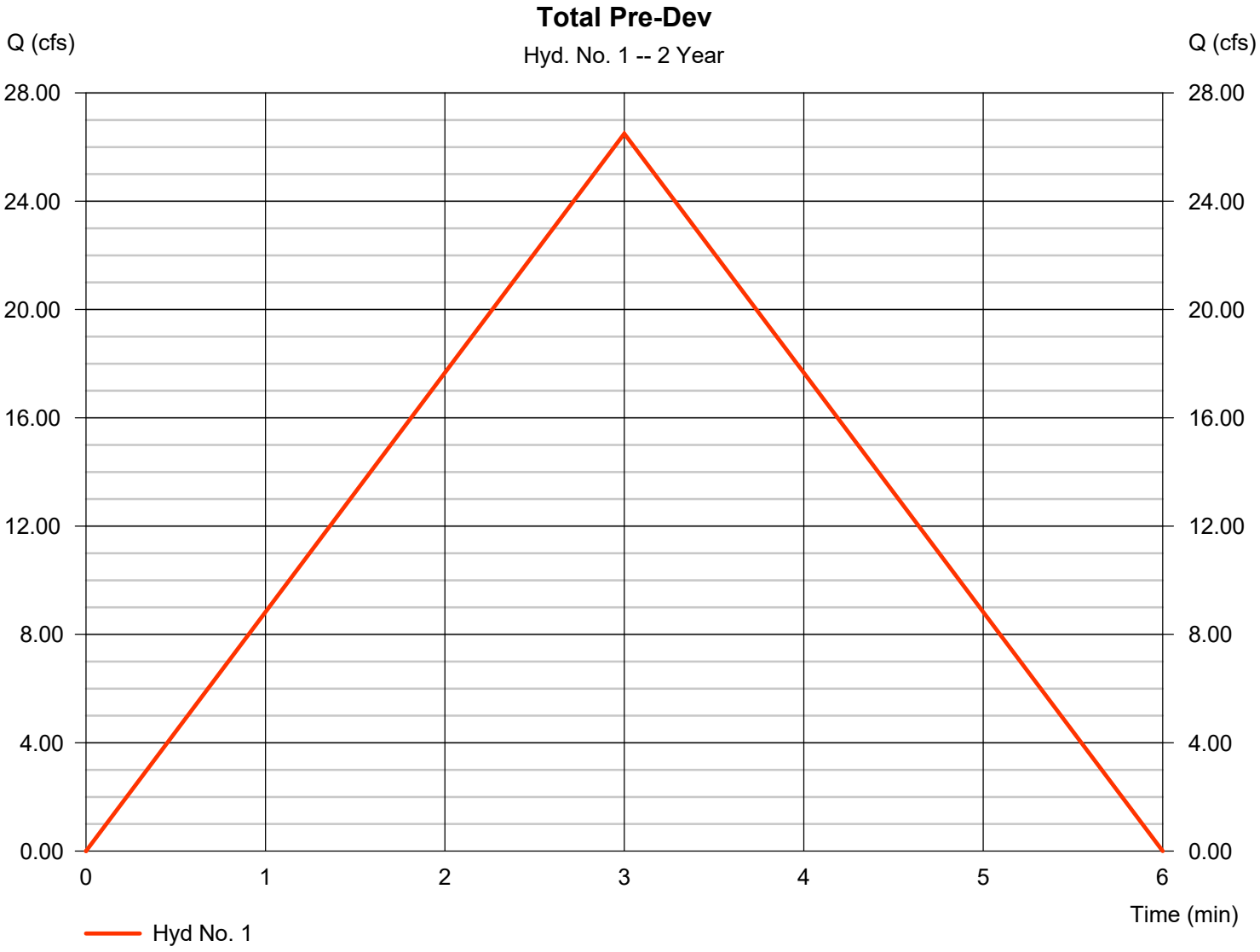
Hydrograph Report

Hyd. No. 1

Total Pre-Dev

Hydrograph type	=	Rational	Peak discharge	=	26.50 cfs
Storm frequency	=	2 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	4,770 cuft
Drainage area	=	5.800 ac	Runoff coeff.	=	0.73*
Intensity	=	6.258 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.700 x 0.95) + (2.100 x 0.35)] / 5.800



TR55 Tc Worksheet

Hyd. No. 1

Total Pre-Dev

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 300.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 4.13		0.00		0.00		
Land slope (%)	= 6.50		0.00		0.00		
Travel Time (min)	**= 1.60**	**+**	**0.00**	**+**	**0.00**	**=**	**1.60**
Shallow Concentrated Flow							
Flow length (ft)	= 150.00		0.00		0.00		
Watercourse slope (%)	= 6.50		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.11		0.00		0.00		
Travel Time (min)	**= 0.61**	**+**	**0.00**	**+**	**0.00**	**=**	**0.61**
Channel Flow							
X sectional flow area (sqft)	= 3.14		0.00		0.00		
Wetted perimeter (ft)	= 6.30		0.00		0.00		
Channel slope (%)	= 3.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=10.79						
			0.00				
					0.00		
Flow length (ft)	({0})555.0		0.0		0.0		
Travel Time (min)	**= 0.86**	**+**	**0.00**	**+**	**0.00**	**=**	**0.86**

Total Travel Time, Tc ..... 3.00 min

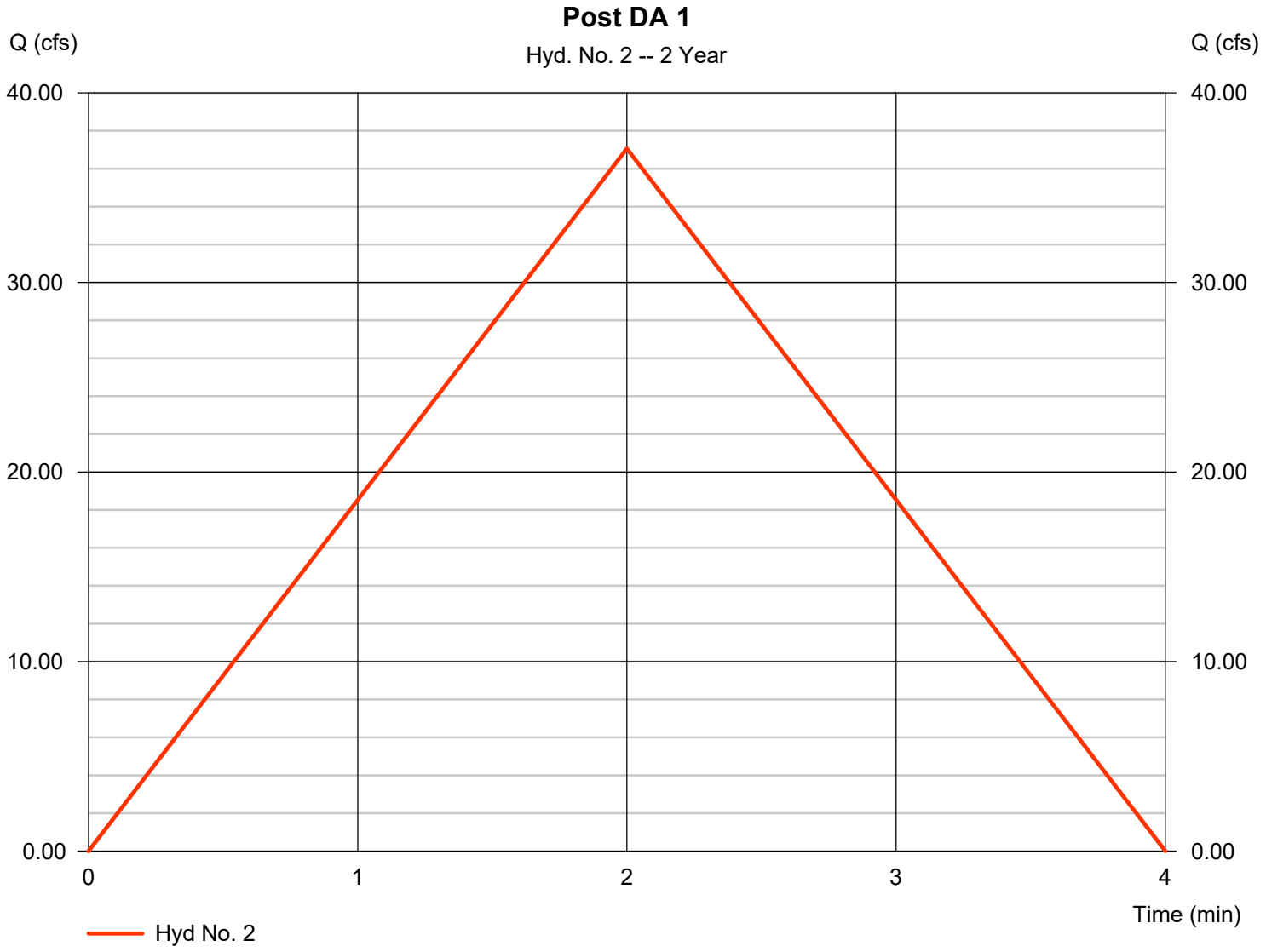
Hydrograph Report

Hyd. No. 2

Post DA 1

Hydrograph type	=	Rational	Peak discharge	=	37.06 cfs
Storm frequency	=	2 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	4,448 cuft
Drainage area	=	7.500 ac	Runoff coeff.	=	0.75*
Intensity	=	6.589 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(5.000 x 0.95) + (2.500 x 0.35)] / 7.500



TR55 Tc Worksheet

Hyd. No. 2

Post DA 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 120.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 4.13		0.00		0.00		
Land slope (%)	= 8.50		0.00		0.00		
Travel Time (min)	**= 0.69**	**+**	**0.00**	**+**	**0.00**	**=**	**0.69**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 3.14		0.00		0.00		
Wetted perimeter (ft)	= 6.28		0.00		0.00		
Channel slope (%)	= 3.10		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=10.99						
			0.00				
					0.00		
Flow length (ft)	({0})945.0		0.0		0.0		
Travel Time (min)	**= 1.43**	**+**	**0.00**	**+**	**0.00**	**=**	**1.43**

Total Travel Time, Tc ..... 2.00 min

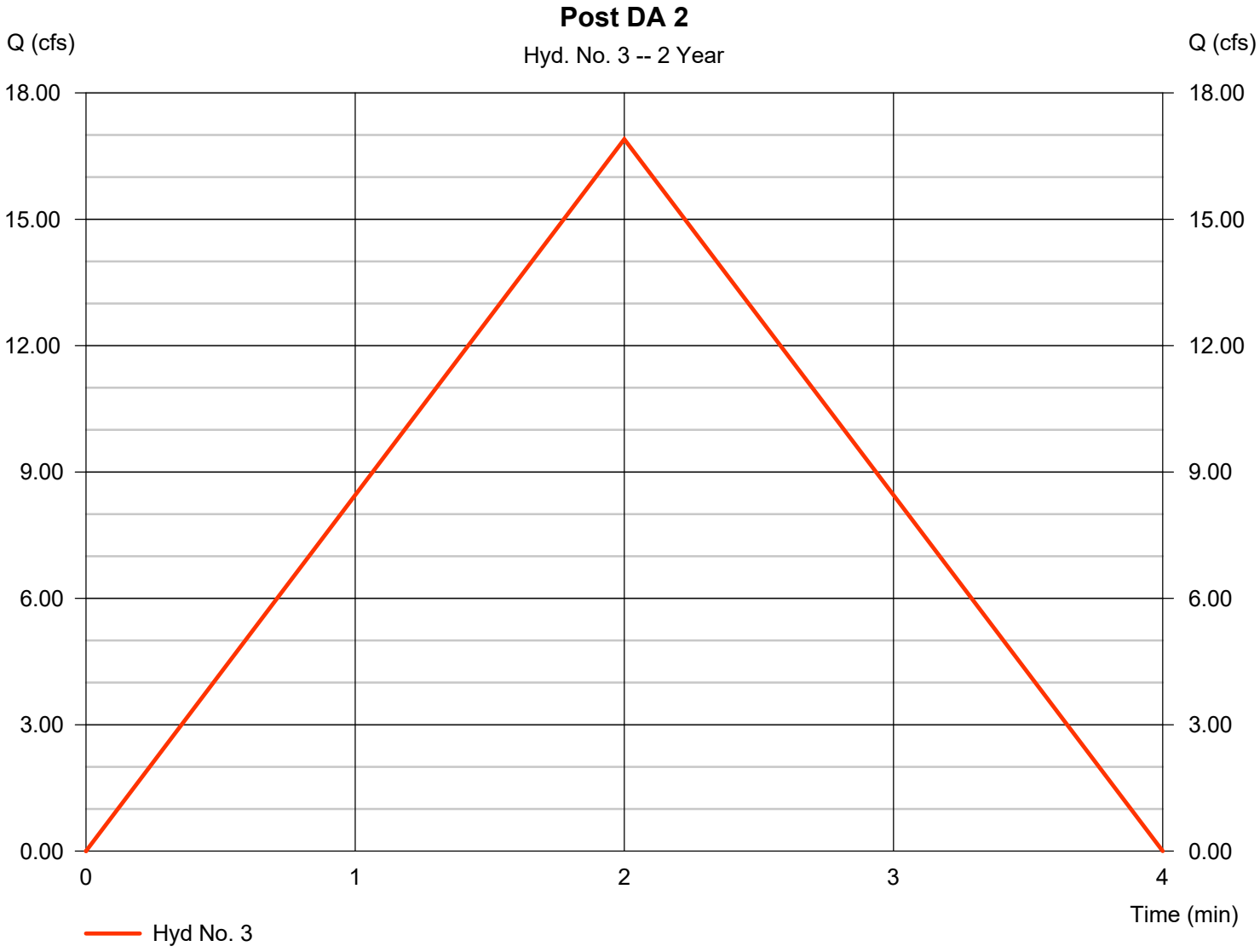
Hydrograph Report

Hyd. No. 3

Post DA 2

Hydrograph type	=	Rational	Peak discharge	=	16.90 cfs
Storm frequency	=	2 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	2,028 cuft
Drainage area	=	2.700 ac	Runoff coeff.	=	0.95*
Intensity	=	6.589 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.700 x 0.95)] / 2.700



TR55 Tc Worksheet

Hyd. No. 3

Post DA 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 285.00		0.00		0.00		
Watercourse slope (%)	= 2.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=2.87		0.00		0.00		
Travel Time (min)	**= 1.65**	**+**	**0.00**	**+**	**0.00**	**=**	**1.65**
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 ..... 2.00 min

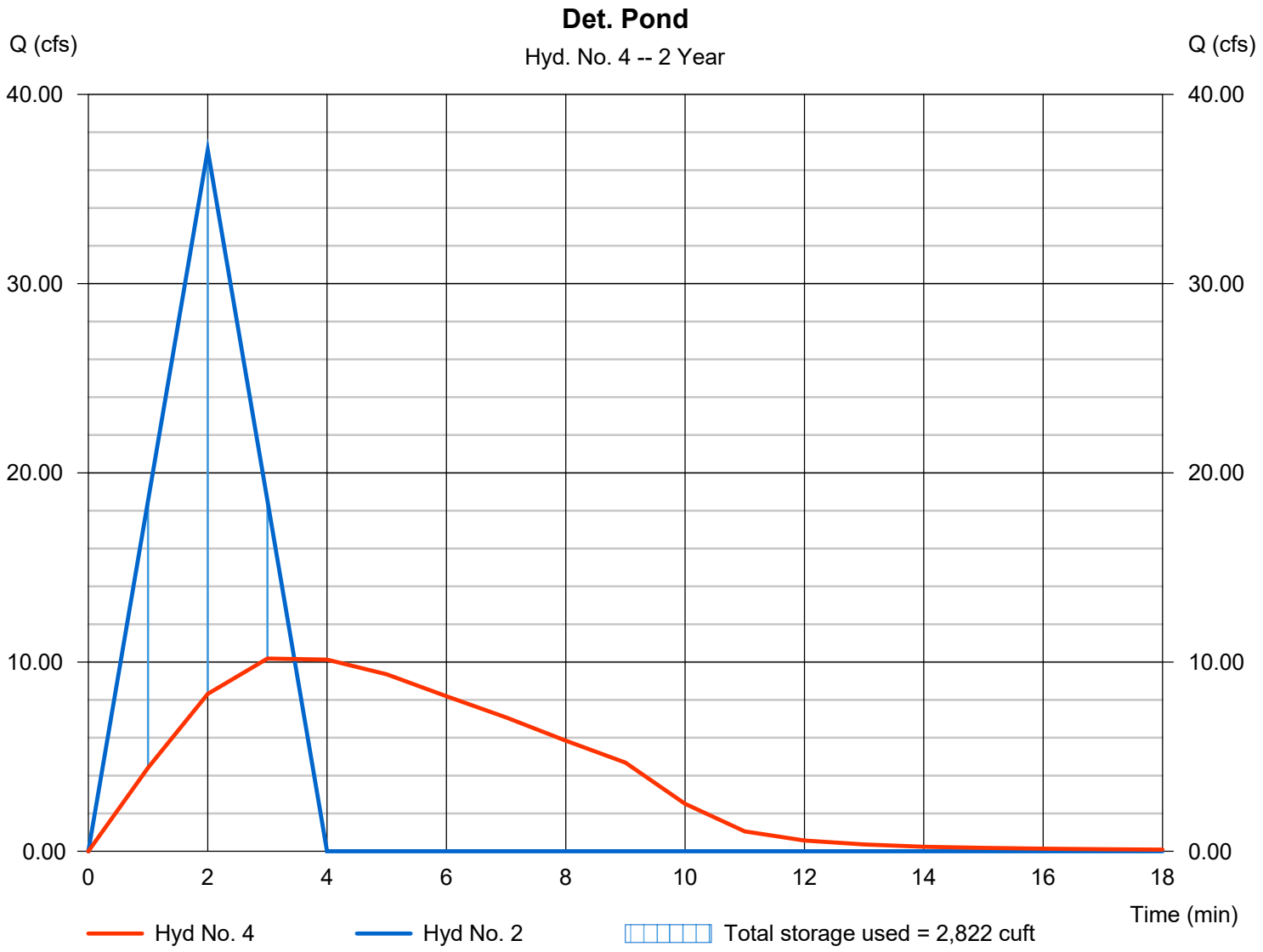
Hydrograph Report

Hyd. No. 4

Det. Pond

Hydrograph type	= Reservoir	Peak discharge	= 10.19 cfs
Storm frequency	= 2 yrs	Time to peak	= 3 min
Time interval	= 1 min	Hyd. volume	= 4,447 cuft
Inflow hyd. No.	= 2 - Post DA 1	Max. Elevation	= 421.18 ft
Reservoir name	= <New Pond>	Max. Storage	= 2,822 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - <New Pond>

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 419.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	419.00	00	0	0
1.00	420.00	1,151	384	384
2.00	421.00	2,721	1,880	2,264
3.00	422.00	3,349	3,029	5,293
4.00	423.00	4,033	3,685	8,979
4.25	423.25	4,836	1,107	10,086

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 419.00	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 1.50	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	No	No	No

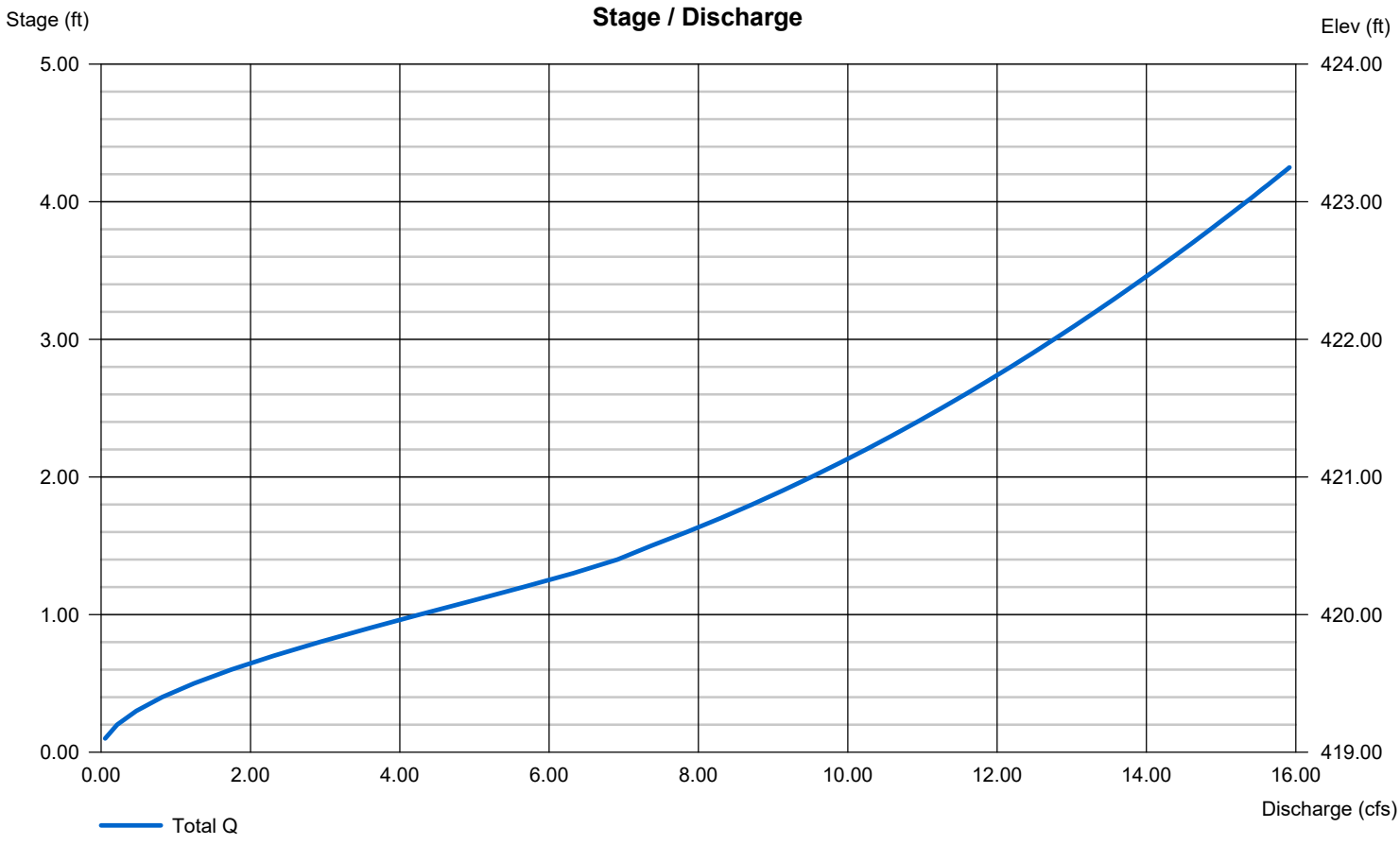
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

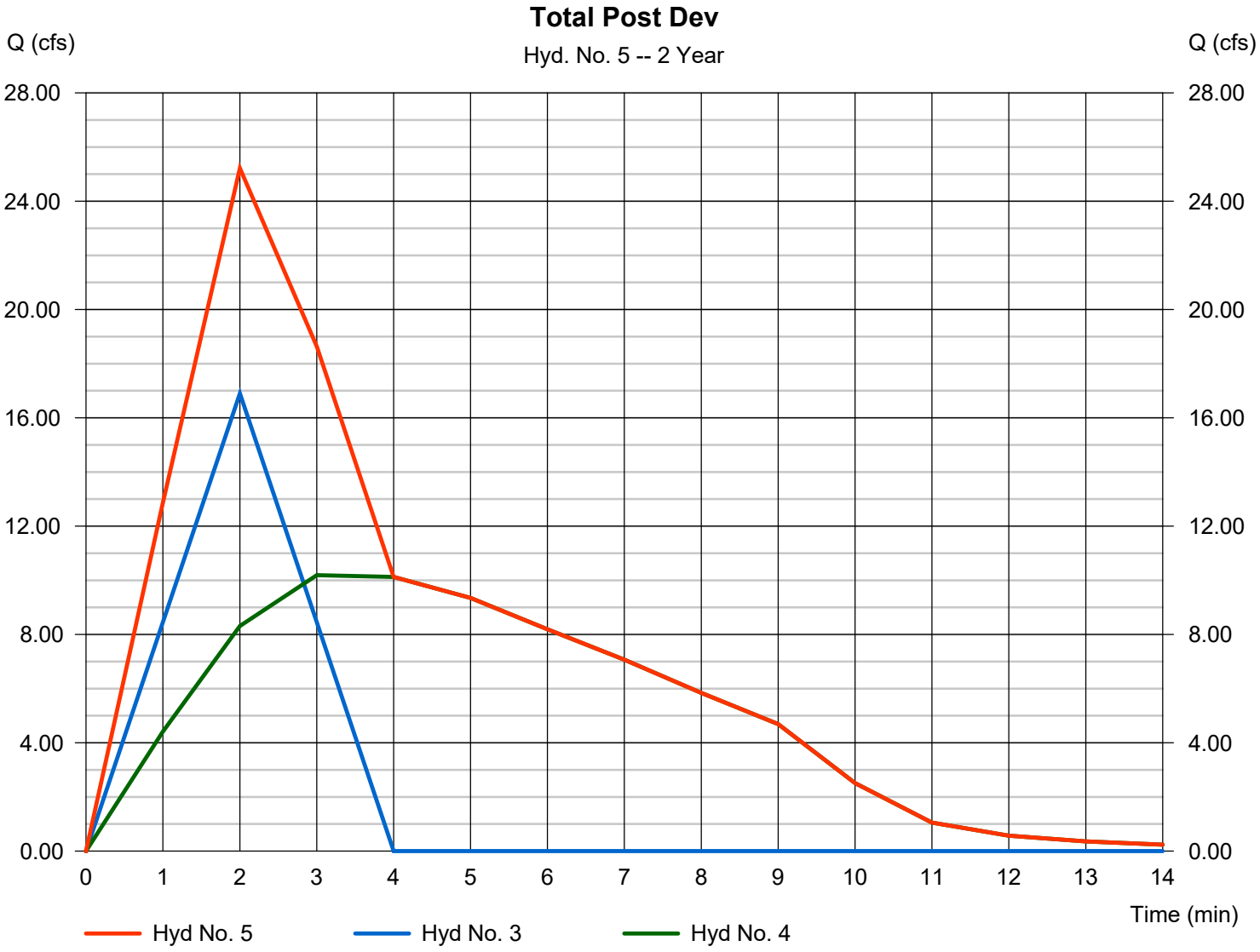


Hydrograph Report

Hyd. No. 5

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 25.22 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 6,475 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.700 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	Rational	30.69	1	3	5,524	------	------	------	Total Pre-Dev
2	Rational	42.76	1	2	5,131	------	------	------	Post DA 1
3	Rational	19.50	1	2	2,340	------	------	------	Post DA 2
4	Reservoir	10.78	1	3	5,130	2	421.36	3,345	Det. Pond
5	Combine	28.49	1	2	7,470	3, 4	------	------	Total Post Dev

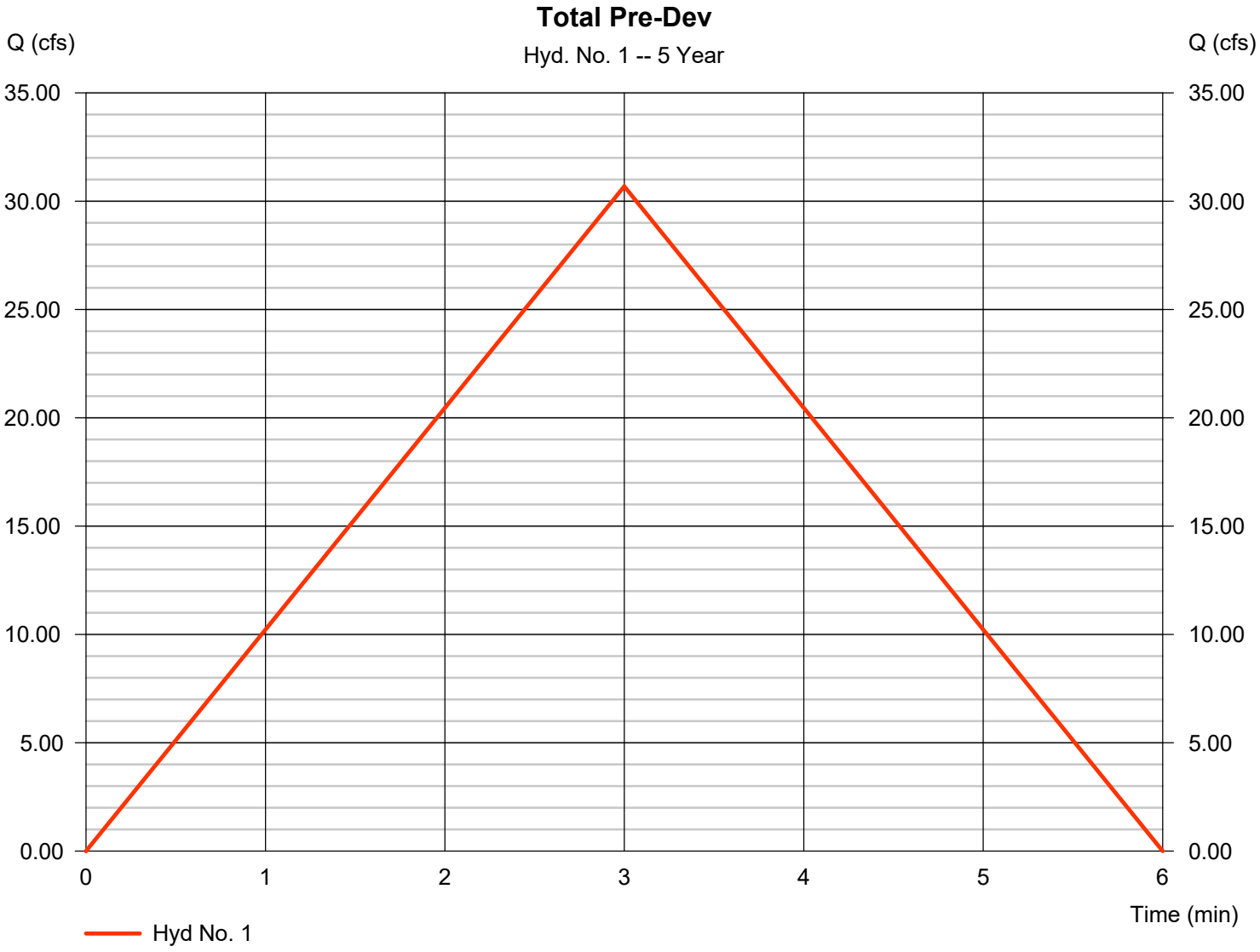
Hydrograph Report

Hyd. No. 1

Total Pre-Dev

Hydrograph type	=	Rational	Peak discharge	=	30.69 cfs
Storm frequency	=	5 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	5,524 cuft
Drainage area	=	5.800 ac	Runoff coeff.	=	0.73*
Intensity	=	7.248 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.700 x 0.95) + (2.100 x 0.35)] / 5.800



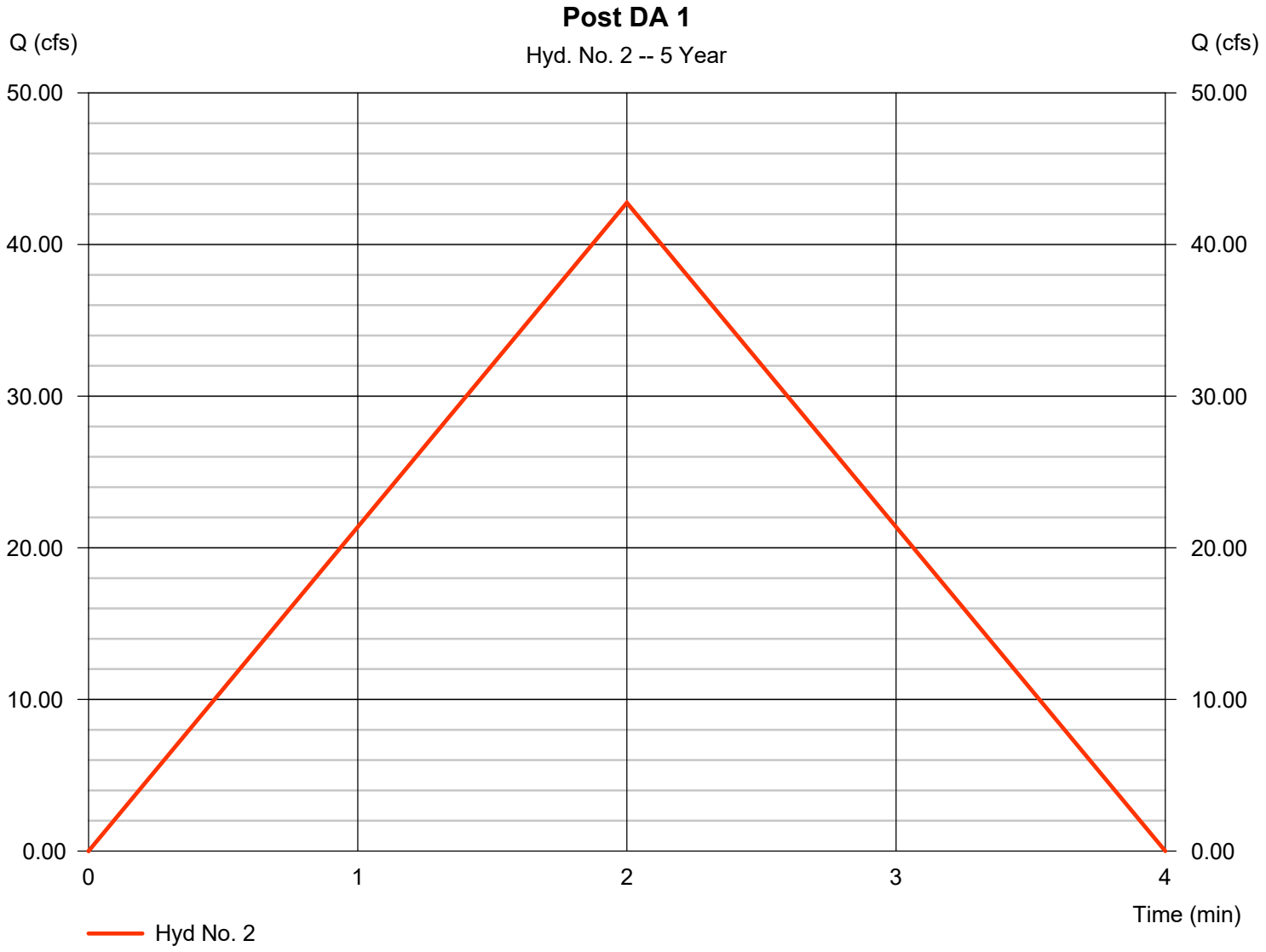
Hydrograph Report

Hyd. No. 2

Post DA 1

Hydrograph type	=	Rational	Peak discharge	=	42.76 cfs
Storm frequency	=	5 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	5,131 cuft
Drainage area	=	7.500 ac	Runoff coeff.	=	0.75*
Intensity	=	7.602 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(5.000 x 0.95) + (2.500 x 0.35)] / 7.500



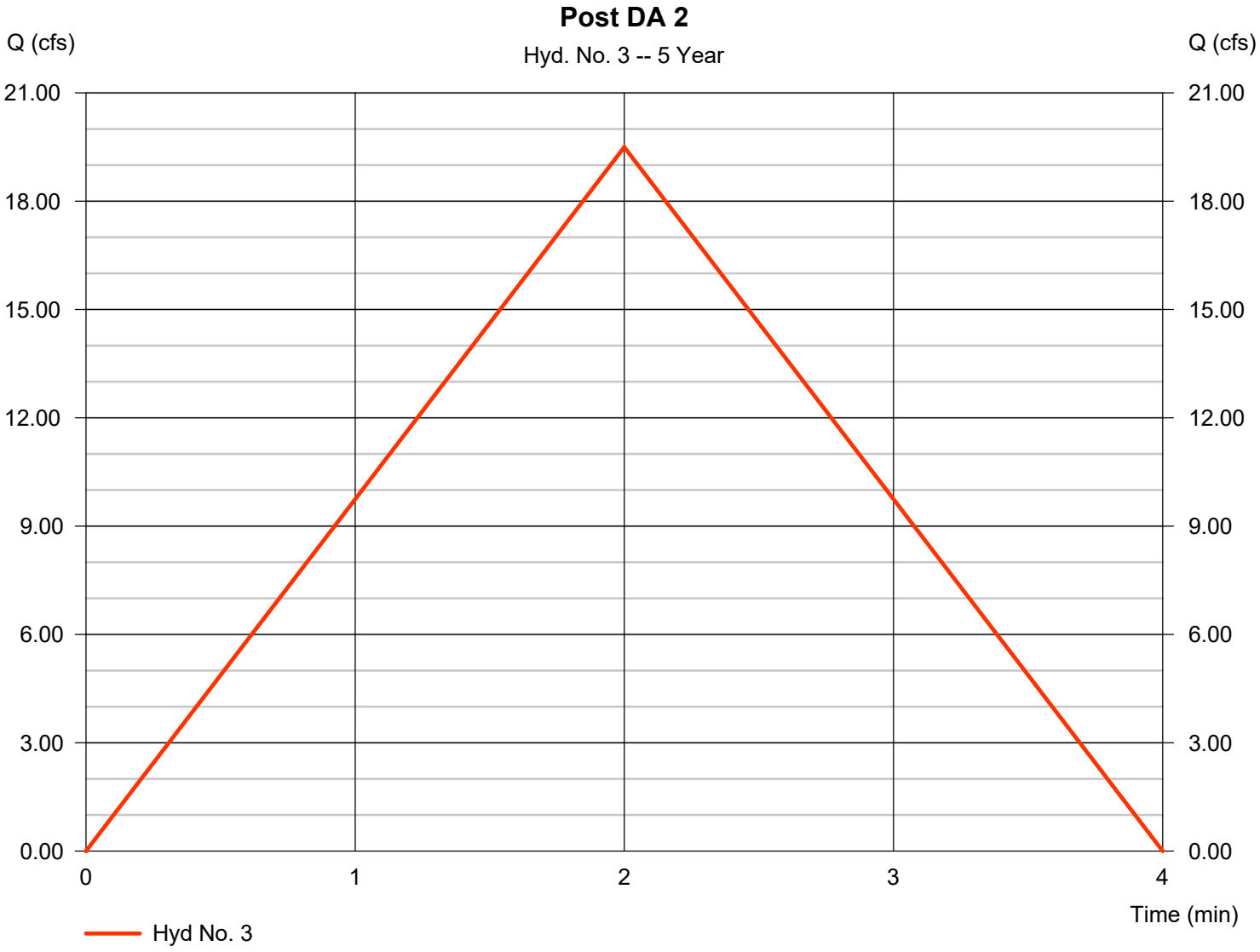
Hydrograph Report

Hyd. No. 3

Post DA 2

Hydrograph type	=	Rational	Peak discharge	=	19.50 cfs
Storm frequency	=	5 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	2,340 cuft
Drainage area	=	2.700 ac	Runoff coeff.	=	0.95*
Intensity	=	7.602 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.700 x 0.95)] / 2.700



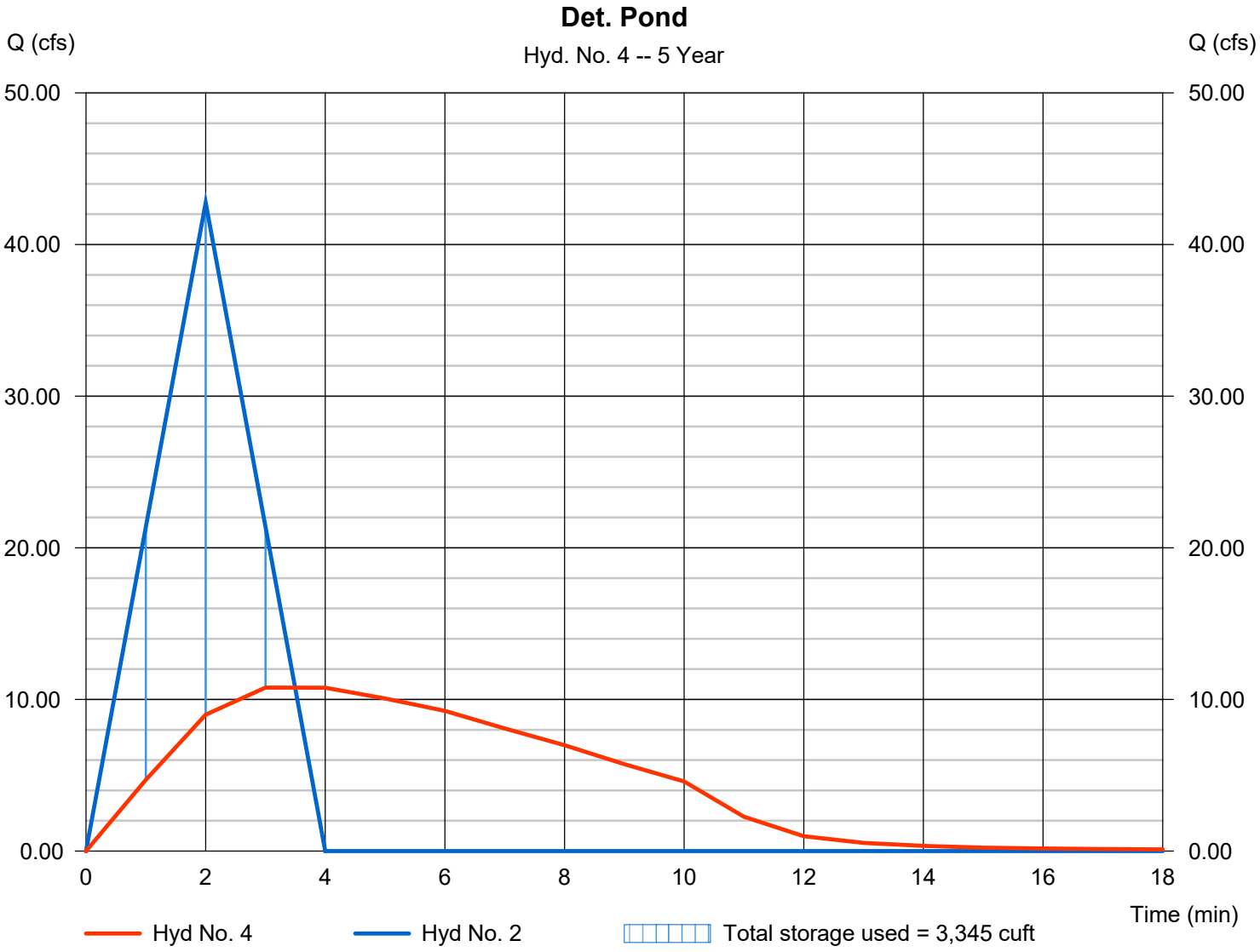
Hydrograph Report

Hyd. No. 4

Det. Pond

Hydrograph type	= Reservoir	Peak discharge	= 10.78 cfs
Storm frequency	= 5 yrs	Time to peak	= 3 min
Time interval	= 1 min	Hyd. volume	= 5,130 cuft
Inflow hyd. No.	= 2 - Post DA 1	Max. Elevation	= 421.36 ft
Reservoir name	= <New Pond>	Max. Storage	= 3,345 cuft

Storage Indication method used.

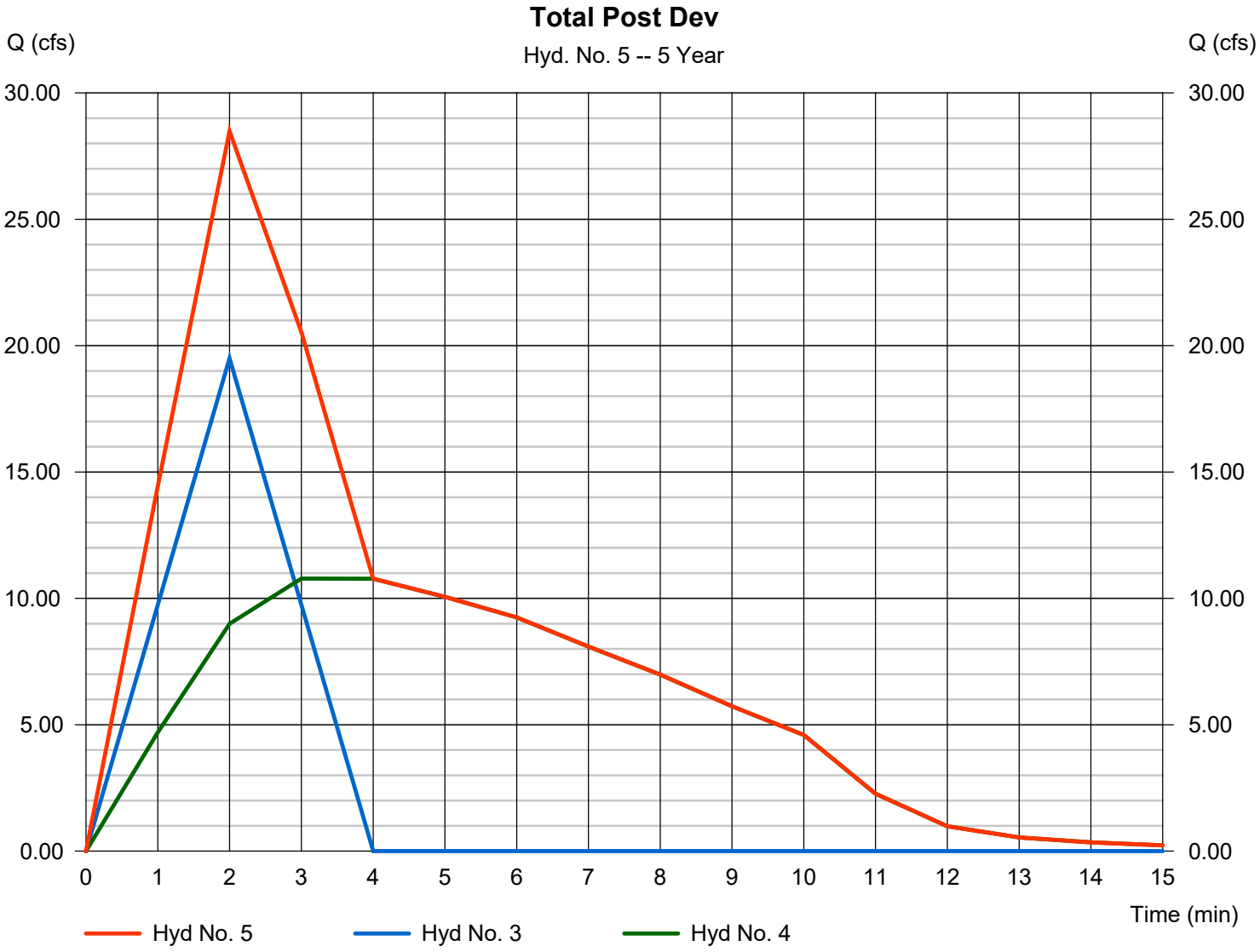


Hydrograph Report

Hyd. No. 5

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 28.49 cfs
Storm frequency	= 5 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 7,470 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.700 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	Rational	33.86	1	3	6,095	------	------	------	Total Pre-Dev
2	Rational	47.10	1	2	5,652	------	------	------	Post DA 1
3	Rational	21.48	1	2	2,577	------	------	------	Post DA 2
4	Reservoir	11.25	1	4	5,651	2	421.50	3,778	Det. Pond
5	Combine	30.95	1	2	8,229	3, 4	------	------	Total Post Dev

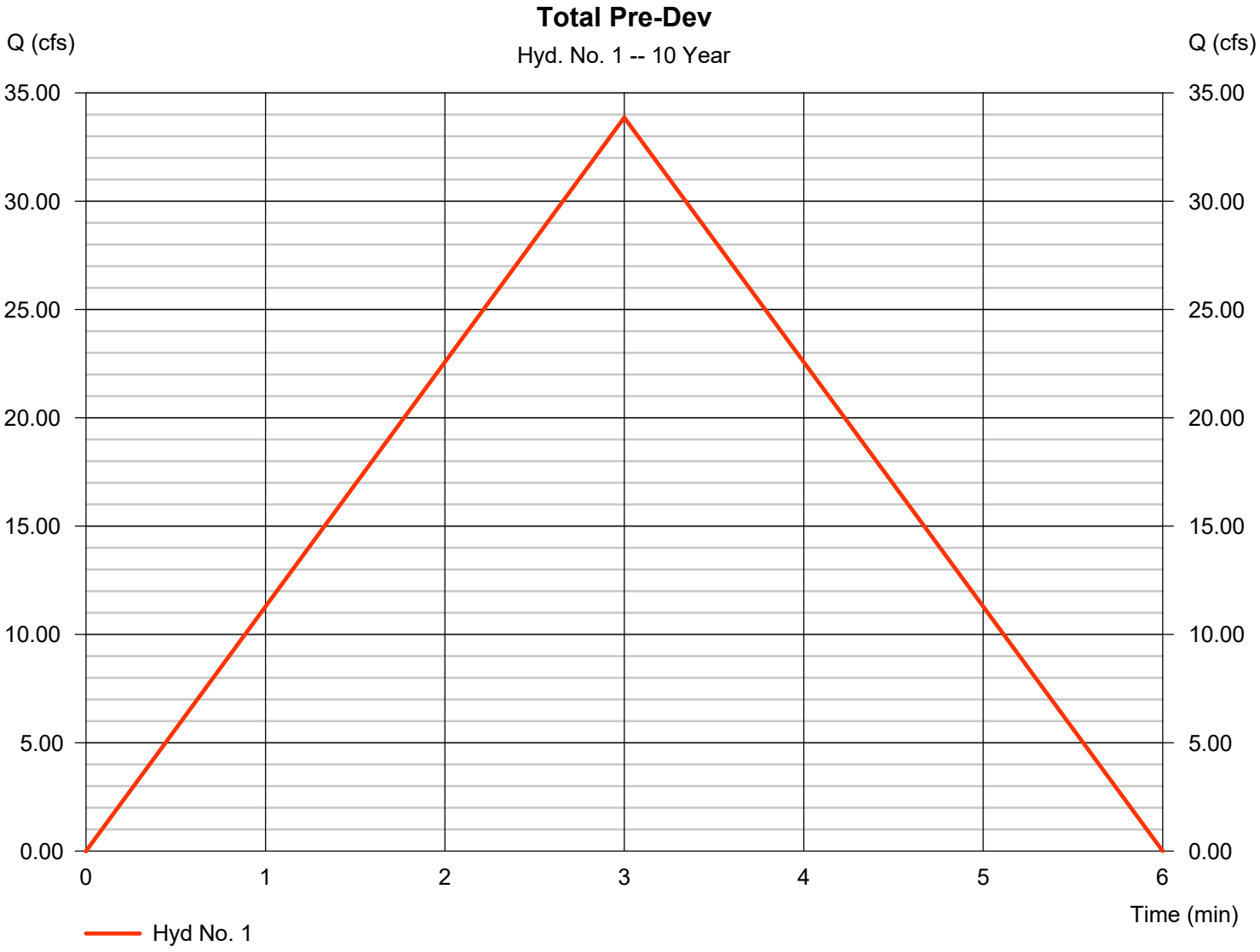
Hydrograph Report

Hyd. No. 1

Total Pre-Dev

Hydrograph type	=	Rational	Peak discharge	=	33.86 cfs
Storm frequency	=	10 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	6,095 cuft
Drainage area	=	5.800 ac	Runoff coeff.	=	0.73*
Intensity	=	7.998 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.700 x 0.95) + (2.100 x 0.35)] / 5.800



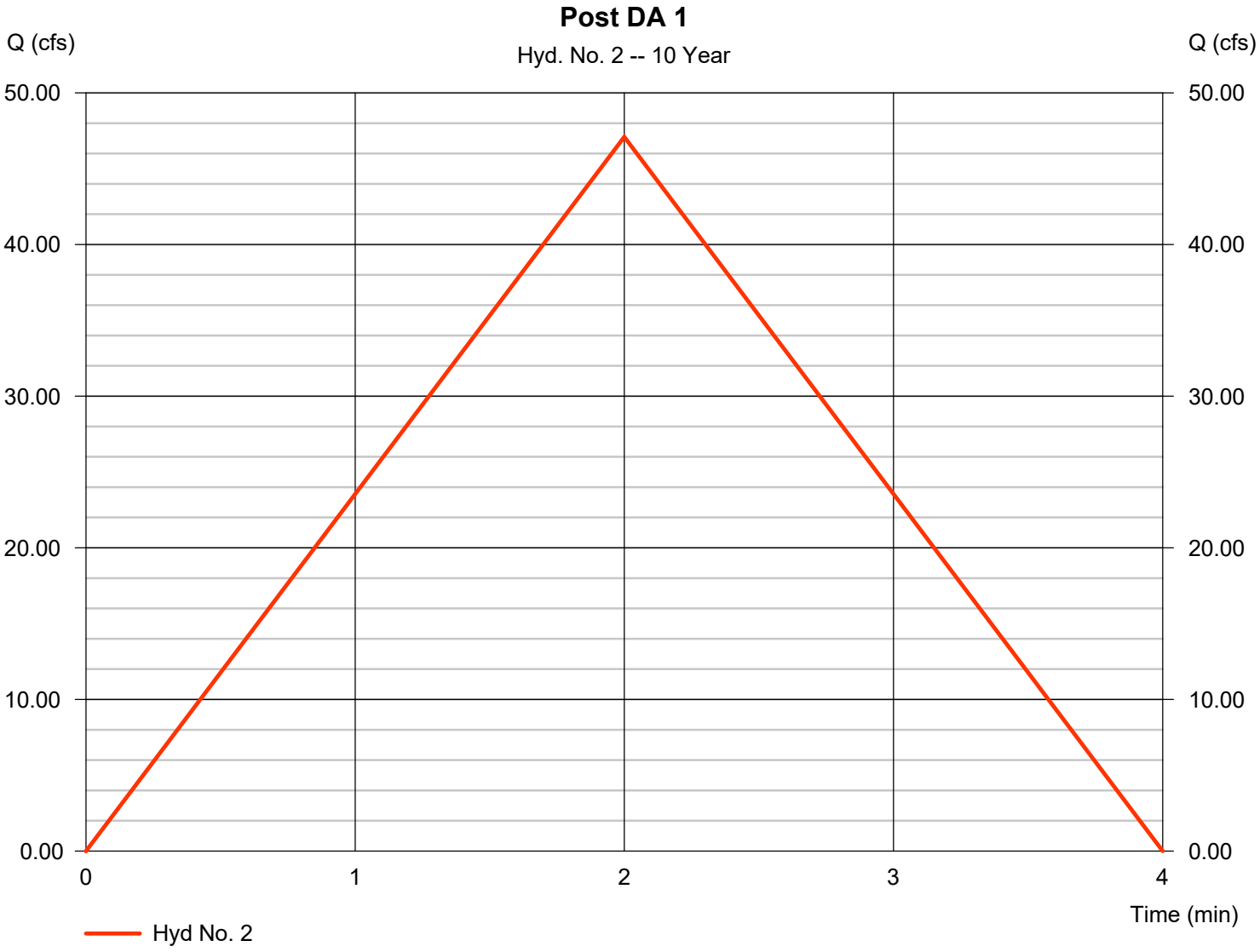
Hydrograph Report

Hyd. No. 2

Post DA 1

Hydrograph type	=	Rational	Peak discharge	=	47.10 cfs
Storm frequency	=	10 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	5,652 cuft
Drainage area	=	7.500 ac	Runoff coeff.	=	0.75*
Intensity	=	8.373 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(5.000 x 0.95) + (2.500 x 0.35)] / 7.500



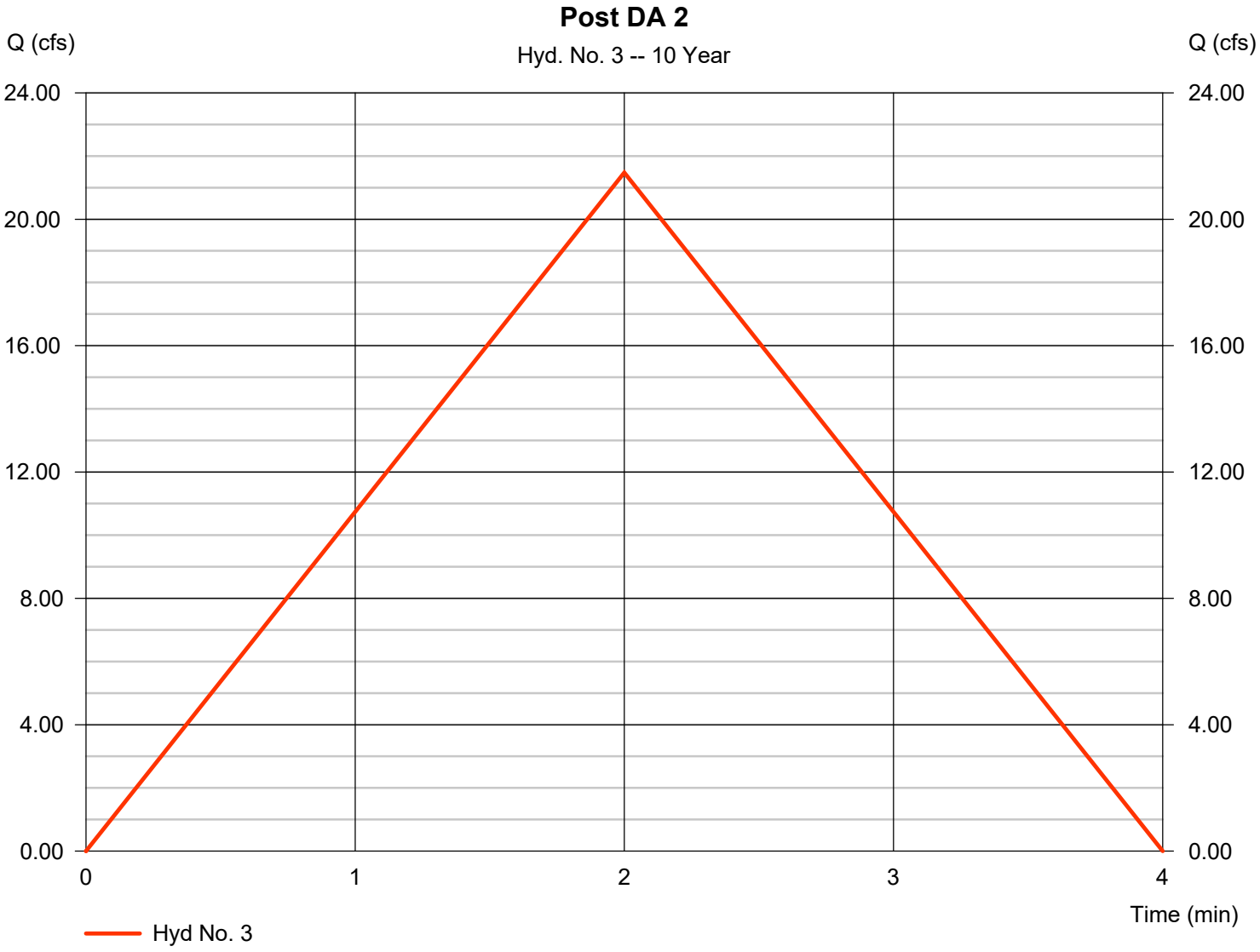
Hydrograph Report

Hyd. No. 3

Post DA 2

Hydrograph type	=	Rational	Peak discharge	=	21.48 cfs
Storm frequency	=	10 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	2,577 cuft
Drainage area	=	2.700 ac	Runoff coeff.	=	0.95*
Intensity	=	8.373 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.700 x 0.95)] / 2.700



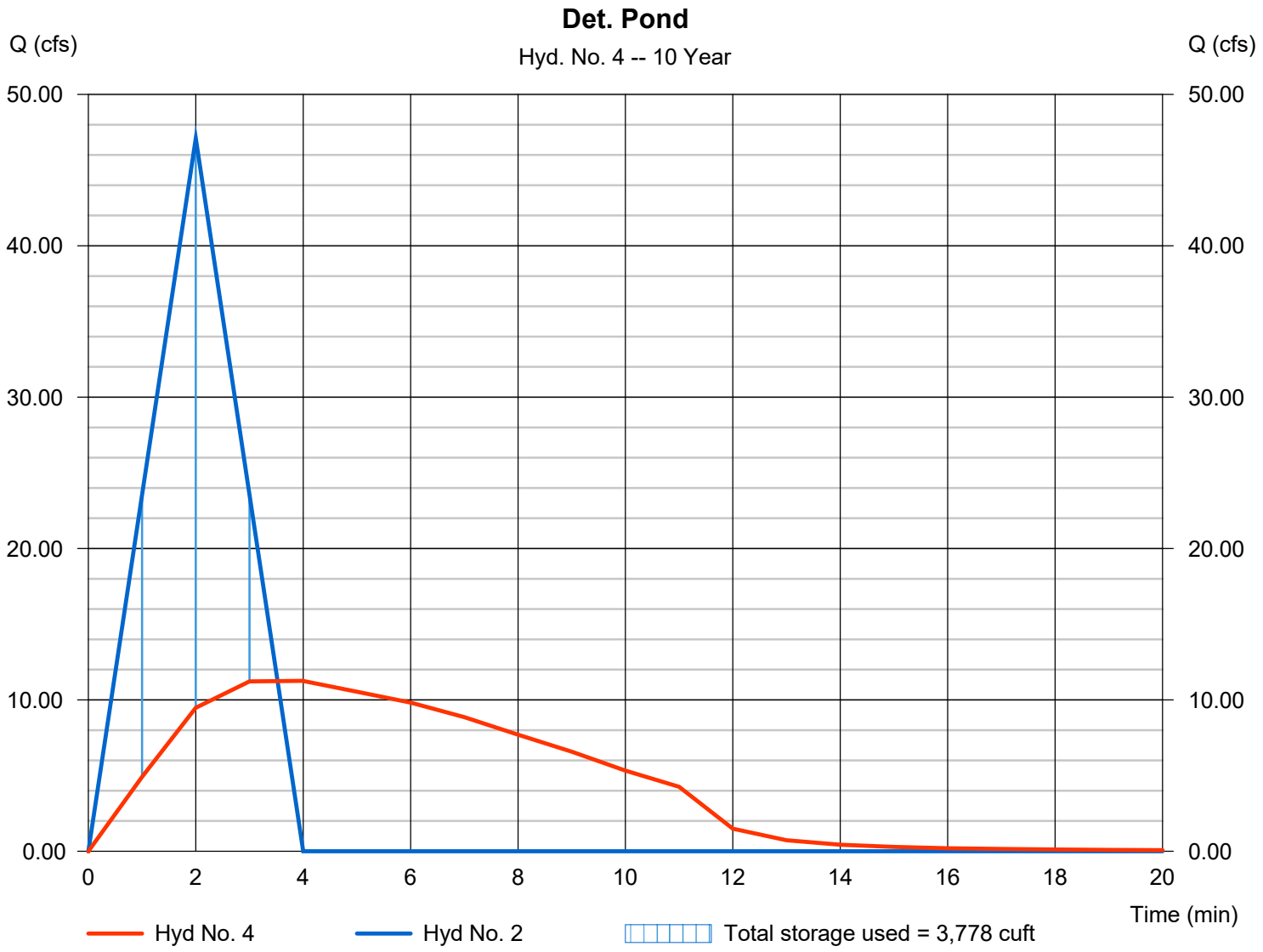
Hydrograph Report

Hyd. No. 4

Det. Pond

Hydrograph type	= Reservoir	Peak discharge	= 11.25 cfs
Storm frequency	= 10 yrs	Time to peak	= 4 min
Time interval	= 1 min	Hyd. volume	= 5,651 cuft
Inflow hyd. No.	= 2 - Post DA 1	Max. Elevation	= 421.50 ft
Reservoir name	= <New Pond>	Max. Storage	= 3,778 cuft

Storage Indication method used.

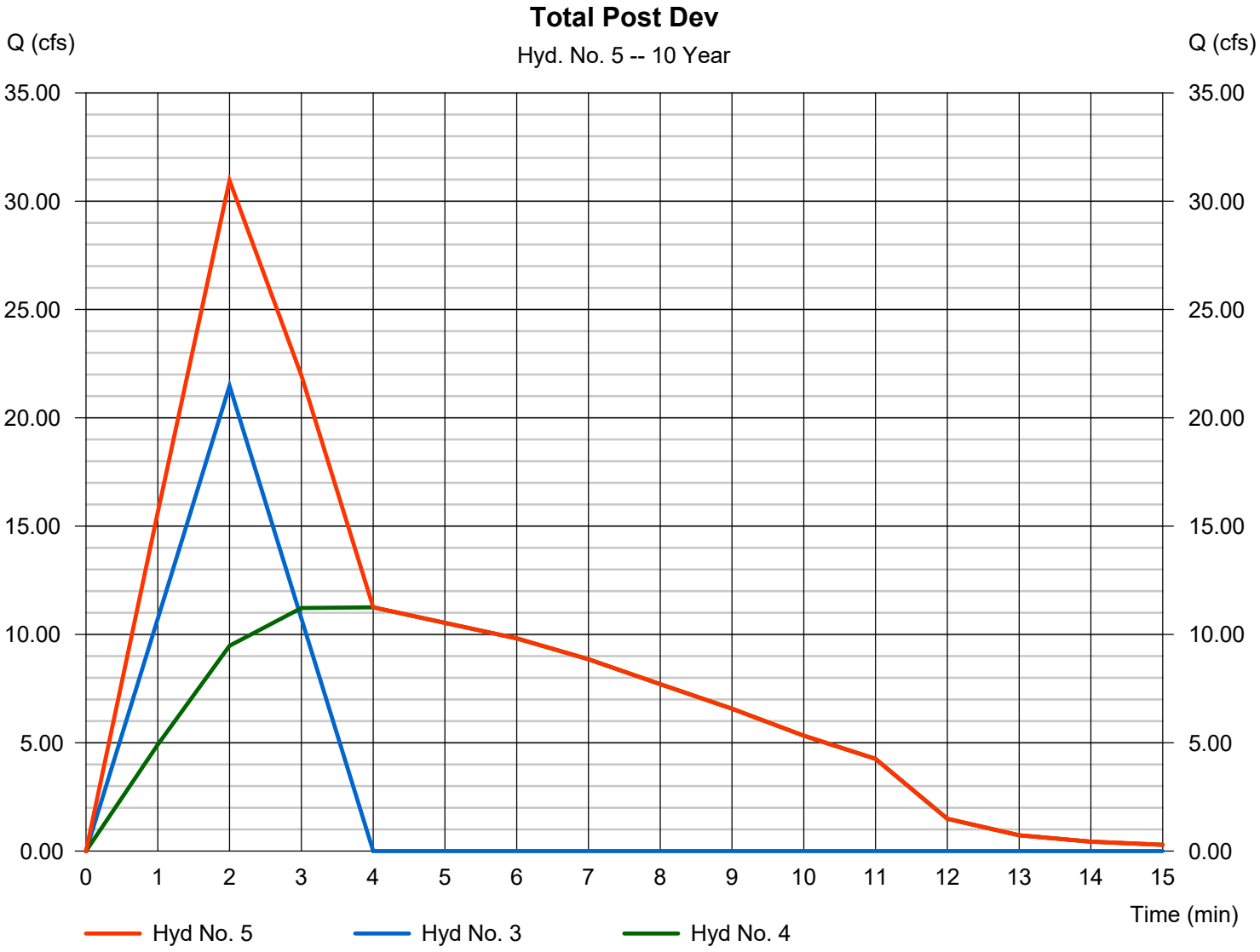


Hydrograph Report

Hyd. No. 5

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 30.95 cfs
Storm frequency	= 10 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 8,229 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.700 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	Rational	38.60	1	3	6,949	------	------	------	Total Pre-Dev
2	Rational	53.60	1	2	6,432	------	------	------	Post DA 1
3	Rational	24.44	1	2	2,933	------	------	------	Post DA 2
4	Reservoir	11.95	1	4	6,431	2	421.72	4,452	Det. Pond
5	Combine	34.37	1	2	9,364	3, 4	------	------	Total Post Dev

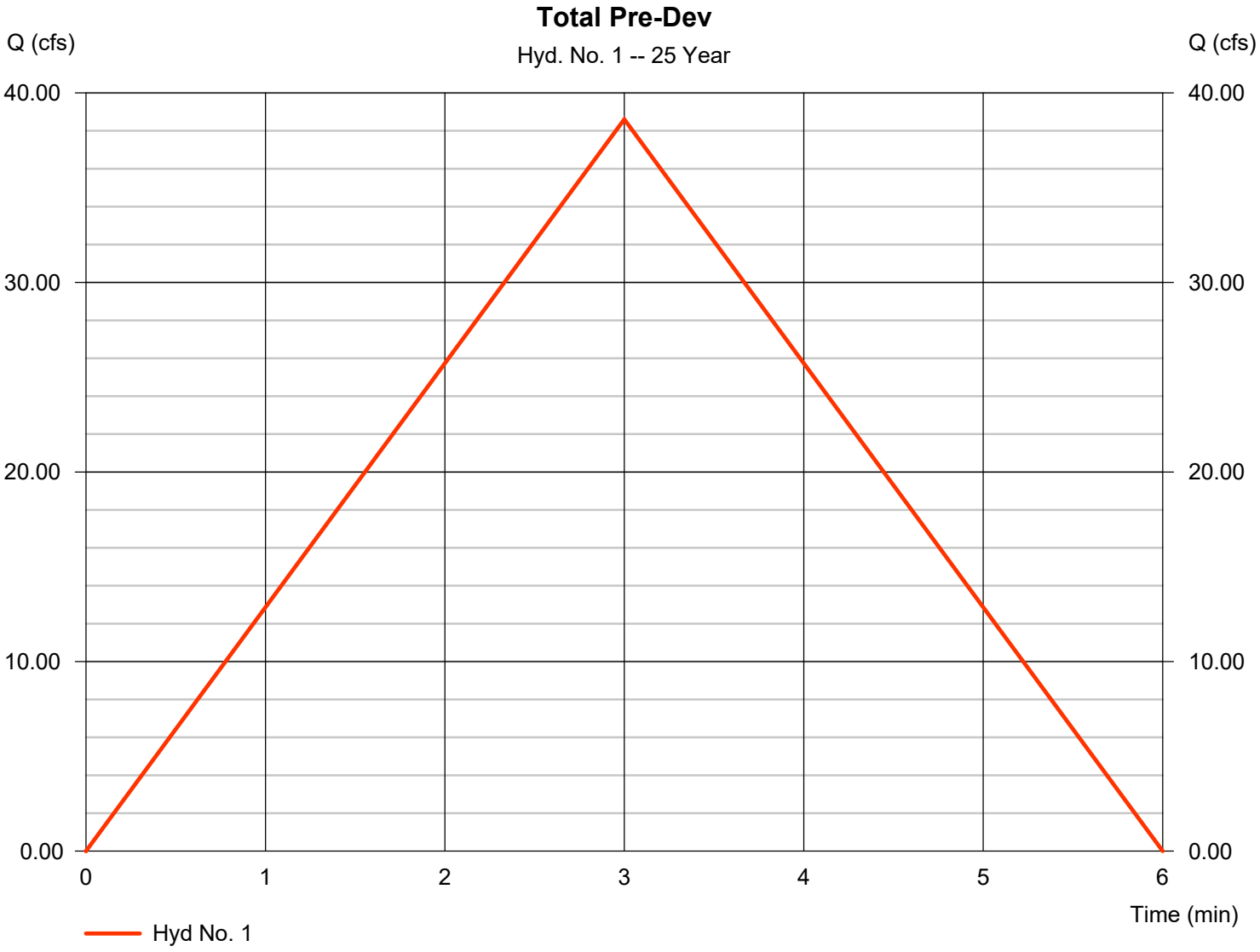
Hydrograph Report

Hyd. No. 1

Total Pre-Dev

Hydrograph type	=	Rational	Peak discharge	=	38.60 cfs
Storm frequency	=	25 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	6,949 cuft
Drainage area	=	5.800 ac	Runoff coeff.	=	0.73*
Intensity	=	9.118 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.700 x 0.95) + (2.100 x 0.35)] / 5.800



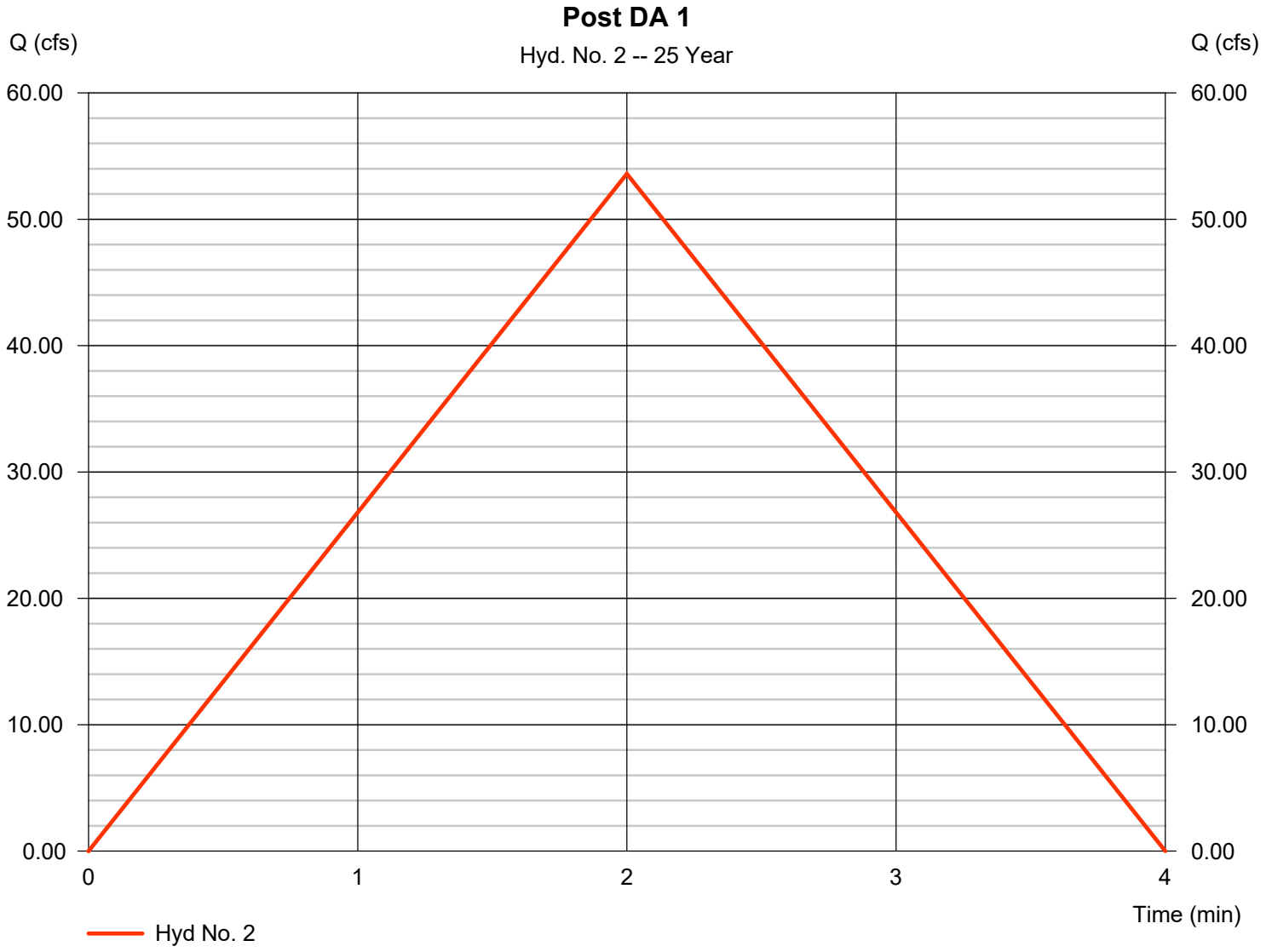
Hydrograph Report

Hyd. No. 2

Post DA 1

Hydrograph type	=	Rational	Peak discharge	=	53.60 cfs
Storm frequency	=	25 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	6,432 cuft
Drainage area	=	7.500 ac	Runoff coeff.	=	0.75*
Intensity	=	9.529 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(5.000 x 0.95) + (2.500 x 0.35)] / 7.500



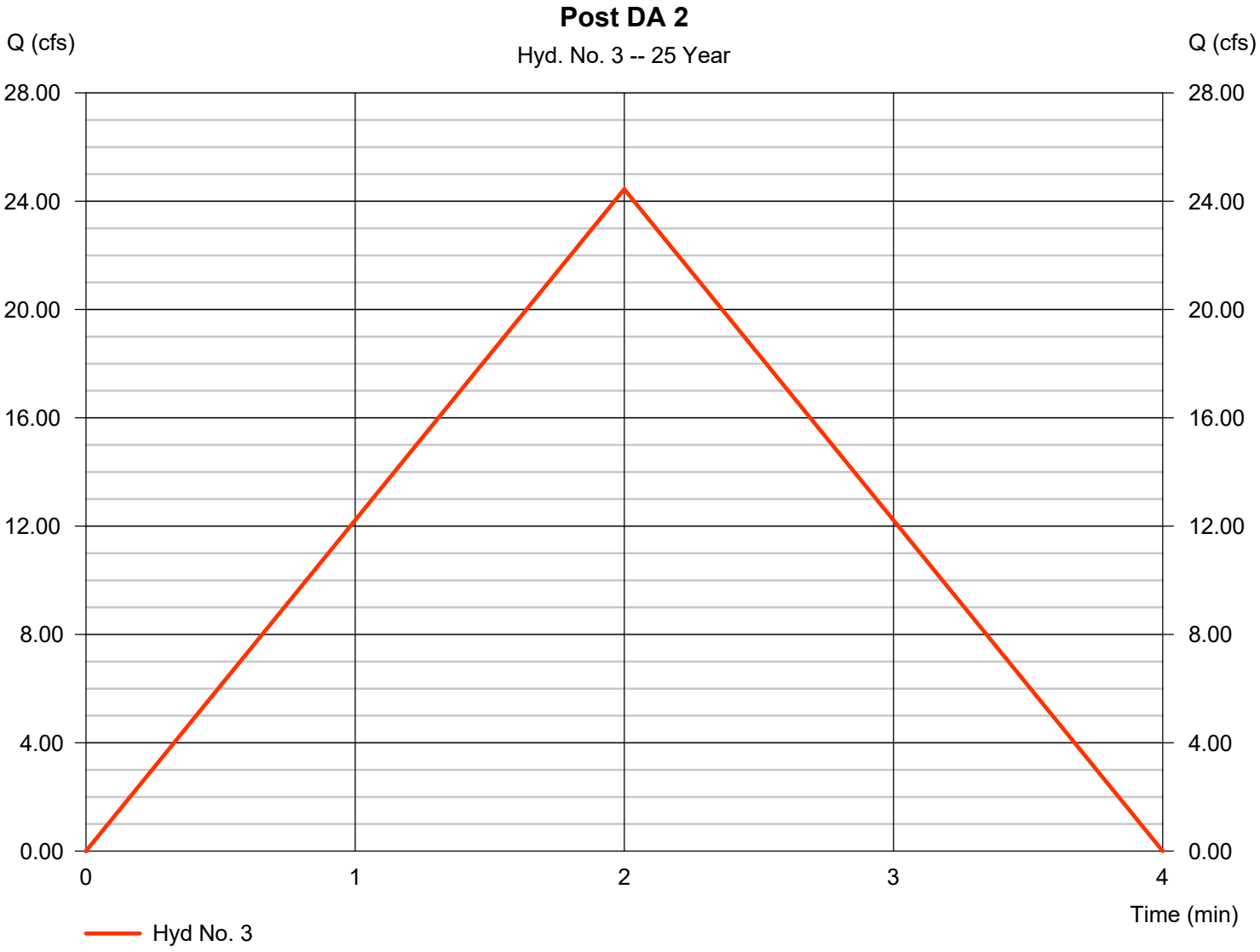
Hydrograph Report

Hyd. No. 3

Post DA 2

Hydrograph type	=	Rational	Peak discharge	=	24.44 cfs
Storm frequency	=	25 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	2,933 cuft
Drainage area	=	2.700 ac	Runoff coeff.	=	0.95*
Intensity	=	9.529 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.700 x 0.95)] / 2.700



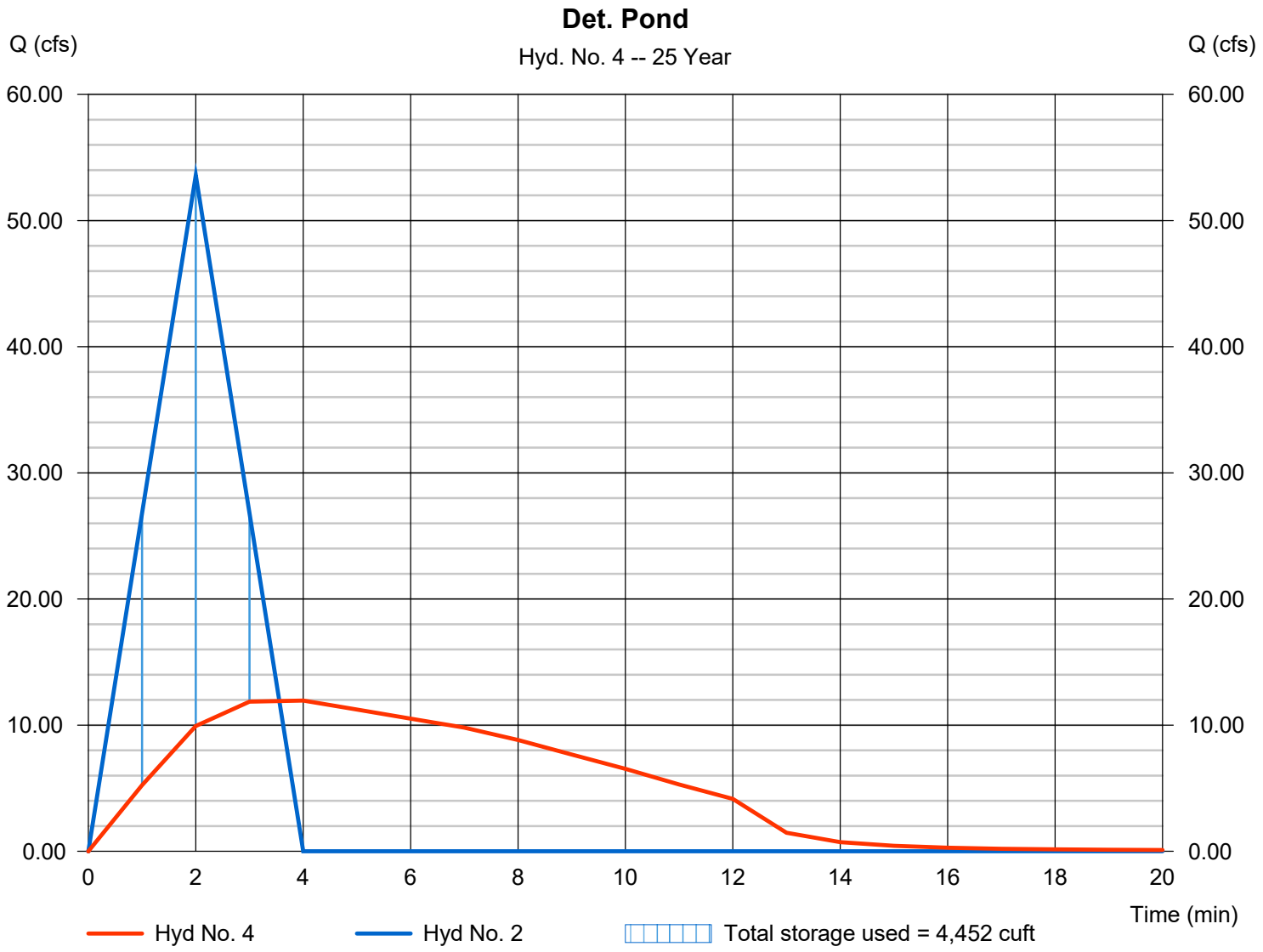
Hydrograph Report

Hyd. No. 4

Det. Pond

Hydrograph type	= Reservoir	Peak discharge	= 11.95 cfs
Storm frequency	= 25 yrs	Time to peak	= 4 min
Time interval	= 1 min	Hyd. volume	= 6,431 cuft
Inflow hyd. No.	= 2 - Post DA 1	Max. Elevation	= 421.72 ft
Reservoir name	= <New Pond>	Max. Storage	= 4,452 cuft

Storage Indication method used.

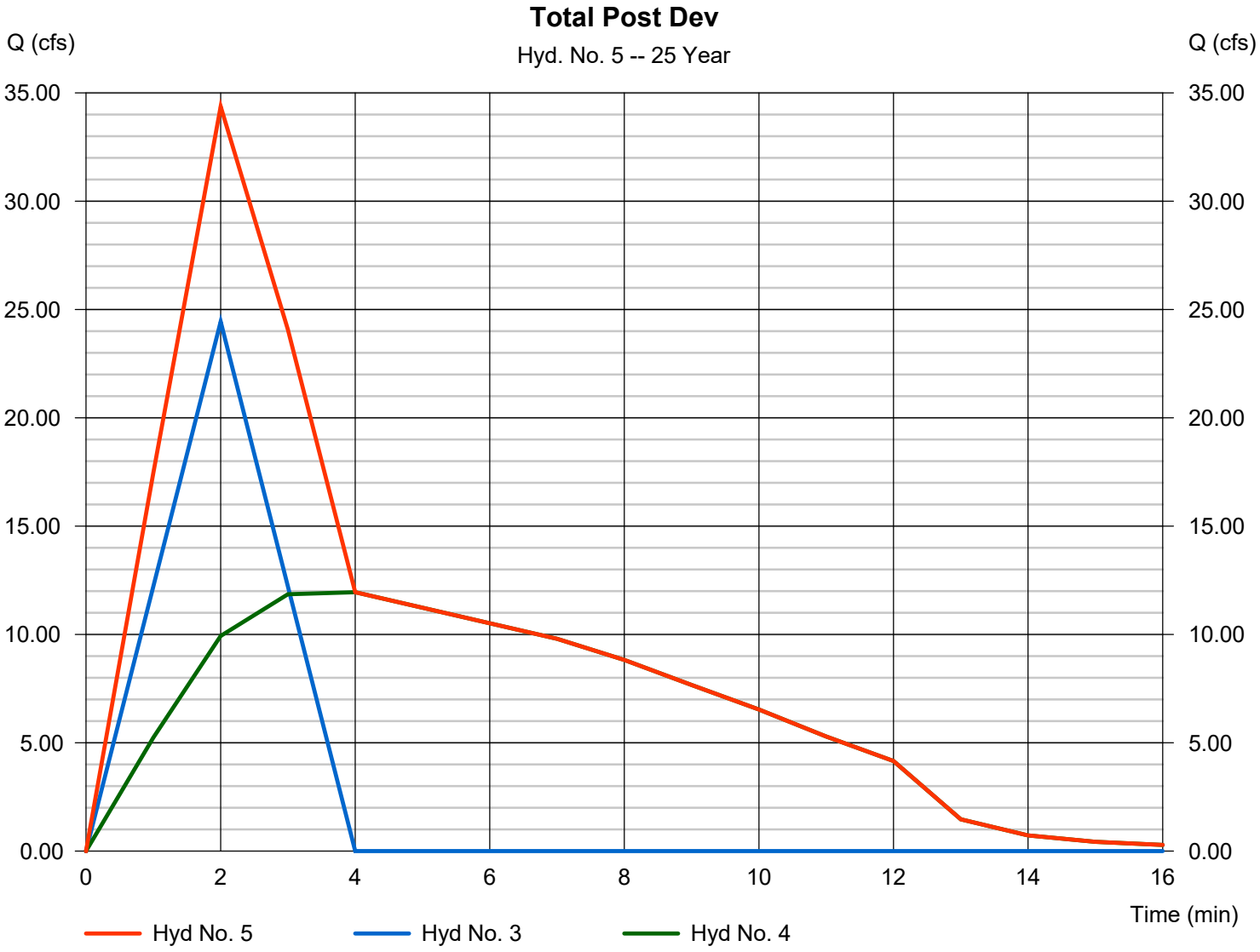


Hydrograph Report

Hyd. No. 5

Total Post Dev

Hydrograph type	=	Combine	Peak discharge	=	34.37 cfs
Storm frequency	=	25 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	9,364 cuft
Inflow hyds.	=	3, 4	Contrib. drain. area	=	2.700 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	Rational	42.36	1	3	7,624	------	------	------	Total Pre-Dev
2	Rational	58.75	1	2	7,050	------	------	------	Post DA 1
3	Rational	26.79	1	2	3,215	------	------	------	Post DA 2
4	Reservoir	12.47	1	4	7,049	2	421.90	4,990	Det. Pond
5	Combine	37.05	1	2	10,264	3, 4	------	------	Total Post Dev

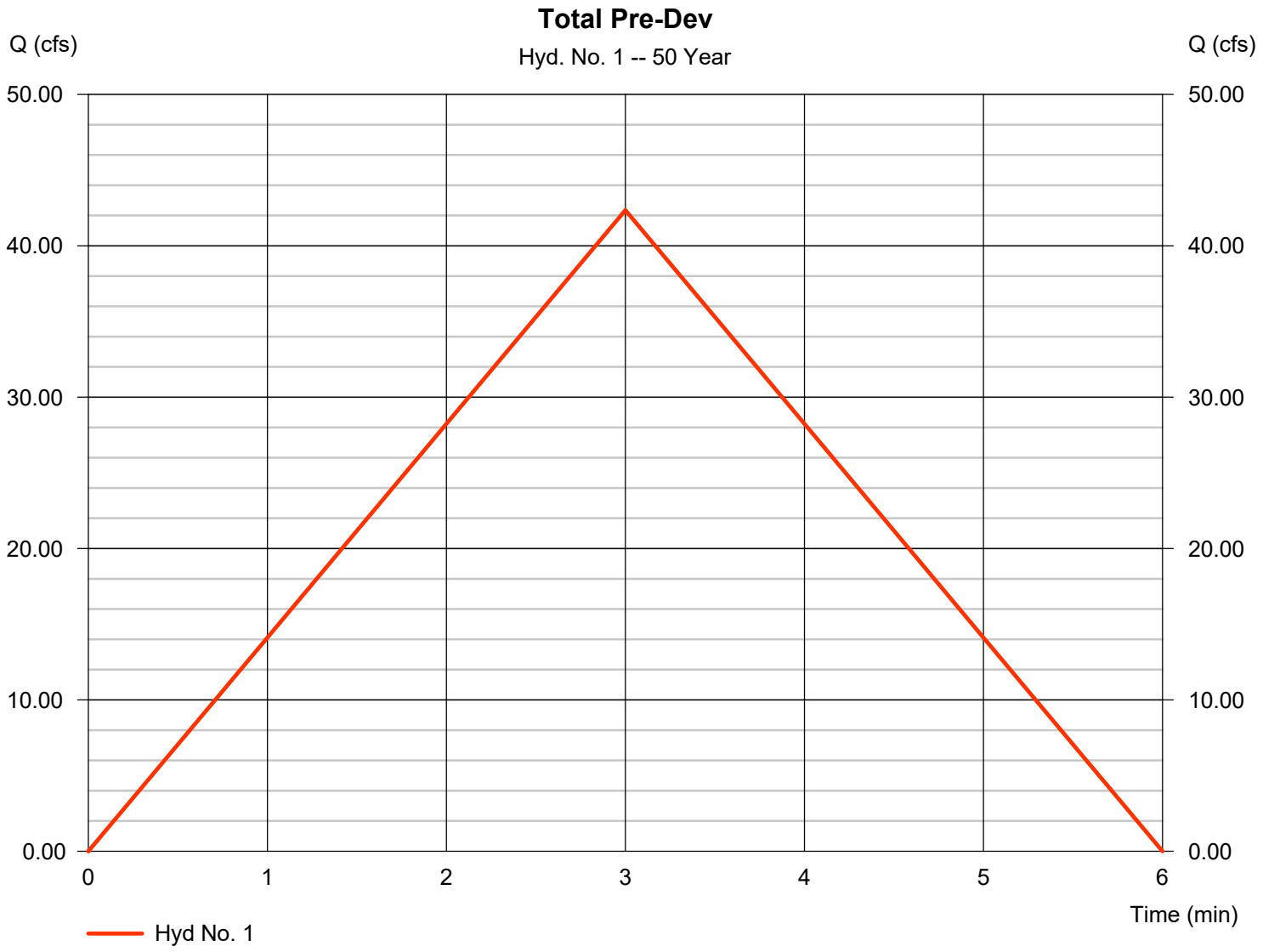
Hydrograph Report

Hyd. No. 1

Total Pre-Dev

Hydrograph type	=	Rational	Peak discharge	=	42.36 cfs
Storm frequency	=	50 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	7,624 cuft
Drainage area	=	5.800 ac	Runoff coeff.	=	0.73*
Intensity	=	10.004 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.700 x 0.95) + (2.100 x 0.35)] / 5.800



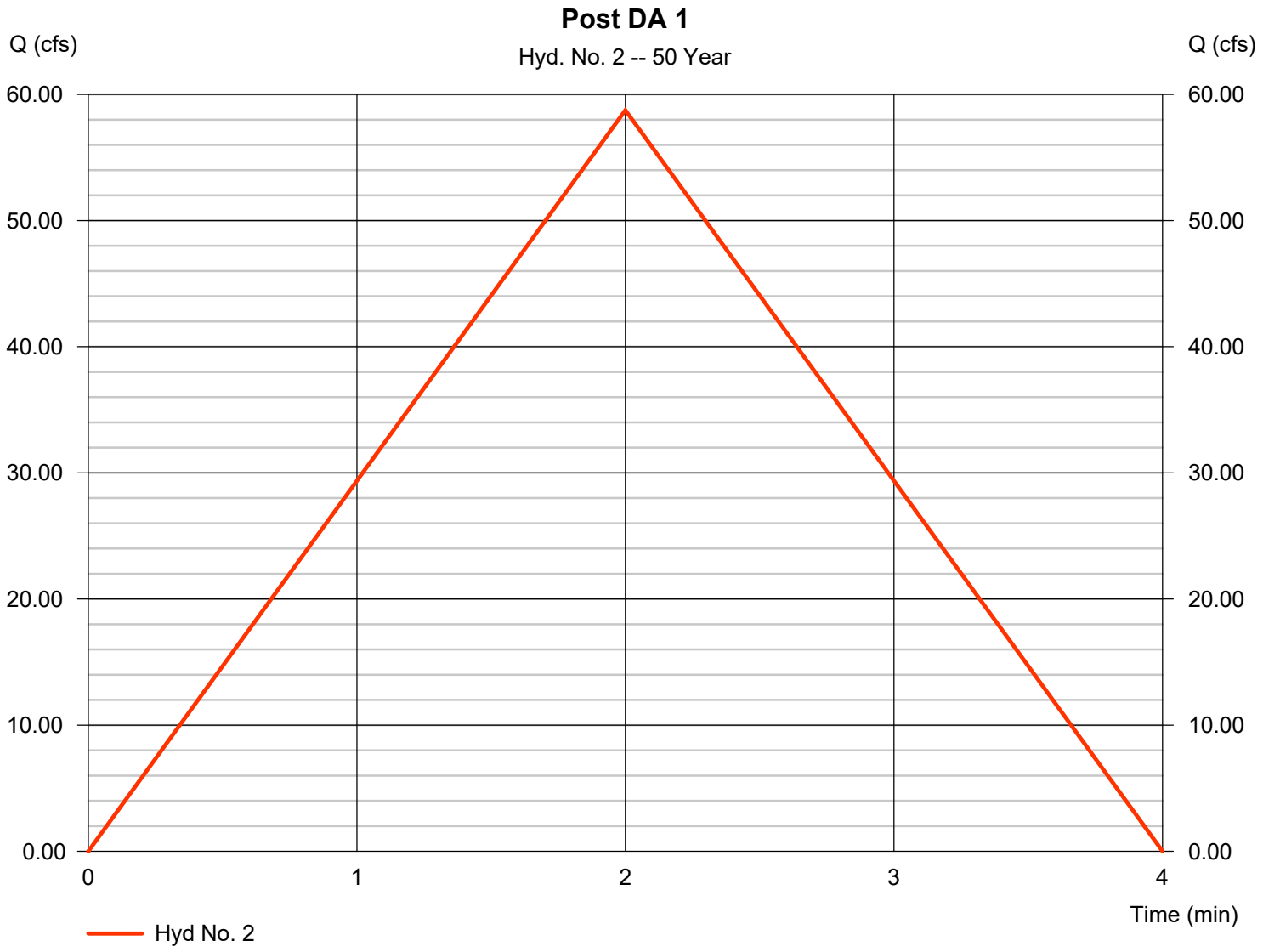
Hydrograph Report

Hyd. No. 2

Post DA 1

Hydrograph type	=	Rational	Peak discharge	=	58.75 cfs
Storm frequency	=	50 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	7,050 cuft
Drainage area	=	7.500 ac	Runoff coeff.	=	0.75*
Intensity	=	10.444 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(5.000 x 0.95) + (2.500 x 0.35)] / 7.500



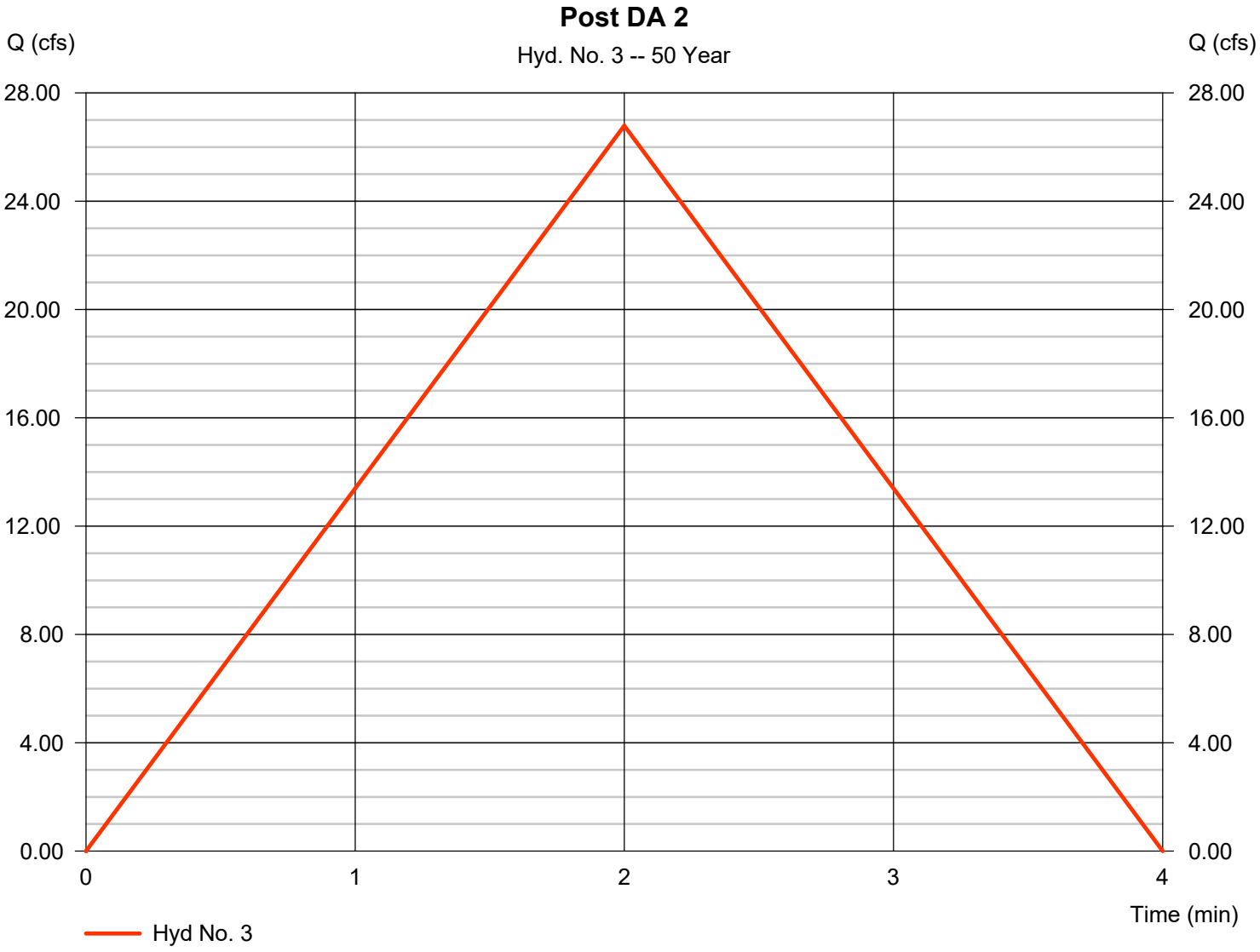
Hydrograph Report

Hyd. No. 3

Post DA 2

Hydrograph type	=	Rational	Peak discharge	=	26.79 cfs
Storm frequency	=	50 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	3,215 cuft
Drainage area	=	2.700 ac	Runoff coeff.	=	0.95*
Intensity	=	10.444 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.700 x 0.95)] / 2.700



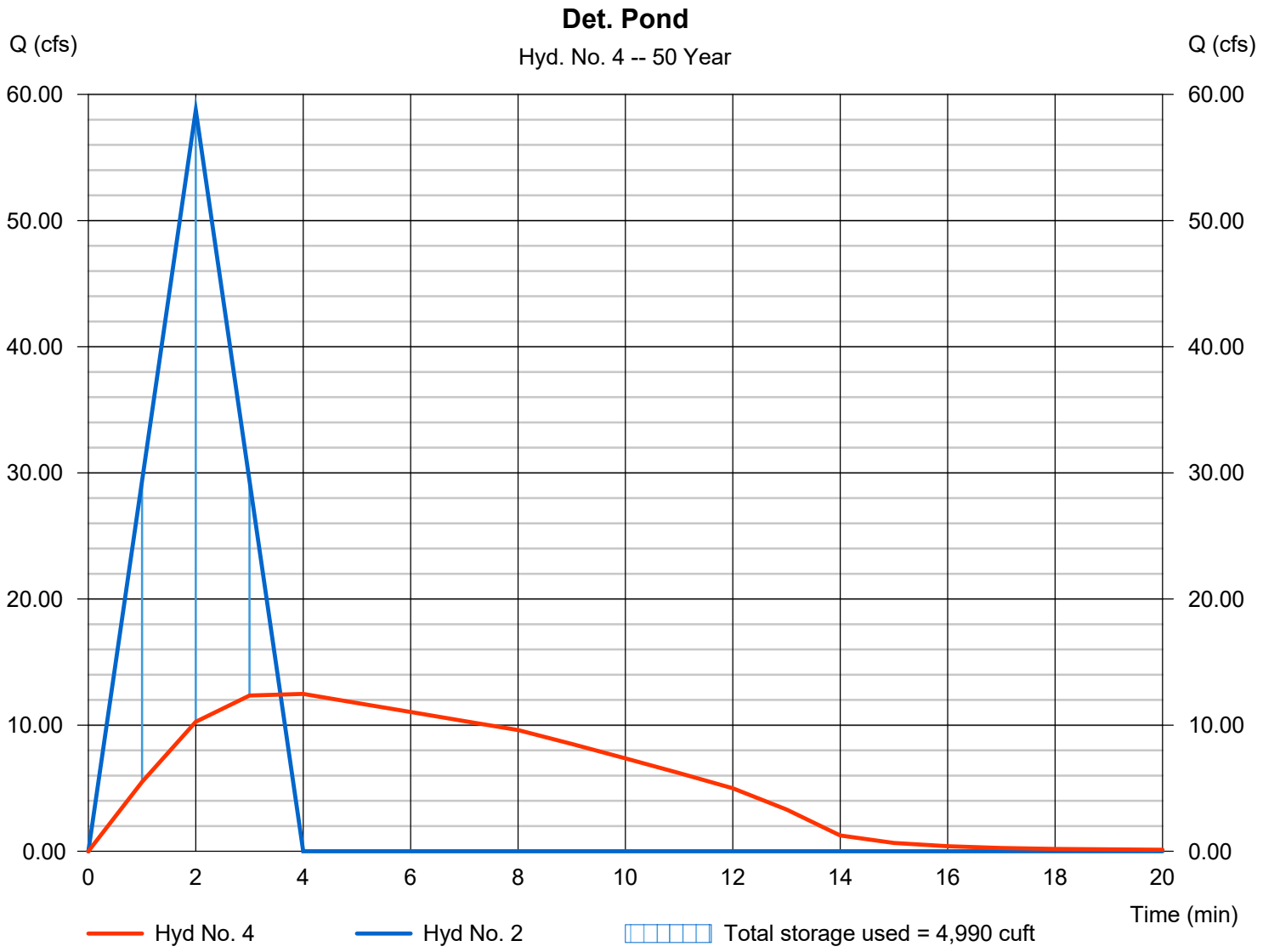
Hydrograph Report

Hyd. No. 4

Det. Pond

Hydrograph type	= Reservoir	Peak discharge	= 12.47 cfs
Storm frequency	= 50 yrs	Time to peak	= 4 min
Time interval	= 1 min	Hyd. volume	= 7,049 cuft
Inflow hyd. No.	= 2 - Post DA 1	Max. Elevation	= 421.90 ft
Reservoir name	= <New Pond>	Max. Storage	= 4,990 cuft

Storage Indication method used.

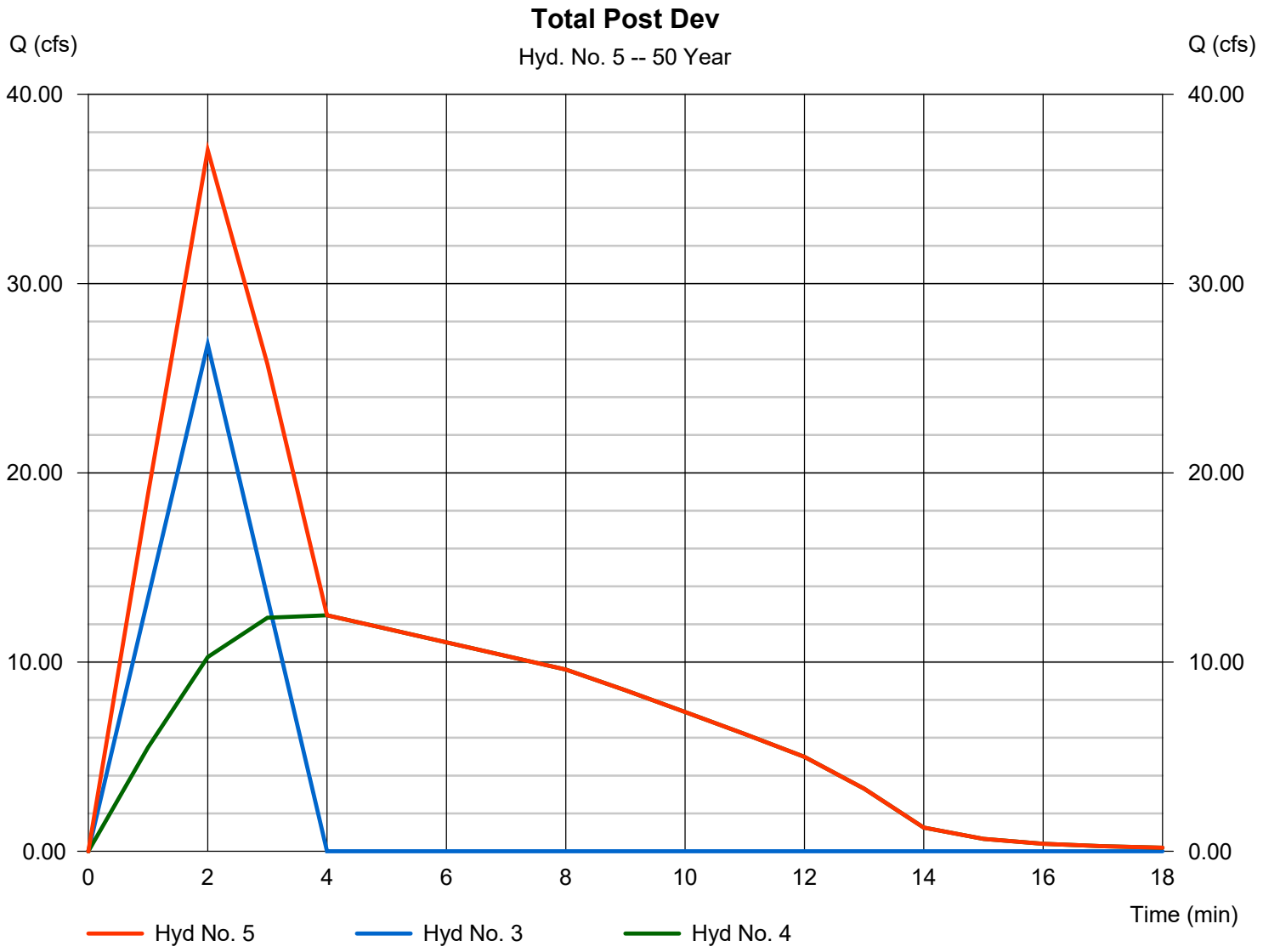


Hydrograph Report

Hyd. No. 5

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 37.05 cfs
Storm frequency	= 50 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 10,264 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.700 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	Rational	46.13	1	3	8,303	------	------	------	Total Pre-Dev
2	Rational	63.94	1	2	7,672	------	------	------	Post DA 1
3	Rational	29.15	1	2	3,499	------	------	------	Post DA 2
4	Reservoir	12.95	1	4	7,672	2	422.07	5,535	Det. Pond
5	Combine	39.75	1	2	11,170	3, 4	------	------	Total Post Dev

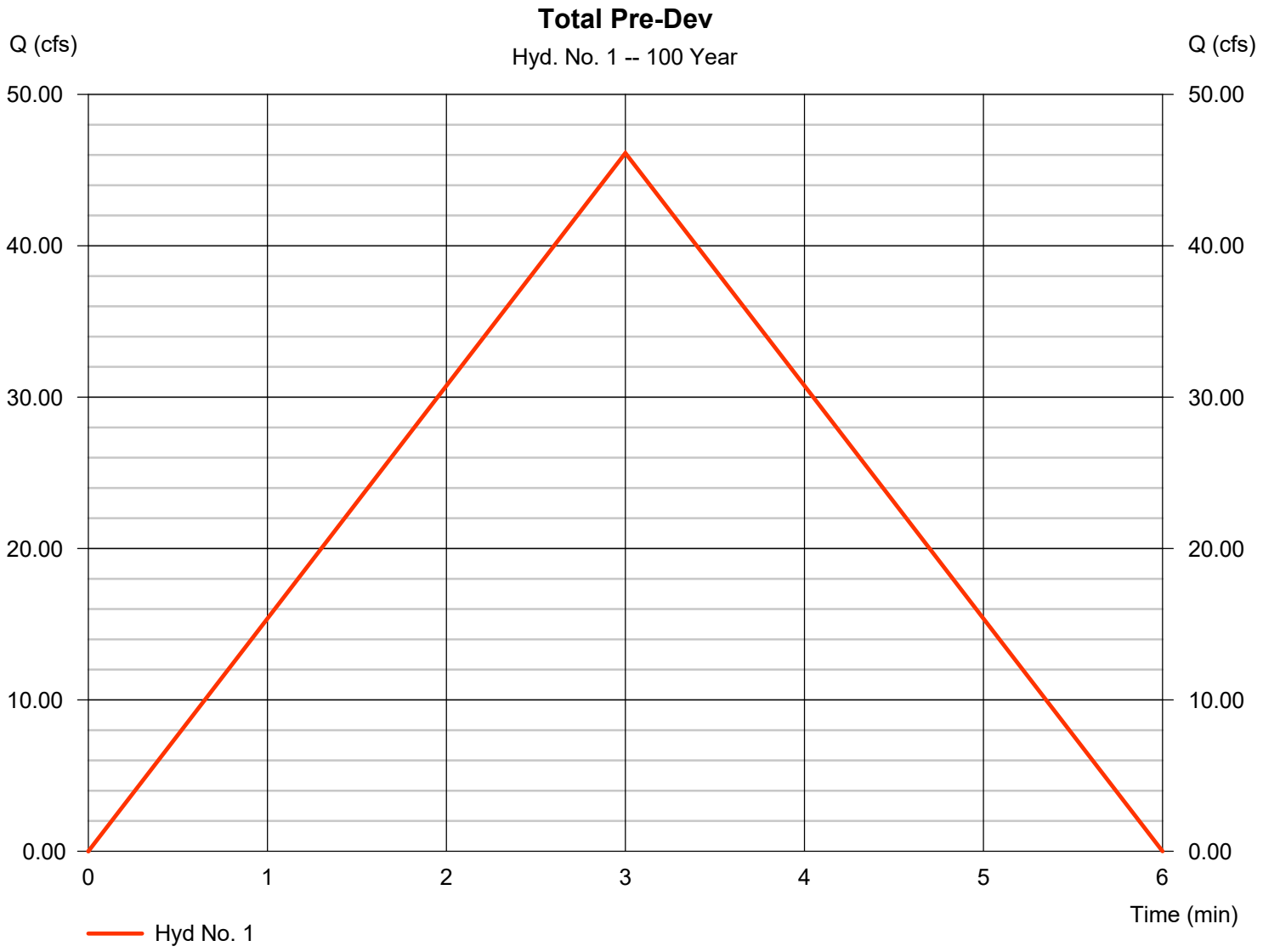
Hydrograph Report

Hyd. No. 1

Total Pre-Dev

Hydrograph type	=	Rational	Peak discharge	=	46.13 cfs
Storm frequency	=	100 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	8,303 cuft
Drainage area	=	5.800 ac	Runoff coeff.	=	0.73*
Intensity	=	10.895 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(3.700 x 0.95) + (2.100 x 0.35)] / 5.800



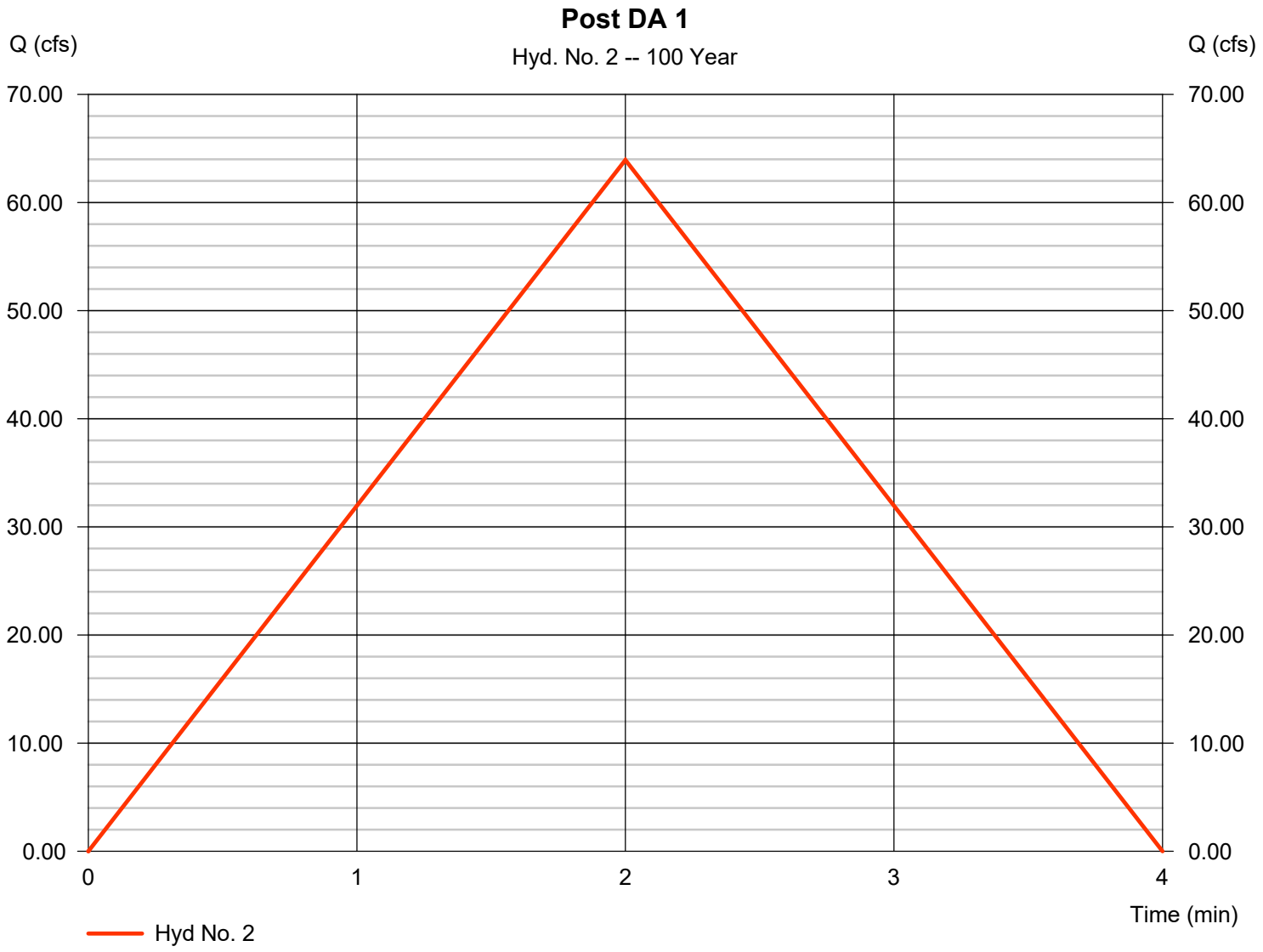
Hydrograph Report

Hyd. No. 2

Post DA 1

Hydrograph type	=	Rational	Peak discharge	=	63.94 cfs
Storm frequency	=	100 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	7,672 cuft
Drainage area	=	7.500 ac	Runoff coeff.	=	0.75*
Intensity	=	11.366 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(5.000 x 0.95) + (2.500 x 0.35)] / 7.500



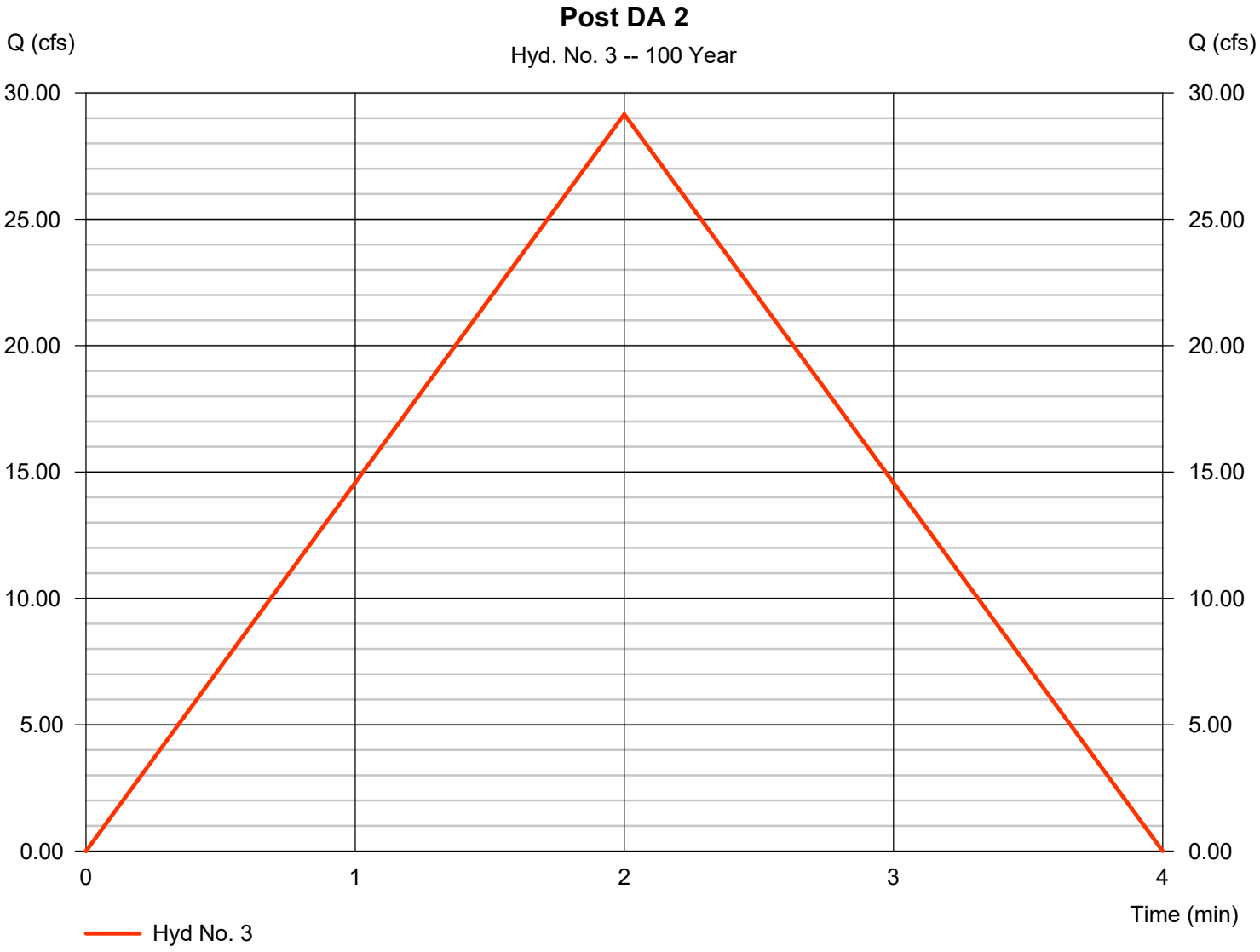
Hydrograph Report

Hyd. No. 3

Post DA 2

Hydrograph type	=	Rational	Peak discharge	=	29.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	2 min
Time interval	=	1 min	Hyd. volume	=	3,499 cuft
Drainage area	=	2.700 ac	Runoff coeff.	=	0.95*
Intensity	=	11.366 in/hr	Tc by TR55	=	2.00 min
IDF Curve	=	Pulaski County.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(2.700 x 0.95)] / 2.700



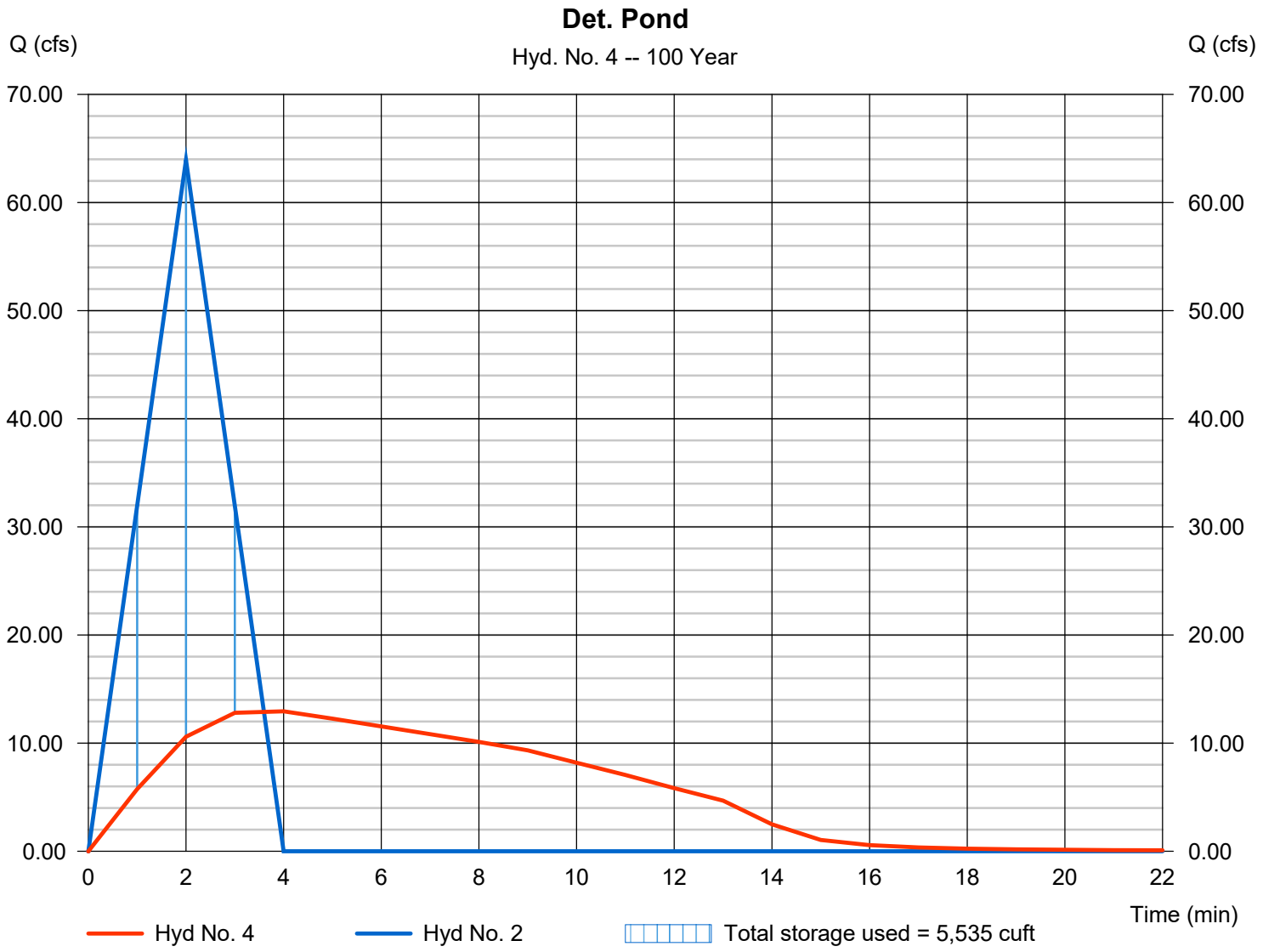
Hydrograph Report

Hyd. No. 4

Det. Pond

Hydrograph type	= Reservoir	Peak discharge	= 12.95 cfs
Storm frequency	= 100 yrs	Time to peak	= 4 min
Time interval	= 1 min	Hyd. volume	= 7,672 cuft
Inflow hyd. No.	= 2 - Post DA 1	Max. Elevation	= 422.07 ft
Reservoir name	= <New Pond>	Max. Storage	= 5,535 cuft

Storage Indication method used.

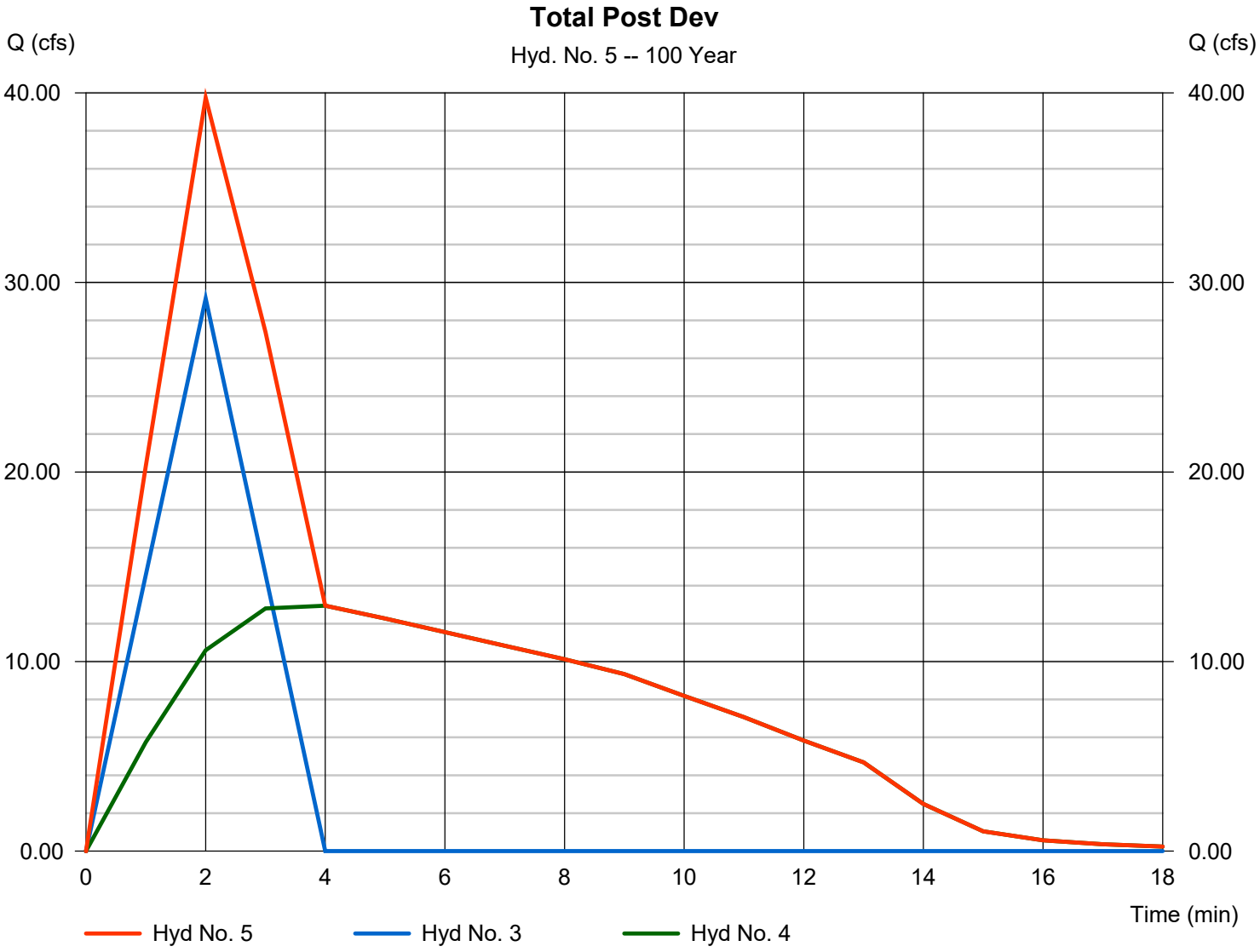


Hydrograph Report

Hyd. No. 5

Total Post Dev

Hydrograph type	= Combine	Peak discharge	= 39.75 cfs
Storm frequency	= 100 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 11,170 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.700 ac



Pipe Sizing Worksheet

① Total Area = 3.0 Ac
H.S. Area = 1.8 Ac

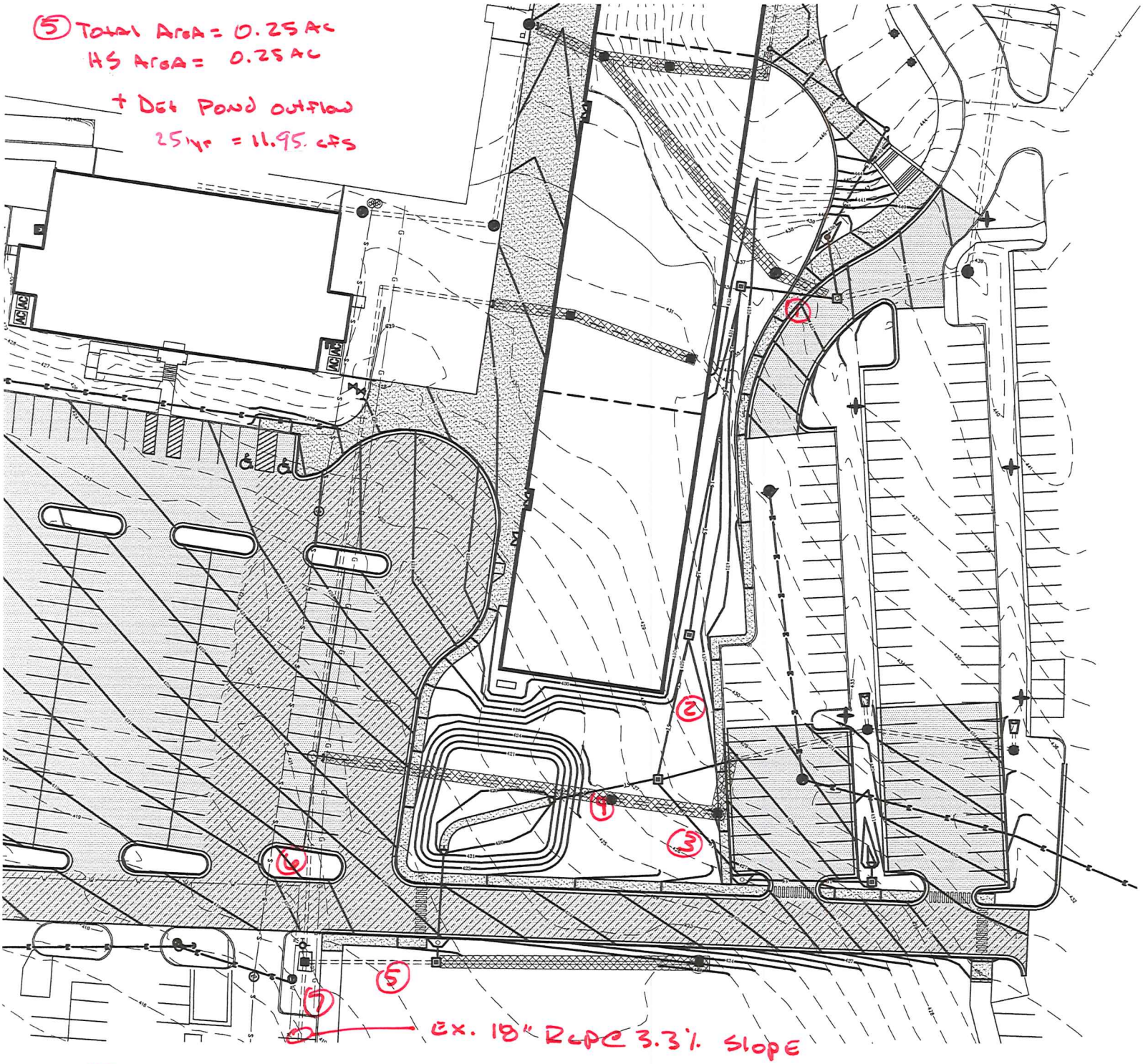
② Total Area = 0.5 Ac
HS Area = 0.5 Ac

③ Total Area = 0.3 Ac
HS Area 0.3 Ac

④ Total Area = 6.1 Ac
HS Area = 3.4 Ac

⑤ Total Area = 0.25 Ac
HS Area = 0.25 Ac

+ Det Pond outflow
25 yr = 11.95 cfs

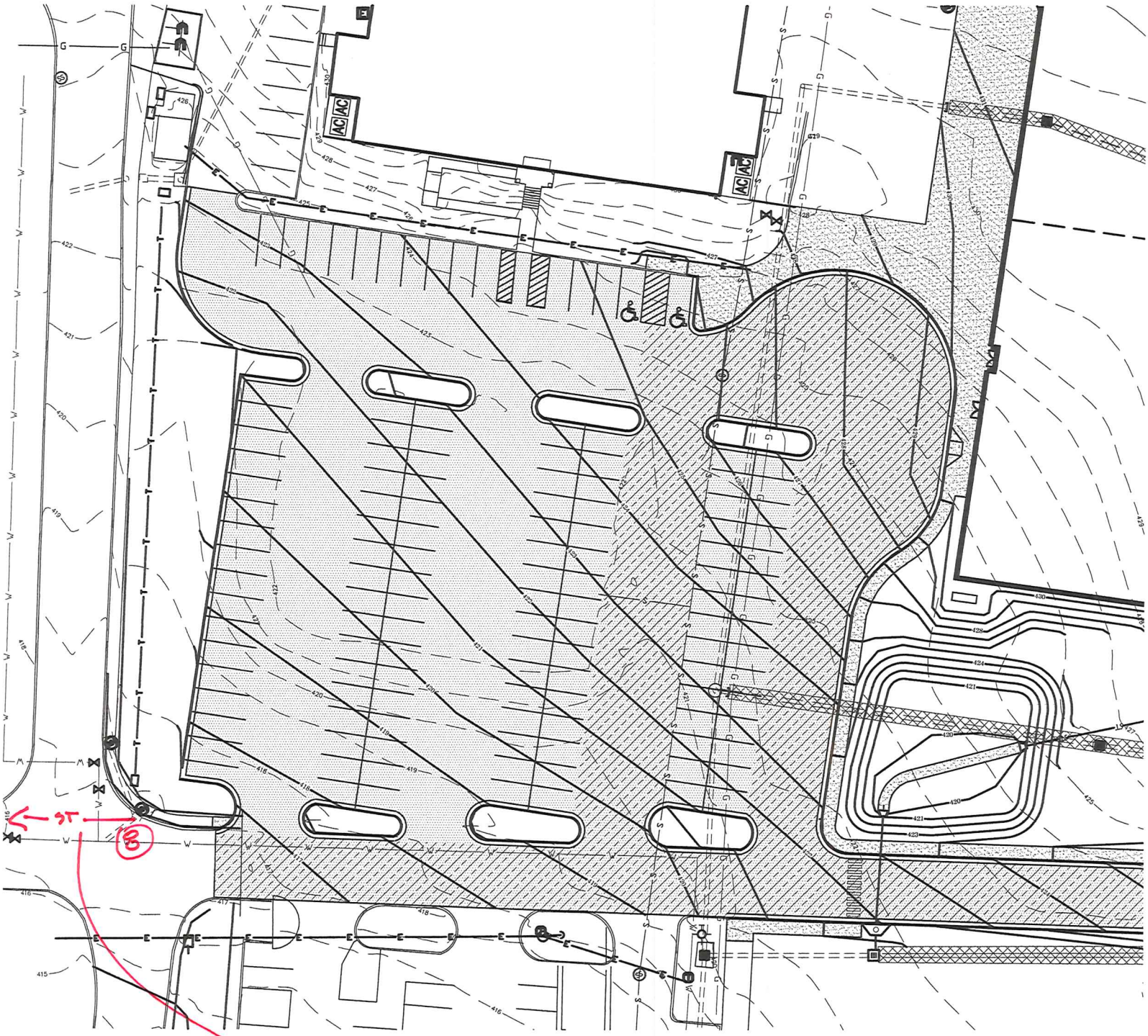


⑥ Total Area = 0.1 Ac
HS Area = 0.1 Ac

⑦ = ⑤ + ⑥

Pipe Sizing Worksheet

⑧ Total Area = 1.6 Ac
H.S. Area = 1.6 Ac



Ex 24" RCP @ 3.6% slope

This flows into the School Det. Pond on Boswell

Bryant HS Addition

PIPE SIZING CALCULATIONS 25-YR STORM

RATIONAL METHOD Q=CIA

SEE DRAINAGE CALCS FOR INTENSITY DETERMINATION

PIPE DESC.	DESIGN FLOW	PROPOSED PIPE SIZE	PIPE FLOW CHECK	PERV. SURF. AREA	IMPV. SURF AREA	TOTAL AREA	PERV. C 0.25 PERV. C VALUE	IMPV. C 0.9 IMP. C VALUE	TOTAL C	INTENSITY 25-YR STORM 8.5 INTENSITY	AVG C	D.A. FLOW	TOTAL FLOW	MIN. SLOPE	
#1	17.60	2	28.00	1.8	1.8	3.6	0.45	1.62	2.07	8.50	0.58	17.60	17.60	0.013	
#2	17.98	2	42.54	0	0.05	0.5	0.00	0.05	0.05	8.50	0.09	0.38	17.98	0.03	
#3	2.30	1.5	18.39	0	0.3	0.3	0.00	0.27	0.27	8.50	0.90	2.30	2.30	0.026	
#4	31.75	2.5	110.88	2.7	3.4	6.1	0.68	3.06	3.74	8.50	0.61	31.75	31.75	0.062	
#5	13.86	1.5	13.97	0	0.25	0.25	0.00	0.23	0.23	8.50	0.90	1.91	13.86	0.015	add 11.95 cfs (pond)
#6	0.77	1.5	17.30	0	0.1	0.1	0.00	0.09	0.09	8.50	0.90	0.77	0.77	0.023	
#7	34.04	1.5	20.72	0.01	0	0.01	0.00	0.00	0.00	8.50	0.25	0.02	34.04	0.033	
#8	14.63	2	46.60	0	1.6	1.6	0.00	1.44	1.44	8.50	0.90	12.24	14.63	0.036	

Designed by: Josh Minton, Minton Engineering

4-26-24

Date

Inlet Worksheet

(1) 2 curb inlets w/ back open throat - Total 8'

Total Area = 1.6 Ac

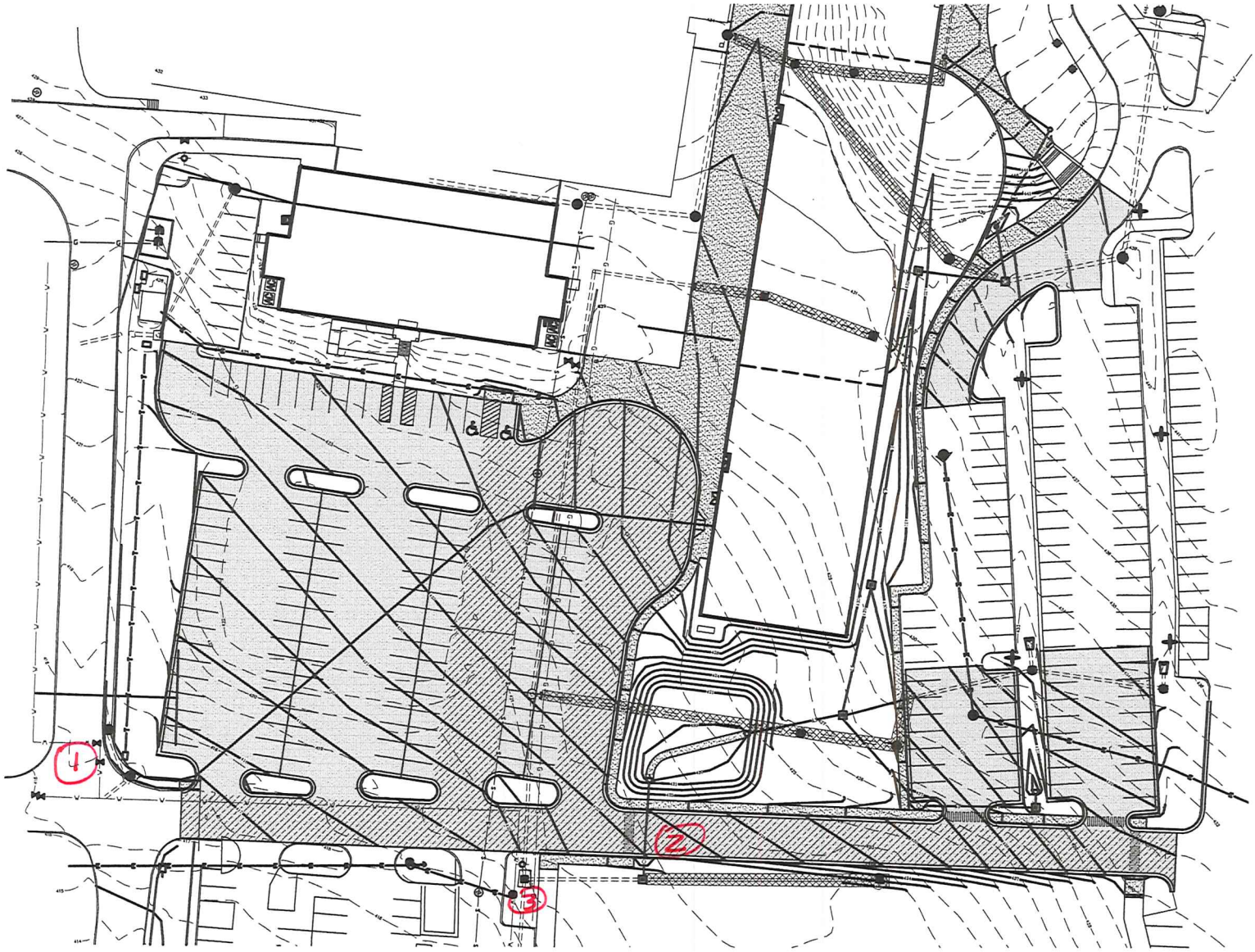
H.S. Area = 1.6 Ac

(2) Curb Inlet w/ ext. throat 10'-3"

Total Area = 0.25 Ac

H.S. Area = 0.25 Ac

(3) This grate inlet is surrounded by island - does not take in a sig. amt. of water



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 26 2024

Inlet #1

Curb Inlet

Location	= Sag
Curb Length (ft)	= 8.00
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

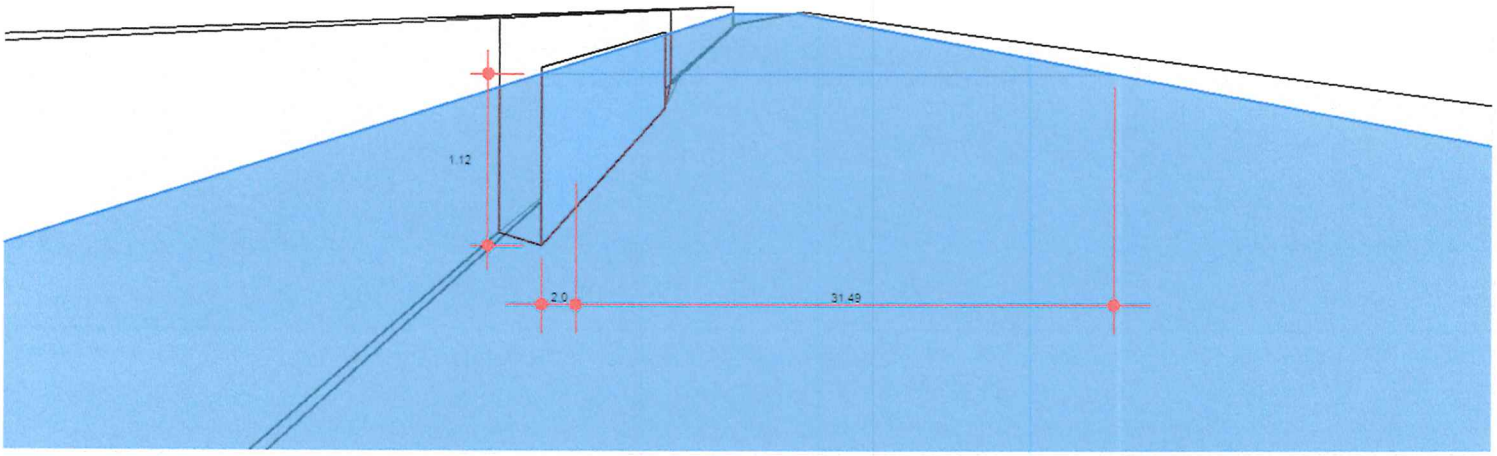
Calculations

Compute by:	Known Q
Q (cfs)	= 14.63

Highlighted

Q Total (cfs)	= 14.63
Q Capt (cfs)	= 14.63
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 13.48
Efficiency (%)	= 100
Gutter Spread (ft)	= 33.49
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



Inlet Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Apr 26 2024

Inlet #2

Curb Inlet

Location	= On grade
Curb Length (ft)	= 10.67
Throat Height (in)	= 6.00
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.40
Gutter n-value	= 0.016

Calculations

Compute by:	Known Q
Q (cfs)	= 1.90

Highlighted

Q Total (cfs)	= 1.90
Q Capt (cfs)	= 1.90
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 6.95
Efficiency (%)	= 100
Gutter Spread (ft)	= 6.30
Gutter Vel (ft/s)	= 3.68
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet

