BERTIN ENGINEERING

STORMWATER DRAINAGE ANALYSIS

RESIDENTIAL DEVELOPMENT
BLOCK 4201.01, LOT 33.03
GROVERS MILL ROAD & MALL ACCESS ROAD
TOWNSHIP OF LAWRENCE, MERCER COUNTY, NEW JERSEY
BE# 21-210

DATE PREPARED:	**OCTOBER 12, 2023**
DATE REVISED:	**MARCH 19, 2024**

ERIC M. HOUGH, P.E.
N.J.P.E. LICENSE NO. 51893

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STORMWATER DRAINAGE ANALYSIS

TOWNHOUSE DEVELOPMENT
BLOCK 4201.01, LOT 33.03
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I. PROJECT SUMMARY

The proposed project consists of developing a vacant lot into a proposed residential development with 6 multifamily buildings. The entire site has an area of 6.86 acres. The existing site is mostly wooded. The proposed development will add 3.086 acres of impervious and contain 1.498 acres of new roof area.

For the stormwater drainage analysis, the portion of the site being disturbed will be considered the area of study. The area of study drains into the existing stormwater drainage system located in Grovers Mill Road. The total size of the studied drainage area is 5.225 acres.

Due to the increase in impervious surface, small-scale infiltration basins will be required to reduce the proposed runoff to meet the required rate reductions. The outlet of the drainage system will tie directly into the existing stormwater system in Grovers Mill Road. To address water quality, runoff from the proposed parking areas and driveways be treated by a sand filter located in each aboveground infiltration basin. A separate underground infiltration basin is proposed to collect the rooftop runoff from Building B.

Below is a summary of the stormwater analysis results:

Frequency (year)	Existing (cfs)	Proposed (cfs)	Change (cfs)	% Exist.	Max. Allowable %
2	1.72	0.86	0.87	49.8%	50
10	6.43	4.72	1.71	73.3%	75
100	18.54	14.77	3.77	79.7%	80

As per the above table, runoff directed towards the Grovers Mill Road stormwater system will be reduced to levels below the existing with the required reductions for all design storms.

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II. STORMWATER DRAINAGE CALCULATIONS

1. DESIGN CRITERIA

All hydrographs and peak flow rates were calculated utilizing the Technical Release 55 (TR-55) method.

for *TR-55*

Rainfall distribution = C

A_m= drainage area (mi^2)

Q = runoff (in)

F_p = pond and swamp adjustment factor

$q_p = q_u A_m Q F_p$

q_p = peak discharge (cfs)

q_u = unit peak discharge (cfs)

2. EXISING RUNOFF

I) Area of Concern:

Drainage Area	Total (acres)	Woods (acres)	
		HSG B	HSG C
Existing	5.225	2.994	2.231

The existing drainage area is located in multiple soil types (see Soil Boundary Map).

CN Values: Woods (B) = 55
Woods (C) = 70

II) Peak Discharge (as determined by TR-55):

Existing Drainage Area - Pervious				
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)
2	3.31	61	15.2	1.72
10	5.01			6.43
100	8.33			18.54

3. PROPOSED RUNOFF

The primary portion of the proposed pavement areas as well as the proposed roof drainage from Buildings A, D & E will be directed into an aboveground basin with sand filter (Prop - Detained 1). The discharge from this basin , as well as a portion of the proposed pavement and the roof drainage from Buildings C & F, will be directed into another aboveground basin with sand filter (Prop - Detained 2). The proposed roof area of Building B will enter an underground infiltration basin (Basin B) located beneath the associated parking area. The remaining portion of the proposed drainage area (Prop - Bypass) will flow toward Mall Access Road. The outflow from Prop - Detained 2 will flow into the existing drainage on Grovers Mill Road.

Drainage Area	Total (acres)	Pervious (acres)		Impervious (acres)
		HSG B	HSG C	
Prop - Detained 1	1.853	0.524	0.017	1.312
Prop - Detained 2	2.520	0.520	0.465	1.535
Prop - Bypass	0.622	0.380	0.233	0.009
Prop - Building B	0.230	0.000	0.000	0.230

CN Values: Pervious (B) = 61
Pervious (C) = 74
Impervious = 98

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4. PROPOSED RUNOFF - DETAINED 1

I) Peak Discharge: Proposed Drainage Area - Detained 1 (as determined by TR-55):

Proposed Drainage Area - Detained 1 (Pervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)
2	3.31			0.20
10	5.01	61	12.2	0.72
100	8.33			2.07

Proposed Drainage Area - Detained 1 (Impervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)
2	3.31			4.12
10	5.01	98	10.0	6.27
100	8.33			10.47

Proposed Drainage Area - Detained 1						
Storm (year)	Pervious		Impervious		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.20	12.22	4.12	12.13	4.26	12.15
10	0.72	12.20	6.27	12.13	6.92	12.15
100	2.07	12.18	10.47	12.13	12.42	12.15

II) Detention Summary - Basin #1:

Outlet Control: 43 LF of 15" HDPE @ 5.0%, Inv 72.50
7" Orifice at Elevation 73.0
4' Rect. Weir at Elevation 74.25
4'x4' Overflow Riser at Elevation 75.00

Depth vs. Storage		
Elevation (ft)	Discharge (cfs)	Storage (cf)
71.00	0.00	0
72.00	0.00	4,710
74.00	1.08	14,947
76.00	9.94	25,989

Inflow vs. Outflow					
Storm (year)	Inflow		Outflow		
	Peak Flow (cfs)	Time (hr)	Peak Flow (cfs)	Time (hr)	Peak Elev. (ft)
2	4.26	12.15	0.24	13.75	73.28
10	6.92	12.15	1.11	12.68	74.04
100	12.42	12.15	7.38	12.27	75.00

III) Emergency Spillway Design:

Above Ground Basin contains an emergency spillway designed for the unrouted 100 Year Storm flow.

Q_{100} = 12.42 cfs

Use Q = 3.2 x L x $H^{1.5}$ to solve for L (weir Length) with H = 0.5 ft

12.42 cfs = 3.2 x L x 0.5^1.5 L = 11.0 ft Use 11 ft

Check Allowable Discharge Velocity: V = 2.4 ft/s (Allowable Discharge Velocity)

V = Q / A = 12.42 cfs / (11 ft x 0.5 ft) = 2.26 ft/s < 2.4 ft/s **OK**

The elevation of the emergency spillway is 75.00 with a peak emergency 100-year water elevation of 75.50.

5. PROPOSED RUNOFF - DETAINED 2

I) Peak Discharge: Proposed Drainage Area - Detained 2 (as determined by TR-55):

Proposed Drainage Area - Detained 2 (Pervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)
2	3.31	67	19.3	0.57
10	5.01			1.54
100	8.33			3.85

Proposed Drainage Area - Detained 2 (Impervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)
2	3.31	98	10.0	4.82
10	5.01			7.34
100	8.33			12.25

Proposed Drainage Area - Basin #2								
Storm (year)	Basin #1 Route		Detained 2 (Perv)		Detained 2 (Imp)		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.24	13.75	0.57	12.28	4.82	12.13	5.19	12.15
10	1.11	12.68	1.54	12.27	7.34	12.13	8.87	12.15
100	7.38	12.27	3.85	12.25	12.25	12.13	21.41	12.17

II) Detention Summary - Basin #2:

Basin: 26 LF of 18" HDPE @ 4.0%, Inv 67.0

Outlet Control: 1.8' Rectangular Weir at Elevation 68.50

4'x4' Overflow Riser at Elevation 70.33

Depth vs. Storage		
Elevation (ft)	Discharge (cfs)	Storage (cf)
67.00	0.00	0
69.00	2.04	14,142
71.00	15.25	28,884

Inflow vs. Outflow					
Storm (year)	Inflow		Outflow		
	Peak Flow (cfs)	Time (hr)	Peak Flow (cfs)	Time (hr)	Peak Elev. (ft)
2	5.19	12.15	0.78	13.03	68.76
10	8.87	12.15	4.27	12.40	69.32
100	21.41	12.17	13.65	12.37	70.57

III) Overflow Design

Above Ground Basin contains an emergency spillway designed for the unrouted 100 Year Storm flow.

Q_{100} = 21.41 cfs

Use $Q = 3.2 \times L \times H^{1.5}$ to solve for L (weir Length) with H = 0.5 ft

21.41 cfs = 3.2 x L x 0.5^1.5 L = 18.9 ft Use 19 ft

Check Allowable Discharge Velocity: V = 2.4 ft/s (Allowable Discharge Velocity)

V = Q / A = 21.41 cfs / (19 ft x 0.5 ft) = 2.25 ft/s < 2.4 ft/s **OK**

The elevation of the emergency spillway is 70.60 with a peak emergency 100-year water elevation of 71.10.

6. PROPOSED RUNOFF - BYPASS

Proposed Drainage Area - Bypass (Pervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)
2	3.31	66	10.0	0.44
10	5.01			1.22
100	8.33			3.07

Proposed Drainage Area - Bypass (Impervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)
2	3.31	98	10.0	0.03
10	5.01			0.04
100	8.33			0.07

Proposed Drainage Area - Bypass						
Storm (year)	Pervious		Impervious		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.44	12.17	0.03	12.13	0.47	12.17
10	1.22	12.15	0.04	12.13	1.26	12.15
100	3.07	12.15	0.07	12.13	3.14	12.15

7. PROPOSED RUNOFF - COMBINED (TOTAL)

Proposed Drainage Area						
Storm (year)	Detention Route		Bypass		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.78	13.03	0.47	12.17	0.86	12.93
10	4.27	12.40	1.26	12.15	4.72	12.37
100	13.65	12.37	3.14	12.15	14.77	12.33

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8. EXISTING VS. PROPOSED RUNOFF

Frequency (year)	Existing (cfs)	Proposed (cfs)	Change (cfs)	% Exist.
2	1.72	0.86	0.87	49.8%
10	6.43	4.72	1.71	73.3%
100	18.54	14.77	3.77	79.7%

The calculations indicate that the proposed site redevelopment with detention decreases the surface runoff for the four storms. Runoff due to a 2, 10 & 100 year storm are decreased by 0.87, 1.71 & 3.77 cfs respectively.

9. INFILTRATION BASIN DESIGN FOR ROOF RUNOFF

The infiltration basin will collect the entire 100-year runoff volume from the proposed retail building.

I) Determine the 100-Year Runoff Volume

Frequency (year)	Rainfall, P (in)	Curve Number	Area (acres)	T_c (min)	Peak Discharge (cfs)	Volume (cf)
100	8.33	98	0.230	10.0	1.84	6,754

II) Determine Size of Infiltration Basin B:

Infiltration basin will be constructed from Cultec Recharger 360HD chambers w/ 6" stone bed.
Total size of infiltration basin is 114 chambers with a bed size of 2,725 sf.
Volume of Infiltration Basin = 6,885 cf > 6,754 cf

See attached Cultec Recharger 360HD Volume Worksheet.

10. WATER QUALITY DESIGN

The above ground detention basin is designed with a sand filter to treat the pavement area directed into the drainage system for the Stormwater Quality Design Storm. As per N.J.A.C. 7:8-5.6, the BMP flow rate is determined using NRCS methodology based on the following criteria:

T_d (Storm Duration) = 2 hours
I = 0.625 inches/hr for Stormwater Quality Design Storm (See Table 5-1)

I) Area of Analysis:

Treated drainage area is equal to the detained basin areas.

Drainage Area	Total (acres)	Pervious (acres)		Impervious (acres)
		HSG B	HSG C	
Prop - Treated 1	1.853	0.524	0.017	1.312
Prop - Treated 2	2.520	0.520	0.465	1.535

II) Treated Area 1 (Prop - Basin 1) Routed Through Basin 1:

Proposed Drainage Area - Treated 1 (Pervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	61	12.2	0.00	0

Proposed Drainage Area - Treated 1 (Impervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	98	10.0	3.59	4,927

Proposed Drainage Area - Treated 1							
Storm (year)	Pervious		Impervious		Combined		
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Volume (cf)
WQ	0.00	n/a	3.59	1.12	3.59	1.12	4,927

Inflow vs. Outflow					
Storm (year)	Inflow		Outflow		
	Peak Flow (cfs)	Time (hr)	Peak Flow (cfs)	Time (hr)	Peak Elev. (ft)
WQ	3.59	1.12	0.00	n/a	72.04

Entire Water Quality Storm Volume is contained within the aboveground basin below the lowest orifice.

III) Treated Area 2 (Prop - Basin 2) Routed Through Basin 2:

Proposed Drainage Area - Treated 2 (Pervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	67	19.3	0.02	49

Proposed Drainage Area - Treated 2 (Impervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T_c (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	98	10.0	4.20	5,765

Proposed Drainage Area - Treated 2								
Storm (year)	Treated #1 Route		Treated 2 (Perv)		Treated 2 (Imp)		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
WQ	0.00	n/a	0.02	1.82	4.20	1.12	0.00	n/a

Entire Water Quality Storm Volume is contained within the aboveground basin below the lowest orifice.

11. STORMWATER RECHARGE REQUIREMENT

As per the NJDEP, the required amount of groundwater recharge is determined by the Annual Groundwater Recharge Analysis worksheet (see attached). According to page 1 of the worksheet, there is an annual recharge deficit for the post-development condition of 58,289 (Vdef) for the portion of the site to be disturbed (5.224 acres).

Basin 1 collects a large amount of the impervious area from the pavement. The amount of impervious area collected is 57,151 sf (Aimp) and provides the Annual BMP Recharge Volume (Vdef) at a calculated BMP effective depth (dBMP) of 2.4 inches. Since the provided BMP effective depth in the basin of 24 inches (below lowest orifice) is greater than the calculated depth, the stormwater recharge requirement is satisfied. This calculation omits the additional recharge provided by the other infiltration basins utilized on the property. See the attached Soil Maps for the locations of the referenced soil types.

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12. STORM SEWER ANALYSIS TABLE

The following table lists the areas collected by the proposed storm sewer. See the attached Storm Sewer Design Calculations for pipe capacity calculations.

Use c = 0.99 for impervious areas
0.25 for pervious areas (HSG B)
0.51 for pervious areas (HSG C)

Inlet	Imperv. (Acres)	Perv. B (Acres)	Perv. C (Acres)	Total (Acres)	Weighted c
DI#1	0.095	0.021	0.000	0.116	0.86
DI#2	0.105	0.029	0.000	0.134	0.83
DI#3	0.188	0.017	0.012	0.217	0.91
DI#4	0.060	0.009	0.000	0.069	0.89
DI#5	0.088	0.007	0.000	0.095	0.94
DI#6	0.000	0.349	0.000	0.349	0.25
DI#7	0.204	0.002	0.002	0.208	0.98
DI#8	0.226	0.045	0.041	0.312	0.82
DI#9	0.528	0.000	0.000	0.528	0.99
DI#10	0.151	0.000	0.036	0.187	0.90
TD#1	0.143	0.000	0.062	0.205	0.84
TD#2	0.059	0.000	0.015	0.074	0.89
DMH#1	0.282	0.000	0.000	0.282	0.99
DMH#2	0.401	0.000	0.000	0.401	0.99

13. PREFORMED SCOUR HOLE DESIGN

Scour holes are designed for the 25-year storm. A scour hole is proposed for each discharge point into the two above-ground basins.

Scour Hole #1:

Q_{25} = 6.54 cfs (See Storm Sewer Design Calculations)
D_o = 15 in
T_w = $0.2D_o$ = 0.25 ft

Length of Hole Bottom (L) = $3 \times D_o$ = **3.75 ft**
Width of Hole Bottom (W) = $2 \times W_o$ = **2.50 ft**
Median Stone Dia. (d_{50}) = $(0.0125 / 0.2D_o) \times (Q / W_o)^{4/3}$ = **0.45 ft (Use 6" = 0.5 ft)**

Scour Hole #2:

Q_{25} = 0.52 cfs (See Storm Sewer Design Calculations)
D_o = 15 in
T_w = $0.2D_o$ = 0.25 ft

Length of Hole Bottom (L) = $3 \times D_o$ = **3.75 ft**
Width of Hole Bottom (W) = $2 \times W_o$ = **2.50 ft**
Median Stone Dia. (d_{50}) = $(0.0125 / 0.2D_o) \times (Q / W_o)^{4/3}$ = **0.17 ft (Use 4" = 0.33 ft)**

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Scour Hole #3:

Q_{25} = 11.84 cfs (See Storm Sewer Design Calculations)
D_o = 18 in
T_w = $0.2D_o$ = 0.30 ft

Length of Hole Bottom (L) = $3 \times D_o$ = **4.50 ft**
Width of Hole Bottom (W) = $2 \times W_o$ = **3.00 ft**
Median Stone Dia. (d_{50}) = $(0.0125 / 0.2D_o) \times (Q / W_o)^{4/3}$ = **0.65 ft (Use 8" = 0.67 ft)**

Scour Hole #4:

Q_{25} = 0.41 cfs (See Storm Sewer Design Calculations)
D_o = 6 in
T_w = $0.2D_o$ = 0.10 ft

Length of Hole Bottom (L) = $3 \times D_o$ = **1.50 ft**
Width of Hole Bottom (W) = $2 \times W_o$ = **1.00 ft**
Median Stone Dia. (d_{50}) = $(0.0125 / 0.2D_o) \times (Q / W_o)^{4/3}$ = **0.10 ft (Use 4" = 0.33 ft)**

Scour Hole #5:

A = 0.361 ac
c = 0.99 for impervious areas
I_{25} = 5.80 in/hr (T_c = 10 min.)

Q_{25} = 0.99 x 5.80 x 0.361 = **2.07 cfs**
D_o = 10 in
T_w = $0.2D_o$ = 0.17 ft

Length of Hole Bottom (L) = $3 \times D_o$ = **2.50 ft**
Width of Hole Bottom (W) = $2 \times W_o$ = **1.67 ft**
Median Stone Dia. (d_{50}) = $(0.0125 / 0.2D_o) \times (Q / W_o)^{4/3}$ = **0.09 ft (Use 4" = 0.33 ft)**

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14 GROUNDWATER MOUNDING ANALYSIS

The soils report was prepared by Wham Engineering Services, Inc. on March 29, 2023. A percolation rate of 10 in/hr is used at TP-2.

Basin #1:

Time to Drain 100 Year Volume:

Test Infiltration Rate:	10	in/hr		
Design Infiltration Rate (1/2 Test Rate)	5	in/hr	=	0.417 ft/hr
Volume Below Lowest Orifice:	17,708	cf		
Area of Infiltration	4,550	sf		

Time to Drain: 17,708 cf / (2270 sf x 0.863 ft/hr)
= 9.34 hours

Elevation of Groundwater: 66 (10 ft down from existing grade elevation of TP-2)
Bottom of Basin Elevation: 71.00
Groundwater Mounding Height at Center: 10.726 ft (From Groundwater Mounding Calculator)
Elevaton of Groundwater Mounding at Center: 10.726 ft + 66.0 = 76.73 (Above basin bottom)

Since groundwater mounding at center is higher than bottom of basin, additional analysis is required.

Trial Design Infiltration Rate / Factor: 1.222 in/hr = 0.102 ft/hr
Time to Drain x Factor: 17,708 cf / (4550 sf x 0.102 ft/hr) = 38.22 hours
Groundwater Mounding Height at Center: 4.993 ft (From Groundwater Mounding Calculator)
Elevaton of Groundwater Mounding at Center: 4.993 ft + 66 = 70.99 (Approx. basin bottom)

Basin #2:

The soils report was prepared by Wham Engineering Services, Inc. on March 29, 2023. A percolation rate of 10 in/hr is used at TP-1.

Time to Drain 100 Year Volume:

Test Infiltration Rate:	10	in/hr		
Design Infiltration Rate (1/2 Test Rate)	5	in/hr	=	0.417 ft/hr
Volume Below Lowest Orifice:	10,607	cf		
Area of Infiltration	6,921	sf		

Time to Drain: 10,607 cf / (2270 sf x 0.863 ft/hr)
= 3.68 hours

Elevation of Groundwater: 65 (10 ft down from existing grade elevation of TP-2)
Bottom of Basin Elevation: 67.00
Groundwater Mounding Height at Center: 4.861 ft (From Groundwater Mounding Calculator)
Elevaton of Groundwater Mounding at Center: 4.861 ft + 65.0 = 69.86 (Above basin bottom)

Since groundwater mounding at center is higher than bottom of basin, additional analysis is required.

Trial Design Infiltration Rate / Factor: 0.620 in/hr = 0.052 ft/hr
Time to Drain x Factor: 10,607 cf / (6921 sf x 0.052 ft/hr) = 29.66 hours
Groundwater Mounding Height at Center: 1.989 ft (From Groundwater Mounding Calculator)
Elevaton of Groundwater Mounding at Center: 1.989 ft + 65 = 66.99 (Approx. basin bottom)

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Basin B:

The soils report was prepared by Wham Engineering Services, Inc. on March 29, 2023. A percolation rate of 10 in/hr is used at TP-4.

Time to Drain 100 Year Volume:

Test Infiltration Rate:	10	in/hr		
Design Infiltration Rate (1/2 Test Rate)	5	in/hr	=	0.417 ft/hr
Volume Below Lowest Orifice:	7,270	cf		
Area of Infiltration	2,725	sf		

Time to Drain: 7,270.0 cf / (2270 sf x 0.863 ft/hr)
= 6.40 hours

Elevation of Groundwater:	70	(9 ft down from existing grade elevation of TP-4)
Bottom of Basin Elevation:	74.50	
Groundwater Mounding Height at Center:	3.608	ft (From Groundwater Mounding Calculator)
Elevaton of Groundwater Mounding at Center:	3.608	ft + 70.0 = 73.61 (Below basin bottom)

CULTEC Stormwater Design Calculator

Date:	November 15, 2023

Project Information:

Calculations Performed By:

RECHARGER 360HD

Recharger 360HD Chamber Specifications		
Height	36.0	inches
Width	60.0	inches
Length	4.17	feet
Installed Length	3.67	feet
Bare Chamber Volume	36.69	cu. feet
Installed Chamber Volume	55.78	cu. feet

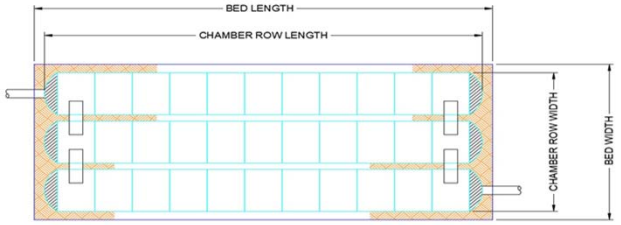
Breakdown of Storage Provided by Recharger 360HD Stormwater System		
Within Chambers	4,208.59	cu. feet
Within Feed Connectors	1.37	cu. feet
Within Stone	2,675.29	cu. feet
Total Storage Provided	**6,885.3**	**cu. feet**
Total Storage Required	6754.00	cu. feet

Materials List

Recharger 360HD		
Total Number of Chambers Required	**114**	**pieces**
Chamber Units	114	pieces
End Caps	4	pieces
HVLV FC-48 Feed Connectors	2	pieces
CULTEC No. 410 Non-Woven Geotextile	1008	sq. yards
CULTEC No. 4800 Woven Geotextile	26	feet
Stone	248	cu. yards

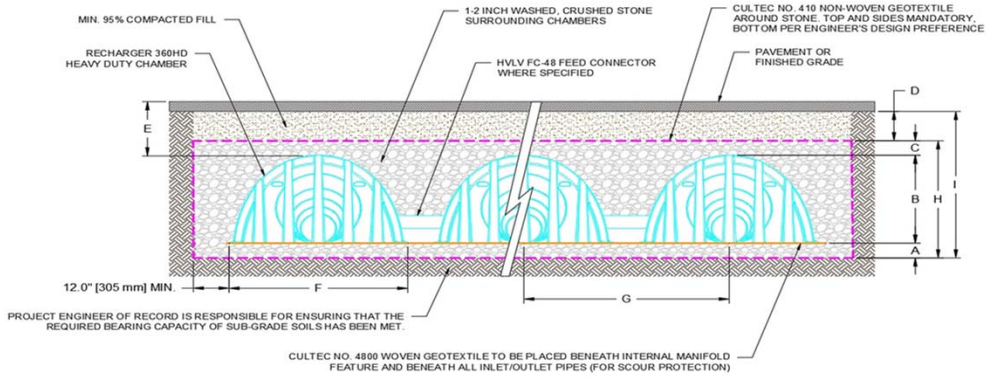
Based on 2 Internal Manifolds

Bed Detail



Bed Layout Information		
Number of Rows Wide	2	pieces
Number of Chambers Long	57	pieces
Chamber Row Width	10.75	feet
Chamber Row Length	211.69	feet
Bed Width	12.75	feet
Bed Length	213.69	feet
Bed Area Required	2724.55	sq. feet
Length of Separator Row	N/A	feet

Bed detail for reference only. Not project specific. Not to scale.



Conceptual graphic only. Not job specific.

Cross Section Table Reference			
A	Depth of Stone Base	**6.0**	inches
B	Chamber Height	**36.0**	inches
C	Depth of Stone Above Units	**6.0**	inches
D	Depth of 95% Compacted Fill	**12.0**	inches
E	Max. Depth Allowed Above the Chamber	**12.00**	feet
F	Chamber Width	**60.0**	inches
G	Center to Center Spacing	**5.75**	feet
H	Effective Depth	**4.00**	feet
I	Bed Depth	**5.00**	feet

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tech@cultec.com

Created on : 11/15/2023

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MERCER CO., LAWRENCE TWP	44.9	1.43

Project Name:	21-210
Description:	Lawrence, NJ
Analysis Date:	10/12/23

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.733	Woods	Pits, Muck	0.0	-
2	0.898	Woods	Matapeake	13.0	42,519
3	0.938	Woods	Matapeake	13.0	44,413
4	0.361	Woods	Portsmouth	0.0	-
5	0.063	Woods	Sassafras	13.3	3,036
6	0.295	Woods	Othello	0.0	-
7	1.936	Woods	Fallsington	0.0	-
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.2			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				4.7	89,967

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.418	Open space	Pits, Muck	0.0	-
2	0.196	Open space	Matapeake	12.9	9,194
3	0.418	Open space	Matapeake	12.9	19,607
4	0.189	Open space	Portsmouth	0.0	-
5	0.06	Open space	Sassafras	13.2	2,878
6	0.168	Open space	Othello	0.0	-
7	0.548	Open space	Fallsington	0.0	-
8	3.227	Impervious areas	Fallsington	0.0	-
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.2			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				1.7	31,678

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft) 140,568
Post-Development Annual Recharge Deficit=	*58,289*	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	0.98	(in)	DRWC=	0.25	(in)
ERWC =	0.28	(in)	EDRWC=	0.07	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
21-210	Lawrence, NJ	10/12/23	Infiltration Basin 1

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	4550.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	2.4	in
Upper level of the BMP surface (negative if above ground)	dBMPu	0.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	60.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.28	in
ERWC Modified to consider dEXC	EDRWC	0.07	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.05	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.20	in
Inches of Rainfall to capture	Pdesign	0.27	in
Recharge Provided Avg. over Imp. Area		12.2	in
Runoff Captured Avg. over imp. Area		12.6	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.08	unitless
BMP Volume	VBMP	917	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	58,289	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	57,151	sq.ft
Root Zone Water Capacity	RWC	0.98	in
RWC Modified to consider dEXC	DRWC	0.25	in
Climatic Factor	C-factor	1.43	no units
Average Annual P	Pavg	44.9	in
Recharge Requirement over Imp. Area	dr	5.0	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		58,289	cu.ft
Avg BMP Recharge Efficiency		97.3%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.7%	%
%Runoff Infiltrated		36.1%	%
%Runoff Recharged		14.3%	%
%Rainfall Recharged		11.1%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

STORM SEWER DESIGN CALCULATIONS

PROJECT: Townhouse Development - Lawrence, NJ
PROJECT No: 21-210

BY: MBL
CHK'D: CJB
DATE: 3/19/24

STORM EVENT: 25 Year

NOAA Precipitation Frequency Table						
Duration (min)	5	10	15	30	60	120
Intensity(in/hr)	7.28	5.80	4.90	3.63	2.42	1.51

Drainage Structure		Area	Runoff			Inlet			Pipe					Pipe Design						
From	To	A Acres	Coef. C	C x A	Sum CA	Tc min	i in/hr	Q cfs	Tc min	Tt min	T total min	i in/hr	Q cfs	Dia in	Manning's n	Length ft	Slope %	Q full cfs	V full fps	V design fps
DI#1	DMH#1	0.12	0.86	0.10	0.10	10	5.80	0.58	10	-	10.00	5.80	0.58	15	0.012	111	3.90	13.8	11.2	6.2
DI#2	DMH#1	0.13	0.83	0.11	0.11	10	5.80	0.64	10	-	10.00	5.80	0.64	15	0.012	58	0.70	5.9	4.8	3.2
DMH#1	DMH#2	0.28	0.99	0.28	0.49	10	5.80	1.62	10	0.3	10.30	5.75	2.82	15	0.012	185	1.00	7.0	5.7	5.4
DI#3	DI#4	0.22	0.91	0.20	0.20	10	5.80	1.16	10	-	10.00	5.80	1.16	15	0.012	82	1.00	7.0	5.7	4.3
DI#4	DMH#2	0.07	0.89	0.06	0.26	10	5.80	0.35	10	0.32	10.32	5.74	1.49	15	0.012	121	3.00	12.1	9.9	7.0
DMH#2	FES#1	0.40	0.99	0.40	1.15	10	5.80	2.32	10.32	0.29	10.61	5.69	6.54	15	0.012	35	2.00	9.9	8.1	8.7
DI#5	BASIN#1	0.10	0.94	0.09	0.09	10	5.80	0.52	10	-	10.00	5.80	0.52	15	0.012	38	2.00	9.9	8.1	4.5
TD#1	DI#6	0.21	0.84	0.17	0.17	10	5.80	0.99	10	-	10.00	5.80	0.99	8	0.011	228	0.50	1.0	2.9	3.3
DI#6	DI#7	0.35	0.25	0.09	0.26	10	5.80	0.52	10	1.15	11.15	5.59	1.45	15	0.012	45	0.70	5.9	4.8	4.1
DI#7	DMH#3	0.21	0.98	0.20	0.46	10	5.80	1.16	11.15	0.18	11.33	5.56	2.56	15	0.012	225	0.80	6.3	5.1	4.9
OCS#1	DMH#3							2.84					2.84	15	0.012	43	5.00	15.6	12.7	10.1
DMH#3	DMH#4				0.46				11.33	0.77	12.10	5.42	5.33	18	0.012	78	1.50	13.9	7.9	7.6
DI#8	DMH#4	0.31	0.83	0.26	0.26	10	5.80	1.51	10	-	10.00	5.80	1.51	18	0.012	17	0.50	8.0	4.5	3.5
DI#9	DI#10	0.53	0.99	0.52	0.52	10	5.80	3.02	10	-	10.00	5.80	3.02	15	0.012	21	1.00	7.0	5.7	5.6
DI#10	DMH#4	0.19	0.90	0.17	0.69	10	5.80	0.99	10	0.06	10.06	5.79	4.00	18	0.012	232	0.60	8.8	5.0	4.9
DMH#4	FES#2	0.31	0.83	0.26	1.67	10	5.80	1.51	12.1	0.17	12.27	5.39	11.84	18	0.012	36	1.10	11.9	6.7	7.7
TD#2	BASIN#2	0.07	0.89	0.07	0.07	10	5.80	0.41	10	-	10.00	5.80	0.41	6	0.011	34	0.70	0.6	3.1	3.1
OCS#2	EXIN							7.42					7.42	18	0.013	26	4.00	21.0	11.9	10.9

TABLE 7.1

TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100 YEAR FREQUENCY STORM

Land Use Description		Hydrologic Soil Group A	B	C	D
Cultivated land:					
without conservation treatment		0.49	0.67	0.81	0.88
with conservation treatment		0.27	0.43	0.61	0.67
Pasture or range land:					
poor condition		0.38	0.63	0.78	0.84
good condition		NA	0.25	0.51	0.65
Meadow: good condition		NA	NA	0.44	0.61
Wood or forest land:					
thin stand, poor cover, no mulch		NA	NA	0.59	0.79
good cover		NA	NA	0.45	0.59
Open spaces, lawns, parks, golf courses, cemeteries:					
good condition, grass cover on 75% or more of area		NA	0.25	0.51	0.65
fair condition, grass cover on 50–75% of area		NA	0.45	0.63	0.74
Commercial and business areas (85% impervious)		0.84	0.90	0.93	0.96
Industrial districts (72% impervious)		0.67	0.81	0.88	0.92
Residential:					
Average lot size	Average impervious				
⅛ acre	65%	0.59	0.76	0.86	0.90
¼ acre	38%	0.25	0.55	0.70	0.80
⅓ acre	30%	NA	0.49	0.67	0.78
½ acre	25%	NA	0.45	0.65	0.76
1 acre	20%	NA	0.41	0.63	0.74
Paved parking lots, roofs, driveways, etc.		0.99	0.99	0.99	0.99
Streets and roads:					
paved with curbs and storm sewers		0.99	0.99	0.99	0.99
gravel		0.57	0.76	0.84	0.88
dirt		0.49	0.69	0.80	0.84

Note: NA denotes information is not available; design engineers should rely on another authoritative source.

Source: New Jersey Department of Environmental Protection, Technical Manual for Land Use Regulation Program, Bureaus of Inland and Coastal Regulations, Stream Encroachment Permits (Trenton, New Jersey: Department of Environmental Protection, Revised September 1995) p. 12.

NOAA Atlas 14, Volume 2, Version 3
Location name: Lawrence Township, New Jersey, USA*
Latitude: 40.2864°, Longitude: -74.6847°
Elevation: 71 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.08** (3.68-4.50)	**4.86** (4.42-5.38)	**5.78** (5.22-6.38)	**6.46** (5.82-7.12)	**7.28** (6.53-8.03)	**7.88** (7.04-8.70)	**8.48** (7.55-9.38)	**9.05** (8.00-10.0)	**9.76** (8.54-10.9)	**10.3** (8.94-11.5)
10-min	**3.25** (2.95-3.60)	**3.89** (3.53-4.30)	**4.63** (4.18-5.11)	**5.16** (4.66-5.69)	**5.80** (5.21-6.40)	**6.28** (5.61-6.93)	**6.74** (5.99-7.45)	**7.17** (6.34-7.96)	**7.72** (6.76-8.60)	**8.11** (7.04-9.08)
15-min	**2.71** (2.46-3.00)	**3.26** (2.96-3.60)	**3.90** (3.53-4.31)	**4.35** (3.93-4.80)	**4.90** (4.40-5.41)	**5.30** (4.74-5.85)	**5.68** (5.05-6.28)	**6.03** (5.33-6.69)	**6.47** (5.67-7.22)	**6.78** (5.89-7.60)
30-min	**1.86** (1.68-2.05)	**2.25** (2.04-2.49)	**2.77** (2.51-3.06)	**3.15** (2.84-3.48)	**3.63** (3.26-4.01)	**3.99** (3.57-4.40)	**4.35** (3.87-4.81)	**4.70** (4.15-5.21)	**5.15** (4.51-5.74)	**5.49** (4.77-6.16)
60-min	**1.16** (1.05-1.28)	**1.41** (1.28-1.56)	**1.78** (1.61-1.96)	**2.05** (1.85-2.26)	**2.42** (2.17-2.67)	**2.70** (2.42-2.98)	**3.00** (2.66-3.31)	**3.29** (2.91-3.65)	**3.70** (3.24-4.12)	**4.01** (3.48-4.49)
2-hr	**0.703** (0.636-0.779)	**0.857** (0.775-0.949)	**1.09** (0.982-1.20)	**1.26** (1.14-1.39)	**1.51** (1.35-1.66)	**1.70** (1.52-1.88)	**1.90** (1.68-2.10)	**2.11** (1.86-2.34)	**2.40** (2.09-2.68)	**2.63** (2.27-2.95)
3-hr	**0.515** (0.463-0.574)	**0.627** (0.566-0.699)	**0.796** (0.716-0.888)	**0.928** (0.832-1.03)	**1.11** (0.992-1.24)	**1.26** (1.12-1.40)	**1.42** (1.25-1.58)	**1.58** (1.38-1.77)	**1.81** (1.56-2.03)	**2.00** (1.70-2.25)
6-hr	**0.327** (0.294-0.367)	**0.397** (0.357-0.445)	**0.502** (0.450-0.562)	**0.589** (0.525-0.657)	**0.713** (0.630-0.796)	**0.817** (0.717-0.911)	**0.929** (0.807-1.04)	**1.05** (0.902-1.17)	**1.22** (1.03-1.37)	**1.37** (1.14-1.55)
12-hr	**0.197** (0.177-0.223)	**0.238** (0.214-0.270)	**0.304** (0.271-0.343)	**0.359** (0.320-0.405)	**0.442** (0.390-0.497)	**0.514** (0.449-0.578)	**0.593** (0.511-0.666)	**0.681** (0.578-0.767)	**0.812** (0.676-0.920)	**0.925** (0.756-1.05)
24-hr	**0.114** (0.104-0.125)	**0.138** (0.127-0.151)	**0.176** (0.161-0.193)	**0.208** (0.190-0.228)	**0.257** (0.233-0.280)	**0.299** (0.268-0.326)	**0.345** (0.307-0.376)	**0.396** (0.349-0.433)	**0.473** (0.410-0.518)	**0.539** (0.461-0.592)
2-day	**0.066** (0.060-0.072)	**0.080** (0.073-0.088)	**0.102** (0.093-0.112)	**0.120** (0.110-0.132)	**0.147** (0.133-0.161)	**0.170** (0.153-0.186)	**0.195** (0.174-0.214)	**0.223** (0.197-0.244)	**0.263** (0.229-0.290)	**0.298** (0.256-0.329)
3-day	**0.046** (0.043-0.051)	**0.056** (0.052-0.061)	**0.071** (0.065-0.078)	**0.084** (0.077-0.092)	**0.102** (0.093-0.111)	**0.118** (0.106-0.128)	**0.134** (0.121-0.146)	**0.152** (0.136-0.167)	**0.179** (0.157-0.196)	**0.201** (0.175-0.221)
4-day	**0.037** (0.034-0.040)	**0.044** (0.041-0.048)	**0.056** (0.052-0.061)	**0.066** (0.060-0.072)	**0.080** (0.073-0.087)	**0.091** (0.083-0.099)	**0.104** (0.094-0.113)	**0.117** (0.105-0.128)	**0.137** (0.121-0.149)	**0.153** (0.134-0.167)
7-day	**0.024** (0.022-0.027)	**0.029** (0.027-0.032)	**0.037** (0.034-0.040)	**0.043** (0.039-0.046)	**0.051** (0.047-0.056)	**0.058** (0.053-0.064)	**0.066** (0.060-0.072)	**0.074** (0.067-0.081)	**0.086** (0.076-0.094)	**0.096** (0.084-0.105)
10-day	**0.019** (0.018-0.021)	**0.023** (0.021-0.025)	**0.028** (0.026-0.031)	**0.033** (0.030-0.036)	**0.039** (0.036-0.042)	**0.044** (0.040-0.048)	**0.049** (0.045-0.053)	**0.055** (0.049-0.059)	**0.062** (0.056-0.068)	**0.069** (0.061-0.075)
20-day	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.018** (0.017-0.020)	**0.021** (0.020-0.022)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.030** (0.027-0.032)	**0.032** (0.030-0.034)	**0.036** (0.033-0.038)	**0.039** (0.035-0.042)
30-day	**0.011** (0.010-0.011)	**0.013** (0.012-0.013)	**0.015** (0.014-0.016)	**0.017** (0.016-0.018)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**0.022** (0.021-0.024)	**0.024** (0.022-0.025)	**0.026** (0.024-0.028)	**0.028** (0.026-0.030)
45-day	**0.009** (0.008-0.009)	**0.011** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.013-0.014)	**0.015** (0.014-0.016)	**0.016** (0.016-0.017)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.020** (0.019-0.021)	**0.021** (0.020-0.023)
60-day	**0.008** (0.008-0.008)	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.011-0.013)	**0.013** (0.013-0.014)	**0.014** (0.013-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)

[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.

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PF graphical

Basin 1

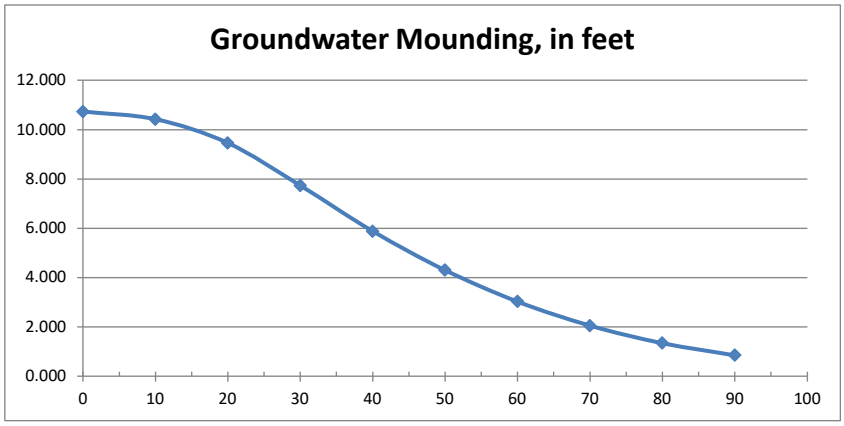
Input Values

5.00	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
25.00	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
27.830	x	1/2 length of basin (x direction, in feet)
45.470	y	1/2 width of basin (y direction, in feet)
9.34	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

20.726	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
10.726	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
10.726	0
10.419	10
9.456	20
7.727	30
5.873	40
4.298	50
3.022	60
2.044	70
1.334	80
0.844	90

Re-Calculate Now



Disclaimer

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Basin 1 - Modified

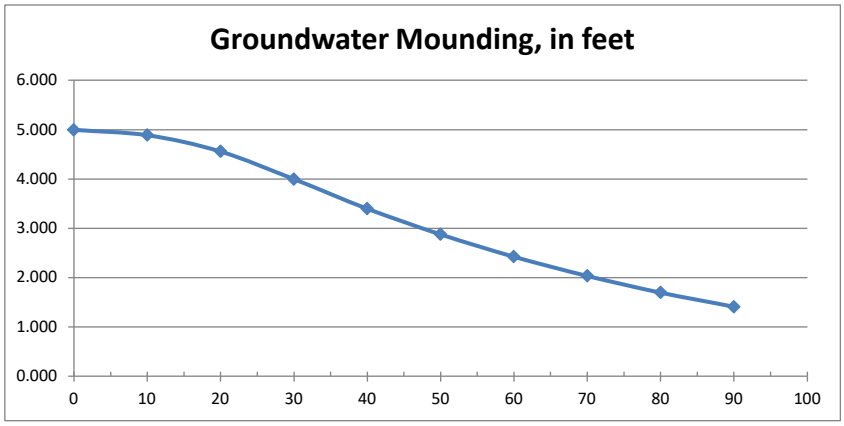
Input Values

1.22	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
25.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
27.830	x	1/2 length of basin (x direction, in feet)
45.470	y	1/2 width of basin (y direction, in feet)
38.22	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

14.993	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
4.993	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
4.993	0
4.886	10
4.556	20
3.993	30
3.395	40
2.874	50
2.421	60
2.030	70
1.694	80
1.406	90

Re-Calculate Now



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Basin 2

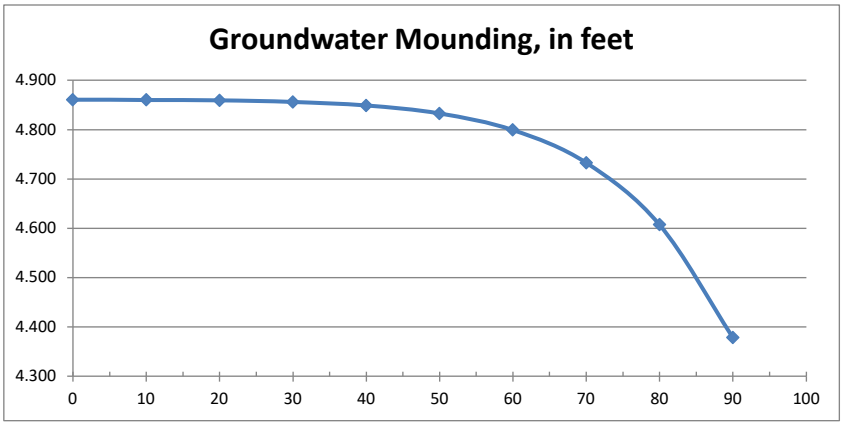
Input Values

5.00	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
25.00	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
115.845	x	1/2 length of basin (x direction, in feet)
13.510	y	1/2 width of basin (y direction, in feet)
3.68	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

14.861	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
4.861	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
4.861	0
4.860	10
4.859	20
4.856	30
4.849	40
4.833	50
4.799	60
4.732	70
4.607	80
4.378	90

Re-Calculate Now



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Basin 2 - Modified

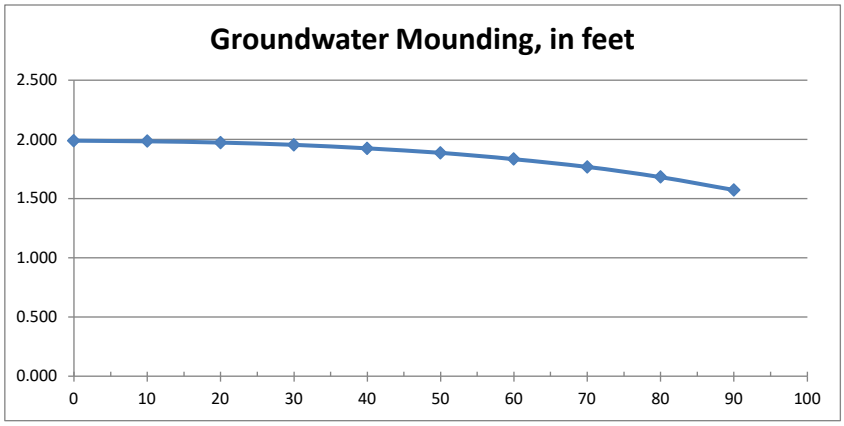
Input Values

0.62	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
25.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
115.845	x	1/2 length of basin (x direction, in feet)
13.510	y	1/2 width of basin (y direction, in feet)
29.66	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

11.989	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.989	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.989	0
1.985	10
1.973	20
1.953	30
1.925	40
1.885	50
1.834	60
1.768	70
1.682	80
1.572	90

Re-Calculate Now



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Basin B

Input Values

5.00	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
25.00	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
106.845	x	1/2 length of basin (x direction, in feet)
6.375	y	1/2 width of basin (y direction, in feet)
6.40	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

13.608	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
3.608	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
3.608	0
3.605	10
3.599	20
3.585	30
3.561	40
3.520	50
3.453	60
3.345	70
3.174	80
2.898	90

Re-Calculate Now

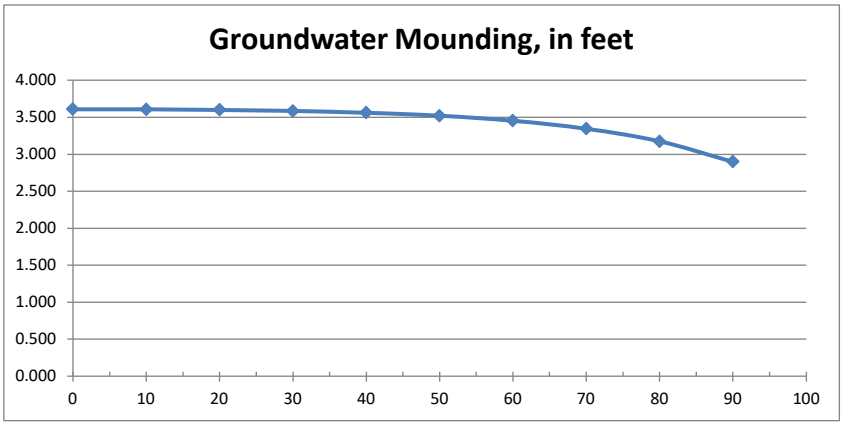

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Table 5-2: NJDEP 1.25-Inch/2-Hour Stormwater Runoff Water Quality Design Storm Rainfall Distribution

Time (Minutes)	Cumulative Rainfall (Inches)	Time (Minutes)	Cumulative Rainfall (Inches)	Time (Minutes)	Cumulative Rainfall (Inches)
1	0.00166	41	0.1728	81	1.0906
2	0.00332	42	0.1796	82	1.0972
3	0.00498	43	0.1864	83	1.1038
4	0.00664	44	0.1932	84	1.1104
5	0.00830	45	0.2000	85	1.1170
6	0.00996	46	0.2117	86	1.1236
7	0.01162	47	0.2233	87	1.1302
8	0.01328	48	0.2350	88	1.1368
9	0.01494	49	0.2466	89	1.1434
10	0.01660	50	0.2583	90	1.1500
11	0.01828	51	0.2783	91	1.1550
12	0.01996	52	0.2983	92	1.1600
13	0.02164	53	0.3183	93	1.1650
14	0.02332	54	0.3383	94	1.1700
15	0.02500	55	0.3583	95	1.1750
16	0.03000	56	0.4116	96	1.1800
17	0.03500	57	0.4650	97	1.1850
18	0.04000	58	0.5183	98	1.1900
19	0.04500	59	0.5717	99	1.1950
20	0.05000	60	0.6250	100	1.2000
21	0.05500	61	0.6783	101	1.2050
22	0.06000	62	0.7317	102	1.2100
23	0.06500	63	0.7850	103	1.2150
24	0.07000	64	0.8384	104	1.2200
25	0.07500	65	0.8917	105	1.2250
26	0.08000	66	0.9117	106	1.2267
27	0.08500	67	0.9317	107	1.2284
28	0.09000	68	0.9517	108	1.2300
29	0.09500	69	0.9717	109	1.2317
30	0.10000	70	0.9917	110	1.2334
31	0.10660	71	1.0034	111	1.2351
32	0.11320	72	1.0150	112	1.2367
33	0.11980	73	1.0267	113	1.2384
34	0.12640	74	1.0383	114	1.2400
35	0.13300	75	1.0500	115	1.2417
36	0.13960	76	1.0568	116	1.2434
37	0.14620	77	1.0636	117	1.2450
38	0.15280	78	1.0704	118	1.2467
39	0.15940	79	1.0772	119	1.2483
40	0.16600	80	1.0840	120	1.2500

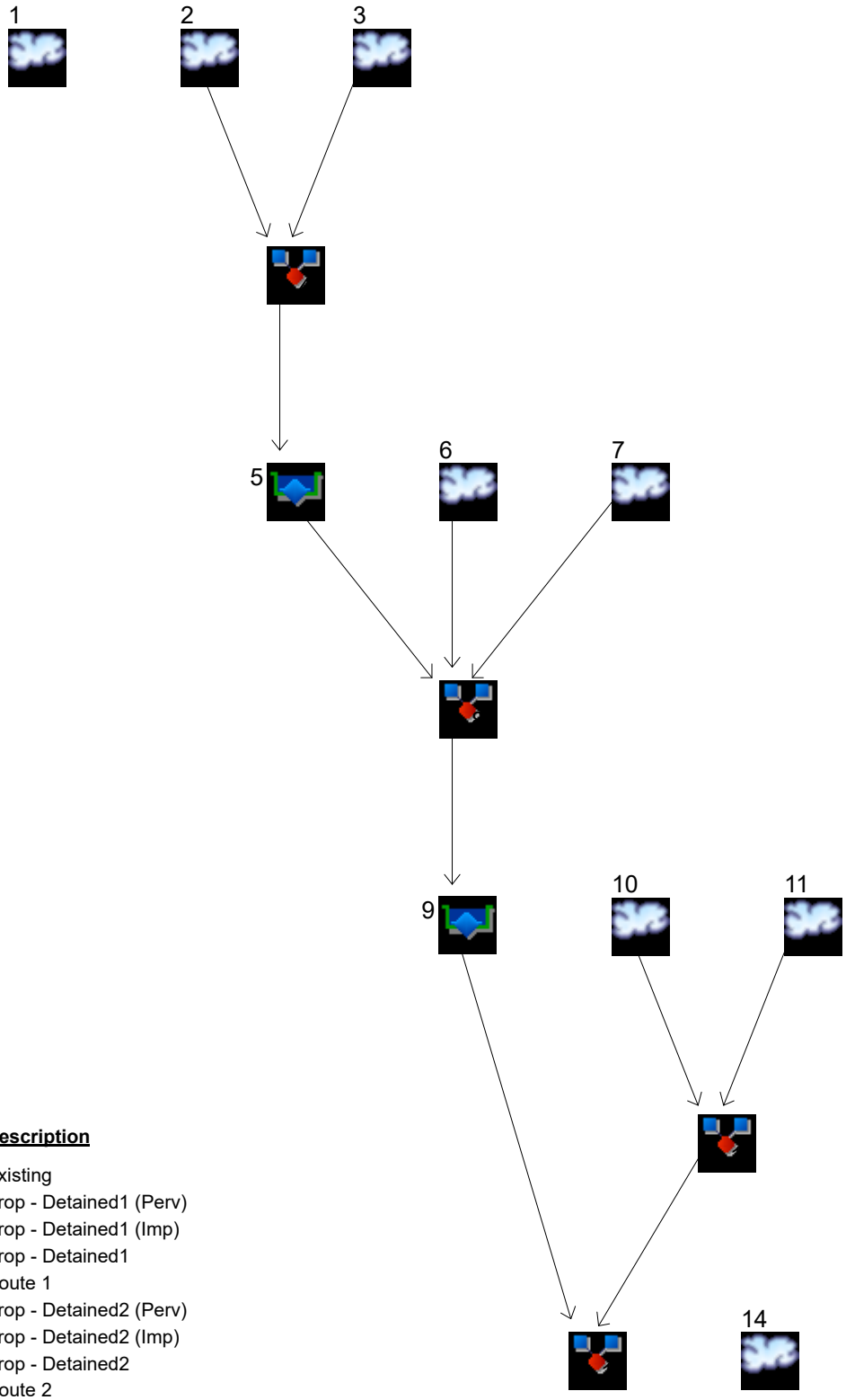
Hydraflow Table of Contents

21-210-3.gpw

Hydraflow Hydrographs by Intelisolve v9.25

Tuesday, Apr 9, 2024

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Existing
2	SCS Runoff	Prop - Detained1 (Perv)
3	SCS Runoff	Prop - Detained1 (Imp)
4	Combine	Prop - Detained1
5	Reservoir	Route 1
6	SCS Runoff	Prop - Detained2 (Perv)
7	SCS Runoff	Prop - Detained2 (Imp)
8	Combine	Prop - Detained2
9	Reservoir	Route 2
10	SCS Runoff	Prop - Bypass (Perv)
11	SCS Runoff	Prop - Bypass (Imp)
12	Combine	Prop - Bypass
13	Combine	Proposed
14	SCS Runoff	Building B

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.25

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	1.723	1	736	9,406	------	------	------	Existing
2	SCS Runoff	0.197	1	733	945	------	------	------	Prop - Detained1 (Perv)
3	SCS Runoff	4.117	1	728	14,655	------	------	------	Prop - Detained1 (Imp)
4	Combine	4.264	1	729	15,600	2, 3	------	------	Prop - Detained1
5	Reservoir	0.243	1	825	5,763	4	73.28	11,257	Route 1
6	SCS Runoff	0.567	1	737	2,679	------	------	------	Prop - Detained2 (Perv)
7	SCS Runoff	4.816	1	728	17,146	------	------	------	Prop - Detained2 (Imp)
8	Combine	5.191	1	729	25,588	5, 6, 7	------	------	Prop - Detained2
9	Reservoir	0.776	1	782	15,681	8	68.76	12,413	Route 2
10	SCS Runoff	0.438	1	730	1,556	------	------	------	Prop - Bypass (Perv)
11	SCS Runoff	0.028	1	728	101	------	------	------	Prop - Bypass (Imp)
12	Combine	0.465	1	730	1,657	10, 11	------	------	Prop - Bypass
13	Combine	0.858	1	776	17,338	9, 12	------	------	Proposed
14	SCS Runoff	0.722	1	728	2,569	------	------	------	Building B

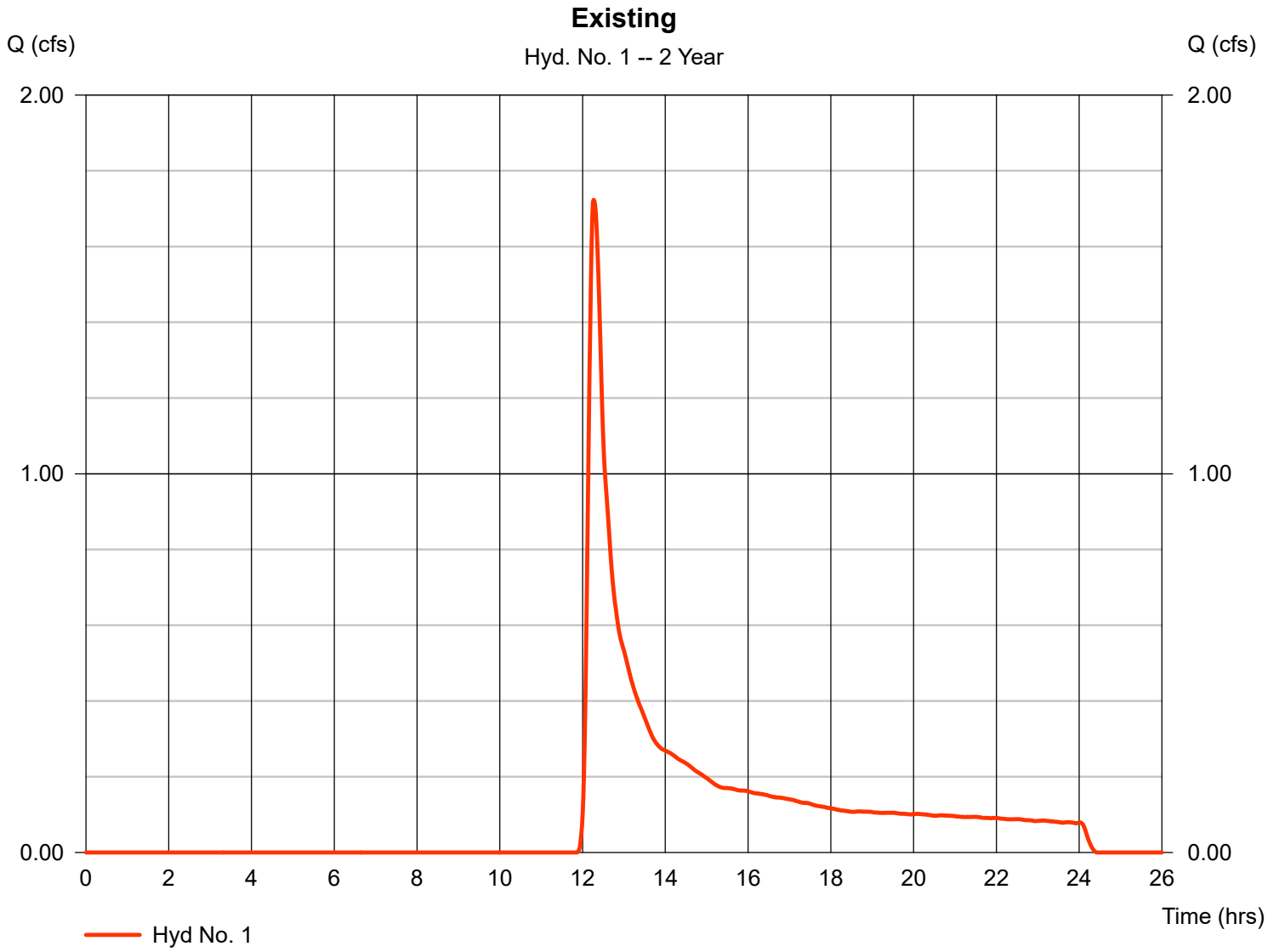
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.723 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.27 hrs
Time interval	=	1 min	Hyd. volume	=	9,406 cuft
Drainage area	=	5.225 ac	Curve number	=	61*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.20 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(2.994 x 55) + (2.231 x 70)] / 5.225



TR55 Tc Worksheet

Hyd. No. 1

Existing

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.31		0.00		0.00		
Land slope (%)	= 6.00		0.00		0.00		
Travel Time (min)	**= 13.61**	**+**	**0.00**	**+**	**0.00**	**=**	**13.61**
Shallow Concentrated Flow							
Flow length (ft)	= 361.00		0.00		0.00		
Watercourse slope (%)	= 5.80		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 3.89		0.00		0.00		
Travel Time (min)	**= 1.55**	**+**	**0.00**	**+**	**0.00**	**=**	**1.55**
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		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 15.20 min

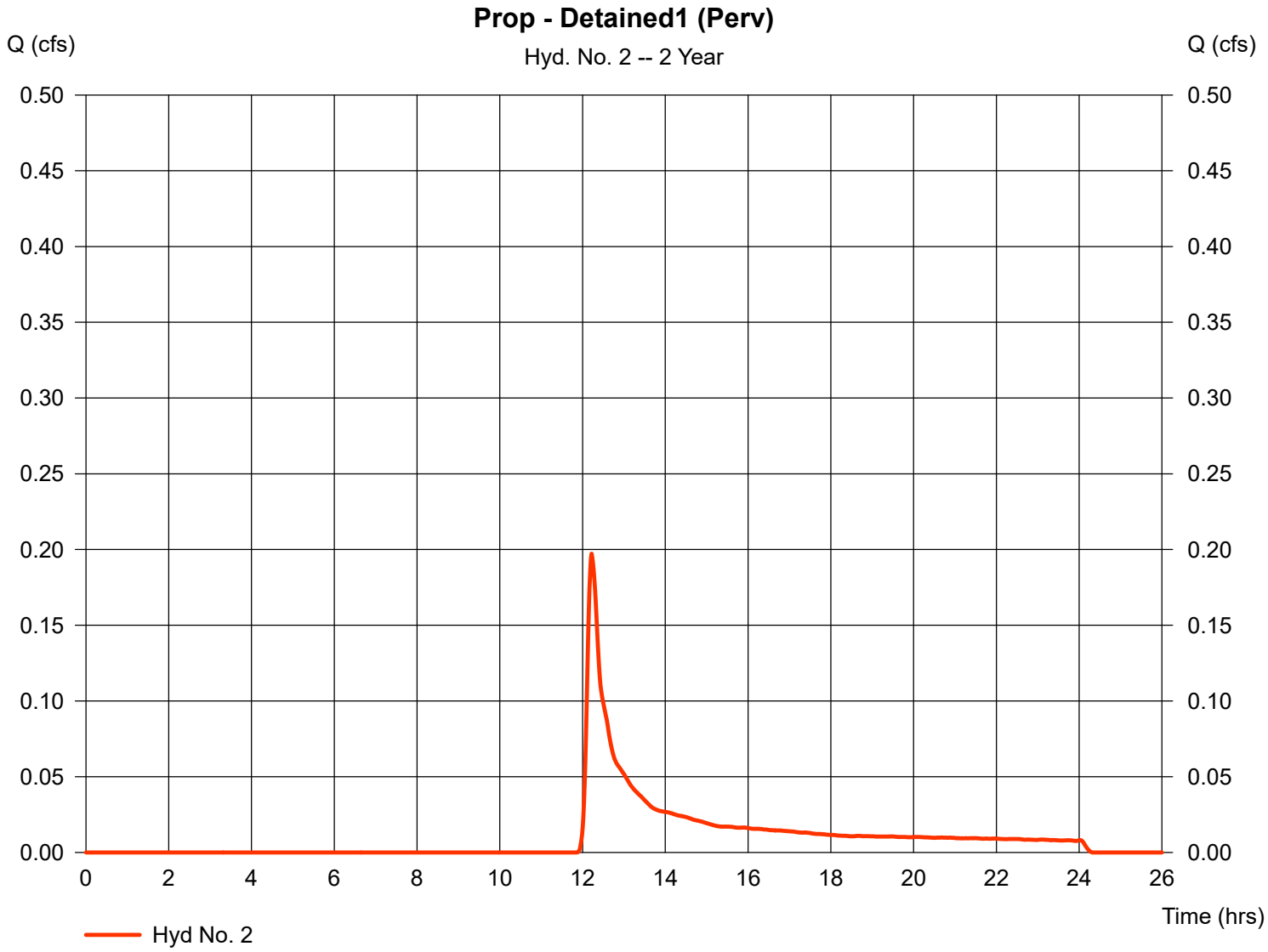
Hydrograph Report

Hyd. No. 2

Prop - Detained1 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.197 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.22 hrs
Time interval	=	1 min	Hyd. volume	=	945 cuft
Drainage area	=	0.540 ac	Curve number	=	61*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.20 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.020 x 74)] / 0.540



TR55 Tc Worksheet

Hyd. No. 2

Prop - Detained1 (Perv)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.31		0.00		0.00		
Land slope (%)	= 3.30		0.00		0.00		
Travel Time (min)	**= 11.48**	**+**	**0.00**	**+**	**0.00**	**=**	**11.48**
Shallow Concentrated Flow							
Flow length (ft)	= 167.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 3.64		0.00		0.00		
Travel Time (min)	**= 0.76**	**+**	**0.00**	**+**	**0.00**	**=**	**0.76**
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		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

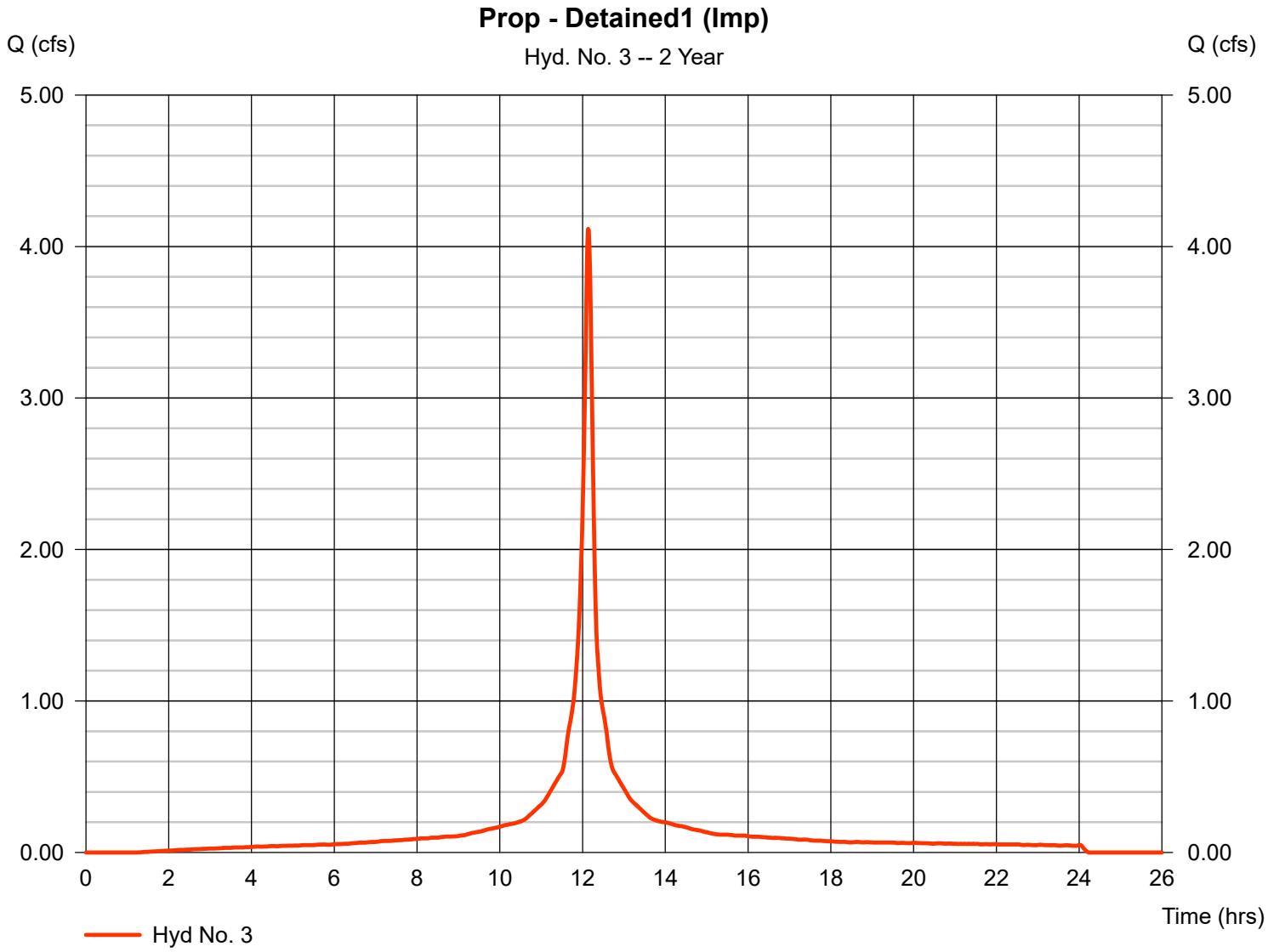
Total Travel Time, Tc ..... 12.20 min

Hydrograph Report

Hyd. No. 3

Prop - Detained1 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.117 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	14,655 cuft
Drainage area	=	1.312 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

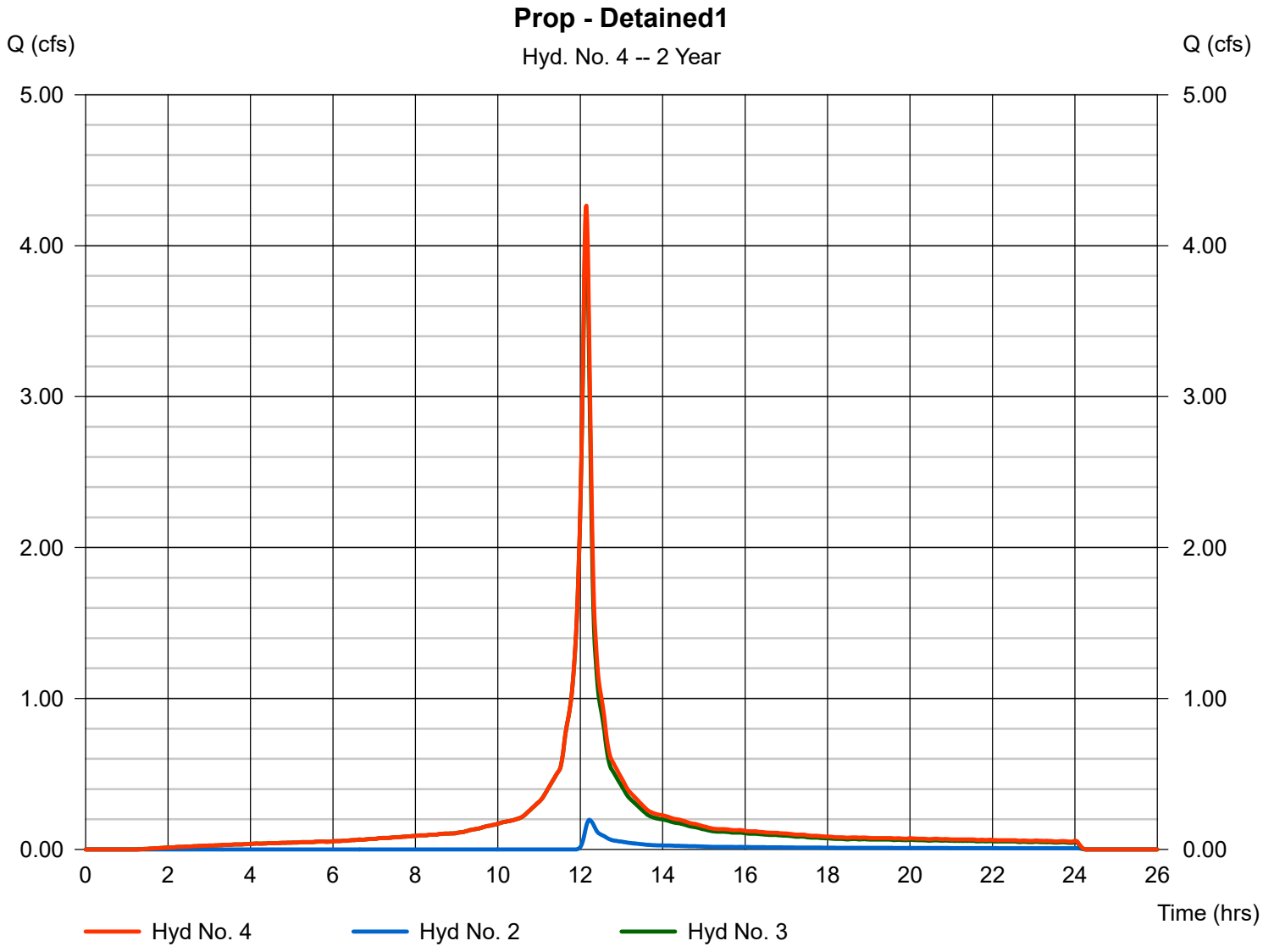


Hydrograph Report

Hyd. No. 4

Prop - Detained1

Hydrograph type	= Combine	Peak discharge	= 4.264 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 15,600 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 1.852 ac



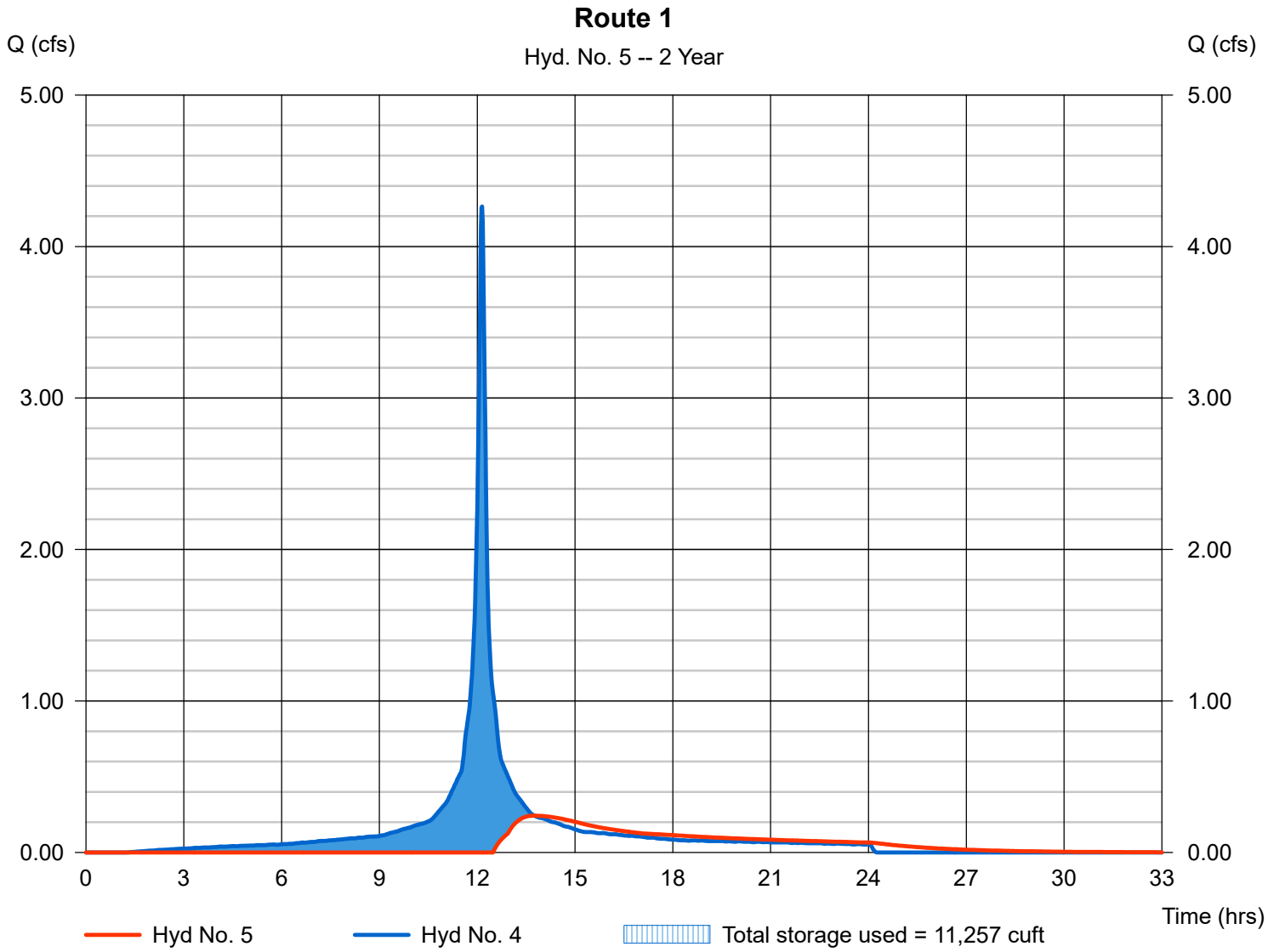
Hydrograph Report

Hyd. No. 5

Route 1

Hydrograph type	=	Reservoir	Peak discharge	=	0.243 cfs
Storm frequency	=	2 yrs	Time to peak	=	13.75 hrs
Time interval	=	1 min	Hyd. volume	=	5,763 cuft
Inflow hyd. No.	=	4 - Prop - Detained1	Max. Elevation	=	73.28 ft
Reservoir name	=	Basin 1	Max. Storage	=	11,257 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Basin 1

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 71.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	71.00	4,550	0	0
1.00	72.00	4,870	4,710	4,710
3.00	74.00	5,367	10,237	14,947
5.00	76.00	5,675	11,042	25,989

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	7.00	0.00	0.00
Span (in)	= 15.00	7.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 72.50	73.00	0.00	0.00
Length (ft)	= 43.00	0.00	0.00	0.00
Slope (%)	= 5.00	0.00	0.00	n/a
N-Value	= .012	.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)	= 16.00	4.00	0.00	0.00
Crest El. (ft)	= 75.00	74.25	0.00	0.00
Weir Coeff.	= 3.20	3.20	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	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	71.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
1.00	4,710	72.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
3.00	14,947	74.00	1.09 ic	1.08 ic	---	---	0.00	0.00	---	---	---	---	1.083
5.00	25,989	76.00	10.01 ic	0.08 ic	---	---	6.73 s	3.14 s	---	---	---	---	9.944

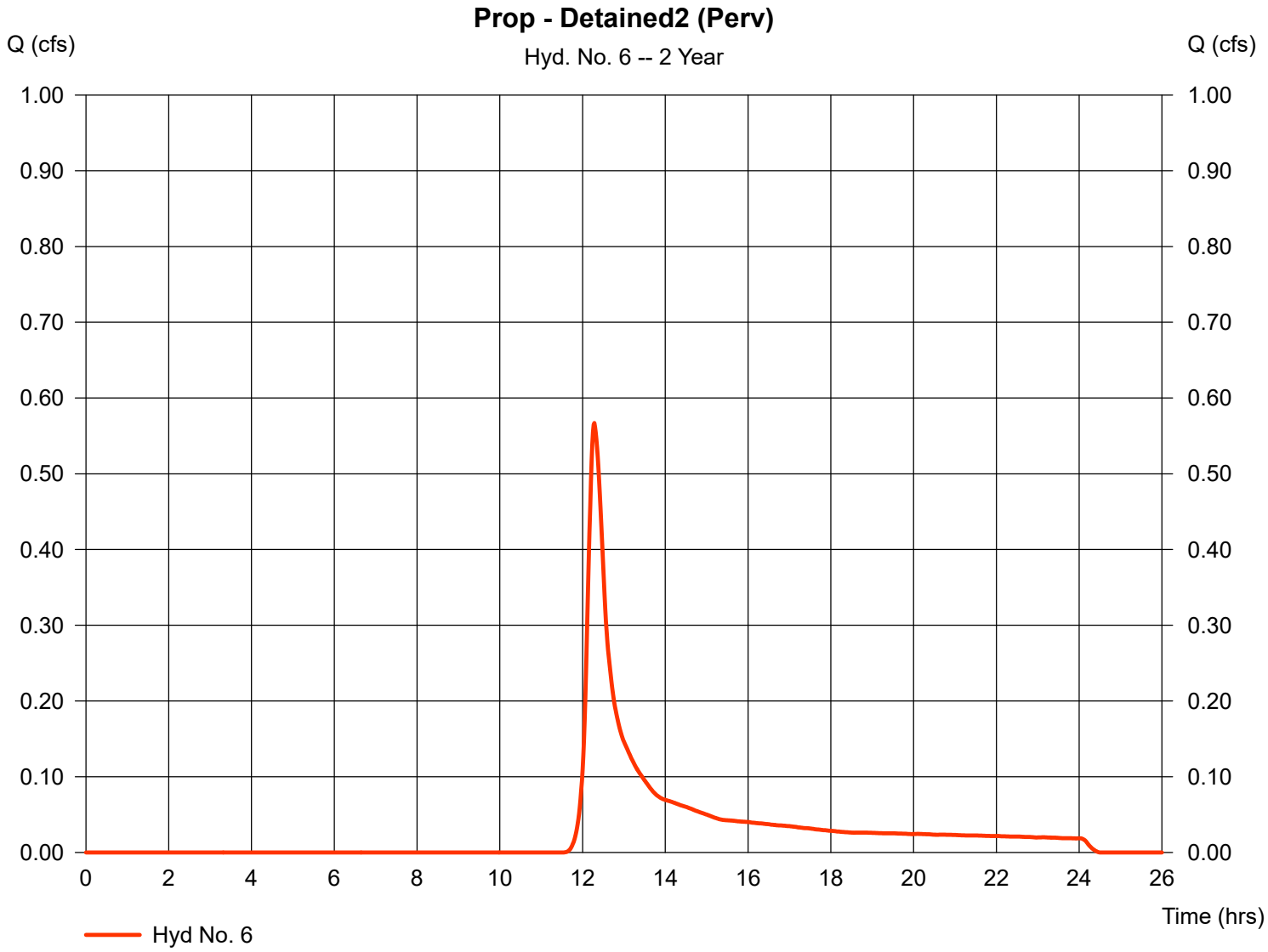
Hydrograph Report

Hyd. No. 6

Prop - Detained2 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.567 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.28 hrs
Time interval	=	1 min	Hyd. volume	=	2,679 cuft
Drainage area	=	0.990 ac	Curve number	=	67*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.30 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.470 x 74)] / 0.990



TR55 Tc Worksheet

Hyd. No. 6

Prop - Detained2 (Perv)

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.31	0.00	0.00	
Land slope (%)	= 2.80	0.00	0.00	
Travel Time (min)	**= 12.26 +**	**0.00 +**	**0.00 =**	**12.26**
Shallow Concentrated Flow				
Flow length (ft)	= 0.00	0.00	0.00	
Watercourse slope (%)	= 0.00	0.00	0.00	
Surface description	= Unpaved	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)	= 2.50	1.23	0.00	
Wetted perimeter (ft)	= 5.39	3.14	0.00	
Channel slope (%)	= 2.90	1.20	0.00	
Manning's n-value	= 0.240	0.012	0.015	
Velocity (ft/s)	= 0.63	7.26	0.00	
Flow length (ft)	= 232.0	410.0	0.0	
Travel Time (min)	**= 6.12 +**	**0.94 +**	**0.00 =**	**7.06**

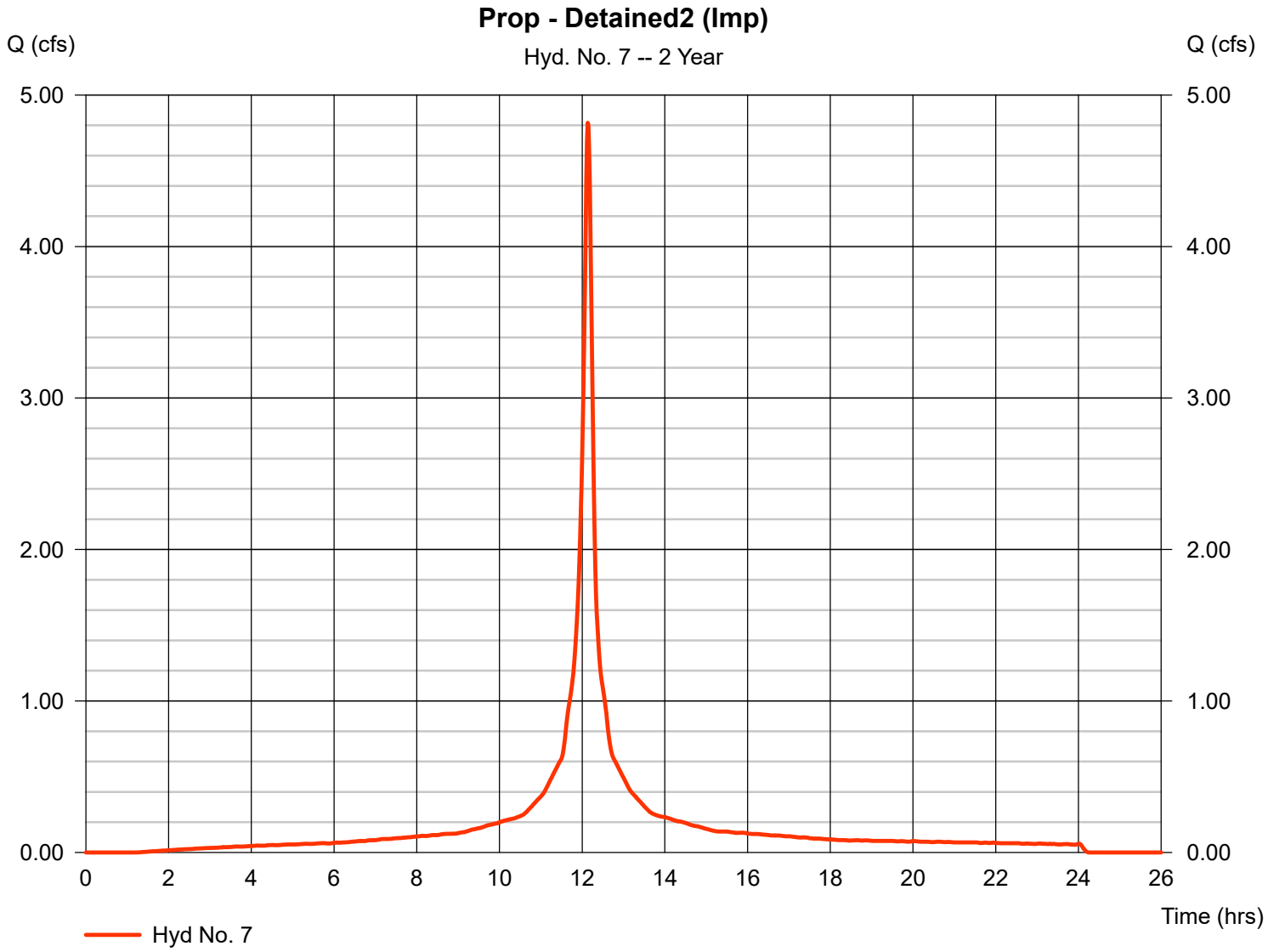
Total Travel Time, Tc ..... 19.30 min

Hydrograph Report

Hyd. No. 7

Prop - Detained2 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.816 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	17,146 cuft
Drainage area	=	1.535 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

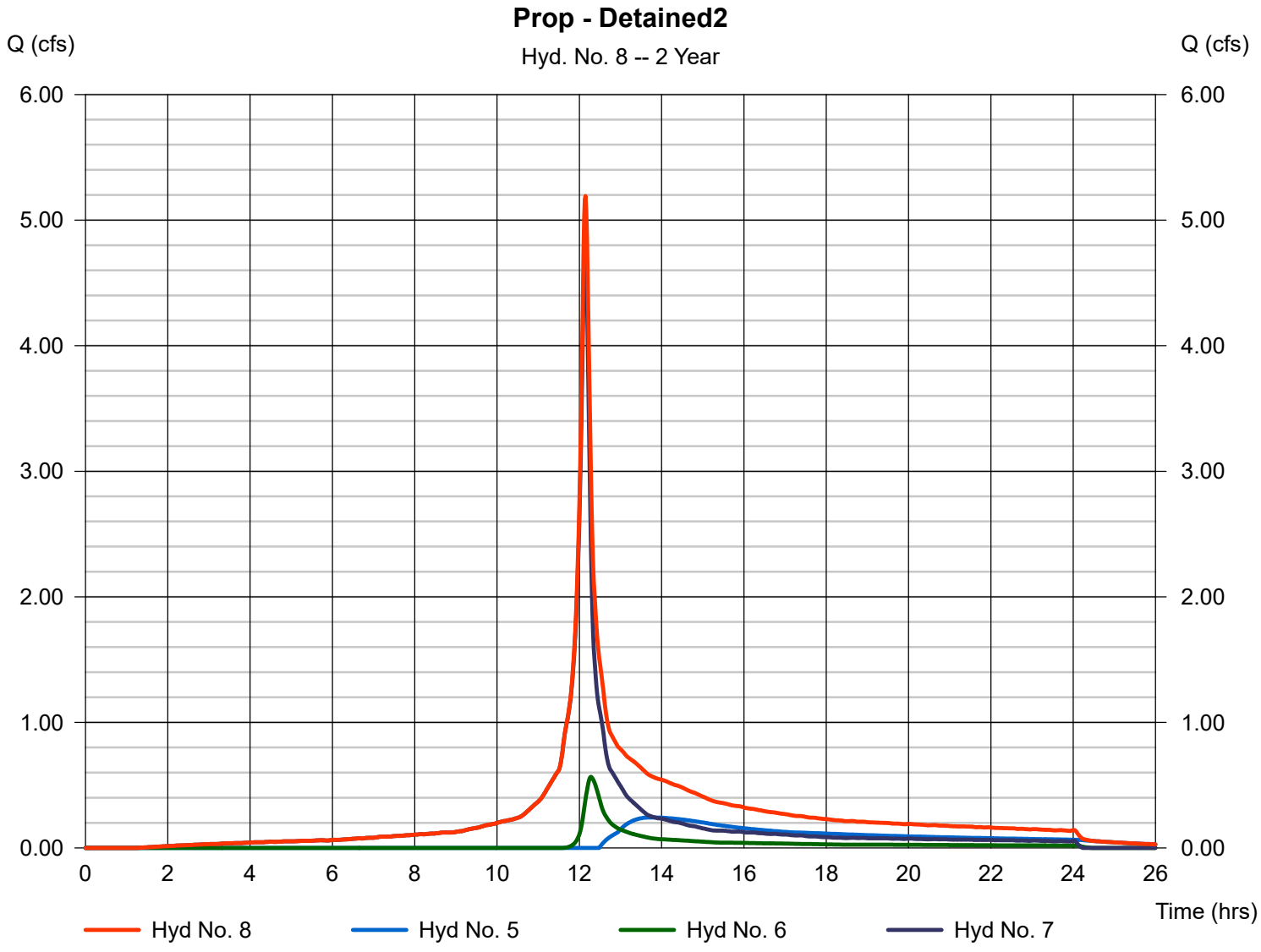


Hydrograph Report

Hyd. No. 8

Prop - Detained2

Hydrograph type	= Combine	Peak discharge	= 5.191 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 25,588 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 2.525 ac



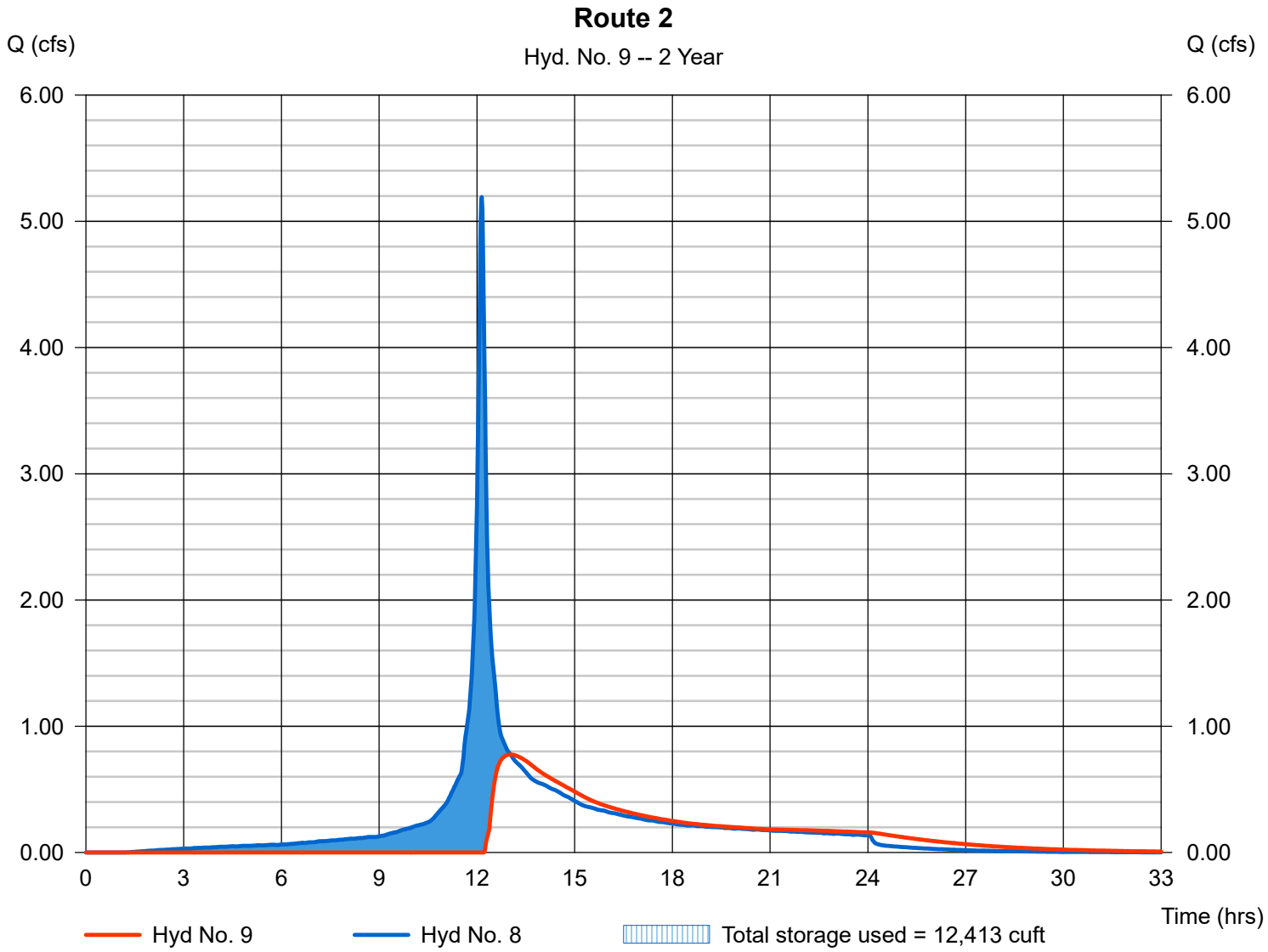
Hydrograph Report

Hyd. No. 9

Route 2

Hydrograph type	=	Reservoir	Peak discharge	=	0.776 cfs
Storm frequency	=	2 yrs	Time to peak	=	13.03 hrs
Time interval	=	1 min	Hyd. volume	=	15,681 cuft
Inflow hyd. No.	=	8 - Prop - Detained2	Max. Elevation	=	68.76 ft
Reservoir name	=	Basin 2	Max. Storage	=	12,413 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - Basin 2

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 67.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	67.00	6,921	0	0
2.00	69.00	7,221	14,142	14,142
4.00	71.00	7,521	14,742	28,884

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	Inactive	Inactive	0.00
Span (in)	= 18.00	21.00	15.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 67.00	68.50	68.50	0.00
Length (ft)	= 26.00	0.00	0.00	0.00
Slope (%)	= 4.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	1.80	0.00	0.00
Crest El. (ft)	= 70.33	68.50	0.00	0.00
Weir Coeff.	= 3.20	3.20	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	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	67.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
2.00	14,142	69.00	2.04 ic	0.00	0.00	---	0.00	2.04	---	---	---	---	2.036
4.00	28,884	71.00	15.26 ic	0.00	0.00	---	10.23 s	5.02 s	---	---	---	---	15.25

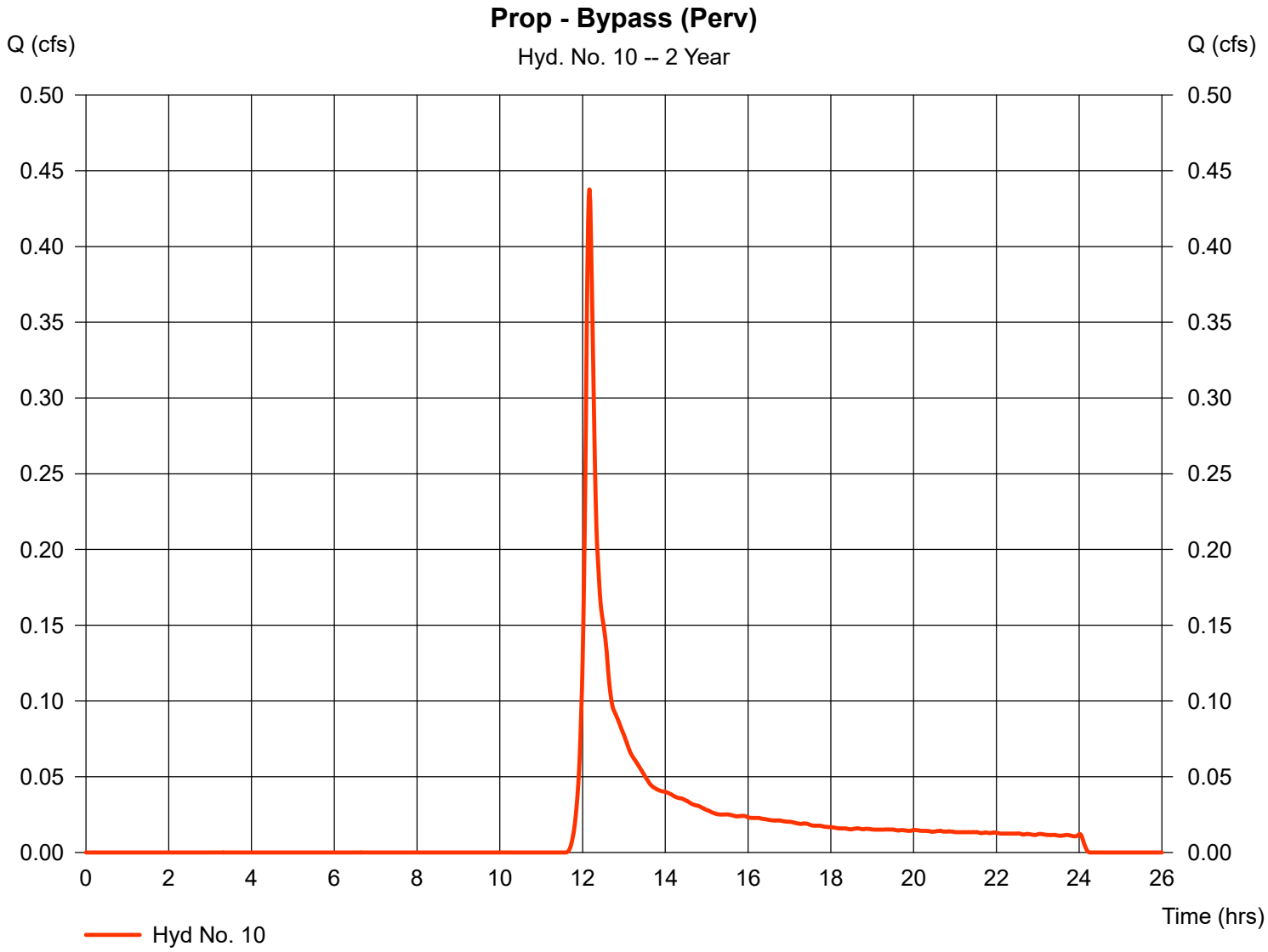
Hydrograph Report

Hyd. No. 10

Prop - Bypass (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.438 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.17 hrs
Time interval	=	1 min	Hyd. volume	=	1,556 cuft
Drainage area	=	0.613 ac	Curve number	=	66*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.380 x 61) + (0.233 x 74)] / 0.613

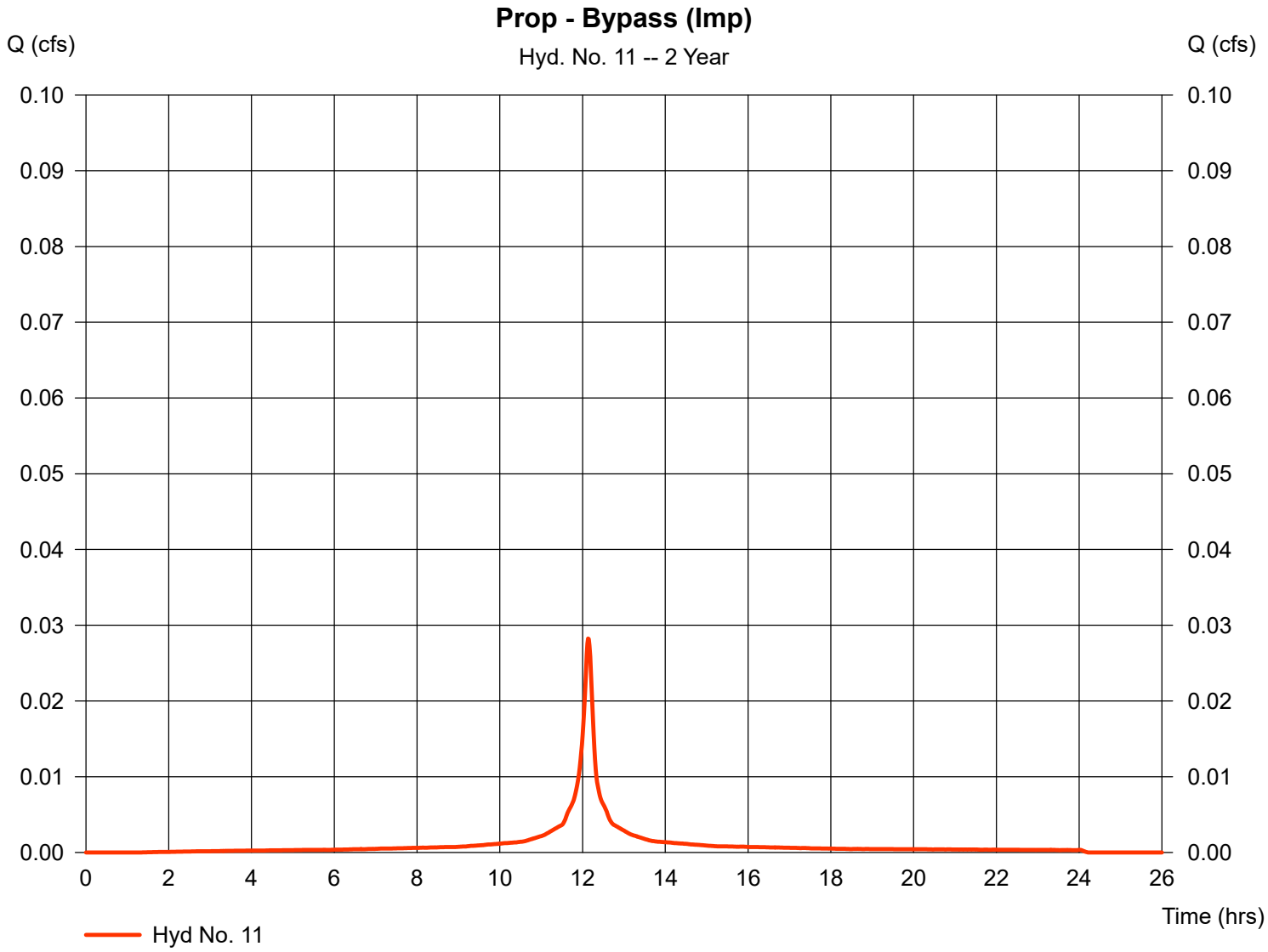


Hydrograph Report

Hyd. No. 11

Prop - Bypass (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.028 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	101 cuft
Drainage area	=	0.009 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

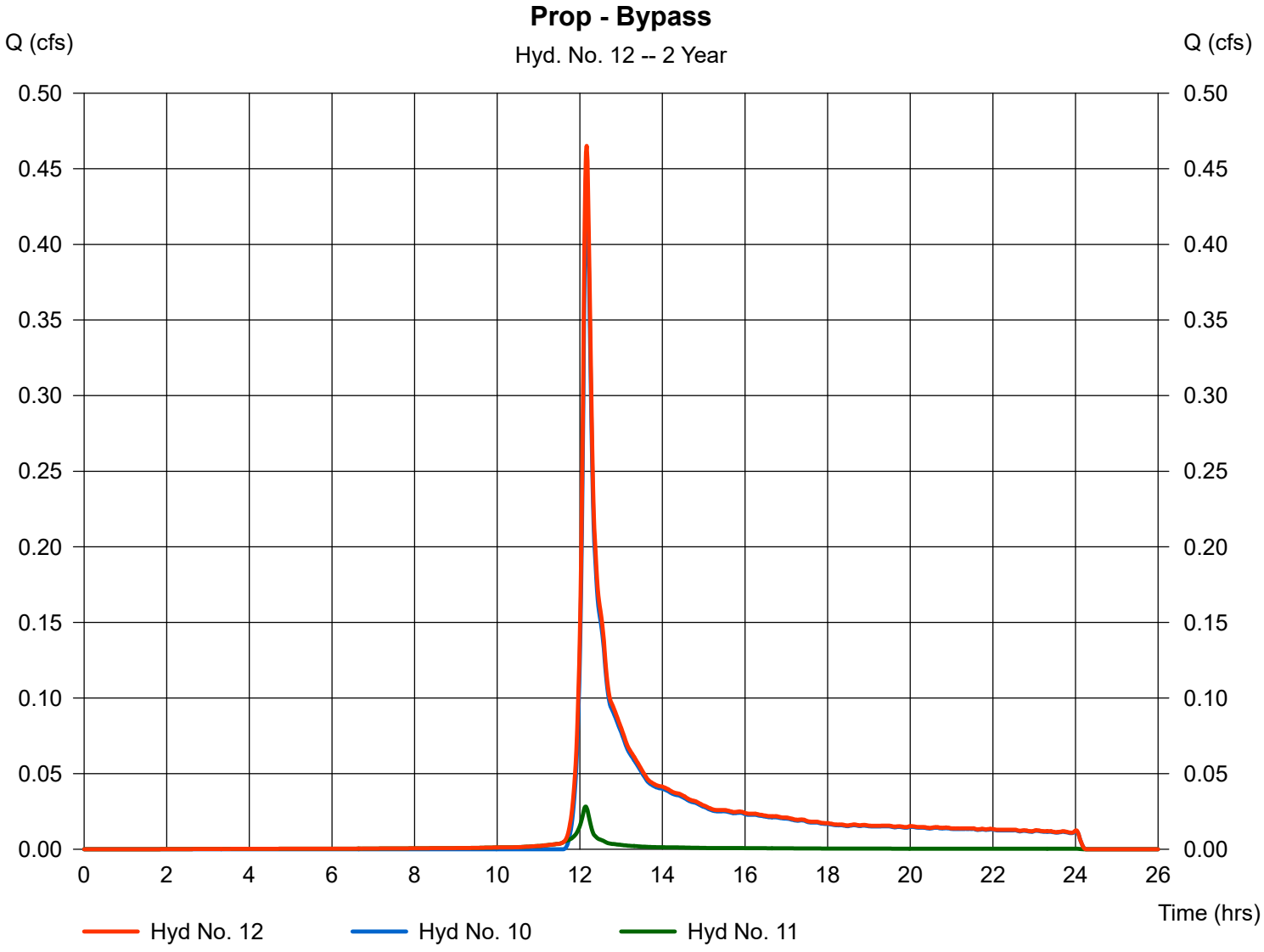


Hydrograph Report

Hyd. No. 12

Prop - Bypass

Hydrograph type	=	Combine	Peak discharge	=	0.465 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.17 hrs
Time interval	=	1 min	Hyd. volume	=	1,657 cuft
Inflow hyds.	=	10, 11	Contrib. drain. area	=	0.622 ac

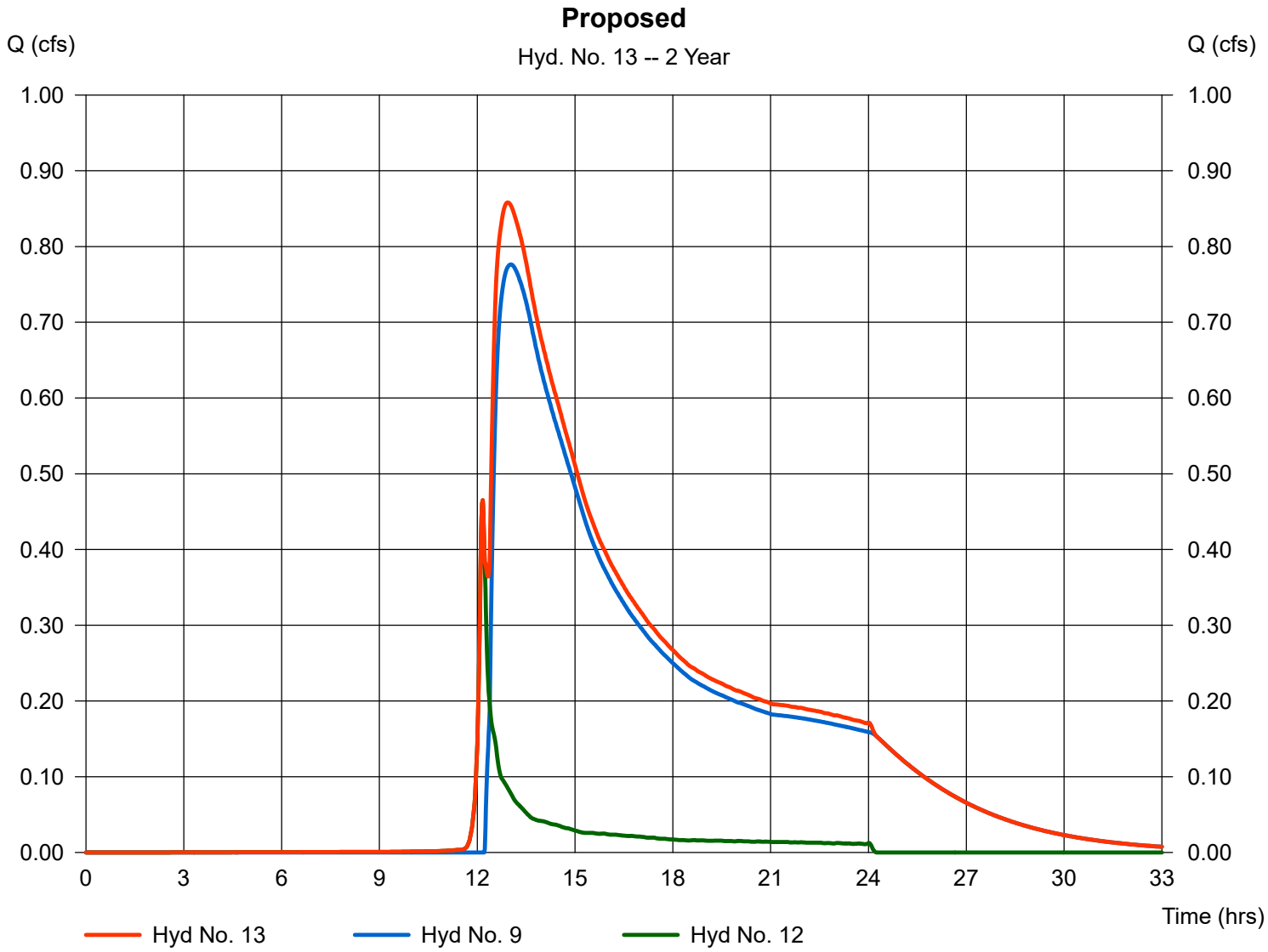


Hydrograph Report

Hyd. No. 13

Proposed

Hydrograph type	= Combine	Peak discharge	= 0.858 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.93 hrs
Time interval	= 1 min	Hyd. volume	= 17,338 cuft
Inflow hyds.	= 9, 12	Contrib. drain. area	= 0.000 ac

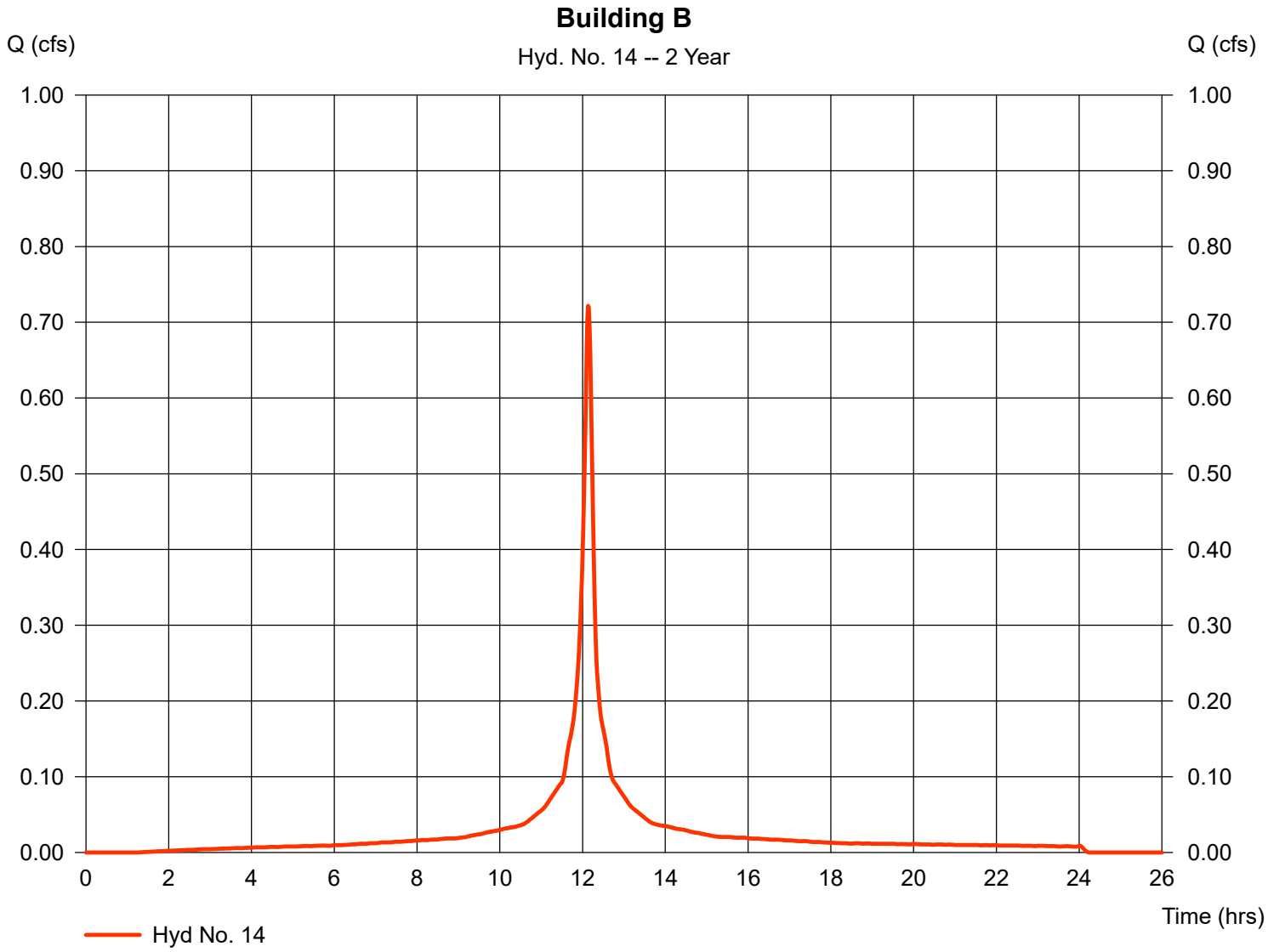


Hydrograph Report

Hyd. No. 14

Building B

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.722 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	2,569 cuft
Drainage area	=	0.230 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.25

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	6.431	1	734	26,407	------	------	------	Existing
2	SCS Runoff	0.722	1	732	2,653	------	------	------	Prop - Detained1 (Perv)
3	SCS Runoff	6.273	1	728	22,732	------	------	------	Prop - Detained1 (Imp)
4	Combine	6.923	1	729	25,386	2, 3	------	------	Prop - Detained1
5	Reservoir	1.109	1	761	15,549	4	74.04	15,145	Route 1
6	SCS Runoff	1.541	1	736	6,505	------	------	------	Prop - Detained2 (Perv)
7	SCS Runoff	7.339	1	728	26,596	------	------	------	Prop - Detained2 (Imp)
8	Combine	8.873	1	729	48,650	5, 6, 7	------	------	Prop - Detained2
9	Reservoir	4.266	1	744	38,743	8	69.32	16,468	Route 2
10	SCS Runoff	1.215	1	729	3,860	------	------	------	Prop - Bypass (Perv)
11	SCS Runoff	0.043	1	728	156	------	------	------	Prop - Bypass (Imp)
12	Combine	1.257	1	729	4,016	10, 11	------	------	Prop - Bypass
13	Combine	4.717	1	742	42,758	9, 12	------	------	Proposed
14	SCS Runoff	1.100	1	728	3,985	------	------	------	Building B

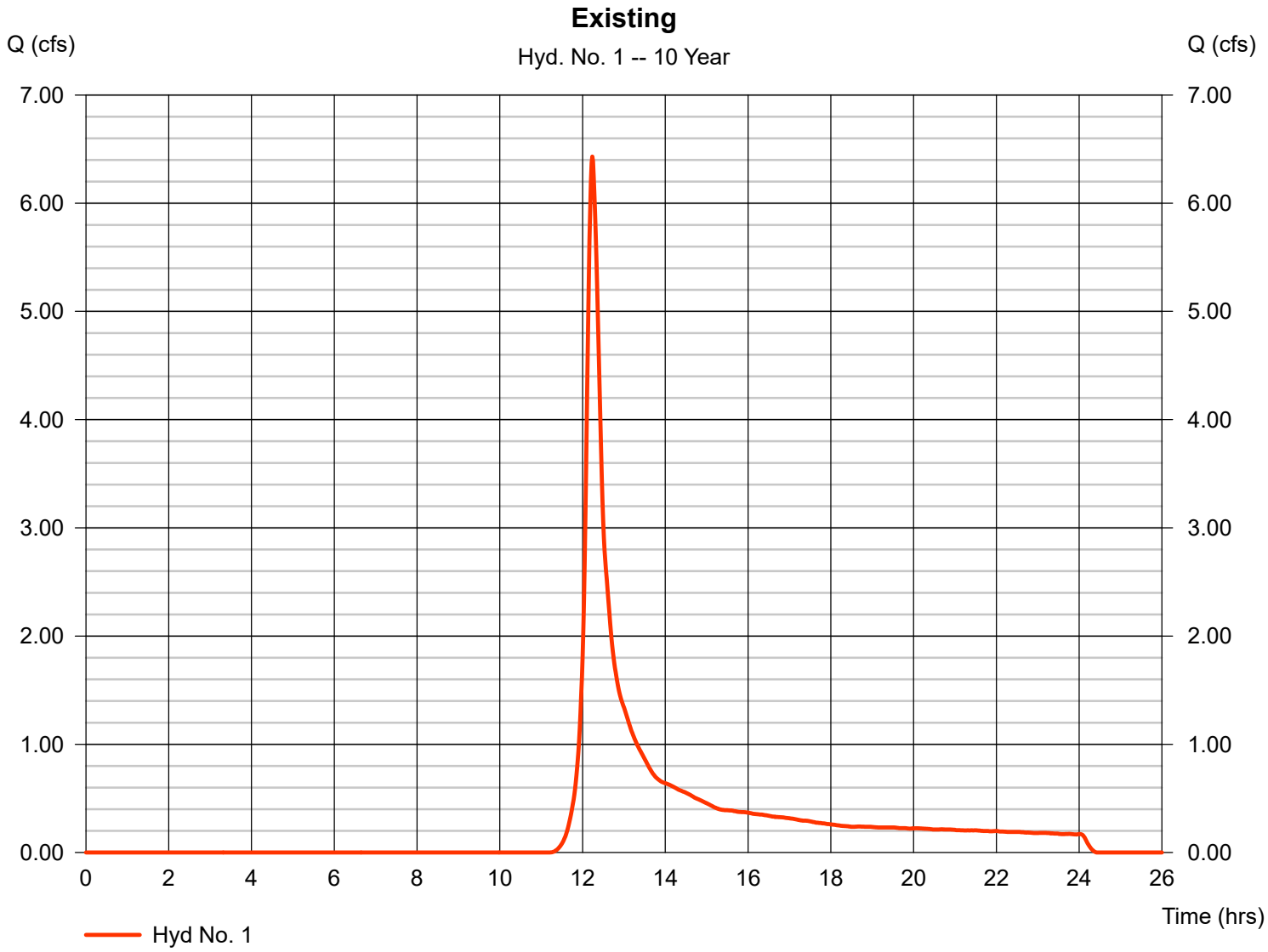
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.431 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.23 hrs
Time interval	=	1 min	Hyd. volume	=	26,407 cuft
Drainage area	=	5.225 ac	Curve number	=	61*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.20 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(2.994 x 55) + (2.231 x 70)] / 5.225



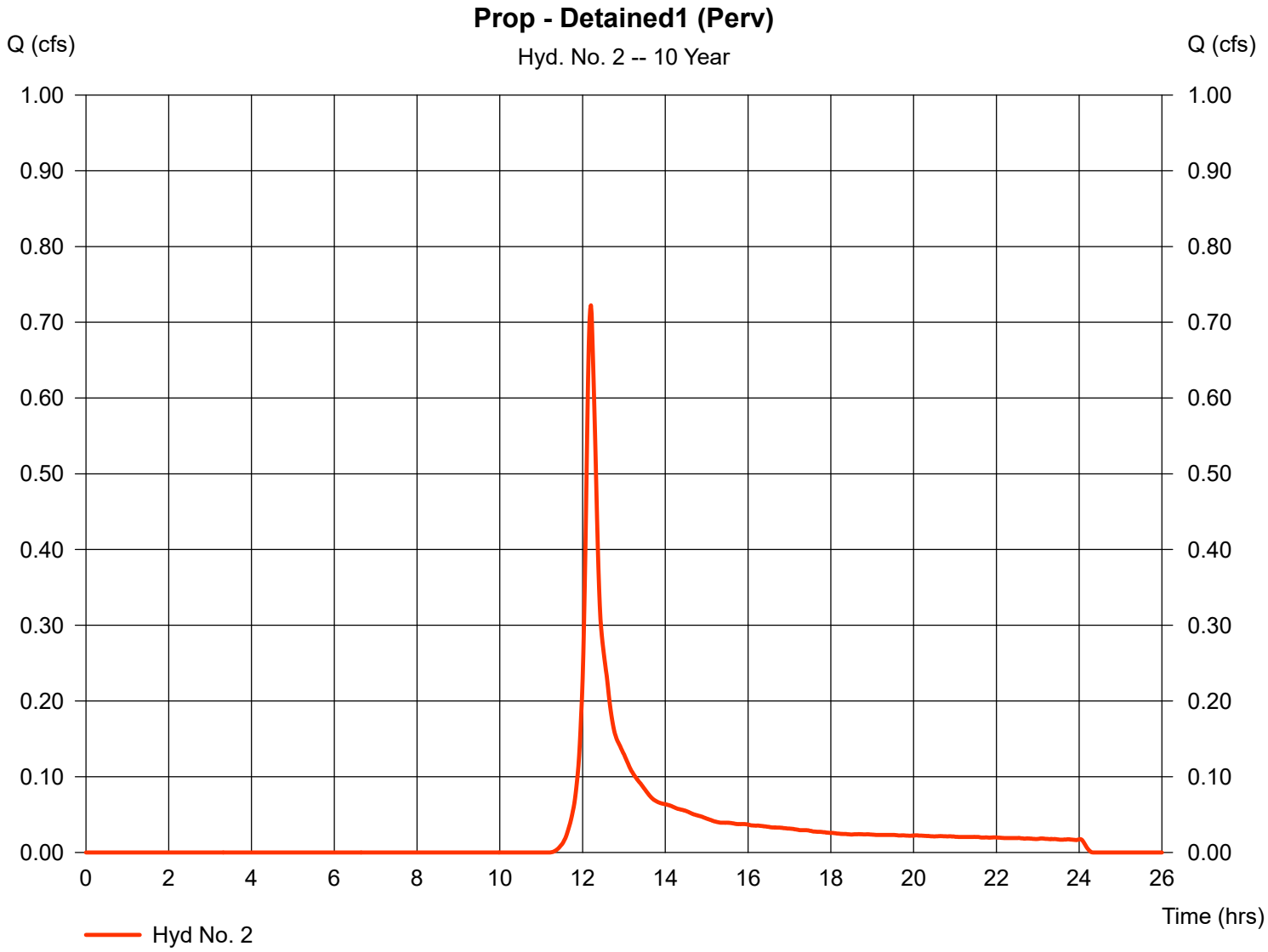
Hydrograph Report

Hyd. No. 2

Prop - Detained1 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.722 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	1 min	Hyd. volume	=	2,653 cuft
Drainage area	=	0.540 ac	Curve number	=	61*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.20 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.020 x 74)] / 0.540

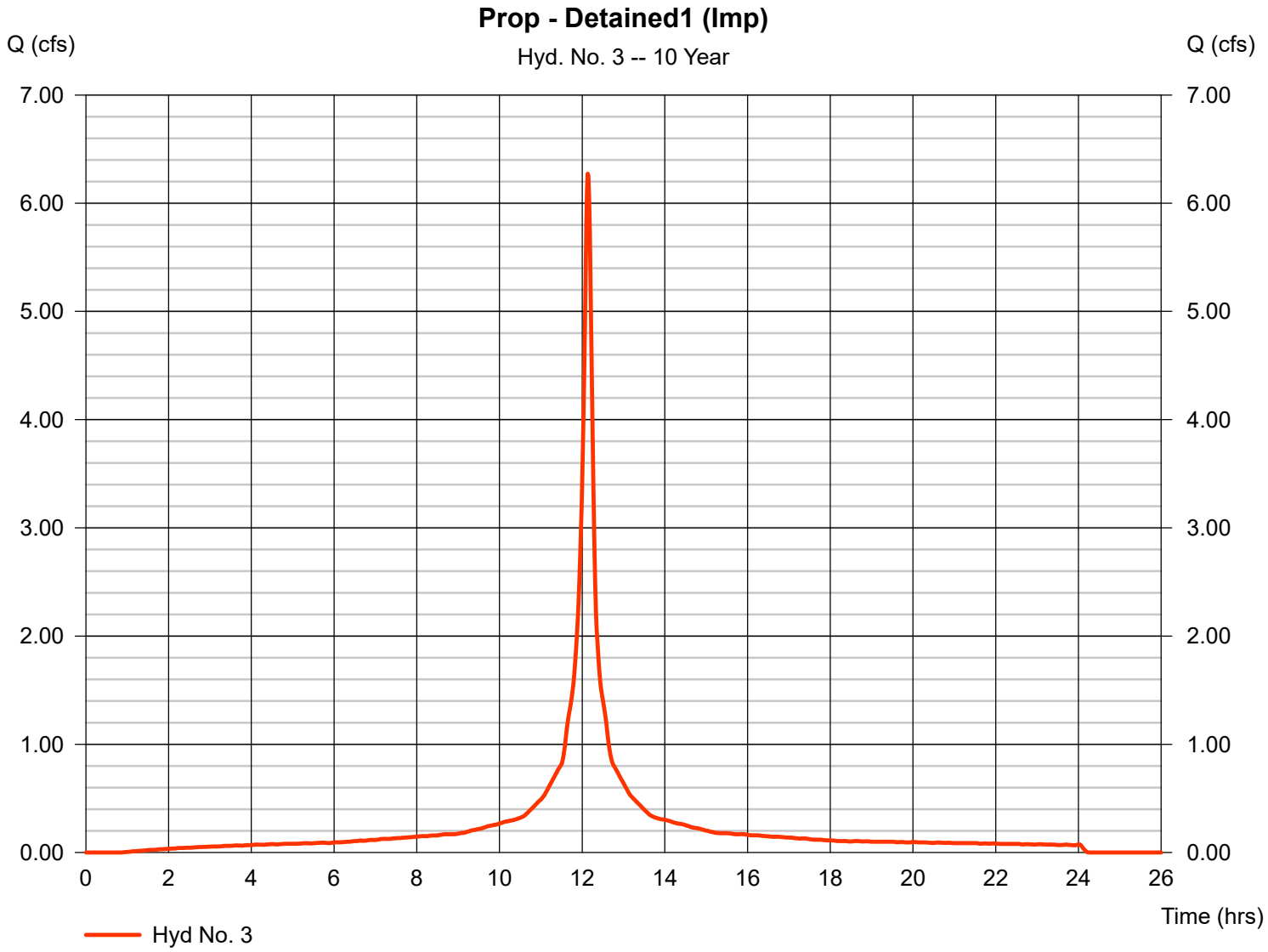


Hydrograph Report

Hyd. No. 3

Prop - Detained1 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.273 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	22,732 cuft
Drainage area	=	1.312 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

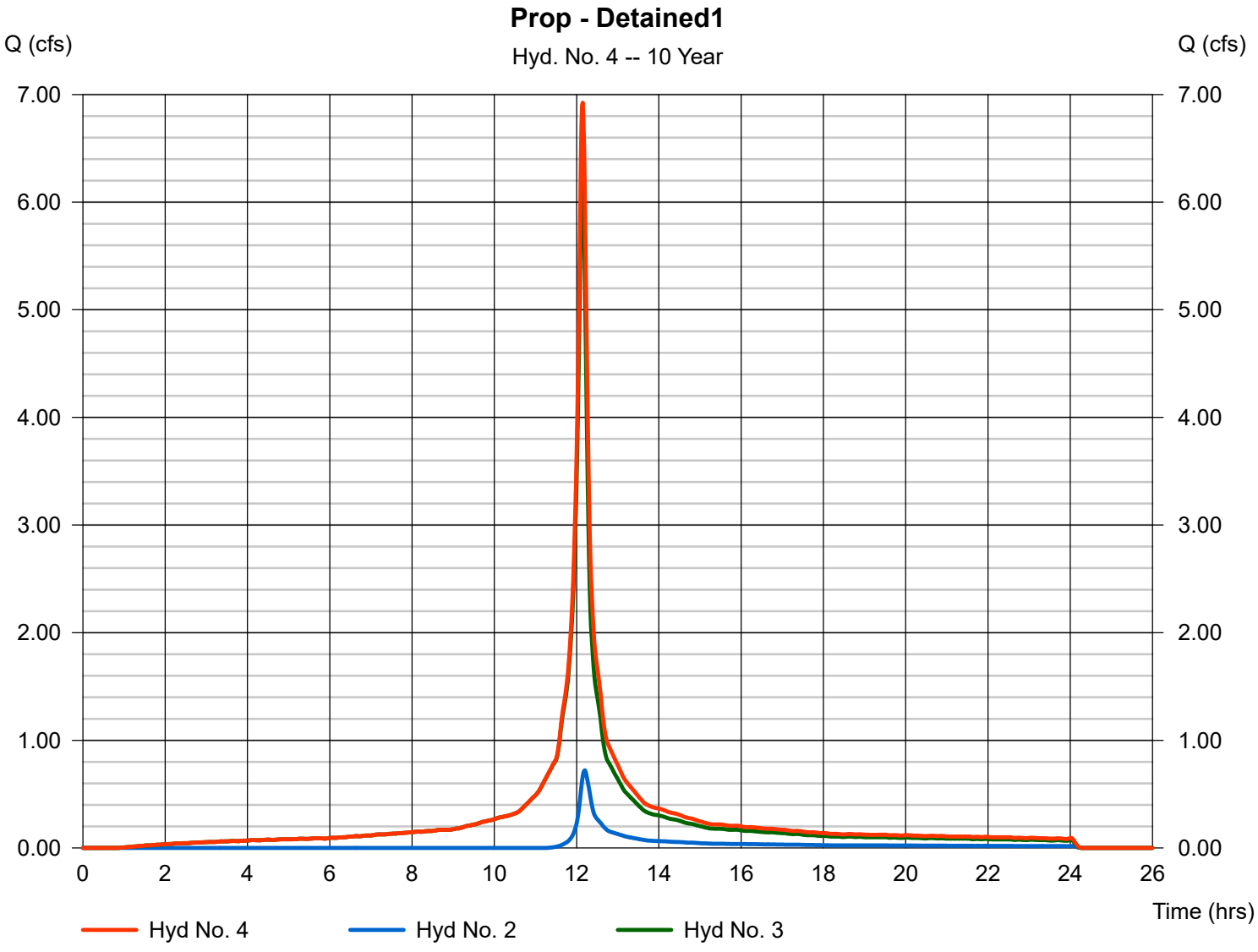


Hydrograph Report

Hyd. No. 4

Prop - Detained1

Hydrograph type	= Combine	Peak discharge	= 6.923 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 25,386 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 1.852 ac



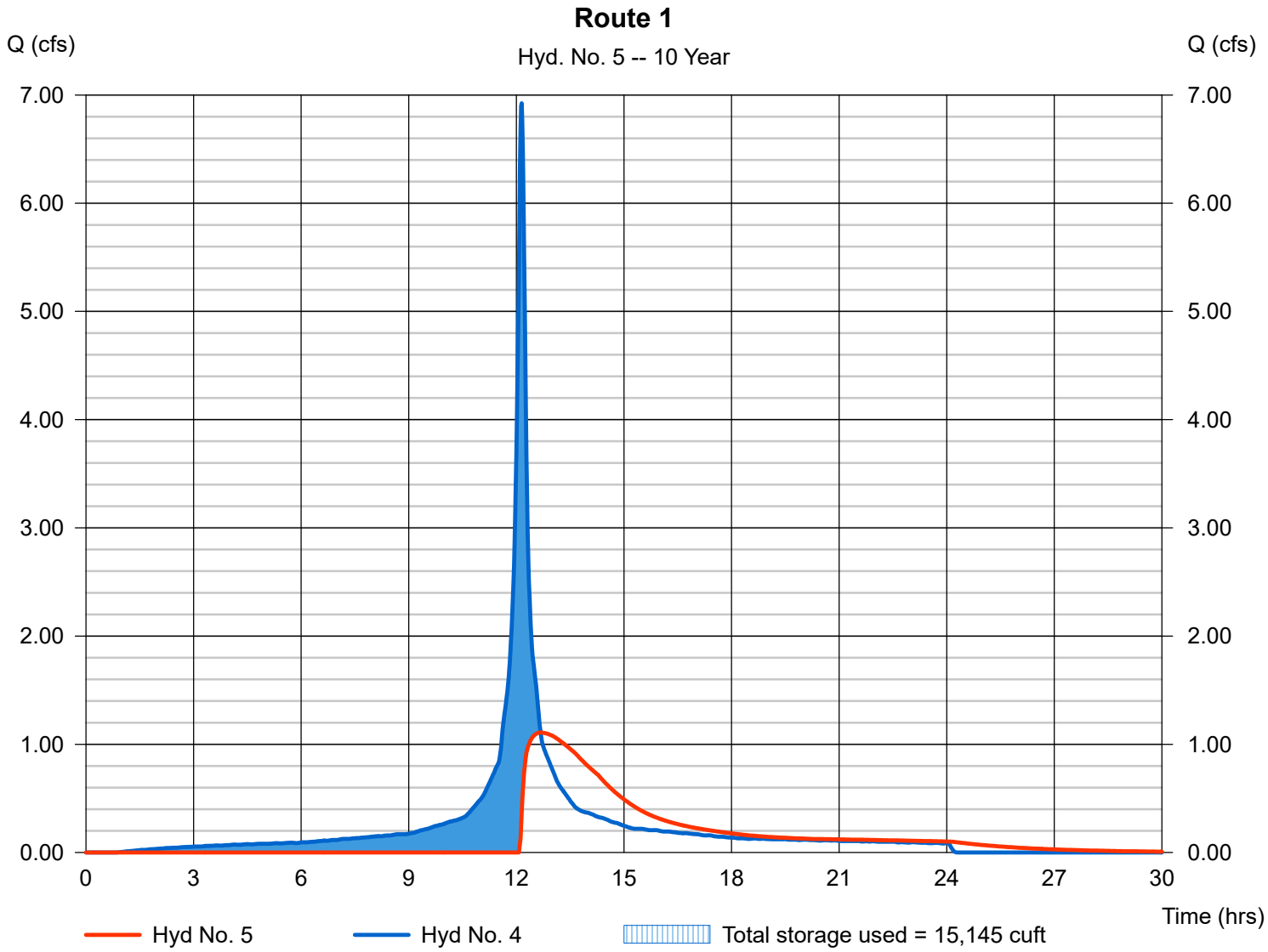
Hydrograph Report

Hyd. No. 5

Route 1

Hydrograph type	=	Reservoir	Peak discharge	=	1.109 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.68 hrs
Time interval	=	1 min	Hyd. volume	=	15,549 cuft
Inflow hyd. No.	=	4 - Prop - Detained1	Max. Elevation	=	74.04 ft
Reservoir name	=	Basin 1	Max. Storage	=	15,145 cuft

Storage Indication method used.



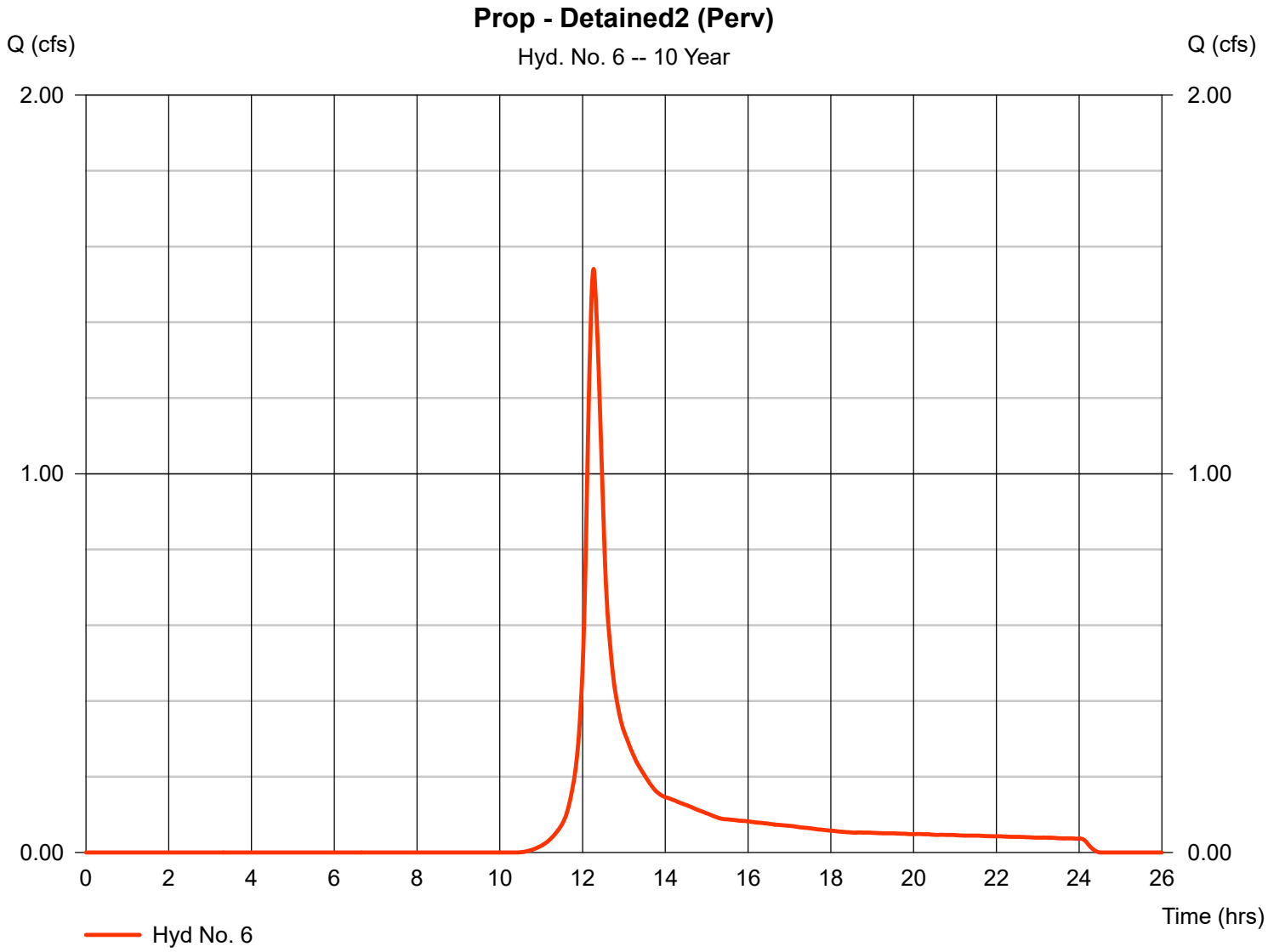
Hydrograph Report

Hyd. No. 6

Prop - Detained2 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.541 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.27 hrs
Time interval	=	1 min	Hyd. volume	=	6,505 cuft
Drainage area	=	0.990 ac	Curve number	=	67*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.30 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.470 x 74)] / 0.990

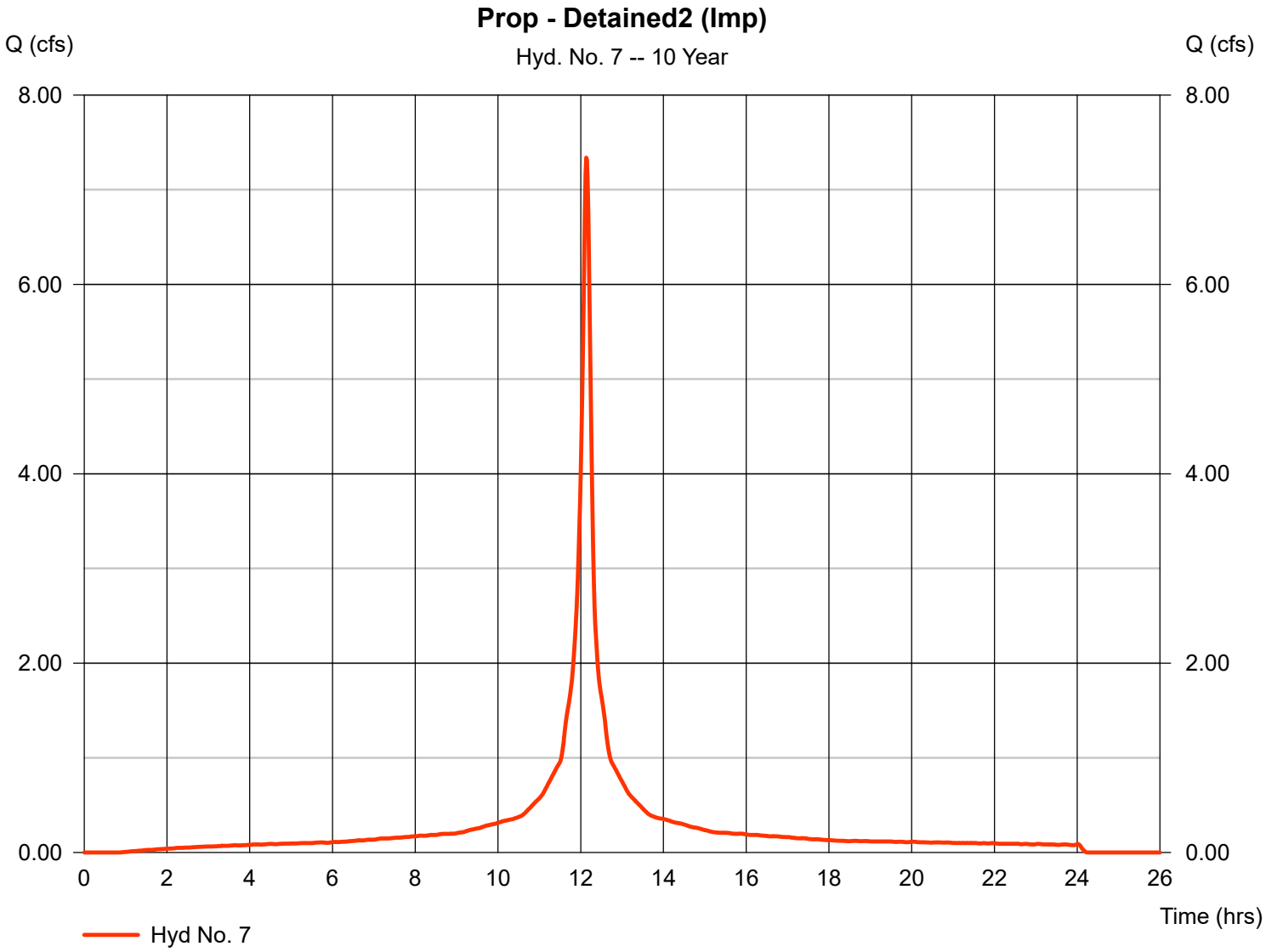


Hydrograph Report

Hyd. No. 7

Prop - Detained2 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.339 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	26,596 cuft
Drainage area	=	1.535 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

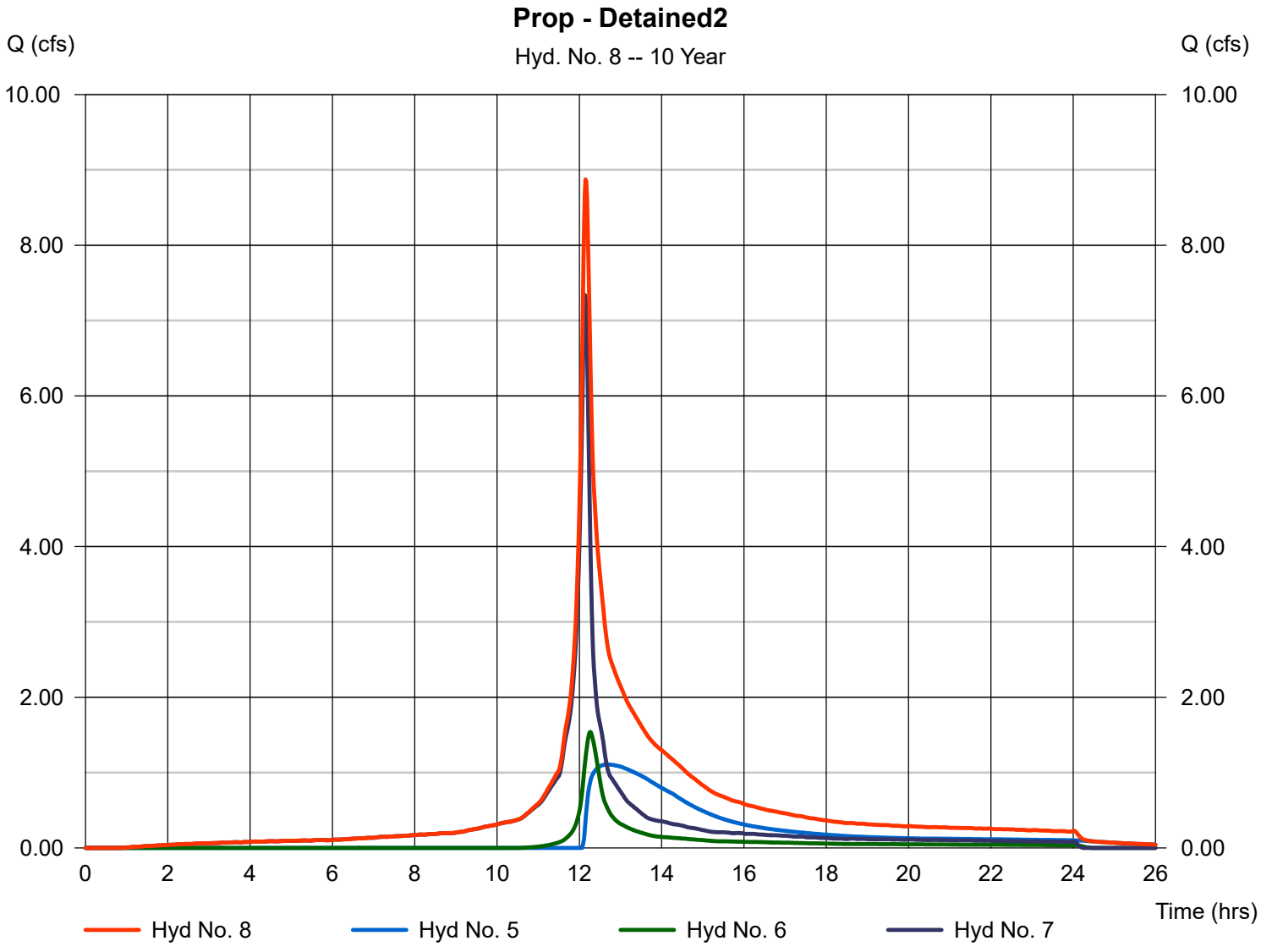


Hydrograph Report

Hyd. No. 8

Prop - Detained2

Hydrograph type	= Combine	Peak discharge	= 8.873 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 48,650 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 2.525 ac



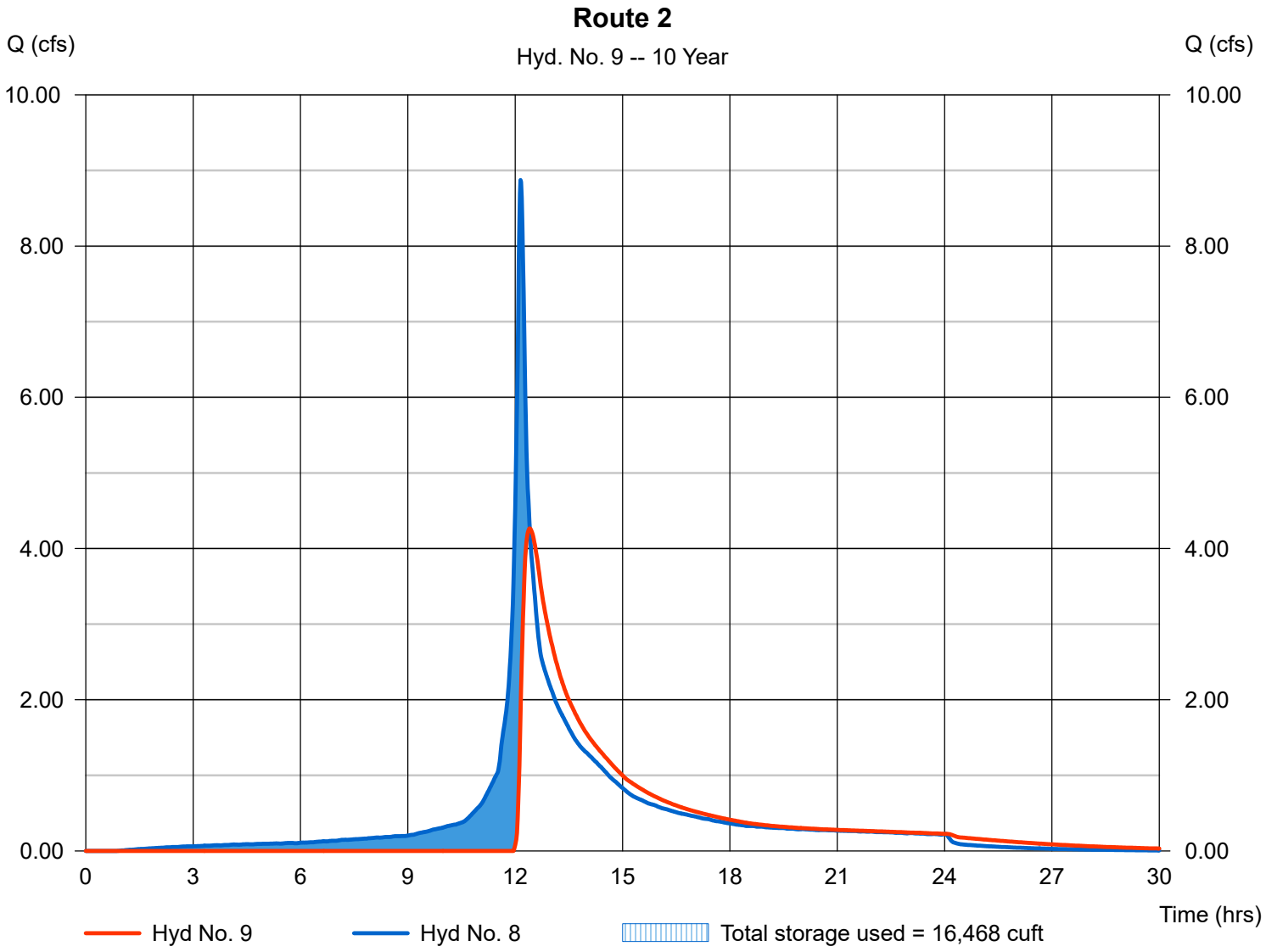
Hydrograph Report

Hyd. No. 9

Route 2

Hydrograph type	=	Reservoir	Peak discharge	=	4.266 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.40 hrs
Time interval	=	1 min	Hyd. volume	=	38,743 cuft
Inflow hyd. No.	=	8 - Prop - Detained2	Max. Elevation	=	69.32 ft
Reservoir name	=	Basin 2	Max. Storage	=	16,468 cuft

Storage Indication method used.



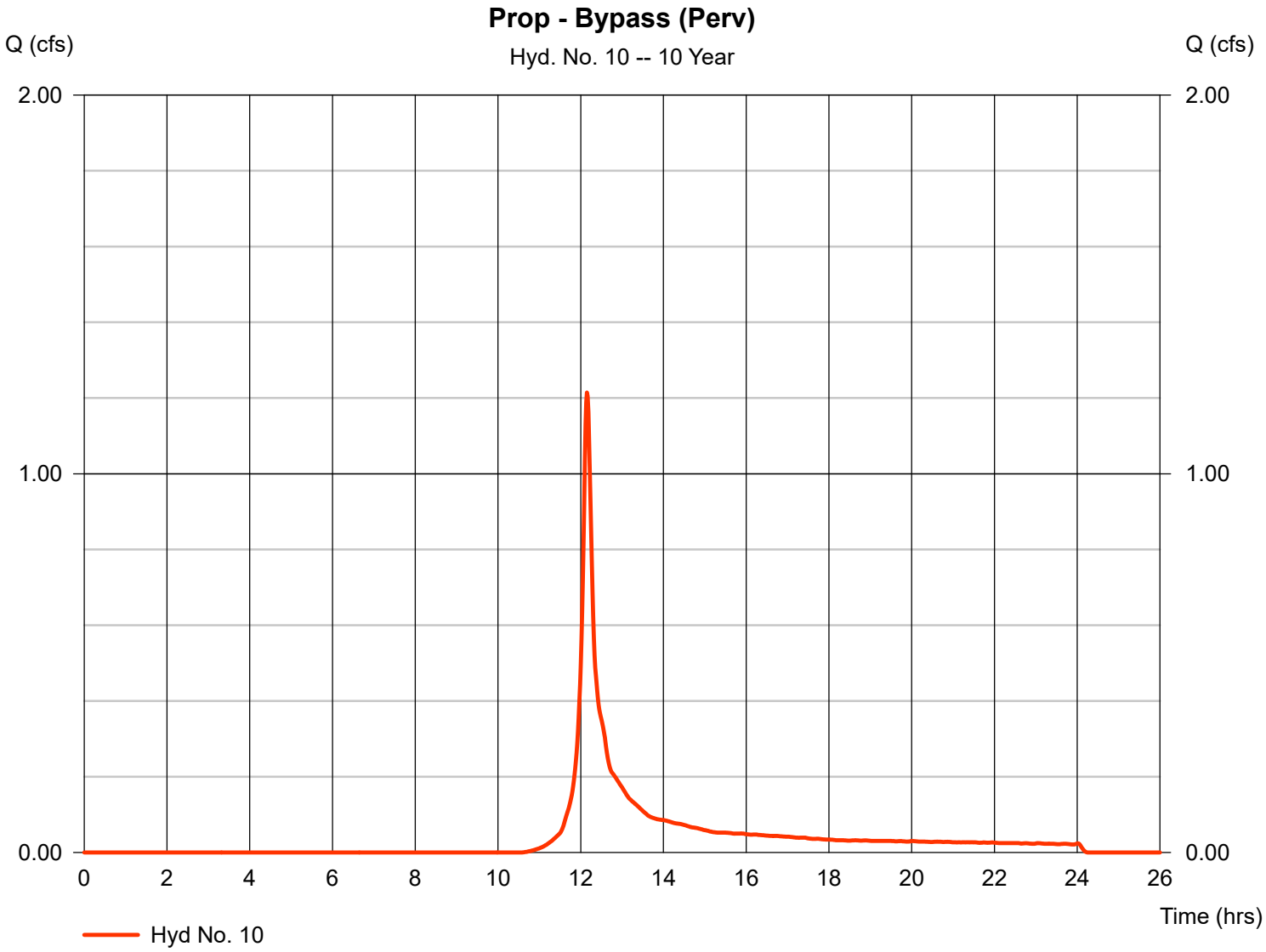
Hydrograph Report

Hyd. No. 10

Prop - Bypass (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.215 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.15 hrs
Time interval	=	1 min	Hyd. volume	=	3,860 cuft
Drainage area	=	0.613 ac	Curve number	=	66*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.380 x 61) + (0.233 x 74)] / 0.613

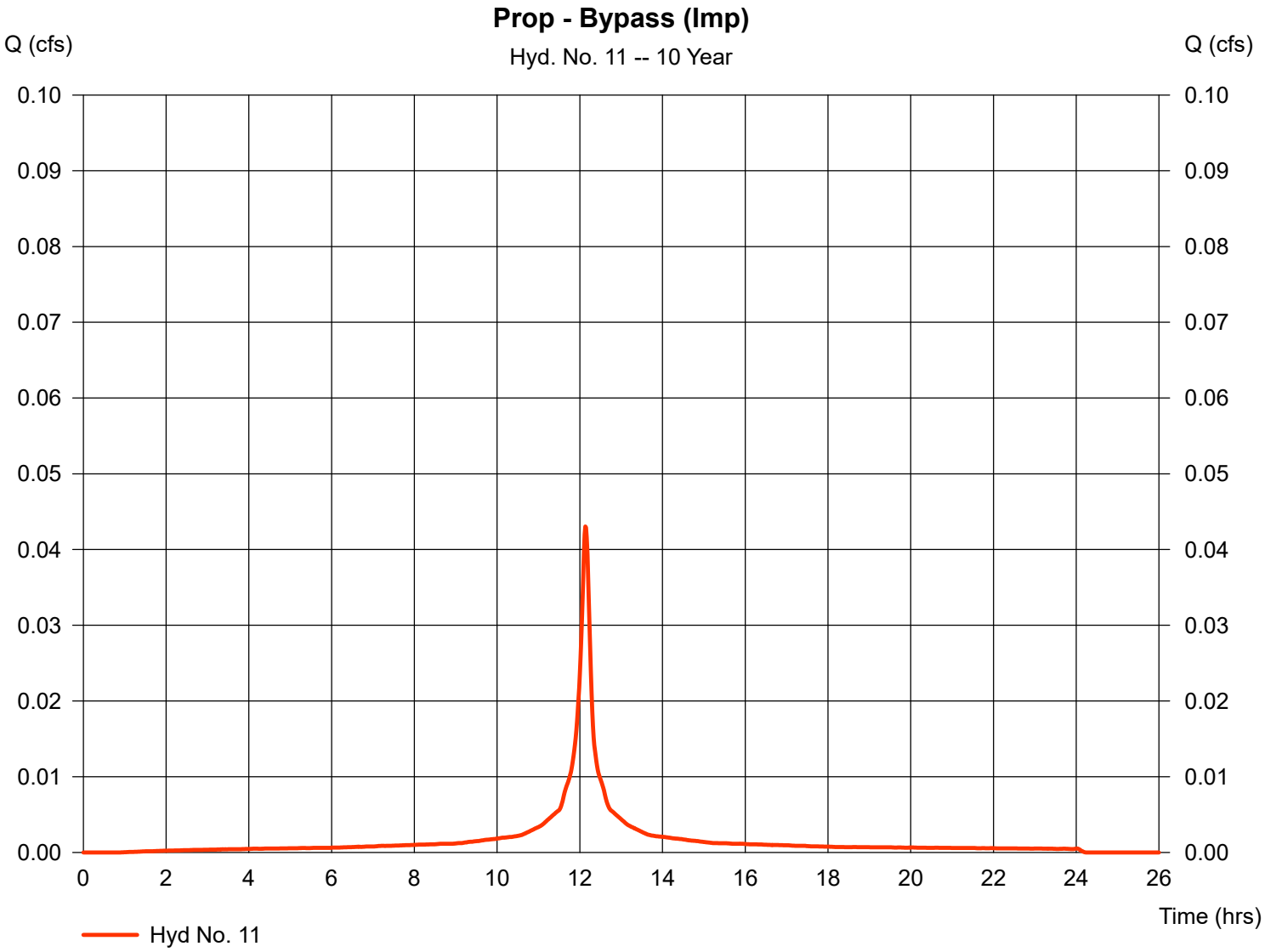


Hydrograph Report

Hyd. No. 11

Prop - Bypass (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.043 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	156 cuft
Drainage area	=	0.009 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

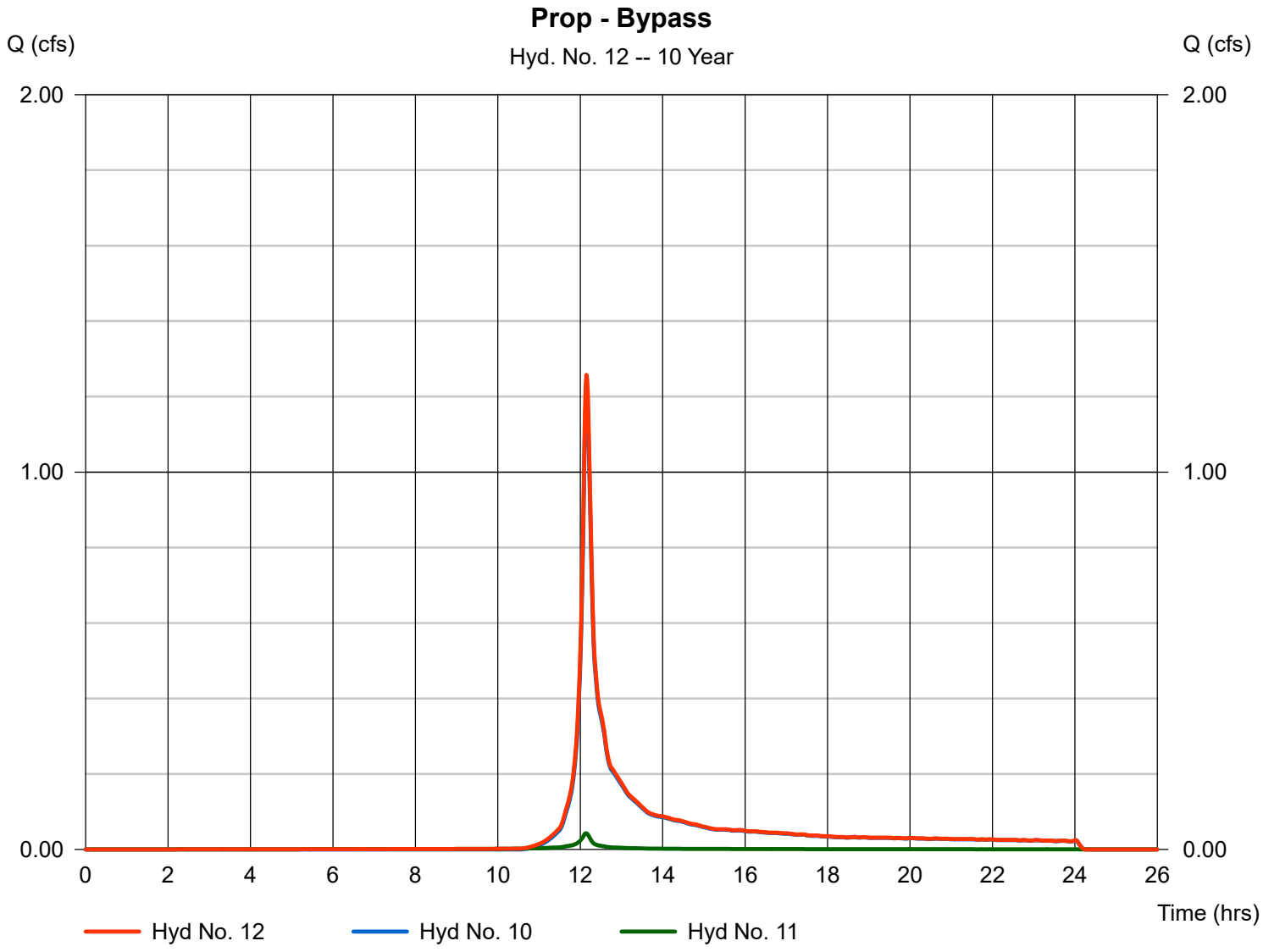


Hydrograph Report

Hyd. No. 12

Prop - Bypass

Hydrograph type	= Combine	Peak discharge	= 1.257 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 4,016 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.622 ac

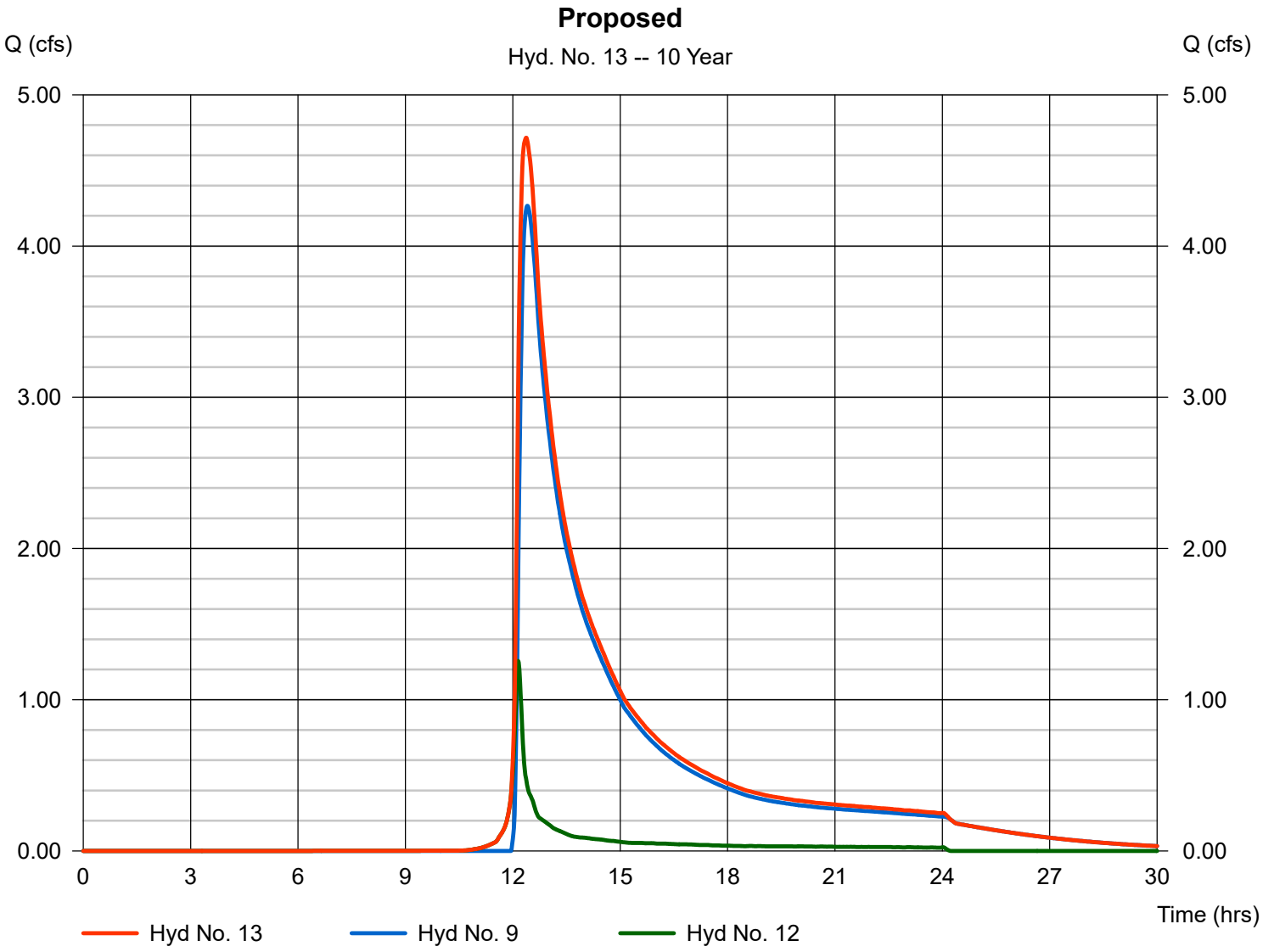


Hydrograph Report

Hyd. No. 13

Proposed

Hydrograph type	= Combine	Peak discharge	= 4.717 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 1 min	Hyd. volume	= 42,758 cuft
Inflow hyds.	= 9, 12	Contrib. drain. area	= 0.000 ac

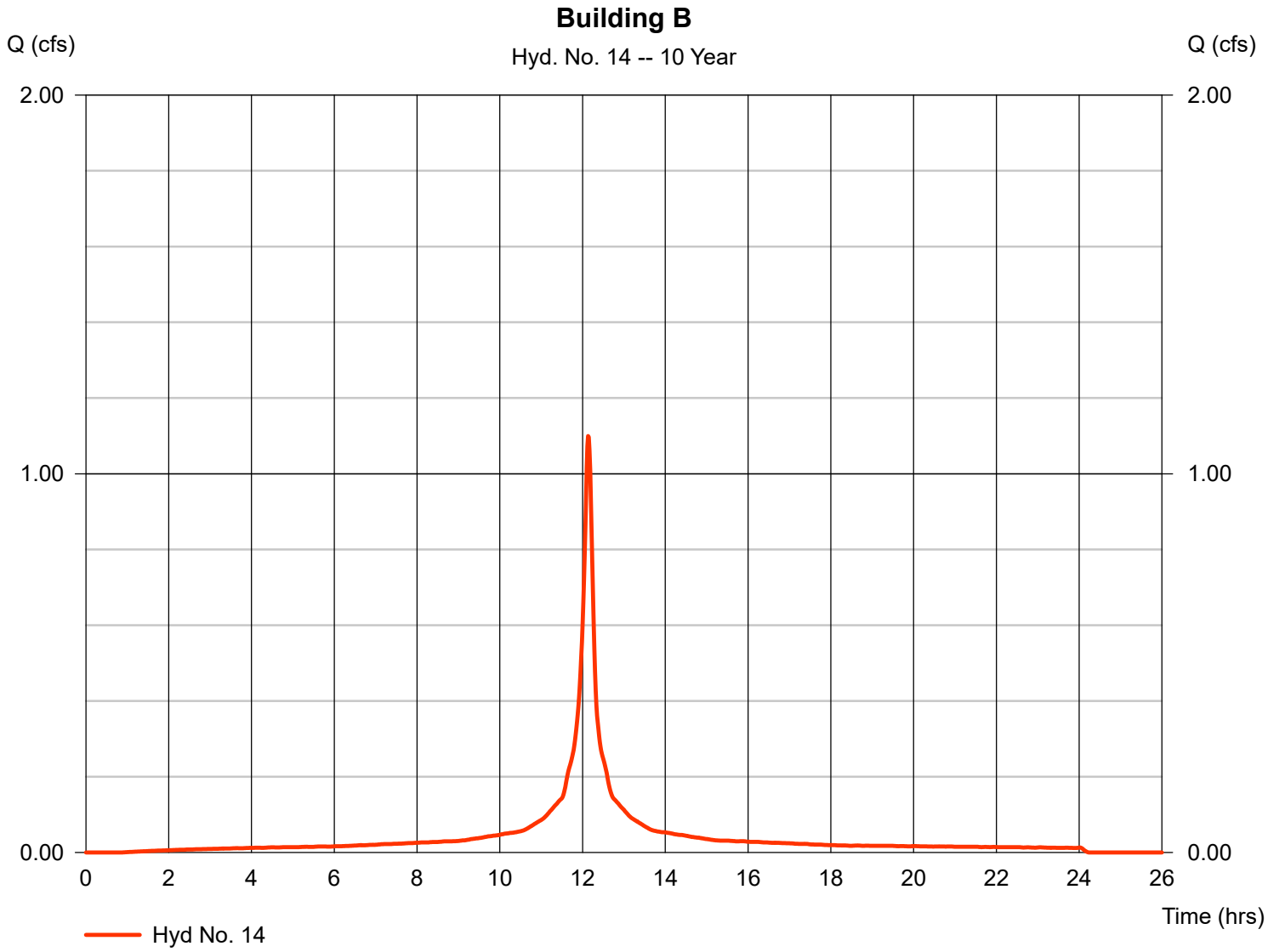


Hydrograph Report

Hyd. No. 14

Building B

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.100 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	3,985 cuft
Drainage area	=	0.230 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.25

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	18.54	1	733	71,019	------	------	------	Existing
2	SCS Runoff	2.070	1	731	7,136	------	------	------	Prop - Detained1 (Perv)
3	SCS Runoff	10.47	1	728	38,529	------	------	------	Prop - Detained1 (Imp)
4	Combine	12.42	1	729	45,665	2, 3	------	------	Prop - Detained1
5	Reservoir	7.379	1	736	35,828	4	75.00	20,471	Route 1
6	SCS Runoff	3.846	1	735	15,800	------	------	------	Prop - Detained2 (Perv)
7	SCS Runoff	12.25	1	728	45,078	------	------	------	Prop - Detained2 (Imp)
8	Combine	21.41	1	730	96,706	5, 6, 7	------	------	Prop - Detained2
9	Reservoir	13.65	1	742	86,799	8	70.57	25,696	Route 2
10	SCS Runoff	3.068	1	729	9,523	------	------	------	Prop - Bypass (Perv)
11	SCS Runoff	0.072	1	728	264	------	------	------	Prop - Bypass (Imp)
12	Combine	3.139	1	729	9,787	10, 11	------	------	Prop - Bypass
13	Combine	14.77	1	740	96,586	9, 12	------	------	Proposed
14	SCS Runoff	1.835	1	728	6,754	------	------	------	Building B

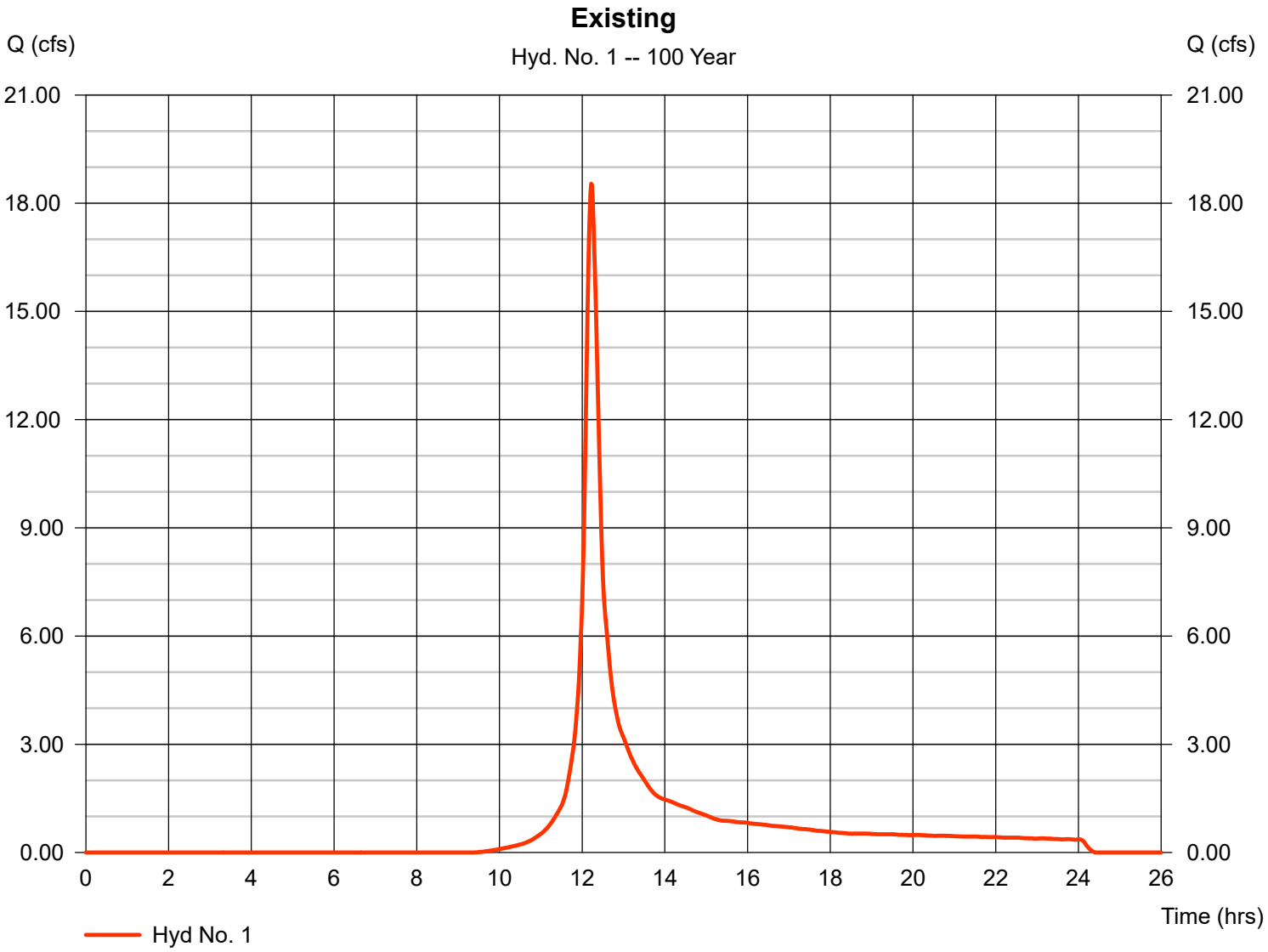
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.54 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.22 hrs
Time interval	=	1 min	Hyd. volume	=	71,019 cuft
Drainage area	=	5.225 ac	Curve number	=	61*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.20 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(2.994 x 55) + (2.231 x 70)] / 5.225



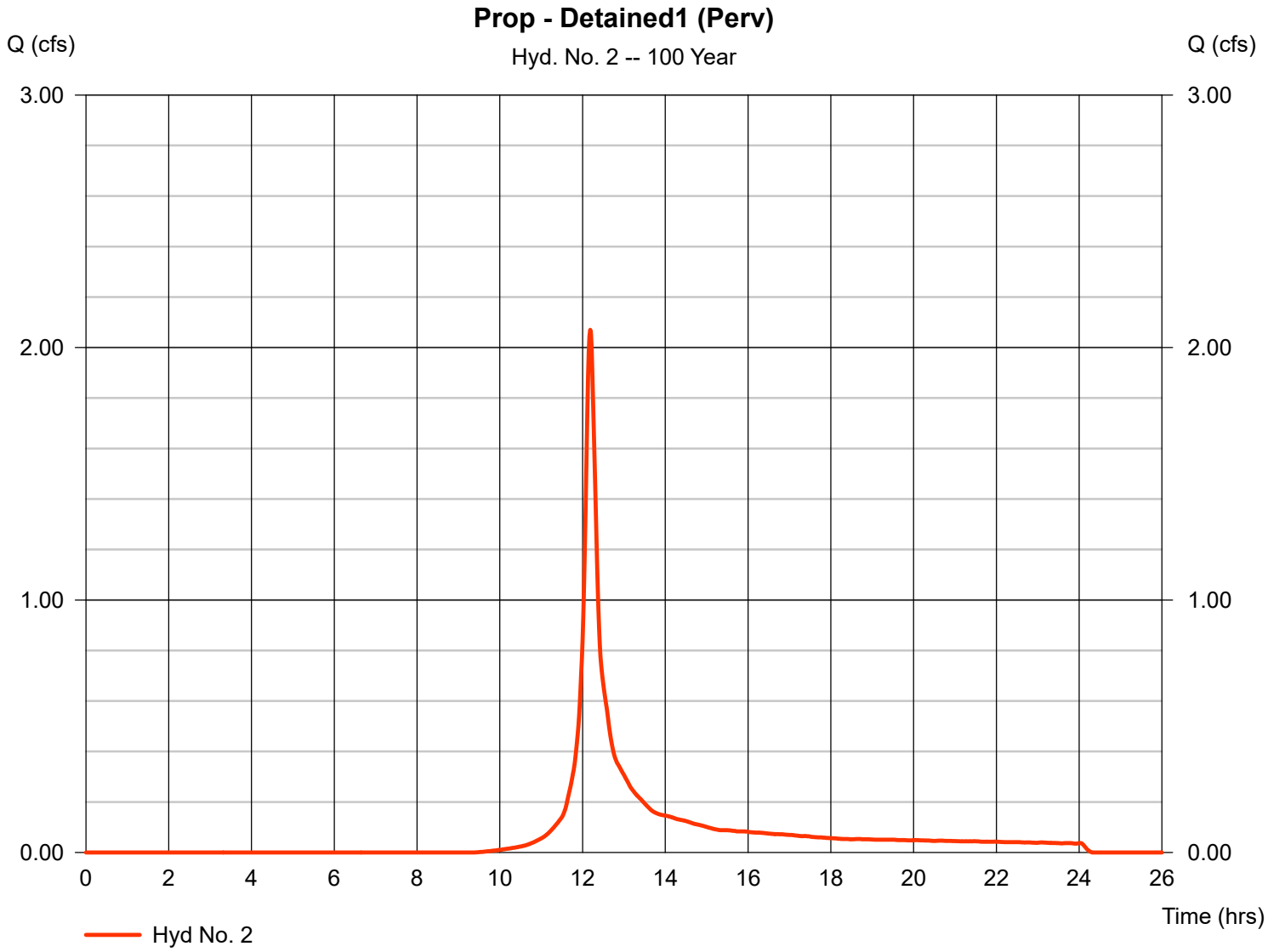
Hydrograph Report

Hyd. No. 2

Prop - Detained1 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.070 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.18 hrs
Time interval	=	1 min	Hyd. volume	=	7,136 cuft
Drainage area	=	0.540 ac	Curve number	=	61*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.20 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.020 x 74)] / 0.540

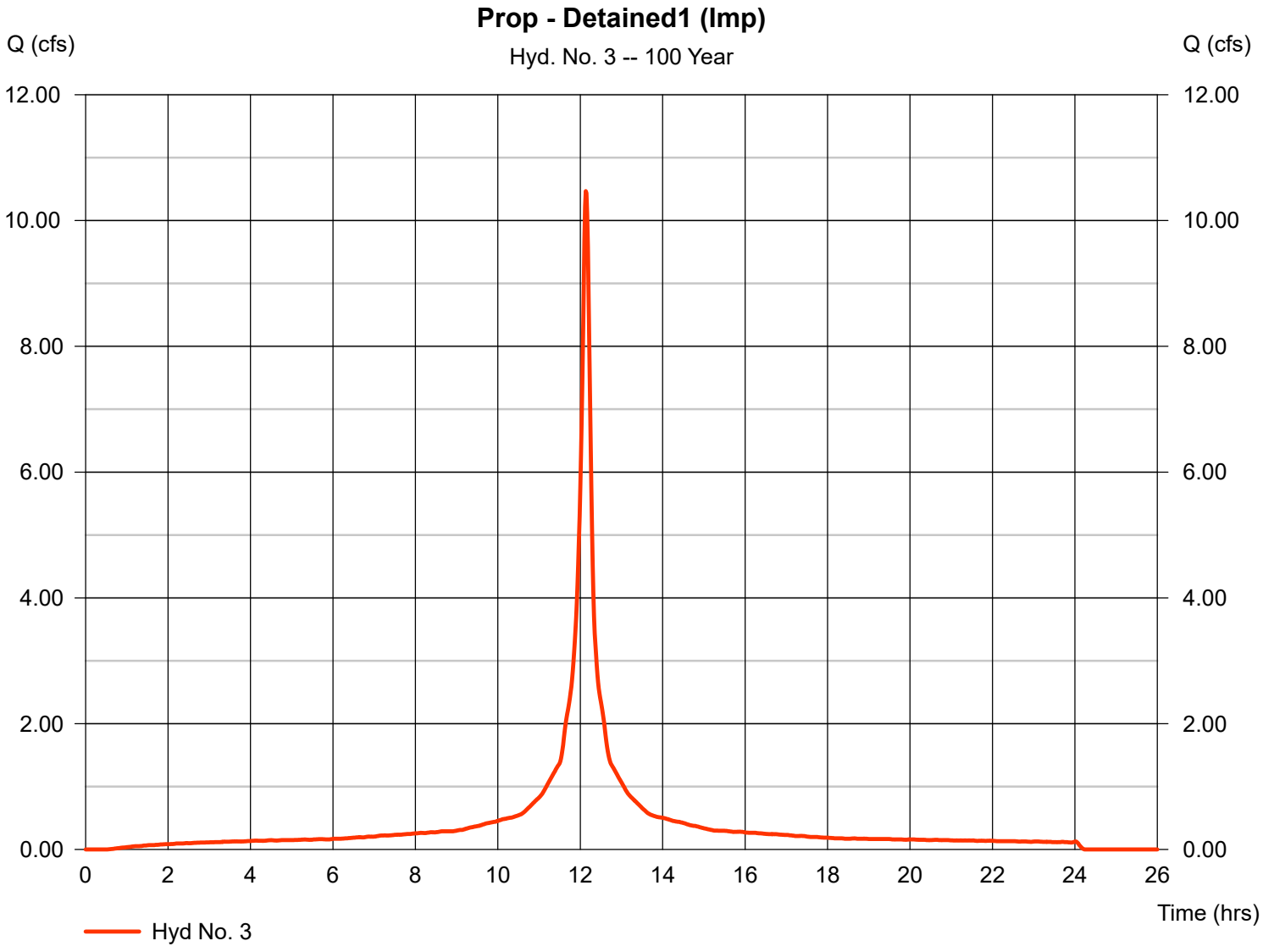


Hydrograph Report

Hyd. No. 3

Prop - Detained1 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.47 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	38,529 cuft
Drainage area	=	1.312 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

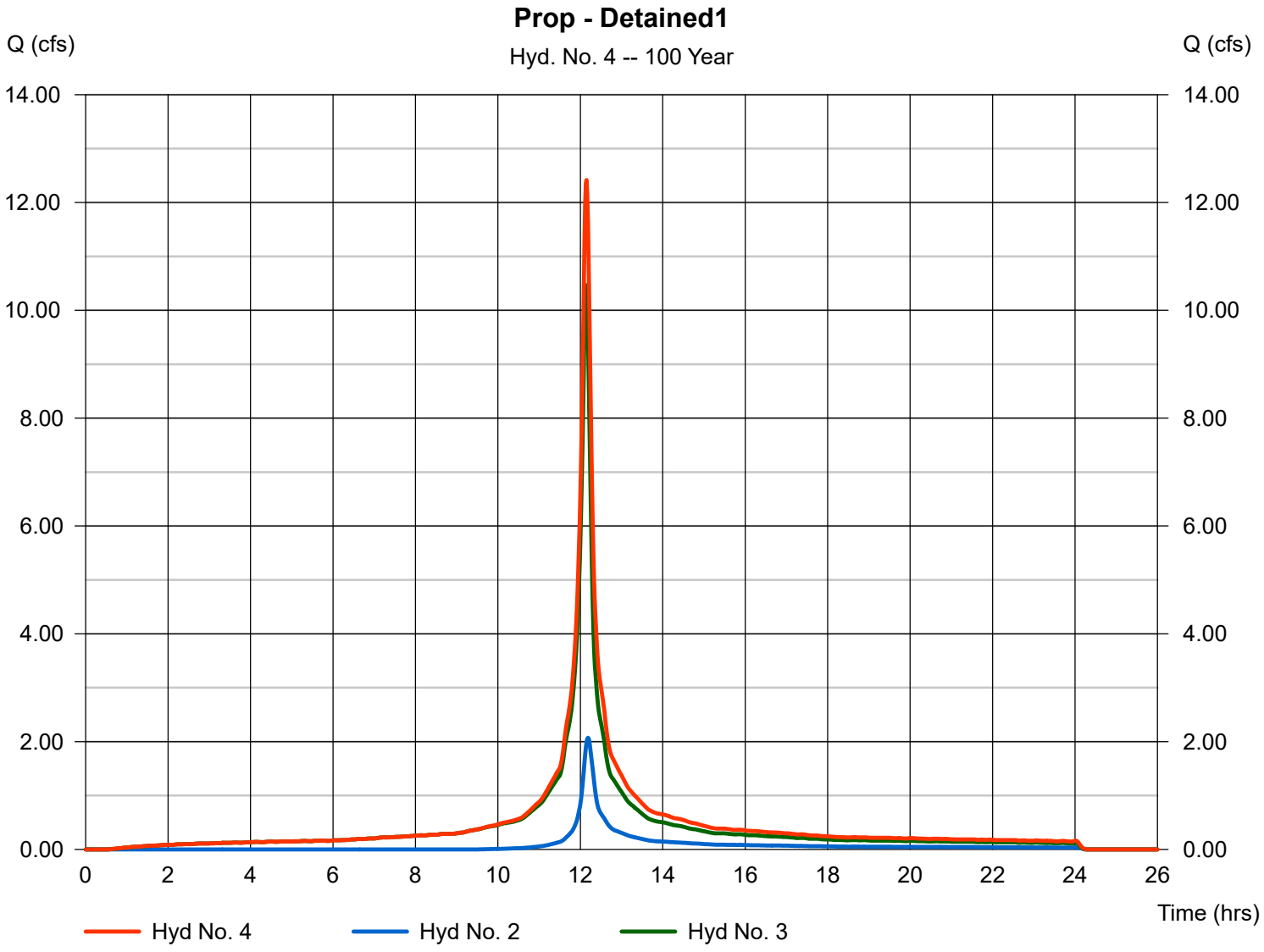


Hydrograph Report

Hyd. No. 4

Prop - Detained1

Hydrograph type	= Combine	Peak discharge	= 12.42 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 45,665 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 1.852 ac



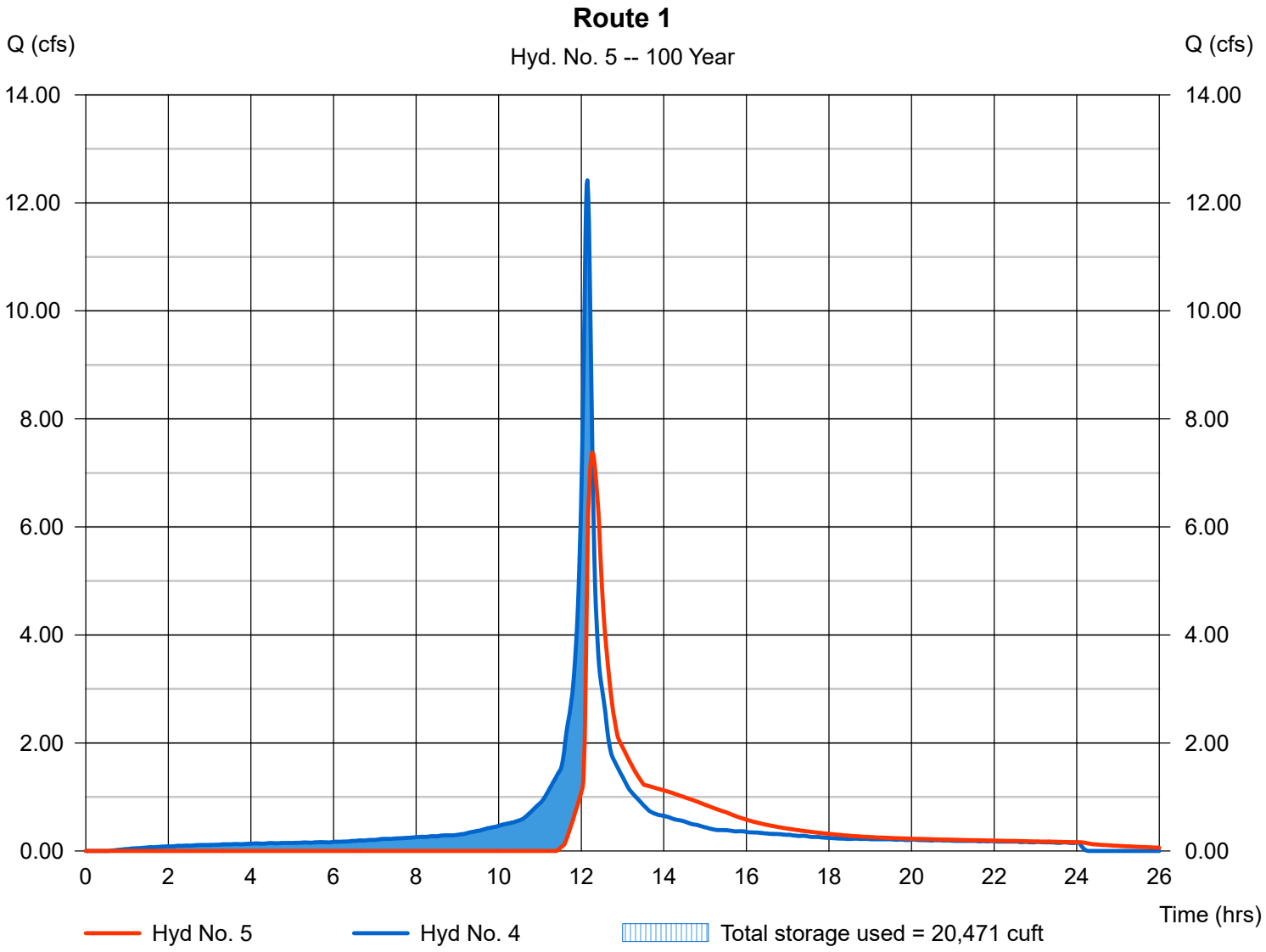
Hydrograph Report

Hyd. No. 5

Route 1

Hydrograph type	=	Reservoir	Peak discharge	=	7.379 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.27 hrs
Time interval	=	1 min	Hyd. volume	=	35,828 cuft
Inflow hyd. No.	=	4 - Prop - Detained1	Max. Elevation	=	75.00 ft
Reservoir name	=	Basin 1	Max. Storage	=	20,471 cuft

Storage Indication method used.



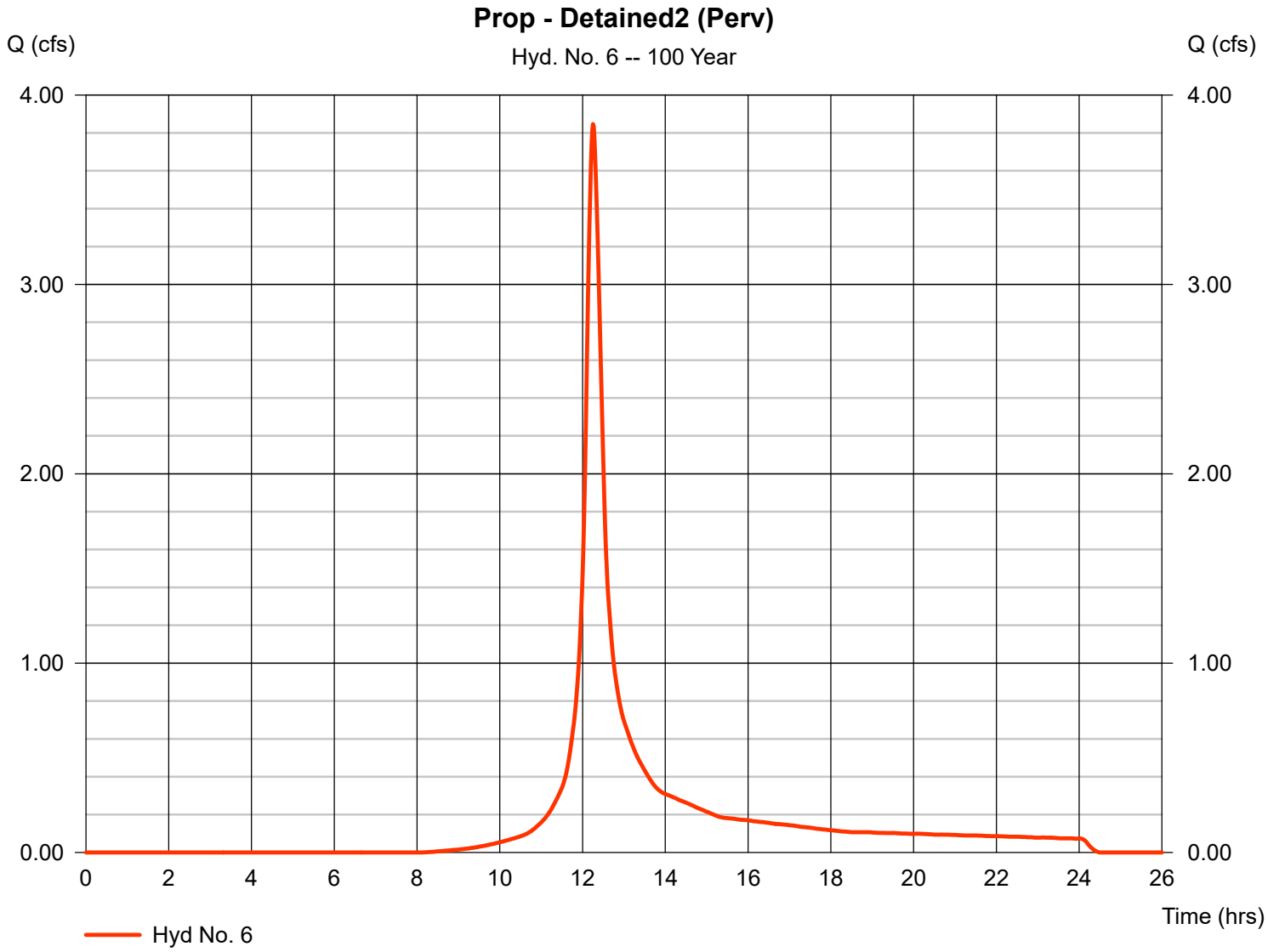
Hydrograph Report

Hyd. No. 6

Prop - Detained2 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.846 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.25 hrs
Time interval	=	1 min	Hyd. volume	=	15,800 cuft
Drainage area	=	0.990 ac	Curve number	=	67*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.30 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.470 x 74)] / 0.990

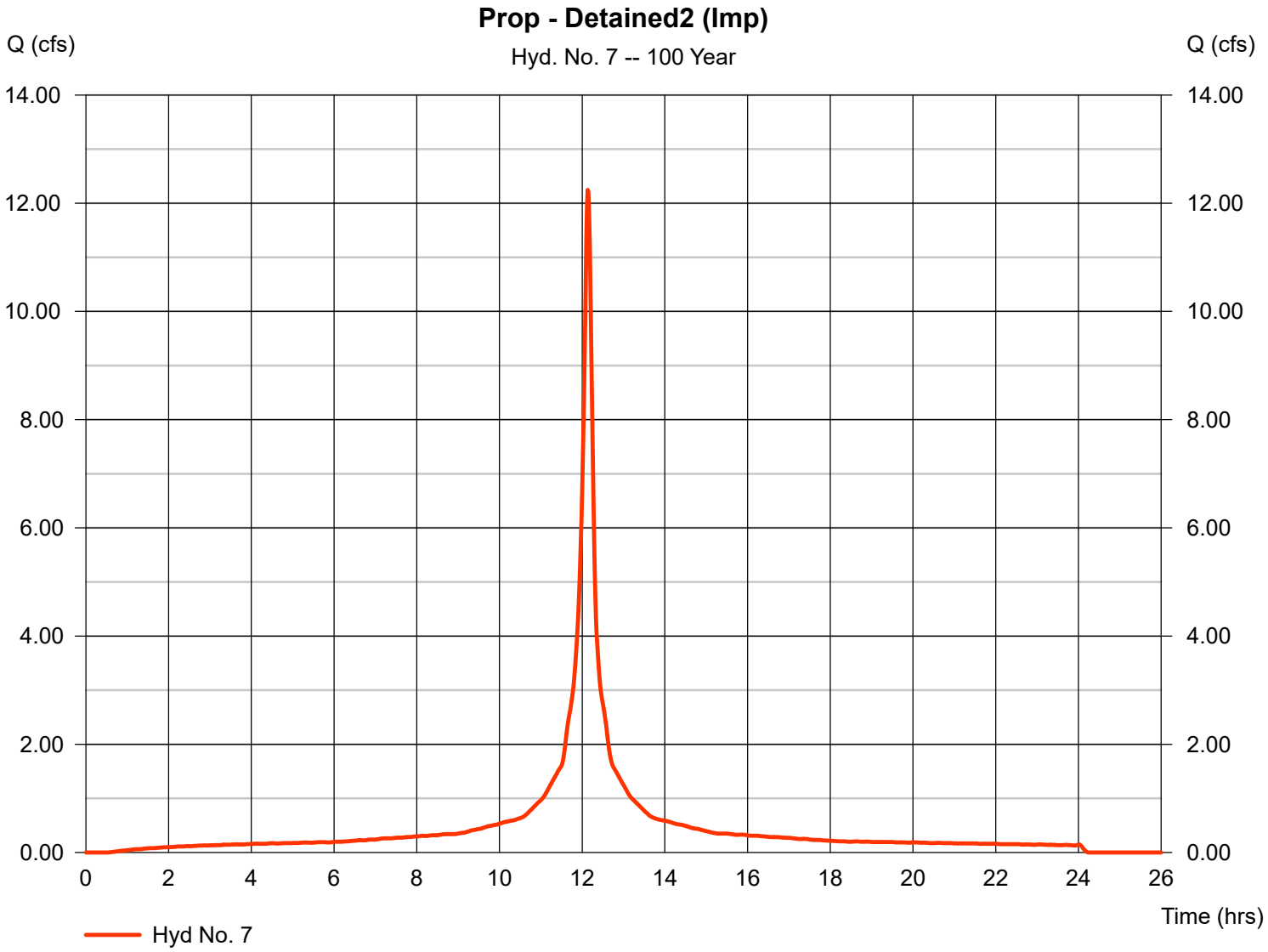


Hydrograph Report

Hyd. No. 7

Prop - Detained2 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.25 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	45,078 cuft
Drainage area	=	1.535 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

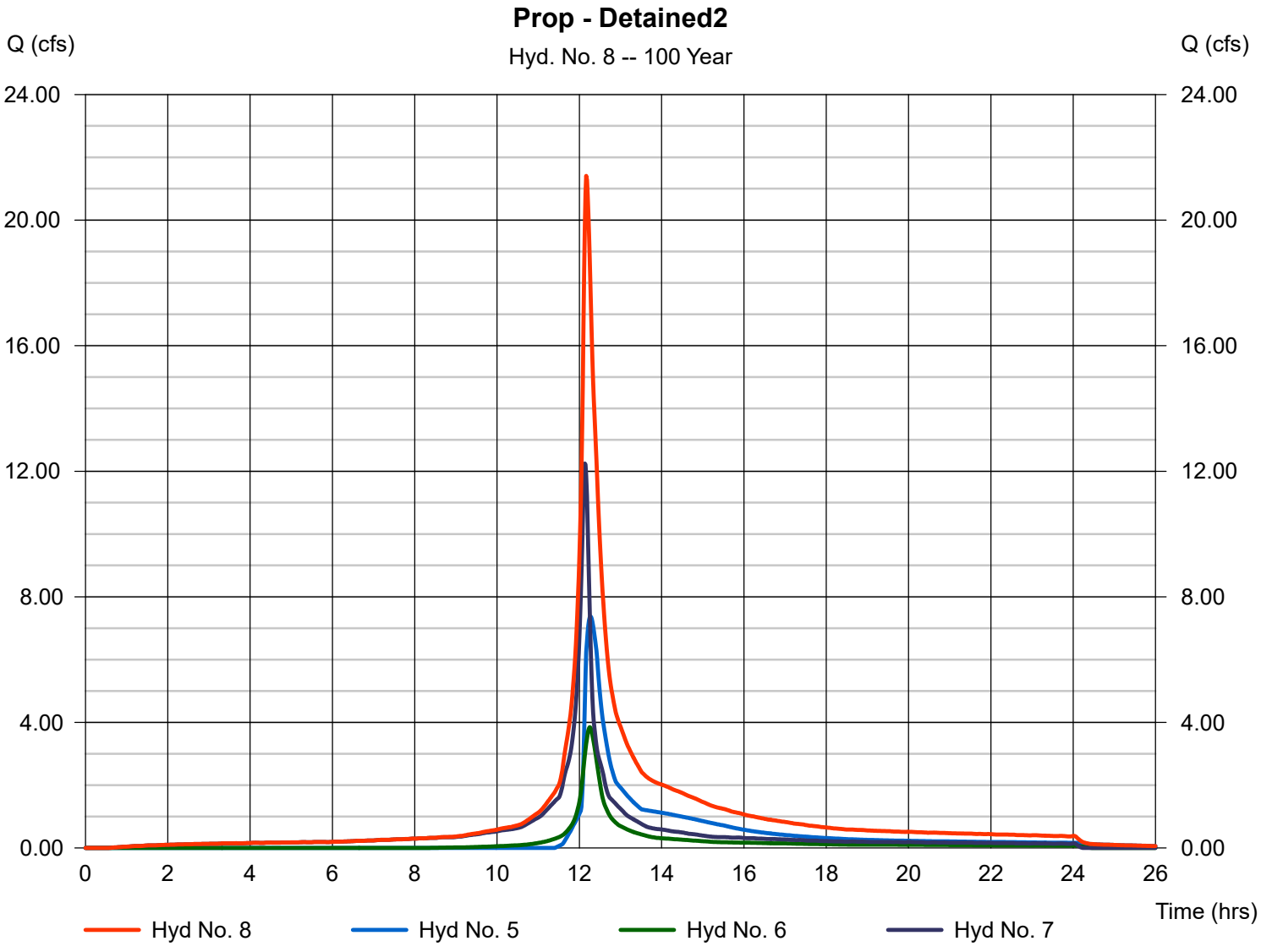


Hydrograph Report

Hyd. No. 8

Prop - Detained2

Hydrograph type	= Combine	Peak discharge	= 21.41 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 1 min	Hyd. volume	= 96,706 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 2.525 ac



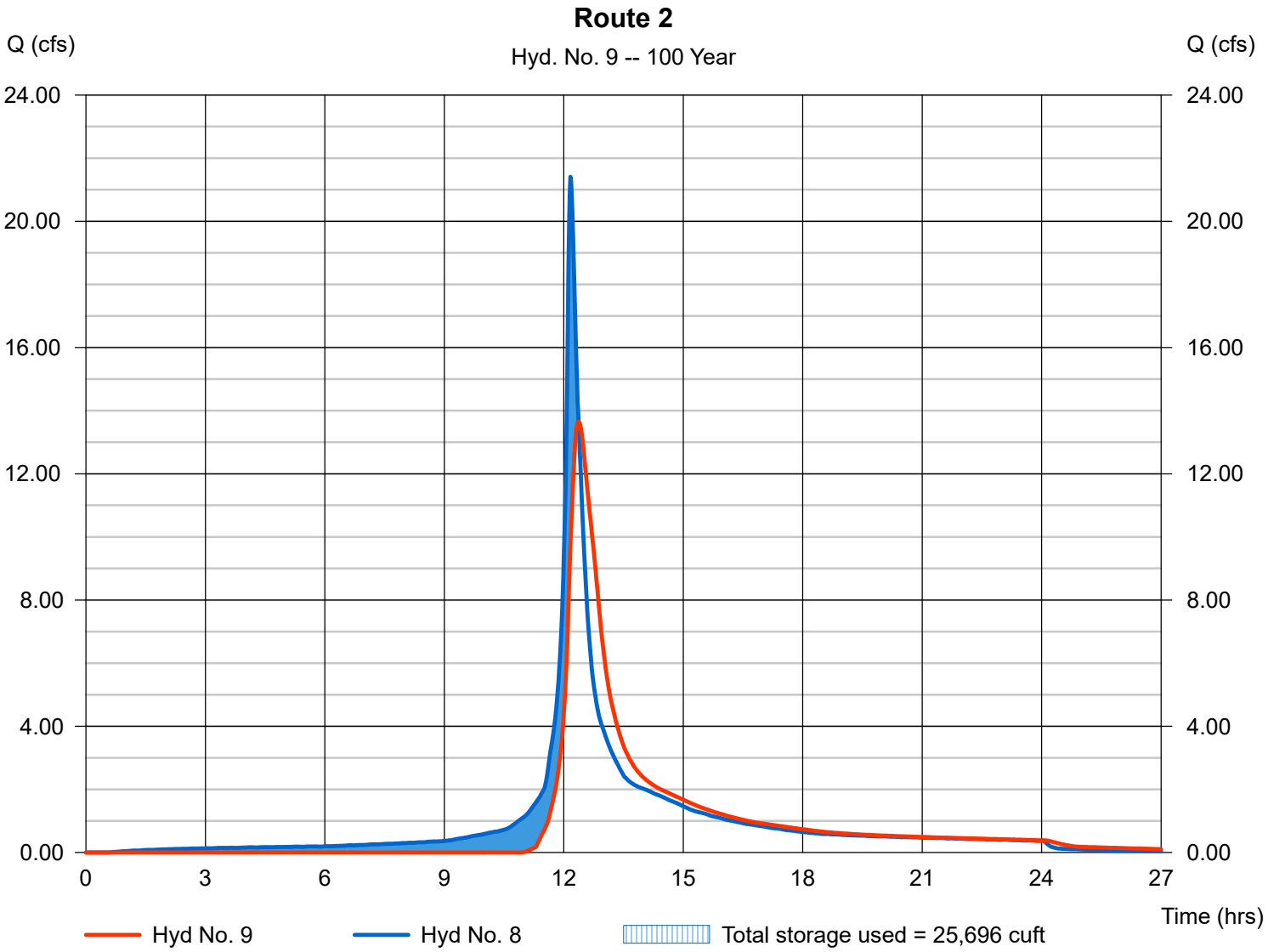
Hydrograph Report

Hyd. No. 9

Route 2

Hydrograph type	=	Reservoir	Peak discharge	=	13.65 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.37 hrs
Time interval	=	1 min	Hyd. volume	=	86,799 cuft
Inflow hyd. No.	=	8 - Prop - Detained2	Max. Elevation	=	70.57 ft
Reservoir name	=	Basin 2	Max. Storage	=	25,696 cuft

Storage Indication method used.



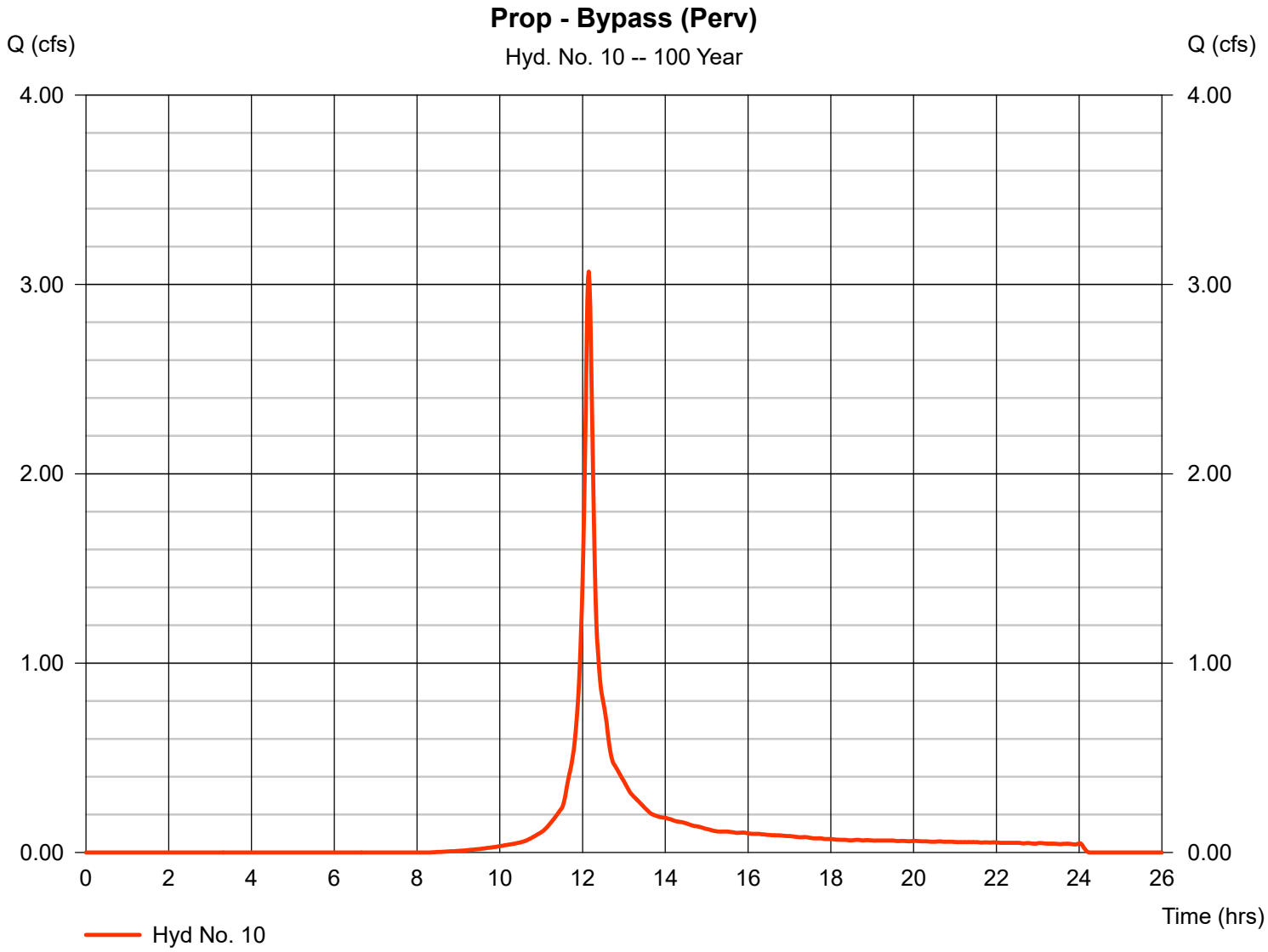
Hydrograph Report

Hyd. No. 10

Prop - Bypass (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.068 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.15 hrs
Time interval	=	1 min	Hyd. volume	=	9,523 cuft
Drainage area	=	0.613 ac	Curve number	=	66*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.380 x 61) + (0.233 x 74)] / 0.613

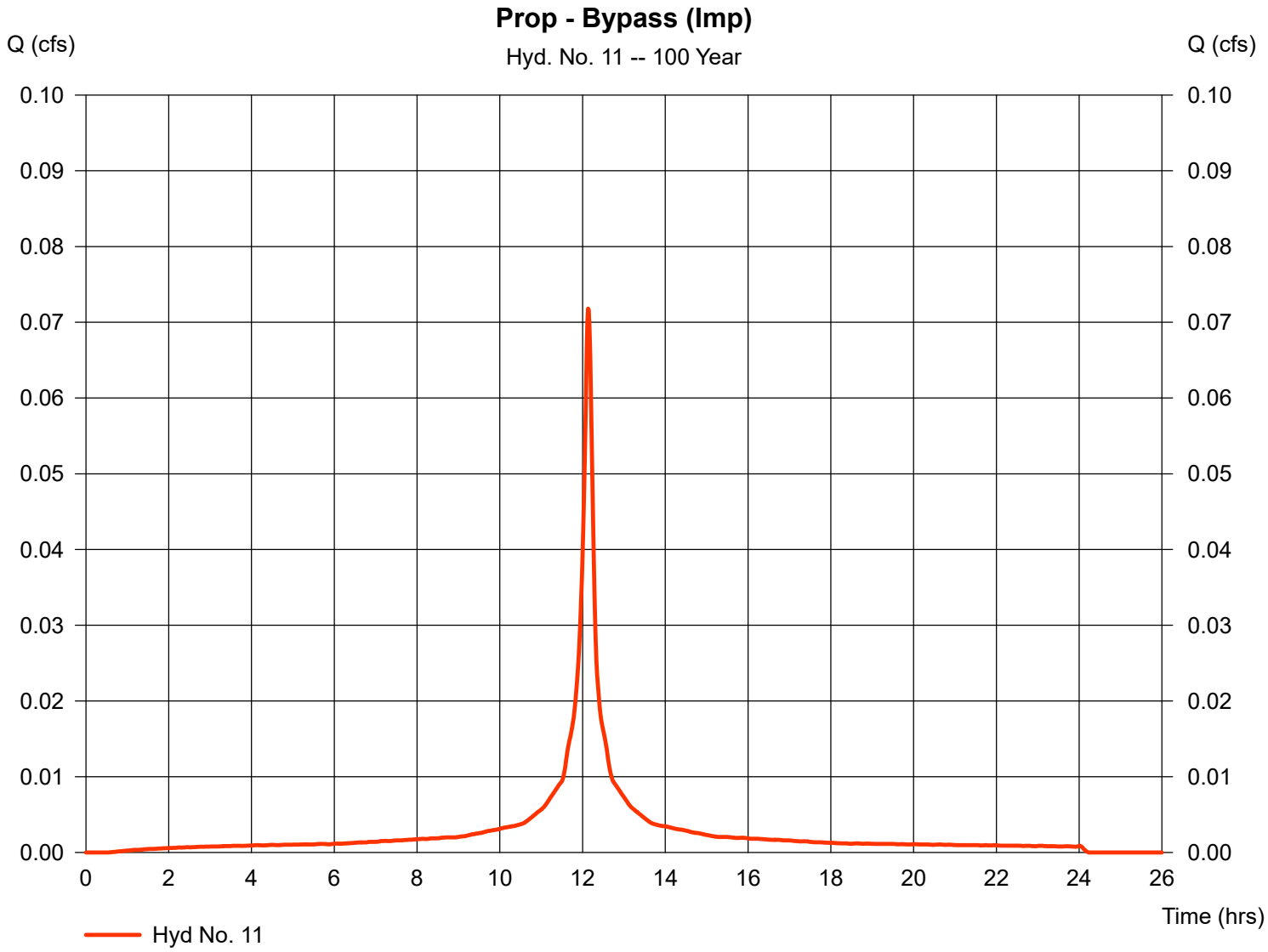


Hydrograph Report

Hyd. No. 11

Prop - Bypass (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.072 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	264 cuft
Drainage area	=	0.009 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484

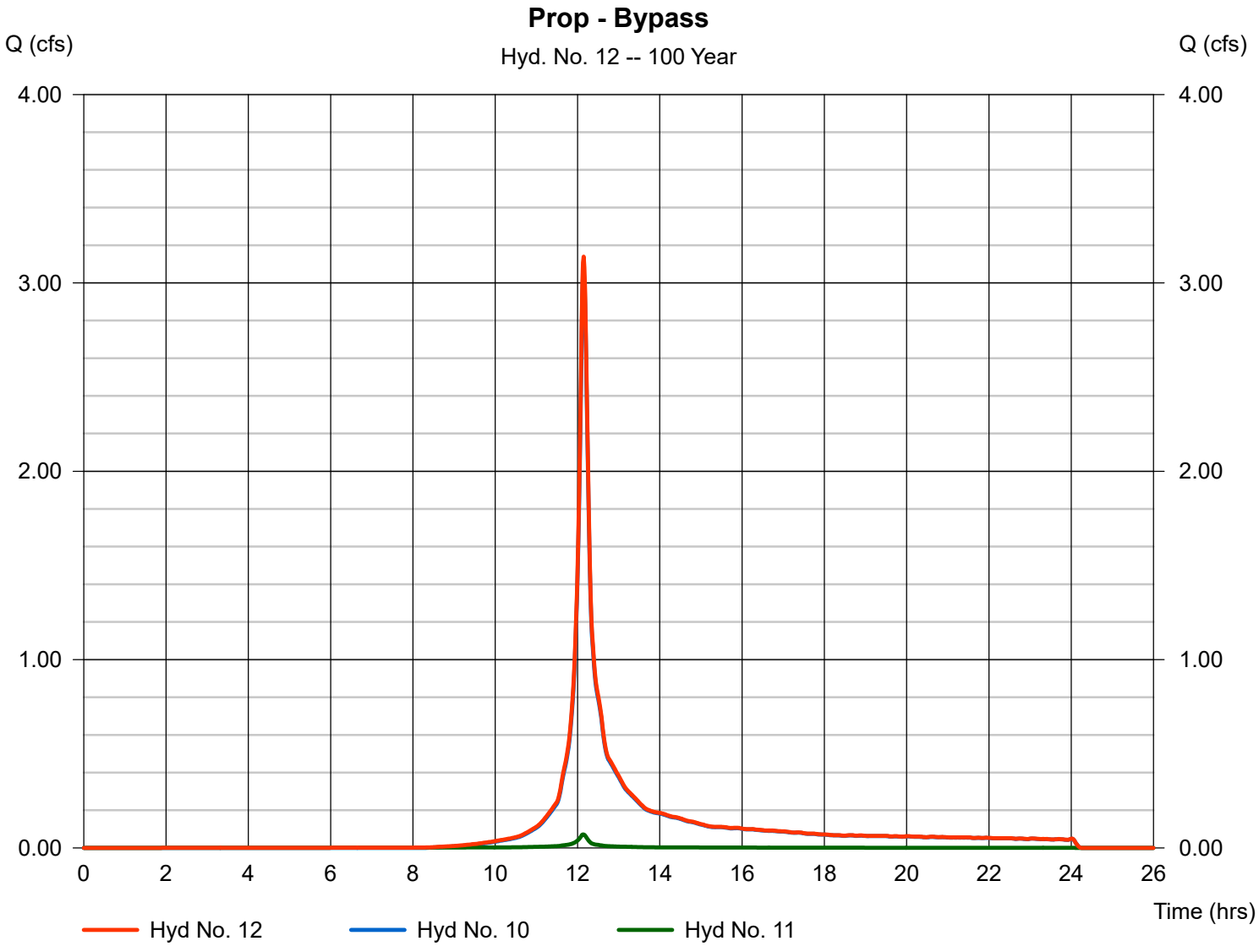


Hydrograph Report

Hyd. No. 12

Prop - Bypass

Hydrograph type	= Combine	Peak discharge	= 3.139 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 9,787 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.622 ac

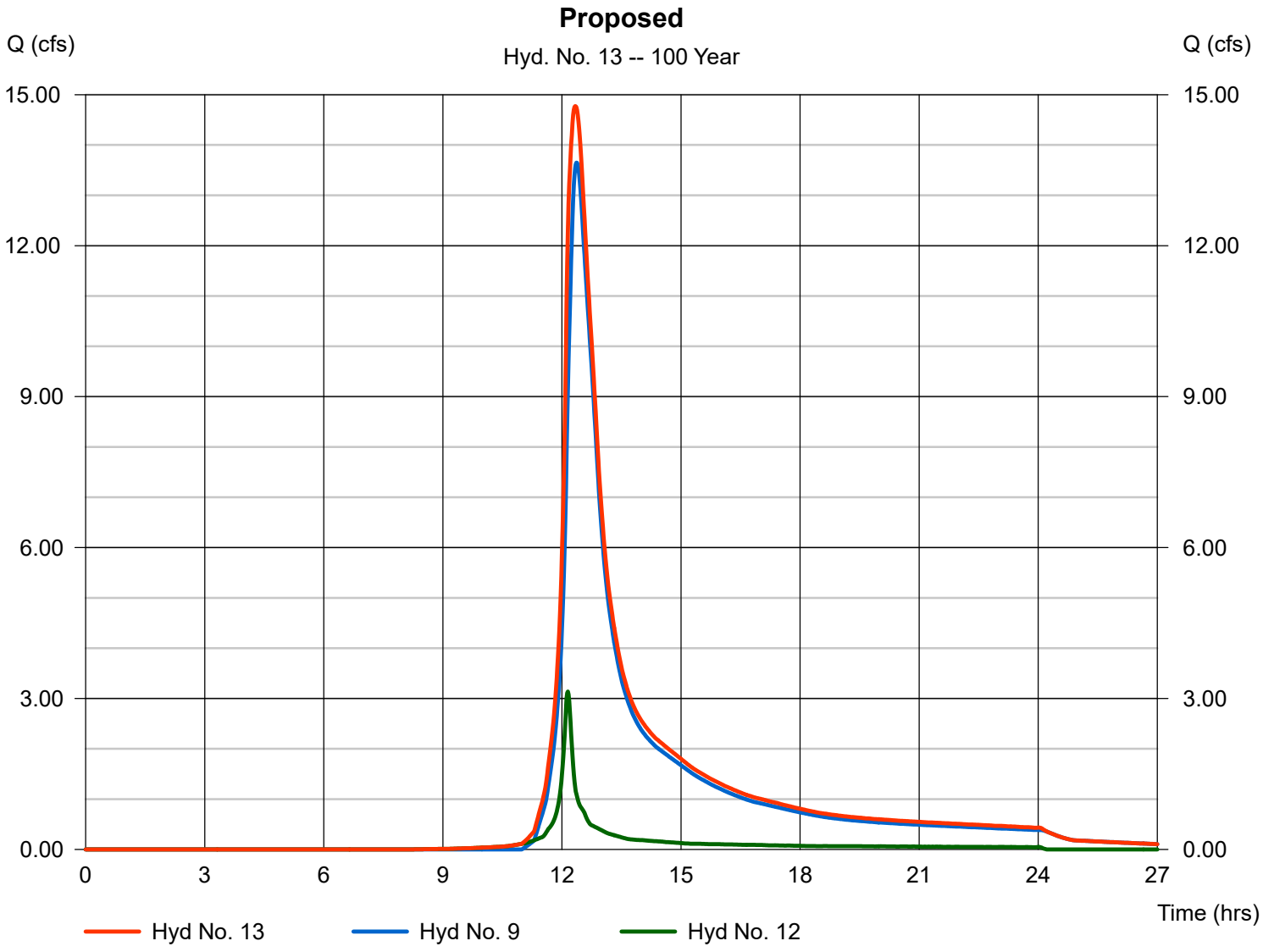


Hydrograph Report

Hyd. No. 13

Proposed

Hydrograph type	= Combine	Peak discharge	= 14.77 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.33 hrs
Time interval	= 1 min	Hyd. volume	= 96,586 cuft
Inflow hyds.	= 9, 12	Contrib. drain. area	= 0.000 ac

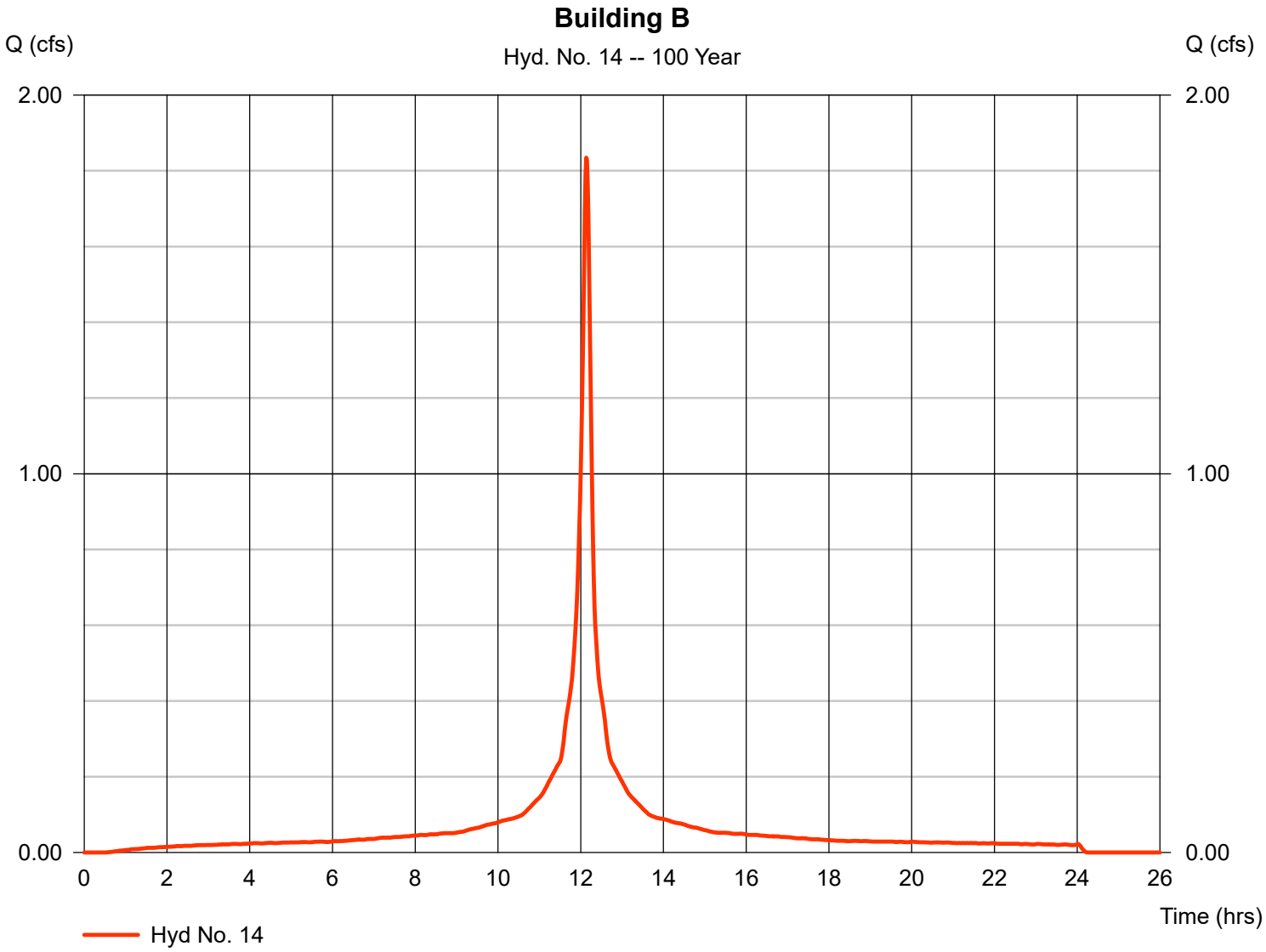


Hydrograph Report

Hyd. No. 14

Building B

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.835 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	1 min	Hyd. volume	=	6,754 cuft
Drainage area	=	0.230 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Custom
Storm duration	=	NOAA_C.cds	Shape factor	=	484



Hydraflow Table of Contents

21-210-wq3.gpw

Hydraflow Hydrographs by Intelisolve v9.25

Tuesday, Apr 9, 2024

1 - Year

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.25

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	0.000	1	n/a	0	------	------	------	Prop - Treated 1 (Perv)
2	SCS Runoff	3.588	1	67	4,927	------	------	------	Prop - Treated 1 (Imp)
3	Combine	3.588	1	67	4,927	1, 2	------	------	Prop - Treated 1
4	Reservoir	0.000	1	n/a	0	3	72.04	4,927	Route 1
5	SCS Runoff	0.022	1	109	49	------	------	------	Prop - Treated 2 (Perv)
6	SCS Runoff	4.198	1	67	5,765	------	------	------	Prop - Treated 2 (Imp)
7	Combine	4.198	1	67	5,813	4, 5, 6	------	------	Prop - Treated 2
8	Reservoir	0.000	1	n/a	0	7	67.82	5,813	Route 2

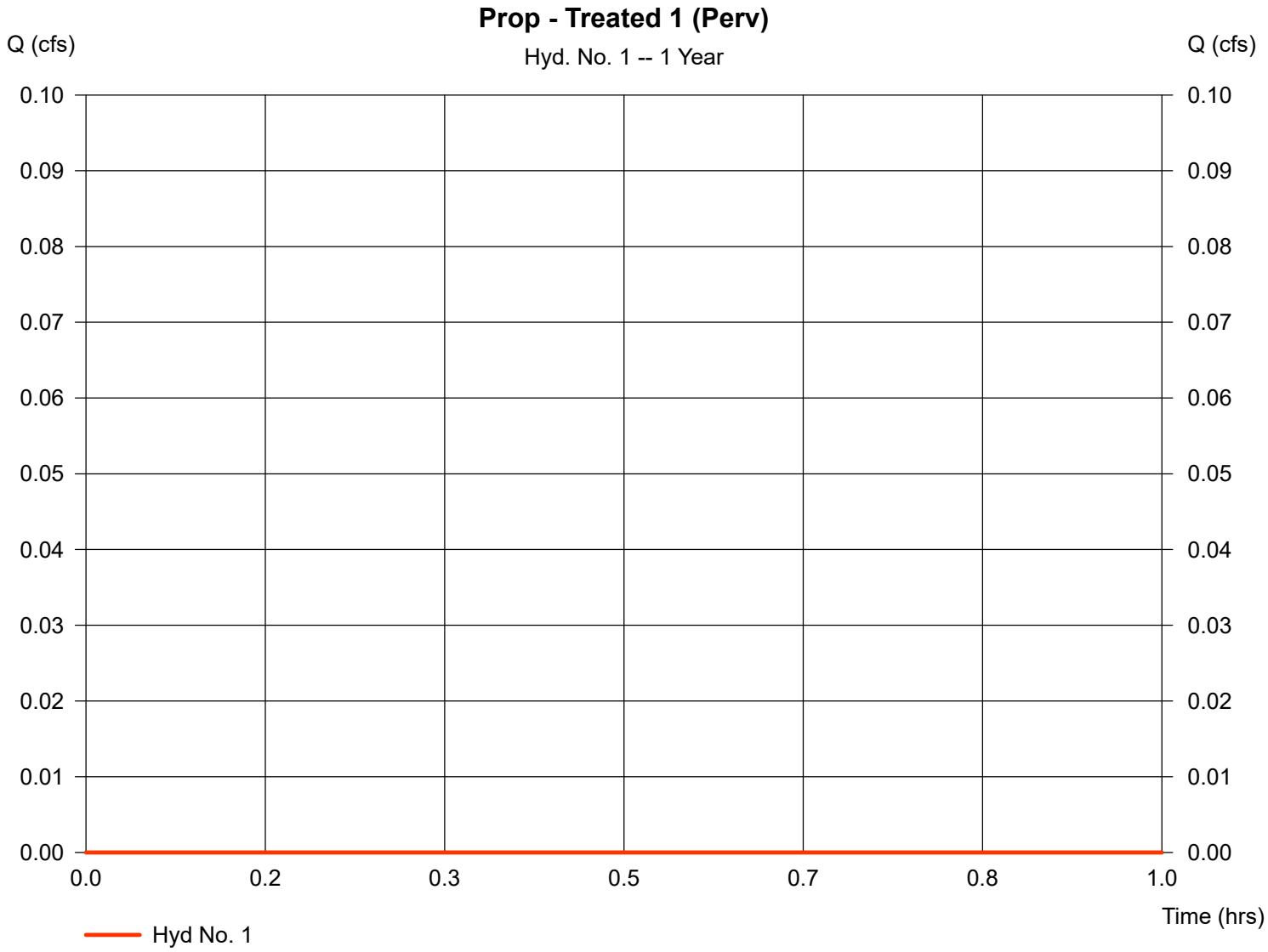
Hydrograph Report

Hyd. No. 1

Prop - Treated 1 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Drainage area	=	0.540 ac	Curve number	=	61*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.20 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	NJWaterQuality.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.020 x 74)] / 0.540

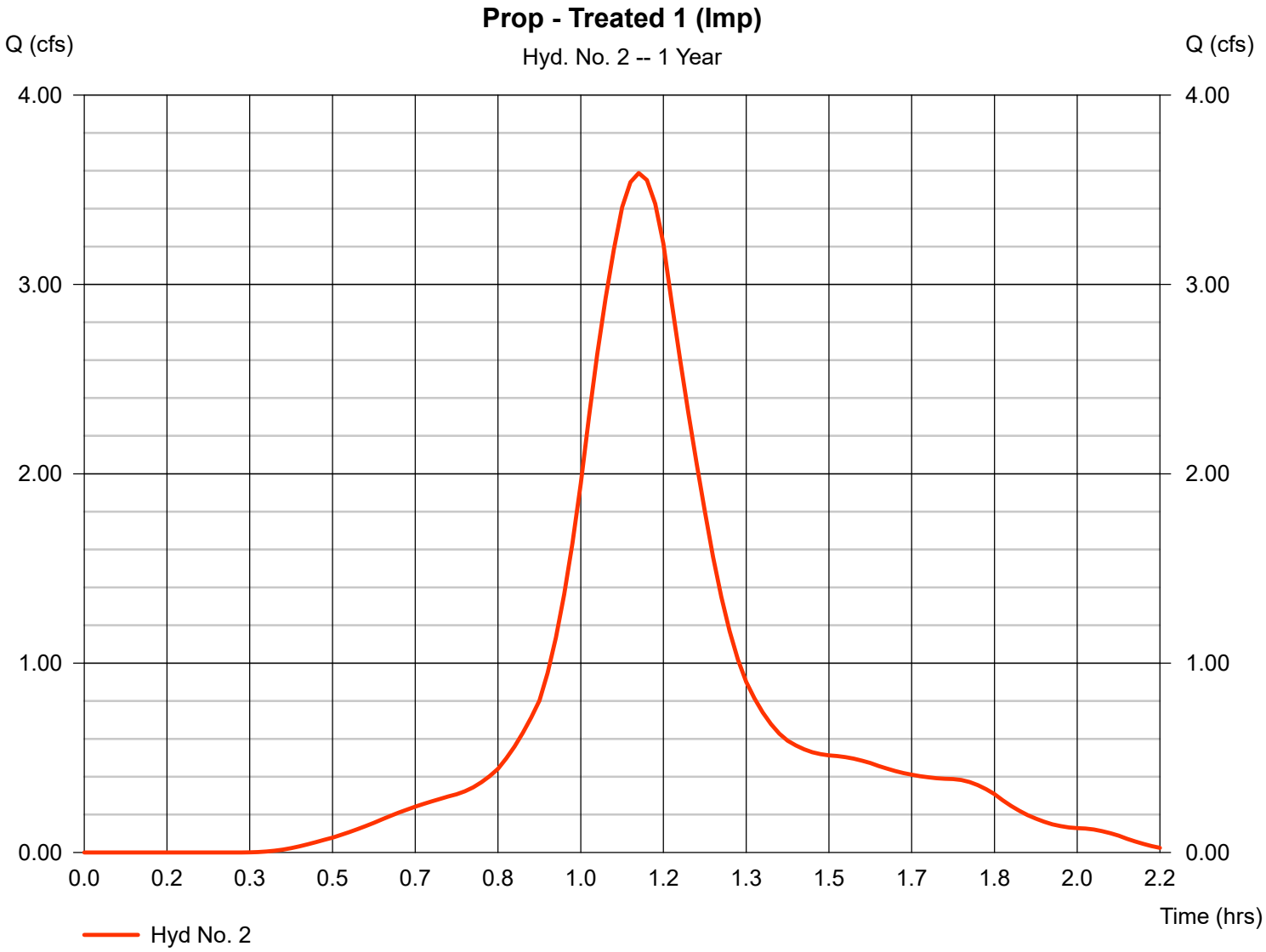


Hydrograph Report

Hyd. No. 2

Prop - Treated 1 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.588 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.12 hrs
Time interval	=	1 min	Hyd. volume	=	4,927 cuft
Drainage area	=	1.312 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	NJWaterQuality.cds	Shape factor	=	484

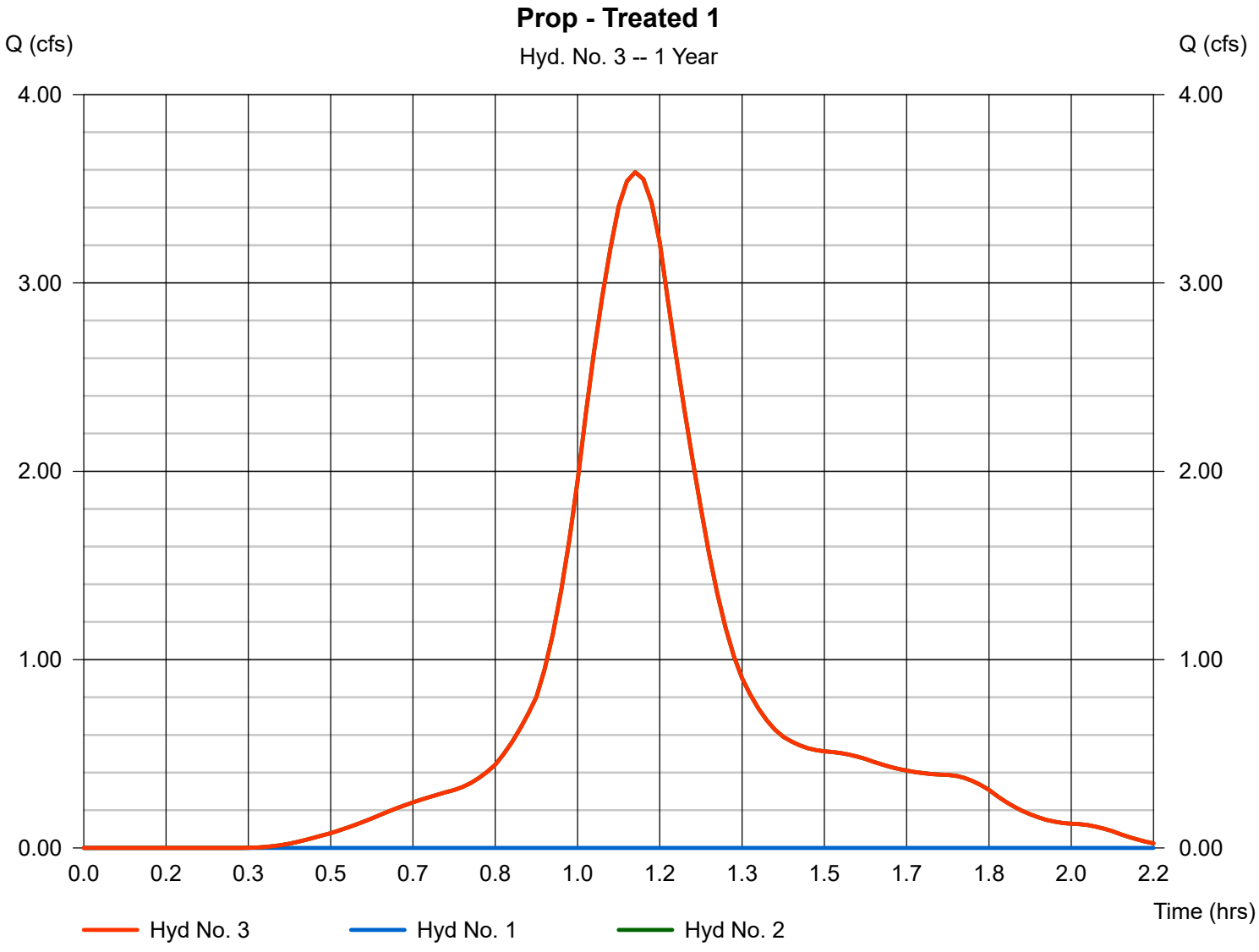


Hydrograph Report

Hyd. No. 3

Prop - Treated 1

Hydrograph type	= Combine	Peak discharge	= 3.588 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.12 hrs
Time interval	= 1 min	Hyd. volume	= 4,927 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 1.852 ac



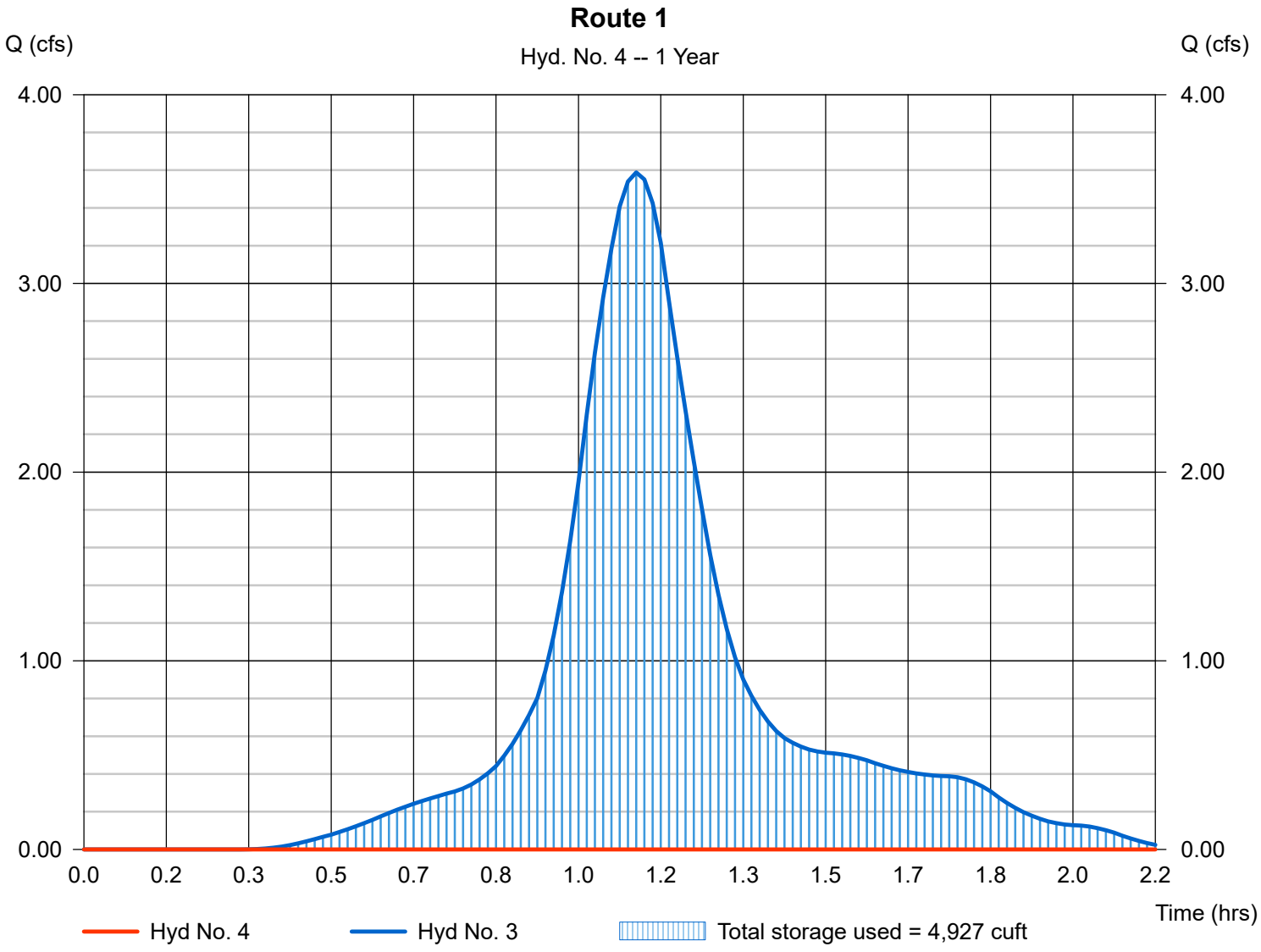
Hydrograph Report

Hyd. No. 4

Route 1

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	3 - Prop - Treated 1	Max. Elevation	=	72.04 ft
Reservoir name	=	Basin 1	Max. Storage	=	4,927 cuft

Storage Indication method used.



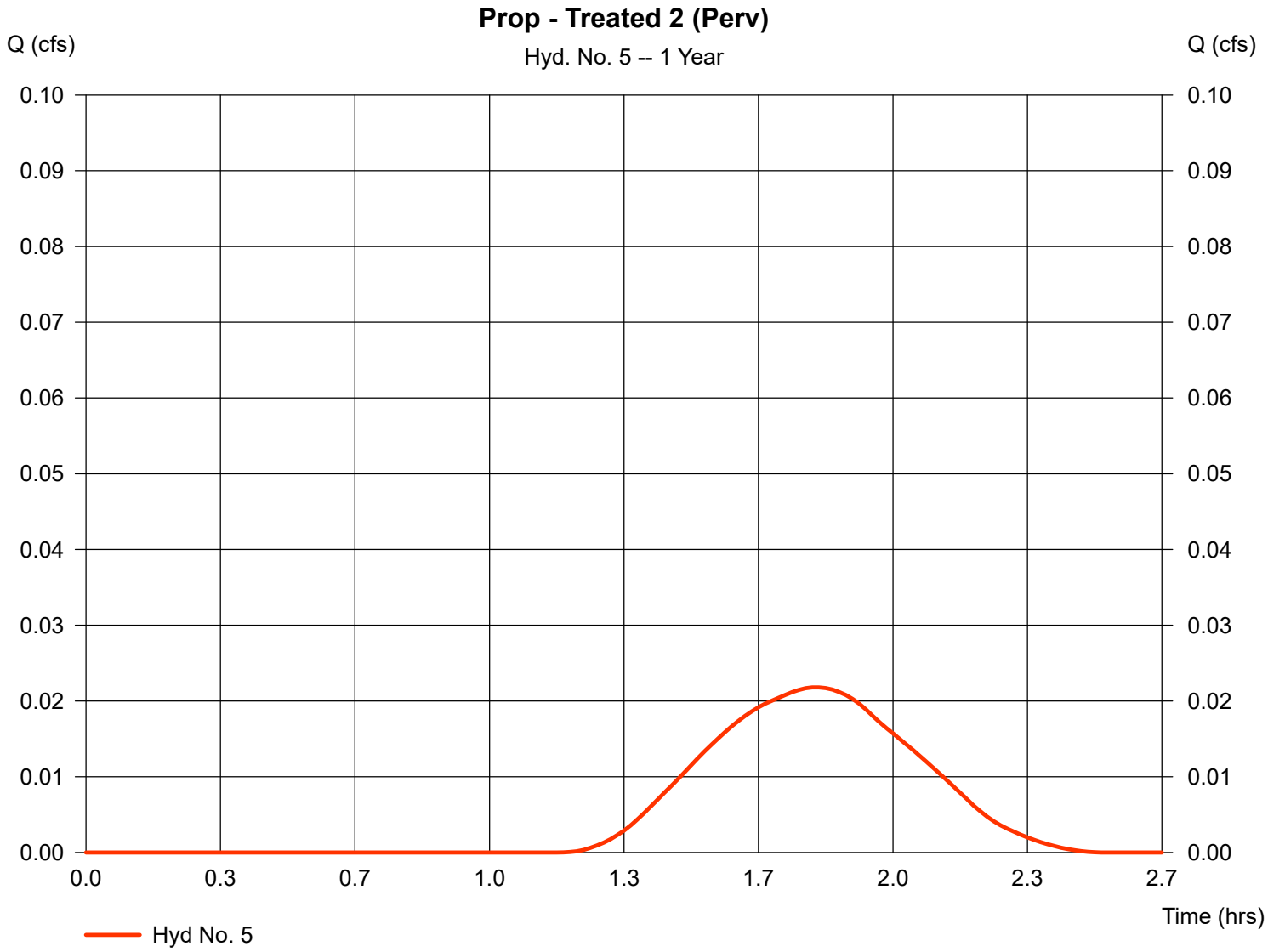
Hydrograph Report

Hyd. No. 5

Prop - Treated 2 (Perv)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.022 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.82 hrs
Time interval	=	1 min	Hyd. volume	=	49 cuft
Drainage area	=	0.990 ac	Curve number	=	67*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.30 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	NJWaterQuality.cds	Shape factor	=	484

* Composite (Area/CN) = [(0.520 x 61) + (0.470 x 74)] / 0.990

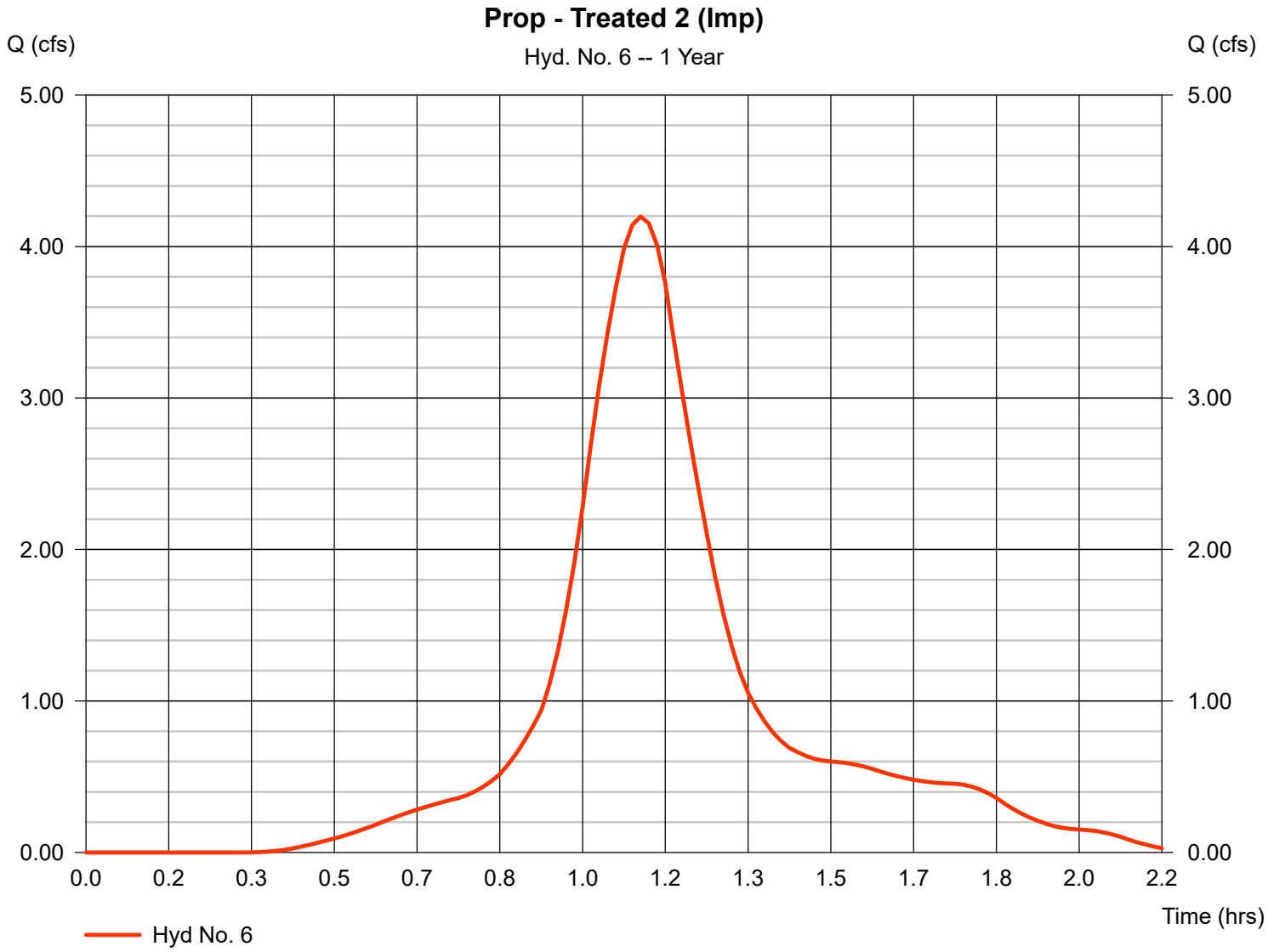


Hydrograph Report

Hyd. No. 6

Prop - Treated 2 (Imp)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.198 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.12 hrs
Time interval	=	1 min	Hyd. volume	=	5,765 cuft
Drainage area	=	1.535 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	NJWaterQuality.cds	Shape factor	=	484

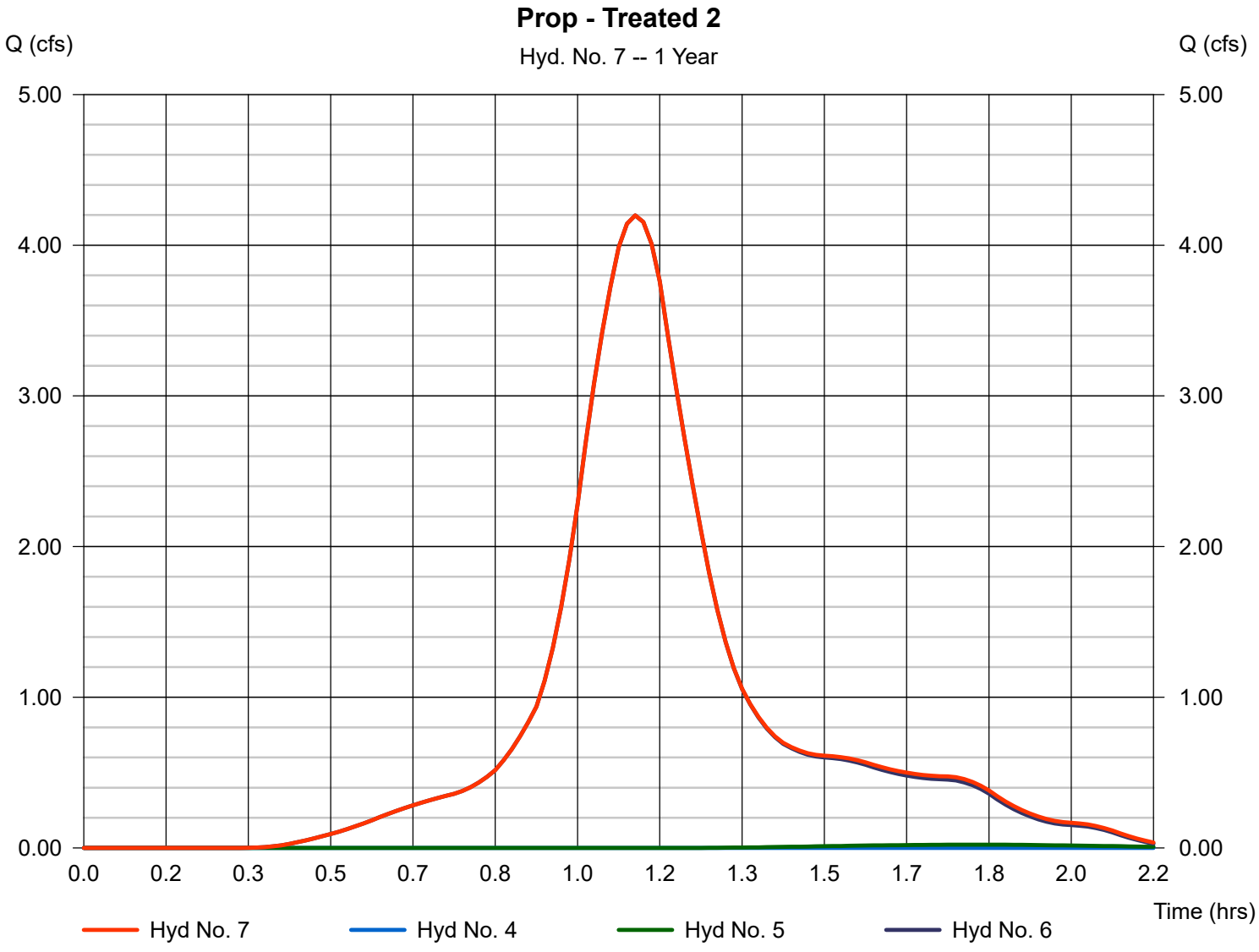


Hydrograph Report

Hyd. No. 7

Prop - Treated 2

Hydrograph type	= Combine	Peak discharge	= 4.198 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.12 hrs
Time interval	= 1 min	Hyd. volume	= 5,813 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 2.525 ac



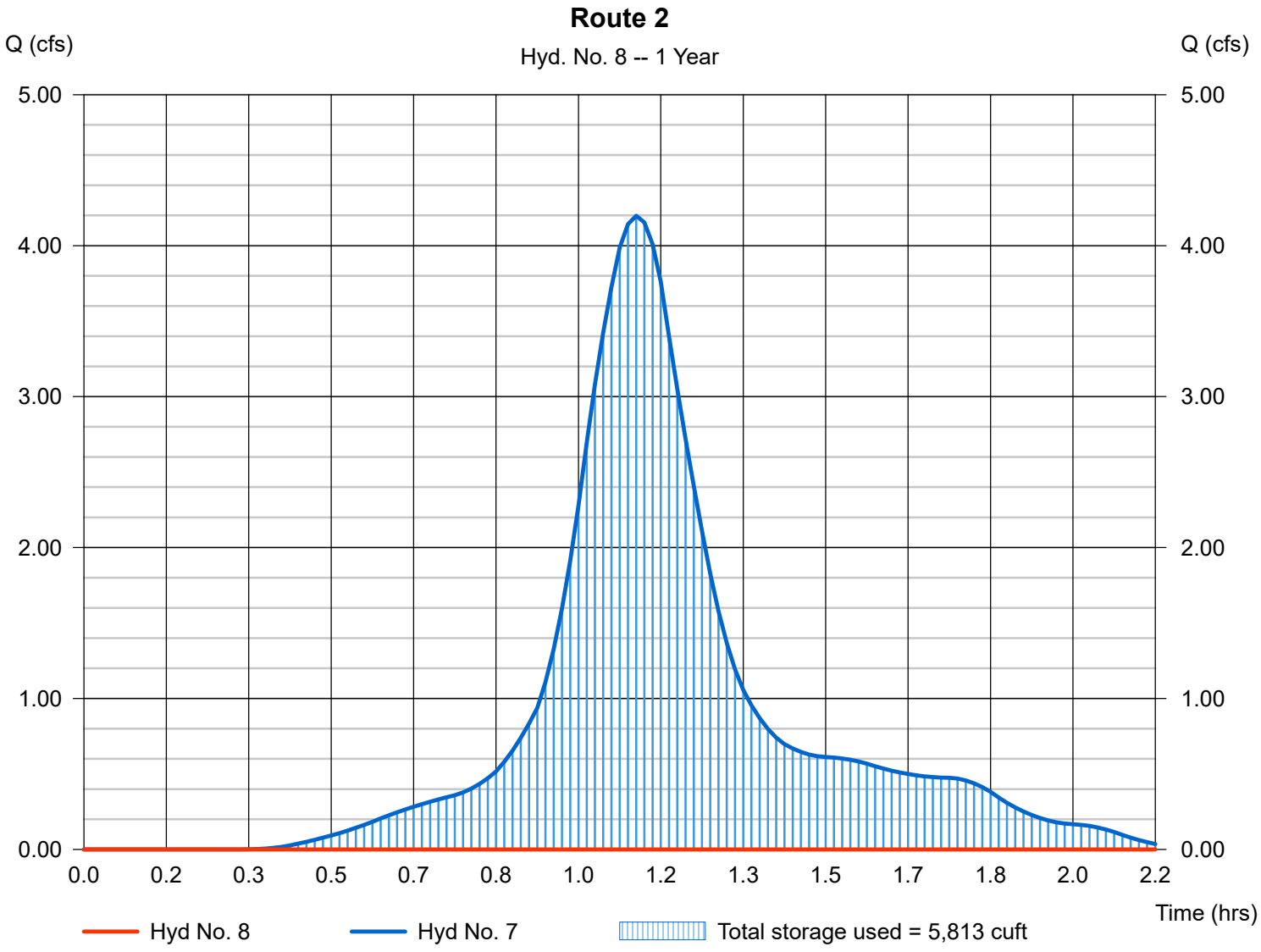
Hydrograph Report

Hyd. No. 8

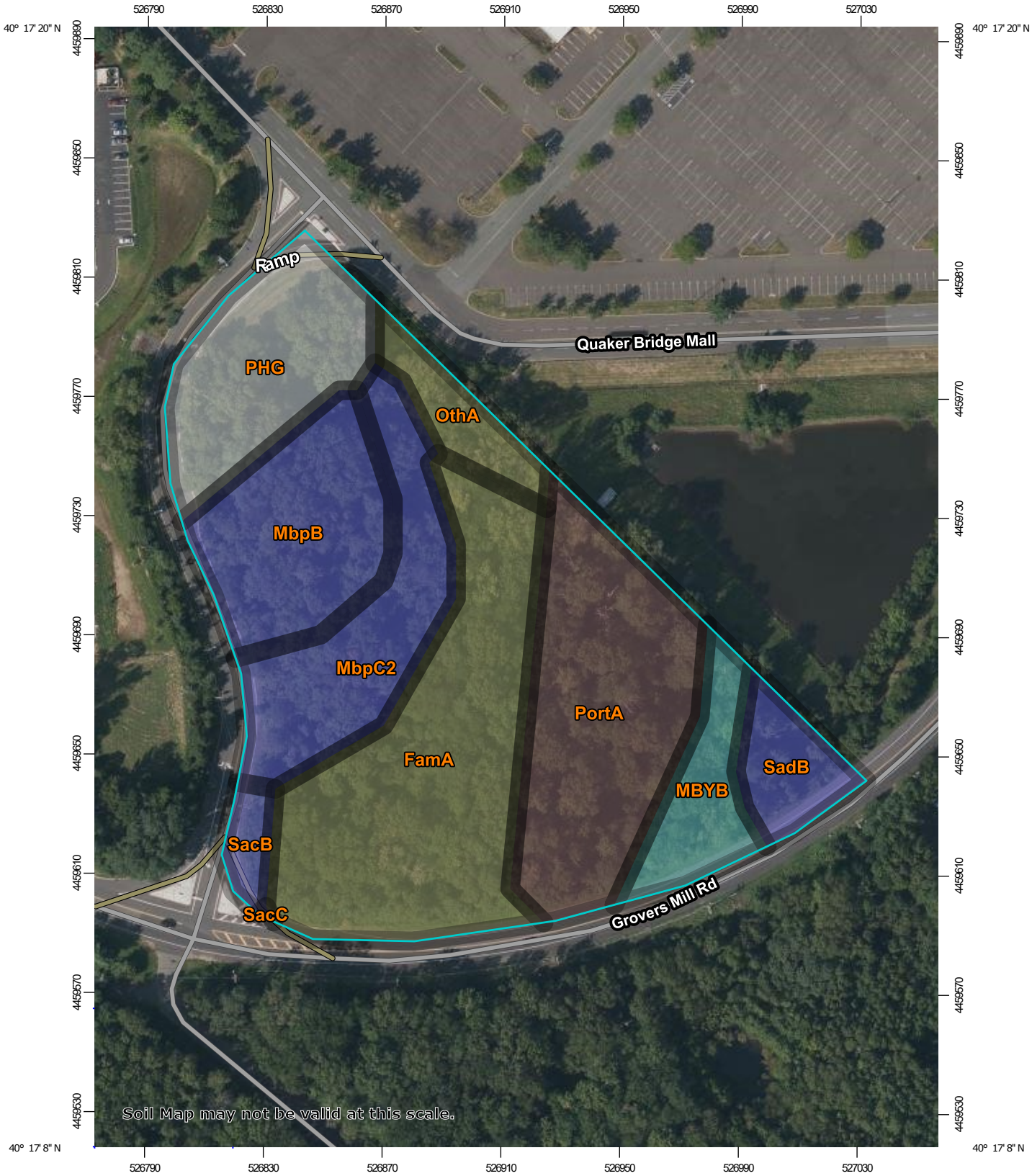
Route 2

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	7 - Prop - Treated 2	Max. Elevation	=	67.82 ft
Reservoir name	=	Basin 2	Max. Storage	=	5,813 cuft

Storage Indication method used.



Hydrologic Soil Group—Mercer County, New Jersey
(Soil Boundary Map)



Map Scale: 1:1,830 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mercer County, New Jersey
Survey Area Data: Version 17, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 6, 2020—Sep 21, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FamA	Fallsington sandy loams, 0 to 2 percent slopes, northern coastal plain	C/D	2.1	26.3%
MbpB	Matapeake loam, 2 to 5 percent slopes	B	1.0	12.6%
MbpC2	Matapeake loam, 5 to 10 percent slopes, eroded	B	1.0	12.9%
MBYB	Mattapex and Bertie loams, 0 to 5 percent slopes	C	0.5	6.1%
OthA	Othello silt loams, 0 to 2 percent slopes, northern coastal plain	C/D	0.3	4.1%
PHG	Pits, sand and gravel		0.9	11.9%
PortA	Portsmouth variant silt loam, 0 to 2 percent slopes	B/D	1.6	19.9%
SacB	Sassafras sandy loam, 2 to 5 percent slopes, Northern Coastal Plain	B	0.1	1.8%
SacC	Sassafras sandy loam, 5 to 10 percent slopes, Northern Coastal Plain	B	0.0	0.0%
SadB	Sassafras gravelly sandy loam, 2 to 5 percent slopes	B	0.3	4.3%
Totals for Area of Interest			**7.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

DM1: EXISTING DRAINAGE AREA MAP

DETENSION BASIN

OthA

PHG

MbpB

MbpC2

FamA

SadB

MBYB

PortA

SacB

Tc PATH (TYP)

EXISTING DRAINAGE AREA 5.225 ACRES

TAX BLOCK 4201.01
LOT 33.03
Area=298,614 SF, 6.855 Acres
"Wooded Lot"
"No Buildings"

LOT 32.03
LOT 32.02
LOT 33.02
LOT 33.01

MALL ACCESS ROAD (50' WIDE)
MILL ROAD (66' WIDE)
GROVERS
CR 638

Block Building
Approximate Tree Line
Chain Link Fence
Edge of Pavement
Slope Easement
Concrete Curb
Uplands
Wetlands
Ditch
20' WIDE SANITARY SEWER EASEMENT
20' Wide Sanitary Sewer Easement
20' EASEMENT
50' TRANSITION AREA
50' DRAINAGE EASEMENT
APPROXIMATE LOCATION OF DRAINAGE EASEMENT
12" Water Main
8" Water Main

SAN MANHOLE RIM=81.62 (SW) INV IN=62.5 (NW) INV IN=62.0 (NW) INV OUT=61.9 (SSE)
SAN MANHOLE RIM=83.65 INV=77.2
SAN MANHOLE RIM=70.11 INV IN=59.5 INV OUT=59.4
SAN MANHOLE RIM=71.30 INV IN=55.7 INV OUT=55.5
SAN MANHOLE RIM=68.89 INV IN=58.1 INV OUT=58.1
SAN MANHOLE RIM=70.60 INV IN=60.4 INV OUT=60.3
SAN MANHOLE RIM=71.08 INV IN=59.9 INV OUT=59.8
P.S. MANHOLE RIM=71.43
P.S. MANHOLE RIM=69.50

STORM INLET GR=84.51
STORM INLET GR=81.57 INV IN=78.9 INV OUT=76.6
STORM INLET GR=81.48 INV IN=76.4 (15") INV IN=76.5 (18") INV OUT=76.3
STORM INLET GR=78.56 INV IN=72.9 INV OUT=72.7
STORM INLET GR=76.26 INV IN=70.8 INV OUT=70.7
STORM INLET GR=73.67 INV IN=68.0 INV OUT=67.7
STORM MANHOLE RIM=72.40 INV IN=65.2 INV OUT=63.8
STORM INLET GR=68.7 INV OUT=63.5
STORM INLET GR=69.27 INV IN=63.3 (21") INV IN=63.3 (15") INV OUT=63.2
STORM INLET GR=71.84 INV IN=67.7 INV OUT=66.8
STORM INLET GR=70.07 INV IN=66.3 (21") INV IN=61.8 (36") INV OUT=61.8
STORM INLET GR=71.94 INV IN=61.5 INV OUT=61.5
STORM INLET GR=69.65 INV IN=61.8 (30") INV IN=64.2 (36") INV OUT=61.8
STORM INLET GR=68.91 INV IN=62.4 INV OUT=62.4
STORM INLET GR=68.88 INV IN=62.6 (30") INV IN=63.0 (15") INV OUT=62.5
STORM INLET GR=70.81 INV OUT=67.6
STORM INLET GR=68.91 INV IN=62.6 INV OUT=62.6

F.E.S. INV=64.4
F.E.S. INV=61.4

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

DM2: PROPOSED DRAINAGE AREA MAP

PROPOSED DRAINAGE AREA BUILDING B: 0.230 AC

PROPOSED DRAINAGE AREA DETAINED: 1.853 AC

PROPOSED DRAINAGE AREA BYPASS: 0.622 AC

PROPOSED DRAINAGE AREA DETAINED 2: 2.520 AC

PROPOSED DRAINAGE AREA BYPASS: 0.622 AC

Tc PATH (TYP)

INFILTRATION BASIN B:
2,725 SF BED
114 CULTEC 360HD CHAMBERS
TOP STONE ELEVATION: 78.50
TOP CHAMBER ELEVATION: 76.50
BOTTOM CHAMBER ELEV: 75.00
BOTTOM STONE ELEV: 74.50

AMAR COURT

MALL ACCESS ROAD

MILL ROAD

GROVERS

CR 638 (66' WIDE)

GRAPHIC SCALE
(IN FEET)
1 inch = 30 ft.

DM3: INLET DRAINAGE AREA MAP

DI#1
0.116 AC

DI#4
0.069 AC

TD#1
0.205 AC

DI#3
0.217 AC

DMH#2
0.401 AC

DI#9
0.556 AC

TD#2
0.074 AC

DI#10
0.187 AC

DI#6
0.349 AC

DI#2
0.134 AC

DI#7
0.208 AC

DI#5
0.095 AC

DI#8
0.312 AC

INFILTRATION BASIN B:
2,725 SF BED
114 CULTEC 360HD CHAMBERS
TOP STONE ELEVATION: 78.50
TOP CHAMBER ELEVATION: 78.00
BOTTOM CHAMBER ELEV: 75.00
BOTTOM STONE ELEV: 74.50

INFILTRATION BASIN #1

INFILTRATION BASIN #2

MALL ACCESS ROAD

MILL ROAD

GROVERS

CR 638

(66' WIDE)

(50' WIDE)

OthA

HSG

MbpB

PdcB

FarA

SadB

MBYB

PortA

SscB

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.