



**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:  
DATE REVISED:**

**OCTOBER 12, 2023  
JUNE 13, 2024**

**CALISTO J. BERTIN, P.E.  
N.J.P.E. LICENSE NO. 28845**

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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 3.043 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:

<b>Frequency (year)</b>	<b>Existing (cfs)</b>	<b>Proposed (cfs)</b>	<b>Change (cfs)</b>	<b>% Exist.</b>	<b>Max. Allowable %</b>
2	1.79	0.87	0.93	48.3%	50
10	6.75	4.85	1.90	71.9%	75
100	19.86	15.78	4.08	79.5%	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.

**II. STORMWATER DRAINAGE CALCULATIONS**

**1. DESIGN CRITERIA**

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

Rainfall distribution = C

County precipitation depths (P) for the 2, 10 & 100 year storm events have been adjusted for current and future conditions based on N.J.A.C. 7:8-5.7(c) & (d).

**2. EXISTING 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 <sub>c</sub> (min)	Peak Discharge (cfs)
2	3.34	61	15.2	1.79
10	5.11			6.75
100	8.66			19.86

**3. PROPOSED RUNOFF**

The majority of the proposed pavement area and roof drainage from Buildings A, D & E will be directed into aboveground basins with sand filters (Prop - Detained 1 & Prop - Detained 3). The discharge from these basins, 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	1.832	0.637	0.104	1.091
Prop - Detained 2	2.065	0.237	0.407	1.421
Prop - Detained 3	0.488	0.196	0.000	0.292
Prop - Bypass	0.610	0.397	0.204	0.009
Prop - Building B	0.230	0.000	0.000	0.230

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

**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 <sub>c</sub> (min)	Peak Discharge (cfs)
2	3.84	63	12.2	0.56
10	5.86			1.56
100	11.33			4.95

Proposed Drainage Area - Detained 1 (Impervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)
2	3.84	98	10.0	3.98
10	5.86			6.11
100	11.33			11.85

Proposed Drainage Area - Detained 1						
Storm (year)	Pervious		Impervious		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.56	12.20	3.98	12.13	4.48	12.15
10	1.56	12.18	6.11	12.13	7.57	12.15
100	4.95	12.18	11.85	12.13	16.61	12.15

II) Detention Summary - Basin #1:

Outlet Control: 9 LF of 15" HDPE @ 5.0%, Inv 71.00  
 4" Orifice at Elevation 72.00  
 4' Rect. Weir at Elevation 74.17  
 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	6,413
74.00	0.57	20,094
76.00	12.30	35,193

<-Elevation of Lowest Orifice = 72.00

Inflow vs. Outflow					
Storm (year)	Inflow		Outflow		
	Peak Flow (cfs)	Time (hr)	Peak Flow (cfs)	Time (hr)	Peak Elev. (ft)
2	4.48	12.15	0.30	13.60	72.67
10	7.57	12.15	0.52	13.55	73.71
100	16.61	12.15	9.51	12.28	74.99

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**III) Emergency Spillway Design:**

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

$$\text{Use } Q = 3.2 \times L \times H^{1.5} \text{ to solve for } L \text{ (weir Length) with } H = 0.5 \text{ ft} \quad Q_{100} = 16.61 \text{ cfs}$$

$$16.61 \text{ cfs} = 3.2 \times L \times 0.5^{1.5} \quad L = 14.7 \text{ ft} \quad \text{Use 15 ft}$$

Check Allowable Discharge Velocity:  $V = 2.4 \text{ ft/s}$  (Allowable Discharge Velocity)

$$V = Q / A = 16.61 \text{ cfs} / (11 \text{ ft} \times 0.5 \text{ ft}) = 2.21 \text{ ft/s} < 2.4 \text{ ft/s} \quad \text{OK}$$

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

**5. PROPOSED RUNOFF - DETAINED 3****I) Peak Discharge: Proposed Drainage Area - Detained 1 (as determined by TR-55):**

Proposed Drainage Area - Detained 3 (Pervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	$T_c$ (min)	Peak Discharge (cfs)
2	3.84	61	10.0	0.14
10	5.86			0.43
100	11.33			1.41

Proposed Drainage Area - Detained 3 (Impervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	$T_c$ (min)	Peak Discharge (cfs)
2	3.84	98	10.0	1.07
10	5.86			1.64
100	11.33			3.17

Proposed Drainage Area - Detained 3						
Storm (year)	Pervious		Impervious		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.14	12.17	1.07	12.13	1.20	12.15
10	0.43	12.15	1.64	12.13	2.06	12.15
100	1.41	12.15	3.17	12.13	4.57	12.15

**II) Detention Summary - Basin #3:**

Outlet Control: 72 LF of 15" HDPE @ 2.9%, Inv 73.00  
 3" Orifice at Elevation 74.50  
 4'x4' Overflow Riser at Elevation 76.00

Depth vs. Storage		
Elevation (ft)	Discharge (cfs)	Storage (cf)
74.00	0.00	0
75.00	0.15	5,192
76.00	0.28	10,512
77.00	10.81	15,973

<-Elevation of Lowest Orifice = 74.50

Inflow vs. Outflow					
Storm (year)	Inflow		Outflow		
	Peak Flow (cfs)	Time (hr)	Peak Flow (cfs)	Time (hr)	Peak Elev. (ft)
2	1.20	12.15	0.04	15.63	74.64
10	2.06	12.15	0.13	13.58	74.94
100	4.57	4.57	0.35	13.37	76.00

**6. 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 <sub>c</sub> (min)	Peak Discharge (cfs)
2	3.34	69	19.3	0.51
10	5.11			1.31
100	8.66			3.90

Proposed Drainage Area - Detained 2 (Impervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)
2	3.34	98	10.0	5.19
10	5.11			7.96
100	8.66			15.43

Proposed Drainage Area - Basin #2										
Storm (year)	Basin #1 Route		Basin #3 Route		Detained 2 (Perv)		Detained 2 (Imp)		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.30	13.60	0.04	15.63	0.51	12.27	5.19	12.13	5.59	12.15
10	0.52	13.55	0.13	13.58	1.31	12.27	7.96	12.13	9.34	12.15
100	9.51	12.28	0.35	13.37	3.90	12.25	15.43	12.13	24.79	12.18

II) Detention Summary - Basin #2:

Outlet Control: 19 LF of 24" RCP @ 5.0%, Inv 67.0  
 4" Orifice at Elevation 67.75  
 8"x39" Orifice at Elevation 68.50  
 4'x4' Overflow Riser at Elevation 70.50

Depth vs. Storage		
Elevation (ft)	Discharge (cfs)	Storage (cf)
67.00	0.00	0
69.00	4.35	17,892
71.00	24.37	36,395

<-Elevation of Lowest Orifice =67.75

Inflow vs. Outflow					
Storm (year)	Inflow		Outflow		
	Peak Flow (cfs)	Time (hr)	Peak Flow (cfs)	Time (hr)	Peak Elev. (ft)
2	5.59	12.15	0.73	13.48	68.60
10	9.34	12.15	4.14	12.37	69.98
100	24.79	12.18	14.24	12.43	70.48

**III) Overflow Design**

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

Use  $Q = 3.2 \times L \times H^{1.5}$  to solve for L (weir Length) with H = 0.5 ft  $Q_{100} = 24.79$  cfs  
 $24.79 \text{ cfs} = 3.2 \times L \times 0.5^{1.5}$  L = 21.9 ft Use 22 ft

Check Allowable Discharge Velocity: V = 2.4 ft/s (Allowable Discharge Velocity)  
 $V = Q / A = 24.79 \text{ cfs} / (19 \text{ ft} \times 0.5 \text{ ft}) = 2.25 \text{ ft/s} < 2.4 \text{ ft/s}$  **OK**

The elevation of the emergency spillway is 70.50 with a peak emergency 100-year water elevation of 71.00.

**7. PROPOSED RUNOFF - BYPASS**

Proposed Drainage Area - Bypass (Pervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)
2	3.34	65	10.0	0.67
10	5.11			1.70
100	8.66			4.99

Proposed Drainage Area - Bypass (Impervious)				
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)
2	3.34	98	10.0	0.03
10	5.11			0.05
100	8.66			0.10

Proposed Drainage Area - Bypass						
Storm (year)	Pervious		Impervious		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
2	0.67	12.17	0.03	12.13	0.70	12.17
10	1.70	12.15	0.05	12.13	1.75	12.15
100	4.99	12.15	0.10	12.13	5.09	12.15

**8. 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	0.73	13.48	0.70	12.17	0.87	12.17
10	4.14	12.37	1.75	12.15	4.85	12.30
100	14.24	12.43	5.09	12.15	15.78	12.23



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**9. EXISTING VS. PROPOSED RUNOFF**

Frequency (year)	Existing (cfs)	Proposed (cfs)	Change (cfs)	% Exist.
2	1.79	0.87	0.93	48.3%
10	6.75	4.85	1.90	71.9%
100	19.86	15.78	4.08	79.5%

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 0.93, 1.90 & 4.08 cfs respectively.

**10. 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 <sub>c</sub> (min)	Peak Discharge (cfs)	Volume (cf)
100	8.66	98	0.230	10.0	2.50	9,258

**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 = 9,416 cf > 9,258 cf

See attached Cultec Recharger 360HD Volume Worksheet.

**11. 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<sub>d</sub> (Storm Duration) = 2 hours

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

**I) Area of Analysis:**

Treated drainage areas are equal to the detained basin areas.

Drainage Area	Total (acres)	Pervious (acres)		Impervious (acres)
		HSG B	HSG C	
Prop - Treated 1	1.832	0.637	0.104	1.091
Prop - Treated 2	2.065	0.237	0.407	1.421
Prop - Treated 3	0.488	0.196	0.000	0.292

**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 <sub>c</sub> (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	63	12.2	0.00	0

Proposed Drainage Area - Treated 1 (Impervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	98	10.0	2.98	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	1.87	2.98	1.12	2.98	1.12	4,100

Inflow vs. Outflow					
Storm (year)	Inflow		Outflow		
	Peak Flow (cfs)	Time (hr)	Peak Flow (cfs)	Time (hr)	Peak Elev. (ft)
WQ	2.98	1.12	0.00	n/a	71.64

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

III) Treated Area 3 (Prop - Basin 3) Routed Through Basin 3:

Proposed Drainage Area - Treated 3 (Pervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	61	10.0	0.00	0

Proposed Drainage Area - Treated 3 (Impervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	98	10	0.80	1,097

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	0.80	1.12	0.80	1.12	1,097

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

Proposed Drainage Area - Treated 2 (Pervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	69	19.3	0.02	60

Proposed Drainage Area - Treated 2 (Impervious)					
Frequency (year)	Rainfall, P (in)	Curve Number	T <sub>c</sub> (min)	Peak Discharge (cfs)	Volume (cf)
WQ	1.25	98	10.0	3.89	5,337

Proposed Drainage Area - Treated 2										
Storm (year)	Treated #1 Route		Treated #3 Route		Treated 2 (Perv)		Treated 2 (Imp)		Combined	
	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)	Peak (cfs)	Time (hr)
WQ	0.00	n/a	0.80	1.12	0.02	1.77	3.89	1.12	0.00	n/a

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

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**12. 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 49,143 (Vdef) for the portion of the site to be disturbed (5.225 acres).

Basin 1 collects a large amount of the impervious area from the pavement. The amount of impervious area collected is 47,524 sf (Aimp) and provides the Annual BMP Recharge Volume (Vdef) at a calculated BMP effective depth (dBMP) of 1.4 inches. Since the provided BMP effective depth in the basin of 12 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.

**13. 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	0.077	0.009	0.000	0.086	0.91
DI#2	0.106	0.029	0.000	0.135	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	0.080	0.008	0.000	0.088	0.92
DI#6	0.000	0.137	0.000	0.137	0.25
DI#7	0.204	0.002	0.002	0.208	0.98
DI#8	0.158	0.037	0.047	0.242	0.78
DI#9	0.497	0.001	0.058	0.556	0.94
DI#10	0.152	0.000	0.035	0.187	0.90
TD#3	0.075	0.078	0.086	0.239	0.58
TD#2	0.060	0.000	0.015	0.074	0.90
DMH#2	0.401	0.000	0.000	0.401	0.99

**14. 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:**

$Q_{25} = 5.52$  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. ( $d_{50}$ ) =  $(0.0125 / 0.2D_o) \times (Q / W_o)^{4/3} = 0.36$  ft (Use 6" = 0.5 ft)

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21-210: Residential Development - Lawrence, NJ

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**Scour Hole #2:**

$$Q_{25} = 0.46 \text{ cfs (See Storm Sewer Design Calculations)}$$

$$D_o = 15 \text{ in}$$

$$T_w = 0.2D_o = 0.25 \text{ ft}$$

$$\text{Length of Hole Bottom (L)} = 3 \times D_o = 3.75 \text{ ft}$$

$$\text{Width of Hole Bottom (W)} = 2 \times W_o = 2.50 \text{ ft}$$

$$\text{Median Stone Dia. (d}_{50}) = (0.0125 / 0.2D_o) \times (Q / W_o)^{4/3} = 0.14 \text{ ft (Use 4" = 0.33 ft)}$$

**Scour Hole #3:**

$$Q_{25} = 8.31 \text{ cfs (See Storm Sewer Design Calculations)}$$

$$D_o = 18 \text{ in}$$

$$T_w = 0.2D_o = 0.30 \text{ ft}$$

$$\text{Length of Hole Bottom (L)} = 3 \times D_o = 4.50 \text{ ft}$$

$$\text{Width of Hole Bottom (W)} = 2 \times W_o = 3.00 \text{ ft}$$

$$\text{Median Stone Dia. (d}_{50}) = (0.0125 / 0.2D_o) \times (Q / W_o)^{4/3} = 0.41 \text{ ft (Use 8" = 0.67 ft)}$$

**Scour Hole #4:**

$$Q_{25} = 0.41 \text{ cfs (See Storm Sewer Design Calculations)}$$

$$D_o = 15 \text{ in}$$

$$T_w = 0.2D_o = 0.25 \text{ ft}$$

$$\text{Length of Hole Bottom (L)} = 3 \times D_o = 3.75 \text{ ft}$$

$$\text{Width of Hole Bottom (W)} = 2 \times W_o = 2.50 \text{ ft}$$

$$\text{Median Stone Dia. (d}_{50}) = (0.0125 / 0.2D_o) \times (Q / W_o)^{4/3} = 0.01 \text{ ft (Use 4" = 0.33 ft)}$$

**Scour Hole #5:**

$$A = 0.362 \text{ ac}$$

$$c = 0.98 \text{ for impervious areas}$$

$$I_{25} = 7.28 \text{ in/hr (T}_c = 5 \text{ min.)}$$

$$Q_{25} = 0.98 \times 7.28 \times 0.362 = 2.58 \text{ cfs scale}$$

$$D_o = 10 \text{ in}$$

$$T_w = 0.2D_o = 0.17 \text{ ft}$$

$$\text{Length of Hole Bottom (L)} = 3 \times D_o = 2.50 \text{ ft}$$

$$\text{Width of Hole Bottom (W)} = 2 \times W_o = 1.67 \text{ ft}$$

$$\text{Median Stone Dia. (d}_{50}) = (0.0125 / 0.2D_o) \times (Q / W_o)^{4/3} = 0.09 \text{ ft (Use 4" = 0.33 ft)}$$

**BERTIN ENGINEERING**

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JOB  
 SHEET NO.  
 CALCULATED BY  
 CHECKED BY  
 SCALE

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**Scour Hole #6:**

A = 0.257 ac  
 c = 0.98 for impervious areas  
 $I_{25} = 7.28$  in/hr ( $T_c = 5$  min.)

$$Q_{25} = 0.98 \quad x \quad 7.28 \quad x \quad 0.257 \quad = \quad 1.83 \text{ cfs} \quad \text{scale}$$

$$D_o = 10 \text{ in}$$

$$T_w = 0.2D_o = 0.17 \text{ ft}$$

$$\text{Length of Hole Bottom (L)} = 3 \times D_o = 2.50 \text{ ft}$$

$$\text{Width of Hole Bottom (W)} = 2 \times W_o = 1.67 \text{ ft}$$

$$\text{Median Stone Dia. (d}_{50}) = (0.0125 / 0.2D_o) \times (Q / W_o)^{4/3} = 0.09 \text{ ft (Use 4" = 0.33 ft)}$$

**15. 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: 6,413 cf  
 Area of Infiltration 6,293 sf

$$\text{Time to Drain: } 6,413 \text{ cf} / (6293 \text{ sf} \times 0.417 \text{ ft/hr}) = 2.45 \text{ hours}$$

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: 6.487 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 6.487 ft + 66.0 = 72.49 (Above basin bottom)

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

Trial Design Infiltration Rate / Factor: 1.556 in/hr = 0.130 ft/hr  
 Time to Drain x Factor: 6,413 cf / (6293 sf x 0.130 ft/hr) = 7.86 hours  
 Groundwater Mounding Height at Center: 5.000 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 5.000 ft + 66 = 71.00 (Basin bottom)

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**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: 6,637 cf  
 Area of Infiltration 8,792 sf

Time to Drain: 6,637 cf / (8792 sf x 0.417 ft/hr)  
 = 1.81 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: 3.669 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 3.669 ft + 65.0 = 68.67 (Above basin bottom)

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

Trial Design Infiltration Rate / Factor: 0.820 in/hr = 0.068 ft/hr  
 Time to Drain x Factor: 6,637 cf / (8792 sf x 0.068 ft/hr) = 11.05 hours  
 Groundwater Mounding Height at Center: 1.999 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 1.999 ft + 65 = 67.00 (Basin bottom)

**Basin #3:**

The soils report was prepared by Wham Engineering Services, Inc. on June 10, 2024. A percolation rate of 10 in/hr is used at TP-7.

Time to Drain 100 Year Volume:

Test Infiltration Rate: 18.5 in/hr  
 Design Infiltration Rate (1/2 Test Rate) 9.25 in/hr = 0.771 ft/hr  
 Volume Below Lowest Orifice: 6,637 cf  
 Area of Infiltration 2,581 sf

Time to Drain: 6,637 cf / (2581 sf x 0.771 ft/hr)  
 = 3.34 hours

Elevation of Groundwater: 70 (16 ft down from existing grade elevation of TP-7)  
 Bottom of Basin Elevation: 74.00  
 Groundwater Mounding Height at Center: 9.576 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 9.576 ft + 70.0 = 79.58 (Above basin bottom)

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

Trial Design Infiltration Rate / Factor: 1.209 in/hr = 0.101 ft/hr  
 Time to Drain x Factor: 6,637 cf / (2581 sf x 0.101 ft/hr) = 25.52 hours  
 Groundwater Mounding Height at Center: 4.000 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 4.000 ft + 70 = 74.00 (Basin bottom)

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CJB	DATE	6/13/2024

**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: 9,258 cf  
 Area of Infiltration 3,682 sf

Time to Drain: 9,258.0 cf / (3682 sf x 0.417 ft/hr)  
 = 6.03 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: 4.756 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 4.756 ft + 70.0 = 74.76 (Below basin bottom)

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

Trial Design Infiltration Rate / Factor: 3.332 in/hr = 0.278 ft/hr  
 Time to Drain x Factor: 9,258 cf / (3682 sf x 0.278 ft/hr) = 9.06 hours  
 Groundwater Mounding Height at Center: 4.000 ft (From Groundwater Mounding Calculator)  
 Elevation of Groundwater Mounding at Center: 4.000 ft + 70 = 74.00 (Basin bottom)



# CULTEC Stormwater Design Calculator

Date:	June 17, 2024
<b>Project Information:</b>	

<b>Calculations Performed By:</b>	

## 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	5,872.60	cu. feet
Within Feed Connectors	2.74	cu. feet
Within Stone	3,540.56	cu. feet
<b>Total Storage Provided</b>	<b>9,415.9</b>	<b>cu. feet</b>
Total Storage Required	9258.00	cu. feet

## Materials List

Recharger 360HD		
<b>Total Number of Chambers Required</b>	<b>159</b>	<b>pieces</b>
Chamber Units	159	pieces
End Caps	6	pieces
HVLV FC-48 Feed Connectors	4	pieces
CULTEC No. 410 Non-Woven Geotextile	1264	sq. yards
CULTEC No. 4800 Woven Geotextile	37	feet
Stone	328	cu. yards

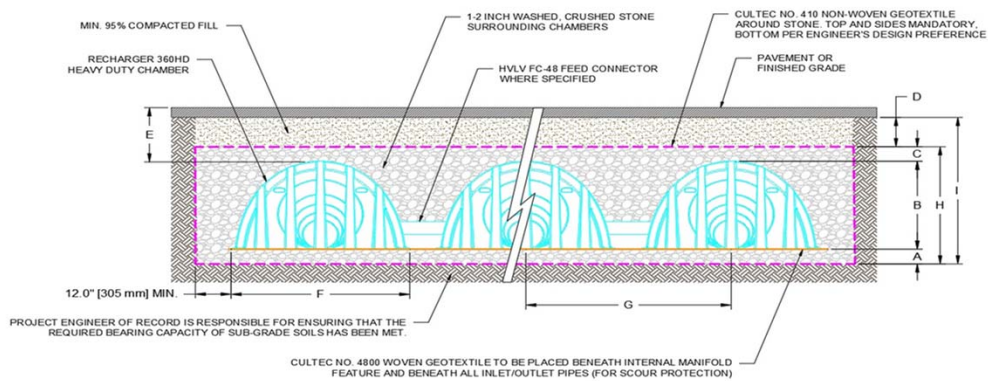
Based on 2 Internal Manifolds

## Bed Detail



Bed Layout Information		
Number of Rows Wide	3	pieces
Number of Chambers Long	53	pieces
Chamber Row Width	16.50	feet
Chamber Row Length	197.01	feet
Bed Width	18.50	feet
Bed Length	199.01	feet
Bed Area Required	3681.69	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



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:	06/13/24

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	0.404	Open space	Pits, Muck	0.0	-
2	0.277	Open space	Matapeake	12.9	12,993
3	0.533	Open space	Matapeake	12.9	25,001
4	0.193	Open space	Portsmouth	0.0	-
5	0.059	Open space	Sassafras	13.2	2,830
6	0.168	Open space	Othello	0.0	-
7	0.547	Open space	Fallsington	0.0	-
8	3.043	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)
				2.2	40,824

### 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.

<b>Annual Recharge Requirements Calculation ↓</b>			
% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	132,553
<b>Post-Development Annual Recharge Deficit=</b>	<b>49,143</b>	(cubic feet)	
<b>Recharge Efficiency Parameters Calculations (area averages)</b>			
RWC= 1.28	(in)	DRWC= 0.32	(in)
ERWC = 0.36	(in)	EDRWC= 0.09	(in)

Project Name		Description		Analysis Date		BMP or LID Type					
21-210		Lawrence, NJ		06/13/24		Infiltration Basin 1					
Recharge BMP Input Parameters				Root Zone Water capacity Calculated Parameters				Recharge Design Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	6293.0	sq.ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.36	in	Inches of Runoff to capture	Qdesign	0.16	in
BMP Effective Depth, this is the design variable	dBMP	1.4	in	ERWC Modified to consider dEXC	EDRWC	0.09	in	Inches of Rainfall to capture	Pdesign	0.22	in
Upper level of the BMP surface (negative if above ground)	dBMPu	0.0	in	Empty Portion of RWC under Infil. BMP	RERWC	0.07	in	Recharge Provided Avg. over Imp. Area		10.0	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	60.0	in					Runoff Captured Avg. over imp. Area		10.6	in
Post-development Land Segment Location of BMP, Input Zero if Location is distributed or undetermined	SegBMP	0	unitless								
				BMP Calculated Size Parameters				CALCULATION CHECK MESSAGES			
				ABMP/Aimp	Aratio	0.11	unitless	Volume Balance--> <b>OK</b>			
				BMP Volume	VBMP	734	cu.ft	dBMP Check--> <b>OK</b>			
								dEXC Check--> <b>OK</b>			
								BMP Location--> <b>Location is selected as distributed or undetermined</b>			
Parameters from Annual Recharge Worksheet				System Performance Calculated Parameters				OTHER NOTES			
Post-D Deficit Recharge (or desired recharge volume)	Vdef	47,524	cu.ft	Annual BMP Recharge Volume		47,524	cu.ft	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 sensitive 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.			
Post-D Impervious Area (or target Impervious Area)	Aimp	57,151	sq.ft	Avg BMP Recharge Efficiency		94.2%	Represents % Infiltration Recharged				
Root Zone Water Capacity	RWC	1.28	in	%Rainfall became Runoff		77.7%	%				
RWC Modified to consider dEXC	DRWC	0.32	in	%Runoff Infiltrated		30.4%	%				
Climatic Factor	C-factor	1.43	no units	%Runoff Recharged		12.3%	%				
Average Annual P	Pavg	44.9	in	%Rainfall Recharged		9.6%	%				
Recharge Requirement over Imp. Area	dr	4.3	in								
<p><b>How to solve for different recharge volumes:</b> 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.</p> <p>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 click the "Default Vdef &amp; Aimp" button.</p>											

# STORM SEWER DESIGN CALCULATIONS

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

BY: MBL  
 CHK'D: CJB  
 DATE: 6/13/24

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 A Acres	Runoff Coef. C	C x A	Sum CA	Inlet			Pipe					Pipe Design							
						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	
TD#3	DI#1	0.24	0.58	0.14	0.14	10	5.80	0.81	10	-	10.00	5.80	0.81	8	0.011	41	2.00	2.0	5.7	5.5	
DI#1	DMH#1	0.09	0.91	0.08	0.22	10	5.80	0.46	10	0.12	10.12	5.78	1.27	15	0.012	127	1.00	7.0	5.7	4.5	
DI#2	DMH#1	0.14	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				0.33	10	5.80		10.12	0.47	10.59	5.69	1.88	15	0.012	185	1.00	7.0	5.7	4.9	
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	0.99	10	5.80	2.32	10.59	0.63	11.22	5.58	5.52	15	0.012	35	2.00	9.9	8.1	8.4	
DI#5	BASIN#1	0.09	0.92	0.08	0.08	10	5.80	0.46	10	-	10.00	5.80	0.46	15	0.012	12	5.00	15.6	12.7	6.3	
OCS#3	DI#6							0.15					0.15	15	0.012	72	2.90	11.9	9.7	3.8	
DI#6	DI#7	0.14	0.25	0.03	0.03	10	5.80	0.17	10	-	10.00	5.80	0.32	15	0.012	45	0.70	5.9	4.8	2.8	
DI#7	DMH#3	0.21	0.98	0.20	0.23	10	5.80	1.16	10	0.27	10.27	5.75	1.47	15	0.012	208	0.80	6.3	5.1	4.3	
OCS#1	DMH#3							0.55					0.55	15	0.012	9	5.00	15.6	12.7	6.6	
DMH#3	DMH#4				0.23				10.27	0.81	11.08	5.61	1.99	18	0.012	98	1.50	13.9	7.9	5.8	
DI#8	DMH#4	0.24	0.78	0.19	0.19	10	5.80	1.10	10	-	10.00	5.80	1.10	18	0.012	17	0.50	8.0	4.5	3.2	
DI#9	DI#10	0.56	0.94	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	0.70	9.5	5.4	5.2	
DMH#4	FES#2	0.31	0.83	0.26	1.37	10	5.80	1.51	11.08	0.28	11.36	5.56	8.31	18	0.012	36	1.10	11.9	6.7	7.4	
TD#2	BASIN#2	0.07	0.90	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							4.86					4.86	24	0.013	19	5.00	50.6	16.1	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			
$\frac{1}{8}$ acre	65%	0.59	0.76	0.86
$\frac{1}{4}$ acre	38%	0.25	0.55	0.70
$\frac{1}{2}$ acre	30%	NA	0.49	0.67
$\frac{3}{4}$ acre	25%	NA	0.45	0.65
1 acre	20%	NA	0.41	0.63
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.



**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**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)<sup>1</sup></b>										
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)

<sup>1</sup> 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.

[Back to Top](#)

**PF graphical**

## Basin 1

Input Values

5.00
0.150
25.00
49.100
56.750
2.45
10.00

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

16.487
6.487

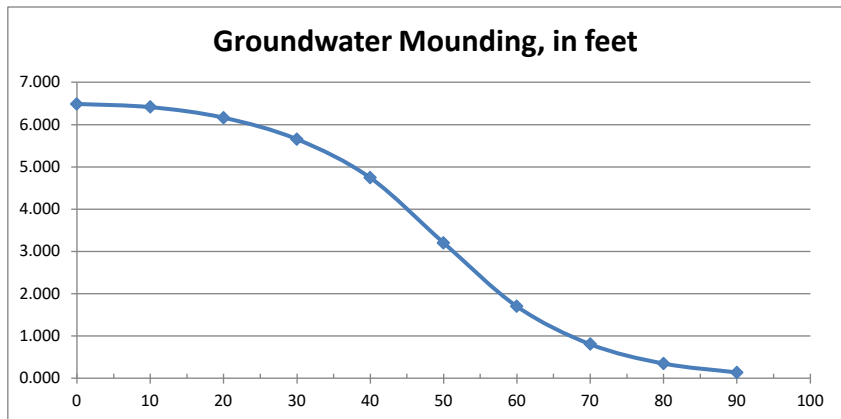
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

6.487	0
6.412	10
6.160	20
5.651	30
4.741	40
3.199	50
1.697	60
0.803	70
0.342	80
0.132	90



**Re-Calculate Now**



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## Basin 1 - Modified

**Input Values**

1.56
0.150
25.00
49.100
56.750
7.86
10.00

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 $K_h = 5 \times \text{Recharge Rate (R)}$  in the costal plan;  $K_h=R$  outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

15.000
5.000

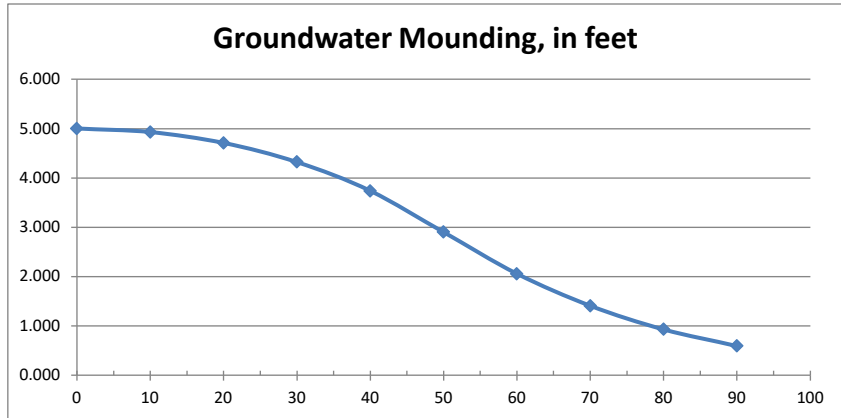
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

5.000	0
4.929	10
4.709	20
4.323	30
3.736	40
2.899	50
2.055	60
1.404	70
0.926	80
0.591	90



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## Basin 2

### Input Values

5.00
0.150
25.00
115.845
17.670
1.81
10.00

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 $K_h = 5 \times \text{Recharge Rate (R)}$  in the costal plan;  $K_h=R$  outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

13.669
3.669

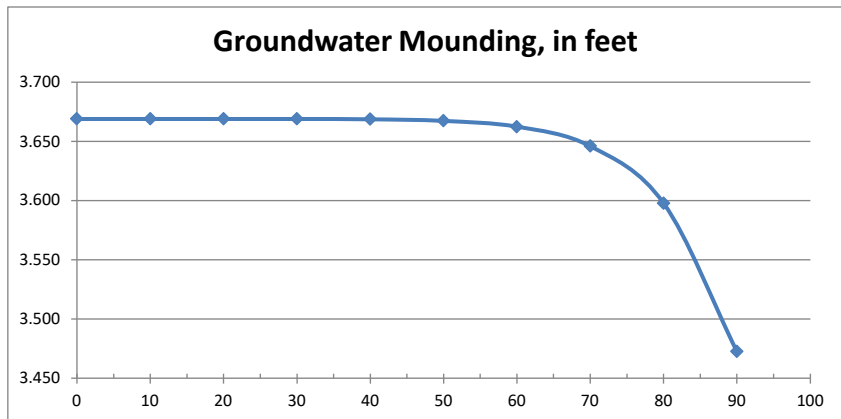
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
 **$\Delta h(\text{max})$**  Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

3.669	0
3.669	10
3.669	20
3.669	30
3.669	40
3.667	50
3.662	60
3.646	70
3.598	80
3.473	90



**Re-Calculate Now**



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## Basin 2 - Modified

**Input Values**

0.82
0.150
25.00
115.845
17.670
11.05
10.00

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 $K_h = 5 \times \text{Recharge Rate (R)}$  in the costal plan;  $K_h=R$  outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

11.999
1.999

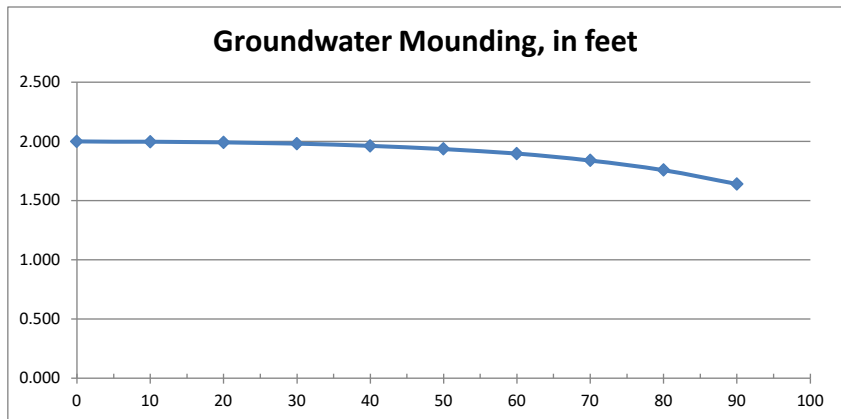
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
 **$\Delta h(\text{max})$**  Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

1.999	0
1.997	10
1.991	20
1.980	30
1.962	40
1.936	50
1.896	60
1.839	70
1.757	80
1.641	90



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## Basin 3

**Input Values**

9.25
0.150
25.00
17.580
82.380
3.34
10.00

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

19.576
9.576

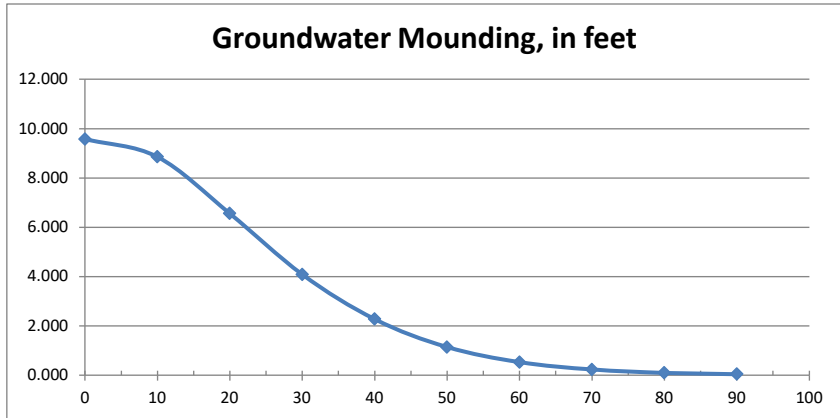
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

9.576	0
8.852	10
6.556	20
4.078	30
2.268	40
1.136	50
0.522	60
0.223	70
0.091	80
0.036	90



**Re-Calculate Now**



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## Basin 3 - Modified

**Input Values**

1.21
0.150
25.00
17.580
82.380
25.52
10.00

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 $K_h = 5 \times \text{Recharge Rate (R)}$  in the costal plan;  $K_h=R$  outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

14.000
4.000

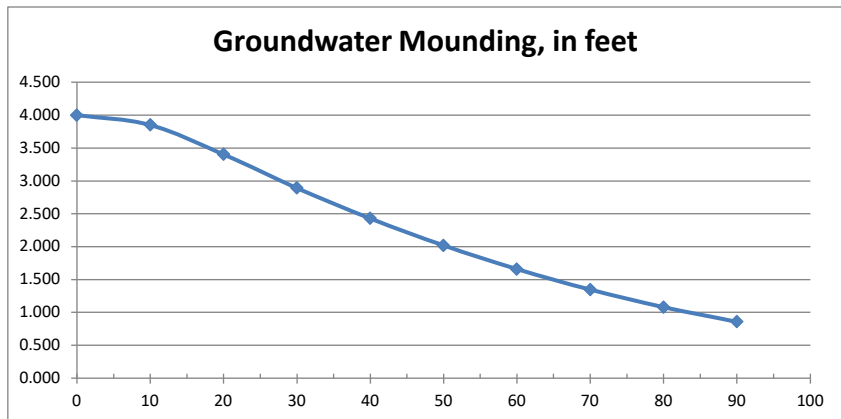
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

**Ground-water Mounding, in feet**      **center of basin in x direction, in feet**

4.000	0
3.849	10
3.403	20
2.892	30
2.429	40
2.017	50
1.656	60
1.344	70
1.079	80
0.856	90



**Re-Calculate Now**



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## Basin B

### Input Values

5.00
0.150
25.00
99.505
9.250
6.03
10.00

**R** Recharge rate (permeability rate) (in/hr)  
**Specific yield, Sy (dimensionless)**  
 default value is 0.15; max value is 0.2 provided that a lab test data is submitted  
**Horizontal hydraulic conductivity (in/hr)**  
 $K_h = 5 \times \text{Recharge Rate (R)}$  in the costal plan;  $K_h=R$  outside the coastal plan  
**x** 1/2 length of basin (x direction, in feet)  
**y** 1/2 width of basin (y direction, in feet)  
**t** Duration of infiltration period (hours)  
**hi(0)** Initial thickness of saturated zone (feet)

14.756
4.756

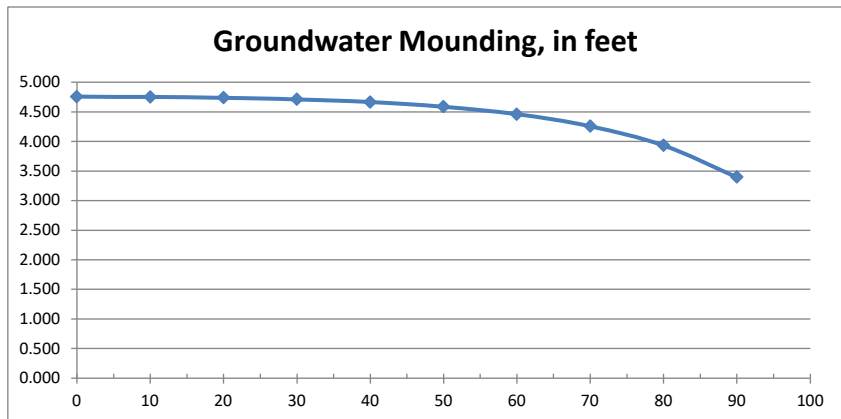
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
 **$\Delta h(\text{max})$**  Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Distance from  
 Ground-water center of basin in x  
 Mounding, in feet direction, in feet

4.756	0
4.752	10
4.739	20
4.712	30
4.665	40
4.587	50
4.460	60
4.257	70
3.932	80
3.397	90



Re-Calculate Now



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## Basin B - Modified

### Input Values

3.33
0.150
25.00
99.505
9.250
9.06
10.00

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

14.000
4.000

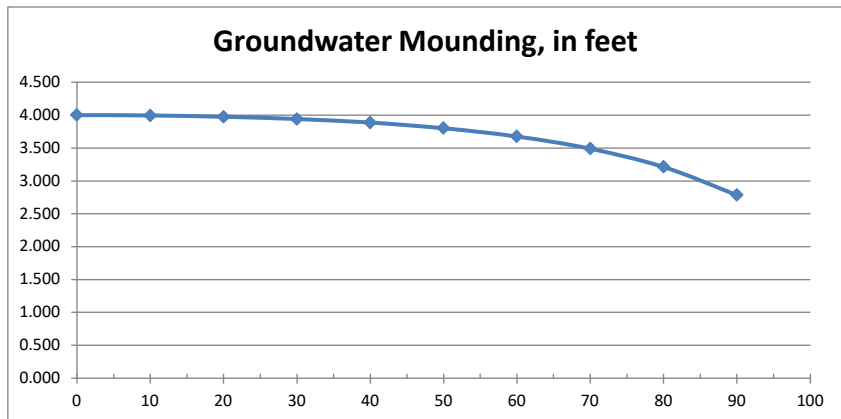
**h(max)** Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)  
**Δh(max)** Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water center of basin in x  
 Mounding, in feet direction, in feet

4.000	0
3.994	10
3.975	20
3.941	30
3.885	40
3.801	50
3.675	60
3.489	70
3.213	80
2.784	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**

<b>Time (Minutes)</b>	<b>Cumulative Rainfall (Inches)</b>	<b>Time (Minutes)</b>	<b>Cumulative Rainfall (Inches)</b>	<b>Time (Minutes)</b>	<b>Cumulative Rainfall (Inches)</b>
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

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# Watershed Model Schematic



## Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	Existing



# 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	1.790	1	736	9,651	-----	-----	-----	Existing
21-210-EX.gpw					Return Period: 2 Year			Monday, Jun 17, 2024	

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

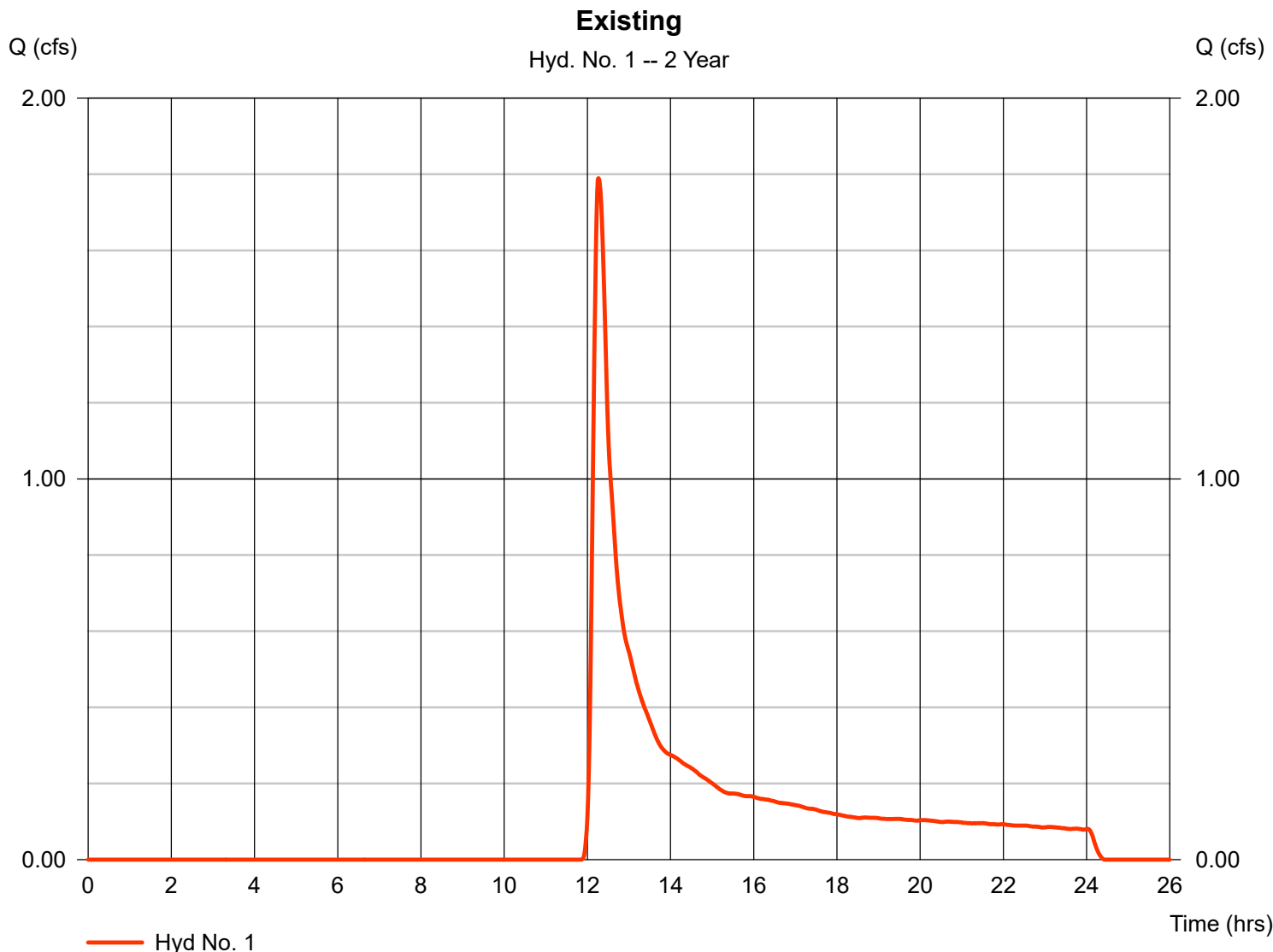
## Hyd. No. 1

Existing

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 5.225 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 3.34 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 1.790 cfs  
 Time to peak = 12.27 hrs  
 Hyd. volume = 9,651 cuft  
 Curve number = 61\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 15.20 min  
 Distribution = Custom  
 Shape factor = 484

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



# TR55 Tc Worksheet

## Hyd. No. 1

Existing

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 13.61</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 13.61</b>
<b>Shallow Concentrated Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 1.55</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 1.55</b>
<b>Channel Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>15.20 min</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	6.752	1	734	27,570	-----	-----	-----	Existing
21-210-EX.gpw					Return Period: 10 Year			Monday, Jun 17, 2024	

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

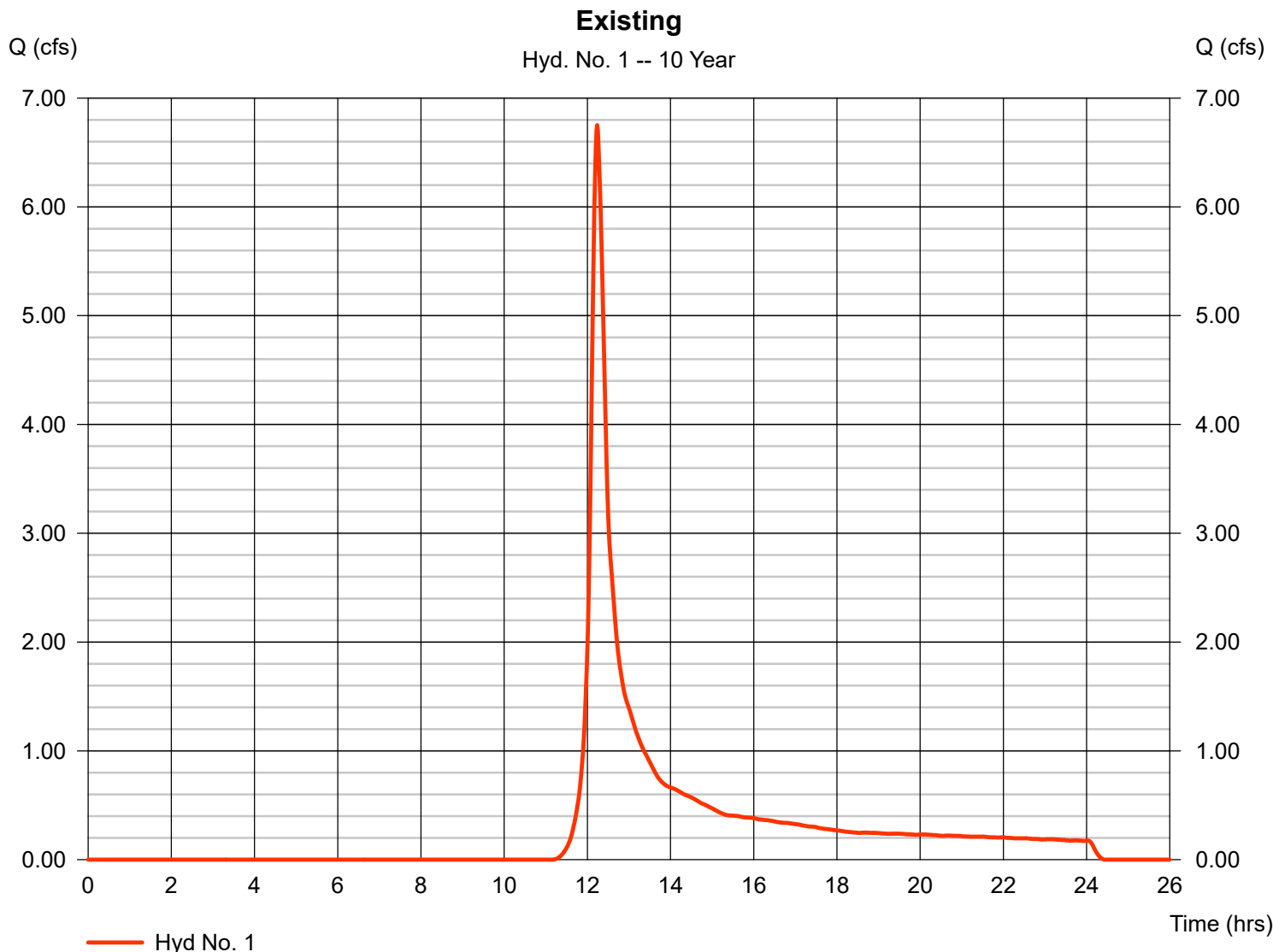
## Hyd. No. 1

Existing

Hydrograph type = SCS Runoff  
 Storm frequency = 10 yrs  
 Time interval = 1 min  
 Drainage area = 5.225 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 5.11 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 6.752 cfs  
 Time to peak = 12.23 hrs  
 Hyd. volume = 27,570 cuft  
 Curve number = 61\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 15.20 min  
 Distribution = Custom  
 Shape factor = 484

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



# 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	19.86	1	733	75,958	-----	-----	-----	Existing
21-210-EX.gpw					Return Period: 100 Year			Monday, Jun 17, 2024	

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

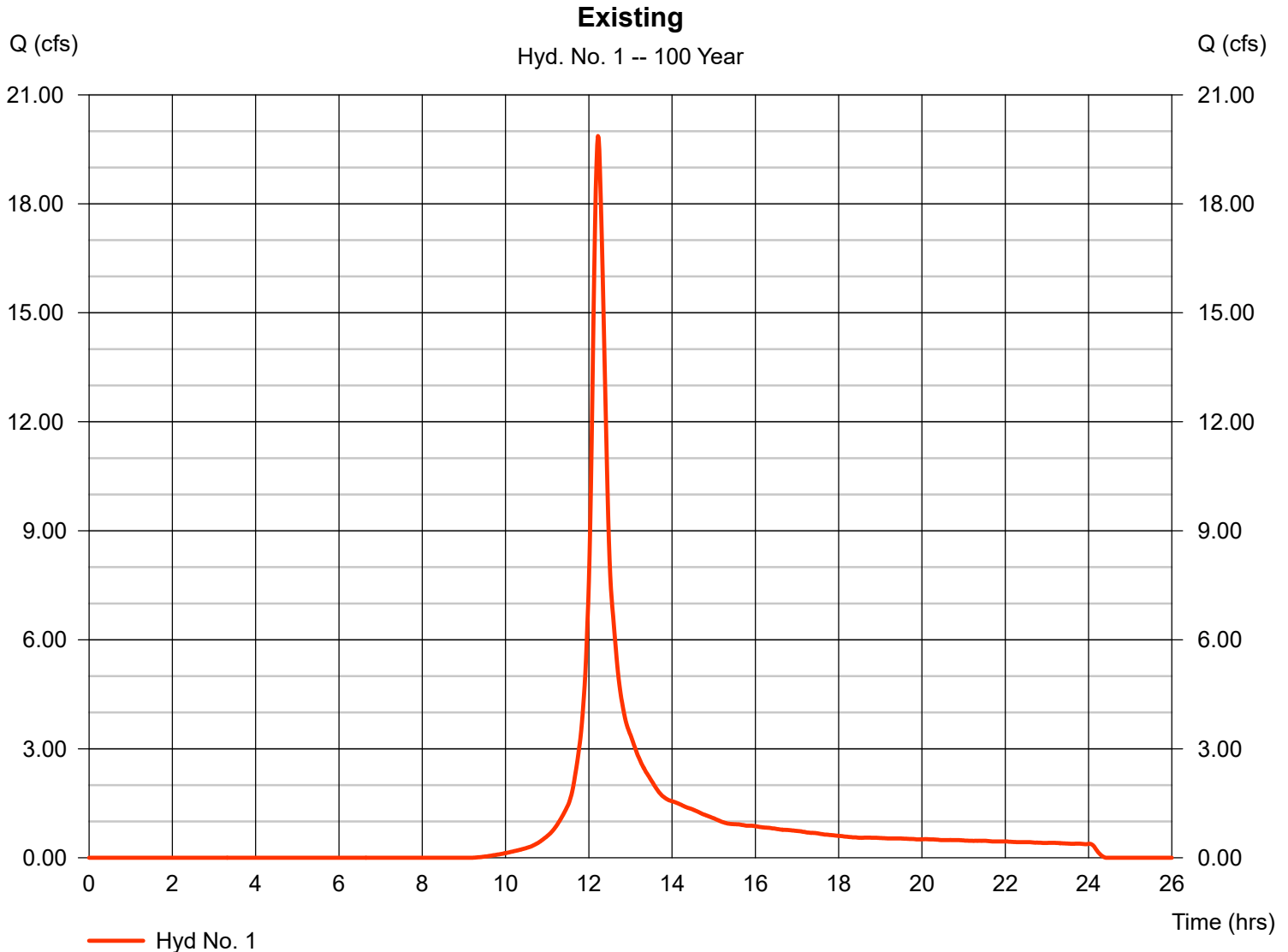
## Hyd. No. 1

Existing

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 5.225 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 8.66 in  
Storm duration = NOAA\_C.cds

Peak discharge = 19.86 cfs  
Time to peak = 12.22 hrs  
Hyd. volume = 75,958 cuft  
Curve number = 61\*  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 15.20 min  
Distribution = Custom  
Shape factor = 484

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



## **Watershed Model Schematic ..... 9**

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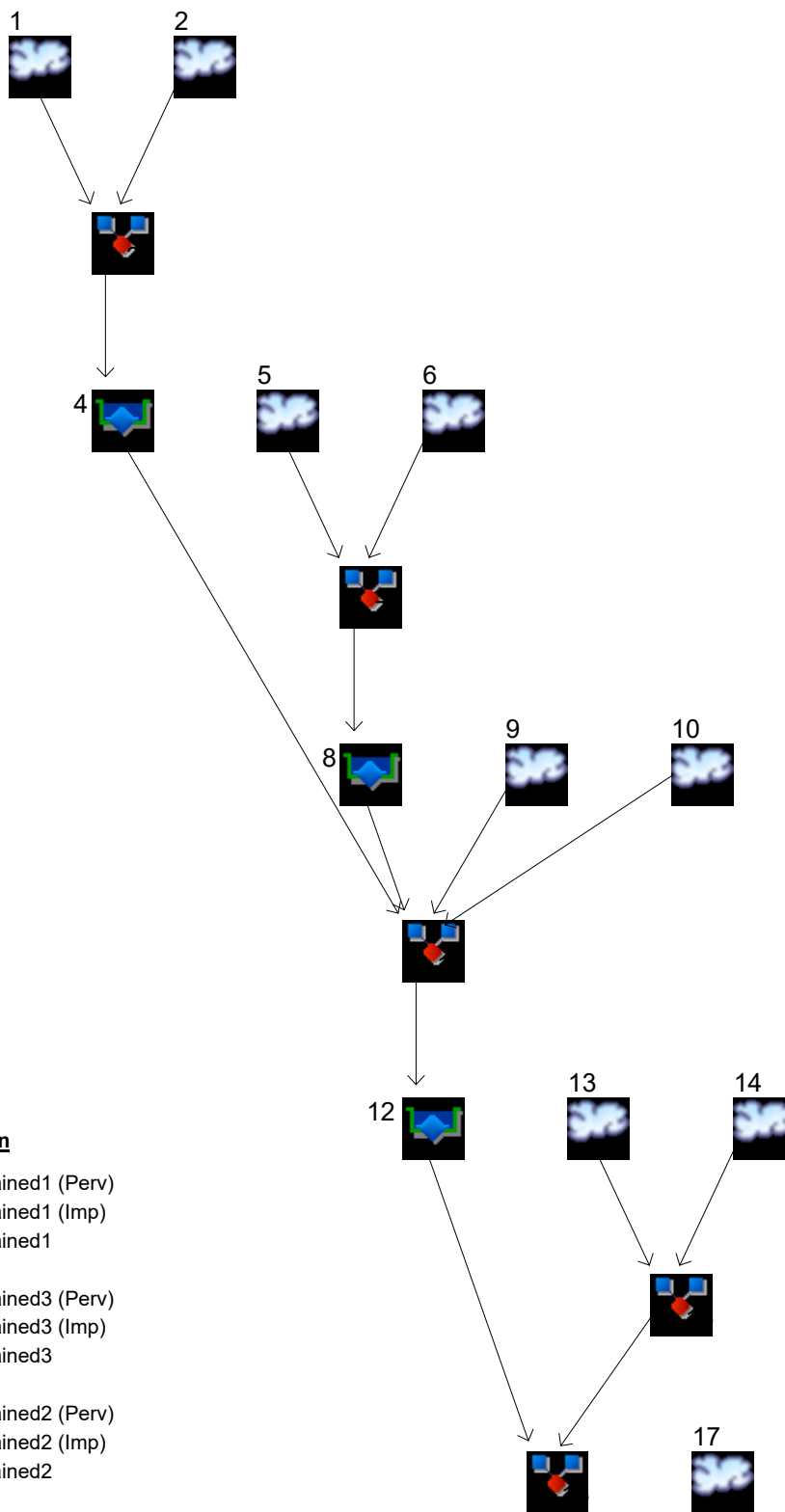
### **100 - Year**



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# Watershed Model Schematic



**Legend**

Hyd.	Origin	Description
1	SCS Runoff	Prop - Detained1 (Perv)
2	SCS Runoff	Prop - Detained1 (Imp)
3	Combine	Prop - Detained1
4	Reservoir	Route 1
5	SCS Runoff	Prop - Detained3 (Perv)
6	SCS Runoff	Prop - Detained3 (Imp)
7	Combine	Prop - Detained3
8	Reservoir	Route 3
9	SCS Runoff	Prop - Detained2 (Perv)
10	SCS Runoff	Prop - Detained2 (Imp)
11	Combine	Prop - Detained2
12	Reservoir	Route 2
13	SCS Runoff	Prop - Bypass (Perv)
14	SCS Runoff	Prop - Bypass (Imp)
15	Combine	Prop - Bypass
16	Combine	Proposed
17	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	0.560	1	732	2,203	-----	-----	-----	Prop - Detained1 (Perv)	
2	SCS Runoff	3.983	1	728	14,279	-----	-----	-----	Prop - Detained1 (Imp)	
3	Combine	4.475	1	729	16,482	1, 2	-----	-----	Prop - Detained1	
4	Reservoir	0.296	1	816	10,053	3	72.67	10,973	Route 1	
5	SCS Runoff	0.141	1	730	521	-----	-----	-----	Prop - Detained3 (Perv)	
6	SCS Runoff	1.066	1	728	3,822	-----	-----	-----	Prop - Detained3 (Imp)	
7	Combine	1.202	1	729	4,343	5, 6	-----	-----	Prop - Detained3	
8	Reservoir	0.038	1	938	1,721	7	74.64	3,323	Route 3	
9	SCS Runoff	0.512	1	736	2,318	-----	-----	-----	Prop - Detained2 (Perv)	
10	SCS Runoff	5.188	1	728	18,598	-----	-----	-----	Prop - Detained2 (Imp)	
11	Combine	5.592	1	729	32,691	4, 8, 9, 10	-----	-----	Prop - Detained2	
12	Reservoir	0.732	1	809	25,566	11	68.60	14,355	Route 2	
13	SCS Runoff	0.672	1	730	2,257	-----	-----	-----	Prop - Bypass (Perv)	
14	SCS Runoff	0.033	1	728	118	-----	-----	-----	Prop - Bypass (Imp)	
15	Combine	0.704	1	730	2,375	13, 14	-----	-----	Prop - Bypass	
16	Combine	0.865	1	730	27,941	12, 15	-----	-----	Proposed	
17	SCS Runoff	0.840	1	728	3,010	-----	-----	-----	Building B	
21-210-PR.gpw					Return Period: 2 Year			Monday, Jun 17, 2024		

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

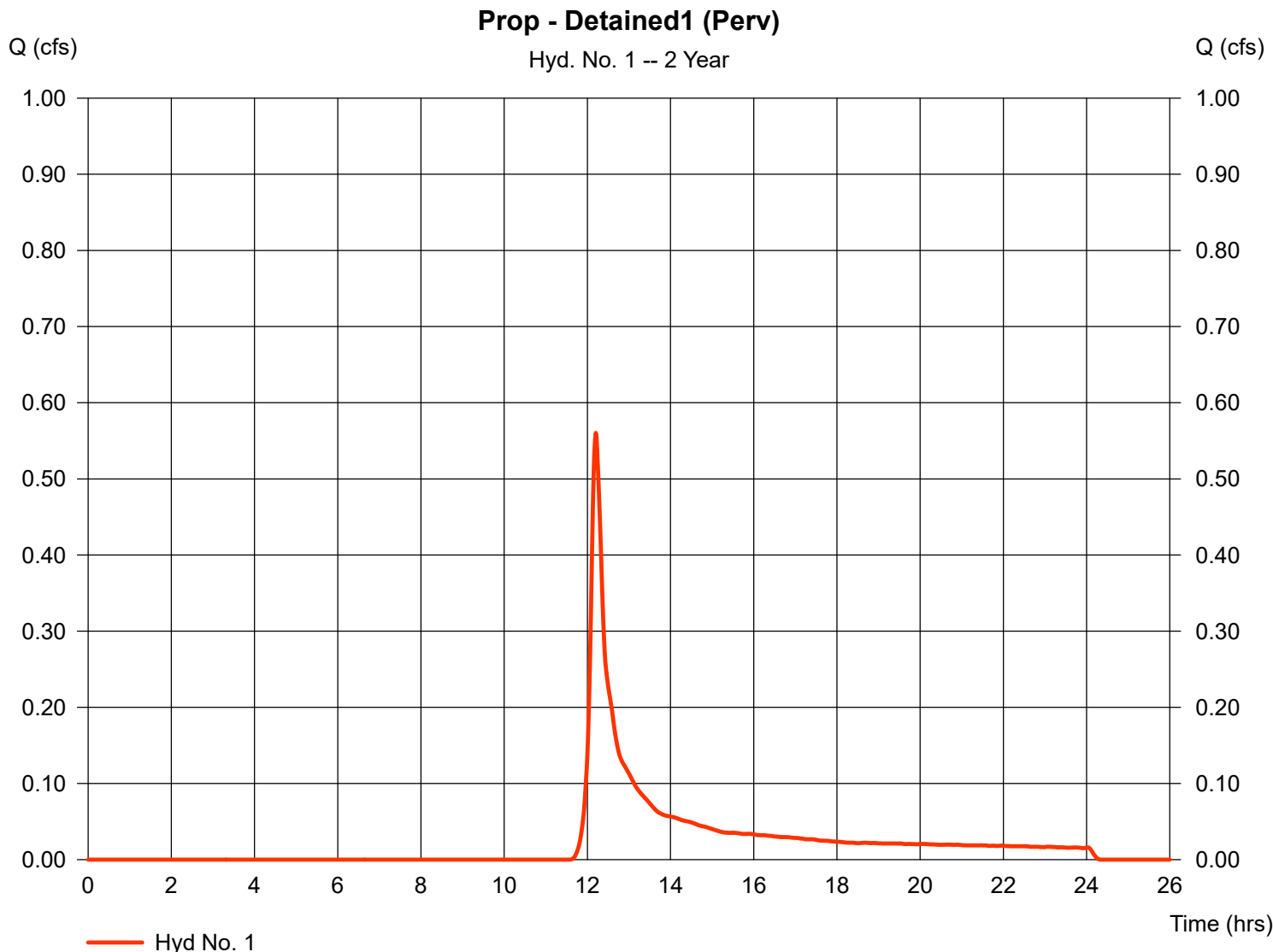
## Hyd. No. 1

Prop - Detained1 (Perv)

Hydrograph type = SCS Runoff  
Storm frequency = 2 yrs  
Time interval = 1 min  
Drainage area = 0.741 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 3.84 in  
Storm duration = NOAA\_C.cds

Peak discharge = 0.560 cfs  
Time to peak = 12.20 hrs  
Hyd. volume = 2,203 cuft  
Curve number = 63\*  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 12.20 min  
Distribution = Custom  
Shape factor = 484

\* Composite (Area/CN) = [(0.637 x 61) + (0.104 x 74)] / 0.741



# TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve v9.25

## Hyd. No. 1

Prop - Detained1 (Perv)

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 11.48</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 11.48</b>
<b>Shallow Concentrated Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.76</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.76</b>
<b>Channel Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>12.20 min</b>

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

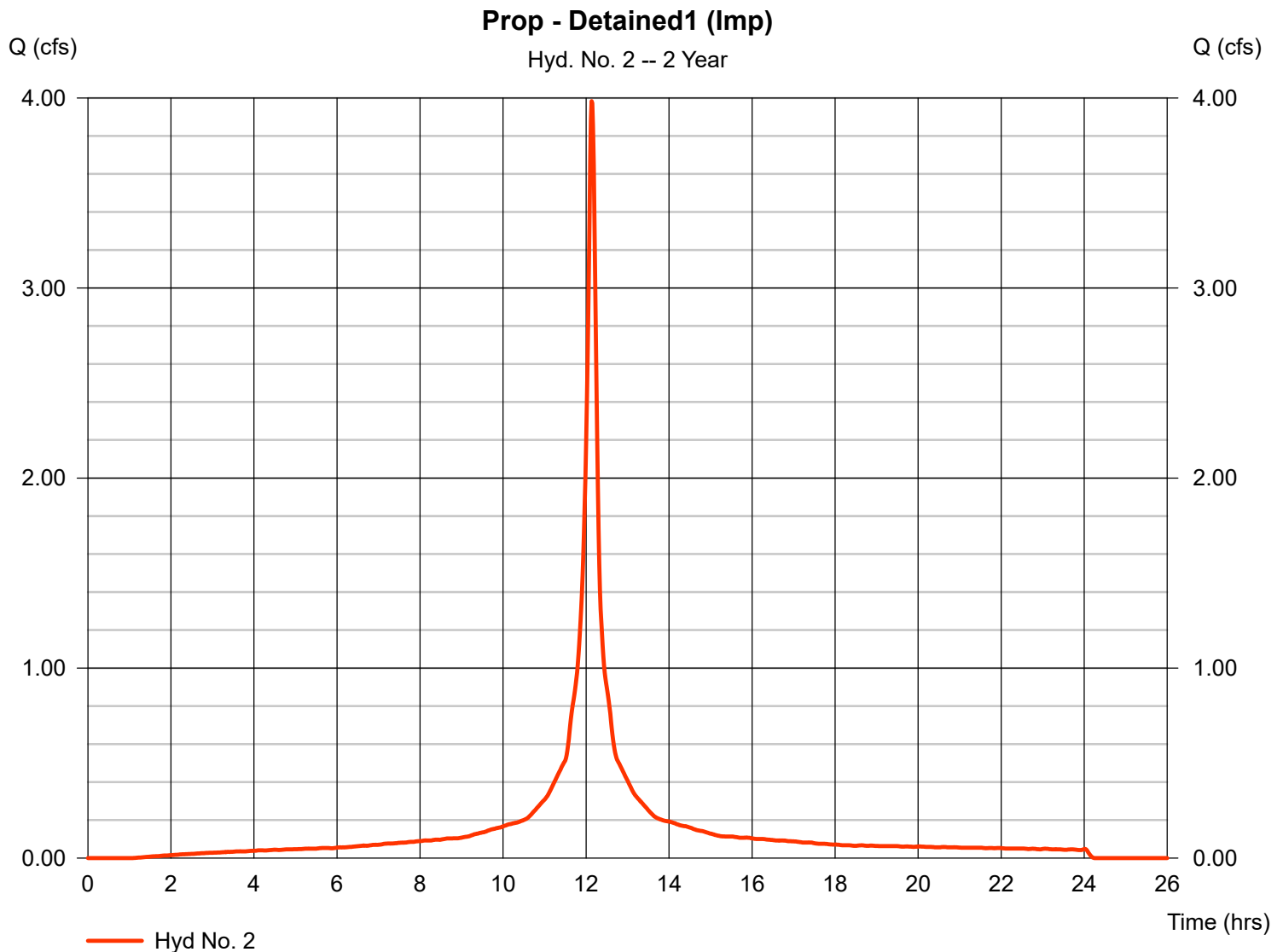
Monday, Jun 17, 2024

## Hyd. No. 2

Prop - Detained1 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 1.091 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 3.983 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 14,279 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

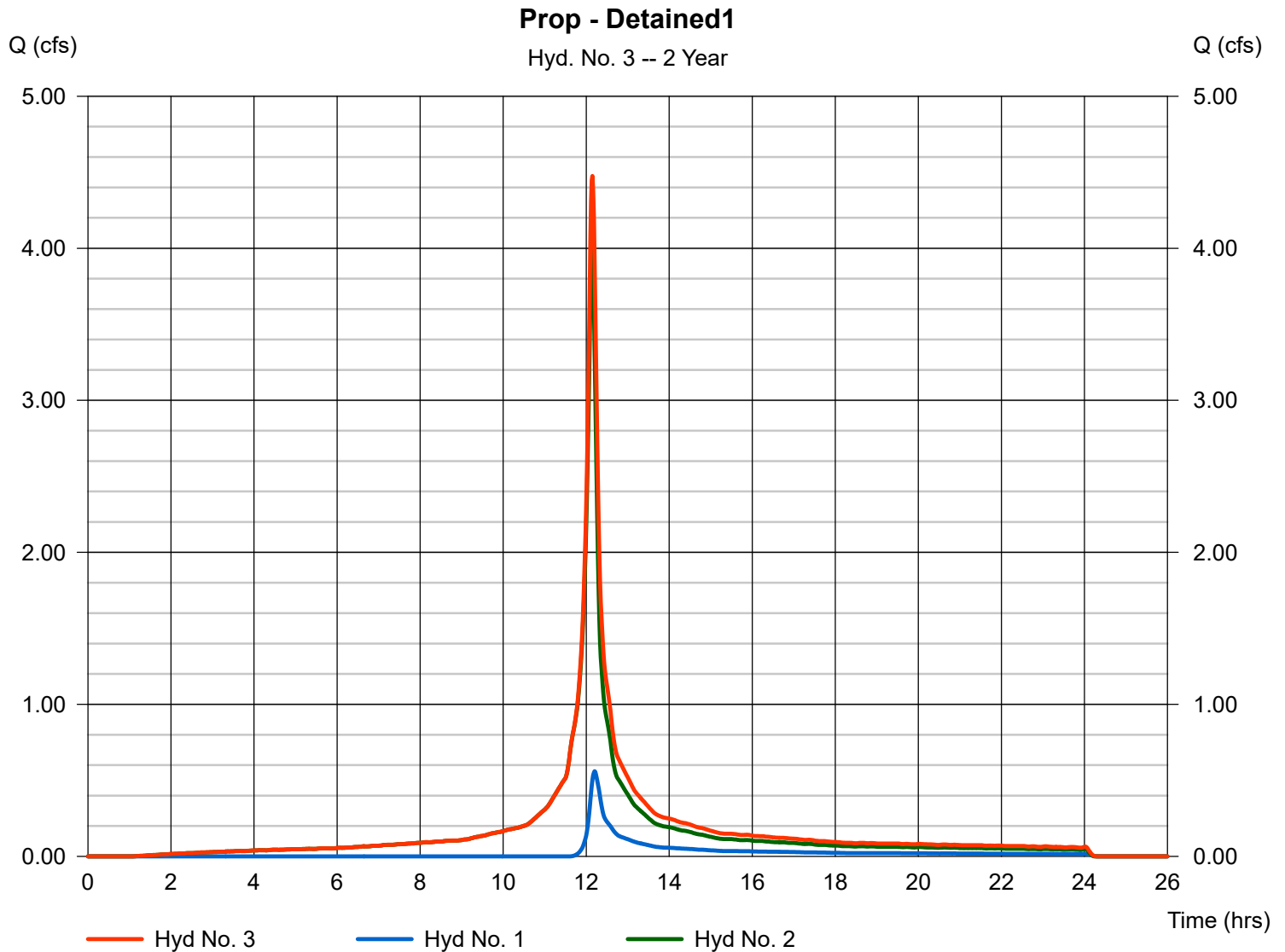
Monday, Jun 17, 2024

## Hyd. No. 3

Prop - Detained1

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2

Peak discharge = 4.475 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 16,482 cuft  
Contrib. drain. area = 1.832 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

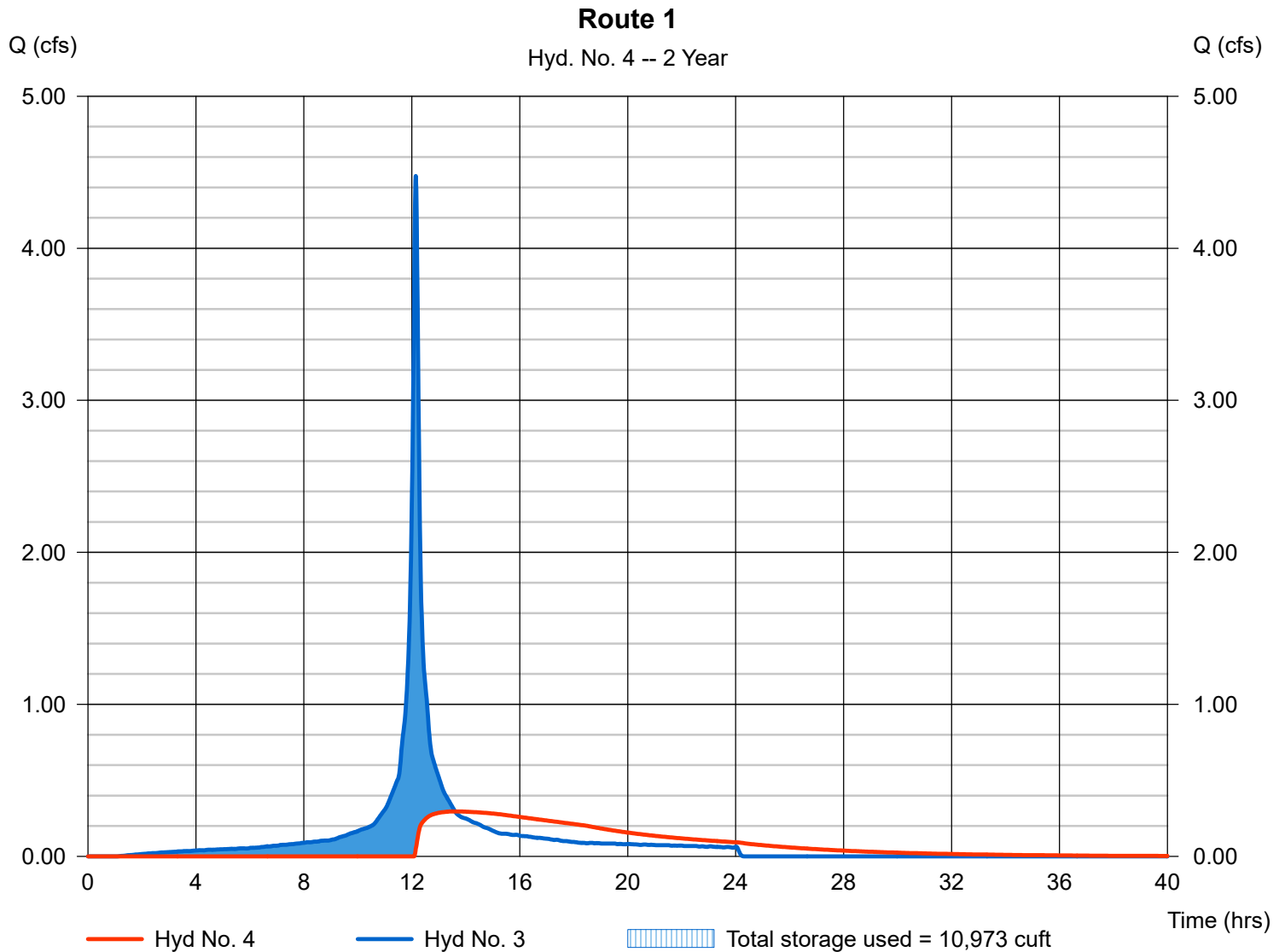
## Hyd. No. 4

Route 1

Hydrograph type = Reservoir  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyd. No. = 3 - Prop - Detained1  
Reservoir name = Basin 1

Peak discharge = 0.296 cfs  
Time to peak = 13.60 hrs  
Hyd. volume = 10,053 cuft  
Max. Elevation = 72.67 ft  
Max. Storage = 10,973 cuft

Storage Indication method used.





## Pond No. 1 - Basin 1

### Pond Data

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

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	71.00	6,293	0	0
1.00	72.00	6,532	6,413	6,413
3.00	74.00	7,149	13,681	20,094
5.00	76.00	7,950	15,099	35,193

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	4.00	Inactive	0.00
Span (in)	= 15.00	4.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 71.00	72.00	73.00	0.00
Length (ft)	= 9.00	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	Yes	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	4.00	Inactive	0.00
Crest El. (ft)	= 75.00	74.17	74.50	0.00
Weir Coeff.	= 3.20	3.20	3.20	3.33
Weir Type	= Riser	Rect	Rect	---
Multi-Stage	= Yes	Yes	Yes	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	Civ A cfs	Civ B cfs	Civ 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	0.00	0.00	---	---	---	0.000
1.00	6,413	72.00	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
3.00	20,094	74.00	0.59 ic	0.57 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.569
5.00	35,193	76.00	12.35 ic	0.03 ic	0.00	---	8.23 s	4.04 s	0.00	---	---	---	12.30

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

## Hyd. No. 5

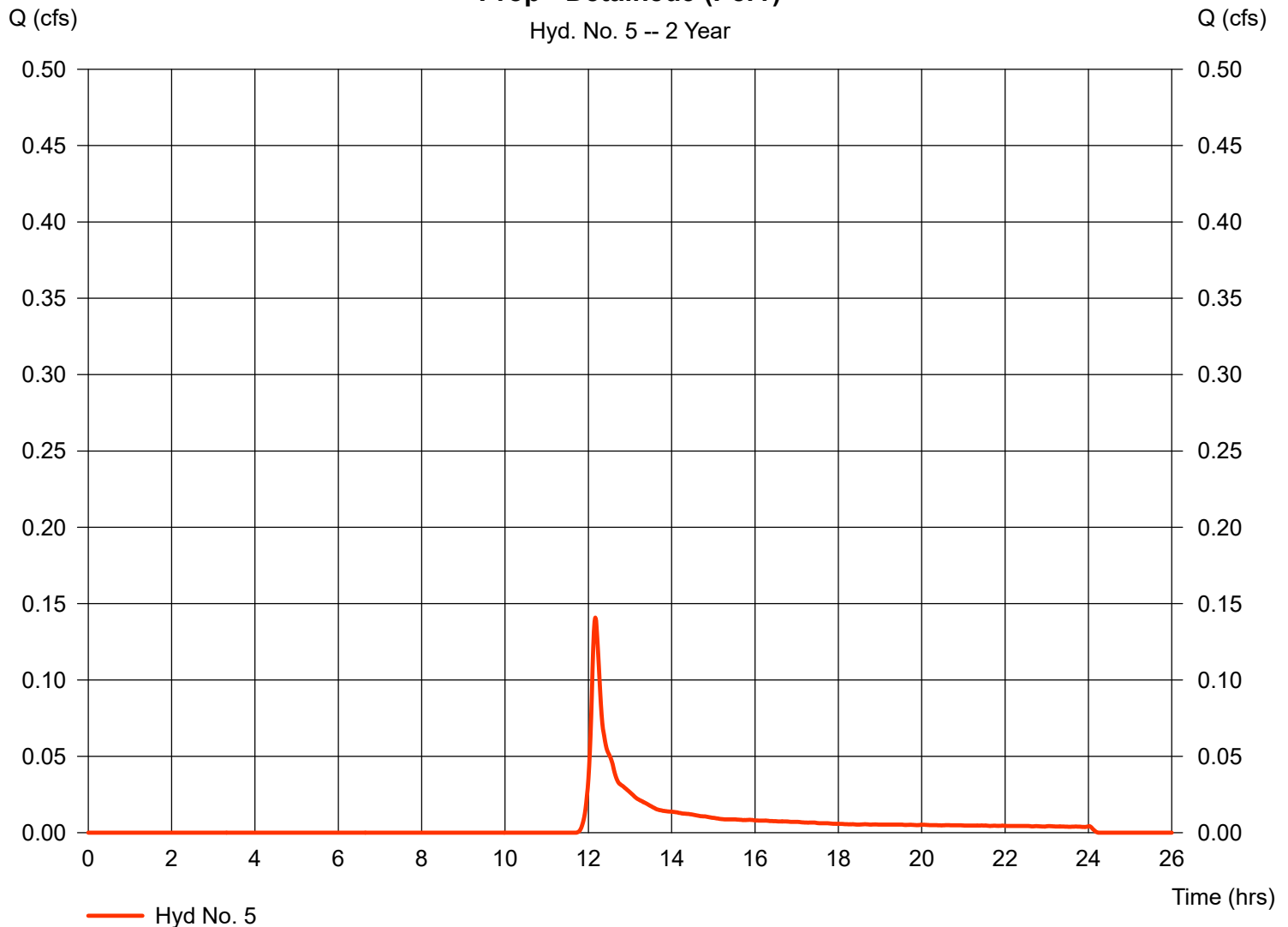
Prop - Detained3 (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 0.196 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 0.141 cfs  
 Time to peak = 12.17 hrs  
 Hyd. volume = 521 cuft  
 Curve number = 61  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484

### Prop - Detained3 (Perv)

Hyd. No. 5 -- 2 Year



# TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve v9.25

## Hyd. No. 5

Prop - Detained3 (Perv)

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 57.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.31	0.00	0.00	
Land slope (%)	= 1.50	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 10.04</b>	<b>+</b> <b>0.00</b>	<b>+</b> <b>0.00</b>	<b>= 10.04</b>
<b>Shallow Concentrated Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b> <b>0.00</b>	<b>+</b> <b>0.00</b>	<b>= 0.00</b>
<b>Channel Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b> <b>0.00</b>	<b>+</b> <b>0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>10.00 min</b>

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

## Hyd. No. 6

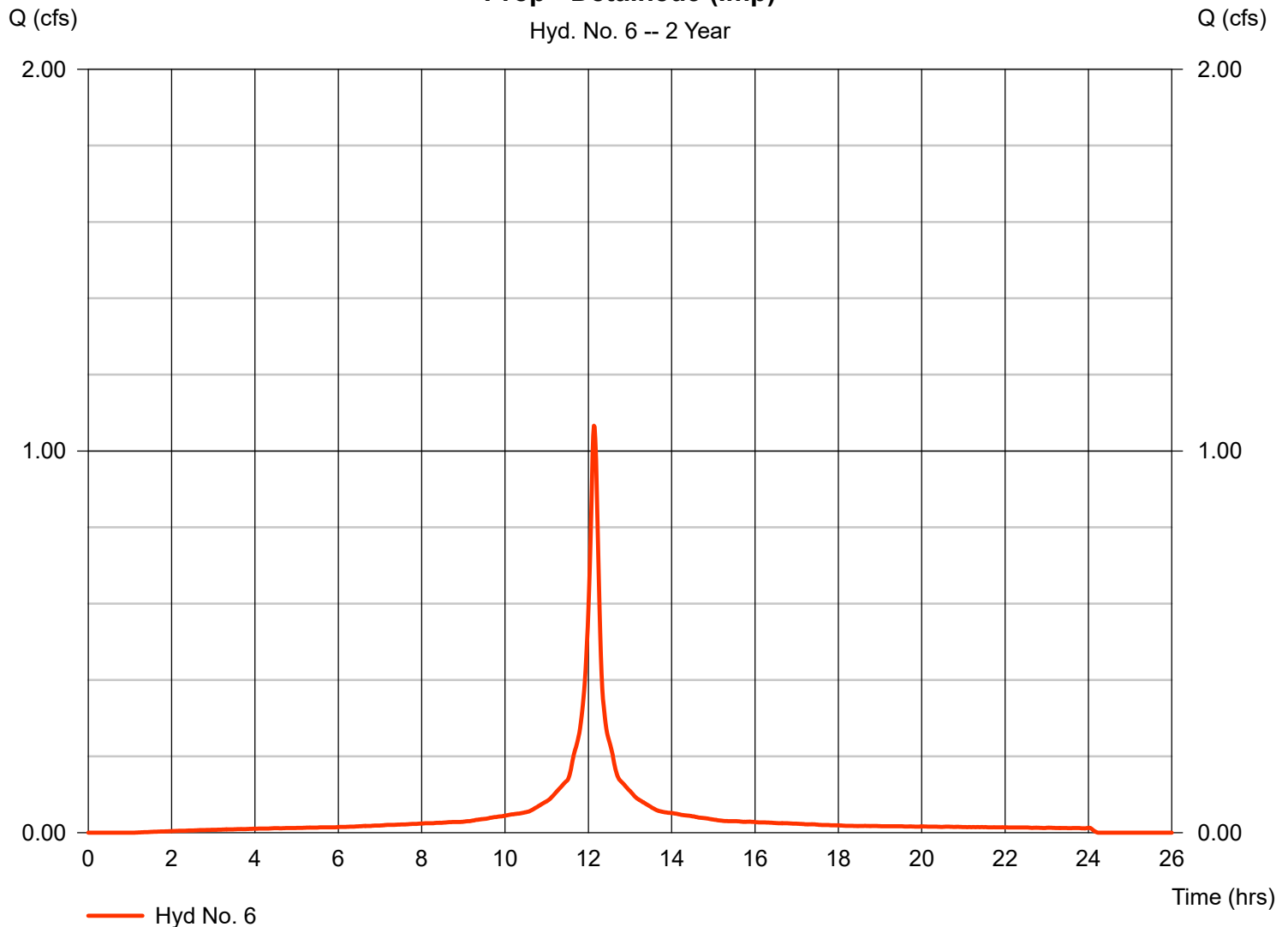
Prop - Detained3 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 0.292 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 1.066 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 3,822 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484

**Prop - Detained3 (Imp)**

Hyd. No. 6 -- 2 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

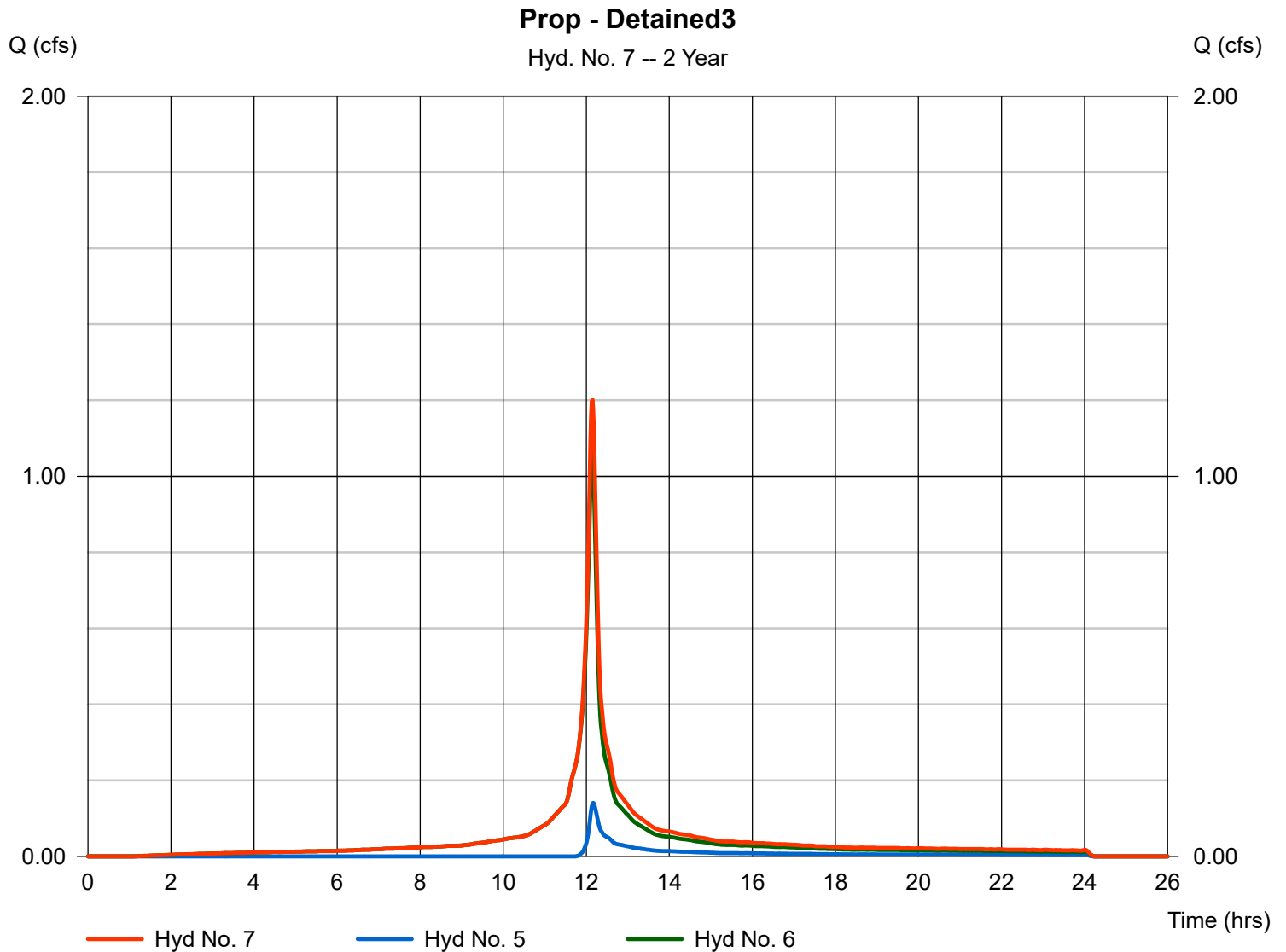
Monday, Jun 17, 2024

## Hyd. No. 7

Prop - Detained3

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 5, 6

Peak discharge = 1.202 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 4,343 cuft  
Contrib. drain. area = 0.488 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

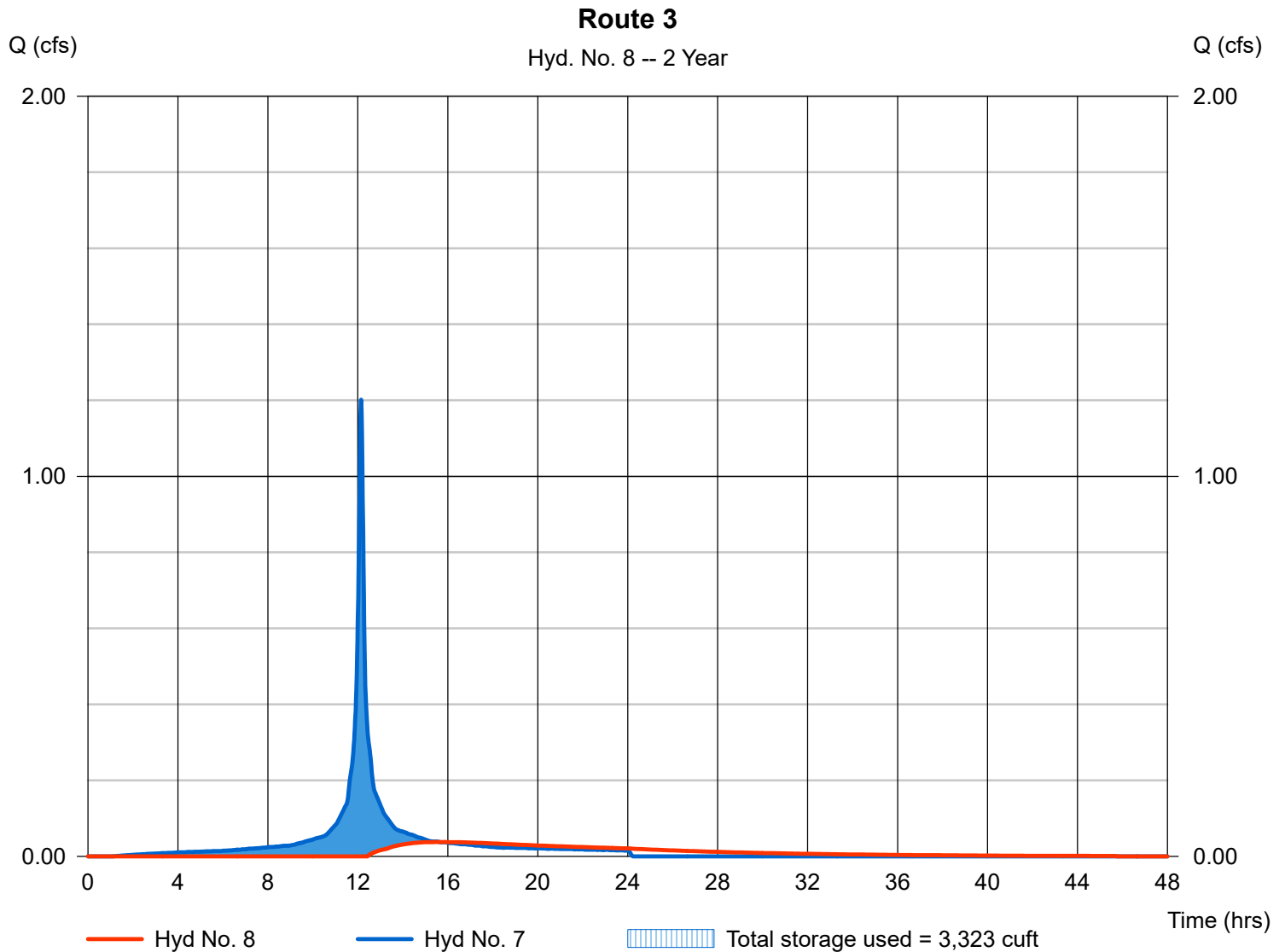
## Hyd. No. 8

Route 3

Hydrograph type = Reservoir  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyd. No. = 7 - Prop - Detained3  
Reservoir name = Basin 3

Peak discharge = 0.038 cfs  
Time to peak = 15.63 hrs  
Hyd. volume = 1,721 cuft  
Max. Elevation = 74.64 ft  
Max. Storage = 3,323 cuft

Storage Indication method used.





# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

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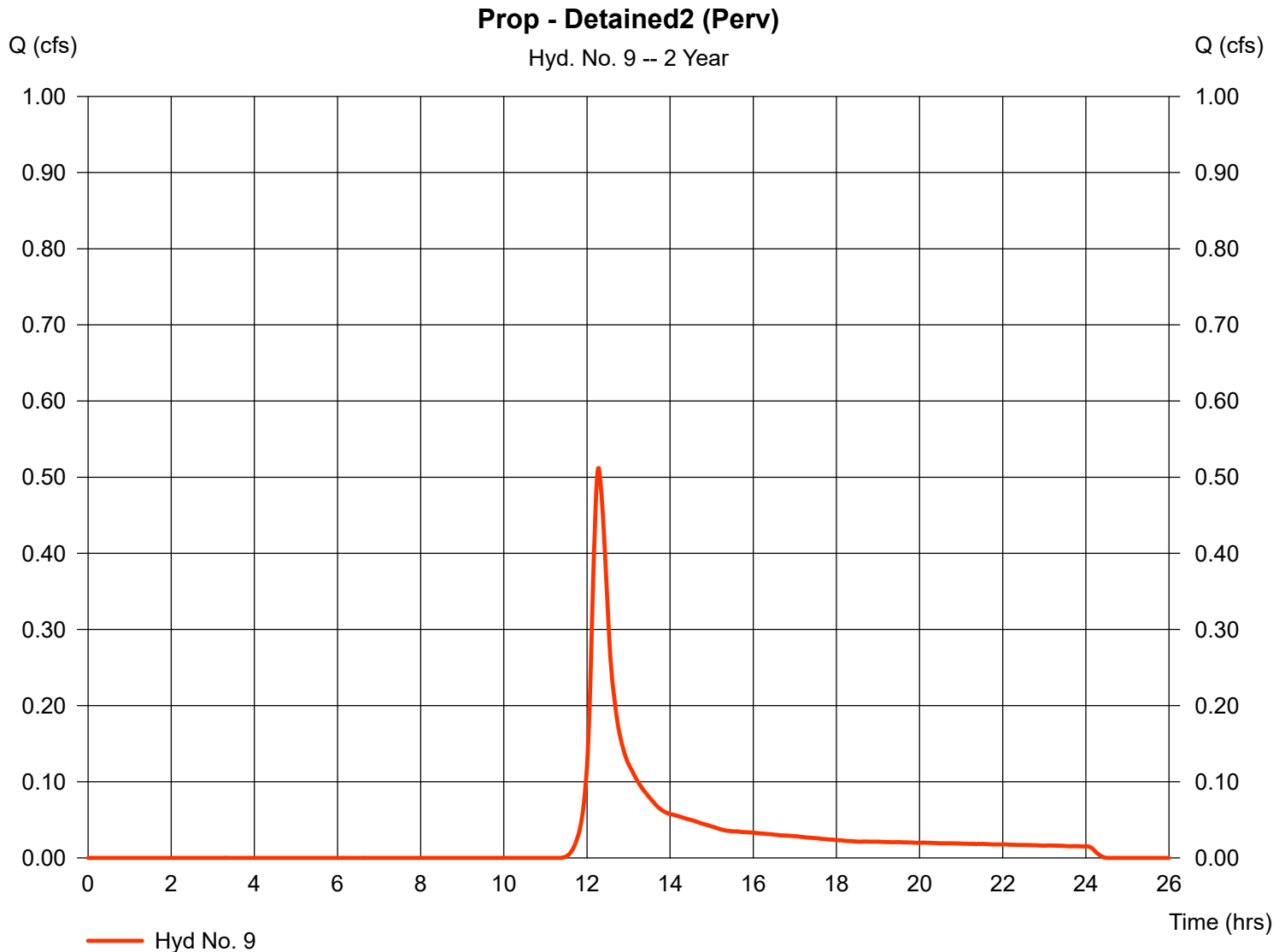
## Hyd. No. 9

Prop - Detained2 (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 0.644 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 0.512 cfs  
 Time to peak = 12.27 hrs  
 Hyd. volume = 2,318 cuft  
 Curve number = 66\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 19.30 min  
 Distribution = Custom  
 Shape factor = 484

\* Composite (Area/CN) = [(0.407 x 61) + (0.237 x 74)] / 0.644





# TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve v9.25

## Hyd. No. 9

Prop - Detained2 (Perv)

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 12.26</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 12.26</b>
<b>Shallow Concentrated Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Channel Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 6.12</b>	<b>+ 0.94</b>	<b>+ 0.00</b>	<b>= 7.06</b>
<b>Total Travel Time, Tc .....</b>				<b>19.30 min</b>

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

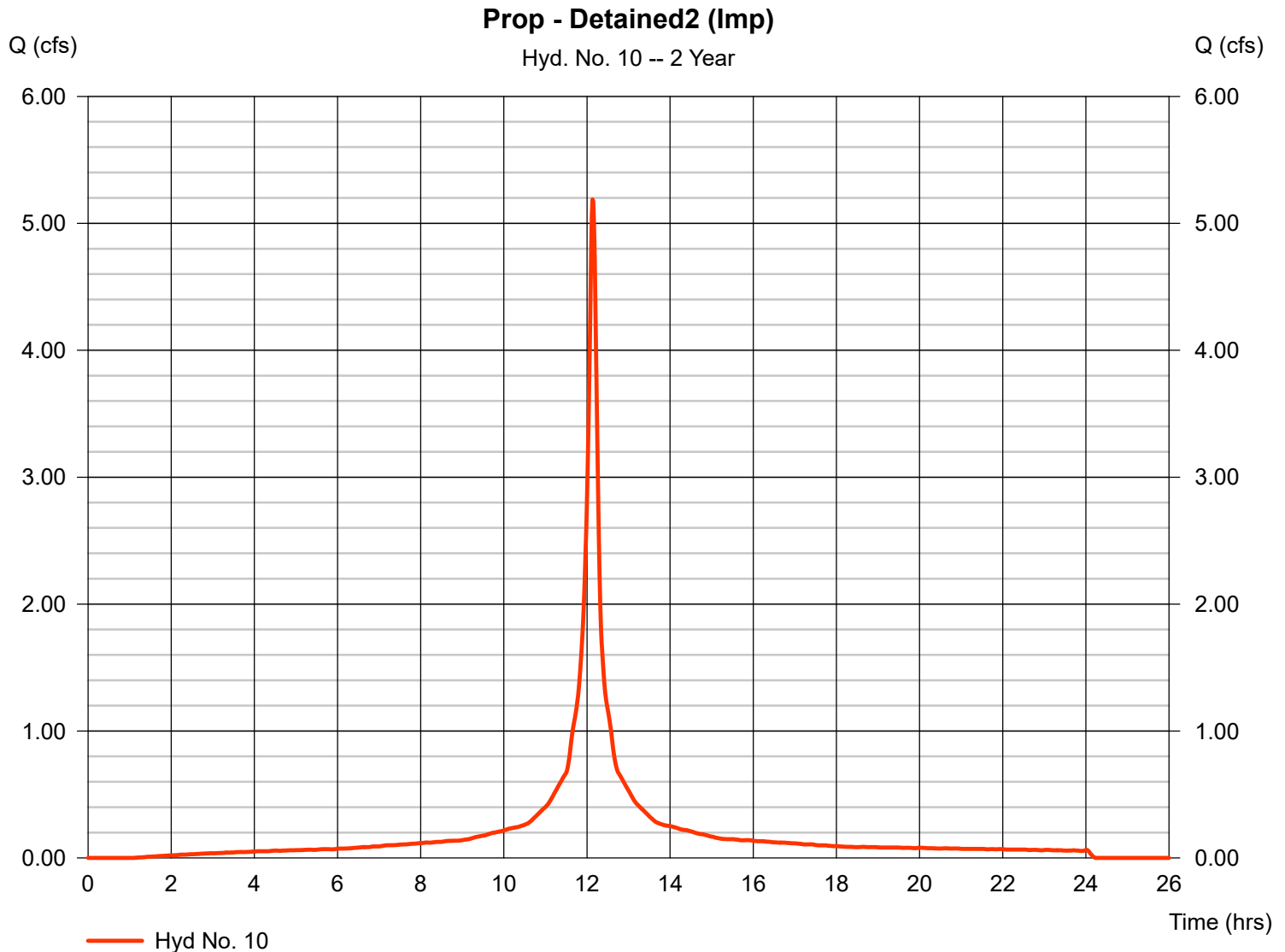
Monday, Jun 17, 2024

## Hyd. No. 10

Prop - Detained2 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 1.421 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 5.188 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 18,598 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

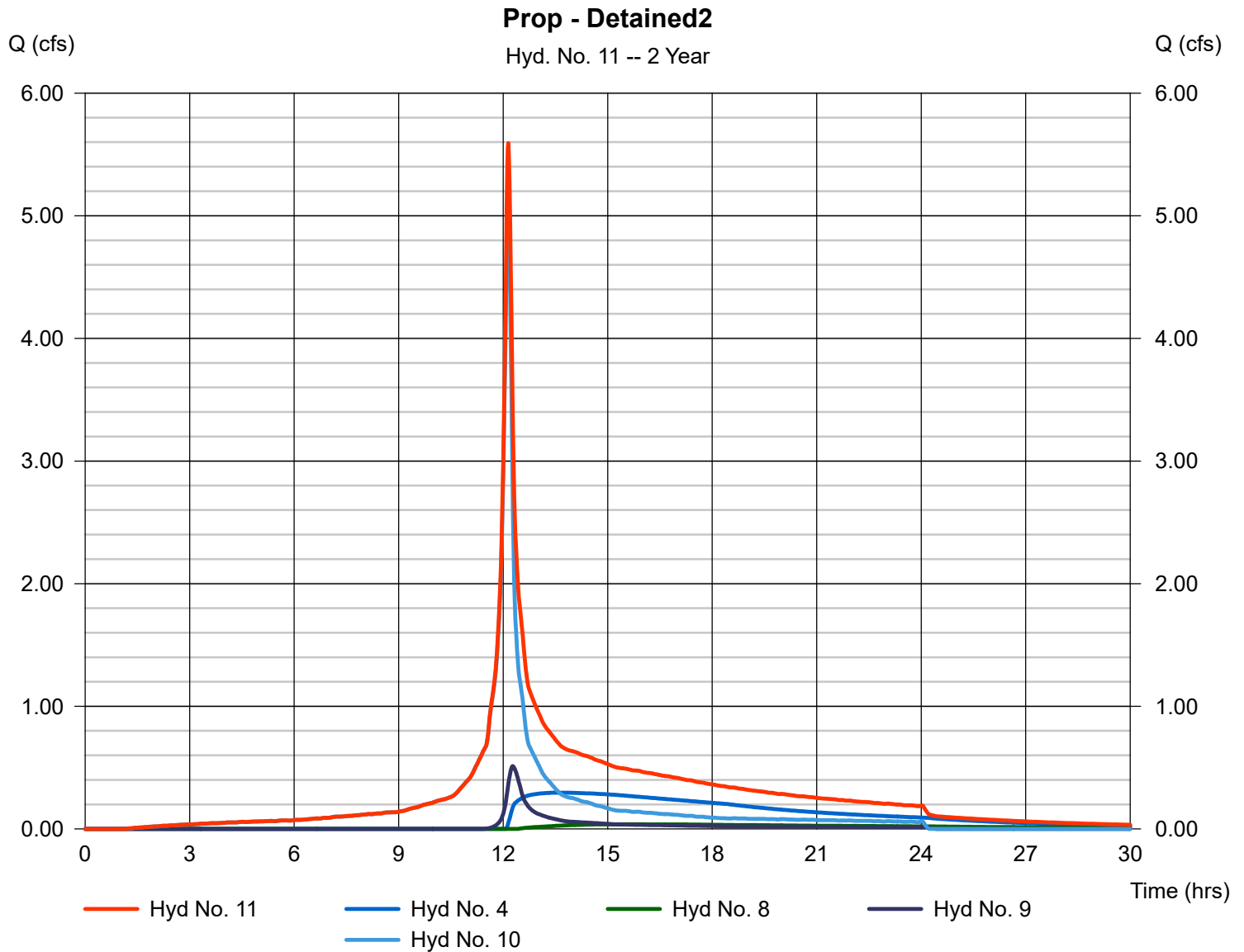
Monday, Jun 17, 2024

## Hyd. No. 11

Prop - Detained2

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 4, 8, 9, 10

Peak discharge = 5.592 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 32,691 cuft  
Contrib. drain. area = 2.065 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

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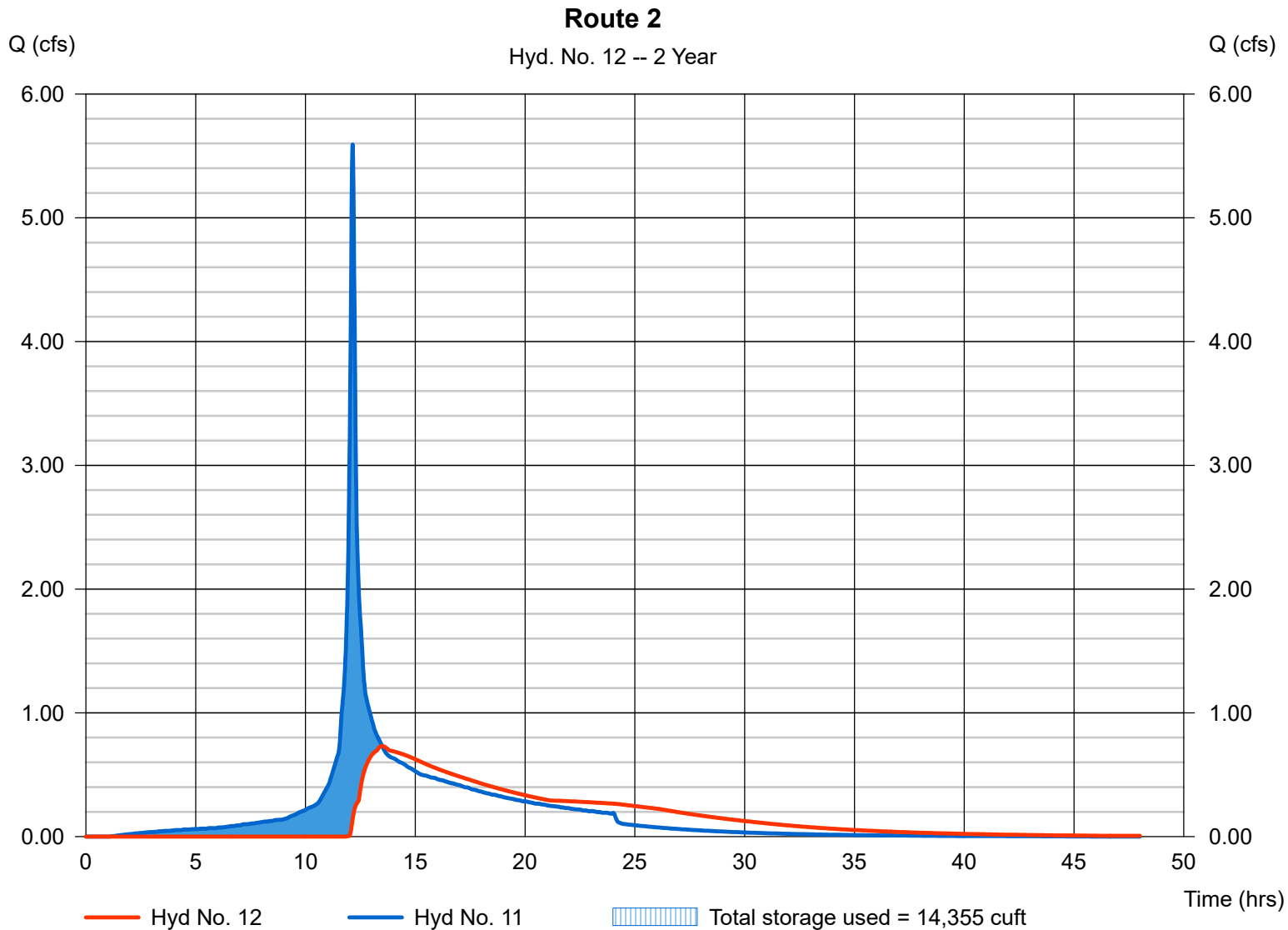
## Hyd. No. 12

Route 2

Hydrograph type = Reservoir  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyd. No. = 11 - Prop - Detained2  
Reservoir name = Basin 2

Peak discharge = 0.732 cfs  
Time to peak = 13.48 hrs  
Hyd. volume = 25,566 cuft  
Max. Elevation = 68.60 ft  
Max. Storage = 14,355 cuft

Storage Indication method used.



## Pond No. 2 - Basin 2

### Pond Data

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

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	67.00	8,792	0	0
2.00	69.00	9,100	17,892	17,892
4.00	71.00	9,403	18,503	36,395

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	4.00	8.00	0.00
Span (in)	= 24.00	4.00	39.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 67.00	67.75	68.50	0.00
Length (ft)	= 19.00	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	Yes	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 70.50	70.50	69.00	0.00
Weir Coeff.	= 3.20	3.20	3.20	3.20
Weir Type	= Riser	Rect	Rect	---
Multi-Stage	= Yes	Yes	Yes	Yes
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	0.00	0.00	---	---	0.000
2.00	17,892	69.00	4.44 ic	0.44 ic	3.91 ic	---	0.00	0.00	0.00	0.00	---	---	4,349
4.00	36,395	71.00	24.38 ic	0.27 ic	6.62 ic	---	17.49 s	0.00	0.00	0.00	---	---	24.37

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

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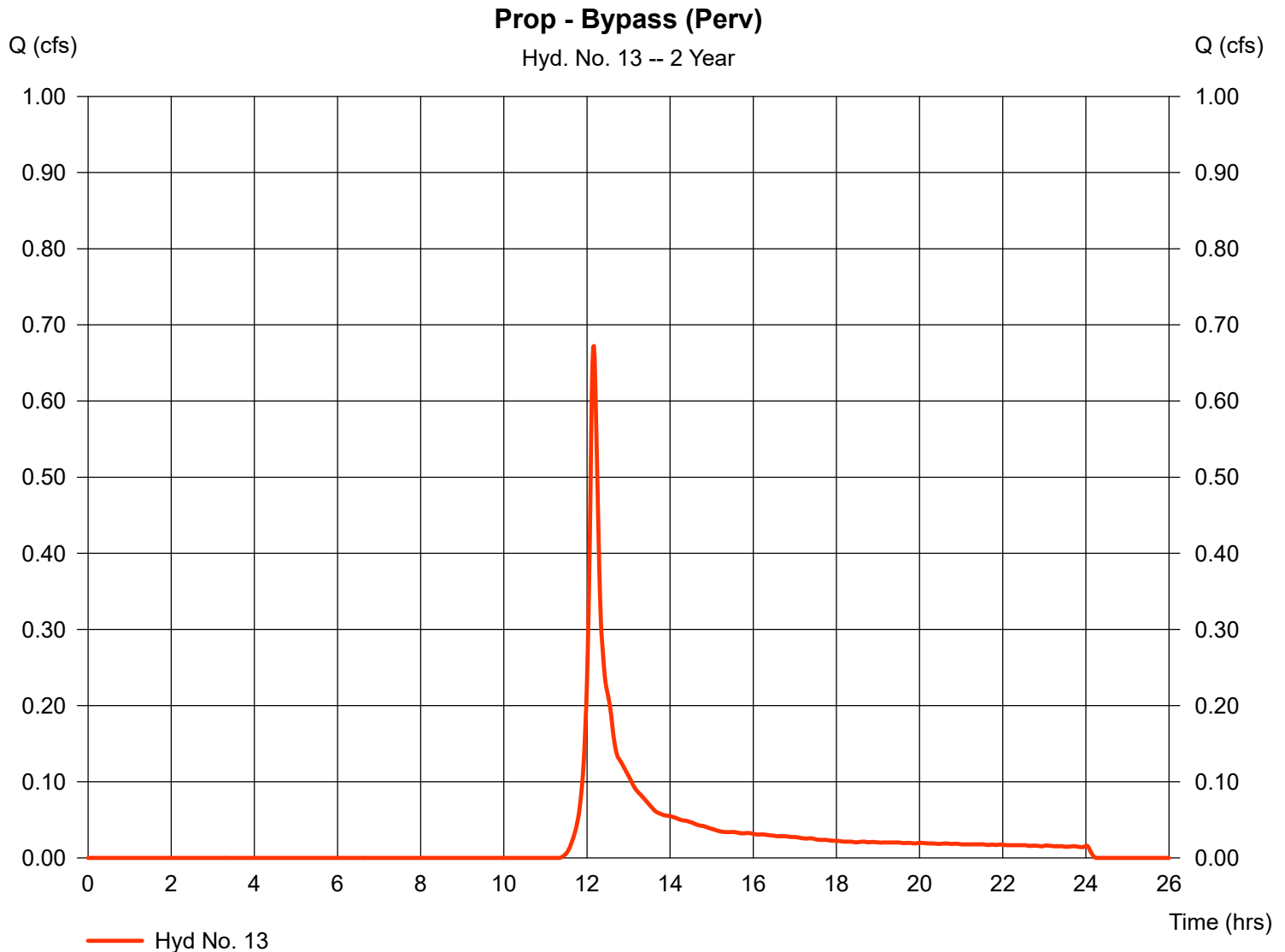
## Hyd. No. 13

Prop - Bypass (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 0.627 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 0.672 cfs  
 Time to peak = 12.17 hrs  
 Hyd. volume = 2,257 cuft  
 Curve number = 66\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484

\* Composite (Area/CN) =  $[(0.399 \times 61) + (0.228 \times 74)] / 0.627$



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

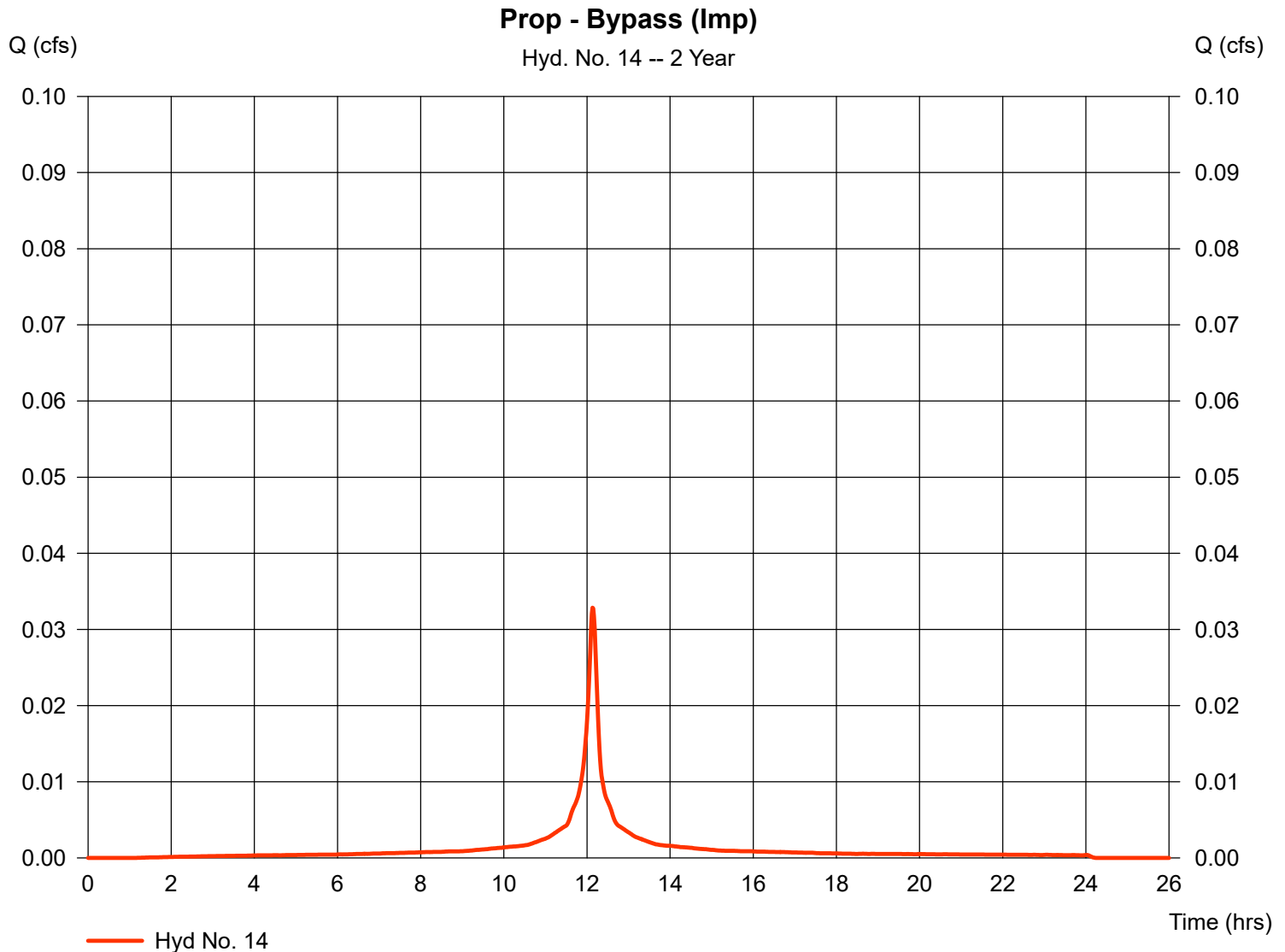
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## Hyd. No. 14

Prop - Bypass (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 0.009 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 0.033 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 118 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

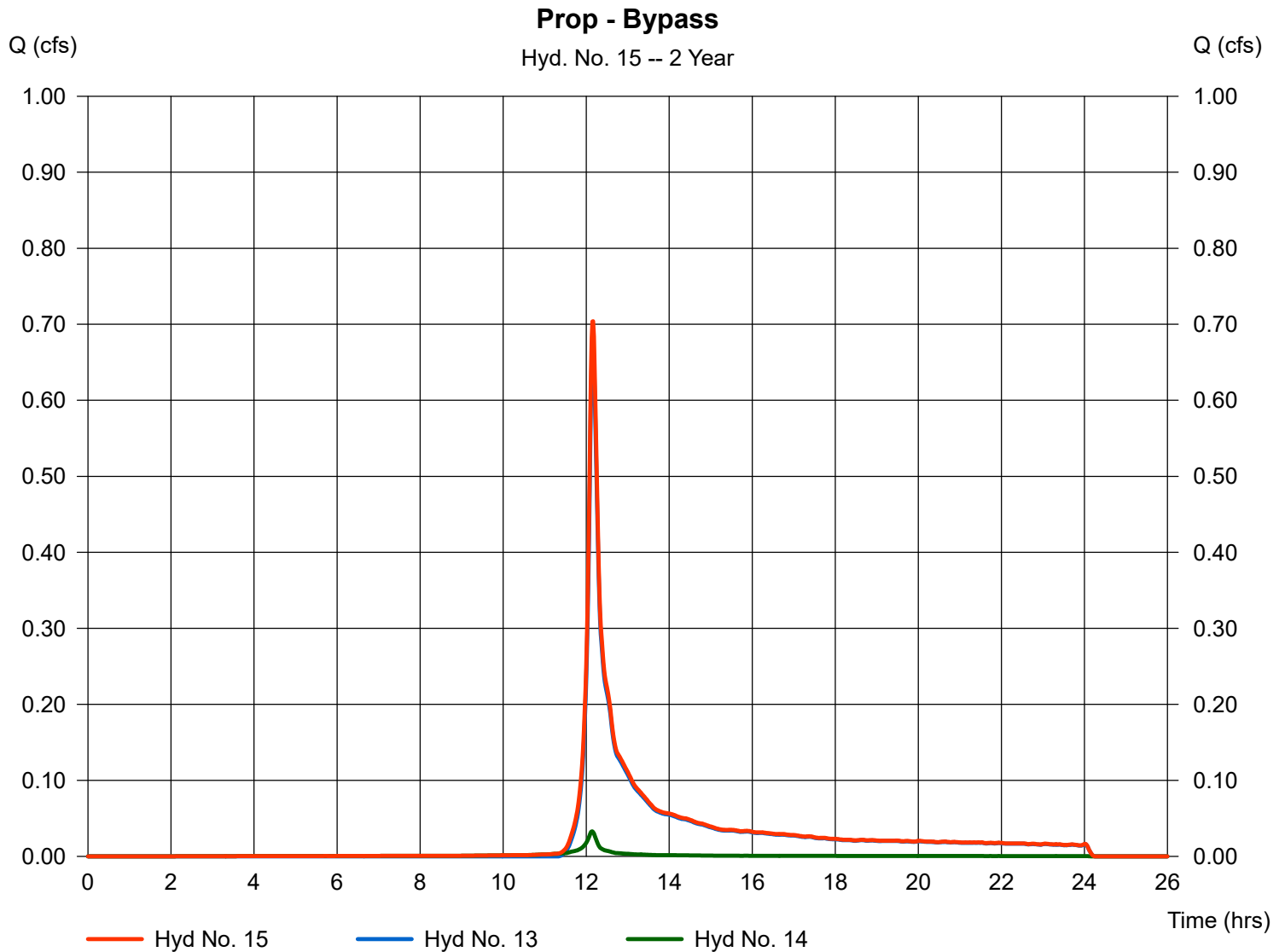
Monday, Jun 17, 2024

## Hyd. No. 15

Prop - Bypass

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 13, 14

Peak discharge = 0.704 cfs  
Time to peak = 12.17 hrs  
Hyd. volume = 2,375 cuft  
Contrib. drain. area = 0.636 ac





# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

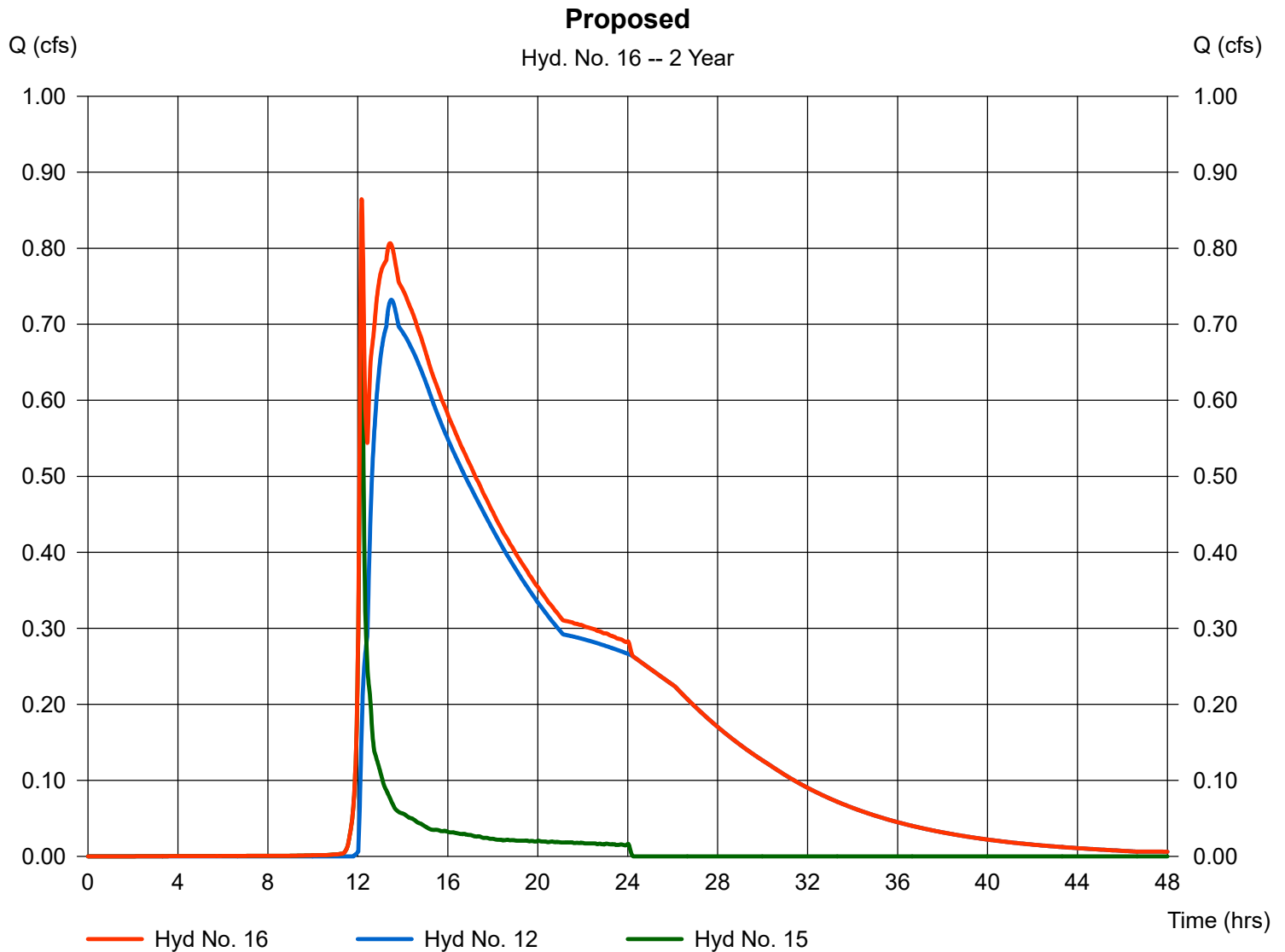
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## Hyd. No. 16

Proposed

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 12, 15

Peak discharge = 0.865 cfs  
Time to peak = 12.17 hrs  
Hyd. volume = 27,941 cuft  
Contrib. drain. area = 0.000 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

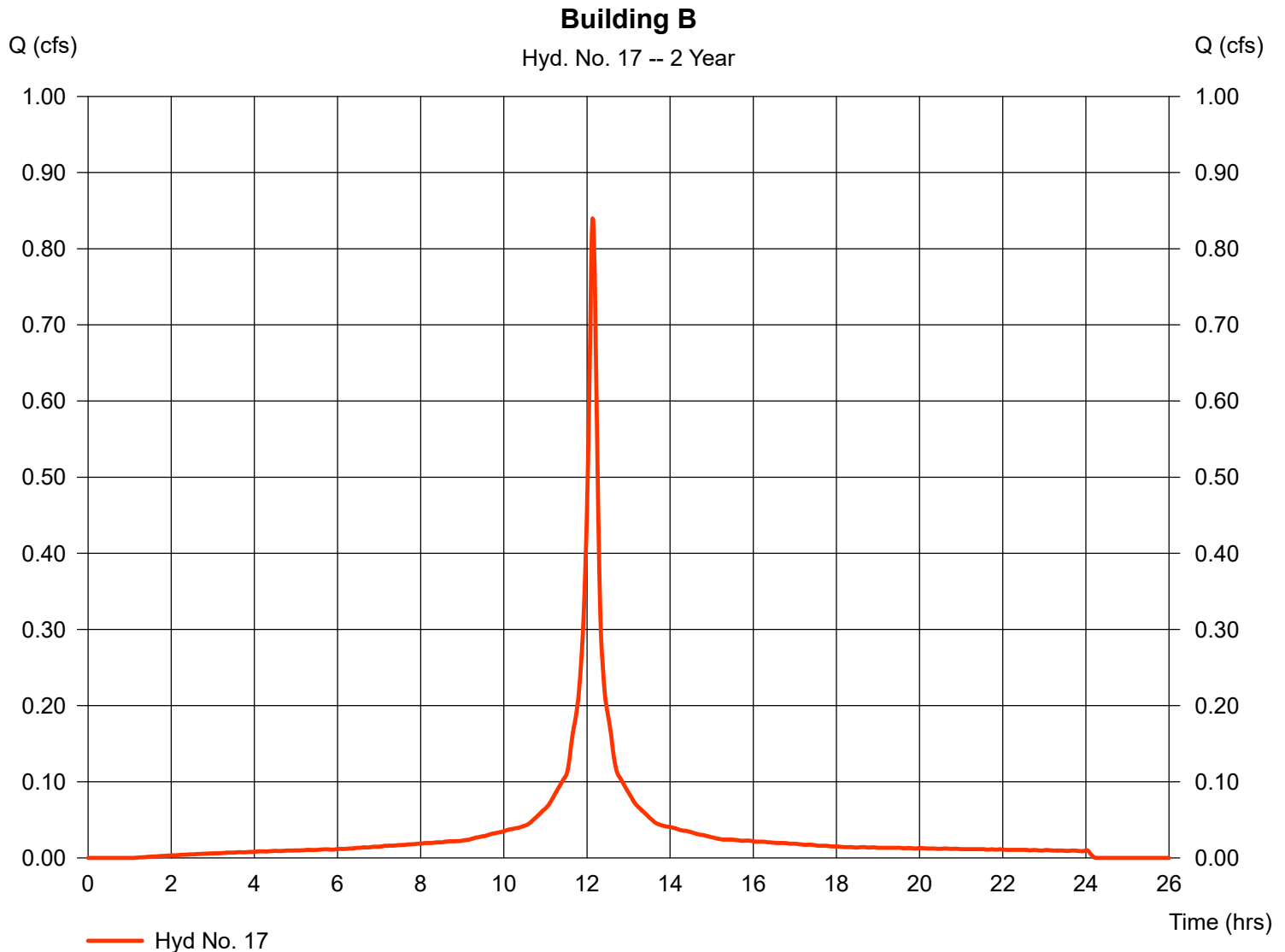
Monday, Jun 17, 2024

## Hyd. No. 17

Building B

Hydrograph type = SCS Runoff  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Drainage area = 0.230 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 3.84 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 0.840 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 3,010 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 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	1.564	1	731	5,505	-----	-----	-----	Prop - Detained1 (Perv)	
2	SCS Runoff	6.110	1	728	22,265	-----	-----	-----	Prop - Detained1 (Imp)	
3	Combine	7.573	1	729	27,770	1, 2	-----	-----	Prop - Detained1	
4	Reservoir	0.521	1	813	21,341	3	73.71	18,081	Route 1	
5	SCS Runoff	0.425	1	729	1,361	-----	-----	-----	Prop - Detained3 (Perv)	
6	SCS Runoff	1.635	1	728	5,959	-----	-----	-----	Prop - Detained3 (Imp)	
7	Combine	2.055	1	729	7,320	5, 6	-----	-----	Prop - Detained3	
8	Reservoir	0.132	1	815	4,698	7	74.94	4,881	Route 3	
9	SCS Runoff	1.309	1	736	5,463	-----	-----	-----	Prop - Detained2 (Perv)	
10	SCS Runoff	7.958	1	728	29,000	-----	-----	-----	Prop - Detained2 (Imp)	
11	Combine	9.335	1	729	60,502	4, 8, 9, 10	-----	-----	Prop - Detained2	
12	Reservoir	4.136	1	742	53,297	11	68.98	17,713	Route 2	
13	SCS Runoff	1.699	1	729	5,319	-----	-----	-----	Prop - Bypass (Perv)	
14	SCS Runoff	0.050	1	728	184	-----	-----	-----	Prop - Bypass (Imp)	
15	Combine	1.749	1	729	5,503	13, 14	-----	-----	Prop - Bypass	
16	Combine	4.853	1	738	58,800	12, 15	-----	-----	Proposed	
17	SCS Runoff	1.288	1	728	4,694	-----	-----	-----	Building B	
21-210-PR.gpw					Return Period: 10 Year			Monday, Jun 17, 2024		

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

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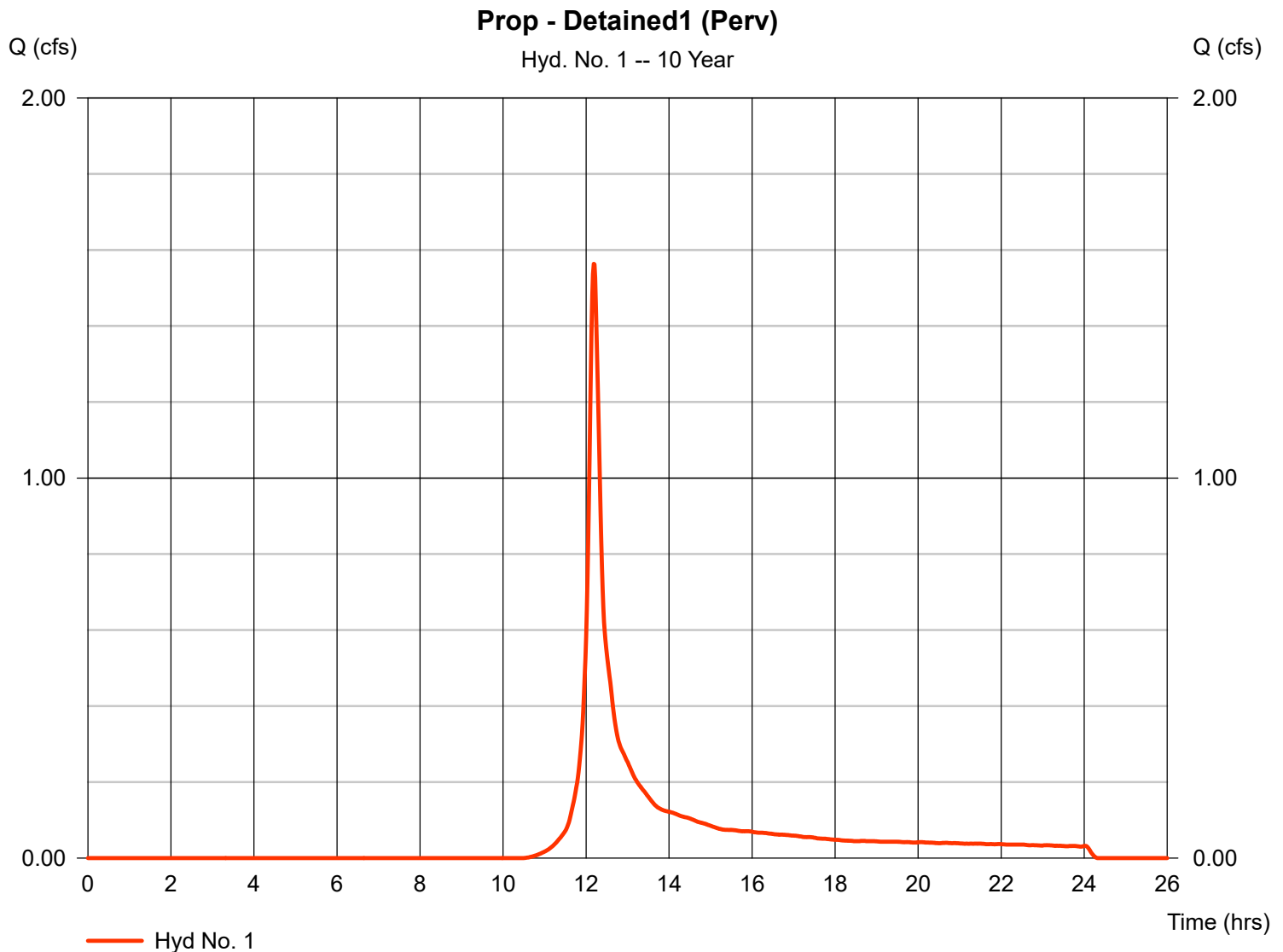
## Hyd. No. 1

Prop - Detained1 (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 10 yrs  
 Time interval = 1 min  
 Drainage area = 0.741 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 5.86 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 1.564 cfs  
 Time to peak = 12.18 hrs  
 Hyd. volume = 5,505 cuft  
 Curve number = 63\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 12.20 min  
 Distribution = Custom  
 Shape factor = 484

\* Composite (Area/CN) =  $[(0.637 \times 61) + (0.104 \times 74)] / 0.741$



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

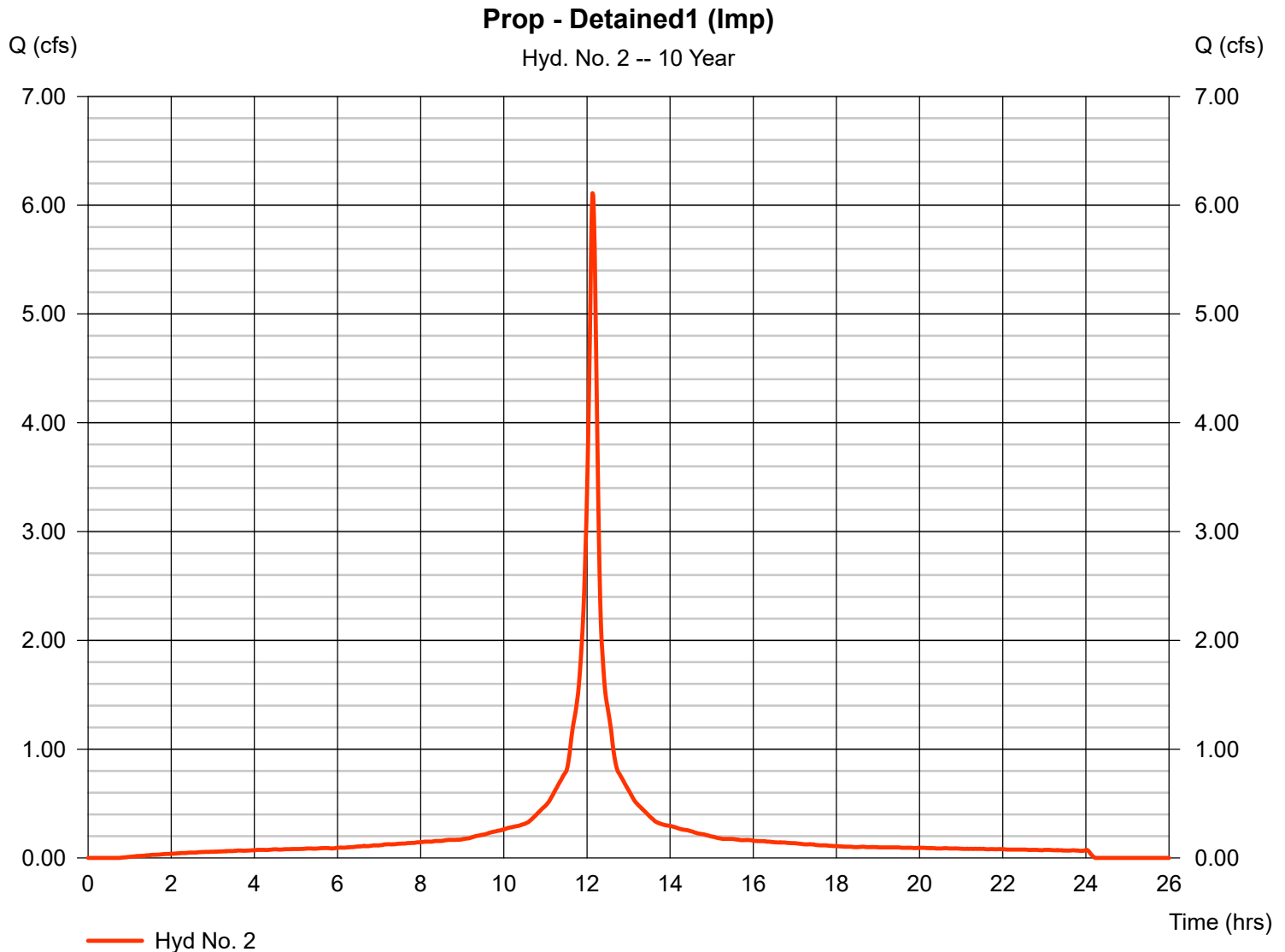
Monday, Jun 17, 2024

## Hyd. No. 2

Prop - Detained1 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 10 yrs  
 Time interval = 1 min  
 Drainage area = 1.091 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 5.86 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 6.110 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 22,265 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

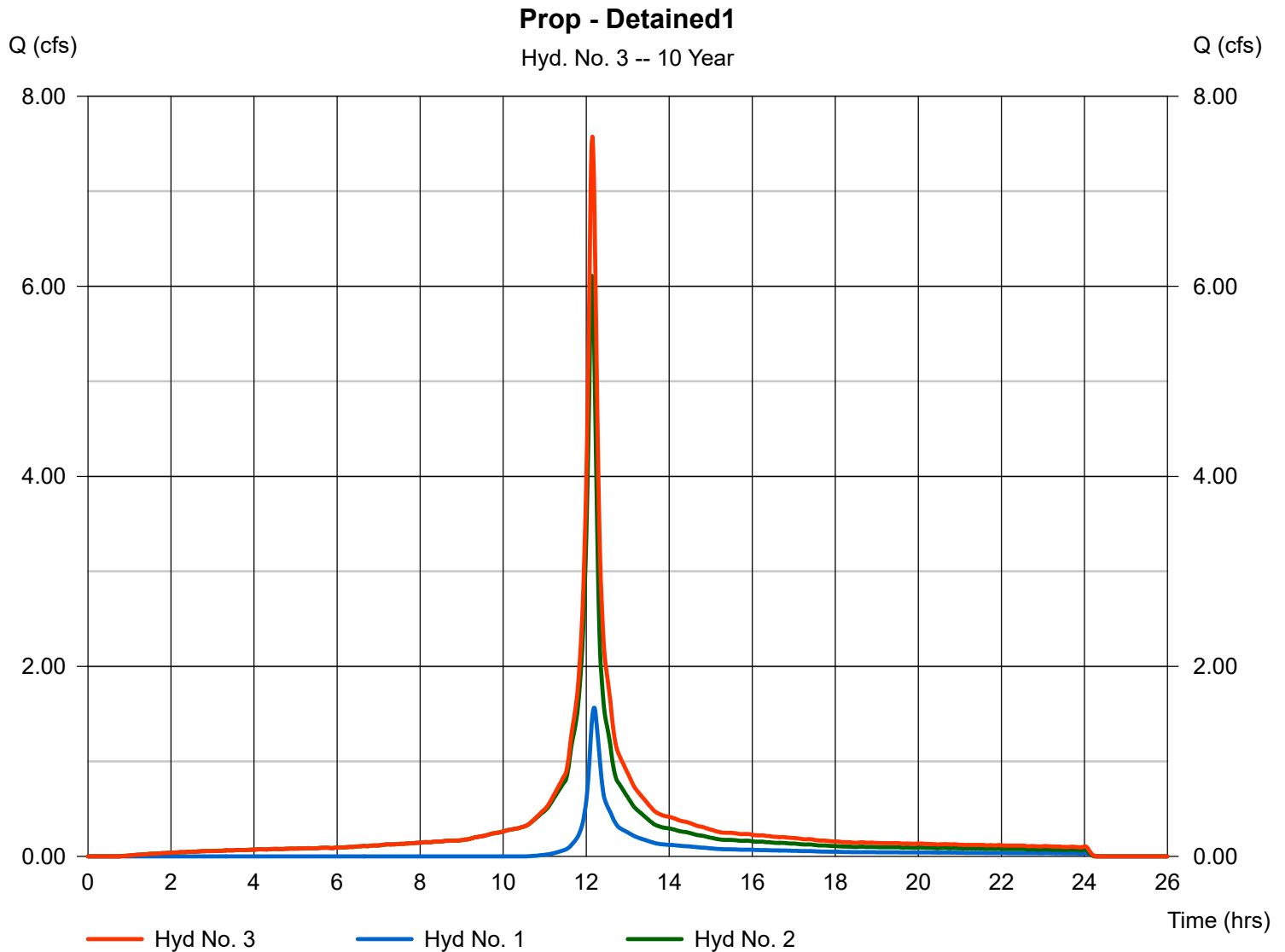
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## Hyd. No. 3

Prop - Detained1

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2

Peak discharge = 7.573 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 27,770 cuft  
Contrib. drain. area = 1.832 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

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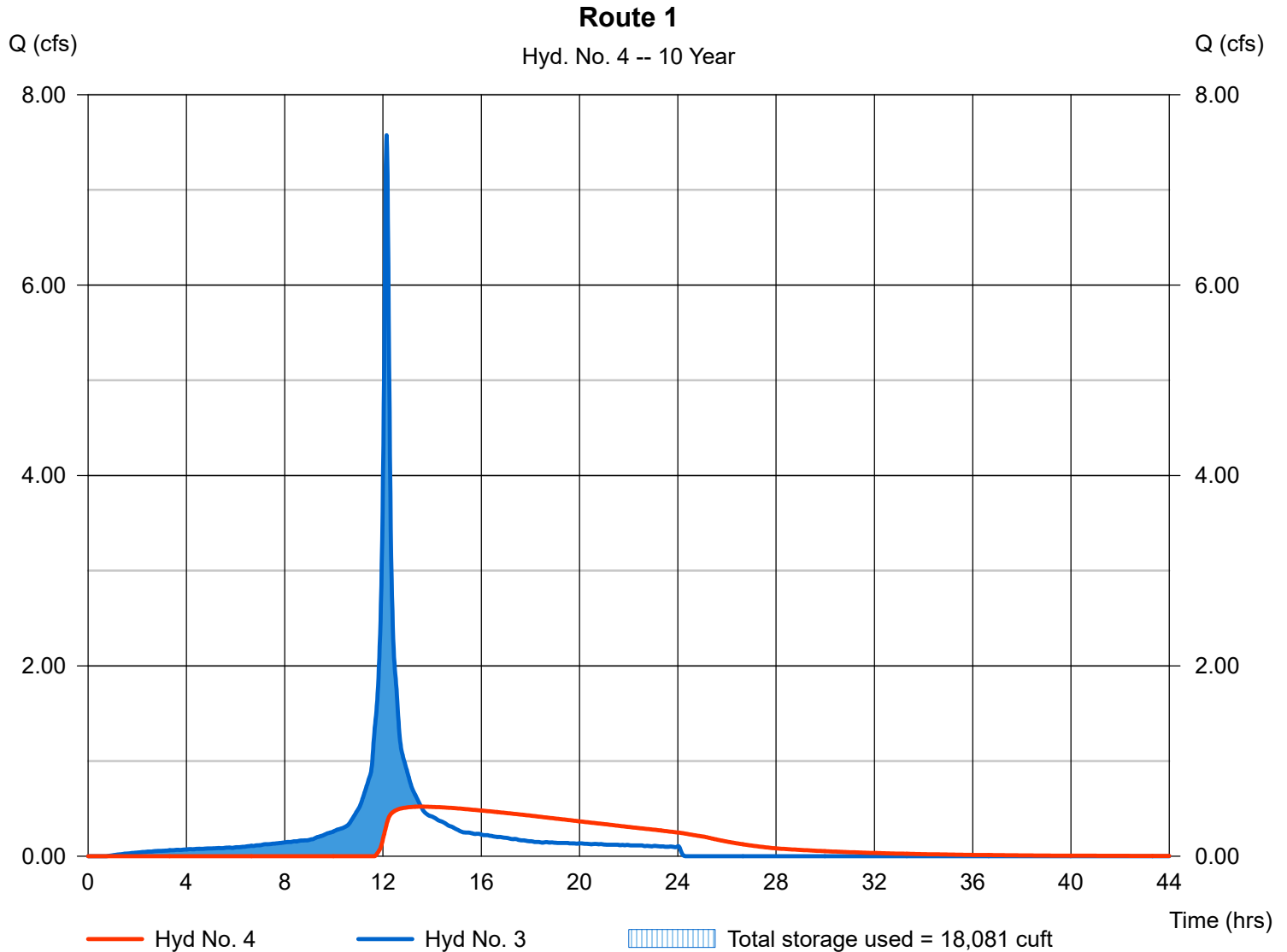
## Hyd. No. 4

Route 1

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyd. No. = 3 - Prop - Detained1  
Reservoir name = Basin 1

Peak discharge = 0.521 cfs  
Time to peak = 13.55 hrs  
Hyd. volume = 21,341 cuft  
Max. Elevation = 73.71 ft  
Max. Storage = 18,081 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

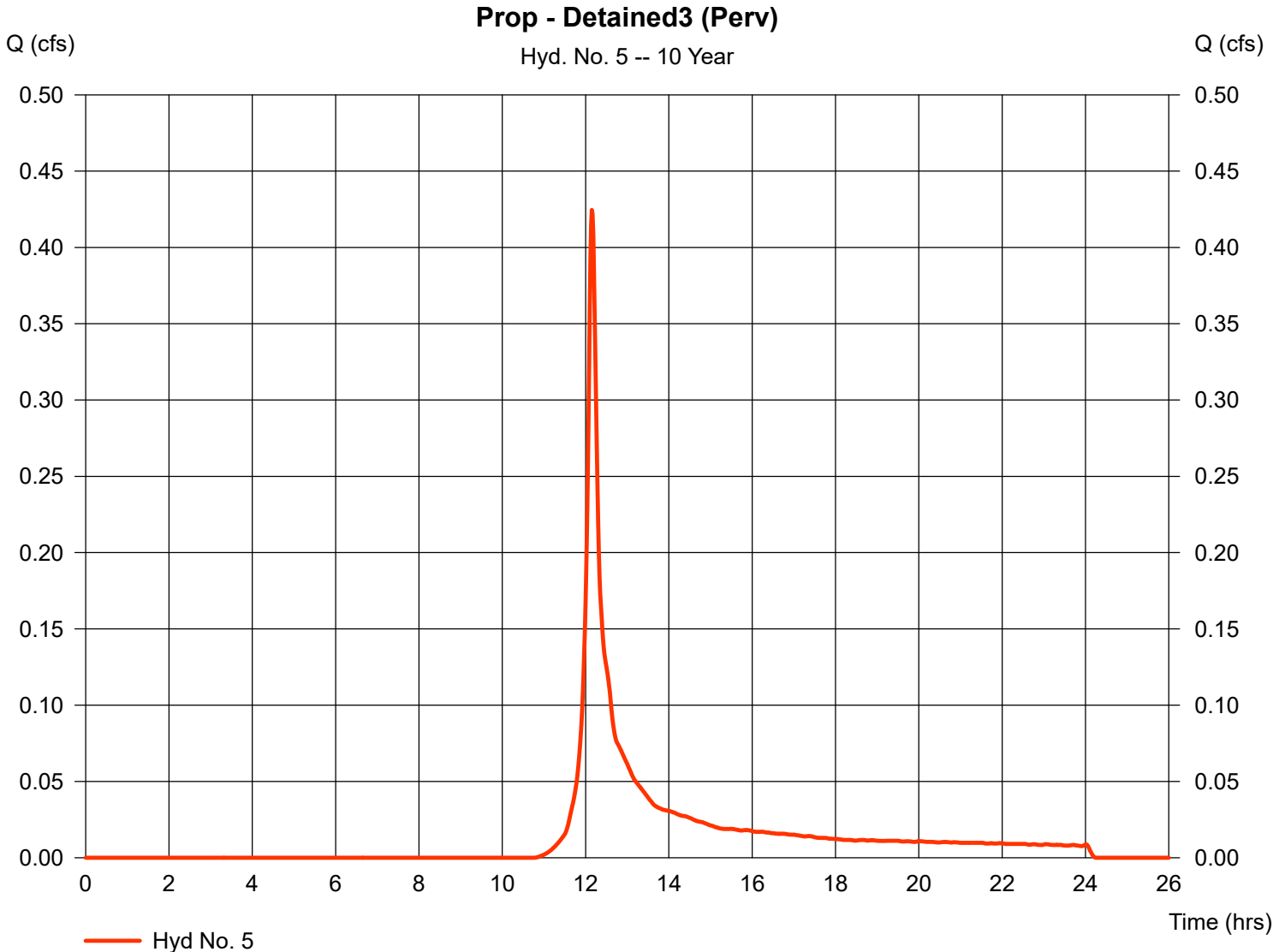
Monday, Jun 17, 2024

## Hyd. No. 5

Prop - Detained3 (Perv)

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Time interval = 1 min  
Drainage area = 0.196 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 5.86 in  
Storm duration = NOAA\_C.cds

Peak discharge = 0.425 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 1,361 cuft  
Curve number = 61  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.00 min  
Distribution = Custom  
Shape factor = 484





# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

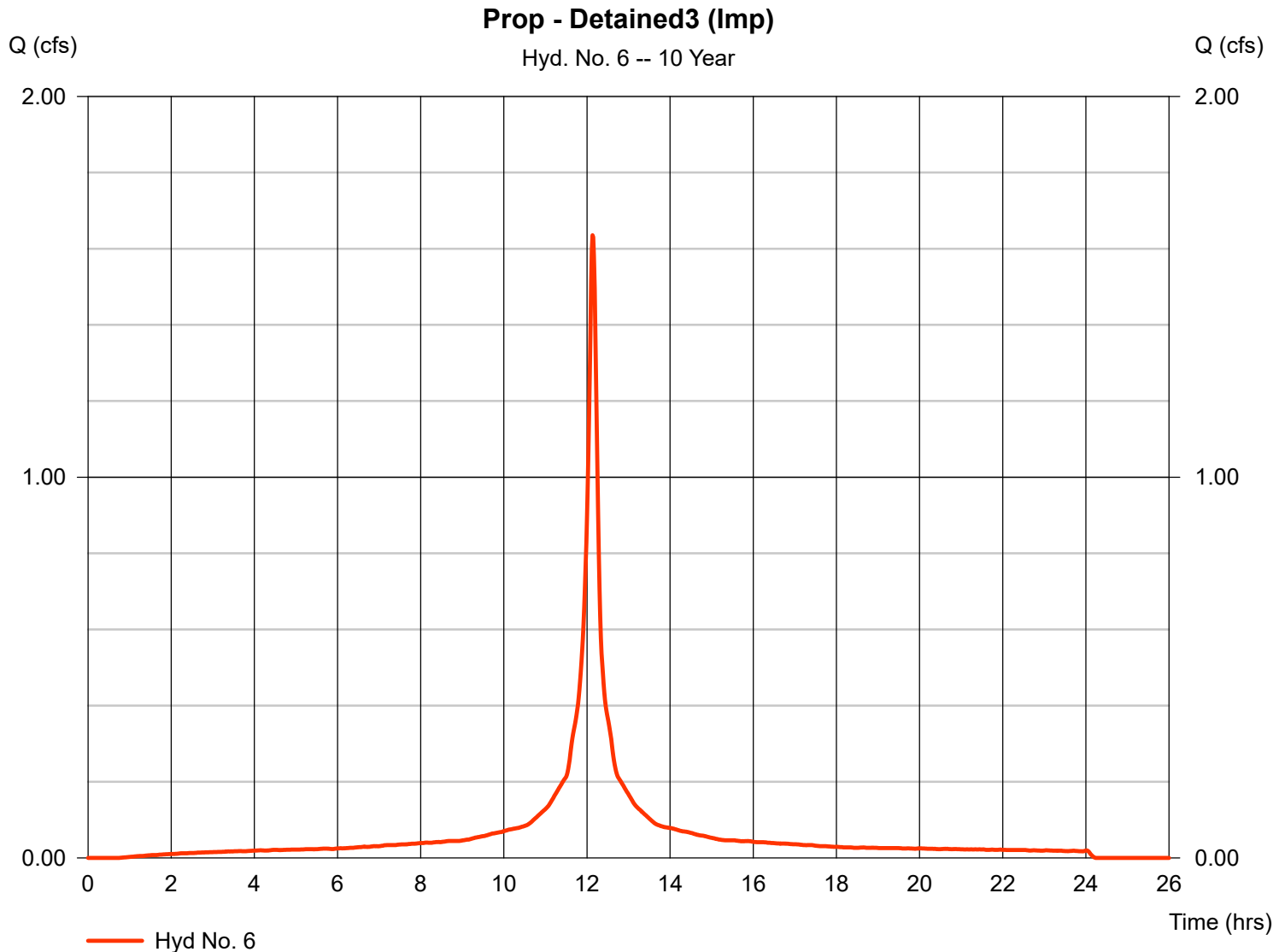
Monday, Jun 17, 2024

## Hyd. No. 6

Prop - Detained3 (Imp)

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Time interval = 1 min  
Drainage area = 0.292 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 5.86 in  
Storm duration = NOAA\_C.cds

Peak discharge = 1.635 cfs  
Time to peak = 12.13 hrs  
Hyd. volume = 5,959 cuft  
Curve number = 98  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.00 min  
Distribution = Custom  
Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

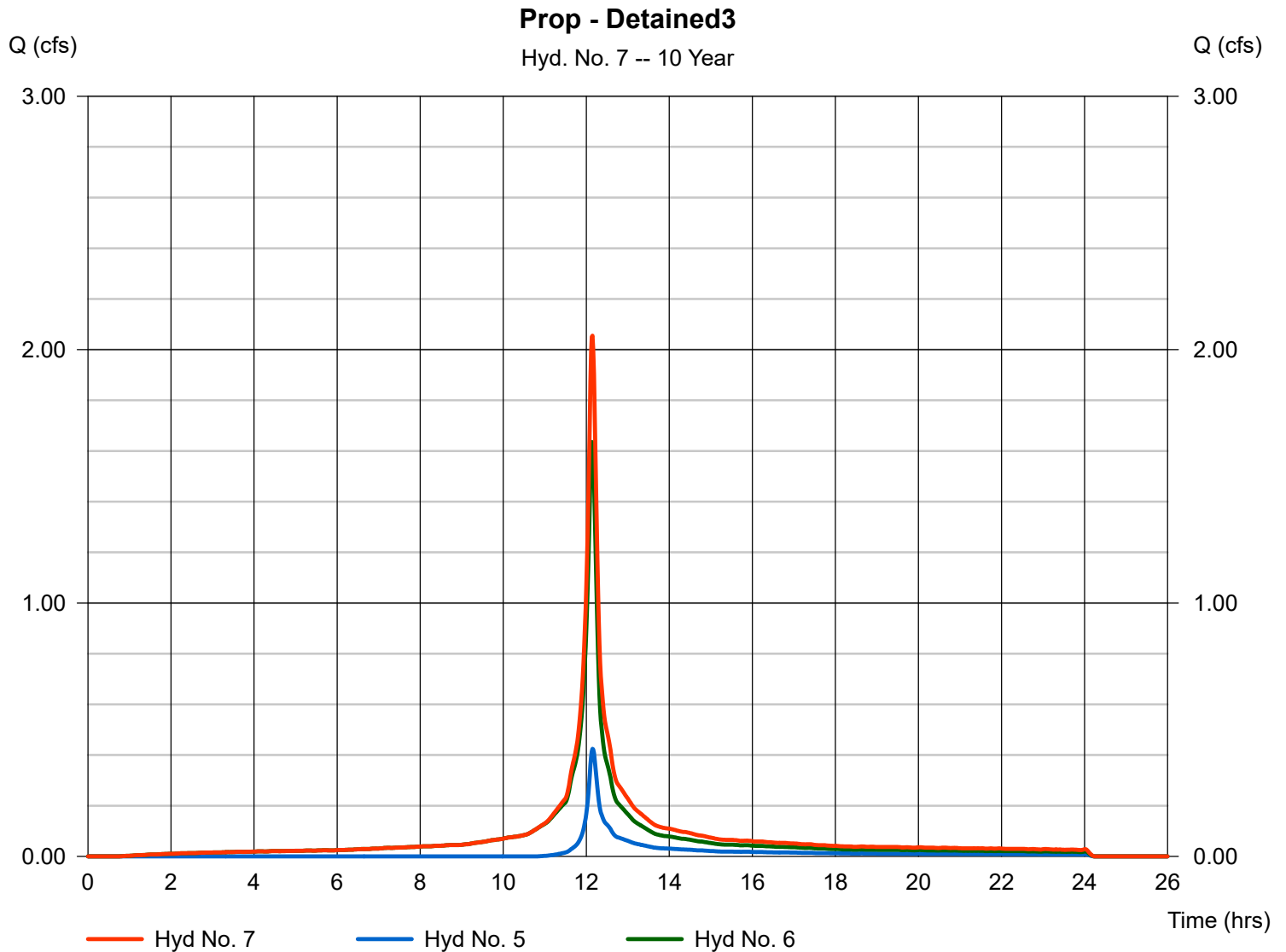
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## Hyd. No. 7

Prop - Detained3

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyds. = 5, 6

Peak discharge = 2.055 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 7,320 cuft  
Contrib. drain. area = 0.488 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

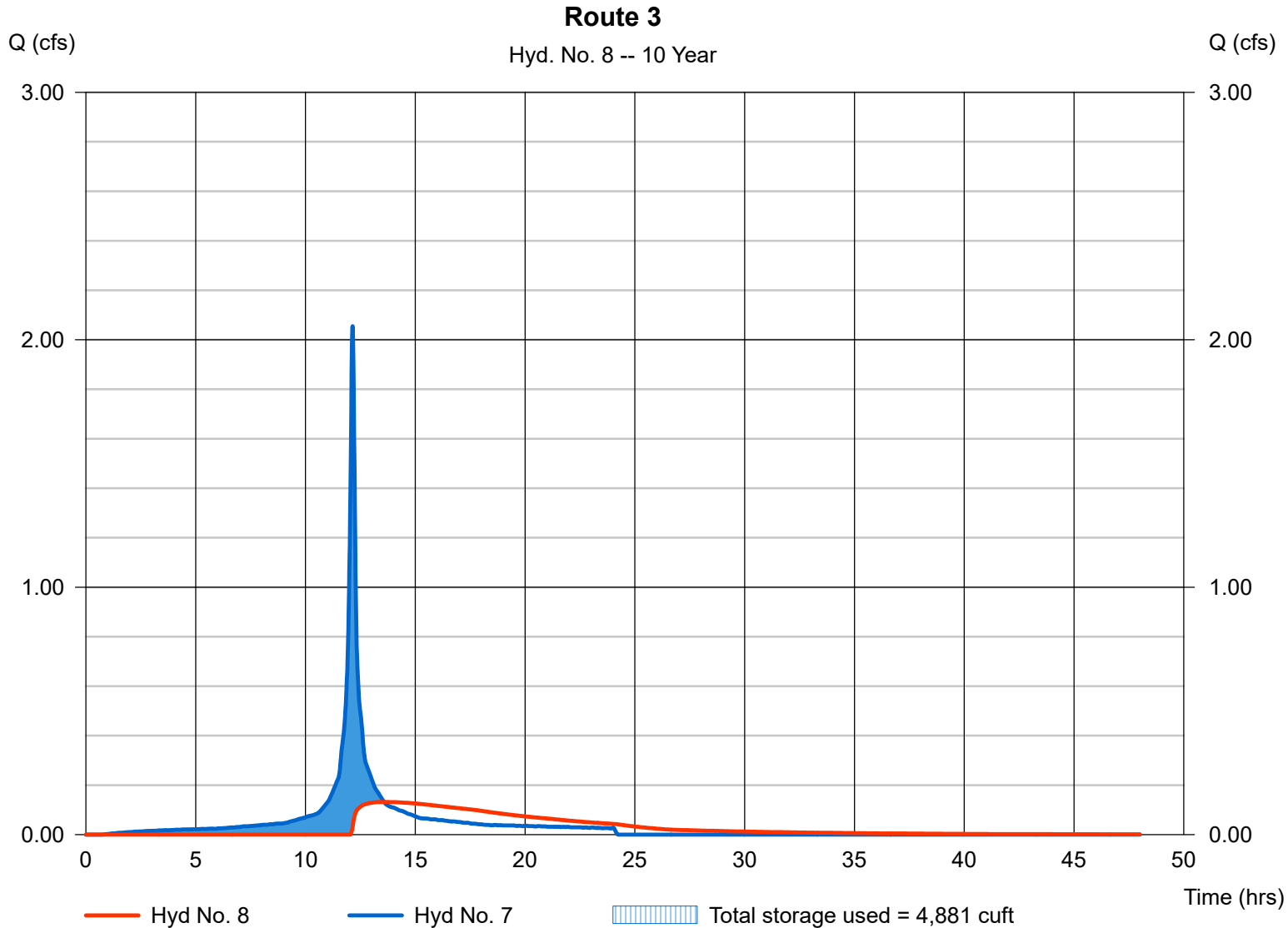
## Hyd. No. 8

Route 3

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyd. No. = 7 - Prop - Detained3  
Reservoir name = Basin 3

Peak discharge = 0.132 cfs  
Time to peak = 13.58 hrs  
Hyd. volume = 4,698 cuft  
Max. Elevation = 74.94 ft  
Max. Storage = 4,881 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

## Hyd. No. 9

Prop - Detained2 (Perv)

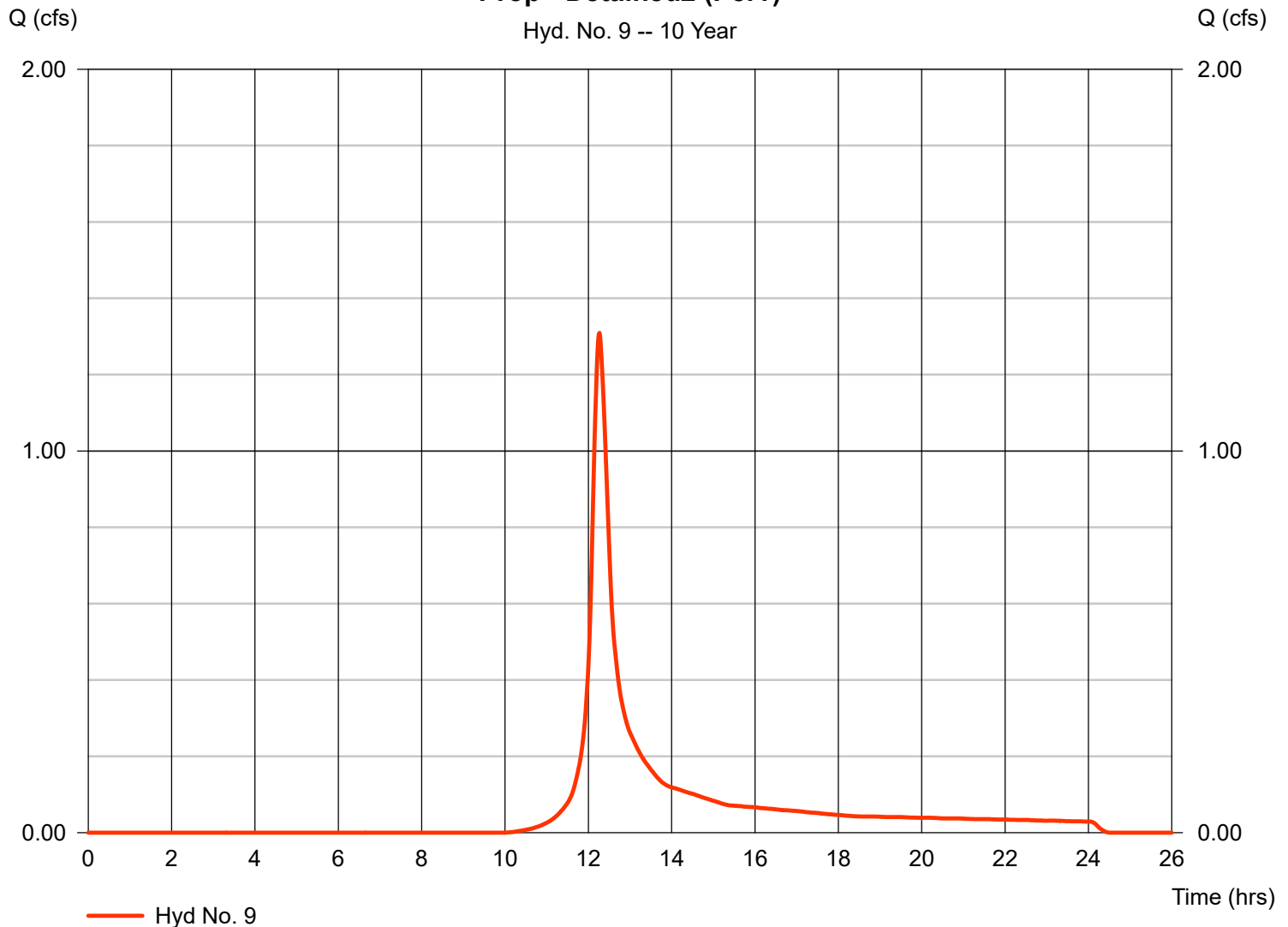
Hydrograph type = SCS Runoff  
 Storm frequency = 10 yrs  
 Time interval = 1 min  
 Drainage area = 0.644 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 5.86 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 1.309 cfs  
 Time to peak = 12.27 hrs  
 Hyd. volume = 5,463 cuft  
 Curve number = 66\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 19.30 min  
 Distribution = Custom  
 Shape factor = 484

\* Composite (Area/CN) = [(0.407 x 61) + (0.237 x 74)] / 0.644

**Prop - Detained2 (Perv)**

Hyd. No. 9 -- 10 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

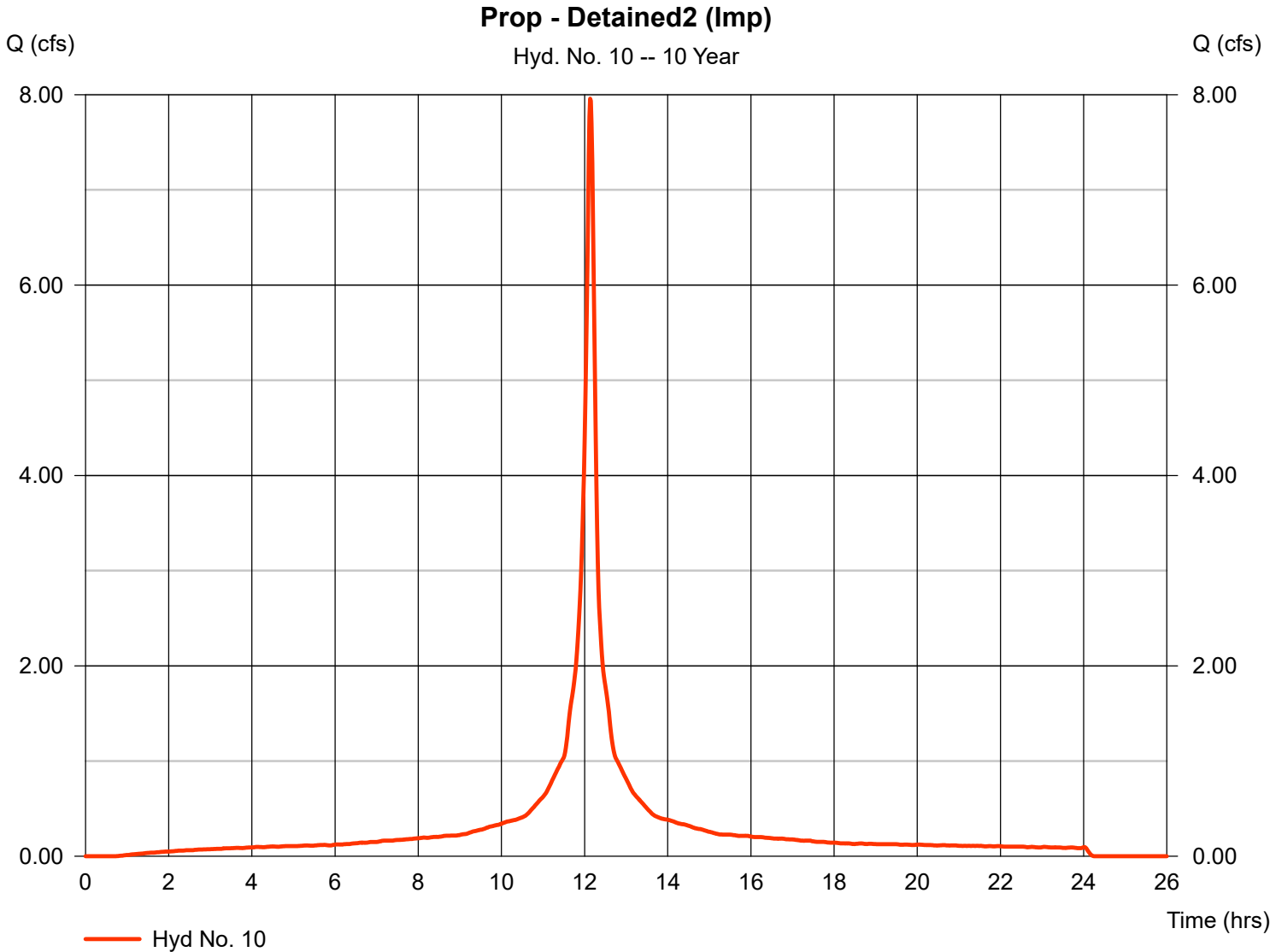
Monday, Jun 17, 2024

## Hyd. No. 10

Prop - Detained2 (Imp)

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Time interval = 1 min  
Drainage area = 1.421 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 5.86 in  
Storm duration = NOAA\_C.cds

Peak discharge = 7.958 cfs  
Time to peak = 12.13 hrs  
Hyd. volume = 29,000 cuft  
Curve number = 98  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.00 min  
Distribution = Custom  
Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

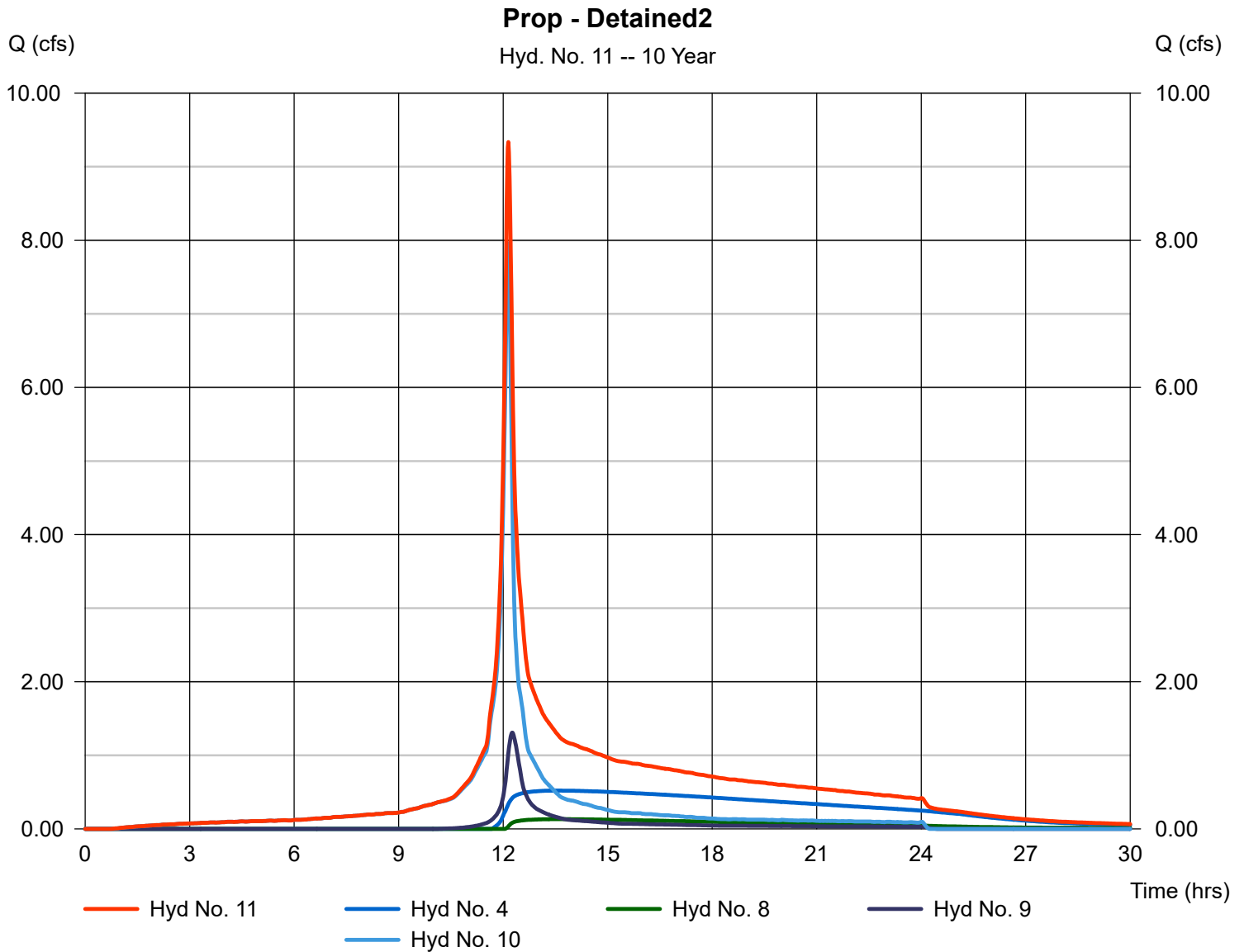
Monday, Jun 17, 2024

## Hyd. No. 11

Prop - Detained2

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyds. = 4, 8, 9, 10

Peak discharge = 9.335 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 60,502 cuft  
Contrib. drain. area = 2.065 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

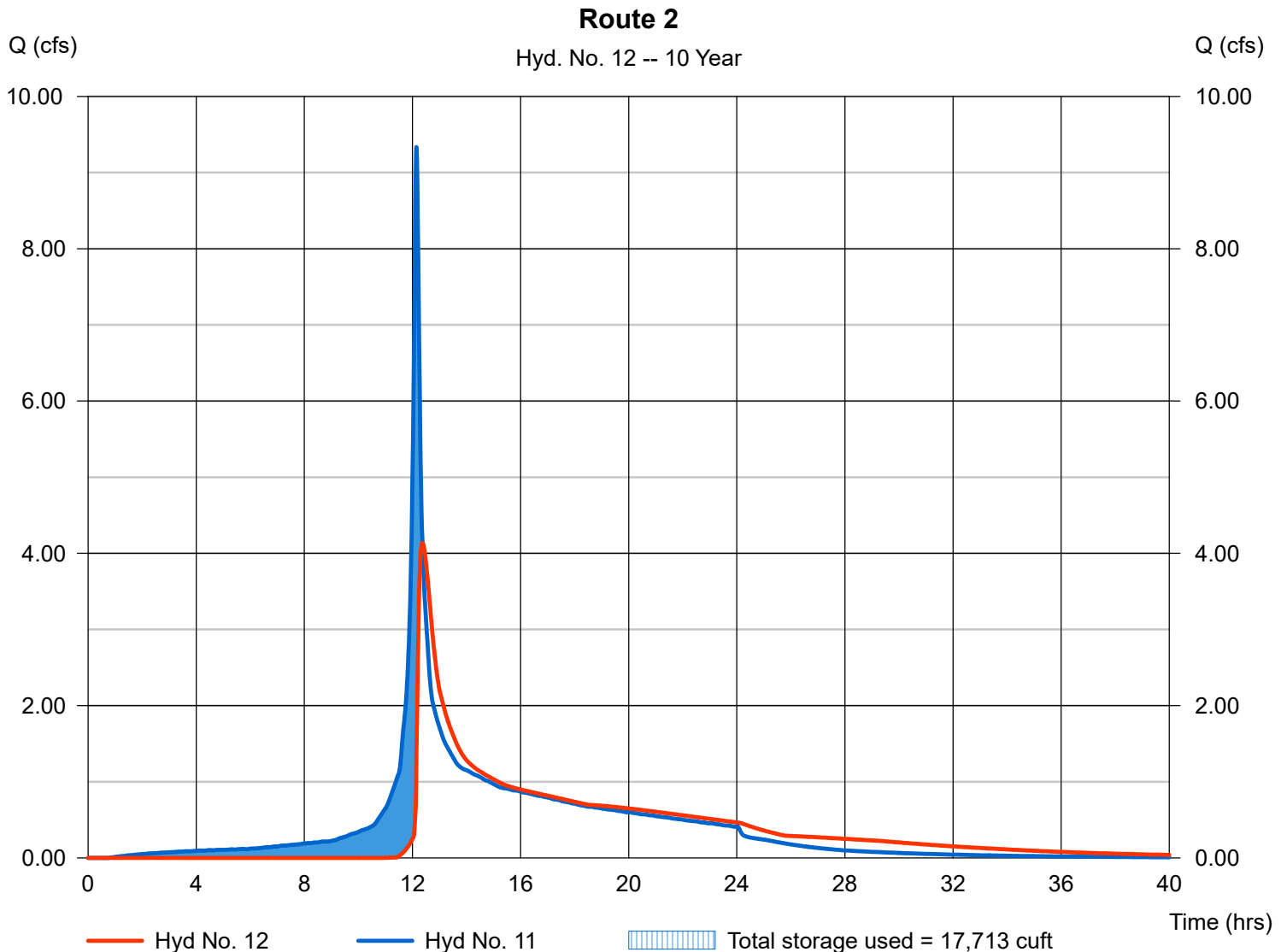
## Hyd. No. 12

Route 2

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyd. No. = 11 - Prop - Detained2  
Reservoir name = Basin 2

Peak discharge = 4.136 cfs  
Time to peak = 12.37 hrs  
Hyd. volume = 53,297 cuft  
Max. Elevation = 68.98 ft  
Max. Storage = 17,713 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

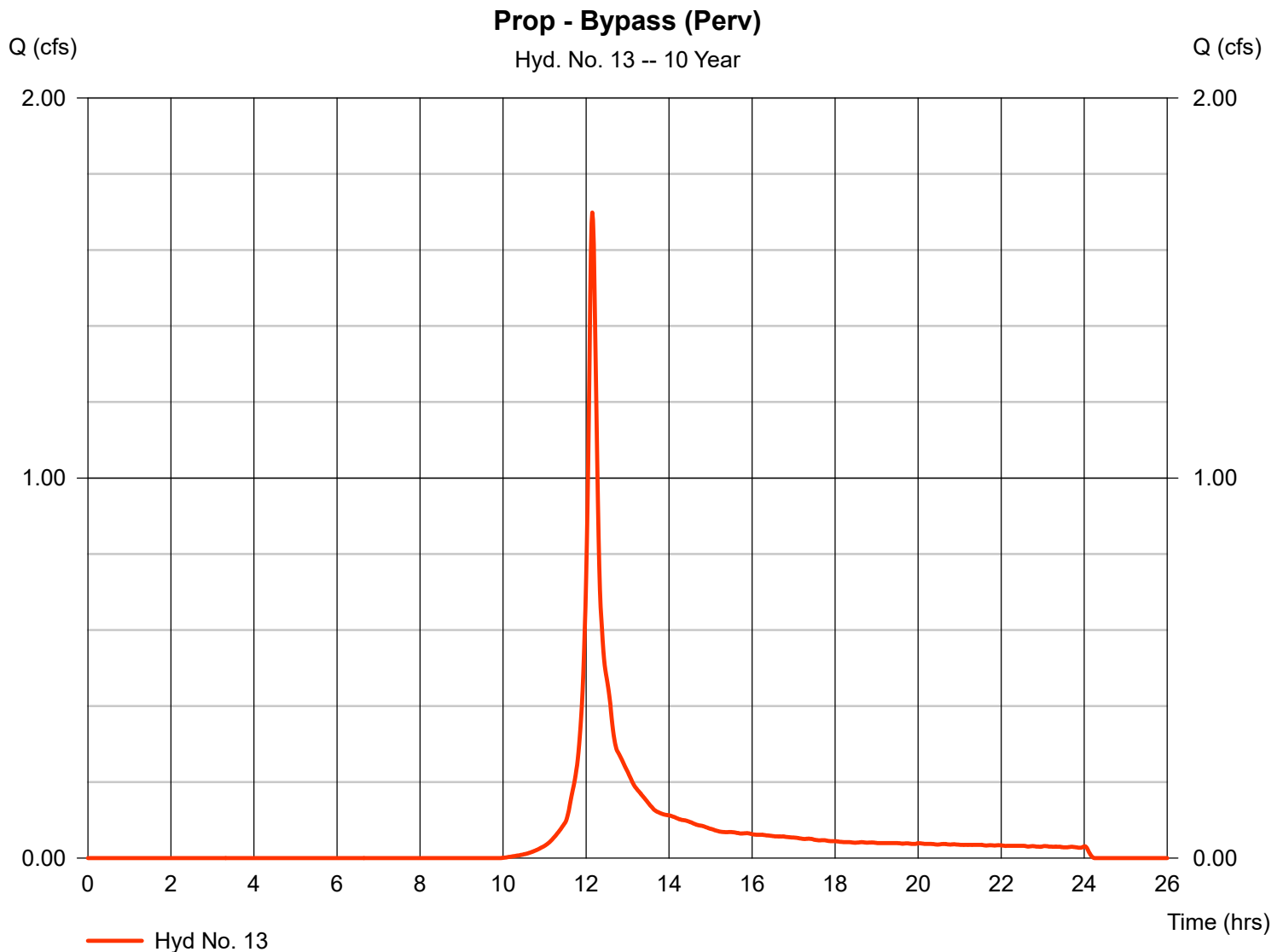
## Hyd. No. 13

Prop - Bypass (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 10 yrs  
 Time interval = 1 min  
 Drainage area = 0.627 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 5.86 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 1.699 cfs  
 Time to peak = 12.15 hrs  
 Hyd. volume = 5,319 cuft  
 Curve number = 66\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484

\* Composite (Area/CN) = [(0.399 x 61) + (0.228 x 74)] / 0.627





# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

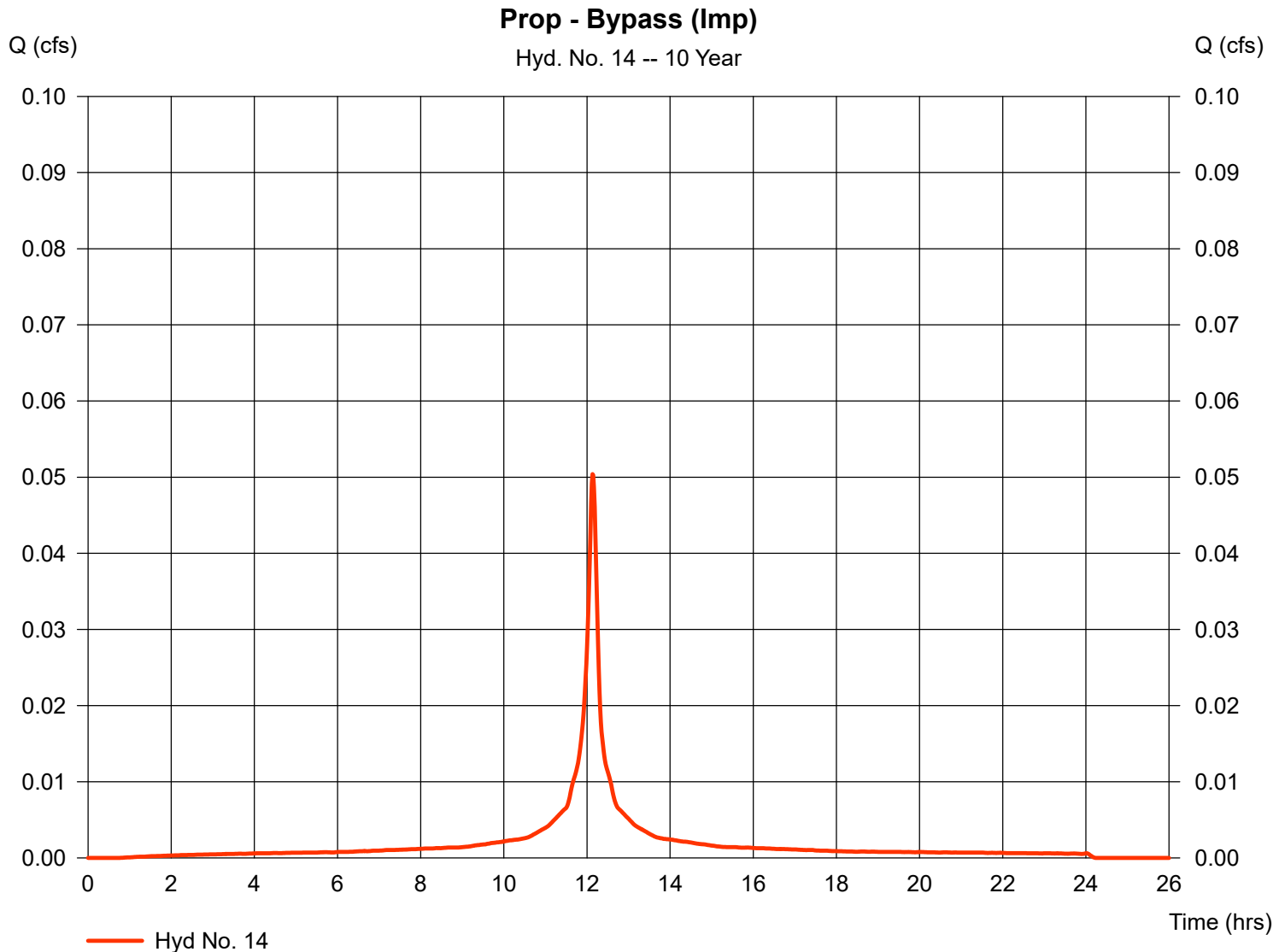
Monday, Jun 17, 2024

## Hyd. No. 14

Prop - Bypass (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 10 yrs  
 Time interval = 1 min  
 Drainage area = 0.009 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 5.86 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 0.050 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 184 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

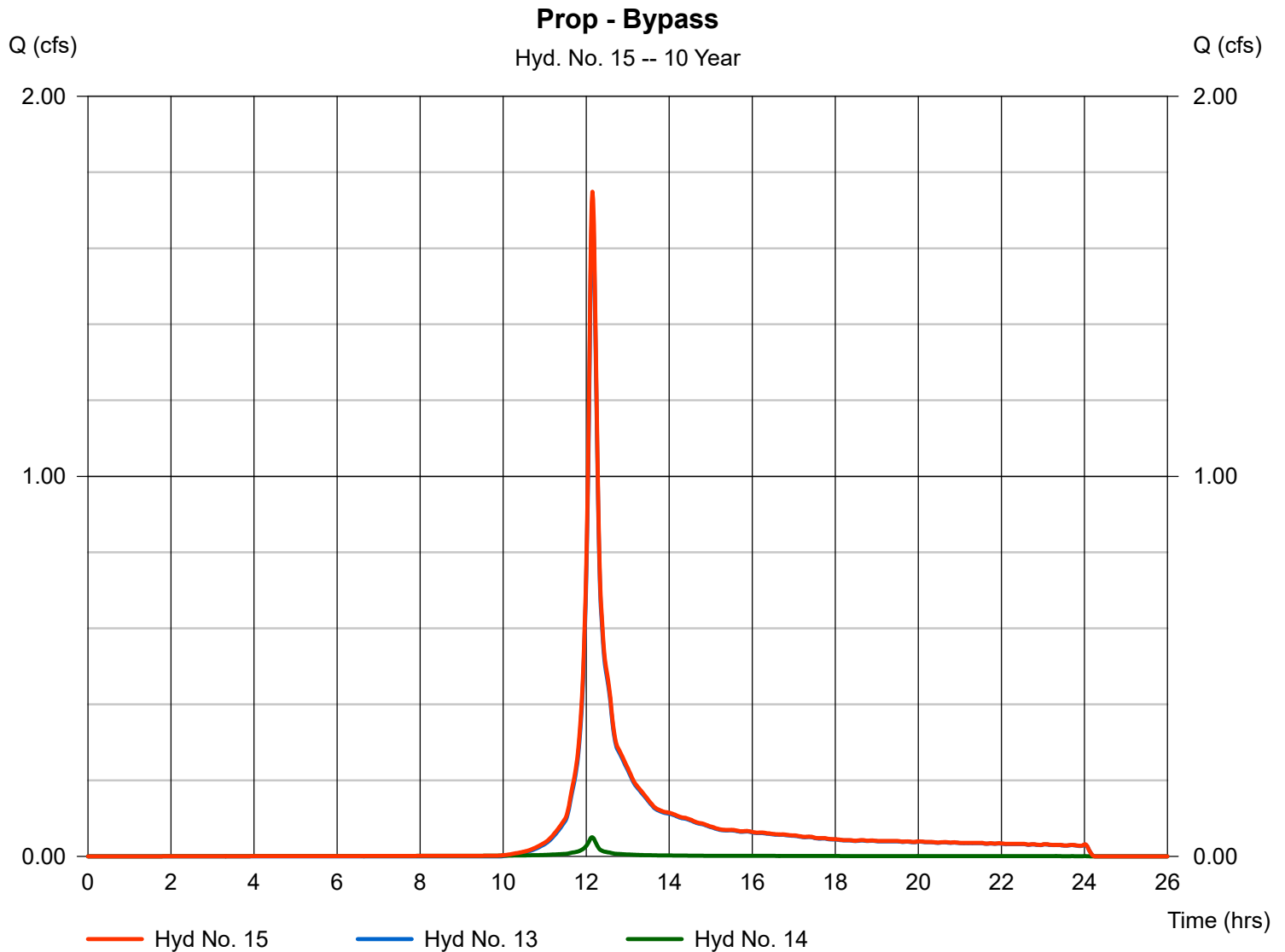
Monday, Jun 17, 2024

## Hyd. No. 15

Prop - Bypass

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 1 min  
Inflow hyds. = 13, 14

Peak discharge = 1.749 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 5,503 cuft  
Contrib. drain. area = 0.636 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

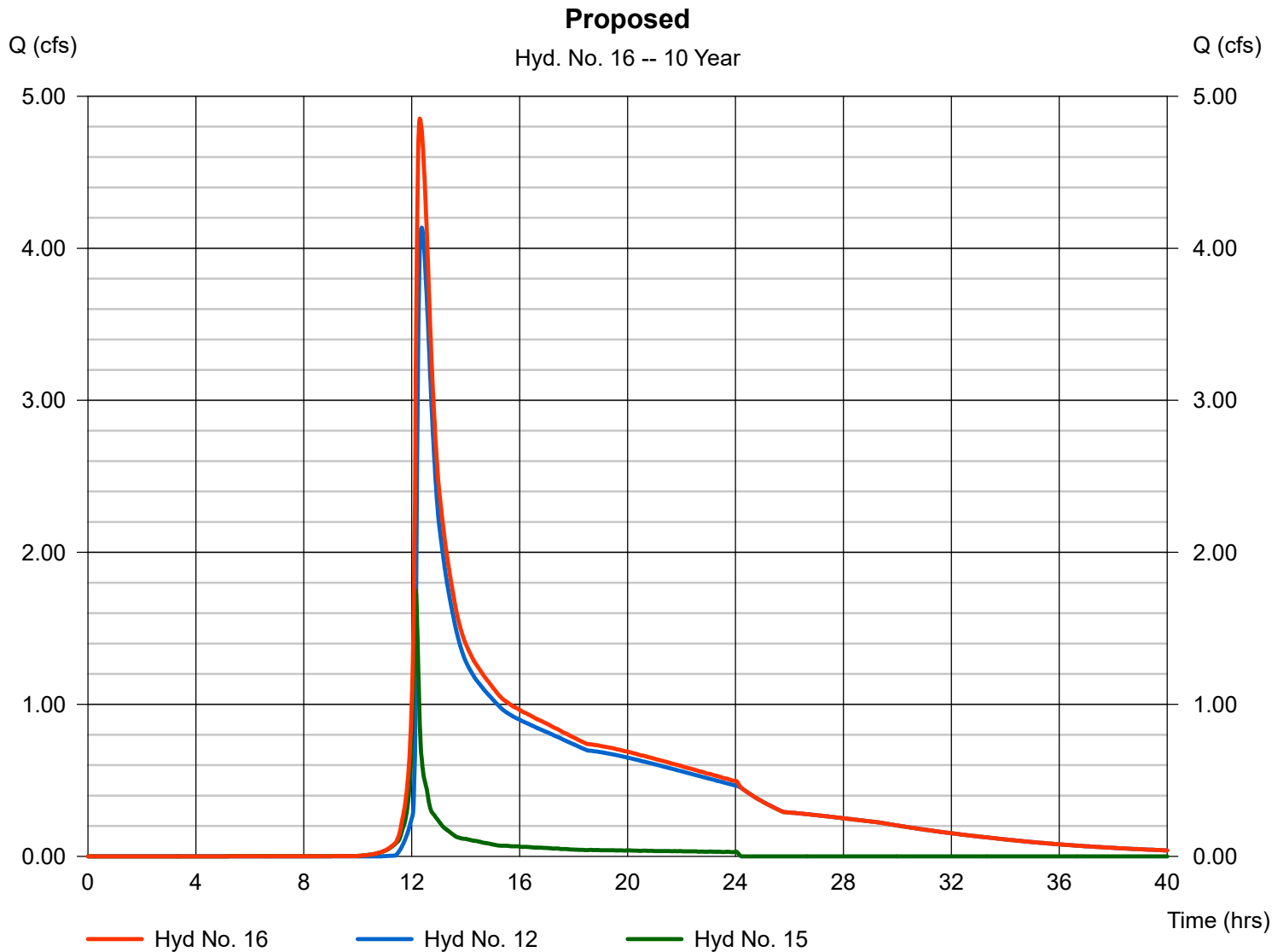
Monday, Jun 17, 2024

## Hyd. No. 16

Proposed

Hydrograph type = Combine  
 Storm frequency = 10 yrs  
 Time interval = 1 min  
 Inflow hyds. = 12, 15

Peak discharge = 4.853 cfs  
 Time to peak = 12.30 hrs  
 Hyd. volume = 58,800 cuft  
 Contrib. drain. area = 0.000 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

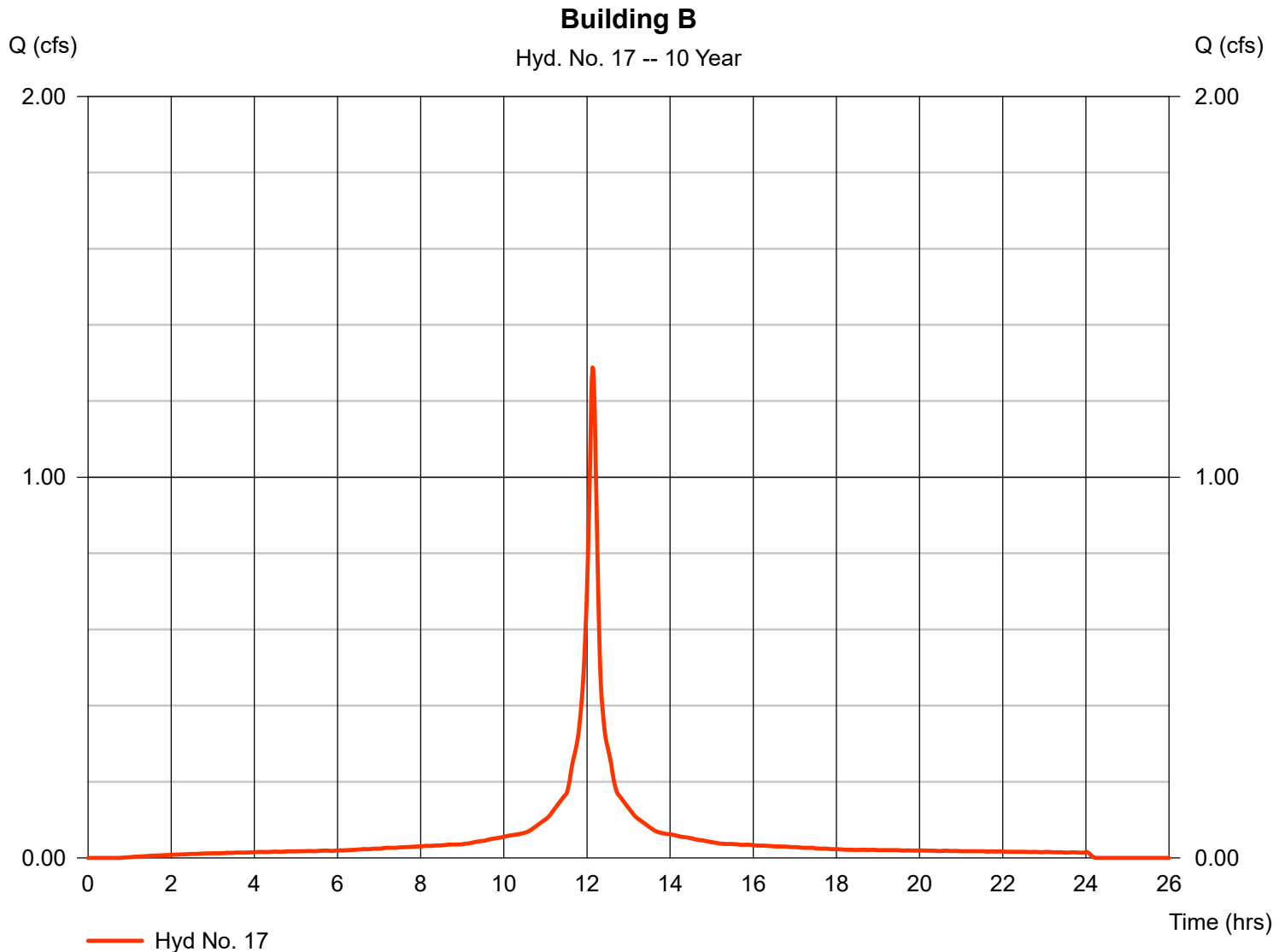
Monday, Jun 17, 2024

## Hyd. No. 17

Building B

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Time interval = 1 min  
Drainage area = 0.230 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 5.86 in  
Storm duration = NOAA\_C.cds

Peak discharge = 1.288 cfs  
Time to peak = 12.13 hrs  
Hyd. volume = 4,694 cuft  
Curve number = 98  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.00 min  
Distribution = Custom  
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	4.949	1	731	17,037	-----	-----	-----	Prop - Detained1 (Perv)
2	SCS Runoff	11.85	1	728	43,915	-----	-----	-----	Prop - Detained1 (Imp)
3	Combine	16.61	1	729	60,952	1, 2	-----	-----	Prop - Detained1
4	Reservoir	9.509	1	737	54,501	3	74.99	27,532	Route 1
5	SCS Runoff	1.406	1	729	4,371	-----	-----	-----	Prop - Detained3 (Perv)
6	SCS Runoff	3.172	1	728	11,754	-----	-----	-----	Prop - Detained3 (Imp)
7	Combine	4.568	1	729	16,125	5, 6	-----	-----	Prop - Detained3
8	Reservoir	0.345	1	802	13,464	7	76.00	10,535	Route 3
9	SCS Runoff	3.895	1	735	16,050	-----	-----	-----	Prop - Detained2 (Perv)
10	SCS Runoff	15.43	1	728	57,198	-----	-----	-----	Prop - Detained2 (Imp)
11	Combine	24.79	1	731	141,213	4, 8, 9, 10	-----	-----	Prop - Detained2
12	Reservoir	14.24	1	746	133,831	11	70.48	31,562	Route 2
13	SCS Runoff	4.992	1	729	15,626	-----	-----	-----	Prop - Bypass (Perv)
14	SCS Runoff	0.098	1	728	362	-----	-----	-----	Prop - Bypass (Imp)
15	Combine	5.089	1	729	15,989	13, 14	-----	-----	Prop - Bypass
16	Combine	15.78	1	734	149,820	12, 15	-----	-----	Proposed
17	SCS Runoff	2.498	1	728	9,258	-----	-----	-----	Building B
21-210-PR.gpw					Return Period: 100 Year			Monday, Jun 17, 2024	

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

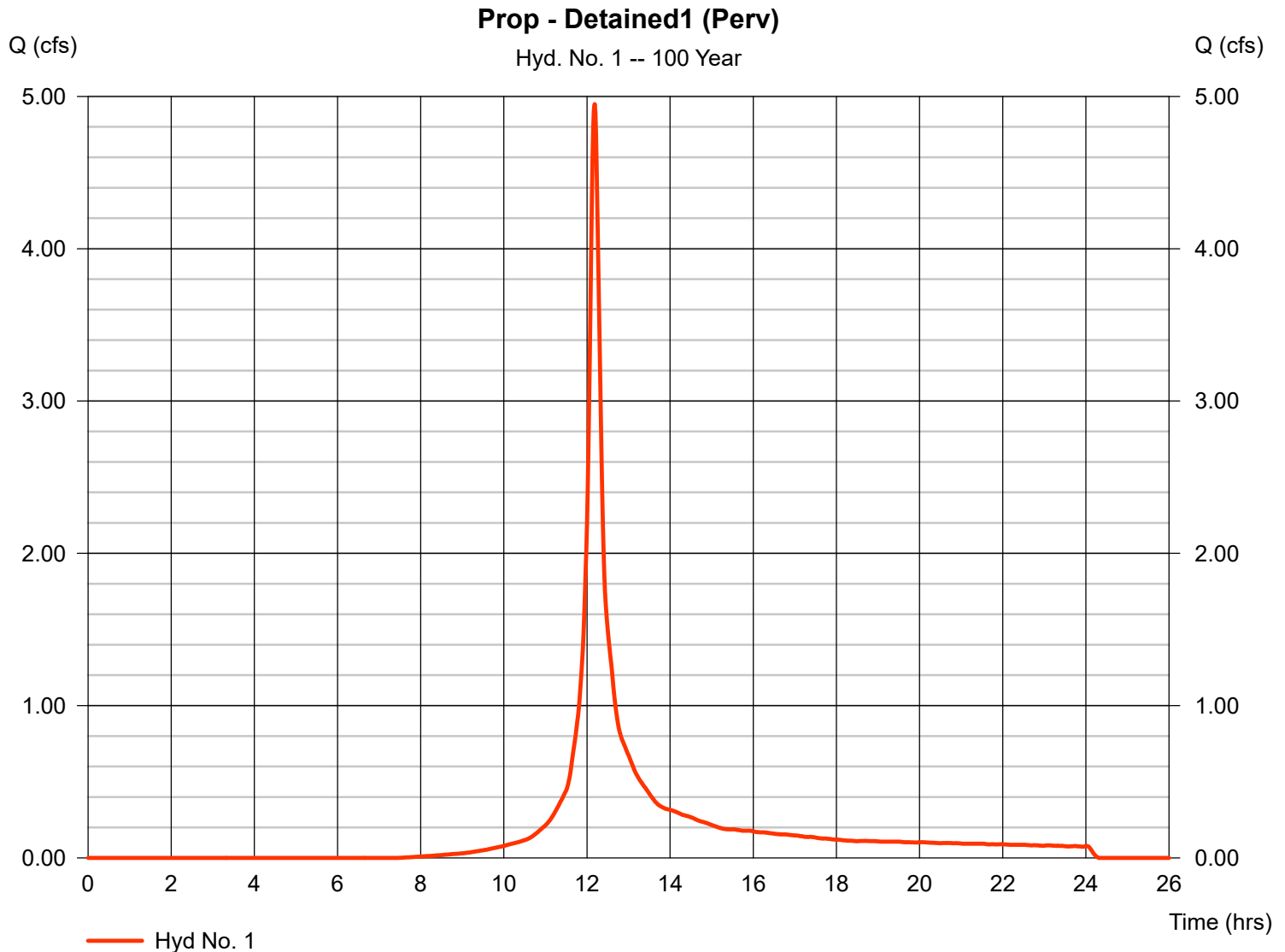
## Hyd. No. 1

Prop - Detained1 (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 0.741 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 11.33 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 4.949 cfs  
 Time to peak = 12.18 hrs  
 Hyd. volume = 17,037 cuft  
 Curve number = 63\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 12.20 min  
 Distribution = Custom  
 Shape factor = 484

\* Composite (Area/CN) = [(0.637 x 61) + (0.104 x 74)] / 0.741



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

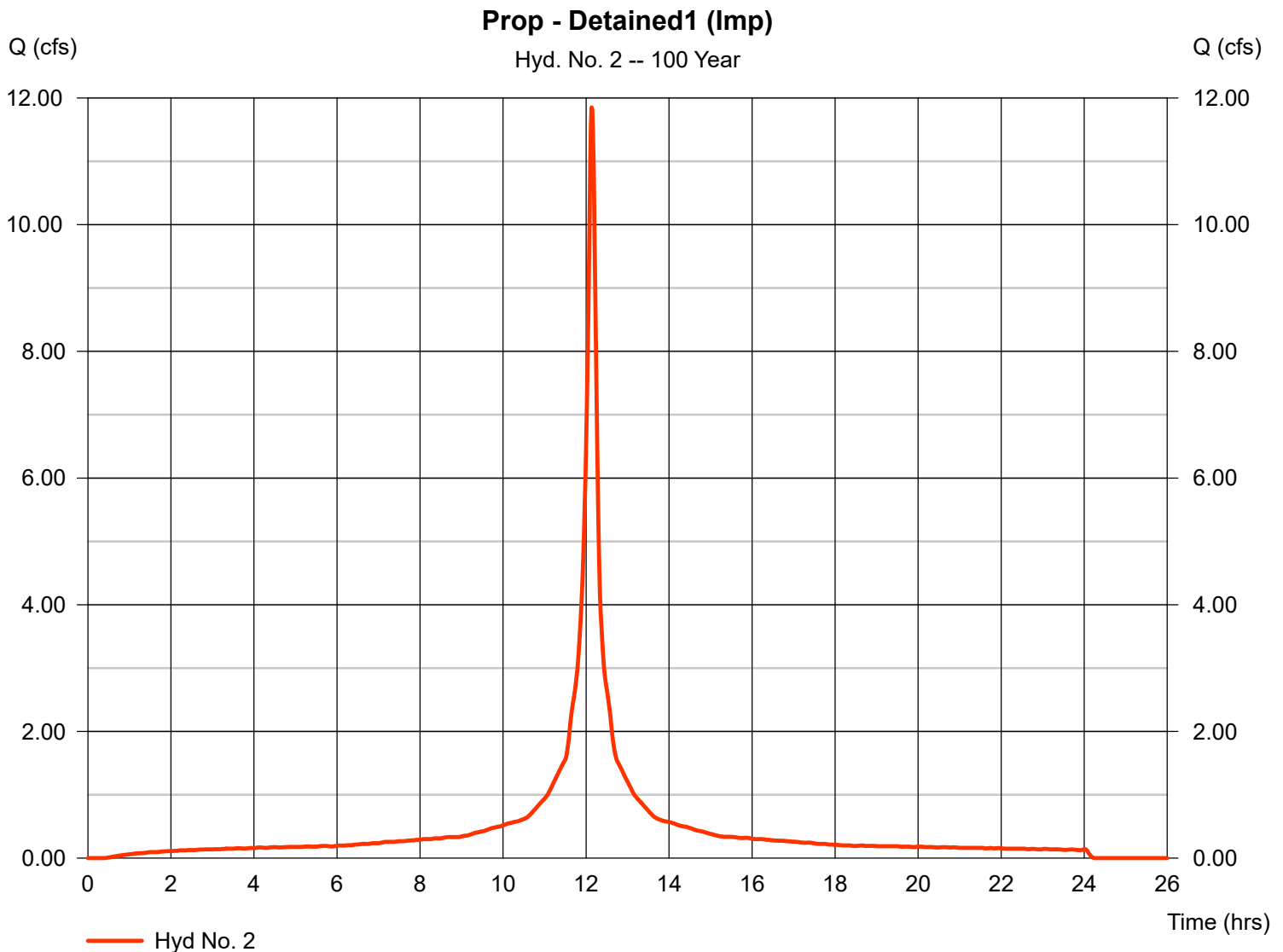
Monday, Jun 17, 2024

## Hyd. No. 2

Prop - Detained1 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 1.091 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 11.33 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 11.85 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 43,915 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

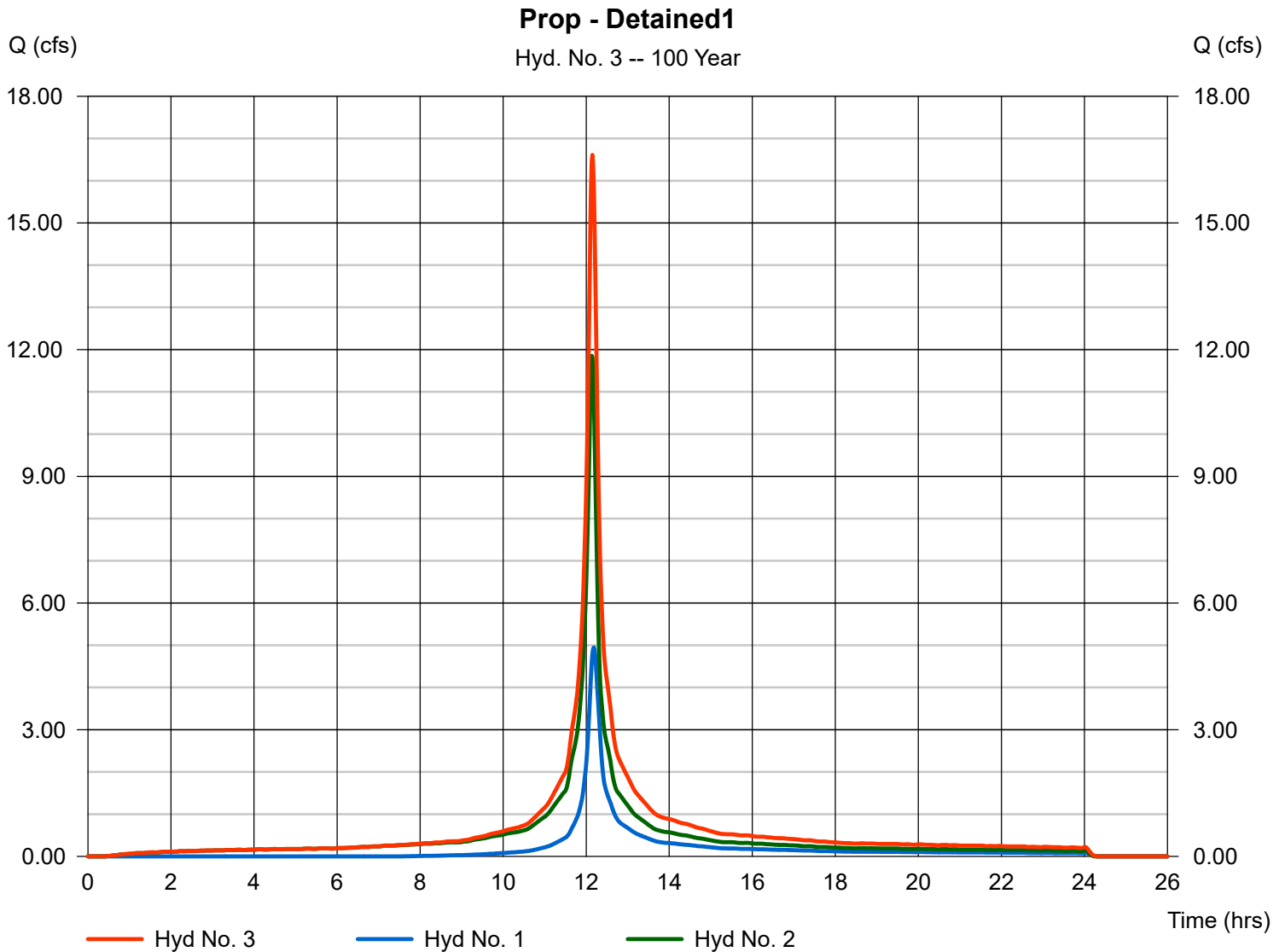
Monday, Jun 17, 2024

## Hyd. No. 3

Prop - Detained1

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2

Peak discharge = 16.61 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 60,952 cuft  
Contrib. drain. area = 1.832 ac





# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

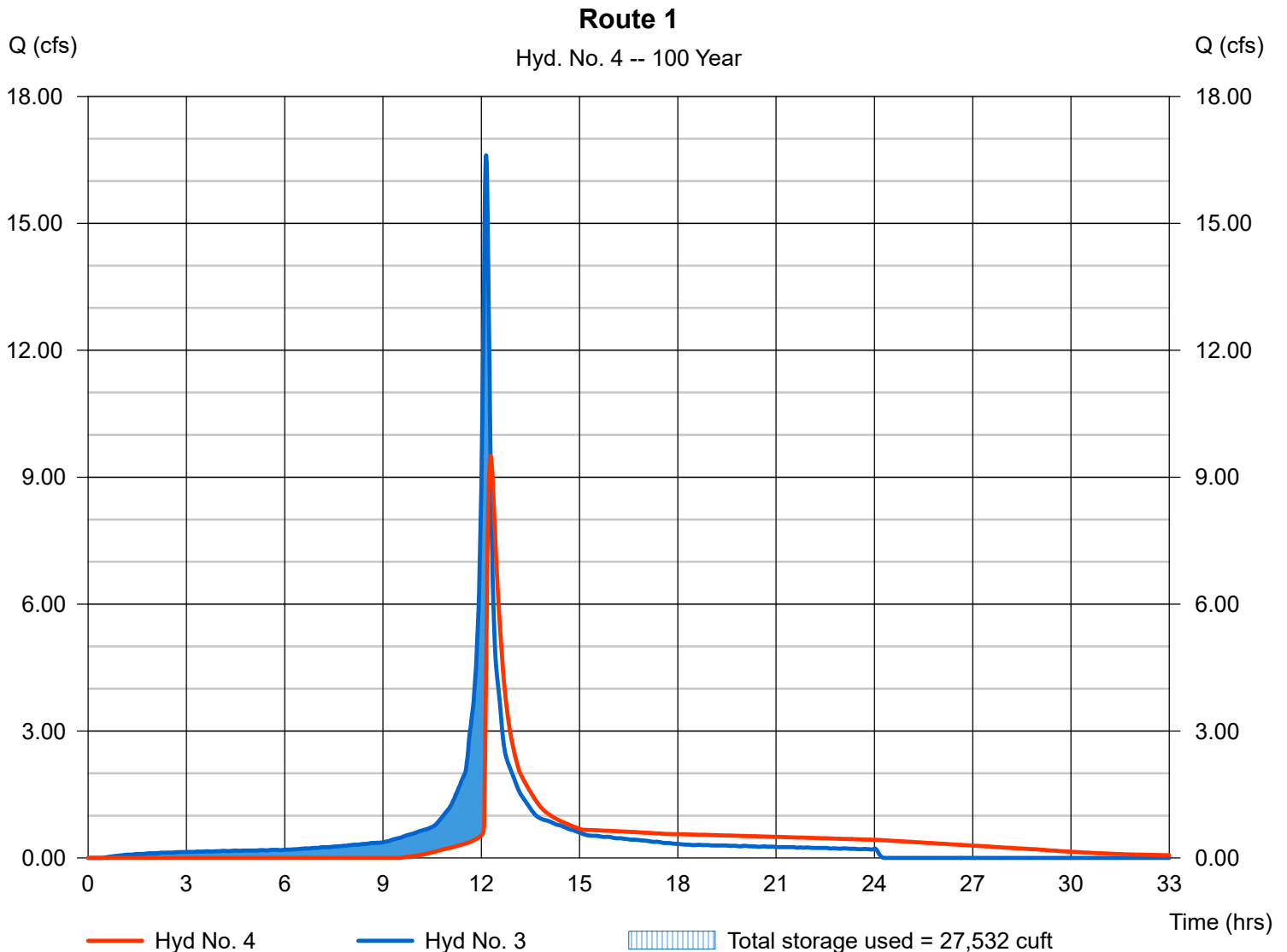
## Hyd. No. 4

Route 1

Hydrograph type = Reservoir  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Inflow hyd. No. = 3 - Prop - Detained1  
 Reservoir name = Basin 1

Peak discharge = 9.509 cfs  
 Time to peak = 12.28 hrs  
 Hyd. volume = 54,501 cuft  
 Max. Elevation = 74.99 ft  
 Max. Storage = 27,532 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

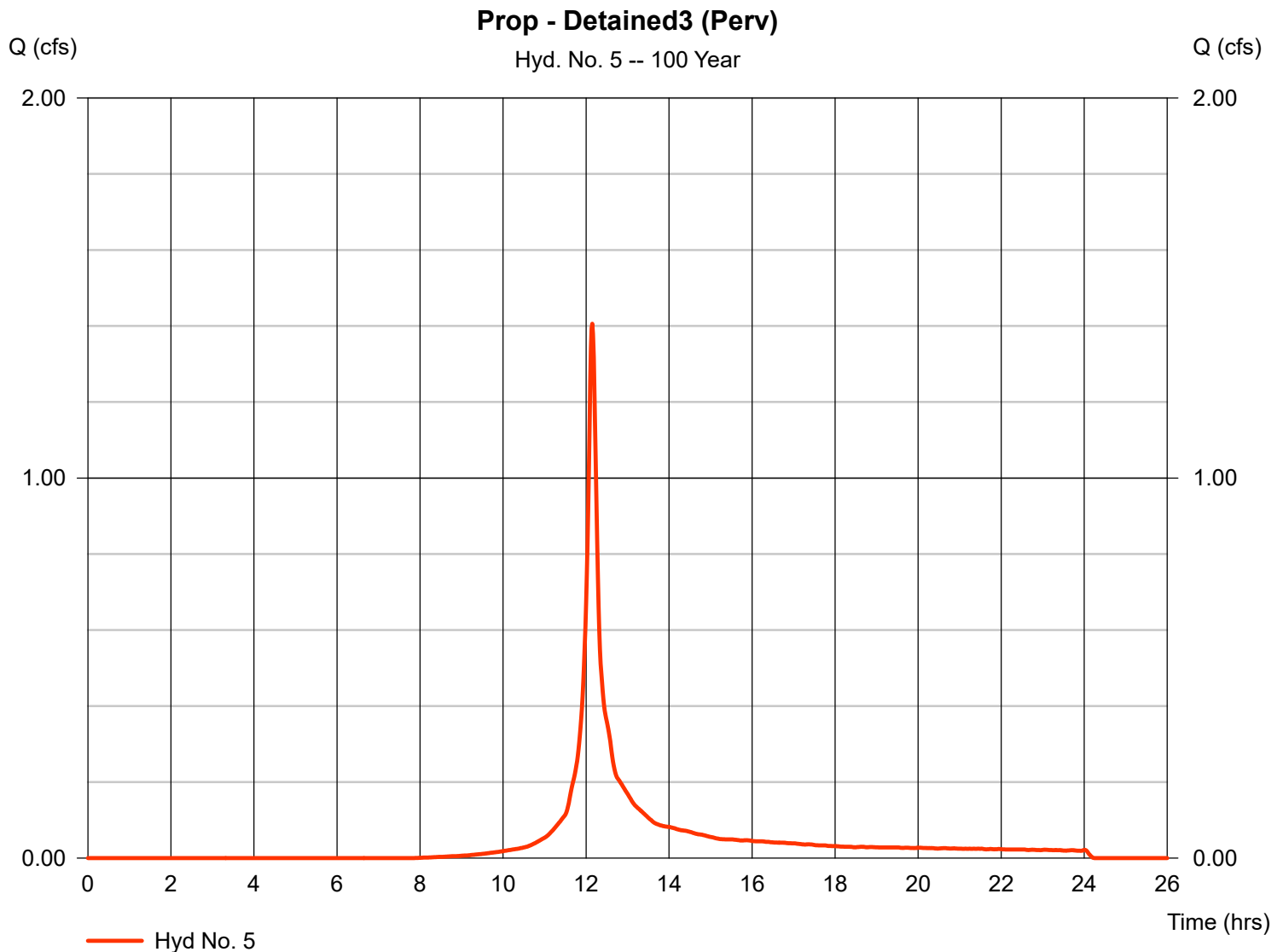
Monday, Jun 17, 2024

## Hyd. No. 5

Prop - Detained3 (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 0.196 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 11.33 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 1.406 cfs  
 Time to peak = 12.15 hrs  
 Hyd. volume = 4,371 cuft  
 Curve number = 61  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

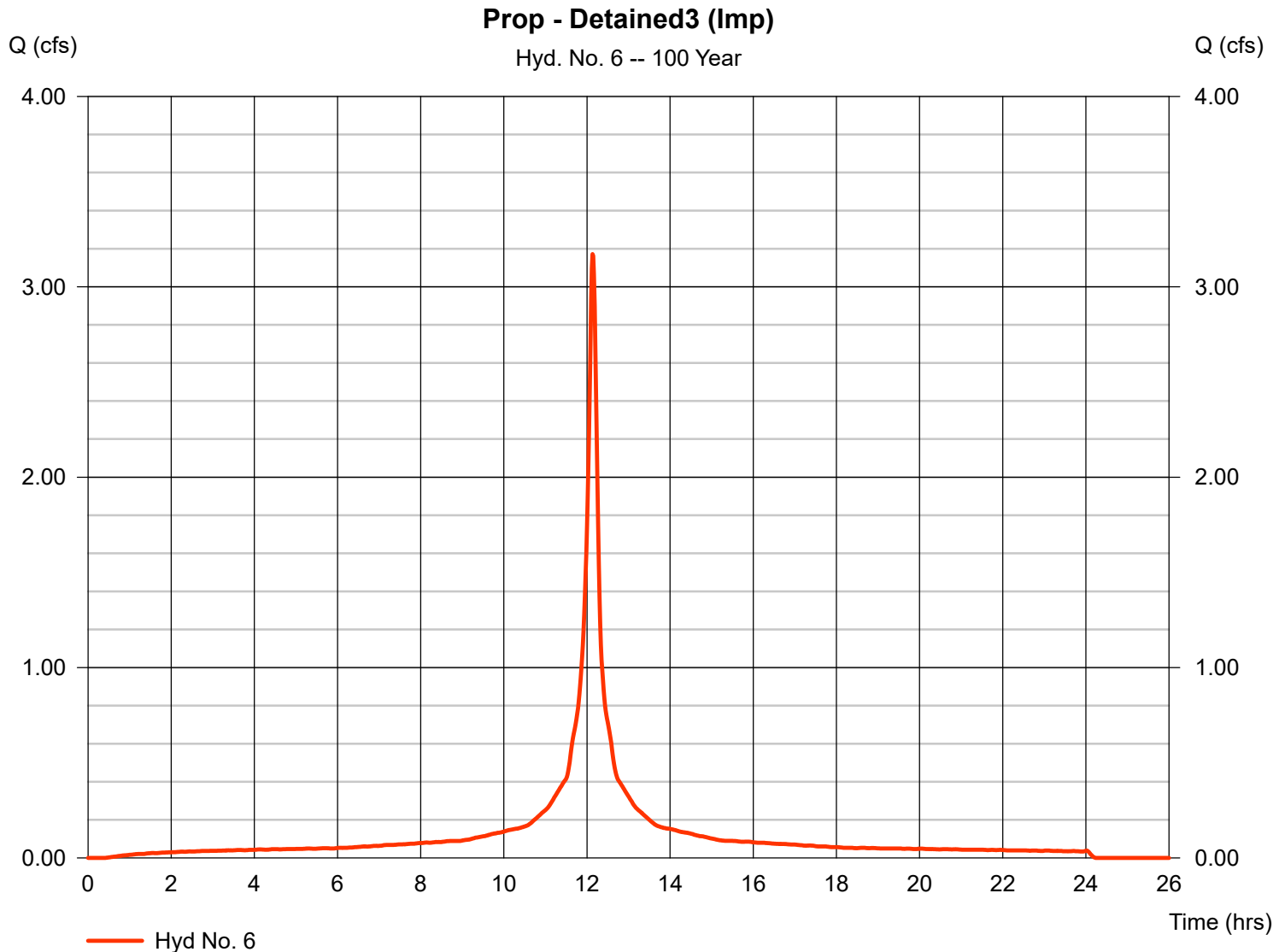
Monday, Jun 17, 2024

## Hyd. No. 6

Prop - Detained3 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 0.292 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 11.33 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 3.172 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 11,754 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

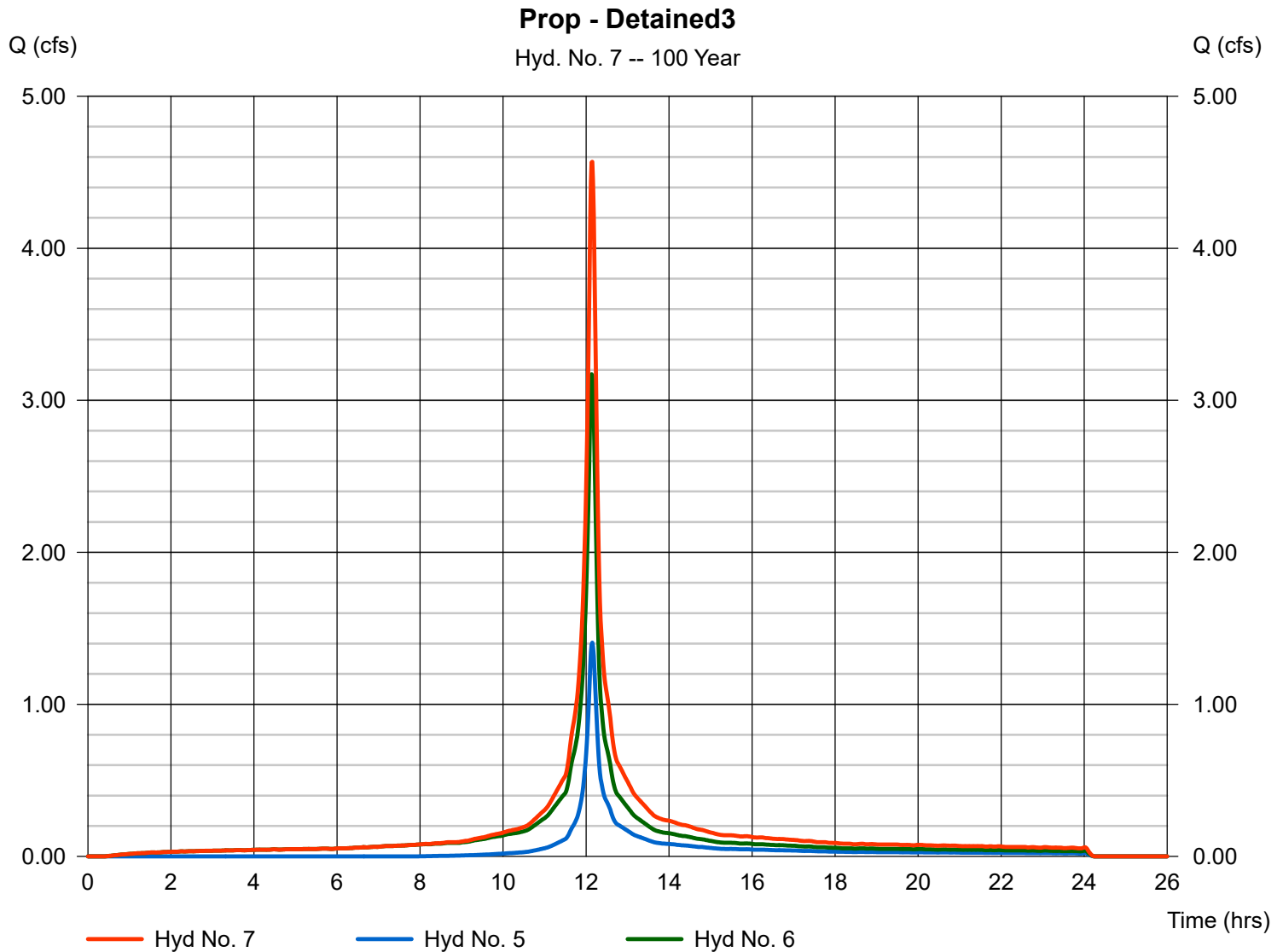
Monday, Jun 17, 2024

## Hyd. No. 7

Prop - Detained3

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 5, 6

Peak discharge = 4.568 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 16,125 cuft  
Contrib. drain. area = 0.488 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

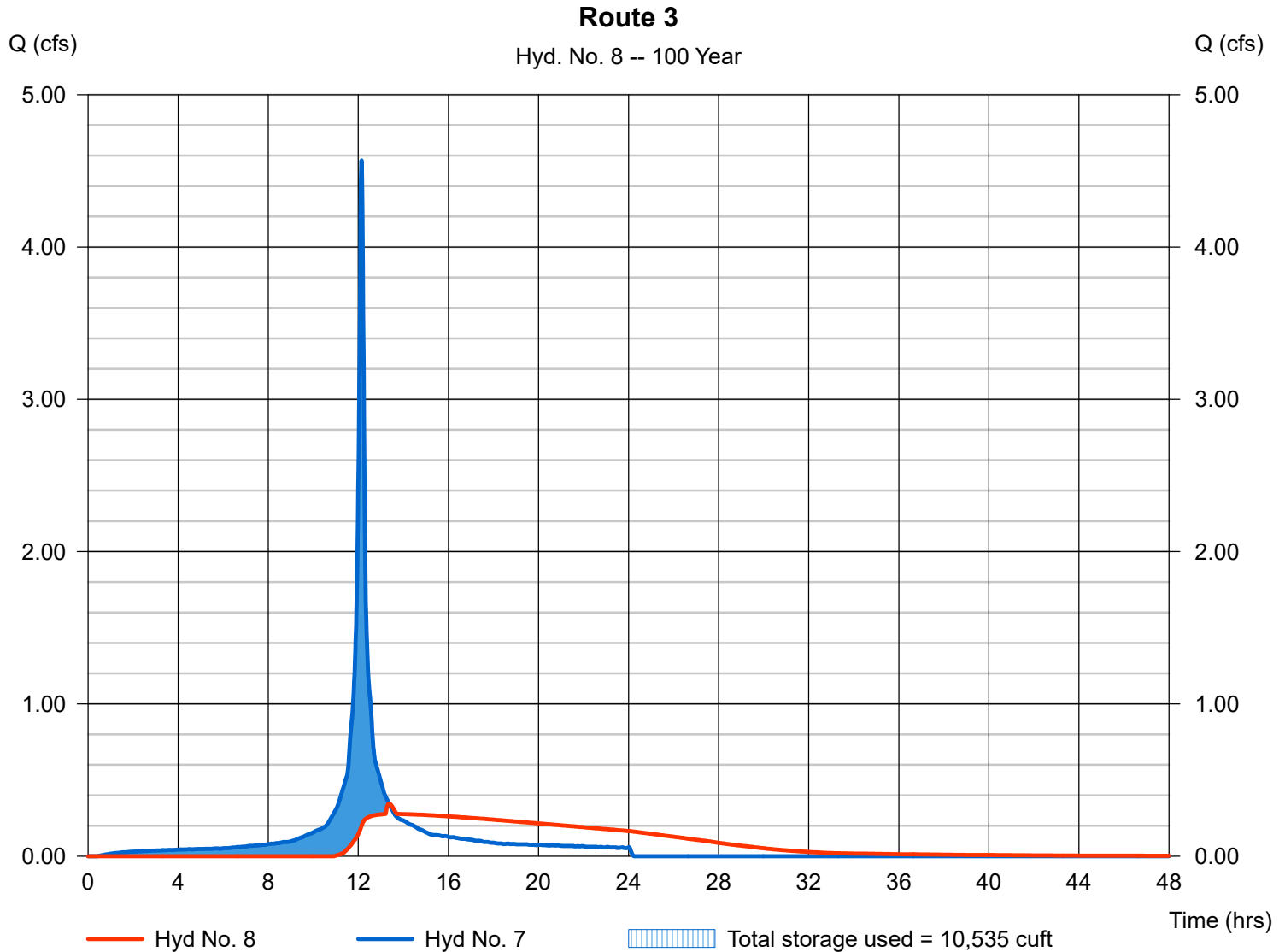
## Hyd. No. 8

Route 3

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyd. No. = 7 - Prop - Detained3  
Reservoir name = Basin 3

Peak discharge = 0.345 cfs  
Time to peak = 13.37 hrs  
Hyd. volume = 13,464 cuft  
Max. Elevation = 76.00 ft  
Max. Storage = 10,535 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

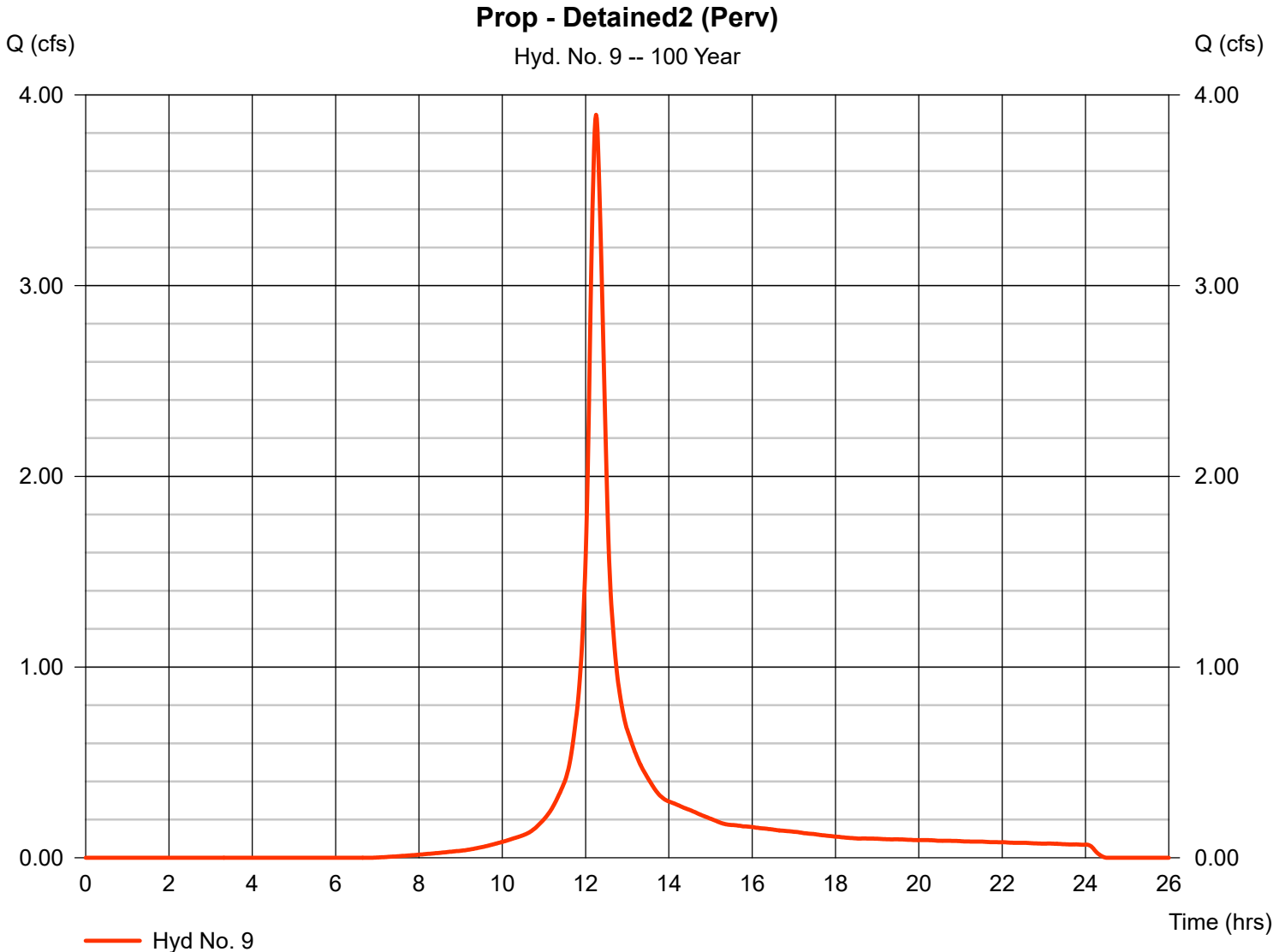
## Hyd. No. 9

Prop - Detained2 (Perv)

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 0.644 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 11.33 in  
Storm duration = NOAA\_C.cds

Peak discharge = 3.895 cfs  
Time to peak = 12.25 hrs  
Hyd. volume = 16,050 cuft  
Curve number = 66\*  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 19.30 min  
Distribution = Custom  
Shape factor = 484

\* Composite (Area/CN) = [(0.407 x 61) + (0.237 x 74)] / 0.644



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

## Hyd. No. 10

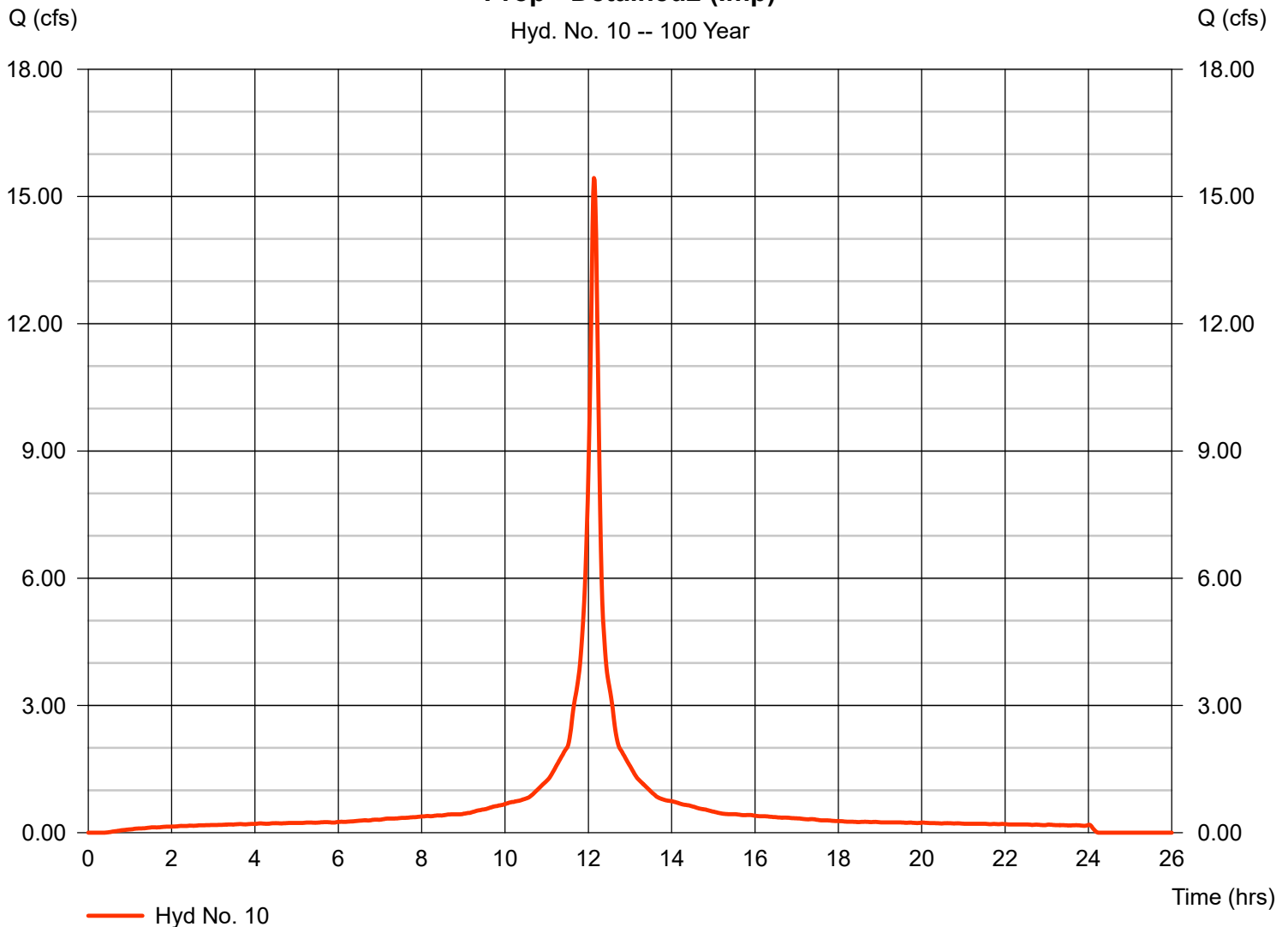
Prop - Detained2 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 1.421 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 11.33 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 15.43 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 57,198 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484

**Prop - Detained2 (Imp)**

Hyd. No. 10 -- 100 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

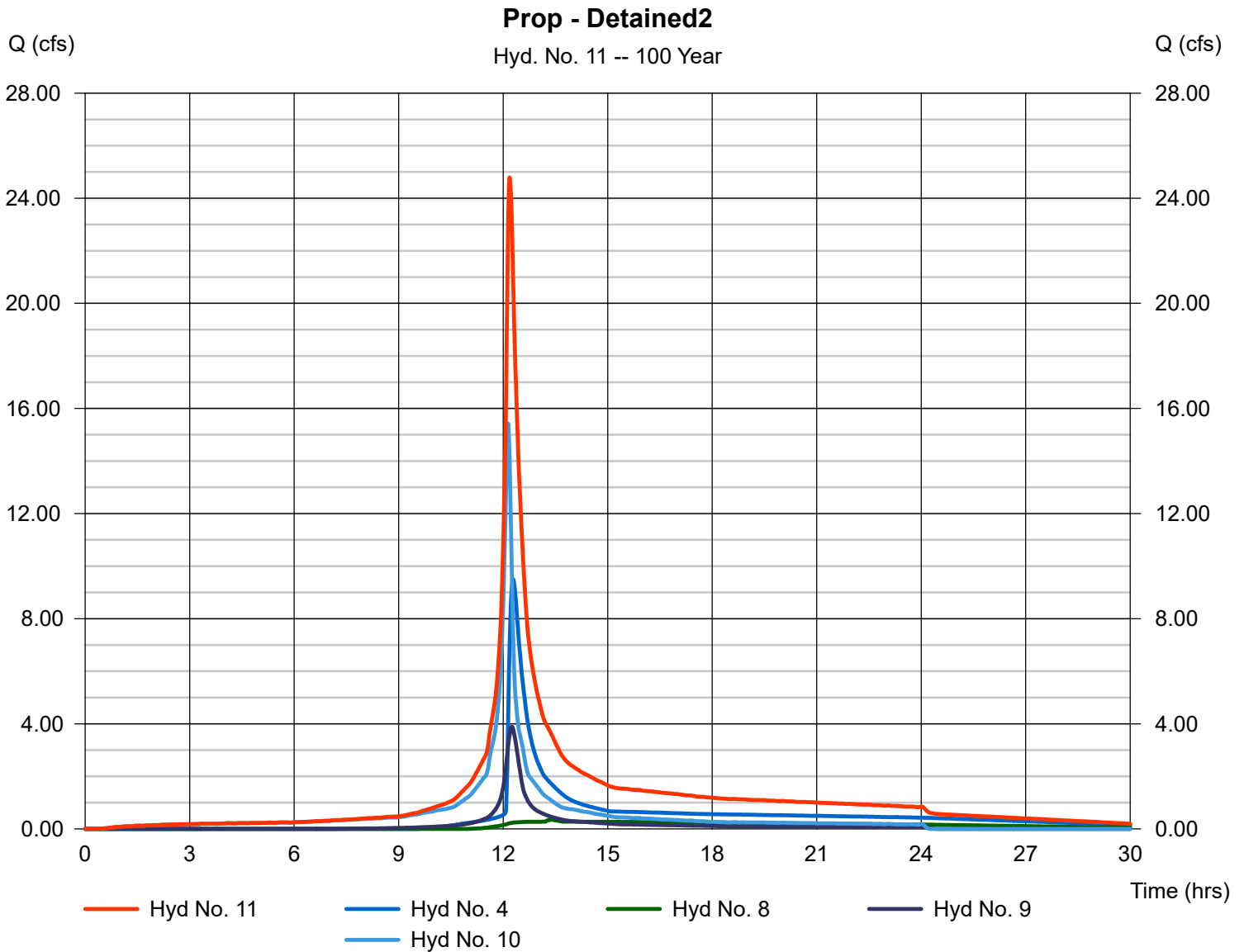
Monday, Jun 17, 2024

## Hyd. No. 11

Prop - Detained2

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 4, 8, 9, 10

Peak discharge = 24.79 cfs  
Time to peak = 12.18 hrs  
Hyd. volume = 141,213 cuft  
Contrib. drain. area = 2.065 ac





# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

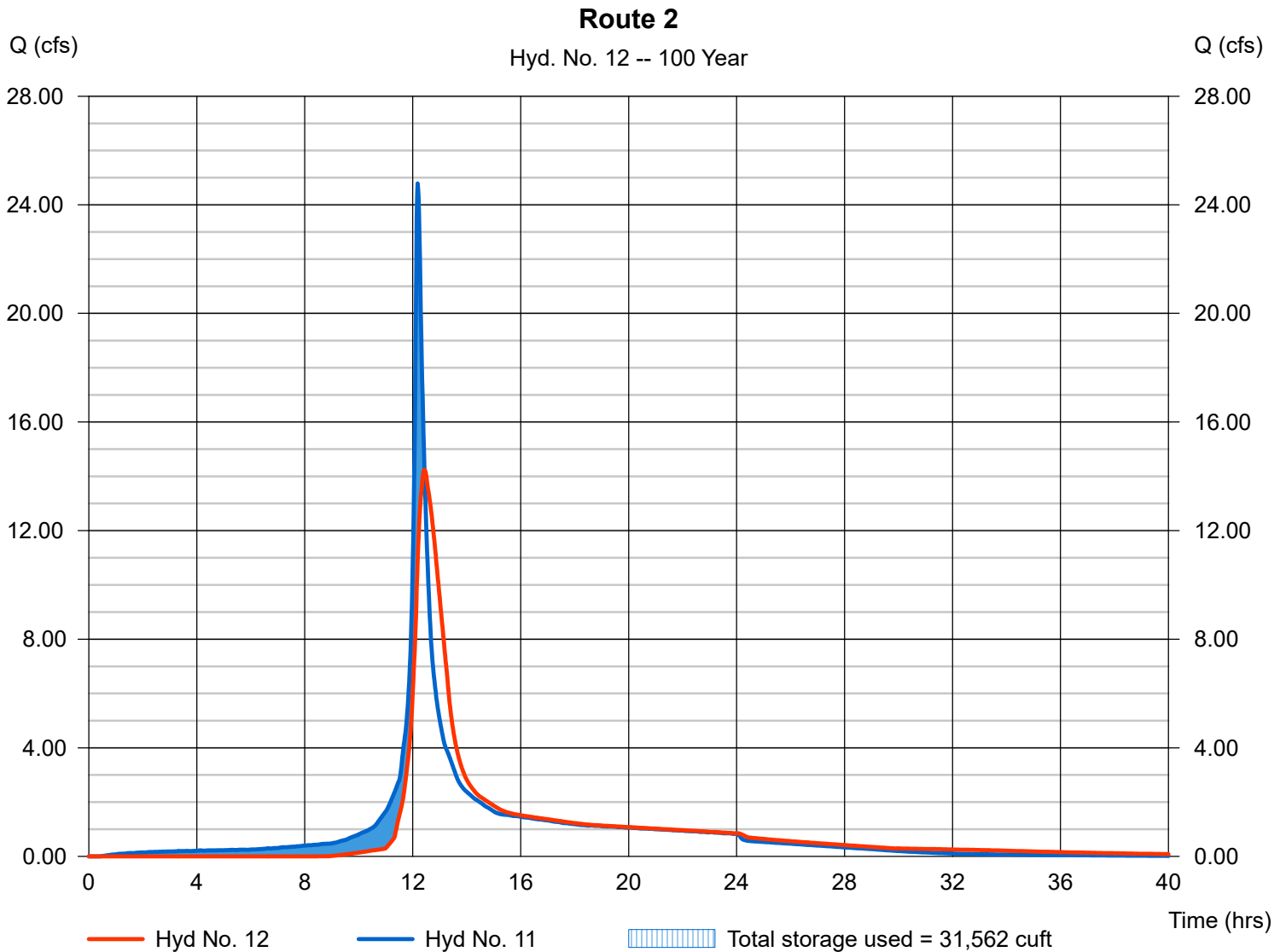
## Hyd. No. 12

Route 2

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyd. No. = 11 - Prop - Detained2  
Reservoir name = Basin 2

Peak discharge = 14.24 cfs  
Time to peak = 12.43 hrs  
Hyd. volume = 133,831 cuft  
Max. Elevation = 70.48 ft  
Max. Storage = 31,562 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

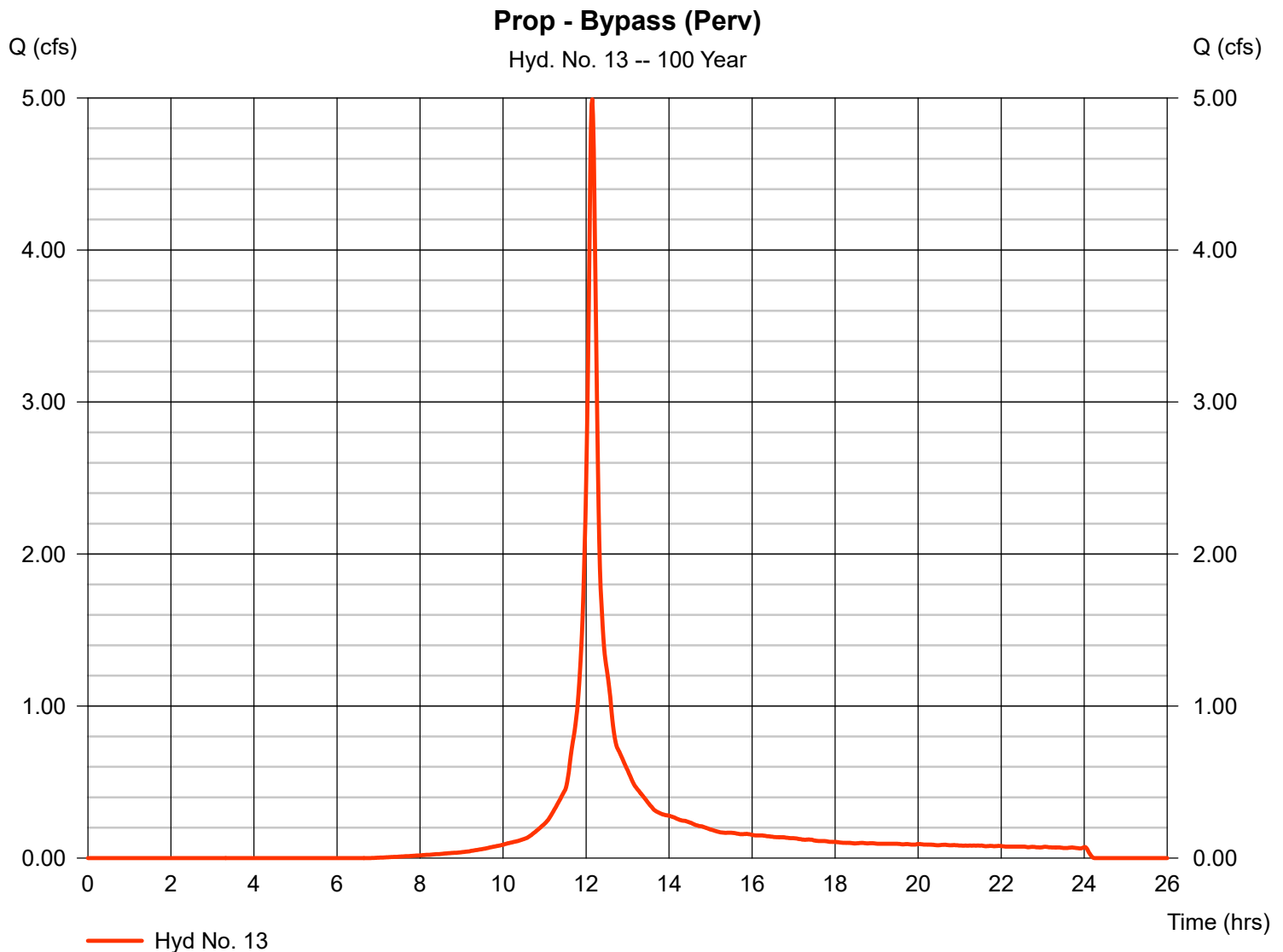
Monday, Jun 17, 2024

## Hyd. No. 13

Prop - Bypass (Perv)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.992 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.15 hrs
Time interval	= 1 min	Hyd. volume	= 15,626 cuft
Drainage area	= 0.627 ac	Curve number	= 66*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 11.33 in	Distribution	= Custom
Storm duration	= NOAA_C.cds	Shape factor	= 484

\* Composite (Area/CN) = [(0.399 x 61) + (0.228 x 74)] / 0.627



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

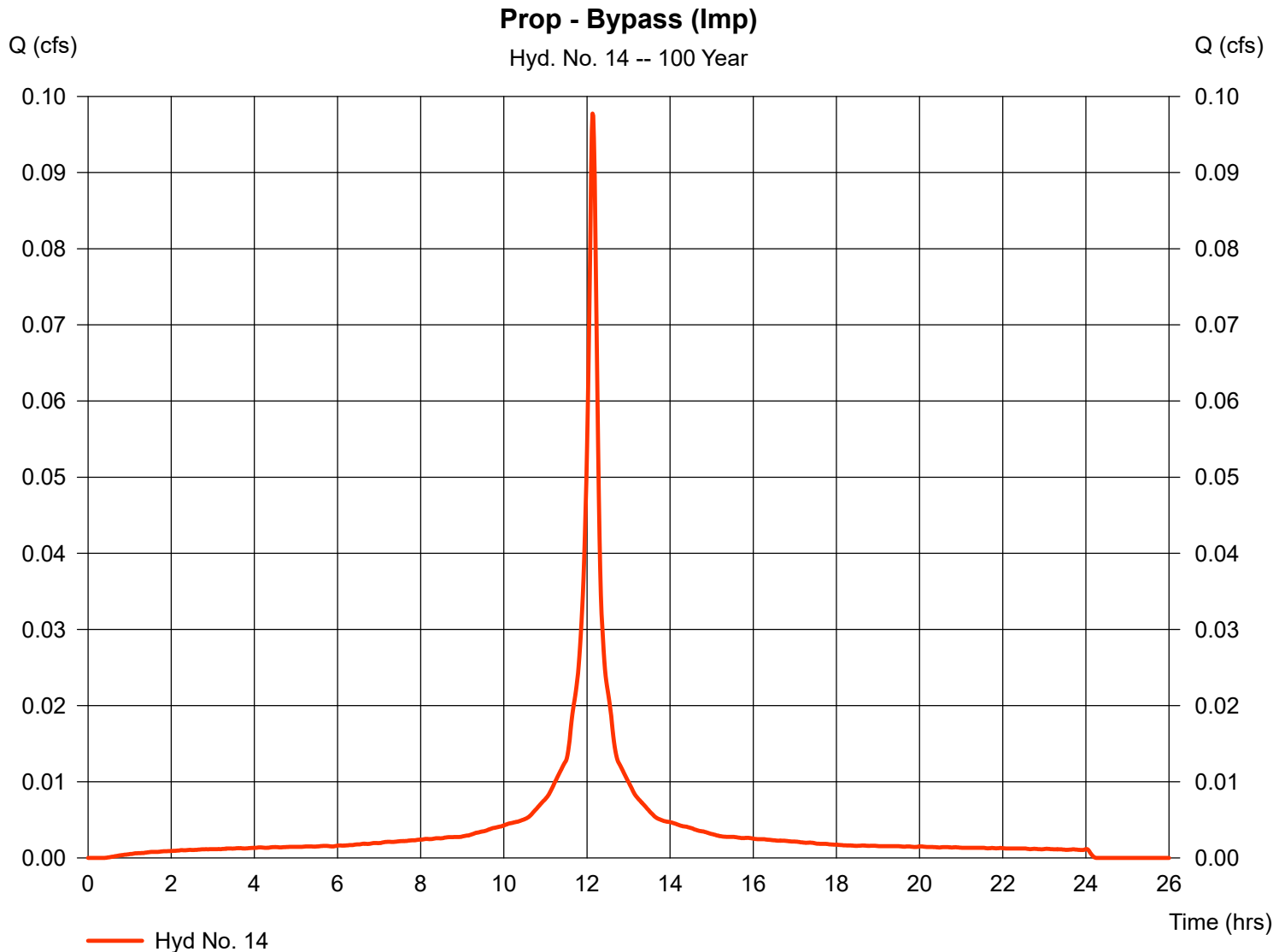
Monday, Jun 17, 2024

## Hyd. No. 14

Prop - Bypass (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 0.009 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 11.33 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 0.098 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 362 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

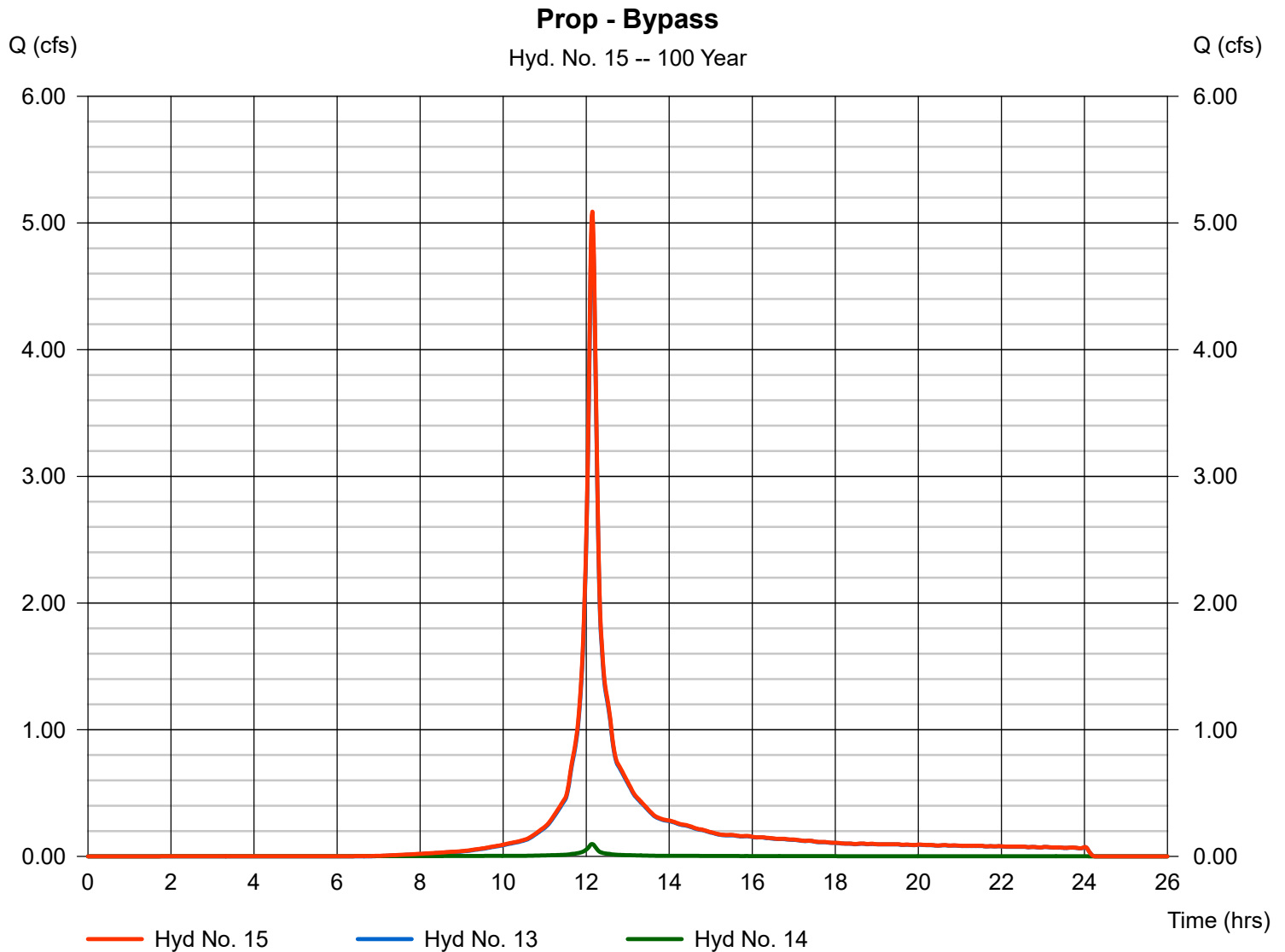
Monday, Jun 17, 2024

## Hyd. No. 15

Prop - Bypass

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 13, 14

Peak discharge = 5.089 cfs  
Time to peak = 12.15 hrs  
Hyd. volume = 15,989 cuft  
Contrib. drain. area = 0.636 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

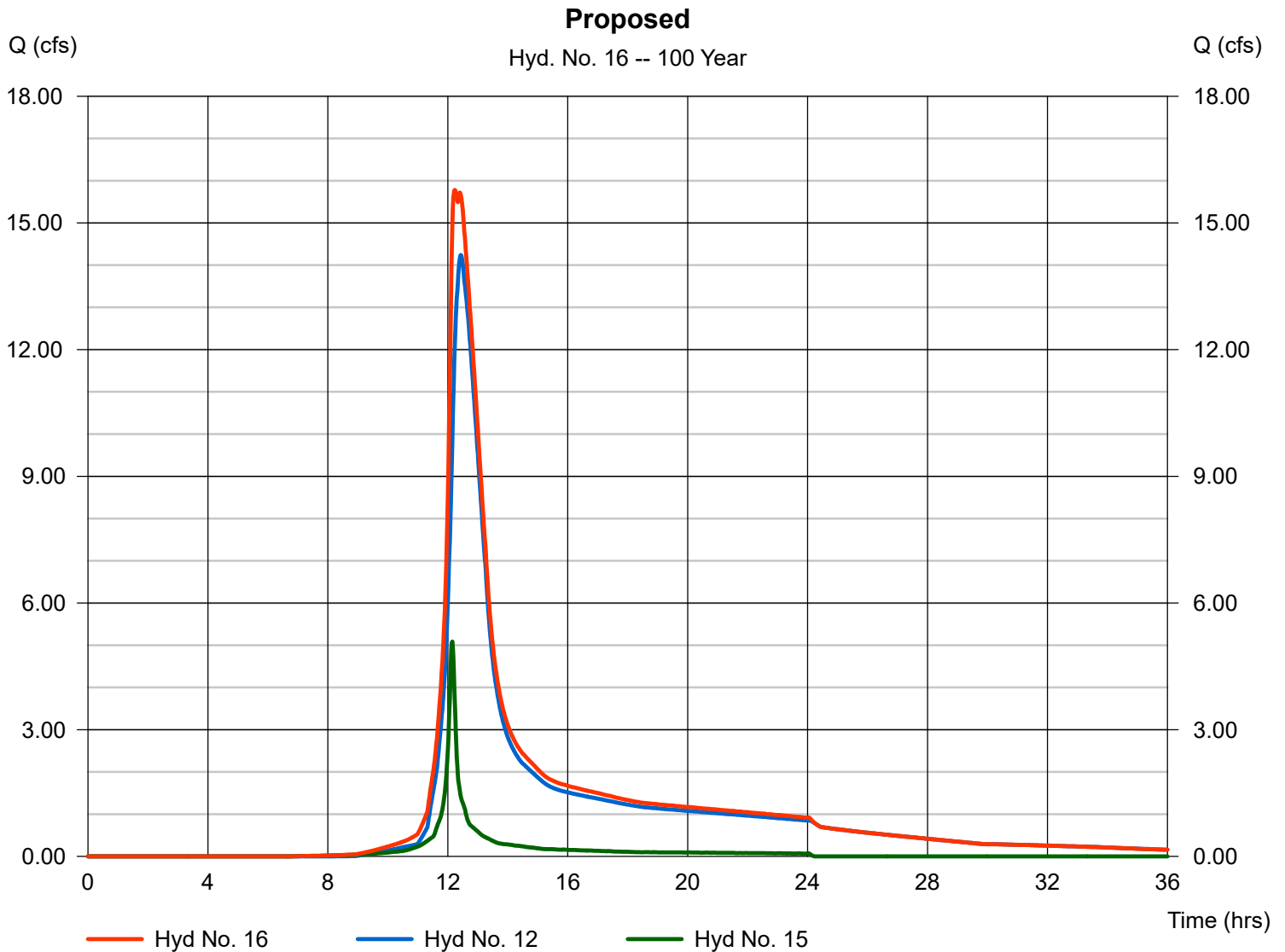
Monday, Jun 17, 2024

## Hyd. No. 16

Proposed

Hydrograph type = Combine  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Inflow hyds. = 12, 15

Peak discharge = 15.78 cfs  
 Time to peak = 12.23 hrs  
 Hyd. volume = 149,820 cuft  
 Contrib. drain. area = 0.000 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

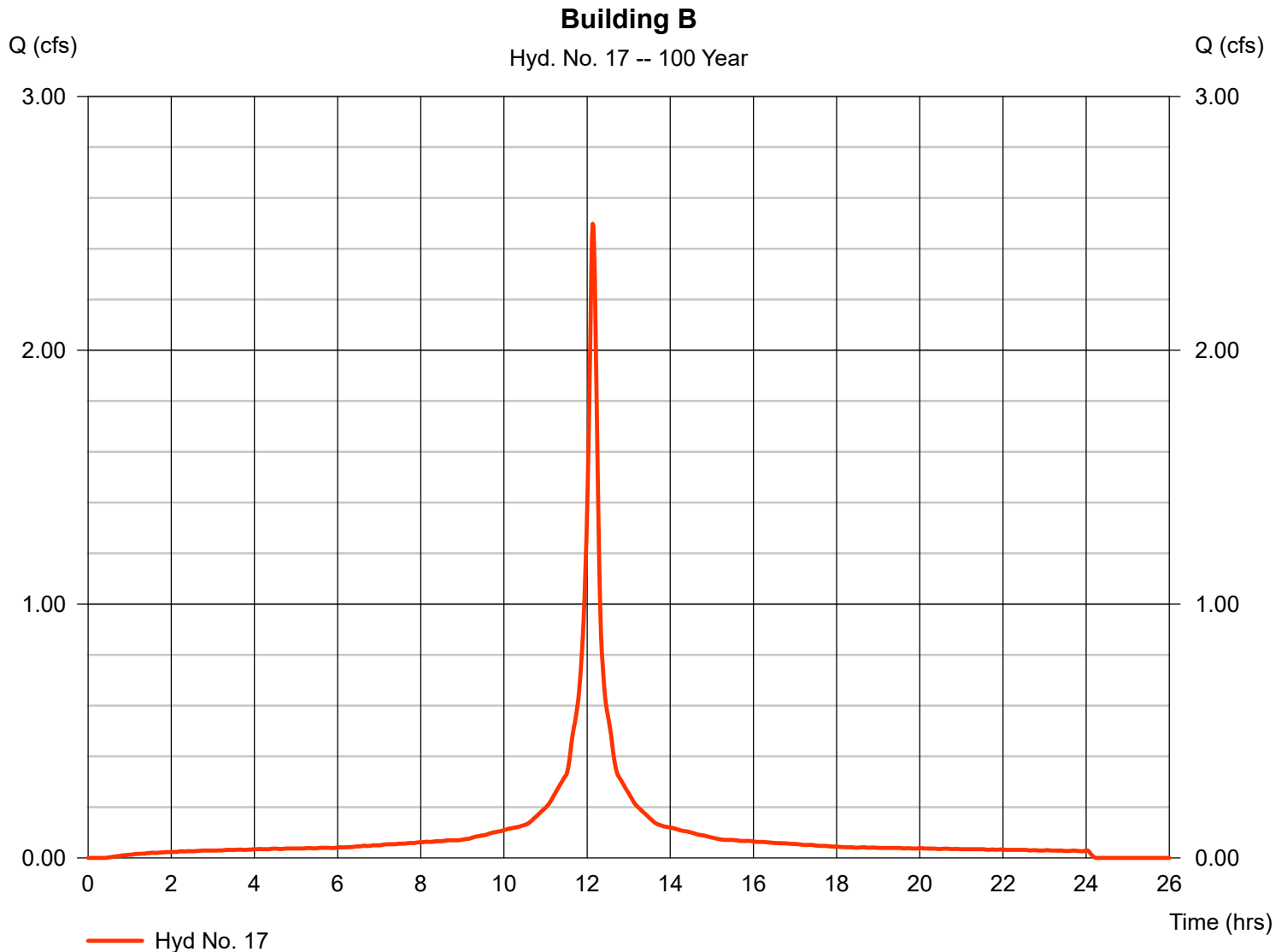
Monday, Jun 17, 2024

## Hyd. No. 17

Building B

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 0.230 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 11.33 in  
 Storm duration = NOAA\_C.cds

Peak discharge = 2.498 cfs  
 Time to peak = 12.13 hrs  
 Hyd. volume = 9,258 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



## 1 - Year

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# 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	0.002	1	112	3	-----	-----	-----	Prop - Detained1 (Perv)	
2	SCS Runoff	2.984	1	67	4,097	-----	-----	-----	Prop - Detained1 (Imp)	
3	Combine	2.984	1	67	4,100	1, 2	-----	-----	Prop - Detained1	
4	Reservoir	0.000	1	n/a	0	3	71.64	4,100	Route 1	
5	SCS Runoff	0.000	1	n/a	0	-----	-----	-----	Prop - Detained3 (Perv)	
6	SCS Runoff	0.799	1	67	1,097	-----	-----	-----	Prop - Detained3 (Imp)	
7	Combine	0.799	1	67	1,097	5, 6	-----	-----	Prop - Detained3	
8	Reservoir	0.000	1	n/a	0	7	74.21	1,097	Route 3	
9	SCS Runoff	0.023	1	106	60	-----	-----	-----	Prop - Detained2 (Perv)	
10	SCS Runoff	3.886	1	67	5,337	-----	-----	-----	Prop - Detained2 (Imp)	
11	Combine	3.886	1	67	5,396	4, 8, 9, 10	-----	-----	Prop - Detained2	
12	Reservoir	0.000	1	n/a	0	11	67.60	5,396	Route 2	
21-210-wq.gpw					Return Period: 1 Year			Monday, Jun 17, 2024		



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

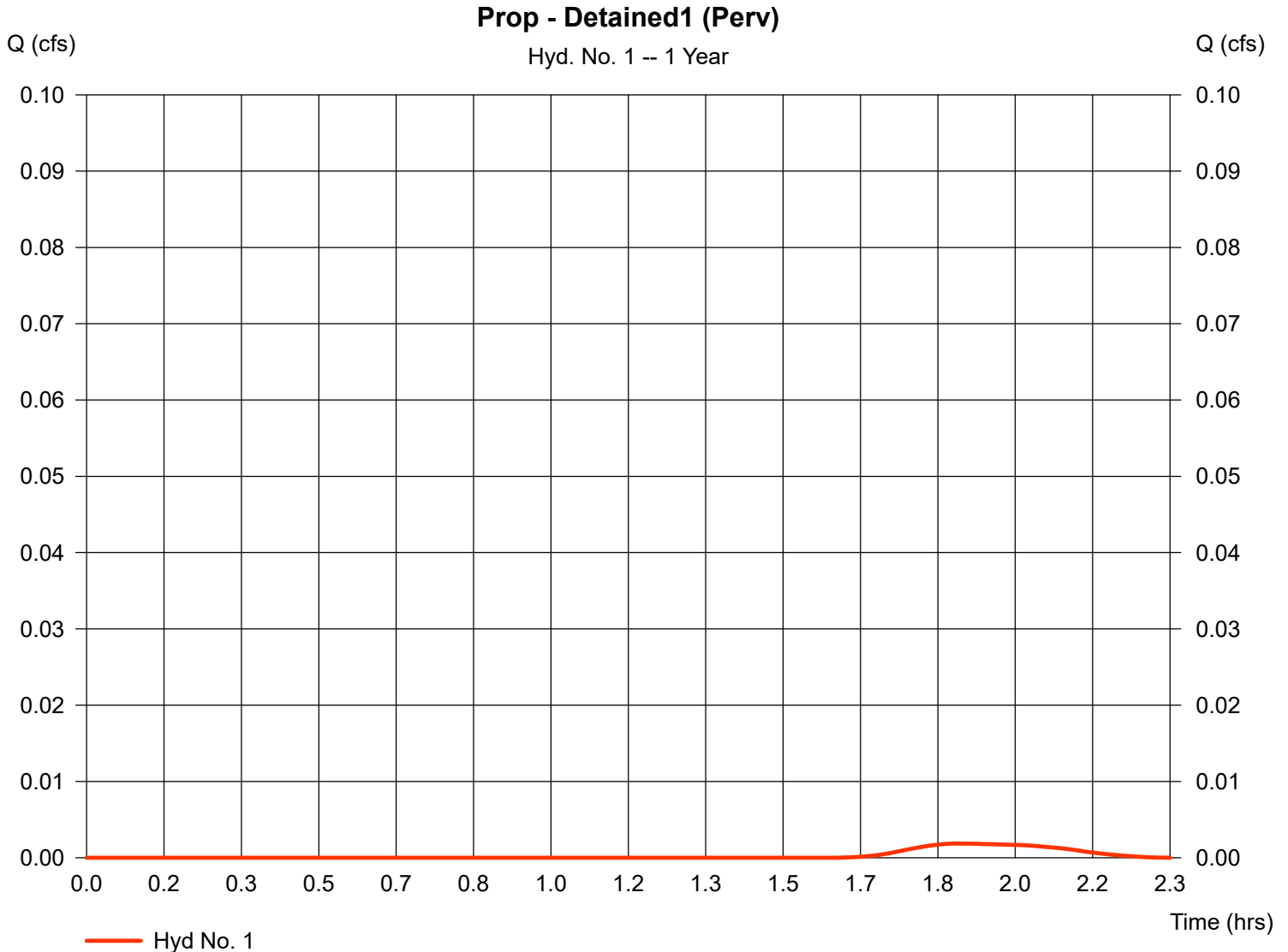
## Hyd. No. 1

Prop - Detained1 (Perv)

Hydrograph type = SCS Runoff  
Storm frequency = 1 yrs  
Time interval = 1 min  
Drainage area = 0.741 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 1.25 in  
Storm duration = NJWaterQuality.cds

Peak discharge = 0.002 cfs  
Time to peak = 1.87 hrs  
Hyd. volume = 3 cuft  
Curve number = 63\*  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 12.20 min  
Distribution = Custom  
Shape factor = 484

\* Composite (Area/CN) = [(0.637 x 61) + (0.104 x 74)] / 0.741



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

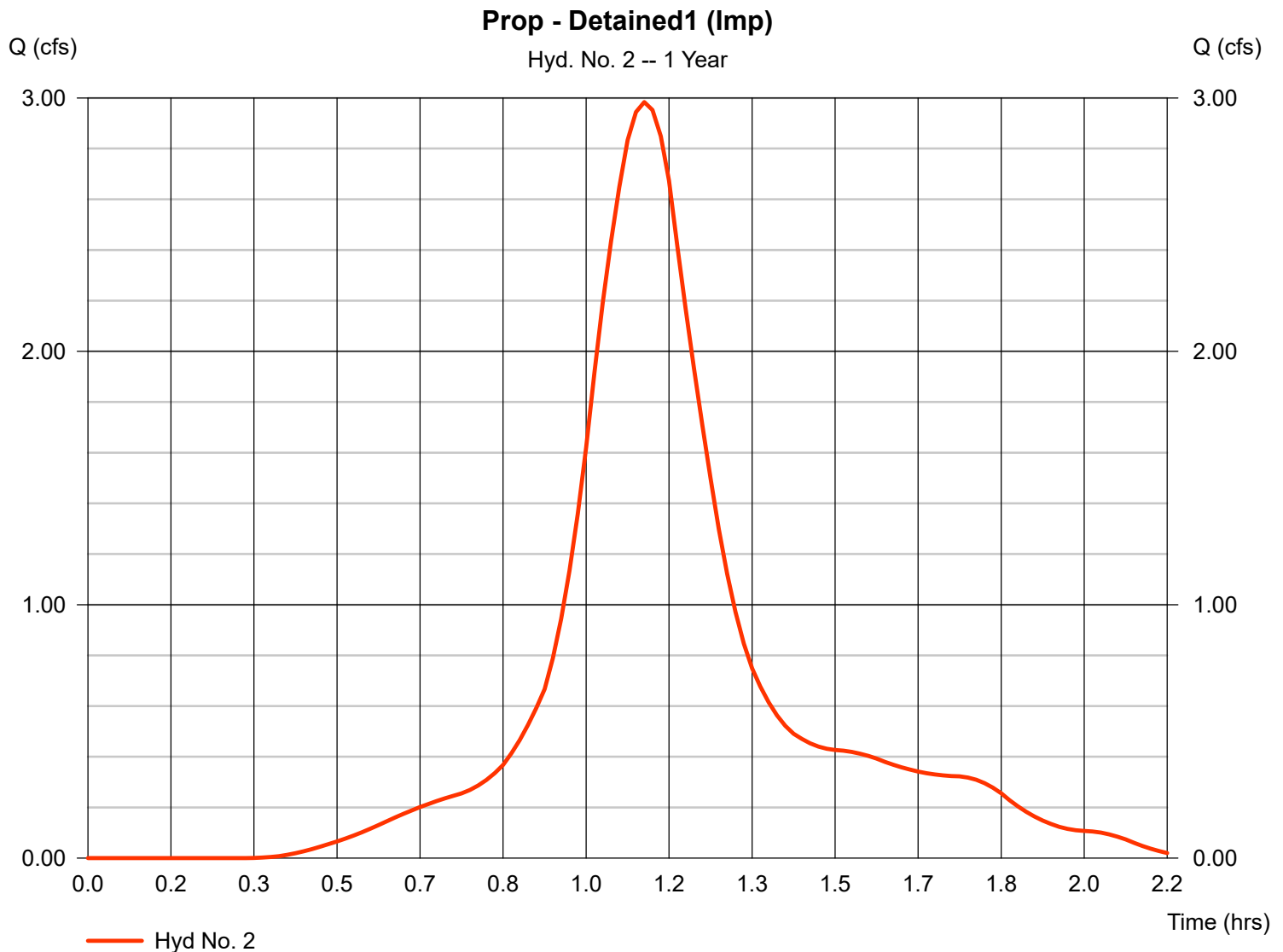
Monday, Jun 17, 2024

## Hyd. No. 2

Prop - Detained1 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 1 yrs  
 Time interval = 1 min  
 Drainage area = 1.091 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 1.25 in  
 Storm duration = NJWaterQuality.cds

Peak discharge = 2.984 cfs  
 Time to peak = 1.12 hrs  
 Hyd. volume = 4,097 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

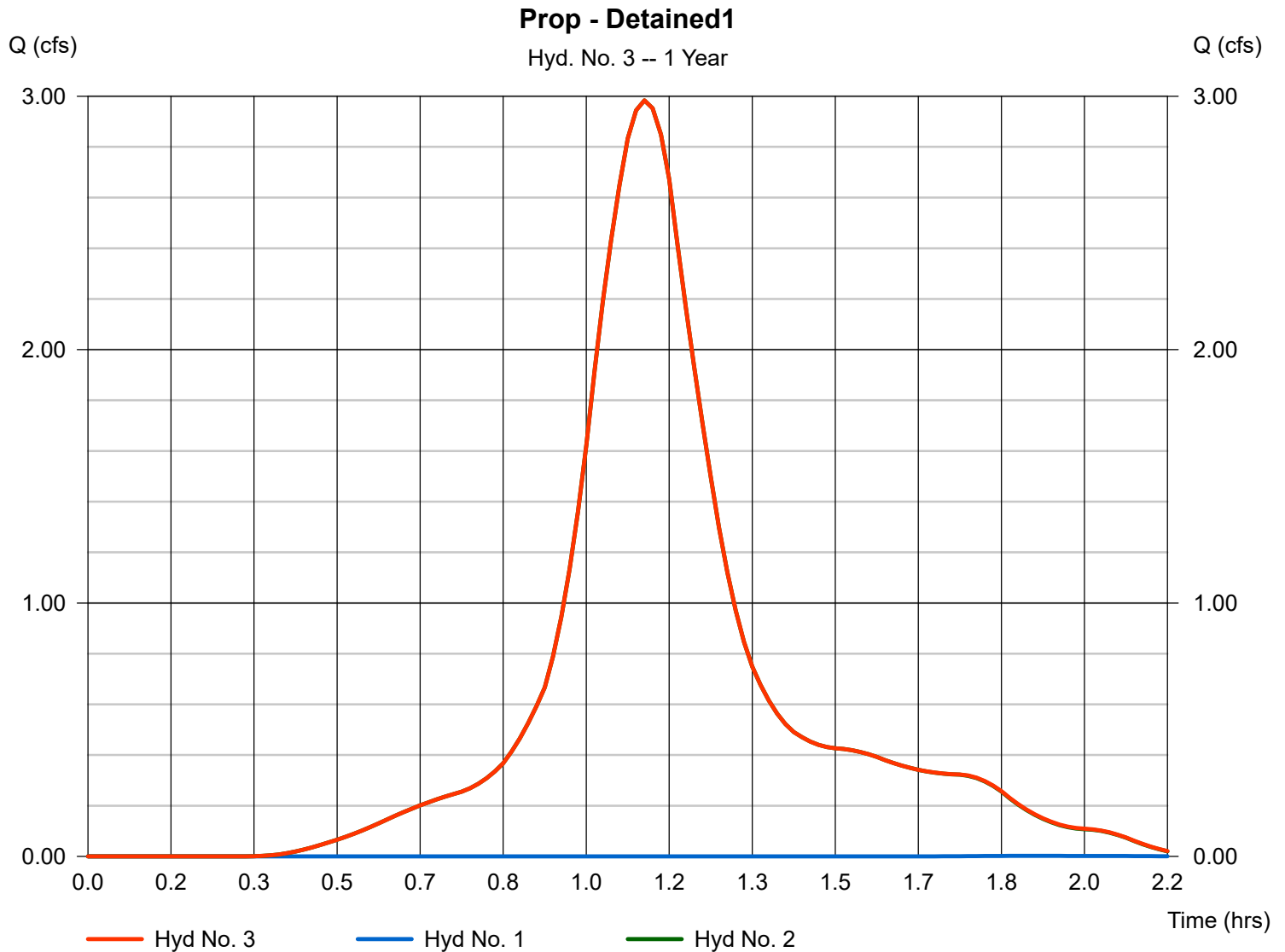
Monday, Jun 17, 2024

## Hyd. No. 3

Prop - Detained1

Hydrograph type = Combine  
Storm frequency = 1 yrs  
Time interval = 1 min  
Inflow hyds. = 1, 2

Peak discharge = 2.984 cfs  
Time to peak = 1.12 hrs  
Hyd. volume = 4,100 cuft  
Contrib. drain. area = 1.832 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

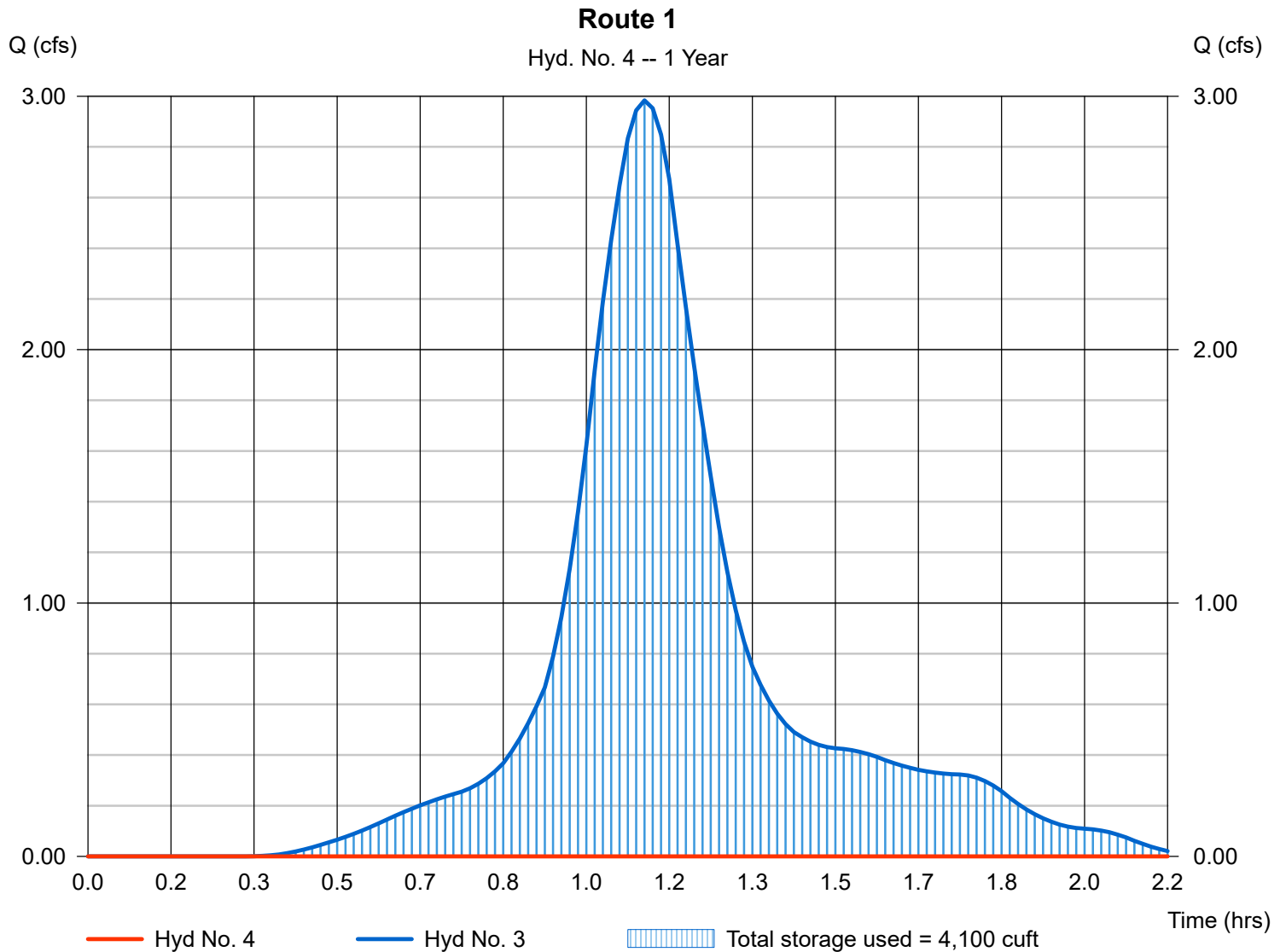
## Hyd. No. 4

Route 1

Hydrograph type = Reservoir  
Storm frequency = 1 yrs  
Time interval = 1 min  
Inflow hyd. No. = 3 - Prop - Detained1  
Reservoir name = Basin 1

Peak discharge = 0.000 cfs  
Time to peak = n/a  
Hyd. volume = 0 cuft  
Max. Elevation = 71.64 ft  
Max. Storage = 4,100 cuft

Storage Indication method used.



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

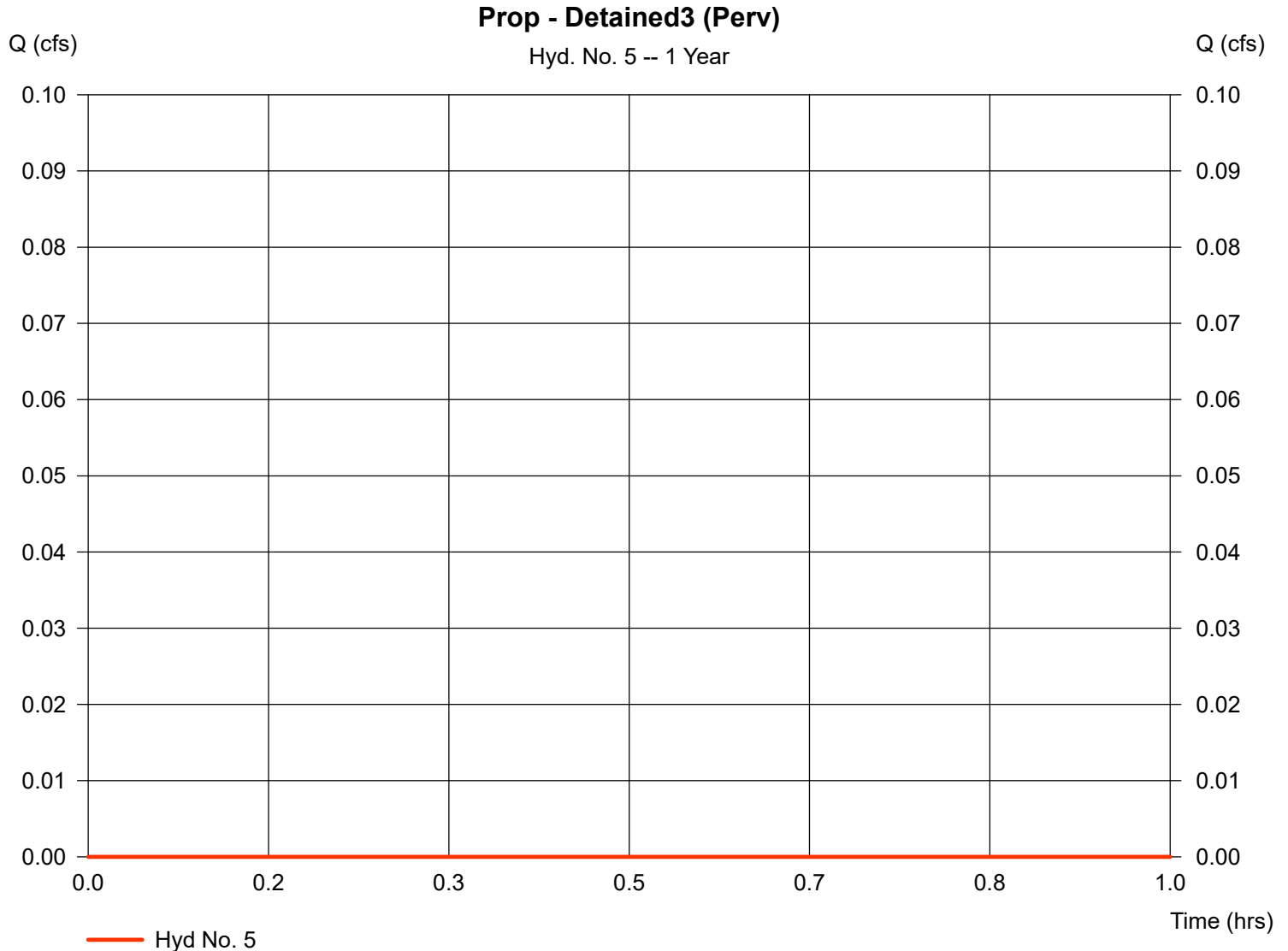
Monday, Jun 17, 2024

## Hyd. No. 5

Prop - Detained3 (Perv)

Hydrograph type = SCS Runoff  
Storm frequency = 1 yrs  
Time interval = 1 min  
Drainage area = 0.196 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 1.25 in  
Storm duration = NJWaterQuality.cds

Peak discharge = 0.000 cfs  
Time to peak = n/a  
Hyd. volume = 0 cuft  
Curve number = 61  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.00 min  
Distribution = Custom  
Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

## Hyd. No. 6

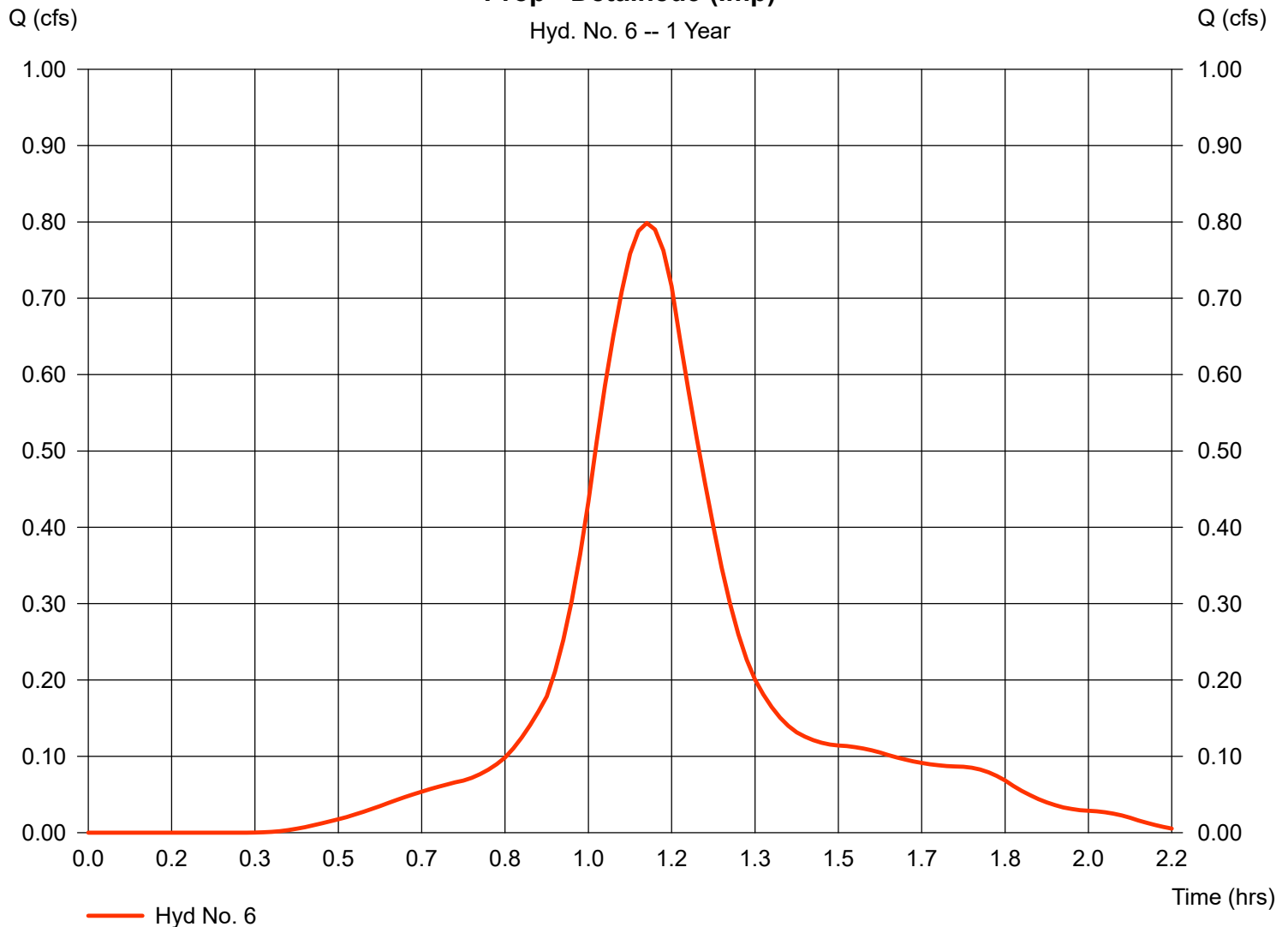
Prop - Detained3 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 1 yrs  
 Time interval = 1 min  
 Drainage area = 0.292 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 1.25 in  
 Storm duration = NJWaterQuality.cds

Peak discharge = 0.799 cfs  
 Time to peak = 1.12 hrs  
 Hyd. volume = 1,097 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484

**Prop - Detained3 (Imp)**

Hyd. No. 6 -- 1 Year



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

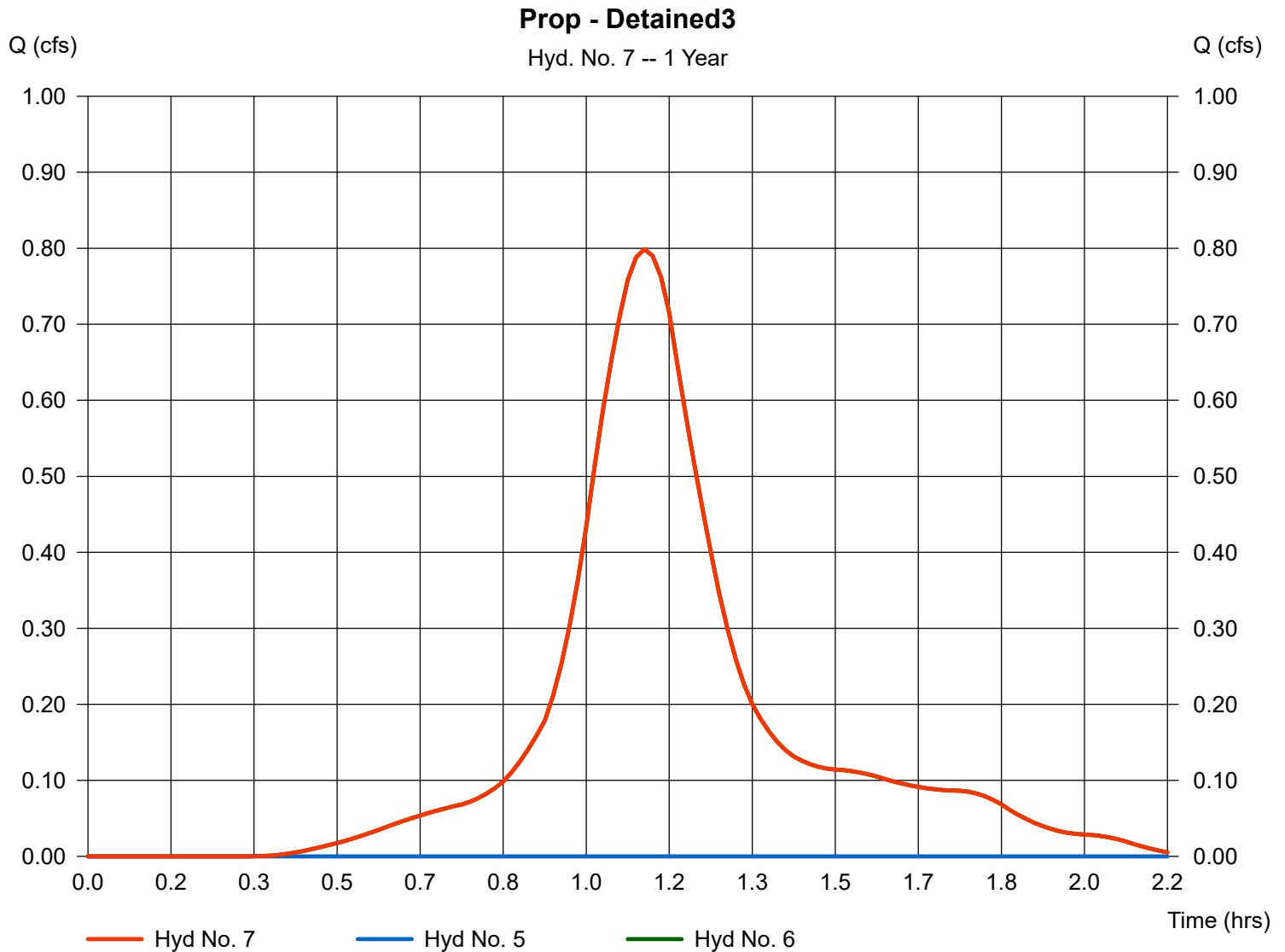
Monday, Jun 17, 2024

## Hyd. No. 7

Prop - Detained3

Hydrograph type = Combine  
Storm frequency = 1 yrs  
Time interval = 1 min  
Inflow hyds. = 5, 6

Peak discharge = 0.799 cfs  
Time to peak = 1.12 hrs  
Hyd. volume = 1,097 cuft  
Contrib. drain. area = 0.488 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

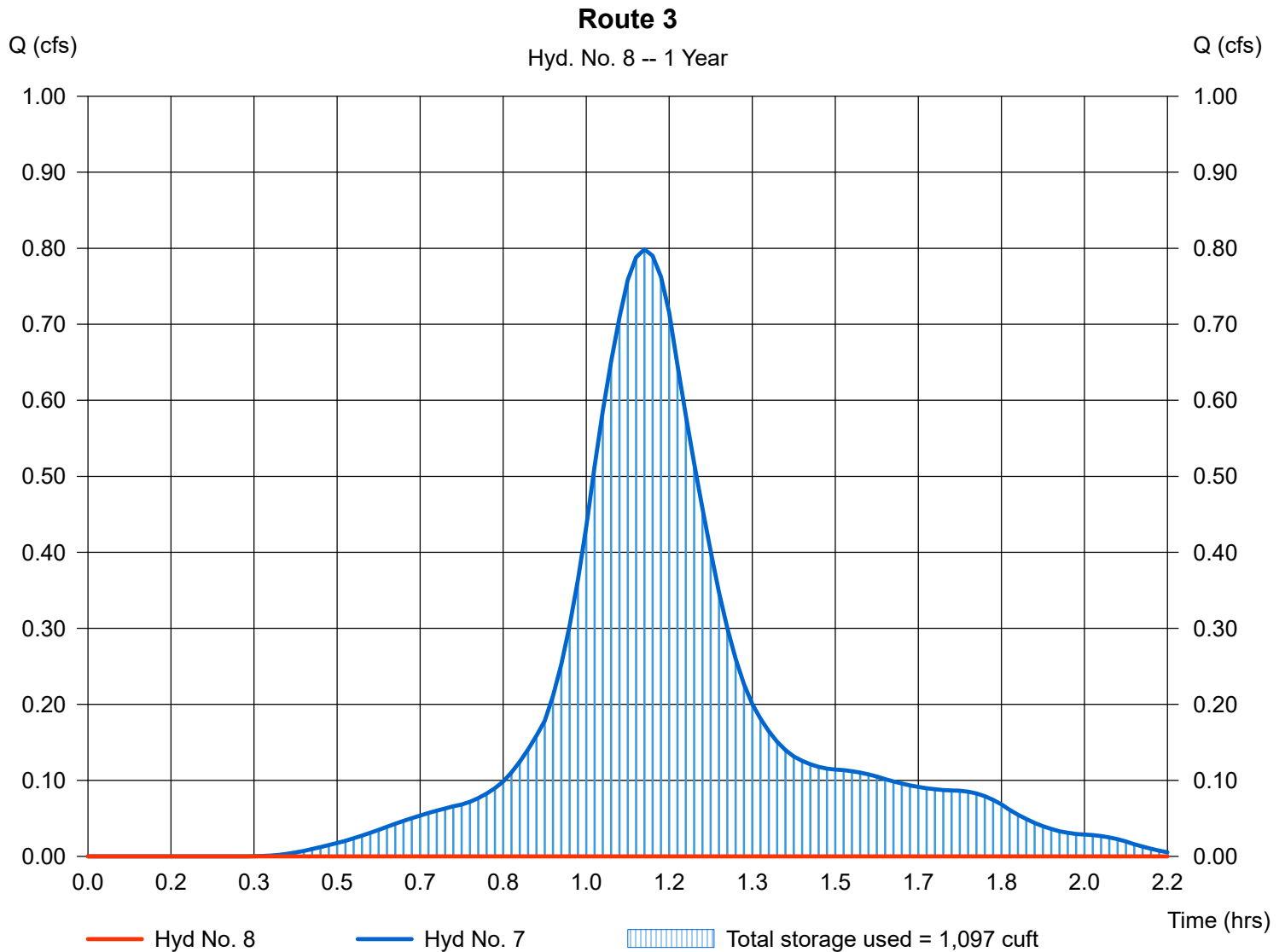
## Hyd. No. 8

Route 3

Hydrograph type = Reservoir  
 Storm frequency = 1 yrs  
 Time interval = 1 min  
 Inflow hyd. No. = 7 - Prop - Detained3  
 Reservoir name = Basin 3

Peak discharge = 0.000 cfs  
 Time to peak = n/a  
 Hyd. volume = 0 cuft  
 Max. Elevation = 74.21 ft  
 Max. Storage = 1,097 cuft

Storage Indication method used.





# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

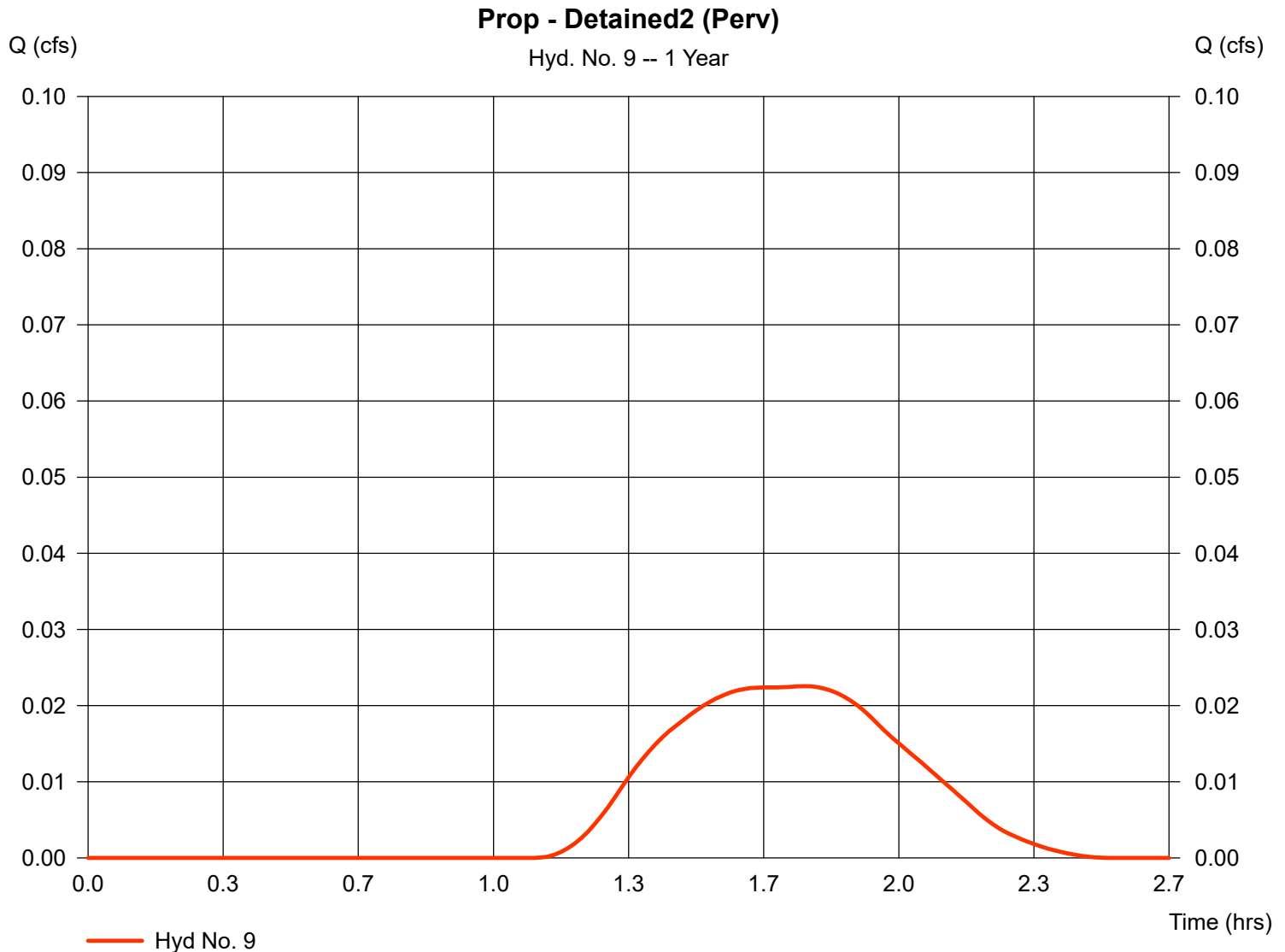
## Hyd. No. 9

Prop - Detained2 (Perv)

Hydrograph type = SCS Runoff  
 Storm frequency = 1 yrs  
 Time interval = 1 min  
 Drainage area = 0.644 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 1.25 in  
 Storm duration = NJWaterQuality.cds

Peak discharge = 0.023 cfs  
 Time to peak = 1.77 hrs  
 Hyd. volume = 60 cuft  
 Curve number = 69\*  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 19.30 min  
 Distribution = Custom  
 Shape factor = 484

\* Composite (Area/CN) = [(0.237 x 61) + (0.407 x 74)] / 0.644



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

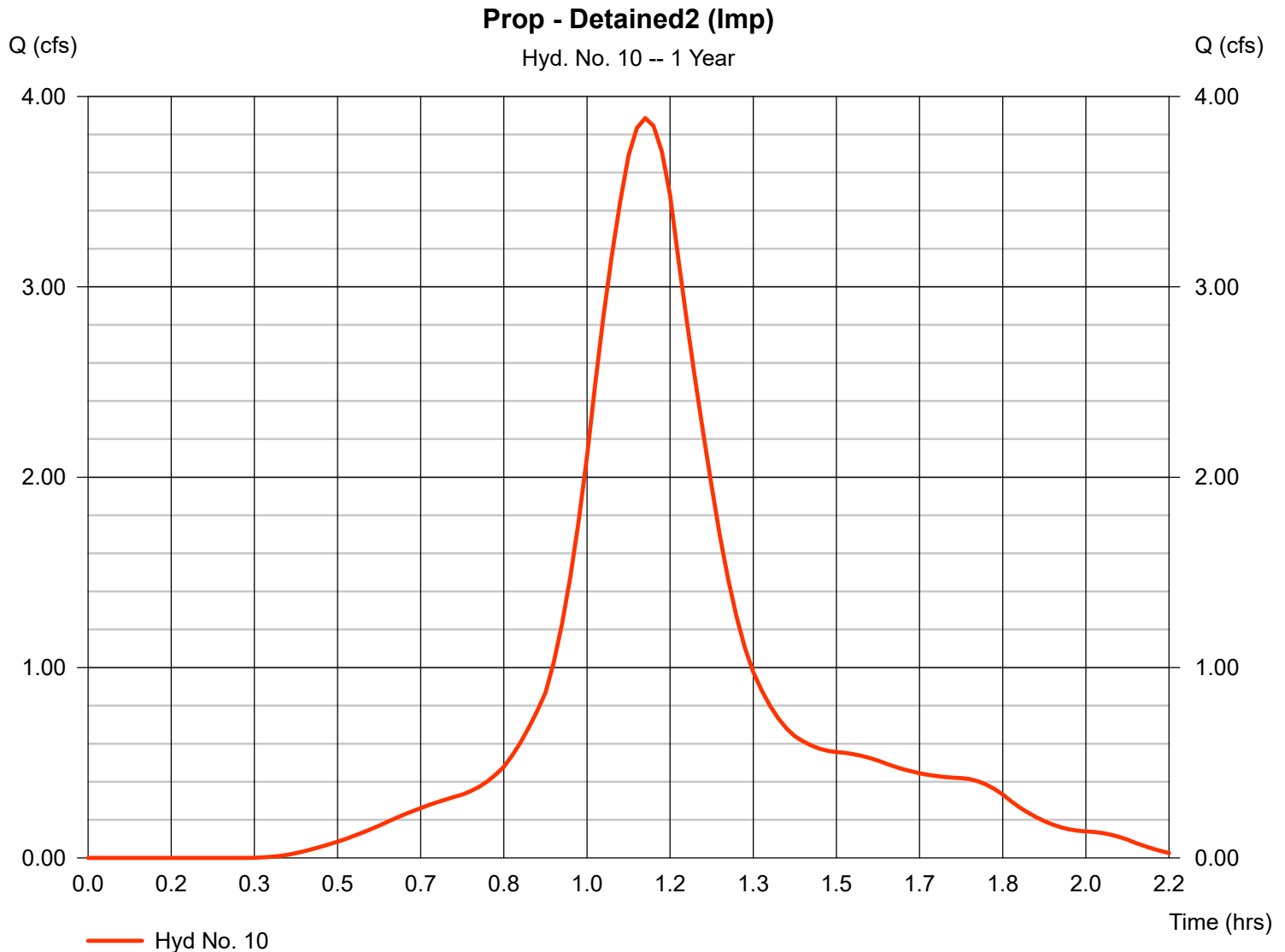
Monday, Jun 17, 2024

## Hyd. No. 10

Prop - Detained2 (Imp)

Hydrograph type = SCS Runoff  
 Storm frequency = 1 yrs  
 Time interval = 1 min  
 Drainage area = 1.421 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 1.25 in  
 Storm duration = NJWaterQuality.cds

Peak discharge = 3.886 cfs  
 Time to peak = 1.12 hrs  
 Hyd. volume = 5,337 cuft  
 Curve number = 98  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.00 min  
 Distribution = Custom  
 Shape factor = 484



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

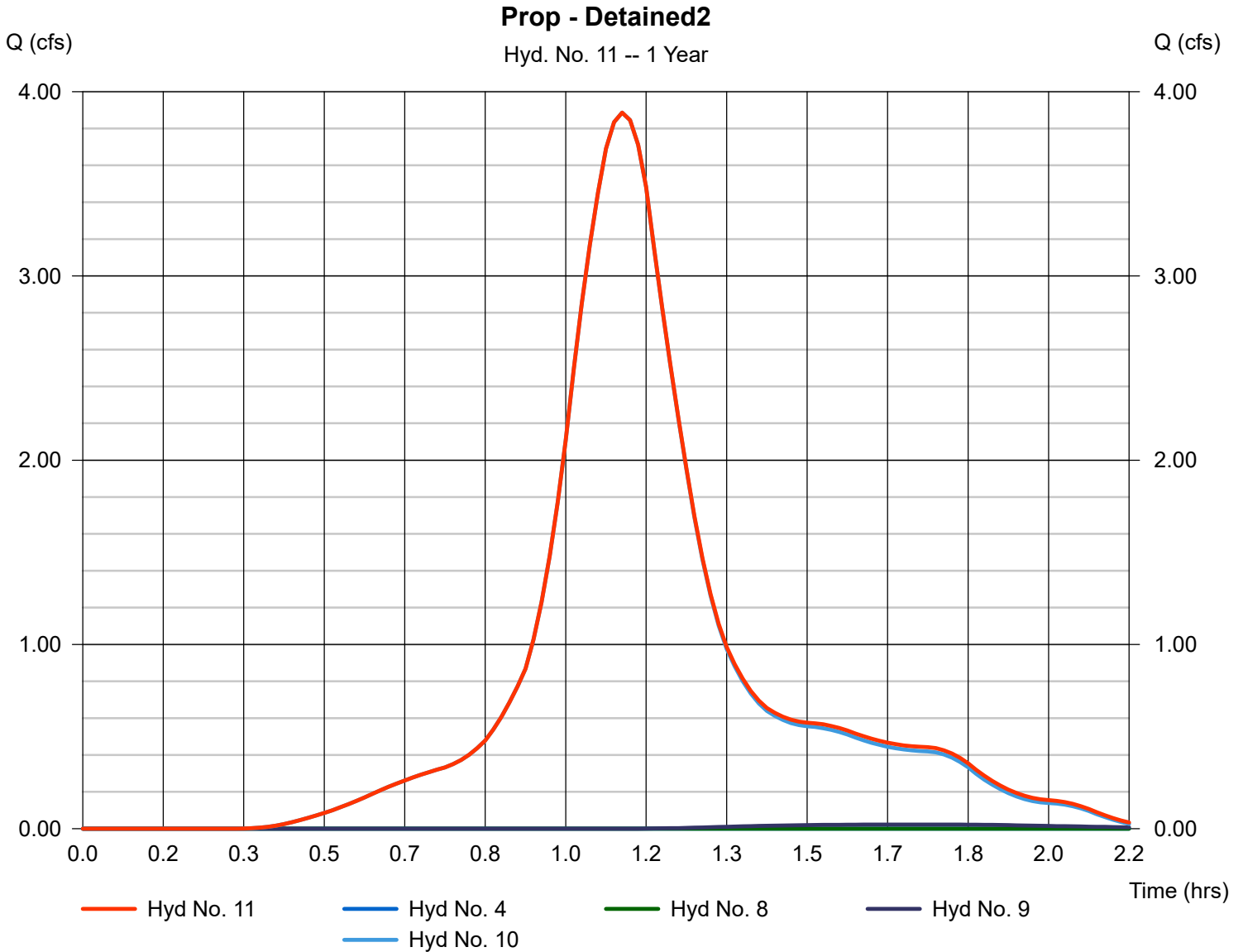
Monday, Jun 17, 2024

## Hyd. No. 11

Prop - Detained2

Hydrograph type = Combine  
Storm frequency = 1 yrs  
Time interval = 1 min  
Inflow hyds. = 4, 8, 9, 10

Peak discharge = 3.886 cfs  
Time to peak = 1.12 hrs  
Hyd. volume = 5,396 cuft  
Contrib. drain. area = 2.065 ac



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.25

Monday, Jun 17, 2024

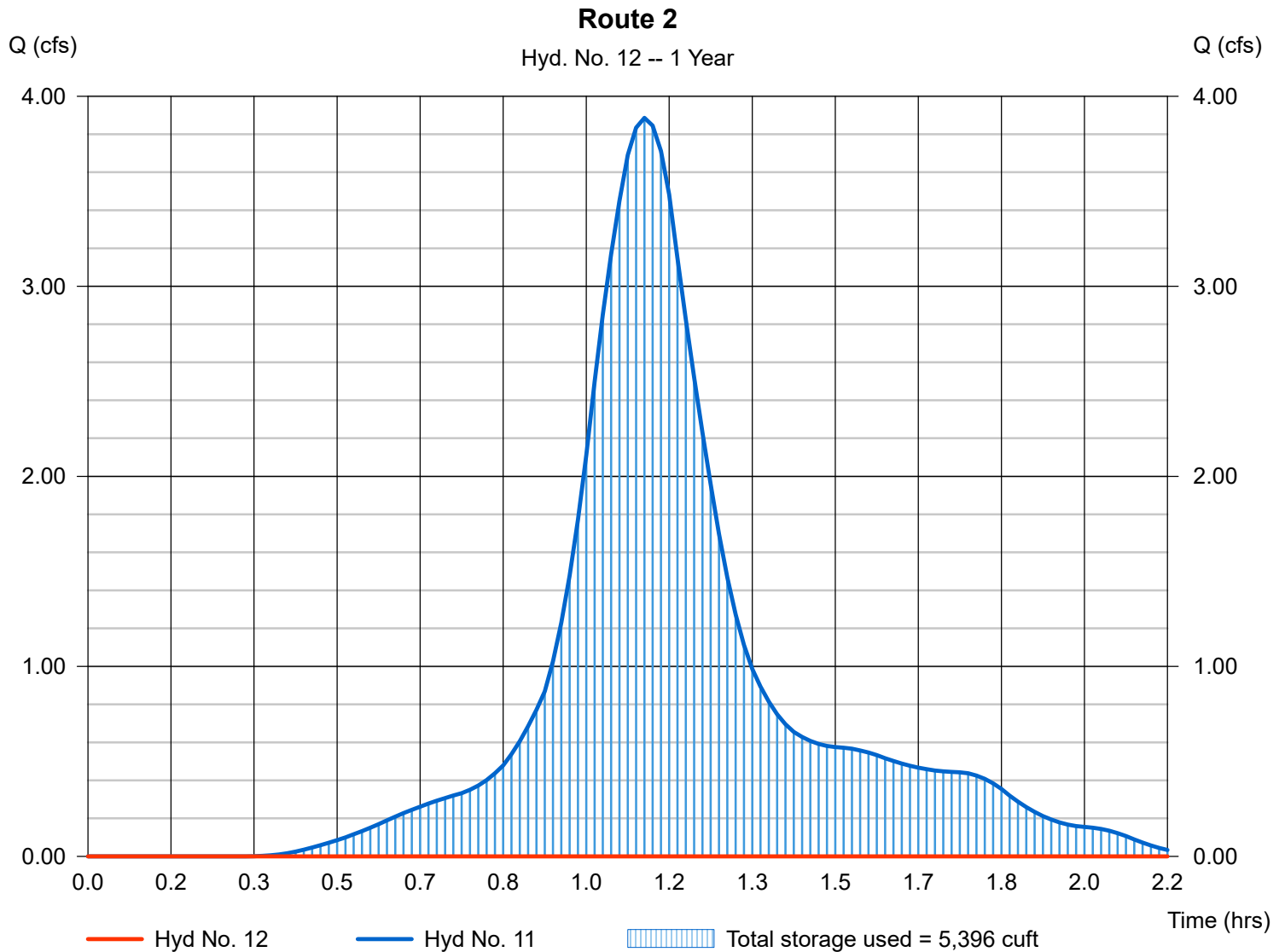
## Hyd. No. 12

Route 2

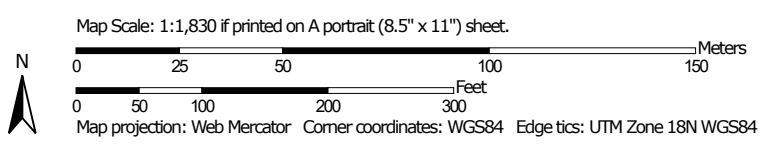
Hydrograph type = Reservoir  
 Storm frequency = 1 yrs  
 Time interval = 1 min  
 Inflow hyd. No. = 11 - Prop - Detained2  
 Reservoir name = Basin 2

Peak discharge = 0.000 cfs  
 Time to peak = n/a  
 Hyd. volume = 0 cuft  
 Max. Elevation = 67.60 ft  
 Max. Storage = 5,396 cuft

Storage Indication method used.



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



## 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%
<b>Totals for Area of Interest</b>			<b>7.9</b>	<b>100.0%</b>



## 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.

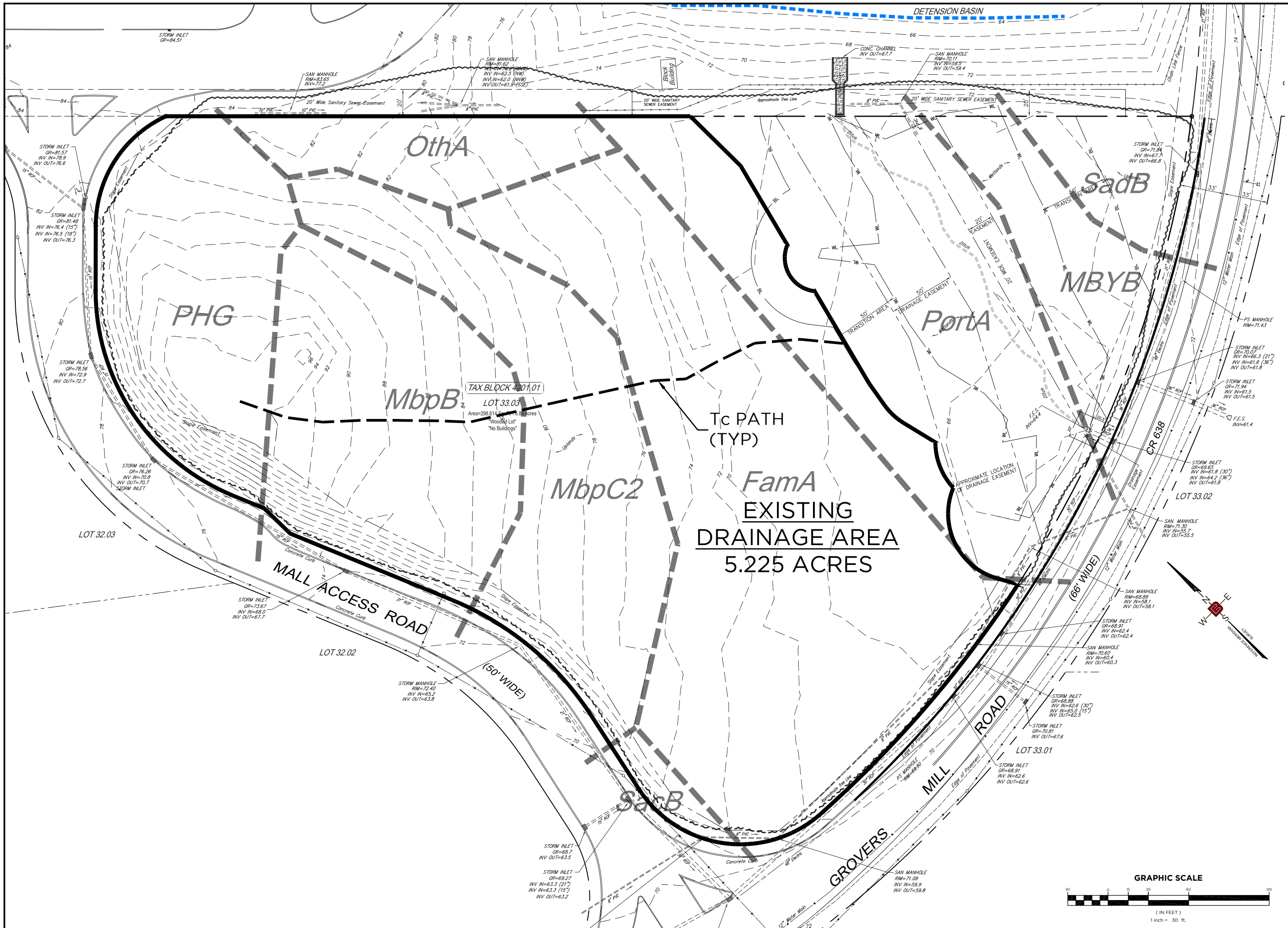
## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher





DM1: EXISTING DRAINAGE AREA MAP



**PROPOSED DRAINAGE AREA DETAINED 3: 0.488 AC**

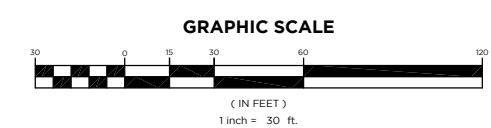
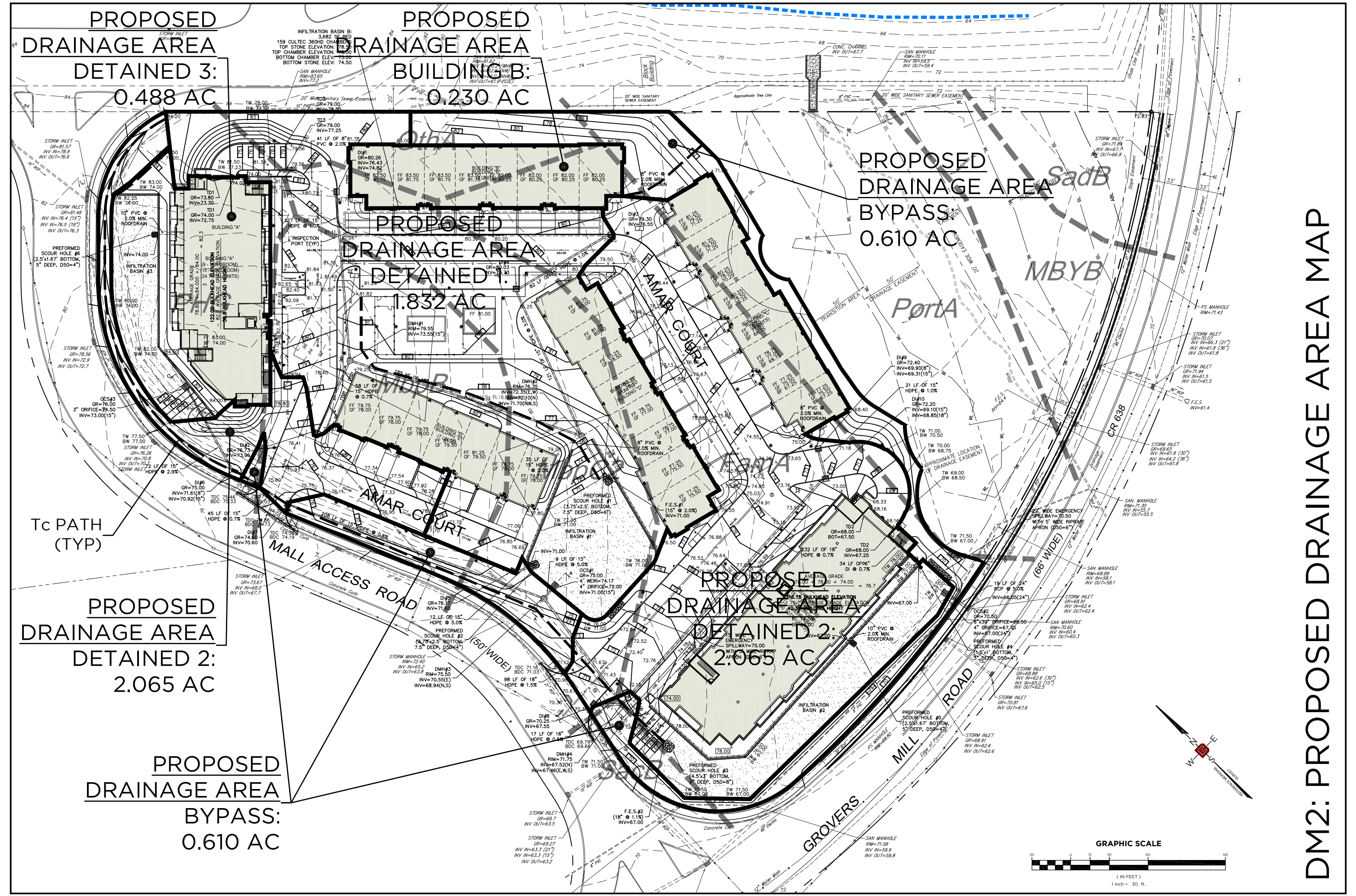
**PROPOSED DRAINAGE AREA BUILDING B: 0.230 AC**

**PROPOSED DRAINAGE AREA DETAINED 1: 1.832 AC**

**PROPOSED DRAINAGE AREA BYPASS: 0.610 AC**

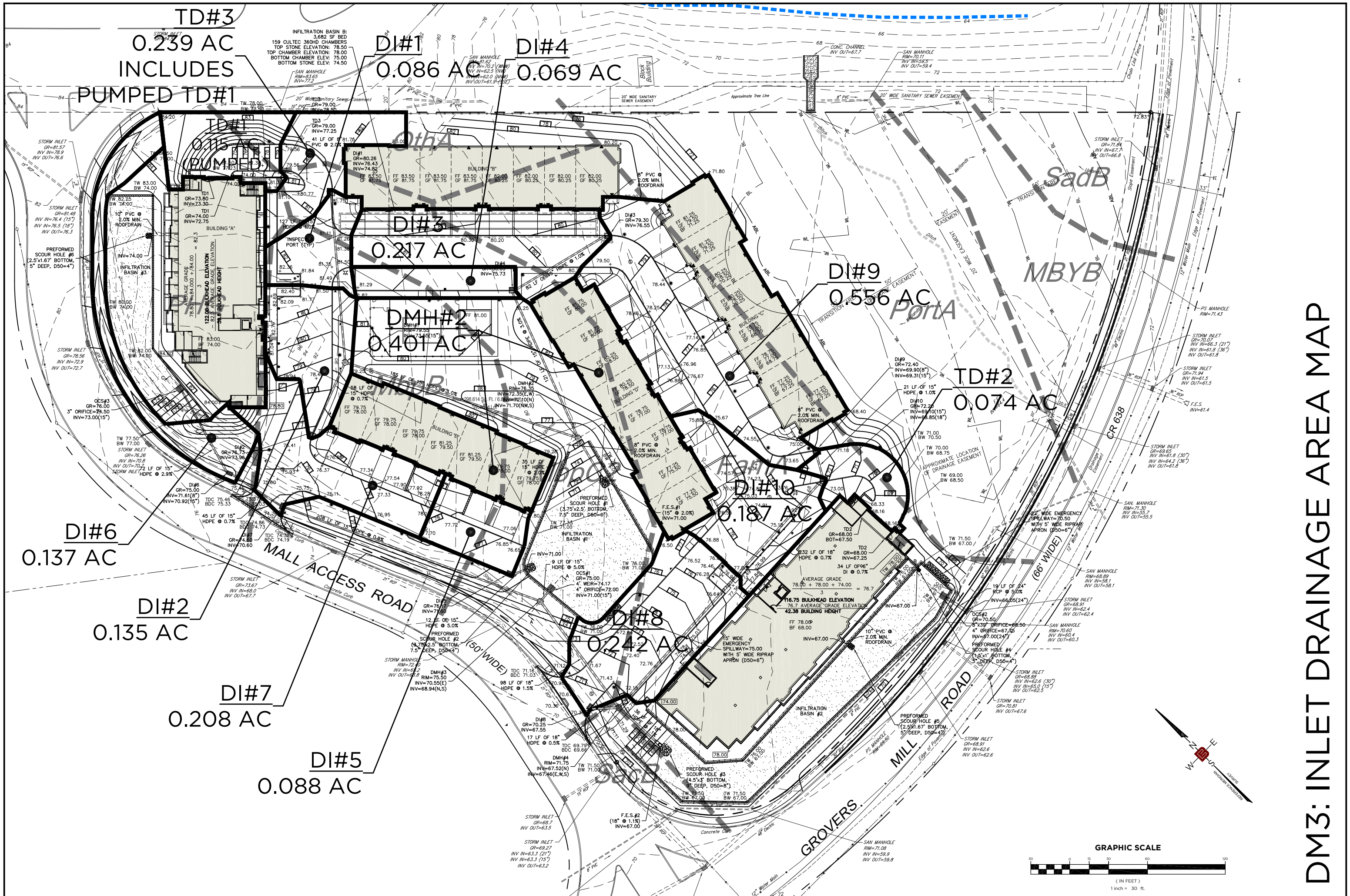
**PROPOSED DRAINAGE AREA DETAINED 2: 2.065 AC**

**PROPOSED DRAINAGE AREA BYPASS: 0.610 AC**



**DM2: PROPOSED DRAINAGE AREA MAP**





**TD#3**  
**0.239 AC**  
**INCLUDES**  
**PUMPED TD#1**

**DI#1**  
**0.086 AC**

**DI#4**  
**0.069 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**  
**0.137 AC**

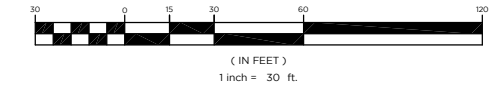
**DI#2**  
**0.135 AC**

**DI#7**  
**0.208 AC**

**DI#5**  
**0.088 AC**

**DI#8**  
**0.242 AC**

**GRAPHIC SCALE**



**DM3: INLET DRAINAGE AREA MAP**