SITE ENGINEERING DESIGN REPORT

Proposed Development
Derby, Connecticut
Job No.2522

Prepared For:
Cedar Village at Minerva Square

Prepared By:

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August 11, 2021

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TABLE OF CONTENTS

TABLES

INTRODUCTION:

Cedar Village at Minerva Square. is proposing the construction of a residential development located on67-71 Minerva Street, in Derby. Proposed developments include on residential building over parking. Proposed parking count for the development is 56 spaces, on site and 46 additional spaces on an existing adjacent off-site parking lot

Currently the property is comprised of a single 0.8227 acre parcel. The existing site is the former manufacturing site. The existing soil condition consists of mainly imperious buildings and parking lots with some gravel areas and exposed slabs.

Overall, the site slopes from northwest to southeast draining to the adjacent streets at the corner of the property. The maximum elevation is approximately elevation 79 feet. The minimum elevation is approximately 75 feet.

The residential development will have two access driveways one from Minerva Street and the other from Caroline Street.

EXISTING STORM WATER RUNOFF

For analysis purposes the site has been examined as a single drainage area. This drainage area will be referred to as DA-EX1 for the balance of this report.

DA-EX1, drains storm water to existing adjacent streets of the site. Based on the above, it is apparent that there is one point of interest associated with the existing drainage patterns, the point immediately prior to the retention pond area, where the areas drain currently. Peak rates of storm water runoff, for 5, 10, 25, 50 and 100 year storm events, have been calculated for these points of interest for each drainage area. The rates are depicted on Table 1. The supporting calculations are included as Appendix A.

These existing flows will later be compared to post development flow as a means of assessing the impact of the proposed project on surrounding infrastructures.

TABLE 1

Existing Flows (CFS)
Runoff to surrounding area

	5 year	10 year	25 year	50 year	100 year
DA-EX1	3.759	4.094	5.596	6.407	7.216

PROPOSED STORM WATER DRAINAGE

A primary concern was addressed during the design of the storm water control system. The impact on the surrounding infrastructure was to be absolutely minimized.

To achieve this objective the site drainage was diverted into one storm sewer system that will accommodate the drainage area.

Design details for these systems are presented on Sheet SP-2 (part of the overall Project Documents). The system will drain all roofs on the site, all paved areas, sidewalks, and grassy areas that contribute runoff to the system. The roofs and parking will be the major elements of the total impervious area on the site. The proposed buildings and parking will create an overall impervious area of approximately 0.55 acres for the entire site. The roof, grassy areas, sidewalks, parking and driveways will contribute to the runoff totals seen in table 2. This is in comparison to the existing impervious area of 0.729 ac on site today. Therefore this development will reduce the rate and volume of run off just based on the fact that it will reduce the total amount of impervious area.

The whole drainage area will discharge water through a series of hooded catch basins, pipes, and roof leaders into the proposed gallery system. The first is the hooded catch basins, which are designed to capture large floating debris from direct runoff. The second is the infiltration of water at the gallery system. These units are able to reduce the buildup of sediments, hydrocarbons, and heavy metals in the storm water runoff, and are also able to remove oils such as motor oil.

After pre-treatment and infiltration-storage stages, the runoff will then discharge slowly through a control structure. The proposed gallery's control structure will be constructed to include a 3.4-foot high weir wall to allow for the detention of the water quality volume with in the proposed galleries. This weir wall will allow the storage of approximately 1,952 cubic feet. The rate of flow has been reduced for up to the 100-year storm event for each drainage area, and therefore for the entire site of development. See Table 2 below for calculated rate reductions.

Table 2, (below) presents the effect of these flow patterns on the existing infrastructures. It can be safely stated that flows from the proposed systems will produce peak flows of less than the existing peak flows to the area east of the site.

TABLE 2

Proposed Flows (CFS)
Runoff to surrounding areas

	5year	10 year	25 year	50 year	100 year
DA-EX1	3.759	4.094	5.596	6.407	7.216
DA-PRO1	2.594	3.227	4.843	5.687	6.528

Percent Reduction of discharge from existing discharges

	5year	10 year	25 year	50 year	100 year
DA-1	30%	21%	13%	11%	9.5%

SANITARY SEWER

Residential Site:

Sanitary Sewer discharge from the hotel site will be through a proposed 8-inch PVC sanitary sewer line which will connect to an existing line on site to Caroline Street. Currently there is a sewer main through the site, which will be partially abandoned after construction of the new 8" PVC line.

Using the technical standards of the Connecticut Public Health Code, the estimated sewage flow is 150 gallons per room per day per bedroom. This Development has a proposed 90 bedrooms:

150 X 90= 13,500 gallons per day average flow
Average Flow = 9.38 g.p.m.

Peak flow estimate = 9.38 x 5 (peaking factor)

= 46.9 g.p.m. Peak or 0.215 cfs

Other Utilities

All proposed utilities to the site will be through underground utility connections. Electrical service will be from existing underground electric on site and Caroline Street, water and gas service will be from existing water and gas mains in on site and Caroline Street.

APPENDIX A

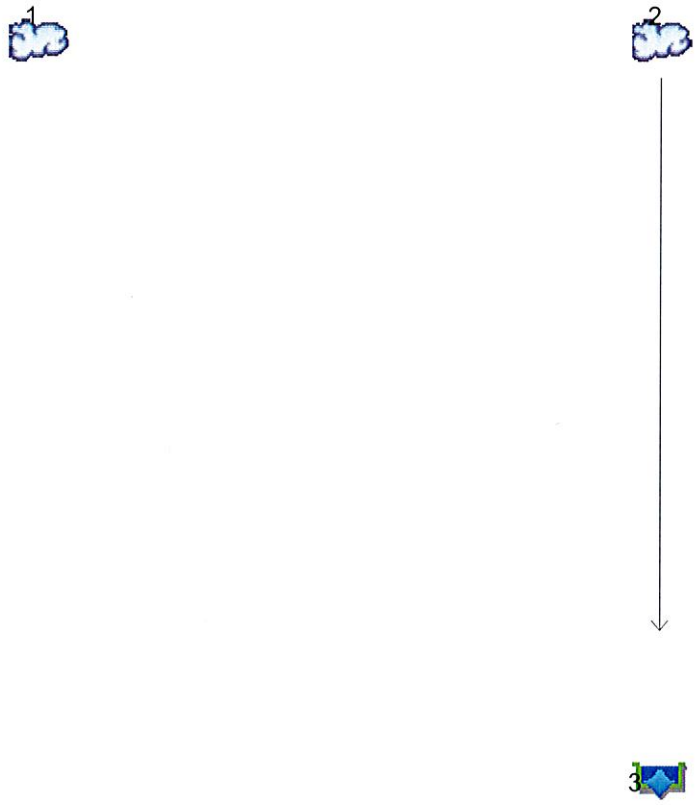
WATER QUALITY VOLUME COMPUTATION:
COMMERCIAL DEVELOPMENT = 35,836 SF
IMPERVIOUS AREA = 24,054 OR 67%
WQV= (P*RV*A); RV=0.05+0.009*I
RV= 0.05+0.009*I= 0.653WATERSHED INCHES
WQV= (0.653"*35,836)/12=1,950 CF REQUIRED
PROVIDED = 1,952 CF

APPENDIX B

DRAINAGE CALCULATIONS

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Legend

Hyd.	Origin	Description
1	SCS Runoff	Existing Site
2	SCS Runoff	Proposed Site
3	Reservoir	from galleries

Hydraflow Table of Contents

draiange.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 08 / 11 / 2021

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	3.759	4.094	5.596	6.407	7.216	Existing Site
2	SCS Runoff	------	-------	-------	-------	3.211	3.562	5.141	5.995	6.847	Proposed Site
3	Reservoir	2	-------	-------	-------	2.594	3.227	4.843	5.687	6.528	from galleries

Hydrograph Report

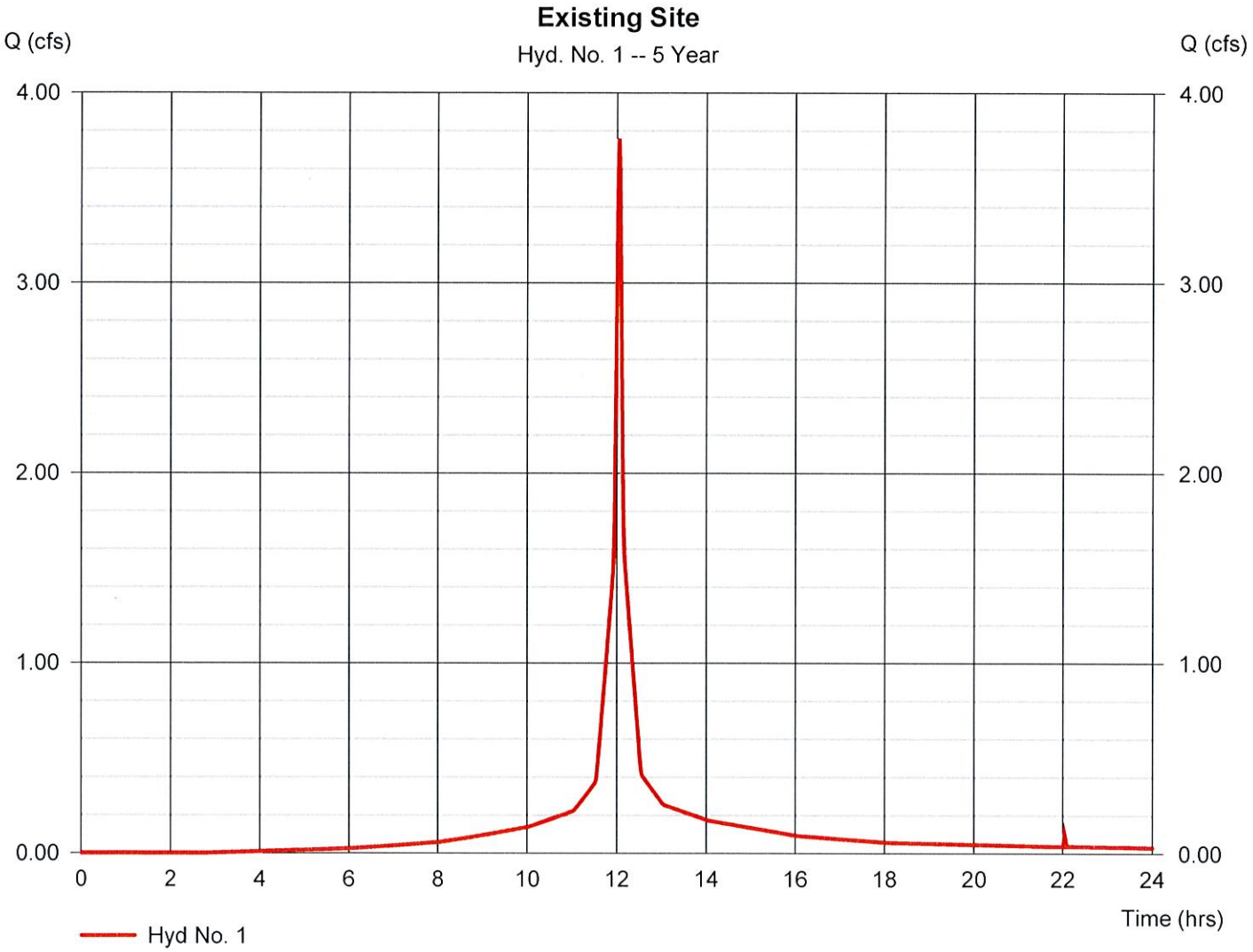
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 08 / 11 / 2021

Hyd. No. 1

Existing Site

Hydrograph type	= SCS Runoff	Peak discharge	= 3.759 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 1 min	Hyd. volume	= 10,977 cuft
Drainage area	= 0.820 ac	Curve number	= 94*
Basin Slope	= 3.0 %	Hydraulic length	= 100 ft
Tc method	= LAG	Time of conc. (Tc)	= 1.71 min
Total precip.	= 4.62 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.729 x 98) + (0.094 x 61)] / 0.820



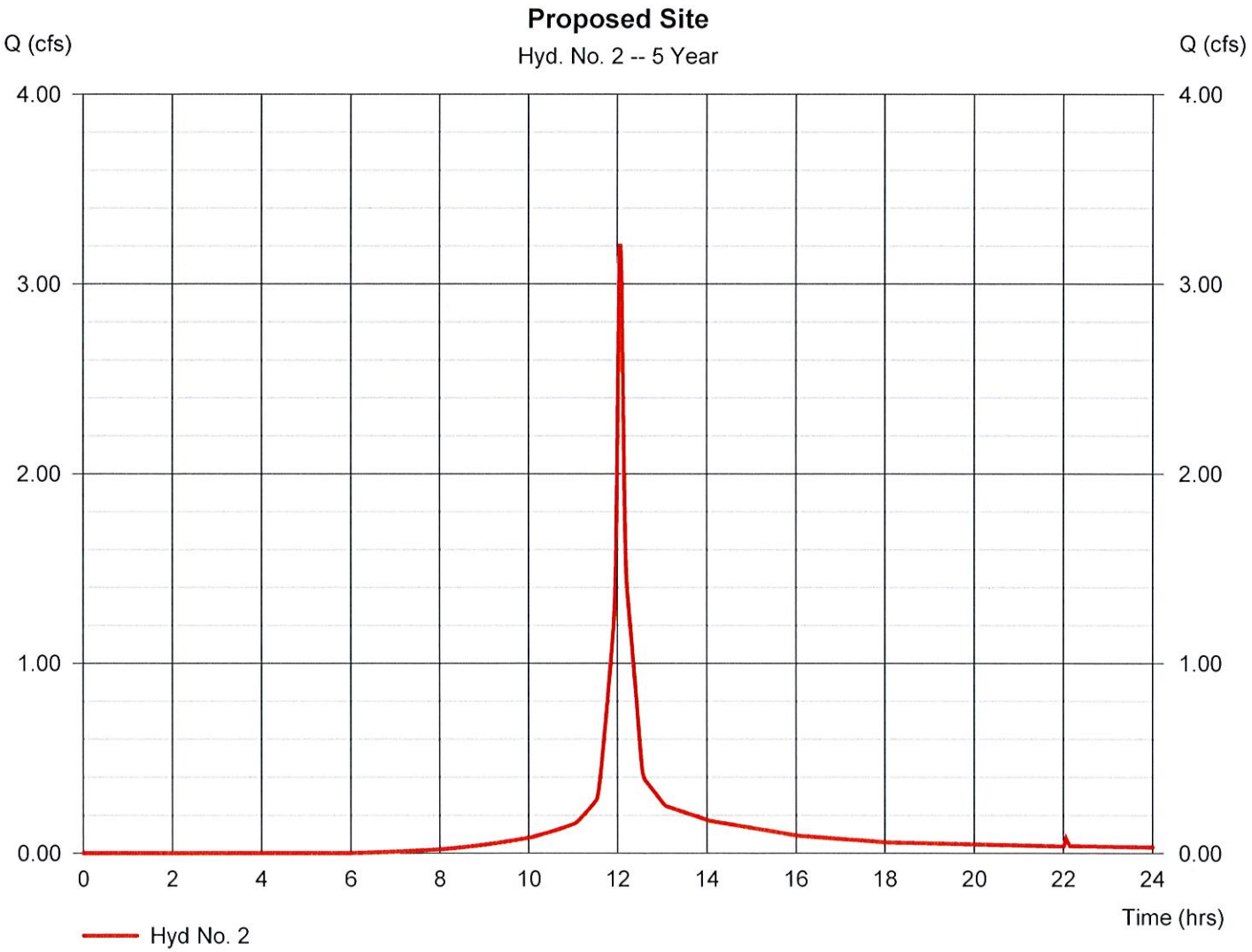
Hydrograph Report

Hyd. No. 2

Proposed Site

Hydrograph type	= SCS Runoff	Peak discharge	= 3.211 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 9,382 cuft
Drainage area	= 0.830 ac	Curve number	= 86*
Basin Slope	= 1.7 %	Hydraulic length	= 125 ft
Tc method	= LAG	Time of conc. (Tc)	= 3.79 min
Total precip.	= 4.62 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.277 x 61)] / 0.830



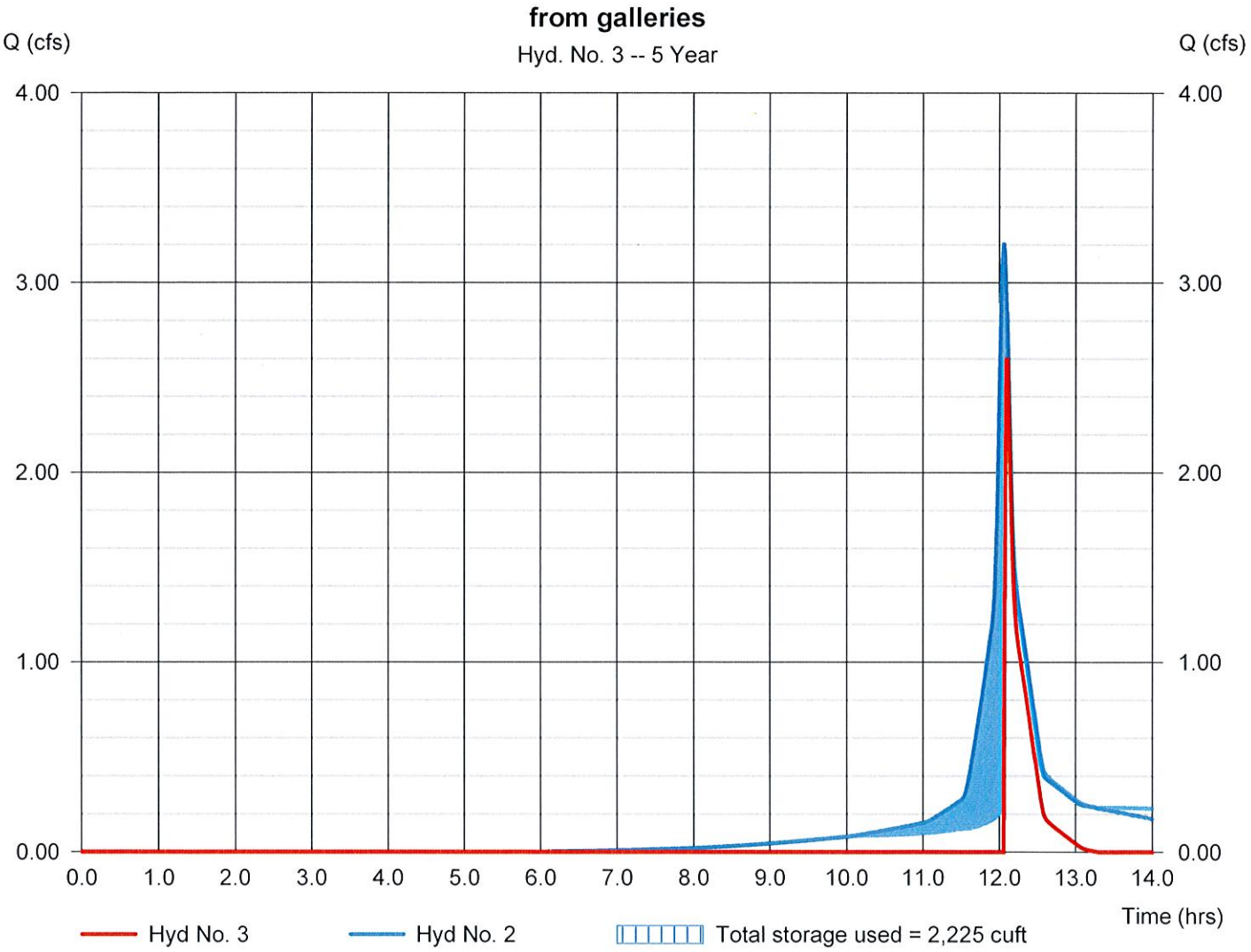
Hydrograph Report

Hyd. No. 3

from galleries

Hydrograph type	= Reservoir	Peak discharge	= 2.594 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 2,098 cuft
Inflow hyd. No.	= 2 - Proposed Site	Max. Elevation	= 73.70 ft
Reservoir name	= Galleries	Max. Storage	= 2,225 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 1 - Galleries

Pond Data

UG Chambers -Invert elev. = 70.00 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 122.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 69.00 ft, Width = 5.00 ft, Height = 5.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	69.00	n/a	0	0
0.50	69.50	n/a	122	122
1.00	70.00	n/a	122	244
1.50	70.50	n/a	268	513
2.00	71.00	n/a	268	781
2.50	71.50	n/a	268	1,049
3.00	72.00	n/a	268	1,318
3.50	72.50	n/a	268	1,586
4.00	73.00	n/a	268	1,855
4.50	73.50	n/a	268	2,123
5.00	74.00	n/a	268	2,392

Culvert / Orifice Structures

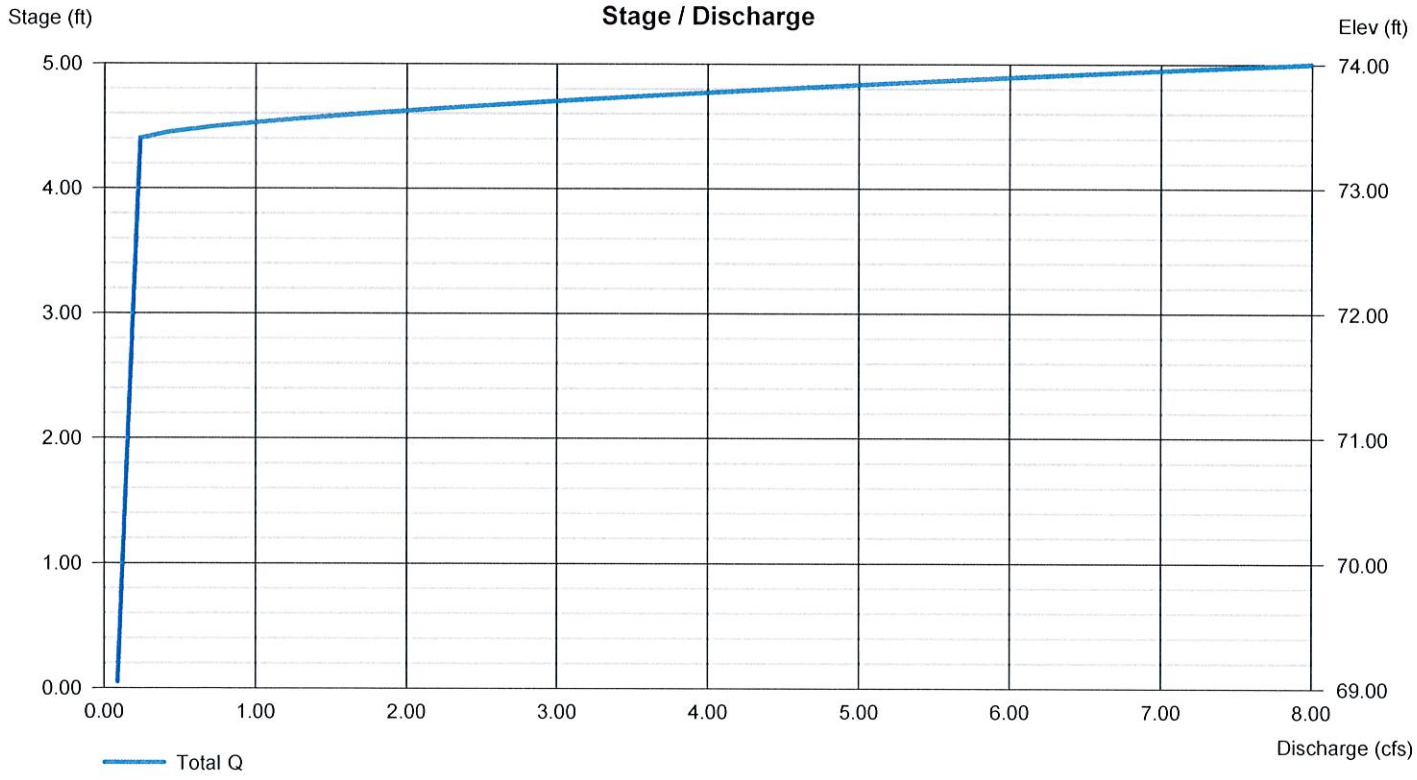
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	5.00	0.00	0.00
Crest El. (ft)	= 0.00	73.40	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	Rect	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 6.000 (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).



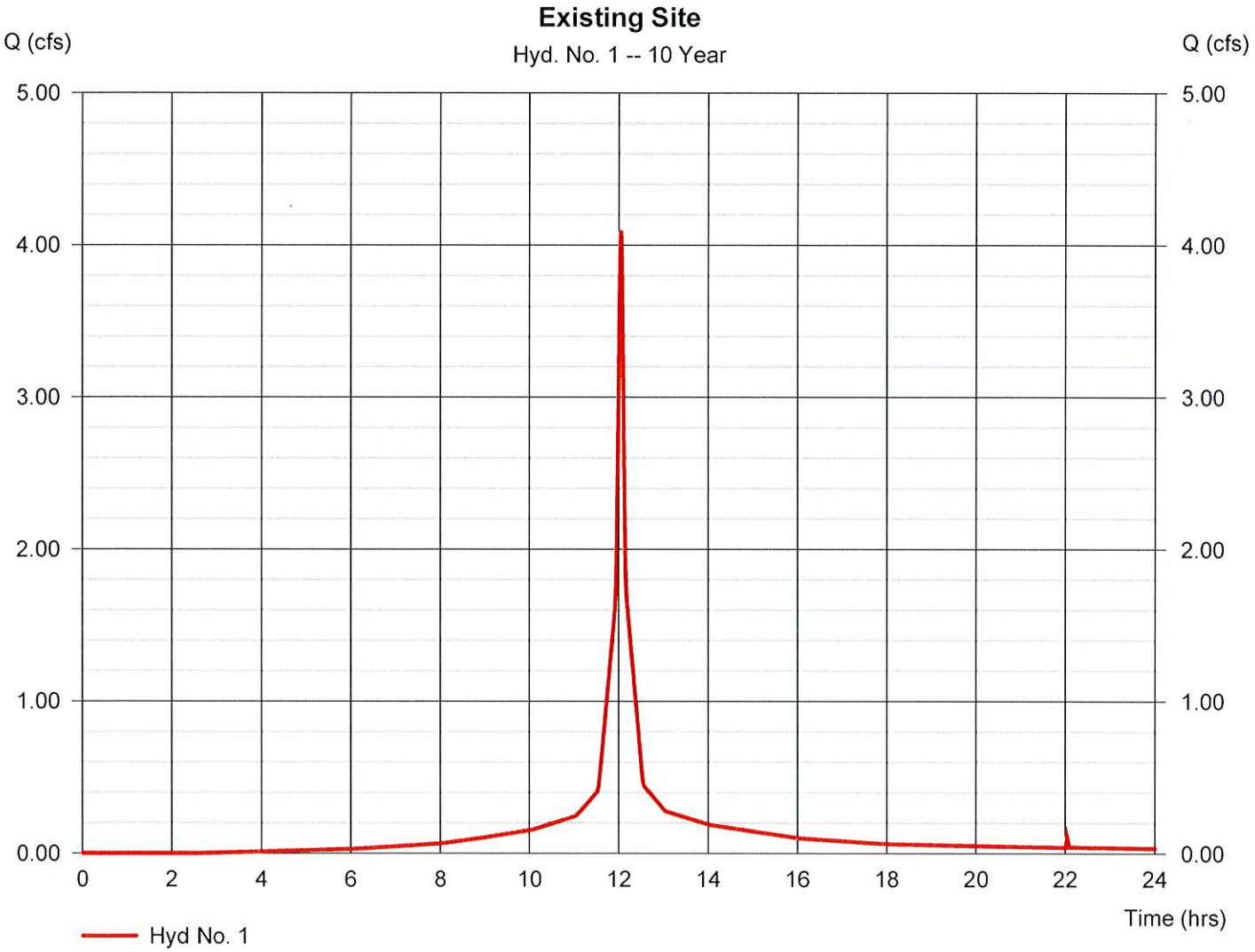
Hydrograph Report

Hyd. No. 1

Existing Site

Hydrograph type	= SCS Runoff	Peak discharge	= 4.094 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 1 min	Hyd. volume	= 12,022 cuft
Drainage area	= 0.820 ac	Curve number	= 94*
Basin Slope	= 3.0 %	Hydraulic length	= 100 ft
Tc method	= LAG	Time of conc. (Tc)	= 1.71 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.729 x 98) + (0.094 x 61)] / 0.820



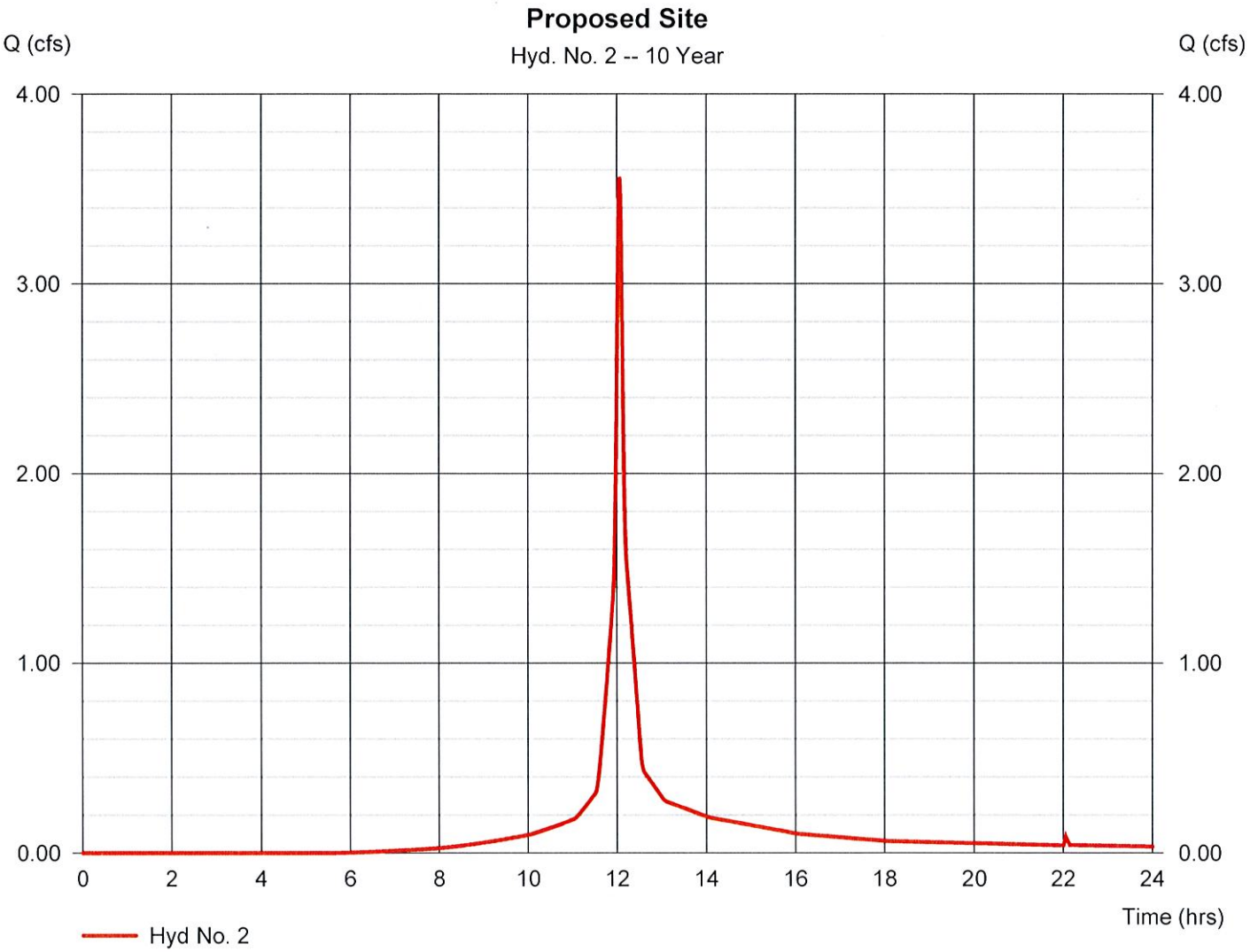
Hydrograph Report

Hyd. No. 2

Proposed Site

Hydrograph type	= SCS Runoff	Peak discharge	= 3.562 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 10,446 cuft
Drainage area	= 0.830 ac	Curve number	= 86*
Basin Slope	= 1.7 %	Hydraulic length	= 125 ft
Tc method	= LAG	Time of conc. (Tc)	= 3.79 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.277 x 61)] / 0.830



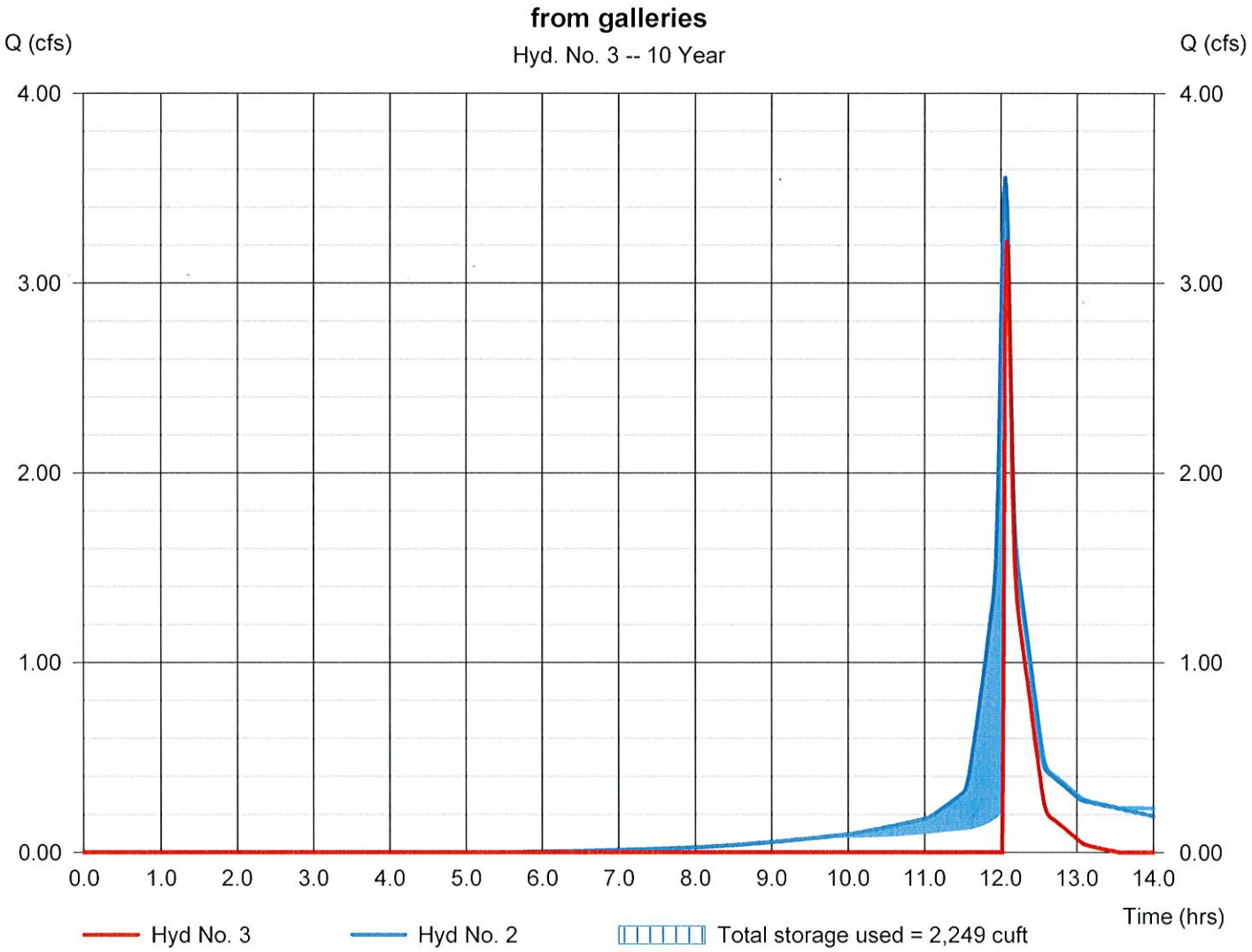
Hydrograph Report

Hyd. No. 3

from galleries

Hydrograph type	= Reservoir	Peak discharge	= 3.227 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 2,746 cuft
Inflow hyd. No.	= 2 - Proposed Site	Max. Elevation	= 73.74 ft
Reservoir name	= Galleries	Max. Storage	= 2,249 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



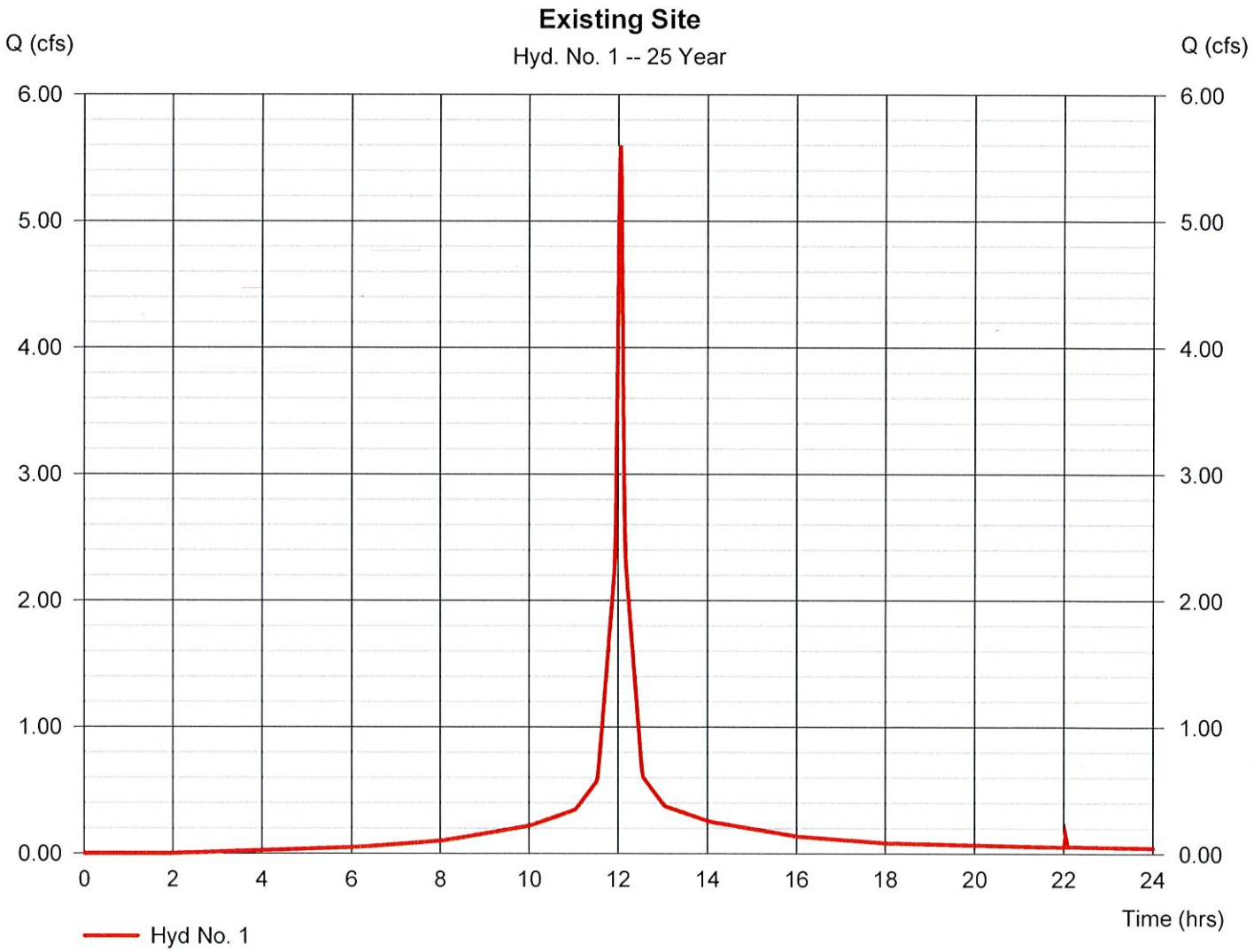
Hydrograph Report

Hyd. No. 1

Existing Site

Hydrograph type	= SCS Runoff	Peak discharge	= 5.596 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 1 min	Hyd. volume	= 16,745 cuft
Drainage area	= 0.820 ac	Curve number	= 94*
Basin Slope	= 3.0 %	Hydraulic length	= 100 ft
Tc method	= LAG	Time of conc. (Tc)	= 1.71 min
Total precip.	= 6.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.729 x 98) + (0.094 x 61)] / 0.820



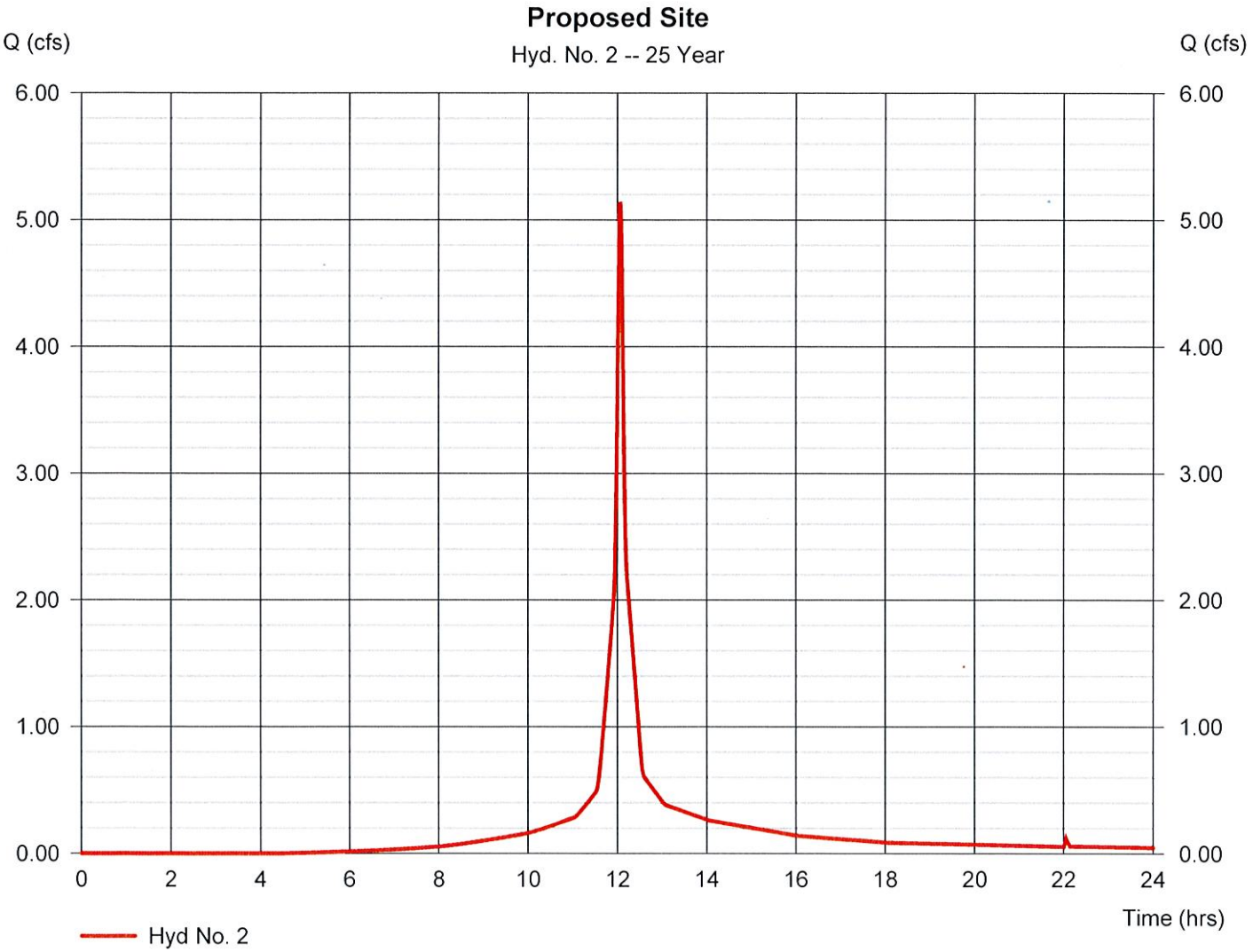
Hydrograph Report

Hyd. No. 2

Proposed Site

Hydrograph type	= SCS Runoff	Peak discharge	= 5.141 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 15,327 cuft
Drainage area	= 0.830 ac	Curve number	= 86*
Basin Slope	= 1.7 %	Hydraulic length	= 125 ft
Tc method	= LAG	Time of conc. (Tc)	= 3.79 min
Total precip.	= 6.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.277 x 61)] / 0.830



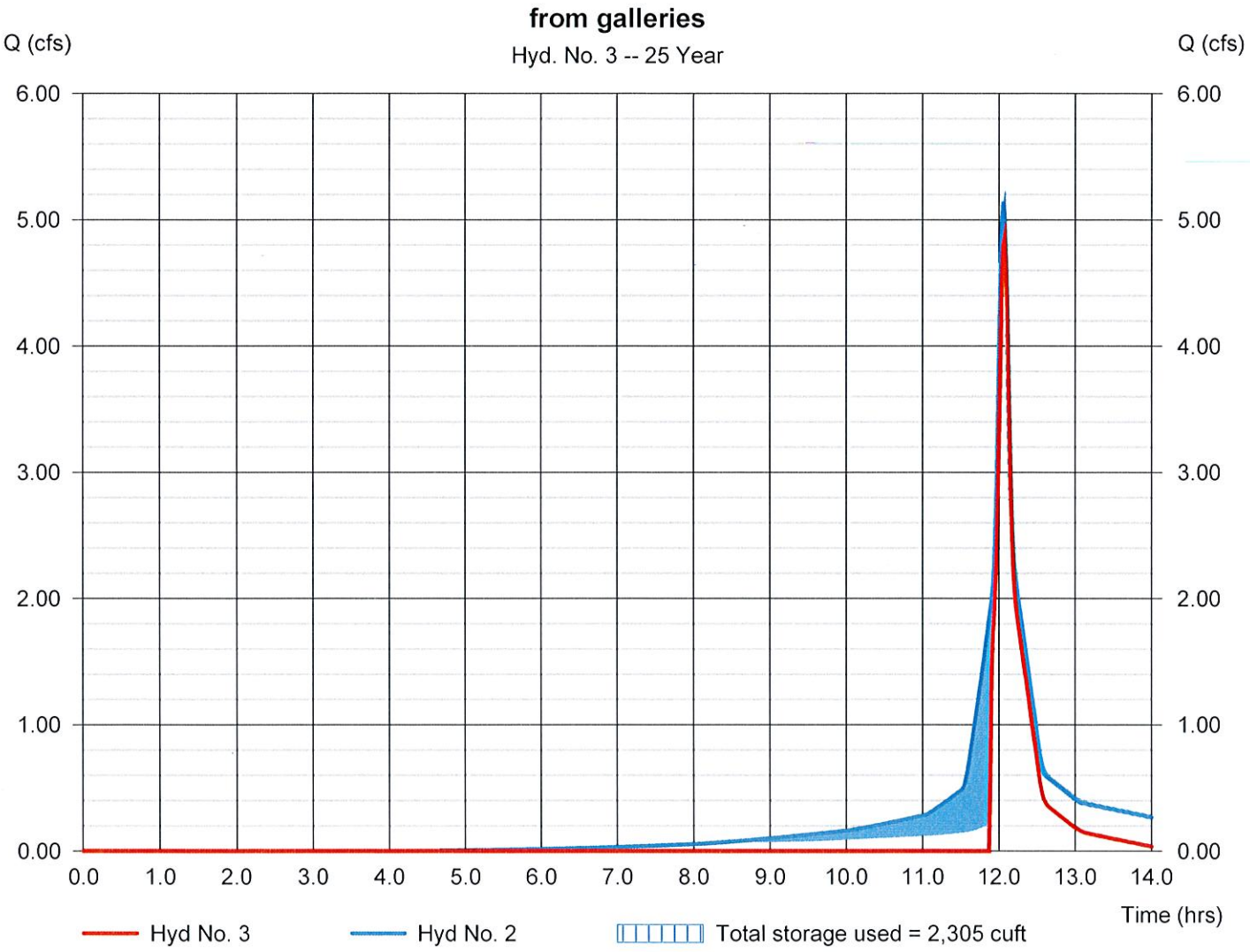
Hydrograph Report

Hyd. No. 3

from galleries

Hydrograph type	= Reservoir	Peak discharge	= 4.843 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 5,970 cuft
Inflow hyd. No.	= 2 - Proposed Site	Max. Elevation	= 73.84 ft
Reservoir name	= Galleries	Max. Storage	= 2,305 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



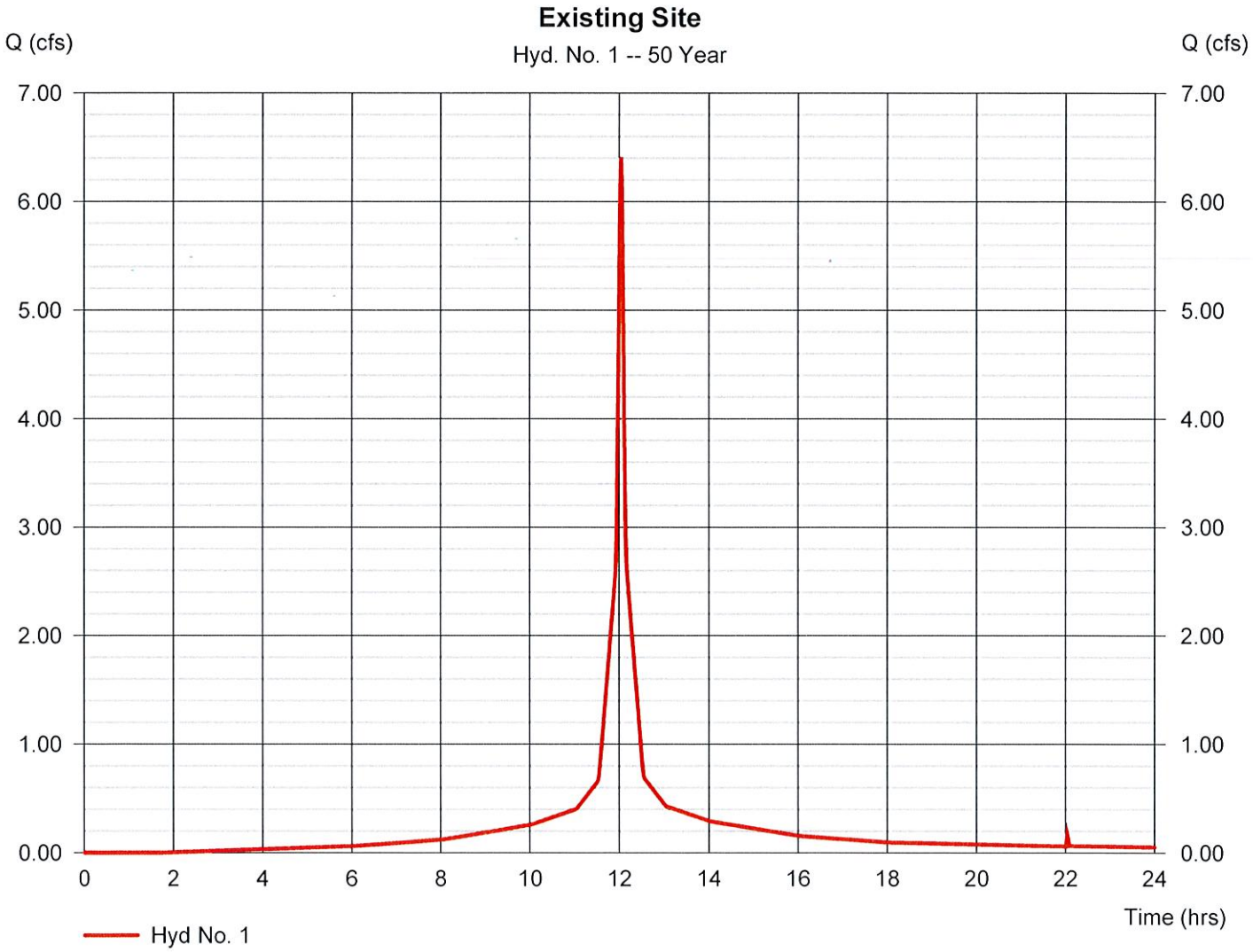
Hydrograph Report

Hyd. No. 1

Existing Site

Hydrograph type	= SCS Runoff	Peak discharge	= 6.407 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 1 min	Hyd. volume	= 19,322 cuft
Drainage area	= 0.820 ac	Curve number	= 94*
Basin Slope	= 3.0 %	Hydraulic length	= 100 ft
Tc method	= LAG	Time of conc. (Tc)	= 1.71 min
Total precip.	= 7.64 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.729 x 98) + (0.094 x 61)] / 0.820



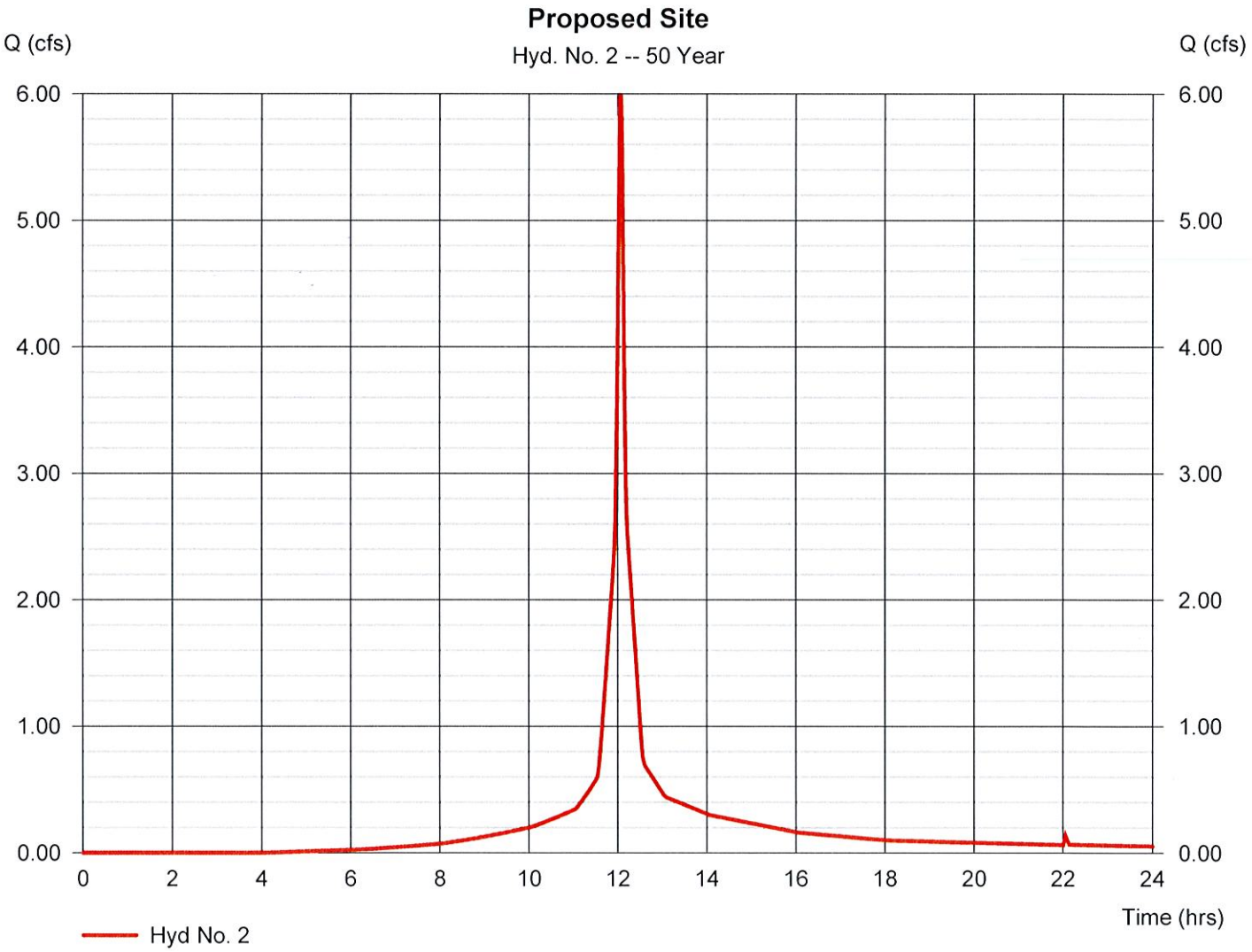
Hydrograph Report

Hyd. No. 2

Proposed Site

Hydrograph type	= SCS Runoff	Peak discharge	= 5.995 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 18,026 cuft
Drainage area	= 0.830 ac	Curve number	= 86*
Basin Slope	= 1.7 %	Hydraulic length	= 125 ft
Tc method	= LAG	Time of conc. (Tc)	= 3.79 min
Total precip.	= 7.64 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.277 x 61)] / 0.830



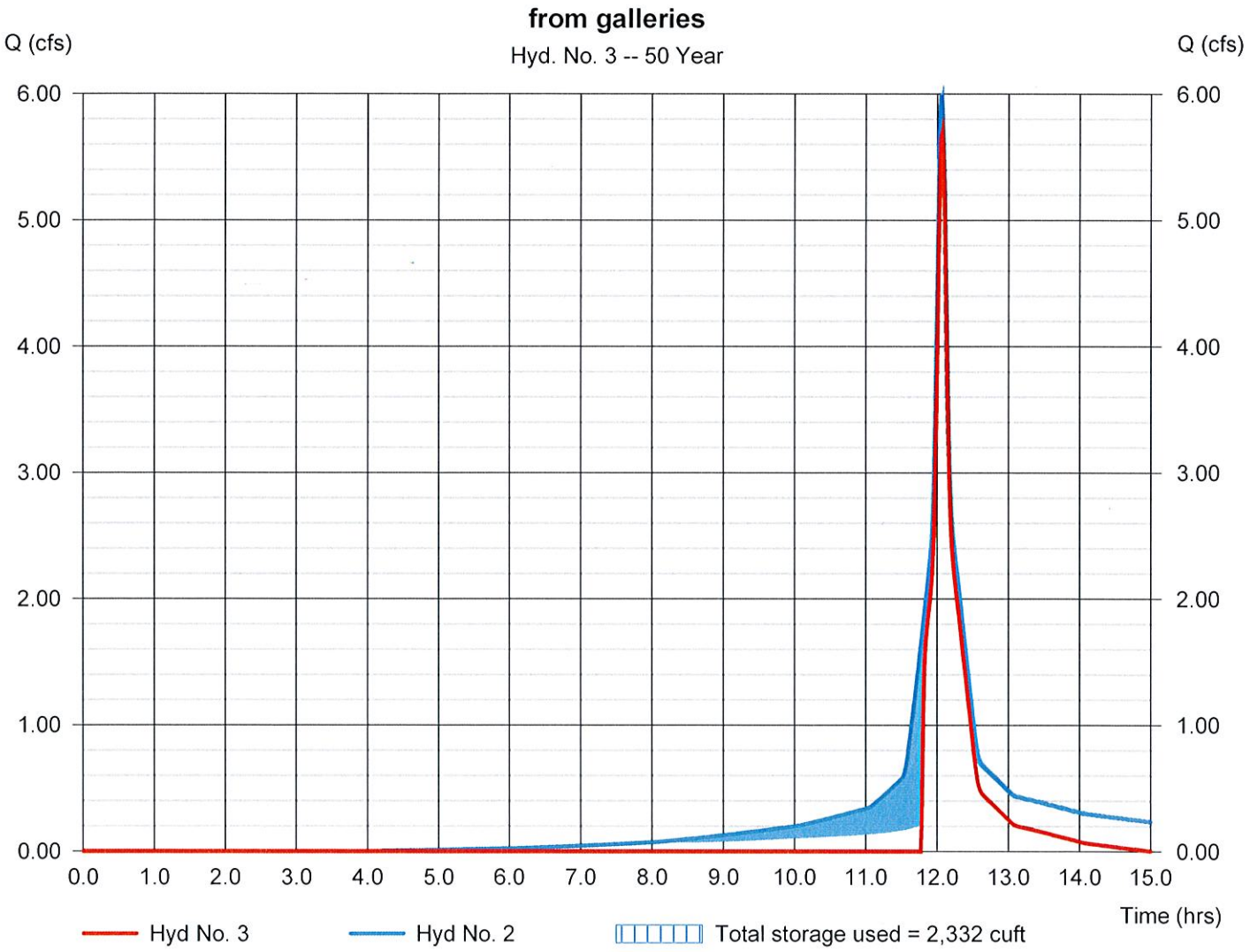
Hydrograph Report

Hyd. No. 3

from galleries

Hydrograph type	= Reservoir	Peak discharge	= 5.687 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 7,890 cuft
Inflow hyd. No.	= 2 - Proposed Site	Max. Elevation	= 73.89 ft
Reservoir name	= Galleries	Max. Storage	= 2,332 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



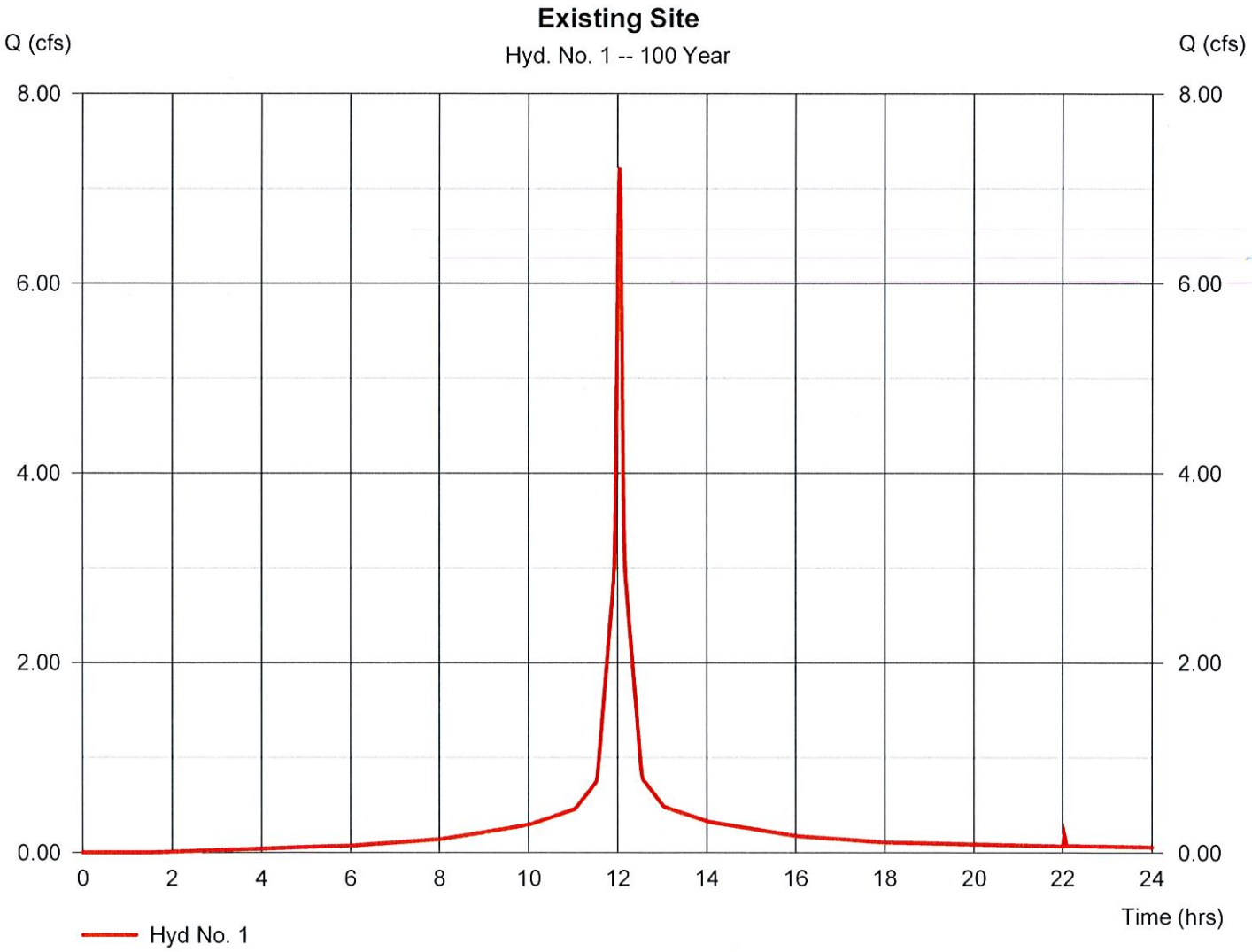
Hydrograph Report

Hyd. No. 1

Existing Site

Hydrograph type	= SCS Runoff	Peak discharge	= 7.216 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 1 min	Hyd. volume	= 21,903 cuft
Drainage area	= 0.820 ac	Curve number	= 94*
Basin Slope	= 3.0 %	Hydraulic length	= 100 ft
Tc method	= LAG	Time of conc. (Tc)	= 1.71 min
Total precip.	= 8.57 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.729 x 98) + (0.094 x 61)] / 0.820



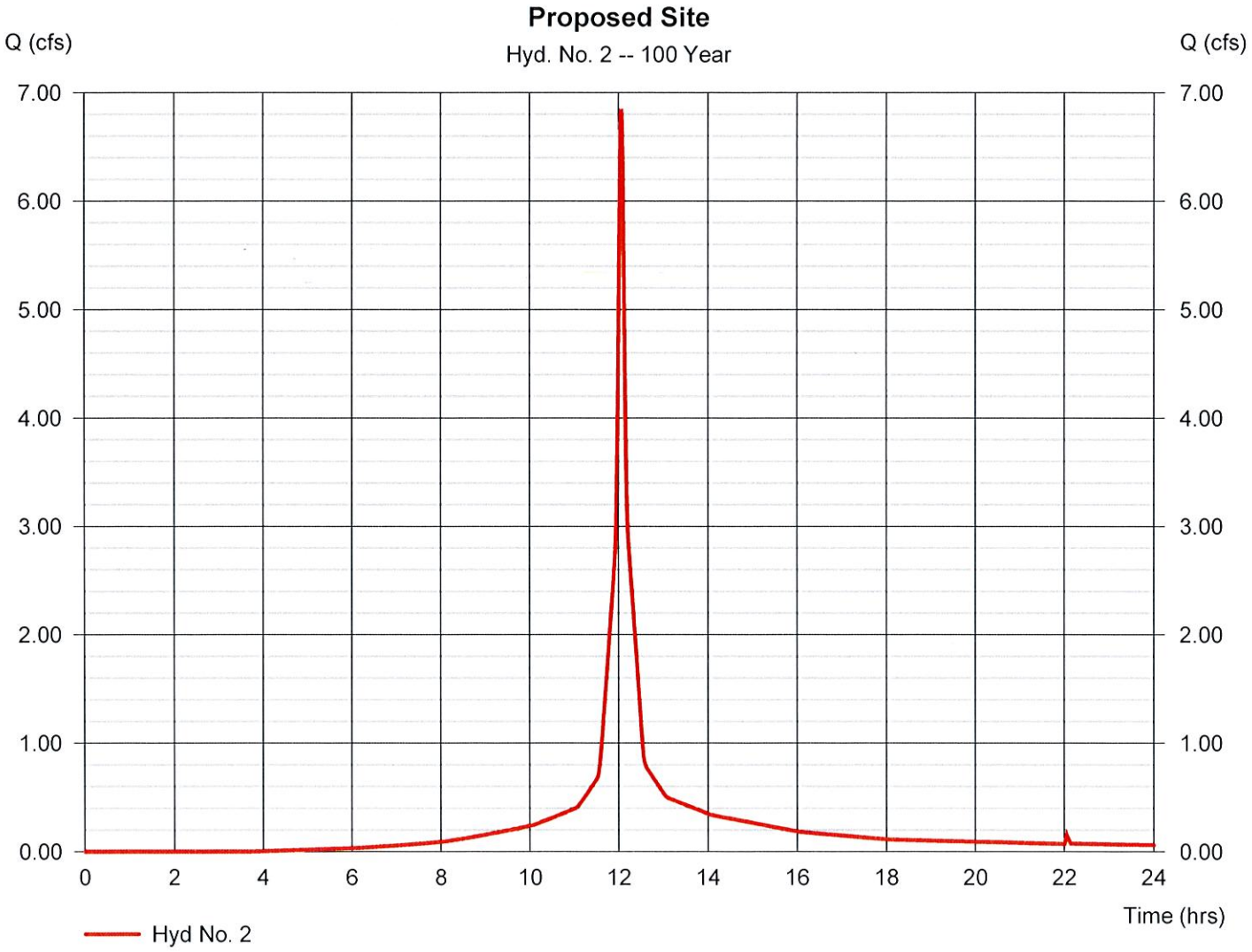
Hydrograph Report

Hyd. No. 2

Proposed Site

Hydrograph type	= SCS Runoff	Peak discharge	= 6.847 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 20,744 cuft
Drainage area	= 0.830 ac	Curve number	= 86*
Basin Slope	= 1.7 %	Hydraulic length	= 125 ft
Tc method	= LAG	Time of conc. (Tc)	= 3.79 min
Total precip.	= 8.57 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.277 x 61)] / 0.830



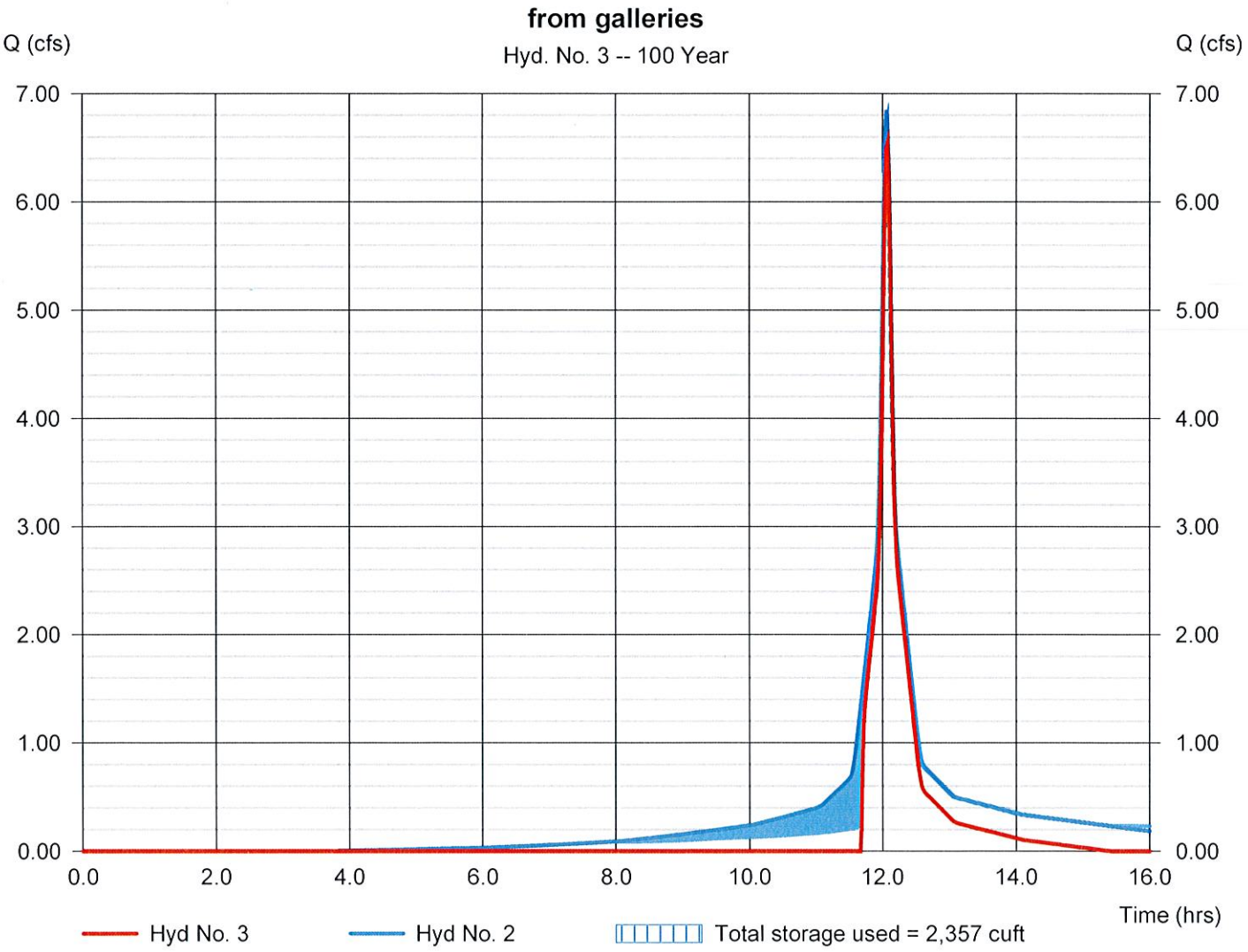
Hydrograph Report

Hyd. No. 3

from galleries

Hydrograph type	= Reservoir	Peak discharge	= 6.528 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 9,887 cuft
Inflow hyd. No.	= 2 - Proposed Site	Max. Elevation	= 73.94 ft
Reservoir name	= Galleries	Max. Storage	= 2,357 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	37.7795	9.5000	0.8133	--------
3	0.0000	0.0000	0.0000	--------
5	99.3592	15.3000	0.9554	--------
10	69.0361	11.6000	0.8412	--------
25	182.6736	18.0000	1.0144	--------
50	118.5118	13.6000	0.8977	--------
100	133.2439	13.2000	0.8997	--------

File name: Newhaven.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	4.29	3.37	2.80	2.41	2.12	1.90	1.72	1.58	1.46	1.36	1.28	1.20
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.60	4.54	3.82	3.30	2.91	2.60	2.35	2.15	1.98	1.83	1.71	1.60
10	6.50	5.21	4.37	3.78	3.34	3.00	2.73	2.50	2.32	2.16	2.02	1.90
25	7.59	6.22	5.26	4.56	4.02	3.60	3.26	2.97	2.73	2.53	2.35	2.20
50	8.59	6.94	5.84	5.05	4.46	4.00	3.63	3.32	3.07	2.85	2.66	2.50
100	9.79	7.87	6.60	5.70	5.03	4.50	4.08	3.73	3.44	3.20	2.98	2.80

Tc = time in minutes. Values may exceed 60.

Precip. file name: H:\LIBRARY\DEPT\SITE\hydraflow\derby-noaa-ct.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.92	3.57	0.00	4.62	5.00	6.71	7.64	8.57
SCS 6-Hr	2.00	2.39	0.00	3.40	3.58	4.32	4.89	5.45
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00