DRAINAGE STUDY

FOR

SHADOW RUN RANCH

HIGHWAY 76, PAUMA VALLEY
SAN DIEGO COUNTY, CALIFORNIA
TM 5223 RPL-3

Engineer:

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Prepared by: _____ Date: 12/20/2019
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12/01/01	Original
6/13/05	1st Revision
3/06/09	2nd Revision
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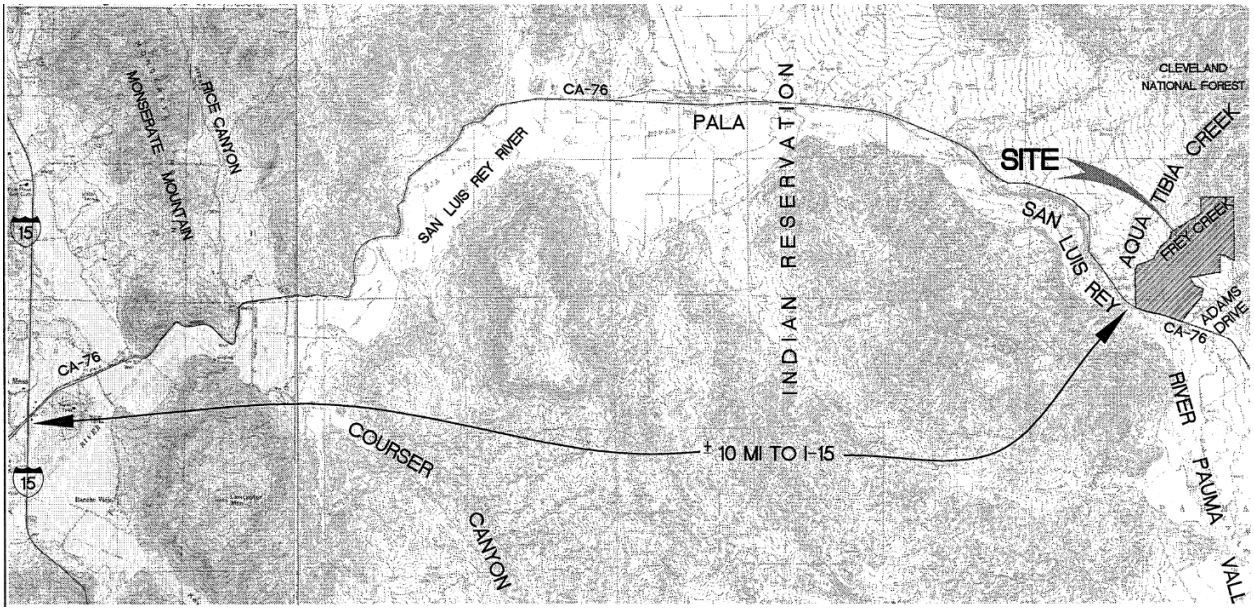
12/16/13	4th Revision
05/16/14	Final
07/30/14	Public Notice Copies
12/20/19	Updated report and attenuation calculations

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION

The proposed project is located north and adjacent to Highway 76 and west of Adams Drive approximately 10 miles east of the I-15 freeway. The site is approximately 248 acres in size. The majority of the site is currently covered with Orange and Avocado groves. Elevation of the site ranges from 740 to 1430 MSL and slopes southerly toward Highway 76. Several natural drainage courses traverse the property with tributary areas less than 1 square mile terminating at existing culverts that cross Highway 76. One natural drainage channel crossing the western portion of the site (Frey Creek Basin) has a tributary area of approximately 4 square miles and terminates at Highway 76 where an existing bridge structure spans the creek. The proposed project is a 44 lot subdivision of single family homes with a minimum lot size of 2 acres. The project will include a system of private roads which will enter the project from Adams Drive with a secondary or emergency access to the site off of Highway 76. Approximately 202.5 acres of the 248.3 acre site will remain in its natural state as open space.



VICINITY MAP

2.0 PURPOSE

The purpose of this study is to determine the peak runoff rates and velocities for the pre-development and post-development conditions. Comparisons will be made at the same discharge points for each drainage basin affecting the site and adjacent properties. The adequacy of existing conveyance facilities affected by the project such as culverts, sidewalk underdrains, curb inlets, and bioretention facilities will be determined.

3.0 METHODOLOGY

The Rational Method as outlined in the County of San Diego Hydrology Manual, dated June 2003, was used to determine the runoff flow rate for basins 1 and 2 which have tributary areas less than 1 square mile. The Soil Conservation Service – NRCS Hydrologic Method as outlined in the County's hydrology manual was used to determine the peak flow rate for basin 3 which has a tributary area of approximately 4 square miles. The 100-year frequency storm event was analyzed to determine peak runoff rates discharging the site for both the existing and post-development condition. The Rick Engineering Company Rational Method program for San Diego County and Hydrology Studio were used for attenuation calculations, and San Diego Hydrology Model 3.1 (SDHM) were used for the hydromodification calculations.

Soil type on-site and within the tributary areas was determined to be a combination of types A, B and C from the Soil Hydrologic Groups map (see Appendix A). Runoff coefficients, "C" were determined from Table 3-1 (Appendix A) based on Land Use and Soil Type as follows:

- Undisturbed Natural Terrain / Permanent Open Space → C = 0.20 – 0.30
- Low Density Residential (LDR) / Residential, 1.0 DU/AC or less → C = 0.27 – 0.36

Weighted Coefficients were used in the calculations to determine C in areas with multiple soil types and impervious areas.

4.0 HYDROLOGY

4.1 Pre-Development Conditions

A pre-development hydrology map delineating basin areas, flow paths, concentration points, and existing drainage facilities has been prepared and is attached to this report as Exhibit "A". Pre-development hydrology calculations can be found in Appendix C.

Basin 1 – Runoff currently flows southerly over existing natural terrain and groves terminating at Highway 76 where a double 42" RCP culvert conveys runoff under Highway 76.

Basin 2 – Runoff currently flows southerly through the groves in a mostly defined natural channel toward Highway 76 where an existing 36" RCP culvert conveys runoff under Highway 76.

Basin 3 – The Frey Creek basin begins northerly and easterly of the proposed site. Runoff from the hillsides flows toward the creek bed which runs southwesterly through the hills crossing the northern portion of the site and running south toward Highway 76 across the western side of the

property. At Highway 76 a large bridge structure spans the creek with the deck approximately 20' above the creek bed.

4.2 Post-Development Conditions

A post-development hydrology map delineating basin areas, flow paths, concentration points, and proposed drainage facilities has been prepared and is attached to this report as Exhibit "B". Post-development hydrology calculations can be found in Appendix C.

Basin 1 – In the post-development condition, runoff will continue to flow southerly towards the existing culvert at Highway 76, as described in the pre-development conditions section for Basin 1. The runoff, however, will be interrupted by streets traversing the site and will be directed through proposed new culverts and routed in brow ditches or earthen channels back to the natural drainage courses traversing the site. Runoff discharging from proposed streets, driveways, homes and existing groove areas will be routed through proposed bioretention facilities and/or tree wells and dispersion areas prior to discharging to the natural terrain. The development will not result in an increase in peak discharge from basin 1.

Basin 2 – In the post-development condition, runoff will continue to flow southerly toward the existing culvert at Highway 76, as described in the pre-development conditions for Basin 2. The runoff, however, will be routed through proposed new culverts and routed in brow ditches or earthen channels back to the natural drainage courses traversing the site. All runoff will continue to concentrate at the existing culvert crossing at Highway 76. Runoff discharging from proposed streets, driveways, homes and existing groove areas will be routed through proposed bioretenton and/or tree wells and dispersion areas prior to discharging to the natural terrain. The development will result in increase in peak discharge from basin 2 of approximately 42.5 cfs. The bioretention facilities proposed for this project will mitigate any increase in runoff also the two larger bioretention facilities Imp's 10.22 and 2.06 will be larger and designed to allow for more ponding to mitigate the increase in discharge.

Basin 3 – In the post development condition the characteristics of the basin will remain pretty much the same as in the pre-development condition with the exception of approximately 15 acres of the 4 square mile tributary basin will be developed with single family homes. The development will affect less than 1% of the total drainage shed. On pad bioretention facilities are proposed for each lot in this tributary area. Additionally all the impervious areas from the driveways, and homes will be treated by on pad dispersion areas and water released off pad through existing mature groves utilizing tree wells for additional WQ treatment. See hydro-mod calculations and attenuation analysis (Appendix C & F).

5.0 CONCLUSION

The development of this site will create an increase in total runoff, however the construction of bioretention facilities and associated Hydromodification improvements will mitigate any increase in runoff. There will be no net increase in peak runoff at the locations of the existing culverts crossing under Highway 76. All runoff discharging from the site across Highway 76 enters the San Luis Rey River south of the Highway. Table 1 below provides a summary of the pre- and post-development areas and flows at the project discharge points. Hydromodification by its definition will handle any post construction changes in flow characteristics.

Note: Ref. section 6.2.7 of the Hydraulic Design Manual.

“Conjunctive use of detention facilities for water quality treatment and flood management is acceptable, and encouraged when it is desirable and feasible. When an aboveground detention facility is used for both water quality and flood control, the flood storage volume shall be provided in addition to the storage volume designated for water quality treatment.” ***

*** Per Table 2 below: See provided calculations showing that the DCV can be retained within the soil and storage layers of the basin using the pore storage volume, therefore the flood storage volume will be counted at the bottom surface elevation of the basin for Attenuation calcultaions.

See the SDHM Hydromodification modeling in (Appendix F)

Table 1 – Attenuation of 100-year Flows

	Q100 - (CFS)		
POC	PRE-DEV.	POST DEV. w/o ATTENUATION	POST w/ ATTENUATION
CP # 1	108.8	95.9	69.29
CP # 2	38.7	42.5	25.57
CP # 3	3,000.1	3,000.1	3,000.1

Table 2 – DCV Volume Pore Storage Calculations

DCV retained by underground storage - Basin 1												
	Void	IMP 10.10	IMP 10.11,12,14	IMP 10.13	IMP 10.15	IMP 10.19	DB 1.11	DB 1.12	DB 1.13	IMP 1.14	DB 1.15	
Final DCV Tributary to BMP		1,075	3,374	1,591	0	1,045	0	0	0	1,861	0	C.F.
Provided Surface Area		1,220	4,020	1,320	0	1,245	0	0	0	3,125	0	S.F.
Provided Soil Media Thickness	40%	21	21	21	0	21	0	0	0	21	0	IN.
Provided Gravel Thickness	40%	12	12	16	0	12	0	0	0	12	0	IN.
Underground storage provided		1,342	4,422	1,628	0	1,370	0	0	0	3,438	0	C.F.
Excess underground storage		267	1,048	37	0	325	0	0	0	1,577	0	C.F.
DCV retained by underground storage - Basin 2												
	Void	DB 2.04	IMP-10.21	IMP-10.16	IMP-10.17	IMP-10.18	IMP-10.22	DB 2.01	DB 2.02	IMP 2.06	Large Lot	
Final DCV Tributary to BMP	Void	0	0	2,734	940	0	6,072	2,863	0	9,910	0	C.F.
Provided Surface Area		0	0	3,500	1,100	0	6,960	1,740	0	10,344	400	S.F.
Provided Soil Media Thickness	40%	0	0	21	21	0	21	21	0	21	0	IN.
Provided Gravel Thickness	40%	0	0	12	12	0	12	30	0	12	0	IN.
Underground storage provided		0	0	3,850	1,210	0	7,656	2,958	0	11,378	0	C.F.
Excess underground storage		0	0	1,116	270	0	1,584	95	0	1,468	0	C.F.
				= Drainage areas directed to "Basins w/ underground pore storage layers"								
				= Drainage areas directed to "Dispersion Areas" and "Tree Wells"								

REFERENCES

U.S. Army Corps of Engineers. Hec-HMS Hydrologic Modeling Software. (Software Version 3.3)

CivilDesign Corporation. *San Diego County Rational Method*. (Software Version 7.5)

County of San Diego Department of Public Works Flood Control Section. *San Diego County Hydrology Manual.* (2003)

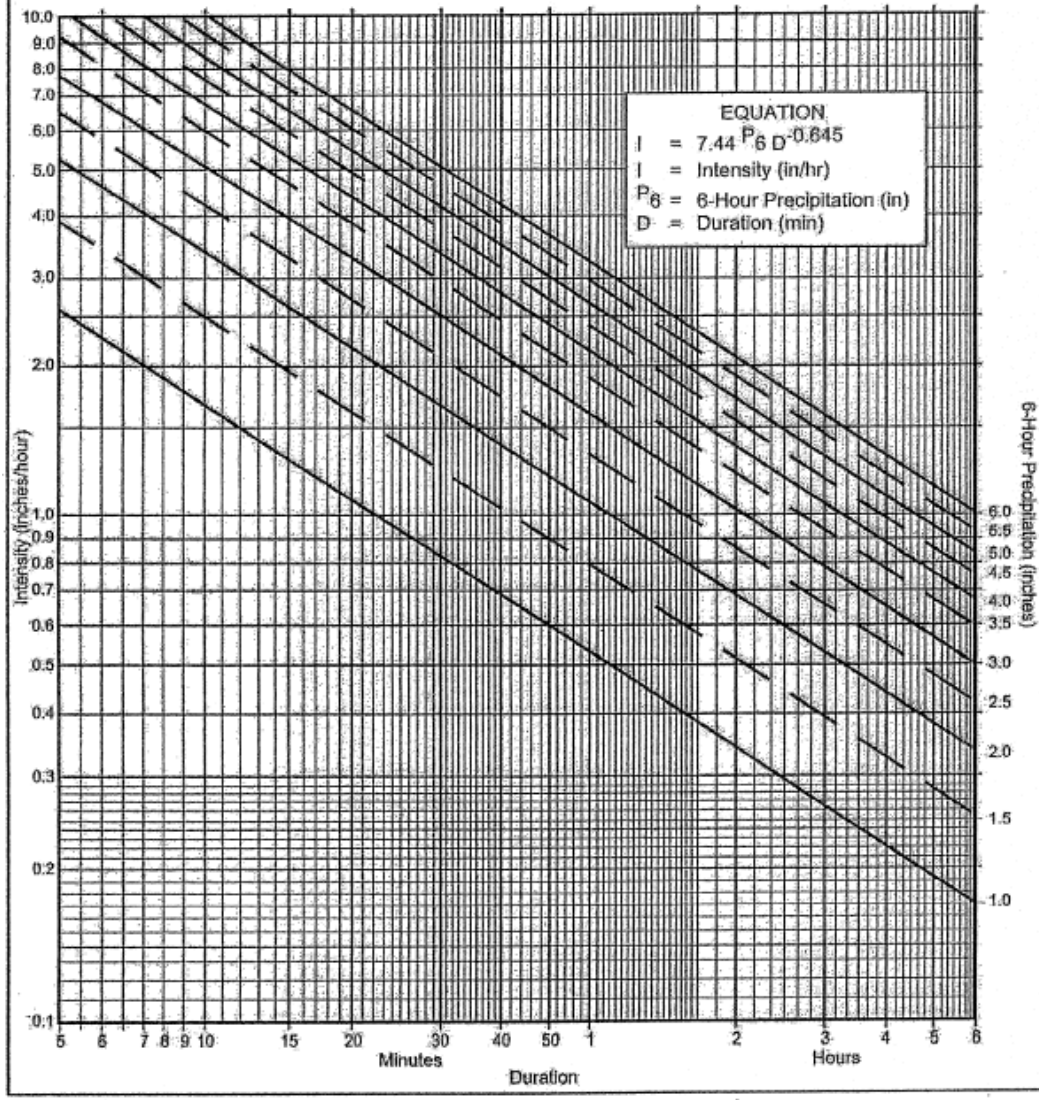
APPENDIX “A”

REFERANCE CHARTS – TABLES AND FIGURES

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.7 in., P_{24} = 7.5, $\frac{P_6}{P_{24}}$ = 49.3 %(2)

(c) Adjusted P_6(2) = 3.7 in.

(d) t_x = _____ min.

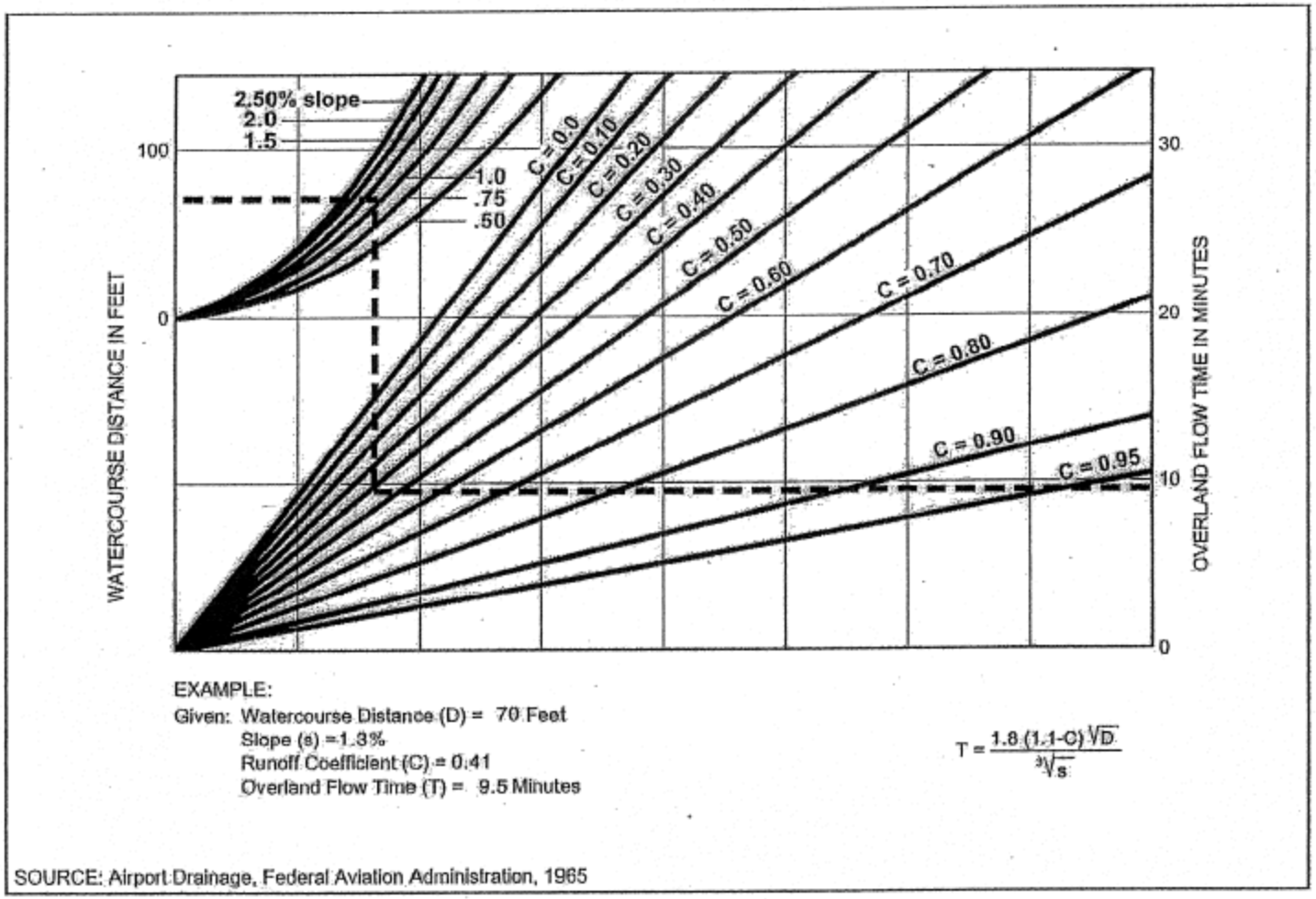
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P_6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.69	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

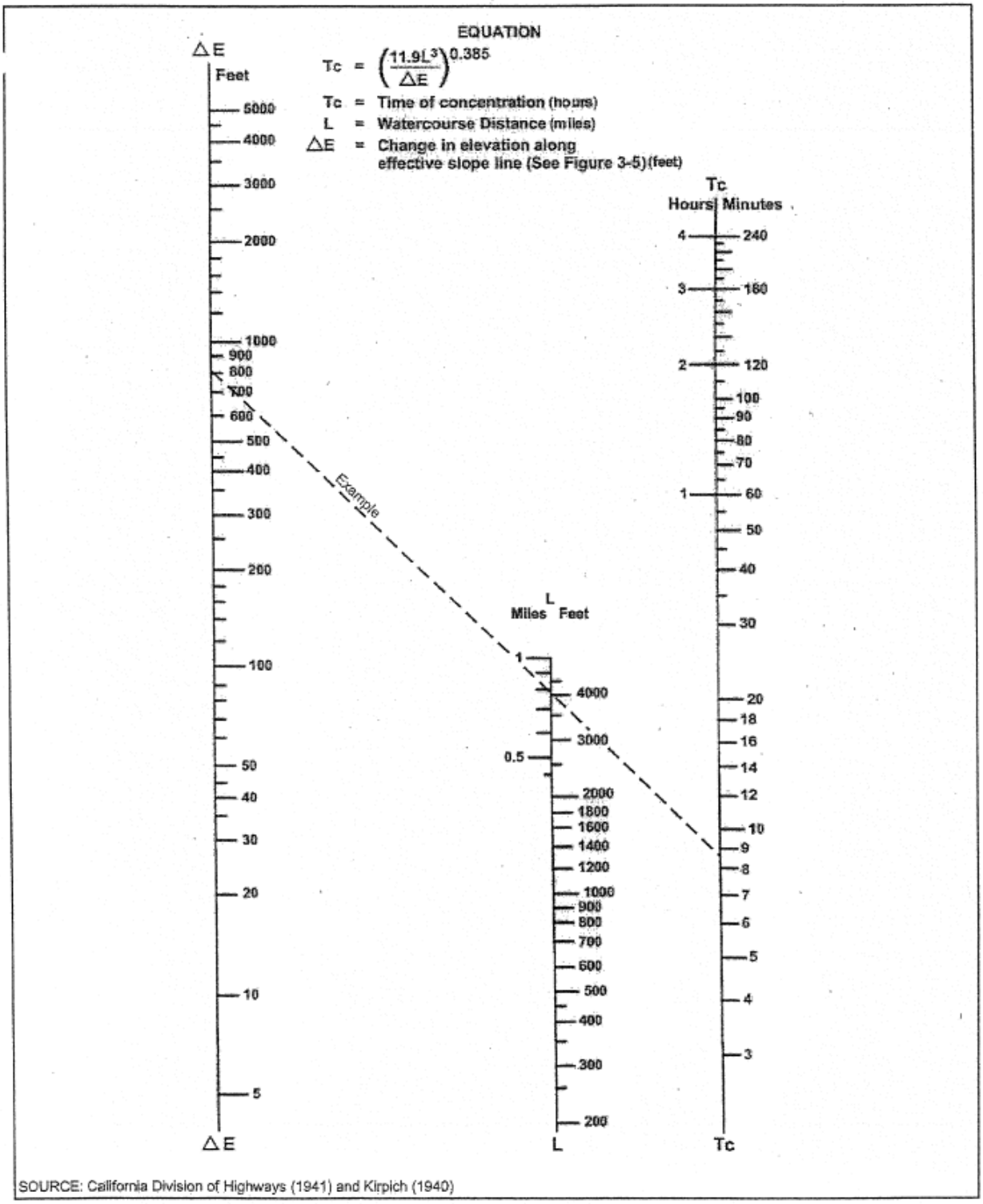
FIGURE
3-1



FIGURE

3-3

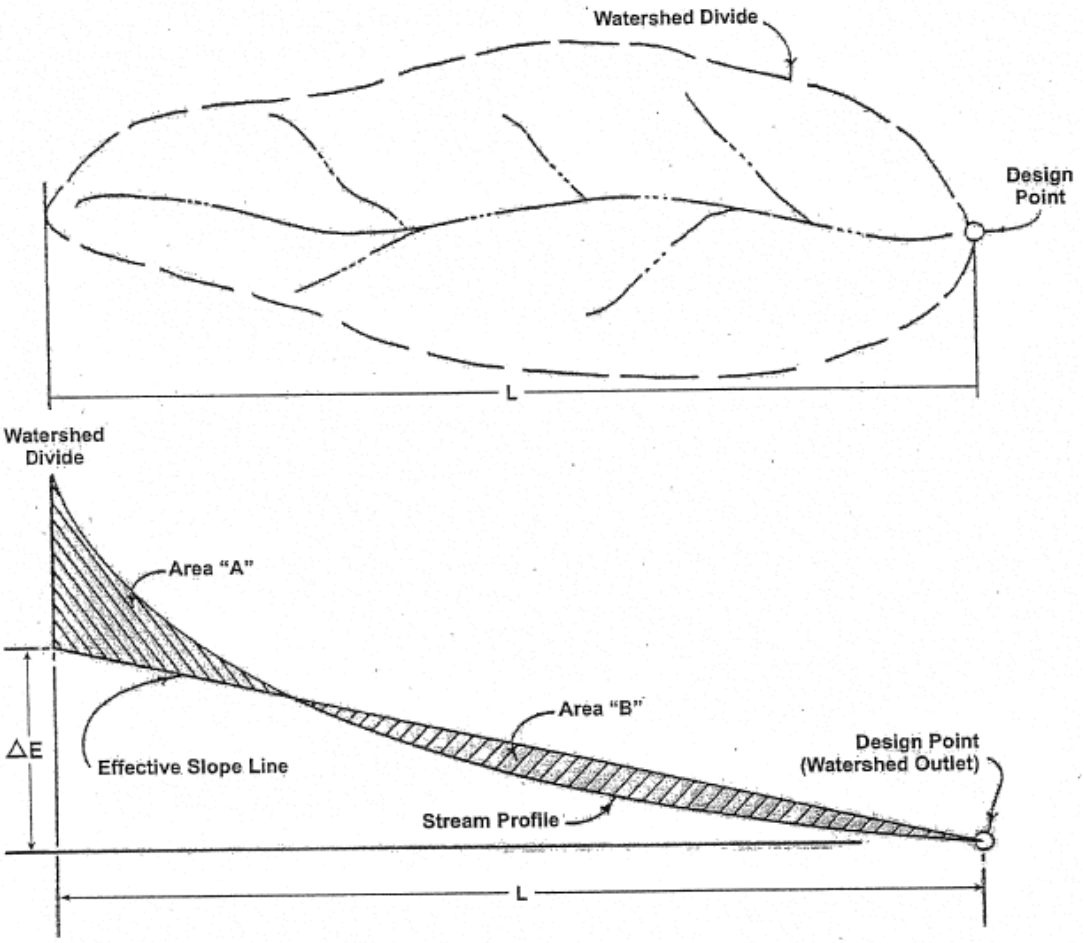
Rational Formula - Overland Time of Flow Nomograph



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

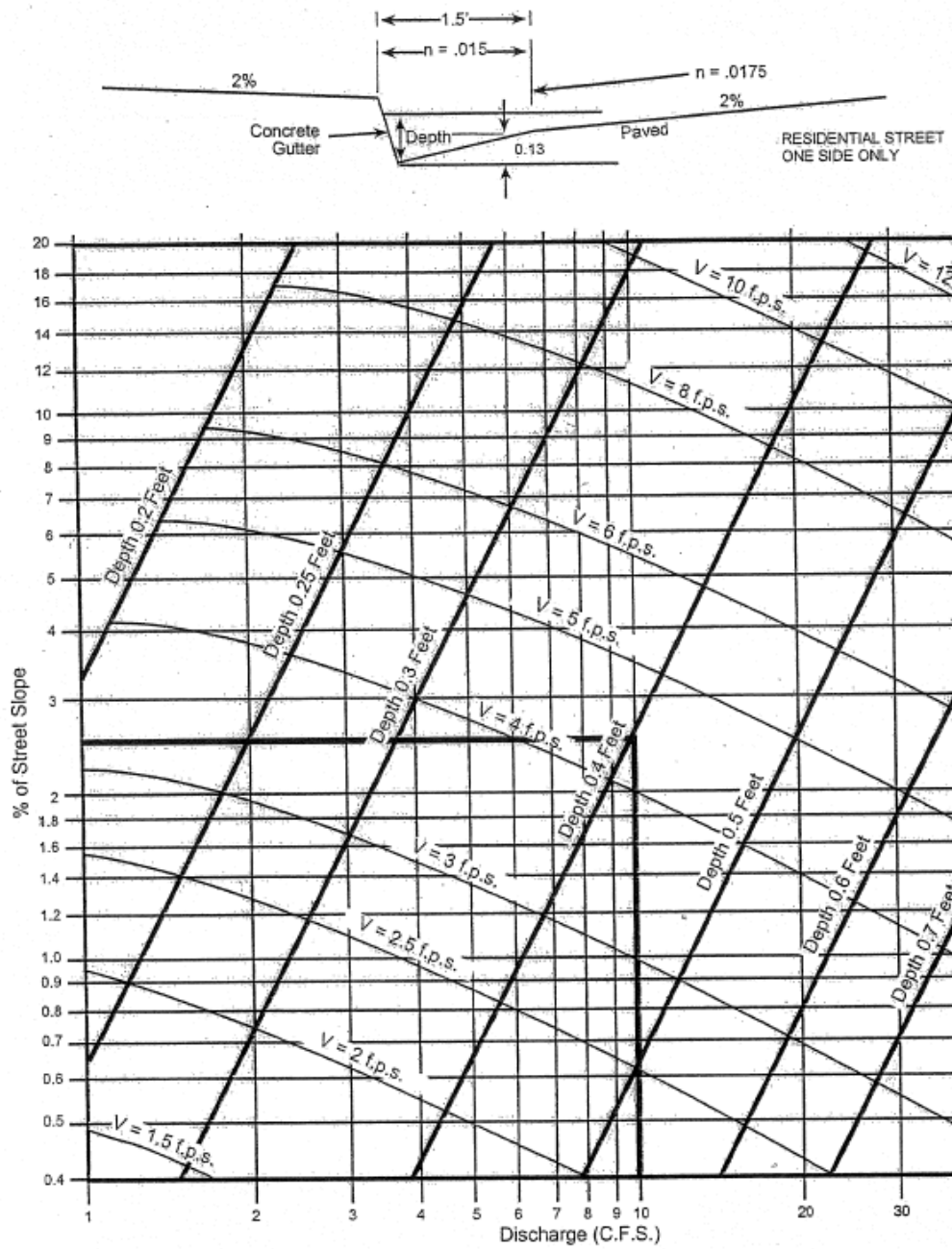
Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-5

Computation of Effective Slope for Natural Watersheds

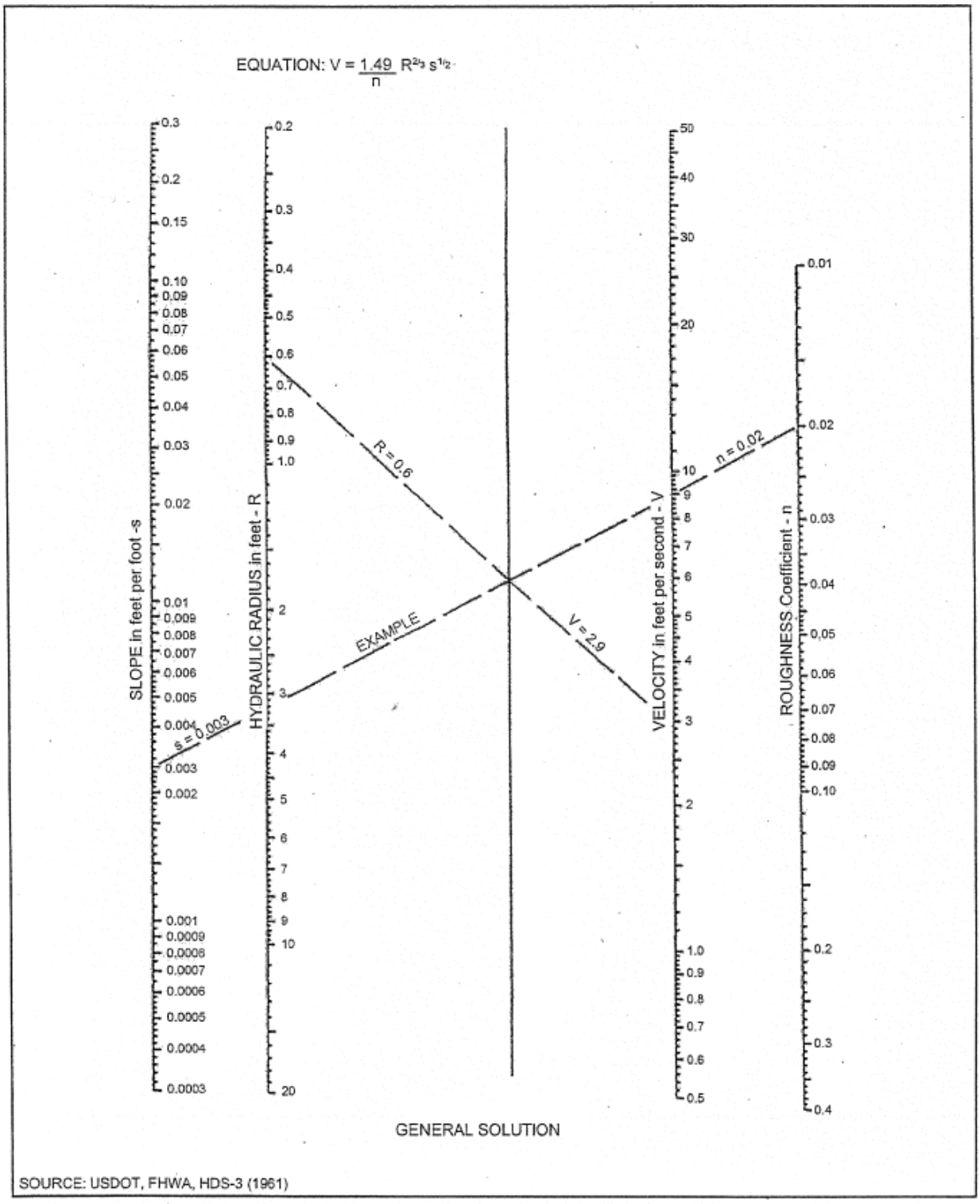


EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

FIGURE 3-6

Gutter and Roadway Discharge - Velocity Chart



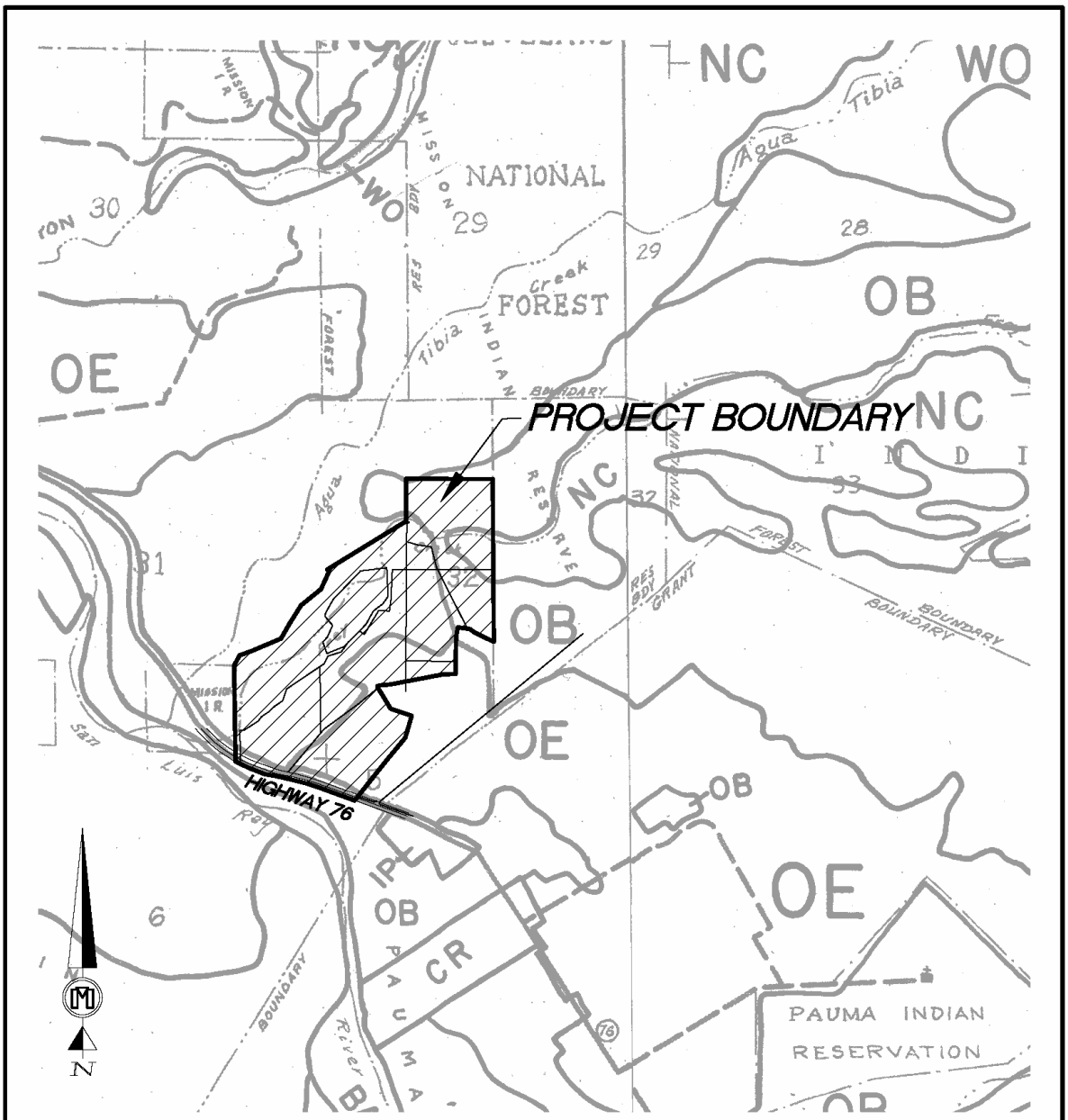
SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE 3-7

Manning's Equation Nomograph

County of San Diego
Hydrology Manual
Rainfall Isopluvials
100 Year Rainfall Event - 6 Hours
Isopluvial (inches)
DPW GIS
SanGIS
Miles
SITE
Riverside County
Imperial County
Orange County
Pacific Ocean
Mexico

County of San Diego
Hydrology Manual
Rainfall Isophrvials
100 Year Rainfall Event - 24 Hours
Isopluvial (inches)
DPW GIS
SanGIS
N
E
W
S
3 0 3 Miles
SITE
Riverside County
Imperial County
Orange County
Pacific Ocean
Mexico



GROUND COVER

FROM COUNTY OF SAN DIEGO MAPS
SHEETS 13 AND 14

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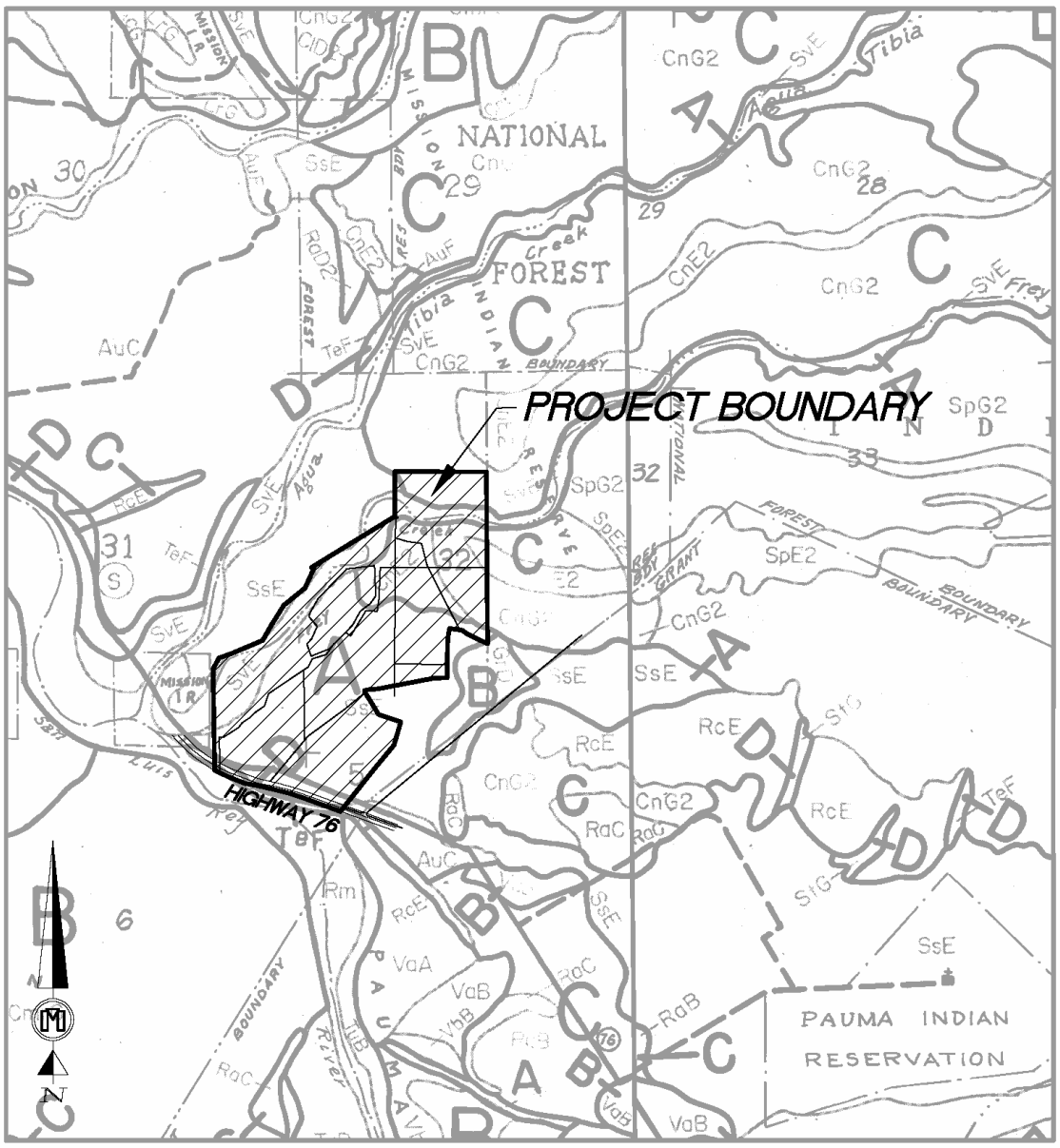
Date: October 30, 2013 - 3:50 PM by: dmasson



HYDROLOGIC SOIL GROUPS

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Date: October 30, 2013 - 3:50 PM by: dmasson

APPENDIX “B”

HYDROGRAPHS – PRE AND POST

BASIN’S 1, 2, AND 3

Basin 1 - Predevelopment

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 38 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 152.88 ACRES RUNOFF COEFFICIENT 0.27
PEAK DISCHARGE 108.8 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	38	DISCHARGE (CFS) =	9.7
TIME (MIN) =	76	DISCHARGE (CFS) =	10.5
TIME (MIN) =	114	DISCHARGE (CFS) =	12.9
TIME (MIN) =	152	DISCHARGE (CFS) =	14.7
TIME (MIN) =	190	DISCHARGE (CFS) =	21.5
TIME (MIN) =	228	DISCHARGE (CFS) =	30.3
TIME (MIN) =	266	DISCHARGE (CFS) =	108.8
TIME (MIN) =	304	DISCHARGE (CFS) =	17.3
TIME (MIN) =	342	DISCHARGE (CFS) =	11.6
TIME (MIN) =	380	DISCHARGE (CFS) =	0

Basin 2 - Predevelopment

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/18/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 48 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 63.2 ACRES
RUNOFF COEFFICIENT 0.27 PEAK DISCHARGE 38.7 CFS

TIME (MIN) =	0	DISCHARGE (CFS) = 0
TIME (MIN) =	48	DISCHARGE (CFS) = 3.7
TIME (MIN) =	96	DISCHARGE (CFS) = 4.6
TIME (MIN) =	144	DISCHARGE (CFS) = 5.2
TIME (MIN) =	192	DISCHARGE (CFS) = 7.7
TIME (MIN) =	240	DISCHARGE (CFS) = 10.8
TIME (MIN) =	288	DISCHARGE (CFS) = 38.7
TIME (MIN) =	336	DISCHARGE (CFS) = 6.1
TIME (MIN) =	384	DISCHARGE (CFS) = 4.1
TIME (MIN) =	432	DISCHARGE (CFS) = 0

Basin 3 Single Lot - Predevelopment

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/18/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 19 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 0.91 ACRES

RUNOFF COEFFICIENT 0.27 PEAK DISCHARGE 1 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	19	DISCHARGE (CFS) =	0
TIME (MIN) =	38	DISCHARGE (CFS) =	0.1
TIME (MIN) =	57	DISCHARGE (CFS) =	0.1
TIME (MIN) =	76	DISCHARGE (CFS) =	0.1
TIME (MIN) =	95	DISCHARGE (CFS) =	0.1
TIME (MIN) =	114	DISCHARGE (CFS) =	0.1
TIME (MIN) =	133	DISCHARGE (CFS) =	0.1
TIME (MIN) =	152	DISCHARGE (CFS) =	0.1
TIME (MIN) =	171	DISCHARGE (CFS) =	0.1
TIME (MIN) =	190	DISCHARGE (CFS) =	0.1
TIME (MIN) =	209	DISCHARGE (CFS) =	0.1
TIME (MIN) =	228	DISCHARGE (CFS) =	0.2
TIME (MIN) =	247	DISCHARGE (CFS) =	0.3
TIME (MIN) =	266	DISCHARGE (CFS) =	1
TIME (MIN) =	285	DISCHARGE (CFS) =	0.2
TIME (MIN) =	304	DISCHARGE (CFS) =	0.1
TIME (MIN) =	323	DISCHARGE (CFS) =	0.1
TIME (MIN) =	342	DISCHARGE (CFS) =	0.1
TIME (MIN) =	361	DISCHARGE (CFS) =	0.1
TIME (MIN) =	380	DISCHARGE (CFS) =	0

Drainage Basin 1.01

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 25 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 10.3 ACRES

RUNOFF COEFFICIENT 0.23 PEAK DISCHARGE 8.2 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	25	DISCHARGE (CFS) =	0.5
TIME (MIN) =	50	DISCHARGE (CFS) =	0.6
TIME (MIN) =	75	DISCHARGE (CFS) =	0.6
TIME (MIN) =	100	DISCHARGE (CFS) =	0.7
TIME (MIN) =	125	DISCHARGE (CFS) =	0.8
TIME (MIN) =	150	DISCHARGE (CFS) =	1
TIME (MIN) =	175	DISCHARGE (CFS) =	1.1
TIME (MIN) =	200	DISCHARGE (CFS) =	1.6
TIME (MIN) =	225	DISCHARGE (CFS) =	2.3
TIME (MIN) =	250	DISCHARGE (CFS) =	8.2
TIME (MIN) =	275	DISCHARGE (CFS) =	1.3
TIME (MIN) =	300	DISCHARGE (CFS) =	0.9
TIME (MIN) =	325	DISCHARGE (CFS) =	0.7
TIME (MIN) =	350	DISCHARGE (CFS) =	0.6
TIME (MIN) =	375	DISCHARGE (CFS) =	0

Drainage Basin 1.02

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/18/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 22 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 4.93 ACRES

RUNOFF COEFFICIENT 0.11 PEAK DISCHARGE 2 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	22	DISCHARGE (CFS) =	0
TIME (MIN) =	44	DISCHARGE (CFS) =	0.1
TIME (MIN) =	66	DISCHARGE (CFS) =	0.1
TIME (MIN) =	88	DISCHARGE (CFS) =	0.1
TIME (MIN) =	110	DISCHARGE (CFS) =	0.2
TIME (MIN) =	132	DISCHARGE (CFS) =	0.2
TIME (MIN) =	154	DISCHARGE (CFS) =	0.2
TIME (MIN) =	176	DISCHARGE (CFS) =	0.2
TIME (MIN) =	198	DISCHARGE (CFS) =	0.3
TIME (MIN) =	220	DISCHARGE (CFS) =	0.4
TIME (MIN) =	242	DISCHARGE (CFS) =	0.6
TIME (MIN) =	264	DISCHARGE (CFS) =	2
TIME (MIN) =	286	DISCHARGE (CFS) =	0.3
TIME (MIN) =	308	DISCHARGE (CFS) =	0.2
TIME (MIN) =	330	DISCHARGE (CFS) =	0.2
TIME (MIN) =	352	DISCHARGE (CFS) =	0.1
TIME (MIN) =	374	DISCHARGE (CFS) =	0

Drainage Basin 1.03

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 12 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 6.65 ACRES
RUNOFF COEFFICIENT 0.21 PEAK DISCHARGE 7.7 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	12	DISCHARGE (CFS) =	0.3
TIME (MIN) =	24	DISCHARGE (CFS) =	0.3
TIME (MIN) =	36	DISCHARGE (CFS) =	0.3
TIME (MIN) =	48	DISCHARGE (CFS) =	0.3
TIME (MIN) =	60	DISCHARGE (CFS) =	0.4
TIME (MIN) =	72	DISCHARGE (CFS) =	0.4
TIME (MIN) =	84	DISCHARGE (CFS) =	0.4
TIME (MIN) =	96	DISCHARGE (CFS) =	0.4
TIME (MIN) =	108	DISCHARGE (CFS) =	0.4
TIME (MIN) =	120	DISCHARGE (CFS) =	0.5
TIME (MIN) =	132	DISCHARGE (CFS) =	0.5
TIME (MIN) =	144	DISCHARGE (CFS) =	0.5
TIME (MIN) =	156	DISCHARGE (CFS) =	0.6
TIME (MIN) =	168	DISCHARGE (CFS) =	0.6
TIME (MIN) =	180	DISCHARGE (CFS) =	0.7
TIME (MIN) =	192	DISCHARGE (CFS) =	0.7
TIME (MIN) =	204	DISCHARGE (CFS) =	0.9
TIME (MIN) =	216	DISCHARGE (CFS) =	1
TIME (MIN) =	228	DISCHARGE (CFS) =	1.5
TIME (MIN) =	240	DISCHARGE (CFS) =	2.2
TIME (MIN) =	252	DISCHARGE (CFS) =	7.7
TIME (MIN) =	264	DISCHARGE (CFS) =	1.2
TIME (MIN) =	276	DISCHARGE (CFS) =	0.8
TIME (MIN) =	288	DISCHARGE (CFS) =	0.6
TIME (MIN) =	300	DISCHARGE (CFS) =	0.5
TIME (MIN) =	312	DISCHARGE (CFS) =	0.5
TIME (MIN) =	324	DISCHARGE (CFS) =	0.4
TIME (MIN) =	336	DISCHARGE (CFS) =	0.4
TIME (MIN) =	348	DISCHARGE (CFS) =	0.3
TIME (MIN) =	360	DISCHARGE (CFS) =	0.3
TIME (MIN) =	372	DISCHARGE (CFS) =	0

Drainage Basin 1.04

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 16 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 9.06 ACRES
RUNOFF COEFFICIENT 0.21 PEAK DISCHARGE 8.8 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	16	DISCHARGE (CFS) =	0.4
TIME (MIN) =	32	DISCHARGE (CFS) =	0.4
TIME (MIN) =	48	DISCHARGE (CFS) =	0.5
TIME (MIN) =	64	DISCHARGE (CFS) =	0.5
TIME (MIN) =	80	DISCHARGE (CFS) =	0.5
TIME (MIN) =	96	DISCHARGE (CFS) =	0.6
TIME (MIN) =	112	DISCHARGE (CFS) =	0.6
TIME (MIN) =	128	DISCHARGE (CFS) =	0.6
TIME (MIN) =	144	DISCHARGE (CFS) =	0.7
TIME (MIN) =	160	DISCHARGE (CFS) =	0.8
TIME (MIN) =	176	DISCHARGE (CFS) =	0.8
TIME (MIN) =	192	DISCHARGE (CFS) =	1
TIME (MIN) =	208	DISCHARGE (CFS) =	1.2
TIME (MIN) =	224	DISCHARGE (CFS) =	1.7
TIME (MIN) =	240	DISCHARGE (CFS) =	2.4
TIME (MIN) =	256	DISCHARGE (CFS) =	8.8
TIME (MIN) =	272	DISCHARGE (CFS) =	1.4
TIME (MIN) =	288	DISCHARGE (CFS) =	0.9
TIME (MIN) =	304	DISCHARGE (CFS) =	0.7
TIME (MIN) =	320	DISCHARGE (CFS) =	0.6
TIME (MIN) =	336	DISCHARGE (CFS) =	0.5
TIME (MIN) =	352	DISCHARGE (CFS) =	0.5
TIME (MIN) =	368	DISCHARGE (CFS) =	0.4
TIME (MIN) =	384	DISCHARGE (CFS) =	0

Drainage Basin 1.05

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 15 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 2.72 ACRES

RUNOFF COEFFICIENT 0.12 PEAK DISCHARGE 1.6 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	15	DISCHARGE (CFS) =	0.1
TIME (MIN) =	30	DISCHARGE (CFS) =	0.1
TIME (MIN) =	45	DISCHARGE (CFS) =	0.1
TIME (MIN) =	60	DISCHARGE (CFS) =	0.1
TIME (MIN) =	75	DISCHARGE (CFS) =	0.1
TIME (MIN) =	90	DISCHARGE (CFS) =	0.1
TIME (MIN) =	105	DISCHARGE (CFS) =	0.1
TIME (MIN) =	120	DISCHARGE (CFS) =	0.1
TIME (MIN) =	135	DISCHARGE (CFS) =	0.1
TIME (MIN) =	150	DISCHARGE (CFS) =	0.1
TIME (MIN) =	165	DISCHARGE (CFS) =	0.1
TIME (MIN) =	180	DISCHARGE (CFS) =	0.2
TIME (MIN) =	195	DISCHARGE (CFS) =	0.2
TIME (MIN) =	210	DISCHARGE (CFS) =	0.2
TIME (MIN) =	225	DISCHARGE (CFS) =	0.3
TIME (MIN) =	240	DISCHARGE (CFS) =	0.4
TIME (MIN) =	255	DISCHARGE (CFS) =	1.6
TIME (MIN) =	270	DISCHARGE (CFS) =	0.2
TIME (MIN) =	285	DISCHARGE (CFS) =	0.2
TIME (MIN) =	300	DISCHARGE (CFS) =	0.1
TIME (MIN) =	315	DISCHARGE (CFS) =	0.1
TIME (MIN) =	330	DISCHARGE (CFS) =	0.1
TIME (MIN) =	345	DISCHARGE (CFS) =	0.1
TIME (MIN) =	360	DISCHARGE (CFS) =	0.1
TIME (MIN) =	375	DISCHARGE (CFS) =	0

Drainage Basin 1.06

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 26 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 28.93 ACRES

RUNOFF COEFFICIENT 0.18 PEAK DISCHARGE 17.5 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	26	DISCHARGE (CFS) =	1.2
TIME (MIN) =	52	DISCHARGE (CFS) =	1.3
TIME (MIN) =	78	DISCHARGE (CFS) =	1.4
TIME (MIN) =	104	DISCHARGE (CFS) =	1.6
TIME (MIN) =	130	DISCHARGE (CFS) =	1.7
TIME (MIN) =	156	DISCHARGE (CFS) =	2.1
TIME (MIN) =	182	DISCHARGE (CFS) =	2.4
TIME (MIN) =	208	DISCHARGE (CFS) =	3.5
TIME (MIN) =	234	DISCHARGE (CFS) =	4.9
TIME (MIN) =	260	DISCHARGE (CFS) =	17.5
TIME (MIN) =	286	DISCHARGE (CFS) =	2.8
TIME (MIN) =	312	DISCHARGE (CFS) =	1.9
TIME (MIN) =	338	DISCHARGE (CFS) =	1.5
TIME (MIN) =	364	DISCHARGE (CFS) =	1.2
TIME (MIN) =	390	DISCHARGE (CFS) =	0

Drainage Basin 1.07

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 30 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 18.71 ACRES
RUNOFF COEFFICIENT 0.12 PEAK DISCHARGE 6.9 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	30	DISCHARGE (CFS) =	0.5
TIME (MIN) =	60	DISCHARGE (CFS) =	0.5
TIME (MIN) =	90	DISCHARGE (CFS) =	0.6
TIME (MIN) =	120	DISCHARGE (CFS) =	0.7
TIME (MIN) =	150	DISCHARGE (CFS) =	0.8
TIME (MIN) =	180	DISCHARGE (CFS) =	0.9
TIME (MIN) =	210	DISCHARGE (CFS) =	1.4
TIME (MIN) =	240	DISCHARGE (CFS) =	1.9
TIME (MIN) =	270	DISCHARGE (CFS) =	6.9
TIME (MIN) =	300	DISCHARGE (CFS) =	1.1
TIME (MIN) =	330	DISCHARGE (CFS) =	0.7
TIME (MIN) =	360	DISCHARGE (CFS) =	0.6
TIME (MIN) =	390	DISCHARGE (CFS) =	0

Drainage Basin 1.08

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 15 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 2.23 ACRES

RUNOFF COEFFICIENT 0.1 PEAK DISCHARGE 1.1 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	15	DISCHARGE (CFS) =	0
TIME (MIN) =	30	DISCHARGE (CFS) =	0.1
TIME (MIN) =	45	DISCHARGE (CFS) =	0.1
TIME (MIN) =	60	DISCHARGE (CFS) =	0.1
TIME (MIN) =	75	DISCHARGE (CFS) =	0.1
TIME (MIN) =	90	DISCHARGE (CFS) =	0.1
TIME (MIN) =	105	DISCHARGE (CFS) =	0.1
TIME (MIN) =	120	DISCHARGE (CFS) =	0.1
TIME (MIN) =	135	DISCHARGE (CFS) =	0.1
TIME (MIN) =	150	DISCHARGE (CFS) =	0.1
TIME (MIN) =	165	DISCHARGE (CFS) =	0.1
TIME (MIN) =	180	DISCHARGE (CFS) =	0.1
TIME (MIN) =	195	DISCHARGE (CFS) =	0.1
TIME (MIN) =	210	DISCHARGE (CFS) =	0.1
TIME (MIN) =	225	DISCHARGE (CFS) =	0.2
TIME (MIN) =	240	DISCHARGE (CFS) =	0.3
TIME (MIN) =	255	DISCHARGE (CFS) =	1.1
TIME (MIN) =	270	DISCHARGE (CFS) =	0.2
TIME (MIN) =	285	DISCHARGE (CFS) =	0.1
TIME (MIN) =	300	DISCHARGE (CFS) =	0.1
TIME (MIN) =	315	DISCHARGE (CFS) =	0.1
TIME (MIN) =	330	DISCHARGE (CFS) =	0.1
TIME (MIN) =	345	DISCHARGE (CFS) =	0.1
TIME (MIN) =	360	DISCHARGE (CFS) =	0.1
TIME (MIN) =	375	DISCHARGE (CFS) =	0

Drainage Basin 1.09

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 11 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 6.13 ACRES
RUNOFF COEFFICIENT 0.1 PEAK DISCHARGE 3.6 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	11	DISCHARGE (CFS) =	0.1
TIME (MIN) =	22	DISCHARGE (CFS) =	0.1
TIME (MIN) =	33	DISCHARGE (CFS) =	0.1
TIME (MIN) =	44	DISCHARGE (CFS) =	0.1
TIME (MIN) =	55	DISCHARGE (CFS) =	0.2
TIME (MIN) =	66	DISCHARGE (CFS) =	0.2
TIME (MIN) =	77	DISCHARGE (CFS) =	0.2
TIME (MIN) =	88	DISCHARGE (CFS) =	0.2
TIME (MIN) =	99	DISCHARGE (CFS) =	0.2
TIME (MIN) =	110	DISCHARGE (CFS) =	0.2
TIME (MIN) =	121	DISCHARGE (CFS) =	0.2
TIME (MIN) =	132	DISCHARGE (CFS) =	0.2
TIME (MIN) =	143	DISCHARGE (CFS) =	0.2
TIME (MIN) =	154	DISCHARGE (CFS) =	0.2
TIME (MIN) =	165	DISCHARGE (CFS) =	0.3
TIME (MIN) =	176	DISCHARGE (CFS) =	0.3
TIME (MIN) =	187	DISCHARGE (CFS) =	0.3
TIME (MIN) =	198	DISCHARGE (CFS) =	0.3
TIME (MIN) =	209	DISCHARGE (CFS) =	0.4
TIME (MIN) =	220	DISCHARGE (CFS) =	0.5
TIME (MIN) =	231	DISCHARGE (CFS) =	0.7
TIME (MIN) =	242	DISCHARGE (CFS) =	1
TIME (MIN) =	253	DISCHARGE (CFS) =	3.6
TIME (MIN) =	264	DISCHARGE (CFS) =	0.6
TIME (MIN) =	275	DISCHARGE (CFS) =	0.4
TIME (MIN) =	286	DISCHARGE (CFS) =	0.3
TIME (MIN) =	297	DISCHARGE (CFS) =	0.3
TIME (MIN) =	308	DISCHARGE (CFS) =	0.2
TIME (MIN) =	319	DISCHARGE (CFS) =	0.2
TIME (MIN) =	330	DISCHARGE (CFS) =	0.2
TIME (MIN) =	341	DISCHARGE (CFS) =	0.2
TIME (MIN) =	352	DISCHARGE (CFS) =	0.2
TIME (MIN) =	363	DISCHARGE (CFS) =	0.1
TIME (MIN) =	374	DISCHARGE (CFS) =	0

Drainage Basin 1.10

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 41 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 23.76 ACRES
RUNOFF COEFFICIENT 0.1 PEAK DISCHARGE 6 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	41	DISCHARGE (CFS) =	0.5
TIME (MIN) =	82	DISCHARGE (CFS) =	0.6
TIME (MIN) =	123	DISCHARGE (CFS) =	0.7
TIME (MIN) =	164	DISCHARGE (CFS) =	0.8
TIME (MIN) =	205	DISCHARGE (CFS) =	1.2
TIME (MIN) =	246	DISCHARGE (CFS) =	1.6
TIME (MIN) =	287	DISCHARGE (CFS) =	6
TIME (MIN) =	328	DISCHARGE (CFS) =	0.9
TIME (MIN) =	369	DISCHARGE (CFS) =	0.6
TIME (MIN) =	410	DISCHARGE (CFS) =	0

Drainage Basin 1.11

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 33 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 6.5 ACRES

RUNOFF COEFFICIENT 0.1 PEAK DISCHARGE 1.9 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	33	DISCHARGE (CFS) =	0.1
TIME (MIN) =	66	DISCHARGE (CFS) =	0.2
TIME (MIN) =	99	DISCHARGE (CFS) =	0.2
TIME (MIN) =	132	DISCHARGE (CFS) =	0.2
TIME (MIN) =	165	DISCHARGE (CFS) =	0.3
TIME (MIN) =	198	DISCHARGE (CFS) =	0.4
TIME (MIN) =	231	DISCHARGE (CFS) =	0.5
TIME (MIN) =	264	DISCHARGE (CFS) =	1.9
TIME (MIN) =	297	DISCHARGE (CFS) =	0.3
TIME (MIN) =	330	DISCHARGE (CFS) =	0.2
TIME (MIN) =	363	DISCHARGE (CFS) =	0.2
TIME (MIN) =	396	DISCHARGE (CFS) =	0

Drainage Basin 1.12

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 34 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 13.37 ACRES

RUNOFF COEFFICIENT 0.15 PEAK DISCHARGE 5.7 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	34	DISCHARGE (CFS) =	0.4
TIME (MIN) =	68	DISCHARGE (CFS) =	0.5
TIME (MIN) =	102	DISCHARGE (CFS) =	0.5
TIME (MIN) =	136	DISCHARGE (CFS) =	0.7
TIME (MIN) =	170	DISCHARGE (CFS) =	0.8
TIME (MIN) =	204	DISCHARGE (CFS) =	1.1
TIME (MIN) =	238	DISCHARGE (CFS) =	1.6
TIME (MIN) =	272	DISCHARGE (CFS) =	5.7
TIME (MIN) =	306	DISCHARGE (CFS) =	0.9
TIME (MIN) =	340	DISCHARGE (CFS) =	0.6
TIME (MIN) =	374	DISCHARGE (CFS) =	0.5
TIME (MIN) =	408	DISCHARGE (CFS) =	0

Drainage Basin 1.13

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 25 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 2.26 ACRES
RUNOFF COEFFICIENT 0.16 PEAK DISCHARGE 1.2 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	25	DISCHARGE (CFS) =	0.1
TIME (MIN) =	50	DISCHARGE (CFS) =	0.1
TIME (MIN) =	75	DISCHARGE (CFS) =	0.1
TIME (MIN) =	100	DISCHARGE (CFS) =	0.1
TIME (MIN) =	125	DISCHARGE (CFS) =	0.1
TIME (MIN) =	150	DISCHARGE (CFS) =	0.1
TIME (MIN) =	175	DISCHARGE (CFS) =	0.2
TIME (MIN) =	200	DISCHARGE (CFS) =	0.2
TIME (MIN) =	225	DISCHARGE (CFS) =	0.4
TIME (MIN) =	250	DISCHARGE (CFS) =	1.2
TIME (MIN) =	275	DISCHARGE (CFS) =	0.2
TIME (MIN) =	300	DISCHARGE (CFS) =	0.1
TIME (MIN) =	325	DISCHARGE (CFS) =	0.1
TIME (MIN) =	350	DISCHARGE (CFS) =	0.1
TIME (MIN) =	375	DISCHARGE (CFS) =	0

Drainage Basin 1.14

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 20 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 3 ACRES
RUNOFF COEFFICIENT 0.19 PEAK DISCHARGE 2.3 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	20	DISCHARGE (CFS) =	0.1
TIME (MIN) =	40	DISCHARGE (CFS) =	0.1
TIME (MIN) =	60	DISCHARGE (CFS) =	0.1
TIME (MIN) =	80	DISCHARGE (CFS) =	0.2
TIME (MIN) =	100	DISCHARGE (CFS) =	0.2
TIME (MIN) =	120	DISCHARGE (CFS) =	0.2
TIME (MIN) =	140	DISCHARGE (CFS) =	0.2
TIME (MIN) =	160	DISCHARGE (CFS) =	0.2
TIME (MIN) =	180	DISCHARGE (CFS) =	0.3
TIME (MIN) =	200	DISCHARGE (CFS) =	0.3
TIME (MIN) =	220	DISCHARGE (CFS) =	0.4
TIME (MIN) =	240	DISCHARGE (CFS) =	0.6
TIME (MIN) =	260	DISCHARGE (CFS) =	2.3
TIME (MIN) =	280	DISCHARGE (CFS) =	0.4
TIME (MIN) =	300	DISCHARGE (CFS) =	0.2
TIME (MIN) =	320	DISCHARGE (CFS) =	0.2
TIME (MIN) =	340	DISCHARGE (CFS) =	0.2
TIME (MIN) =	360	DISCHARGE (CFS) =	0.1
TIME (MIN) =	380	DISCHARGE (CFS) =	0

Drainage Basin 1.15

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/18/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 29 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 6.79 ACRES

RUNOFF COEFFICIENT 0.1 PEAK DISCHARGE 2.1 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	29	DISCHARGE (CFS) =	0.2
TIME (MIN) =	58	DISCHARGE (CFS) =	0.2
TIME (MIN) =	87	DISCHARGE (CFS) =	0.2
TIME (MIN) =	116	DISCHARGE (CFS) =	0.2
TIME (MIN) =	145	DISCHARGE (CFS) =	0.3
TIME (MIN) =	174	DISCHARGE (CFS) =	0.3
TIME (MIN) =	203	DISCHARGE (CFS) =	0.4
TIME (MIN) =	232	DISCHARGE (CFS) =	0.6
TIME (MIN) =	261	DISCHARGE (CFS) =	2.1
TIME (MIN) =	290	DISCHARGE (CFS) =	0.3
TIME (MIN) =	319	DISCHARGE (CFS) =	0.2
TIME (MIN) =	348	DISCHARGE (CFS) =	0.2
TIME (MIN) =	377	DISCHARGE (CFS) =	0

Drainage Basin 2.01

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/13/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 24 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 5.28 ACRES

RUNOFF COEFFICIENT 0.15 PEAK DISCHARGE 2.8 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	24	DISCHARGE (CFS) =	0.2
TIME (MIN) =	48	DISCHARGE (CFS) =	0.2
TIME (MIN) =	72	DISCHARGE (CFS) =	0.2
TIME (MIN) =	96	DISCHARGE (CFS) =	0.2
TIME (MIN) =	120	DISCHARGE (CFS) =	0.3
TIME (MIN) =	144	DISCHARGE (CFS) =	0.3
TIME (MIN) =	168	DISCHARGE (CFS) =	0.3
TIME (MIN) =	192	DISCHARGE (CFS) =	0.4
TIME (MIN) =	216	DISCHARGE (CFS) =	0.6
TIME (MIN) =	240	DISCHARGE (CFS) =	0.8
TIME (MIN) =	264	DISCHARGE (CFS) =	2.8
TIME (MIN) =	288	DISCHARGE (CFS) =	0.4
TIME (MIN) =	312	DISCHARGE (CFS) =	0.3
TIME (MIN) =	336	DISCHARGE (CFS) =	0.2
TIME (MIN) =	360	DISCHARGE (CFS) =	0.2
TIME (MIN) =	384	DISCHARGE (CFS) =	0

Drainage Basin 2.02

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/13/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 30 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 12.51 ACRES

RUNOFF COEFFICIENT 0.15 PEAK DISCHARGE 5.8 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	30	DISCHARGE (CFS) =	0.4
TIME (MIN) =	60	DISCHARGE (CFS) =	0.4
TIME (MIN) =	90	DISCHARGE (CFS) =	0.5
TIME (MIN) =	120	DISCHARGE (CFS) =	0.6
TIME (MIN) =	150	DISCHARGE (CFS) =	0.7
TIME (MIN) =	180	DISCHARGE (CFS) =	0.8
TIME (MIN) =	210	DISCHARGE (CFS) =	1.1
TIME (MIN) =	240	DISCHARGE (CFS) =	1.6
TIME (MIN) =	270	DISCHARGE (CFS) =	5.8
TIME (MIN) =	300	DISCHARGE (CFS) =	0.9
TIME (MIN) =	330	DISCHARGE (CFS) =	0.6
TIME (MIN) =	360	DISCHARGE (CFS) =	0.5
TIME (MIN) =	390	DISCHARGE (CFS) =	0

Drainage Basin 2.04

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 33 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 20.15 ACRES
RUNOFF COEFFICIENT 0.13 PEAK DISCHARGE 7.6 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	33	DISCHARGE (CFS) =	0.6
TIME (MIN) =	66	DISCHARGE (CFS) =	0.7
TIME (MIN) =	99	DISCHARGE (CFS) =	0.7
TIME (MIN) =	132	DISCHARGE (CFS) =	0.9
TIME (MIN) =	165	DISCHARGE (CFS) =	1
TIME (MIN) =	198	DISCHARGE (CFS) =	1.5
TIME (MIN) =	231	DISCHARGE (CFS) =	2.1
TIME (MIN) =	264	DISCHARGE (CFS) =	7.6
TIME (MIN) =	297	DISCHARGE (CFS) =	1.2
TIME (MIN) =	330	DISCHARGE (CFS) =	0.8
TIME (MIN) =	363	DISCHARGE (CFS) =	0.6
TIME (MIN) =	396	DISCHARGE (CFS) =	0

Drainage Basin 2.06

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/13/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 45 MIN. 6 HOUR RAINFALL 3.7 INCHES

BASIN AREA 17.84 ACRES

RUNOFF COEFFICIENT 0.26 PEAK DISCHARGE 11 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	45	DISCHARGE (CFS) =	1.1
TIME (MIN) =	90	DISCHARGE (CFS) =	1.3
TIME (MIN) =	135	DISCHARGE (CFS) =	1.5
TIME (MIN) =	180	DISCHARGE (CFS) =	2.2
TIME (MIN) =	225	DISCHARGE (CFS) =	3
TIME (MIN) =	270	DISCHARGE (CFS) =	11
TIME (MIN) =	315	DISCHARGE (CFS) =	1.7
TIME (MIN) =	360	DISCHARGE (CFS) =	1.2
TIME (MIN) =	405	DISCHARGE (CFS) =	0

Drainage Basin 10.10

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 9 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.42 ACRES

RUNOFF COEFFICIENT 0.79 PEAK DISCHARGE 2.2 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	9	DISCHARGE (CFS) =	1.2
TIME (MIN) =	18	DISCHARGE (CFS) =	0.1
TIME (MIN) =	27	DISCHARGE (CFS) =	0.1
TIME (MIN) =	36	DISCHARGE (CFS) =	0.1
TIME (MIN) =	45	DISCHARGE (CFS) =	0.1
TIME (MIN) =	54	DISCHARGE (CFS) =	0.1
TIME (MIN) =	63	DISCHARGE (CFS) =	0.1
TIME (MIN) =	72	DISCHARGE (CFS) =	0.1
TIME (MIN) =	81	DISCHARGE (CFS) =	0.1
TIME (MIN) =	90	DISCHARGE (CFS) =	0.1
TIME (MIN) =	99	DISCHARGE (CFS) =	0.1
TIME (MIN) =	108	DISCHARGE (CFS) =	0.1
TIME (MIN) =	117	DISCHARGE (CFS) =	0.1
TIME (MIN) =	126	DISCHARGE (CFS) =	0.1
TIME (MIN) =	135	DISCHARGE (CFS) =	0.1
TIME (MIN) =	144	DISCHARGE (CFS) =	0.1
TIME (MIN) =	153	DISCHARGE (CFS) =	0.1
TIME (MIN) =	162	DISCHARGE (CFS) =	0.1
TIME (MIN) =	171	DISCHARGE (CFS) =	0.1
TIME (MIN) =	180	DISCHARGE (CFS) =	0.2
TIME (MIN) =	189	DISCHARGE (CFS) =	0.2
TIME (MIN) =	198	DISCHARGE (CFS) =	0.2
TIME (MIN) =	207	DISCHARGE (CFS) =	0.2
TIME (MIN) =	216	DISCHARGE (CFS) =	0.3
TIME (MIN) =	225	DISCHARGE (CFS) =	0.3
TIME (MIN) =	234	DISCHARGE (CFS) =	0.4
TIME (MIN) =	243	DISCHARGE (CFS) =	0.6
TIME (MIN) =	252	DISCHARGE (CFS) =	2.2
TIME (MIN) =	261	DISCHARGE (CFS) =	0.4
TIME (MIN) =	270	DISCHARGE (CFS) =	0.2
TIME (MIN) =	279	DISCHARGE (CFS) =	0.2
TIME (MIN) =	288	DISCHARGE (CFS) =	0.2
TIME (MIN) =	297	DISCHARGE (CFS) =	0.1
TIME (MIN) =	306	DISCHARGE (CFS) =	0.1
TIME (MIN) =	315	DISCHARGE (CFS) =	0.1
TIME (MIN) =	324	DISCHARGE (CFS) =	0.1
TIME (MIN) =	333	DISCHARGE (CFS) =	0.1
TIME (MIN) =	342	DISCHARGE (CFS) =	0.1
TIME (MIN) =	351	DISCHARGE (CFS) =	0.1
TIME (MIN) =	360	DISCHARGE (CFS) =	0.1
TIME (MIN) =	369	DISCHARGE (CFS) =	0

Drainage Basin 10.11

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/18/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 11 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.55 ACRES
RUNOFF COEFFICIENT 0.61 PEAK DISCHARGE 2 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	11	DISCHARGE (CFS) =	0.1
TIME (MIN) =	22	DISCHARGE (CFS) =	0.1
TIME (MIN) =	33	DISCHARGE (CFS) =	0.1
TIME (MIN) =	44	DISCHARGE (CFS) =	0.1
TIME (MIN) =	55	DISCHARGE (CFS) =	0.1
TIME (MIN) =	66	DISCHARGE (CFS) =	0.1
TIME (MIN) =	77	DISCHARGE (CFS) =	0.1
TIME (MIN) =	88	DISCHARGE (CFS) =	0.1
TIME (MIN) =	99	DISCHARGE (CFS) =	0.1
TIME (MIN) =	110	DISCHARGE (CFS) =	0.1
TIME (MIN) =	121	DISCHARGE (CFS) =	0.1
TIME (MIN) =	132	DISCHARGE (CFS) =	0.1
TIME (MIN) =	143	DISCHARGE (CFS) =	0.1
TIME (MIN) =	154	DISCHARGE (CFS) =	0.1
TIME (MIN) =	165	DISCHARGE (CFS) =	0.1
TIME (MIN) =	176	DISCHARGE (CFS) =	0.2
TIME (MIN) =	187	DISCHARGE (CFS) =	0.2
TIME (MIN) =	198	DISCHARGE (CFS) =	0.2
TIME (MIN) =	209	DISCHARGE (CFS) =	0.2
TIME (MIN) =	220	DISCHARGE (CFS) =	0.3
TIME (MIN) =	231	DISCHARGE (CFS) =	0.4
TIME (MIN) =	242	DISCHARGE (CFS) =	0.5
TIME (MIN) =	253	DISCHARGE (CFS) =	2
TIME (MIN) =	264	DISCHARGE (CFS) =	0.3
TIME (MIN) =	275	DISCHARGE (CFS) =	0.2
TIME (MIN) =	286	DISCHARGE (CFS) =	0.2
TIME (MIN) =	297	DISCHARGE (CFS) =	0.1
TIME (MIN) =	308	DISCHARGE (CFS) =	0.1
TIME (MIN) =	319	DISCHARGE (CFS) =	0.1
TIME (MIN) =	330	DISCHARGE (CFS) =	0.1
TIME (MIN) =	341	DISCHARGE (CFS) =	0.1
TIME (MIN) =	352	DISCHARGE (CFS) =	0.1
TIME (MIN) =	363	DISCHARGE (CFS) =	0.1
TIME (MIN) =	374	DISCHARGE (CFS) =	0

Drainage Basin 10.12

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 16 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.3 ACRES
RUNOFF COEFFICIENT 0.47 PEAK DISCHARGE 0.6 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	16	DISCHARGE (CFS) =	0
TIME (MIN) =	32	DISCHARGE (CFS) =	0
TIME (MIN) =	48	DISCHARGE (CFS) =	0
TIME (MIN) =	64	DISCHARGE (CFS) =	0
TIME (MIN) =	80	DISCHARGE (CFS) =	0
TIME (MIN) =	96	DISCHARGE (CFS) =	0
TIME (MIN) =	112	DISCHARGE (CFS) =	0
TIME (MIN) =	128	DISCHARGE (CFS) =	0
TIME (MIN) =	144	DISCHARGE (CFS) =	0.1
TIME (MIN) =	160	DISCHARGE (CFS) =	0.1
TIME (MIN) =	176	DISCHARGE (CFS) =	0.1
TIME (MIN) =	192	DISCHARGE (CFS) =	0.1
TIME (MIN) =	208	DISCHARGE (CFS) =	0.1
TIME (MIN) =	224	DISCHARGE (CFS) =	0.1
TIME (MIN) =	240	DISCHARGE (CFS) =	0.2
TIME (MIN) =	256	DISCHARGE (CFS) =	0.6
TIME (MIN) =	272	DISCHARGE (CFS) =	0.1
TIME (MIN) =	288	DISCHARGE (CFS) =	0.1
TIME (MIN) =	304	DISCHARGE (CFS) =	0.1
TIME (MIN) =	320	DISCHARGE (CFS) =	0
TIME (MIN) =	336	DISCHARGE (CFS) =	0
TIME (MIN) =	352	DISCHARGE (CFS) =	0
TIME (MIN) =	368	DISCHARGE (CFS) =	0
TIME (MIN) =	384	DISCHARGE (CFS) =	0

Drainage Basin 10.13

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 10 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.64 ACRES
RUNOFF COEFFICIENT 0.76 PEAK DISCHARGE 3 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	10	DISCHARGE (CFS) =	0.1
TIME (MIN) =	20	DISCHARGE (CFS) =	0.1
TIME (MIN) =	30	DISCHARGE (CFS) =	0.1
TIME (MIN) =	40	DISCHARGE (CFS) =	0.1
TIME (MIN) =	50	DISCHARGE (CFS) =	0.1
TIME (MIN) =	60	DISCHARGE (CFS) =	0.1
TIME (MIN) =	70	DISCHARGE (CFS) =	0.1
TIME (MIN) =	80	DISCHARGE (CFS) =	0.1
TIME (MIN) =	90	DISCHARGE (CFS) =	0.1
TIME (MIN) =	100	DISCHARGE (CFS) =	0.1
TIME (MIN) =	110	DISCHARGE (CFS) =	0.2
TIME (MIN) =	120	DISCHARGE (CFS) =	0.2
TIME (MIN) =	130	DISCHARGE (CFS) =	0.2
TIME (MIN) =	140	DISCHARGE (CFS) =	0.2
TIME (MIN) =	150	DISCHARGE (CFS) =	0.2
TIME (MIN) =	160	DISCHARGE (CFS) =	0.2
TIME (MIN) =	170	DISCHARGE (CFS) =	0.2
TIME (MIN) =	180	DISCHARGE (CFS) =	0.2
TIME (MIN) =	190	DISCHARGE (CFS) =	0.3
TIME (MIN) =	200	DISCHARGE (CFS) =	0.3
TIME (MIN) =	210	DISCHARGE (CFS) =	0.4
TIME (MIN) =	220	DISCHARGE (CFS) =	0.4
TIME (MIN) =	230	DISCHARGE (CFS) =	0.6
TIME (MIN) =	240	DISCHARGE (CFS) =	0.9
TIME (MIN) =	250	DISCHARGE (CFS) =	3
TIME (MIN) =	260	DISCHARGE (CFS) =	0.5
TIME (MIN) =	270	DISCHARGE (CFS) =	0.3
TIME (MIN) =	280	DISCHARGE (CFS) =	0.3
TIME (MIN) =	290	DISCHARGE (CFS) =	0.2
TIME (MIN) =	300	DISCHARGE (CFS) =	0.2
TIME (MIN) =	310	DISCHARGE (CFS) =	0.2
TIME (MIN) =	320	DISCHARGE (CFS) =	0.1
TIME (MIN) =	330	DISCHARGE (CFS) =	0.1
TIME (MIN) =	340	DISCHARGE (CFS) =	0.1
TIME (MIN) =	350	DISCHARGE (CFS) =	0.1
TIME (MIN) =	360	DISCHARGE (CFS) =	0.1
TIME (MIN) =	370	DISCHARGE (CFS) =	0

Drainage Basin 10.14

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 7 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.72 ACRES
RUNOFF COEFFICIENT 0.72 PEAK DISCHARGE 4.1 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	7	DISCHARGE (CFS) =	0.1
TIME (MIN) =	14	DISCHARGE (CFS) =	0.1
TIME (MIN) =	21	DISCHARGE (CFS) =	0.1
TIME (MIN) =	28	DISCHARGE (CFS) =	0.1
TIME (MIN) =	35	DISCHARGE (CFS) =	0.1
TIME (MIN) =	42	DISCHARGE (CFS) =	0.1
TIME (MIN) =	49	DISCHARGE (CFS) =	0.1
TIME (MIN) =	56	DISCHARGE (CFS) =	0.1
TIME (MIN) =	63	DISCHARGE (CFS) =	0.1
TIME (MIN) =	70	DISCHARGE (CFS) =	0.1
TIME (MIN) =	77	DISCHARGE (CFS) =	0.1
TIME (MIN) =	84	DISCHARGE (CFS) =	0.1
TIME (MIN) =	91	DISCHARGE (CFS) =	0.2
TIME (MIN) =	98	DISCHARGE (CFS) =	0.2
TIME (MIN) =	105	DISCHARGE (CFS) =	0.2
TIME (MIN) =	112	DISCHARGE (CFS) =	0.2
TIME (MIN) =	119	DISCHARGE (CFS) =	0.2
TIME (MIN) =	126	DISCHARGE (CFS) =	0.2
TIME (MIN) =	133	DISCHARGE (CFS) =	0.2
TIME (MIN) =	140	DISCHARGE (CFS) =	0.2
TIME (MIN) =	147	DISCHARGE (CFS) =	0.2
TIME (MIN) =	154	DISCHARGE (CFS) =	0.2
TIME (MIN) =	161	DISCHARGE (CFS) =	0.2
TIME (MIN) =	168	DISCHARGE (CFS) =	0.2
TIME (MIN) =	175	DISCHARGE (CFS) =	0.3
TIME (MIN) =	182	DISCHARGE (CFS) =	0.3
TIME (MIN) =	189	DISCHARGE (CFS) =	0.3
TIME (MIN) =	196	DISCHARGE (CFS) =	0.3
TIME (MIN) =	203	DISCHARGE (CFS) =	0.4
TIME (MIN) =	210	DISCHARGE (CFS) =	0.4
TIME (MIN) =	217	DISCHARGE (CFS) =	0.5
TIME (MIN) =	224	DISCHARGE (CFS) =	0.5
TIME (MIN) =	231	DISCHARGE (CFS) =	0.8
TIME (MIN) =	238	DISCHARGE (CFS) =	1.1
TIME (MIN) =	245	DISCHARGE (CFS) =	4.1
TIME (MIN) =	252	DISCHARGE (CFS) =	0.6
TIME (MIN) =	259	DISCHARGE (CFS) =	0.4
TIME (MIN) =	266	DISCHARGE (CFS) =	0.3
TIME (MIN) =	273	DISCHARGE (CFS) =	0.3
TIME (MIN) =	280	DISCHARGE (CFS) =	0.2
TIME (MIN) =	287	DISCHARGE (CFS) =	0.2
TIME (MIN) =	294	DISCHARGE (CFS) =	0.2
TIME (MIN) =	301	DISCHARGE (CFS) =	0.2
TIME (MIN) =	308	DISCHARGE (CFS) =	0.2
TIME (MIN) =	315	DISCHARGE (CFS) =	0.2
TIME (MIN) =	322	DISCHARGE (CFS) =	0.1
TIME (MIN) =	329	DISCHARGE (CFS) =	0.1
TIME (MIN) =	336	DISCHARGE (CFS) =	0.1
TIME (MIN) =	343	DISCHARGE (CFS) =	0.1
TIME (MIN) =	350	DISCHARGE (CFS) =	0.1
TIME (MIN) =	357	DISCHARGE (CFS) =	0.1
TIME (MIN) =	364	DISCHARGE (CFS) =	0

Drainage Basin 10.15

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 14 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.77 ACRES
RUNOFF COEFFICIENT 0.52 PEAK DISCHARGE 2 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	14	DISCHARGE (CFS) =	0.1
TIME (MIN) =	28	DISCHARGE (CFS) =	0.1
TIME (MIN) =	42	DISCHARGE (CFS) =	0.1
TIME (MIN) =	56	DISCHARGE (CFS) =	0.1
TIME (MIN) =	70	DISCHARGE (CFS) =	0.1
TIME (MIN) =	84	DISCHARGE (CFS) =	0.1
TIME (MIN) =	98	DISCHARGE (CFS) =	0.1
TIME (MIN) =	112	DISCHARGE (CFS) =	0.1
TIME (MIN) =	126	DISCHARGE (CFS) =	0.1
TIME (MIN) =	140	DISCHARGE (CFS) =	0.1
TIME (MIN) =	154	DISCHARGE (CFS) =	0.2
TIME (MIN) =	168	DISCHARGE (CFS) =	0.2
TIME (MIN) =	182	DISCHARGE (CFS) =	0.2
TIME (MIN) =	196	DISCHARGE (CFS) =	0.2
TIME (MIN) =	210	DISCHARGE (CFS) =	0.3
TIME (MIN) =	224	DISCHARGE (CFS) =	0.4
TIME (MIN) =	238	DISCHARGE (CFS) =	0.6
TIME (MIN) =	252	DISCHARGE (CFS) =	2
TIME (MIN) =	266	DISCHARGE (CFS) =	0.3
TIME (MIN) =	280	DISCHARGE (CFS) =	0.2
TIME (MIN) =	294	DISCHARGE (CFS) =	0.2
TIME (MIN) =	308	DISCHARGE (CFS) =	0.1
TIME (MIN) =	322	DISCHARGE (CFS) =	0.1
TIME (MIN) =	336	DISCHARGE (CFS) =	0.1
TIME (MIN) =	350	DISCHARGE (CFS) =	0.1
TIME (MIN) =	364	DISCHARGE (CFS) =	0.1
TIME (MIN) =	378	DISCHARGE (CFS) =	0

Drainage Basin 10.16

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/12/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 24 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 2.04 ACRES

RUNOFF COEFFICIENT 0.41 PEAK DISCHARGE 3 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	24	DISCHARGE (CFS) =	0.2
TIME (MIN) =	48	DISCHARGE (CFS) =	0.2
TIME (MIN) =	72	DISCHARGE (CFS) =	0.2
TIME (MIN) =	96	DISCHARGE (CFS) =	0.2
TIME (MIN) =	120	DISCHARGE (CFS) =	0.3
TIME (MIN) =	144	DISCHARGE (CFS) =	0.3
TIME (MIN) =	168	DISCHARGE (CFS) =	0.4
TIME (MIN) =	192	DISCHARGE (CFS) =	0.4
TIME (MIN) =	216	DISCHARGE (CFS) =	0.6
TIME (MIN) =	240	DISCHARGE (CFS) =	0.8
TIME (MIN) =	264	DISCHARGE (CFS) =	3
TIME (MIN) =	288	DISCHARGE (CFS) =	0.5
TIME (MIN) =	312	DISCHARGE (CFS) =	0.3
TIME (MIN) =	336	DISCHARGE (CFS) =	0.2
TIME (MIN) =	360	DISCHARGE (CFS) =	0.2
TIME (MIN) =	384	DISCHARGE (CFS) =	0

Drainage Basin 10.17

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/12/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 15 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 0.5 ACRES
RUNOFF COEFFICIENT 0.58 PEAK DISCHARGE 1.4 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	15	DISCHARGE (CFS) =	0.1
TIME (MIN) =	30	DISCHARGE (CFS) =	0.1
TIME (MIN) =	45	DISCHARGE (CFS) =	0.1
TIME (MIN) =	60	DISCHARGE (CFS) =	0.1
TIME (MIN) =	75	DISCHARGE (CFS) =	0.1
TIME (MIN) =	90	DISCHARGE (CFS) =	0.1
TIME (MIN) =	105	DISCHARGE (CFS) =	0.1
TIME (MIN) =	120	DISCHARGE (CFS) =	0.1
TIME (MIN) =	135	DISCHARGE (CFS) =	0.1
TIME (MIN) =	150	DISCHARGE (CFS) =	0.1
TIME (MIN) =	165	DISCHARGE (CFS) =	0.1
TIME (MIN) =	180	DISCHARGE (CFS) =	0.1
TIME (MIN) =	195	DISCHARGE (CFS) =	0.2
TIME (MIN) =	210	DISCHARGE (CFS) =	0.2
TIME (MIN) =	225	DISCHARGE (CFS) =	0.3
TIME (MIN) =	240	DISCHARGE (CFS) =	0.4
TIME (MIN) =	255	DISCHARGE (CFS) =	1.4
TIME (MIN) =	270	DISCHARGE (CFS) =	0.2
TIME (MIN) =	285	DISCHARGE (CFS) =	0.1
TIME (MIN) =	300	DISCHARGE (CFS) =	0.1
TIME (MIN) =	315	DISCHARGE (CFS) =	0.1
TIME (MIN) =	330	DISCHARGE (CFS) =	0.1
TIME (MIN) =	345	DISCHARGE (CFS) =	0.1
TIME (MIN) =	360	DISCHARGE (CFS) =	0.1
TIME (MIN) =	375	DISCHARGE (CFS) =	0

Drainage Basin 10.18

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 11/22/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 16 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.54 ACRES
RUNOFF COEFFICIENT 0.51 PEAK DISCHARGE 1.3 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	16	DISCHARGE (CFS) =	0.1
TIME (MIN) =	32	DISCHARGE (CFS) =	0.1
TIME (MIN) =	48	DISCHARGE (CFS) =	0.1
TIME (MIN) =	64	DISCHARGE (CFS) =	0.1
TIME (MIN) =	80	DISCHARGE (CFS) =	0.1
TIME (MIN) =	96	DISCHARGE (CFS) =	0.1
TIME (MIN) =	112	DISCHARGE (CFS) =	0.1
TIME (MIN) =	128	DISCHARGE (CFS) =	0.1
TIME (MIN) =	144	DISCHARGE (CFS) =	0.1
TIME (MIN) =	160	DISCHARGE (CFS) =	0.1
TIME (MIN) =	176	DISCHARGE (CFS) =	0.1
TIME (MIN) =	192	DISCHARGE (CFS) =	0.2
TIME (MIN) =	208	DISCHARGE (CFS) =	0.2
TIME (MIN) =	224	DISCHARGE (CFS) =	0.3
TIME (MIN) =	240	DISCHARGE (CFS) =	0.3
TIME (MIN) =	256	DISCHARGE (CFS) =	1.3
TIME (MIN) =	272	DISCHARGE (CFS) =	0.2
TIME (MIN) =	288	DISCHARGE (CFS) =	0.1
TIME (MIN) =	304	DISCHARGE (CFS) =	0.1
TIME (MIN) =	320	DISCHARGE (CFS) =	0.1
TIME (MIN) =	336	DISCHARGE (CFS) =	0.1
TIME (MIN) =	352	DISCHARGE (CFS) =	0.1
TIME (MIN) =	368	DISCHARGE (CFS) =	0.1
TIME (MIN) =	384	DISCHARGE (CFS) =	0

Drainage Basin 10.19

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY
RUN DATE 9/17/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 12 MIN. 6 HOUR
RAINFALL 3.7 INCHES BASIN AREA 0.54 ACRES
RUNOFF COEFFICIENT 0.59 PEAK DISCHARGE 1.8 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	12	DISCHARGE (CFS) =	0.1
TIME (MIN) =	24	DISCHARGE (CFS) =	0.1
TIME (MIN) =	36	DISCHARGE (CFS) =	0.1
TIME (MIN) =	48	DISCHARGE (CFS) =	0.1
TIME (MIN) =	60	DISCHARGE (CFS) =	0.1
TIME (MIN) =	72	DISCHARGE (CFS) =	0.1
TIME (MIN) =	84	DISCHARGE (CFS) =	0.1
TIME (MIN) =	96	DISCHARGE (CFS) =	0.1
TIME (MIN) =	108	DISCHARGE (CFS) =	0.1
TIME (MIN) =	120	DISCHARGE (CFS) =	0.1
TIME (MIN) =	132	DISCHARGE (CFS) =	0.1
TIME (MIN) =	144	DISCHARGE (CFS) =	0.1
TIME (MIN) =	156	DISCHARGE (CFS) =	0.1
TIME (MIN) =	168	DISCHARGE (CFS) =	0.1
TIME (MIN) =	180	DISCHARGE (CFS) =	0.2
TIME (MIN) =	192	DISCHARGE (CFS) =	0.2
TIME (MIN) =	204	DISCHARGE (CFS) =	0.2
TIME (MIN) =	216	DISCHARGE (CFS) =	0.2
TIME (MIN) =	228	DISCHARGE (CFS) =	0.3
TIME (MIN) =	240	DISCHARGE (CFS) =	0.5
TIME (MIN) =	252	DISCHARGE (CFS) =	1.8
TIME (MIN) =	264	DISCHARGE (CFS) =	0.3
TIME (MIN) =	276	DISCHARGE (CFS) =	0.2
TIME (MIN) =	288	DISCHARGE (CFS) =	0.1
TIME (MIN) =	300	DISCHARGE (CFS) =	0.1
TIME (MIN) =	312	DISCHARGE (CFS) =	0.1
TIME (MIN) =	324	DISCHARGE (CFS) =	0.1
TIME (MIN) =	336	DISCHARGE (CFS) =	0.1
TIME (MIN) =	348	DISCHARGE (CFS) =	0.1
TIME (MIN) =	360	DISCHARGE (CFS) =	0.1
TIME (MIN) =	372	DISCHARGE (CFS) =	0

Drainage Basin 10.21

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 11/22/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 14 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 0.67 ACRES

RUNOFF COEFFICIENT 0.51 PEAK DISCHARGE 1.7 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	14	DISCHARGE (CFS) =	0.1
TIME (MIN) =	28	DISCHARGE (CFS) =	0.1
TIME (MIN) =	42	DISCHARGE (CFS) =	0.1
TIME (MIN) =	56	DISCHARGE (CFS) =	0.1
TIME (MIN) =	70	DISCHARGE (CFS) =	0.1
TIME (MIN) =	84	DISCHARGE (CFS) =	0.1
TIME (MIN) =	98	DISCHARGE (CFS) =	0.1
TIME (MIN) =	112	DISCHARGE (CFS) =	0.1
TIME (MIN) =	126	DISCHARGE (CFS) =	0.1
TIME (MIN) =	140	DISCHARGE (CFS) =	0.1
TIME (MIN) =	154	DISCHARGE (CFS) =	0.1
TIME (MIN) =	168	DISCHARGE (CFS) =	0.2
TIME (MIN) =	182	DISCHARGE (CFS) =	0.2
TIME (MIN) =	196	DISCHARGE (CFS) =	0.2
TIME (MIN) =	210	DISCHARGE (CFS) =	0.2
TIME (MIN) =	224	DISCHARGE (CFS) =	0.3
TIME (MIN) =	238	DISCHARGE (CFS) =	0.5
TIME (MIN) =	252	DISCHARGE (CFS) =	1.7
TIME (MIN) =	266	DISCHARGE (CFS) =	0.3
TIME (MIN) =	280	DISCHARGE (CFS) =	0.2
TIME (MIN) =	294	DISCHARGE (CFS) =	0.1
TIME (MIN) =	308	DISCHARGE (CFS) =	0.1
TIME (MIN) =	322	DISCHARGE (CFS) =	0.1
TIME (MIN) =	336	DISCHARGE (CFS) =	0.1
TIME (MIN) =	350	DISCHARGE (CFS) =	0.1
TIME (MIN) =	364	DISCHARGE (CFS) =	0.1
TIME (MIN) =	378	DISCHARGE (CFS) =	0

Drainage Basin 10.22

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/12/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 17 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 3.26 ACRES

RUNOFF COEFFICIENT 0.56 PEAK DISCHARGE 8.1 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	17	DISCHARGE (CFS) =	0.4
TIME (MIN) =	34	DISCHARGE (CFS) =	0.4
TIME (MIN) =	51	DISCHARGE (CFS) =	0.5
TIME (MIN) =	68	DISCHARGE (CFS) =	0.5
TIME (MIN) =	85	DISCHARGE (CFS) =	0.5
TIME (MIN) =	102	DISCHARGE (CFS) =	0.5
TIME (MIN) =	119	DISCHARGE (CFS) =	0.6
TIME (MIN) =	136	DISCHARGE (CFS) =	0.6
TIME (MIN) =	153	DISCHARGE (CFS) =	0.7
TIME (MIN) =	170	DISCHARGE (CFS) =	0.8
TIME (MIN) =	187	DISCHARGE (CFS) =	1
TIME (MIN) =	204	DISCHARGE (CFS) =	1.1
TIME (MIN) =	221	DISCHARGE (CFS) =	1.6
TIME (MIN) =	238	DISCHARGE (CFS) =	2.2
TIME (MIN) =	255	DISCHARGE (CFS) =	8.1
TIME (MIN) =	272	DISCHARGE (CFS) =	1.3
TIME (MIN) =	289	DISCHARGE (CFS) =	0.9
TIME (MIN) =	306	DISCHARGE (CFS) =	0.7
TIME (MIN) =	323	DISCHARGE (CFS) =	0.6
TIME (MIN) =	340	DISCHARGE (CFS) =	0.5
TIME (MIN) =	357	DISCHARGE (CFS) =	0.4
TIME (MIN) =	374	DISCHARGE (CFS) =	0

Drainage Basin 20.10

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RUN DATE 9/16/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 23 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 5 ACRES

RUNOFF COEFFICIENT 0.2 PEAK DISCHARGE 3.6 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	23	DISCHARGE (CFS) =	0
TIME (MIN) =	46	DISCHARGE (CFS) =	0.2
TIME (MIN) =	69	DISCHARGE (CFS) =	0.2
TIME (MIN) =	92	DISCHARGE (CFS) =	0.3
TIME (MIN) =	115	DISCHARGE (CFS) =	0.3
TIME (MIN) =	138	DISCHARGE (CFS) =	0.3
TIME (MIN) =	161	DISCHARGE (CFS) =	0.4
TIME (MIN) =	184	DISCHARGE (CFS) =	0.4
TIME (MIN) =	207	DISCHARGE (CFS) =	0.5
TIME (MIN) =	230	DISCHARGE (CFS) =	0.7
TIME (MIN) =	253	DISCHARGE (CFS) =	1.1
TIME (MIN) =	276	DISCHARGE (CFS) =	3.6
TIME (MIN) =	299	DISCHARGE (CFS) =	0.6
TIME (MIN) =	322	DISCHARGE (CFS) =	0.4
TIME (MIN) =	345	DISCHARGE (CFS) =	0.3
TIME (MIN) =	368	DISCHARGE (CFS) =	0.3
TIME (MIN) =	391	DISCHARGE (CFS) =	0

Basin 3 Single Lot - Post Development

RATIONAL METHOD HYDROGRAPH PROGRAM COPYRIGHT 1992, 2001 RICK ENGINEERING COMPANY

RUN DATE 9/18/2019 HYDROGRAPH FILE NAME Text1 TIME OF CONCENTRATION 17 MIN. 6 HOUR RAINFALL 3.7 INCHES BASIN AREA 0.91 ACRES

RUNOFF COEFFICIENT 0.36 PEAK DISCHARGE 1.5 CFS

TIME (MIN) =	0	DISCHARGE (CFS) =	0
TIME (MIN) =	17	DISCHARGE (CFS) =	0.1
TIME (MIN) =	34	DISCHARGE (CFS) =	0.1
TIME (MIN) =	51	DISCHARGE (CFS) =	0.1
TIME (MIN) =	68	DISCHARGE (CFS) =	0.1
TIME (MIN) =	85	DISCHARGE (CFS) =	0.1
TIME (MIN) =	102	DISCHARGE (CFS) =	0.1
TIME (MIN) =	119	DISCHARGE (CFS) =	0.1
TIME (MIN) =	136	DISCHARGE (CFS) =	0.1
TIME (MIN) =	153	DISCHARGE (CFS) =	0.1
TIME (MIN) =	170	DISCHARGE (CFS) =	0.1
TIME (MIN) =	187	DISCHARGE (CFS) =	0.2
TIME (MIN) =	204	DISCHARGE (CFS) =	0.2
TIME (MIN) =	221	DISCHARGE (CFS) =	0.3
TIME (MIN) =	238	DISCHARGE (CFS) =	0.4
TIME (MIN) =	255	DISCHARGE (CFS) =	1.5
TIME (MIN) =	272	DISCHARGE (CFS) =	0.2
TIME (MIN) =	289	DISCHARGE (CFS) =	0.2
TIME (MIN) =	306	DISCHARGE (CFS) =	0.1
TIME (MIN) =	323	DISCHARGE (CFS) =	0.1
TIME (MIN) =	340	DISCHARGE (CFS) =	0.1
TIME (MIN) =	357	DISCHARGE (CFS) =	0.1
TIME (MIN) =	374	DISCHARGE (CFS) =	0

APPENDIX “C”

PRE AND POST-DEVELOPMENT HYDROLOGY CALCULATIONS

BASIN’S 1, 2, 3, AND X

Pre-Development Hydrology Conditions - Basin 1								
BASIN ID	AREA	C	CA	Change in elevation	Longest Runoff length	T_c	I_{100}	Q_{100} (W/o Attenuation)
	(ac.)			ft	ft	(min.)	(in/hr)	(cfs)
1.01	152.88	0.270	41.28	1004	4802	**38.0**	**2.64**	**108.8**

Pre-Development Hydrology Conditions - Basin 2								
BASIN ID	AREA	C	CA	Change in elevation	Longest Runoff length	T_c	I_{100}	Q_{100} (W/o Attenuation)
	(ac.)			ft	ft	(min.)	(in/hr)	(cfs)
2.01	63.20	0.270	17.06	404	4452	**48.0**	**2.27**	**38.7**

Pre-Development hydrology Calculations - Basin-3

San Diego County Hydrology Manual
Date: June 2003

Section: Appendix D
Page: 2 of 3

WORKSHEET 4-2 Shadow Run Ranch (name of project) **Curve Number Worksheet**

RUNOFF CURVE NUMBER (for PZN Condition = 2.0) CN_2:

column 1	column 2	column 3	column 4	column 5	column 6
GROUND COVER/ LAND USE	HYDROLOGIC CONDITION (field in-spection)	SOIL GROUP	CN_2 From Hydrology Manual, Table 4-2	FRACTION OF AREA A_i/A	PARTIAL CN_2 $CN_2 \times A_i/A$
O.E. ORCHARDS EVERGREEN	Good	A C	33 72	.027 .003	0.89 0.22
O.B. OPEN BRUSH	Good	A C	41 75	.012 .189	0.49 14.18
N.C. Narrowleaf chaparral	Fair	A C	55 81	.028 .151	1.54 12.23
B.C. Broadleaf chaparral	Good	B C	57 71	.206 .185	11.74 13.14
W.O. WOODLAND	Good	A B C	28 55 70	.007 .138 .054	0.20 7.59 3.78
			Sums =	1.000	66

For entire basin CN_2 = 66

WORKSHEET 4-3 Shadow Run Ranch (name of project) **Peak Discharge Computation**

*****For use with NRCS Hydrologic Method Computations*****

Items in boxes are required input parameters for the SDUH Peak Discharge Program.

Computed by:_____ Date:_____

Project Identification (Drainage Area Name): FRYE CREEK

Geographic location of center of drainage area: Long:_____" Lat:_____"

Drainage Area: 4.0 – square miles

Storm Frequency (Section 2.3): 100 – year

6-Hour Storm Duration Precipitation (Appendix B): 3.7 – inches

24-Hour Storm Duration Precipitation (Appendix B): 7.5 – inches

Precipitation Zone Number (PZN): (Section 4.1.2.4 and Appendix C)
PZN = 1.0 ____ 2.0 2.0 3.0 ____ 4.0

PZN Ajustment Factor for 5-year to 35-year storm frequency (interpolate): (Section 4.1.2.4 and Table 4-6)
1.5 ____ 2.5 ____ 2.0 ____ 1.5

PZN Ajustment Factor for 35-year to 150-year storm frequency (interpolate): (Section 4.1.2.4 and Table 4-6)
2.0 ____ 3.0 3.0 3.0 ____ 2.0

PZN Adjusted Runoff Curve Number (interpolate between nearest whole number PZN conditions): (Sections 4.1.2.4 and 4.2.4, Tables 4-6 and 4-10)
$CN_{1.0 \text{ or } (2.0)}$ 66 CN_X 82 $CN_{2.0 \text{ or } (3.0)}$ 82

Watershed Length (L) (Section 4.3.1): 6.0 – miles

Length to Centroid (L_c) (Section 4.3.1): 3.55 – miles

Slope (s) (Section 4.3.1): 798.3 – feet/mile Basin $\bar{n}$ Factor (Section 4.3.5): .055

Corps lag (T_L) = 24 $\bar{n}$ $((L \times L_c)/s^{0.5})^m$ (Section 4.3.1.1)
OR
Corps lag (T_L) = 0.8 T_c (Section 4.3.1.2) Lag Time: 1.2 – hours

Time to Peak = 0.862 x Corps lag (Section 4.1.5.5): Time to Peak : 1.0 – hours

Project: Shadow Run Ranch Simulation Run: Run 1

Start of Run:	26Feb2009, 00:00	Basin Model:	Basin 3
End of Run:	27Feb2009, 06:00	Meteorologic Model:	Met 1
Compute Time:	26Feb2009, 16:06:40	Control Specifications:	Control 1

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin-1	4.0	3003.1	26Feb2009, 17:15	5.58

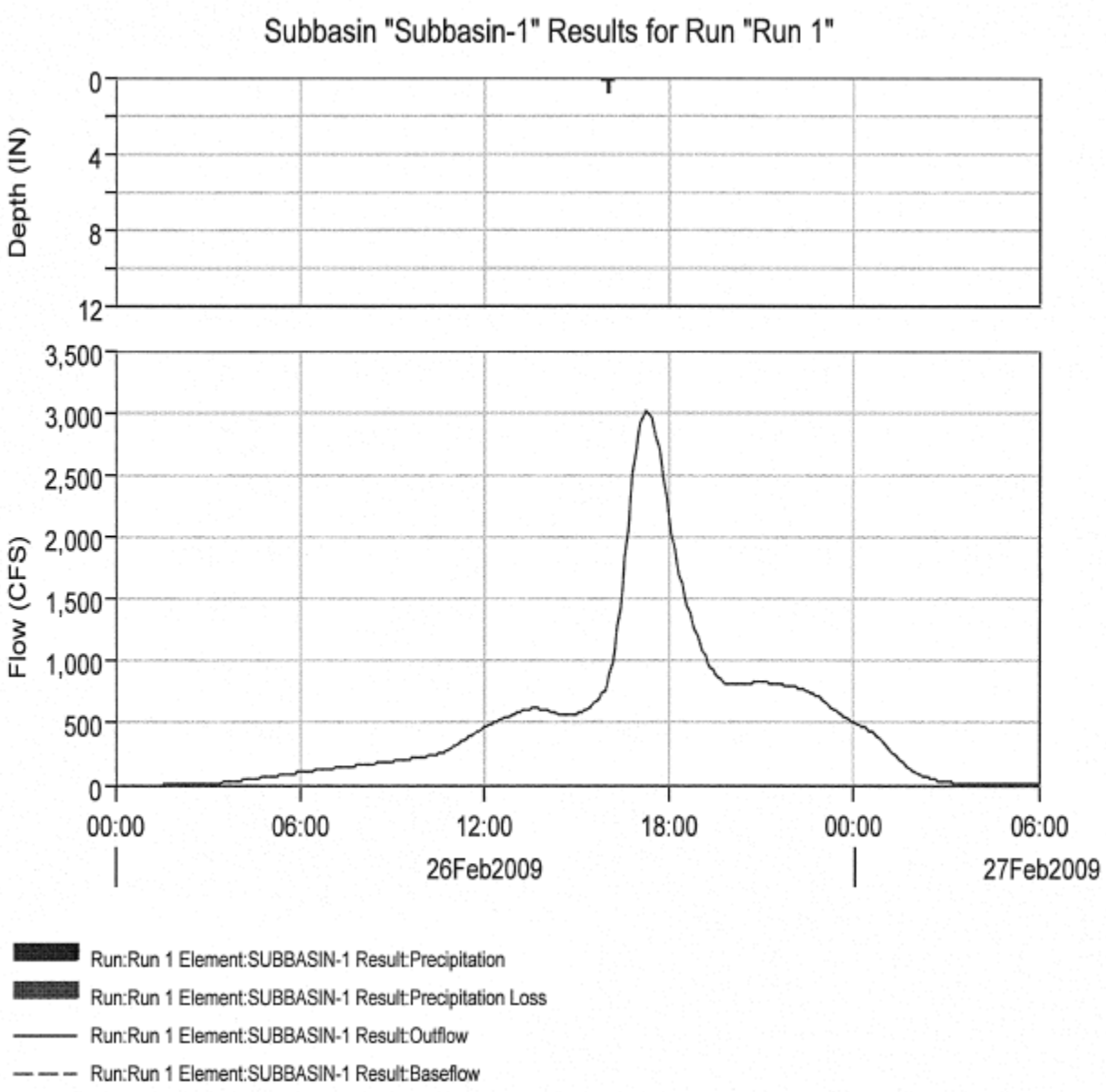
Project: Shadow Run Ranch
Simulation Run: Run 1 Subbasin: Subbasin-1

Start of Run:	26Feb2009, 00:00	Basin Model:	Basin 3
End of Run:	27Feb2009, 06:00	Meteorologic Model:	Met 1
Compute Time:	26Feb2009, 16:06:40	Control Specifications:	Control 1

Volume Units: IN

Computed Results

Peak Discharge :	3003.1 (CFS)	Date/Time of Peak Discharge :	26Feb2009, 17:15
Total Precipitation :	7.46 (IN)	Total Direct Runoff :	5.58 (IN)
Total Loss :	0.00 (IN)	Total Baseflow :	0.00 (IN)
Total Excess :	5.58 (IN)	Discharge :	5.58 (IN)


Subbasin "Subbasin-1" Results for Run "Run 1"
Depth (IN)
0
4
8
12
Flow (CFS)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
00:00
06:00
12:00
18:00
00:00
06:00
26Feb2009
27Feb2009
Run:Run 1 Element:SUBBASIN-1 Result:Precipitation
Run:Run 1 Element:SUBBASIN-1 Result:Precipitation Loss
Run:Run 1 Element:SUBBASIN-1 Result:Outflow
Run:Run 1 Element:SUBBASIN-1 Result:Baseflow

Post-Development Hydrology Conditions - Basin 1								
BASIN ID	**AREA**	**C**	**CA**	**Change in elevation**	**Longest Runoff length**	**T_c**	**I_{100}**	**Q_{100} (W/o Attenuation)**
	(ac.)			ft	ft	(min.)	(in/hr)	(cfs)
1.01	10.30	0.230	2.37	57	872	**25.0**	**3.45**	**8.2**
1.02	4.93	0.110	0.54	74	718	**22.0**	**3.75**	**2.0**
1.03	6.65	0.210	1.40	368	760	**12.0**	**5.54**	**7.7**
1.04	9.06	0.210	1.90	647	1293	**16.0**	**4.60**	**8.8**
1.05	2.72	0.120	0.33	46	379	**15.0**	**4.80**	**1.6**
1.06	28.93	0.180	5.21	792	2511	**26.0**	**3.37**	**17.5**
1.07	18.71	0.120	2.25	83	1095	**30.0**	**3.07**	**6.9**
1.08	2.23	0.100	0.22	66	413	**15.0**	**4.80**	**1.1**
1.09	6.13	0.100	0.61	112	367	**11.0**	**5.86**	**3.6**
1.10	23.76	0.100	2.38	244	2407	**41.0**	**2.51**	**6.0**
1.11	6.50	0.100	0.65	86	1251	**33.0**	**2.89**	**1.9**
1.12	13.37	0.150	2.01	96	1424	**34.0**	**2.83**	**5.7**
1.13	2.26	0.160	0.36	22	546	**25.0**	**3.45**	**1.2**
1.14	3.00	0.190	0.57	57	639	**20.0**	**3.99**	**2.3**
1.15	6.79	0.100	0.68	103	1150	**29.0**	**3.14**	**2.1**
10.10	0.42	0.790	0.33	21	639	**9.0**	**6.67**	**2.2**
10.11	0.55	0.610	0.34	38	538	**11.0**	**5.86**	**2.0**
10.12	0.30	0.470	0.14	54	718	**16.0**	**4.60**	**0.6**
10.13	0.64	0.760	0.49	50	855	**10.0**	**6.23**	**3.0**
10.14	0.72	0.720	0.52	30	436	**7.0**	**7.85**	**4.1**
10.15	0.78	0.520	0.41	16	447	**14.0**	**5.02**	**2.0**
10.19	0.54	0.590	0.32	18	423	**12.0**	**5.54**	**1.8**
20.10	5.00	0.200	1.00	32	600	**23.0**	**3.64**	**3.6**
Total	**154.29**							**95.9**

Post-Development Hydrology Conditions - Basin 2								
BASIN ID	**AREA**	**C**	**CA**	**Change in elevation**	**Longest Runoff length**	**T_c**	**I_{100}**	**Q_{100} (W/o Attenuation)**
	(ac.)			ft	ft	(min.)	(in/hr)	(cfs)
2.01	5.28	0.150	0.79	129	1047	**24.0**	**3.54**	**2.8**
2.02	12.51	0.150	1.88	130	1357	**30.0**	**3.07**	**5.8**
2.04	20.15	0.130	2.62	104	1368	**33.0**	**2.89**	**7.6**
2.06	17.84	0.260	4.64	106	2362	**45.0**	**2.36**	**11.0**
10.16	2.04	0.410	0.84	109	1418	**24.0**	**3.54**	**3.0**
10.17	0.50	0.580	0.29	31	724	**15.0**	**4.80**	**1.4**
10.18	0.54	0.510	0.28	27	615	**16.0**	**4.60**	**1.3**
10.21	0.67	0.510	0.34	52	650	**14.0**	**5.02**	**1.7**
10.22	3.26	0.560	1.83	145	1457	**17.0**	**4.43**	**8.1**
Total	62.79							**42.5**

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Project Name:

Hydrology Studio v 3.0.0.13

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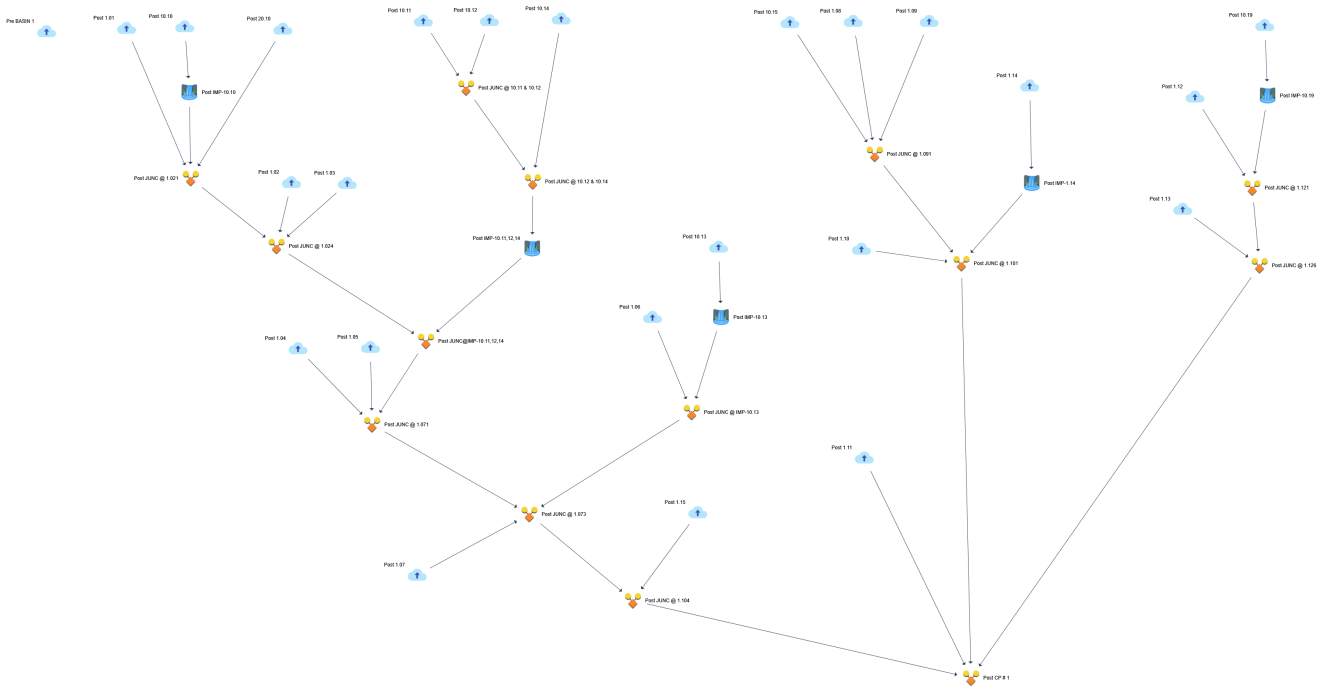
Contents continued...

Basin Model

Hydrology Studio v 3.0.0.13

Project Name:

11-22-2019



Hydrograph by Return Period

Project Name:

11-22-2019

Hydrology Studio v 3.0.0.13

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	Manual	Pre BASIN 1								108.8
2	Manual	Post 1.01								8.200
3	Manual	Post 1.03								7.700
4	Manual	Post 1.04								8.800
5	Manual	Post 1.06								17.50
6	Manual	Post 1.02								2.000
7	Manual	Post 10.10								2.200
8	Pond Route	Post IMP-10.10								1.984
9	Manual	Post 10.15								2.000
10	Manual	Post 10.13								3.000
11	Pond Route	Post IMP-10.13								2.443
12	Manual	Post 20.10								3.600
13	Junction	Post JUNC @ 1.021								10.74
14	Manual	Post 1.08								1.100
15	Junction	Post JUNC @ 1.024								19.55
16	Junction	Post JUNC @ IMP-10.13								18.83
17	Manual	Post 10.11								2.000
18	Manual	Post 10.12								0.600
19	Manual	Post 10.14								4.100
20	Junction	Post JUNC @ 10.11 & 10.12								2.530
21	Junction	Post JUNC @ 10.12 & 10.14								5.340
22	Pond Route	Post IMP-10.11,12,14								3.025
23	Manual	Post 1.05								1.600
24	Junction	Post JUNC@IMP-10.11,12,14								22.58
25	Junction	Post JUNC @ 1.071								31.14
26	Manual	Post 1.07								6.900
27	Manual	Post 1.09								3.600
28	Manual	Post 1.10								6.000
29	Manual	Post 1.14								2.300
30	Pond Route	Post IMP-1.14								0.050
31	Manual	Post 10.19								1.800
32	Manual	Post 1.11								1.900
33	Pond Route	Post IMP-10.19								0.798
34	Manual	Post 1.12								5.700
35	Manual	Post 1.13								1.200
36	Junction	Post JUNC @ 1.073								52.20

Hydrograph by Return Period

Project Name:

11-22-2019

Hydrology Studio v 3.0.0.13

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
37	Junction	Post JUNC @ 1.121								6.316
38	Junction	Post JUNC @ 1.126								6.636
39	Junction	Post JUNC @ 1.091								6.470
40	Junction	Post JUNC @ 1.101								8.852
41	Manual	Post 1.15								2.100
42	Junction	Post JUNC @ 1.104								54.02
43	Junction	Post CP # 1								69.29

Hydrograph 100-yr Summary

Project Name:

11-22-2019

Hydrology Studio v 3.0.0.13

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	Manual	Pre BASIN 1	108.8	4.43	541,044	----		
2	Manual	Post 1.01	8.200	4.17	31,350	----		
3	Manual	Post 1.03	7.700	4.20	18,443	----		
4	Manual	Post 1.04	8.800	4.27	25,456	----		
5	Manual	Post 1.06	17.50	4.33	70,200	----		
6	Manual	Post 1.02	2.000	4.40	6,864	----		
7	Manual	Post 10.10	2.200	4.20	5,076	----		
8	Pond Route	Post IMP-10.10	1.984	4.22	4,661	7	1087.21	987
9	Manual	Post 10.15	2.000	4.20	5,292	----		
10	Manual	Post 10.13	3.000	4.17	6,420	----		
11	Pond Route	Post IMP-10.13	2.443	4.20	5,236	10	966.38	2,325
12	Manual	Post 20.10	3.600	4.60	13,248	----		
13	Junction	Post JUNC @ 1.021	10.74	4.17	49,259	2, 8, 12		
14	Manual	Post 1.08	1.100	4.25	3,330	----		
15	Junction	Post JUNC @ 1.024	19.55	4.20	74,565	3, 6, 13		
16	Junction	Post JUNC @ IMP-10.13	18.83	4.33	75,436	5, 11		
17	Manual	Post 10.11	2.000	4.22	4,554	----		
18	Manual	Post 10.12	0.600	4.27	1,637	----		
19	Manual	Post 10.14	4.100	4.08	6,720	----		
20	Junction	Post JUNC @ 10.11 & 10.12	2.530	4.22	6,191	17, 18		
21	Junction	Post JUNC @ 10.12 & 10.14	5.340	4.08	12,911	19, 20		
22	Pond Route	Post IMP-10.11,12,14	3.025	4.20	10,045	21	1003.02	4,412
23	Manual	Post 1.05	1.600	4.25	4,410	----		
24	Junction	Post JUNC@IMP-10.11,12,14	22.58	4.20	84,610	15, 22		
25	Junction	Post JUNC @ 1.071	31.14	4.20	114,476	4, 23, 24		
26	Manual	Post 1.07	6.900	4.50	29,880	----		
27	Manual	Post 1.09	3.600	4.22	8,250	----		
28	Manual	Post 1.10	6.000	4.78	31,734	----		
29	Manual	Post 1.14	2.300	4.33	7,583	----		
30	Pond Route	Post IMP-1.14	0.050	6.05	3,502	29	899.36	6,556
31	Manual	Post 10.19	1.800	4.20	4,326	----		
32	Manual	Post 1.11	1.900	4.40	8,910	----		
33	Pond Route	Post IMP-10.19	0.798	4.33	3,208	31	883.93	2,678
34	Manual	Post 1.12	5.700	4.53	27,132	----		
35	Manual	Post 1.13	1.200	4.17	4,650	----		
36	Junction	Post JUNC @ 1.073	52.20	4.25	219,792	16, 25, 26		

Hydrograph 100-yr Summary

Project Name:

11-22-2019

Hydrology Studio v 3.0.0.13

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
37	Junction	Post JUNC @ 1.121	6.316	4.53	30,340	33, 34		
38	Junction	Post JUNC @ 1.126	6.636	4.53	34,990	35, 37		
39	Junction	Post JUNC @ 1.091	6.470	4.22	16,872	9, 14, 27		
40	Junction	Post JUNC @ 1.101	8.852	4.22	52,108	28, 30, 39		
41	Manual	Post 1.15	2.100	4.35	9,048	----		
42	Junction	Post JUNC @ 1.104	54.02	4.27	228,840	36, 41		
43	Junction	Post CP # 1	69.29	4.25	324,847	32, 38, 40, 42		

Hydrograph Report

Project Name:

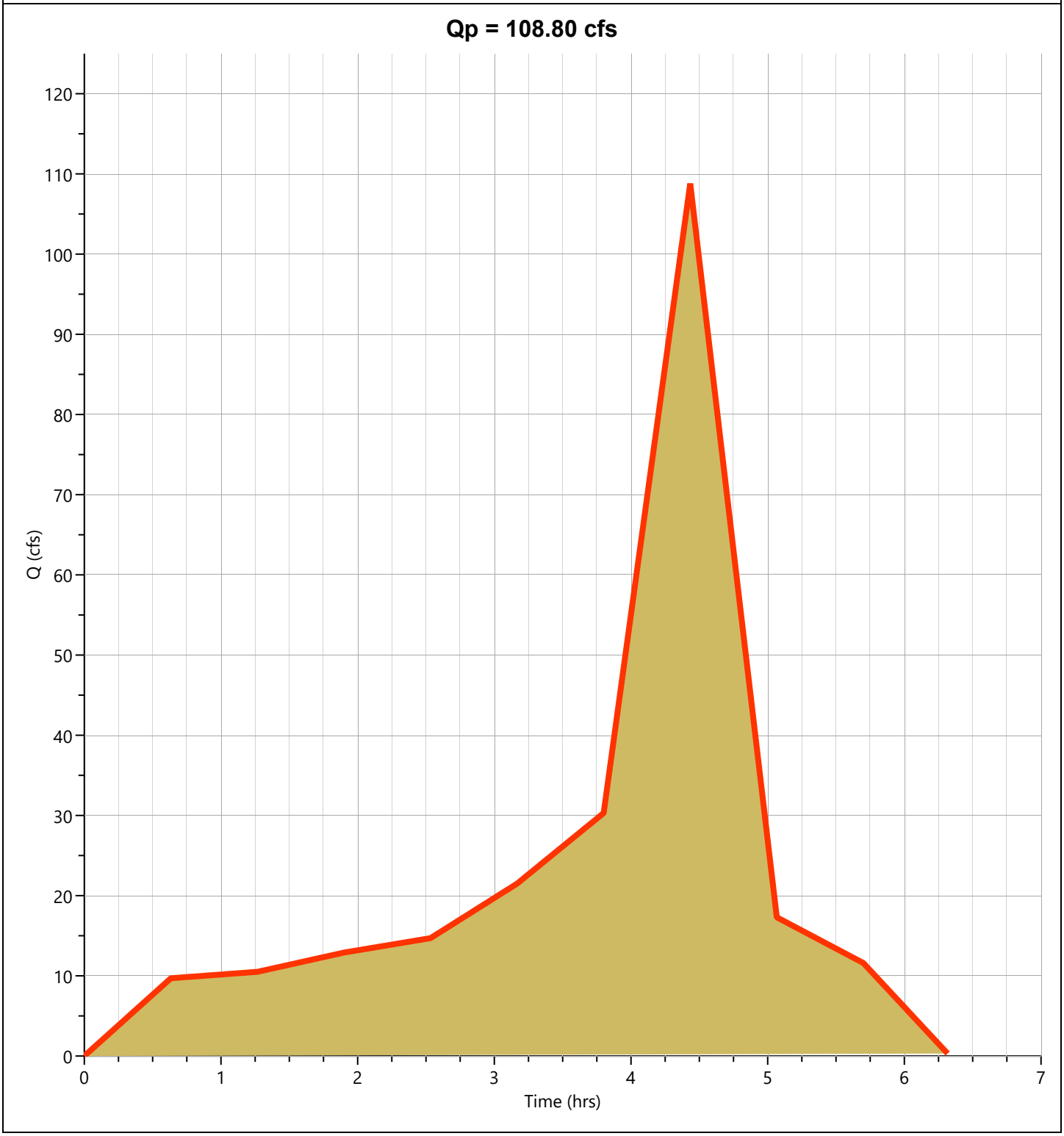
Hydrology Studio v 3.0.0.13

11-22-2019

Pre BASIN 1

Hyd. No. 1

Hydrograph Type	= Manual	Peak Flow	= 108.8 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.43 hrs
Time Interval	= 1 min	Hydrograph Volume	= 541,044 cuft



Hydrograph Report

Project Name:

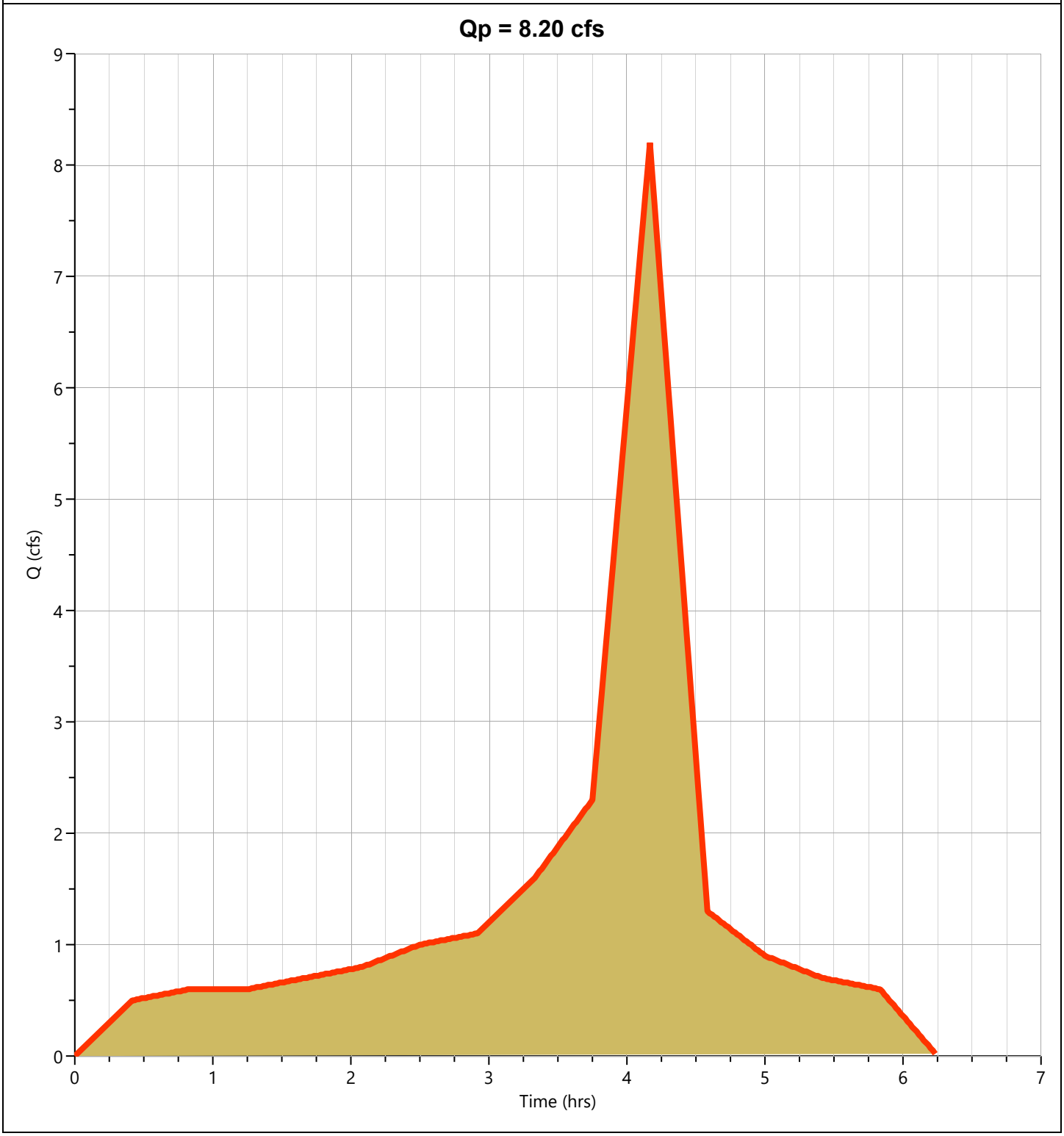
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.01

Hyd. No. 2

Hydrograph Type	= Manual	Peak Flow	= 8.200 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.17 hrs
Time Interval	= 1 min	Hydrograph Volume	= 31,350 cuft



Hydrograph Report

Project Name:

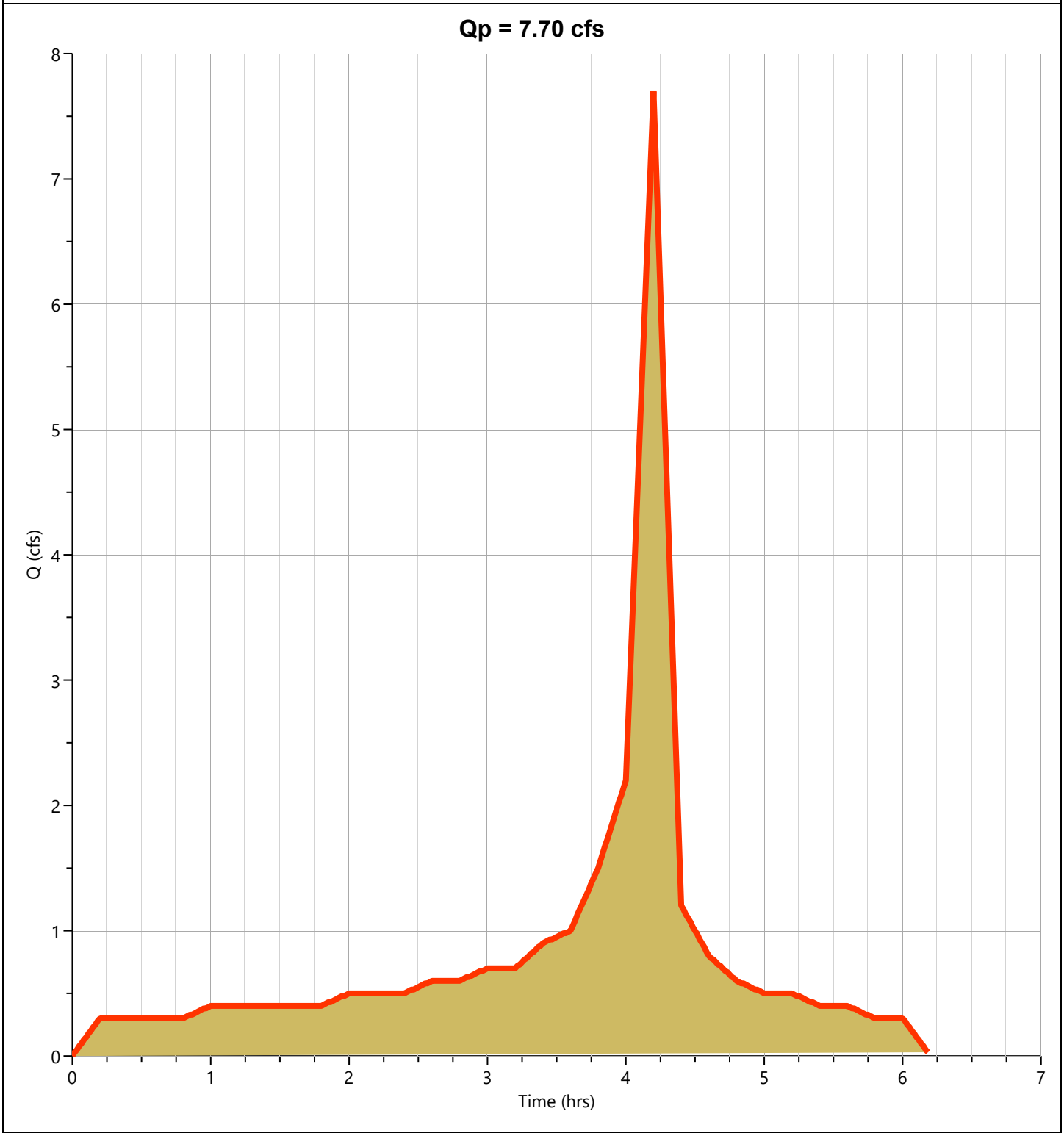
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.03

Hyd. No. 3

Hydrograph Type	= Manual	Peak Flow	= 7.700 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 18,443 cuft



Hydrograph Report

Project Name:

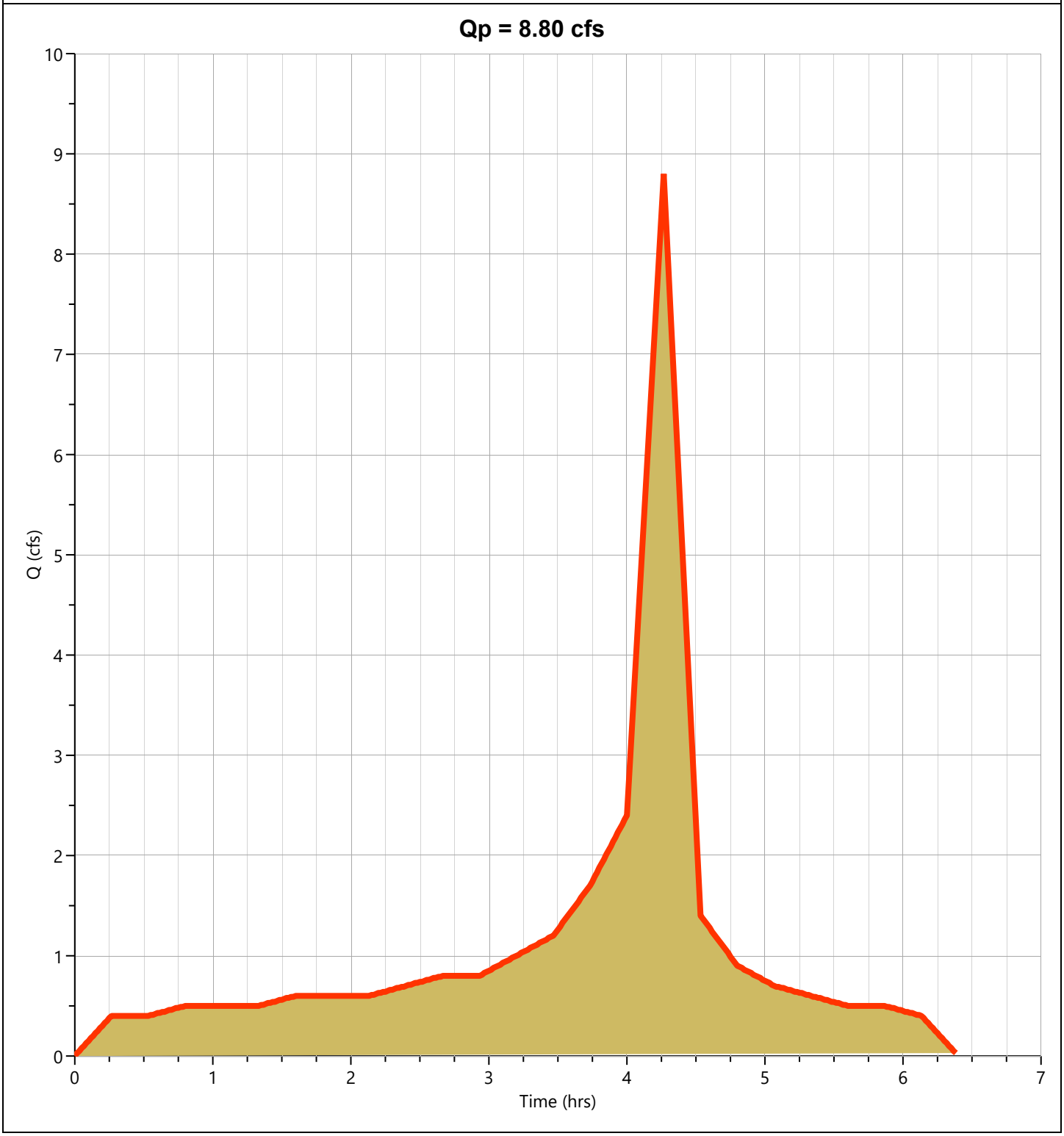
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.04

Hyd. No. 4

Hydrograph Type	= Manual	Peak Flow	= 8.800 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.27 hrs
Time Interval	= 1 min	Hydrograph Volume	= 25,456 cuft



Hydrograph Report

Project Name:

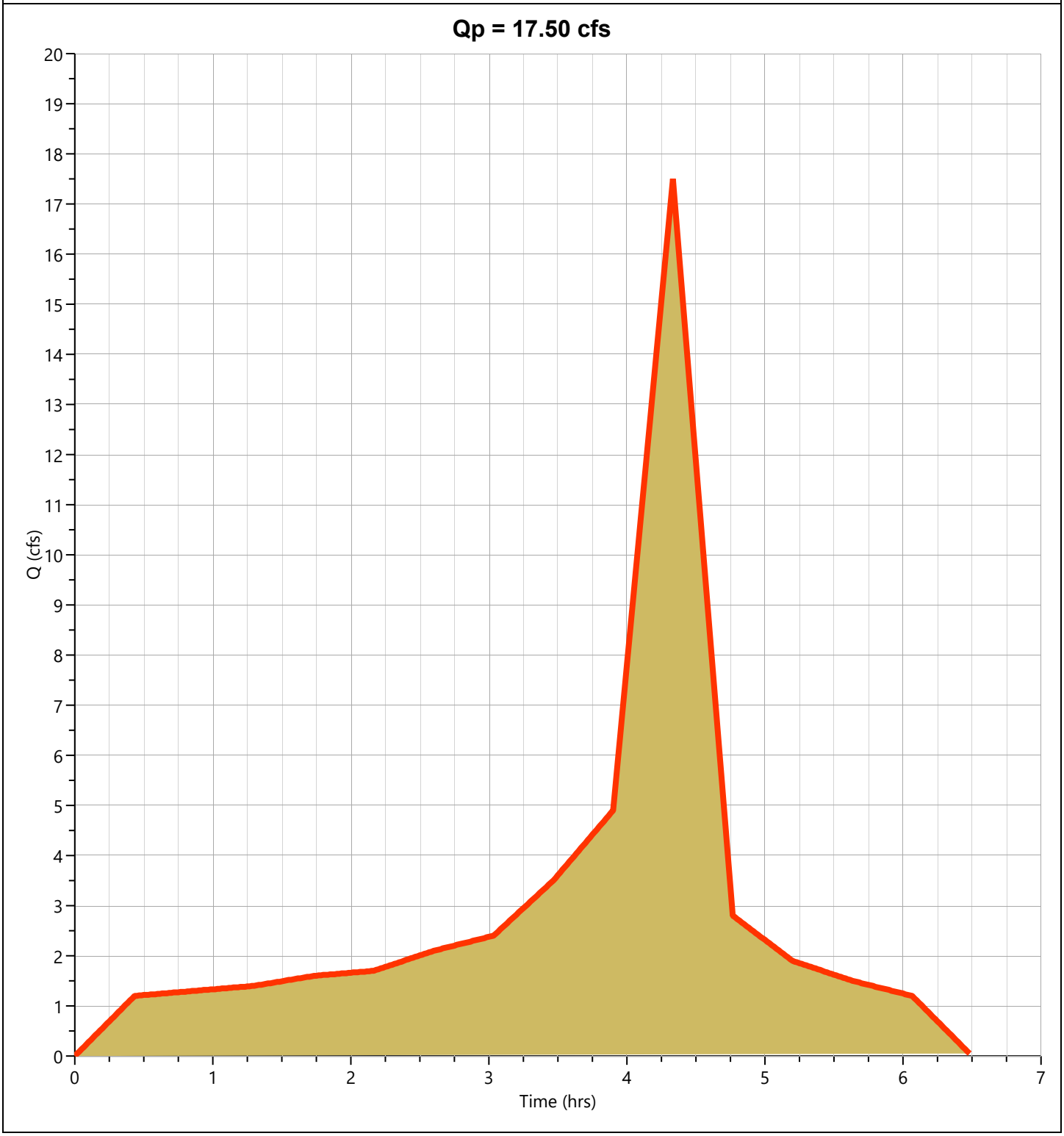
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.06

Hyd. No. 5

Hydrograph Type	= Manual	Peak Flow	= 17.50 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.33 hrs
Time Interval	= 1 min	Hydrograph Volume	= 70,200 cuft



Hydrograph Report

Project Name:

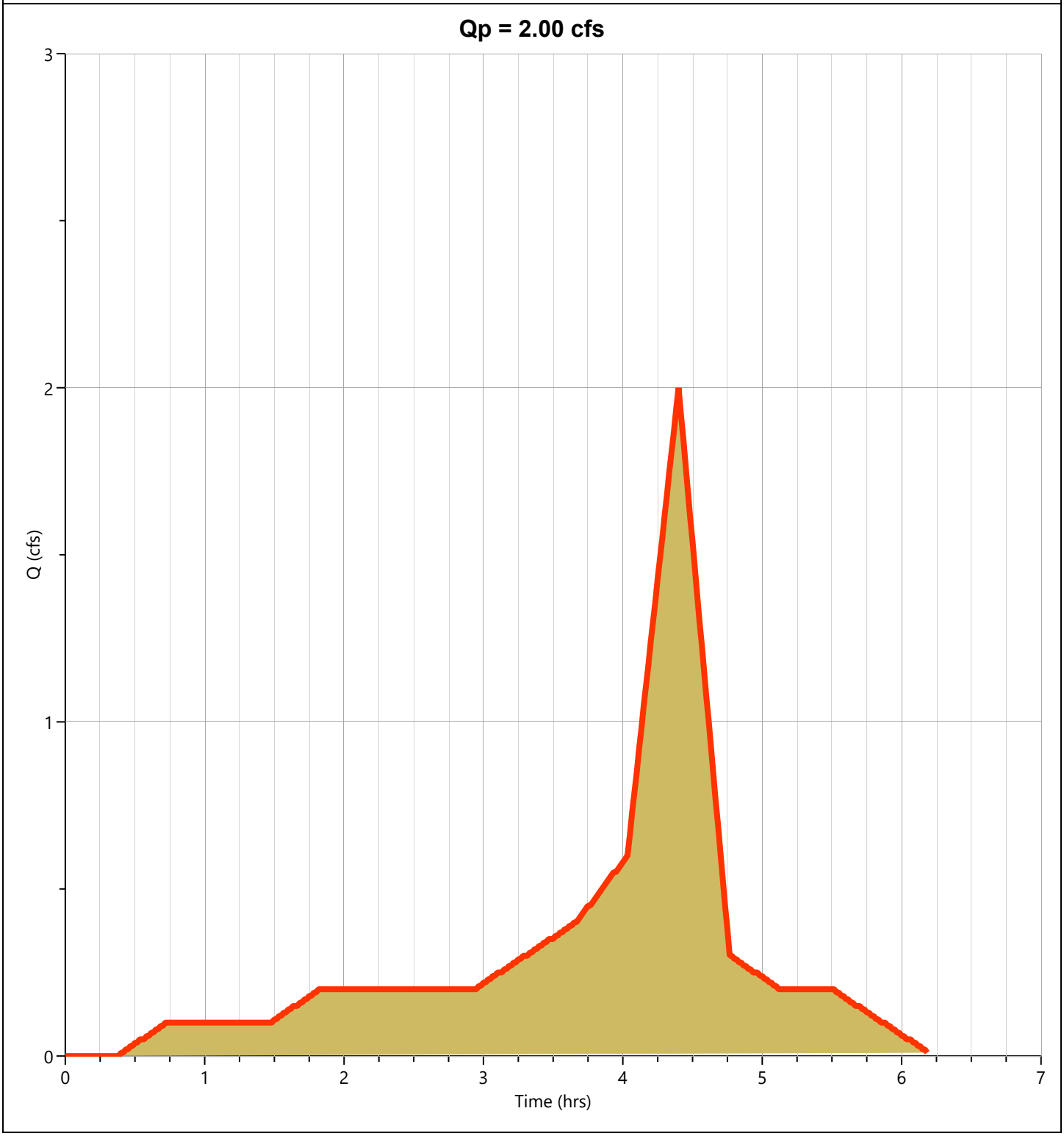
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.02

Hyd. No. 6

Hydrograph Type	= Manual	Peak Flow	= 2.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 6,864 cuft



Hydrograph Report

Project Name:

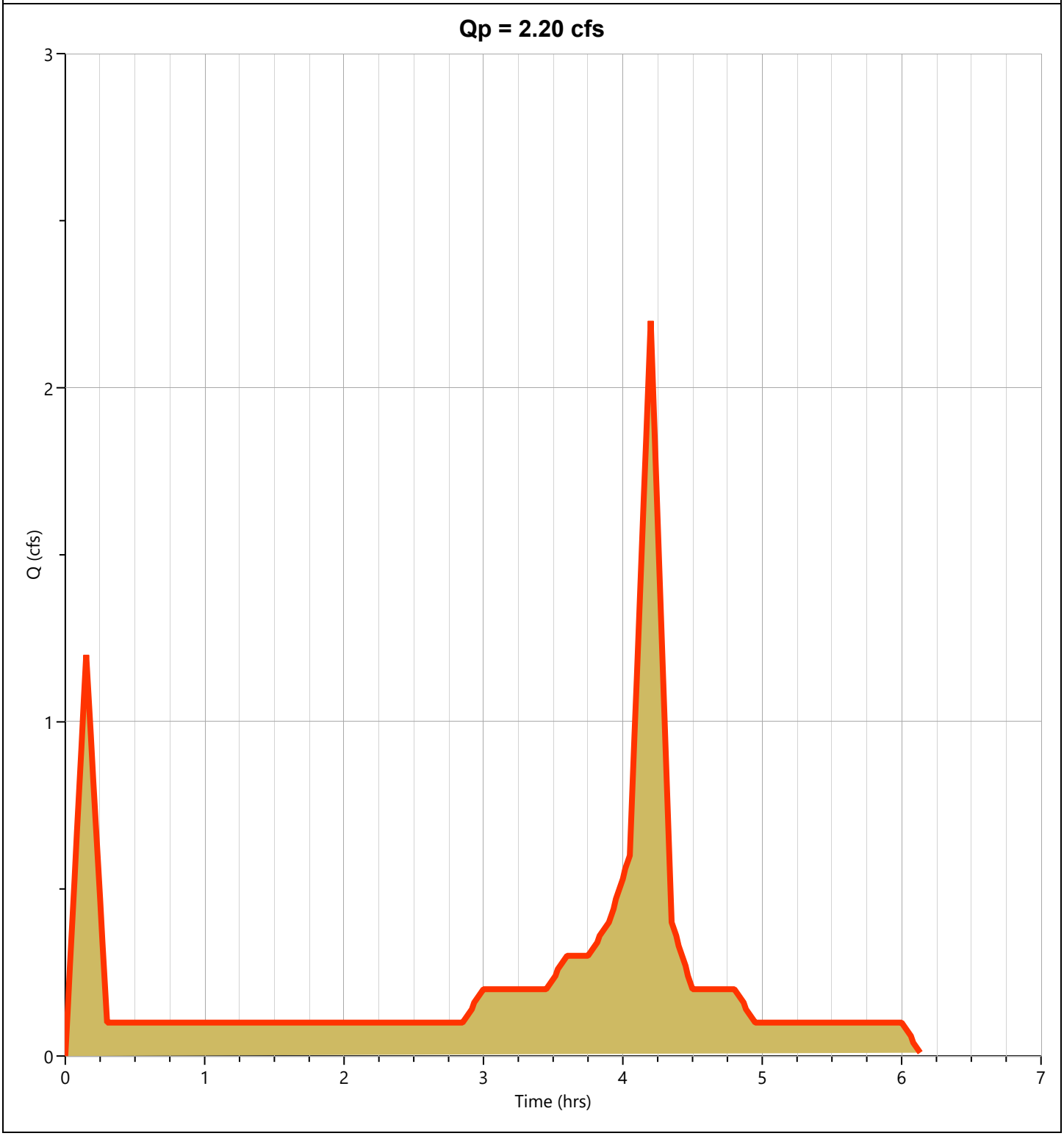
Hydrology Studio v 3.0.0.13

11-22-2019

Post 10.10

Hyd. No. 7

Hydrograph Type	= Manual	Peak Flow	= 2.200 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 5,076 cuft



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.13

11-22-2019

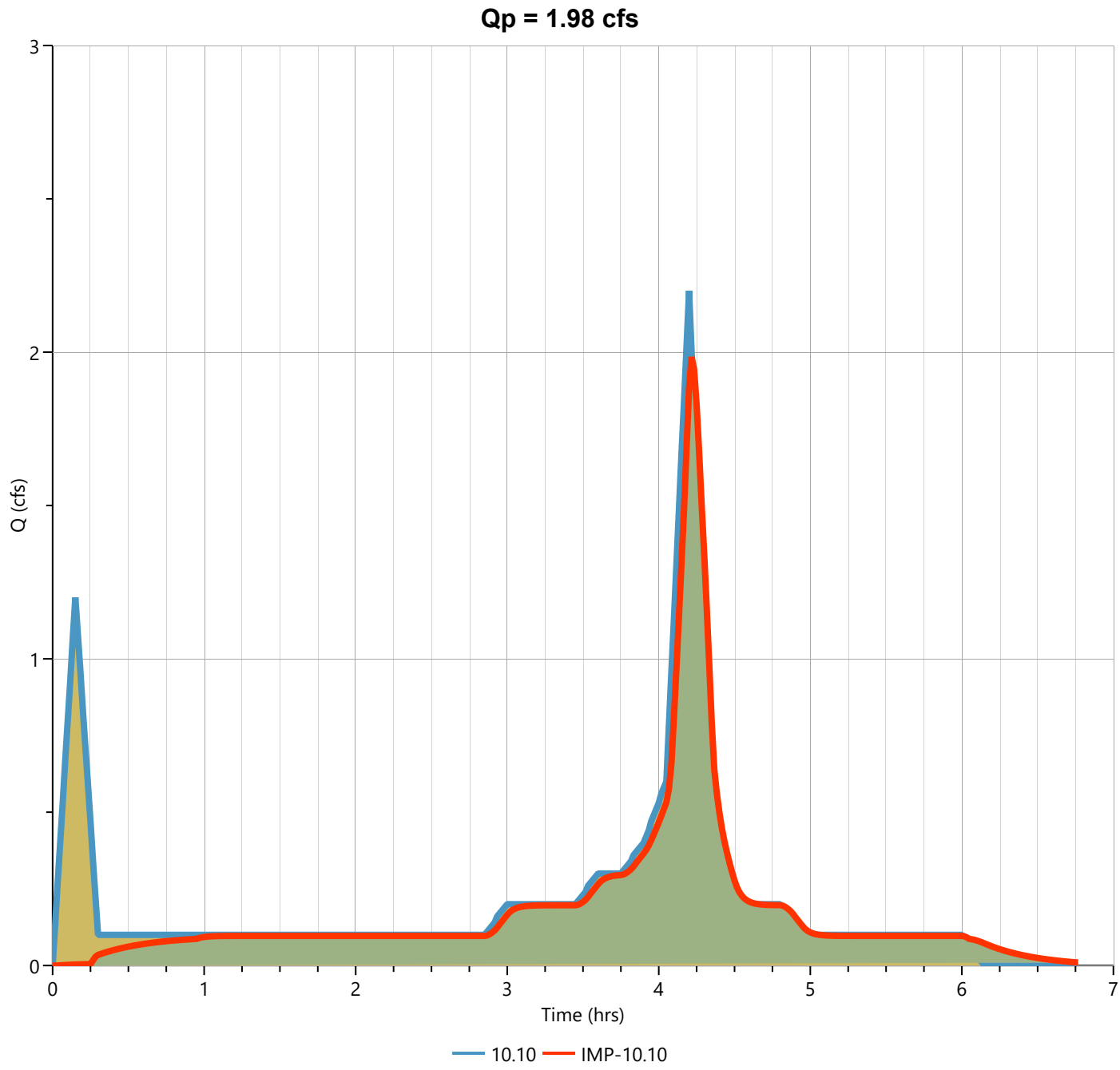
Post IMP-10.10

Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 1.984 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.22 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,661 cuft
Inflow Hydrograph	= 7 - 10.10	Max. Elevation	= 1087.21 ft
Pond Name	= 10.10	Max. Storage	= 987 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 35 min

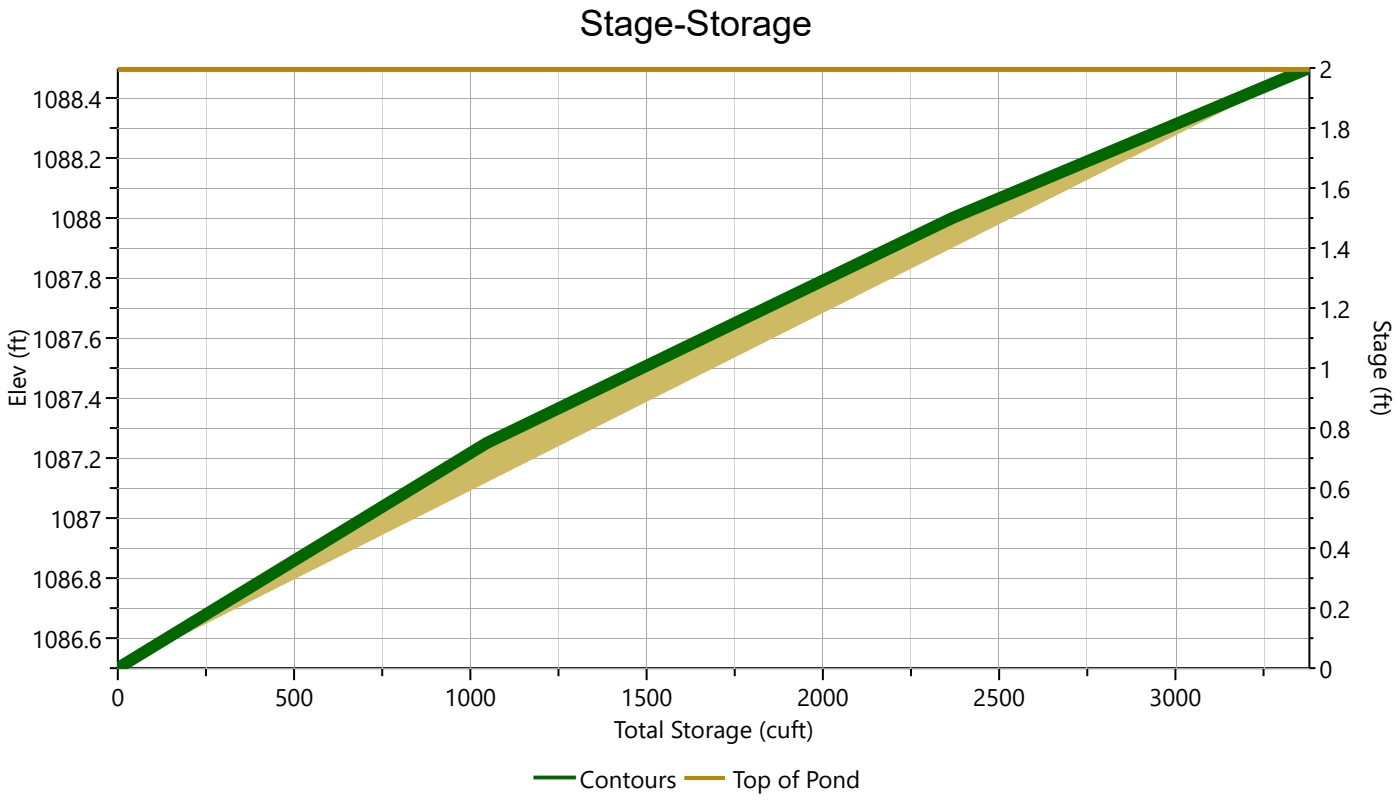


10.10 Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	1086.50
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	1086.50	1,220	0.000	0.000
0.75	1087.25	1,570	1,046	1,046
1.50	1088.00	1,952	1,321	2,367
2.00	1088.50	2,100	1,013	3,380



Pond Report

Project Name:

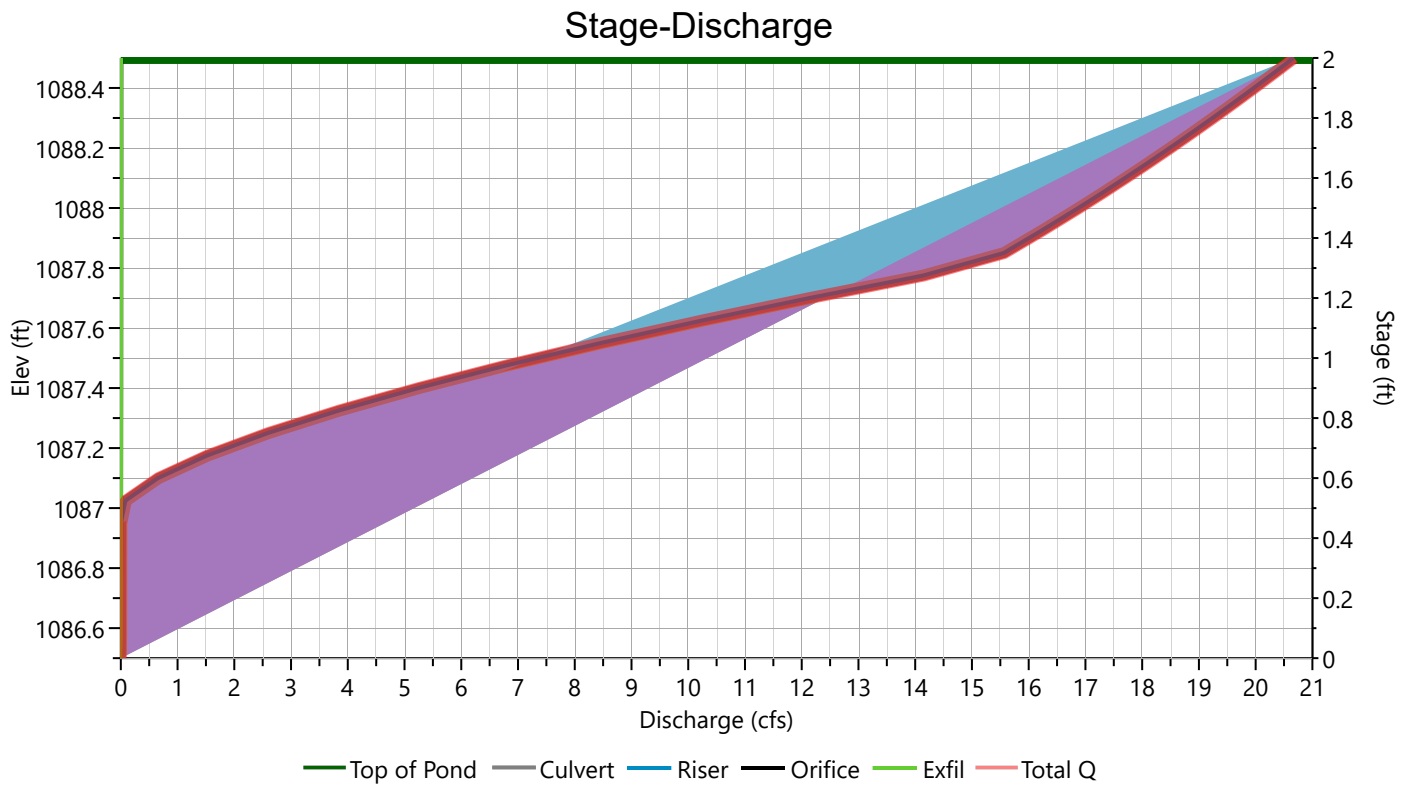
Hydrology Studio v 3.0.0.13

11-22-2019

10.10 Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1*	2	3		
Rise, in	24	.5			Orifice Dia, in	
Span, in	24	.5			No. Orifices	
No. Barrels	1	1			Invert Elevation, ft	
Invert Elevation, ft	1083.75	1084.00			Height, ft	
Orifice Coefficient, Co	0.60	0.60			Orifice Coefficient, Co	
Length, ft	8.5					
Barrel Slope, %	1					
N-Value, n	0.013					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.10**
Crest Elevation, ft	1087					
Crest Length, ft	6.28					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



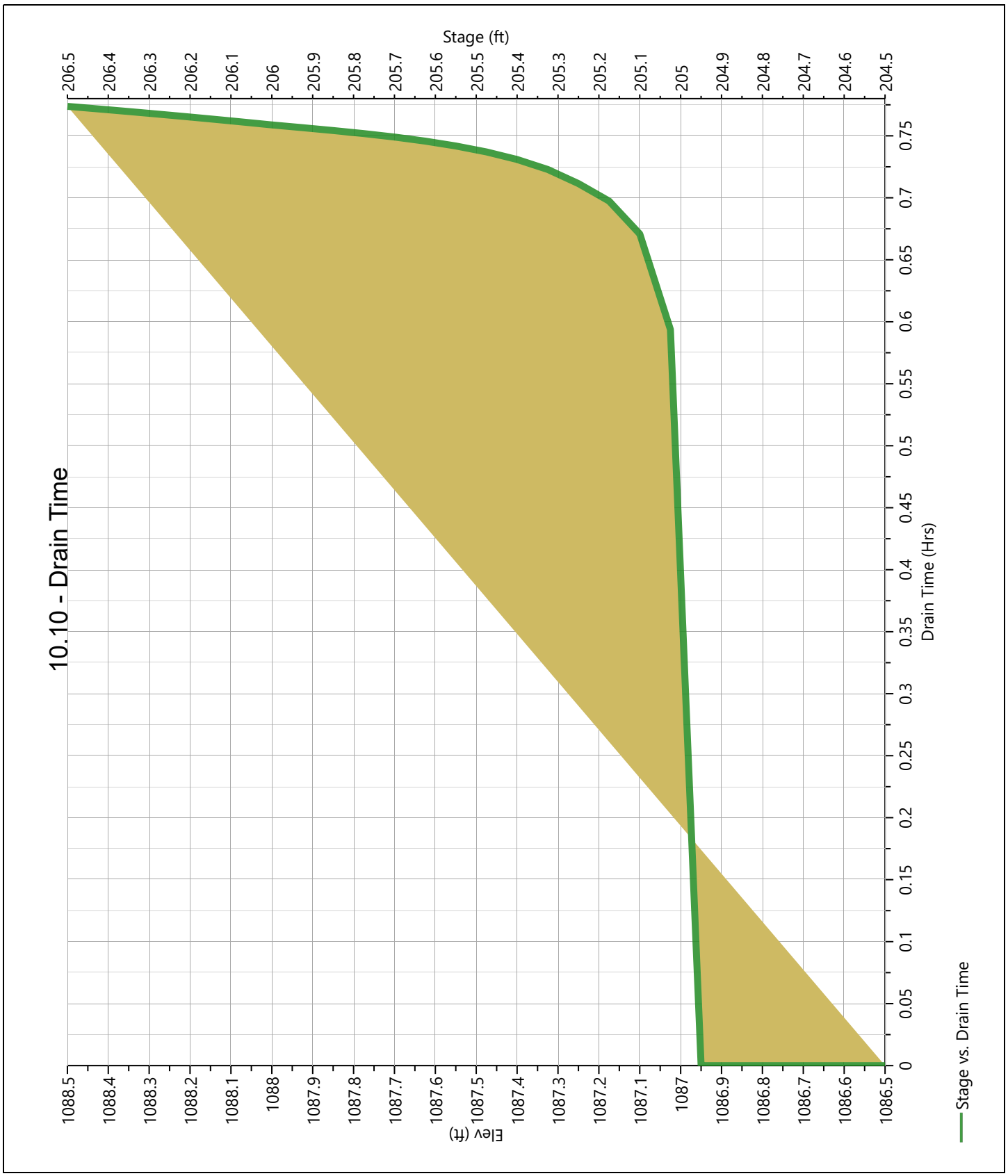
10.10 Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1086.50	0.000	0.000	0.000			0.000					0.000		0.000
0.75	1087.25	1,046	2.596 oc	0.006			2.591					0.004		2.600
1.50	1088.00	2,367	16.88 oc	0.008			16.87 ic					0.005		16.89
2.00	1088.50	3,380	20.68 oc	0.009			20.67 ic					0.005		20.68

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

10.10

Pond Drawdown



Hydrograph Report

Project Name:

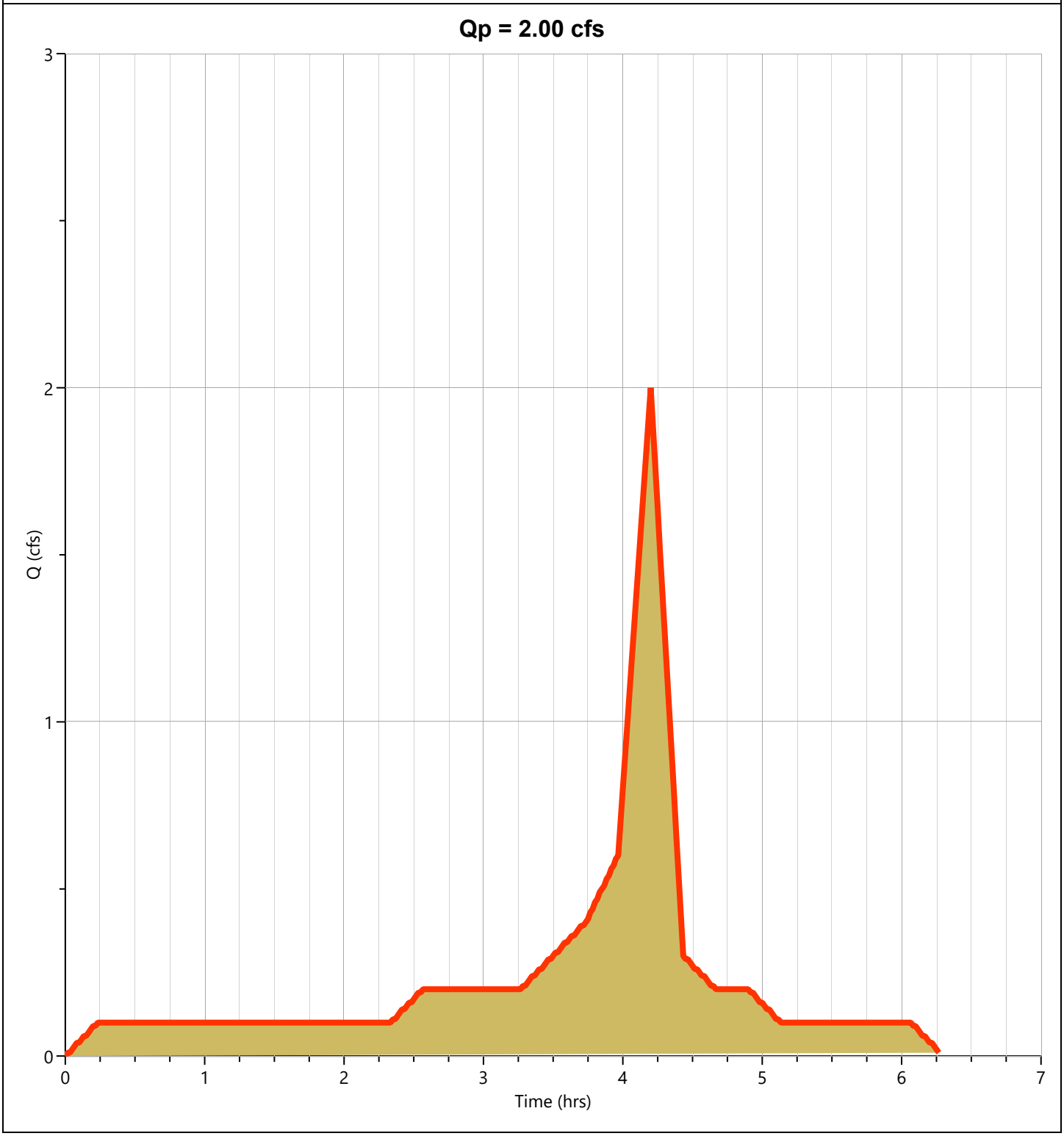
Hydrology Studio v 3.0.0.13

11-22-2019

Post 10.15

Hyd. No. 9

Hydrograph Type	= Manual	Peak Flow	= 2.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 5,292 cuft



Hydrograph Report

Project Name:

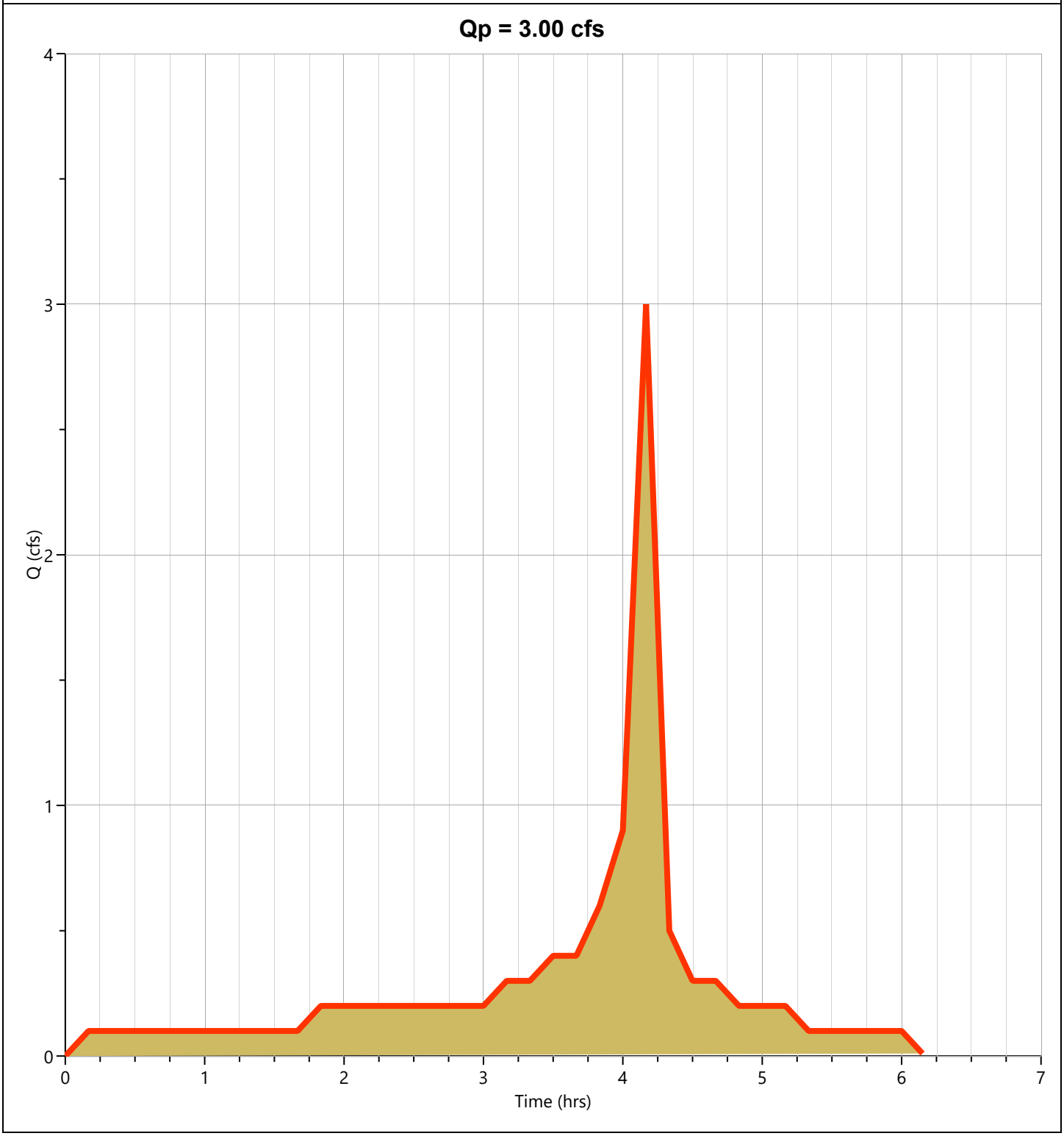
Hydrology Studio v 3.0.0.13

11-22-2019

Post 10.13

Hyd. No. 10

Hydrograph Type	= Manual	Peak Flow	= 3.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.17 hrs
Time Interval	= 1 min	Hydrograph Volume	= 6,420 cuft



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.13

11-22-2019

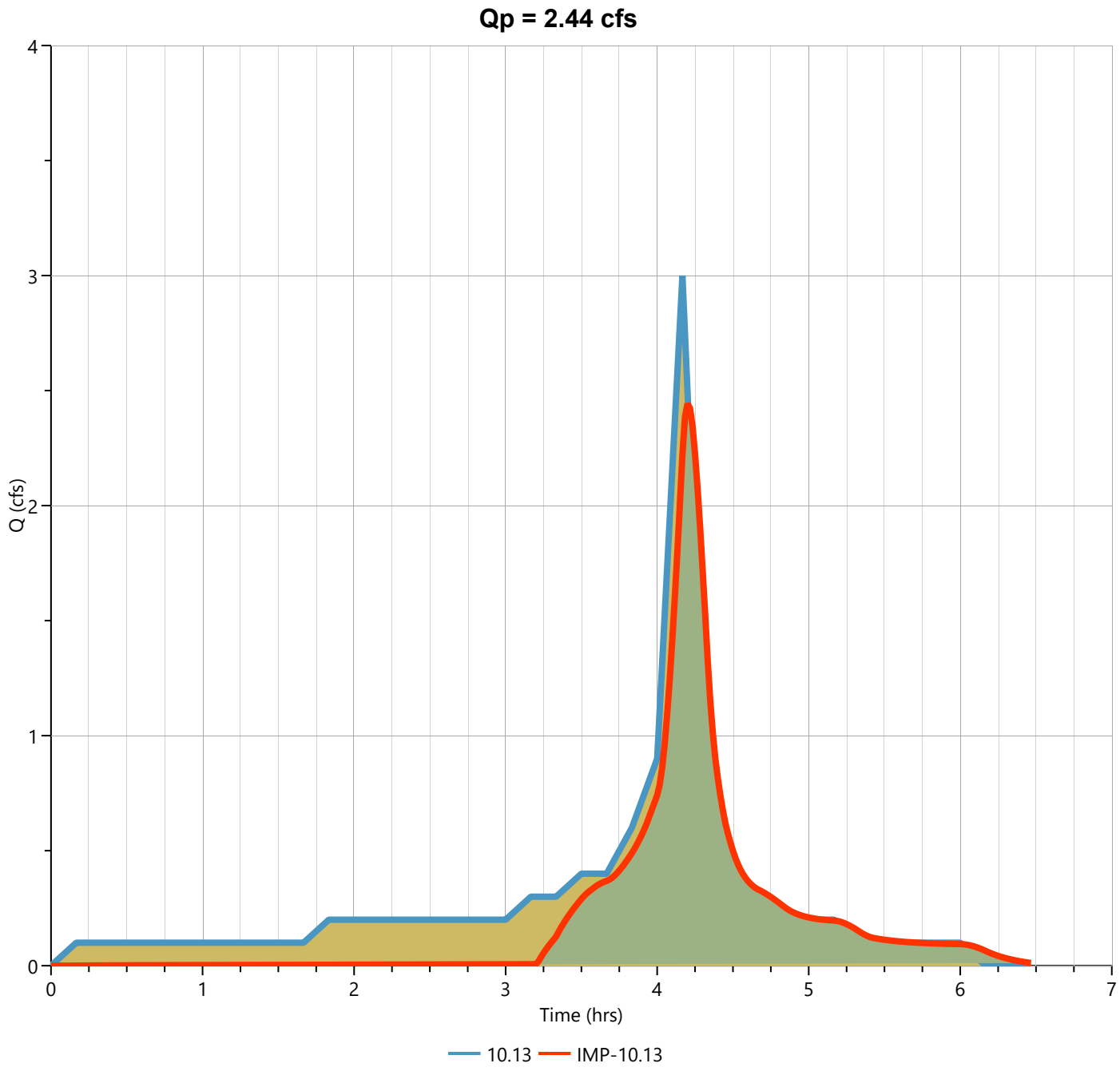
Post IMP-10.13

Hyd. No. 11

Hydrograph Type	= Pond Route	Peak Flow	= 2.443 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 5,236 cuft
Inflow Hydrograph	= 10 - 10.13	Max. Elevation	= 966.38 ft
Pond Name	= IMP-10.13	Max. Storage	= 2,325 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 42 min



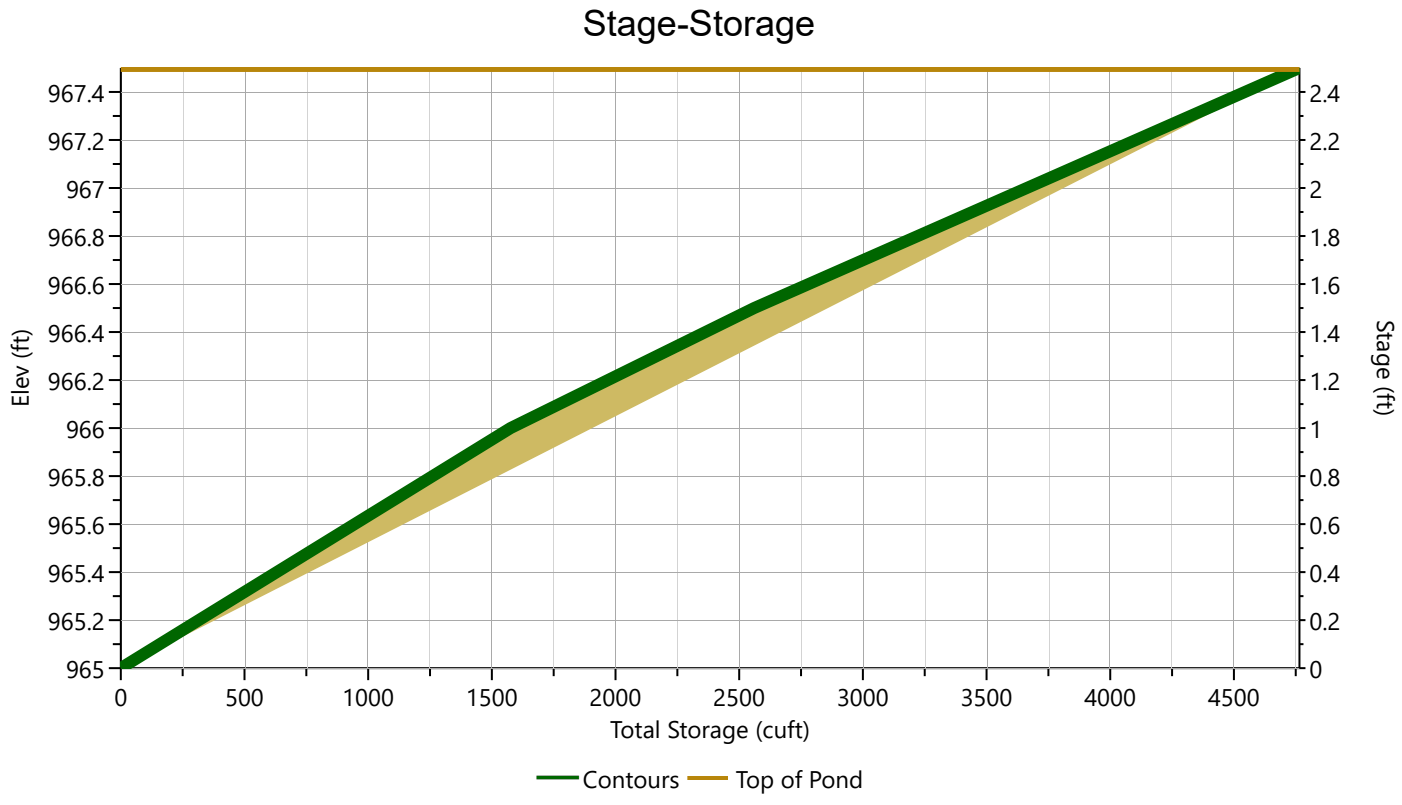
IMP-10.13

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	965.00
Voids (%)	100.00
Volume Calc	Ave End Area

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	965.00	1,320	0.000	0.000
1.00	966.00	1,831	1,576	1,576
1.50	966.50	2,109	985	2,561
2.50	967.50	2,300	2,205	4,765



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

11-22-2019

IMP-10.13

Stage-Discharge

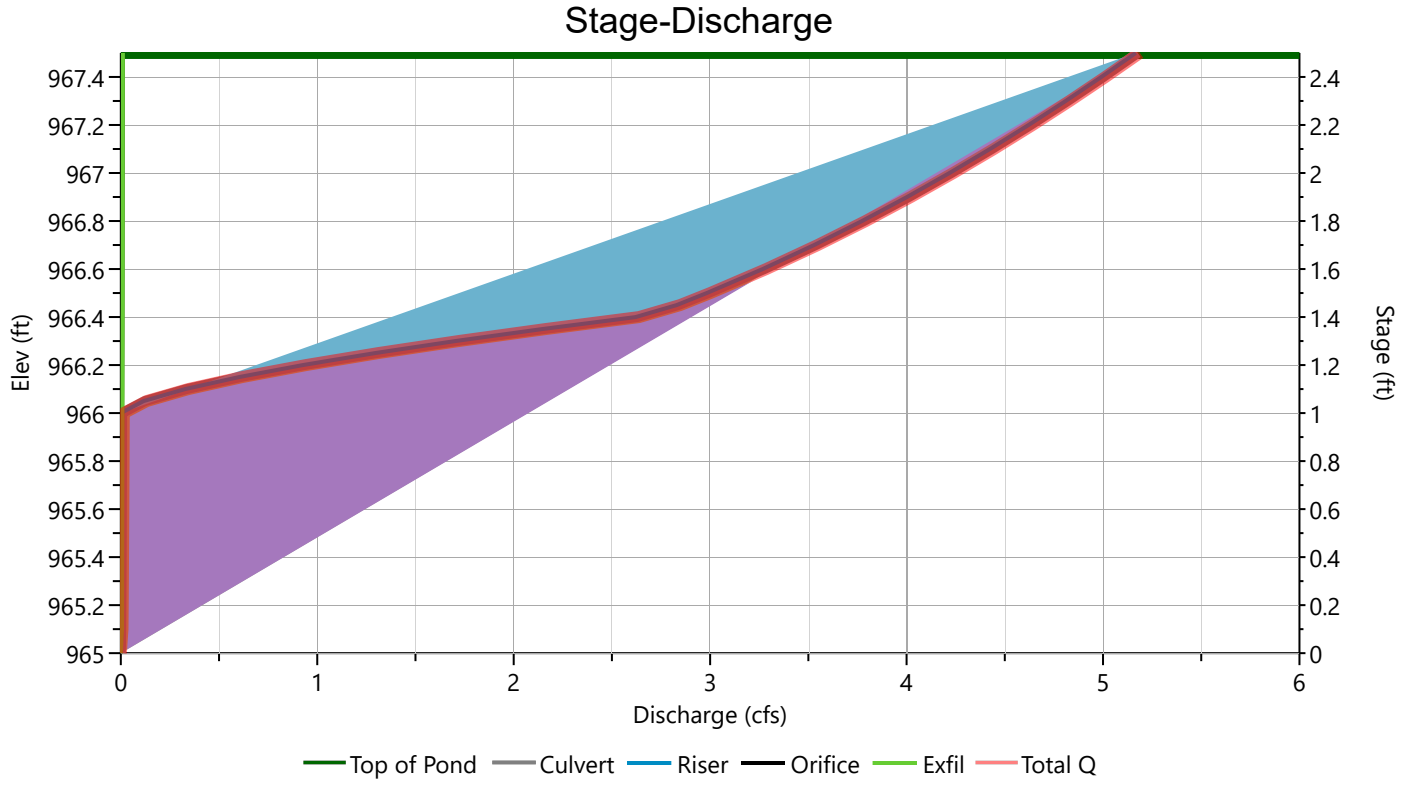
Culvert / Orifices	Culvert	Orifices		
		1*	2	3
Rise, in	12	.5		
Span, in	12	.5		
No. Barrels	1	1		
Invert Elevation, ft	962.25	962.50		
Orifice Coefficient, Co	0.60	0.60		
Length, ft	12			
Barrel Slope, %	1			
N-Value, n	0.013			

Orifice Plate	
Orifice Dia, in	
No. Orifices	
Invert Elevation, ft	
Height, ft	
Orifice Coefficient, Co	

Weirs	Riser*	Weirs		
		1	2	3
Shape / Type	Circular			
Crest Elevation, ft	966			
Crest Length, ft	3.14			
Angle, deg				
Weir Coefficient, Cw	3.3			

Ancillary	
Exfiltration, in/hr	0.20**

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-10.13

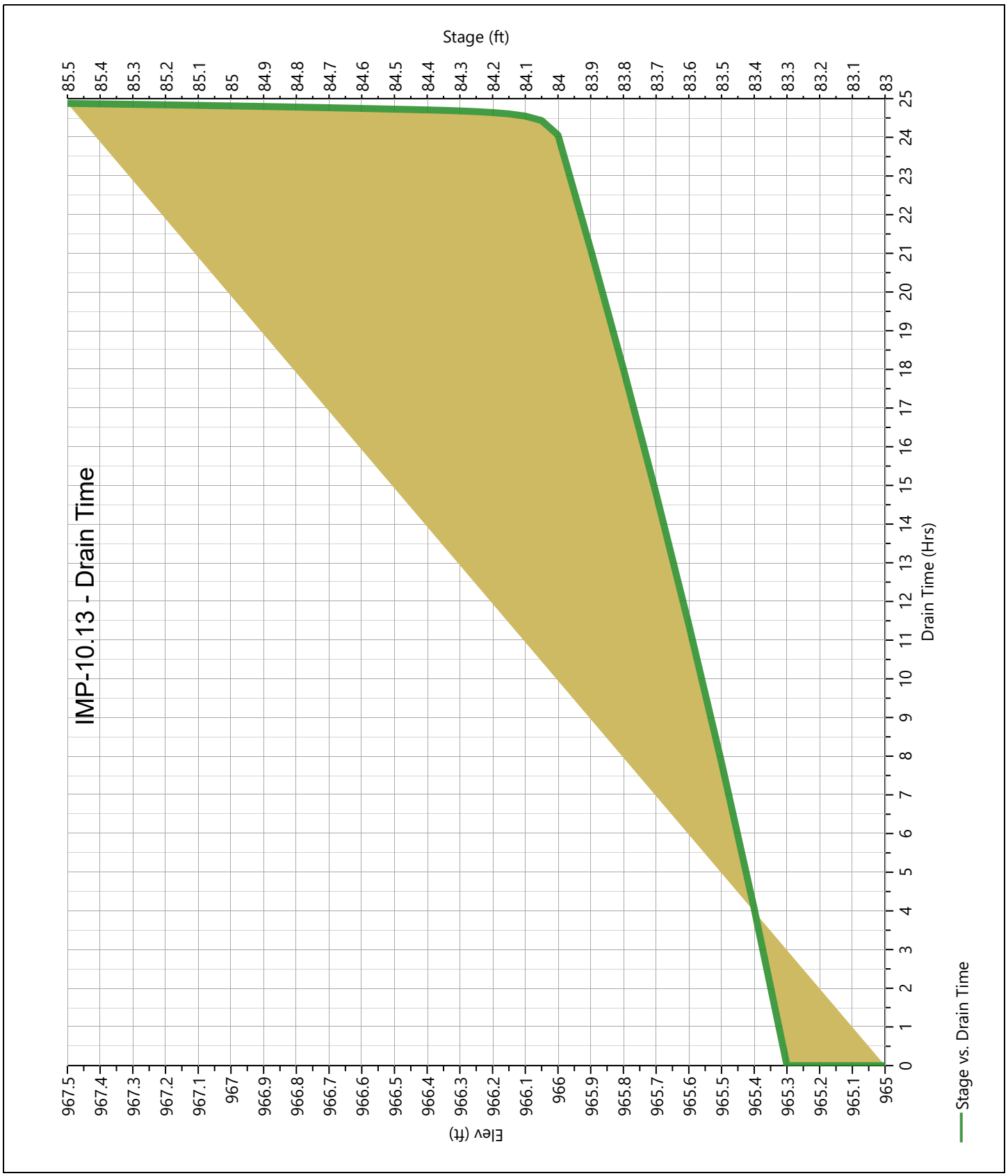
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	965.00	0.000	0.000	0.000			0.000					0.000		0.000
1.00	966.00	1,576	0.007 ic	0.007			0.000					0.008		0.015
1.50	966.50	2,561	2.991 ic	0.008			2.983 ic					0.010		3.001
2.50	967.50	4,765	5.177 ic	0.010			5.167 ic					0.011		5.188

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP-10.13

Pond Drawdown



Hydrograph Report

Project Name:

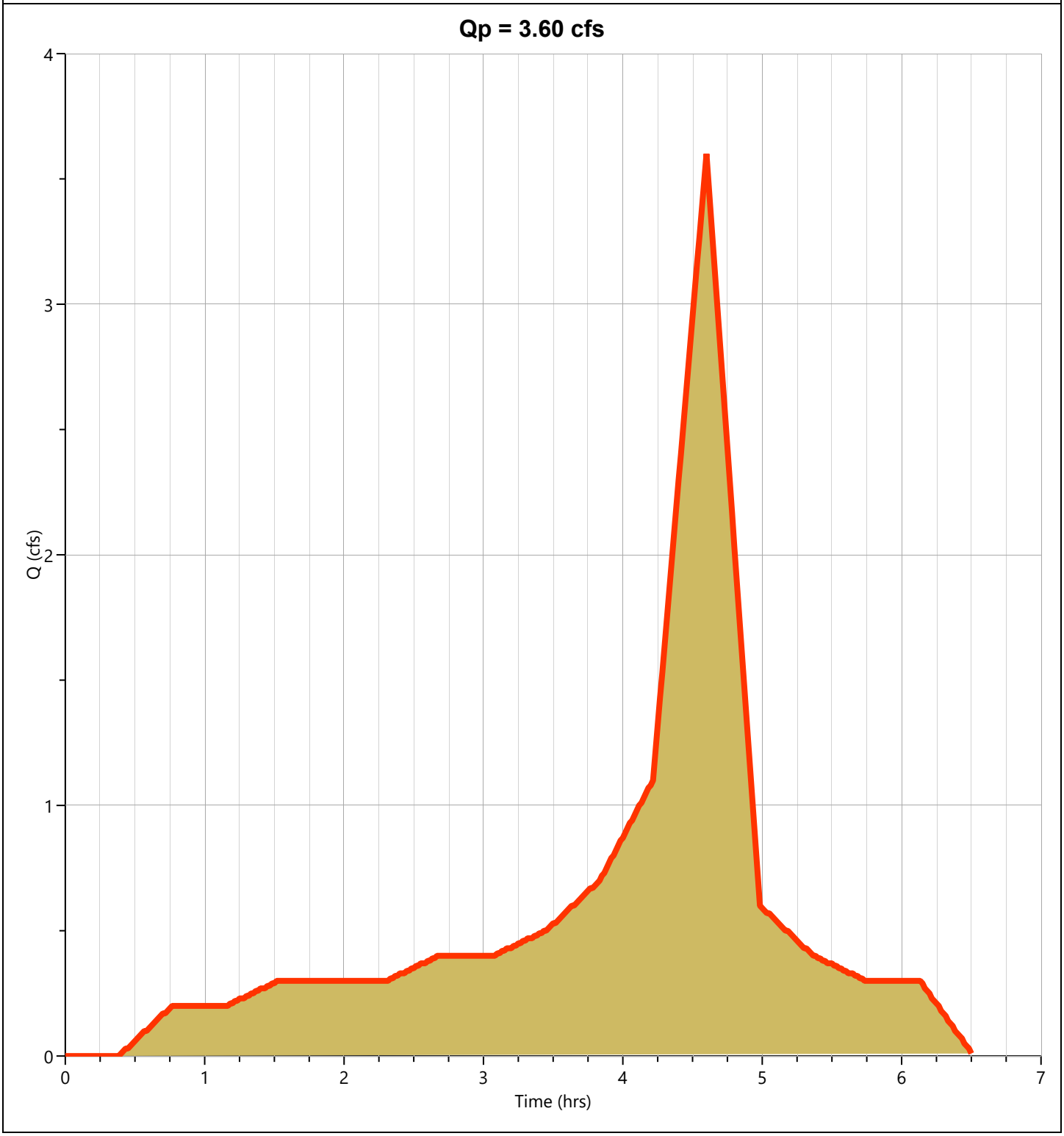
Hydrology Studio v 3.0.0.13

11-22-2019

Post 20.10

Hyd. No. 12

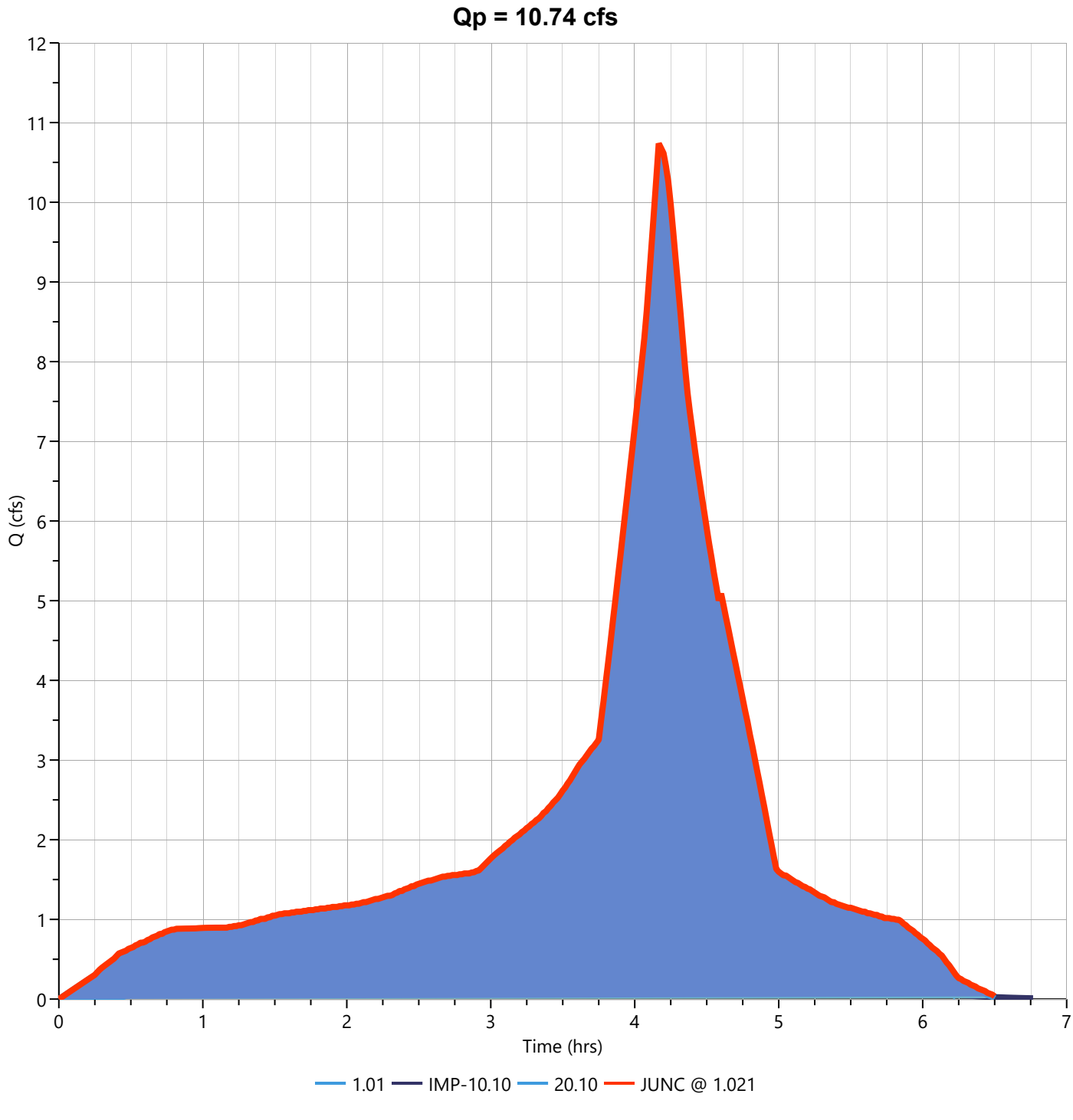
Hydrograph Type	= Manual	Peak Flow	= 3.600 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.60 hrs
Time Interval	= 1 min	Hydrograph Volume	= 13,248 cuft



Post JUNC @ 1.021

Hyd. No. 13

Hydrograph Type	= Junction	Peak Flow	= 10.74 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.17 hrs
Time Interval	= 1 min	Hydrograph Volume	= 49,259 cuft
Inflow Hydrographs	= 2, 8, 12	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

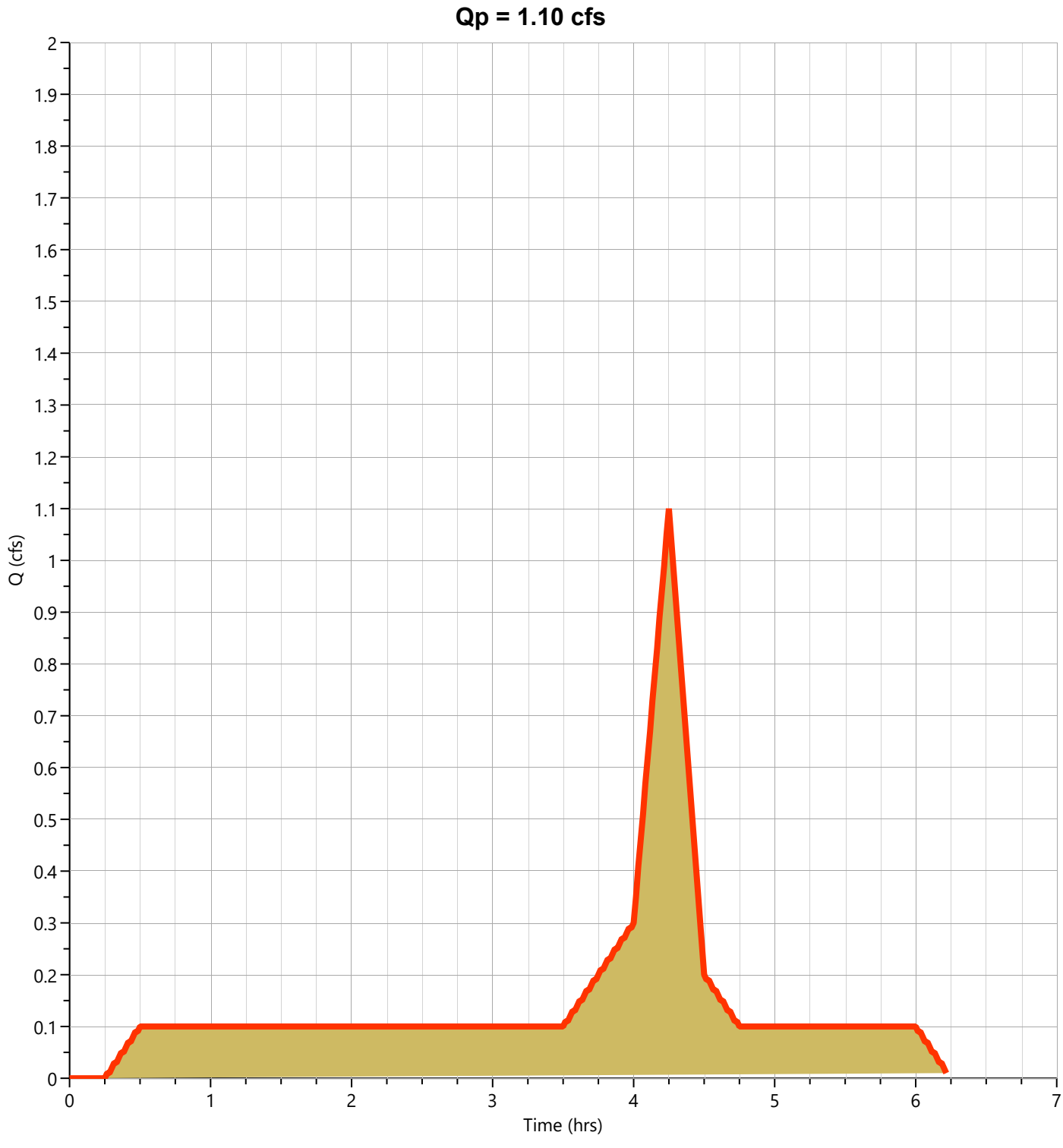
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.08

Hyd. No. 14

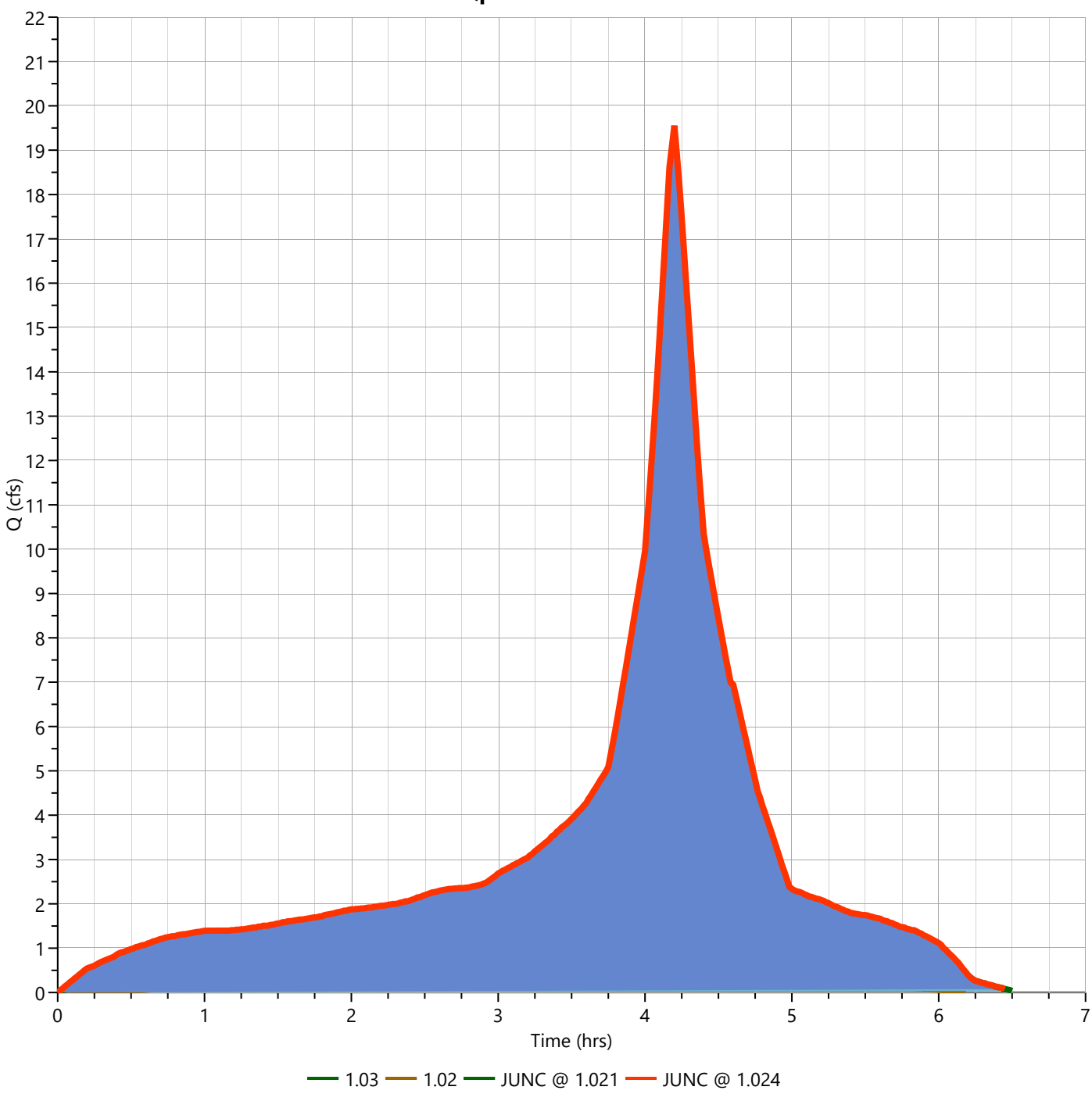
Hydrograph Type	= Manual	Peak Flow	= 1.100 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.25 hrs
Time Interval	= 1 min	Hydrograph Volume	= 3,330 cuft



Post JUNC @ 1.024

Hyd. No. 15

Hydrograph Type	= Junction	Peak Flow	= 19.55 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 74,565 cuft
Inflow Hydrographs	= 3, 6, 13	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

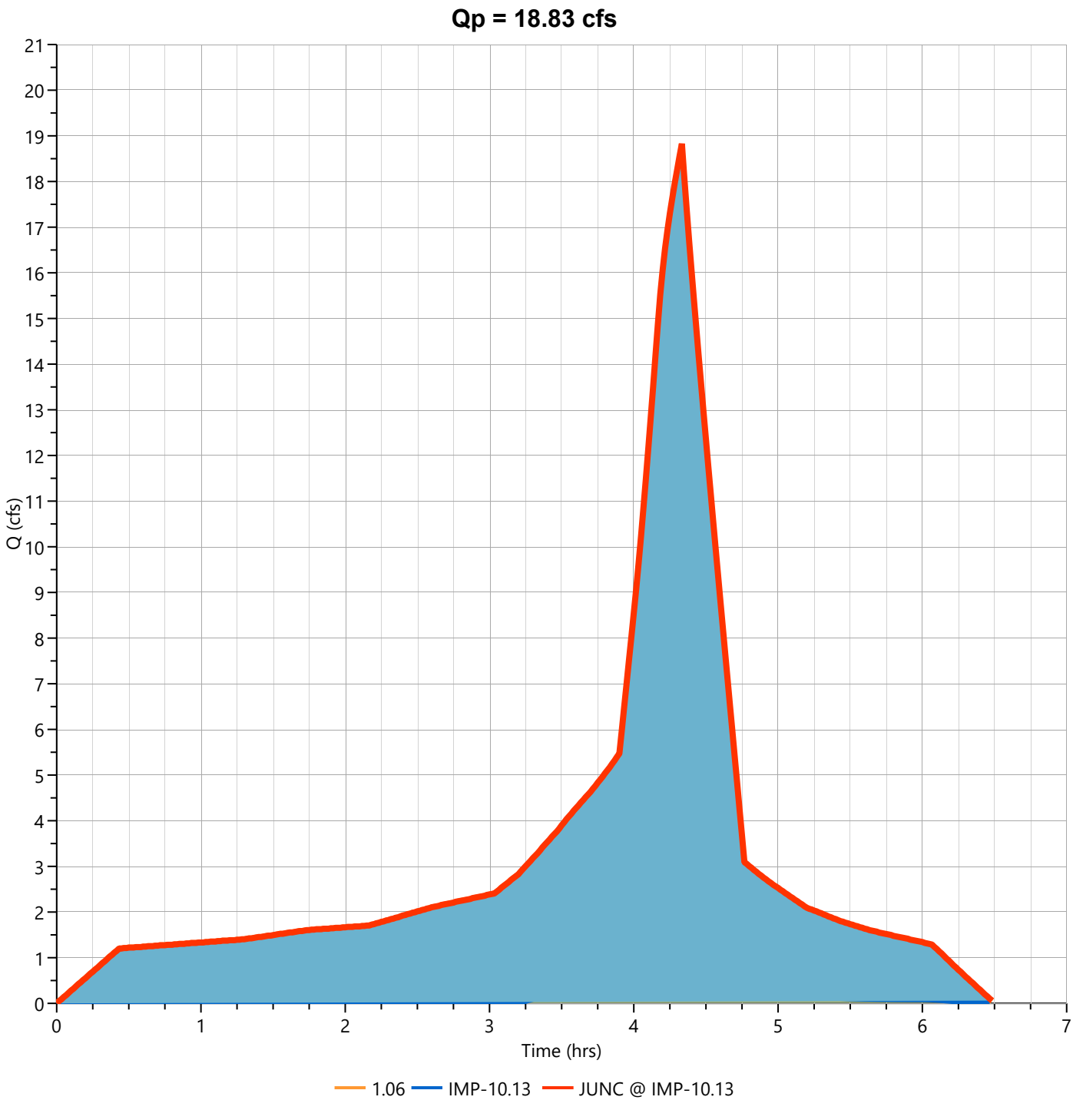
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ IMP-10.13

Hyd. No. 16

Hydrograph Type	= Junction	Peak Flow	= 18.83 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.33 hrs
Time Interval	= 1 min	Hydrograph Volume	= 75,436 cuft
Inflow Hydrographs	= 5, 11	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

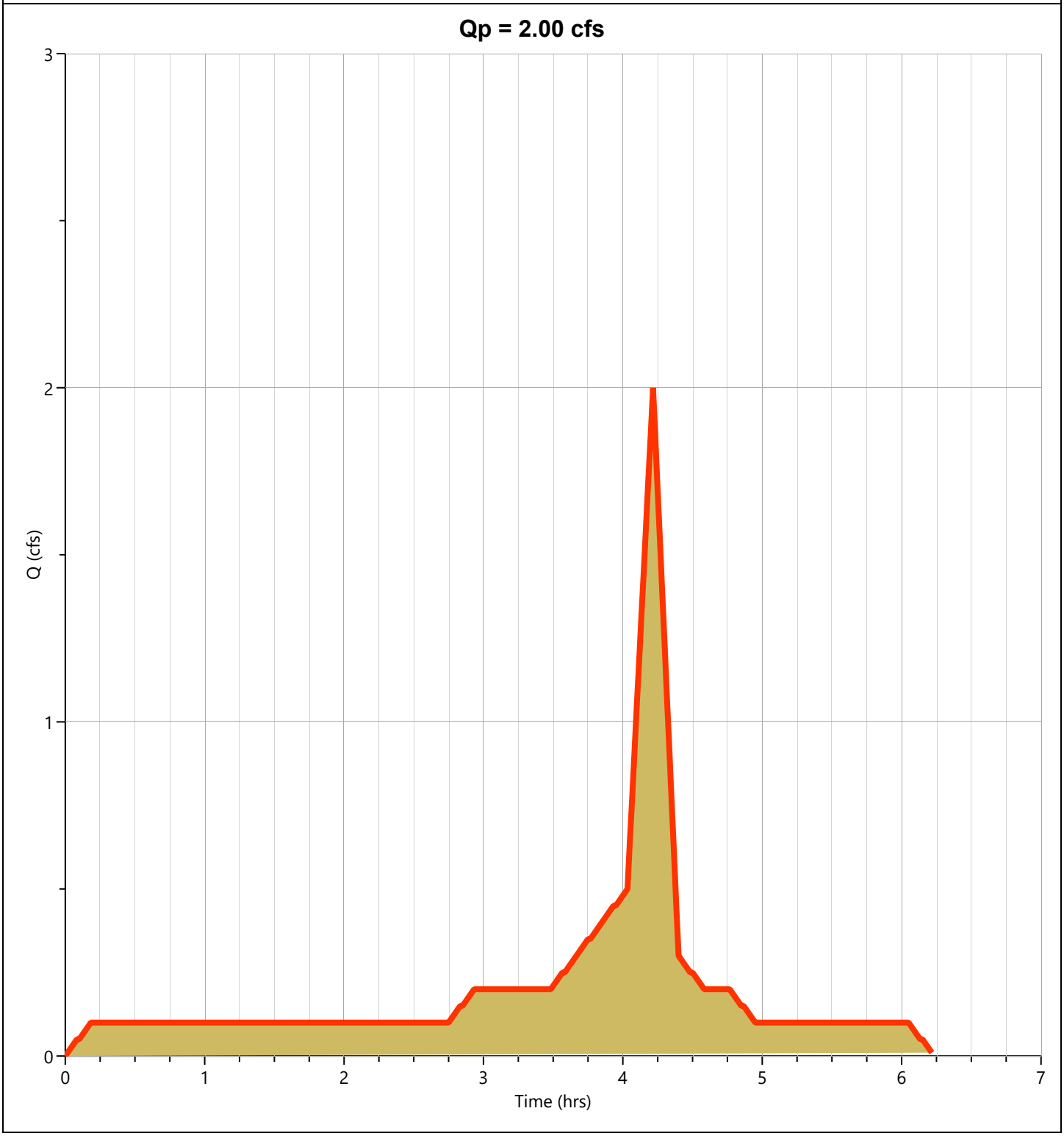
Hydrology Studio v 3.0.0.13

11-22-2019

Post 10.11

Hyd. No. 17

Hydrograph Type	= Manual	Peak Flow	= 2.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.22 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,554 cuft



Hydrograph Report

Project Name:

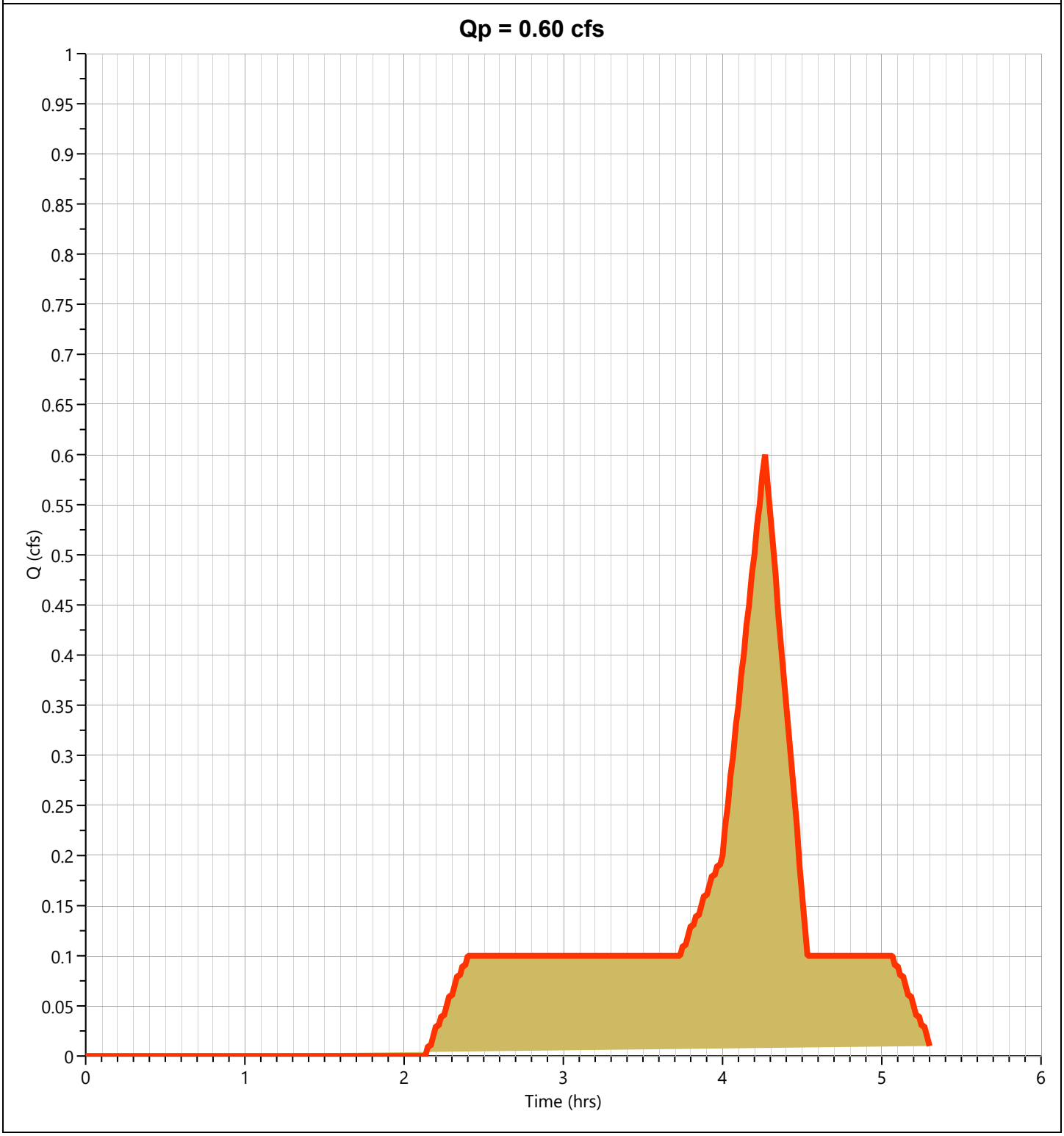
Hydrology Studio v 3.0.0.13

11-22-2019

Post 10.12

Hyd. No. 18

Hydrograph Type	= Manual	Peak Flow	= 0.600 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.27 hrs
Time Interval	= 1 min	Hydrograph Volume	= 1,637 cuft



Hydrograph Report

Project Name:

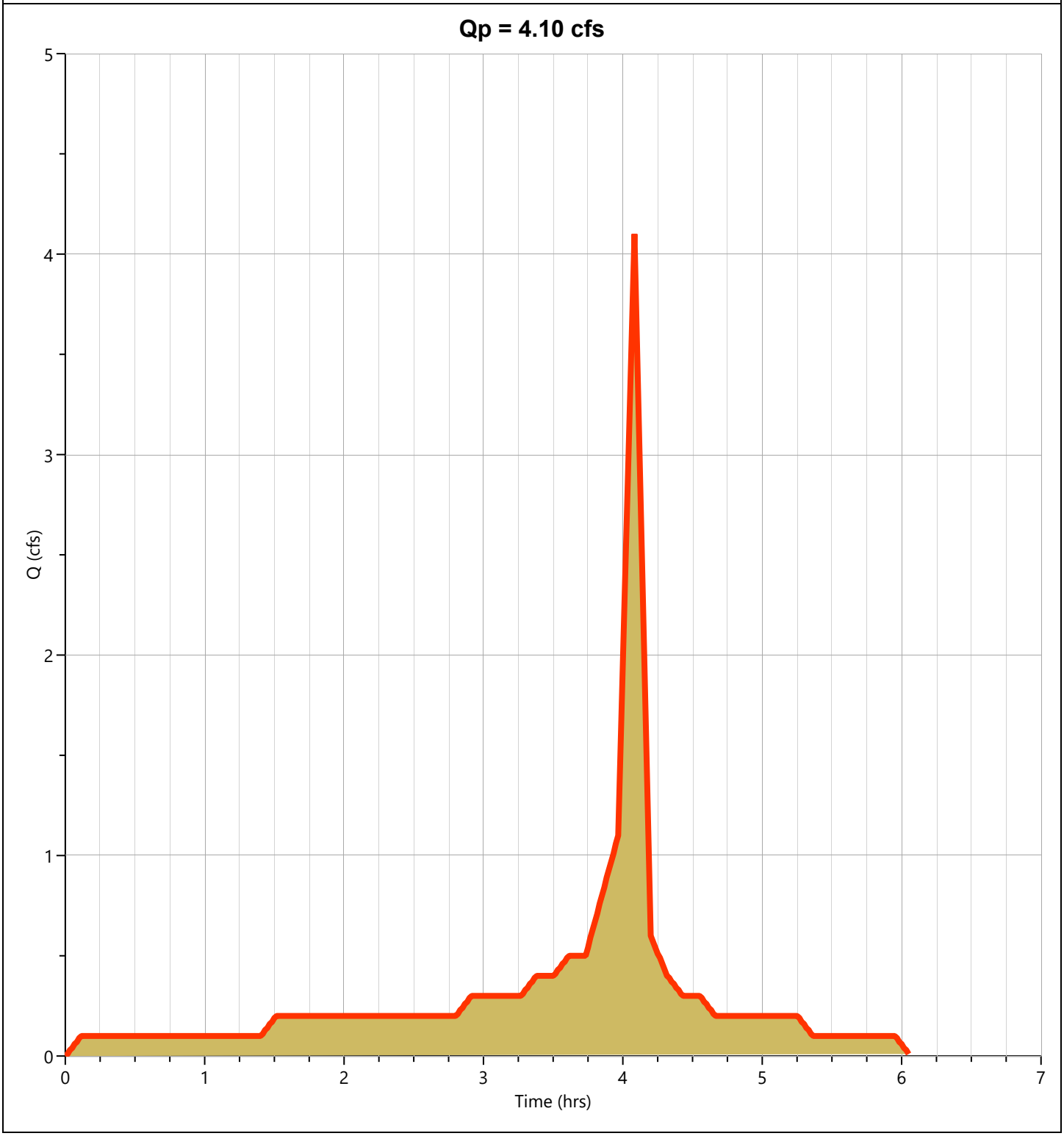
Hydrology Studio v 3.0.0.13

11-22-2019

Post 10.14

Hyd. No. 19

Hydrograph Type	= Manual	Peak Flow	= 4.100 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.08 hrs
Time Interval	= 1 min	Hydrograph Volume	= 6,720 cuft



Hydrograph Report

Project Name:

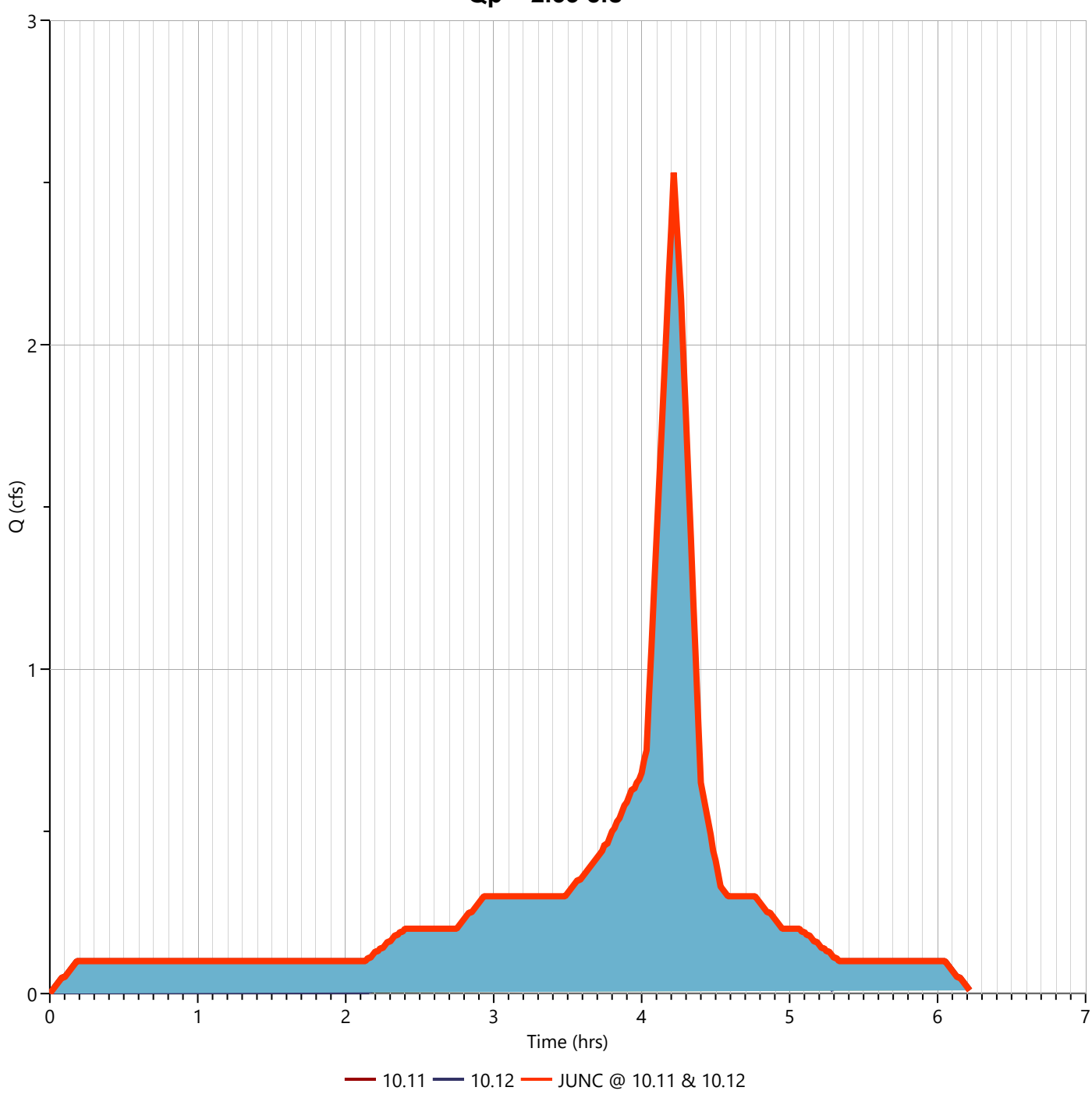
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 10.11 & 10.12

Hyd. No. 20

Hydrograph Type	= Junction	Peak Flow	= 2.530 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.22 hrs
Time Interval	= 1 min	Hydrograph Volume	= 6,191 cuft
Inflow Hydrographs	= 17, 18	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

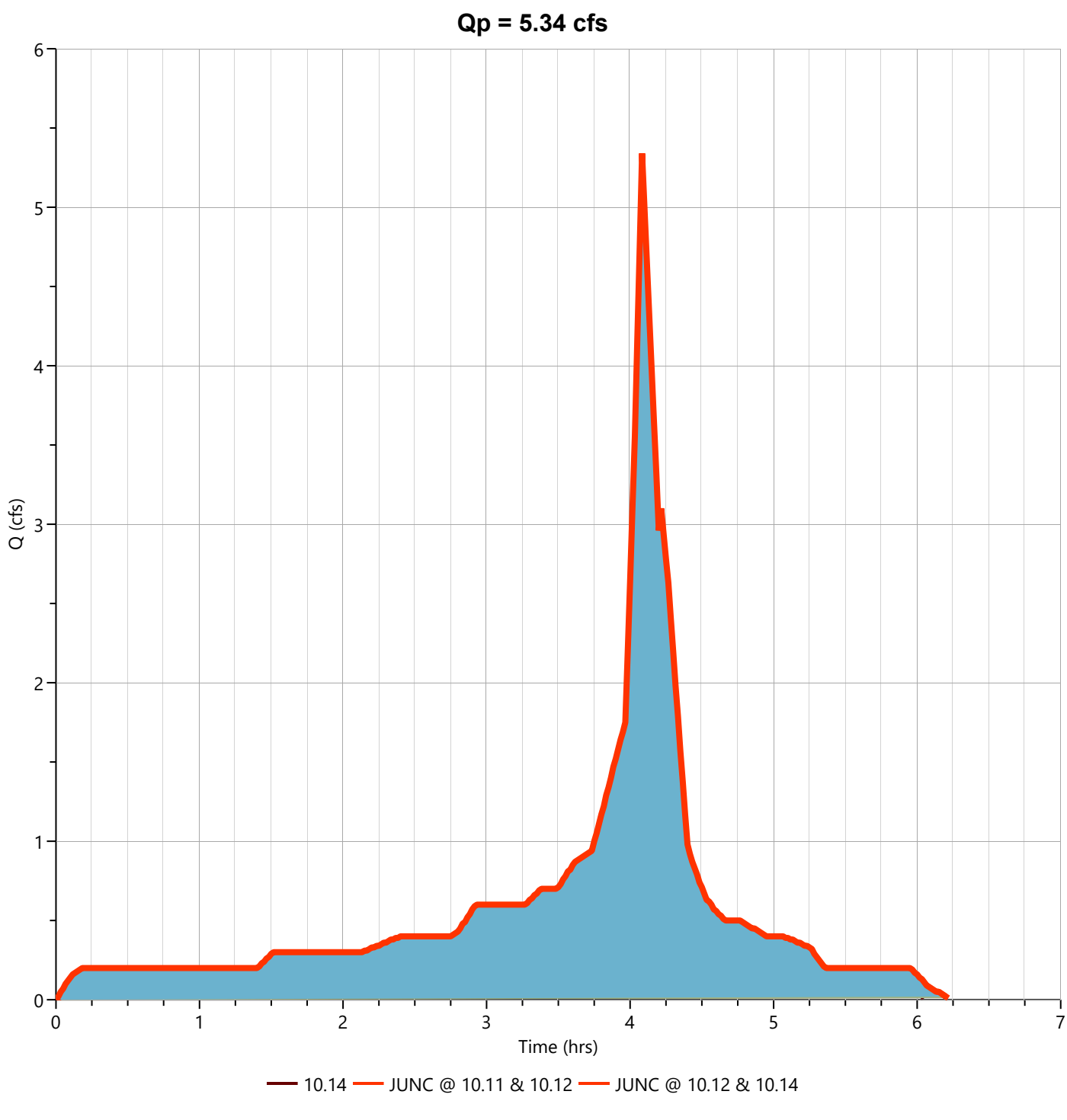
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 10.12 & 10.14

Hyd. No. 21

Hydrograph Type	= Junction	Peak Flow	= 5.340 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.08 hrs
Time Interval	= 1 min	Hydrograph Volume	= 12,911 cuft
Inflow Hydrographs	= 19, 20	Total Contrib. Area	= 0.0 ac



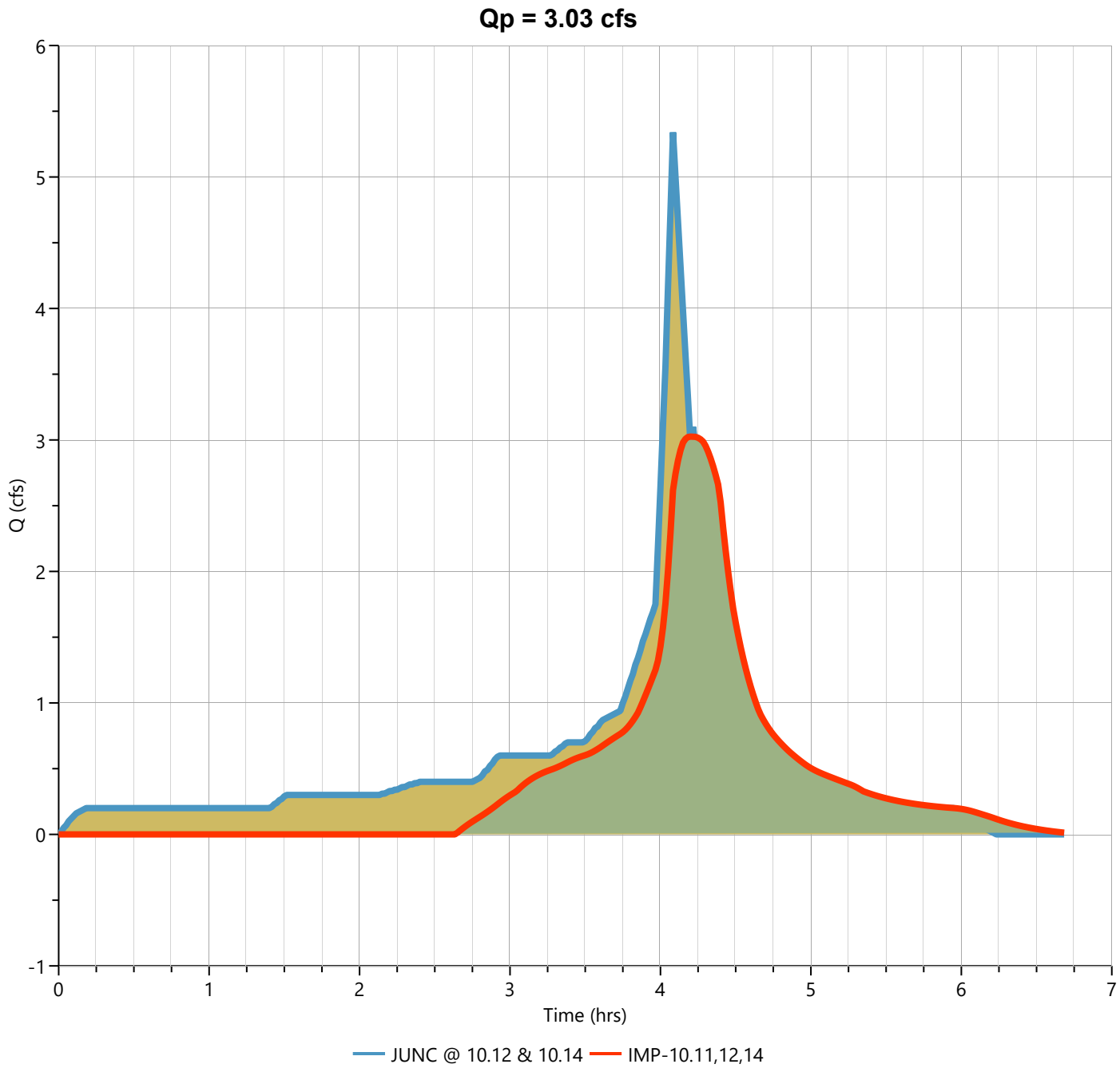
Post IMP-10.11,12,14

Hyd. No. 22

Hydrograph Type	= Pond Route	Peak Flow	= 3.025 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 10,045 cuft
Inflow Hydrograph	= 21 - JUNC @ 10.12 & 10.14	Max. Elevation	= 1003.02 ft
Pond Name	= IMP-10.11,12,14	Max. Storage	= 4,412 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 42 min



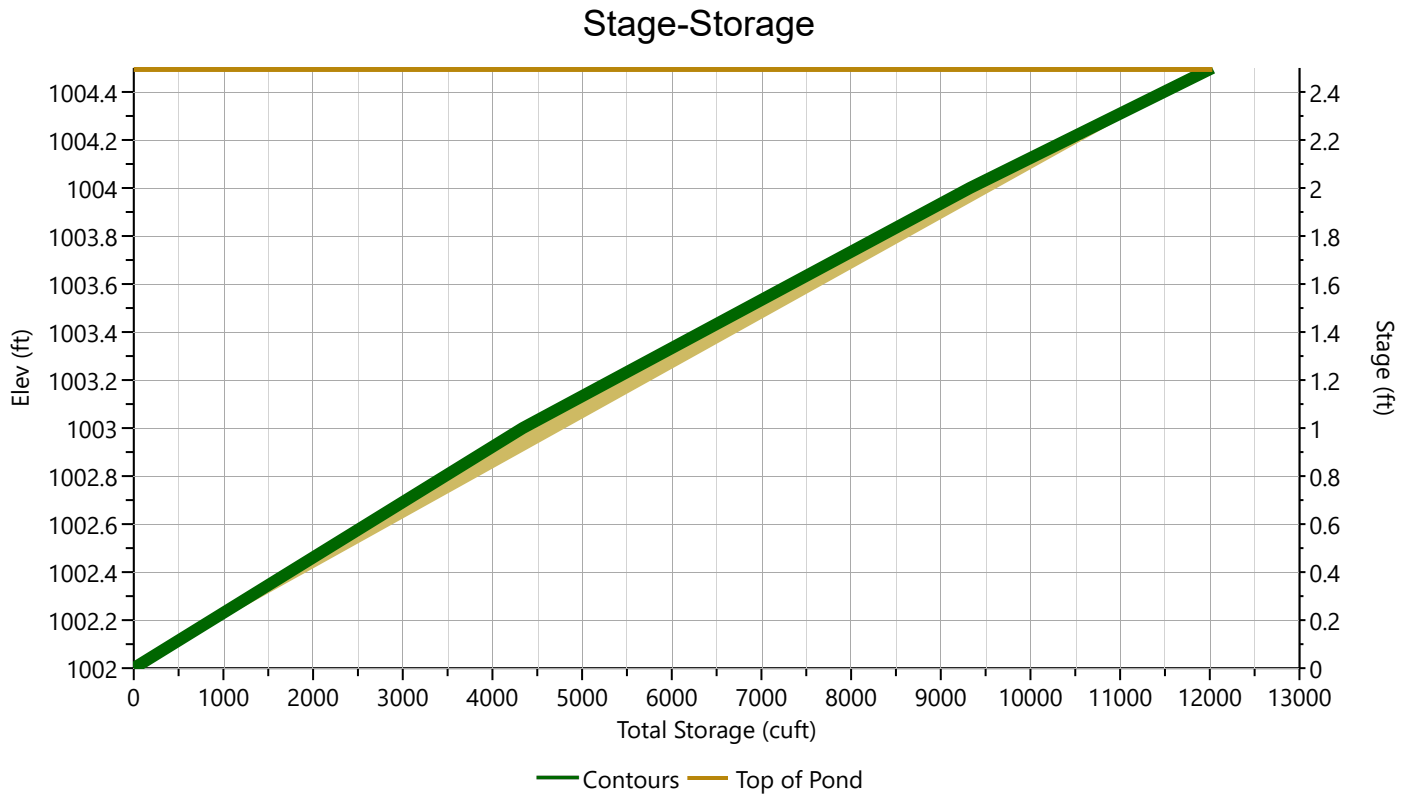
IMP-10.11,12,14

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	1002.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	1002.00	4,020	0.000	0.000
1.00	1003.00	4,655	4,338	4,338
2.00	1004.00	5,318	4,987	9,324
2.50	1004.50	5,500	2,705	12,029



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

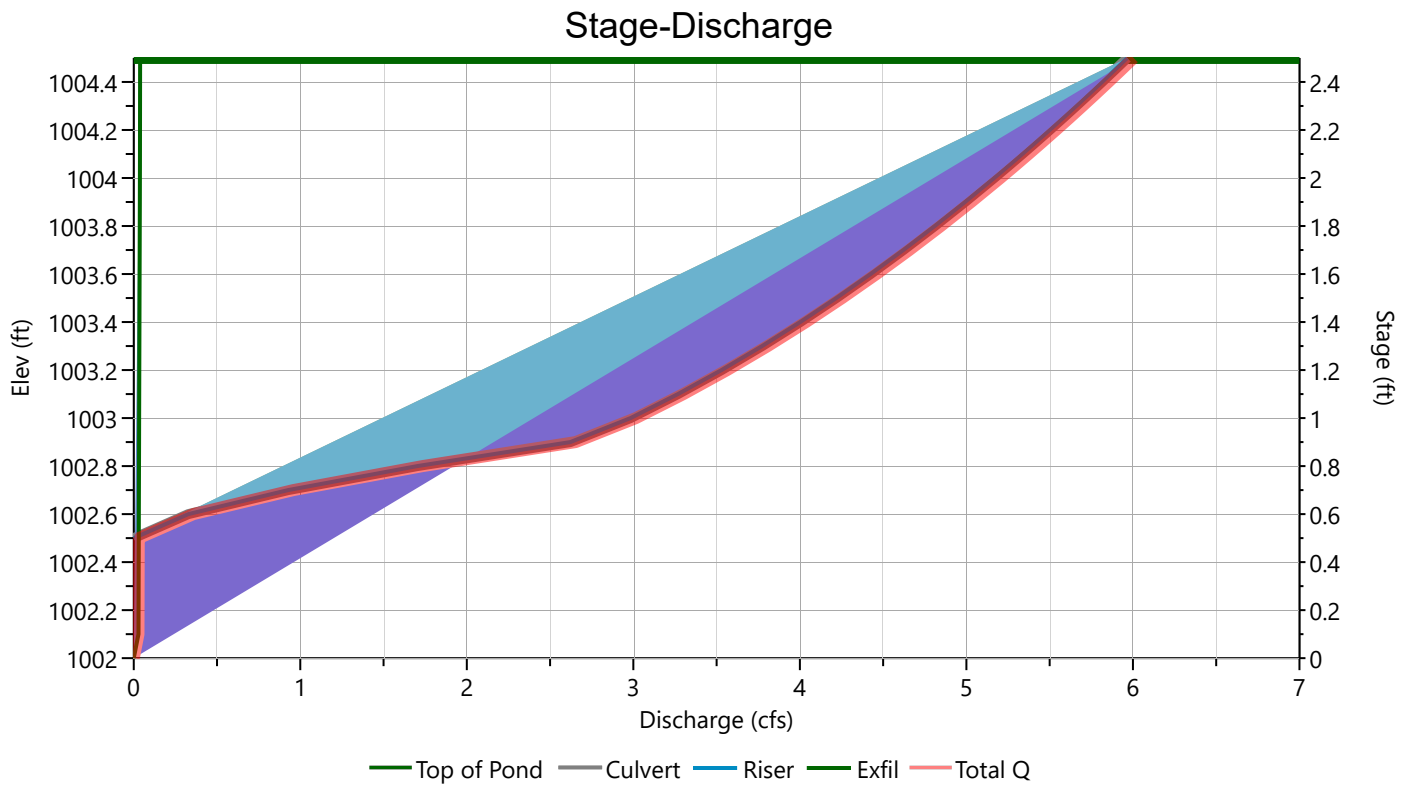
11-22-2019

IMP-10.11,12,14

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1	2	3		
Rise, in	12				Orifice Dia, in	
Span, in	12				No. Orifices	
No. Barrels	1				Invert Elevation, ft	
Invert Elevation, ft	999.25				Height, ft	
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co	
Length, ft	8.5					
Barrel Slope, %	1					
N-Value, n	0.015					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.30**
Crest Elevation, ft	1002.5					
Crest Length, ft	3.14					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-10.11,12,14

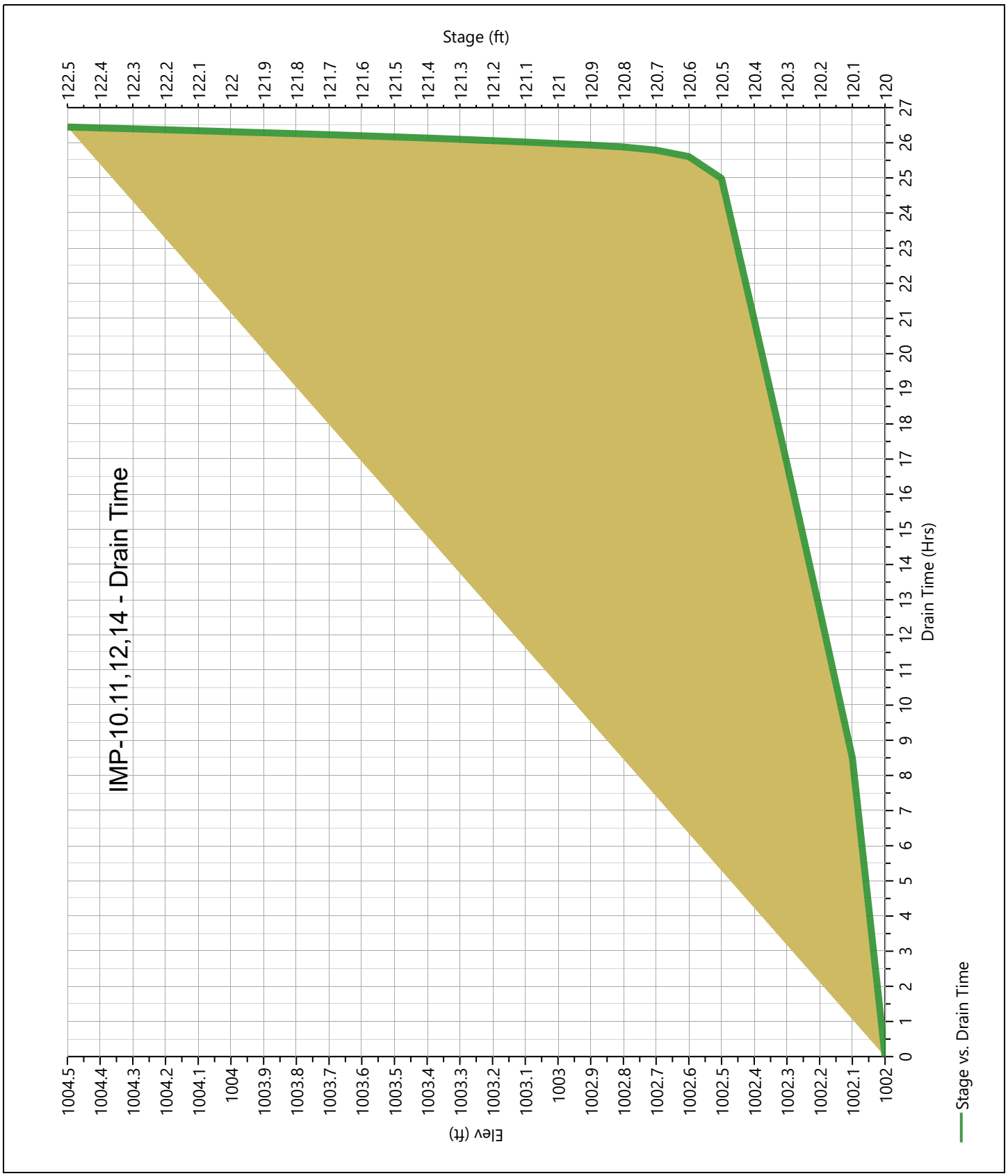
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1002.00	0.000	0.000				0.000					0.000		0.000
1.00	1003.00	4,338	2.983 ic				2.983 ic					0.032		3.015
2.00	1004.00	9,324	5.167 ic				5.167 ic					0.037		5.204
2.50	1004.50	12,029	5.966 ic				5.966 ic					0.038		6.004

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP-10.11,12,14

Pond Drawdown



Hydrograph Report

Project Name:

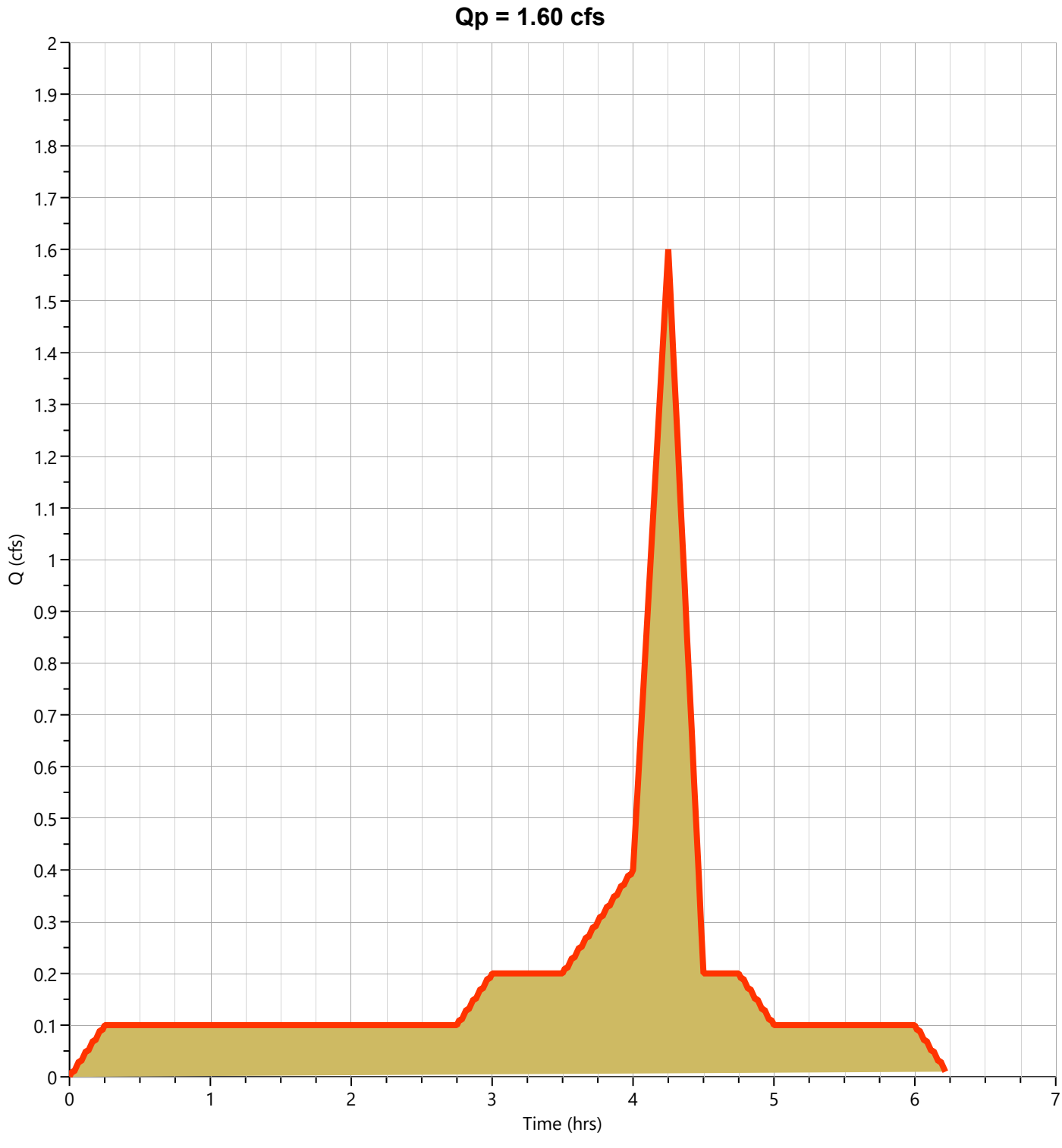
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.05

Hyd. No. 23

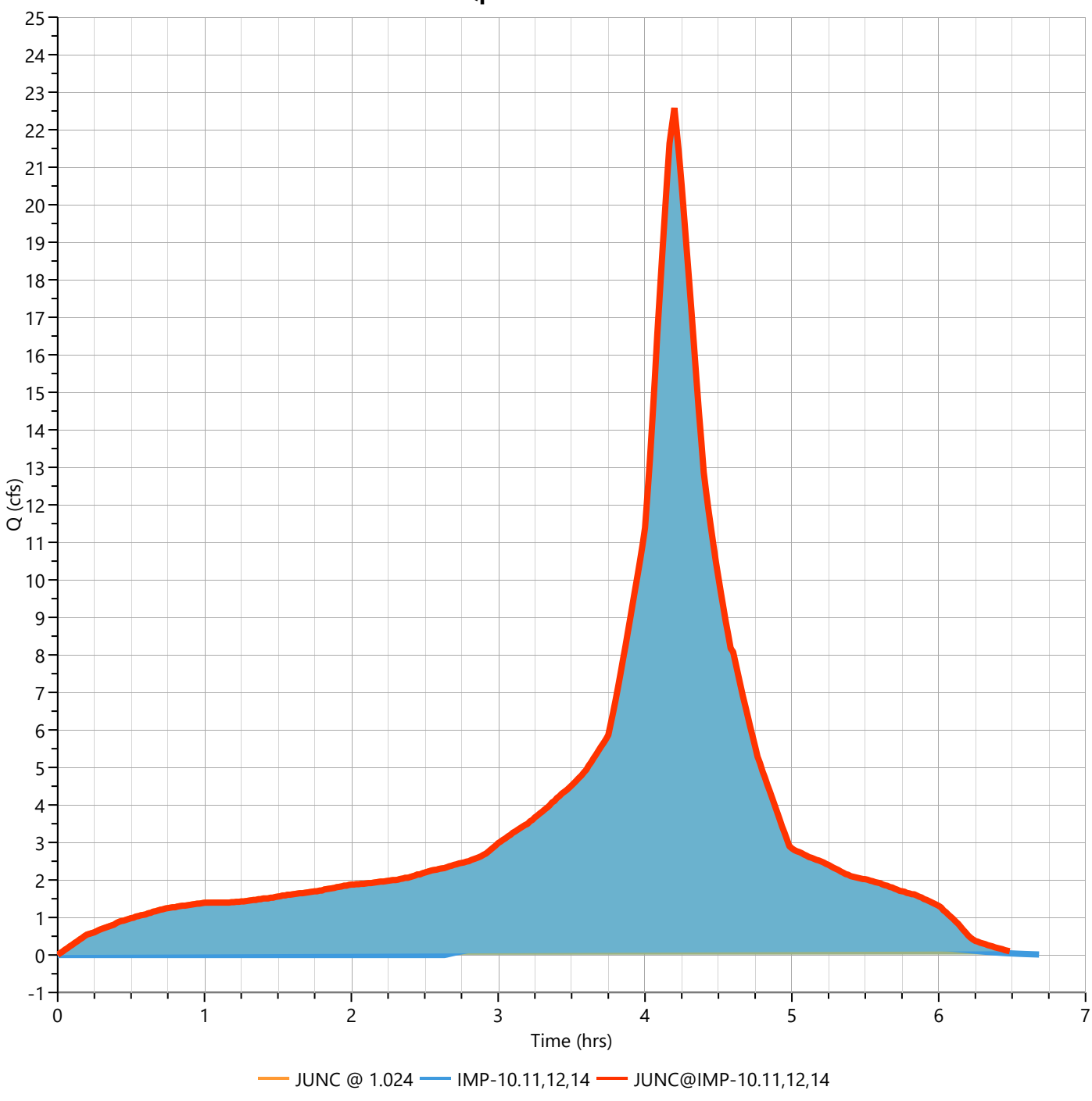
Hydrograph Type	= Manual	Peak Flow	= 1.600 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.25 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,410 cuft



Post JUNC@IMP-10.11,12,14

Hyd. No. 24

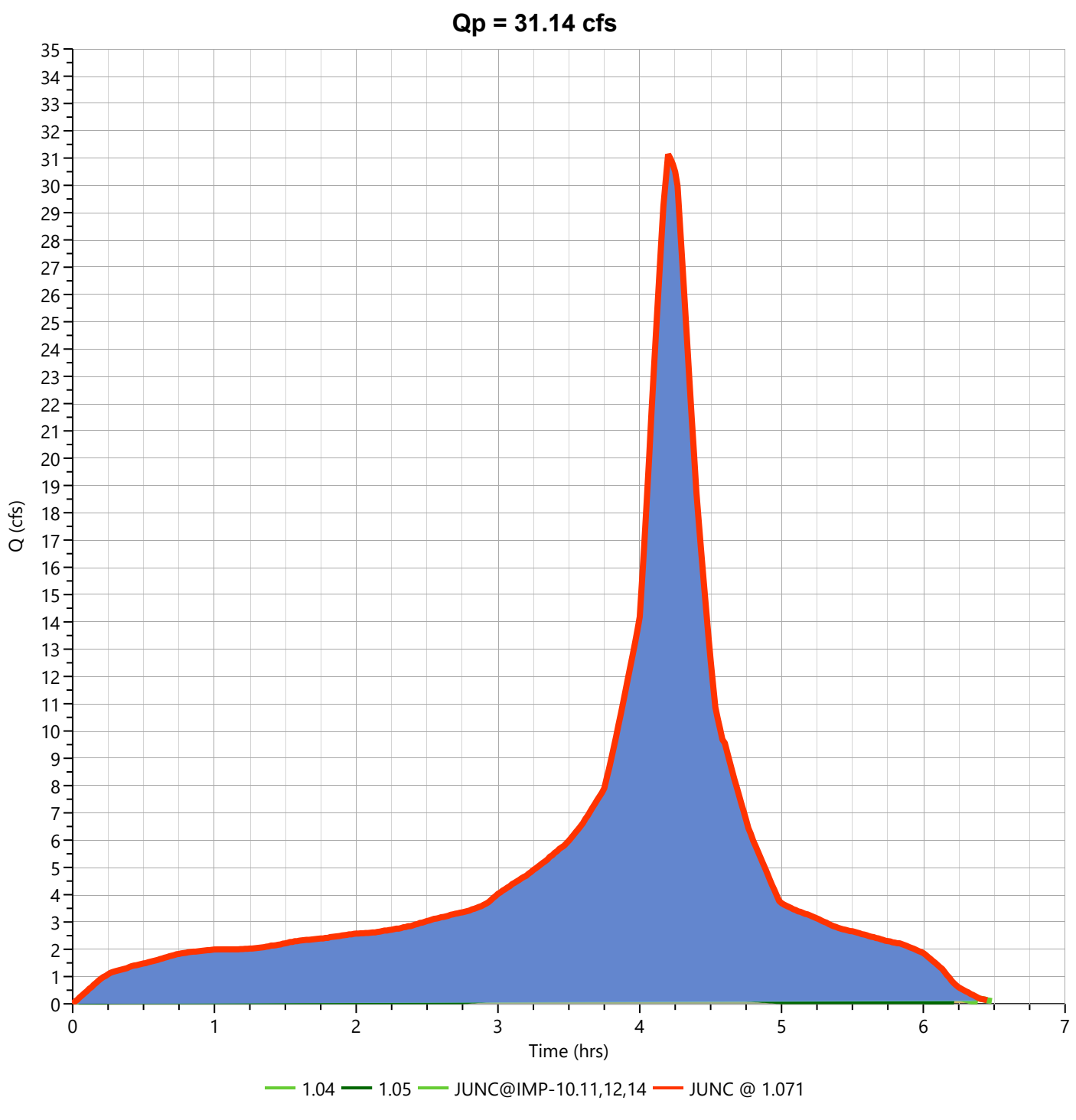
Hydrograph Type	= Junction	Peak Flow	= 22.58 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 84,610 cuft
Inflow Hydrographs	= 15, 22	Total Contrib. Area	= 0.0 ac



Post JUNC @ 1.071

Hyd. No. 25

Hydrograph Type	= Junction	Peak Flow	= 31.14 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 114,476 cuft
Inflow Hydrographs	= 4, 23, 24	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

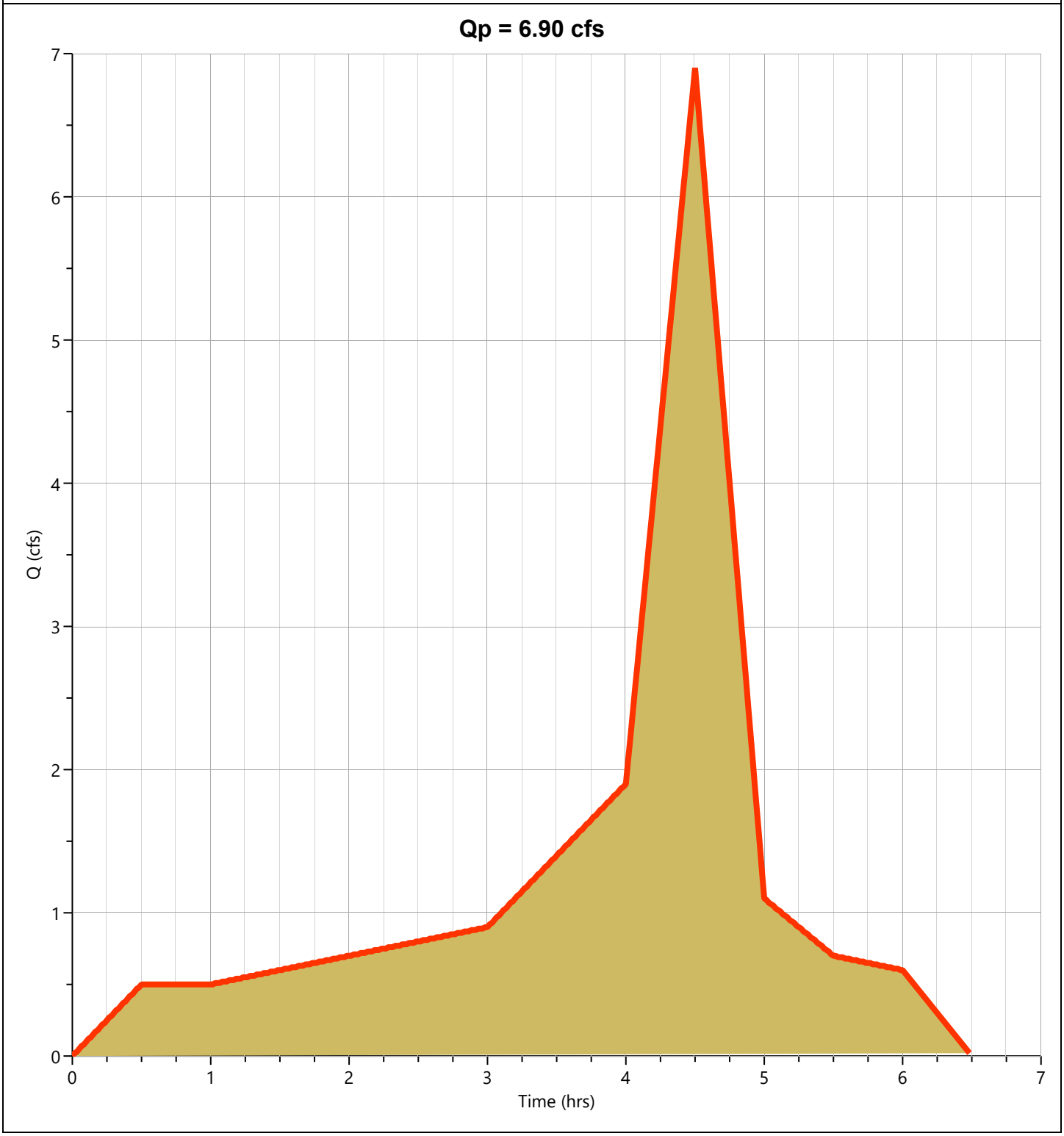
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.07

Hyd. No. 26

Hydrograph Type	= Manual	Peak Flow	= 6.900 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.50 hrs
Time Interval	= 1 min	Hydrograph Volume	= 29,880 cuft



Hydrograph Report

Project Name:

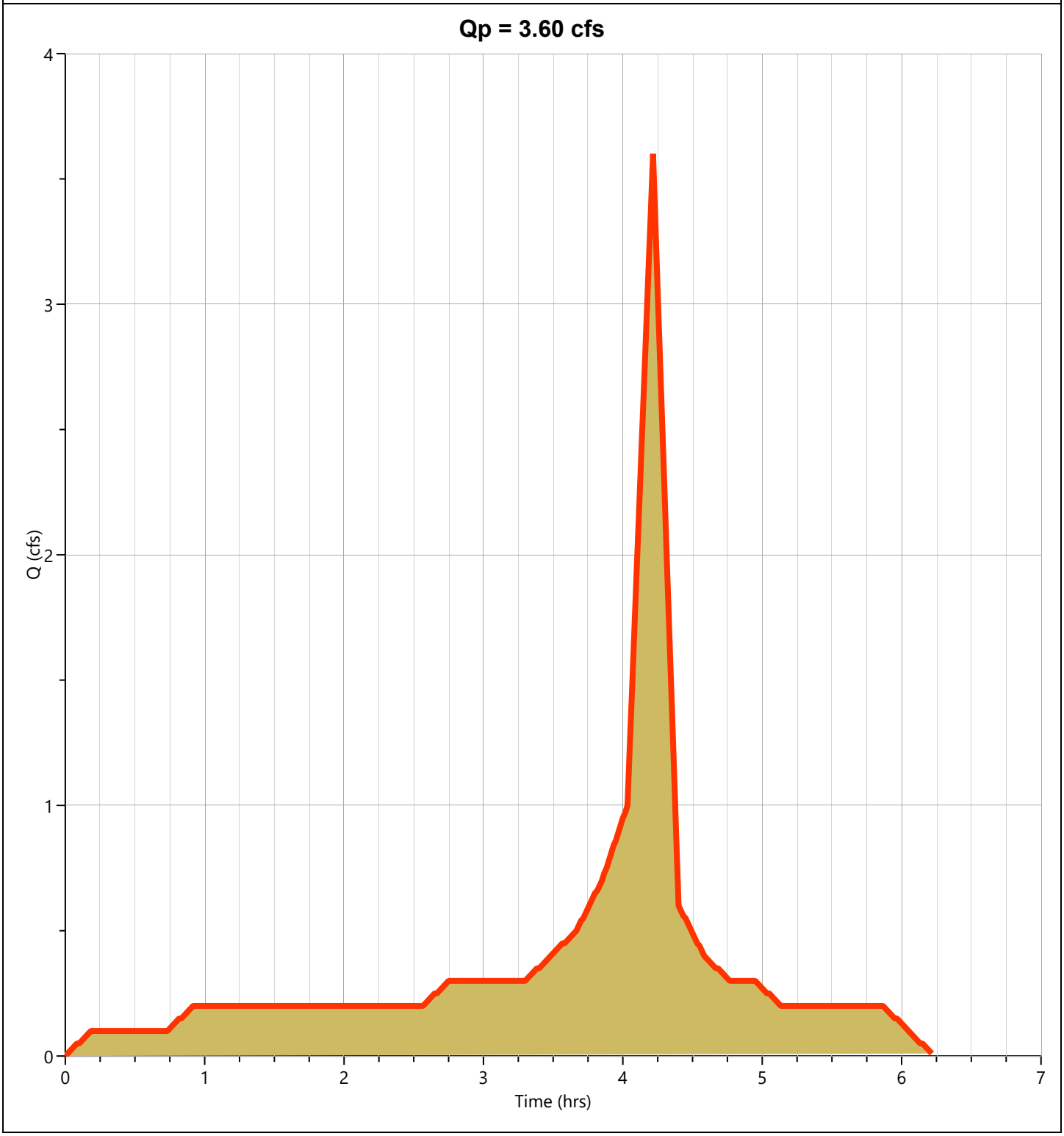
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.09

Hyd. No. 27

Hydrograph Type	= Manual	Peak Flow	= 3.600 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.22 hrs
Time Interval	= 1 min	Hydrograph Volume	= 8,250 cuft



Hydrograph Report

Project Name:

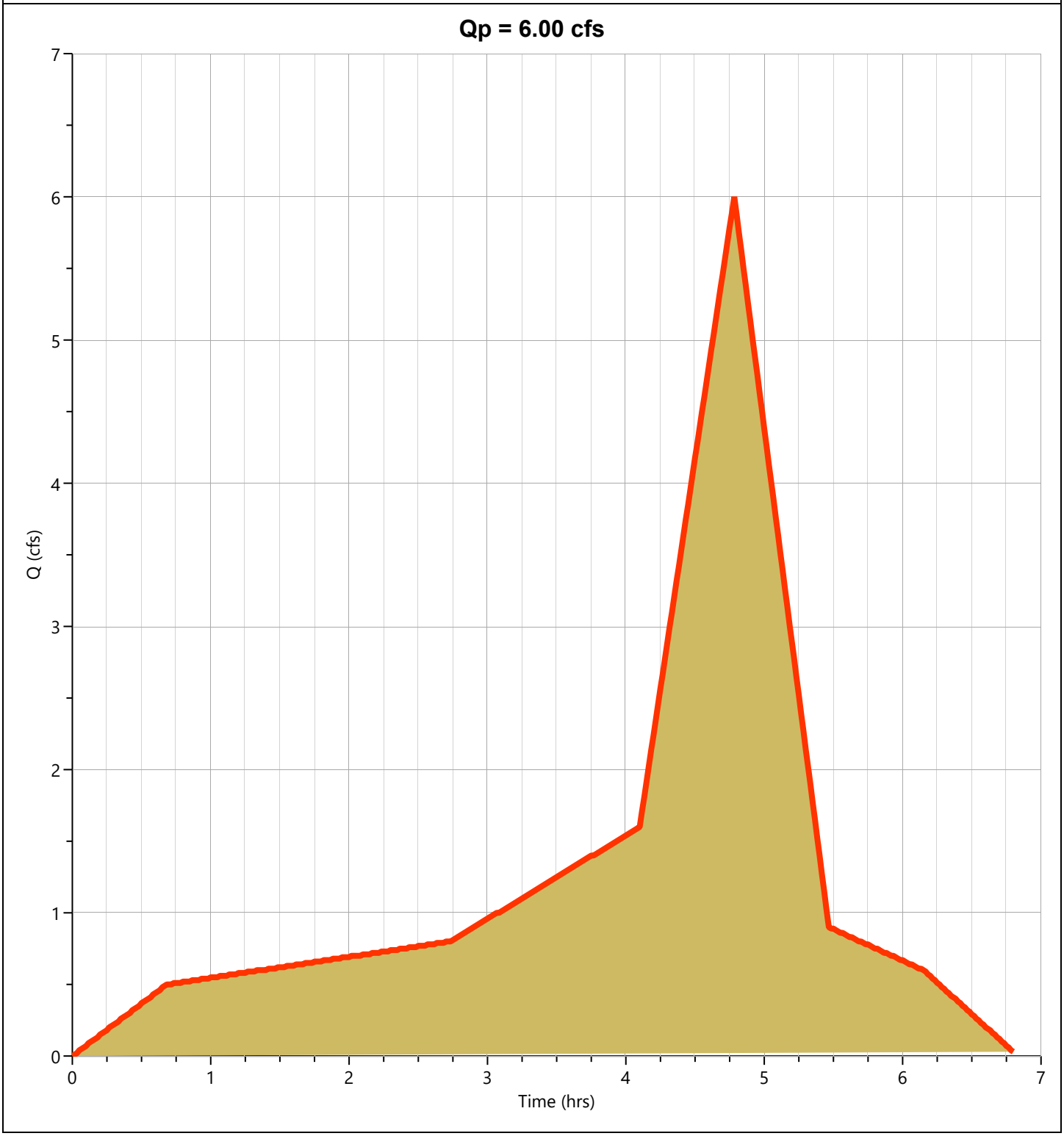
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.10

Hyd. No. 28

Hydrograph Type	= Manual	Peak Flow	= 6.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.78 hrs
Time Interval	= 1 min	Hydrograph Volume	= 31,734 cuft



Hydrograph Report

Project Name:

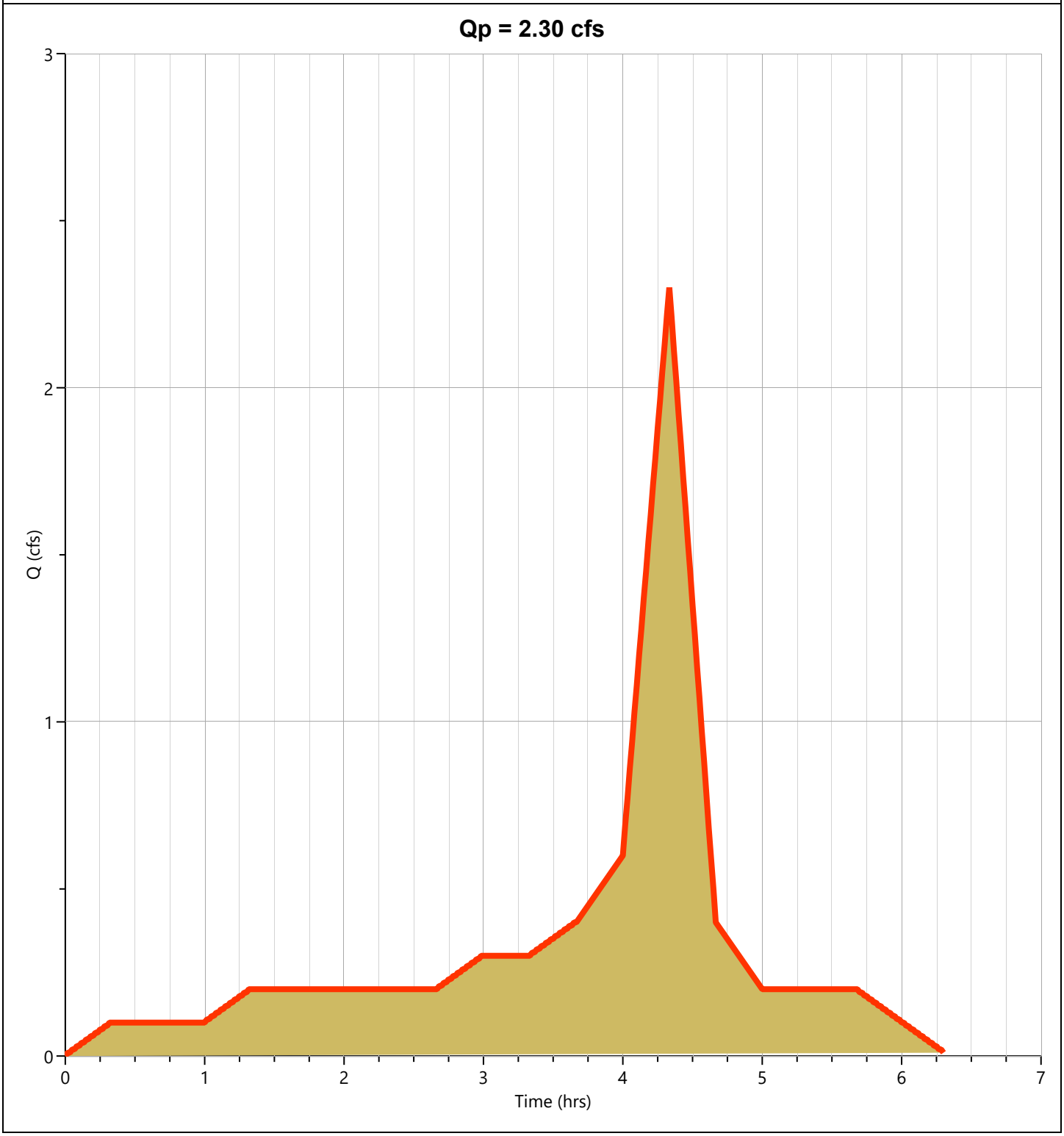
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.14

Hyd. No. 29

Hydrograph Type	= Manual	Peak Flow	= 2.300 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.33 hrs
Time Interval	= 1 min	Hydrograph Volume	= 7,583 cuft



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.13

11-22-2019

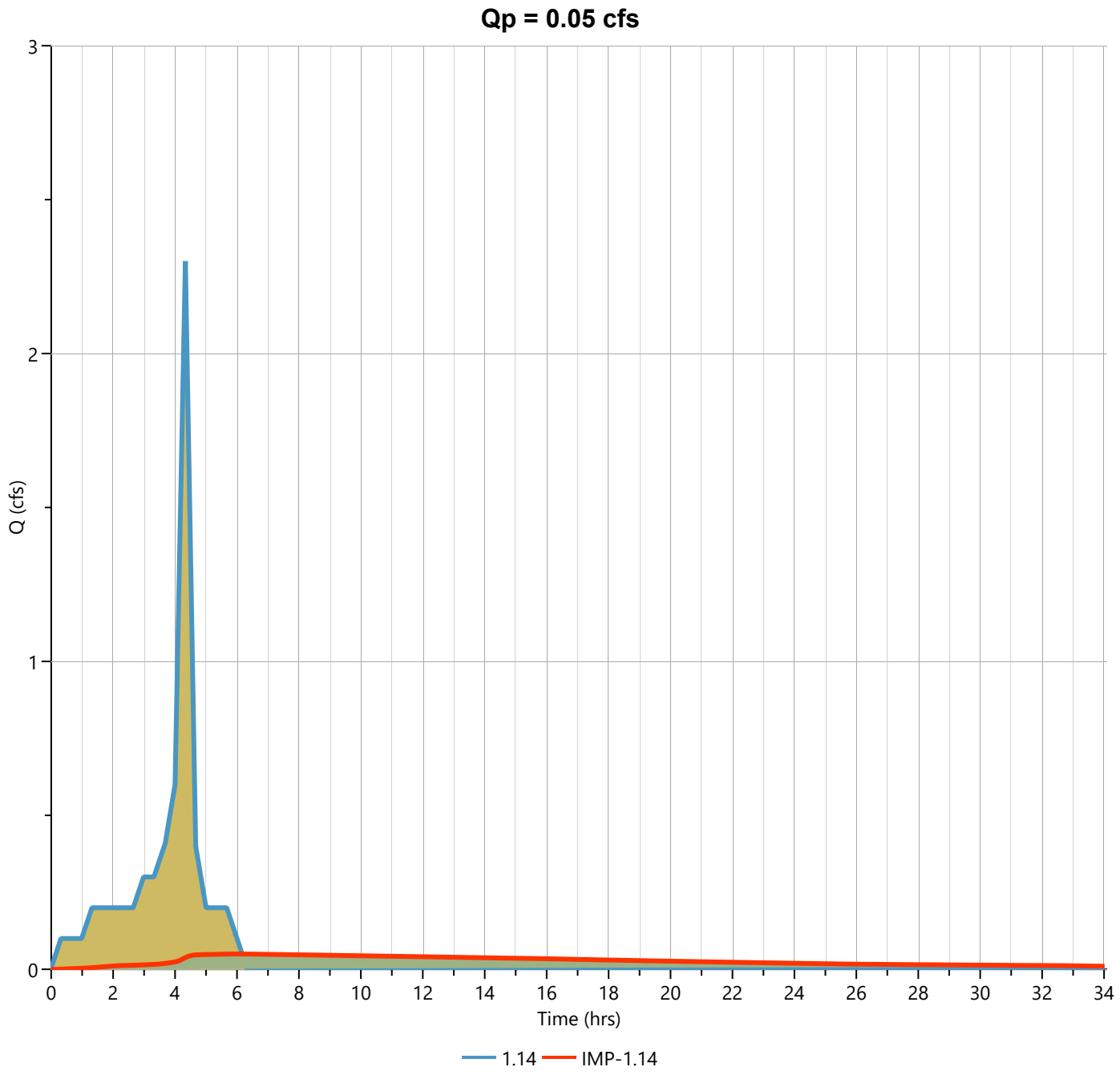
Post IMP-1.14

Hyd. No. 30

Hydrograph Type	= Pond Route	Peak Flow	= 0.050 cfs
Storm Frequency	= 100-yr	Time to Peak	= 6.05 hrs
Time Interval	= 1 min	Hydrograph Volume	= 3,502 cuft
Inflow Hydrograph	= 29 - 1.14	Max. Elevation	= 899.36 ft
Pond Name	= IMP-1.14	Max. Storage	= 6,556 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 12.57 hrs



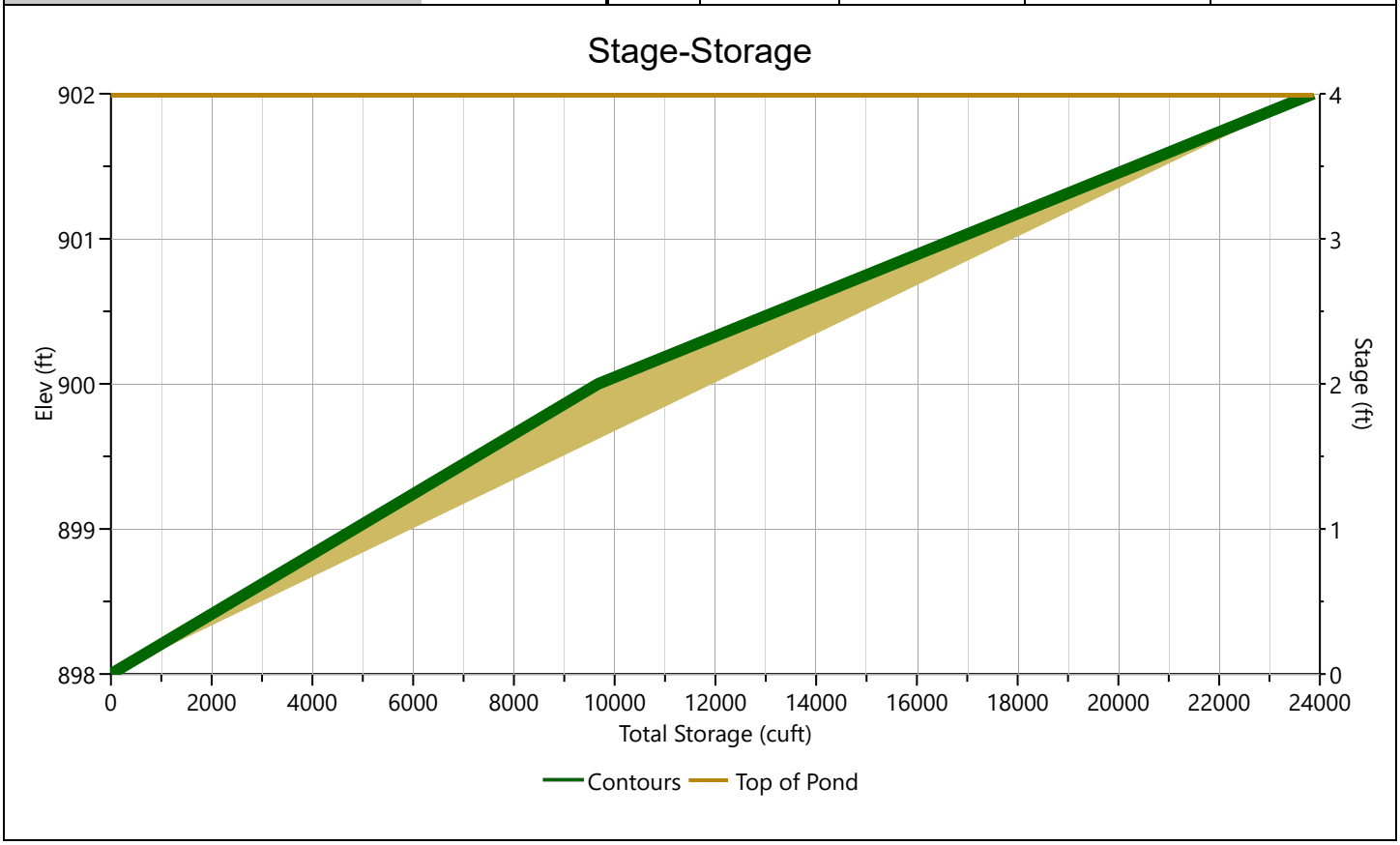
IMP-1.14

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	898.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	898.00	3,125	0.000	0.000
2.00	900.00	6,547	9,672	9,672
4.00	902.00	7,653	14,200	23,872



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

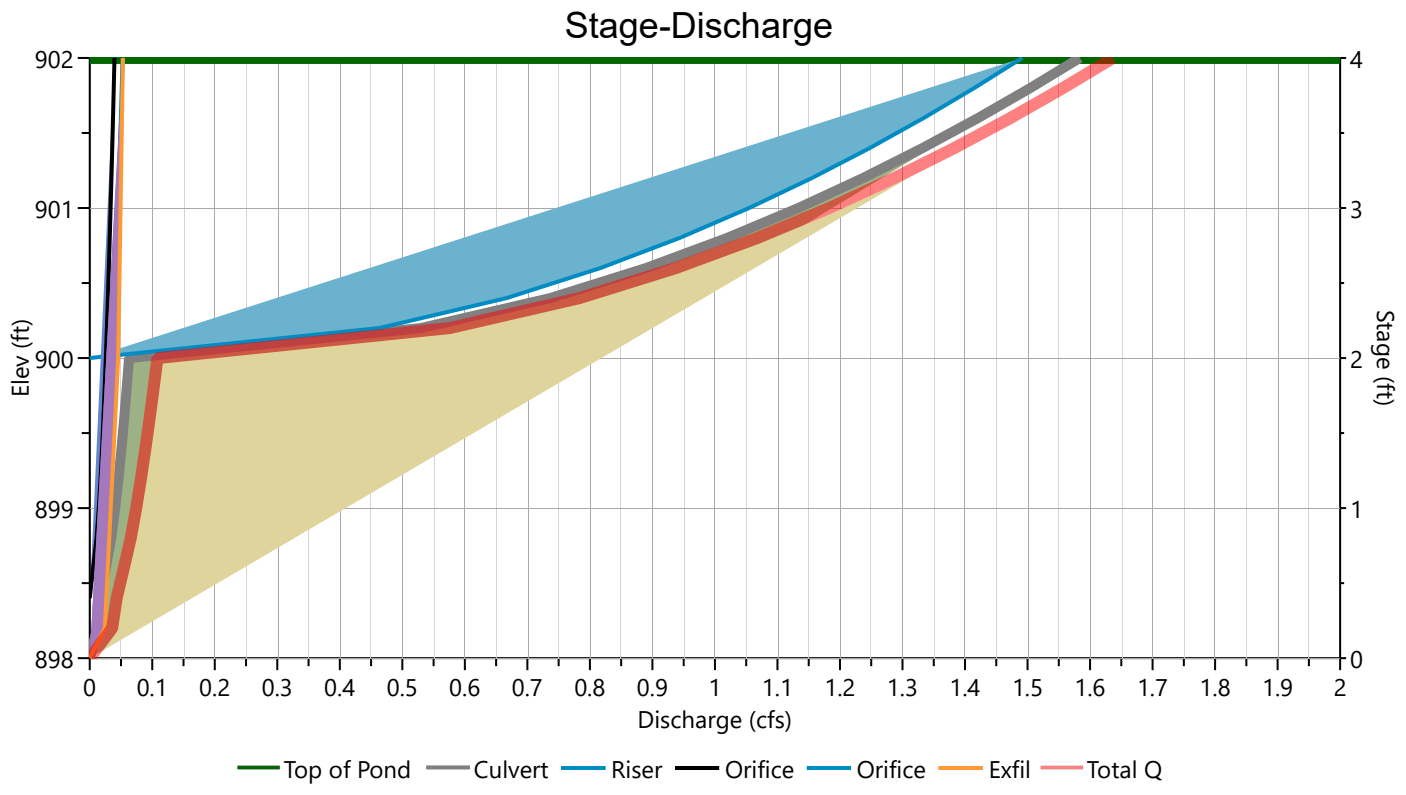
11-22-2019

IMP-1.14

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1*	2	3*		
Rise, in	12	.9		1	Orifice Dia, in	
Span, in	12	.9		1	No. Orifices	
No. Barrels	1	1		1	Invert Elevation, ft	
Invert Elevation, ft	895.25	898.50		895.50	Height, ft	
Orifice Coefficient, Co	0.60	0.60		0.60	Orifice Coefficient, Co	
Length, ft	54					
Barrel Slope, %	1					
N-Value, n	0.013					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.30**
Crest Elevation, ft	900					
Crest Length, ft	1.57					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-1.14

Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	898.00	0.000	0.000	0.000		0.000	0.000					0.000		0.000
2.00	900.00	9,672	0.063 oc	0.026		0.037	0.000					0.045		0.108
4.00	902.00	23,872	1.584 oc	0.040		0.053	1.491 ic					0.053		1.637

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Pond Report

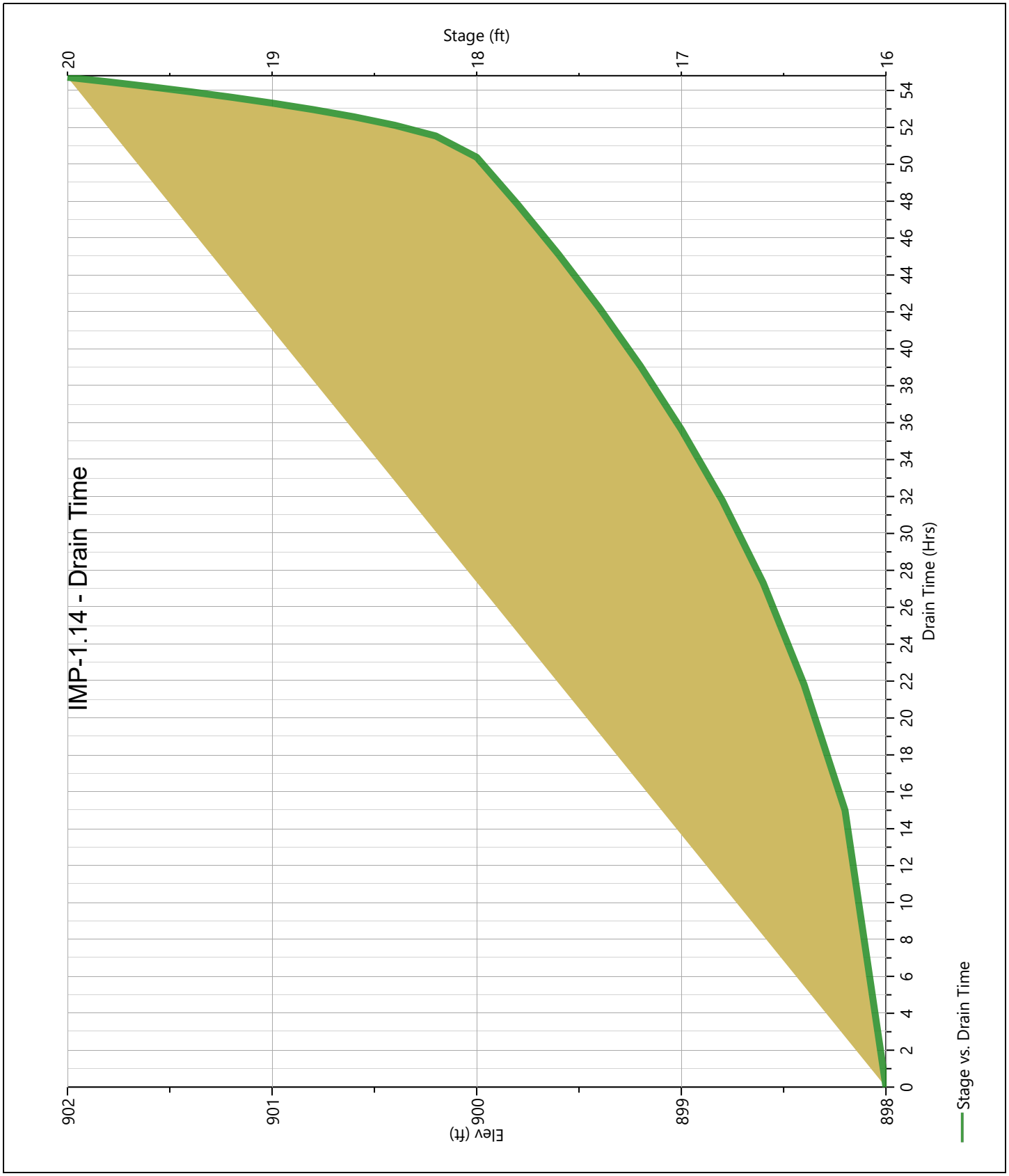
Project Name:

Hydrology Studio v 3.0.0.13

11-22-2019

IMP-1.14

Pond Drawdown



Hydrograph Report

Project Name:

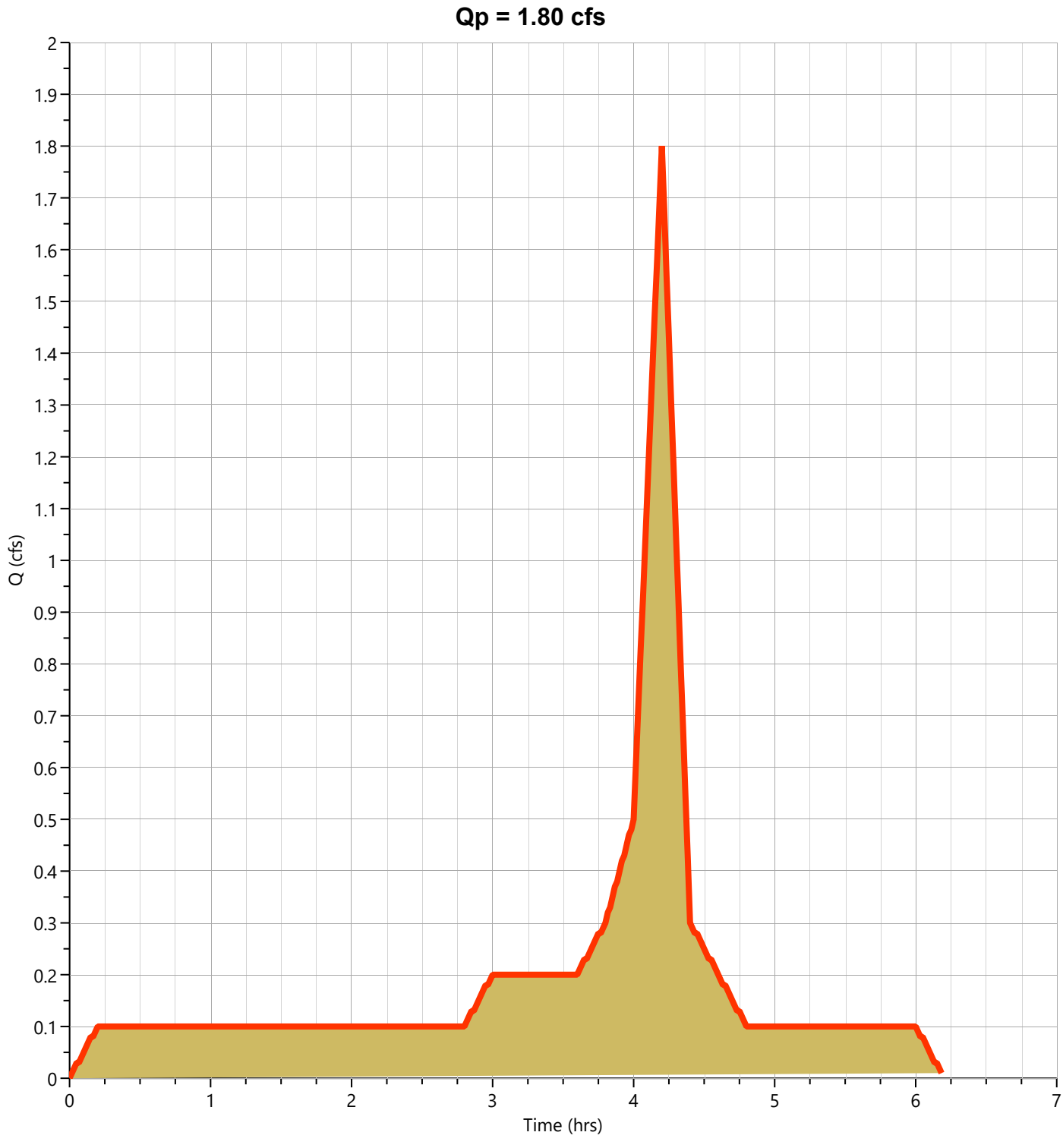
Hydrology Studio v 3.0.0.13

11-22-2019

Post 10.19

Hyd. No. 31

Hydrograph Type	= Manual	Peak Flow	= 1.800 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,326 cuft



Hydrograph Report

Project Name:

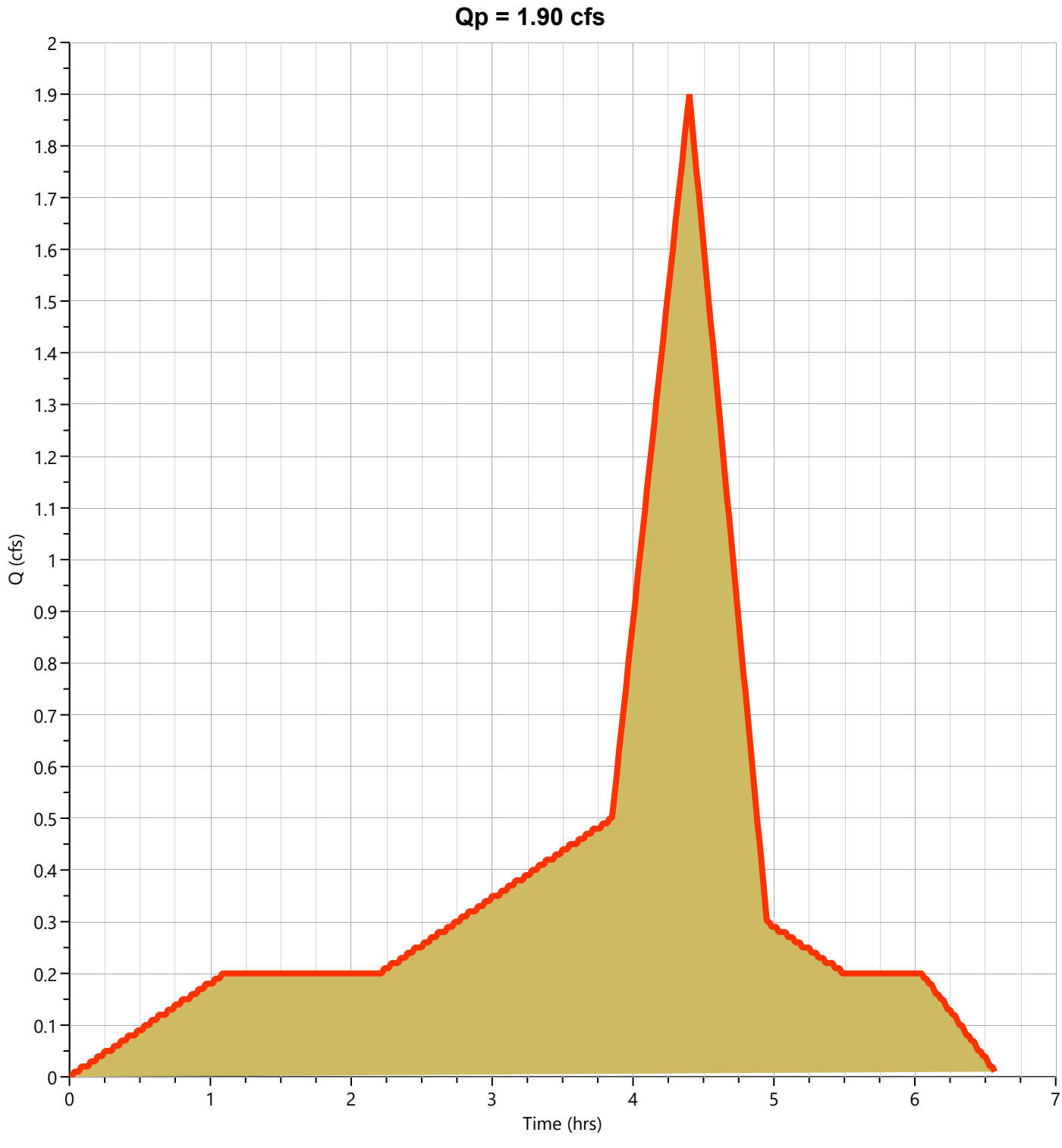
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.11

Hyd. No. 32

Hydrograph Type	= Manual	Peak Flow	= 1.900 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 8,910 cuft



Hydrograph Report

Hydrology Studio v 3.0.0.13

11-22-2019

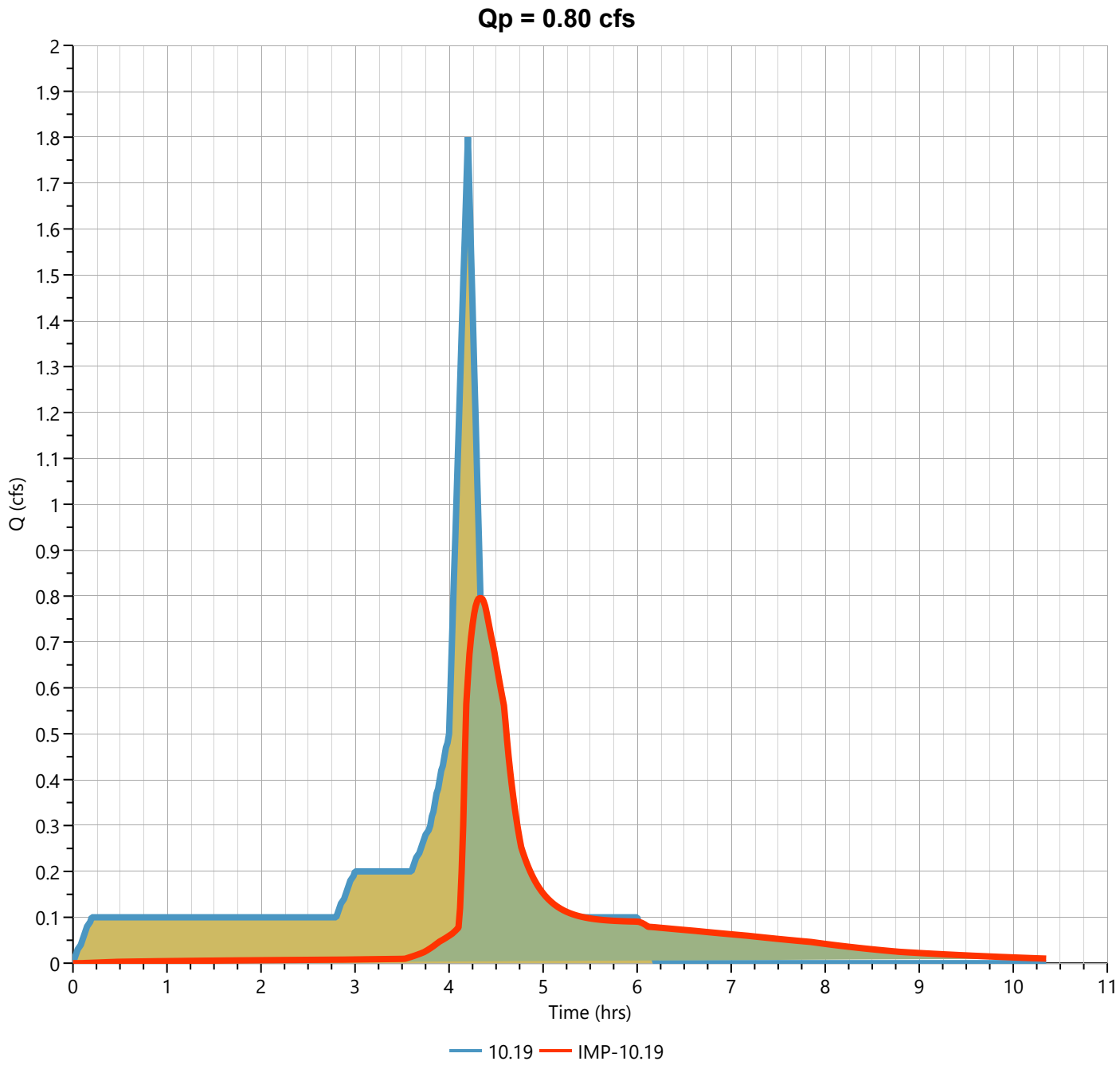
Post IMP-10.19

Hyd. No. 33

Hydrograph Type	= Pond Route	Peak Flow	= 0.798 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.33 hrs
Time Interval	= 1 min	Hydrograph Volume	= 3,208 cuft
Inflow Hydrograph	= 31 - 10.19	Max. Elevation	= 883.93 ft
Pond Name	= IMP-10.19	Max. Storage	= 2,678 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 2.18 hrs



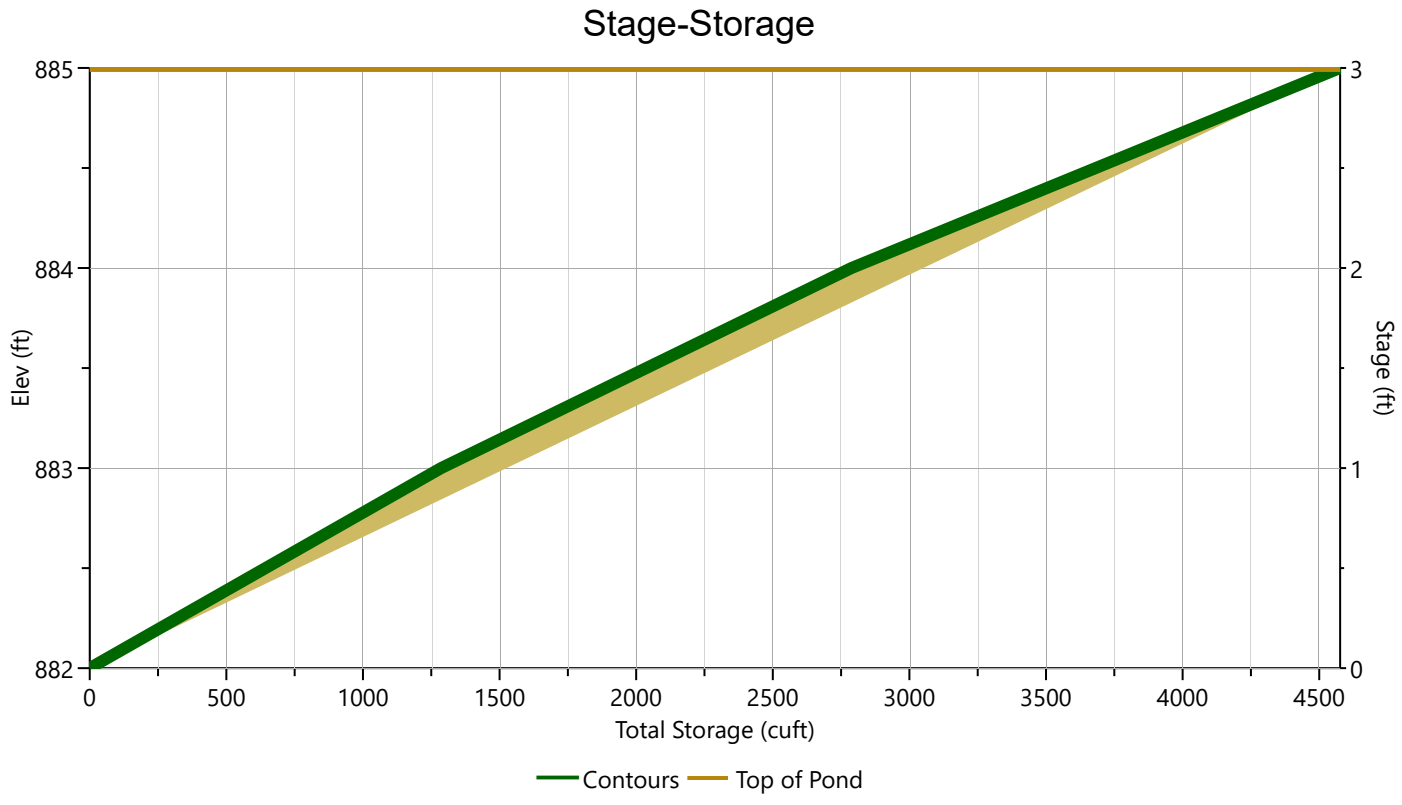
IMP-10.19

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	882.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	882.00	1,245	0.000	0.000
1.00	883.00	1,327	1,286	1,286
2.00	884.00	1,677	1,502	2,788
3.00	885.00	1,900	1,789	4,577



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

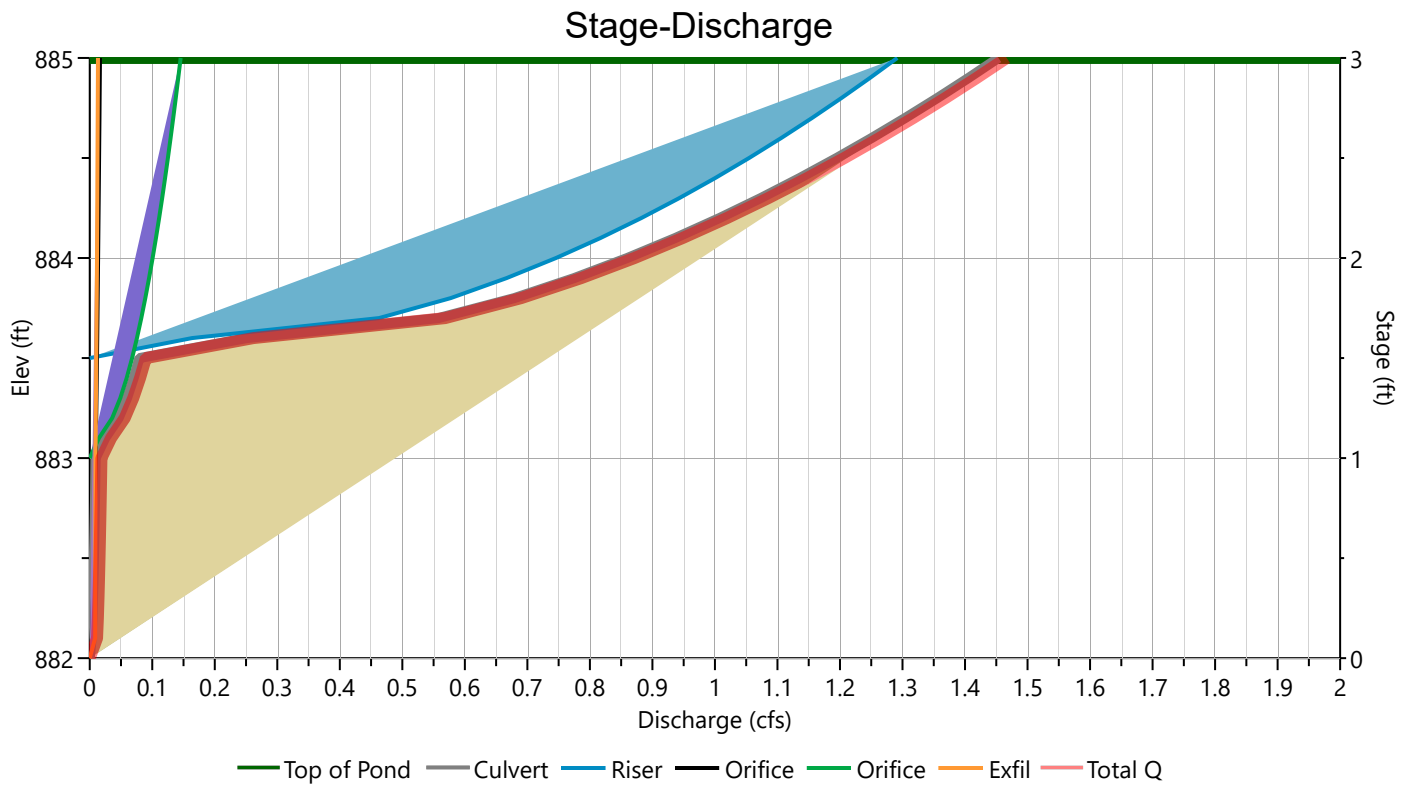
11-22-2019

IMP-10.19

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1*	2*	3		
Rise, in	12	.6	2		Orifice Dia, in	
Span, in	12	.6	2		No. Orifices	
No. Barrels	1	1	1		Invert Elevation, ft	
Invert Elevation, ft	879.25	879.50	883.00		Height, ft	
Orifice Coefficient, Co	0.60	0.60	0.60		Orifice Coefficient, Co	
Length, ft	10					
Barrel Slope, %	1					
N-Value, n	0.013					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.30**
Crest Elevation, ft	883.5					
Crest Length, ft	1.57					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-10.19

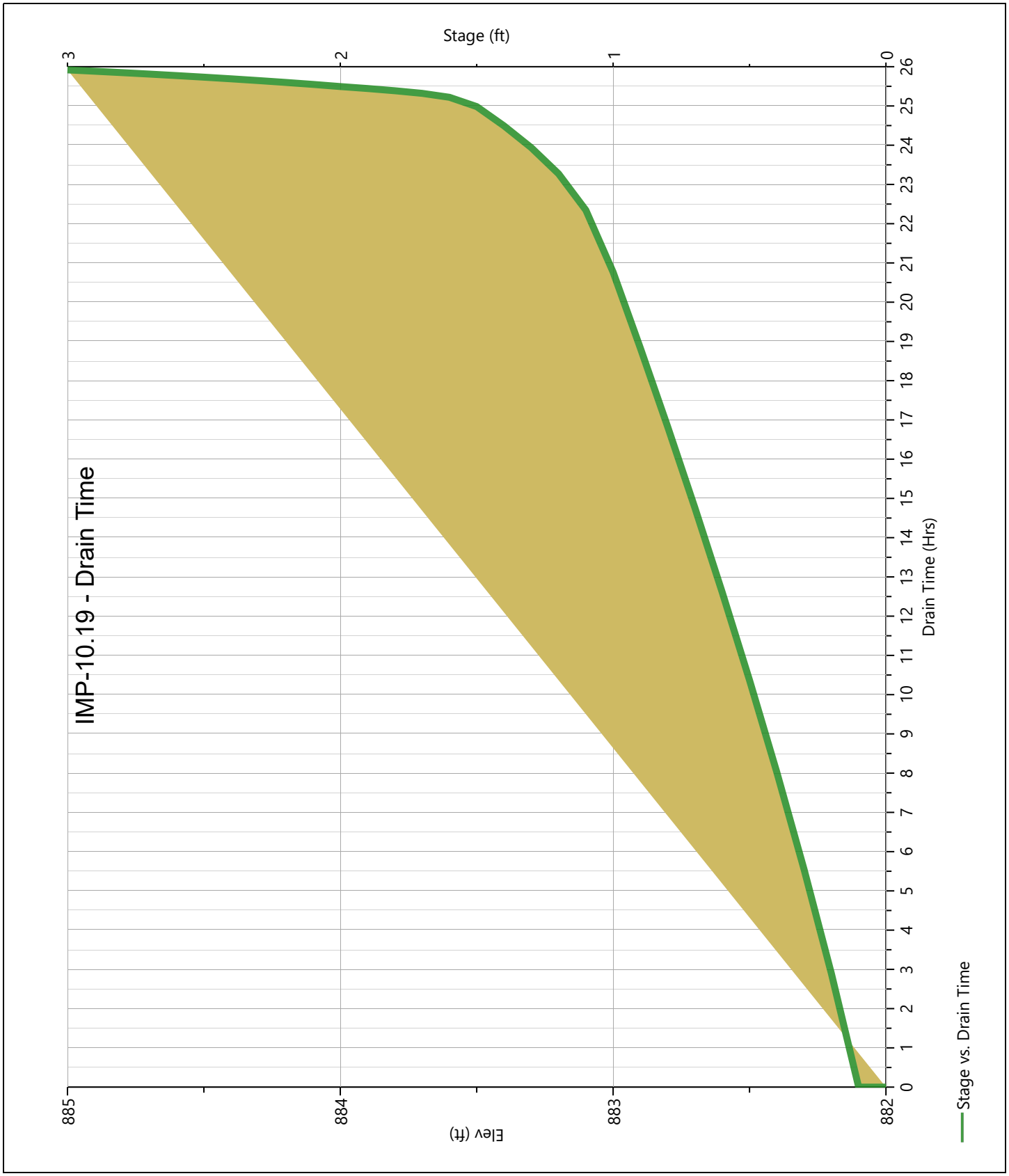
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	882.00	0.000	0.000	0.000	0.000		0.000					0.000		0.000
1.00	883.00	1,286	0.009 ic	0.009	0.000		0.000					0.009		0.019
2.00	884.00	2,788	0.860 ic	0.013	0.101		0.746 ic					0.012		0.871
3.00	885.00	4,577	1.453 ic	0.016	0.145		1.292 ic					0.013		1.467

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP-10.19

Pond Drawdown



Hydrograph Report

Project Name:

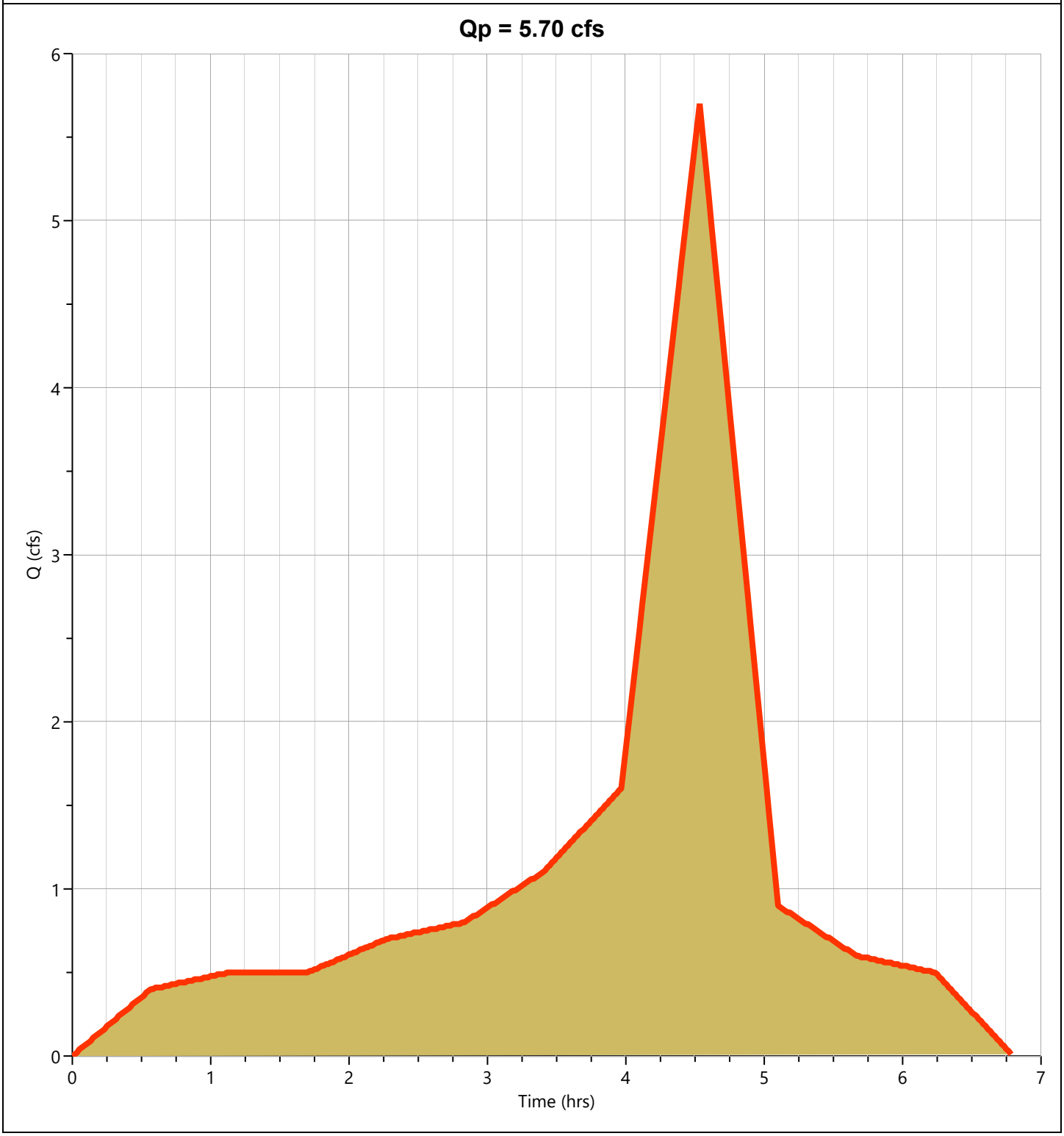
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.12

Hyd. No. 34

Hydrograph Type	= Manual	Peak Flow	= 5.700 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.53 hrs
Time Interval	= 1 min	Hydrograph Volume	= 27,132 cuft



Hydrograph Report

Project Name:

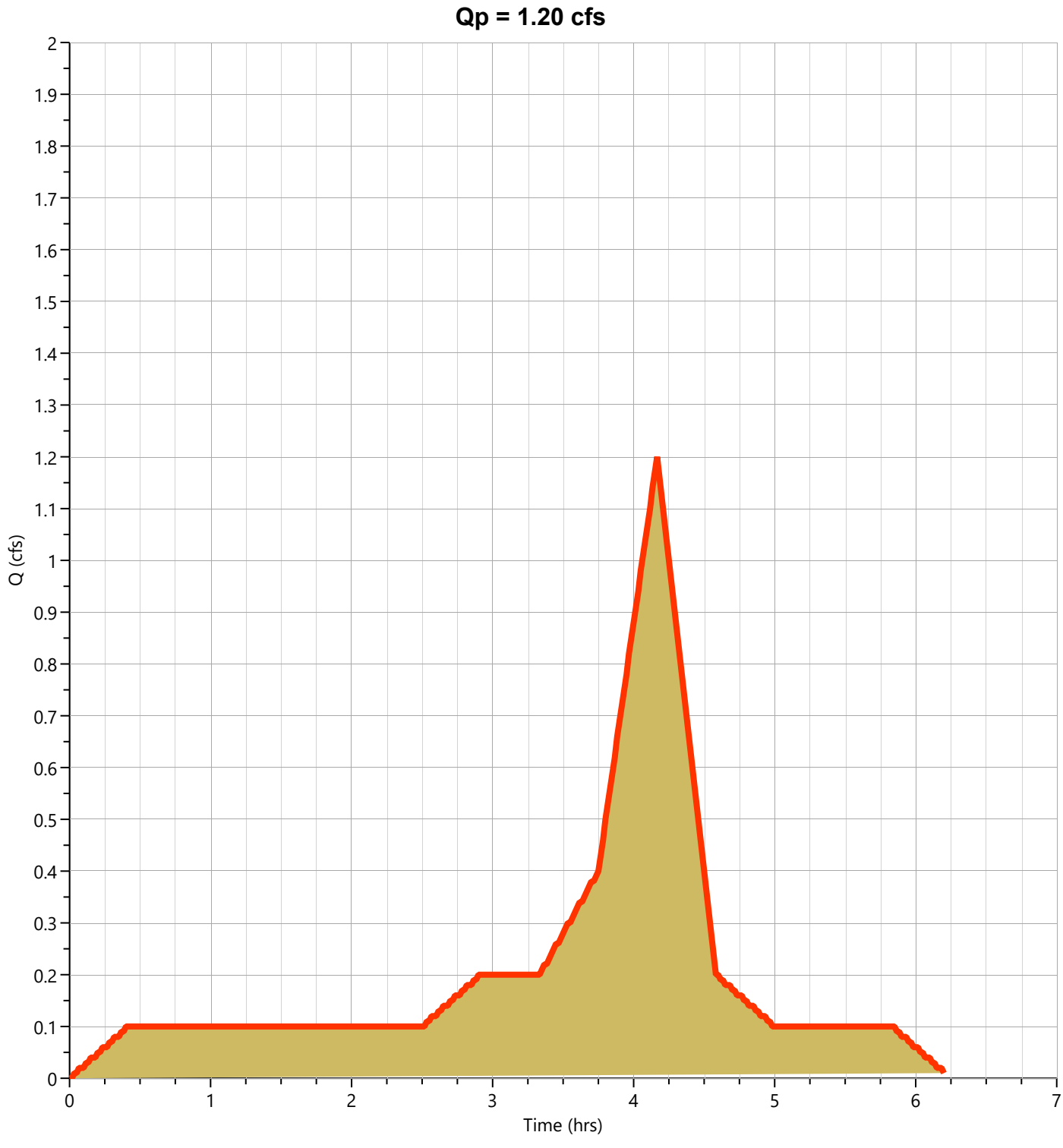
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.13

Hyd. No. 35

Hydrograph Type	= Manual	Peak Flow	= 1.200 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.17 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,650 cuft



Hydrograph Report

Project Name:

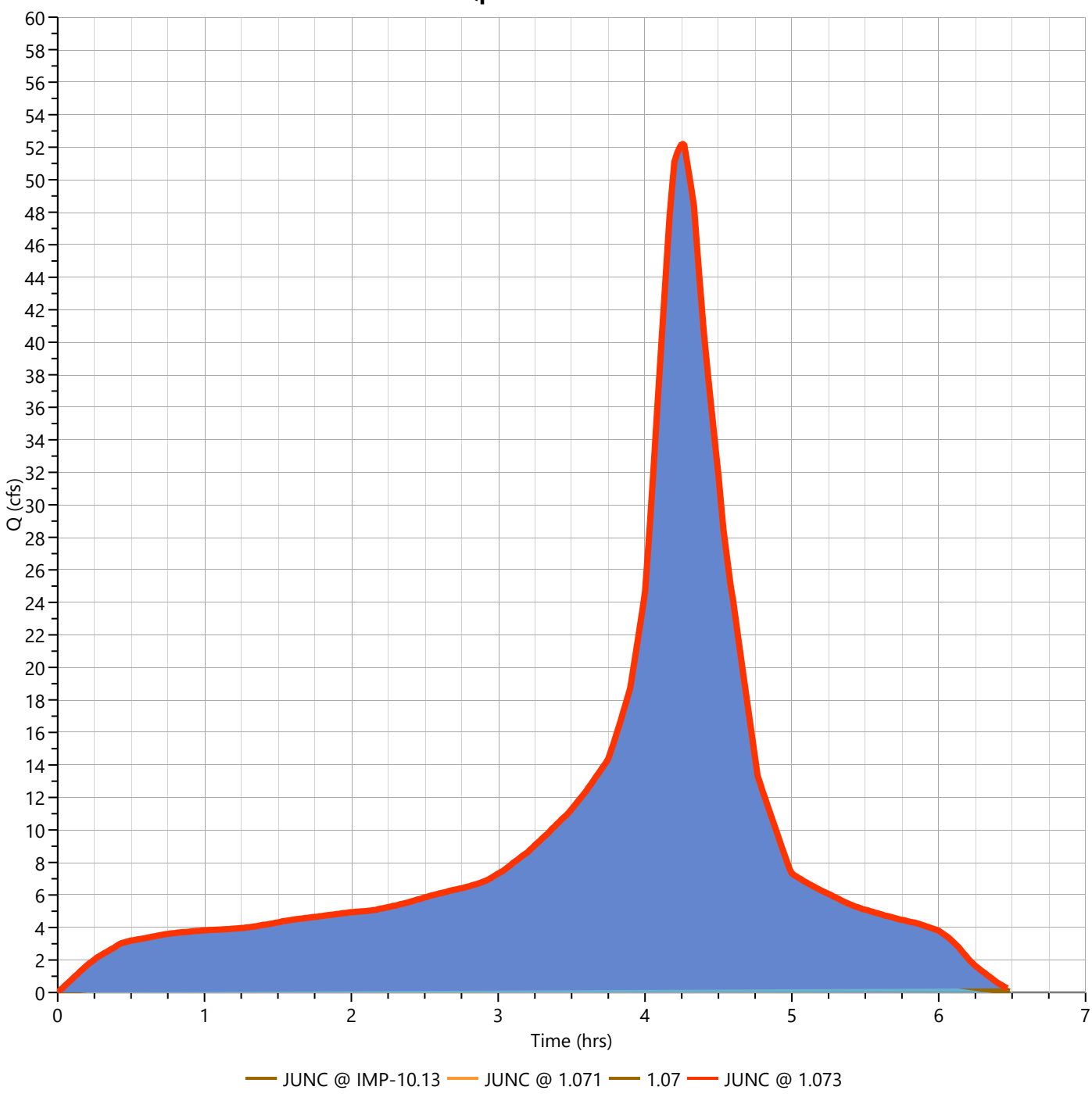
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 1.073

Hyd. No. 36

Hydrograph Type	= Junction	Peak Flow	= 52.20 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.25 hrs
Time Interval	= 1 min	Hydrograph Volume	= 219,792 cuft
Inflow Hydrographs	= 16, 25, 26	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

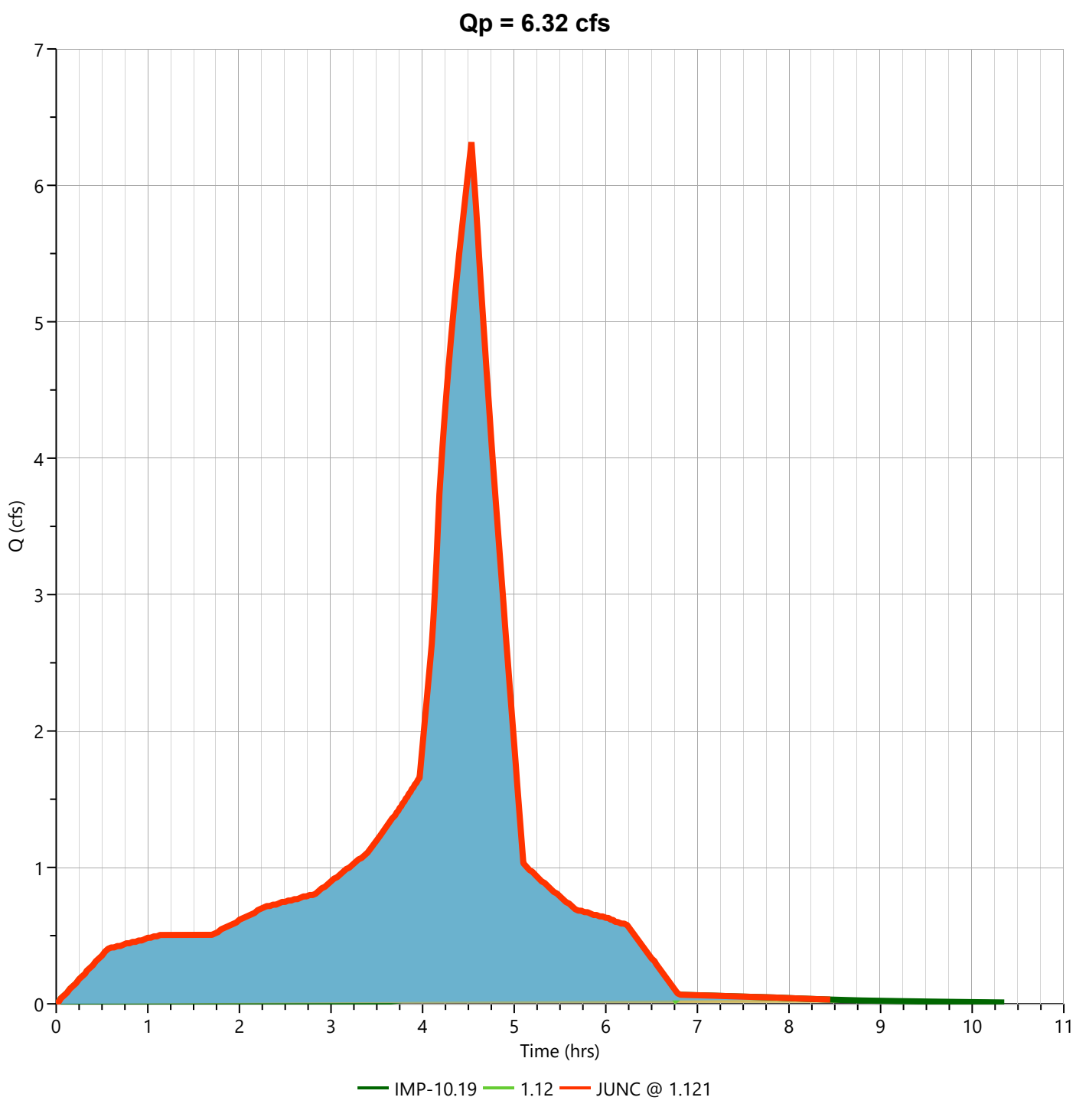
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 1.121

Hyd. No. 37

Hydrograph Type	= Junction	Peak Flow	= 6.316 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.53 hrs
Time Interval	= 1 min	Hydrograph Volume	= 30,340 cuft
Inflow Hydrographs	= 33, 34	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

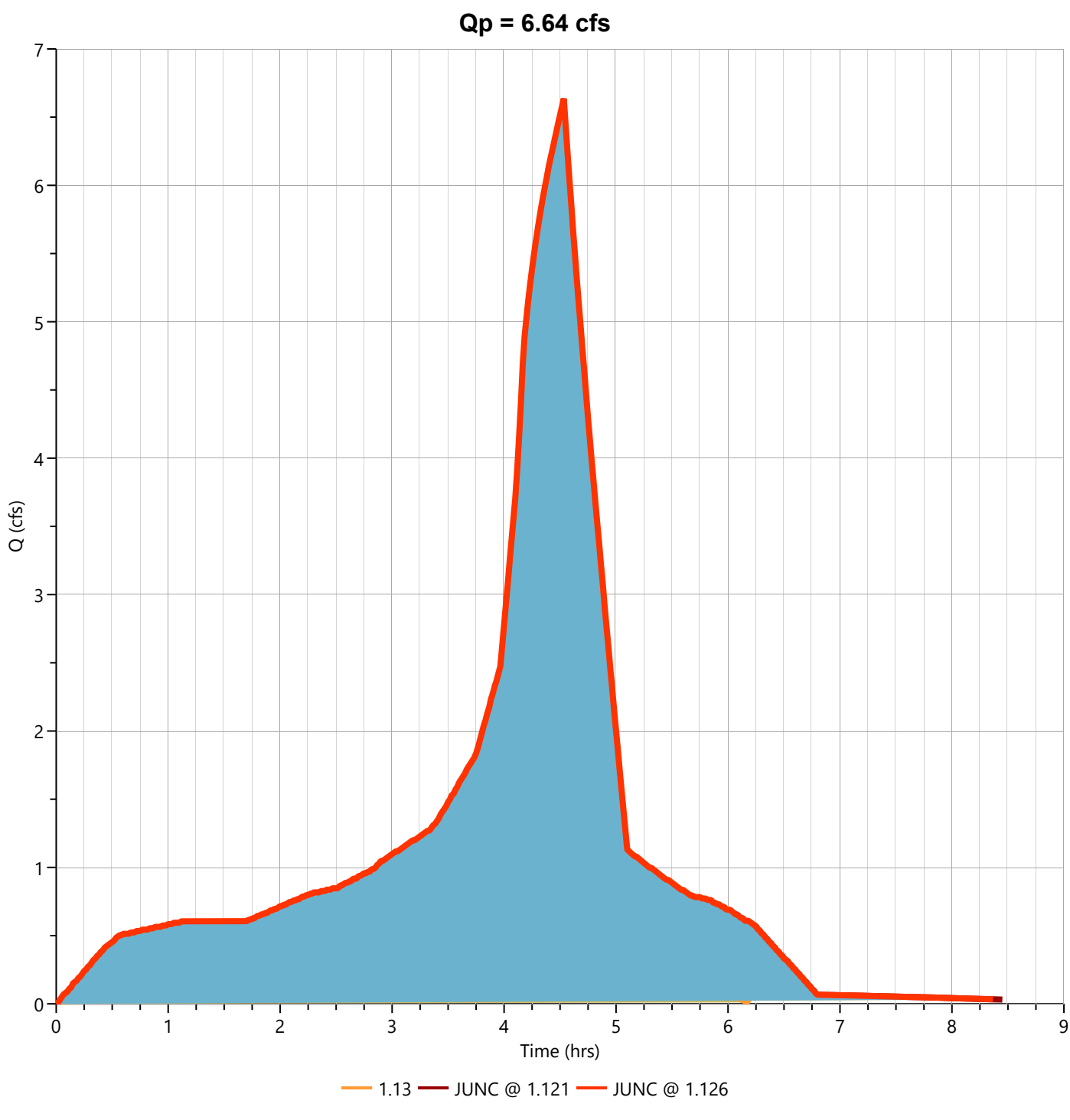
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 1.126

Hyd. No. 38

Hydrograph Type	= Junction	Peak Flow	= 6.636 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.53 hrs
Time Interval	= 1 min	Hydrograph Volume	= 34,990 cuft
Inflow Hydrographs	= 35, 37	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

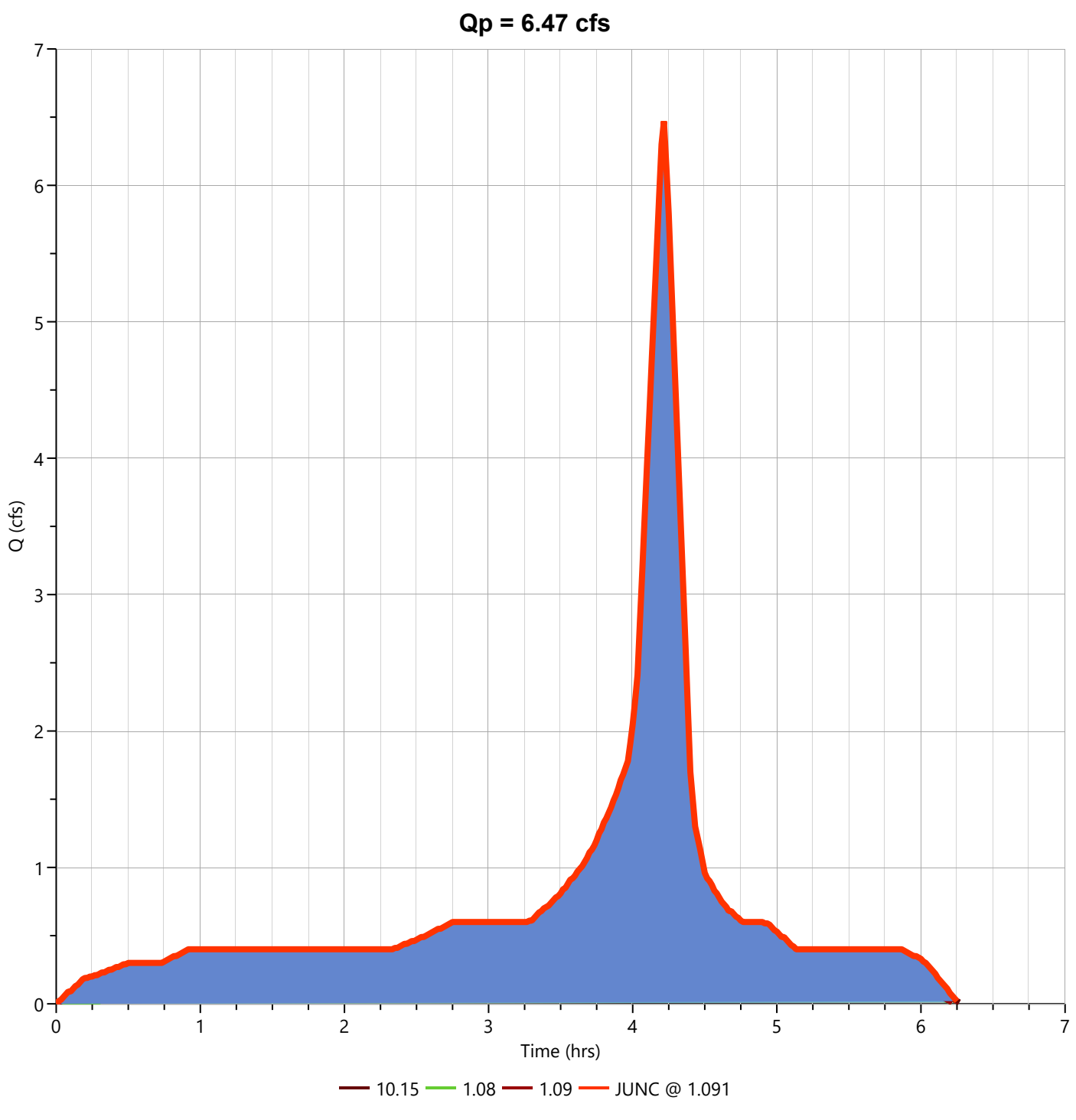
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 1.091

Hyd. No. 39

Hydrograph Type	= Junction	Peak Flow	= 6.470 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.22 hrs
Time Interval	= 1 min	Hydrograph Volume	= 16,872 cuft
Inflow Hydrographs	= 9, 14, 27	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

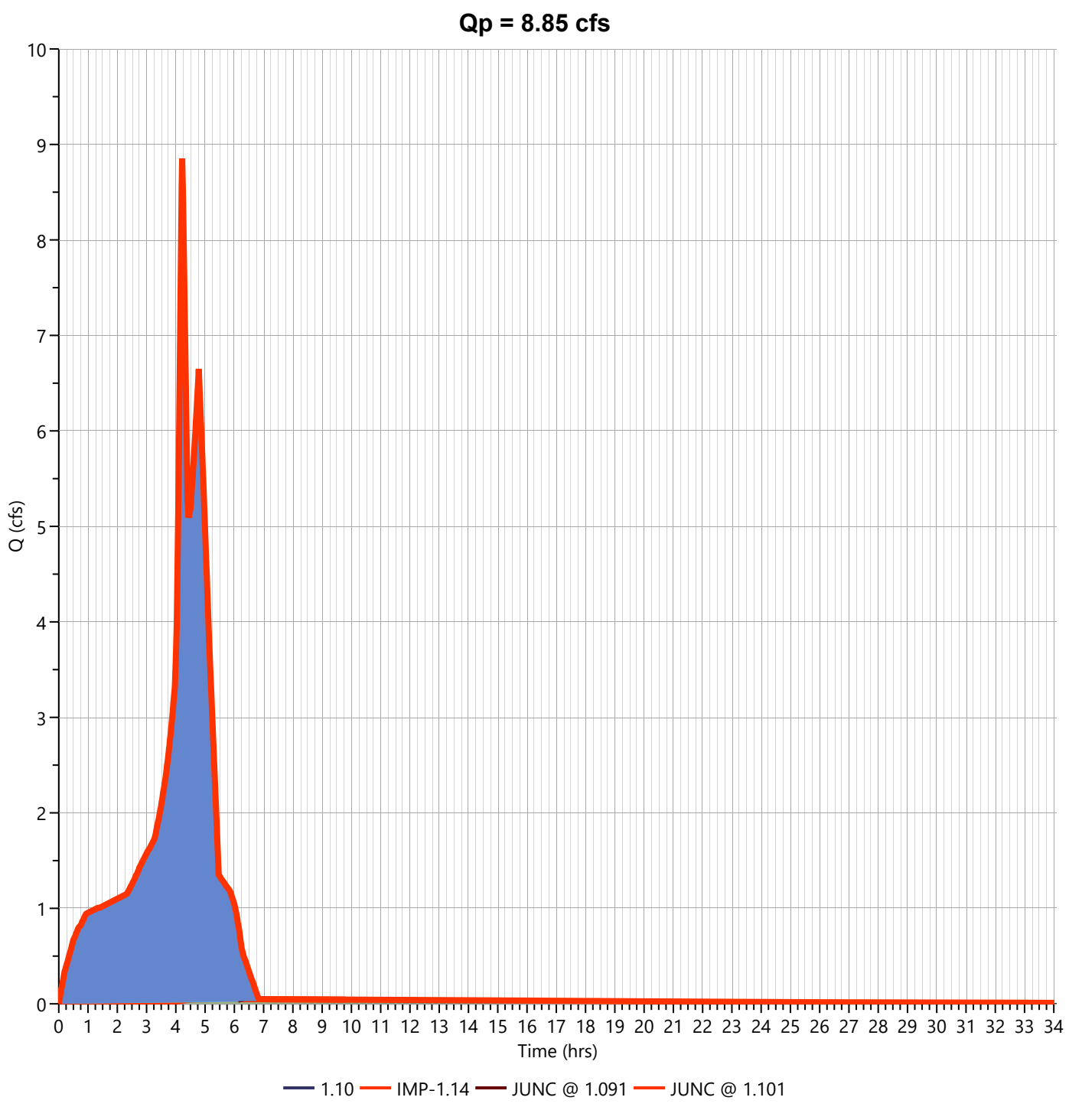
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 1.101

Hyd. No. 40

Hydrograph Type	= Junction	Peak Flow	= 8.852 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.22 hrs
Time Interval	= 1 min	Hydrograph Volume	= 52,108 cuft
Inflow Hydrographs	= 28, 30, 39	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

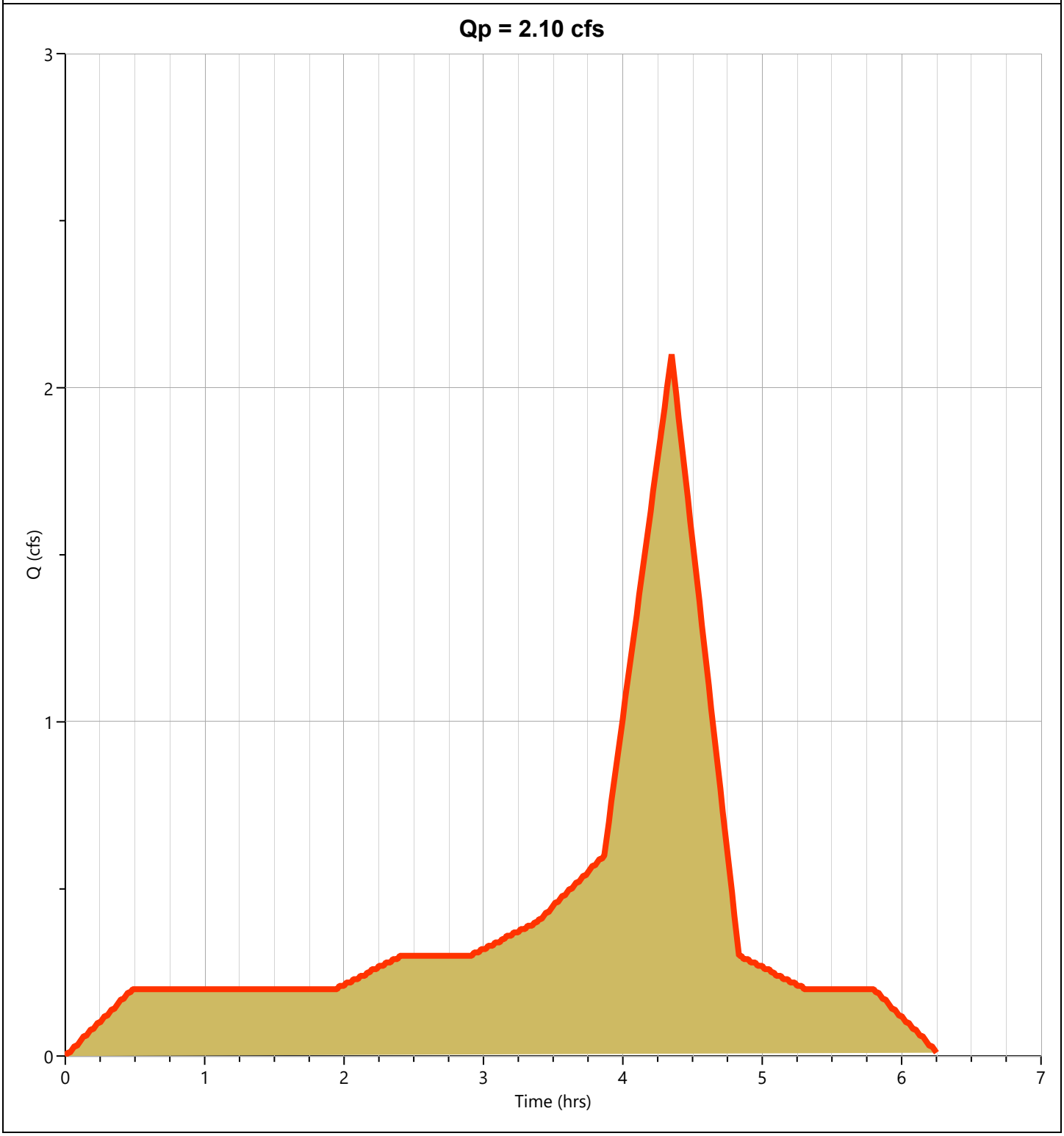
Hydrology Studio v 3.0.0.13

11-22-2019

Post 1.15

Hyd. No. 41

Hydrograph Type	= Manual	Peak Flow	= 2.100 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.35 hrs
Time Interval	= 1 min	Hydrograph Volume	= 9,048 cuft



Hydrograph Report

Project Name:

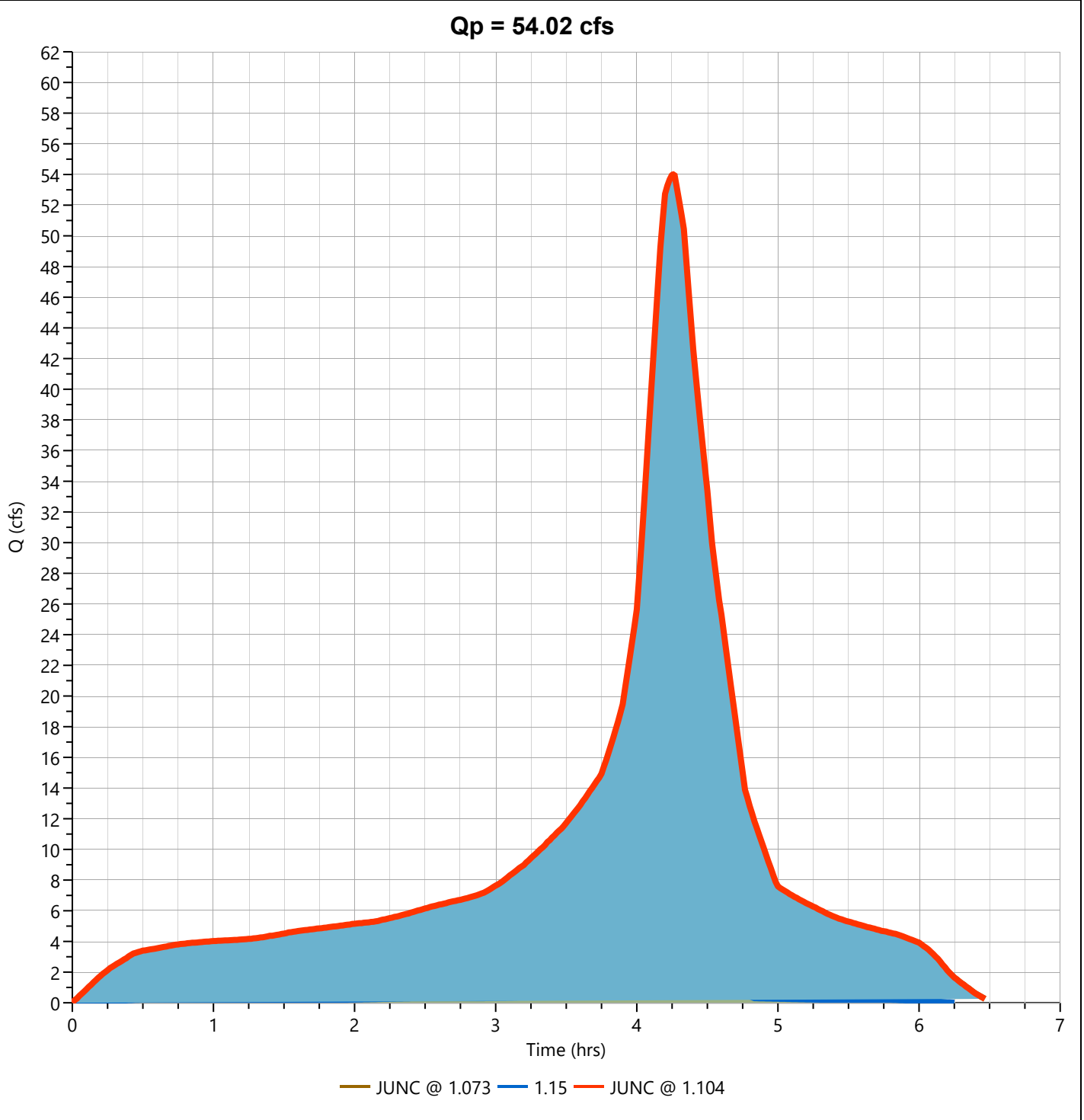
Hydrology Studio v 3.0.0.13

11-22-2019

Post JUNC @ 1.104

Hyd. No. 42

Hydrograph Type	= Junction	Peak Flow	= 54.02 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.27 hrs
Time Interval	= 1 min	Hydrograph Volume	= 228,840 cuft
Inflow Hydrographs	= 36, 41	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

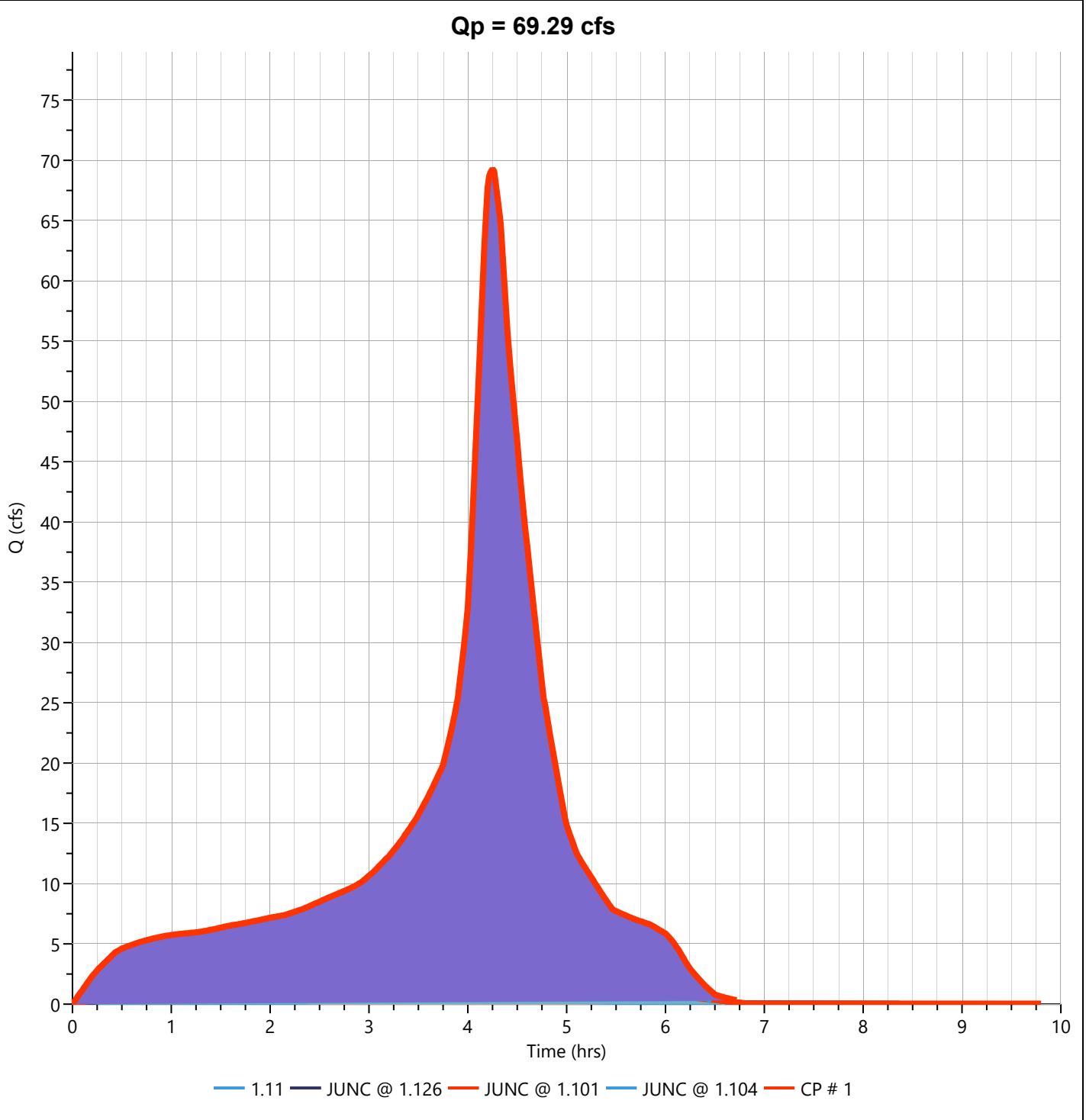
Hydrology Studio v 3.0.0.13

11-22-2019

Post CP # 1

Hyd. No. 43

Hydrograph Type	= Junction	Peak Flow	= 69.29 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.25 hrs
Time Interval	= 1 min	Hydrograph Volume	= 324,847 cuft
Inflow Hydrographs	= 32, 38, 40, 42	Total Contrib. Area	= 0.0 ac



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Hydrology Studio v 3.0.0.13

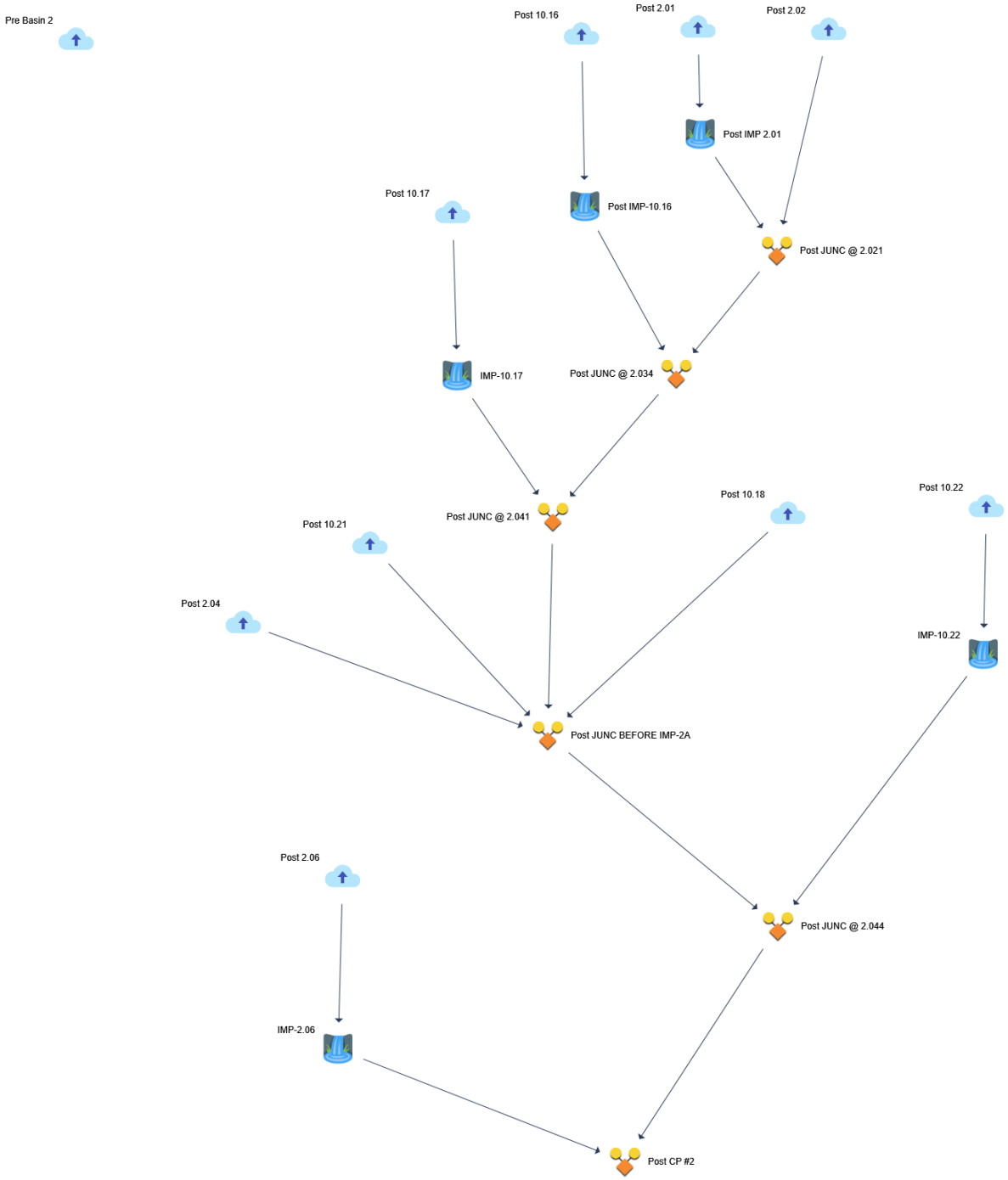
12-17-2019

Basin Model

Hydrology Studio v 3.0.0.13

Project Name:

12-17-2019



Hydrograph by Return Period

Project Name:

12-17-2019

Hydrology Studio v 3.0.0.13

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	Manual	Pre Basin 2								38.70
2	Manual	Post 10.16								3.000
3	Pond Route	Post IMP-10.16								0.445
4	Manual	Post 10.17								1.400
5	Pond Route	IMP-10.17								1.265
6	Manual	Post 10.18								1.300
7	Manual	Post 10.22								8.100
8	Pond Route	IMP-10.22								0.176
9	Manual	Post 2.06								11.00
10	Pond Route	IMP-2.06								9.804
11	Manual	Post 2.01								2.800
12	Manual	Post 2.02								5.800
13	Manual	Post 2.04								7.600
14	Manual	Post 10.21								1.700
15	Pond Route	Post IMP 2.01								2.456
16	Junction	Post JUNC @ 2.021								8.196
18	Junction	Post JUNC @ 2.034								8.410
19	Junction	Post JUNC @ 2.041								8.844
20	Junction	Post JUNC BEFORE IMP-2A								17.17
21	Junction	Post JUNC @ 2.044								17.32
22	Junction	Post CP #2								25.57

Hydrograph 100-yr Summary

Project Name:

12-17-2019

Hydrology Studio v 3.0.0.13

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	Manual	Pre Basin 2	38.70	4.80	233,005	----		
2	Manual	Post 10.16	3.000	4.40	11,242	----		
3	Pond Route	Post IMP-10.16	0.445	4.85	7,425	2	913.06	8,683
4	Manual	Post 10.17	1.400	4.25	4,050	----		
5	Pond Route	IMP-10.17	1.265	4.28	3,361	4	878.75	822
6	Manual	Post 10.18	1.300	4.27	4,037	----		
7	Manual	Post 10.22	8.100	4.25	24,378	----		
8	Pond Route	IMP-10.22	0.176	6.07	12,073	7	767.58	21,624
9	Manual	Post 2.06	11.00	4.50	62,100	----		
10	Pond Route	IMP-2.06	9.804	4.58	54,646	9	739.61	12,307
11	Manual	Post 2.01	2.800	4.40	10,663	----		
12	Manual	Post 2.02	5.800	4.50	25,020	----		
13	Manual	Post 2.04	7.600	4.40	35,046	----		
14	Manual	Post 10.21	1.700	4.20	4,620	----		
15	Pond Route	Post IMP 2.01	2.456	4.45	9,303	11	1021.38	3,197
16	Junction	Post JUNC @ 2.021	8.196	4.50	34,323	12, 15		
18	Junction	Post JUNC @ 2.034	8.410	4.50	41,748	3, 16		
19	Junction	Post JUNC @ 2.041	8.844	4.50	45,109	5, 18		
20	Junction	Post JUNC BEFORE IMP-2A	17.17	4.40	88,812	6, 13, 14, 19		
21	Junction	Post JUNC @ 2.044	17.32	4.40	100,885	8, 20		
22	Junction	Post CP #2	25.57	4.40	155,531	10, 21		

Hydrograph Report

Project Name:

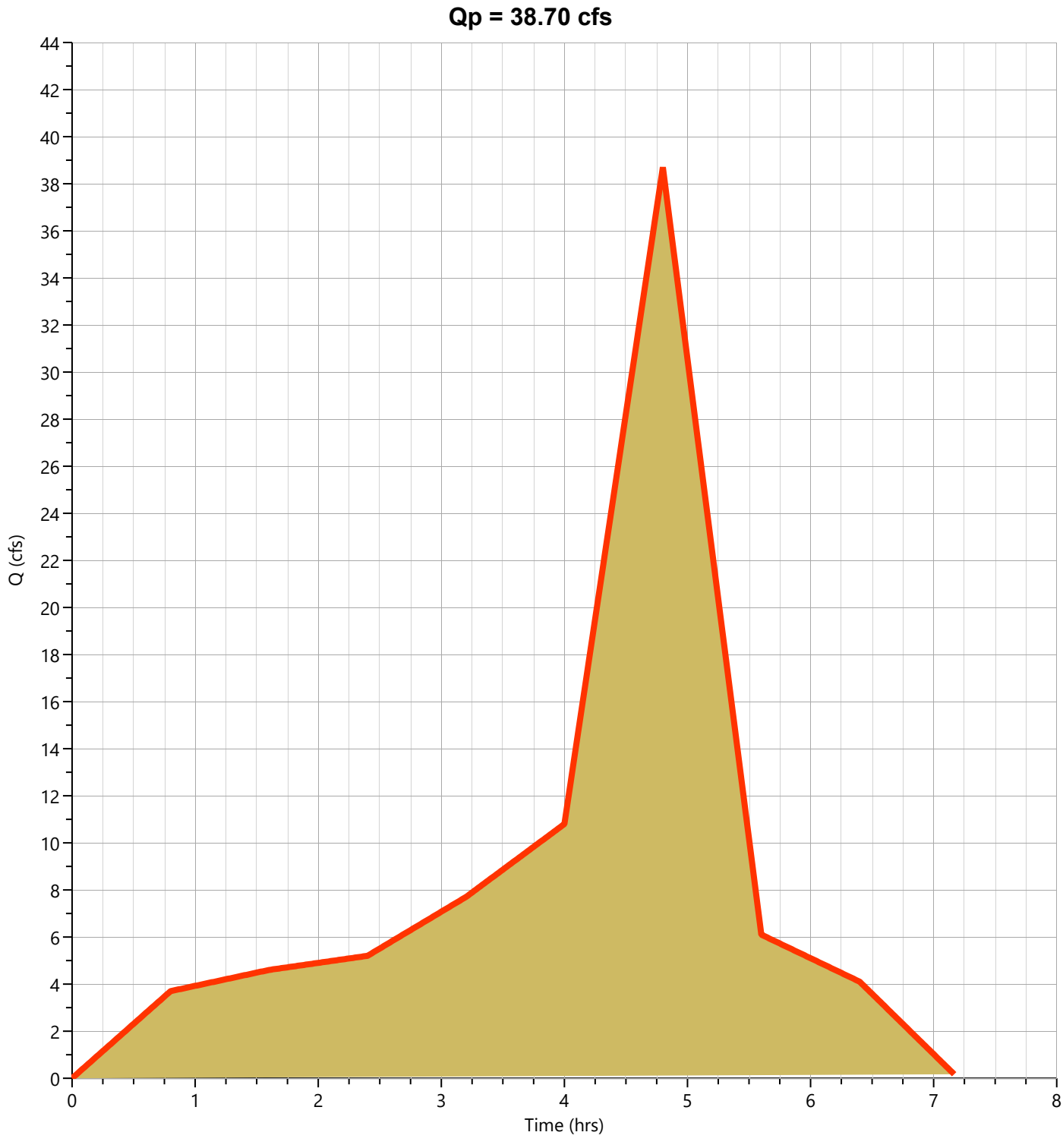
Hydrology Studio v 3.0.0.13

12-17-2019

Pre Basin 2

Hyd. No. 1

Hydrograph Type	= Manual	Peak Flow	= 38.70 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.80 hrs
Time Interval	= 1 min	Hydrograph Volume	= 233,005 cuft



Hydrograph Report

Project Name:

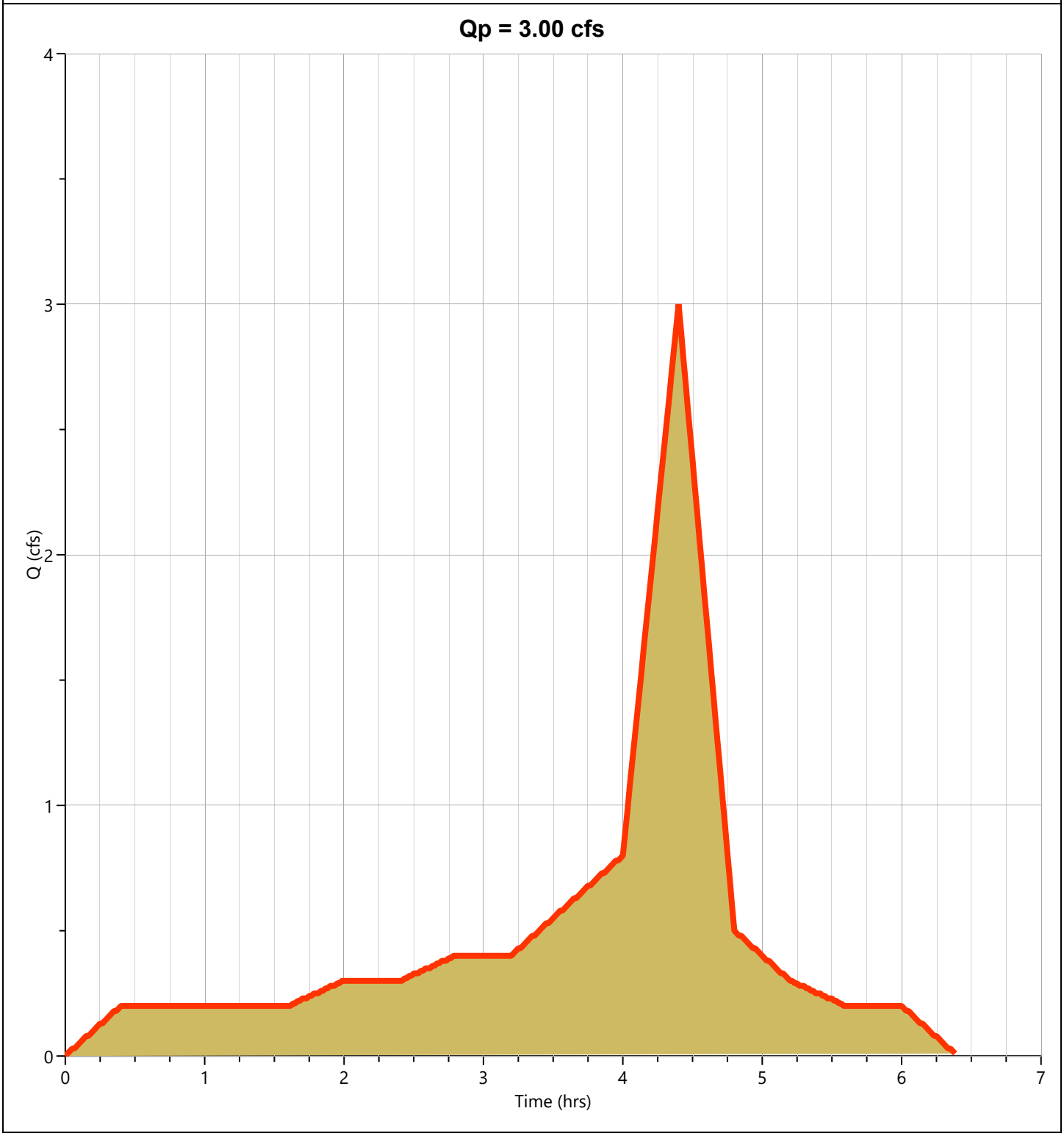
Hydrology Studio v 3.0.0.13

12-17-2019

Post 10.16

Hyd. No. 2

Hydrograph Type	= Manual	Peak Flow	= 3.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 11,242 cuft



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.13

12-17-2019

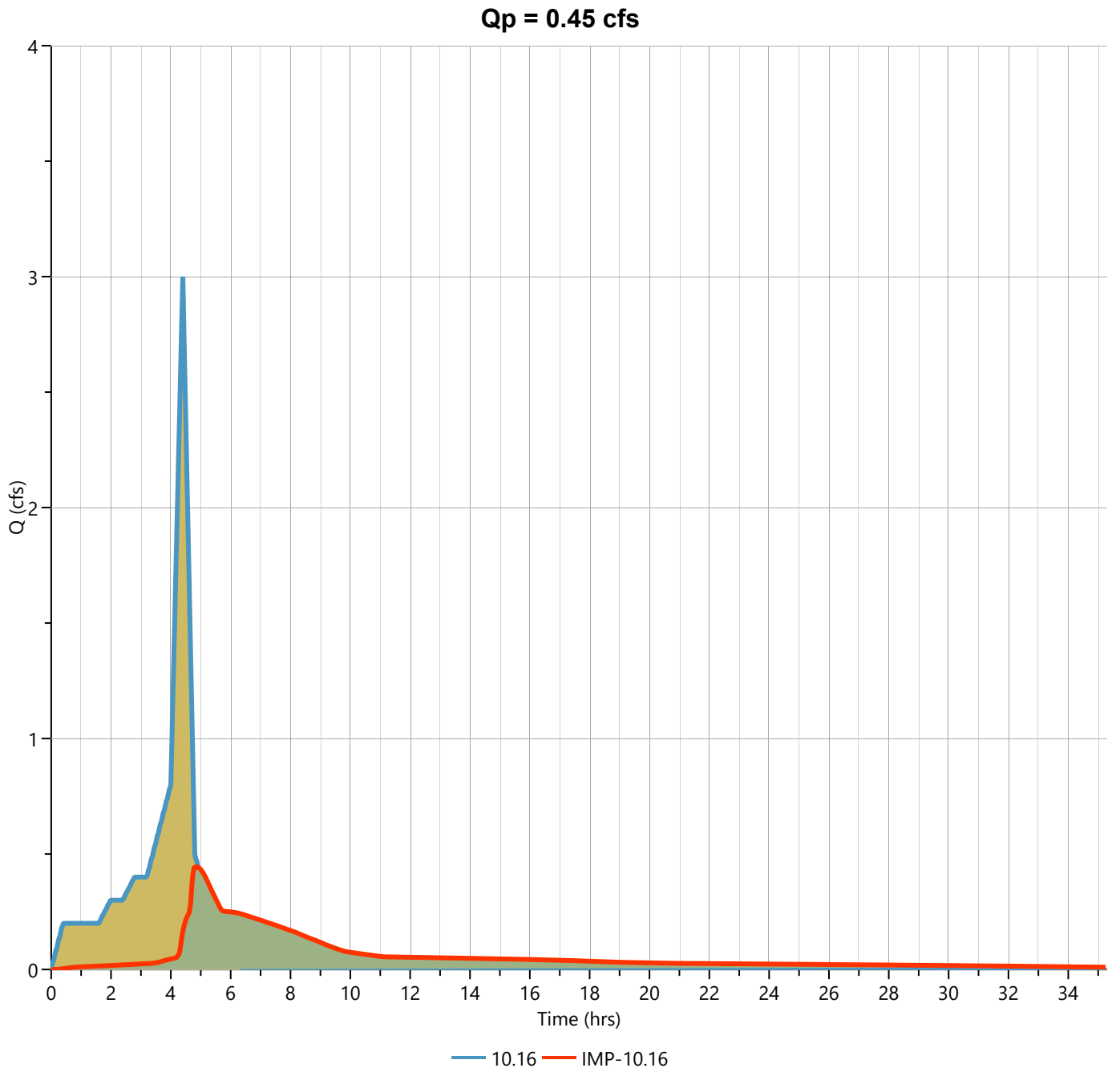
Post IMP-10.16

Hyd. No. 3

Hydrograph Type	= Pond Route	Peak Flow	= 0.445 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.85 hrs
Time Interval	= 1 min	Hydrograph Volume	= 7,425 cuft
Inflow Hydrograph	= 2 - 10.16	Max. Elevation	= 913.06 ft
Pond Name	= IMP-10.16	Max. Storage	= 8,683 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 7.49 hrs



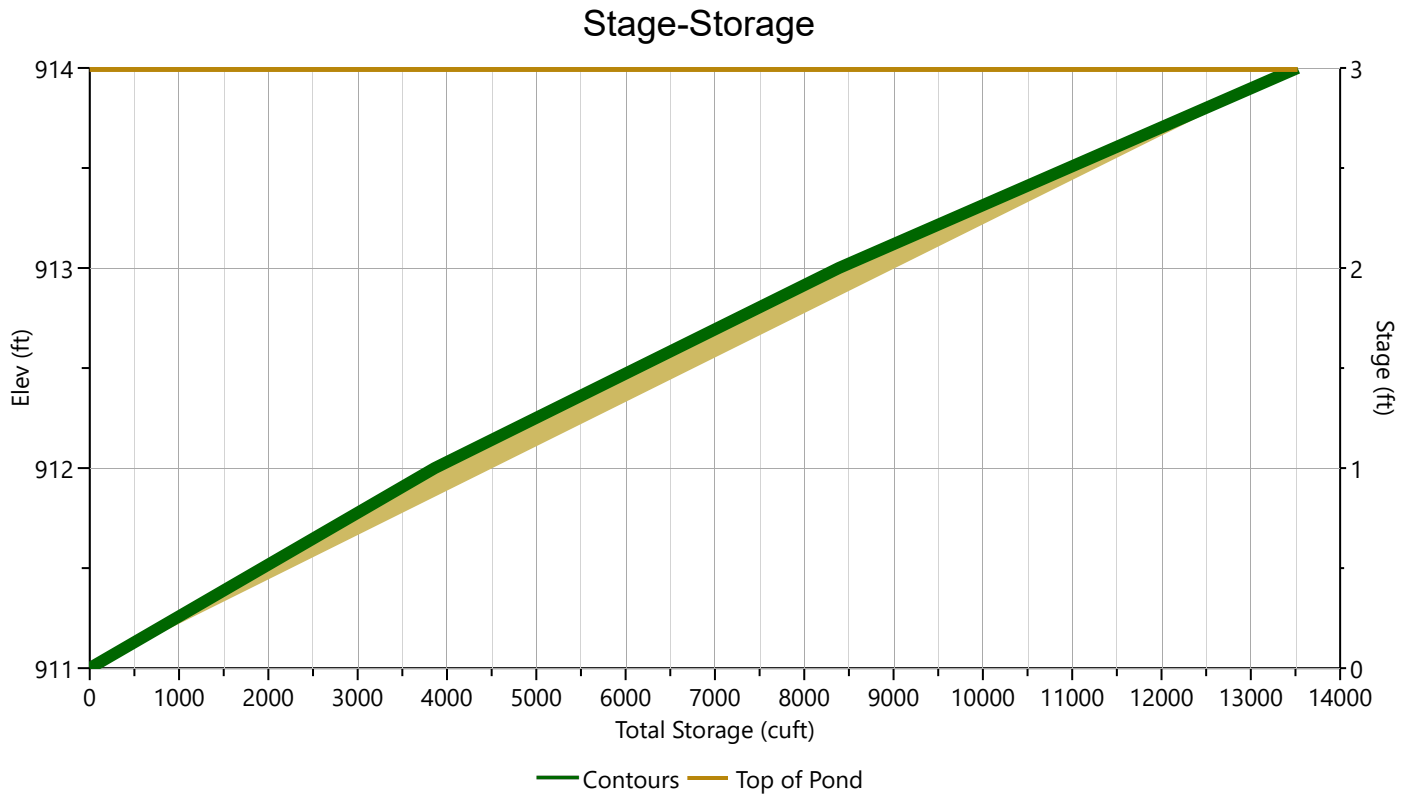
IMP-10.16

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	911.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	911.00	3,500	0.000	0.000
1.00	912.00	4,225	3,863	3,863
2.00	913.00	4,824	4,525	8,387
3.00	914.00	5,450	5,137	13,524



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

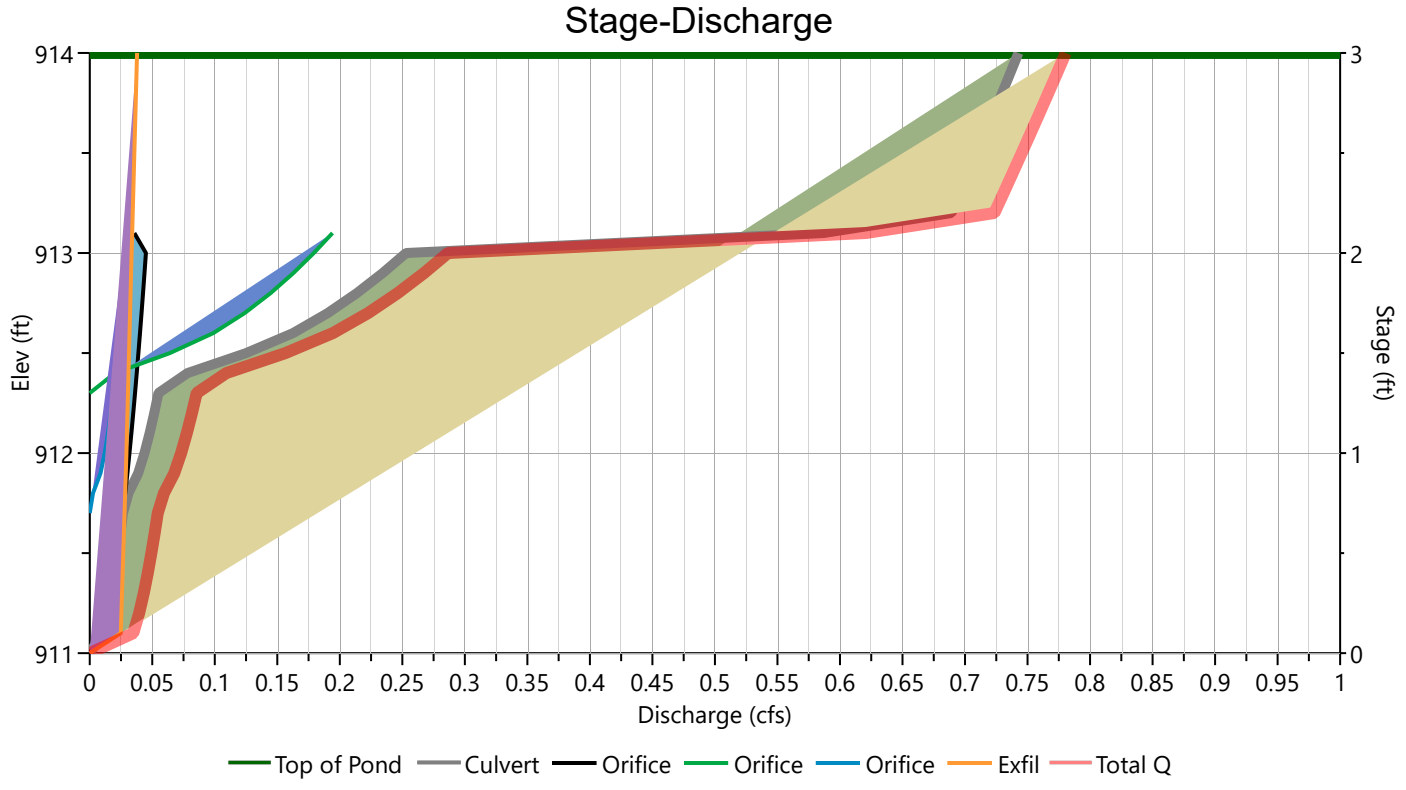
12-17-2019

IMP-10.16

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1*	2*	3*		
Rise, in	12	1.1	3	1	Orifice Dia, in	
Span, in	12	1.1	3	1	No. Orifices	
No. Barrels	1	1	1	1	Invert Elevation, ft	
Invert Elevation, ft	908.25	908.50	912.30	911.75	Height, ft	
Orifice Coefficient, Co	0.60	0.60	0.60	0.60	Orifice Coefficient, Co	
Length, ft	100					
Barrel Slope, %	1					
N-Value, n	0.150					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.30**
Crest Elevation, ft	913					
Crest Length, ft	3.14					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-10.16

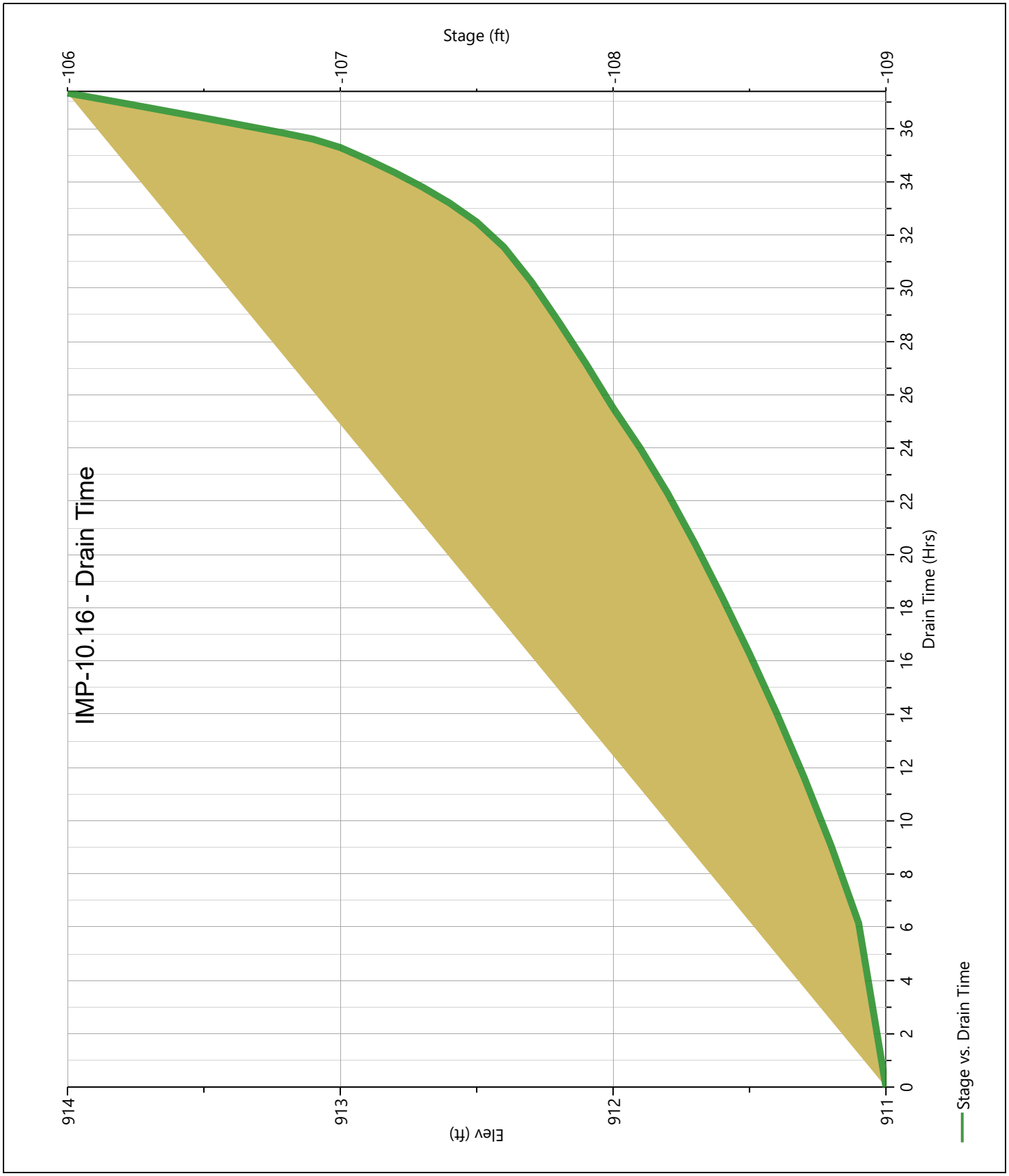
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	911.00	0.000	0.000	0.000	0.000	0.000	0.000					0.000		0.000
1.00	912.00	3,863	0.044 oc	0.032	0.000	0.012	0.000					0.029		0.073
2.00	913.00	8,387	0.253 oc	0.045	0.179	0.029	0.000					0.034		0.287
3.00	914.00	13,524	0.743 oc	0.000	0.000	0.000	0.000					0.038		0.781

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP-10.16

Pond Drawdown



Hydrograph Report

Project Name:

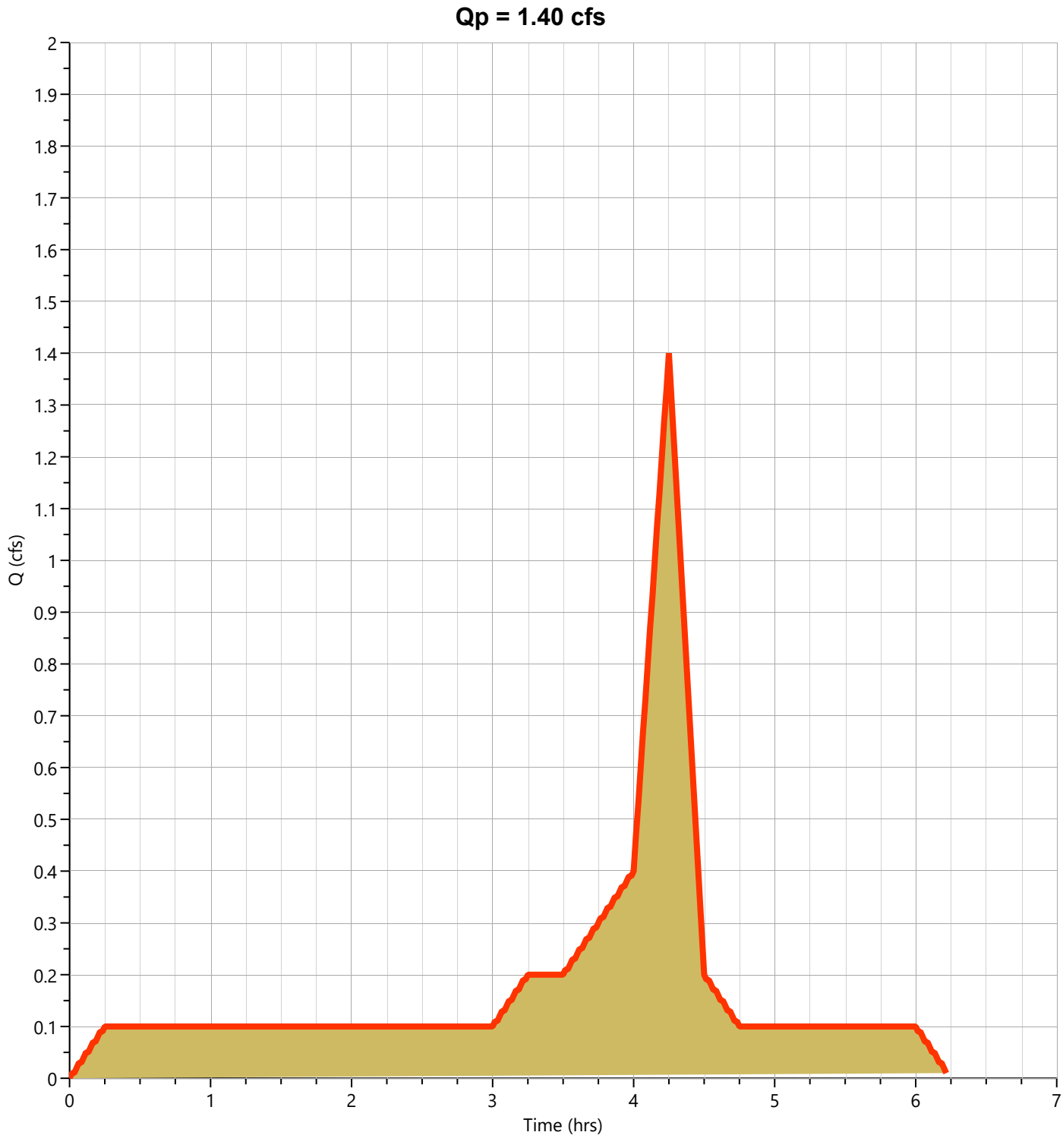
Hydrology Studio v 3.0.0.13

12-17-2019

Post 10.17

Hyd. No. 4

Hydrograph Type	= Manual	Peak Flow	= 1.400 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.25 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,050 cuft



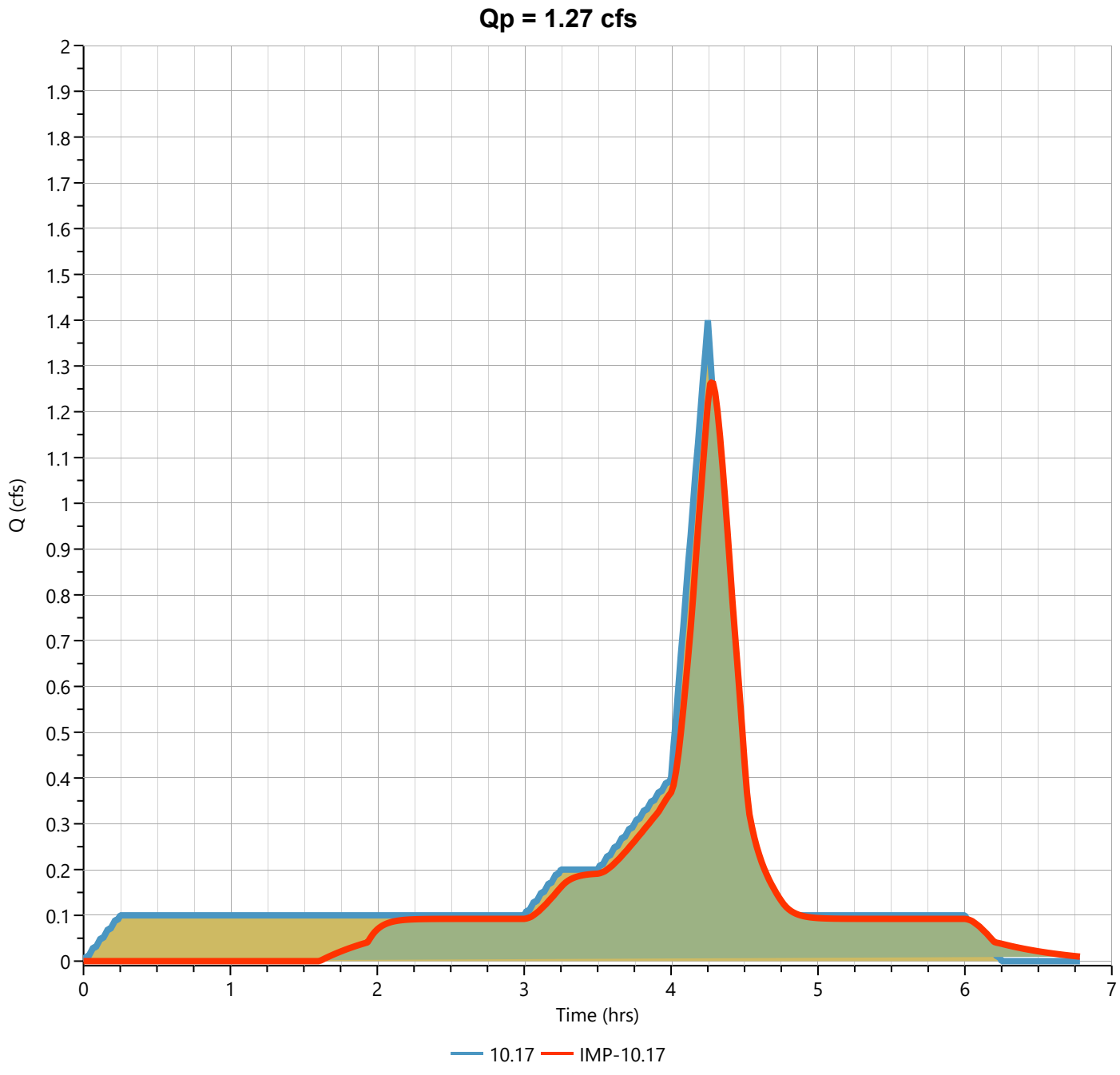
IMP-10.17

Hyd. No. 5

Hydrograph Type	= Pond Route	Peak Flow	= 1.265 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.28 hrs
Time Interval	= 1 min	Hydrograph Volume	= 3,361 cuft
Inflow Hydrograph	= 4 - 10.17	Max. Elevation	= 878.75 ft
Pond Name	= IMP-10.17	Max. Storage	= 822 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 33 min



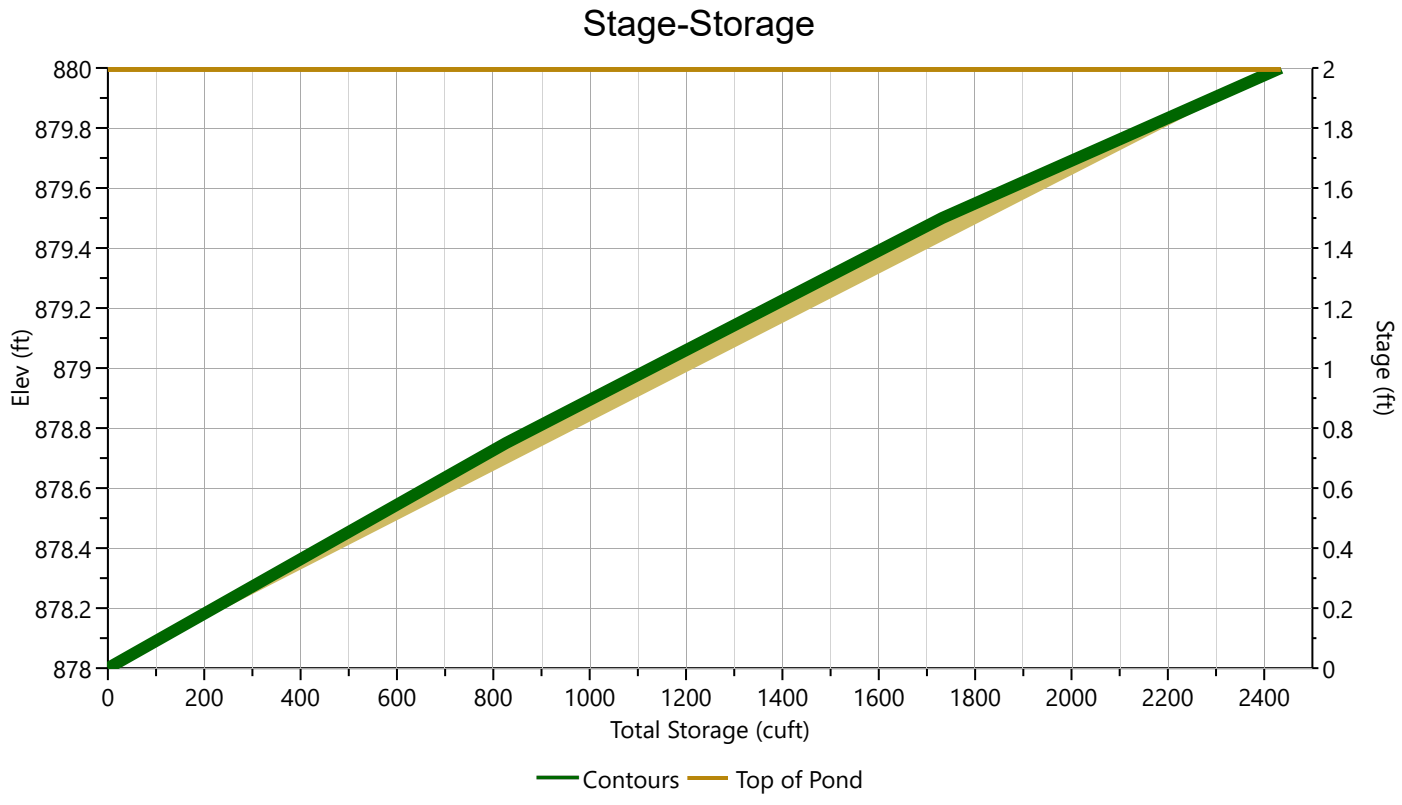
IMP-10.17

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	878.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	878.00	1,100	0.000	0.000
0.75	878.75	1,103	826	826
1.50	879.50	1,311	905	1,732
2.00	880.00	1,500	703	2,434



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

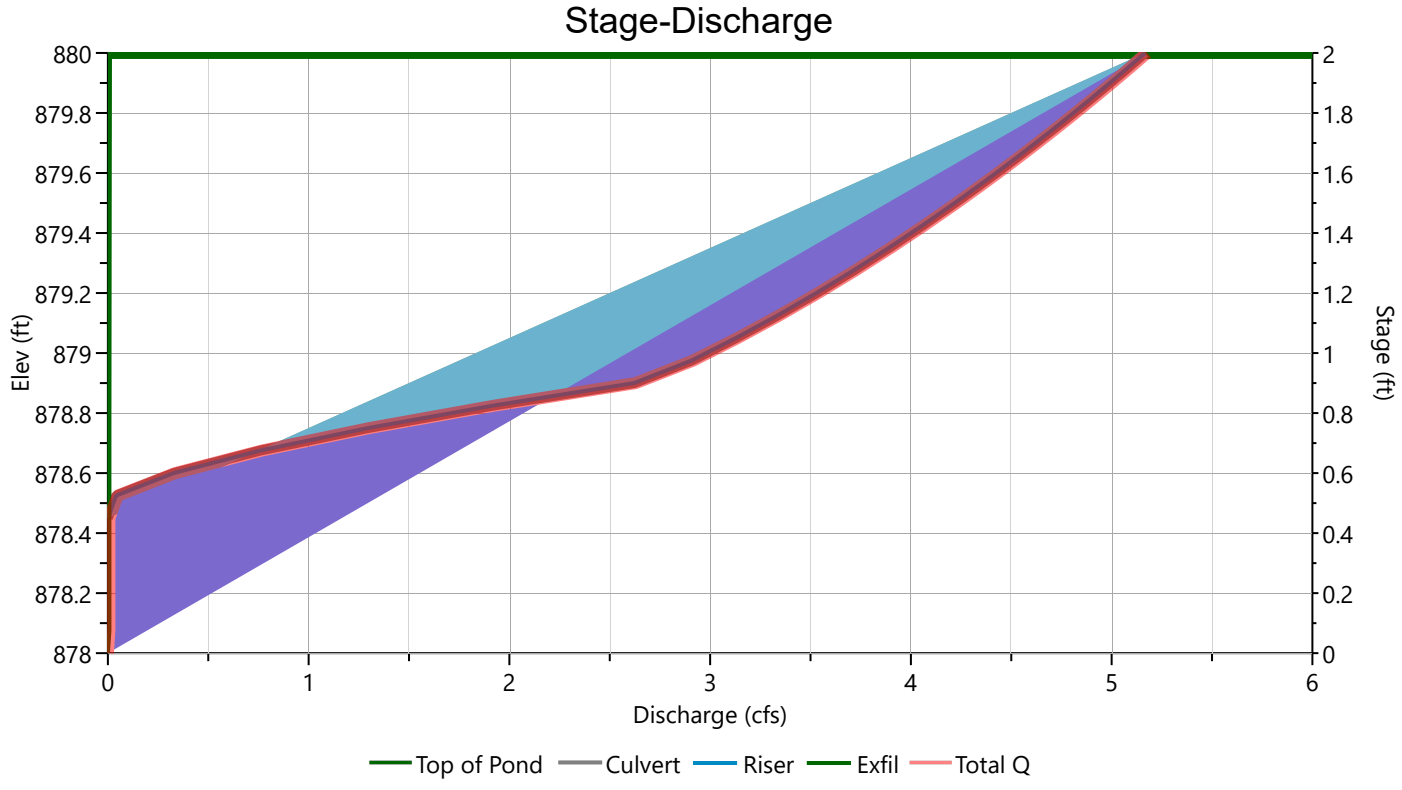
12-17-2019

IMP-10.17

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1	2	3		
Rise, in	12				Orifice Dia, in	
Span, in	12				No. Orifices	
No. Barrels	1				Invert Elevation, ft	
Invert Elevation, ft	875.25				Height, ft	
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co	
Length, ft	40					
Barrel Slope, %	1					
N-Value, n	0.015					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.30**
Crest Elevation, ft	878.5					
Crest Length, ft	3.14					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-10.17

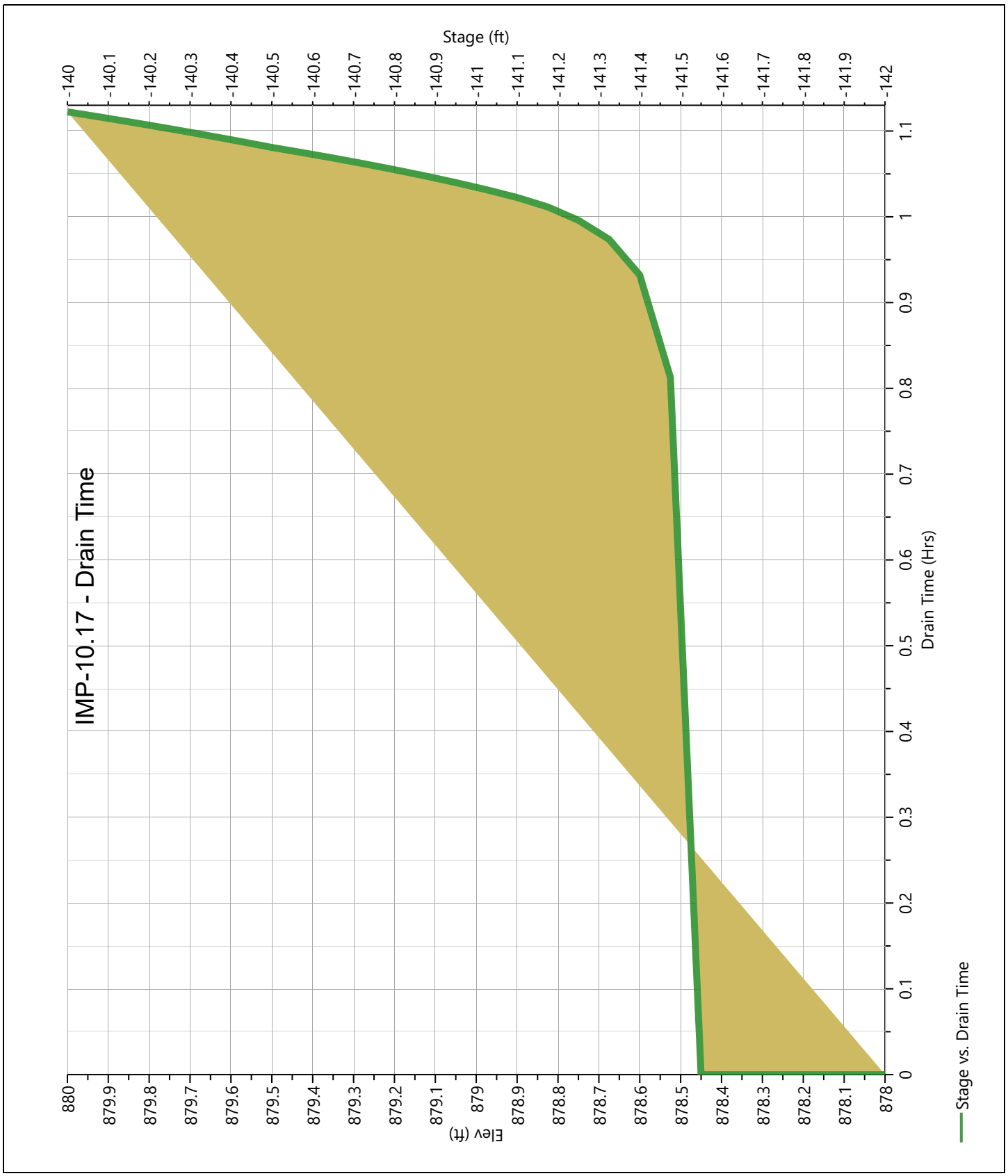
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	878.00	0.000	0.000				0.000					0.000		0.000
0.75	878.75	826	1.295 oc				1.295					0.008		1.303
1.50	879.50	1,732	4.219 oc				4.219 ic					0.009		4.228
2.00	880.00	2,434	5.167 oc				5.167 ic					0.010		5.177

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP-10.17

Pond Drawdown



Hydrograph Report

Project Name:

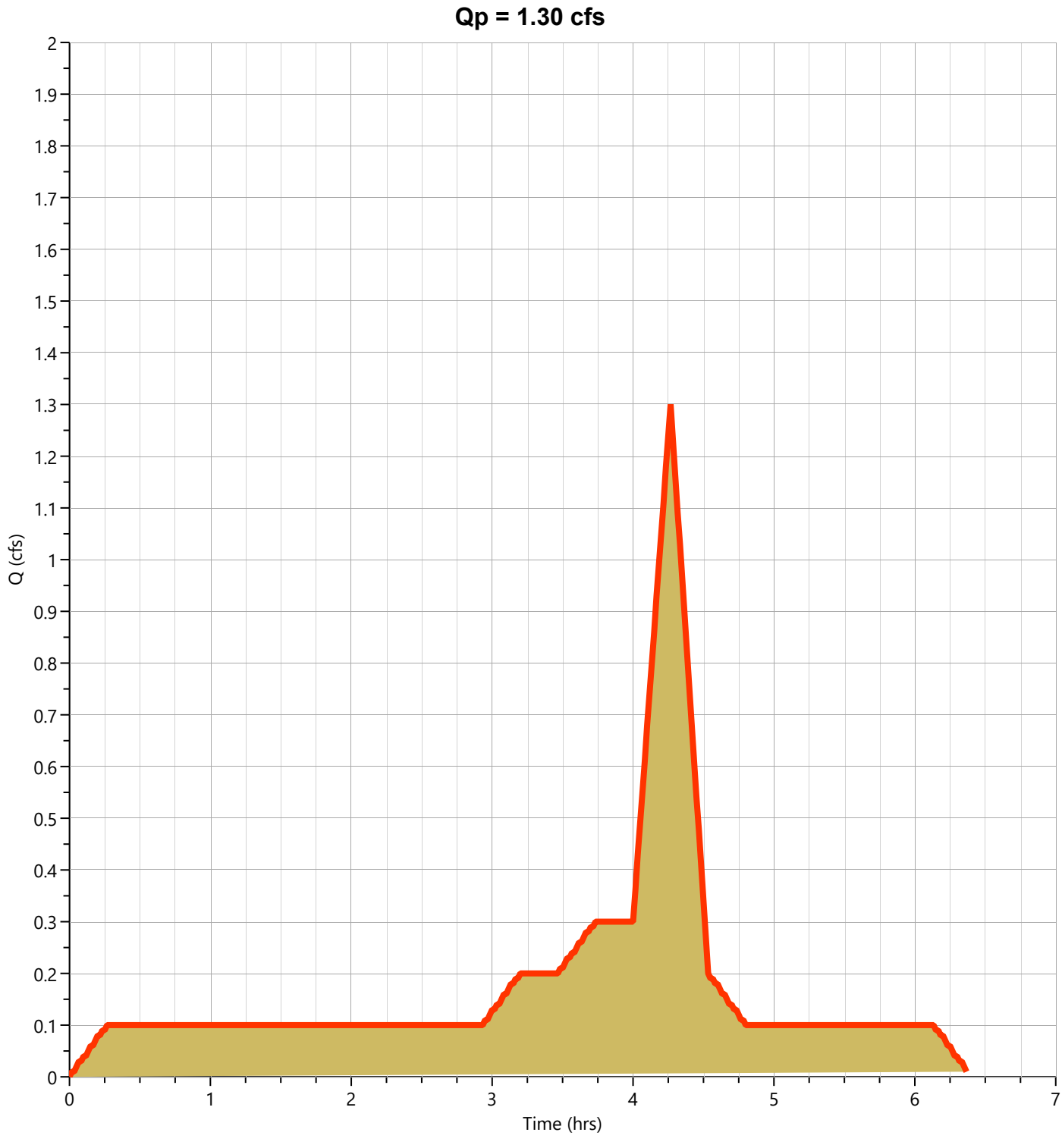
Hydrology Studio v 3.0.0.13

12-17-2019

Post 10.18

Hyd. No. 6

Hydrograph Type	= Manual	Peak Flow	= 1.300 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.27 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,037 cuft



Hydrograph Report

Project Name:

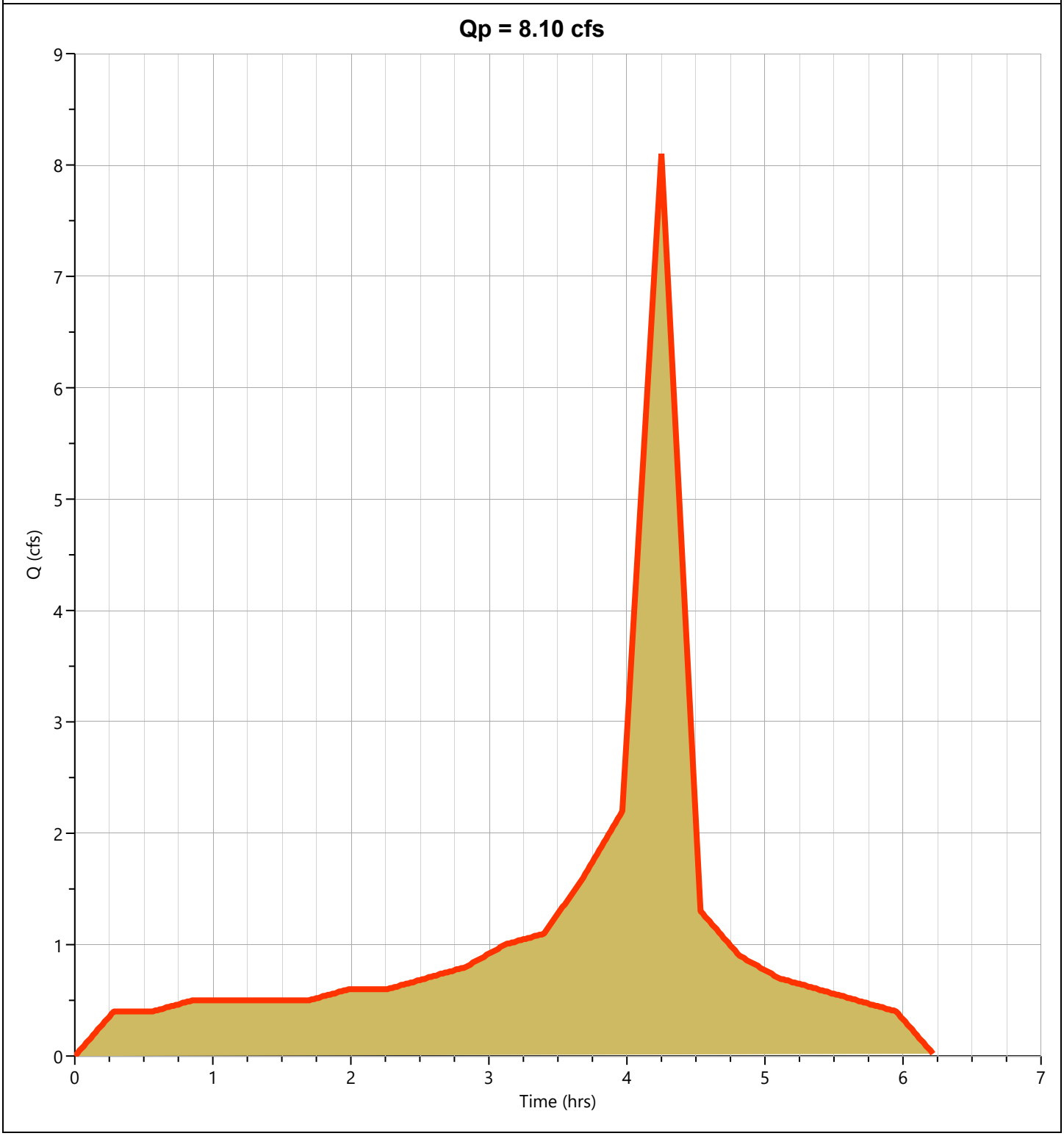
Hydrology Studio v 3.0.0.13

12-17-2019

Post 10.22

Hyd. No. 7

Hydrograph Type	= Manual	Peak Flow	= 8.100 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.25 hrs
Time Interval	= 1 min	Hydrograph Volume	= 24,378 cuft



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.13

12-17-2019

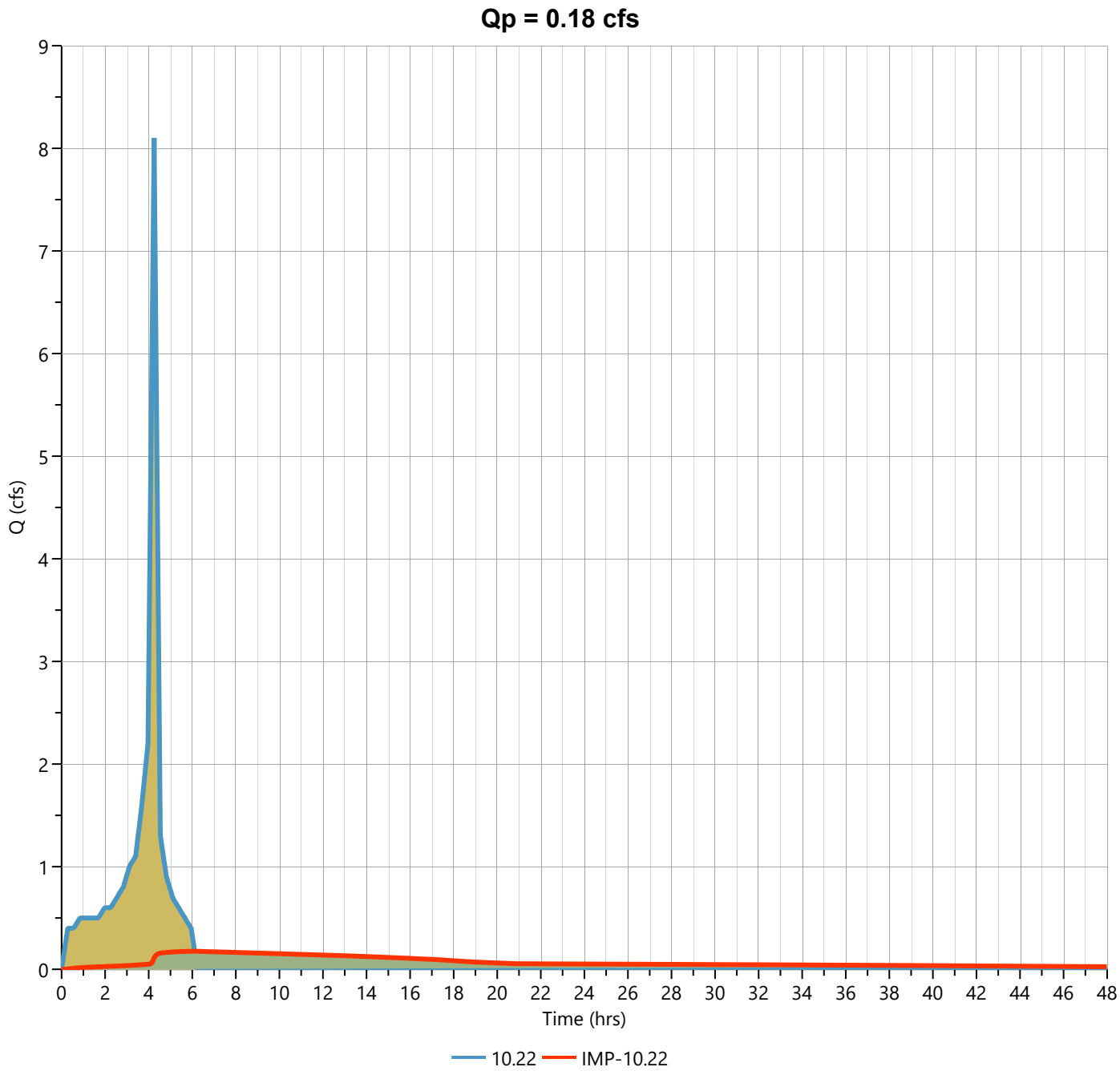
IMP-10.22

Hyd. No. 8

Hydrograph Type	= Pond Route	Peak Flow	= 0.176 cfs
Storm Frequency	= 100-yr	Time to Peak	= 6.07 hrs
Time Interval	= 1 min	Hydrograph Volume	= 12,073 cuft
Inflow Hydrograph	= 7 - 10.22	Max. Elevation	= 767.58 ft
Pond Name	= IMP-10.22	Max. Storage	= 21,624 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 14.44 hrs



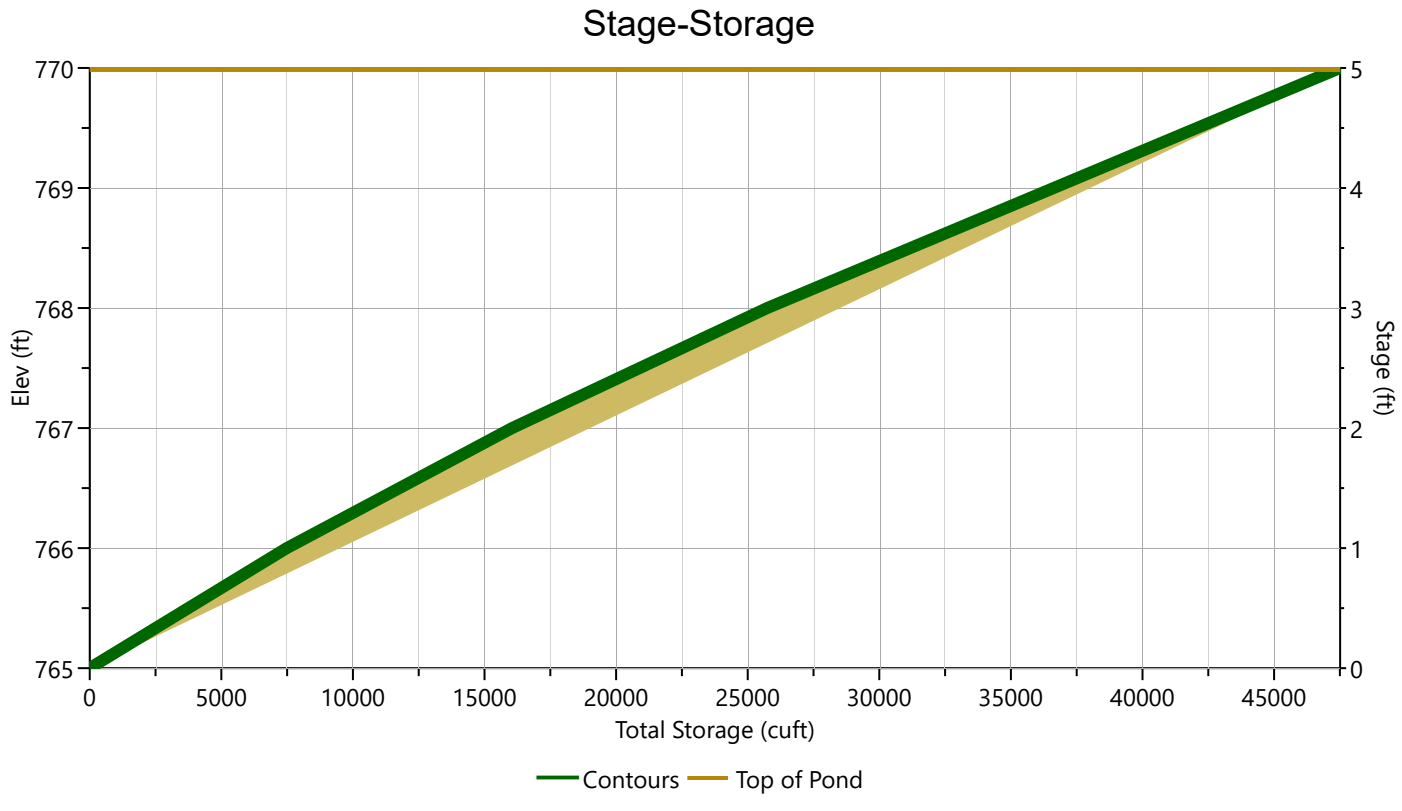
IMP-10.22

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	765.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	765.00	6,960	0.000	0.000
1.00	766.00	8,009	7,485	7,485
2.00	767.00	9,114	8,562	16,046
3.00	768.00	10,275	9,695	25,741
4.00	769.00	11,494	10,885	36,625
5.00	770.00	10,275	10,885	47,510



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

12-17-2019

IMP-10.22

Stage-Discharge

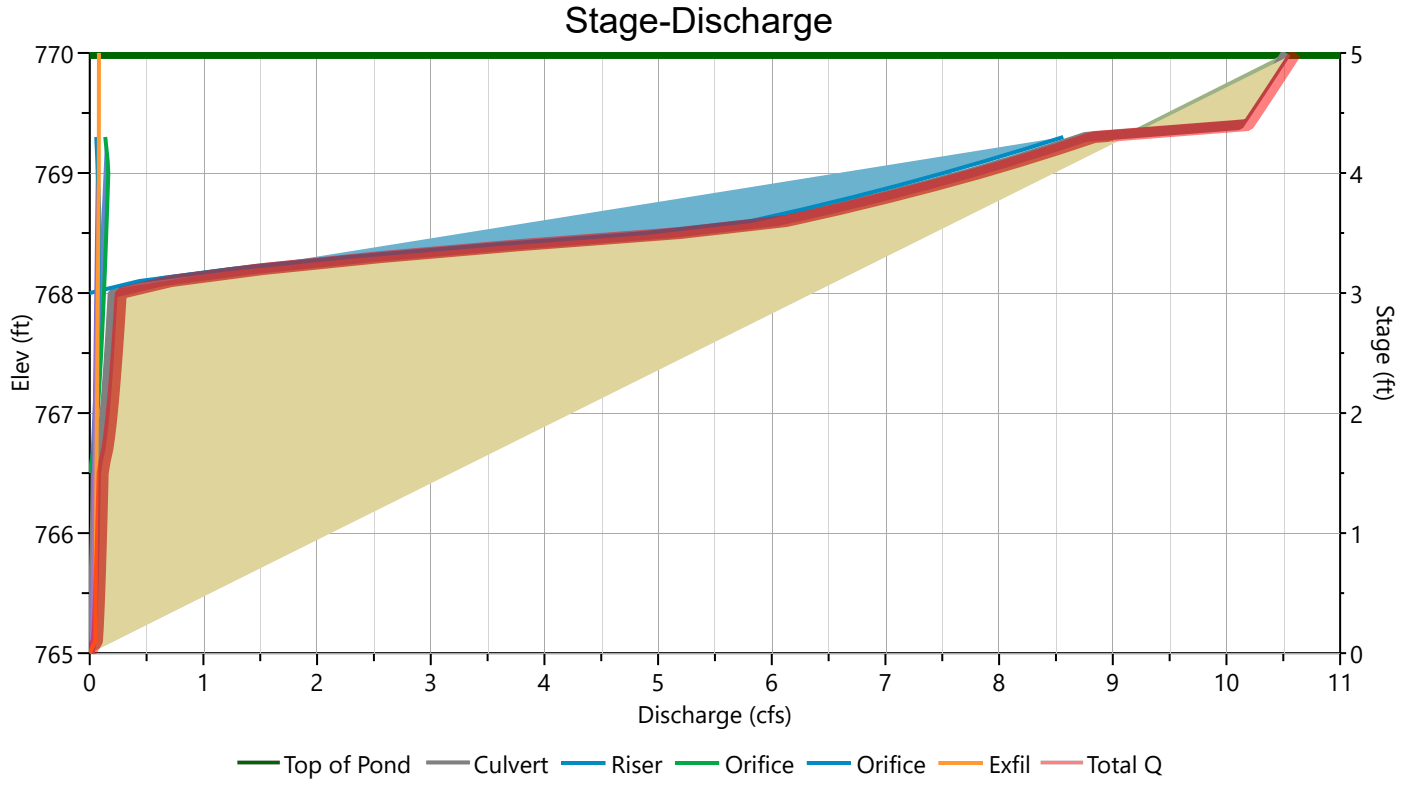
Culvert / Orifices	Culvert	Orifices		
		1	2*	3*
Rise, in	12		2	1.3
Span, in	12		2	1.3
No. Barrels	1		1	1
Invert Elevation, ft	761.75		766.50	762.00
Orifice Coefficient, Co	0.60		0.60	0.60
Length, ft	15			
Barrel Slope, %	1			
N-Value, n	0.013			

Weirs	Riser*	Weirs		
		1	2	3
Shape / Type	Circular			
Crest Elevation, ft	768			
Crest Length, ft	4.19			
Angle, deg				
Weir Coefficient, Cw	3.3			

Orifice Plate	
Orifice Dia, in	
No. Orifices	
Invert Elevation, ft	
Height, ft	
Orifice Coefficient, Co	

Ancillary	
Exfiltration, in/hr	0.30**

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-10.22

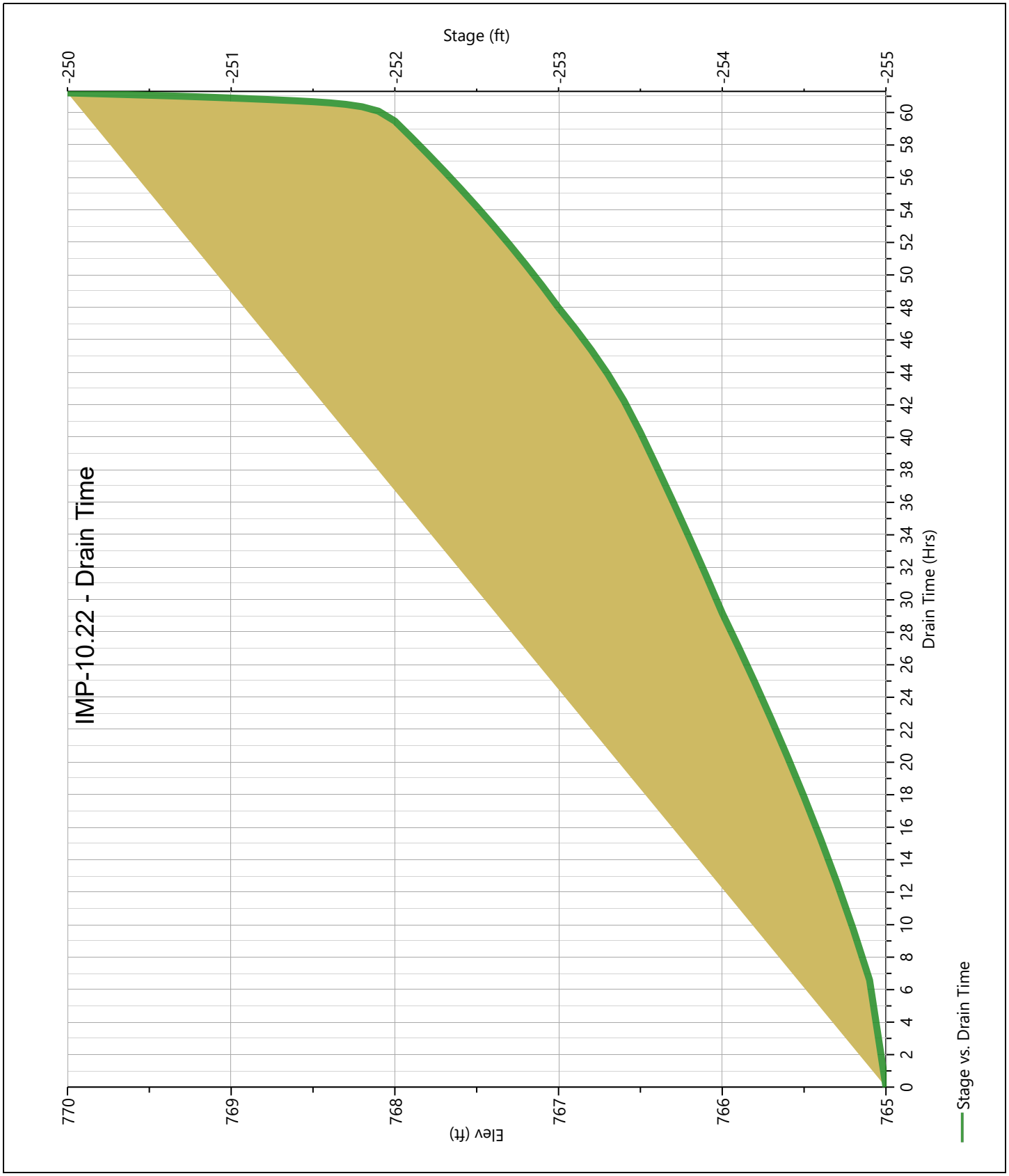
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	765.00	0.000	0.000		0.000	0.000	0.000					0.000		0.000
1.00	766.00	7,485	0.044 ic		0.000	0.044	0.000					0.056		0.100
2.00	767.00	16,046	0.131 ic		0.068	0.063	0.000					0.063		0.194
3.00	768.00	25,741	0.202 ic		0.125	0.077	0.000					0.071		0.273
4.00	769.00	36,625	7.746 ic		0.163	0.071	7.512 ic					0.080		7.826
5.00	770.00	47,510	10.53 ic		0.000	0.000	0.000					0.081		10.61

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP-10.22

Pond Drawdown



Hydrograph Report

Project Name:

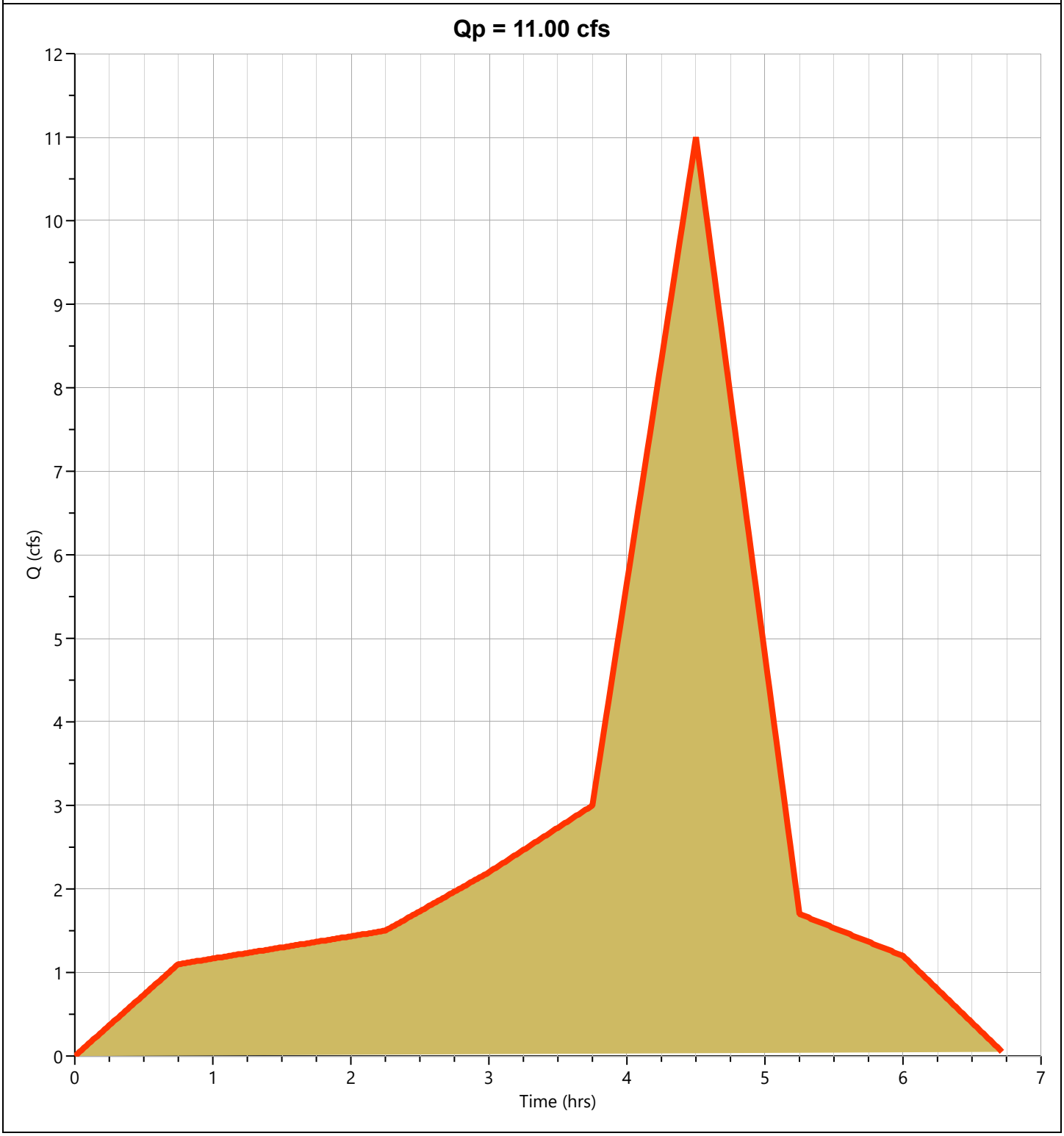
Hydrology Studio v 3.0.0.13

12-17-2019

Post 2.06

Hyd. No. 9

Hydrograph Type	= Manual	Peak Flow	= 11.00 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.50 hrs
Time Interval	= 1 min	Hydrograph Volume	= 62,100 cuft



Hydrograph Report

Hydrology Studio v 3.0.0.13

12-17-2019

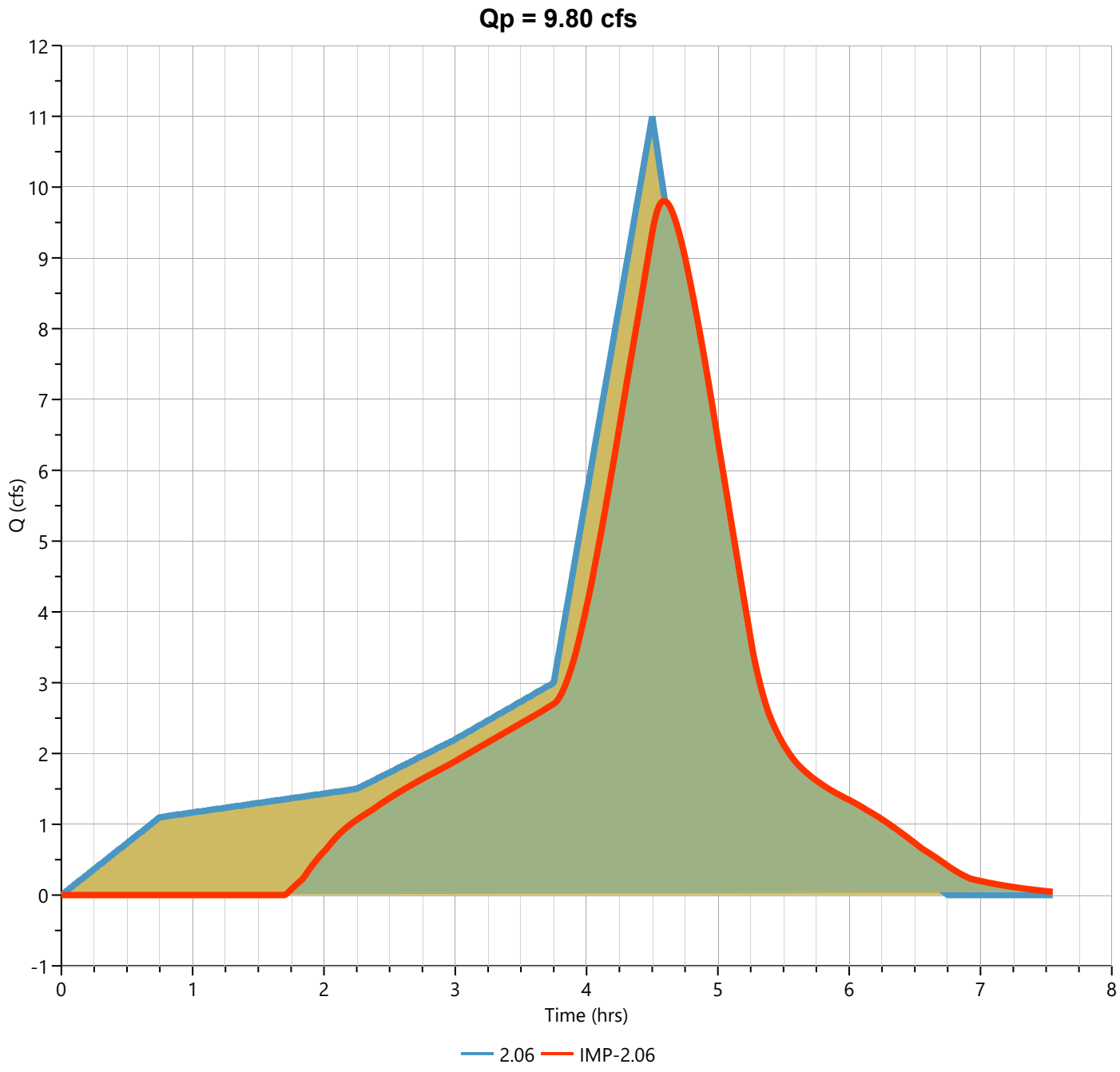
IMP-2.06

Hyd. No. 10

Hydrograph Type	= Pond Route	Peak Flow	= 9.804 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.58 hrs
Time Interval	= 1 min	Hydrograph Volume	= 54,646 cuft
Inflow Hydrograph	= 9 - 2.06	Max. Elevation	= 739.61 ft
Pond Name	= IMP-2.06	Max. Storage	= 12,307 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 32 min



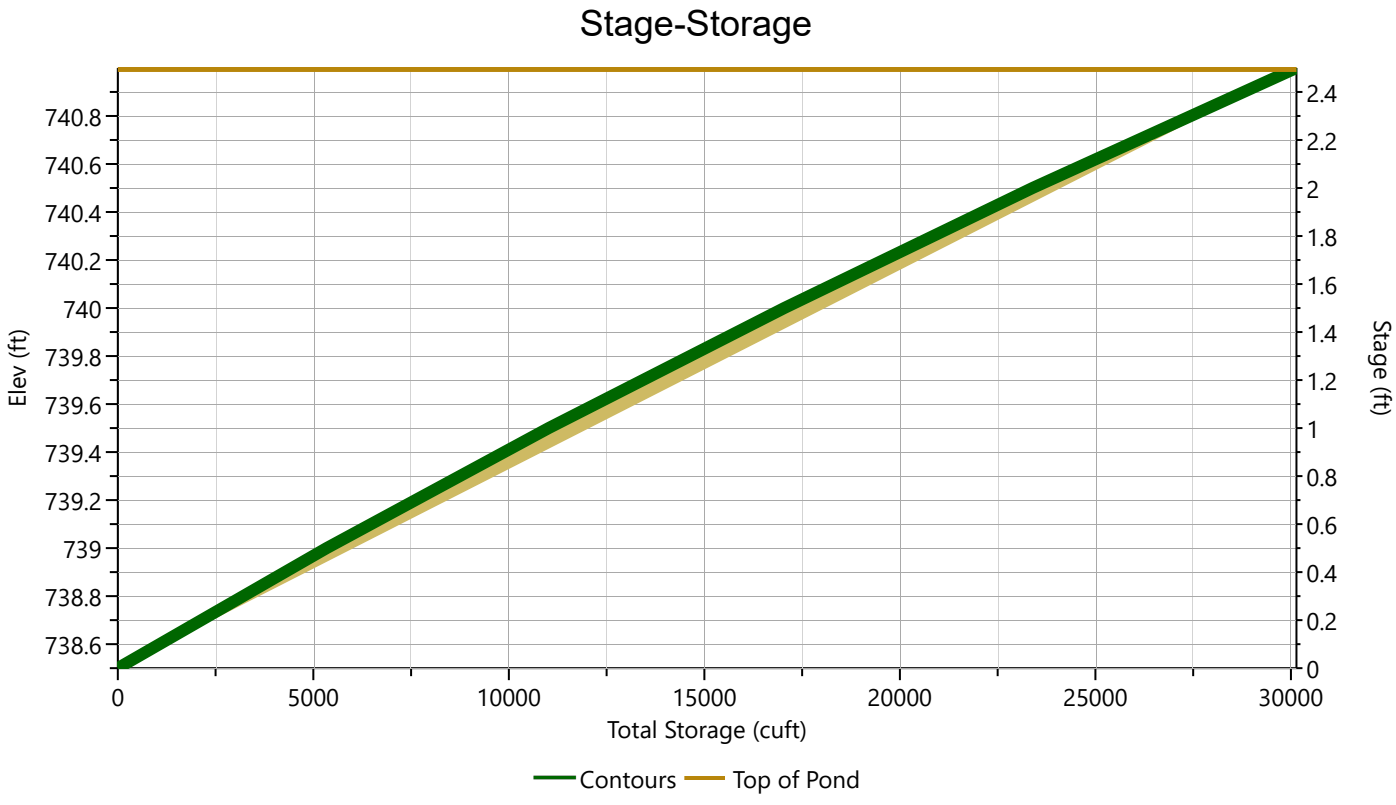
IMP-2.06

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	738.50
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	738.50	10,344	0.000	0.000
0.50	739.00	11,014	5,340	5,340
1.00	739.50	11,699	5,678	11,018
1.50	740.00	12,397	6,024	17,042
2.00	740.50	13,000	6,349	23,391
2.50	741.00	14,000	6,750	30,141



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

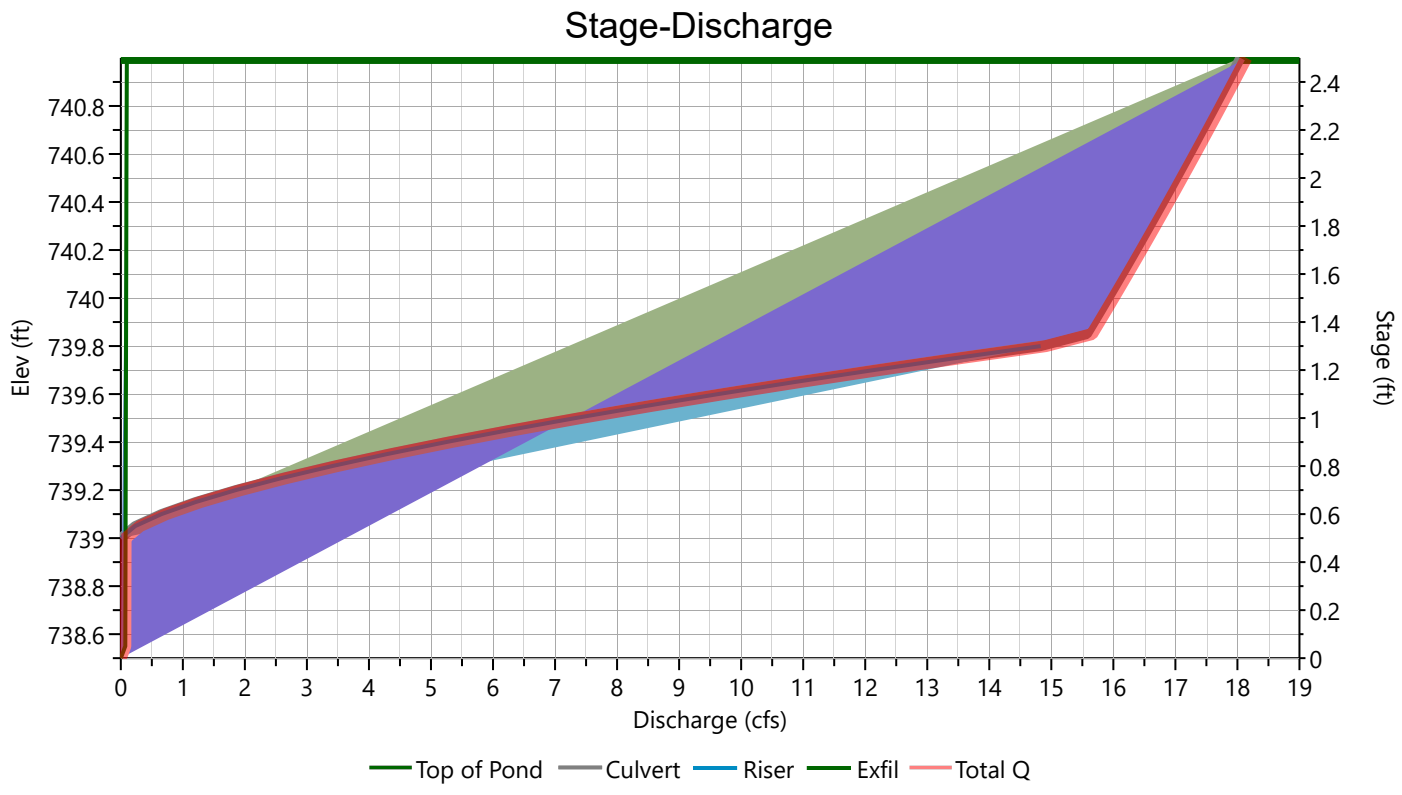
12-17-2019

IMP-2.06

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1	2	3		
Rise, in	18				Orifice Dia, in	
Span, in	18				No. Orifices	
No. Barrels	1				Invert Elevation, ft	
Invert Elevation, ft	735.75				Height, ft	
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co	
Length, ft	16					
Barrel Slope, %	1					
N-Value, n	0.012					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.30**
Crest Elevation, ft	739					
Crest Length, ft	6.28					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP-2.06

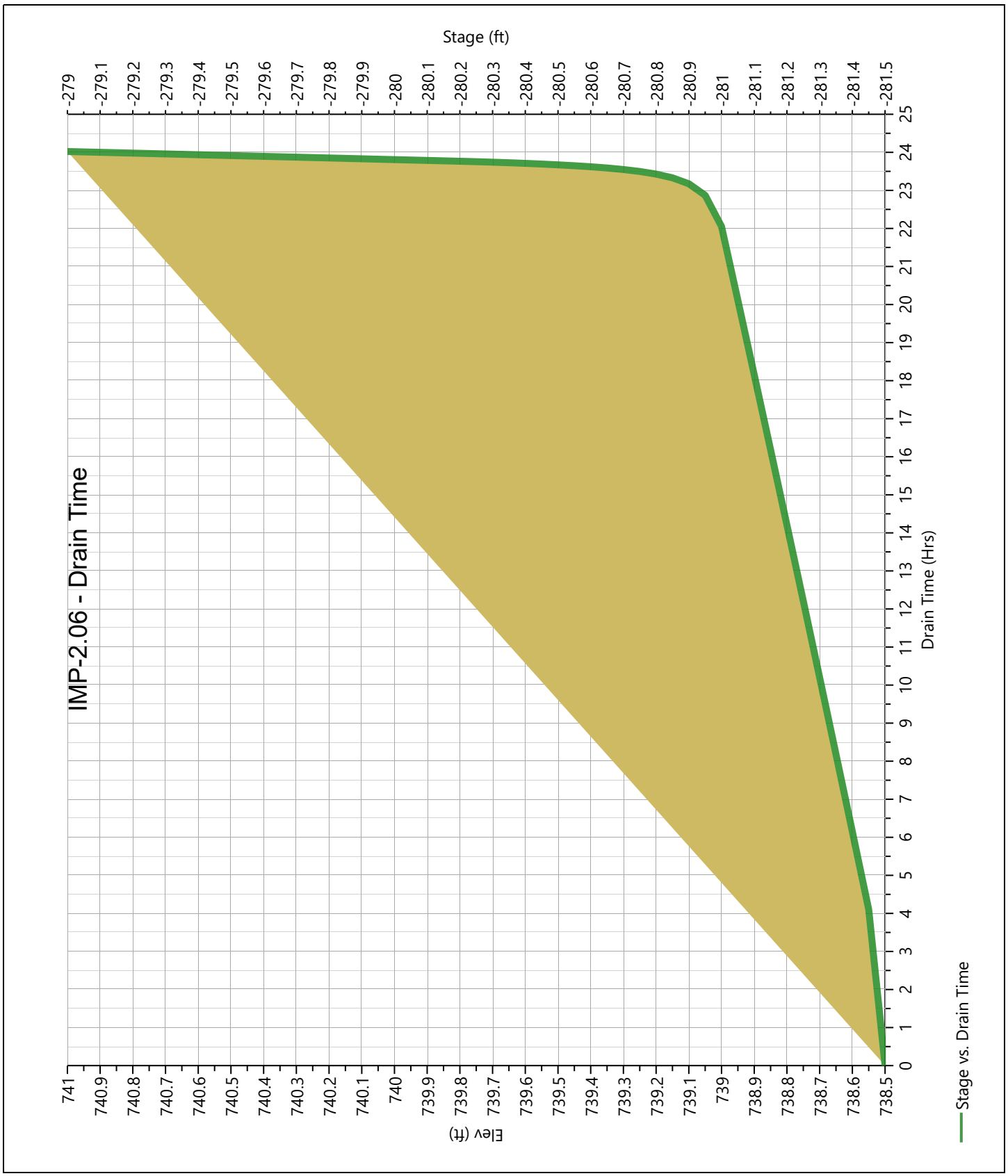
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	738.50	0.000	0.000				0.000					0.000		0.000
0.50	739.00	5,340	0.000 ic				0.000					0.076		0.076
1.00	739.50	11,018	7.327 ic				7.327					0.081		7.408
1.50	740.00	17,042	15.92 ic				0.000					0.086		16.00
2.00	740.50	23,391	17.02 ic				0.000					0.090		17.11
2.50	741.00	30,141	18.05 ic				0.000					0.097		18.14

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP-2.06

Pond Drawdown



Hydrograph Report

Project Name:

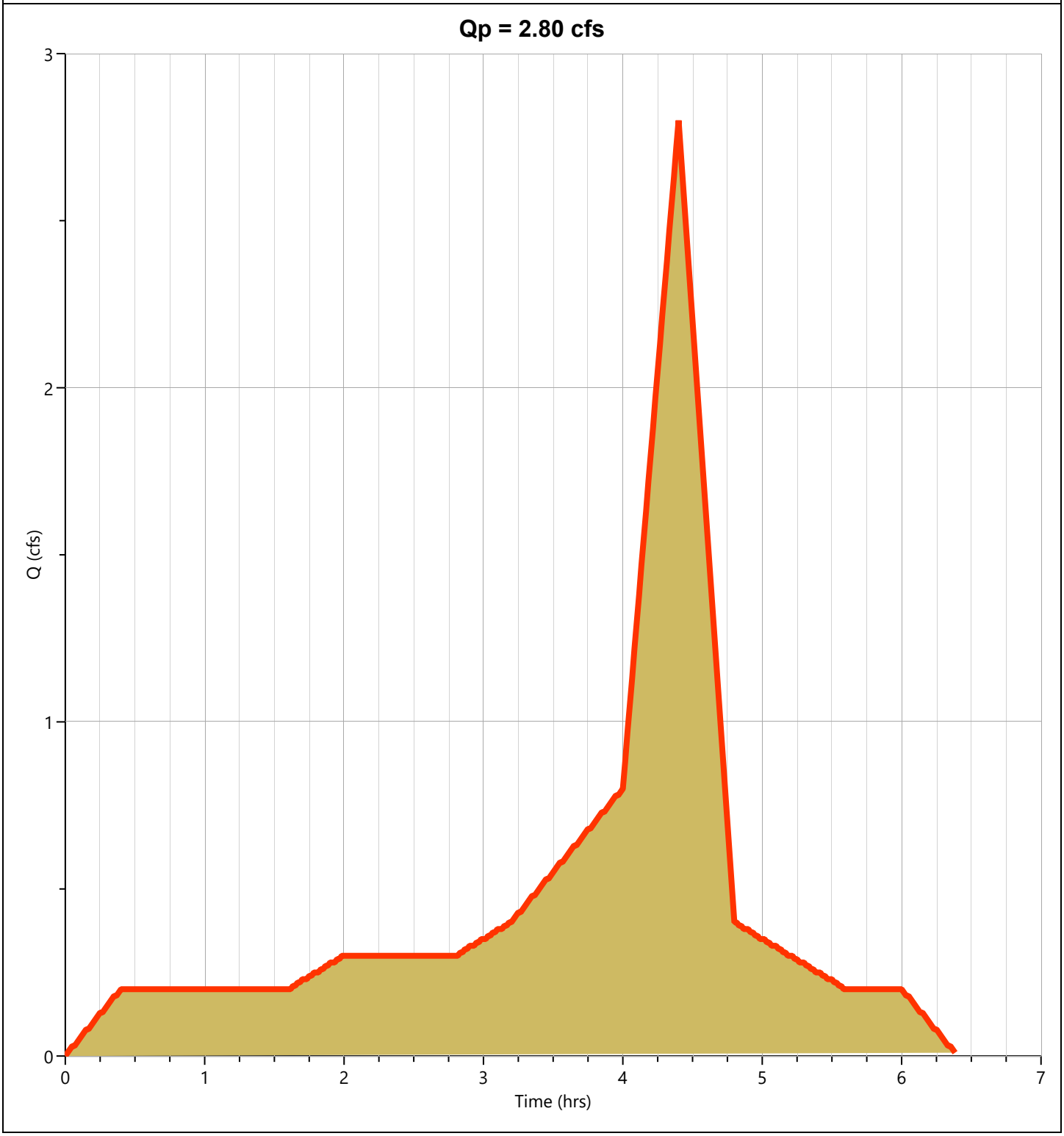
Hydrology Studio v 3.0.0.13

12-17-2019

Post 2.01

Hyd. No. 11

Hydrograph Type	= Manual	Peak Flow	= 2.800 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 10,663 cuft



Hydrograph Report

Project Name:

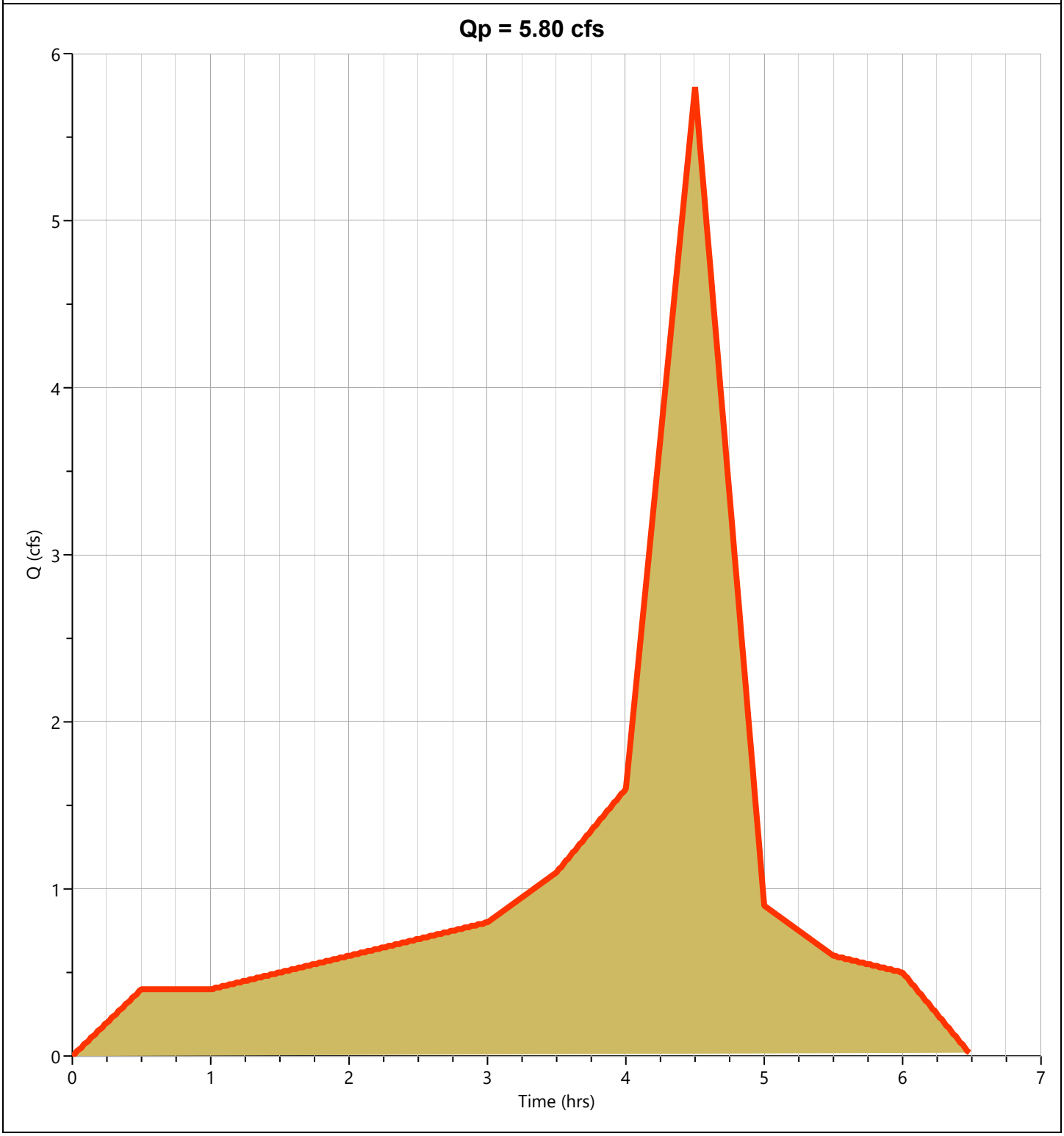
Hydrology Studio v 3.0.0.13

12-17-2019

Post 2.02

Hyd. No. 12

Hydrograph Type	= Manual	Peak Flow	= 5.800 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.50 hrs
Time Interval	= 1 min	Hydrograph Volume	= 25,020 cuft



Hydrograph Report

Project Name:

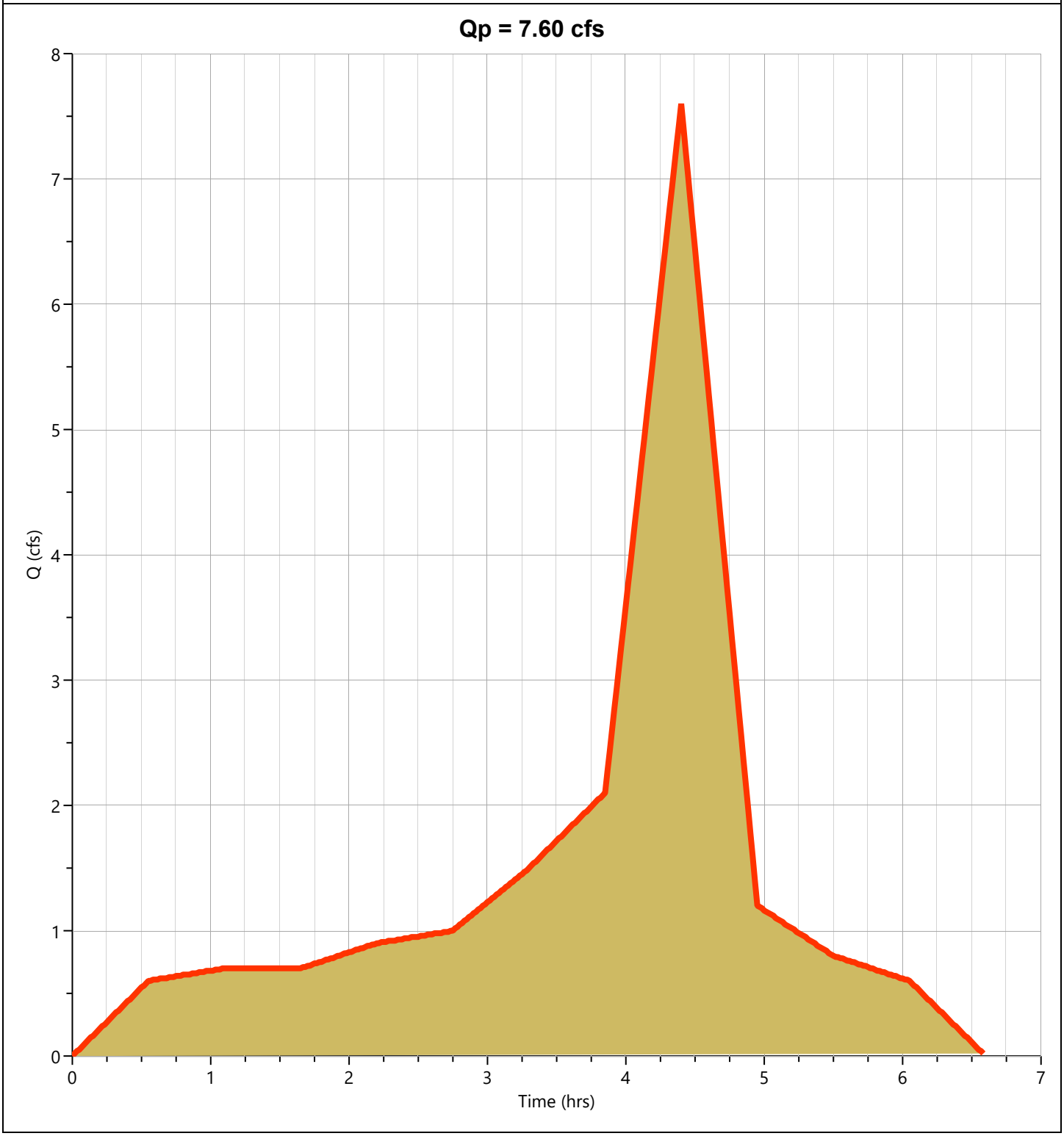
Hydrology Studio v 3.0.0.13

12-17-2019

Post 2.04

Hyd. No. 13

Hydrograph Type	= Manual	Peak Flow	= 7.600 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 35,046 cuft



Hydrograph Report

Project Name:

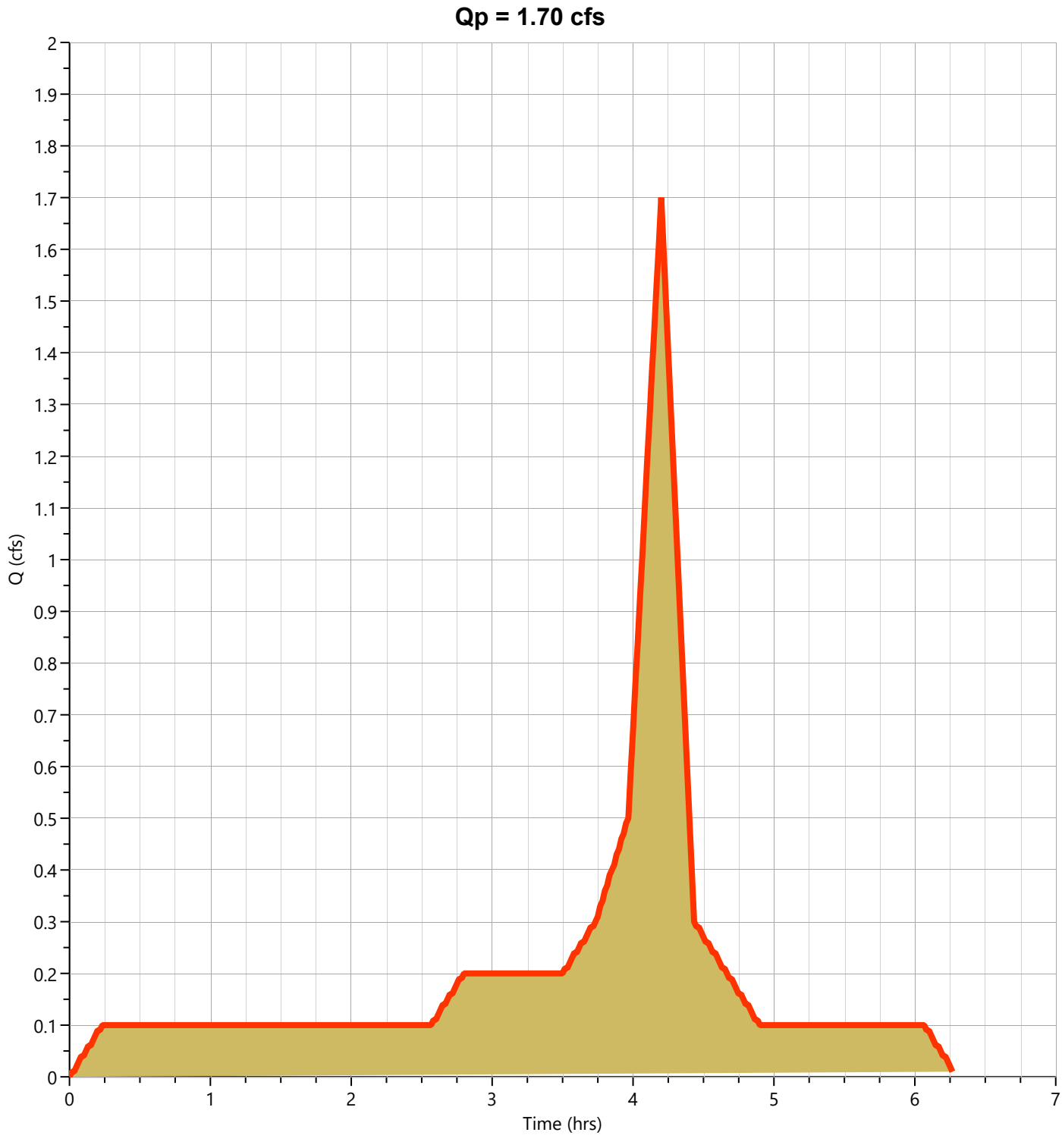
Hydrology Studio v 3.0.0.13

12-17-2019

Post 10.21

Hyd. No. 14

Hydrograph Type	= Manual	Peak Flow	= 1.700 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.20 hrs
Time Interval	= 1 min	Hydrograph Volume	= 4,620 cuft



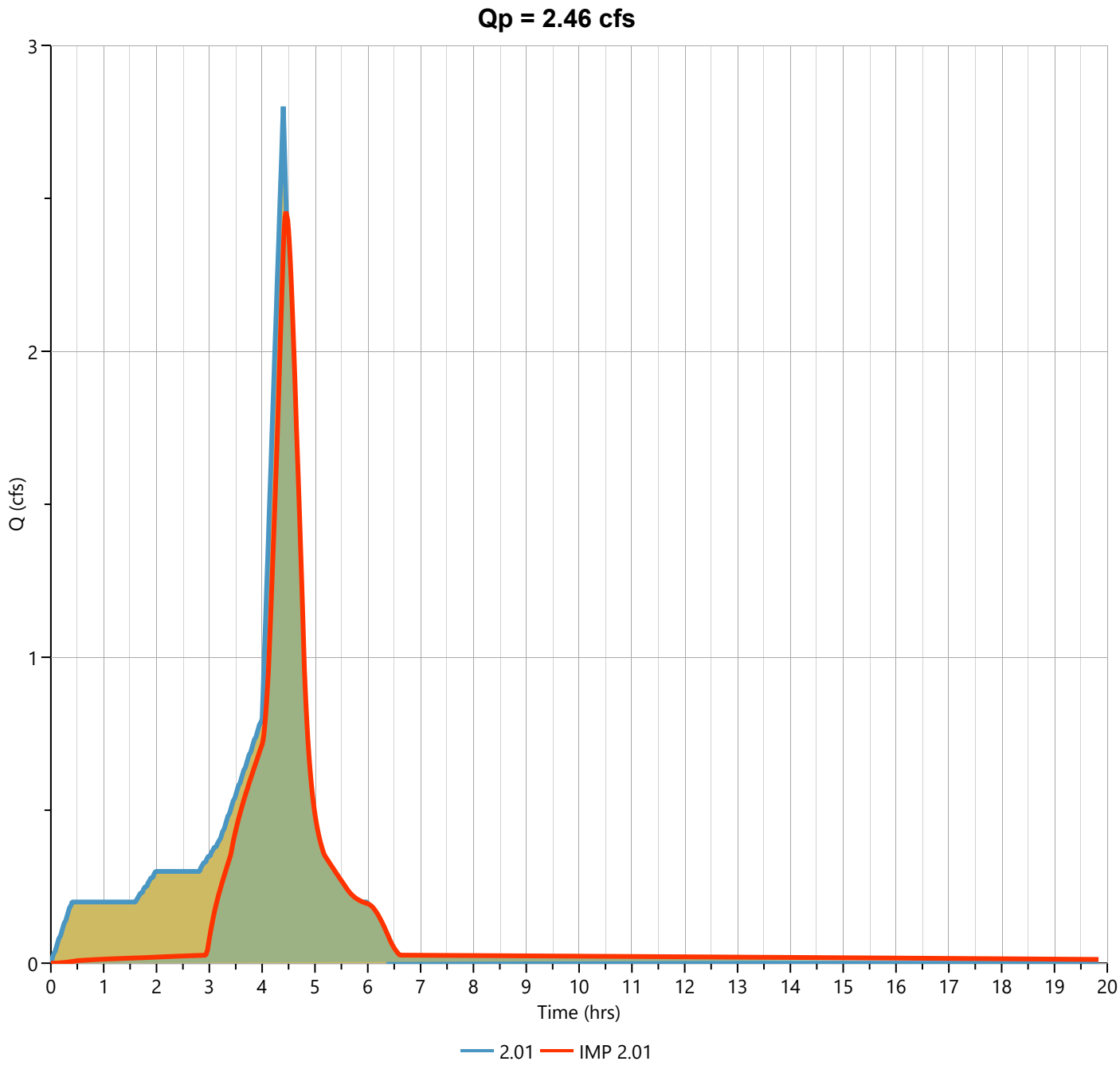
Post IMP 2.01

Hyd. No. 15

Hydrograph Type	= Pond Route	Peak Flow	= 2.456 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.45 hrs
Time Interval	= 1 min	Hydrograph Volume	= 9,303 cuft
Inflow Hydrograph	= 11 - 2.01	Max. Elevation	= 1021.38 ft
Pond Name	= IMP 2.01	Max. Storage	= 3,197 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 45 min



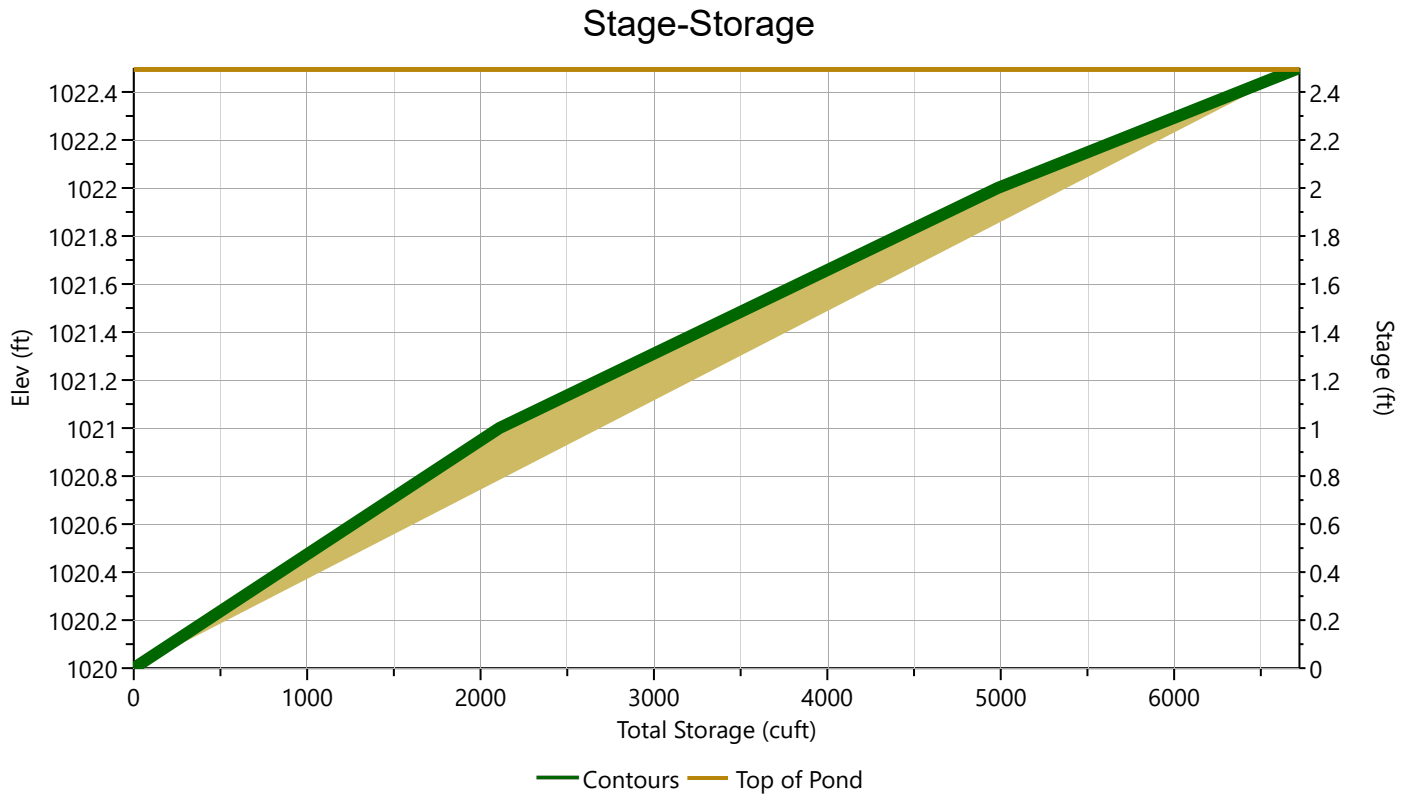
IMP 2.01

Stage-Storage

User Defined Contours	
Description	**Input**
Bottom Elevation, ft	1020.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	1020.00	1,740	0.000	0.000
1.00	1021.00	2,477	2,109	2,109
2.00	1022.00	3,271	2,874	4,983
2.50	1022.50	3,690	1,740	6,723



Pond Report

Project Name:

Hydrology Studio v 3.0.0.13

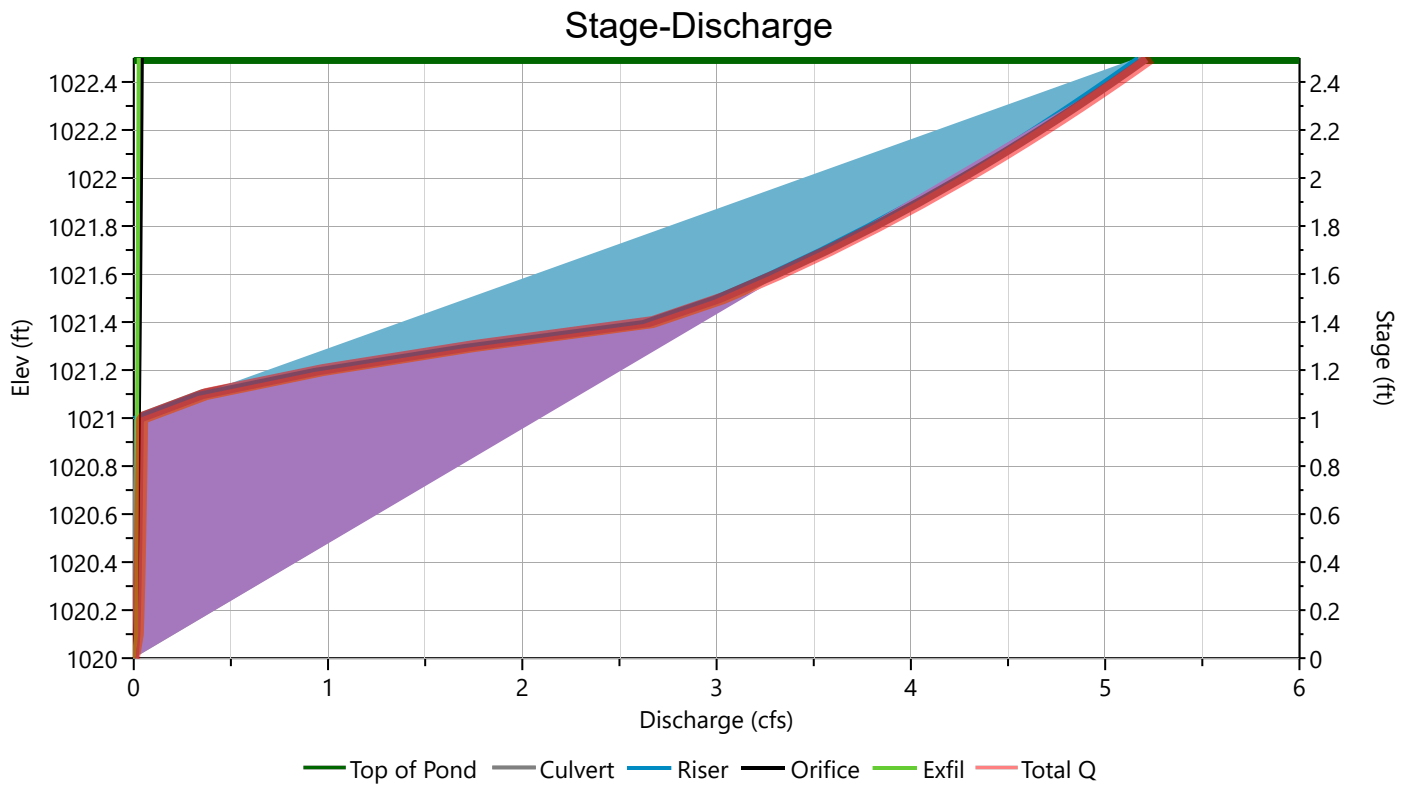
12-17-2019

IMP 2.01

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Orifice Plate	
		1*	2	3		
Rise, in	12	1			Orifice Dia, in	
Span, in	12	1			No. Orifices	
No. Barrels	1	1			Invert Elevation, ft	
Invert Elevation, ft	1015.50	1015.75			Height, ft	
Orifice Coefficient, Co	0.60	0.60			Orifice Coefficient, Co	
Length, ft	68					
Barrel Slope, %	2					
N-Value, n	0.013					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type	Circular				Exfiltration, in/hr	0.30**
Crest Elevation, ft	1021					
Crest Length, ft	3.14					
Angle, deg						
Weir Coefficient, Cw	3.3					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



IMP 2.01

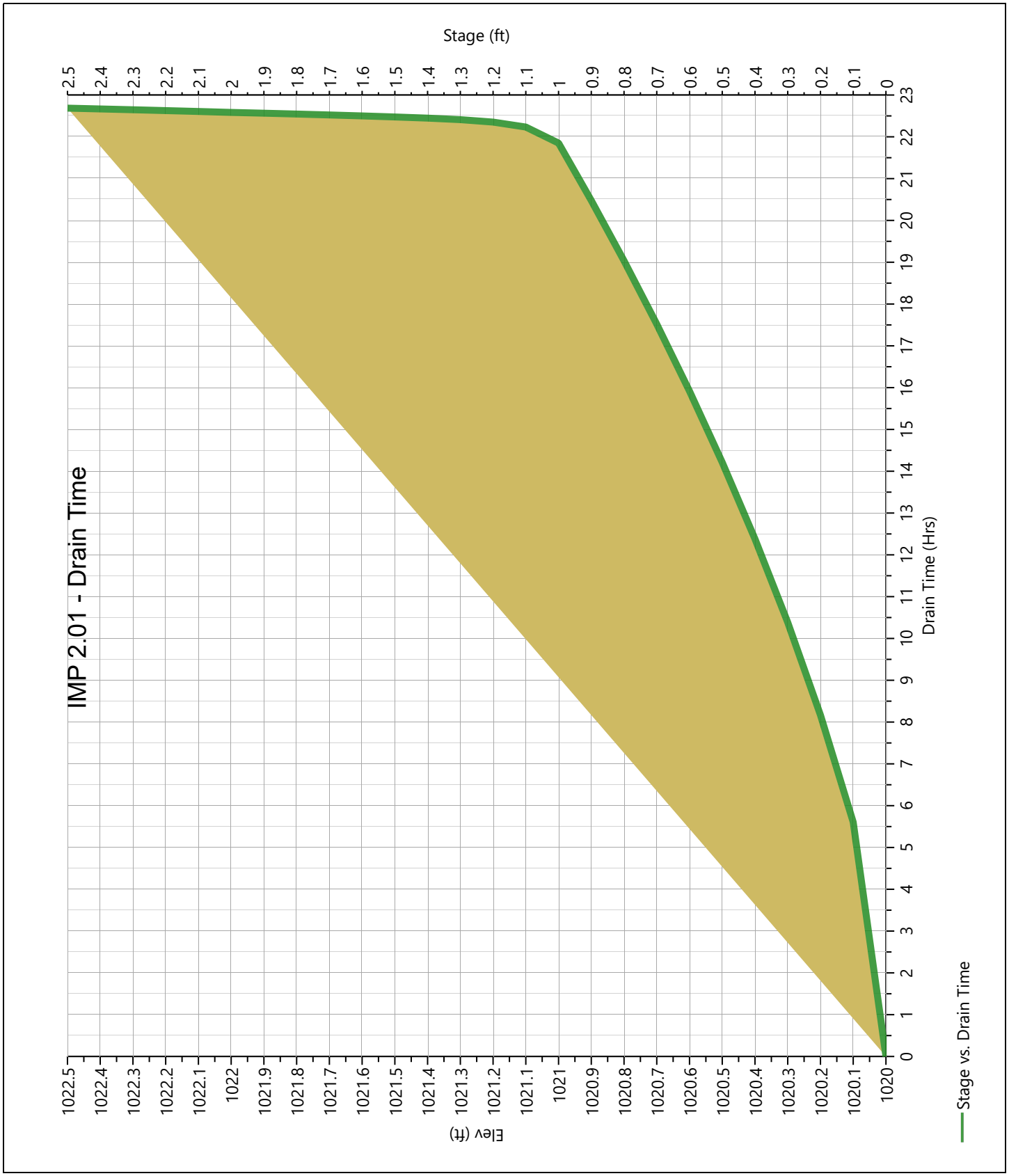
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1020.00	0.000	0.000	0.000			0.000					0.000		0.000
1.00	1021.00	2,109	0.026 oc	0.026			0.000					0.017		0.043
2.00	1022.00	4,983	4.256 oc	0.037			4.219 ic					0.023		4.278
2.50	1022.50	6,723	5.208 oc	0.042			5.167 ic					0.026		5.234

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IMP 2.01

Pond Drawdown



Hydrograph Report

Project Name:

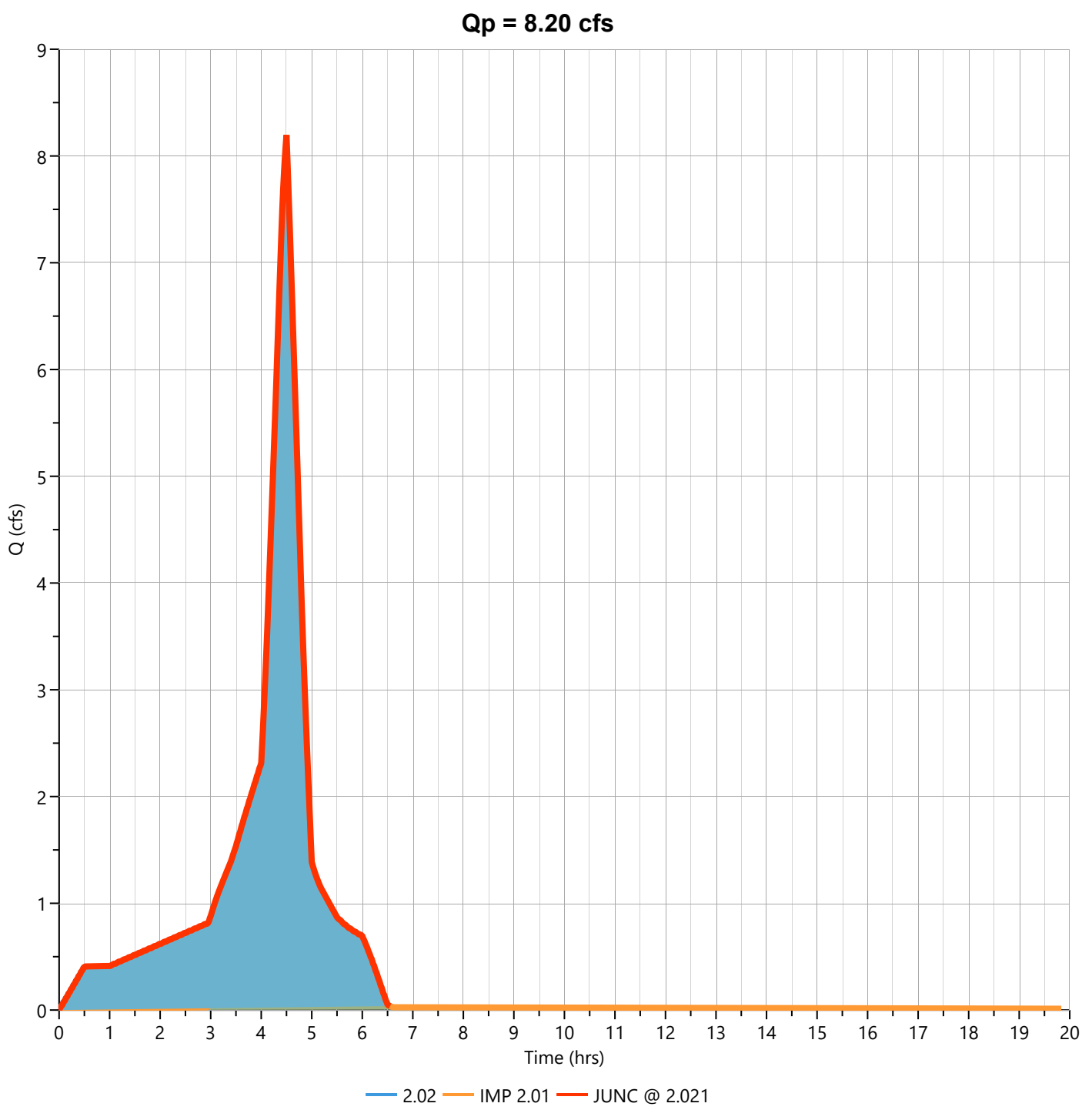
Hydrology Studio v 3.0.0.13

12-17-2019

Post JUNC @ 2.021

Hyd. No. 16

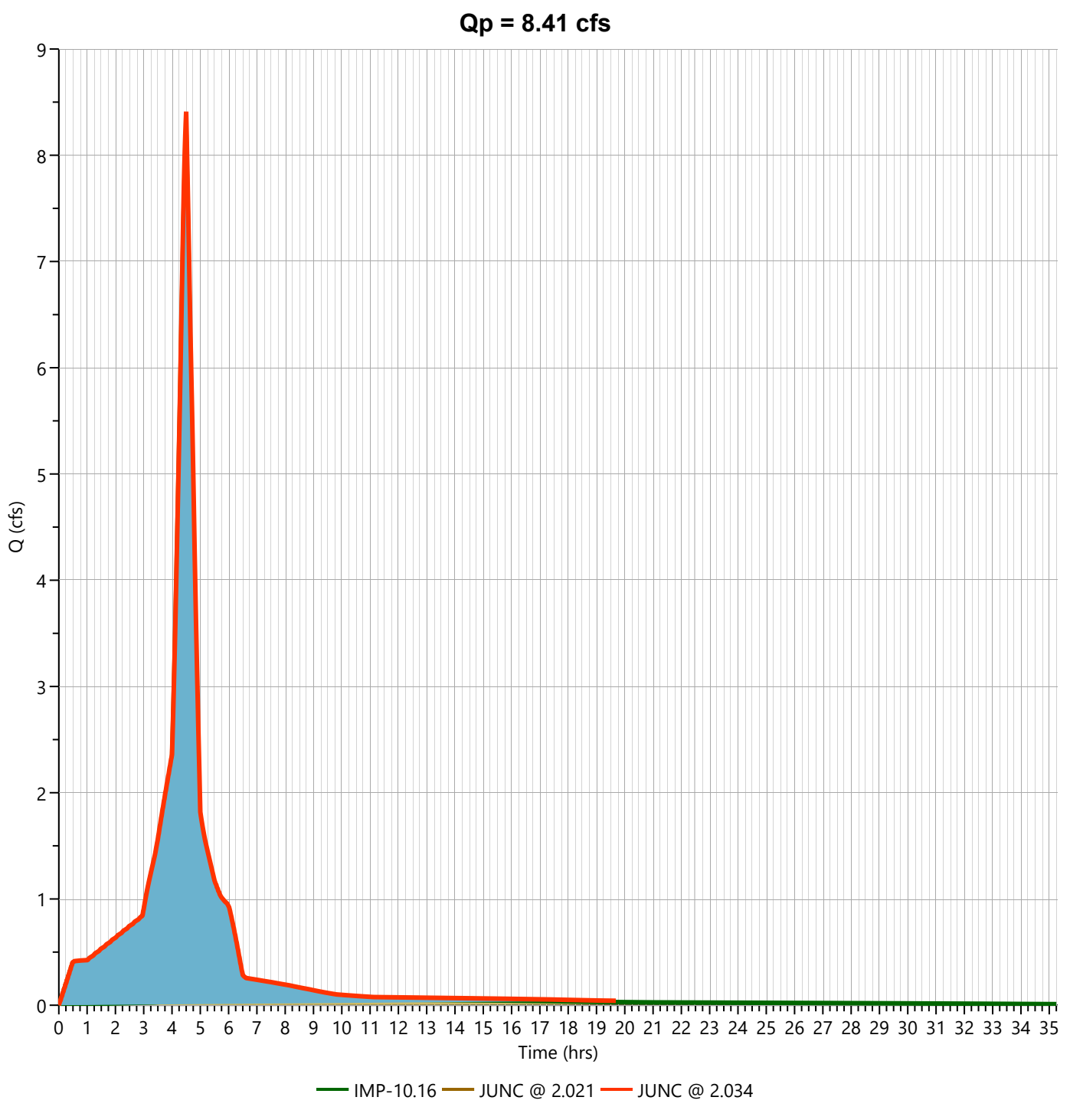
Hydrograph Type	= Junction	Peak Flow	= 8.196 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.50 hrs
Time Interval	= 1 min	Hydrograph Volume	= 34,323 cuft
Inflow Hydrographs	= 12, 15	Total Contrib. Area	= 0.0 ac



Post JUNC @ 2.034

Hyd. No. 18

Hydrograph Type	= Junction	Peak Flow	= 8.410 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.50 hrs
Time Interval	= 1 min	Hydrograph Volume	= 41,748 cuft
Inflow Hydrographs	= 3, 16	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

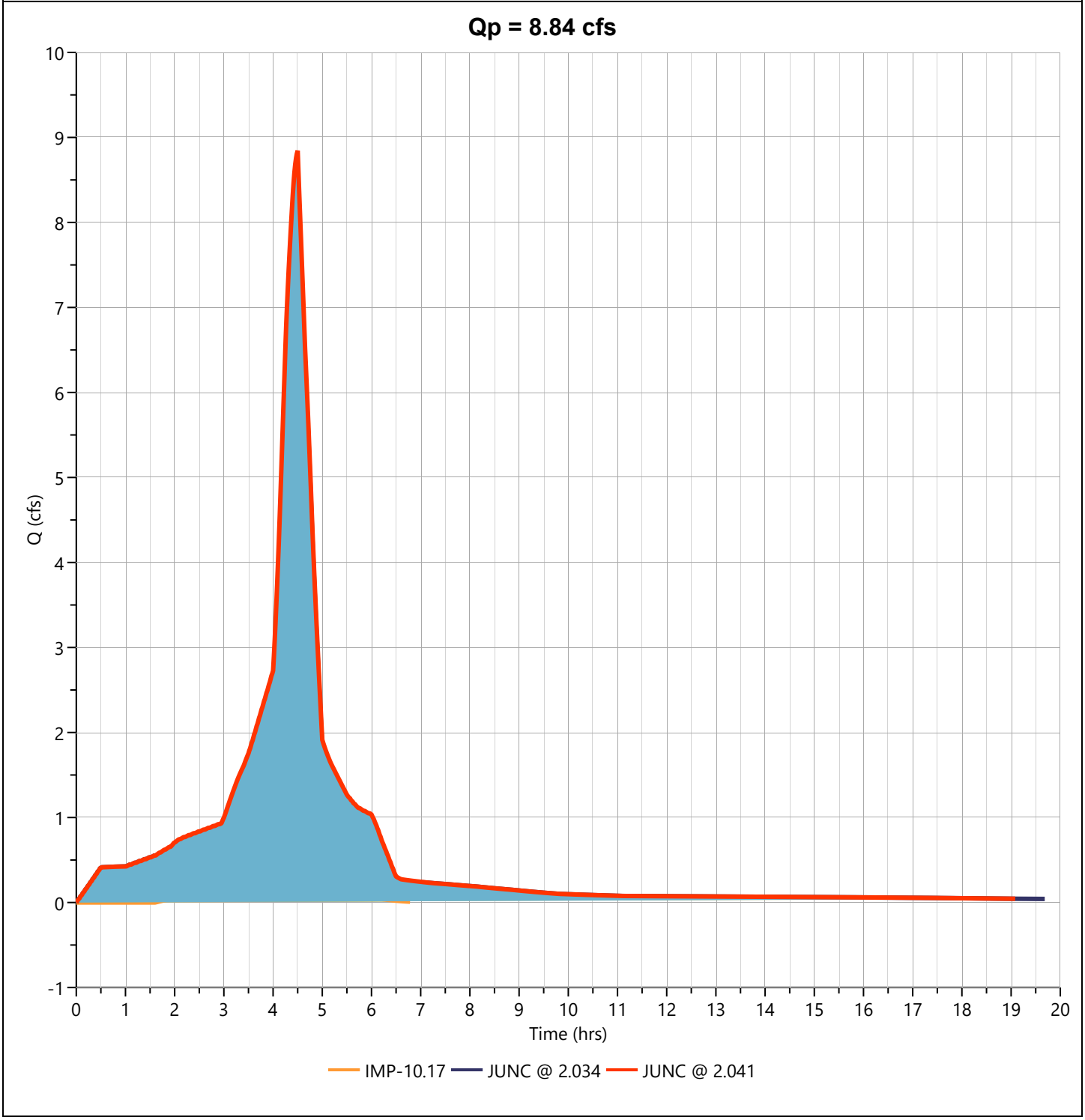
Hydrology Studio v 3.0.0.13

12-17-2019

Post JUNC @ 2.041

Hyd. No. 19

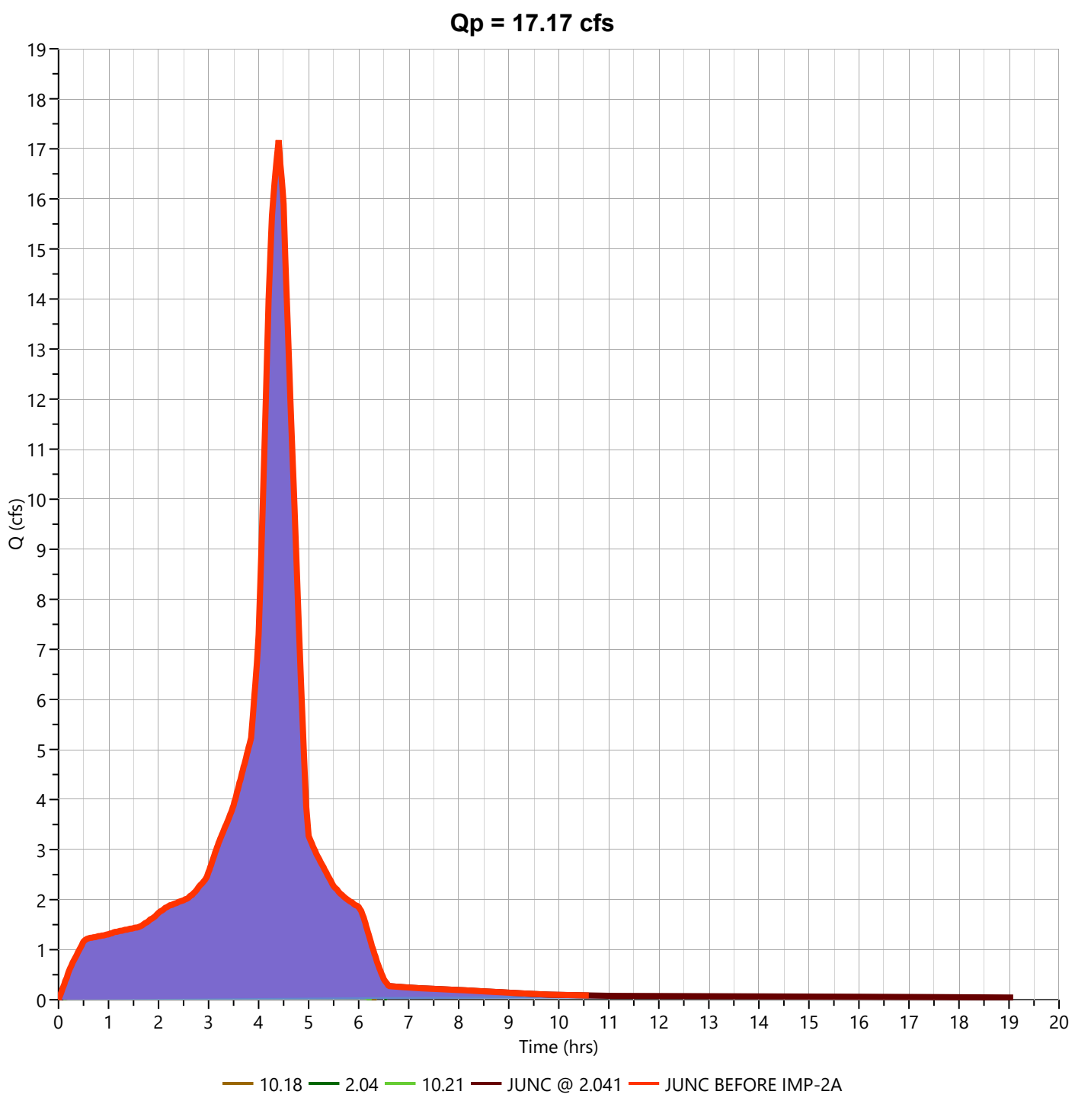
Hydrograph Type	= Junction	Peak Flow	= 8.844 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.50 hrs
Time Interval	= 1 min	Hydrograph Volume	= 45,109 cuft
Inflow Hydrographs	= 5, 18	Total Contrib. Area	= 0.0 ac



Post JUNC BEFORE IMP-2A

Hyd. No. 20

Hydrograph Type	= Junction	Peak Flow	= 17.17 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 88,812 cuft
Inflow Hydrographs	= 6, 13, 14, 19	Total Contrib. Area	= 0.0 ac



Hydrograph Report

Project Name:

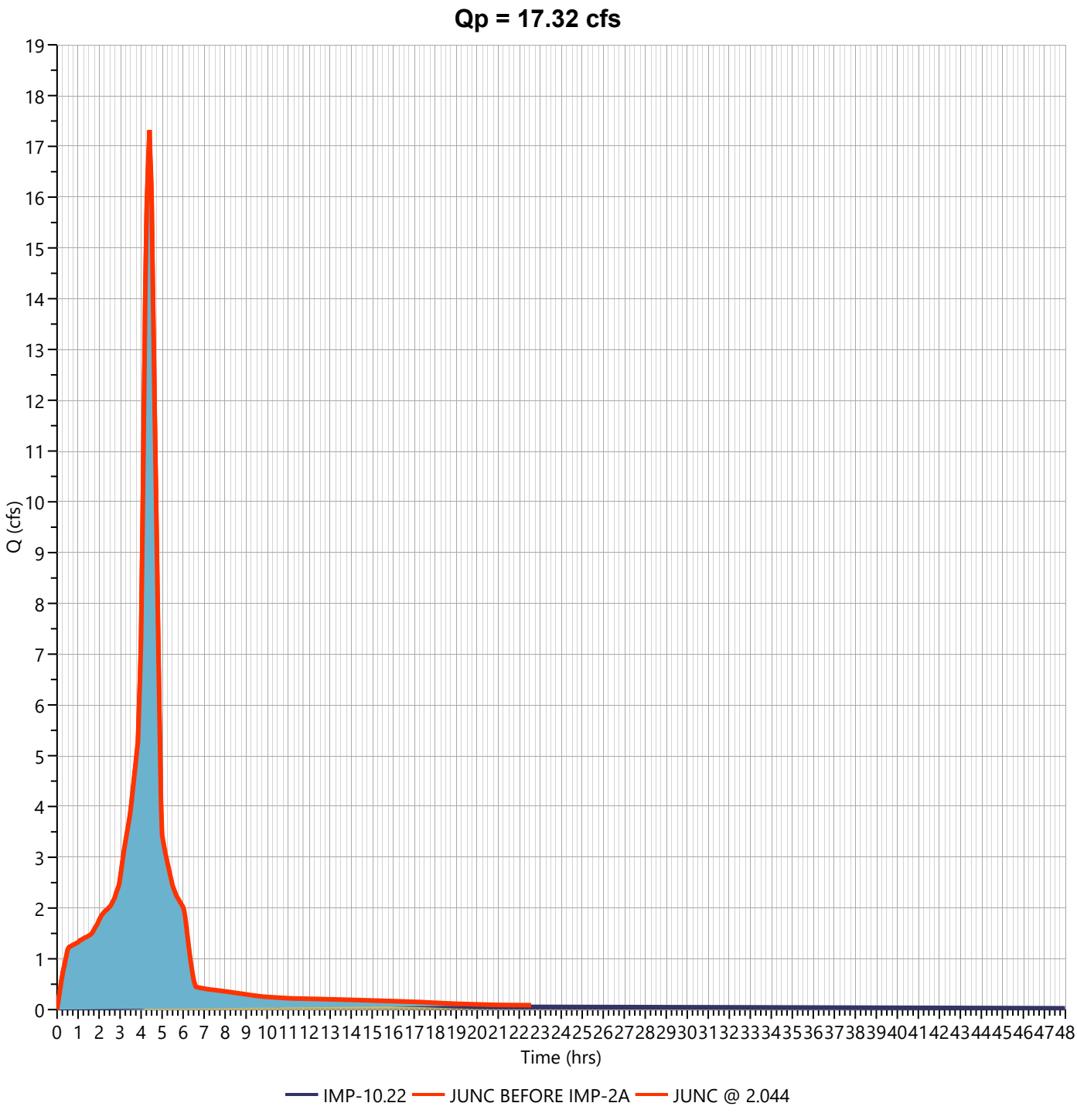
Hydrology Studio v 3.0.0.13

12-17-2019

Post JUNC @ 2.044

Hyd. No. 21

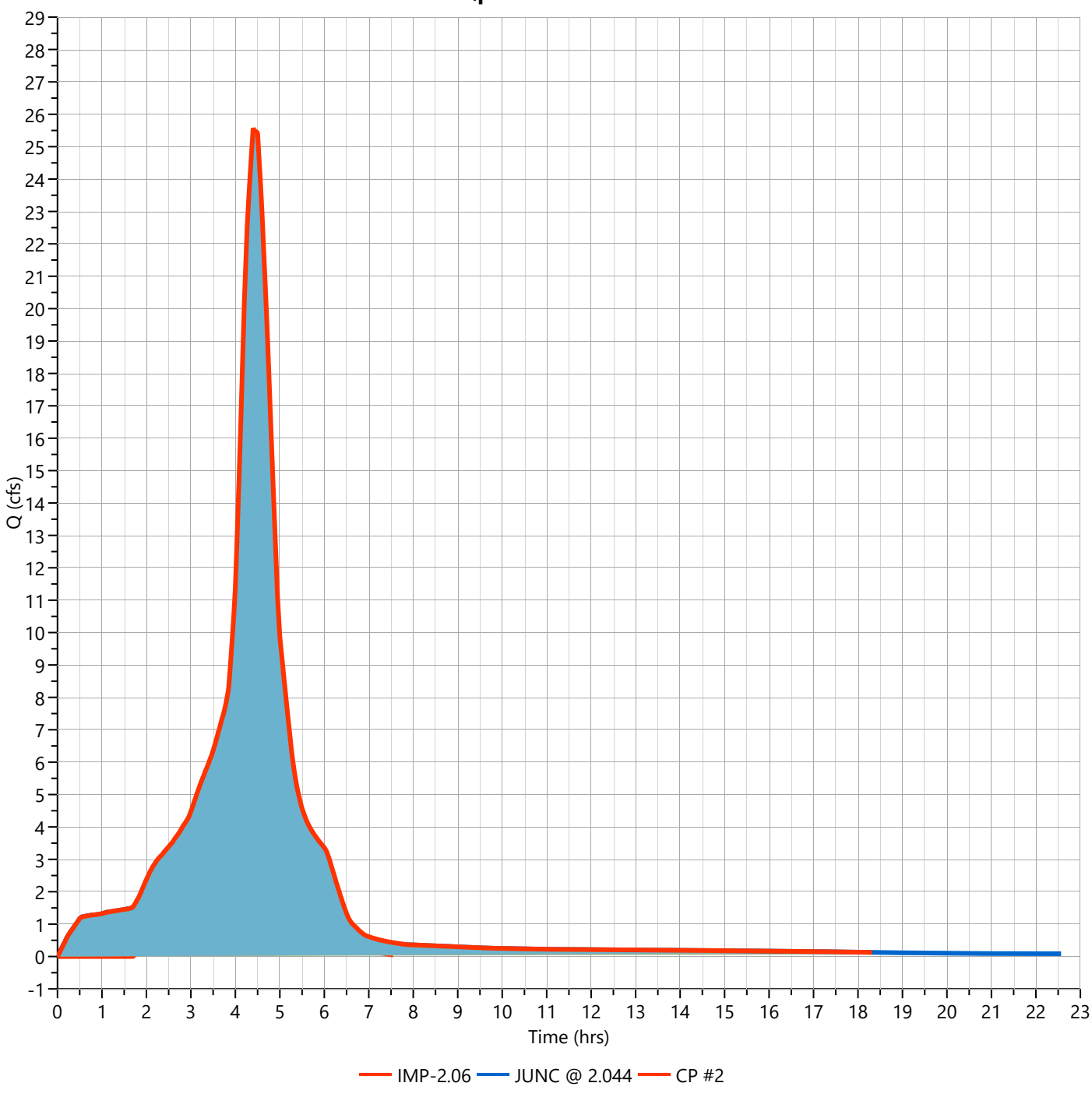
Hydrograph Type	= Junction	Peak Flow	= 17.32 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 100,885 cuft
Inflow Hydrographs	= 8, 20	Total Contrib. Area	= 0.0 ac



Post CP #2

Hyd. No. 22

Hydrograph Type	= Junction	Peak Flow	= 25.57 cfs
Storm Frequency	= 100-yr	Time to Peak	= 4.40 hrs
Time Interval	= 1 min	Hydrograph Volume	= 155,531 cuft
Inflow Hydrographs	= 10, 21	Total Contrib. Area	= 0.0 ac



Post-Development Hydrology Calculations Basins X

```
San Diego County Rational Hydrology Program

 CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

 Rational method hydrology  program based on
 San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 12/27/13
 ------------------------------------------------------------------------
 Shadow Run Ranch - PN 4201
 Post Development Hydrology Calculations
 Sample lot
 File: hydlot4201.dwg
 ------------------------------------------------------------------------
  *********   Hydrology Study Control Information **********

 ------------------------------------------------------------------------


 Program License Serial Number 4065

 ------------------------------------------------------------------------
 Rational hydrology study storm event year is   100.0
 English (in-lb) input data Units used

 Map data precipitation entered:
 6 hour,  precipitation(inches) =  3.700
 24 hour precipitation(inches) =  7.500
 P6/P24 =    49.3%
 San Diego hydrology manual 'C' values used


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        1.000 to Point/Station        2.000
 **** INITIAL AREA EVALUATION ****
 ________________________________________________________________________
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 [LOW DENSITY RESIDENTIAL                    ]
 (1.0 DU/A or Less       )
 Impervious value, Ai = 0.100
 Sub-Area C Value = 0.270
 Initial subarea total flow distance  =  166.000(Ft.)
 Highest elevation = 1000.000(Ft.)
 Lowest elevation =  999.000(Ft.)
 Elevation difference =    1.000(Ft.) Slope =  0.602 %
 Top of Initial Area Slope adjusted by User to  1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 70.00 (Ft)
```

```
for the top area slope value of   1.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =  12.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*(  70.000^.5)/(   1.000^(1/3)]=  12.50
Rainfall intensity (I) =      5.399(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.583(CFS)
Total initial stream area =        0.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.324(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   2.316(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              0.50
      2             47.00              0.00
      3             75.00              0.50
Manning's 'N' friction factor =   0.025
------------------------------------------------------------------
Sub-Channel flow  =      1.324(CFS)
  '     '    flow top width =     13.093(Ft.)
  '     '     velocity=    2.316(Ft/s)
  '     '    area =      0.571(Sq.Ft)
  '     '    Froude number =     1.954

Upstream point elevation =   999.000(Ft.)
Downstream point elevation =   956.500(Ft.)
Flow length =   430.000(Ft.)
Travel time  =    3.09 min.
Time of concentration =   15.59 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.316(Ft/s)
Total irregular channel flow =     1.324(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.316(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Rainfall intensity =      4.681(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.214  CA =      0.428
Subarea runoff =      1.420(CFS) for      1.600(Ac.)
Total runoff =      2.003(CFS)    Total area =       2.000(Ac.)
Depth of flow =   0.102(Ft.), Average velocity =   2.569(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   956.500(Ft.)
Downstream point/station elevation =   956.000(Ft.)
Pipe length  =    49.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     2.003(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.003(CFS)
Normal flow depth in pipe =    7.00(In.)
Flow top width inside pipe =   11.83(In.)
Critical Depth =    7.25(In.)
Pipe flow velocity =      4.22(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    15.79 min.
End of computations, total study area =           2.000 (Ac.)
```

Post-Development hydrology Calculations - Basin-3

San Diego County Hydrology Manual
Date: June 2003

Section: Appendix D
Page: 2 of 3

WORKSHEET 4-2 Shadow Run Ranch (name of project) **Curve Number Worksheet**

RUNOFF CURVE NUMBER (for PZN Condition = 2.0) CN_2:

column 1	column 2	column 3	column 4	column 5	column 6
GROUND COVER/ LAND USE	HYDROLOGIC CONDITION (field inspection)	SOIL GROUP	CN_2 From Hydrology Manual, Table 4-2	FRACTION OF AREA A_i/A	PARTIAL CN_2 $CN_2 \times A_i/A$
O.B. OPEN BRUSH	Good	A C	41 71	.012 .129	0.49 9.18
N.C. Narrow Chaparral	Fair	A C	55 81	.028 .151	1.54 12.23
B.C. Broadleaf Chaparral	Good	B C	57 71	.206 .185	11.74 13.14
W.O Woodland	Good	A B C	29 66 77	.007 .123 .054	0.20 7.59 3.78
O.E. [illegible]	Good	A C	33 72	.0225 .0025	0.74 0.18
Roads 1/2 Acre Pads	Good	A C	54 80	.0045 .0055	0.24 0.04
			Sums =	1.000	66

For entire basin CN_2 = 66

WORKSHEET 4-3 Shadow Run Ranch (name of project) **Peak Discharge Computation**

*****For use with NRCS Hydrologic Method Computations*****

Items in boxes are required input parameters for the SDUH Peak Discharge Program

Computed by: Mesa & Associates, Inc. Date: 3/15/12

Project Identification (Drainage Area Name): Frye Creek

Geographic location of center of drainage area: Long: ____" Lat: ____"

Drainage Area: 4.0 – square miles

Storm Frequency (Section 2.3): 100 – year

6-Hour Storm Duration Precipitation (Appendix B): 3.7 – inches

24-Hour Storm Duration Precipitation (Appendix B): 7.5 – inches

Precipitation Zone Number (PZN): (Section 4.1.2.4 and Appendix C)	PZN = 1.0	____	2.0	2.0	3.0	____	4.0
PZN Ajustment Factor for 5-year to 35-year storm frequency (interpolate): (Section 4.1.2.4 and Table 4-6)	1.5	____	2.5	____	2.0	____	1.5
PZN Ajustment Factor for 35-year to 150-year storm frequency (interpolate): (Section 4.1.2.4 and Table 4-6)	2.0	____	3.0	3.0	3.0	____	2.0

PZN Adjusted Runoff Curve Number (interpolate between nearest whole number PZN conditions): $CN_{10 \text{ or } 20}$ 66 CN_X 82 $CN_{20 \text{ or } 30}$ 82
(Sections 4.1.2.4 and 4.2.4, Tables 4-6 and 4-10)

Watershed Length (L) (Section 4.3.1): 6.0 – miles

Length to Centroid (L_c) (Section 4.3.1): 3.55 – miles

Slope (s) (Section 4.3.1): 198.3 – feet/mile Basin $\bar{n}$ Factor (Section 4.3.5): .055

Corps lag (T_L) = 24 $\bar{n}$ $((L \times L_c)/s^{0.5})^m$ (Section 4.3.1.1)
OR
Corps lag (T_L) = 0.8 T_c (Section 4.3.1.2) Lag Time: 1.2 – hours

Time to Peak = 0.862 x Corps lag (Section 4.1.5.5): Time to Peak: 1.0 – hours

Project: Shadow Run Ranch Simulation Run: Run 1

Start of Run:	26Feb2009, 00:00	Basin Model:	Basin 3
End of Run:	27Feb2009, 06:00	Meteorologic Model:	Met 1
Compute Time:	26Feb2009, 16:06:40	Control Specifications:	Control 1

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin-1	4.0	3003.1	26Feb2009, 17:15	5.58

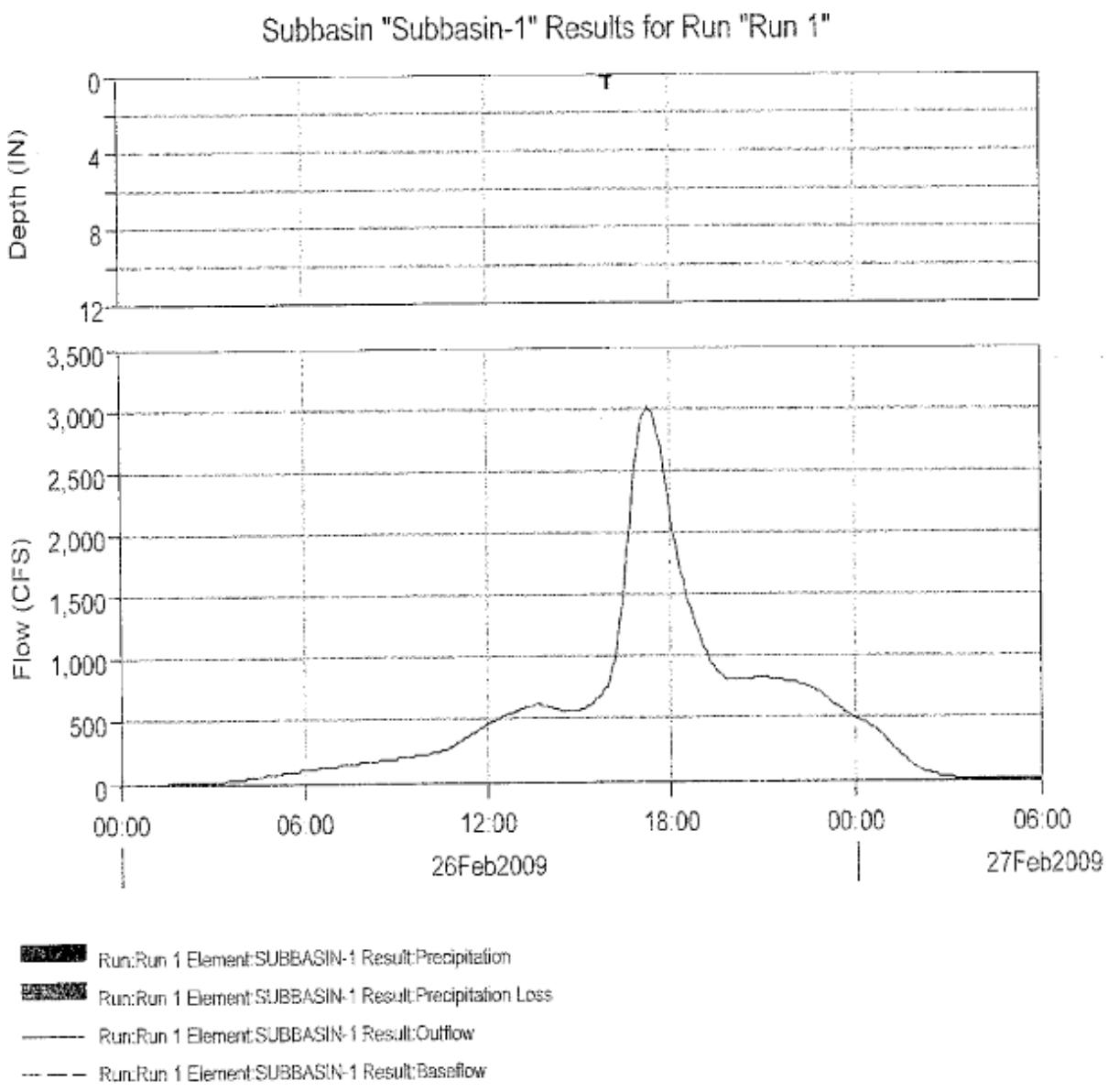
Project: Shadow Run Ranch
Simulation Run: Run 1 Subbasin: Subbasin-1

Start of Run:	26Feb2009, 00:00	Basin Model:	Basin 3
End of Run:	27Feb2009, 06:00	Meteorologic Model:	Met 1
Compute Time:	26Feb2009, 16:06:40	Control Specifications:	Control 1

Volume Units: IN

Computed Results

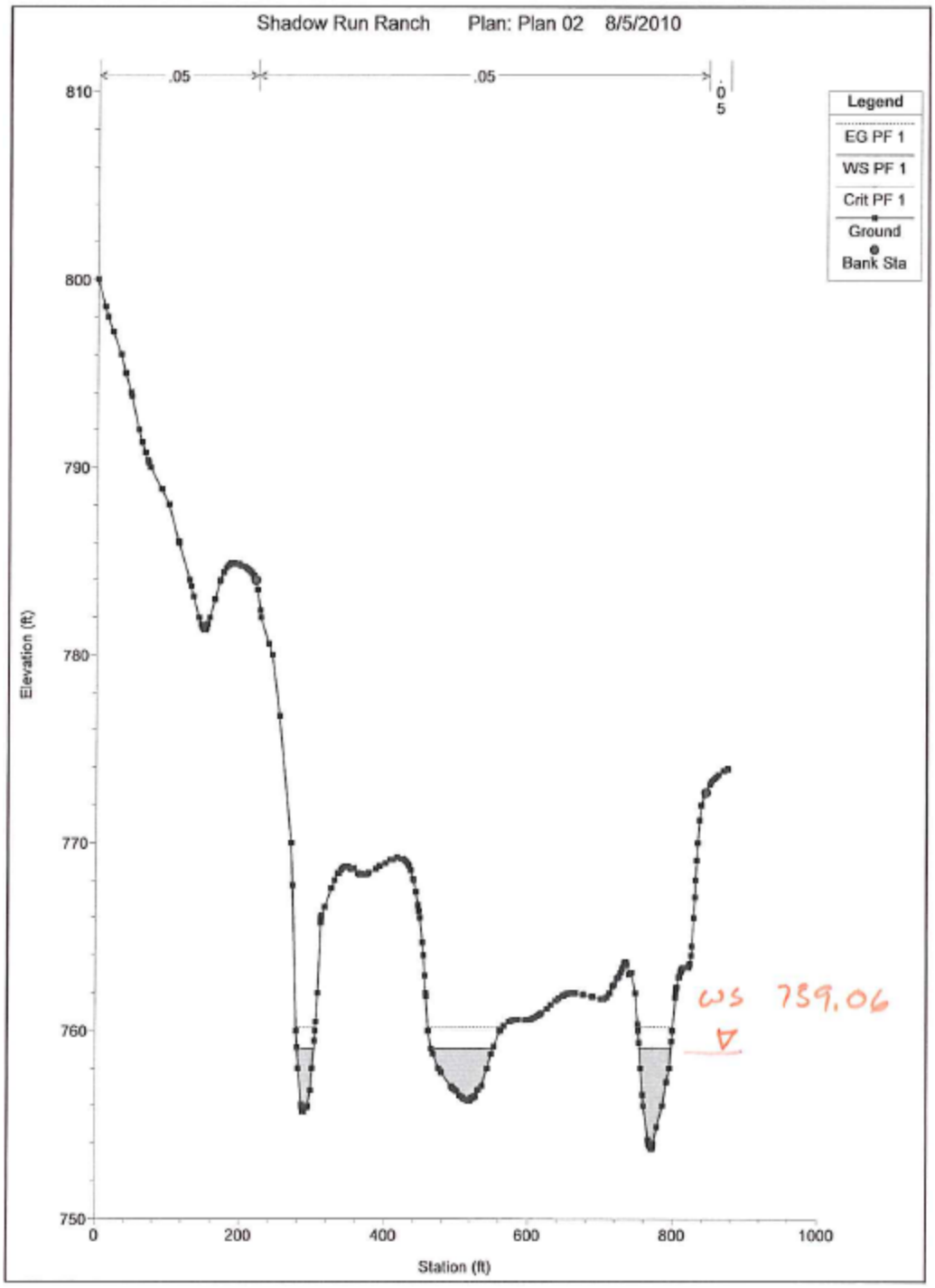
Peak Discharge :	3003.1 (CFS)	Date/Time of Peak Discharge :	26Feb2009, 17:15
Total Precipitation :	7.46 (IN)	Total Direct Runoff :	5.58 (IN)
Total Loss :	0.00 (IN)	Total Baseflow :	0.00 (IN)
Total Excess :	5.58 (IN)	Discharge :	5.58 (IN)


Subbasin "Subbasin-1" Results for Run "Run 1"
Depth (IN)
0
4
8
12
Flow (CFS)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
00:00
06:00
12:00
18:00
00:00
06:00
26Feb2009
27Feb2009
Run:Run 1 Element:SUBBASIN-1 Result:Precipitation
Run:Run 1 Element:SUBBASIN-1 Result:Precipitation Loss
Run:Run 1 Element:SUBBASIN-1 Result:Outflow
Run:Run 1 Element:SUBBASIN-1 Result:Baseflow

APPENDIX “D”

FREY CREEK HYDRAULICS
BASIN – 3

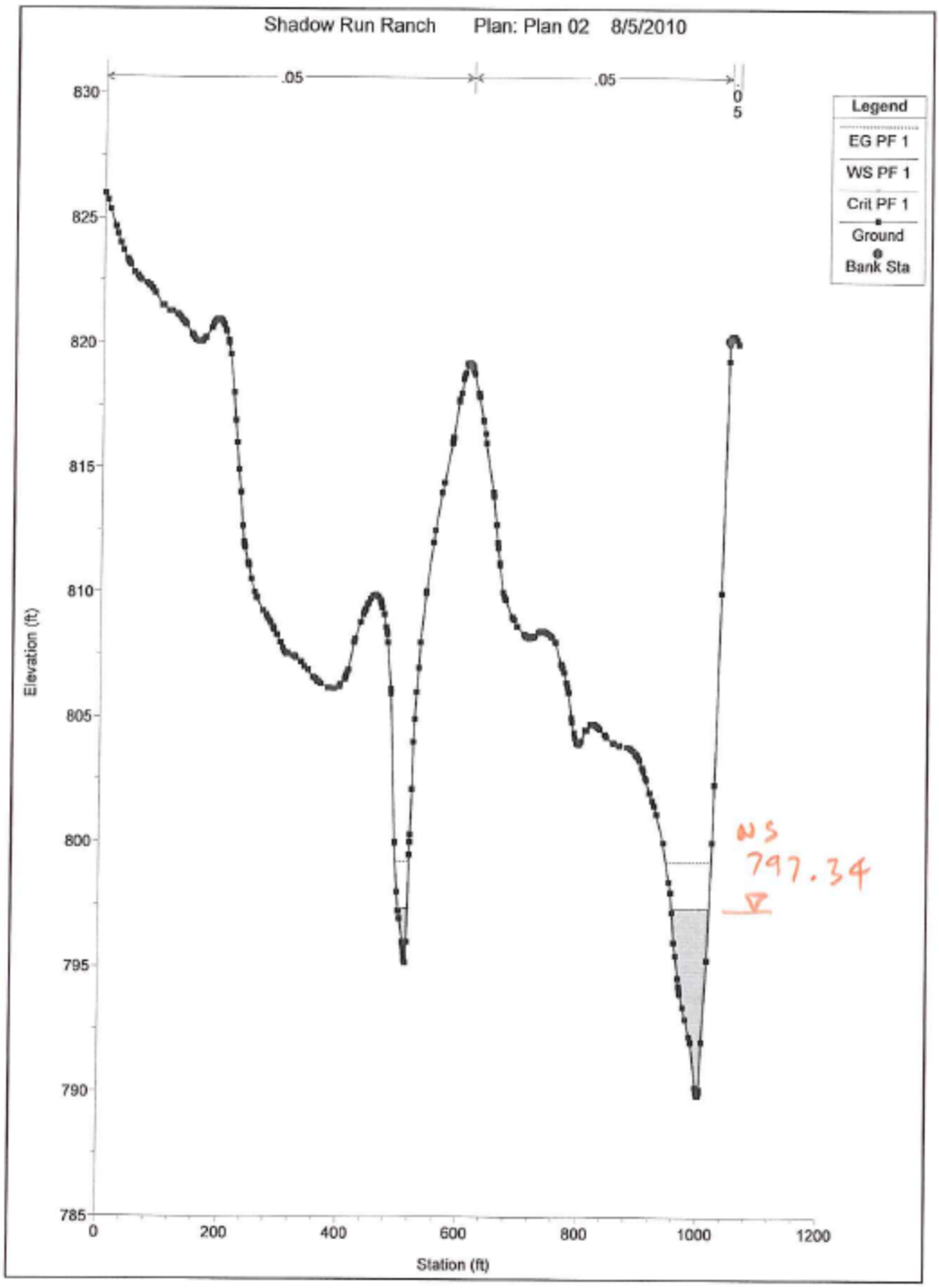
HEC-2 Sections


Shadow Run Ranch Plan: Plan 02 8/5/2010
.05
.05
0
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
810
800
790
780
770
760
750
0
200
400
600
800
1000
Station (ft)
WS 759.06

RS-1

Plan: Plan 02 RIVER-1 Reach-1 RS: 1 Profile: PF 1

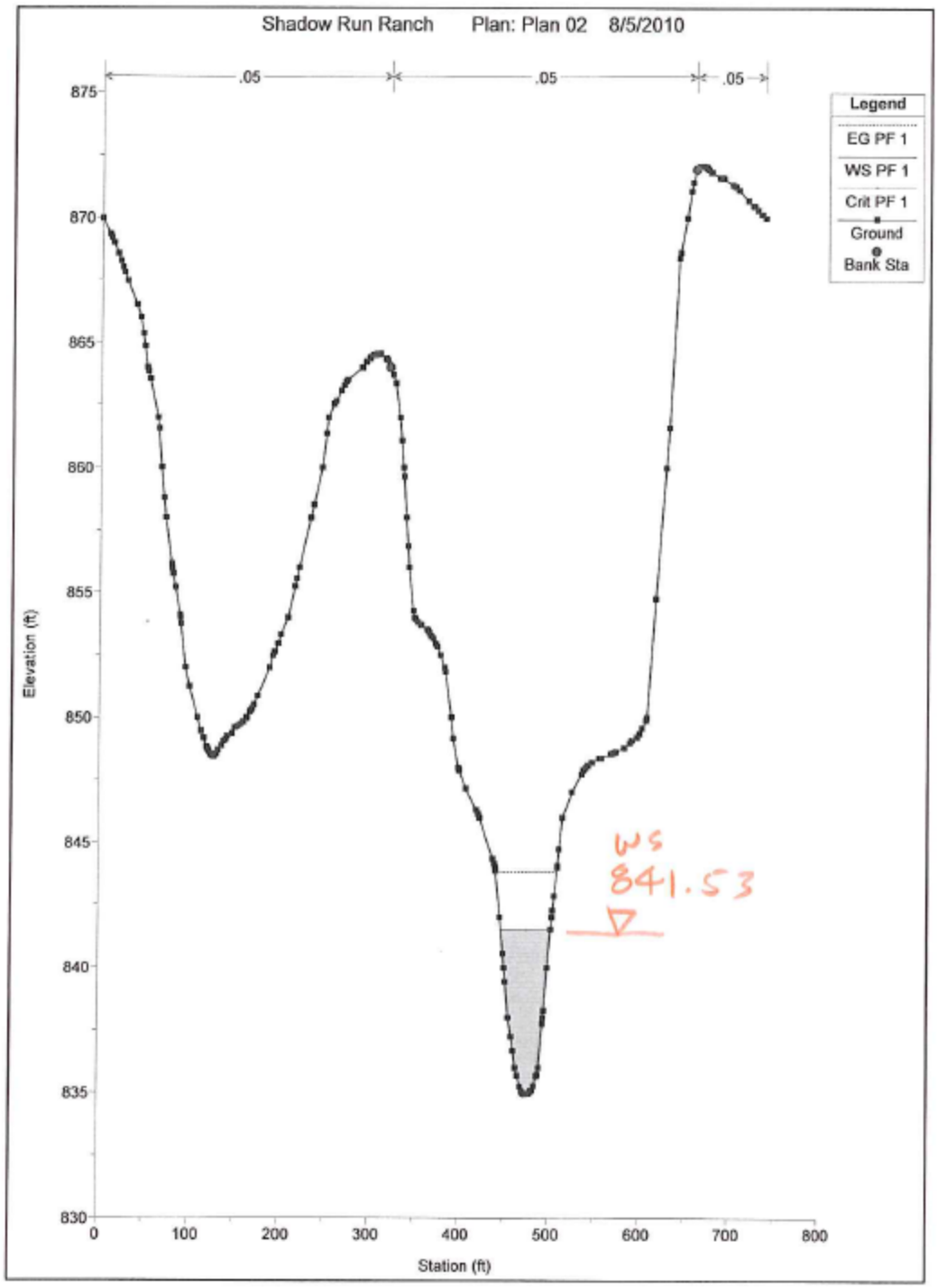
E.G. Elev (ft)	760.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.		0.050	
W.S. Elev (ft)	759.06	Reach Len. (ft)			
Crit W.S. (ft)	759.06	Flow Area (sq ft)		349.98	
E.G. Slope (ft/ft)	0.028600	Area (sq ft)		349.98	
Q Total (cfs)	3003.00	Flow (cfs)		3003.00	
Top Width (ft)	153.57	Top Width (ft)		153.57	
Vel Total (ft/s)	8.58	Avg. Vel. (ft/s)		8.58	
Max Chl Dpth (ft)	5.34	Hydr. Depth (ft)		2.28	
Conv. Total (cfs)	17757.2	Conv. (cfs)		17757.2	
Length Wtd. (ft)		Wetted Per. (ft)		156.88	
Min Ch El (ft)	753.72	Shear (lb/sq ft)		3.98	
Alpha	1.00	Stream Power (lb/ft s)	876.14	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			


Shadow Run Ranch Plan: Plan 02 8/5/2010
.05
.05
0
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
830
825
820
815
810
805
800
795
790
785
0
200
400
600
800
1000
1200
Station (ft)
WS
797.34

RS-2

Plan: Plan 02 RIVER-1 Reach-1 RS: 2 Profile: PF 1

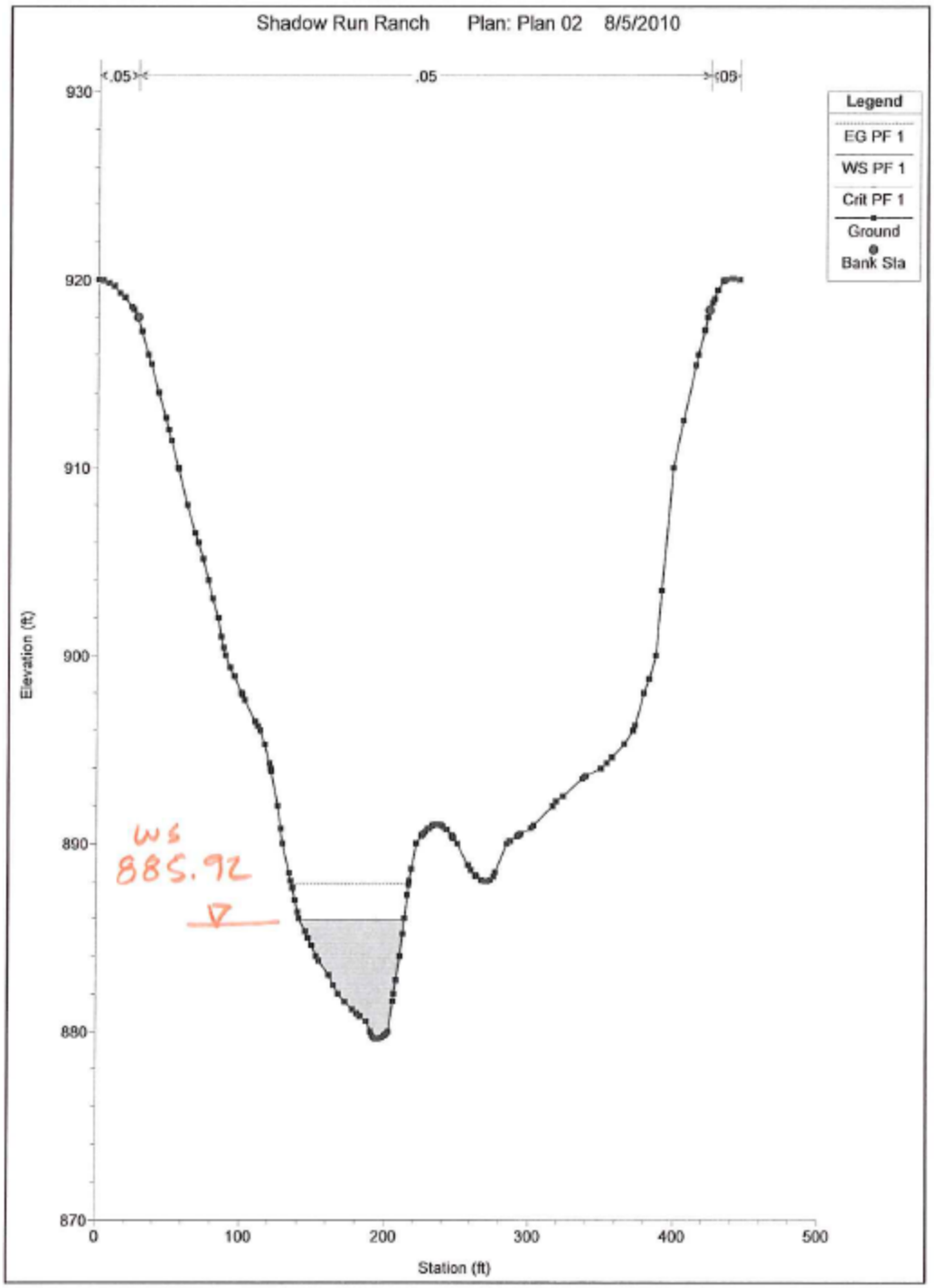
E.G. Elev (ft)	799.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.87	Wt. n-Val.	0.050	0.050	
W.S. Elev (ft)	797.34	Reach Len. (ft)	528.59	523.01	533.60
Crit W.S. (ft)	797.34	Flow Area (sq ft)	17.95	263.42	
E.G. Slope (ft/ft)	0.021556	Area (sq ft)	17.95	263.42	
Q Total (cfs)	3003.00	Flow (cfs)	82.54	2920.46	
Top Width (ft)	78.04	Top Width (ft)	15.56	62.48	
Vel Total (ft/s)	10.67	Avg. Vel. (ft/s)	4.60	11.09	
Max Chl Dpth (ft)	7.49	Hydr. Depth (ft)	1.15	4.22	
Conv. Total (cfs)	20453.9	Conv. (cfs)	562.2	19891.7	
Length Wtd. (ft)	523.09	Wetted Per. (ft)	16.59	65.03	
Min Ch El (ft)	789.85	Shear (lb/sq ft)	1.46	5.45	
Alpha	1.05	Stream Power (lb/ft s)	1060.68	0.00	0.00
Frctn Loss (ft)	12.92	Cum Volume (acre-ft)	0.11	3.68	
C & E Loss (ft)	0.22	Cum SA (acres)	0.09	1.30	


Shadow Run Ranch Plan: Plan 02 8/5/2010
.05
.05
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
875
870
865
860
855
850
845
840
835
830
0
100
200
300
400
500
600
700
800
Station (ft)
WS
841.53

RS-3

Plan: Plan 02 RIVER-1 Reach-1 RS: 3 Profile: PF 1

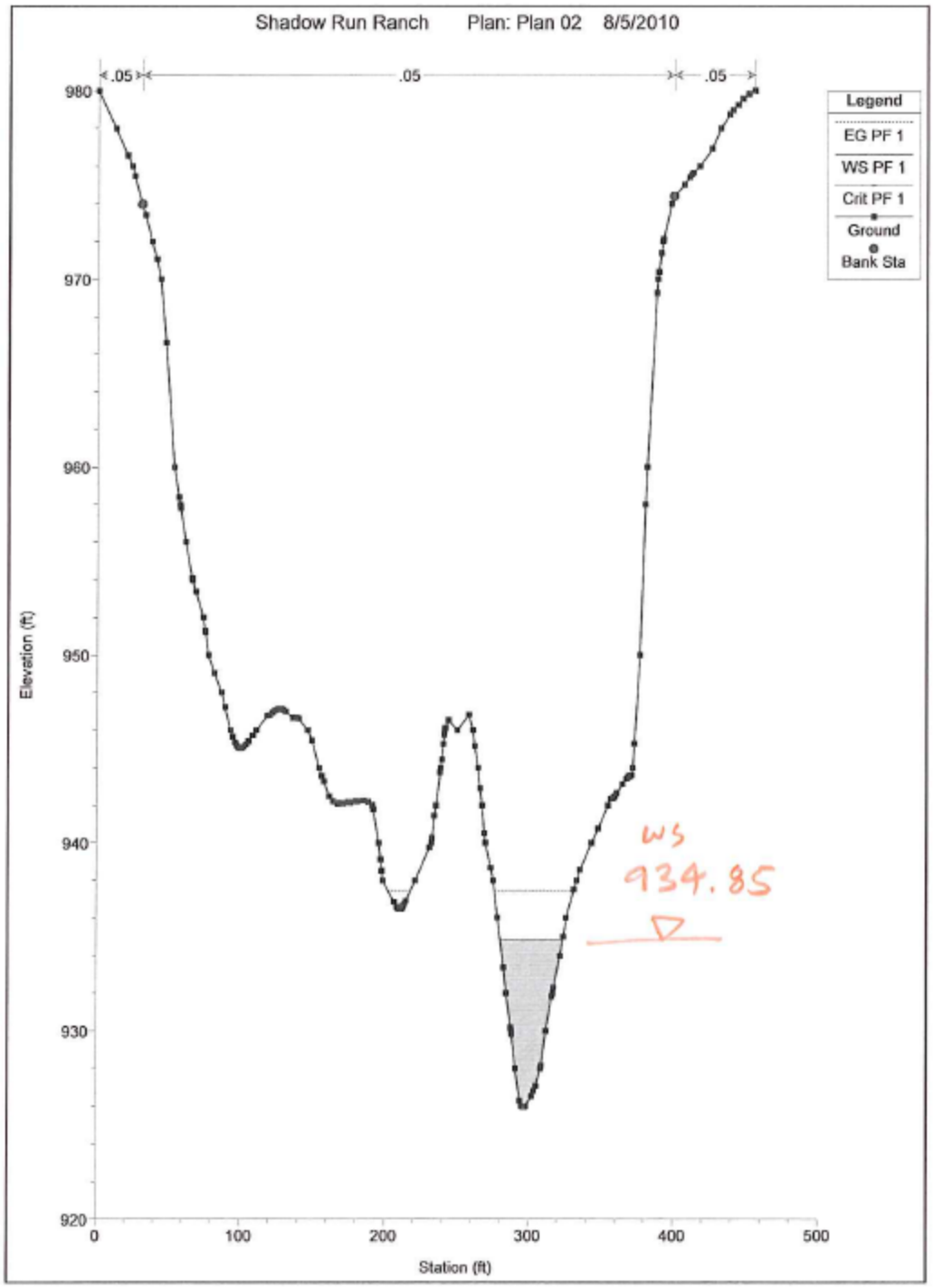
E.G. Elev (ft)	843.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.28	Wt. n-Val.		0.050	
W.S. Elev (ft)	841.53	Reach Len. (ft)	484.40	523.33	604.63
Crit W.S. (ft)	841.53	Flow Area (sq ft)		247.90	
E.G. Slope (ft/ft)	0.023602	Area (sq ft)		247.90	
Q Total (cfs)	3003.00	Flow (cfs)		3003.00	
Top Width (ft)	55.11	Top Width (ft)		55.11	
Vel Total (ft/s)	12.11	Avg. Vel. (ft/s)		12.11	
Max Chl Dpth (ft)	6.59	Hydr. Depth (ft)		4.50	
Conv. Total (cfs)	19547.1	Conv. (cfs)		19547.1	
Length Wtd. (ft)	522.80	Wetted Per. (ft)		57.36	
Min Ch El (ft)	834.94	Shear (lb/sq ft)		6.37	
Alpha	1.00	Stream Power (lb/ft s)	737.87	0.00	0.00
Frctn Loss (ft)	11.79	Cum Volume (acre-ft)	0.21	6.75	
C & E Loss (ft)	0.12	Cum SA (acres)	0.18	2.00	


Shadow Run Ranch Plan: Plan 02 8/5/2010
.05
.05
.09
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
930
920
910
900
890
880
870
0
100
200
300
400
500
Station (ft)
WS
885.92

RS - 4

Plan: Plan 02 RIVER-1 Reach-1 RS: 4 Profile: PF 1

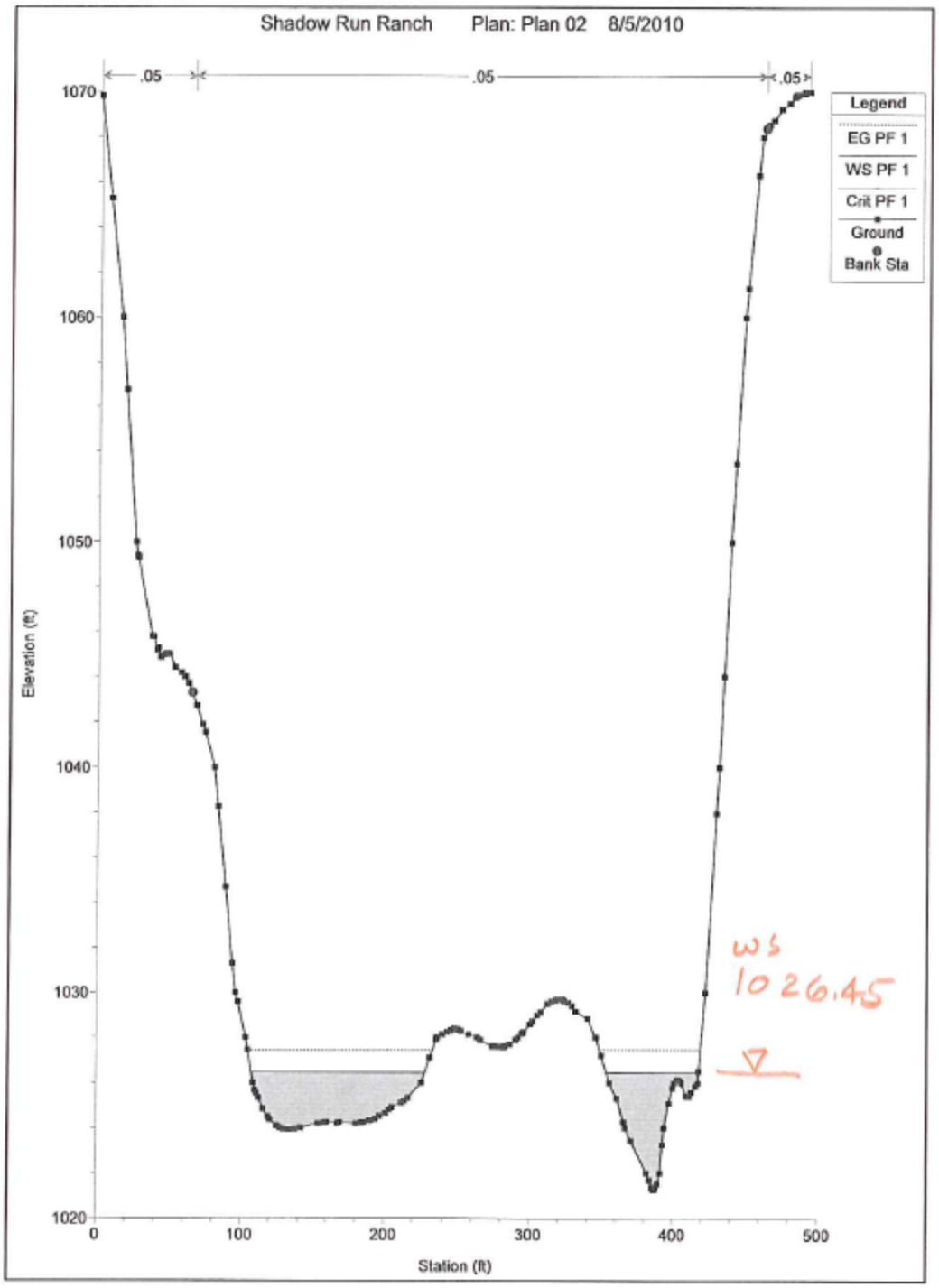
E.G. Elev (ft)	887.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.89	Wt. n-Val.		0.050	
W.S. Elev (ft)	885.92	Reach Len. (ft)	676.63	613.71	584.87
Crit W.S. (ft)	885.92	Flow Area (sq ft)		272.26	
E.G. Slope (ft/ft)	0.024340	Area (sq ft)		272.26	
Q Total (cfs)	3003.00	Flow (cfs)		3003.00	
Top Width (ft)	72.23	Top Width (ft)		72.23	
Vel Total (ft/s)	11.03	Avg. Vel. (ft/s)		11.03	
Max Chl Dpth (ft)	6.31	Hydr. Depth (ft)		3.77	
Conv. Total (cfs)	19248.6	Conv. (cfs)		19248.6	
Length Wtd. (ft)	613.71	Wetted Per. (ft)		74.20	
Min Ch El (ft)	879.61	Shear (lb/sq ft)		5.58	
Alpha	1.00	Stream Power (lb/ft s)	444.76	0.00	0.00
Frctn Loss (ft)	14.71	Cum Volume (acre-ft)	0.21	10.42	
C & E Loss (ft)	0.04	Cum SA (acres)	0.18	2.90	


Shadow Run Ranch Plan: Plan 02 8/5/2010
.05
.05
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
980
970
960
950
940
930
920
0
100
200
300
400
500
Station (ft)
WS
934.85

RS - 5

Plan: Plan 02 RIVER-1 Reach-1 RS: 5 Profile: PF 1

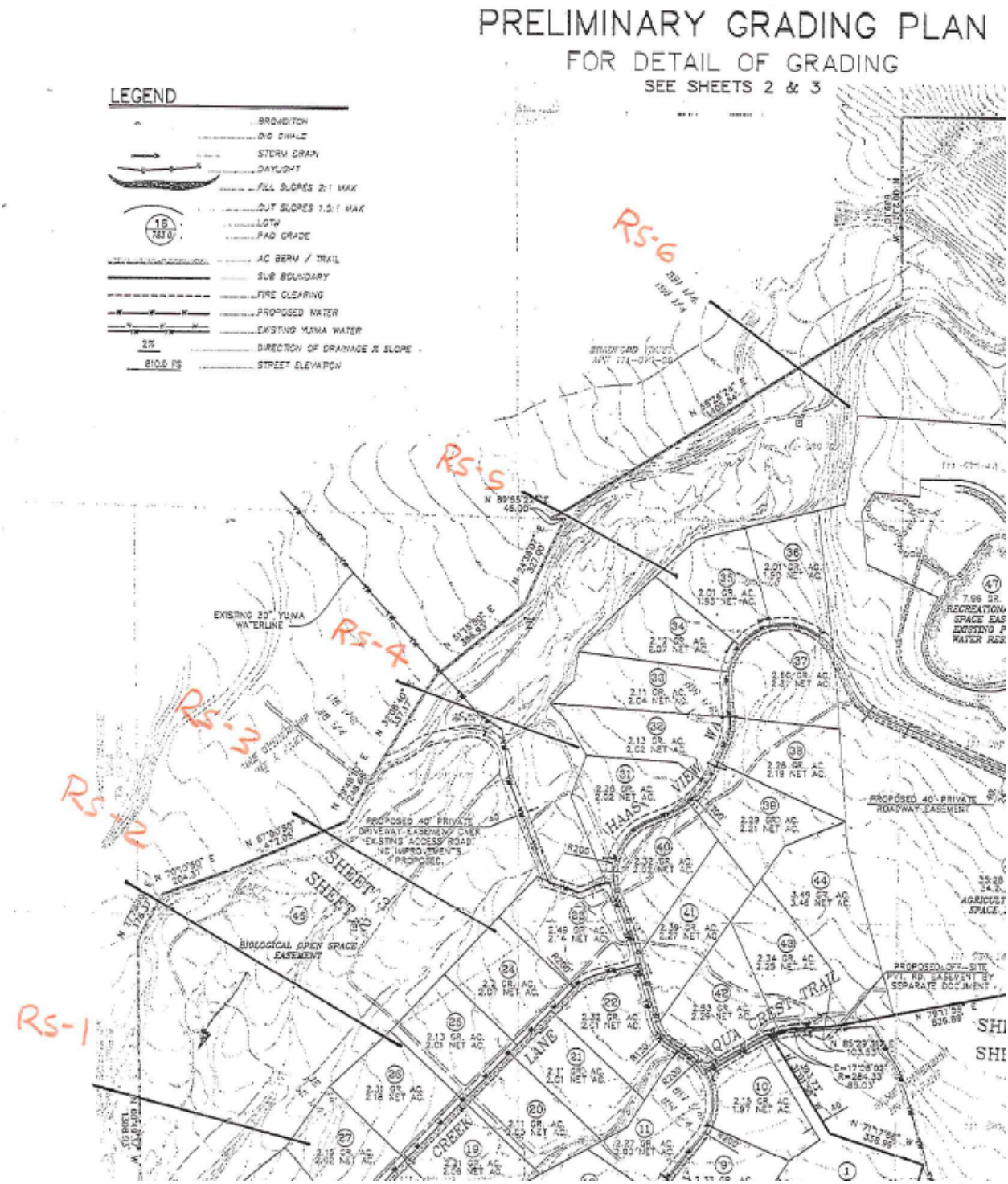
E.G. Elev (ft)	937.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.65	Wt. n-Val.		0.050	
W.S. Elev (ft)	934.85	Reach Len. (ft)	702.45	720.62	738.88
Crit W.S. (ft)	934.85	Flow Area (sq ft)		230.03	
E.G. Slope (ft/ft)	0.023728	Area (sq ft)		230.03	
Q Total (cfs)	3003.00	Flow (cfs)		3003.00	
Top Width (ft)	43.56	Top Width (ft)		43.56	
Vel Total (ft/s)	13.06	Avg. Vel. (ft/s)		13.06	
Max Chl Dpth (ft)	8.90	Hydr. Depth (ft)		5.28	
Conv. Total (cfs)	19494.9	Conv. (cfs)		19494.9	
Length Wtd. (ft)	720.62	Wetted Per. (ft)		47.76	
Min Ch El (ft)	925.95	Shear (lb/sq ft)		7.13	
Alpha	1.00	Stream Power (lb/ft s)	455.35	0.00	0.00
Frctn Loss (ft)	17.32	Cum Volume (acre-ft)	0.21	14.57	
C & E Loss (ft)	0.23	Cum SA (acres)	0.18	3.86	


Shadow Run Ranch Plan: Plan 02 8/5/2010
.05
.05
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1070
1060
1050
1040
1030
1020
Elevation (ft)
0
100
200
300
400
500
Station (ft)
WS
1026.45

RS - 6

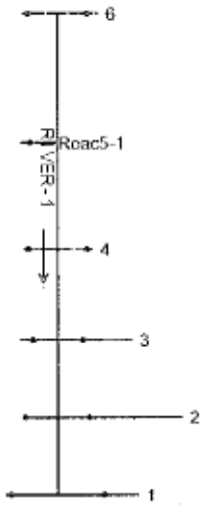
Plan: Plan 02 RIVER-1 Reach-1 RS: 6 Profile: PF 1

E.G. Elev (ft)	1027.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.01	Wt. n-Val.		0.050	
W.S. Elev (ft)	1026.45	Reach Len. (ft)	841.04	872.80	905.28
Crit W.S. (ft)	1026.45	Flow Area (sq ft)		371.61	
E.G. Slope (ft/ft)	0.029544	Area (sq ft)		371.61	
Q Total (cfs)	3003.00	Flow (cfs)		3003.00	
Top Width (ft)	184.74	Top Width (ft)		184.74	
Vel Total (ft/s)	8.08	Avg. Vel. (ft/s)		8.08	
Max Chl Dpth (ft)	5.19	Hydr. Depth (ft)		2.01	
Conv. Total (cfs)	17471.0	Conv. (cfs)		17471.0	
Length Wtd. (ft)	872.80	Wetted Per. (ft)		186.76	
Min Ch El (ft)	1021.26	Shear (lb/sq ft)		3.67	
Alpha	1.00	Stream Power (lb/ft s)	491.17	0.00	0.00
Frctn Loss (ft)	23.04	Cum Volume (acre-ft)	0.21	20.60	
C & E Loss (ft)	0.16	Cum SA (acres)	0.18	6.15	



HEC-RAS Plan: Plan 02 River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6	PF 1	3003.00	1021.26	1026.45	1026.45	1027.47	0.029544	8.08	371.61	184.74	1.00
Reach-1	5	PF 1	3003.00	925.95	934.85	934.85	937.49	0.023728	13.06	230.03	43.56	1.00
Reach-1	4	PF 1	3003.00	879.61	885.92	885.92	887.81	0.024340	11.03	272.26	72.23	1.00
Reach-1	3	PF 1	3003.00	834.94	841.53	841.53	843.81	0.023602	12.11	247.90	55.11	1.01
Reach-1	2	PF 1	3003.00	789.85	797.34	797.34	799.20	0.021556	11.09	281.37	78.04	0.95
Reach-1	1	PF 1	3003.00	753.72	759.06	759.06	760.21	0.028600	8.58	349.98	153.57	1.00



None of the XS's are Geo-Referenced (= Geo-Ref user entered XS + Geo-Ref interpolated XS + Non Geo-Ref user entered XS + Non Geo-Ref interpolated XS)

APPENDIX “E”

Existing / Proposed storm drain Hydraulics

Basin 1, 2 and 3

Culvert Calculator Report
Existing 2-42" RCP

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	762.00	ft	Headwater Depth/Height	1.71	
Computed Headwater Elev	762.00	ft	Discharge	186.16	cfs
Inlet Control HW Elev.	762.00	ft	Tailwater Elevation	752.00	ft
Outlet Control HW Elev.	761.63	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	756.00	ft	Downstream Invert	752.00	ft
Length	100.00	ft	Constructed Slope	0.040000	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.87	ft
Slope Type	Steep		Normal Depth	1.67	ft
Flow Regime	Supercritical		Critical Depth	2.98	ft
Velocity Downstream	17.78	ft/s	Critical Slope	0.008022	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.50	ft
Section Size	42 inch		Rise	3.50	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	761.63	ft	Upstream Velocity Head	1.76	ft
Ke	0.50		Entrance Loss	0.88	ft

Inlet Control Properties					
Inlet Control HW Elev.	762.00	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	19.2	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
Existing 36" RCP

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	739.00	ft	Headwater Depth/Height	1.67	
Computed Headwater Elev	739.00	ft	Discharge	62.63	cfs
Inlet Control HW Elev.	739.00	ft	Tailwater Elevation	725.00	ft
Outlet Control HW Elev.	738.78	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	734.00	ft	Downstream Invert	725.00	ft
Length	100.00	ft	Constructed Slope	0.090000	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.26	ft
Slope Type	Steep		Normal Depth	1.15	ft
Flow Regime	Supercritical		Critical Depth	2.55	ft
Velocity Downstream	22.22	ft/s	Critical Slope	0.008319	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	738.78	ft	Upstream Velocity Head	1.49	ft
Ke	0.50		Entrance Loss	0.74	ft

Inlet Control Properties				
Inlet Control HW Elev.	739.00	ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall		Area Full	7.1 ft²
K	0.00980		HDS 5 Chart	1
M	2.00000		HDS 5 Scale	1
C	0.03980		Equation Form	1
Y	0.67000			

Worksheet for Existing Bridge basin 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.05405	ft/ft
Discharge	3003.10	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	16.00
0+00.00	6.00
0+04.00	4.00
0+08.00	0.00
0+18.00	0.00
0+24.00	4.00
0+30.00	5.00
0+30.00	16.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 16.00)	(0+00.00, 6.00)	0.013
(0+00.00, 6.00)	(0+30.00, 5.00)	0.045
(0+30.00, 5.00)	(0+30.00, 16.00)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	7.17	ft
Elevation Range	0.00 to 16.00 ft	
Flow Area	148.00	ft²

Worksheet for Existing Bridge basin 3

Results

Wetted Perimeter		36.76	ft
Hydraulic Radius		4.03	ft
Top Width		30.00	ft
Normal Depth		7.17	ft
Critical Depth		9.01	ft
Critical Slope		0.02129	ft/ft
Velocity		20.29	ft/s
Velocity Head		6.40	ft
Specific Energy		13.57	ft
Froude Number		1.61	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		7.17	ft
Critical Depth		9.01	ft
Channel Slope		0.05405	ft/ft
Critical Slope		0.02129	ft/ft

Cross Section for Existing Bridge basin 3

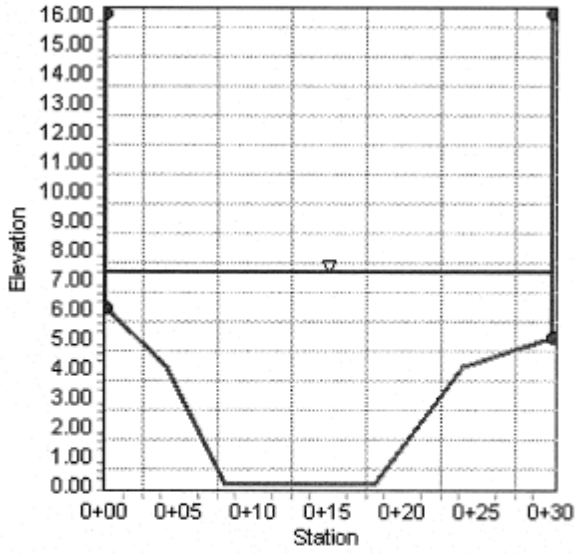
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.05405	ft/ft
Normal Depth	7.17	ft
Discharge	3003.10	ft³/s

Cross Section Image



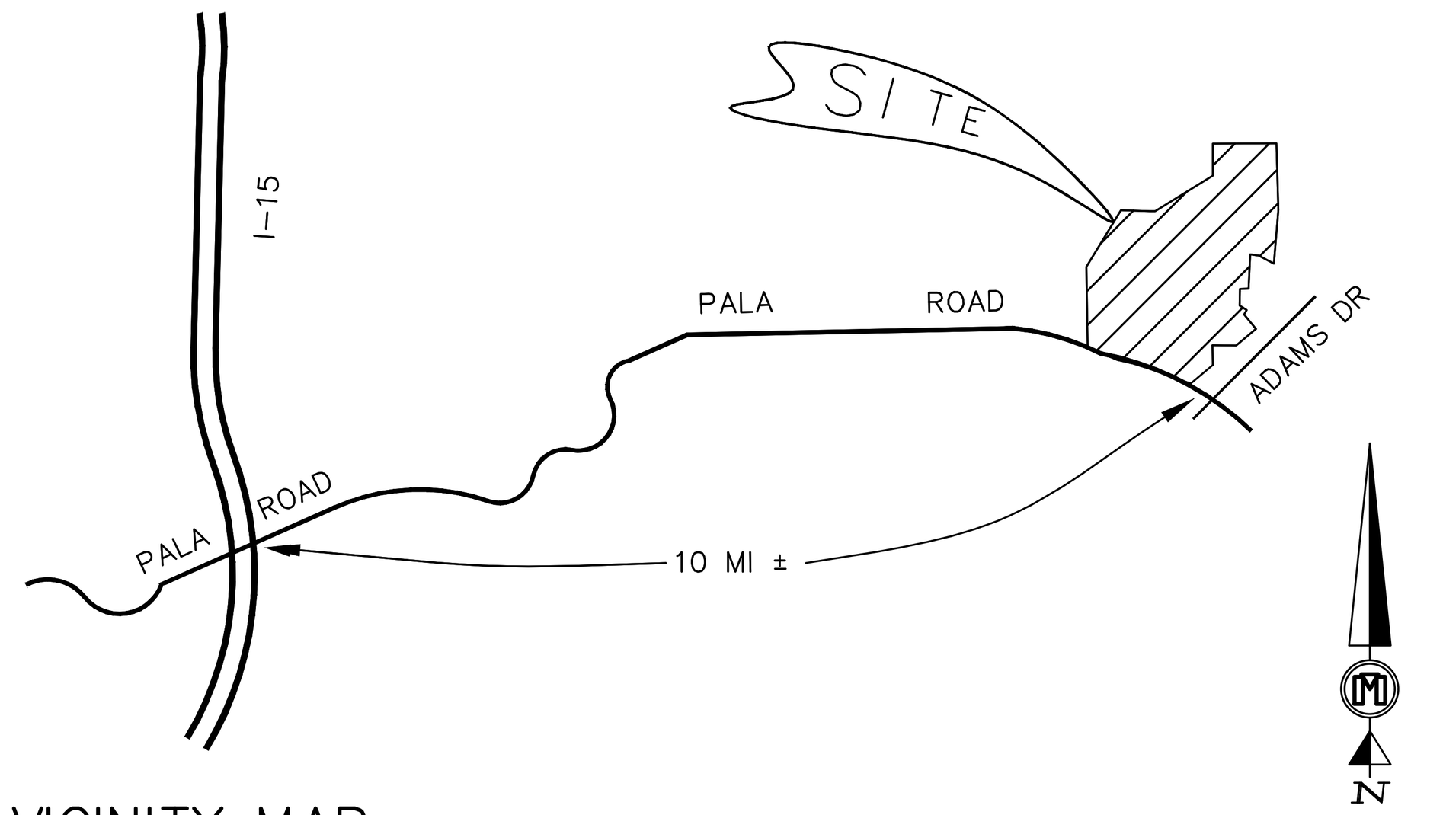
ATTACHMENT – 1

COUNTY OF SAN DIEGO TRACT NO. TM 5223 RPL-3

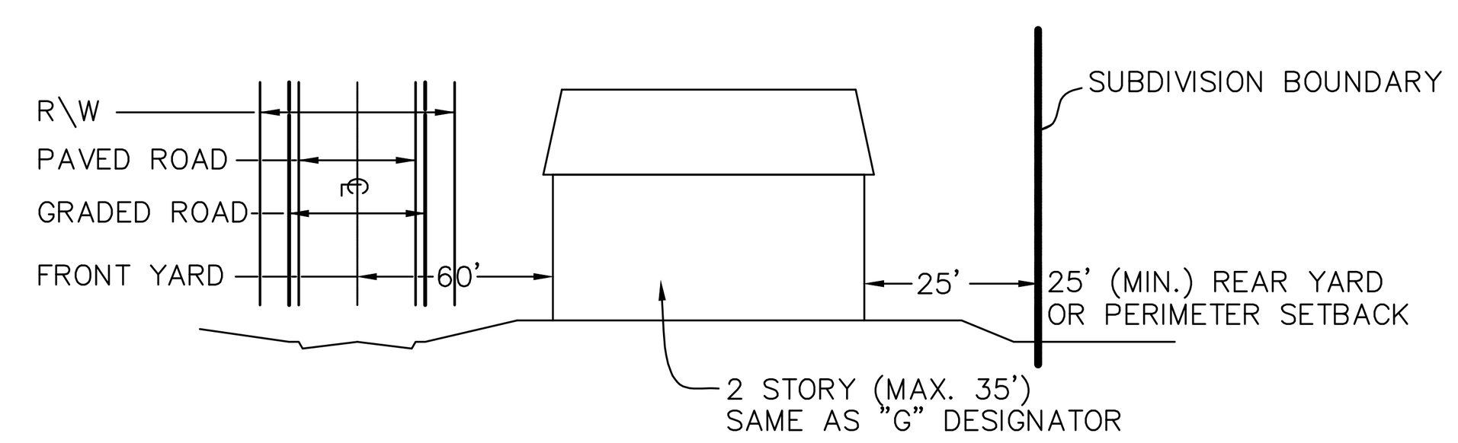
SHADOW RUN RANCH, PAUMA VALLEY

PRELIMINARY GRADING PLAN

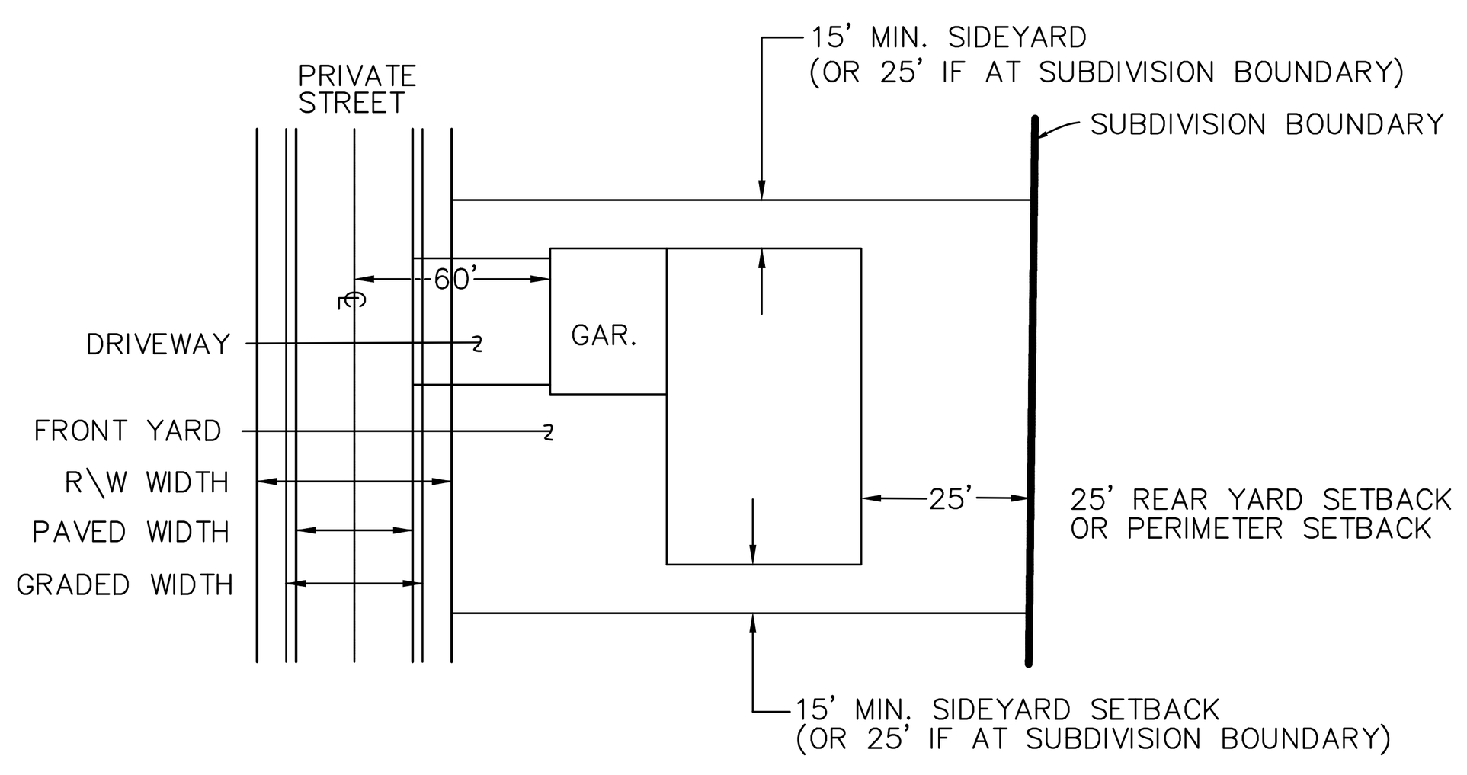
FOR DETAIL OF GRADING
SEE SHEETS 2 & 3



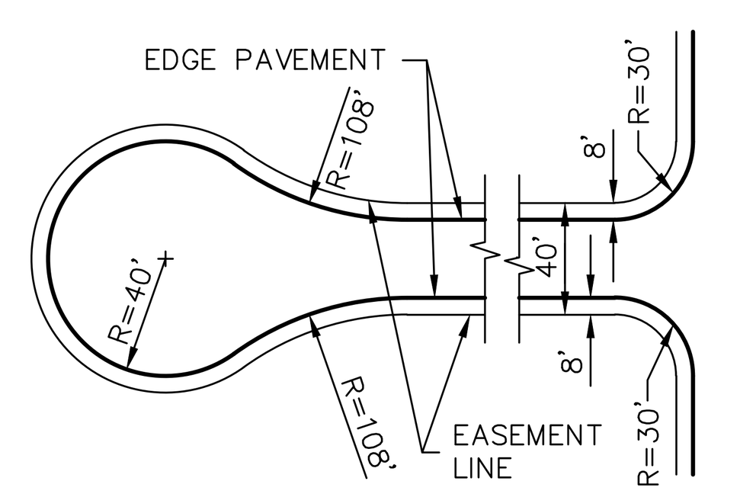
VICINITY MAP
NO SCALE



TYPICAL SITE SECTION
NO SCALE



TYPICAL SITE PLAN
NO SCALE

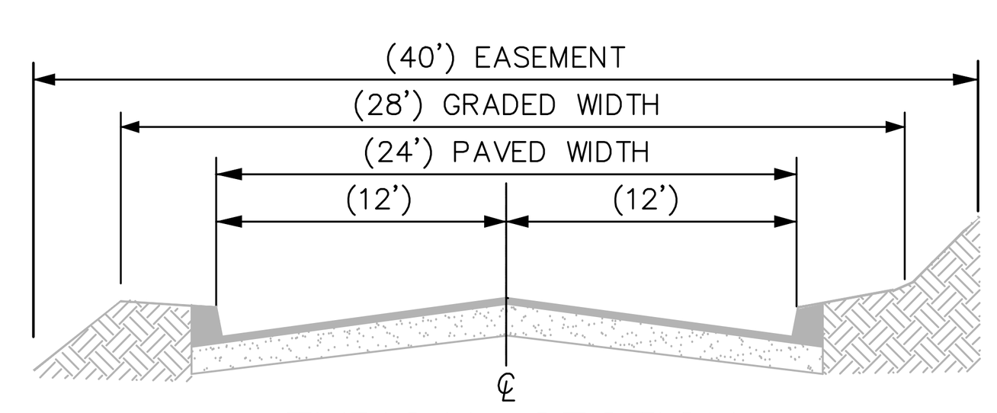


TYPICAL CUL DE SAC DETAIL
NOT TO SCALE

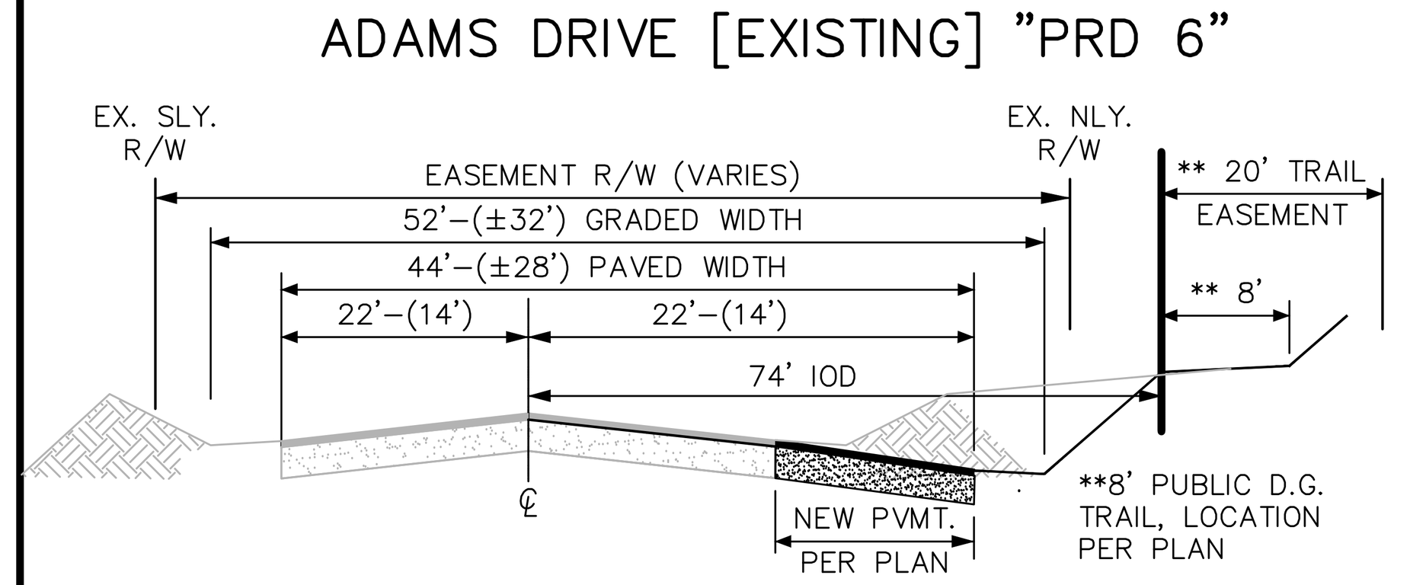
TYPICAL STREET SECTIONS

STRUCTURAL SECTION CHART FOR PRIVATE ROADS

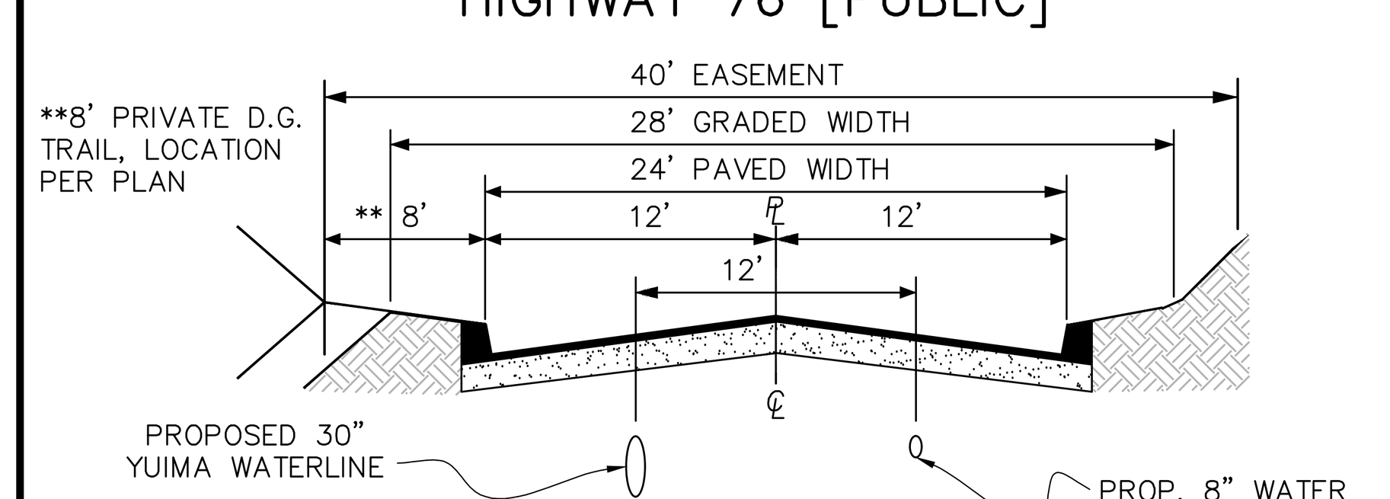
STREET GRADES	STRUCTURAL SECTION
0% TO 10%	DISINTEGRATED GRANITE
10% TO 15%	2" AC OVER 6" CLASS II AB (MINIMUM) OR PER SOIL ENGINEER'S RECOMMENDATIONS
15% TO 20%	3" AC OVER 7" CLASS II AB (MINIMUM) OR PER SOIL ENGINEER'S RECOMMENDATIONS



TYPICAL SECTION
ADAMS DRIVE [EXISTING] "PRD 6"



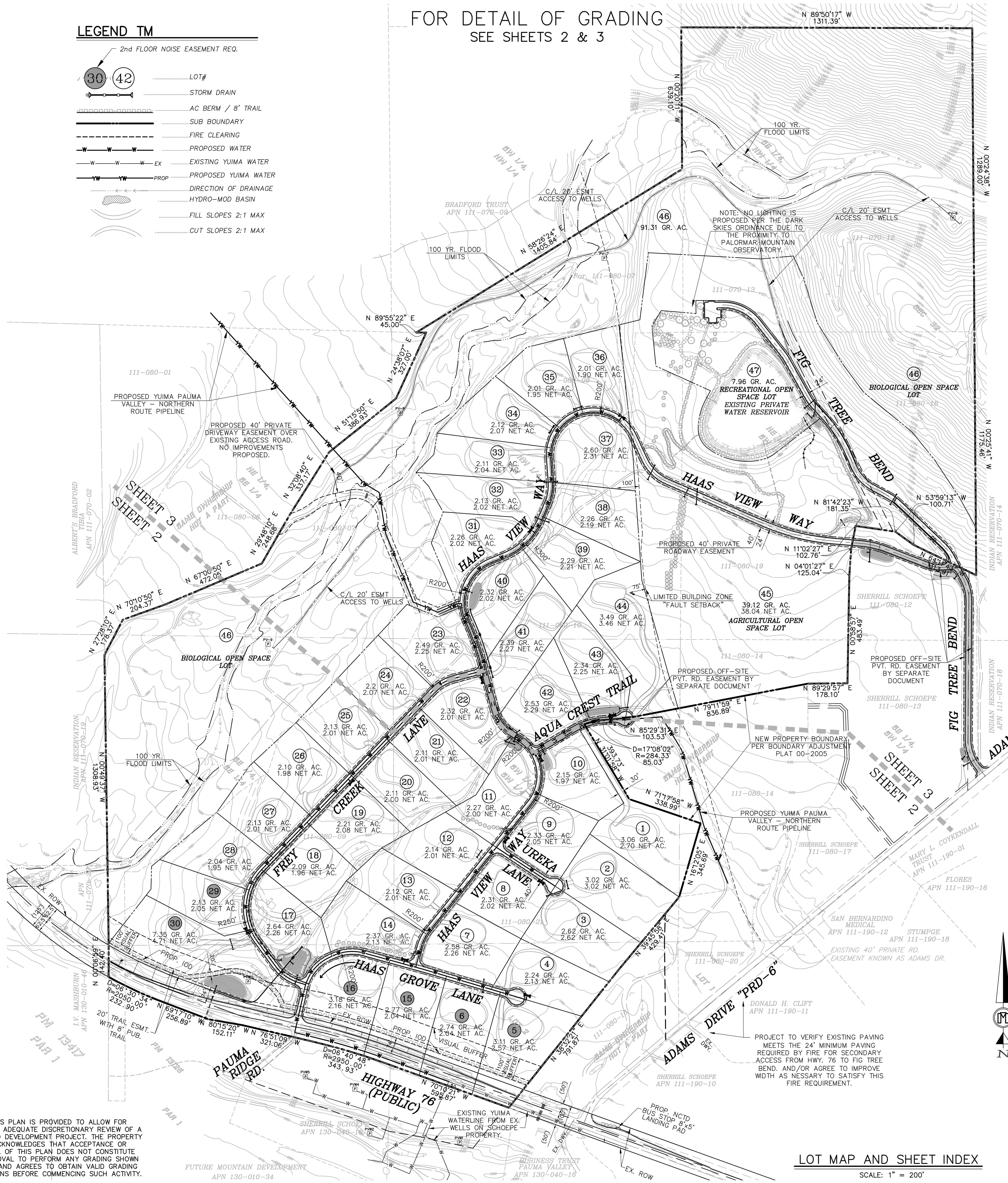
TYPICAL SECTION
HIGHWAY 76 [PUBLIC]



TYPICAL SECTION
PROPOSED PRIVATE ROADS

LEGEND TM

- 2nd FLOOR NOISE EASEMENT REQ.
- LOT#
- STORM DRAIN
- AC BERM / 8' TRAIL
- SUB BOUNDARY
- FIRE CLEARING
- PROPOSED WATER
- EXISTING YUIMA WATER
- PROPOSED YUIMA WATER
- DIRECTION OF DRAINAGE
- HYDRO-MOD BASIN
- FILL SLOPES 2:1 MAX
- CUT SLOPES 2:1 MAX



LOT MAP AND SHEET INDEX
SCALE: 1" = 200'

NOTE: THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.

OWNER/SUBDIVIDER

SHERRILL ANN SCHOEPE, GENERAL PARTNER
SHADOW RUN RANCH, LLC
PO BOX 1249
PAUMA VALLEY, CA 92061
(760) 742-1893
Sherrill Ann Schoepe, Trustee

PLANNERS

TRS CONSULTANTS
438 CAMINO DEL RIO SOUTH, SUITE 223
SAN DIEGO, CA 92108
(619) 299-2525

ENGINEER

MASSON & ASSOCIATES INC.
200 E. WASHINGTON AVE. SUITE 200
ESCONDIDO, CA. 92025
(760) 741-3570

ROBERT D'AMARO, R.C.E. C081699
EXP. 03/31/2020

REGISTERED PROFESSIONAL ENGINEER ROBERT D'AMARO No. C081699 Exp. 03/31/20 CIVIL STATE OF CALIFORNIA

ZONING

	NORTHWESTERLY PORTION	SOUTHEASTERLY PORTION
USE REGULATIONS	A70	A70
NEIGHBORHOOD REGS.	M	M
DENSITY	.25	.25
LOT SIZE	4 AC.	4 AC.
BUILDING TYPE	C	C
MAX. FLR. AREA	–	–
FLR. AREA RATIO	–	–
HEIGHT	G	G
COVERAGE	–	–
SETBACK	C	C
OPEN SPACE	–	–
SPECIAL AREA REGS.	F	–

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS: PORTIONS OF SECTIONS 5&6, T10S, R1W, S.B.B.M. & PORTIONS OF SECTIONS 31&32, T9S, R1W, S.B.B.M.

NOTES

1. ZONING – EXISTING: (A70) LIMITED AGRICULTURE
2. GENERAL PLAN LAND USE DESIGNATION:– EXISTING: (19) AGRICULTURE
3. COMMUNITY PLAN: PALA/PAUMA SUBREGIONAL PLAN
4. GENERAL PLAN REGIONAL CATEGORY: ESTATE DEVELOPMENT AREA (EDA)
5. MINIMUM LOT SIZE: 2 AC (GROSS)
6. TOTAL LOTS: 47 TOTAL, 44 RESIDENTIAL, 3 OPEN SPACE
7. SITE AREA: 248.26 AC. Gross
8. SITE ADDRESS: NORTH SIDE OF PALA ROAD (SR-76), WEST OF ADAMS DRIVE
9. CALIFORNIA COORDINATE INDEX: 427-1764
10. SOURCE OF TOPOGRAPHY: IDAHO MAPPING SERVICES, BOISE, IDAHO ON 09-15-2000
11. ASSESSOR'S PARCEL NO's.: 111-080-07,08,09,10,18, & 19; 111-070-12 & 13; PROTIONS OF 111-080-14,15, & 16
12. WATER SUPPLIED BY: YUIMA M.W.D.
13. SEWAGE SUPPLIED BY: INDIVIDUAL SEWER SEPTIC SYSTEMS DESIGN BY: VINJIE MIDDLETON
14. GAS SUPPLIED BY: PROPANE TANKS AND DELEVERY SERVICE ON EACH LOT
15. ELECTRIC SUPPLIED BY: SAN DIEGO GAS & ELECTRIC
16. FIRE PROTECTION: CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
17. SCHOOL DISTRICTS: FALLBROOK UNION HIGH SCHOOL, VALLEY CENTER-PAUMA UNIFIED
18. LEGAL ACCESS: HIGHWAY 76
19. BOUNDARY INFORMATION HAS BEEN COMPILED FROM RECORD DATA
20. GRADING AS SHOWN, AND PURSUANT TO THE COUNTY GRADING ORDINANCE
21. ALL IMPROVEMENTS TO COUNTY OF SAN DIEGO STANDARDS
22. PROPOSED PRIVATE DRIVEWAYS TO BE GRADED TO 20' WIDTH WITH 16' PAVED, PER COUNTY STANDARD DS-7
23. GRADING OF DRIVEWAYS AND PADS SHALL BE DONE INDIVIDUALLY
24. TAX RATE AREA: 94143 AND 94158
25. NO STREET LIGHTS ARE PROPOSED
26. ASSOCIATED PERMITS: M.U.P. / P.R.D.
27. BOUNDARY ADJUSTMENT 00-0205 SUBMITTED PREVIOUSY, TO RECORD PRIOR TO T.M.

PARK LAND DEDICATION STATEMENT

THE SUBDIVIDER SHALL PAY PARK IN LIEU FEES PURSUANT TO CHAPTER 1 OF DIVISION 10 OF TITLE 8 OF THE SAN DIEGO COUNTY CODE, PRIOR TO APPROVAL OF FINAL MAP, AND WILL REQUEST A CREDIT FOR UP TO 50% OF PARK FEES FOR AN ONSITE PRIVATE PARK, THE DESIGN OF WHICH IS SHOWN ON THE MAJOR USE PERMIT PLOT PLAN (PDS2000-3300-00-030).

SPECIAL ASSESSMENT STATEMENT

THE SUBDIVIDER DOES NOT PROPOSE TO REQUEST THE BOARD OF SUPERVISORS FOR PERMISSION TO INITIATE PROCEEDINGS UNDER A SPECIAL ACT FOR CONSTRUCTION OF ANY OF THE SUBDIVISION IMPROVEMENTS.

SOLAR ACCESS STATEMENT

THIS IS A SOLAR SUBDIVISION AS REQUIRED BY SECTION 81.401(m) OF THE SUBDIVISION ORDINANCE. ALL LOTS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQUARE FEET OF UNRESTRICTED ACCESS TO SUNLIGHT ON THE BUILDABLE PORTION OF THE LOT.

ACCESS NOTE

IT IS THE RESPONSIBILITY OF THE SUBDIVIDER TO PROVIDE INSURABLE ACCESS TO EACH PARCEL CREATED BY THIS MAP.

EARTHWORK QUANTITIES **

CUT 63,660.0 CY. FILL 63,660.0 CY. IMPORT/EXPORT 0 CY. BALANCE

** NOTE: EARTHWORK QUANTITIES ARE ESTIMATES ONLY. EARTHWORK QUANTITIES INDICATED ARE RAW VOLUMES TO FINISHED SURFACE AND ARE ESTIMATES FOR PERMIT PURPOSES ONLY. QUANTITIES DO NOT INCLUDE ANY ALLOWANCES FOR STREET UNDERCUT, FOOTING/TRENCHING SPOILS ETC...

CONTRACTOR RESPONSIBLE FOR REVIEWING AND IMPLEMENTING THE RECOMMENDATIONS IN THE SOILS REPORT AND VERIFYING QUANTITIES PRIOR TO BIDDING.

SOILS ENGINEER

VINJE & MIDDLETON ENGINEERING
2450 VINEYARD AVENUE
ESCONDIDO, CA 92025
(760) 743-1504

THIS DOES NOT CONSTITUTE APPROVAL OR DISAPPROVAL; INFORMATION HAS BEEN SUBMITTED TO THE COUNTY OF SAN DIEGO DEPARTMENT OF ENVIRONMENTAL HEALTH IN SATISFACTORY FORM ON JULY 2005 REF. # VH0730

200 100 0 200 400 600
SCALE IN FEET
GRAPHIC SCALE
1"=200'

MASSON & ASSOCIATES, INC.
200 East Washington Avenue, Suite 200
Escondido, CA 92025 P. 760.741.3570
www.masson-assoc.com
Planning ▲ Engineering ▲ Surveying ▲ Telecom

CALIF. COORD. INDEX: 427-1764

COUNTY OF SAN DIEGO TRACT NO. TM 5223 RPL-3

SHADOW RUN RANCH, PAUMA VALLEY
PRELIMINARY GRADING PLAN

TABLE 1. SUMMARY OF IMPs CHARACTERISTICS						
IMP #	Per COSD BMP Design Manual App. E	IMP Size (s.f.)	Riser Dia. (in)	Riser - Ponding Depth (in)	Drying Time (hr)	Freeboard (ft)
IMP 1.14	PR-1	3,125	6	6	6	2.5
IMP 2.06	PR-1	10,344	24	6	20	1.4
IMP 10.10	PR-1	1,220	24	6	12	1
IMP 10.11,12,14	INF-2	4,020	6	6	20	1.5
IMP 10.13	PR-1	1,320	12	12	19	1
IMP 10.16	PR-1	3,500	12	9	9	1
IMP 10.17	INF-2	1,100	12	6	20	1.38
IMP 10.19	PR-1	1,245	6	12	13	1
IMP 10.22	PR-1	6,960	16	18	21	2.42

Q100 - (CFS)					
POC	PRE-DEV.	PRE-DEV FPS	POST DEV. w/o ATTENUATION	POST w/ ATTENUATION	POST FPS
CP # 1	108.8	6.97	95.9	69.29	4.96
CP # 2	38.7	6.64	42.5	26.04	5.17
CP # 3	3,000.1	8.60	3,000.1	3,000.1	8.60

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IMP 10.17	INF-2	1,100	12	6	20	1.38
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COUNTY OF SAN DIEGO TRACT NO. TM 5223 RPL-3

SHADOW RUN RANCH, PAUMA VALLEY
PRELIMINARY GRADING PLAN

Draft Grading Plan Notes (must be included on the Preliminary Grading Plan for public review and public hearing):

"PRE-CONSTRUCTION MEETING: (Prior to Preconstruction Conference, and prior to any clearing, grubbing, trenching, grading, or any land disturbances.)

(BIOLOGICAL RESOURCES)

BIO GR#1 – TEMPORARY FENCING: [PDS, PCC] [DPW,PDCI] [PC] [PDS, FEE]. INTENT: In order to prevent inadvertent disturbance to onsite open space and adjacent areas containing native habitat, temporary construction fencing shall be installed. DESCRIPTION OF REQUIREMENT: Prior to the commencement of any grading and or clearing in association with this grading plan, temporary orange construction fencing shall be placed to protect from inadvertent disturbance of proposed onsite open space and adjacent offsite native habitat. The placement of such fencing shall be approved by the PDS, Permit Compliance Section. Upon approval, the fencing shall remain in place until the conclusion of grading activities after which the fencing shall be removed. DOCUMENTATION: The applicant shall provide evidence that the fencing has been installed and have a California licensed surveyor certify that the fencing is located on the boundary of the open space easement(s). The applicant shall submit photos of the fencing along with the certification letter to the [PDS, PCC] for approval. TIMING: Prior to Preconstruction Conference, and prior to any clearing, grubbing, trenching, grading, or any land disturbances the fencing shall be installed, and shall remain for the duration of the grading and clearing. MONITORING: The [PDS, PCC] shall either attend the preconstruction conference and approve the installation of the temporary fencing, or review the certification and pictures provided by the applicant.

BIO GR#2 – RESOURCE AVOIDANCE: [PDS, PCC] [DPW, PDCI] PDS, FEE X2].
INTENT: In order to avoid impacts to Least Bell's vireo and Southwestern willow flycatcher, which are a sensitive biological resource pursuant to the Migratory Bird Treaty Act (MBTA), a Resource Avoidance Area (RAA), shall be implemented on all plans. DESCRIPTION OF REQUIREMENT: There shall be no brushing, clearing and/or grading such that none will be allowed within 500 feet of raptor nesting habitat during the breeding season of Least Bell's vireo and Southwestern willow flycatcher within Resource Avoidance Area (RAA) as indicated on these plans. The breeding season is defined as occurring between March 15th and September 15th, and May 1st thru September 1st. The Director of Planning and Land Use [PDS, PCC] may waive this condition, through written concurrence from the US Fish and Wildlife Service and the California Department of Fish and Wildlife, provided that no raptors are present in the vicinity of the brushing, clearing or grading. DOCUMENTATION: The applicant shall provide a letter of agreement with this condition; alternatively, the applicant may submit a written request for waiver of this condition. Although, No Grading shall occur within the RAA until concurrence is received from the County and the Wildlife Agencies. TIMING: Prior to preconstruction conference and prior to any clearing, grubbing, trenching, grading, or any land disturbances and throughout the duration of the grading and construction, compliance with this condition is mandatory unless the requirement is waived by the County upon receipt of concurrence from the Wildlife Agencies. MONITORING: The [DPW, PDCI] shall not allow any grading in the RAA during the specified dates, unless a concurrence from the [PDS, PCC] is received. The [PDS, PCC] shall review the concurrence letter."

(CULTURAL RESOURCES)

CULT GR#-1-ARCHAELOGICAL MONITORING [PDS, FEE X2]

INTENT: In order to comply with the Mitigation Monitoring and Reporting Program for PDS2001-3100-5223 and the County of San Diego Guidelines for Significance – Cultural Resources, a Cultural Resource Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The County approved 'Project Archaeologist,' Luiseno Native American Monitor, and [PDS, PCC], shall attend the pre-construction meeting with the contractors to explain and coordinate the requirements of the grading monitoring program. The Project Archaeologist and Luiseno Native American Monitor shall monitor the original cutting of previously undisturbed deposits in all areas identified for development including off-site improvements. The archaeological grading monitoring program shall comply with the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Archeological and Historic Resources. DOCUMENTATION: The applicant shall have the contracted Project Archeologist and Luiseno Native American attend the preconstruction meeting to explain the monitoring requirements. TIMING: Prior to any clearing, grubbing, trenching, grading, or any land disturbances this condition shall be completed. MONITORING: The [DPW, PDCI] shall invite the [PDS, PCC] to the preconstruction conference to coordinate the Archaeological Monitoring requirements of this condition. The [PDS, PCC] shall attend the preconstruction conference and confirm the attendance of the approved Project Archeologist.

(PALEONTOLOGICAL RESOURCES)

PALEO GR#1 – PALEONTOLOGICAL MONITORING: [DPW, PDCI] [PDS, PCC] [PC] [PDS, FEE X2]

INTENT: In order to comply with the Mitigation Monitoring and Reporting Program pursuant to PDS2001-3100 5223, a Paleontological Resource Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The County approved Project Paleontologist, and the PDS Permit Compliance Coordinator (PCC), shall attend the pre-construction meeting with the contractors to explain and coordinate the requirements of the grading monitoring program. The Project Paleontologist shall monitor during the original cutting of previously undisturbed deposits for the project, both on and off site, the Qualified Paleontological Resources Monitor shall be on-site to monitor as determined necessary by the Qualified Paleontologist. The grading monitoring program shall comply with the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Paleontological Resources <http://www.sdcounty.ca.gov/dplu/procguid.html>. DOCUMENTATION: The applicant shall have the contracted Project Paleontologist attend the preconstruction meeting to explain the monitoring requirements. TIMING: Prior to Preconstruction Conference, and prior to any clearing, grubbing, trenching, grading, or any land disturbances this condition shall be completed. MONITORING: The [DPW, PDCI] shall invite the [PDS, PCC] to the preconstruction conference to coordinate the Paleontological Resource Monitoring requirements of this condition. The [PDS, PCC] shall attend the preconstruction conference and confirm the attendance of the approved Project Paleontologist.

DURING CONTRUCTION: (The following actions shall occur throughout the duration of the grading construction).

(AIR QUALITY)

AIR GR#1-AIR QUALITY

INTENT: In order to mitigate for construction phase particulate emissions. DESCRIPTION OF REQUIREMENT: The project shall comply with the following Air Quality measures:

a. All haul/dump trucks entering or leaving the site with soil or fill material must maintain at least 2 feet of freeboard or cover loads of all haul/dump trucks securely (unnumbered design measure).
b. Dust control measures of the Grading Ordinance will be enhanced with a minimum of three (3) daily applications of water to the construction areas, between dozer/scraper passes and on any unpaved roads within the project limits.
c. Grading is to be terminated in winds exceed 25 mph.
d. Sweepers and water trucks shall be used to control dust and debris at public street access points.
e. Dirt storage piles will be stabilized by chemical binders, tarps, fencing or other suppression measures.
f. Internal construction-roadways will be stabilized by paving, chip sealing or chemicals after rough grading.
g. A minimum of four 15 mph signs shall be posted and enforced on unpaved areas during construction.
h. Electricity from the utility grid shall be used to power construction equipment to the maximum extent feasible.

DOCUMENTATION: The applicant shall comply with the Air Quality requirements of this condition. TIMING: The following actions shall occur throughout the duration of the grading construction. MONITORING: The [DPW, PDCI] shall make sure that the grading contractor complies with the Air Quality requirements of this condition. The [DPW, PDCI] shall contact the [PDS, PCC] if the applicant fails to comply with this condition.

(BIOLOGICAL RESOURCES)

BIO GR#3 – BIOLOGICAL MONITORING [PDS, FEE X3]

INTENT: In order to prevent inadvertent disturbance to Least Bell's vireo and Southwestern willow flycatcher , all grading located adjacent to Frey creek shall be monitored by a biological monitor. DESCRIPTION OF REQUIREMENT: A County approved biologist shall perform biological monitoring during all grading, clearing, grubbing, trenching, and construction activities. The Project Biologist shall supervise and monitor grading activities to ensure against damage to biological resources that are intended to be protected and preserved. The monitor(s) shall be on site during all grading and clearing activities that are in or adjacent to any wetland or potential occupied habitat, Biological open space areas or sensitive habitats. If there are disturbances, the monitor must report them immediately to the [PDS PCC]. Additionally, the biologist shall perform the following duties:

1. Perform weekly inspection of fencing and erosion control measures (daily during rain events) near proposed preservation areas and report deficiencies immediately to the DPW Construction Inspector;
2. Perform periodically monitor the work area for excessive dust generation in compliance with the County grading ordinance and report deficiencies immediately to the DPW Construction Inspector;
3. Monitor construction lighting periodically to ensure lighting is the lowest illumination possible allowed for safety, selectively placed, shielded, and directed away from preserved habitat;
4. Monitor equipment maintenance, staging, and fuel dispensing areas to ensure there is no runoff to Waters of the US;
5. Monitor noise levels to ensure they are not in excess of 60 decibels during the breeding season of Least Bell's vireo and Southwestern willow flycatcher defined as April 15 and September 15;
6. Stop or divert all work when deficiencies require mediation and notify DPW Construction Inspector and [PDS PCC] within 24 hours; (8) produce periodic (monthly during grading) and final reports and submit to the Wildlife Agencies and the PDS (final report will release bond);
7. Confer with the Wildlife Agencies and [PDS PCC] within 24 hours any time protected habitat or Least Bell's vireo and Southwestern willow flycatcher are being affected by construction;
8. Attend construction meetings and other meetings as necessary.

DOCUMENTATION: The Project Biologist shall prepare and submit to the satisfaction the [PDS, PCC] monitoring reports, which indicate that the monitoring has occurred as indicated above. TIMING: The following actions shall occur throughout the duration of the grading construction. MONITORING: The [DPW, PDCI] shall assure that the Project Biologist is on-site performing the Monitoring duties of this condition during all applicable grading activities as determined by the Biologist. The [DPW, PDCI] shall contact the [PDS, PCC] if the Project Biologist or applicant fails to comply with this condition. The [PDS, PCC] shall review and approve the monitoring reports for compliance with this condition.

(CULTURAL RESOURCES)

CULT #GR-2-ARCHAEOLOGICAL MONITORING [PDS, FEE X2]

INTENT: In order to comply with the Mitigation Monitoring and Reporting Program for PDS2001-3100-5223 and the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Archeological and Historic Resources <http://www.sdcounty.ca.gov/dplu/procguid.html>, a Cultural Resource Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The Project Archaeologist and Luiseno Native American Monitor shall monitor the original cutting of previously undisturbed deposits in all areas identified for development including off-site improvements. The archaeological grading monitoring program shall comply with the following requirements during earth-disturbing activities:

a. During the original cutting of previously undisturbed deposits, the Project Archaeologist and Luiseno Native American Monitor shall be onsite as determined necessary by the Project Archaeologist. Inspections will vary based on the rate of excavation, the materials excavated, and the presence and abundance of artifacts and features. The frequency and location of inspections will be determined by the Project Archaeologist in consultation with the Luiseno Native American Monitor. Monitoring of the cutting of previously disturbed deposits will be determined by the Project Archaeologist in consultation with the Luiseno Native American Monitor.
b. In the event that previously unidentified potentially significant cultural resources are discovered, the Project Archaeologist or the Native American monitor, shall have the authority to divert or temporarily halt ground disturbance operations in the area of discovery to allow evaluation of potentially significant cultural resources. At the time of discovery, the Project Archaeologist shall contact the PDS Staff Archaeologist. The Project Archaeologist, in consultation with the PDS Staff Archaeologist and the Luiseno Native American monitor, shall determine the significance of the discovered resources. Construction activities will be allowed to resume in the affected area only after the PDS Staff Archaeologist has concurred with the evaluation. Isolates and clearly non-significant deposits shall be minimally documented in the field. Should the cultural materials for isolates and non-significant deposits not be collected by the Project Archaeologist, then the Native American monitor may collect the cultural material for transfer to a Tribal Curation facility or repatriation program. A Research Design and Data Recovery Program to mitigate impacts to significant cultural resources shall be prepared by the Project Archaeologist in coordination with the Luiseno Native American monitor. The County Archaeologist shall review and approve the Program, which shall be carried out using professional archaeological methods. The Research Design and Data Recovery Program shall include (1) pursuant to CEQA §21083.2(g), reasonable efforts to preserve (avoidance) "unique" cultural resources or Sacred Sites; (2) the capping of identified Sacred Sites or unique cultural resources and placement of development over the cap, if avoidance is infeasible; and (3) data recovery for non-unique cultural resources. The preferred option is preservation (avoidance).
c. "If any human remains are discovered, the Property Owner or their representative shall contact the County Coroner and the PDS Staff Archaeologist. Upon identification of human remains, no further disturbance shall occur in the area of the find until the County Coroner has made the necessary findings as to origin. If the remains are determined to be of Native American origin, the Most Likely Descendant, as identified by the Native American Heritage Commission, shall be contacted by the Property Owner or their representative in order to determine proper treatment and disposition of the remains. The immediate vicinity where the Native American human remains are located is not to be damaged or disturbed by further development activity until consultation with the MLD regarding their recommendations as required by Public Resources Code Section 5097.98 has been conducted. Public Resources Code §5097.98, CEQA §15064.5 and Health & Safety Code §7050.5 shall be followed in the event that human remains are discovered.
d. The Project Archaeologist shall submit monthly status reports to the Director of PDS starting from the date of the Notice to Proceed to termination of implementation of the grading monitoring program. The reports shall briefly summarize all activities during the period and the status of progress on overall plan implementation. Upon completion of the implementation phase, a final report shall be submitted describing the plan compliance procedures and site conditions before and after construction.

DOCUMENTATION: The applicant shall implement the archaeological grading monitoring program pursuant to this condition. TIMING: The following actions shall occur throughout the duration of the grading construction. MONITORING: The [DPW, PDCI] shall make sure that the Project Archeologist is on-site performing the monitoring duties of this condition. The [DPW, PDCI] shall contact the [PDS, PCC] if the Project Archeologist or applicant fails to comply with this condition.

(PALEONTOLOGICAL RESOURCES)

PALEO GR#2 – PALEONTOLOGICAL MONITORING: [DPW, PDCI] [PDS, PCC] [PC] [PDS, FEE X2]

INTENT: In order to comply with Mitigation Monitoring and Reporting Program pursuant to 3100-5223, and the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Paleontological Resources <http://www.sdcounty.ca.gov/dplu/procguid.html>, a Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The Project Paleontologist shall monitor During the original cutting of previously undisturbed deposits for the project, both on and off site, the Qualified Paleontological Resources Monitor shall be on-site to monitor as determined necessary by the Qualified Paleontologist. The grading monitoring program shall comply with the following requirements during grading:

a. If paleontological resources are encountered during grading/excavation, the following shall be completed:
1. The Qualified Paleontological Resources Monitor shall have the authority to direct, divert, or halt any grading/excavation activity until such time that the sensitivity of the resource can be determined and the appropriate salvage implemented.
2. The Qualified Monitor shall immediately contact the Qualified Paleontologist.
3. The Qualified Paleontologist shall contact the County's Permit Compliance Coordinator immediately.
4. The Qualified Paleontologist shall determine if the discovered resource is significant. If it is not significant, grading/excavation shall resume."
b. If the paleontological resource is significant or potentially significant, the Qualified Paleontologist or Qualified Paleontological Resources Monitor, under the supervision of the Qualified Paleontologist, shall complete the following tasks in the field:
1. Salvage unearthed fossil remains, including simple excavation of exposed specimens or, if necessary, plaster-jacketing of large and/or fragile specimens or more elaborate quarry excavations of richly fossiliferous deposits;
2. Record stratigraphic and geologic data to provide a context for the recovered fossil remains, typically including a detailed description of all paleontological localities within the project site, as well as the lithology of fossil-bearing strata within the measured stratigraphic section, if feasible, and photographic documentation of the geologic setting; and
3. Transport the collected specimens to a laboratory for processing (cleaning, curation, cataloging, etc.).

DOCUMENTATION: The applicant shall implement the grading monitoring program pursuant to this condition. TIMING: The following actions shall occur throughout the duration of the grading construction. MONITORING: The [DPW, PDCI] shall make sure that the Project Archeologist is on-site performing the Monitoring duties of this condition. The [DPW, PDCI] shall contact the [PDS, PCC] if the Project Paleontologist or applicant fails to comply with this condition.

ROUGH GRADING: (Prior to rough grading approval and issuance of any building permit).

(BIOLOGICAL RESOURCES)

BIO GR#4 – BIOLOGICAL MONITORING [PDS, FEE]

INTENT: In order to comply with the adopted Mitigation Monitoring and Reporting Program (MMRP) pursuant to PDS2001-3100-5223 and the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Biological Resources, <http://www.sdcounty.ca.gov/dplu/procguid.html> a Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The Project Biologist shall prepare and submit a final letter report substantiating his/her supervision of the grading activities and substantiating that grading did not impact additional areas of Least Bell's vireo and Southwestern willow flycatcher or other sensitive biological resources. The report shall conform to the County of San Diego Report Format Guidelines for Biological Resources <http://www.sdcounty.ca.gov/dplu/procguid.html>. It shall also include but not be limited to the following items:

a. Photos of the temporary fencing that was installed during the trenching, grading, or clearing activities.
b. Monitoring logs showing the date and time that the monitor was on site.
c. Photos of the site after the grading and clearing activities.

DOCUMENTATION: The applicant shall submit the final biological monitoring report to the [PDS, PCC] for review and approval. TIMING: Upon completion of all grading activities, and prior to Rough Grading final Inspection (Grading Ordinance SEC 87.421.a.2), <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf> the final report shall be completed. MONITORING: The [PDS, PCC] shall review the final report for compliance with the project MMRP, and inform [DPW, PDCI] that the requirement is completed.

(CULTURAL RESOURCES)

CULT #GR-3-ARCHAEOLOGICAL MONITORING [PDS, FEE]

INTENT: In order to comply with the adopted Mitigation Monitoring and Reporting Program (MMRP) pursuant to PDS2001-3100-5223, and the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Archaeological Resources, <http://www.sdcounty.ca.gov/dplu/procguid.html> an Archaeological Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The Project Archaeologist shall prepare one of the following reports upon completion of the grading activities that require monitoring:

a. If no archaeological resources are encountered during earth-disturbing activities, then submit a final Negative Monitoring Report substantiating that earth-disturbing activities are completed and no cultural resources were encountered. Archaeological monitoring logs showing the date and time that the monitor was on site and any comments from the Luiseno Native American monitor must be included in the Negative Monitoring Report.
b. If archaeological resources were encountered during the earth-disturbing activities, the Project Archaeologist shall provide an Archaeological Monitoring Report stating that the field monitoring activities have been completed, and that resources have been encountered. The report shall detail all cultural artifacts and deposits discovered during monitoring and the anticipated time schedule for completion of the curation phase of the monitoring.

DOCUMENTATION: The applicant shall submit the Archaeological Monitoring report to the [PDS, PCC] for review and approval. TIMING: Upon completion of all earth-disturbing activities, and prior to Rough Grading final Inspection (Grading Ordinance SEC 87.421.a.2 <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf>), the report shall be completed. MONITORING: The [PDS, PCC] shall review the report or field monitoring memo for compliance with the project MMRP, and inform [DPW, PDCI] that the requirement is completed.

(PALEONTOLOGICAL RESOURCES)

PALEO GR#3 – PALEONTOLOGICAL MONITORING: [PDS, PCC] [RG, BP] [PDS, FEE].
INTENT: In order to comply with the adopted Mitigation Monitoring and Reporting Program (MMRP) pursuant to PDS2001-3100 5223, and the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Paleontological Resources, <http://www.sdcounty.ca.gov/dplu/procguid.html> a Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The Project Paleontologist shall prepare one of the following letters upon completion of the grading activities that require monitoring:

a. If no paleontological resources were discovered, submit a "No Fossils Found" letter from the grading contractor to the [PDS, PCC] stating that the monitoring has been completed and that no fossils were discovered, and including the names and signatures from the fossil monitors. The letter shall be in the format of Attachment E of the County of San Diego Guidelines for Determining Significance for Paleontological Resources.
b. If Paleontological resources were encountered during grading, a letter shall be prepared stating that the field grading monitoring activities have been completed, and that resources have been encountered. The letter shall detail the anticipated time schedule for completion of the curation phase of the monitoring.

DOCUMENTATION: The applicant shall submit the letter report to the [PDS, PCC] for review and approval. TIMING: Upon completion of all grading activities, and prior to Rough Grading final Inspection (Grading Ordinance SEC 87.421.a.2) <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf>, the letter report shall be completed. MONITORING: The [PDS, PCC] shall review the final negative letter report or field monitoring memo for compliance with the project MMRP, and inform [DPW, PDCI] that the requirement is completed.

FINAL GRADING RELEASE: (Prior to any occupancy, final grading release, or use of the premises in reliance of this permit).

(BIOLOGICAL RESOURCES)

BIO GR#5 – OPEN SPACE SIGNAGE & FENCING [PDS, FEE]

INTENT: In order to comply with Condition BIO# 4, 5 pursuant to the adopted Mitigation Monitoring and Reporting Program (MMRP) for PDS2001-3100-5223, the fencing and signage shall be installed. DESCRIPTION OF REQUIREMENT: The permanent fences or walls, and open space signs shall be placed along the open space boundary of lots(s) 12-24, 17-20, 23-36, and 45 as shown on Figure 5 – Open Space, Fencing, and Signage Exhibit of the approved Biological Resources Survey Report for the Shadow Run Ranch Project, prepared by Vincent Scheidt.

a. Evidence shall be site photos and a statement from a California Registered Engineer, or licensed surveyor that the permanent walls or fences, and open space signs have been installed.
b. The signs must be corrosion resistant, a minimum of 6" x 9" in size, on posts not less than three (3) feet in height from the ground surface, and must state the following:

Sensitive Environmental Resources
Area Restricted by Easement
Entry without express written permission from the County of San Diego
is prohibited. To report a violation or for more information about easement
restrictions and exceptions contact the County of San Diego,
Planning & Development Services
Reference: (PDS2001-3100 5223, Env. Log. 3910-00-02-035)

DOCUMENTATION: The applicant shall install the fencing and signage and provide the documentation photos and certification statement to the [PDS, PCC]. TIMING: Prior to the occupancy of any structure or prior to Final Grading Release (Grading Ordinance Sec. 87.421.a.3) <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf> the fencing and signage shall be installed. MONITORING: The [PDS, PCC] shall review the photos and statement for compliance with this condition.

BIO GR#6 – EASEMENT AVOIDANCE [PDS, FEE]

INTENT: In order to protect sensitive resources, pursuant to County Grading Ordinance Section 87.112 <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf> the open space easements shall be avoided. DESCRIPTION OF REQUIREMENT: The easement indicated on this plan is for the protection of native habitat within Frey creek that is a sensitive environmental resources and prohibits all of the following on any portion of the land subject to said easement: grading; excavation; placement of soil, sand, rock, gravel, or other material; clearing of vegetation; construction, erection, or placement of any building or structure; vehicular activities; trash dumping; or use for any purpose other than as open space. It is unlawful to grade or clear within an open space easement; any disturbance shall constitute a violation of the County Grading Ordinance Section 87.112 <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf> and will result in enforcement action and restoration. DOCUMENTATION: The applicant shall provide a letter statement to the [PDS, PCC] stating that all Sensitive Resource Easements were avoided during the grading construction, and that no impacts or encroachment into the open space occurred. TIMING: Prior to Final Grading Release the letter verifying the easements were not disturbed shall be submitted. MONITORING: The [DPW, PDCI] shall not allow any grading, clearing or encroachment into the open space easement."

(CULTURAL RESOURCES)

CULT #GR-4-ARCHAEOLOGICAL MONITORING [PDS, FEE]

INTENT: In order to comply with the adopted Mitigation Monitoring and Reporting Program (MMRP) pursuant to PDS2001-3100-5223, and the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Archaeological Resources <http://www.sdcounty.ca.gov/dplu/procguid.html>, an Archaeological Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The Project Archaeologist shall prepare a final report that documents the results, analysis, and conclusions of all phases of the Archaeological Monitoring Program if cultural resources were encountered during earth-disturbing activities. The report shall include the following:

a. Department of Parks and Recreation Primary and Archaeological Site forms.
b. Daily Monitoring Logs
c. Evidence that all prehistoric cultural resources collected during the archaeological grading monitoring program have been submitted to a San Diego curation facility or a culturally affiliated Tribal curation facility that meets federal standards per 36 CFR Part 79, and, therefore, would be professionally curated and made available to other archaeologists/researchers for further study. The collections and associated records, including title, shall be transferred to the San Diego curation facility and shall be accompanied by payment of the fees necessary for permanent curation. Evidence shall be in the form of a letter from the curation facility stating that archaeological materials have been received and that all fees have been paid.

Evidence that all historic cultural resources collected during the archaeological grading monitoring program have been submitted to a San Diego curation facility that meets federal standards per 36 CFR Part 79, and, therefore, would be professionally curated and made available to other archaeologists/researchers for further study. The collections and associated records, including title, shall be transferred to the San Diego curation facility and shall be accompanied by payment of the fees necessary for permanent curation. Evidence shall be in the form of a letter from the curation facility stating that archaeological materials have been received and that all fees have been paid.

d. If no cultural resources are discovered, a brief letter to that effect must be submitted stating that the archaeological grading monitoring activities have been completed. Daily Monitoring Logs must be submitted with the negative monitoring report.

DOCUMENTATION: The applicant shall submit the report to the [PDS, PCC] for review and approval. Once approved, a final copy of the report shall be submitted to the South Coastal Information Center (SCIC) and the culturally-affiliated Tribe. TIMING: Prior to the occupancy of any structure or use of the premises in reliance of PDS2000-3300-030, and prior to Final Grading Release (Grading Ordinance Sec. 87.421.a.3 <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf>), the final report shall be completed. MONITORING: The [PDS, PCC] shall review the final report for compliance with the project MMRP and the report format guidelines. Upon acceptance of the report, [PDS, PCC] shall inform [PDS, LDR] and [DPW, PDCI] that the requirement is complete and the bond amount can be relinquished. If the monitoring was bonded separately, then [PDS, PCC] shall inform [PDS or DPW FISCAL] to release the bond back to the applicant.

(PALEONTOLOGICAL RESOURCES)

PALEO GR#5 – PALEONTOLOGICAL MONITORING: [PDS, PCC] [RG, BP] [PDS, FEE].
INTENT: In order to comply with the adopted Mitigation Monitoring and Reporting Program (MMRP) pursuant to PDS2001-3100 5223, and the County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements for Paleontological Resources <http://www.sdcounty.ca.gov/dplu/procguid.html>, a Grading Monitoring Program shall be implemented. DESCRIPTION OF REQUIREMENT: The Project Paleontologist shall prepare a final report that documents the results, analysis, and conclusions of all phases of the Paleontological Monitoring Program if resources were encountered during grading. The report shall include the following:

a. If paleontological resources were discovered, the Following tasks shall be completed by or under the supervision of the Project Paleontologist:
1. Prepare collected fossil remains for curation, to include cleaning the fossils by removing the enclosing rock material, stabilizing fragile specimens using glues and other hardeners, if necessary, and repairing broken specimens;
2. Curate, catalog and identify all fossil remains to the lowest taxon possible, inventory specimens, assigning catalog numbers, and enter the appropriate specimen and locality data into a collection database;
3. Submit a detailed report prepared by the Project Paleontologist in the format provided in Appendix D of the County of San Diego's Guidelines for Determining Significance for Paleontological Resources and identifying which accredited institution has agreed to accept the curated fossils. Submit TWO hard copies of the final Paleontological Resources Mitigation Report to the Director of PDS for final approval of the mitigation, and submit an electronic copy of the complete report in Microsoft Word on a CD. In addition, submit one copy of the report to the San Diego Natural History Museum and one copy to the institution that received the fossils.
4. Transfer the cataloged fossil remains and copies of relevant field notes, maps, stratigraphic sections, and photographs to an accredited institution (museum or university) in California that maintains paleontological collections for archival storage and/or display, and submit Proof of Transfer of Paleontological Resources, in the form of a letter, from the director of the paleontology department of the accredited institution to the Director of PDS verifying that the curated fossils from the project site have been received by the institution."
b. If no resources were discovered, a brief letter to that effect and stating that the grading monitoring activities have been completed, shall be sent to the Director of Planning and Land Use by the Project Paleontologist.

DOCUMENTATION: The applicant shall submit the letter report to the [PDS, PCC] for review and approval. TIMING: Prior to the Final Grading Release (Grading Ordinance Sec. 87.421.a.3) <http://www.sdcounty.ca.gov/dpw/docs/propgradord.pdf>, the final report shall be completed. MONITORING: The [PDS, PCC] shall review the final report for compliance with the project MMRP, and inform [DPW, PDCI] that the requirement is completed."

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CALIF. COORD. INDEX: 427-1764

ATTACHMENT – 2

1,000 YR. RESERVOIR CALCULATIONS

For
SHADOW RUN RANCH

TM 5223

Preparation/Revision Date:

November 25, 2013

Prepared for:

Sherrill Ann Schoepe, General Partner

Shadow Run Ranch, LLC

P.O. Box 1249

Pauma Valley, CA 92061

Telephone: (760) 742-1893

Prepared by:

Masson & Associates, Inc.

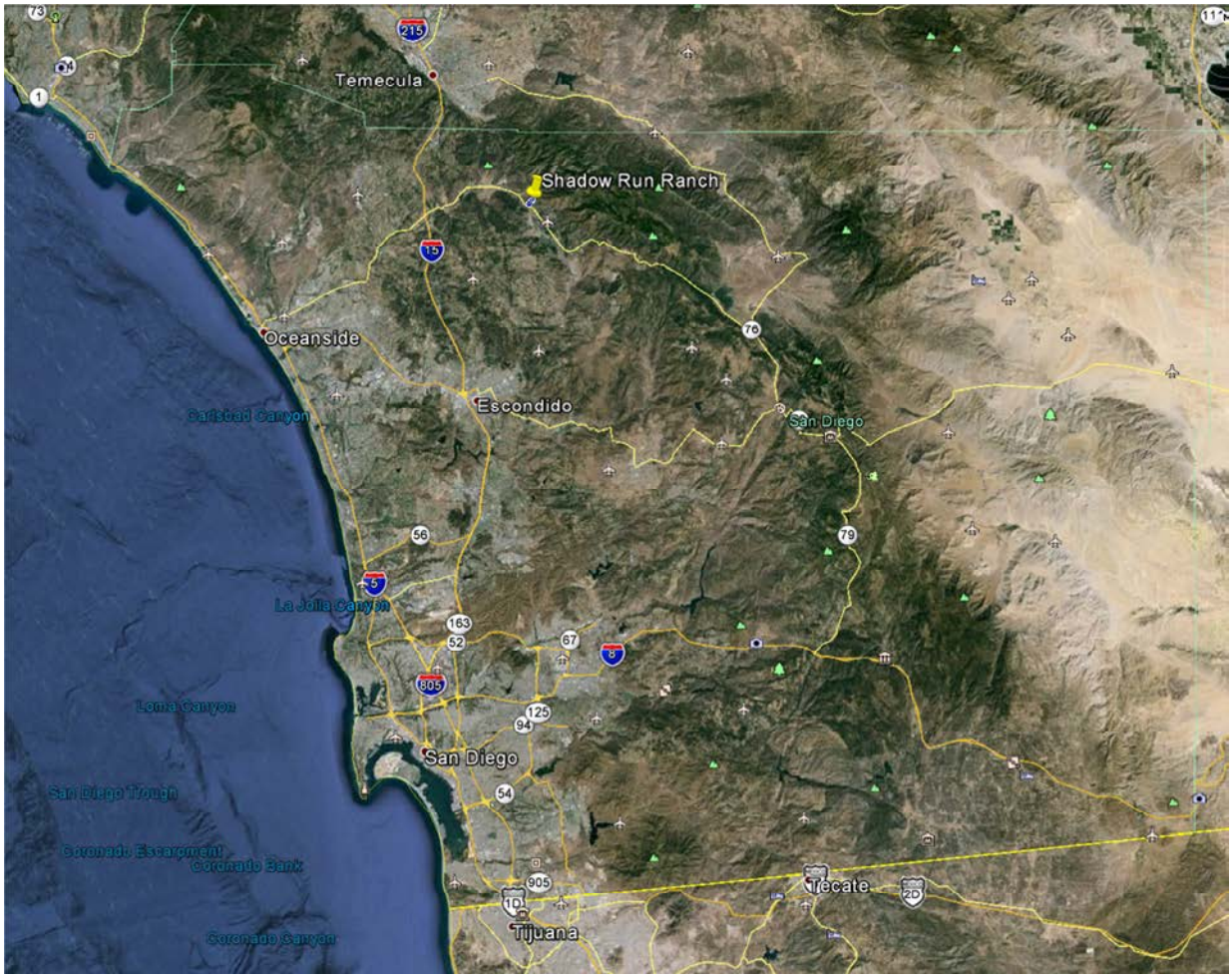
200 East Washington Avenue, Suite 200

Escondido, CA 92025

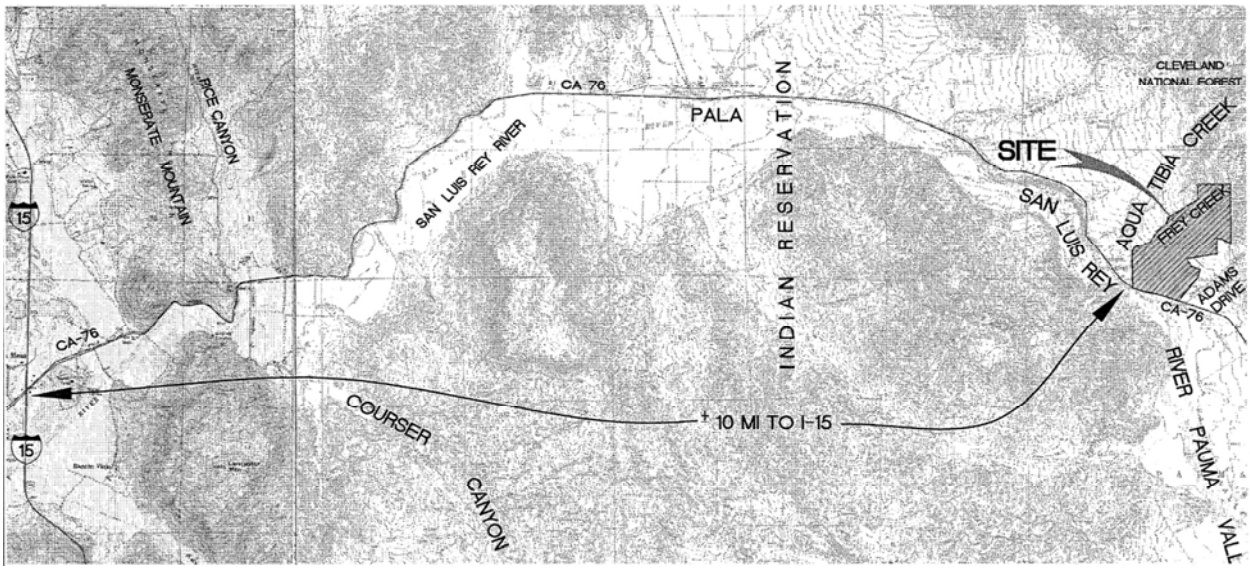
Telephone: (760) 741-3570

Tuesday, November 26, 2013

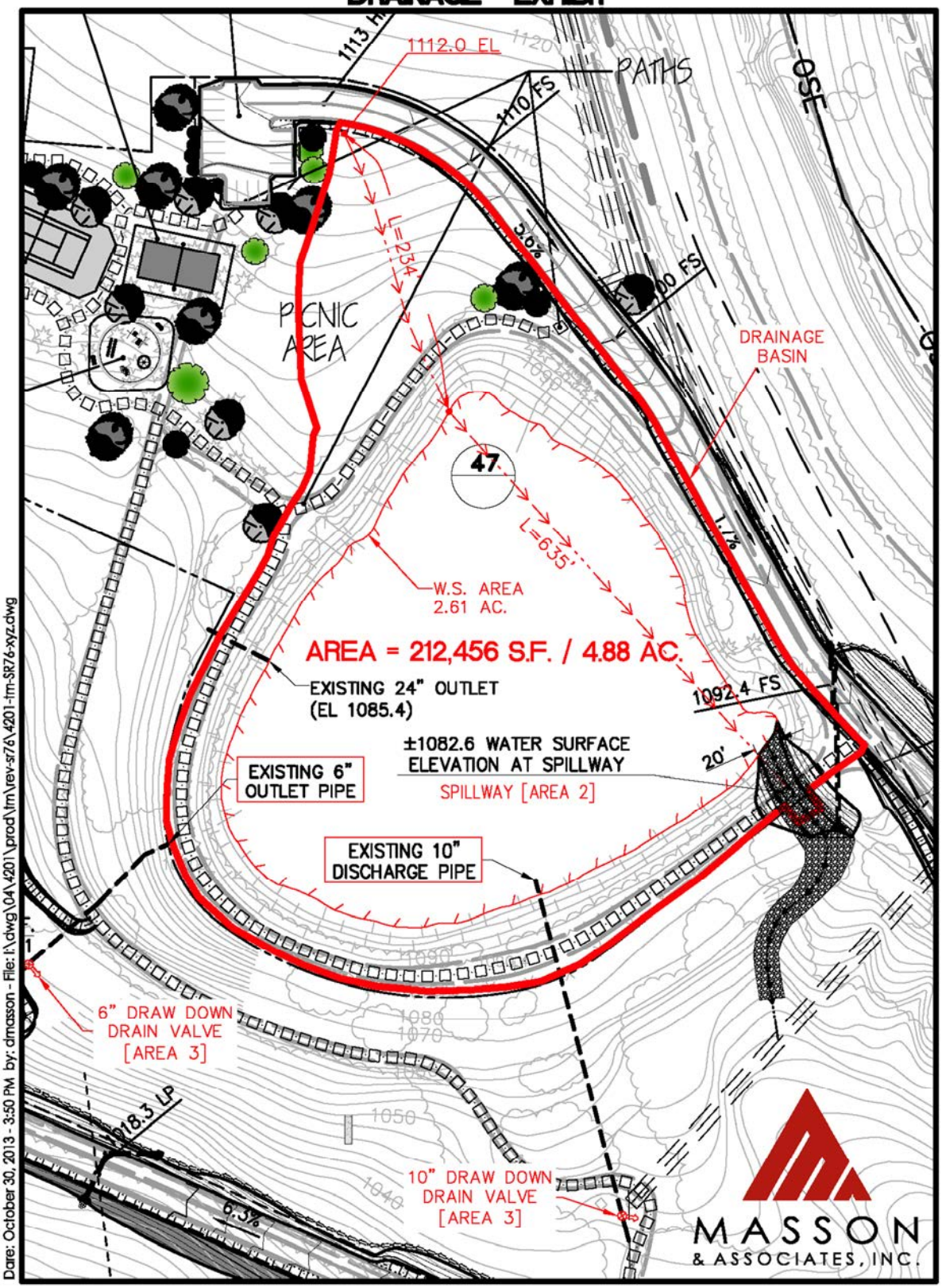
Regional map:



Project location Map:



DRAINAGE - EXHIBIT



MASSON & ASSOCIATES, INC.

PROJECT NO.:
DESCRIPTION:
CALCULATED BY: DATE:
CHECKED BY: DATE:
SHEET OF
SCALE:

Calculating Q for 1000 years

soil Type D ⇒ C = 0.35 From Table 3.1, A = 4.88 Ac

$T_c = T_i + T_t$

$T_i = 6.9$ min from Table 3.2 (for 10% slope, slope on site is around 12%)

$T_t = 0$ ∴ $T_c = 6.9$ min

By calculation Q for years 2, 5, 10, 25, 50, 100, we will find the fraction for Q between $Q_{2,5,10,25,100}$ to Estimate the Q_{1000}

year 2

$P_6 = 1.68$ in $P_{24} = 2.7$ in $\frac{P_6}{P_{24}} = \frac{1.68}{2.7} \times 100 = 62\%$ ✓ ∴ $P_6 = 1.68$ in

∴ $I = 3.7$ in/hr (From figure 3.1)

$Q_2 = CIA$ $Q_2 = 0.35 \times 3.7 \times 4.88 = 6.3$ cfs

year 5

$P_6 = 2.2$ in $P_{24} = 4.1$ in $\frac{P_6}{P_{24}} = \frac{2.2}{4.1} \times 100 = 53.7\%$ ✓ ∴ $P_6 = 2.2$ in

∴ $I = 4.4$ in/hr (figure 3.1)

$Q_5 = CIA$ $Q_5 = 0.35 \times 4.4 \times 4.88 = 7.5$ cfs

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CALCULATED BY: DATE:
CHECKED BY: DATE:
SHEET OF
SCALE:

Year 10

$P_6 = 2.43$ in $P_{24} = 5.2$ in $\frac{P_6}{P_{24}} = \frac{2.43}{5.2} \times 100 = 46.7\%$ ✓ $\therefore P_6 = 2.43$ in

$I = 4.8$ in/hr (Figure 3.1)

$Q_{10} = CIA$ $Q_{10} = 0.35 \times 4.8 \times 4.88 = 8.2$ cfs

Year 25

$P_6 = 2.9$ in $P_{24} = 5.6$ in $\frac{P_6}{P_{24}} = \frac{2.9}{5.6} \times 100 = 51.8\%$ ✓ $\therefore P_6 = 2.9$

$I = 5.8$ in/hr (Figure 3.1)

$Q_{25} = CIA$ $Q_{25} = 0.35 \times 5.8 \times 4.88 = 9.9$ cfs

Year 50

$P_6 = 2.3$ in $P_{24} = 6.7$ in $\frac{P_6}{P_{24}} = \frac{2.3}{6.7} \times 100 = 49.3\%$ ✓ $\therefore P_6 = 3.3$ in

$I = 6.8$ in/hr (Figure 3.1)

$Q_{50} = CIA$ $Q = 0.35 \times 6.8 \times 4.88 = 11.6$ cfs

Year 100

$P_6 = 3.7$ in $P_{24} = 7.5$ in $\frac{P_6}{P_{24}} = \frac{3.7}{7.5} \times 100 = 49.3\%$ ✓ $\therefore P_6 = 3.7$ in

$I = 7.7$ in/hr (Figure 3.1)

$Q_{100} = CIA$ $Q_{100} = 0.35 \times 7.7 \times 4.88 = 13.2$ cfs

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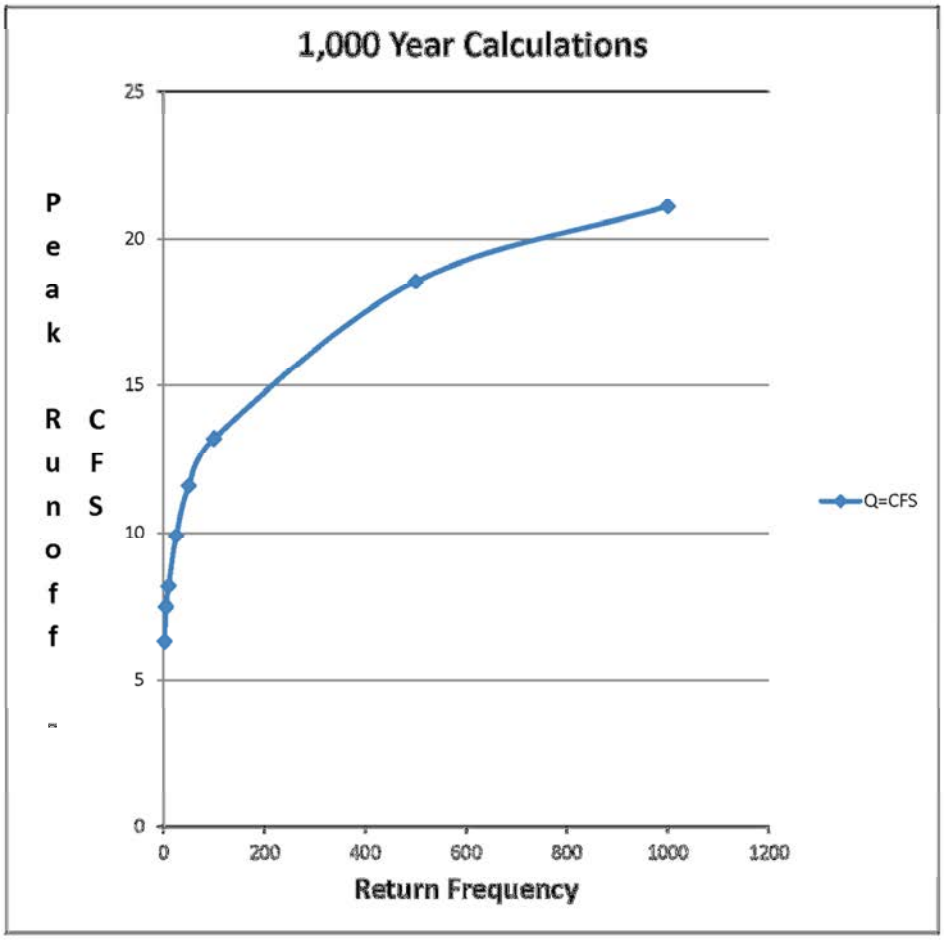
Yr	Q=CFS
2	6.3
5	7.5
10	8.2
25	9.9
50	11.6
100	13.2
500	18.56
1000	21.1



Methodology:

The peak runoff for the 2, 5, 10, 25, 50 and 100 year frequency storms have been calculated on the previous page and summarize on this page, in accordance with the requirements of the County of San Diego Hydrology Manual. The relationship between the values of the storms remains fairly consistent. The relationship between runoff intensity / flow is 1.6:1 for storm frequencies that have a return frequency that is 10:1. For example:

The flow for a 50 year storm is 1.6 times the flow rate for a 5 year storm and the flow rate for a 100 year storm is 1.6 times the flow rate for a 10 year storm.

Using this relationship we can extrapolate and calculate the peak flow rate for a 1000 year storm, which would be 1.6 times the 100 year storm (or 21.1 cfs).

page (4)

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PROJECT NO.:
DESCRIPTION:
CALCULATED BY: DATE:
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SCALE:

We calculation Q fraction between 50/5 , 100/10 to find out fraction between 1000/100 :

$\frac{50}{5} = \frac{116}{75} = 1.55$ $\frac{100}{10} = \frac{13.2}{8.2} = 1.6$

$\Rightarrow Q_{1000} = 13.2 \times 1.6 = 21.1$ cfs

We use weirs equation for trapezoidal cross section to find H in feet:

$Q = CLH^{3/2}$ $H = \left(\frac{Q}{CL}\right)^{2/3} = \left(\frac{21.1}{3.1 \times 2.0}\right)^{2/3} = 0.5$ ft

for C value please refer to table 5.9 from Handbook of Hydraulics (Brater and King)

Therefore, we have shown that the spillway is more than sufficient to convey the 1000 year storm.

ATTACHMENT – 3

MASSON
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May 31, 2013

Sherrill Schoepe
Shadow Run Ranch, LLC
Post Office Box 1249
Pauma Valley, CA 92061

RE: Scoping letter comment DPLU 20-5

Dear Ms. Schoepe:

This letter is to address DPLU Comment #20-5, in the County of San Diego EIR Scoping Letter dated December 14, 2012, it states:

> Page 6-7, Other Hazards. The geotechnical report states that the project drainage system should be checked for its ability to handle short-term, concentrated flows if significant reservoir overtopping were to occur during an earthquake. Please include an addendum to the geotechnical report which provides a detailed evaluation of the project drainage system and whether it can handle short-term concentrated flows if significant reservoir overtopping were to occur. The addendum should consider the worst case scenario of failure of the existing reservoir embankment in its evaluation. The addendum should include specific design measures as necessary to dissipate and/or divert flows to levels that ensure the safety of all proposed house pads to be placed below the dam. The addendum shall include the following concluding statement and must be signed and stamped by a California Certified Engineering Geologist and if necessary a California Licensed Civil Engineer: "Based on the available information described in this addendum, it is the opinion of the undersigned, that the measures described herein are sufficient to assure the house pads would be safe from the potential effects of dam inundation at the site." 12/14/2012 2nd Request. This comment was not addressed.

Per this request we have looked into the proposed downstream drainage system and have determined that the proposed downstream drainage system is sized appropriately to convey the water outlined in the seiche overtopping scenario italicized below for the short term concentrated flow.

> *From URS - We modeled the reservoir water level like a seiche, with a 1-ft wave running up the inner slope of the reservoir. Based on this we estimate the reservoir could overflow (or overtop) at a rate of about 0.2 ft3/ft-sec.*

The area of most concern is the southwesterly portion of the reservoir facing the proposed project. This area has a total overtopping rate of 62 cfs. This area is upstream from a proposed 1,415 s.f. hydro-modification basin 2A.1. HMP basin 2A.1 has been designed to accommodate water storage of 1,179 cubic feet, which is several times the amount of the overtopping volume. This basin has a 36" stand pipe and an outlet flow capacity of 24 cfs. Therefore, the overtopping flows would not exceed the original design capacity of the proposed drainage system.

Solved.

With regard to the worst case scenario of failure, by piping, we reference the URS letter dated May 22, 2013 which includes a proposal for a synthetic liner system. Preliminary recommendations for the liner, based on input from URS and liner manufacturers, are attached. In our opinion, a properly designed and installed impervious liner system would be sufficient to mitigate the hazard of piping related seepage from the reservoir.

Sincerely,

Bruce A. Tait, QSP/QSD
Director of Engineering

Cc: David Schug
Cc: Robert Hingtgen

ATTACHMENT – 4

N/A

OPERATION & MAINTENANCE PLAN

For
SHADOW RUN RANCH

TM 5223

Preparation/Revision Date:

November 21, 2013

May 19, 2014

Prepared for:

Sherrill Ann Schoepe, General Partner

Shadow Run Ranch, LLC

P.O. Box 1249

Pauma Valley, CA 92061

Telephone: (760) 742-1893

Prepared by:

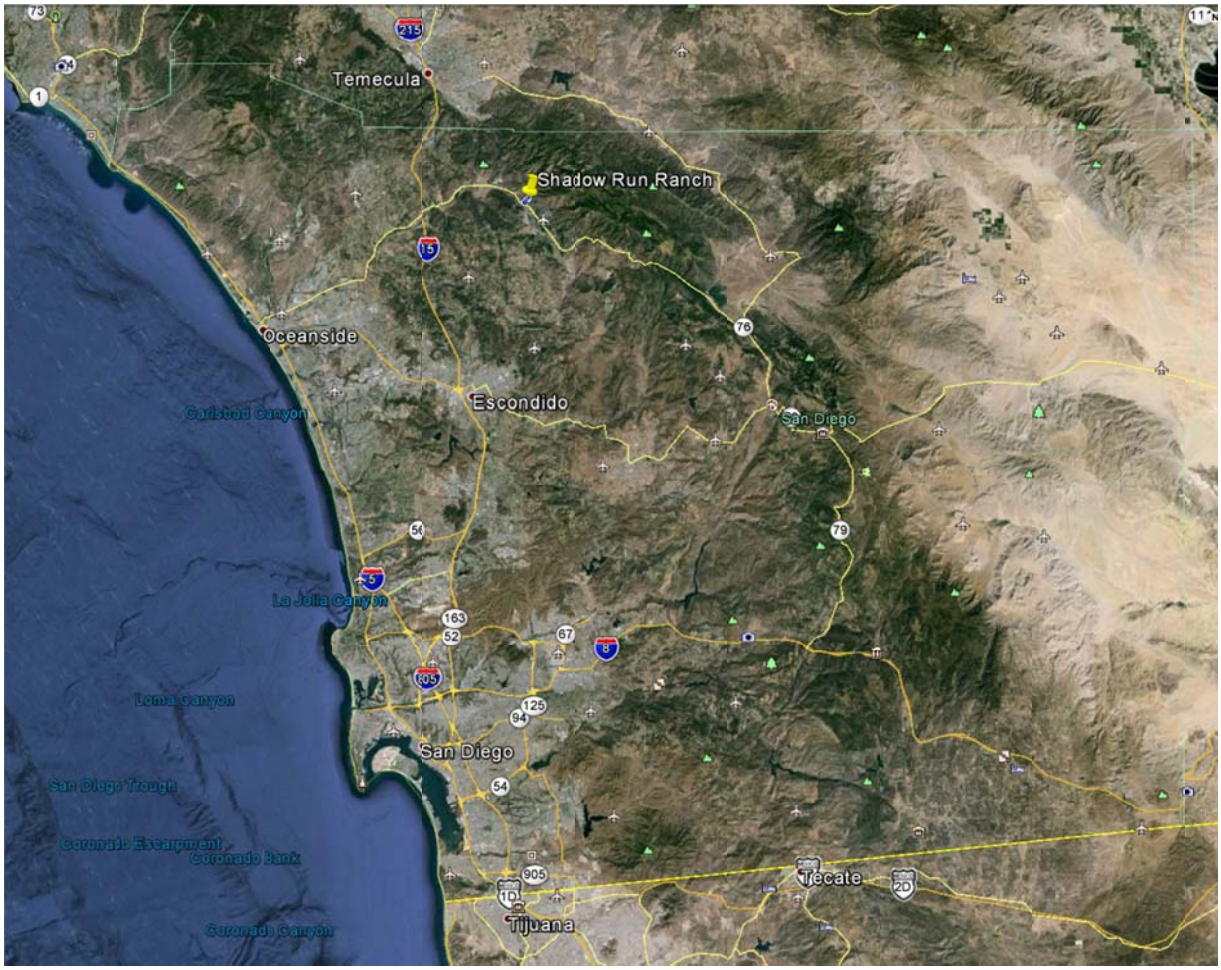
Masson & Associates, Inc.

200 East Washington Avenue, Suite 200

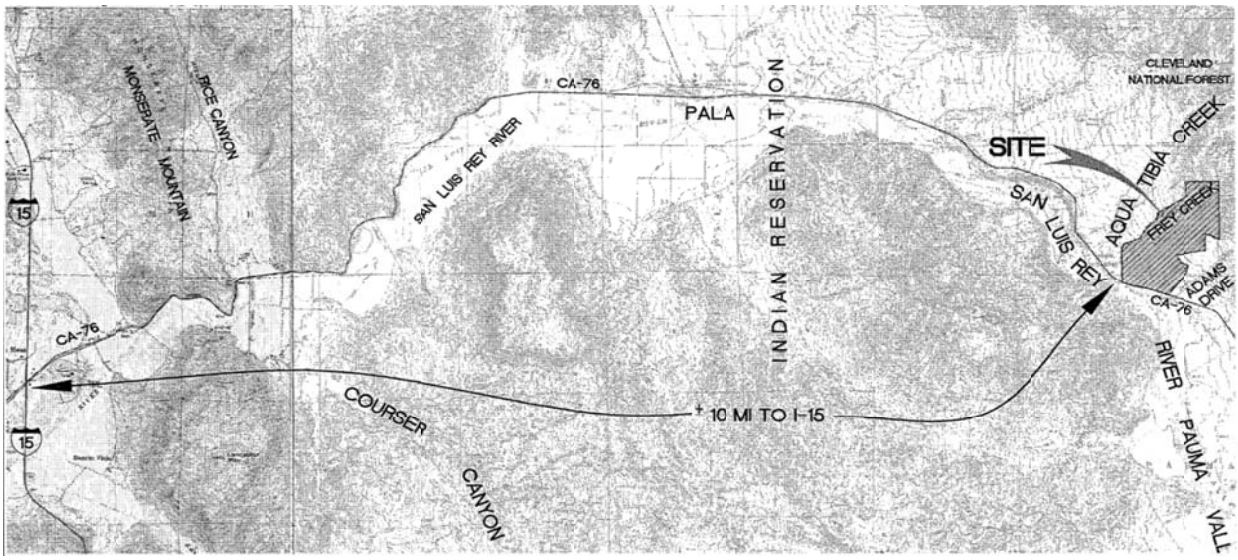
Escondido, CA 92025

Telephone: (760) 741-3570

Regional map:



Project location Map:



Reservoir area:

1.0 Purpose of Document

The proposed project's HOA, County of San Diego as well as the ongoing agricultural operations and future home owners of the project are stakeholders in this Operations and Maintenance Plan (O&M). The following is an outline of the system and elements affected by this O&M. The operation and maintenance of the existing reservoir are the responsibility of the project proponent and their successors in title. The operation and maintenance associated with the existing reservoir are discussed below. The discussion includes a routine action, maintenance indicator, field observation methods, frequency, and maintenance activity. Costs associated with each activity are included. The scope and purpose of this O&M is to ensure the operational items associated with the existing reservoir are working properly and the safety and stability of the reservoir are maintained at optimum working levels.

The Four primary maintenance areas for the reservoir are as follows:

1. Reservoir embankment [AREA 1]
    a. Stability
    b. Landscaping
    c. Irrigation
    d. Burrowing animals
2. Reservoir spillway [AREA 2]
    a. Stability
    b. Energy dissipaters
    c. Scour
3. Reservoir drain lines [AREA-3]
    a. Pipeline condition
    b. Shutoff valves
    c. Drain valves
4. Monitoring wells [AREA-4]
    a. Depth to ground water

The landscape architect should choose plant coverage for slope protection and erosion control along the outer edge of the reservoir embankment that will be high in erosion control value with shallow root systems and which will deter small burrowing animals. The reservoir slope embankment shall be watered sparingly to maintain landscape coverage for erosion control.

2.0 Facilities and Resources

The facilities and resources identified to be managed and inspected are shown above and attached as graphic **EXHIBIT "A" - "RESERVOIR AREAS".** The management and inspection of the reservoir will be the responsibility of the ownership of the recreational open space lot 47 of TM 5223 (the homeowners association (HOA)). The property manager(s) of the HOA shall at all times have a qualified grove manager(s) that will be employed by said HOA and have a set number of hours dedicated monthly to inspect and fill out inspection reports in

conformance with this Operations and Maintenance Plan. The Grove Manager will receive on-site training in the proper maintenance and repair of the facility. The HOA shall dedicate $6,000 yearly and have a reserve fund to anticipate any startup and ongoing maintenance of the reservoir systems. Additionally the reservoir shall be inspected by a registered Civil Engineer or registered Geologist on a yearly basis for any additional recommendations.

3.0 Operations

The goal of this O&M is to ensure safety and operational conditions of all reservoir systems on a monthly basis. This includes; testing the valves on the two (2) 6" irrigation/down drain lines and the one (1) 10" down drain line. These valves and pipes shall be maintained and operational so that they can be utilized in case of an emergency to drawdown ½ the reservoir capacity within 7 days, and completely drain the reservoir within 20 days.

The report shall contain, at a minimum, the following items: Example inspection report attached as Exhibit "B".

Inspection Protocol: Inspections will include:

- Date of inspection
- Reservoir level
- Water use in previous month
- Note any unusual signs of changed water levels
- Condition of the spillway
- Check scour and erosion
- Condition of the 6" drain line
- Condition of the 10" drain line
- Overall embankment stability
- Any signs of slope movement
- Any signs of seepage around or below reservoir
- Any rock falls nearby
- Vegetation control
- Control of burrowing animals
- Irrigation control
- Three existing monitoring wells

Inspections:

The grove manager shall visually inspect on a monthly basis, the entire slope embankment [Area 1] of the reservoir including the spillway [Area 2] looking for any settlement, surface cracking, burrowing animals, overwatering and seepage. In addition the (2) 6" drain line pipes and (1) 10" drain line pipe [Area 3] shall be tested monthly, to ensure the valves and drain capacities are working properly.

On a monthly basis, or if an earthquake is felt at or near the reservoir (as outlined below), measure and record the depth to groundwater in the three existing monitoring wells at the top of the reservoir embankment [Area 4]. The HOA shall be notified immediately if any substantially changed groundwater levels are indicated. The reports shall be submitted to the HOA and COSD within 10 working days of the date of the inspection and will be filed in the HOA manager's office and shall be stored for 5 years.

Special inspections:

If an earthquake occurs at or near the reservoir, or has been reported to occur, within the following criteria, immediate inspection shall be required:

- $M \geq 4.0$ w/in 25 miles,
- $M \geq 5.0$ w/in 50 miles,
- $M \geq 6.0$ w/in 75 miles,
- $M \geq 7.0$ w/in 125 miles,
- $M \geq 8.0$ w/in 200 miles,

If such an earthquake occurs, the following items shall be inspected and reported upon:

- Date of inspection
- Reservoir level
- Water use in previous month
- Note any unusual signs of changed water levels
- Condition of the spillway
- Check scour and erosion
- Condition of the 6" drain line
- Condition of the 10" drain line
- Overall embankment stability
- Any signs of slope movement
- Any signs of seepage around or below reservoir
- Any rock falls nearby
- Vegetation control
- Control of burrowing animals
- Irrigation control
- Three existing monitoring wells

Repairs recommended in the inspection reports shall be accomplished within: 10 working days, or immediately for repairs that are mandated by reservoir stability issues.

4.0 Maintenance / Repair

IMPLEMENTATION AND MAINTENANCE REQUIREMENTS

The primary maintenance requirements for the reservoir are as follows:

- Weed, prune, and water, especially during plant establishment
- Keep landscape healthy and clean
- The grounds, consisting of the inner embankment and the perimeter pad, shall be free of large deep rooted trees and bushes
- Maintain control of small burrowing animals
- When encountered burrowing animals shall be removed and any holes filled in

Aesthetic and Functional Maintenance:

Aesthetic maintenance is important for public acceptance of facilities. Functional maintenance is important for performance and safety reasons.

Both forms of maintenance will be combined into overall system maintenance.

Aesthetic Maintenance

The following activities will be included in the aesthetics maintenance program:

- Replace dead or dying plants.
- Weed Control.
- Weeds will be removed through mechanical means.
- Herbicide will not be used because these chemicals impact the water quality.
- Prune overgrown plants.

Functional Maintenance

Components of a Functional Maintenance program include Preventive Maintenance and Corrective Maintenance.

a. **Preventive Maintenance -** Preventive maintenance activities to be instituted are:

- Trash and Debris. During each inspection, debris and trash removal will be conducted.
- Down drain outlet piping: Visual inspection of (2) 6" drain line pipes and (1) 10" drain line pipe shall be inspected and checked for leaking and or corrosive condition.
- Test down drain system. During each inspection, each down drain pipe shall be tested. Open valves and check valves and piping for any leaking.

- Sediment Removal. Sediment accumulation, as part of the operation and maintenance program at the spillway, will be monitored quarterly during the dry season, and after every large storm (0.50 inch), and monthly during the wet season. If accumulation of debris or sediment is determined to cause of decline in design performance, prompt action (i.e., within ten working days) will be taken to restore to design performance standards. Actions will include removal of sediment. Characterization and appropriate disposal of sediment will comply with applicable local, county, state, or federal requirements.
- Removal of Standing Water - Standing water must be removed if it contributes to the development of aquatic plant communities or mosquito breeding areas. Water standing for more than 96 hours will be removed.
- Fertilization – Any vegetation seed mix will be designed so that fertilization and irrigation (after establishment of the planting) is not necessary. Fertilizers will not be used to maintain the vegetation.
- On a monthly basis, and if an earthquake is felt at or near the reservoir (as outlined above) measure and record the depth to groundwater in the three existing monitoring wells at the top of the reservoir embankment. Notify the HOA and the Geotechnical Engineer of Record immediately if any substantially changed groundwater levels are indicated.

b. **Corrective Maintenance -** Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function.

   Corrective maintenance activities include:

   - Removal of Debris and Sediment - Sediment, debris and trash, which impede the hydraulic functioning of reservoir spillway and vegetative growth, will be removed and properly disposed.
   - Down drain outlet piping – two (2) 6" drain line pipes and one (1) 10" drain line pipe. Paint exposed piping, poly-wrap pipe protection if necessary, replace damaged sections.
   - Test down drain system. Replace valves if necessary.
   - Embankment and Slope Repairs – Damaged to slopes and embankments will be evidenced by erosion or collapsed surface areas. Once deemed necessary, damage to the slopes of the reservoir embankment will be repaired (within 10 working days).
   - Erosion Repair – Erosion will be evident by rills or small gullies in the surfaces of the reservoir embankment slope. Corrective steps will be taken to prevent loss of soil and any subsequent danger to the performance of the reservoir embankment. There are a number of corrective actions that can be taken. These include temporary measures such as erosion control blankets or reducing flow through the area. Designers or contractors will be consulted to address erosion problems if the solution is not evident.
   - Elimination of Animal Burrows - Animal burrows (evidenced by holes & mounds) will be filled and steps taken to remove the animals if burrowing

problems continue to occur (filling and compacting). If the problem persists, vector control specialists will be consulted regarding removal steps. This consulting is necessary as the threat of rabies in some areas may necessitate the animals being destroyed rather than relocated. If the reservoir embankment performance is affected, abatement will begin. Otherwise, abatement will be performed annually in September.

- General Facility Maintenance - In addition to the above elements of corrective maintenance, general corrective maintenance will address the overall facility and its associated components. If corrective maintenance is being done to one component, other components will be inspected to see if maintenance is needed.
- Replace dead or dying plant material.

Table 1: Shadow Run Ranch Reservoir Operations and Maintenance Plan Schedule

Action	Responsible Party	Frequency	Threshold for Action	Reporting Requirement
Inspect Embankment, Reservoir, Spillway	HOA, Grove Manager	Monthly or as needed	As regularly scheduled for the month or after any ground shaking, unexpected change in water level, reported change in embankment vegetation cover or report of changes by residences.	Reservoir Maintenance Record Monthly Entry or after specific incident
Inspect Embankment, Reservoir, Spillway	HOA, Geotechnical Engineer	Annually or as needed	As regularly scheduled for the year or as requested by HOA	Reservoir Maintenance Record Annual Entry or after specific call

Table 2: Observations Triggering Non-Routine Maintenance and Repairs

No.	Inspection	Procedure	Trigger	Follow-up
1	Reservoir level	Determine normal range of elevation changes considering rainfall, humidity, temperature, grove irrigation rates, etc.	If the reservoir level drops more than 15% beyond the expected amount, and there is no visible leakage or seepage, or pipe leakage, contact the Geotechnical Engineer of Record (GER) immediately.	Geotechnical Engineer of Record shall perform an inspection within 10 calendar days and determine the cause of the unexpected drop in reservoir level. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
2	Water use in previous month	_____C.F.	See Item 1, above	
3	Note any unusual signs of changed water levels		See Item 1, above	
4	Condition of the spillway	Inspect per Section 4 of the report.	If there are any cracks, or leaks in the spillway, contact the Civil Engineer of Record (CER) immediately.	The CER shall perform an inspection within 10 calendar days and determine the cause of the leaks or cracks. The CER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
5	Check scour and erosion	Inspect per Section 4 of the report.	If there is any evidence of excessive (more than 6") scour or erosion below the	The CER shall perform an inspection within 10 calendar days and determine the cause of the excessive scour or

			spillway, or on the embankment, contact the Civil Engineer of Record (CER). Otherwise, follow the procedures in Section 4 of the report.	erosion. The CER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
6	Condition of the 6” drain line	Inspect per Section 4 of the report.	If valves do not operate properly, repair or replace within 14 calendar days.	
7	Condition of the 10” drain line	Inspect per Section 4 of the report.	If valves do not operate properly, repair or replace within 14 calendar days.	
8	Overall embankment stability	Inspect per Section 4 of the report.	If there are signs of movement of the embankment, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 24 hours and determine the cause of the embankment movement. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
9	Any signs of slope movement	See Item 8, above.		

10	Any signs of seepage around or below reservoir	Inspect per Section 4 of the report.	If there are signs of excessive seepage of the embankment, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 24 hours and determine the cause of the seepage. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
11	Any rock falls nearby	Inspect per Section 4 of the report.	If the rock falls are indicative of movement of the embankment or the immediately adjacent soils or rocks, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 24 hours and determine the cause of the rockfall. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
12	Vegetation control	Inspect, maintain and repair per Section 4 of the report.		
13	Control of burrowing animals	Inspect, maintain and repair per		

		Section 4 of the report.		
14	Irrigation control	Check for overwatering.	Adjust irrigation rate.	
15	Three existing monitoring wells	Inspect, maintain and repair per Section 4 of the report. Determine the normal relationship between the water level in the wells and the reservoir.	If the water level in the wells does not follow the normal relationship between the wells and the reservoir, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 10 calendar days and determine the cause of the rockfall. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.

Regulatory Assurance

Implementation of this Operation and Maintenance plan is assured through an ongoing condition of Major Use Permit # 3300-00-030 .

Maintenance Costs

A detailed cost breakdown for the operation & maintenance of each area / system are attached and made part of this document. Total estimated annual costs for each are:

Reservoir embankment = $2000
Down drain piping = $500
Water valves = $500
Landscaping = $2000
Irrigation = $500
Burrowing animals = $500
Total ---------- $6000 yearly.

Inspection Frequency

- All items above will be monitored monthly and after every large storm (rainfall of 0.50 inch or more).
- After each seismic event as listed above.

Each inspection will be fully documented and made available upon request. Records will be kept for a minimum of 5 years.

Sherrill Schoepe Shadow Run Ranch, LLC Post Office Box 1249 Pauma Valley, CA 92061

EXHIBIT "A"

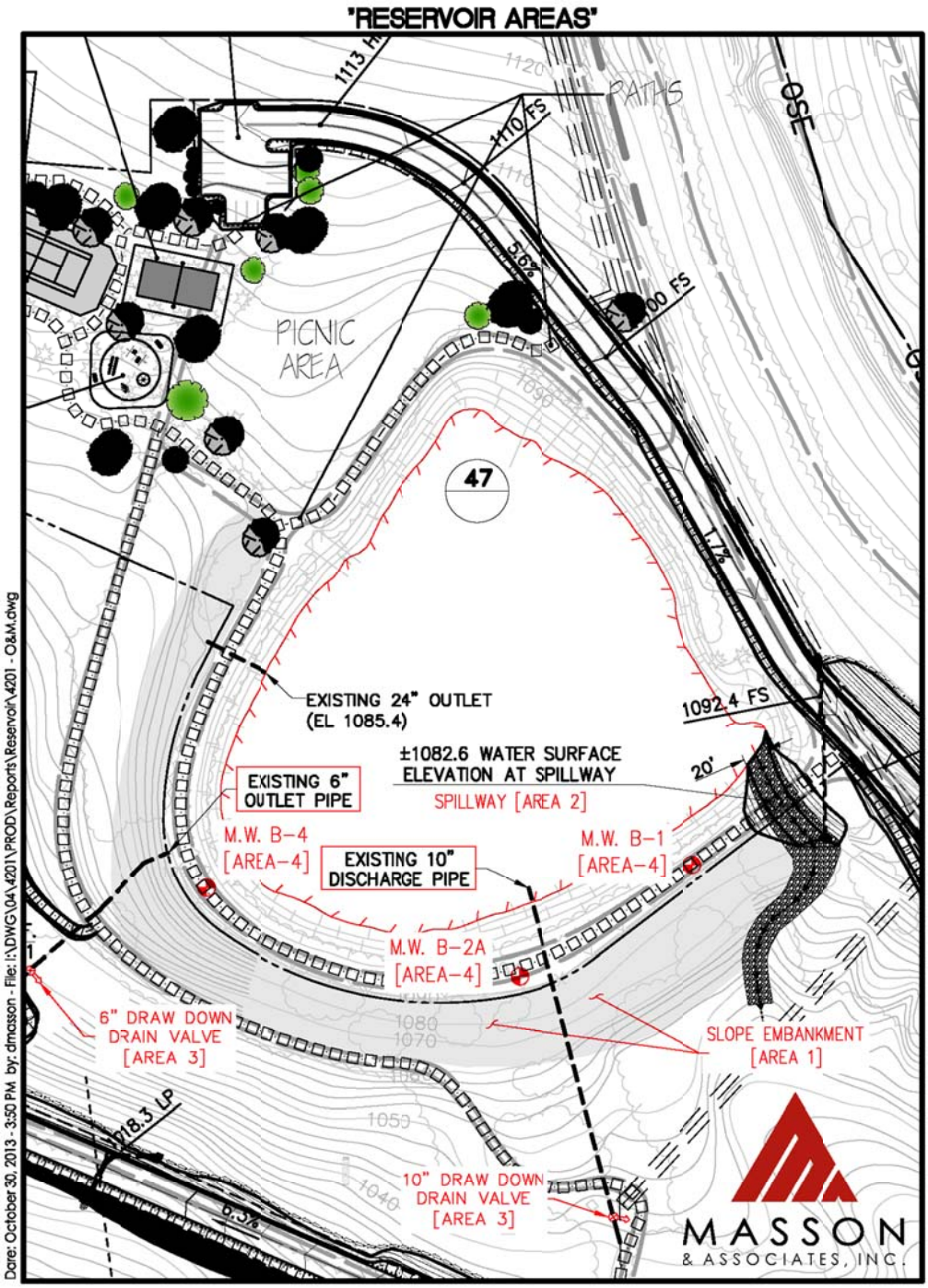

"RESERVOIR AREAS"
PICNIC AREA
PATHS
47
EXISTING 24" OUTLET (EL 1085.4)
±1082.6 WATER SURFACE ELEVATION AT SPILLWAY
SPILLWAY [AREA 2]
EXISTING 6" OUTLET PIPE
EXISTING 10" DISCHARGE PIPE
M.W. B-4 [AREA-4]
M.W. B-1 [AREA-4]
M.W. B-2A [AREA-4]
6" DRAW DOWN DRAIN VALVE [AREA 3]
10" DRAW DOWN DRAIN VALVE [AREA 3]
SLOPE EMBANKMENT [AREA 1]
1092.4 FS
1110 FS
1113 HP
18.3 LP
MASSON & ASSOCIATES, INC.
Date: October 30, 2013 - 3:50 PM by: dmasson - File: I:\DWG\04\4201\PROD\Reports\Reservoir\4201 - O&M.dwg

EXHIBIT "B"

ENGINEERS INSPECTION REPORT

OFFICE OF THE STATE ENGINEER-DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH
1313 Sherman Street, Room 818, Denver, CO 80203, (303) 866-3581

DAM NAME _____ W. DIV. _____ W. DIST. _____ DATE OF INSPECTION ___/___/___

DAM ID _____ FILE NO. C- _____ FOREST I.D. _____ DATE OF LAST INSPECTION ___/___/___

OWNER NAME _____ OWNER PHONE _____

ADDRESS _____ ZIP CODE _____

CONTACT NAME _____ CONTACT PHONE _____

CLASS _____ CAPACITY _____ AF SURFACE AREA _____ AC. HEIGHT _____ FT. CREST LENGTH _____ FT CREST WIDTH _____ FT.

CURRENT RESTRICTION ☐ (NO) ☐ (YES) LEVEL _____ EPP ON FILE ☐ (NO) ☐ (YES) SPWY WIDTH _____ FT. FBD. _____ FT. Z _____

INSPECTION PARTY REPRESENTING _____

DIRECTIONS: MARK AN **X** FOR CONDITIONS FOUND **AND** UNDERLINE WORDS THAT APPLY. GIVE LOCATION AND EXTENT WITH NUMBER REFERENCE I.E (25) ALL ALONG SLOPE, OR SHOW IT ON SKETCH.

FIELD CONDITIONS OBSERVED

WATER LEVEL - BELOW DAM CREST _____ FT., BELOW SPILLWAY _____ FT., GAGE ROD _____

GROUND MOISTURE CONDITION: DRY _____ WET _____ SNOWCOVER _____ OTHER _____

UPSTREAM SLOPE

PROBLEMS NOTED: ☐ (0) NONE ☐ (1) RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED ☐ (2) WAVE EROSION-WITH SCARPS
☐ (3) CRACKS-WITH DISPLACEMENT ☐ (4) SINKHOLE ☐ (5) APPEARS TOO STEEP ☐ (6) DEPRESSIONS OR BULGES ☐ (7) SLIDES
☐ (8) CONCRETE FACING-HOLES, CRACKS, DISPLACED, UNDERMINED ☐ (9) OTHER _____
Comments: _____

CREST

PROBLEMS NOTED: ☐ (10) NONE ☐ (11) RUTS OR PUDDLES ☐ (12) EROSION ☐ (13) CRACKS - WITH DISPLACEMENT ☐ (14) SINKHOLES
☐ (15) NOT WIDE ENOUGH ☐ (16) LOW AREA ☐ (17) MISALIGNMENT ☐ (18) INADEQUATE SURFACE DRAINAGE
☐ (19) OTHER _____
Comments: _____

DOWNSTREAM SLOPE

PROBLEMS NOTED: ☐ (20) NONE ☐ (21) LIVESTOCK DAMAGE ☐ (22) EROSION OR GULLIES ☐ (23) CRACKS - WITH DISPLACEMENT ☐ (24) SINKHOLE
☐ (25) APPEARS TOO STEEP ☐ (26) DEPRESSION OR BULGES ☐ (27) SLIDE ☐ (28) SOFT AREAS ☐ (29) OTHER _____
Comments: _____

SEEPAGE

PROBLEMS NOTED: ☐ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT
☐ (33) SEEPAGE EXITS AT POINT SOURCE ☐ (34) SEEPAGE AREA AT TOE ☐ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED/MUDDY
DRAIN OUTFALLS SEEN __No __Yes ☐ (37) FLOW INCREASED/MUDDY ☐ (38) DRAIN DRY/OBSTRUCTED
☐ (39) OTHER _____ Show location of drains on sketch and indicate amount and quality of discharge
Comments: _____

OUTLET

PROBLEMS NOTED: ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE
☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED ☐ (45) OUTLET NOT OPERATED DURING INSPECTION
INTERIOR INSPECTED ☐ (120) NO ☐ (121) YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE
☐ (49) OTHER _____
Comments: _____

SPILLWAY

PROBLEMS NOTED: ☐ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION-WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT
☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED
☐ (58) CONCRETE DETERIORATED/UNDERMINED ☐ (59) OTHER _____
Comments: _____

See Guidelines on Back of this Sheet

Conditions Observed	GOOD	ACCEPTABLE	POOR
UPSTREAM SLOPE			
CREST			
DOWNSTREAM SLOPE			
SEEPAGE			
OUTLET			
SPILLWAY			

DC185a-85

EXHIBIT "B"

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD	ACCEPTABLE	POOR
In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threater the safety of the dam.	Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.	Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD	ACCEPTABLE	POOR
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.	Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.	Seepage conditions observed appear to threaten the safety of the dam. Examples: 1) Designed drain or seepage flows have increased without increase in reservoir level. 2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples. 3) Widespread seepage, concentrated seepage or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD	ACCEPTABLE	POOR
Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for Class I dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's **engineer** is in effect. Periodic inspections by owner's engineer.	Monitoring includes movement surveys and leakage measurements for Class I & II dams; leakage measurements for Class III dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by **owner**. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.	All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD	ACCEPTABLE	POOR
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.	Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are required.	Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY	CONDITIONALLY SATISFACTORY	UNSATISFACTORY
The safety inspection indicates no conditions that appear to threaten the safety of the dan, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.	The safety inspection indicates symptoms of *possible* structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen *could* lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full or reduced storage in the reservoir.	The safety inspection indicates *definite* signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which *could* lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE	CONDITIONAL FULL STORAGE	RESTRICTION
Dam may be used to full capacity with no conditions attached.	Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.	Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

CLASSIFICATION OF DAMS

CLASS I	CLASS II	CLASS III
Class I - Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.	Class II - Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.	Class III - Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water line.

EXHIBIT "B"

DAM NAME: _____ DAM I.D.: _____ DATE ___/___/___

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☐ (111) GAGE ROD ☐ (112) PIEZOMETERS ☐ (113) SEEPAGE WEIRS/FLUMES
☐ (114) SURVEY MONUMENTS ☐ (115) OTHER _____
MONITORING OF INSTRUMENTATION: ☐ (116) NO ☐ (117) YES PERIODIC INSPECTIONS BY: ☐ (118) OWNER ☐ (119) ENGINEER
Comments: _____

GOOD ☐ ACCEPTABLE ☐ POOR ☐ — MONITORING

MAINTENANCE AND REPAIR

PROBLEMS NOTED: ☐ (60) NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) CATTLE DAMAGE
☐ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE
☐ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE-FACING, OUTLET, SPILLWAY
☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☐ (68) OTHER _____
Comments: _____

GOOD ☐ ACCEPTABLE ☐ POOR ☐ — MAINTENANCE AND REPAIRS

OVERALL CONDITIONS

REMARKS: _____

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☐ 71 SATISFACTORY ☐ 72 CONDITIONALLY SATISFACTORY ☐ 73 UNSATISFACTORY — OVERALL CONDITIONS

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

MAINTENANCE - MINOR REPAIR - MONITORING

☐ (80) PROVIDE ADDITIONAL RIPRAP: _____
☐ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE: _____
☐ (82) CLEAR TREES AND/OR BRUSH FROM: _____
☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES: _____
☐ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: _____
☐ (85) PROVIDE SURFACE DRAINAGE FOR: _____
☐ (86) MONITOR: _____
☐ (87) DEVELOP AND SUBMIT AN EMERGENCY PREPAREDNESS PLAN. _____
☐ (88) OTHER: _____
☐ (89) OTHER: _____

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans & Specification must be approved by State Engineer prior to construction.)

☐ (90) PREPARE PLANS AND SPECIFICATIONS FOR THE REHABILITATION OF THE DAM: _____
☐ (91) PREPARE AS-BUILT DRAWINGS OF: _____
☐ (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM: _____
☐ (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE: _____
☐ (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY: _____
☐ (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS: _____
☐ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET: _____
☐ (97) OTHER: _____
☐ (98) OTHER: _____
☐ (99) OTHER: _____

SAFE STORAGE LEVEL RECOMMENDED AS A RESULT OF THIS INSPECTION

☐ (101) FULL STORAGE
☐ (102) CONDITIONAL FULL STORAGE
☐ (103) RECOMMENDED RESTRICTION → RESTRICTED LEVEL OFFICIAL ORDER TO FOLLOW

_____ FT. BELOW DAMS CREST
_____ FT. BELOW SPILLWAY CREST
_____ FT. GAGE HEIGHT
_____ NO STORAGE-MAINTAIN OUTLET FULLY OPEN
_____ _____

REASON FOR RESTRICTION: _____

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE OR CONTINUED STORAGE AT THE RESTRICTED LEVEL _____

Engineer's Signature _____ INSPECTED BY Owner's Signature _____ OWNER/OWNER'S REPRESENTATIVE DATE: ___/___/___

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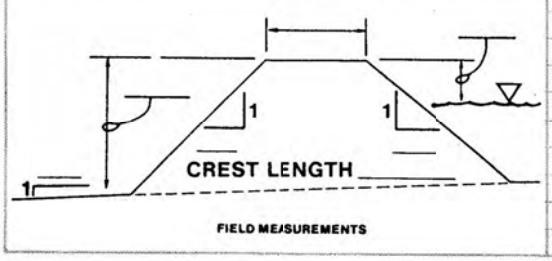
EXHIBIT "B"

DAM NAME_____ DAM ID_____ DATE__/__/__



FIELD MEASUREMENTS

ATTACHMENT – 5

OPERATION & MAINTENANCE PLAN

For
SHADOW RUN RANCH

TM 5223

Preparation/Revision Date:

November 21, 2013

May 19, 2014

Prepared for:

Sherrill Ann Schoepe, General Partner

Shadow Run Ranch, LLC

P.O. Box 1249

Pauma Valley, CA 92061

Telephone: (760) 742-1893

Prepared by:

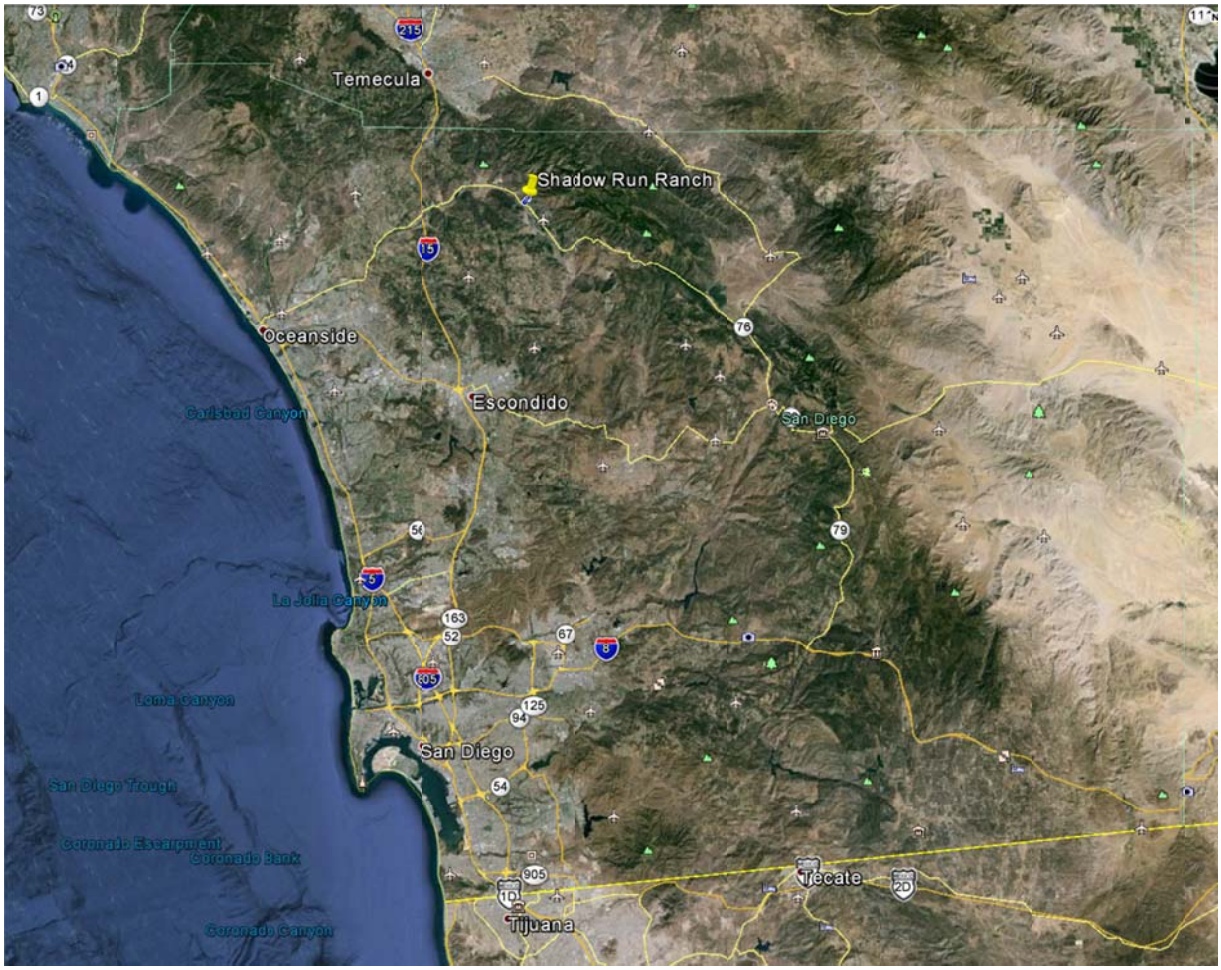
Masson & Associates, Inc.

200 East Washington Avenue, Suite 200

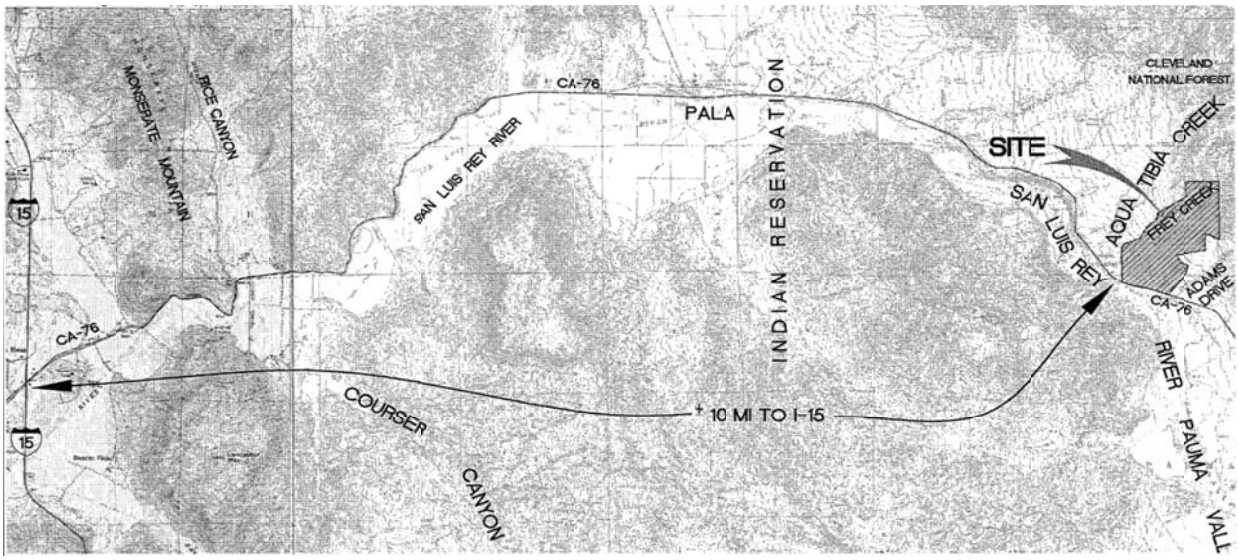
Escondido, CA 92025

Telephone: (760) 741-3570

Regional map:



Project location Map:



Reservoir area:

1.0 Purpose of Document

The proposed project's HOA, County of San Diego as well as the ongoing agricultural operations and future home owners of the project are stakeholders in this Operations and Maintenance Plan (O&M). The following is an outline of the system and elements affected by this O&M. The operation and maintenance of the existing reservoir are the responsibility of the project proponent and their successors in title. The operation and maintenance associated with the existing reservoir are discussed below. The discussion includes a routine action, maintenance indicator, field observation methods, frequency, and maintenance activity. Costs associated with each activity are included. The scope and purpose of this O&M is to ensure the operational items associated with the existing reservoir are working properly and the safety and stability of the reservoir are maintained at optimum working levels.

The Four primary maintenance areas for the reservoir are as follows:

1. Reservoir embankment [AREA 1]
    a. Stability
    b. Landscaping
    c. Irrigation
    d. Burrowing animals
2. Reservoir spillway [AREA 2]
    a. Stability
    b. Energy dissipaters
    c. Scour
3. Reservoir drain lines [AREA-3]
    a. Pipeline condition
    b. Shutoff valves
    c. Drain valves
4. Monitoring wells [AREA-4]
    a. Depth to ground water

The landscape architect should choose plant coverage for slope protection and erosion control along the outer edge of the reservoir embankment that will be high in erosion control value with shallow root systems and which will deter small burrowing animals. The reservoir slope embankment shall be watered sparingly to maintain landscape coverage for erosion control.

2.0 Facilities and Resources

The facilities and resources identified to be managed and inspected are shown above and attached as graphic **EXHIBIT "A" - "RESERVOIR AREAS".** The management and inspection of the reservoir will be the responsibility of the ownership of the recreational open space lot 47 of TM 5223 (the homeowners association (HOA)). The property manager(s) of the HOA shall at all times have a qualified grove manager(s) that will be employed by said HOA and have a set number of hours dedicated monthly to inspect and fill out inspection reports in

conformance with this Operations and Maintenance Plan. The Grove Manager will receive on-site training in the proper maintenance and repair of the facility. The HOA shall dedicate $6,000 yearly and have a reserve fund to anticipate any startup and ongoing maintenance of the reservoir systems. Additionally the reservoir shall be inspected by a registered Civil Engineer or registered Geologist on a yearly basis for any additional recommendations.

3.0 Operations

The goal of this O&M is to ensure safety and operational conditions of all reservoir systems on a monthly basis. This includes; testing the valves on the two (2) 6" irrigation/down drain lines and the one (1) 10" down drain line. These valves and pipes shall be maintained and operational so that they can be utilized in case of an emergency to drawdown ½ the reservoir capacity within 7 days, and completely drain the reservoir within 20 days.

The report shall contain, at a minimum, the following items: Example inspection report attached as Exhibit "B".

Inspection Protocol: Inspections will include:

- Date of inspection
- Reservoir level
- Water use in previous month
- Note any unusual signs of changed water levels
- Condition of the spillway
- Check scour and erosion
- Condition of the 6" drain line
- Condition of the 10" drain line
- Overall embankment stability
- Any signs of slope movement
- Any signs of seepage around or below reservoir
- Any rock falls nearby
- Vegetation control
- Control of burrowing animals
- Irrigation control
- Three existing monitoring wells

Inspections:

The grove manager shall visually inspect on a monthly basis, the entire slope embankment [Area 1] of the reservoir including the spillway [Area 2] looking for any settlement, surface cracking, burrowing animals, overwatering and seepage. In addition the (2) 6" drain line pipes and (1) 10" drain line pipe [Area 3] shall be tested monthly, to ensure the valves and drain capacities are working properly.

On a monthly basis, or if an earthquake is felt at or near the reservoir (as outlined below), measure and record the depth to groundwater in the three existing monitoring wells at the top of the reservoir embankment [Area 4]. The HOA shall be notified immediately if any substantially changed groundwater levels are indicated. The reports shall be submitted to the HOA and COSD within 10 working days of the date of the inspection and will be filed in the HOA manager's office and shall be stored for 5 years.

Special inspections:

If an earthquake occurs at or near the reservoir, or has been reported to occur, within the following criteria, immediate inspection shall be required:

- $M \geq 4.0$ w/in 25 miles,
- $M \geq 5.0$ w/in 50 miles,
- $M \geq 6.0$ w/in 75 miles,
- $M \geq 7.0$ w/in 125 miles,
- $M \geq 8.0$ w/in 200 miles,

If such an earthquake occurs, the following items shall be inspected and reported upon:

- Date of inspection
- Reservoir level
- Water use in previous month
- Note any unusual signs of changed water levels
- Condition of the spillway
- Check scour and erosion
- Condition of the 6" drain line
- Condition of the 10" drain line
- Overall embankment stability
- Any signs of slope movement
- Any signs of seepage around or below reservoir
- Any rock falls nearby
- Vegetation control
- Control of burrowing animals
- Irrigation control
- Three existing monitoring wells

Repairs recommended in the inspection reports shall be accomplished within: 10 working days, or immediately for repairs that are mandated by reservoir stability issues.

4.0 Maintenance / Repair

IMPLEMENTATION AND MAINTENANCE REQUIREMENTS

The primary maintenance requirements for the reservoir are as follows:

- Weed, prune, and water, especially during plant establishment
- Keep landscape healthy and clean
- The grounds, consisting of the inner embankment and the perimeter pad, shall be free of large deep rooted trees and bushes
- Maintain control of small burrowing animals
- When encountered burrowing animals shall be removed and any holes filled in

Aesthetic and Functional Maintenance:

Aesthetic maintenance is important for public acceptance of facilities. Functional maintenance is important for performance and safety reasons.

Both forms of maintenance will be combined into overall system maintenance.

Aesthetic Maintenance

The following activities will be included in the aesthetics maintenance program:

- Replace dead or dying plants.
- Weed Control.
- Weeds will be removed through mechanical means.
- Herbicide will not be used because these chemicals impact the water quality.
- Prune overgrown plants.

Functional Maintenance

Components of a Functional Maintenance program include Preventive Maintenance and Corrective Maintenance.

a. **Preventive Maintenance -** Preventive maintenance activities to be instituted are:

- Trash and Debris. During each inspection, debris and trash removal will be conducted.
- Down drain outlet piping: Visual inspection of (2) 6" drain line pipes and (1) 10" drain line pipe shall be inspected and checked for leaking and or corrosive condition.
- Test down drain system. During each inspection, each down drain pipe shall be tested. Open valves and check valves and piping for any leaking.

- Sediment Removal. Sediment accumulation, as part of the operation and maintenance program at the spillway, will be monitored quarterly during the dry season, and after every large storm (0.50 inch), and monthly during the wet season. If accumulation of debris or sediment is determined to cause of decline in design performance, prompt action (i.e., within ten working days) will be taken to restore to design performance standards. Actions will include removal of sediment. Characterization and appropriate disposal of sediment will comply with applicable local, county, state, or federal requirements.
- Removal of Standing Water - Standing water must be removed if it contributes to the development of aquatic plant communities or mosquito breeding areas. Water standing for more than 96 hours will be removed.
- Fertilization – Any vegetation seed mix will be designed so that fertilization and irrigation (after establishment of the planting) is not necessary. Fertilizers will not be used to maintain the vegetation.
- On a monthly basis, and if an earthquake is felt at or near the reservoir (as outlined above) measure and record the depth to groundwater in the three existing monitoring wells at the top of the reservoir embankment. Notify the HOA and the Geotechnical Engineer of Record immediately if any substantially changed groundwater levels are indicated.

b. **Corrective Maintenance -** Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function.

   Corrective maintenance activities include:

   - Removal of Debris and Sediment - Sediment, debris and trash, which impede the hydraulic functioning of reservoir spillway and vegetative growth, will be removed and properly disposed.
   - Down drain outlet piping – two (2) 6" drain line pipes and one (1) 10" drain line pipe. Paint exposed piping, poly-wrap pipe protection if necessary, replace damaged sections.
   - Test down drain system. Replace valves if necessary.
   - Embankment and Slope Repairs – Damaged to slopes and embankments will be evidenced by erosion or collapsed surface areas. Once deemed necessary, damage to the slopes of the reservoir embankment will be repaired (within 10 working days).
   - Erosion Repair – Erosion will be evident by rills or small gullies in the surfaces of the reservoir embankment slope. Corrective steps will be taken to prevent loss of soil and any subsequent danger to the performance of the reservoir embankment. There are a number of corrective actions that can be taken. These include temporary measures such as erosion control blankets or reducing flow through the area. Designers or contractors will be consulted to address erosion problems if the solution is not evident.
   - Elimination of Animal Burrows - Animal burrows (evidenced by holes & mounds) will be filled and steps taken to remove the animals if burrowing

problems continue to occur (filling and compacting). If the problem persists, vector control specialists will be consulted regarding removal steps. This consulting is necessary as the threat of rabies in some areas may necessitate the animals being destroyed rather than relocated. If the reservoir embankment performance is affected, abatement will begin. Otherwise, abatement will be performed annually in September.

- General Facility Maintenance - In addition to the above elements of corrective maintenance, general corrective maintenance will address the overall facility and its associated components. If corrective maintenance is being done to one component, other components will be inspected to see if maintenance is needed.
- Replace dead or dying plant material.

Table 1: Shadow Run Ranch Reservoir Operations and Maintenance Plan Schedule

Action	Responsible Party	Frequency	Threshold for Action	Reporting Requirement
Inspect Embankment, Reservoir, Spillway	HOA, Grove Manager	Monthly or as needed	As regularly scheduled for the month or after any ground shaking, unexpected change in water level, reported change in embankment vegetation cover or report of changes by residences.	Reservoir Maintenance Record Monthly Entry or after specific incident
Inspect Embankment, Reservoir, Spillway	HOA, Geotechnical Engineer	Annually or as needed	As regularly scheduled for the year or as requested by HOA	Reservoir Maintenance Record Annual Entry or after specific call

Table 2: Observations Triggering Non-Routine Maintenance and Repairs

No.	Inspection	Procedure	Trigger	Follow-up
1	Reservoir level	Determine normal range of elevation changes considering rainfall, humidity, temperature, grove irrigation rates, etc.	If the reservoir level drops more than 15% beyond the expected amount, and there is no visible leakage or seepage, or pipe leakage, contact the Geotechnical Engineer of Record (GER) immediately.	Geotechnical Engineer of Record shall perform an inspection within 10 calendar days and determine the cause of the unexpected drop in reservoir level. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
2	Water use in previous month	_____C.F.	See Item 1, above	
3	Note any unusual signs of changed water levels		See Item 1, above	
4	Condition of the spillway	Inspect per Section 4 of the report.	If there are any cracks, or leaks in the spillway, contact the Civil Engineer of Record (CER) immediately.	The CER shall perform an inspection within 10 calendar days and determine the cause of the leaks or cracks. The CER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
5	Check scour and erosion	Inspect per Section 4 of the report.	If there is any evidence of excessive (more than 6") scour or erosion below the	The CER shall perform an inspection within 10 calendar days and determine the cause of the excessive scour or

			spillway, or on the embankment, contact the Civil Engineer of Record (CER). Otherwise, follow the procedures in Section 4 of the report.	erosion. The CER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
6	Condition of the 6” drain line	Inspect per Section 4 of the report.	If valves do not operate properly, repair or replace within 14 calendar days.	
7	Condition of the 10” drain line	Inspect per Section 4 of the report.	If valves do not operate properly, repair or replace within 14 calendar days.	
8	Overall embankment stability	Inspect per Section 4 of the report.	If there are signs of movement of the embankment, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 24 hours and determine the cause of the embankment movement. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
9	Any signs of slope movement	See Item 8, above.		

10	Any signs of seepage around or below reservoir	Inspect per Section 4 of the report.	If there are signs of excessive seepage of the embankment, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 24 hours and determine the cause of the seepage. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
11	Any rock falls nearby	Inspect per Section 4 of the report.	If the rock falls are indicative of movement of the embankment or the immediately adjacent soils or rocks, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 24 hours and determine the cause of the rockfall. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.
12	Vegetation control	Inspect, maintain and repair per Section 4 of the report.		
13	Control of burrowing animals	Inspect, maintain and repair per		

		Section 4 of the report.		
14	Irrigation control	Check for overwatering.	Adjust irrigation rate.	
15	Three existing monitoring wells	Inspect, maintain and repair per Section 4 of the report. Determine the normal relationship between the water level in the wells and the reservoir.	If the water level in the wells does not follow the normal relationship between the wells and the reservoir, contact the GER immediately.	Consult with the GER immediately to determine if an immediate evacuation is necessary. Otherwise the GER shall perform an inspection within 10 calendar days and determine the cause of the rockfall. The GER shall recommend a repair and specify a deadline for the repair, based on the level of urgency of the problem.

Regulatory Assurance

Implementation of this Operation and Maintenance plan is assured through an ongoing condition of Major Use Permit # 3300-00-030 .

Maintenance Costs

A detailed cost breakdown for the operation & maintenance of each area / system are attached and made part of this document. Total estimated annual costs for each are:

Reservoir embankment = $2000
Down drain piping = $500
Water valves = $500
Landscaping = $2000
Irrigation = $500
Burrowing animals = $500
Total ---------- $6000 yearly.

Inspection Frequency

- All items above will be monitored monthly and after every large storm (rainfall of 0.50 inch or more).
- After each seismic event as listed above.

Each inspection will be fully documented and made available upon request. Records will be kept for a minimum of 5 years.

Sherrill Schoepe Shadow Run Ranch, LLC Post Office Box 1249 Pauma Valley, CA 92061

EXHIBIT "A"

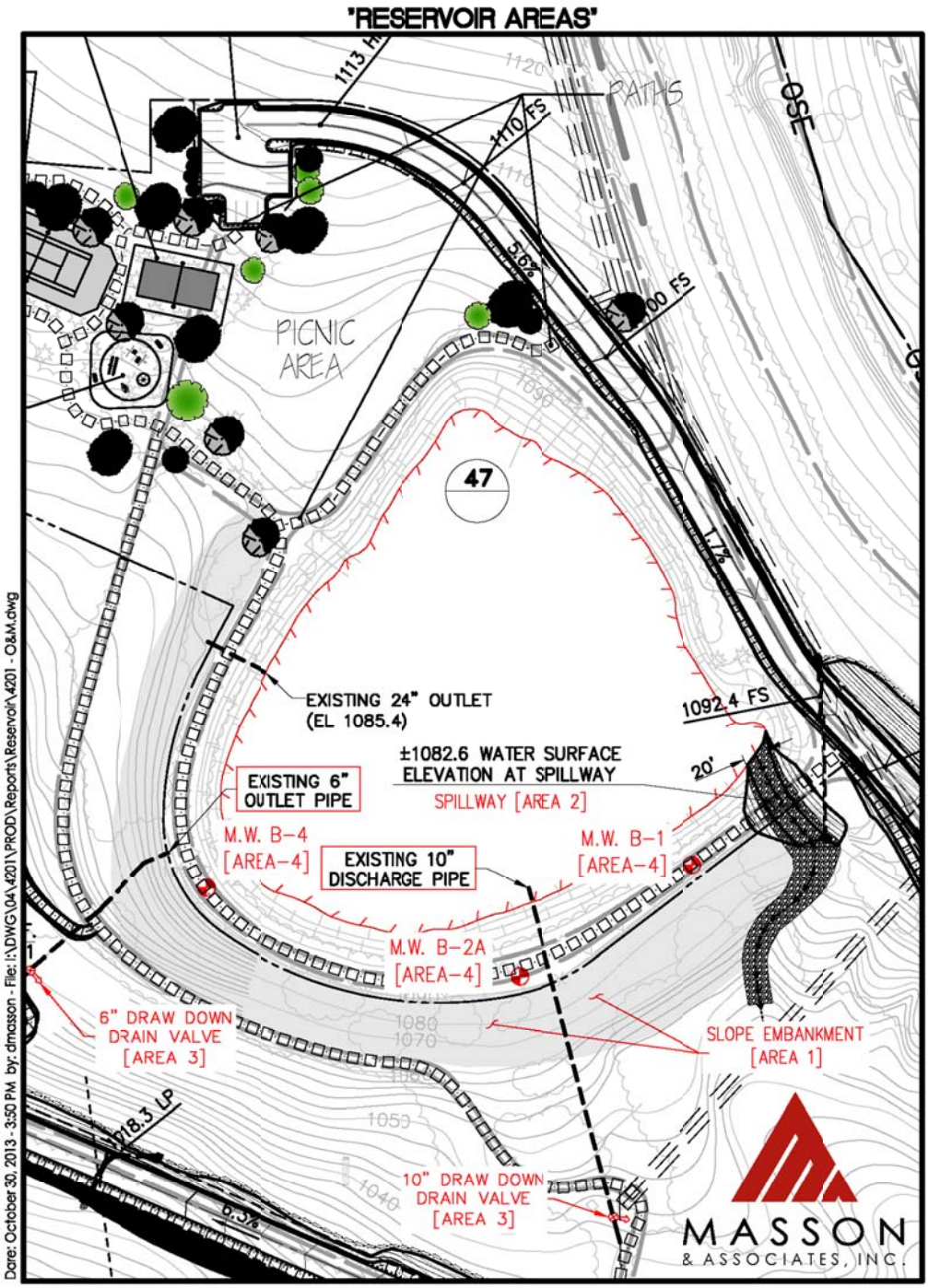

"RESERVOIR AREAS"
PICNIC AREA
PATHS
47
EXISTING 24" OUTLET (EL 1085.4)
±1082.6 WATER SURFACE ELEVATION AT SPILLWAY
SPILLWAY [AREA 2]
EXISTING 6" OUTLET PIPE
EXISTING 10" DISCHARGE PIPE
M.W. B-4 [AREA-4]
M.W. B-1 [AREA-4]
M.W. B-2A [AREA-4]
6" DRAW DOWN DRAIN VALVE [AREA 3]
10" DRAW DOWN DRAIN VALVE [AREA 3]
SLOPE EMBANKMENT [AREA 1]
1092.4 FS
1110 FS
1113 HP
18.3 LP
MASSON & ASSOCIATES, INC.
Date: October 30, 2013 - 3:50 PM by: dmasson - File: I:\DWG\04\4201\PROD\Reports\Reservoir\4201 - O&M.dwg

EXHIBIT "B"

ENGINEERS INSPECTION REPORT

OFFICE OF THE STATE ENGINEER-DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH
1313 Sherman Street, Room 818, Denver, CO 80203, (303) 866-3581

DAM NAME _____ W. DIV. _____ W. DIST. _____ DATE OF INSPECTION ___/___/___

DAM ID _____ FILE NO. C- _____ FOREST I.D. _____ DATE OF LAST INSPECTION ___/___/___

OWNER NAME _____ OWNER PHONE _____

ADDRESS _____ ZIP CODE _____

CONTACT NAME _____ CONTACT PHONE _____

CLASS _____ CAPACITY _____ AF SURFACE AREA _____ AC. HEIGHT _____ FT. CREST LENGTH _____ FT CREST WIDTH _____ FT.

CURRENT RESTRICTION ☐ (NO) ☐ (YES) LEVEL _____ EPP ON FILE ☐ (NO) ☐ (YES) SPWY WIDTH _____ FT. FBD. _____ FT. Z _____

INSPECTION PARTY REPRESENTING _____

DIRECTIONS: MARK AN **X** FOR CONDITIONS FOUND **AND** UNDERLINE WORDS THAT APPLY. GIVE LOCATION AND EXTENT WITH NUMBER REFERENCE I.E (25) ALL ALONG SLOPE, OR SHOW IT ON SKETCH.

FIELD CONDITIONS OBSERVED

WATER LEVEL - BELOW DAM CREST _____ FT., BELOW SPILLWAY _____ FT., GAGE ROD _____

GROUND MOISTURE CONDITION: DRY _____ WET _____ SNOWCOVER _____ OTHER _____

UPSTREAM SLOPE

PROBLEMS NOTED: ☐ (0) NONE ☐ (1) RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED ☐ (2) WAVE EROSION-WITH SCARPS
☐ (3) CRACKS-WITH DISPLACEMENT ☐ (4) SINKHOLE ☐ (5) APPEARS TOO STEEP ☐ (6) DEPRESSIONS OR BULGES ☐ (7) SLIDES
☐ (8) CONCRETE FACING-HOLES, CRACKS, DISPLACED, UNDERMINED ☐ (9) OTHER _____
Comments: _____

CREST

PROBLEMS NOTED: ☐ (10) NONE ☐ (11) RUTS OR PUDDLES ☐ (12) EROSION ☐ (13) CRACKS - WITH DISPLACEMENT ☐ (14) SINKHOLES
☐ (15) NOT WIDE ENOUGH ☐ (16) LOW AREA ☐ (17) MISALIGNMENT ☐ (18) INADEQUATE SURFACE DRAINAGE
☐ (19) OTHER _____
Comments: _____

DOWNSTREAM SLOPE

PROBLEMS NOTED: ☐ (20) NONE ☐ (21) LIVESTOCK DAMAGE ☐ (22) EROSION OR GULLIES ☐ (23) CRACKS - WITH DISPLACEMENT ☐ (24) SINKHOLE
☐ (25) APPEARS TOO STEEP ☐ (26) DEPRESSION OR BULGES ☐ (27) SLIDE ☐ (28) SOFT AREAS ☐ (29) OTHER _____
Comments: _____

SEEPAGE

PROBLEMS NOTED: ☐ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT
☐ (33) SEEPAGE EXITS AT POINT SOURCE ☐ (34) SEEPAGE AREA AT TOE ☐ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED/MUDDY
DRAIN OUTFALLS SEEN __No __Yes ☐ (37) FLOW INCREASED/MUDDY ☐ (38) DRAIN DRY/OBSTRUCTED
☐ (39) OTHER _____ Show location of drains on sketch and indicate amount and quality of discharge
Comments: _____

OUTLET

PROBLEMS NOTED: ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE
☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED ☐ (45) OUTLET NOT OPERATED DURING INSPECTION
INTERIOR INSPECTED ☐ (120) NO ☐ (121) YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE
☐ (49) OTHER _____
Comments: _____

SPILLWAY

PROBLEMS NOTED: ☐ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION-WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT
☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED
☐ (58) CONCRETE DETERIORATED/UNDERMINED ☐ (59) OTHER _____
Comments: _____

See Guidelines on Back of this Sheet

Conditions Observed	GOOD	ACCEPTABLE	POOR
UPSTREAM SLOPE			
CREST			
DOWNSTREAM SLOPE			
SEEPAGE			
OUTLET			
SPILLWAY			

DC185a-85

EXHIBIT "B"

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD	ACCEPTABLE	POOR
In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threater the safety of the dam.	Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.	Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD	ACCEPTABLE	POOR
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.	Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.	Seepage conditions observed appear to threaten the safety of the dam. Examples: 1) Designed drain or seepage flows have increased without increase in reservoir level. 2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples. 3) Widespread seepage, concentrated seepage or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD	ACCEPTABLE	POOR
Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for Class I dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's **engineer** is in effect. Periodic inspections by owner's engineer.	Monitoring includes movement surveys and leakage measurements for Class I & II dams; leakage measurements for Class III dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by **owner**. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.	All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD	ACCEPTABLE	POOR
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.	Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are required.	Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY	CONDITIONALLY SATISFACTORY	UNSATISFACTORY
The safety inspection indicates no conditions that appear to threaten the safety of the dan, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.	The safety inspection indicates symptoms of *possible* structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen *could* lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full or reduced storage in the reservoir.	The safety inspection indicates *definite* signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which *could* lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE	CONDITIONAL FULL STORAGE	RESTRICTION
Dam may be used to full capacity with no conditions attached.	Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.	Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

CLASSIFICATION OF DAMS

CLASS I	CLASS II	CLASS III
Class I - Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.	Class II - Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.	Class III - Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water line.

EXHIBIT "B"

DAM NAME: _____ DAM I.D.: _____ DATE ___/___/___

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☐ (111) GAGE ROD ☐ (112) PIEZOMETERS ☐ (113) SEEPAGE WEIRS/FLUMES
☐ (114) SURVEY MONUMENTS ☐ (115) OTHER _____
MONITORING OF INSTRUMENTATION: ☐ (116) NO ☐ (117) YES PERIODIC INSPECTIONS BY: ☐ (118) OWNER ☐ (119) ENGINEER
Comments: _____

GOOD ☐ ACCEPTABLE ☐ POOR ☐ — MONITORING

MAINTENANCE AND REPAIR

PROBLEMS NOTED: ☐ (60) NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) CATTLE DAMAGE
☐ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE
☐ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE-FACING, OUTLET, SPILLWAY
☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☐ (68) OTHER _____
Comments: _____

GOOD ☐ ACCEPTABLE ☐ POOR ☐ — MAINTENANCE AND REPAIRS

OVERALL CONDITIONS

REMARKS: _____

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☐ 71 SATISFACTORY ☐ 72 CONDITIONALLY SATISFACTORY ☐ 73 UNSATISFACTORY — OVERALL CONDITIONS

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

MAINTENANCE - MINOR REPAIR - MONITORING

☐ (80) PROVIDE ADDITIONAL RIPRAP: _____
☐ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE: _____
☐ (82) CLEAR TREES AND/OR BRUSH FROM: _____
☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES: _____
☐ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: _____
☐ (85) PROVIDE SURFACE DRAINAGE FOR: _____
☐ (86) MONITOR: _____
☐ (87) DEVELOP AND SUBMIT AN EMERGENCY PREPAREDNESS PLAN. _____
☐ (88) OTHER: _____
☐ (89) OTHER: _____

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans & Specification must be approved by State Engineer prior to construction.)

☐ (90) PREPARE PLANS AND SPECIFICATIONS FOR THE REHABILITATION OF THE DAM: _____
☐ (91) PREPARE AS-BUILT DRAWINGS OF: _____
☐ (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM: _____
☐ (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE: _____
☐ (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY: _____
☐ (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS: _____
☐ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET: _____
☐ (97) OTHER: _____
☐ (98) OTHER: _____
☐ (99) OTHER: _____

SAFE STORAGE LEVEL RECOMMENDED AS A RESULT OF THIS INSPECTION

☐ (101) FULL STORAGE
☐ (102) CONDITIONAL FULL STORAGE
☐ (103) RECOMMENDED RESTRICTION → RESTRICTED LEVEL OFFICIAL ORDER TO FOLLOW

_____ FT. BELOW DAMS CREST
_____ FT. BELOW SPILLWAY CREST
_____ FT. GAGE HEIGHT
_____ NO STORAGE-MAINTAIN OUTLET FULLY OPEN
_____ _____

REASON FOR RESTRICTION: _____

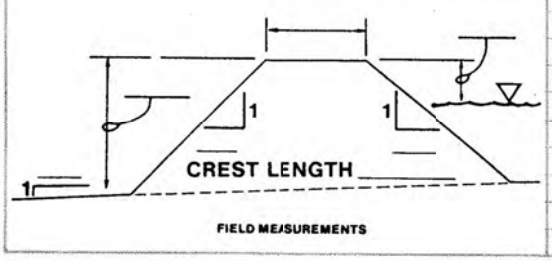
ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE OR CONTINUED STORAGE AT THE RESTRICTED LEVEL _____

Engineer's Signature _____ INSPECTED BY Owner's Signature _____ OWNER/OWNER'S REPRESENTATIVE DATE: ___/___/___

DC-22-2649a-86 pp 2 of ___

EXHIBIT "B"

DAM NAME_____ DAM ID_____ DATE__/__/__



FIELD MEASUREMENTS

ATTACHMENT - 6

RESERVOIR DRAWDOWN CALCULATIONS

For
SHADOW RUN RANCH

TM 5223

Preparation/Revision Date:

November 25, 2013

Prepared for:

Sherrill Ann Schoepe, General Partner

Shadow Run Ranch, LLC

P.O. Box 1249

Pauma Valley, CA 92061

Telephone: (760) 742-1893

Prepared by:

Masson & Associates, Inc.

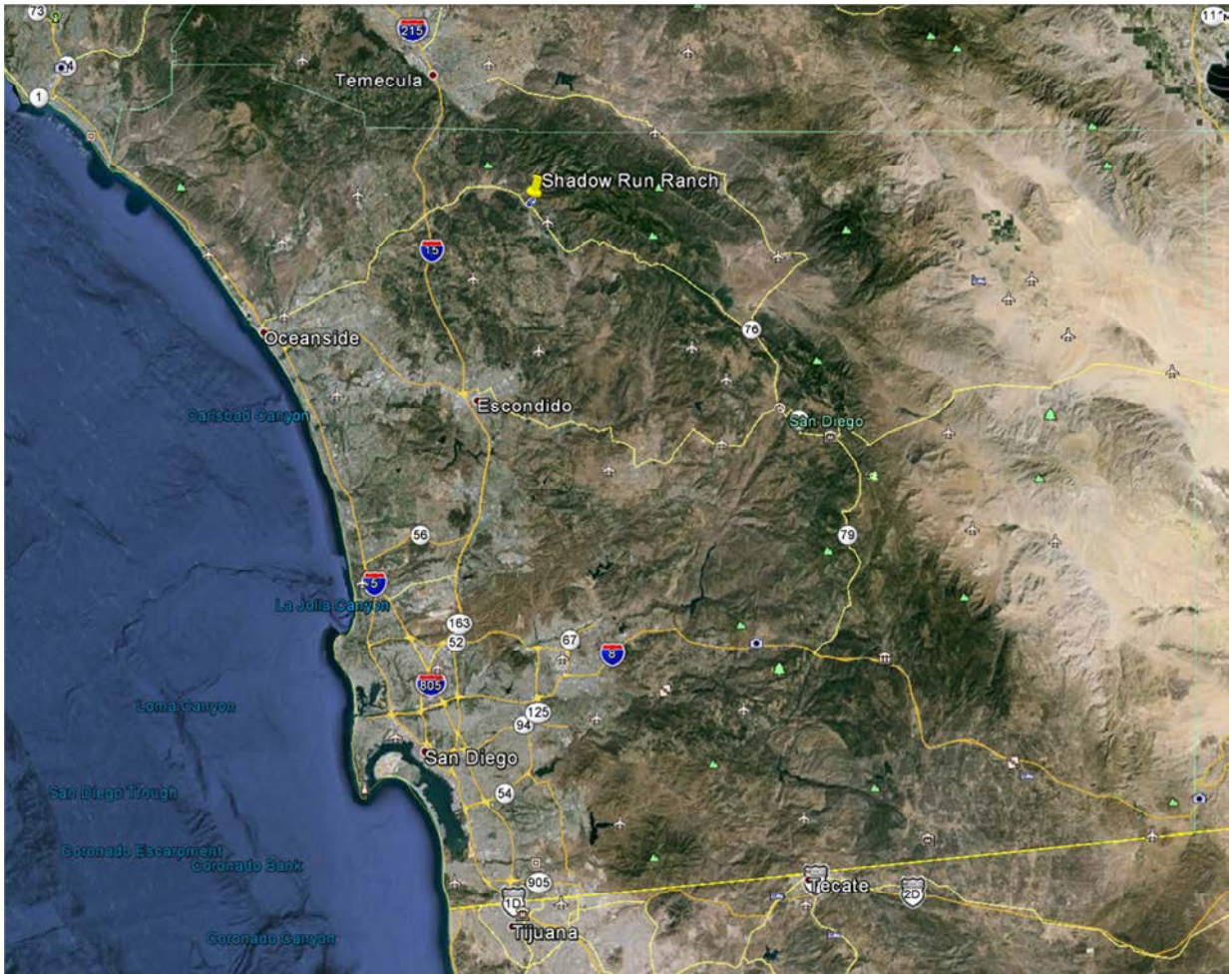
200 East Washington Avenue, Suite 200

Escondido, CA 92025

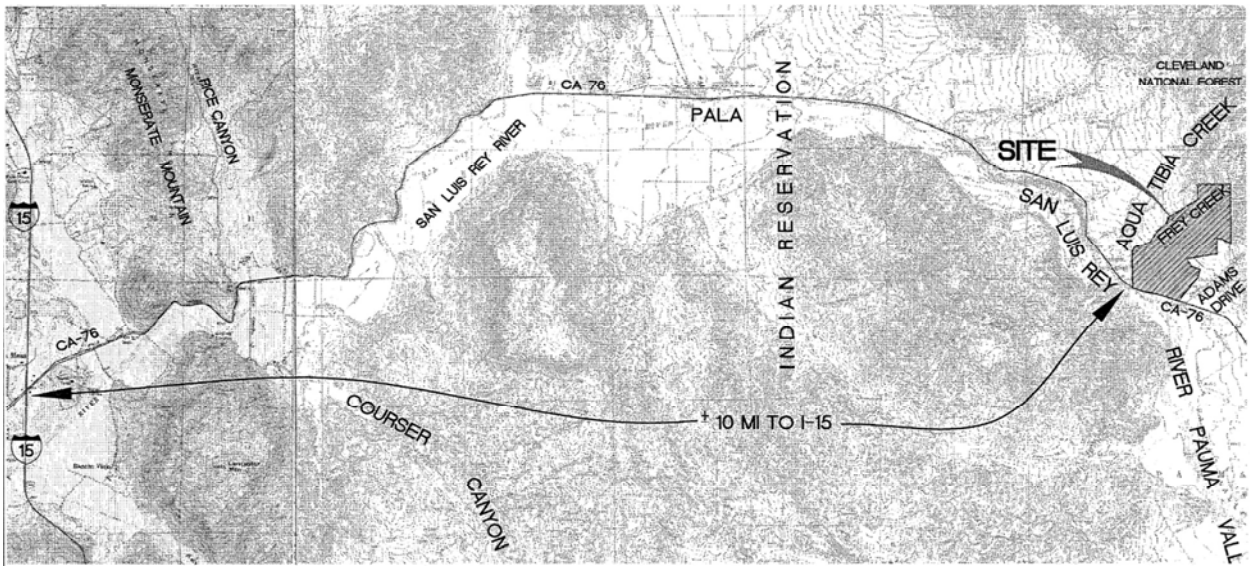
Telephone: (760) 741-3570

Tuesday, November 26, 2013

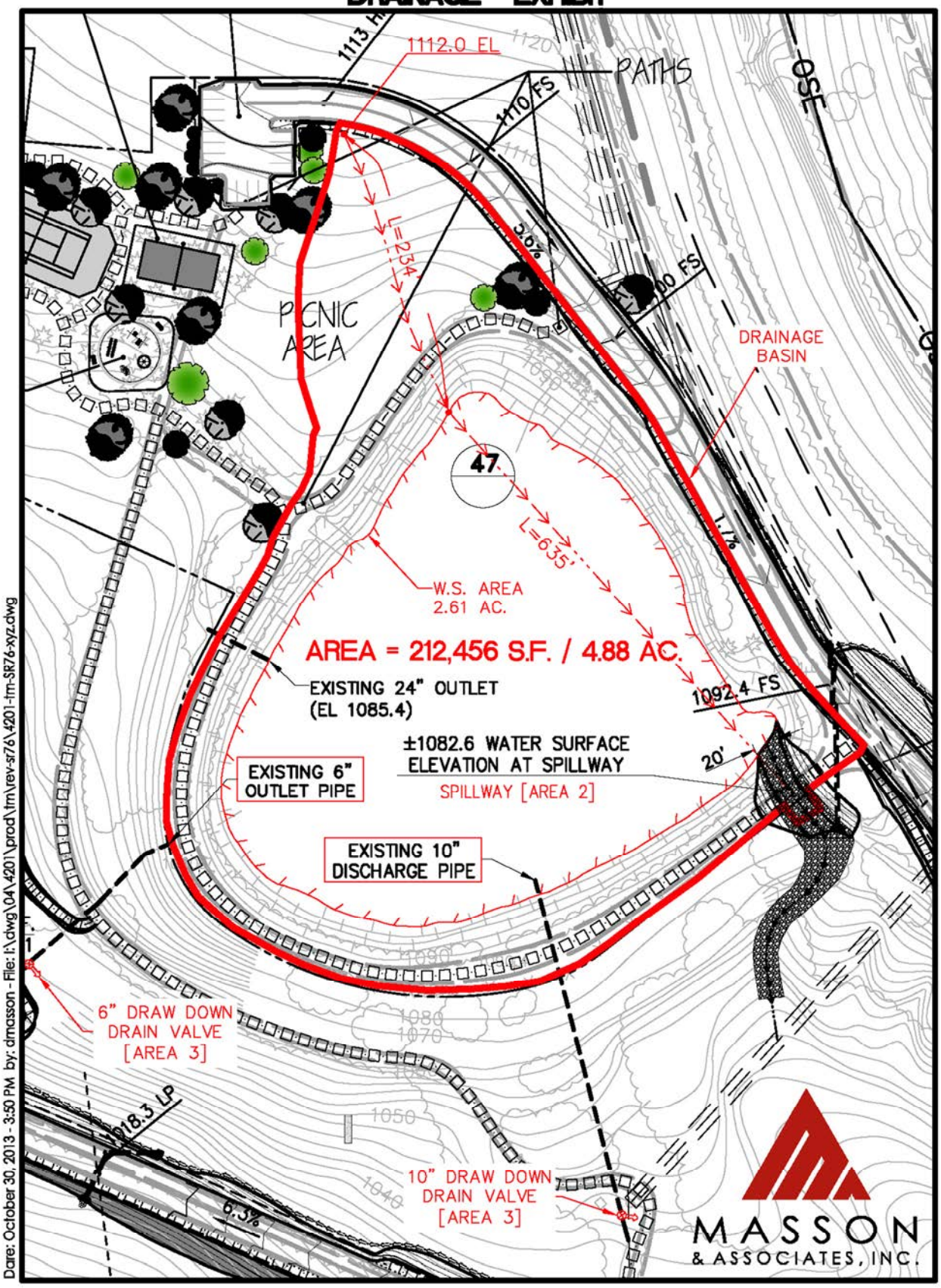
Regional map:



Project location Map:



DRAINAGE - EXHIBIT



Per the exhibit above there are two existing drawdown pipes 6" and 10" that can be used to drain the entire reservoir within 3 days per the calculations provided below.

MASSON & ASSOCIATES, INC.

PROJECT NO.:
DESCRIPTION:
CALCULATED BY: DATE:
CHECKED BY: DATE:
SHEET OF
SCALE:

Calculation for Two pipes 6", 10" that will drain the the total volume of the reservior in x days:

$n = 0.017$ steel $\quad Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

Pipe: $D = 6'' \Rightarrow r = 3'' \Rightarrow r = 0.25$ ft

$S = \frac{1062 - 1050}{120} = 0.1 \times 100 = 10\%$

$R = \frac{A}{P} = \frac{\pi r^2}{2\pi r} = \frac{r}{2} = \frac{0.25}{2}$

$R = 0.125$ ft

$Q = \frac{1.49}{0.017} \times 3.14 (0.25)^2 \times (0.125)^{2/3} \times (0.1)^{1/2} = 1.36$ cfs

Pipe: $D = 10'' \Rightarrow r = 5'' \Rightarrow r = 0.42$ ft, $\quad S = \frac{1062 - 1043}{295} = 0.064 \times 100 = 6.4\%$

$R = \frac{A}{P} = \frac{\pi r^2}{2\pi r} = \frac{r}{2} = \frac{0.42}{2} = 0.21$ ft

$Q = \frac{1.49}{2 \times 0.017} \times 3.14 (0.42)^2 \times (0.21)^{2/3} \times (0.064)^{1/2} = 4.36$ cfs

$Q_T = Q_1 + Q_2 = 1.36 + 4.36 = 5.72$ cfs, $\quad V = 34.5$ Ac feet

$V = 1,502,820$ cubic feet

$\frac{V}{Q_1 + Q_2} = \frac{1,502,820}{5.72} = 262730$ s

$= 4378$ min

$= 72.96$ hr

$= 3.0$ days

∴ There Two pipes 6" and 10" will drain the reservior, volume = 34.5 Ac feet in 3 days.

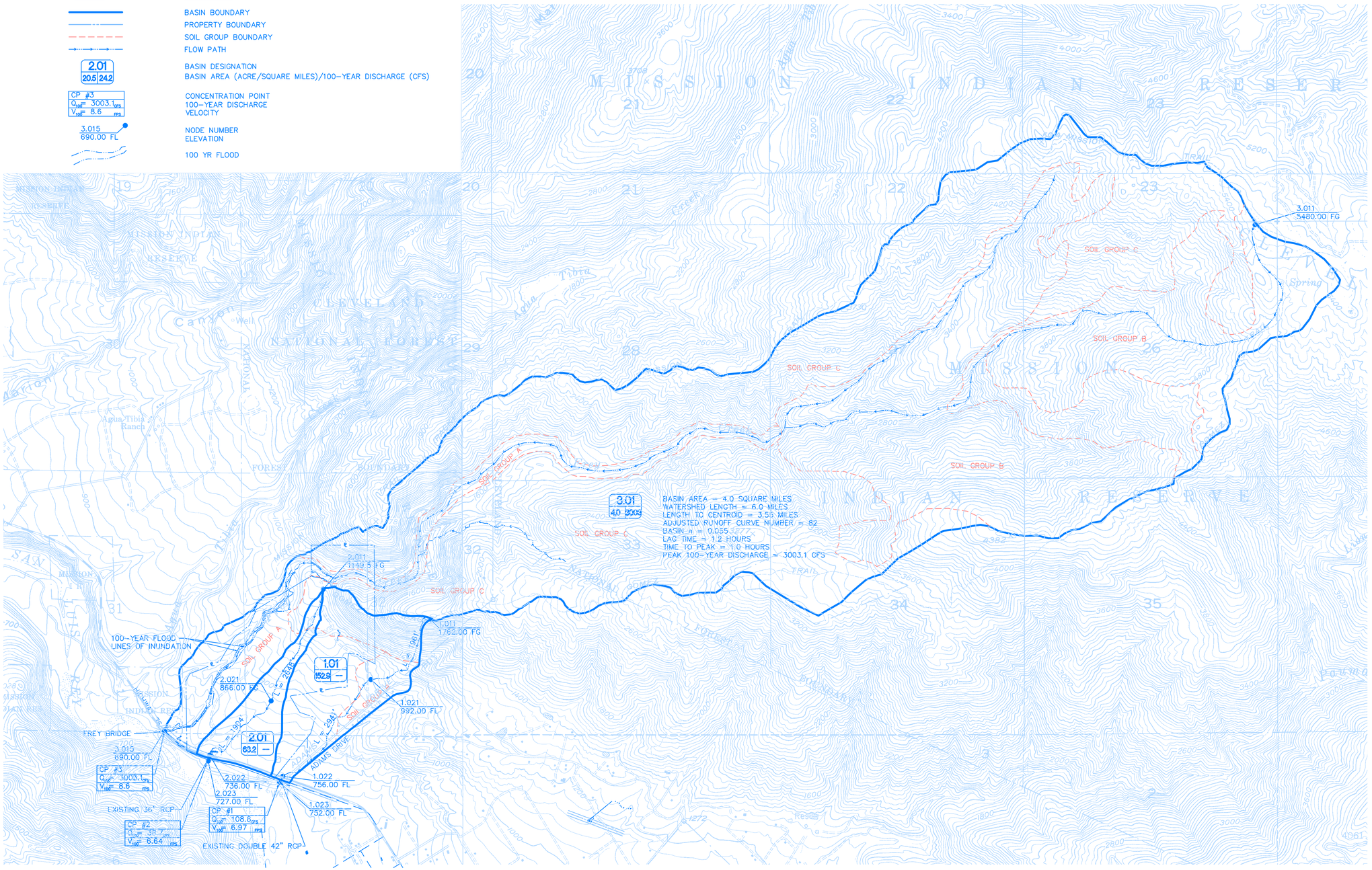
200 EAST WASHINGTON AVENUE, SUITE 200 ESCONDIDO, CA 92025 TEL (760) 741-3570 FAX (760) 741-1786

EXHIBIT “A”

Pre development Hydrology Map

LEGEND

SYMBOL	DESCRIPTION
	BASIN BOUNDARY
	PROPERTY BOUNDARY
	SOIL GROUP BOUNDARY
	FLOW PATH
2.01 / 20.5 | 24.2	BASIN DESIGNATION BASIN AREA (ACRE/SQUARE MILES)/100-YEAR DISCHARGE (CFS)
CP #3 Q_{100}= 3003.1 cfs V_{100}= 8.6 fps	CONCENTRATION POINT 100-YEAR DISCHARGE VELOCITY
3.015 690.00 FL	NODE NUMBER ELEVATION
	100 YR FLOOD



DATE: Nov 22, 19 1:13pm byrthigpen
FILE:\DWG\04\4201\PROD\Reports\Hydrology\4201-DR01 - (C3d).dwg

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EXHIBIT "A" PAGE OF 2
PRE-DEVELOPMENT HYDROLOGY MAP

SHADOW RUN RANCH

COUNTY OF SAN DIEGO TM 5223RPL

PN 04201 DATE: Nov 22, 19 1:13 pm

EXHIBIT “B”

Post development Hydrology Map

LEGEND

SYMBOL	DESCRIPTION
	BASIN BOUNDARY
	SUB BASIN BOUNDARY
	PROPERTY BOUNDARY
	FLOW PATH
3.01 / 4.0 / 3003	BASIN DESIGNATION / BASIN AREA (ACRE/SQUARE MILES) / 100-YEAR DISCHARGE (CFS)
CP # 3	CONCENTRATION POINT 100-YEAR DISCHARGE
2	ON-PAD HYDRO-MOD BASIN
2.02A1 / 915.5 FS	NODE NUMBER ELEVATION
	100' YEAR FLOOD

SOIL GROUP A

SOIL GROUP B

SOIL GROUP C

100-YEAR FLOW LINES OF INUNDATION.

DETENTION BASIN – IMP-2.06
PEAK INFLOW = 11.00 CFS
PEAK OUTFLOW = 9.804 CFS
FLOW DETAINED = 1.196 CFS
VOLUME REQUIRED = 9,910 CF

DETENTION BASIN IMP-10.22
PEAK INFLOW = 8.100 CFS
PEAK OUTFLOW = 0.176 CFS
FLOW DETAINED = 7.924 CFS
VOLUME REQUIRED = 6,084 CF

TABLE 1. SUMMARY OF IMPs CHARACTERISTICS

IMP #	Per COSD BMP Design Manual App. E	IMP Size (s.f.)	Riser Dia. (in)	Riser - Ponding Depth (in)	Drying Time (hr)	Freeboard (ft)
IMP 1.14	PR-1	3,125	6	6	6	2.5
IMP 2.01	PR-1	1,740	12	12	7	1.5
IMP 2.06	PR-1	10,344	24	6	20	1.4
IMP 10.10	PR-1	1,220	24	6	12	1
IMP 10.11,12,14	INF-2	4,020	6	6	20	1.5
IMP 10.13	PR-1	1,320	12	12	19	1
IMP 10.16	PR-1	3,500	12	9	9	1
IMP 10.17	INF-2	1,100	12	6	20	1.38
IMP 10.19	PR-1	1,245	6	12	13	1
IMP 10.22	PR-1	6,960	16	18	21	2.42

POC	Q100 - (CFS) PRE-DEV.	PRE-DEV FPS	POST DEV. w/o ATTENUATION	POST w/ ATTENUATION	POST FPS
CP # 1	108.8	6.97	95.9	69.29	4.96
CP # 2	38.7	6.64	42.5	25.57	5.11
CP # 3	3,000.1	8.60	3,000.1	3,000.1	8.60

1 LARGE LOT DETAIL
Scale: N.T.S.

DEVELOPMENT AREA = 39,786.94 S.F. – 0.913 AC.
IMPERVIOUS AREA = 13,191.21 S.F. – 0.303 AC.
DISPERSION AREA 15,954 S.F. – 0.366 AC PER SD-B
SWALE AT 1% 50' MIN.
EXIST. TREE WELLS MIN. 5 EA PAD PER SD-A

SINGLE RESIDENTIAL LOTS ARE DESIGNED TO INCORPORATE L.I.D. PRACTICES:
1) ROOF RUNOFF TO RUN OVER THE 10' MIN. DISPERSION AREA AND HYDRO-MOD BASIN BEFORE LEAVING THE PAD;
2) DISCONNECTING IMPERVIOUS SURFACES;
3) PITCHING DRIVEWAYS TOWARDS YARDS TO FILTER THE RUNOFF;
4) PAD GRADING WILL DIVERT RUNOFF AWAY FROM TOPS OF SLOPES;
5) SLOPES WILL BE PERMANENTLY STABILIZED WITH LANDSCAPING.

2 ON-PAD HYDRO-MOD BASIN DETAIL
Scale: N.T.S.

SCALE IN FEET
GRAPHIC SCALE

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EXHIBIT "B"
POST-DEVELOPMENT HYDROLOGY MAP
SHADOW RUN RANCH
COUNTY OF SAN DIEGO TM 5223 RPL-3

PN 04201 DATE: Dec 20, 19 9:26 am

DATE:Dec 20, 19 9:26am by:mmasson
REF: E:\DWG\PLAN\4201\PROD\Report\Hydrology\4201 QMOD (Clsd).dwg