STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION TITLE PAGE

CLIENT & PROJECT: Private Fuel Storage, LLC – Private Fuel Storage Facility	PAGE 1 OF 28 +Attach. 1(8 pgs)+Attach.2 (9 pgs)+Attach. 3 (10 pgs) + Attach. 4 (2 pgs) + Attach. 5 (9 pgs) + Attach. 6 (5 pgs)
CALCULATION TITLE (Indicative of Objective): **PFSF Flood Analysis with Larger Drainage Basin**	QA CATEGORY ☒ ☒ - I Nuclear Safety Related ☐ - II ☐ - III ☐ - Non-Safety Related ☐ - ☐ - Fossil/Industrial Plant

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RECORD OF CHANGES

Rev No.	Description of Changes	Pages Revised	Pages Added	Pages Replaced
0	Original Issue	N/A	N/A	N/A
1	Add editorial items & correct errors	As highlighted on the pages		
	Add Record of Changes	2		
	Edit Table of Contents entries	3		
	Add References 10, 11, & 12.	4		
	Edit text	5		
	Edit text	6		
	Delete bullet and word from text	7		
	Add north arrow	8		
	Edit row 7 in Table 3	12		
	Edit text	15		
	Change Table 5 to include explanation of variables	16		
	Add to Table 6- Water level for additional case	17		
	Figure 4, add additional information and north arrow	18		
	Add north arrow	19		
	Add Section 8 "Discussion"	23 & 24		
	Add Fig. 12 & Fig.13	25 & 28		
	Add Table 7 and text	26 & 27		

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Attachment 6 5 pages

1, Objectives

The objective of the calculation is to determine water surface elevation in the floodway crossing the PFSF access road to the east of PFSF site. The 100-year and the PMF flood events are evaluated based on the existing natural ground topography.

2, References

1. Calculation 05996.01-G(B)-02, "The PMF and the 100-yr Flood Flow at the Access Road Crossing and the PFSF Site"

2. U.S. Department of Commerce, National Oceanic And Atmospheric Administration, 1977, "Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainage" Hydrometeorological Report No. 49.

3. "Runoff Estimates for small Rural Watersheds and Development of a Sound Design Method" 1977, Federal Highway Administration. Report No. FHWA-RD-77-159.

4. "Nationwide Summary of U.S. Geological Survey Regional Regression Equations for Estimating Magnitude and Frequency of Flood for Ungaged Sites" 1993. U.S. Geological Survey, Water-Resources Investigation Report 94-4002.

5. U.S.Army Corps of Engineers, Hydrologic Center, "HEC-RAS, River Analysis System", 1997.

6. Calculation 05996.01-G(B)-10, Rev 0, "HEC-RAS Micro Computer Version 1.2 Software Test", May 20, 1997.

7. U.S.Army Corps of Engineers, Office of the Chief Engineers, "HEC-1, Flood Hydrograph Package", 1981.

8. Calculation 05996.01-G(B)-08, Rev 1, "HEC-1 Flood Hydrolograph Package, Micro Computer Version 4.0 Software Test, QS 2-7", May 20, 1997.

9. "Engineering Hydrology" by Victor M. Ponce

10. "Guide for the Use of Technical Release No. 55 - Urban Gydrology", USDA Soil Conservation Services, Dec, 1977.

11. Private Fuel Storage L.L.C., "Safety Analysis Report, Private Fuel Storage Facility, Docket No. 72-22". Skull Valley Indian Reservation, Tooele County, Utah.

12. "Hydrologic Analysis and Design", by Richard H McCuen. Prentice Hall.

3, Methodology

The estimation of the flood level involves two steps:

(1) Perform hydrological analysis to determine flood flow discharge (Runoff).
(2) Perform hydraulic analysis to calculate water surface elevation.

3.1, PMF

The PMF is defined as the most severe flood that is considered reasonably possible at a site as a result of hydrologic and ~~meteorologic~~ meteorological conditions. Two possible types of PMF are possible in the Skull Valley Region where PFSF is located: (1) General Storm PMF which resulted from the convergence precipitation and the orographic precipitation (see note below). (2) Local PMF - While the general storm PMF is a major concern, the summer thunder storm having the greatest potential rainfall intensity and short durations may produce a larger PMF. This PMF is termed as local PMF in Reference 2 and in this calculation.

Note:

Convergence precipitation - Precipitation caused by convective lifting , and therefore cooling of the moist air, assuming not affected by terrain.

Orographic precipitation - Precipitation caused by lifting of moist horizontal air current over the mountain range or other natural barrier.

The general storm PMF and the local storm PMF are evaluated separately. The larger of the two is used to compute the flood level.

The first step to determine PMF is to define Probable Maximum Precipitation (PMP) from the precipitation information and procedure provided by Reference 2. The PMP is then input to the HEC-1 program (Reference 7) to calculate the runoff hydrograph.

Precipitation losses - In calculating runoff flow using HEC-1 program, the infiltration loss and other precipitation losses must be defined. The Soil Conservation Service (SCS) has developed a Curve Number Procedure for estimating runoff based on field studies of the measured runoff from numerous soil cover combinations. This method was adopted by the HEC-1 program as one of the options to account for the precipitation losses. In this analysis, the Skull Valley soil is assumed to be in the Curve Number 70 hydrologic soil group.

Unit hydrograph - The conversion of the precipitation excess (precipitation - infiltration and other losses) to runoff is accomplished by executing the HEC-1 program using SCS dimensionless unit hydrograph as basis. The "lag time" parameter, which is approximated by 0.6 times Tc (concentration time), is input ~~required~~ to convert the dimensionless unit hydrograph to the basin unit hydrograph. The concentration time is estimated using Hathaway Equation (Ref. 9) in Table 1, This equation includes a roughness coefficient to account for different soils.

Tc = 18.31 hours Lag time = 0.6 x 18.31 = 11 hr (HEC-1 data)

The second method using Kirpich Equation, which does not consider the soil type, is also calculated in the table for reference.

Table 1

PFSF, Estimate Concentration Time From South Rim of Basin to Access Road

Kirpich Formula: $Tc=(0.0078 \times L^{0.77}) / S^{0.385}$

Hathaway Formula: $Tc=0.0606 \times (L \times n)^{0.467} / S^{0.234}$, n is the roughness for various types of surface

	From Elev 1 ft	To Elev 2 ft	L mile	L ft	L Km	S	n	Kirpich Tc hour	Hathaway Tc hour	
	6400	5400	3.5	18480	5.6	0.054113	0.5	0.77	1.95	Trees
	5400	5200	1.0	5280	1.6	0.037879	0.2	0.34	0.77	
	5200	5000	2.5	13200	4.0	0.015152	0.5	0.97	2.24	Pasture
	5000	4800	4.9	25872	7.9	0.007730	0.5	2.11	3.59	Pasture
	4800	4600	8.4	44352	13.5	0.004509	0.5	3.94	5.24	Pasture
	4600	4465	6.0	31680	9.7	0.004261	0.5	3.11	4.53	Pasture
Total			**26.3**					**11.24**	**18.31**	

3.2, 100-year Flow

The 100-year flow is estimated using regression equations provided in References 3 and 4.

3.3, Hydraulic Analysis

Flood level profile for the PMF and the 100-year flow are computed using the HEC-RAS program (Reference 5).

3.4, Computer Programs

The two computer programs, HEC-1 for the hydrological analysis and HEC-RAS for the hydraulic calculation, have been tested and qualified by Stone & Webster (References 5, 6, 7, and 8).

4, Hydrological Analysis

4.1, Drainage Area

As shown in Figure 1, watershed areas that contribute runoff to the floodway which flows south to north through the access road, is primarily from the following sources:

- West slope of the Stansbury Mountains, south of Indian Hickman Canyon.
- West slope of the Onaqui Mountains.
- North slope of the Lookout Mountain.
- South tip of the Lower Cedar Mountain Range below White Rock Spring.
- Lowlands in the valley sounded by the above 4.

The total drainage area is about **270 square miles.** The distance from PFSF site to the farthest boundary point near Lookout Mountain is about **26 miles**.

Precipitation runoff from the Cedar Mountain slope and the associated discharge fan would not converged to the above mentioned floodway.

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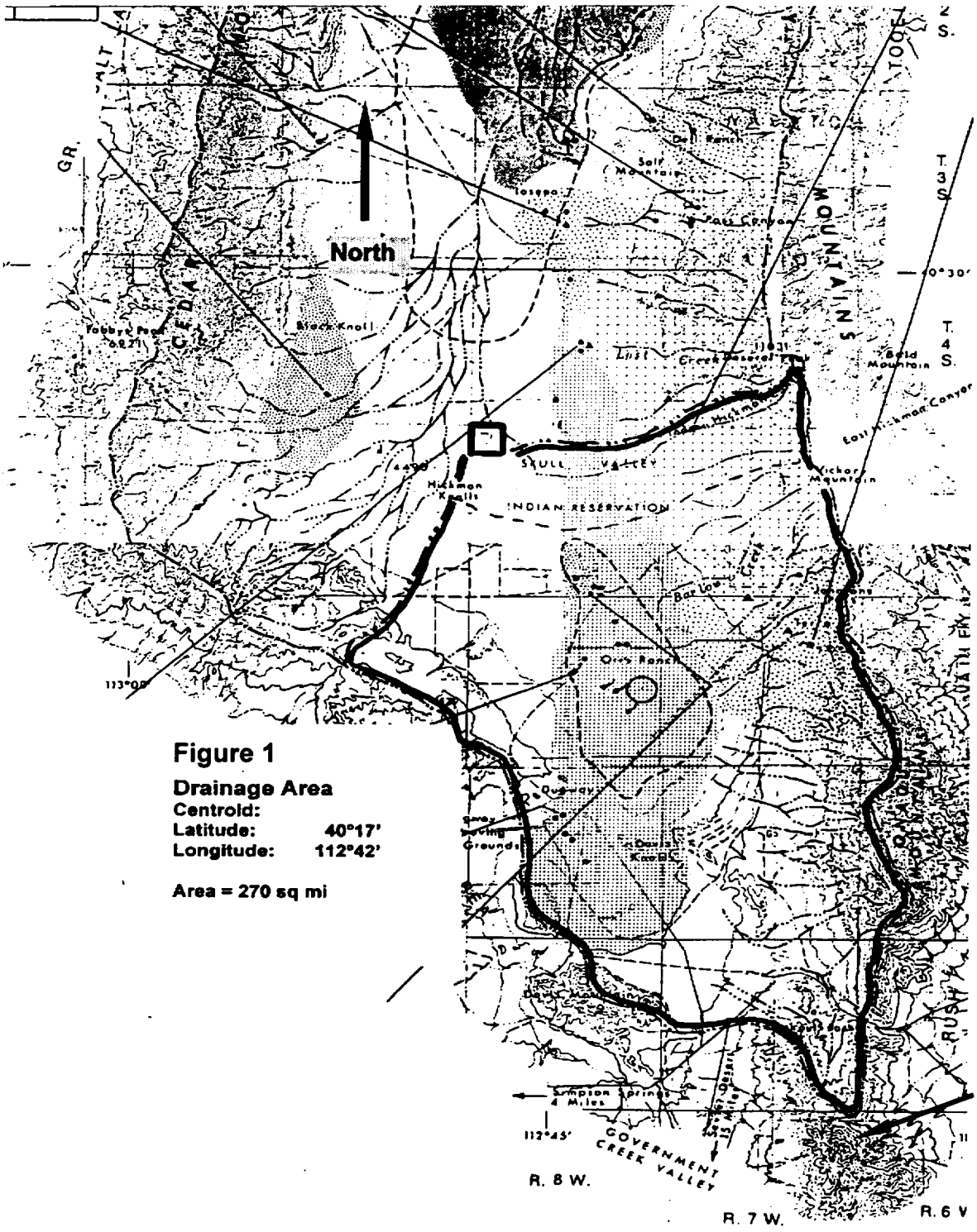


Figure 1

Drainage Area
Centroid:
Latitude: 40°17'
Longitude: 112°42'

Area = 270 sq mi

4.2, General Storm PMP

Table 1 computes general storm PMP for the 6, 12, 18, 24, 48, and 72 hours in item C. The result is plotted in Figure 2. The values of the 3-hour interval precipitation are read from Figure 2 and listed in Table 2.

Table 2 also calculates the 3-hour incremental PMP. Time distribution of the 18 hour incremental is composed in the 3-1-2-4 sequence in the last column for HEC-1 input.

Table 1, General Storm PMP Computation (Refer all figures and tables to Ref. 2)

General Storm PMP Computation

Based on NOAA Report No. 49 "Probable Maximum Precipitation Estimates,Basin Drainages, Colorado River and Great Basin Drainages".

Drainage: Access Road Crossing **Latitude: 40°17'** **Month: August**

Area (mi²): 270 mi² **Longitude: 112°42'**

A. Convergence PMP								
1. Drainage average value	Fig 2.5 - 2.16	10.7 in						
2. Reduction for barrier elev	Fig 2.18	55 %						
3. Rarrier-elev reduced PMP	1 x 2	5.9 in						
					Duration (hrs)			
		6	12	18	24	48	72	
4. Duration variation	Fig 2.25 - 2.27, & Table 2.7	67	85	94	100	116	123	%
5. Convergence PMP for indicated duration	3 x 4	3.9	5.0	5.5	5.9	6.8	7.2	in
6. Incremental 10 mi2 PMP	Successive - of 5	3.9	1.1	0.5	0.4	0.9	0.4	in
7. Area reduction	Fig 2.28 & 2.29	72	89	94	98	100	100	%
8. Areally reduced PMP	6 x 7	2.8	0.9	0.5	0.3	0.9	0.4	in
9. Drainage average PMP	Accu 8	2.8	3.8	4.3	4.6	5.6	6.0	in
B. Orographic PMP								
1. Drainage average orographic index	Fig 3.11a - d	4 in						
2. Areal reduction	Fig 3.20	88.5 %						
3. Adjustment for month	Fig 3.12 - 3.17	100 %						
4. Arealy & seasonally adjustmented PMP	1 x 2 x 3	3.5 in						
					Duration (hrs)			
		6	12	18	24	48	72	
5. Durational variation	Table 3.9	30	57	80	100	159	187	%
6. Orographic PMP for given duration	4 x 5	1.1	2.0	2.8	3.5	5.6	6.6	in
C. Total PMP								
1. A9+B6		3.9	5.8	7.1	8.2	11.2	12.6	in

Figure 2, General PMP (3 hr interval)

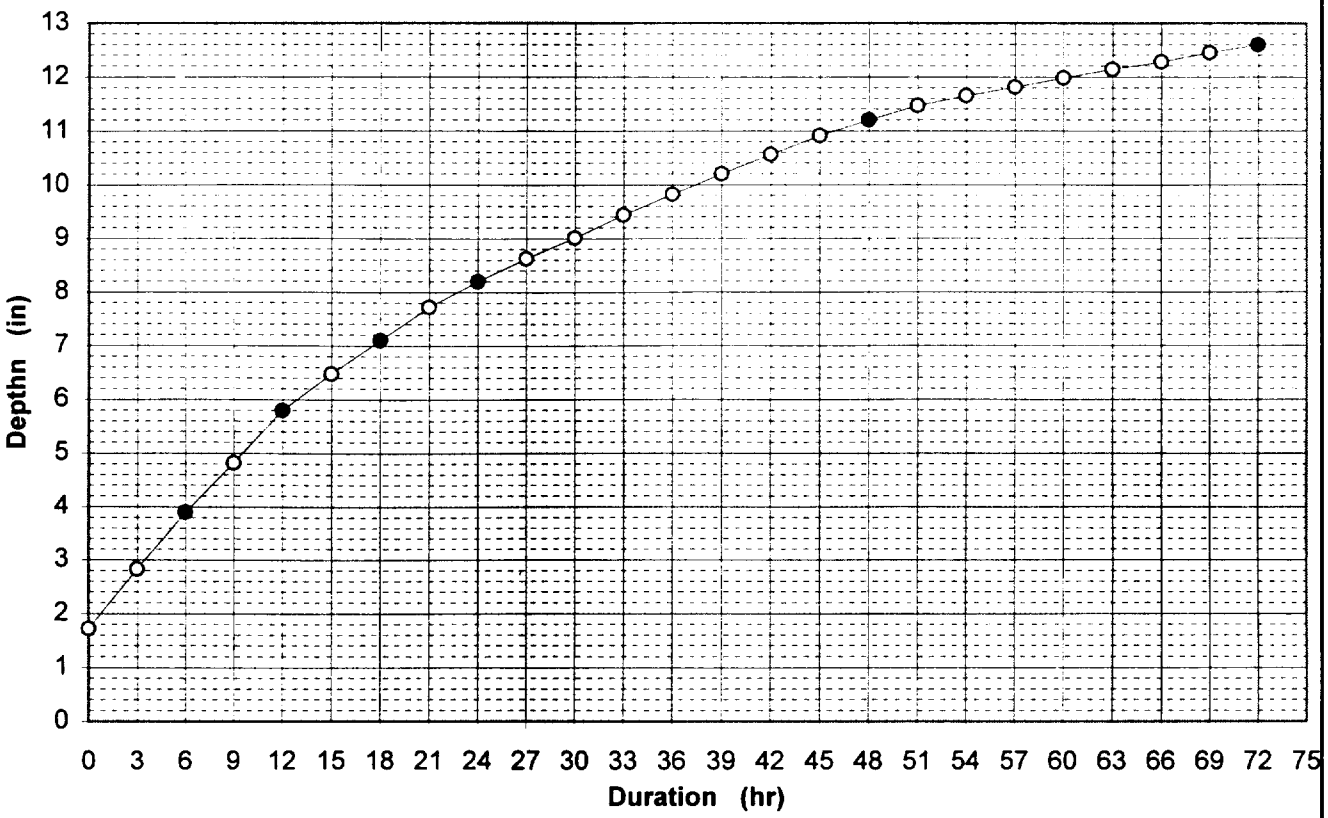
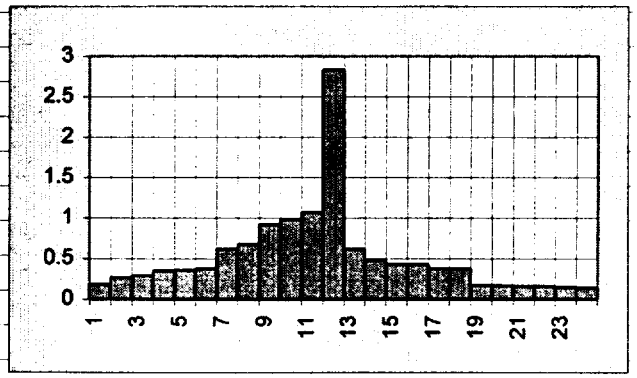


Table 2, Synthetic Rainfall Hyetograph (General Storm PMF)

	Hour	3-Hour PMP (in)	PMP Increment		Input to HEC-1 Hyetograph
	0	1.72			
1	3	2.83	2.83	3	0.18
	6	**3.9**	1.07		0.27
	9	4.82	0.92		0.29
	12	**5.8**	0.98		0.35
	15	6.48	0.68		0.36
	18	**7.1**	0.62		0.38
2	21	7.72	0.62	1	0.62
	24	**8.2**	0.48		0.68
	27	8.63	0.43		0.92
	30	9.01	0.38		0.98
	33	9.44	0.43		1.07
	36	9.82	0.38		2.83
3	39	10.2	0.38	2	0.62
	42	10.56	0.36		0.48
	45	10.91	0.35		0.43
	48	**11.2**	0.29		0.43
	51	11.47	0.27		0.38
	54	11.65	0.18		0.38
4	57	11.81	0.16	4	0.17
	60	11.98	0.17		0.17
	63	12.14	0.16		0.16
	66	12.28	0.14		0.16
	69	12.45	0.17		0.15
	72	**12.6**	0.15		0.14



4.3, Local Storm PMP

Table 3 computes local storm PMP at ¼, ½, ¾ and 1, 2, 3, 4 ,5 and 6 hours, The resulting precipitation is shown in item 7 of the table and is plotted in Figure 3.

From Figure 3, the 15-min ~~pmp~~ PMP is interpolated and the corresponding incremental are calculated in Table 4. The incremental precipitation is rearranged in 5-3-1-2-4-6 sequence to form time distribution precipitation for HEC-1 input.

Table 3, Local Storm PMP Computation (Refer all figures and tables to Ref. 2)

Local Storm PMP Computation
PFSF (Private Fuel Storage Facility) Project
Based on NOAA Report No. 49 "Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages"

Drainage: Access Road **Latitude:** **40°17'**
Area (mi²): 270 mi² **Longitude:** **112°42'** **Minimum Elev 4465 ft**

1. Average 1-hr 1 mi²PMP for drainge	Fig 4.5, Page 115	10.1	in
2a. Reduction for elev		50	%
No adjustment up to 5000'			
5% decrease/1000' above 5000'		100	%
2b. 1 x 2a		10.1	in
3. Average 6/1 hour ratio for drainage	Fig 4.7 - Page 11	1.4	

			Duration (hrs)								
		0.25	**0.50**	**0.75**	**1.00**	**2.00**	**3.00**	**4.00**	**5.00**	**6.00**	
4. Durational variation for 6/1-hr ratio	Table 4.4, Page 1	63	83	93	100	118	126	132	137	140	%
5. 1-mi2 PMP for indicated durations	2b x 4	6.4	8.4	9.4	10.1	11.9	12.7	13.3	13.8	14.1	in
6. Areal reduction	Fig 4.9, Page 123	19.0	24.5	27.5	31.0	35.0	39.0	41	43	45	%
7. Area reduced PMP	**5 x 6**	**1.2**	**2.1**	**2.6**	**3.1**	**4.2**	**5.0**	**5.5**	**5.9**	**6.4**	**in**
8. Incremental PMP	Success (-) in 7										
	15 min increments				3.1	1.0	0.8	0.5	0.5	0.4	in
		1.2	0.8	0.5	0.5						
9. Time sequences of incremental PMP											
Hourly increments					**0.5**	**0.8**	**3.1**	**1**	**0.5**	**0.4**	
Four largest 15-min.		**1.2**	**0.8**	**0.5**	**0.5**						

Figure 3, Local PMP (15-min interval)

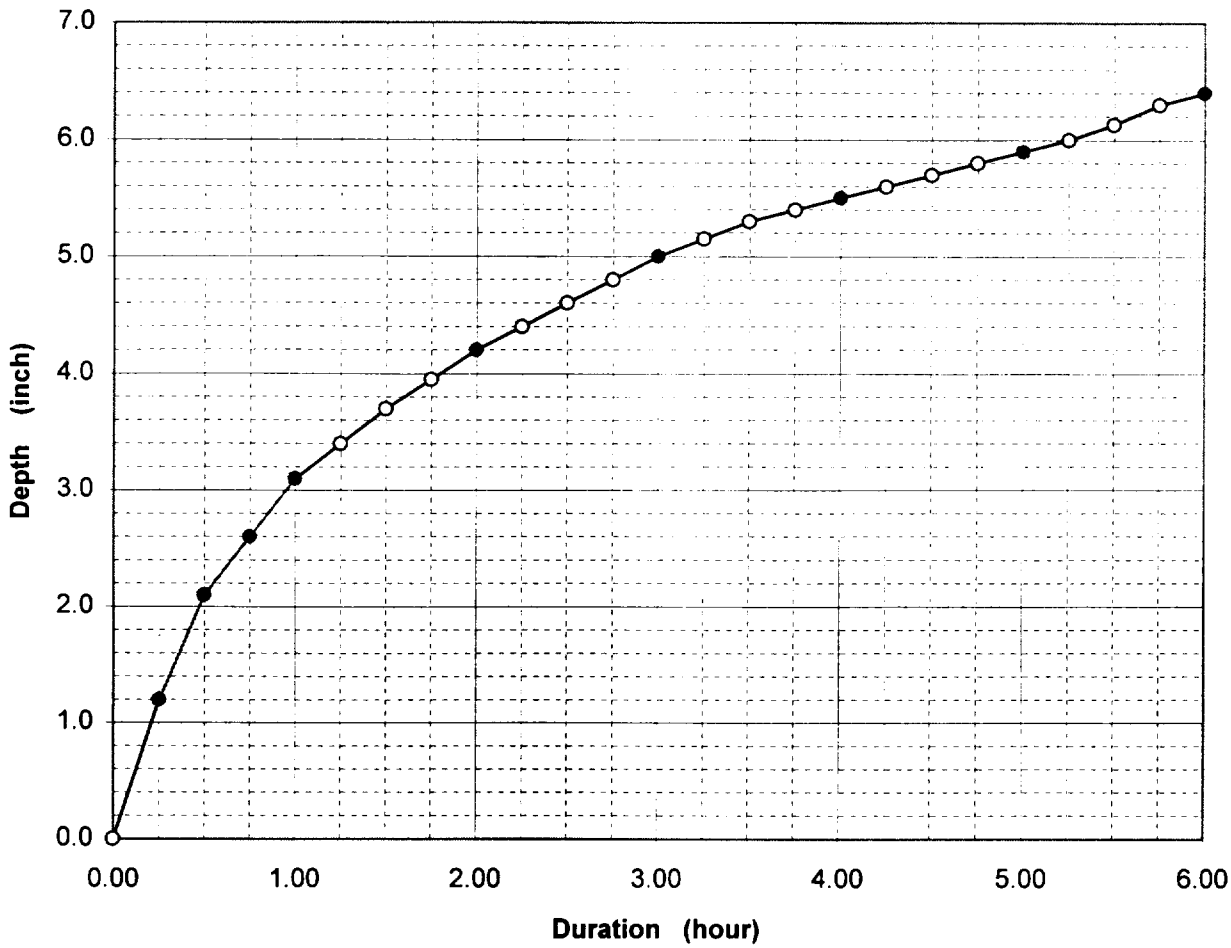
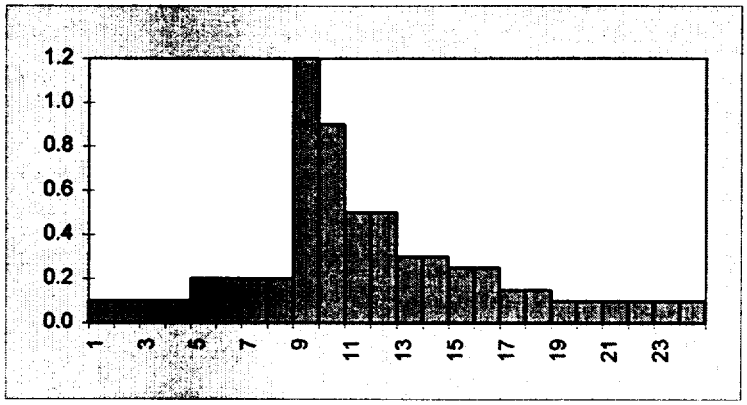


Table 4, Synthetic Rainfall Hyetograph (Local Storm PMF)

Computation of 15-min PMP and Incremental

Duration	No	Depth	No	Incremental	HEC-1 Input 5-3-1-2-4-6	
0.00		0.0				
0.25	1	1.2	1	1.2	5	0.1
0.50		2.1		0.9		0.1
0.75		2.6		0.5		0.1
1.00		3.1		0.5		0.1
1.25	2	3.4	2	0.3	3	0.2
1.50		3.7		0.3		0.2
1.75		4.0		0.3		0.2
2.00		4.2		0.3		0.2
2.25	3	4.4	3	0.2	1	1.2
2.50		4.6		0.2		0.9
2.75		4.8		0.2		0.5
3.00		5.0		0.2		0.5
3.25	4	5.2	4	0.2	2	0.3
3.50		5.3		0.1		0.3
3.75		5.4		0.1		0.3
4.00		5.5		0.1		0.3
4.25	5	5.6	5	0.1	4	0.2
4.50		5.7		0.1		0.1
4.75		5.8		0.1		0.1
5.00		5.9		0.1		0.1
5.25	6	6.0	6	0.1	6	0.1
5.50		6.1		0.1		0.1
5.75		6.3		0.2		0.1
6.00		6.4		0.1		0.1



5, Result of PMF and 100-year Runoff Flow

PMF

Precipitation data developed in the the last column of Table 2 and 4, is input to HEC-1 program to compute hydrograph at the Access Road, the outlet of the drainage basin. The result of HEC-1 runs made for the general storm PMF and the local storm PMF are included in Attachments 1 and 2. The peaks of hydrographs are:

General Storm PMF: Q = 52983 cfs
Local Storm PMF: Q = 40237 cfs

Since the general storm PMF is greater, the final PMF for the hydraulic computation is determined to be:

Q_{PMF} = 53,000 cfs

100-year flow

The 100-year flow for the 270 mi^2 drainage basin is estimated from the FHWA method (Ref. 3) and the USGS Method (Ref. 4)

FHWA Method - Based on hydrological analysis of many watersheds, the Federal Highway Administration has developed a method to estimate peak runoff for the ungaged watersheds. The step-by-step procedure of this method is described in Ref. 3. Detail calculation using this method is included in Table 5. The result is

Q_{100} = 2430 cfs

USGS Method - The USGS has also developed flood-regionalization procedures to predict the magnitude of peak runoff (Ref.4). The 50 states in the country are divided into several hydrophysiographic zones. Within each zone, regressional equations are developed to compute peak runoff for various return periods of flood. In the Skull Valley of Utah where PFSF is located, The regression equation for 100-year flood is

$Q_{100} = 68.1 \times A^{0.63}$, where A is the drainage area in square miles.
$Q_{100} = (68.1)(270^{0.63}) = 2317$ cfs

Since the flow calculated by FHWA method is greater, the 100-year flood flow is determined to be 2430 cfs

~~FHWA Method: Q_{100} = 2,430 cfs (Table 5)~~

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~~USGS Method: $Q_{100} = 68.1 \times A^{0.63} = (68.1)(270^{0.63}) = 2317$ cfs~~

~~Use Q100 = 2430 cfs for hydraulic analysis.~~

Table 5, Calculating 100-year flow using FHWA method (Based on Ref 3)

PFSF Utah

100-year Flow

FHWA Method

1	Area=	270	sq mi	
	Latitute=	40°17'		
	Longitude=	112°42'		
2	**Probable Maximum Runoff Peak Qp(max), See note 1 below.**			
	log(Area)=	2.43		
	Exp=	5.70		
	Qp(max)=	503666	cfs	$Qp(max) = 10^{\{3.92+0.812(logA)-0.0325(logA)(logA)\}}$
3	**Hydrophusiographic Parameters**			
3a	R=	12		Iso-erodent factor
3b	DH=	1935	ft	Elevation different
3c	S=	0		Reservoir or lake area
3d	Zone	17		Hydrophysiographic zone
3e	L=	25	miles	Principal channel length
3f	P60=	0.92	inch	10-year, 60-minute rainfall
3g	LL=	258	miles	Total channel length including secondarey streams
3h	P10=	3.01	inch	10-year, 10-minute rainfall intensity
4	**10-year Runoff Q10**			
	Q10=	1201	cfs	10-year runoff peak, 7 parameter equation (Note 2)
5	**Skip**			
6	Q100=	2428.9	**say 2430**	100-year peak runoff (Note 3)

Note 1: This is the PMF for watersheds in the U.S. and Puerto Rico. The procedure uses this as a basis to make adjustment for different hydrophysiographic zones of rainfall and soil condition in the country

Note 2: $Q10=157.4954A^{0.5815}R^{1.2801}DH^{-0.6249}L^{-0.0429}LL^{0.4032}P_{10}^{-1.5484}P_{60}^{-0.5034}$

Note 3: $Q100=1.6438Q10^{1.02918}$

6, Water Surface Profile

Cross sections in the HEC-RAS model is plotted in Figure 4. The flow discharges used in the computation are:

Q_{100} = 2,430 cfs
Q_{PMF} = 53,000 cfs

The result of the water surface can be found in Table 6 and the detail hydraulic report is included in Attachment 3.

Figure 5 plots the limit of the floodway.
Figure 6 plot the profile of the water surface.
Figures 7 to 11 shows water levels in each cross-section of Figure4.

Table 6

Profile Output Table - Standard Table 1
HEC-RAS Plan: PFSF_0 River: Skull Valey Reach: PFSF

Rivers = 1
Hydraulic Reaches = 1
River Stations = 18
Plans = 1
Profiles = 3

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude	# Chl
PFSF	9400 D	100-year Q	2430.00	4496.52	5.00	486.13	639.02	1.01	Section D
PFSF	9400	PMF	53000.00	4500.51	7.89	7600.73	4643.96	0.80	
PFSF	**9400**	**PMF1**	**85000.00**	**4501.27**	**9.01**	**11174.31**	**4854.65**	**0.82**	
PFSF	5900 C	100-year Q	2430.00	4474.39	1.83	1333.60	1974.90	0.39	Section C
PFSF	5900	PMF	53000.00	4477.40	6.52	9332.06	3331.49	0.60	
PFSF	**5900**	**PMF1**	**85000.00**	**4478.35**	**7.87**	**12682.43**	**3756.88**	**0.64**	
PFSF	4500 A3	100-year Q	2430.00	4465.49	3.79	675.00	1570.35		Section A3
PFSF	4500	PMF	53000.00	4467.99	9.26	6975.88	3470.35	0.94	
PFSF	**4500**	**PMF1**	**85000.00**	**4468.83**	**10.50**	**10154.45**	**4107.89**	**0.95**	
PFSF	2800 A2	100-year Q	2430.00	4451.91	2.34	1038.28	1087.95	0.42	Section A2
PFSF	2800	PMF	53000.00	4455.70	5.77	9184.57	3065.85	0.59	
PFSF	**2800**	**PMF1**	**85000.00**	**4456.72**	**6.80**	**12492.89**	**3383.87**	**0.62**	
PFSF	1300 A1	100-year Q	2430.00	4446.32	2.12	1147.98	1740.88	0.46	Section A1
PFSF	1300	PMF	53000.00	4449.21	5.43	9978.53	4008.66	0.59	
PFSF	**1300**	**PMF1**	**85000.00**	**4450.13**	**6.27**	**13923.87**	**4540.63**	**0.61**	
PFSF	0 A	100-year Q	2430.00	4440.60	2.02	1241.60	2258.30	0.46	section A
PFSF	0	PMF	53000.00	4443.31	6.33	9591.24	3888.38	0.61	
PFSF	**0**	**PMF1**	**85000.00**	**4444.23**	**7.45**	**13396.12**	**4436.82**	**0.64**	

CALCULATION IDENTIFICATION NUMBER				REV. NO.1
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 18

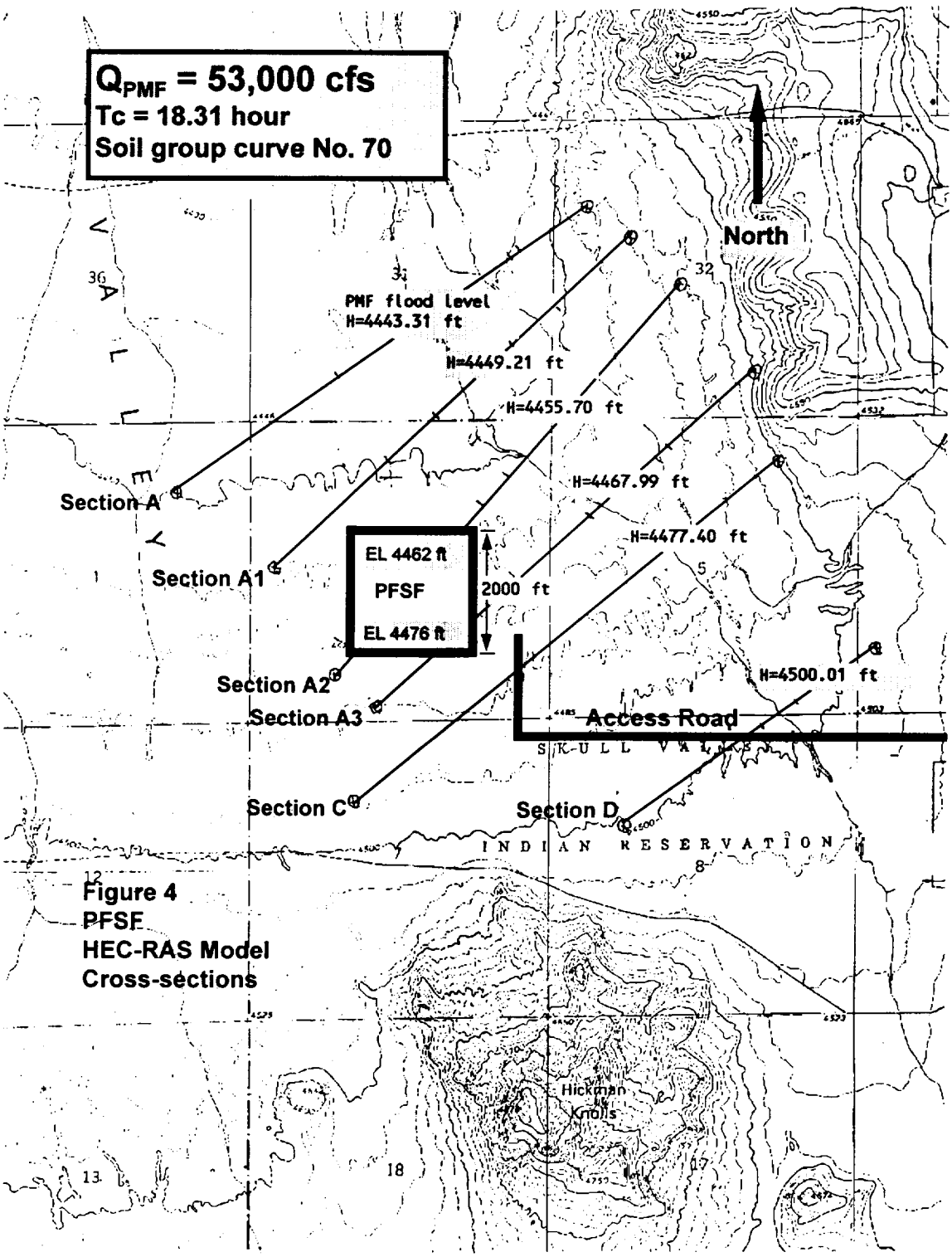


Figure 4
PFSF
HEC-RAS Model
Cross-sections

CALCULATION IDENTIFICATION NUMBER				REV. NO.1
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 19

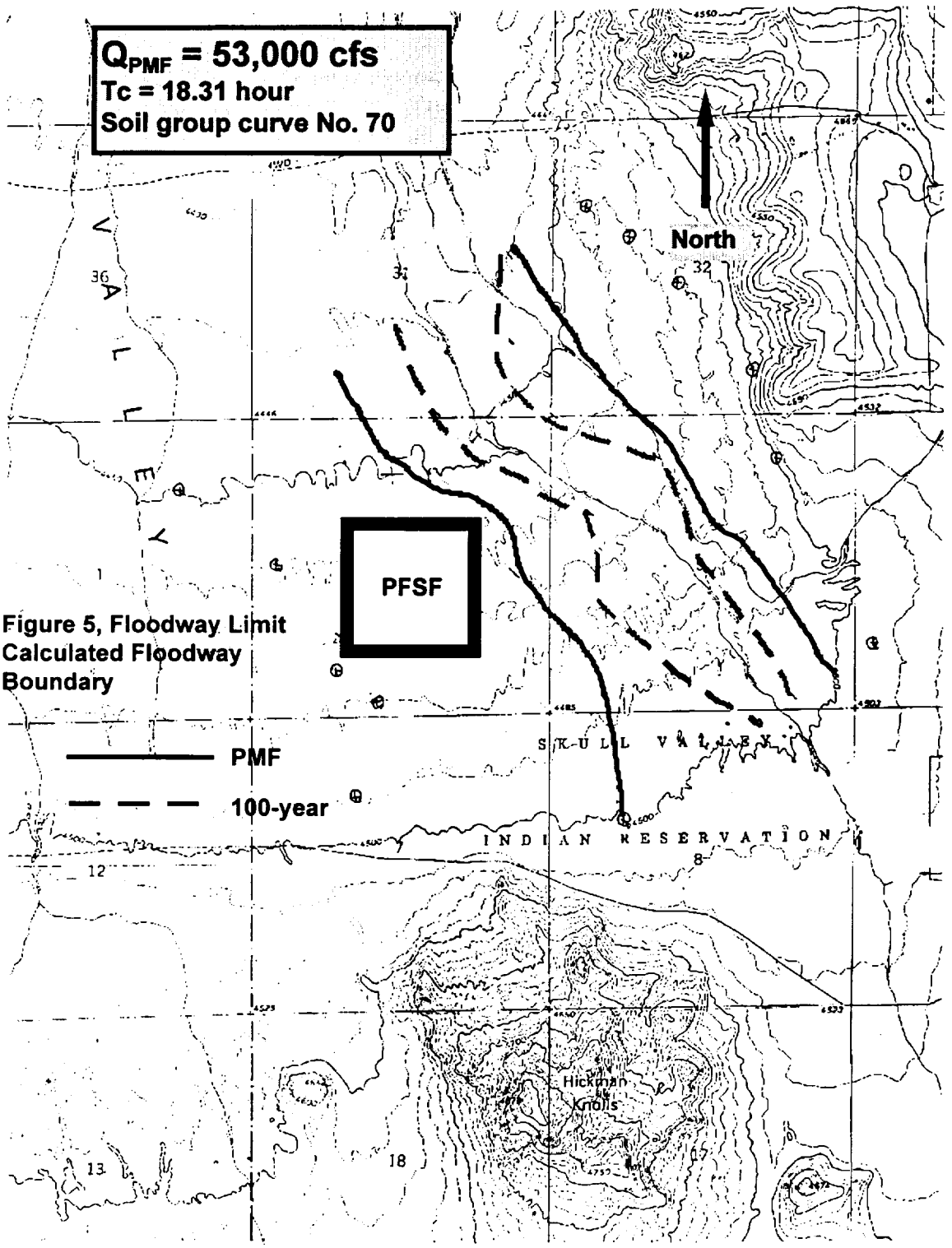


Figure 5, Floodway Limit Calculated Floodway Boundary

Figure 6, Water Surface Profile

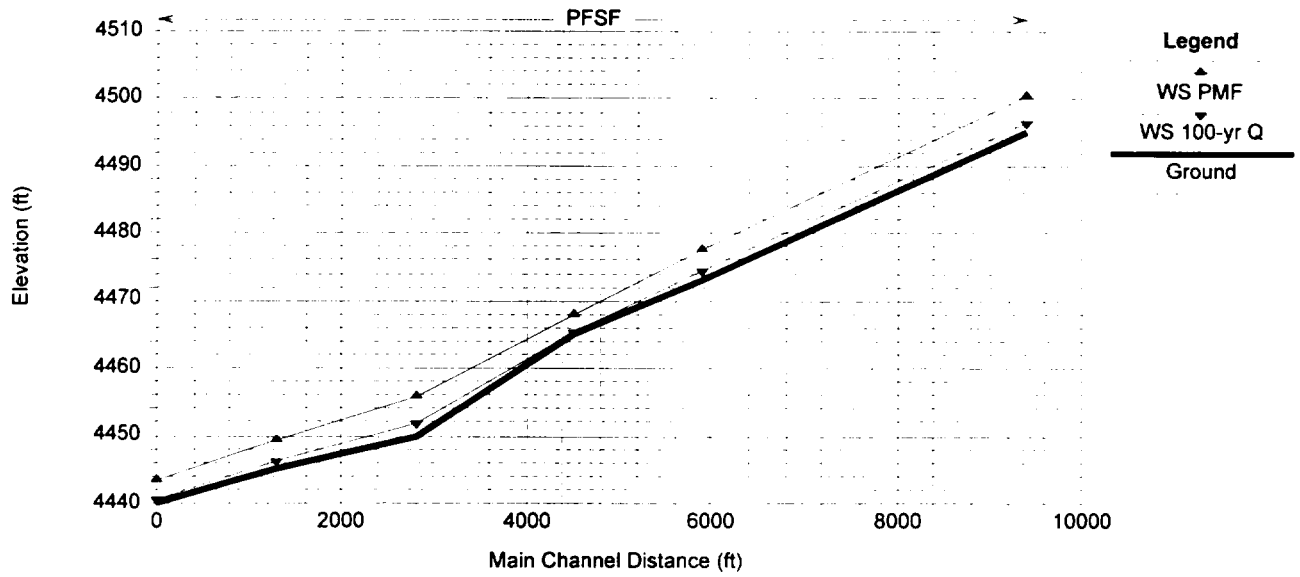


Figure 7

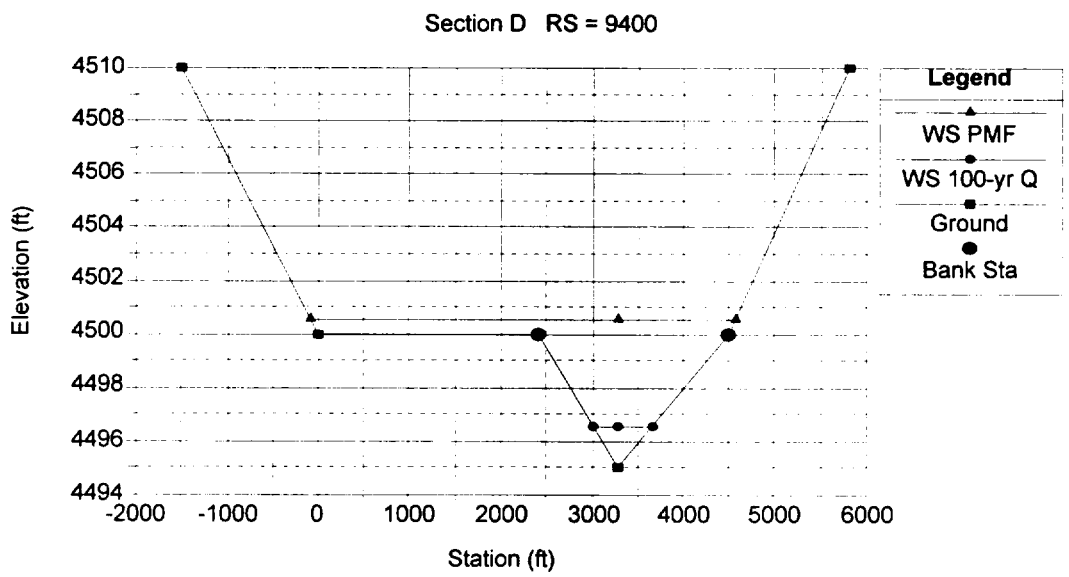


Figure 8

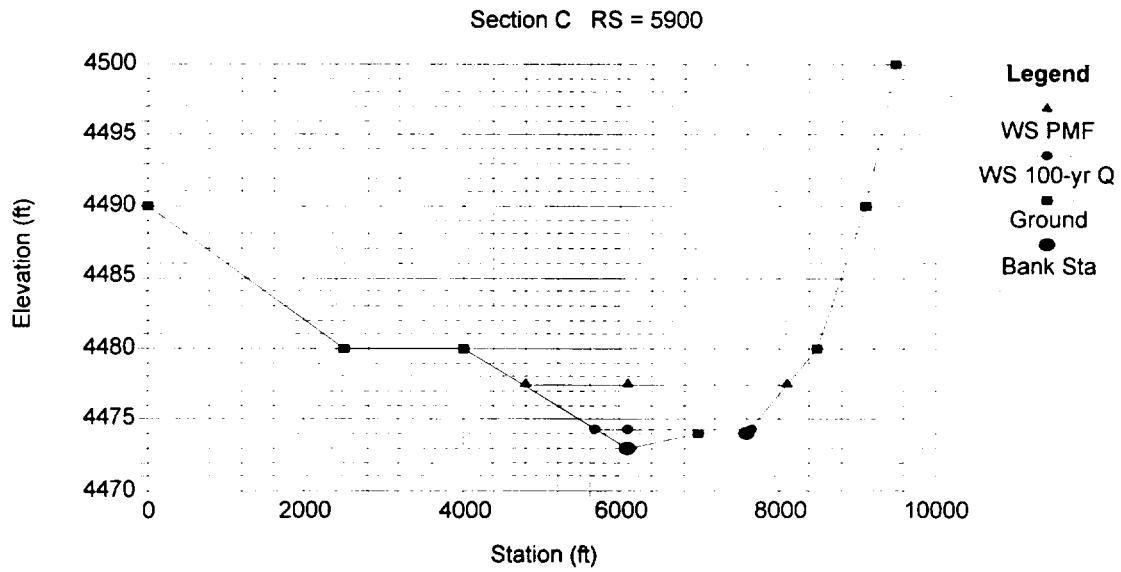


Figure 9

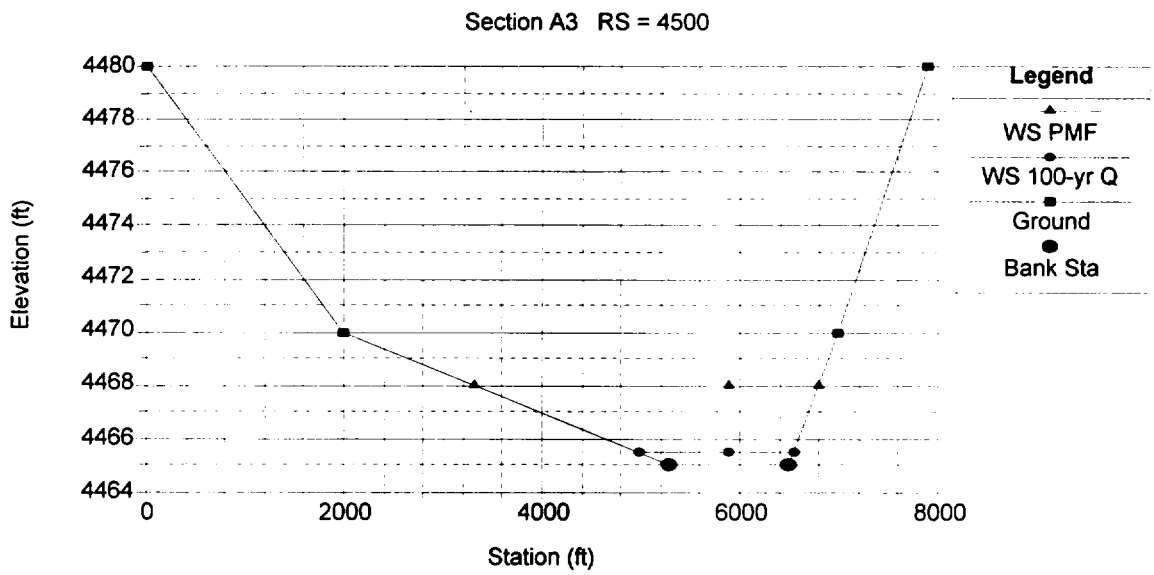


Figure 10

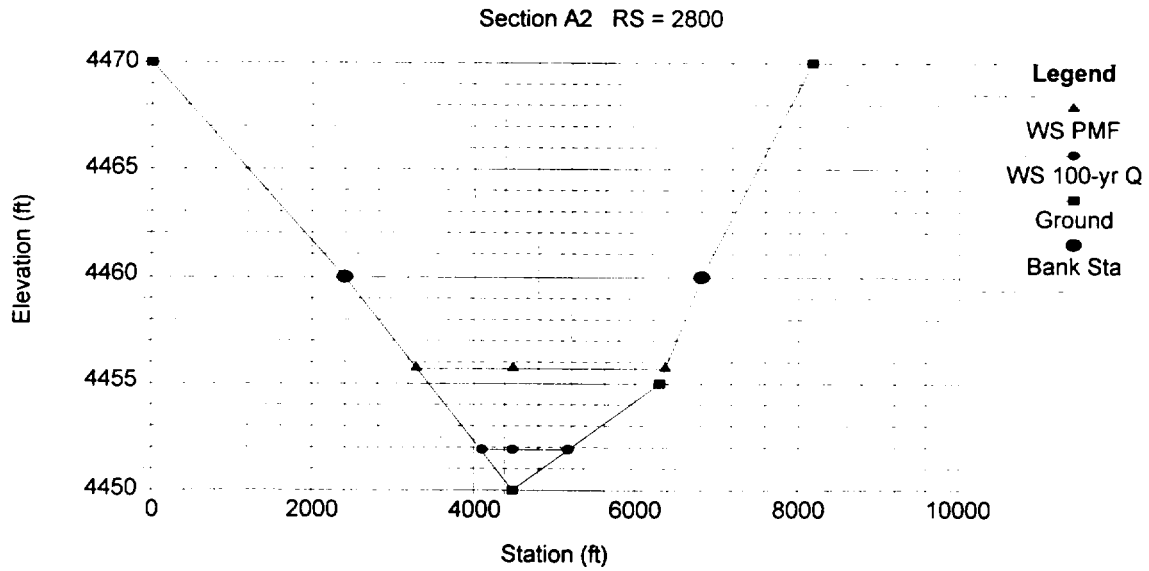
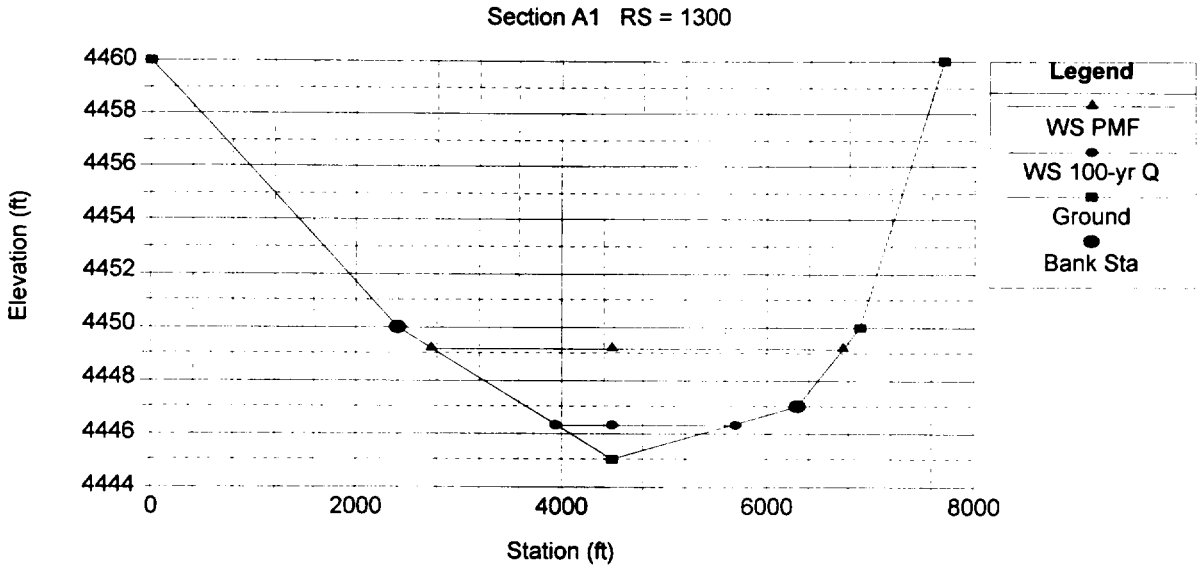


Figure 11



7, Conclusion

The calculated peak runoff for the 100-year and the PMF flood events are:

Q_{100} = 2,430 cfs
Q_{PMF} = 53,000 cfs

Referring to Figure 4 and Table 6, the water level at Section A2, which has the closest point to the PFSF site is:

H_{100} = 4451.9 ft
H_{PMF} = 4455.7 ft

The access road is running obliquely to the flood way . The calculated water surface elevations are:

100-year flood	4496.5 ft
PMF flood	From 4500.5 ft (east bank of flood way) to 4477.4 ft (west bank).

The above water surface elevations are calculated using Manning's = 0.035. Note that these elevations, as well as other elevations in this calculation, are based on the USGS 1:24,000 topographic map datum.

8, Discussion

Three main factors that affect the calculation result of PMF are: (1), precipitation, (2), land surface interception and infiltration, and (3), Concentration time. The approach for defining the three factors in this calculation is summarized as follows.

(1), Precipitation
The precipitation data is evaluated based on NOAA report (Ref. 2). The report gives a procedure to estimate PMP (probable maximum precipitation) in the Great Basin area including the Skull Valley where PFSF is located. Therefore, the PMP data developed in this calculation should have been reasonably defined.

(2), Land Surface Interception and Infiltration
This is related to the SCS (Soil Conservation Service) curve number (CN). The Water Resources Department of Utah suggested CN=70 for the type of soil surface condition in the Skull Valley. (CN=100 is impervious). Consequently, CN=70 is assumed in the calculation.

Several additional HEC-1 analyses were made to test the effect of CN to the PMF. It was found that CN is not a very sensitive factor to the result of PMF.

There are 6 cases analyzed, each assumed CN = 75, 80, 85, 90, and 96, respectively; all other data remain unchanged. The results of these runs are presented in Figure 12. The HEC-1 input and outputs are documented as Attachment 4 in this calculation.

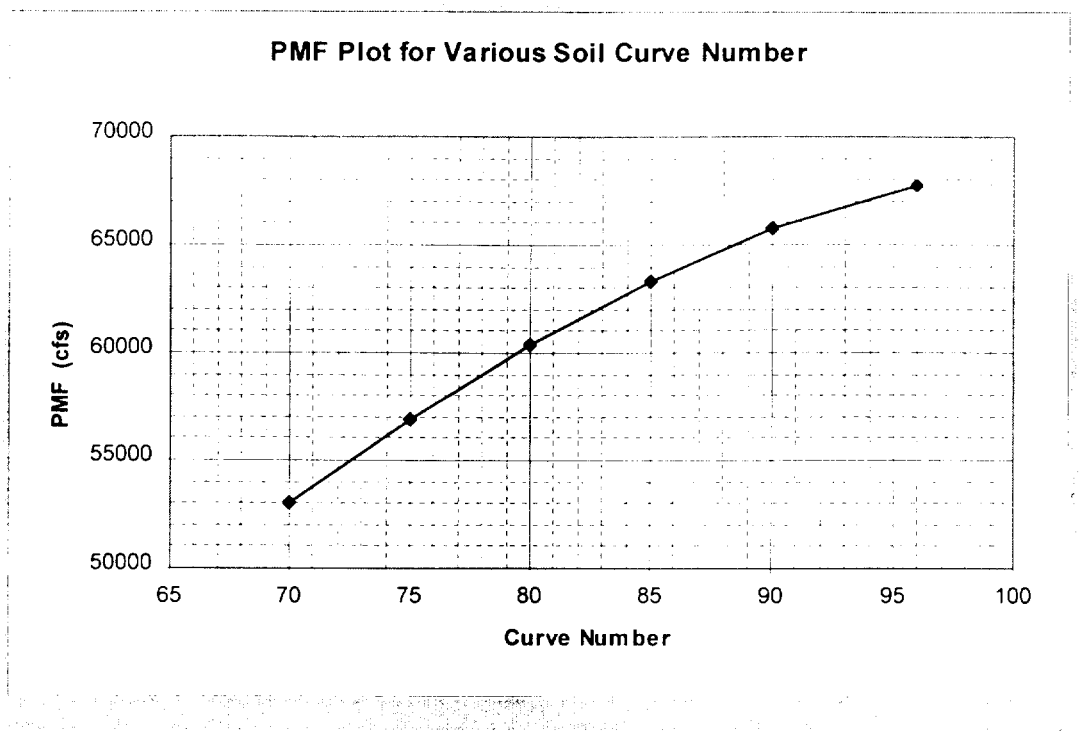
The highest CN = 96 produces PMF = 67759 cfs. However, this number does not describe the soil condition in the Skull Valley. The soil condition for CN=96 is characterized in Table 2-2a of Ref.10 as below:

> Western desert urban areas - Artificial desert landscaping with impervious weed barrier, desert shrub with 1 to 2 inch sand or gravel mulch and basin borders.

The Skull Valley drainage basin is an undeveloped area and the climate is semi-arid. The precipitation runoff, mostly occurs in the surrounding mountain ranges, is intercepted by the pervious unconsolidated sand in the valley to recharge to the groundwater system. Field data has shown that groundwater level is more than 100 ft below the ground. Consequently, CN=96, being close to total impervious or the saturated condition, should not be applied to the area. The hydrologic condition in the area has been described in detail in the SAR (Ref. 11). Based on the SAR and suggestion from Water Resource Department of Utah, CN=70 should be appropriate for this PMF analysis.

Figure 12
Values of PMF Corresponding to Different CN, Tc=18.31 hour

Curve No	PMF
70	53000
75	56887
80	60341
85	63287
90	65734
96	67759



(3) Concentration Time

Most of the empirical methods for estimating the concentration time, Tc, are based on small watershed in a specific geographic region. For example, the Kirpich's method was established on the small agricultural watersheds in Tennessee with drainage area smaller than 0.3 square miles (200 acres). For a large watershed such as the Skull Valley watershed which has an area = 270 square miles, the watershed characteristic and the land cover type should be fully considered. The Skull Valley runoff is dominated by the sheet flows; the roughness coefficient should be included in determining Tc to reflect basin characteristic for each sector of the basin.

The Hathaway formula is selected because it included the roughness. Another method that may be used for the Skull Valley basin is the SCS formula. The SCS has established an equation for estimating the watershed lag, which is defined as the time in hours from the center of mass of the excess rainfall to the peak discharge. This formula, after divided by 0.6 (approximate ratio of lag time and Tc), can be used to calculate Tc. Using this formula the Tc calculated in Table 7. For CN=70, the calculated Tc is 58.9 hours, and for CN=96, it is 23.4 hours. It is believed that the Hathaway method is reasonable and is conservative comparing with the SCS method.

Table 7

PFSF, Estimate Concentration Time From South Rim of Basin to Access Road
SCS Formula

$Tc=0.00526L^{0.8}((1000/CN)-9)^{0.7}S^{-0.5}$

L=Length (ft)
S=slope ft/ft
Tc=Concentration time (min)

(1), CN=70

	From Elev 1 ft	To Elev 2 ft	L mile	L ft	S ft/ft	SCS Tc Min	SCS Tc hour
	6400	5400	3.5	18480	0.054113	197.88	[illegible]
	5400	5200	1.0	5280	0.037879	80.43	[illegible]
	5200	5000	2.5	13200	0.015152	271.26	[illegible]
	5000	4800	4.9	25872	0.007730	850.61	[illegible]
	4800	4600	8.4	44352	0.004509	1311.08	[illegible]
	4600	4465	6.0	31680	0.004261	1030.41	[illegible]
Total			26.3			3533.68	58.9

(2), CN=96

	From Elev 1 ft	To Elev 2 ft	L mile	L ft	S ft/ft	SCS Tc Min	SCS Tc hour
	6400	5400	3.5	18480	0.054113	74.75	[illegible]
	5400	5200	1.0	5280	0.037879	32.79	[illegible]
	5200	5000	2.5	13200	0.015152	107.92	[illegible]
	5000	4800	4.9	25872	0.007730	258.84	[illegible]
	4800	4600	8.4	44352	0.004509	521.61	[illegible]
	4600	4465	6.0	31680	0.004261	409.95	[illegible]
Total			26.3			1405.86	23.4

An Unrealistic PMF Case

As a reference for comparison, one additional PMF case that is unlikely to happen in the Skull Valley basin is also analyzed:

Assuming CN=96 and Tc=11 hours, the calculated PMF = 85,000 cfs (84,857 cfs). The result of water surface is tabulated in the revised portion of Table 6, and plotted in Figure 13. The HEC-1 input and output files are included in Attachment 6. The HES-RAS hydraulic report is included in the revised portion of Attachment 3.

Comparing to the analyzed case (PMF=53,000 cfs), the water level increases about 1 ft. The lowest corner in the PFSF site is still 5.3 ft above the flood level.

CALCULATION IDENTIFICATION NUMBER				REV. NO.1
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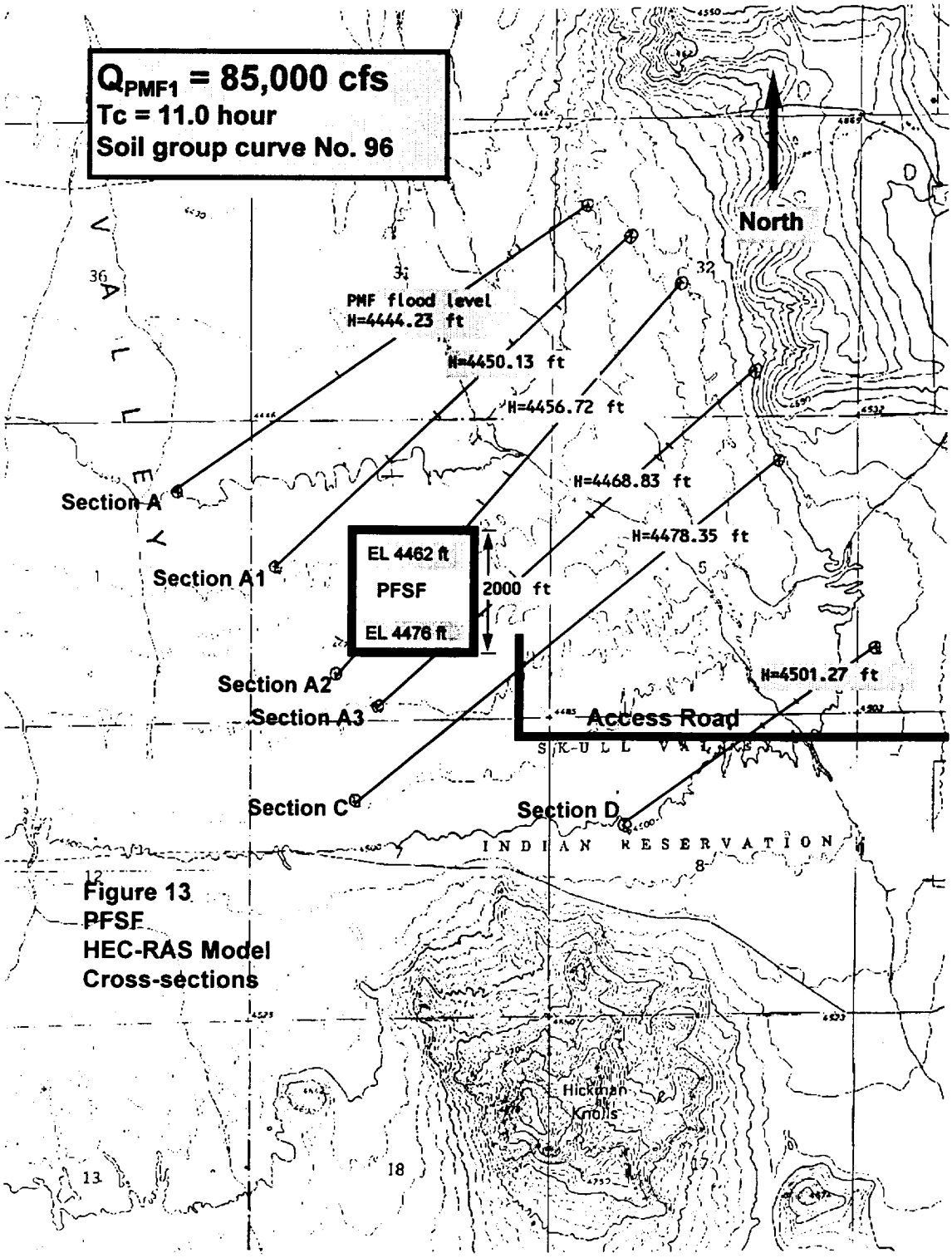

Figure 13
PFSF
HEC-RAS Model
Cross-sections

Attachment 1, HEC-1 File
General Storm PMF

HEC-1 Input

```
ID   PFSF (Private Fuel Storage Facility Project)
ID   General PMF AT ACCESS RD
ID   FILE=GEN_PMF.DAT
ID
IT    60                    200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      70       1
UD  11.0
ZZ
```

HEC-1 Output

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *            SEPTEMBER 1990            *
 *             VERSION 4.0              *
 *                                      *
 *  RUN DATE  02/07/1999  TIME  12:05:44 *
 *                                      *
 ****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
```

```
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                          HEC-1 INPUT                                          PAGE  1

      LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

        1           ID     PFSF (Private Fuel Storage Facility Project)
        2           ID     General PMF AT ACCESS RD
        3           ID     FILE=GEN_PMF.DAT
        4           ID
        5           IT      60                    200
        6           IO       2
        7           PG      60
        8           IN     180
        9           PI    0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
       10           PI    1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
       11           PI    0.16    0.16    0.15    0.14

       12           KK     010
       13           KM    SCS DIMENSIONLESS UNIT HYDROGRAPH
       14           BA   270.0
       15           BF      -1            1.06
       16           PR      60
       17           LS       0      70       1
       18           UD    11.0
       19           ZZ
1*****************************************                                  ****************************************
 *                                       *                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                  *    U.S. ARMY CORPS OF ENGINEERS      *
 *            SEPTEMBER 1990             *                                  *    HYDROLOGIC ENGINEERING CENTER     *
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*                                     *
*  RUN DATE  02/07/1999  TIME  12:05:44 *
*                                     *
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```
*        609 SECOND STREET        *
*     DAVIS, CALIFORNIA 95616     *
*         (916) 756-1104          *
*                                 *
***********************************
```

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                         PFSF (Private Fuel Storage Facility Project)
                         General PMF AT ACCESS RD
                         FILE=GEN_PMF.DAT

  6 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           2  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

  8 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN         180  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

    IT          HYDROGRAPH TIME DATA
                       NMIN          60  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      9    0  ENDING DATE
                     NDTIME        0700  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL    1.00 HOURS
                       TOTAL TIME BASE  199.00 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 12 KK    *       010  *
          *            *
          **************
                         SCS DIMENSIONLESS UNIT HYDROGRAPH

            SUBBASIN RUNOFF DATA

 14 BA        SUBBASIN CHARACTERISTICS
                    TAREA      270.00  SUBBASIN AREA

 15 BF        BASE FLOW CHARACTERISTICS
                    STRTQ      270.00  INITIAL FLOW
                    QRCSN         .00  BEGIN BASE FLOW RECESSION
                    RTIOR     1.06000  RECESSION CONSTANT

              PRECIPITATION DATA

 16 PR           RECORDING STATIONS        60
  0 PW                     WEIGHTS      1.00

 17 LS        SCS LOSS RATE
                    STRTL         .86  INITIAL ABSTRACTION
                   CRVNBR       70.00  CURVE NUMBER
                    RTIMP        1.00  PERCENT IMPERVIOUS AREA

 18 UD        SCS DIMENSIONLESS UNITGRAPH
                     TLAG       11.00  LAG

                                                        ***

            PRECIPITATION STATION DATA

                     STATION    TOTAL    AVG. ANNUAL    WEIGHT
                          60    12.60         .00        1.00

              TEMPORAL DISTRIBUTIONS

              STATION       60,  WEIGHT =   1.00
                    .06       .06       .06       .09       .09       .09       .10       .10       .10       .12
                    .12       .12       .12       .12       .12       .13       .13       .13       .21       .21
                    .21       .23       .23       .23       .31       .31       .31       .33       .33       .33
```

.36	.36	.36	.94	.94	.94	.21	.21	.21	.16
.16	.16	.14	.14	.14	.14	.14	.14	.13	.13
.13	.13	.13	.13	.06	.06	.06	.06	.06	.06
.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
.05	.05								

UNIT HYDROGRAPH
57 END-OF-PERIOD ORDINATES

296.	927.	1755.	2805.	4146.	5798.	7642.	9219.	10329.	11019.
11290.	11290.	11019.	10407.	9712.	8924.	7957.	6823.	5758.	4905.
4245.	3668.	3175.	2815.	2455.	2140.	1844.	1588.	1391.	1199.
1051.	903.	786.	678.	587.	513.	443.	388.	334.	293.
254.	220.	191.	164.	144.	125.	113.	101.	89.	77.
66.	54.	44.	35.	25.	15.	5.			

****

HYDROGRAPH AT STATION 010

****

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	*	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
								*								
1		0000	1	.00	.00	.00	270.	*	5		0400	101	.00	.00	.00	526.
1		0100	2	.06	.06	.00	255.	*	5		0500	102	.00	.00	.00	453.
1		0200	3	.06	.06	.00	241.	*	5		0600	103	.00	.00	.00	389.
1		0300	4	.06	.06	.00	228.	*	5		0700	104	.00	.00	.00	334.
1		0400	5	.09	.09	.00	217.	*	5		0800	105	.00	.00	.00	286.
1		0500	6	.09	.09	.00	208.	*	5		0900	106	.00	.00	.00	245.
1		0600	7	.09	.09	.00	201.	*	5		1000	107	.00	.00	.00	209.
1		0700	8	.10	.10	.00	195.	*	5		1100	108	.00	.00	.00	179.
1		0800	9	.10	.10	.00	192.	*	5		1200	109	.00	.00	.00	152.
1		0900	10	.10	.10	.00	190.	*	5		1300	110	.00	.00	.00	130.
1		1000	11	.12	.12	.00	191.	*	5		1400	111	.00	.00	.00	110.
1		1100	12	.12	.11	.00	193.	*	5		1500	112	.00	.00	.00	94.
1		1200	13	.12	.11	.01	200.	*	5		1600	113	.00	.00	.00	80.
1		1300	14	.12	.10	.02	216.	*	5		1700	114	.00	.00	.00	68.
1		1400	15	.12	.10	.02	246.	*	5		1800	115	.00	.00	.00	58.
1		1500	16	.12	.09	.03	295.	*	5		1900	116	.00	.00	.00	49.
1		1600	17	.13	.09	.03	374.	*	5		2000	117	.00	.00	.00	41.
1		1700	18	.13	.09	.04	490.	*	5		2100	118	.00	.00	.00	35.
1		1800	19	.13	.09	.04	653.	*	5		2200	119	.00	.00	.00	29.
1		1900	20	.21	.13	.08	877.	*	5		2300	120	.00	.00	.00	23.
1		2000	21	.21	.12	.09	1178.	*	6		0000	121	.00	.00	.00	19.
1		2100	22	.21	.11	.09	1566.	*	6		0100	122	.00	.00	.00	15.
1		2200	23	.23	.11	.11	2052.	*	6		0200	123	.00	.00	.00	11.
1		2300	24	.23	.11	.12	2650.	*	6		0300	124	.00	.00	.00	8.

2	0000	25	.23	.10	.13	3373.	*	6	0400	125	.00	.00	.00	6.
2	0100	26	.31	.12	.18	4243.	*	6	0500	126	.00	.00	.00	4.
2	0200	27	.31	.11	.19	5274.	*	6	0600	127	.00	.00	.00	2.
2	0300	28	.31	.10	.20	6466.	*	6	0700	128	.00	.00	.00	1.
2	0400	29	.33	.10	.22	7820.	*	6	0800	129	.00	.00	.00	0.
2	0500	30	.33	.09	.23	9337.	*	6	0900	130	.00	.00	.00	0.
2	0600	31	.33	.09	.24	11016.	*	6	1000	131	.00	.00	.00	0.
2	0700	32	.36	.09	.27	12862.	*	6	1100	132	.00	.00	.00	0.
2	0800	33	.36	.08	.28	14855.	*	6	1200	133	.00	.00	.00	0.
2	0900	34	.36	.07	.28	16971.	*	6	1300	134	.00	.00	.00	0.
2	1000	35	.94	.17	.77	19327.	*	6	1400	135	.00	.00	.00	0.
2	1100	36	.94	.14	.80	22059.	*	6	1500	136	.00	.00	.00	0.
2	1200	37	.94	.12	.82	25246.	*	6	1600	137	.00	.00	.00	0.
2	1300	38	.21	.02	.18	28792.	*	6	1700	138	.00	.00	.00	0.
2	1400	39	.21	.02	.18	32595.	*	6	1800	139	.00	.00	.00	0.
2	1500	40	.21	.02	.18	36664.	*	6	1900	140	.00	.00	.00	0.
2	1600	41	.16	.02	.14	40923.	*	6	2000	141	.00	.00	.00	0.
2	1700	42	.16	.02	.14	45025.	*	6	2100	142	.00	.00	.00	0.
2	1800	43	.16	.02	.14	48512.	*	6	2200	143	.00	.00	.00	0.
2	1900	44	.14	.01	.13	51014.	*	6	2300	144	.00	.00	.00	0.
2	2000	45	.14	.01	.13	52459.	*	7	0000	145	.00	.00	.00	0.
2	2100	46	.14	.01	.13	52983.	*	7	0100	146	.00	.00	.00	0.
2	2200	47	.14	.01	.13	52701.	*	7	0200	147	.00	.00	.00	0.
2	2300	48	.14	.01	.13	51718.	*	7	0300	148	.00	.00	.00	0.
3	0000	49	.14	.01	.13	50175.	*	7	0400	149	.00	.00	.00	0.
3	0100	50	.13	.01	.12	48210.	*	7	0500	150	.00	.00	.00	0.
3	0200	51	.13	.01	.12	45982.	*	7	0600	151	.00	.00	.00	0.
3	0300	52	.13	.01	.12	43485.	*	7	0700	152	.00	.00	.00	0.
3	0400	53	.13	.01	.12	40830.	*	7	0800	153	.00	.00	.00	0.
3	0500	54	.13	.01	.12	38259.	*	7	0900	154	.00	.00	.00	0.
3	0600	55	.13	.01	.12	35992.	*	7	1000	155	.00	.00	.00	0.
3	0700	56	.06	.00	.05	34028.	*	7	1100	156	.00	.00	.00	0.
3	0800	57	.06	.00	.05	32280.	*	7	1200	157	.00	.00	.00	0.
3	0900	58	.06	.00	.05	30700.	*	7	1300	158	.00	.00	.00	0.
3	1000	59	.06	.00	.05	29236.	*	7	1400	159	.00	.00	.00	0.
3	1100	60	.06	.00	.05	27846.	*	7	1500	160	.00	.00	.00	0.
3	1200	61	.06	.00	.05	26436.	*	7	1600	161	.00	.00	.00	0.
3	1300	62	.05	.00	.05	25017.	*	7	1700	162	.00	.00	.00	0.
3	1400	63	.05	.00	.05	23608.	*	7	1800	163	.00	.00	.00	0.
3	1500	64	.05	.00	.05	22227.	*	7	1900	164	.00	.00	.00	0.
3	1600	65	.05	.00	.05	20898.	*	7	2000	165	.00	.00	.00	0.
3	1700	66	.05	.00	.05	19615.	*	7	2100	166	.00	.00	.00	0.
3	1800	67	.05	.00	.05	18407.	*	7	2200	167	.00	.00	.00	0.
3	1900	68	.05	.00	.05	17266.	*	7	2300	168	.00	.00	.00	0.
3	2000	69	.05	.00	.05	16218.	*	8	0000	169	.00	.00	.00	0.
3	2100	70	.05	.00	.05	15256.	*	8	0100	170	.00	.00	.00	0.
3	2200	71	.05	.00	.04	14380.	*	8	0200	171	.00	.00	.00	0.

3	2300	72	.05	.00	.04	13598.	*	8	0300	172	.00	.00	.00	0.
4	0000	73	.05	.00	.04	12906.	*	8	0400	173	.00	.00	.00	0.
4	0100	74	.00	.00	.00	12290.	*	8	0500	174	.00	.00	.00	0.
4	0200	75	.00	.00	.00	11714.	*	8	0600	175	.00	.00	.00	0.
4	0300	76	.00	.00	.00	11160.	*	8	0700	176	.00	.00	.00	0.
4	0400	77	.00	.00	.00	10606.	*	8	0800	177	.00	.00	.00	0.
4	0500	78	.00	.00	.00	10038.	*	8	0900	178	.00	.00	.00	0.
4	0600	79	.00	.00	.00	9434.	*	8	1000	179	.00	.00	.00	0.
4	0700	80	.00	.00	.00	8787.	*	8	1100	180	.00	.00	.00	0.
4	0800	81	.00	.00	.00	8107.	*	8	1200	181	.00	.00	.00	0.
4	0900	82	.00	.00	.00	7410.	*	8	1300	182	.00	.00	.00	0.
4	1000	83	.00	.00	.00	6713.	*	8	1400	183	.00	.00	.00	0.
4	1100	84	.00	.00	.00	6026.	*	8	1500	184	.00	.00	.00	0.
4	1200	85	.00	.00	.00	5360.	*	8	1600	185	.00	.00	.00	0.
4	1300	86	.00	.00	.00	4725.	*	8	1700	186	.00	.00	.00	0.
4	1400	87	.00	.00	.00	4135.	*	8	1800	187	.00	.00	.00	0.
4	1500	88	.00	.00	.00	3592.	*	8	1900	188	.00	.00	.00	0.
4	1600	89	.00	.00	.00	3100.	*	8	2000	189	.00	.00	.00	0.
4	1700	90	.00	.00	.00	2661.	*	8	2100	190	.00	.00	.00	0.
4	1800	91	.00	.00	.00	2282.	*	8	2200	191	.00	.00	.00	0.
4	1900	92	.00	.00	.00	1961.	*	8	2300	192	.00	.00	.00	0.
4	2000	93	.00	.00	.00	1691.	*	9	0000	193	.00	.00	.00	0.
4	2100	94	.00	.00	.00	1462.	*	9	0100	194	.00	.00	.00	0.
4	2200	95	.00	.00	.00	1267.	*	9	0200	195	.00	.00	.00	0.
4	2300	96	.00	.00	.00	1098.	*	9	0300	196	.00	.00	.00	0.
5	0000	97	.00	.00	.00	949.	*	9	0400	197	.00	.00	.00	0.
5	0100	98	.00	.00	.00	819.	*	9	0500	198	.00	.00	.00	0.
5	0200	99	.00	.00	.00	707.	*	9	0600	199	.00	.00	.00	0.
5	0300	100	.00	.00	.00	610.	*	9	0700	200	.00	.00	.00	0.
							*							

****

TOTAL RAINFALL = 12.60, TOTAL LOSS = 3.96, TOTAL EXCESS = 8.64

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	199.00-HR
+ (CFS)	(HR)					
		(CFS)				
+ 52983.	45.00		51703.	40677.	20738.	7591.
		(INCHES)	1.780	5.603	8.569	8.670
		(AC-FT)	25638.	80682.	123397.	124843.

CUMULATIVE AREA = 270.00 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND

TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	010	52983.	45.00	51703.	40677.	20738.	270.00		

*** NORMAL END OF HEC-1 ***

Attachment 2, HEC-1 File
Local Storm PMF

HEC-1 Input

```
ID   PFSF (Private Fuel Storage Facility Project)
ID   General PMF AT ACCESS RD
ID   FILE=LOC_PMF.DAT
ID
IT     5                    200
IO     2
PG    60
IN    15
PI  0.10    0.10    0.10    0.10    0.20    0.20    0.20    0.20    1.20    0.90
PI  0.50    0.50    0.30    0.30    0.30    0.30    0.20    0.10    0.10    0.10
PI  0.10    0.10    0.10    0.10
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      70       1
UD  11.0
ZZ
```

HEC-1 Input

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *            SEPTEMBER 1990            *
 *             VERSION 4.0              *
 *                                      *
 *  RUN DATE  02/07/1999  TIME  12:45:39 *
 *                                      *
 ****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X       XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID     PFSF (Private Fuel Storage Facility Project)
  2           ID     General PMF AT ACCESS RD
  3           ID     FILE=LOC_PMF.DAT
  4           ID
  5           IT       5                    200
  6           IO       2
  7           PG      60
  8           IN      15
  9           PI    0.10    0.10    0.10    0.10    0.20    0.20    0.20    0.20    1.20    0.90
 10           PI    0.50    0.50    0.30    0.30    0.30    0.30    0.20    0.10    0.10    0.10
 11           PI    0.10    0.10    0.10    0.10

 12           KK     010
 13           KM    SCS DIMENSIONLESS UNIT HYDROGRAPH
 14           BA   270.0
 15           BF      -1            1.06
 16           PR      60
 17           LS       0      70       1
 18           UD    11.0
```

```
            19          ZZ
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *            SEPTEMBER 1990             *
 *             VERSION 4.0               *
 *                                       *
 *  RUN DATE  02/07/1999  TIME  12:45:39 *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
                         PFSF (Private Fuel Storage Facility Project)
                         General PMF AT ACCESS RD
                         FILE=LOC_PMF.DAT

  6 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           2  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

  8 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN          15  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1    0  ENDING DATE
                     NDTIME        1635  ENDING TIME
                     ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   16.58 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
```

```
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 12 KK    *       010  *
          *            *
          **************
                         SCS DIMENSIONLESS UNIT HYDROGRAPH

            SUBBASIN RUNOFF DATA

 14 BA        SUBBASIN CHARACTERISTICS
                    TAREA      270.00  SUBBASIN AREA

 15 BF        BASE FLOW CHARACTERISTICS
                    STRTQ      270.00  INITIAL FLOW
                    QRCSN         .00  BEGIN BASE FLOW RECESSION
                    RTIOR     1.06000  RECESSION CONSTANT

              PRECIPITATION DATA

 16 PR           RECORDING STATIONS        60
  0 PW                      WEIGHTS      1.00

 17 LS        SCS LOSS RATE
                    STRTL         .86  INITIAL ABSTRACTION
                   CRVNBR       70.00  CURVE NUMBER
                    RTIMP        1.00  PERCENT IMPERVIOUS AREA

 18 UD        SCS DIMENSIONLESS UNITGRAPH
                     TLAG       11.00  LAG

                                                          ***

            PRECIPITATION STATION DATA

                     STATION    TOTAL    AVG. ANNUAL    WEIGHT
                         60     6.40         .00         1.00

              TEMPORAL DISTRIBUTIONS
```

STATION 60, WEIGHT = 1.00

.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03	.07	.07	.07	.07	.07	.07	.07	.07
.07	.07	.07	.07	.40	.40	.40	.30	.30	.30
.17	.17	.17	.17	.17	.17	.10	.10	.10	.10
.10	.10	.10	.10	.10	.10	.10	.10	.07	.07
.07	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03								

*** WARNING *** UNIT HYDROGRAPH TRUNCATED FROM 662 TO 300 INTERVALS

*** WARNING *** VOLUME UNDER UNIT GRAPH = .92
ORDINATES OF UNIT GRAPH WERE INCREASED TO OBTAIN 1.0 INCHE OF RUNOFF.
TO PREVENT THIS, INCREASE THE COMPUTATION INTERVAL ON THE "IT" RECORD.

UNIT HYDROGRAPH
300 END-OF-PERIOD ORDINATES
VOLUME = 1.00

29.	58.	88.	117.	146.	175.	204.	234.	263.	292.
321.	350.	379.	438.	506.	574.	642.	710.	778.	846.
915.	983.	1051.	1119.	1187.	1255.	1333.	1421.	1508.	1596.
1683.	1771.	1858.	1946.	2033.	2121.	2209.	2296.	2384.	2479.
2595.	2712.	2829.	2946.	3062.	3179.	3296.	3413.	3529.	3646.
3763.	3880.	3996.	4152.	4308.	4463.	4619.	4775.	4930.	5086.
5242.	5397.	5553.	5709.	5864.	6020.	6198.	6383.	6567.	6752.
6937.	7122.	7307.	7492.	7677.	7861.	8046.	8231.	8416.	8586.
8742.	8898.	9053.	9209.	9365.	9520.	9676.	9832.	9987.	10143.
10299.	10454.	10598.	10705.	10812.	10919.	11026.	11133.	11240.	11347.
11454.	11561.	11668.	11775.	11882.	11989.	12048.	12106.	12164.	12223.
12281.	12339.	12398.	12456.	12515.	12573.	12631.	12690.	12748.	12770.
12780.	12789.	12799.	12809.	12819.	12828.	12838.	12848.	12858.	12867.
12877.	12887.	12887.	12877.	12867.	12858.	12848.	12838.	12828.	12819.
12809.	12799.	12789.	12780.	12770.	12748.	12690.	12631.	12573.	12515.
12456.	12398.	12339.	12281.	12223.	12164.	12106.	12048.	11989.	11921.
11853.	11785.	11717.	11649.	11581.	11512.	11444.	11376.	11308.	11240.
11172.	11104.	11028.	10951.	10873.	10795.	10717.	10639.	10561.	10484.
10406.	10328.	10250.	10172.	10094.	10007.	9910.	9812.	9715.	9618.
9520.	9423.	9326.	9228.	9131.	9034.	8937.	8839.	8737.	8620.
8504.	8387.	8270.	8153.	8037.	7920.	7803.	7686.	7570.	7453.
7336.	7219.	7122.	7025.	6927.	6830.	6733.	6636.	6538.	6441.
6344.	6246.	6149.	6052.	5954.	5879.	5811.	5743.	5675.	5607.
5539.	5470.	5402.	5334.	5266.	5198.	5130.	5062.	4999.	4940.
4882.	4823.	4765.	4707.	4648.	4590.	4532.	4473.	4415.	4356.
4298.	4242.	4193.	4145.	4096.	4047.	3999.	3950.	3902.	3853.

3804.	3756.	3707.	3658.	3610.	3574.	3539.	3503.	3468.	3432.
3397.	3361.	3326.	3290.	3255.	3219.	3183.	3148.	3112.	3077.
3041.	3006.	2970.	2935.	2899.	2864.	2828.	2793.	2757.	2722.
2686.	2654.	2625.	2596.	2566.	2537.	2508.	2479.	2450.	2420.

****

HYDROGRAPH AT STATION 010

****

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	*	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	.00	.00	.00	270.	*	1		0820	101	.00	.00	.00	17219.
1		0005	2	.03	.03	.00	269.	*	1		0825	102	.00	.00	.00	17715.
1		0010	3	.03	.03	.00	267.	*	1		0830	103	.00	.00	.00	18216.
1		0015	4	.03	.03	.00	266.	*	1		0835	104	.00	.00	.00	18722.
1		0020	5	.03	.03	.00	265.	*	1		0840	105	.00	.00	.00	19232.
1		0025	6	.03	.03	.00	264.	*	1		0845	106	.00	.00	.00	19743.
1		0030	7	.03	.03	.00	262.	*	1		0850	107	.00	.00	.00	20252.
1		0035	8	.03	.03	.00	261.	*	1		0855	108	.00	.00	.00	20761.
1		0040	9	.03	.03	.00	260.	*	1		0900	109	.00	.00	.00	21270.
1		0045	10	.03	.03	.00	259.	*	1		0905	110	.00	.00	.00	21777.
1		0050	11	.03	.03	.00	258.	*	1		0910	111	.00	.00	.00	22285.
1		0055	12	.03	.03	.00	257.	*	1		0915	112	.00	.00	.00	22793.
1		0100	13	.03	.03	.00	255.	*	1		0920	113	.00	.00	.00	23302.
1		0105	14	.07	.07	.00	254.	*	1		0925	114	.00	.00	.00	23811.
1		0110	15	.07	.07	.00	253.	*	1		0930	115	.00	.00	.00	24320.
1		0115	16	.07	.07	.00	252.	*	1		0935	116	.00	.00	.00	24828.
1		0120	17	.07	.07	.00	251.	*	1		0940	117	.00	.00	.00	25335.
1		0125	18	.07	.07	.00	250.	*	1		0945	118	.00	.00	.00	25842.
1		0130	19	.07	.07	.00	249.	*	1		0950	119	.00	.00	.00	26343.
1		0135	20	.07	.07	.00	249.	*	1		0955	120	.00	.00	.00	26837.
1		0140	21	.07	.06	.00	248.	*	1		1000	121	.00	.00	.00	27323.
1		0145	22	.07	.06	.00	247.	*	1		1005	122	.00	.00	.00	27801.
1		0150	23	.07	.06	.01	247.	*	1		1010	123	.00	.00	.00	28271.
1		0155	24	.07	.06	.01	246.	*	1		1015	124	.00	.00	.00	28733.
1		0200	25	.07	.06	.01	246.	*	1		1020	125	.00	.00	.00	29190.
1		0205	26	.40	.31	.09	249.	*	1		1025	126	.00	.00	.00	29640.
1		0210	27	.40	.27	.13	256.	*	1		1030	127	.00	.00	.00	30085.
1		0215	28	.40	.23	.17	267.	*	1		1035	128	.00	.00	.00	30522.
1		0220	29	.30	.15	.15	283.	*	1		1040	129	.00	.00	.00	30952.
1		0225	30	.30	.14	.16	304.	*	1		1045	130	.00	.00	.00	31376.
1		0230	31	.30	.13	.17	329.	*	1		1050	131	.00	.00	.00	31795.
1		0235	32	.17	.07	.10	358.	*	1		1055	132	.00	.00	.00	32207.
1		0240	33	.17	.06	.10	390.	*	1		1100	133	.00	.00	.00	32608.
1		0245	34	.17	.06	.11	425.	*	1		1105	134	.00	.00	.00	32997.

1	0250	35	.17	.06	.11	464.	*	1	1110	135	.00	.00	.00	33376.
1	0255	36	.17	.05	.11	505.	*	1	1115	136	.00	.00	.00	33743.
1	0300	37	.17	.05	.11	551.	*	1	1120	137	.00	.00	.00	34099.
1	0305	38	.10	.03	.07	599.	*	1	1125	138	.00	.00	.00	34445.
1	0310	39	.10	.03	.07	652.	*	1	1130	139	.00	.00	.00	34783.
1	0315	40	.10	.03	.07	711.	*	1	1135	140	.00	.00	.00	35112.
1	0320	41	.10	.03	.07	779.	*	1	1140	141	.00	.00	.00	35430.
1	0325	42	.10	.03	.07	855.	*	1	1145	142	.00	.00	.00	35738.
1	0330	43	.10	.03	.07	939.	*	1	1150	143	.00	.00	.00	36037.
1	0335	44	.10	.03	.07	1033.	*	1	1155	144	.00	.00	.00	36329.
1	0340	45	.10	.03	.07	1133.	*	1	1200	145	.00	.00	.00	36612.
1	0345	46	.10	.02	.08	1239.	*	1	1205	146	.00	.00	.00	36882.
1	0350	47	.10	.02	.08	1352.	*	1	1210	147	.00	.00	.00	37140.
1	0355	48	.10	.02	.08	1471.	*	1	1215	148	.00	.00	.00	37384.
1	0400	49	.10	.02	.08	1597.	*	1	1220	149	.00	.00	.00	37615.
1	0405	50	.07	.02	.05	1729.	*	1	1225	150	.00	.00	.00	37832.
1	0410	51	.07	.01	.05	1866.	*	1	1230	151	.00	.00	.00	38037.
1	0415	52	.07	.01	.05	2008.	*	1	1235	152	.00	.00	.00	38232.
1	0420	53	.03	.01	.03	2156.	*	1	1240	153	.00	.00	.00	38416.
1	0425	54	.03	.01	.03	2310.	*	1	1245	154	.00	.00	.00	38590.
1	0430	55	.03	.01	.03	2471.	*	1	1250	155	.00	.00	.00	38753.
1	0435	56	.03	.01	.03	2639.	*	1	1255	156	.00	.00	.00	38906.
1	0440	57	.03	.01	.03	2813.	*	1	1300	157	.00	.00	.00	39052.
1	0445	58	.03	.01	.03	2994.	*	1	1305	158	.00	.00	.00	39189.
1	0450	59	.03	.01	.03	3181.	*	1	1310	159	.00	.00	.00	39318.
1	0455	60	.03	.01	.03	3374.	*	1	1315	160	.00	.00	.00	39438.
1	0500	61	.03	.01	.03	3573.	*	1	1320	161	.00	.00	.00	39549.
1	0505	62	.03	.01	.03	3777.	*	1	1325	162	.00	.00	.00	39651.
1	0510	63	.03	.01	.03	3987.	*	1	1330	163	.00	.00	.00	39743.
1	0515	64	.03	.01	.03	4202.	*	1	1335	164	.00	.00	.00	39826.
1	0520	65	.03	.01	.03	4422.	*	1	1340	165	.00	.00	.00	39901.
1	0525	66	.03	.01	.03	4648.	*	1	1345	166	.00	.00	.00	39968.
1	0530	67	.03	.01	.03	4882.	*	1	1350	167	.00	.00	.00	40028.
1	0535	68	.03	.01	.03	5124.	*	1	1355	168	.00	.00	.00	40080.
1	0540	69	.03	.01	.03	5373.	*	1	1400	169	.00	.00	.00	40126.
1	0545	70	.03	.01	.03	5631.	*	1	1405	170	.00	.00	.00	40166.
1	0550	71	.03	.01	.03	5896.	*	1	1410	171	.00	.00	.00	40199.
1	0555	72	.03	.01	.03	6168.	*	1	1415	172	.00	.00	.00	40223.
1	0600	73	.03	.01	.03	6446.	*	1	1420	173	.00	.00	.00	40236.
1	0605	74	.00	.00	.00	6730.	*	1	1425	174	.00	.00	.00	40237.
1	0610	75	.00	.00	.00	7019.	*	1	1430	175	.00	.00	.00	40227.
1	0615	76	.00	.00	.00	7315.	*	1	1435	176	.00	.00	.00	40204.
1	0620	77	.00	.00	.00	7616.	*	1	1440	177	.00	.00	.00	40170.
1	0625	78	.00	.00	.00	7921.	*	1	1445	178	.00	.00	.00	40127.
1	0630	79	.00	.00	.00	8234.	*	1	1450	179	.00	.00	.00	40075.
1	0635	80	.00	.00	.00	8555.	*	1	1455	180	.00	.00	.00	40015.
1	0640	81	.00	.00	.00	8887.	*	1	1500	181	.00	.00	.00	39947.

1	0645	82	.00	.00	.00	9228.	*	1	1505	182	.00	.00	.00	39870.
1	0650	83	.00	.00	.00	9580.	*	1	1510	183	.00	.00	.00	39786.
1	0655	84	.00	.00	.00	9941.	*	1	1515	184	.00	.00	.00	39696.
1	0700	85	.00	.00	.00	10311.	*	1	1520	185	.00	.00	.00	39600.
1	0705	86	.00	.00	.00	10688.	*	1	1525	186	.00	.00	.00	39498.
1	0710	87	.00	.00	.00	11073.	*	1	1530	187	.00	.00	.00	39388.
1	0715	88	.00	.00	.00	11464.	*	1	1535	188	.00	.00	.00	39271.
1	0720	89	.00	.00	.00	11863.	*	1	1540	189	.00	.00	.00	39148.
1	0725	90	.00	.00	.00	12269.	*	1	1545	190	.00	.00	.00	39017.
1	0730	91	.00	.00	.00	12679.	*	1	1550	191	.00	.00	.00	38880.
1	0735	92	.00	.00	.00	13096.	*	1	1555	192	.00	.00	.00	38737.
1	0740	93	.00	.00	.00	13521.	*	1	1600	193	.00	.00	.00	38587.
1	0745	94	.00	.00	.00	13954.	*	1	1605	194	.00	.00	.00	38433.
1	0750	95	.00	.00	.00	14396.	*	1	1610	195	.00	.00	.00	38273.
1	0755	96	.00	.00	.00	14847.	*	1	1615	196	.00	.00	.00	38109.
1	0800	97	.00	.00	.00	15307.	*	1	1620	197	.00	.00	.00	37942.
1	0805	98	.00	.00	.00	15774.	*	1	1625	198	.00	.00	.00	37770.
1	0810	99	.00	.00	.00	16249.	*	1	1630	199	.00	.00	.00	37594.
1	0815	100	.00	.00	.00	16731.	*	1	1635	200	.00	.00	.00	37415.
							*							

****

TOTAL RAINFALL = 6.40, TOTAL LOSS = 3.24, TOTAL EXCESS = 3.16

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	16.58-HR
		(CFS)				
40237.	14.42		37871.	19113.	19113.	19113.
		(INCHES)	1.304	1.819	1.819	1.819
		(AC-FT)	18779.	26195.	26195.	26195.

CUMULATIVE AREA = 270.00 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	010	40237.	14.42	37871.	19113.	19113.	270.00		

*** NORMAL END OF HEC-1 ***

Attachment 3

HRC-RAS File
Hydraulic Report

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HEC-RAS Version 2.0 April 1997
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX


PROJECT DATA
Project Title: PFSF, PMF and 100-yr run
Project File : access.prj
Run Date and Time: 3/21/99 2:35:58 PM

Project in English units

Project Description:
Private Fuel Storage Facility (PFSF), Flood levels



PLAN DATA

Plan Title: Natural flood
Plan File : c:\a1\ras\access.p01

          Geometry Title: USGS 1:24000 map, natural topograph
          Geometry File : c:\a1\ras\access.g01

          Flow Title    : PMF and 100-yr Q
          Flow File     : c:\a1\ras\access.f01

Plan Summary Information:
Number of:  Cross Sections =    6    Mulitple Openings =    0
            Culverts       =    0    Inline Weirs      =    0
            Bridges        =    0

Computational Information
    Water surface calculation tolerance =  0.01
    Critical depth calculaton tolerance =  0.01
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.3
    Flow tolerance factor               =  0.001

Computational Flow Regime: Subcritical Flow
```

FLOW DATA

Flow Title: PMF and 100-yr Q
Flow File : c:\a1\ras\access.f01

Flow Data (cfs)

River	Reach	RS	100-year Q	PMF	PMF1
Skull Valey	PFSF	9400	2430	53000	85000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Skull Valey	PFSF	100-year Q		Normal S = 0.0045
Skull Valey	PFSF	PMF		Normal S = 0.0045

GEOMETRY DATA

Geometry Title: USGS 1:24000 map, natural topograph
Geometry File : c:\a1\ras\access.g01

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 9400

INPUT
Description: Section D
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1500	4510	0	4500	2400	4500	3300	4495	4500	4500
5800	4510								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-1500	.035	2400	.035	4500	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2400	4500	3500	3500	3500	.1	.3

CROSS SECTION OUTPUT Profile #100-year Q

W.S. Elev (ft)	4496.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.		0.035	
E.G. Elev (ft)	4496.91	Reach Len. (ft)	3500.00	3500.00	3500.00
Crit W.S. (ft)	4496.52	Flow Area (sq ft)		486.13	
E.G. Slope (ft/ft)	0.019962	Area (sq ft)		486.13	
Q Total (cfs)	2430.00	Flow (cfs)		2430.00	
Top Width (ft)	639.02	Top Width (ft)		639.02	
Vel Total (ft/s)	5.00	Avg. Vel. (ft/s)		5.00	
Max Chl Dpth (ft)	1.52	Hydr. Depth (ft)		0.76	
Conv. Total (cfs)	17199.0	Conv. (cfs)		17199.0	
Length Wtd. (ft)		Wetted Per. (ft)		639.03	
Min Ch El (ft)	4495.00	Shear (lb/sq ft)		0.95	
Alpha	1.00	Stream Power (lb/ft s)		4.74	
Frctn Loss (ft)		Cum Volume (acre-ft)	20.41	190.40	1.30
C & E Loss (ft)		Cum SA (acres)	39.42	277.00	5.82

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4500.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4501.43	Reach Len. (ft)	3500.00	3500.00	3500.00
Crit W.S. (ft)	4500.51	Flow Area (sq ft)	1253.81	6329.74	17.18
E.G. Slope (ft/ft)	0.007939	Area (sq ft)	1253.81	6329.74	17.18
Q Total (cfs)	53000.00	Flow (cfs)	3012.29	49961.43	26.28
Top Width (ft)	4643.96	Top Width (ft)	2477.12	2100.00	66.84
Vel Total (ft/s)	6.97	Avg. Vel. (ft/s)	2.40	7.89	1.53
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	0.51	3.01	0.26
Conv. Total (cfs)	594832.3	Conv. (cfs)	33807.7	560729.7	294.9
Length Wtd. (ft)	3500.00	Wetted Per. (ft)	2477.13	2100.02	66.84
Min Ch El (ft)	4495.00	Shear (lb/sq ft)	0.25	1.49	0.13
Alpha	1.21	Stream Power (lb/ft s)	0.60	11.79	0.19
Frctn Loss (ft)	19.48	Cum Volume (acre-ft)	360.53	1430.64	88.46
C & E Loss (ft)	0.11	Cum SA (acres)	269.19	467.04	60.67

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #PMF1

W.S. Elev (ft)	4501.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4502.37	Reach Len. (ft)	3500.00	3500.00	3500.00
Crit W.S. (ft)	4501.27	Flow Area (sq ft)	3160.16	7909.86	104.28
E.G. Slope (ft/ft)	0.007688	Area (sq ft)	3160.16	7909.86	104.28
Q Total (cfs)	85000.00	Flow (cfs)	13432.59	71281.15	286.26
Top Width (ft)	4854.65	Top Width (ft)	2589.99	2100.00	164.66
Vel Total (ft/s)	7.61	Avg. Vel. (ft/s)	4.25	9.01	2.75
Max Chl Dpth (ft)	6.27	Hydr. Depth (ft)	1.22	3.77	0.63
Conv. Total (cfs)	969400.8	Conv. (cfs)	153194.8	812941.3	3264.8
Length Wtd. (ft)	3500.00	Wetted Per. (ft)	2589.99	2100.02	164.66
Min Ch El (ft)	4495.00	Shear (lb/sq ft)	0.59	1.81	0.30
Alpha	1.23	Stream Power (lb/ft s)	2.49	16.29	0.83
Frctn Loss (ft)	20.05	Cum Volume (acre-ft)	608.30	1868.14	153.40
C & E Loss (ft)	0.10	Cum SA (acres)	317.31	489.42	82.21

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 5900

INPUT
Description: Section C

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4490	2500	4480	4000	4480	6100	4473	7000	4474
7600	4474	8500	4480	9100	4490	9500	4500		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	6100	.035	7600	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
6100	7600	1400	1400	1400	.1	.3

CROSS SECTION OUTPUT Profile #100-year Q

W.S. Elev (ft)	4474.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4474.44	Reach Len. (ft)	1400.00	1400.00	1400.00
Crit W.S. (ft)	4474.06	Flow Area (sq ft)	289.26	1033.01	11.33
E.G. Slope (ft/ft)	0.003051	Area (sq ft)	289.26	1033.01	11.33
Q Total (cfs)	2430.00	Flow (cfs)	531.90	1889.18	8.91
Top Width (ft)	1974.90	Top Width (ft)	416.60	1500.00	58.30
Vel Total (ft/s)	1.82	Avg. Vel. (ft/s)	1.84	1.83	0.79
Max Chl Dpth (ft)	1.39	Hydr. Depth (ft)	0.69	0.69	0.19
Conv. Total (cfs)	43991.7	Conv. (cfs)	9629.3	34201.0	161.4
Length Wtd. (ft)	1400.00	Wetted Per. (ft)	416.60	1500.00	58.30
Min Ch El (ft)	4473.00	Shear (lb/sq ft)	0.13	0.13	0.04
Alpha	1.01	Stream Power (lb/ft s)	0.24	0.24	0.03
Frctn Loss (ft)	8.73	Cum Volume (acre-ft)	8.79	129.37	0.84
C & E Loss (ft)	0.02	Cum SA (acres)	22.68	191.07	3.47

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4477.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4477.95	Reach Len. (ft)	1400.00	1400.00	1400.00
Crit W.S. (ft)		Flow Area (sq ft)	2908.38	5554.98	868.69
E.G. Slope (ft/ft)	0.004117	Area (sq ft)	2908.38	5554.98	868.69
Q Total (cfs)	53000.00	Flow (cfs)	13407.62	36219.68	3372.70
Top Width (ft)	3331.49	Top Width (ft)	1321.00	1500.00	510.50
Vel Total (ft/s)	5.68	Avg. Vel. (ft/s)	4.61	6.52	3.88
Max Chl Dpth (ft)	4.40	Hydr. Depth (ft)	2.20	3.70	1.70
Conv. Total (cfs)	826041.0	Conv. (cfs)	208966.9	564508.4	52565.7
Length Wtd. (ft)	1400.00	Wetted Per. (ft)	1321.00	1500.00	510.51
Min Ch El (ft)	4473.00	Shear (lb/sq ft)	0.57	0.95	0.44
Alpha	1.10	Stream Power (lb/ft s)	2.61	6.21	1.70
Frctn Loss (ft)	8.88	Cum Volume (acre-ft)	193.32	953.18	52.87
C & E Loss (ft)	0.05	Cum SA (acres)	116.60	322.41	37.47

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PMF1

W.S. Elev (ft)	4478.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4479.12	Reach Len. (ft)	1400.00	1400.00	1400.00
Crit W.S. (ft)		Flow Area (sq ft)	4291.18	6972.95	1418.30
E.G. Slope (ft/ft)	0.004433	Area (sq ft)	4291.18	6972.95	1418.30
Q Total (cfs)	85000.00	Flow (cfs)	23370.33	54901.09	6728.58
Top Width (ft)	3756.88	Top Width (ft)	1604.59	1500.00	652.29

Vel Total (ft/s)	6.70	Avg. Vel. (ft/s)	5.45	7.87	4.74
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)	2.67	4.65	2.17
Conv. Total (cfs)	1276630.0	Conv. (cfs)	351003.1	824569.1	101057.7
Length Wtd. (ft)	1400.00	Wetted Per. (ft)	1604.60	1500.00	652.31
Min Ch El (ft)	4473.00	Shear (lb/sq ft)	0.74	1.29	0.60
Alpha	1.11	Stream Power (lb/ft s)	4.03	10.13	2.85
Frctn Loss (ft)	8.98	Cum Volume (acre-ft)	308.95	1270.23	92.24
C & E Loss (ft)	0.05	Cum SA (acres)	148.80	344.79	49.39

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 4500

INPUT
Description: Section A3
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4480	2000	4470	5300	4465	6500	4465	7000	4470
7900	4480								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	5300	.035	6500	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
5300	6500	1700	1700	1700	.1	.3

CROSS SECTION OUTPUT Profile #100-year Q

W.S. Elev (ft)	4465.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4465.70	Reach Len. (ft)	1700.00	1700.00	1700.00
Crit W.S. (ft)	4465.49	Flow Area (sq ft)	78.36	584.77	11.87
E.G. Slope (ft/ft)	0.020753	Area (sq ft)	78.36	584.77	11.87
Q Total (cfs)	2430.00	Flow (cfs)	186.97	2214.71	28.33
Top Width (ft)	1570.35	Top Width (ft)	321.62	1200.00	48.73
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)	2.39	3.79	2.39
Max Chl Dpth (ft)	0.49	Hydr. Depth (ft)	0.24	0.49	0.24
Conv. Total (cfs)	16868.1	Conv. (cfs)	1297.8	15373.6	196.6
Length Wtd. (ft)	1700.00	Wetted Per. (ft)	321.62	1200.00	48.73
Min Ch El (ft)	4465.00	Shear (lb/sq ft)	0.32	0.63	0.32
Alpha	1.05	Stream Power (lb/ft s)	0.75	2.39	0.75
Frctn Loss (ft)	11.31	Cum Volume (acre-ft)	2.89	103.37	0.47
C & E Loss (ft)	0.04	Cum SA (acres)	10.82	147.68	1.75

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4467.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4469.02	Reach Len. (ft)	1700.00	1700.00	1700.00
Crit W.S. (ft)	4467.99	Flow Area (sq ft)	2944.92	3584.77	446.20
E.G. Slope (ft/ft)	0.011067	Area (sq ft)	2944.92	3584.77	446.20
Q Total (cfs)	53000.00	Flow (cfs)	17186.53	33209.54	2603.93
Top Width (ft)	3470.35	Top Width (ft)	1971.62	1200.00	298.73
Vel Total (ft/s)	7.60	Avg. Vel. (ft/s)	5.84	9.26	5.84
Max Chl Dpth (ft)	2.99	Hydr. Depth (ft)	1.49	2.99	1.49
Conv. Total (cfs)	503795.0	Conv. (cfs)	163367.7	315675.5	24751.9
Length Wtd. (ft)	1700.00	Wetted Per. (ft)	1971.62	1200.00	298.75
Min Ch El (ft)	4465.00	Shear (lb/sq ft)	1.03	2.06	1.03
Alpha	1.15	Stream Power (lb/ft s)	6.02	19.12	6.02
Frctn Loss (ft)	11.06	Cum Volume (acre-ft)	99.25	806.31	31.74
C & E Loss (ft)	0.15	Cum SA (acres)	63.69	279.03	24.47

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #PMF1

W.S. Elev (ft)	4468.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.26	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4470.09	Reach Len. (ft)	1700.00	1700.00	1700.00
Crit W.S. (ft)	4468.83	Flow Area (sq ft)	4831.06	4591.41	731.98
E.G. Slope (ft/ft)	0.010220	Area (sq ft)	4831.06	4591.41	731.98
Q Total (cfs)	85000.00	Flow (cfs)	31952.90	48205.90	4841.19
Top Width (ft)	4107.89	Top Width (ft)	2525.27	1200.00	382.62
Vel Total (ft/s)	8.37	Avg. Vel. (ft/s)	6.61	10.50	6.61
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)	1.91	3.83	1.91
Conv. Total (cfs)	840816.4	Conv. (cfs)	316076.8	476850.8	47888.9
Length Wtd. (ft)	1700.00	Wetted Per. (ft)	2525.28	1200.00	382.64
Min Ch El (ft)	4465.00	Shear (lb/sq ft)	1.22	2.44	1.22
Alpha	1.16	Stream Power (lb/ft s)	8.07	25.63	8.07
Frctn Loss (ft)	11.06	Cum Volume (acre-ft)	162.35	1084.39	57.68
C & E Loss (ft)	0.16	Cum SA (acres)	82.43	301.40	32.75

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 2800

INPUT
Description: Section A2
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4470	2400	4460	4500	4450	6300	4455	6800	4460
8200	4470								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	2400	.035	6800	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2400	6800	1500	1500	1500	.1	.3

CROSS SECTION OUTPUT Profile #100-year Q

W.S. Elev (ft)	4451.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.035	
E.G. Elev (ft)	4451.99	Reach Len. (ft)	1500.00	1500.00	1500.00
Crit W.S. (ft)		Flow Area (sq ft)		1038.28	
E.G. Slope (ft/ft)	0.003234	Area (sq ft)		1038.28	
Q Total (cfs)	2430.00	Flow (cfs)		2430.00	
Top Width (ft)	1087.95	Top Width (ft)		1087.95	
Vel Total (ft/s)	2.34	Avg. Vel. (ft/s)		2.34	
Max Chl Dpth (ft)	1.91	Hydr. Depth (ft)		0.95	
Conv. Total (cfs)	42727.9	Conv. (cfs)		42727.9	
Length Wtd. (ft)	1500.00	Wetted Per. (ft)		1087.96	
Min Ch El (ft)	4450.00	Shear (lb/sq ft)		0.19	
Alpha	1.00	Stream Power (lb/ft s)		0.45	
Frctn Loss (ft)	5.60	Cum Volume (acre-ft)	1.36	71.70	0.24
C & E Loss (ft)	0.00	Cum SA (acres)	4.54	103.03	0.80

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4455.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.		0.035	
E.G. Elev (ft)	4456.21	Reach Len. (ft)	1500.00	1500.00	1500.00
Crit W.S. (ft)		Flow Area (sq ft)		9184.57	
E.G. Slope (ft/ft)	0.004278	Area (sq ft)		9184.57	
Q Total (cfs)	53000.00	Flow (cfs)		53000.00	
Top Width (ft)	3065.85	Top Width (ft)		3065.85	
Vel Total (ft/s)	5.77	Avg. Vel. (ft/s)		5.77	
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)		3.00	
Conv. Total (cfs)	810318.5	Conv. (cfs)		810318.5	
Length Wtd. (ft)	1500.00	Wetted Per. (ft)		3065.87	
Min Ch El (ft)	4450.00	Shear (lb/sq ft)		0.80	
Alpha	1.00	Stream Power (lb/ft s)		4.62	
Frctn Loss (ft)	6.54	Cum Volume (acre-ft)	41.79	557.14	23.04
C & E Loss (ft)	0.02	Cum SA (acres)	25.22	195.79	18.64

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PMF1

W.S. Elev (ft)	4456.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.72	Wt. n-Val.		0.035	
E.G. Elev (ft)	4457.44	Reach Len. (ft)	1500.00	1500.00	1500.00
Crit W.S. (ft)		Flow Area (sq ft)		12492.89	
E.G. Slope (ft/ft)	0.004501	Area (sq ft)		12492.89	
Q Total (cfs)	85000.00	Flow (cfs)		85000.00	
Top Width (ft)	3383.87	Top Width (ft)		3383.87	
Vel Total (ft/s)	6.80	Avg. Vel. (ft/s)		6.80	
Max Chl Dpth (ft)	6.72	Hydr. Depth (ft)		3.69	
Conv. Total (cfs)	1266931.0	Conv. (cfs)		1266931.0	
Length Wtd. (ft)	1500.00	Wetted Per. (ft)		3383.90	

Min Ch El (ft)	4450.00	Shear (lb/sq ft)		1.04	
Alpha	1.00	Stream Power (lb/ft s)		7.06	
Frctn Loss (ft)	6.68	Cum Volume (acre-ft)	68.08	751.02	43.40
C & E Loss (ft)	0.04	Cum SA (acres)	33.16	211.96	25.29

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 1300

INPUT
Description: Section A1
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4460	2400	4450	4500	4445	6300	4447	6900	4450
7700	4460								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	2400	.035	6300	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2400	6300	1300	1300	1300	.1	.3

CROSS SECTION OUTPUT Profile #100-year Q

W.S. Elev (ft)	4446.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.035	
E.G. Elev (ft)	4446.39	Reach Len. (ft)	1300.00	1300.00	1300.00
Crit W.S. (ft)	4445.96	Flow Area (sq ft)		1147.98	
E.G. Slope (ft/ft)	0.004331	Area (sq ft)		1147.98	
Q Total (cfs)	2430.00	Flow (cfs)		2430.00	
Top Width (ft)	1740.88	Top Width (ft)		1740.88	
Vel Total (ft/s)	2.12	Avg. Vel. (ft/s)		2.12	
Max Chl Dpth (ft)	1.32	Hydr. Depth (ft)		0.66	
Conv. Total (cfs)	36923.5	Conv. (cfs)		36923.5	
Length Wtd. (ft)	1300.00	Wetted Per. (ft)		1740.88	
Min Ch El (ft)	4445.00	Shear (lb/sq ft)		0.18	
Alpha	1.00	Stream Power (lb/ft s)		0.38	
Frctn Loss (ft)	5.73	Cum Volume (acre-ft)	1.36	34.06	0.24
C & E Loss (ft)	0.00	Cum SA (acres)	4.54	54.33	0.80

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4449.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.		0.035	0.035
E.G. Elev (ft)	4449.66	Reach Len. (ft)	1300.00	1300.00	1300.00
Crit W.S. (ft)		Flow Area (sq ft)		9491.21	487.31
E.G. Slope (ft/ft)	0.004435	Area (sq ft)		9491.21	487.31
Q Total (cfs)	53000.00	Flow (cfs)		51528.43	1471.57
Top Width (ft)	4008.66	Top Width (ft)		3567.16	441.50
Vel Total (ft/s)	5.31	Avg. Vel. (ft/s)		5.43	3.02
Max Chl Dpth (ft)	4.21	Hydr. Depth (ft)		2.66	1.10
Conv. Total (cfs)	795811.3	Conv. (cfs)		773715.1	22096.1
Length Wtd. (ft)	1300.00	Wetted Per. (ft)		3567.16	441.51
Min Ch El (ft)	4445.00	Shear (lb/sq ft)		0.74	0.31
Alpha	1.02	Stream Power (lb/ft s)		4.00	0.92
Frctn Loss (ft)	5.80	Cum Volume (acre-ft)	41.79	235.58	14.65
C & E Loss (ft)	0.01	Cum SA (acres)	25.22	81.58	11.04

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PMF1

W.S. Elev (ft)	4450.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.59	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4450.72	Reach Len. (ft)	1300.00	1300.00	1300.00
Crit W.S. (ft)		Flow Area (sq ft)	1.93	12945.12	976.82
E.G. Slope (ft/ft)	0.004412	Area (sq ft)	1.93	12945.12	976.82
Q Total (cfs)	85000.00	Flow (cfs)	0.87	81229.45	3769.68
Top Width (ft)	4540.63	Top Width (ft)	30.47	3900.00	610.16
Vel Total (ft/s)	6.10	Avg. Vel. (ft/s)	0.45	6.27	3.86
Max Chl Dpth (ft)	5.13	Hydr. Depth (ft)	0.06	3.32	1.60
Conv. Total (cfs)	1279673.0	Conv. (cfs)	13.1	1222907.0	56752.4
Length Wtd. (ft)	1300.00	Wetted Per. (ft)	30.47	3900.01	610.16
Min Ch El (ft)	4445.00	Shear (lb/sq ft)	0.02	0.91	0.44
Alpha	1.03	Stream Power (lb/ft s)	0.01	5.74	1.70
Frctn Loss (ft)	5.77	Cum Volume (acre-ft)	68.05	313.04	26.58
C & E Loss (ft)	0.01	Cum SA (acres)	32.63	86.55	14.78

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 0

INPUT
Description: Section A
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4450	5100	4440	7000	4440	7900	4450	8700	4470

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	5100	.035	7000	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
5100	7000	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100-year Q

W.S. Elev (ft)	4440.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4440.66	Reach Len. (ft)			
Crit W.S. (ft)	4440.36	Flow Area (sq ft)	90.94	1134.62	16.05
E.G. Slope (ft/ft)	0.004509	Area (sq ft)	90.94	1134.62	16.05
Q Total (cfs)	2430.00	Flow (cfs)	115.81	2293.75	20.44
Top Width (ft)	2258.30	Top Width (ft)	304.56	1900.00	53.75
Vel Total (ft/s)	1.96	Avg. Vel. (ft/s)	1.27	2.02	1.27
Max Chl Dpth (ft)	0.60	Hydr. Depth (ft)	0.30	0.60	0.30
Conv. Total (cfs)	36188.2	Conv. (cfs)	1724.7	34159.2	304.3
Length Wtd. (ft)		Wetted Per. (ft)	304.56	1900.00	53.75
Min Ch El (ft)	4440.00	Shear (lb/sq ft)	0.08	0.17	0.08
Alpha	1.03	Stream Power (lb/ft s)	0.11	0.34	0.11
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4443.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4443.84	Reach Len. (ft)			
Crit W.S. (ft)	4442.56	Flow Area (sq ft)	2800.50	6296.53	494.21
E.G. Slope (ft/ft)	0.004500	Area (sq ft)	2800.50	6296.53	494.21
Q Total (cfs)	53000.00	Flow (cfs)	11168.44	39860.73	1970.82
Top Width (ft)	3888.38	Top Width (ft)	1690.12	1900.00	298.26
Vel Total (ft/s)	5.53	Avg. Vel. (ft/s)	3.99	6.33	3.99
Max Chl Dpth (ft)	3.31	Hydr. Depth (ft)	1.66	3.31	1.66
Conv. Total (cfs)	790055.8	Conv. (cfs)	166484.7	594192.6	29378.5
Length Wtd. (ft)		Wetted Per. (ft)	1690.13	1900.00	298.28
Min Ch El (ft)	4440.00	Shear (lb/sq ft)	0.47	0.93	0.47

Alpha	1.12	Stream Power (lb/ft s)	1.86	5.89	1.86
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #PMF1

W.S. Elev (ft)	4444.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4444.94	Reach Len. (ft)			
Crit W.S. (ft)	4443.38	Flow Area (sq ft)	4558.44	8033.25	804.43
E.G. Slope (ft/ft)	0.004502	Area (sq ft)	4558.44	8033.25	804.43
Q Total (cfs)	85000.00	Flow (cfs)	21389.48	59836.06	3774.46
Top Width (ft)	4436.82	Top Width (ft)	2156.29	1900.00	380.52
Vel Total (ft/s)	6.35	Avg. Vel. (ft/s)	4.69	7.45	4.69
Max Chl Dpth (ft)	4.23	Hydr. Depth (ft)	2.11	4.23	2.11
Conv. Total (cfs)	1266775.0	Conv. (cfs)	318772.5	891751.2	56251.7
Length Wtd. (ft)		Wetted Per. (ft)	2156.30	1900.00	380.55
Min Ch El (ft)	4440.00	Shear (lb/sq ft)	0.59	1.19	0.59
Alpha	1.13	Stream Power (lb/ft s)	2.79	8.85	2.79
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Skull Valey

Reach	River Sta.	n1	n2	n3
PFSF	9400	.035	.035	.035
PFSF	5900	.035	.035	.035
PFSF	4500	.035	.035	.035
PFSF	2800	.035	.035	.035
PFSF	1300	.035	.035	.035
PFSF	0	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: Skull Valey

Reach	River Sta.	Left	Channel	Right
PFSF	9400	3500	3500	3500
PFSF	5900	1400	1400	1400
PFSF	4500	1700	1700	1700
PFSF	2800	1500	1500	1500
PFSF	1300	1300	1300	1300
PFSF	0	0	0	0

ATTACHMENT 4
HEC-1 INPUT DATA FOR THE SOIL CURVE NUMBER SENTIVITY RUNS

SOIL CURVE NO. 75, TC = 18.31 HOUR

```
ID   PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
ID   GENERAL PMF AT ACCESS RD
ID   TC = 18.31 HOUR, SOIL CURVE NO. 75
ID
IT    60                    200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      75       1
UD  11.0
ZZ
```

SOIL CURVE NO. 80, TC = 18.31 HOUR

```
ID   PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
ID   GENERAL PMF AT ACCESS RD
ID   TC = 18.31 HOUR, SOIL CURVE NO. 80
ID
IT    60                    200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      80       1
UD  11.0
ZZ
```

SOIL CURVE NO. 85, TC = 18.31 HOUR

```
ID   PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
ID   GENERAL PMF AT ACCESS RD
ID   TC = 18.31 HOUR, SOIL CURVE NO. 85
ID
IT    60                    200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
```

```
BF    -1            1.06
PR    60
LS     0      85       1
UD  11.0
ZZ
```

SOIL CURVE NO. 90, TC = 18.31 HOUR

```
ID   PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
ID   GENERAL PMF AT ACCESS RD
ID   TC = 18.31 HOUR, SOIL CURVE NO. 90
ID
IT    60                     200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      90       1
UD  11.0
ZZ
```

SOIL CURVE NO. 96, TC = 18.31 HOUR

```
ID   PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
ID   GENERAL PMF AT ACCESS RD
ID   TC = 18.31 HOUR, SOIL CURVE NO. 96
ID
IT    60                     200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      96       1
UD  11.0
ZZ
```

ATTACHMENT 5
HEC-1 PROGRAM OUTPUTS - SOIL CURVE NUMBER SENTIVITY RUNS

SOIL CURVE NO. 75, TC = 18.31 HOUR

```
                                        X     X  XXXXXXX   XXXXX           X
                                        X     X  X        X     X        XX
                                        X     X  X        X              X
                                        XXXXXXX  XXXX     X        XXXXX  X
                                        X     X  X        X              X
                                        X     X  X        X     X        X
                                        X     X  XXXXXXX   XXXXX        XXX

                        PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
                        GENERAL PMF AT ACCESS RD
                        TC = 18.31 HOUR, SOIL CURVE NO. 75


  6 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           2  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

  8 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN         180  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

    IT          HYDROGRAPH TIME DATA
                       NMIN          60  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      9    0  ENDING DATE
                     NDTIME        0700  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL    1.00 HOURS
                       TOTAL TIME BASE  199.00 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** *** ***

            **************
            *            *
 12 KK      *       010  *
            *            *
            **************
                        SCS DIMENSIONLESS UNIT HYDROGRAPH

               SUBBASIN RUNOFF DATA

 14 BA          SUBBASIN CHARACTERISTICS
                      TAREA      270.00  SUBBASIN AREA

 15 BF          BASE FLOW CHARACTERISTICS
                      STRTQ      270.00  INITIAL FLOW
                      QRCSN         .00  BEGIN BASE FLOW RECESSION
                      RTIOR     1.06000  RECESSION CONSTANT

                PRECIPITATION DATA

 16 PR             RECORDING STATIONS        60
  0 PW                        WEIGHTS      1.00

 17 LS          SCS LOSS RATE
                      STRTL         .67  INITIAL ABSTRACTION
                     CRVNBR       75.00  CURVE NUMBER
                      RTIMP        1.00  PERCENT IMPERVIOUS AREA

 18 UD          SCS DIMENSIONLESS UNITGRAPH
```

```
TLAG        11.00  LAG

                                                    ***

PRECIPITATION STATION DATA

        STATION    TOTAL    AVG. ANNUAL    WEIGHT
            60    12.60         .00         1.00

 TEMPORAL DISTRIBUTIONS

 STATION        60,  WEIGHT =   1.00
          .06       .06       .06       .09       .09       .09       .10       .10       .10       .12
          .12       .12       .12       .12       .12       .13       .13       .13       .21       .21
          .21       .23       .23       .23       .31       .31       .31       .33       .33       .33
          .36       .36       .36       .94       .94       .94       .21       .21       .21       .16
          .16       .16       .14       .14       .14       .14       .14       .14       .13       .13
          .13       .13       .13       .13       .06       .06       .06       .06       .06       .06
          .05       .05       .05       .05       .05       .05       .05       .05       .05       .05
          .05       .05

                                        UNIT HYDROGRAPH
                                   57 END-OF-PERIOD ORDINATES
     296.      927.     1755.     2805.     4146.     5798.     7642.     9219.    10329.    11019.
   11290.    11290.    11019.    10407.     9712.     8924.     7957.     6823.     5758.     4905.
    4245.     3668.     3175.     2815.     2455.     2140.     1844.     1588.     1391.     1199.
    1051.      903.      786.      678.      587.      513.      443.      388.      334.      293.
     254.      220.      191.      164.      144.      125.      113.      101.       89.       77.
      66.       54.       44.       35.       25.       15.        5.

  TOTAL RAINFALL =   12.60, TOTAL LOSS =    3.24, TOTAL EXCESS =    9.36

 PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR    199.00-HR
+   (CFS)       (HR)
                          (CFS)
+   56887.     45.00                55550.      43658.      22428.       8219.
                         (INCHES)   1.913       6.014       9.268       9.387
                         (AC-FT)   27545.      86595.     133459.     135174.

                         CUMULATIVE AREA =  270.00 SQ MI

1
                                        RUNOFF SUMMARY
                                   FLOW IN CUBIC FEET PER SECOND
                                TIME IN HOURS,  AREA IN SQUARE MILES

                                     PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM
TIME OF
          OPERATION       STATION    FLOW    PEAK                                          AREA      STAGE     MAX
STAGE
+                                                        6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                           010    56887.   45.00       55550.      43658.      22428.    270.00

 *** NORMAL END OF HEC-1 ***
```

SOIL CURVE NO. 80, TC = 18.31 HOUR

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX


                    PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
                    GENERAL PMF AT ACCESS RD
                    TC = 18.31 HOUR, SOIL CURVE NO. 80

  6 IO        OUTPUT CONTROL VARIABLES
                  IPRNT          2  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

  8 IN        TIME DATA FOR INPUT TIME SERIES
                  JXMIN        180  TIME INTERVAL IN MINUTES
                 JXDATE      1    0  STARTING DATE
                 JXTIME           0  STARTING TIME

    IT        HYDROGRAPH TIME DATA
                   NMIN         60  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        200  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      9    0  ENDING DATE
                 NDTIME       0700  ENDING TIME
                  ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL    1.00 HOURS
                   TOTAL TIME BASE  199.00 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** *** ***

            **************
            *            *
 12 KK      *       010  *
            *            *
            **************
                        SCS DIMENSIONLESS UNIT HYDROGRAPH

            SUBBASIN RUNOFF DATA

 14 BA        SUBBASIN CHARACTERISTICS
                  TAREA      270.00  SUBBASIN AREA

 15 BF        BASE FLOW CHARACTERISTICS
                  STRTQ      270.00  INITIAL FLOW
                  QRCSN         .00  BEGIN BASE FLOW RECESSION
                  RTIOR     1.06000  RECESSION CONSTANT

              PRECIPITATION DATA

 16 PR           RECORDING STATIONS        60
  0 PW                     WEIGHTS      1.00

 17 LS        SCS LOSS RATE
                  STRTL         .50  INITIAL ABSTRACTION
                 CRVNBR       80.00  CURVE NUMBER
                  RTIMP        1.00  PERCENT IMPERVIOUS AREA

 18 UD        SCS DIMENSIONLESS UNITGRAPH
                   TLAG       11.00  LAG

                                                          ***

            PRECIPITATION STATION DATA
```

```
                STATION    TOTAL    AVG. ANNUAL    WEIGHT
                    60    12.60         .00         1.00

          TEMPORAL DISTRIBUTIONS

          STATION       60,  WEIGHT =   1.00
                .06       .06       .06       .09       .09       .09       .10       .10       .10       .12
                .12       .12       .12       .12       .13       .13       .13       .13       .21       .21
                .21       .23       .23       .23       .31       .31       .31       .33       .33       .33
                .36       .36       .36       .94       .94       .94       .21       .21       .21       .16
                .16       .16       .14       .14       .14       .14       .14       .14       .13       .13
                .13       .13       .13       .13       .06       .06       .06       .06       .06       .06
                .05       .05       .05       .05       .05       .05       .05       .05       .05       .05
                .05       .05

                                                UNIT HYDROGRAPH
                                            57 END-OF-PERIOD ORDINATES
          296.      927.     1755.     2805.     4146.     5798.     7642.     9219.    10329.    11019.
        11290.    11290.    11019.    10407.     9712.     8924.     7957.     6823.     5758.     4905.
         4245.     3668.     3175.     2815.     2455.     2140.     1844.     1588.     1391.     1199.
         1051.      903.      786.      678.      587.      513.      443.      388.      334.      293.
          254.      220.      191.      164.      144.      125.      113.      101.       89.       77.
           66.       54.       44.       35.       25.       15.        5.

**********************************************************************************************************

     TOTAL RAINFALL =   12.60, TOTAL LOSS =    2.55, TOTAL EXCESS =   10.05

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR    199.00-HR
+   (CFS)       (HR)
                          (CFS)
+   60341.     45.00                 58960.      46381.      24051.       8826.
                         (INCHES)    2.030       6.389       9.939      10.080
                         (AC-FT)    29237.      91995.     143115.     145158.

                         CUMULATIVE AREA =  270.00 SQ MI

1
                                                RUNOFF SUMMARY
                                         FLOW IN CUBIC FEET PER SECOND
                                       TIME IN HOURS,  AREA IN SQUARE MILES

                                        PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM
TIME OF
        OPERATION       STATION         FLOW     PEAK                                          AREA      STAGE     MAX
STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

        HYDROGRAPH AT
+                           010       60341.   45.00       58960.      46381.      24051.    270.00


 *** NORMAL END OF HEC-1 ***
```

SOIL CURVE NO. 85, TC = 18.31 HOUR

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

```
PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
GENERAL PMF AT ACCESS RD
TC = 18.31 HOUR, SOIL CURVE NO. 85

6 IO          OUTPUT CONTROL VARIABLES
                    IPRNT          2  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

8 IN          TIME DATA FOR INPUT TIME SERIES
                    JXMIN        180  TIME INTERVAL IN MINUTES
                   JXDATE      1    0  STARTING DATE
                   JXTIME           0  STARTING TIME

  IT          HYDROGRAPH TIME DATA
                     NMIN         60  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
```

```
                ITIME        0000  STARTING TIME
                   NQ         200  NUMBER OF HYDROGRAPH ORDINATES
              NDDATE       9    0  ENDING DATE
              NDTIME        0700  ENDING TIME
              ICENT           19  CENTURY MARK

          COMPUTATION INTERVAL    1.00 HOURS
               TOTAL TIME BASE  199.00 HOURS

     ENGLISH UNITS
          DRAINAGE AREA          SQUARE MILES
          PRECIPITATION DEPTH    INCHES
          LENGTH, ELEVATION      FEET
          FLOW                   CUBIC FEET PER SECOND
          STORAGE VOLUME         ACRE-FEET
          SURFACE AREA           ACRES
          TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** *** ***


          **************
          *            *
  12 KK   *       010  *
          *            *
          **************
                    SCS DIMENSIONLESS UNIT HYDROGRAPH

        SUBBASIN RUNOFF DATA

  14 BA   SUBBASIN CHARACTERISTICS
              TAREA      270.00  SUBBASIN AREA

  15 BF   BASE FLOW CHARACTERISTICS
              STRTQ      270.00  INITIAL FLOW
              QRCSN         .00  BEGIN BASE FLOW RECESSION
              RTIOR     1.06000  RECESSION CONSTANT

          PRECIPITATION DATA

  16 PR      RECORDING STATIONS        60
   0 PW                WEIGHTS      1.00

  17 LS   SCS LOSS RATE
              STRTL         .35  INITIAL ABSTRACTION
             CRVNBR       85.00  CURVE NUMBER
              RTIMP        1.00  PERCENT IMPERVIOUS AREA

  18 UD   SCS DIMENSIONLESS UNITGRAPH
               TLAG       11.00  LAG

                                                          ***

        PRECIPITATION STATION DATA

                STATION    TOTAL    AVG. ANNUAL    WEIGHT
                     60    12.60          .00        1.00

          TEMPORAL DISTRIBUTIONS

          STATION       60,  WEIGHT =   1.00
                .06       .06       .06       .09       .09       .09       .10       .10       .10       .12
                .12       .12       .12       .12       .12       .13       .13       .13       .21       .21
                .21       .23       .23       .23       .31       .31       .31       .33       .33       .33
                .36       .36       .36       .94       .94       .94       .21       .21       .21       .16
                .16       .16       .14       .14       .14       .14       .14       .14       .13       .13
                .13       .13       .13       .13       .06       .06       .06       .06       .06       .06
                .05       .05       .05       .05       .05       .05       .05       .05       .05       .05
                .05       .05

                                                UNIT HYDROGRAPH
                                           57 END-OF-PERIOD ORDINATES
          296.      927.     1755.     2805.     4146.     5798.     7642.     9219.    10329.    11019.
        11290.    11290.    11019.    10407.     9712.     8924.     7957.     6823.     5758.     4905.
         4245.     3668.     3175.     2815.     2455.     2140.     1844.     1588.     1391.     1199.
         1051.      903.      786.      678.      587.      513.      443.      388.      334.      293.
          254.      220.      191.      164.      144.      125.      113.      101.       89.       77.
           66.       54.       44.       35.       25.       15.        5.

    TOTAL RAINFALL =   12.60, TOTAL LOSS =    1.88, TOTAL EXCESS =   10.72

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR    199.00-HR
+   (CFS)       (HR)
                          (CFS)
+   63287.     45.00                61878.      48791.      25605.       9413.
```

```
                    (INCHES)     2.131       6.721      10.580       10.750
                     (AC-FT)    30683.      96775.     152358.      154802.

                    CUMULATIVE AREA =  270.00 SQ MI

1
                                                    RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                     PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM
TIME OF
        OPERATION       STATION      FLOW     PEAK                                          AREA      STAGE     MAX
STAGE
+                                                        6-HOUR     24-HOUR     72-HOUR

        HYDROGRAPH AT
+                         010      63287.   45.00       61878.      48791.      25605.     270.00
```

SOIL CURVE NO. 90, TC = 18.31 HOUR

```
                                          X     X  XXXXXXX   XXXXX           X
                                          X     X  X        X     X         XX
                                          X     X  X        X                X
                                          XXXXXXX  XXXX     X        XXXXX   X
                                          X     X  X        X                X
                                          X     X  X        X     X          X
                                          X     X  XXXXXXX   XXXXX          XXX

                         PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
                         GENERAL PMF AT ACCESS RD
                         TC = 18.31 HOUR, SOIL CURVE NO. 90


   6 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           2  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

   8 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN         180  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
                      JXTIME           0  STARTING TIME

     IT          HYDROGRAPH TIME DATA
                        NMIN          60  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      9    0  ENDING DATE
                      NDTIME        0700  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL    1.00 HOURS
                       TOTAL TIME BASE  199.00 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** *** ***

            **************
            *            *
  12 KK     *       010  *
            *            *
            **************
                          SCS DIMENSIONLESS UNIT HYDROGRAPH

              SUBBASIN RUNOFF DATA

  14 BA         SUBBASIN CHARACTERISTICS
                       TAREA      270.00  SUBBASIN AREA

  15 BF         BASE FLOW CHARACTERISTICS
                       STRTQ      270.00  INITIAL FLOW
                       QRCSN         .00  BEGIN BASE FLOW RECESSION
```

```
                    RTIOR     1.06000  RECESSION CONSTANT

               PRECIPITATION DATA

  16 PR           RECORDING STATIONS        60
   0 PW                     WEIGHTS      1.00

  17 LS        SCS LOSS RATE
                    STRTL        .22  INITIAL ABSTRACTION
                   CRVNBR      90.00  CURVE NUMBER
                    RTIMP       1.00  PERCENT IMPERVIOUS AREA

  18 UD        SCS DIMENSIONLESS UNITGRAPH
                     TLAG      11.00  LAG

                                                          ***

             PRECIPITATION STATION DATA

                    STATION    TOTAL    AVG. ANNUAL    WEIGHT
                         60    12.60         .00         1.00

               TEMPORAL DISTRIBUTIONS

               STATION       60,  WEIGHT =   1.00
                    .06       .06       .06       .09       .09       .09       .10       .10       .10       .12
                    .12       .12       .12       .12       .12       .13       .13       .13       .21       .21
                    .21       .23       .23       .23       .31       .31       .31       .33       .33       .33
                    .36       .36       .36       .94       .94       .94       .21       .21       .21       .16
                    .16       .16       .14       .14       .14       .14       .14       .14       .13       .13
                    .13       .13       .13       .13       .06       .06       .06       .06       .06       .06
                    .05       .05       .05       .05       .05       .05       .05       .05       .05       .05
                    .05       .05

                                                UNIT HYDROGRAPH
                                           57 END-OF-PERIOD ORDINATES
             296.      927.     1755.     2805.     4146.     5798.     7642.     9219.    10329.    11019.
           11290.    11290.    11019.    10407.     9712.     8924.     7957.     6823.     5758.     4905.
            4245.     3668.     3175.     2815.     2455.     2140.     1844.     1588.     1391.     1199.
            1051.      903.      786.      678.      587.      513.      443.      388.      334.      293.
             254.      220.      191.      164.      144.      125.      113.      101.       89.       77.
              66.       54.       44.       35.       25.       15.        5.

    TOTAL RAINFALL =   12.60, TOTAL LOSS =    1.23, TOTAL EXCESS =   11.37

  PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR    199.00-HR
+   (CFS)        (HR)
                            (CFS)
+   65734.      44.00                 64222.      50846.      27081.       9979.
                          (INCHES)     2.212       7.004      11.191      11.397
                          (AC-FT)    31846.     100852.     161144.     164120.

                          CUMULATIVE AREA =  270.00 SQ MI

1
                                                RUNOFF SUMMARY
                                          FLOW IN CUBIC FEET PER SECOND
                                       TIME IN HOURS,  AREA IN SQUARE MILES

                                        PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM
TIME OF
          OPERATION       STATION       FLOW     PEAK                                          AREA      STAGE     MAX
STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                           010      65734.   44.00       64222.      50846.      27081.     270.00
```

SOIL CURVE NO. 96, TC = 18.31 HOUR

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

PFSF (PRIVATE FUEL STORAGE FACILITY PROJECT)
GENERAL PMF AT ACCESS RD
TC = 18.31 HOUR, SOIL CURVE NO. 96

```
 6 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          2  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

 8 IN          TIME DATA FOR INPUT TIME SERIES
                    JXMIN        180  TIME INTERVAL IN MINUTES
                   JXDATE      1    0  STARTING DATE
                   JXTIME           0  STARTING TIME

   IT          HYDROGRAPH TIME DATA
                     NMIN         60  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        200  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      9    0  ENDING DATE
                   NDTIME       0700  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL    1.00 HOURS
                     TOTAL TIME BASE  199.00 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** *** ***

            *************
            *           *
 12 KK      *       010 *
            *           *
            *************
                        SCS DIMENSIONLESS UNIT HYDROGRAPH

               SUBBASIN RUNOFF DATA

 14 BA           SUBBASIN CHARACTERISTICS
                      TAREA      270.00  SUBBASIN AREA

 15 BF           BASE FLOW CHARACTERISTICS
                      STRTQ      270.00  INITIAL FLOW
                      QRCSN         .00  BEGIN BASE FLOW RECESSION
                      RTIOR     1.06000  RECESSION CONSTANT

                 PRECIPITATION DATA

 16 PR              RECORDING STATIONS        60
  0 PW                        WEIGHTS      1.00

 17 LS           SCS LOSS RATE
                      STRTL         .08  INITIAL ABSTRACTION
                     CRVNBR       96.00  CURVE NUMBER
                      RTIMP        1.00  PERCENT IMPERVIOUS AREA

 18 UD           SCS DIMENSIONLESS UNITGRAPH
                       TLAG       11.00  LAG

                                                          ***

               PRECIPITATION STATION DATA

                       STATION    TOTAL    AVG. ANNUAL    WEIGHT
                            60    12.60         .00         1.00

                 TEMPORAL DISTRIBUTIONS

                 STATION        60,  WEIGHT =   1.00
                      .06       .06       .06       .09       .09       .09       .10       .10       .10       .12
                      .12       .12       .12       .12       .12       .13       .13       .13       .21       .21
                      .21       .23       .23       .23       .31       .31       .31       .33       .33       .33
                      .36       .36       .36       .94       .94       .94       .21       .21       .21       .16
                      .16       .16       .14       .14       .14       .14       .14       .14       .13       .13
                      .13       .13       .13       .13       .06       .06       .06       .06       .06       .06
                      .05       .05       .05       .05       .05       .05       .05       .05       .05       .05
                      .05       .05

                                                   UNIT HYDROGRAPH
                                              57 END-OF-PERIOD ORDINATES
                 296.      927.     1755.     2805.     4146.     5798.     7642.     9219.    10329.    11019.
               11290.    11290.    11019.    10407.     9712.     8924.     7957.     6823.     5758.     4905.
```

4245.	3668.	3175.	2815.	2455.	2140.	1844.	1588.	1391.	1199.
1051.	903.	786.	678.	587.	513.	443.	388.	334.	293.
254.	220.	191.	164.	144.	125.	113.	101.	89.	77.
66.	54.	44.	35.	25.	15.	5.			

TOTAL RAINFALL = 12.60, TOTAL LOSS = .48, TOTAL EXCESS = 12.12

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	199.00-HR
+	(CFS)	(HR)	(CFS)				
+	67759.	44.00		66108.	52606.	28730.	10634.
			(INCHES)	2.276	7.246	11.872	12.145
			(AC-FT)	32781.	104343.	170954.	174886.

CUMULATIVE AREA = 270.00 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	010	67759.	44.00	66108.	52606.	28730.	270.00		

*** NORMAL END OF HEC-1 ***

Attachment 6, HEC-1 Input Data and Program Output
PMF Run with Tc=11 Hour and Soil Group Curve Number = 96

Input Data

```
ID   PFSF (Private Fuel Storage Facility Project)
ID   General PMF AT ACCESS RD
ID   Tc = 11.0 hour, Soil curve No. 96
ID
IT    60                    200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      96       1
UD   6.6
ZZ
```

Program Output

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

```
                    PFSF (Private Fuel Storage Facility Project)
                    General PMF AT ACCESS RD
                    Tc = 11.0 hour, Soil curve No. 96

  6 IO        OUTPUT CONTROL VARIABLES
                    IPRNT          2  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

  8 IN        TIME DATA FOR INPUT TIME SERIES
                    JXMIN        180  TIME INTERVAL IN MINUTES
                   JXDATE      1    0  STARTING DATE
                   JXTIME           0  STARTING TIME

    IT        HYDROGRAPH TIME DATA
                     NMIN         60  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        200  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      9    0  ENDING DATE
                   NDTIME       0700  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL    1.00 HOURS
                     TOTAL TIME BASE  199.00 HOURS
```

```
ENGLISH UNITS
     DRAINAGE AREA          SQUARE MILES
     PRECIPITATION DEPTH    INCHES
     LENGTH, ELEVATION      FEET
     FLOW                   CUBIC FEET PER SECOND
     STORAGE VOLUME         ACRE-FEET
     SURFACE AREA           ACRES
     TEMPERATURE            DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** *** *** *** *** *** *** ***


            **************
            *            *
  12 KK     *       010  *
            *            *
            **************
                          SCS DIMENSIONLESS UNIT HYDROGRAPH

               SUBBASIN RUNOFF DATA

  14 BA          SUBBASIN CHARACTERISTICS
                       TAREA      270.00  SUBBASIN AREA

  15 BF          BASE FLOW CHARACTERISTICS
                       STRTQ      270.00  INITIAL FLOW
                       QRCSN         .00  BEGIN BASE FLOW RECESSION
                       RTIOR     1.06000  RECESSION CONSTANT

                 PRECIPITATION DATA

  16 PR             RECORDING STATIONS        60
   0 PW                        WEIGHTS      1.00

  17 LS          SCS LOSS RATE
                       STRTL         .08  INITIAL ABSTRACTION
                      CRVNBR       96.00  CURVE NUMBER
                       RTIMP        1.00  PERCENT IMPERVIOUS AREA

  18 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG        6.60  LAG

                                                                  ***

               PRECIPITATION STATION DATA

                        STATION    TOTAL    AVG. ANNUAL    WEIGHT
                             60    12.60         .00         1.00

                 TEMPORAL DISTRIBUTIONS

                 STATION       60,  WEIGHT =   1.00
                       .06       .06       .06       .09       .09       .09       .10       .10
.10       .12
                       .12       .12       .12       .12       .12       .13       .13       .13
.21       .21
                       .21       .23       .23       .23       .31       .31       .31       .33
.33       .33
                       .36       .36       .36       .94       .94       .94       .21       .21
.21       .16
                       .16       .16       .14       .14       .14       .14       .14       .14
.13       .13
                       .13       .13       .13       .13       .06       .06       .06       .06
.06       .06
                       .05       .05       .05       .05       .05       .05       .05       .05
.05       .05
                       .05       .05
```

UNIT HYDROGRAPH
35 END-OF-PERIOD ORDINATES

	1076.	3188.	6358.	10847.	15150.	17583.	18346.	17893.	16216.
14175.									
	11406.	8632.	6823.	5403.	4389.	3508.	2732.	2204.	1756.
1380.									
	1096.	875.	695.	553.	444.	352.	275.	223.	183.
152.									
	121.	91.	65.	39.	13.				

****
*****

HYDROGRAPSTA 010

****
*****

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	*	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	.00	.00	.00	270.	*	5		0400	101	.00	.00	.00	32.
1		0100	2	.06	.06	.00	255.	*	5		0500	102	.00	.00	.00	24.
1		0200	3	.06	.06	.00	246.	*	5		0600	103	.00	.00	.00	16.
1		0300	4	.06	.04	.02	259.	*	5		0700	104	.00	.00	.00	10.
1		0400	5	.09	.05	.04	336.	*	5		0800	105	.00	.00	.00	6.
1		0500	6	.09	.04	.05	534.	*	5		0900	106	.00	.00	.00	3.
1		0600	7	.09	.03	.06	914.	*	5		1000	107	.00	.00	.00	1.
1		0700	8	.10	.02	.07	1536.	*	5		1100	108	.00	.00	.00	1.
1		0800	9	.10	.02	.08	2408.	*	5		1200	109	.00	.00	.00	0.
1		0900	10	.10	.02	.08	3490.	*	5		1300	110	.00	.00	.00	0.
1		1000	11	.12	.02	.10	4741.	*	5		1400	111	.00	.00	.00	0.
1		1100	12	.12	.01	.10	6110.	*	5		1500	112	.00	.00	.00	0.
1		1200	13	.12	.01	.11	7540.	*	5		1600	113	.00	.00	.00	0.
1		1300	14	.12	.01	.11	8995.	*	5		1700	114	.00	.00	.00	0.
1		1400	15	.12	.01	.11	10428.	*	5		1800	115	.00	.00	.00	0.
1		1500	16	.12	.01	.11	11785.	*	5		1900	116	.00	.00	.00	0.
1		1600	17	.13	.01	.12	13053.	*	5		2000	117	.00	.00	.00	0.
1		1700	18	.13	.01	.12	14222.	*	5		2100	118	.00	.00	.00	0.
1		1800	19	.13	.00	.12	15282.	*	5		2200	119	.00	.00	.00	0.
1		1900	20	.21	.01	.20	16328.	*	5		2300	120	.00	.00	.00	0.
1		2000	21	.21	.01	.20	17431.	*	6		0000	121	.00	.00	.00	0.
1		2100	22	.21	.00	.20	18673.	*	6		0100	122	.00	.00	.00	0.
1		2200	23	.23	.00	.22	20191.	*	6		0200	123	.00	.00	.00	0.
1		2300	24	.23	.00	.22	21997.	*	6		0300	124	.00	.00	.00	0.
2		0000	25	.23	.00	.22	23978.	*	6		0400	125	.00	.00	.00	0.
2		0100	26	.31	.00	.30	26124.	*	6		0500	126	.00	.00	.00	0.
2		0200	27	.31	.00	.30	28424.	*	6		0600	127	.00	.00	.00	0.
2		0300	28	.31	.00	.30	30838.	*	6		0700	128	.00	.00	.00	0.
2		0400	29	.33	.00	.32	33443.	*	6		0800	129	.00	.00	.00	0.
2		0500	30	.33	.00	.32	36171.	*	6		0900	130	.00	.00	.00	0.
2		0600	31	.33	.00	.32	38877.	*	6		1000	131	.00	.00	.00	0.
2		0700	32	.36	.00	.35	41559.	*	6		1100	132	.00	.00	.00	0.
2		0800	33	.36	.00	.35	44167.	*	6		1200	133	.00	.00	.00	0.
2		0900	34	.36	.00	.36	46634.	*	6		1300	134	.00	.00	.00	0.
2		1000	35	.94	.00	.94	49597.	*	6		1400	135	.00	.00	.00	0.
2		1100	36	.94	.00	.94	53593.	*	6		1500	136	.00	.00	.00	0.
2		1200	37	.94	.00	.94	59190.	*	6		1600	137	.00	.00	.00	0.
2		1300	38	.21	.00	.21	66398.	*	6		1700	138	.00	.00	.00	0.
2		1400	39	.21	.00	.21	74338.	*	6		1800	139	.00	.00	.00	0.
2		1500	40	.21	.00	.21	81148.	*	6		1900	140	.00	.00	.00	0.
2		1600	41	.16	.00	.16	84857.	*	6		2000	141	.00	.00	.00	0.
2		1700	42	.16	.00	.16	84839.	*	6		2100	142	.00	.00	.00	0.
2		1800	43	.16	.00	.16	81737.	*	6		2200	143	.00	.00	.00	0.
2		1900	44	.14	.00	.14	76527.	*	6		2300	144	.00	.00	.00	0.
2		2000	45	.14	.00	.14	69689.	*	7		0000	145	.00	.00	.00	0.
2		2100	46	.14	.00	.14	62217.	*	7		0100	146	.00	.00	.00	0.
2		2200	47	.14	.00	.14	55012.	*	7		0200	147	.00	.00	.00	0.
2		2300	48	.14	.00	.14	48906.	*	7		0300	148	.00	.00	.00	0.
3		0000	49	.14	.00	.14	44243.	*	7		0400	149	.00	.00	.00	0.
3		0100	50	.13	.00	.13	40425.	*	7		0500	150	.00	.00	.00	0.

3	0200	51	.13	.00	.13	37272.	*	7	0600	151	.00	.00	.00	0.
3	0300	52	.13	.00	.13	34639.	*	7	0700	152	.00	.00	.00	0.
3	0400	53	.13	.00	.13	32417.	*	7	0800	153	.00	.00	.00	0.
3	0500	54	.13	.00	.13	30572.	*	7	0900	154	.00	.00	.00	0.
3	0600	55	.13	.00	.13	28991.	*	7	1000	155	.00	.00	.00	0.
3	0700	56	.06	.00	.06	27585.	*	7	1100	156	.00	.00	.00	0.
3	0800	57	.06	.00	.06	26263.	*	7	1200	157	.00	.00	.00	0.
3	0900	58	.06	.00	.06	24909.	*	7	1300	158	.00	.00	.00	0.
3	1000	59	.06	.00	.06	23405.	*	7	1400	159	.00	.00	.00	0.
3	1100	60	.06	.00	.06	21750.	*	7	1500	160	.00	.00	.00	0.
3	1200	61	.06	.00	.06	20051.	*	7	1600	161	.00	.00	.00	0.
3	1300	62	.05	.00	.05	18390.	*	7	1700	162	.00	.00	.00	0.
3	1400	63	.05	.00	.05	16835.	*	7	1800	163	.00	.00	.00	0.
3	1500	64	.05	.00	.05	15453.	*	7	1900	164	.00	.00	.00	0.
3	1600	65	.05	.00	.05	14241.	*	7	2000	165	.00	.00	.00	0.
3	1700	66	.05	.00	.05	13238.	*	7	2100	166	.00	.00	.00	0.
3	1800	67	.05	.00	.05	12443.	*	7	2200	167	.00	.00	.00	0.
3	1900	68	.05	.00	.05	11788.	*	7	2300	168	.00	.00	.00	0.
3	2000	69	.05	.00	.05	11244.	*	8	0000	169	.00	.00	.00	0.
3	2100	70	.05	.00	.05	10784.	*	8	0100	170	.00	.00	.00	0.
3	2200	71	.05	.00	.05	10399.	*	8	0200	171	.00	.00	.00	0.
3	2300	72	.05	.00	.05	10081.	*	8	0300	172	.00	.00	.00	0.
4	0000	73	.05	.00	.05	9803.	*	8	0400	173	.00	.00	.00	0.
4	0100	74	.00	.00	.00	9499.	*	8	0500	174	.00	.00	.00	0.
4	0200	75	.00	.00	.00	9118.	*	8	0600	175	.00	.00	.00	0.
4	0300	76	.00	.00	.00	8612.	*	8	0700	176	.00	.00	.00	0.
4	0400	77	.00	.00	.00	7921.	*	8	0800	177	.00	.00	.00	0.
4	0500	78	.00	.00	.00	7056.	*	8	0900	178	.00	.00	.00	0.
4	0600	79	.00	.00	.00	6105.	*	8	1000	179	.00	.00	.00	0.
4	0700	80	.00	.00	.00	5141.	*	8	1100	180	.00	.00	.00	0.
4	0800	81	.00	.00	.00	4220.	*	8	1200	181	.00	.00	.00	0.
4	0900	82	.00	.00	.00	3396.	*	8	1300	182	.00	.00	.00	0.
4	1000	83	.00	.00	.00	2682.	*	8	1400	183	.00	.00	.00	0.
4	1100	84	.00	.00	.00	2108.	*	8	1500	184	.00	.00	.00	0.
4	1200	85	.00	.00	.00	1671.	*	8	1600	185	.00	.00	.00	0.
4	1300	86	.00	.00	.00	1325.	*	8	1700	186	.00	.00	.00	0.
4	1400	87	.00	.00	.00	1052.	*	8	1800	187	.00	.00	.00	0.
4	1500	88	.00	.00	.00	831.	*	8	1900	188	.00	.00	.00	0.
4	1600	89	.00	.00	.00	655.	*	8	2000	189	.00	.00	.00	0.
4	1700	90	.00	.00	.00	519.	*	8	2100	190	.00	.00	.00	0.
4	1800	91	.00	.00	.00	410.	*	8	2200	191	.00	.00	.00	0.
4	1900	92	.00	.00	.00	323.	*	8	2300	192	.00	.00	.00	0.
4	2000	93	.00	.00	.00	255.	*	9	0000	193	.00	.00	.00	0.
4	2100	94	.00	.00	.00	201.	*	9	0100	194	.00	.00	.00	0.
4	2200	95	.00	.00	.00	158.	*	9	0200	195	.00	.00	.00	0.
4	2300	96	.00	.00	.00	124.	*	9	0300	196	.00	.00	.00	0.
5	0000	97	.00	.00	.00	96.	*	9	0400	197	.00	.00	.00	0.
5	0100	98	.00	.00	.00	74.	*	9	0500	198	.00	.00	.00	0.
5	0200	99	.00	.00	.00	57.	*	9	0600	199	.00	.00	.00	0.
5	0300	100	.00	.00	.00	43.	*	9	0700	200	.00	.00	.00	0.
							*							

****
*****

TOTAL RAINFALL = 12.60, TOTAL LOSS = .48, TOTAL EXCESS = 12.12

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	199.00-HR
+	(CFS)	(HR)					
			(CFS)				
+	84857.	40.00		80187.	56040.	29075.	10634.
			(INCHES)	2.761	7.719	12.014	12.145
			(AC-FT)	39762.	111154.	173006.	174886.

CUMULATIVE AREA = 270.00 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

MAXIMUM STAGE +	TIME OF OPERATION MAX STAGE	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	010	84857.	40.00	80187.	56040.	29075.	270.00

*** NORMAL END OF HEC-1 ***