PECOS RIVER COMPACT

Report of the River Master
Water Year 1991
Accounting Year 1992

Final Report

June 24, 1992

Neil S. Grigg
River Master of the Pecos River
P.O. Box 8581
Ft Collins, Colorado 80524

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PECOS RIVER COMPACT
Supreme Court of the United States
No. 65, Original
Amended Decree

Final Report of the River Master
Water Year 1991 - Accounting Year 1992
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Purpose of the Report. In its Amended Decree issued March 28, 1988 the Supreme Court of the United States appointed a River Master of the Pecos River and directed him to "...Deliver to the parties a Preliminary Report setting forth the tentative results of the calculations required by Section III.B.1 of this Decree by May 15 of the accounting year..." and to consider "...any written objections to the Preliminary Report submitted by the parties prior to June 15 of the accounting year..." and to deliver "...to the parties a Final Report setting forth the final results of the calculations required by Section III.B.1 of this Decree by July 1 of the accounting year." This is the required Final Report with the determination of:

"a. The Article III(a) obligation;

b. Any shortfall or overage, which calculation shall disregard deliveries of water pursuant to an Approved Plan;

c. The net shortfall, if any, after subtracting any overages accumulated in previous years, beginning with water year 1987."

Result of Calculations and Statement of Shortfall or Overage

The results of the calculations in this Final Report show that New Mexico's delivery in Water Year 1991 was a shortfall of 16,500 acre-feet. The accumulated overage since the beginning of Water Year 1987 is 11,100 acre-feet.

Water Year	Annual Overage or Shortfall	Accumulated Overage or Shortfall
1987	15,400 AF	15,400
1988	23,600	39,000
1989	2,700	41,700
1990	-14,100	27,600
1991	-16,500	11,100

Neil S. Grigg
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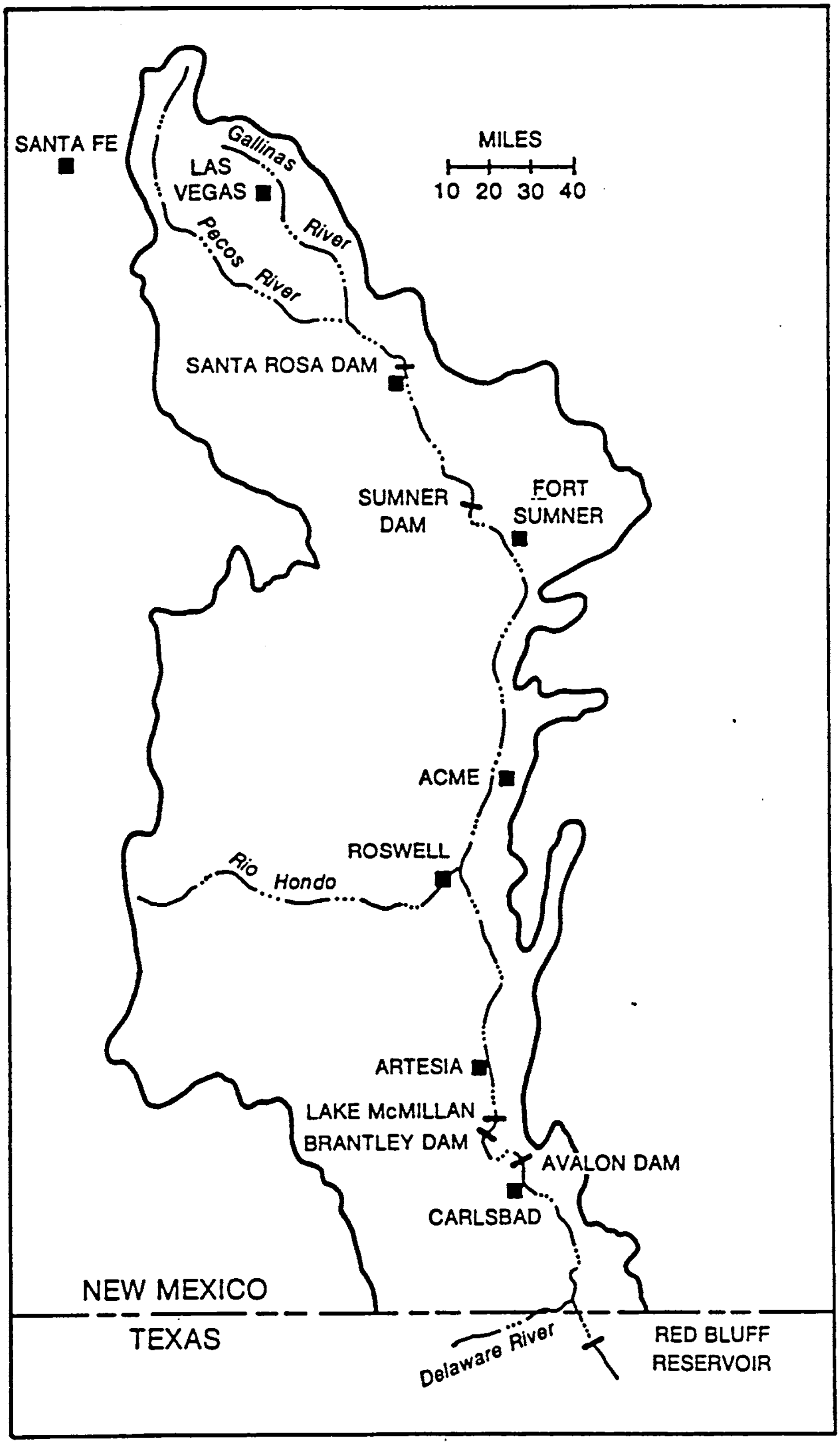


Figure 1. Map of Pecos Basin Showing Accounting Reaches (Adapted from USGS Report: Hydrologic Effects of Phreatophyte Control, 1988)

Table 1. General Calculation of Annual Departures, Thousand Acre-Feet
(revised 6-19-92)

	1989	1990	1991
B.1.a. <u>Index Inflows</u>			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	136.9	102.8	122.7
(b) Flood Inflow Alamogordo - Artesia	2.9	6.6	87.3
(c) Flood Inflow Artesia - Carlsbad	13.7	17.3	13.5
(d) Flood Inflow Carlsbad - State Line	1.2	7.4	8.5
Total (annual flood inflow)	154.7	134.1	232.0
(2) Index Inflow (3-year avg)			173.6
B.1.b. <u>1947 Condition Delivery Obligation</u> (Index Outflow)			75.4
B.1.c. <u>Average Historical (Gaged) Outflow</u>			
Gaged Flow Pecos River at Red Bluff NM	35.1	32.8	107.3
Gaged Flow Delaware River nr Red Bluff NM	1.9	4.4	3.5
(1) Total Annual Historical Outflow	37.0	37.2	110.8
(2) Average Historical Outflow (3-yr average)			61.7
B.1.d. <u>Annual Departure</u>			-13.7
C. <u>Adjustments to Computed Departure</u>			
1. Adjustments for Depletions above Alam Dam			
a. Depletions Due to Irrigation	-2.4	-2.8	-4.4
b. Depl fr Operation of Santa Rosa Reservoir	2.8	2.4	23.3
c. Transfer of Water Use to Upstream of AD	0	0	0
<u>Recomputed Index Inflows</u>			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	137.3	102.4	141.6
(b) Flood Inflow Alamogordo - Artesia	2.9	6.6	87.3
(c) Flood Inflow Artesia - Carlsbad	13.7	17.3	13.5
(d) Flood Inflow Carlsbad - State Line	1.2	7.4	8.5
Total (annual flood inflow)	155.1	133.7	250.9
Recomputed Index Inflow (3-year avg)			179.9
Recomputed 1947 Condition Del Outflow (Index Outflow)			79.3
<u>Recomputed Annual Departures</u>			-17.7
<u>Credits to New Mexico</u>			
C.2 Depletions Due to McMillan Dike			1.2
C.3 Salvage Water Analysis			0
C.4 Unappropriated Flood Waters			0
C.5 Texas Water Stored in NM Reservoirs			0
C.6 Beneficial C.U. Delaware River Water			0
<u>Final Calculated Departure, TAF</u>			-16.5

Table 2. Determination of Flood Inflows, Alamogordo Dam to Artesia - 1991 (B.3)
(6-19-92)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Flow bel Alamog Dam	1.7	1.2	5.1	13.5	47.5	5.8	2.9	3.1	34.5	7.0	.3	.2	122.7
FtSumner Irrig Div	1.2	1.2	4.7	5.4	6.0	5.7	2.8	2.9	4.0	5.6	.1	.0	39.6
Ft Sumner ID Return	.8	.6	1.5	1.7	2.5	2.5	2.5	2.5	2.3	2.1	1.0	.8	21.0
Flow past FS IDist	1.3	.7	1.8	9.7	44.0	2.6	2.7	2.8	32.8	3.4	1.2	1.0	104.1
Channel loss	.5	.2	.6	2.3	6.3	1.4	.2	1.6	4.7	.9	.4	.4	19.6
Residual Flow	.8	.4	1.2	7.4	37.7	1.1	2.4	1.2	28.1	2.5	.9	.6	84.5
Base Inflow	3.1	2.7	2.6	1.4	1.0	1.0	.7	1.5	3.4	4.2	4.2	4.6	30.4
River Pump Divers	.1	.1	.4	.7	2.9	1.7	.7	1.1	.4	.2	.1	.0	8.4
Residual, Artesia	3.9	3.0	3.3	8.1	35.8	.5	2.4	1.6	31.1	6.6	5.0	5.2	106.5
Pecos Flow Artesia	3.9	3.8	2.7	2.4	38.9	2.6	39.6	30.4	41.8	10.7	7.6	9.4	193.8
Flood Inflow, AD-Art	.0	.8	-.7	-5.7	3.0	2.2	37.1	28.9	10.8	4.1	2.6	4.2	87.3

Table 3. Determination of Flood Inflows, Artesia to Carlsbad - 1991 (B.4)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Pecos R at Artesia	3.9	3.8	2.7	2.4	38.9	2.6	39.6	30.4	41.8	10.7	7.6	9.4	193.8
Major John Springs	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	8.2
Carlsbad Springs	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-14.0
Total Inflow	3.4	3.3	2.2	1.9	38.4	2.1	39.1	29.9	41.4	10.2	7.1	8.9	188.0
Channel Losses	.5	.4	.2	.1	8.0	.2	8.2	6.2	8.7	1.9	1.3	1.7	37.3
Evap Loss, Av-Br	.4	.7	1.5	1.4	1.9	2.0	.2	1.3	.7	2.0	.8	.1	13.0
Sto Change, Av-Br	2.1	1.6	-2.0	-7.3	15.6	-10.0	18.3	6.3	12.2	-8.9	-4.3	-14.2	9.3
Carls ID diversions	.0	.0	2.1	11.9	9.8	13.3	5.1	15.5	8.0	12.9	.0	.0	78.6
93% CID diver	.0	.0	1.9	11.0	9.1	12.4	4.8	14.4	7.4	12.0	.0	.0	73.1
Other depletions	.1	.1	.1	.1	.1	.1	.2	.2	.1	.1	.1	.1	1.4
Pecos R at Carlsbad	.9	.8	.7	.5	.4	.4	1.2	1.1	17.6	6.5	11.7	25.5	67.3
Total Outflow	3.9	3.6	2.4	5.8	35.2	5.1	32.8	29.5	46.7	13.7	9.6	13.2	201.4
Flood Inflow	.5	.3	.2	3.9	-3.2	3.0	-6.2	-.4	5.3	3.4	2.5	4.2	13.5

Table 4. Determination of Flood Inflows, Carlsbad to State Line (B.5)

Carlsbad to Red Bluff	6.7 TAF
Delaware River	1.8
Flood Inflows, TAF	8.5 TAF

Table 5. Depletions Due to Irrigation Above Alamogordo Dam - 1991

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	TOTAL
Precip Las Vegas FAA AP	.07	2.96	2.07	3.04	3.65	2.34	.24	14.37
Eff prec Las Veg FAA AP	.07	2.56	1.87	2.62	3.06	2.09	.23	12.50
Precip Pecos Ranger Sta	.00	2.35	2.75	5.96	5.30	3.30	.16	19.82
Eff Precip Pecos RS	.00	2.11	2.40	4.06	3.91	2.81	.15	15.44
Precip Santa Rosa	.00	1.50	.79	4.49	2.89	3.61	.54	13.82
Eff Precip Santa Ro	.00	1.39	.76	3.58	2.51	3.03	.52	11.79
Average eff precip, ft	.00	.17	.14	.29	.26	.22	.03	1.10
consumptive use, ft	.19	.36	.36	.30	.27	.18	.11	1.77
CU less eff precip, ft	.19	.19	.22	.02	.01	.00	.09	.71
Acres (most recent inventory)		9057.						
Streamflow depletion, AF		6400.						
1947 depletion, AF		10804.						
Difference, TAF		4.4						

Table 6. Depletions Due to Santa Rosa Reservoir Operations - 1991
(revised June 19, 1992)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Alamogor ga ht, avg	49.31	50.45	51	49.39	43.51	34.34	33.67	45.86	60.77	60.54	61.24	63.71	50.32
Alacontent	18335	20192	21122	18462	10683	4232	3920	13419	43121	42481	44451	51900	
AlaArea	1577	1673	1716	1585	1052	476	455	1272	2799	2770	2859	3173	
Alaevap	2.33	5.26	9.39	13.73	16.39	15.51	11.38	10.14	8.22	7.81	3.50	2.18	105.84
.77Evap	1.79	4.05	7.23	10.57	12.62	11.94	8.76	7.81	6.33	6.01	2.70	1.68	81.50
AlaPrecip	.36	.00	.00	.00	2.01	.27	6.12	4.65	4.16	.21	1.42	1.86	21.06
NetEvap	1.43	4.05	7.23	10.57	10.61	11.67	2.64	3.16	2.17	5.80	1.28	-.18	60.44
AlaEvaploss	.19	.56	1.03	1.40	.93	.46	.10	.33	.51	1.34	.30	-.05	7.11
L S Rosa ga ht, avg	15.74	16.46	16.77	18.26	99.28	17.21	21.93	39.98	43.21	43.80	43.93	43.86	35.04
SRcontent	25573	26613	27071	29347	9225	27730	35618	79933	90700	92762	93222	92974	
SRarea	1425	1470	1486	1573	630	1508	1807	3215	3466	3526	3538	3531	
SRevap	3.72	5.04	8.27	8.53	10.40	10.48	7.88	7.72	5.77	6.64	4.80	3.72	82.97
.77Evap	2.86	3.88	6.37	6.57	8.01	8.07	6.07	5.94	4.44	5.11	3.70	2.86	63.89
Lake SR precip	.66	.07	.70	.00	1.06	1.39	4.20	2.26	1.76	.28	1.58	2.53	16.49
NetEvap	2.20	3.81	5.67	6.57	6.95	6.68	1.87	3.68	2.68	4.83	2.12	.33	47.40
SREvaploss	.26	.47	.70	.86	.36	.84	.28	.99	.77	1.42	.62	.10	7.68
totalevaploss	.45	1.03	1.74	2.26	1.29	1.30	.38	1.32	1.28	2.76	.93	.05	14.79
sumcontents	43908	46805	48193	47809	19908	31962	39538	93352	133821	135243	137673	144874	
1947area	2031	2109	2168	2151	1066	1608	1921	3620	4600	4600	4600	4600	
1947loss	.24	.71	1.31	1.90	.94	1.56	.42	.95	.83	2.22	.49	-.07	11.51
current-1947	.21	.32	.43	.36	.35	-.26	-.04	.37	.45	.53	.44	.12	3.28

Annual adjustment for excess evaporation = 3.3

ADJUSTMENT FOR EXCESS STORAGE IN SANTA ROSA RESERVOIR

	1990	1991
EndYear Sumner Sto	16126	56770
EndYear S R Sto	24609	92590
Sum	40735	149360
Sto Adjustment, AF		20060
Adjustm Ex Evap, TAF		3.3
Total Adjustment,TAF		23.3

Table 7. Major Johnson Springs New Water

See Appendix of Preliminary Report for computation details

8.2 AF/yr = .7 AF/mo

Table 8. Carlbad Springs New Water 1991
(revised June 17, 1992)

	TAF	cfs	
Pecos R bel DC, cfs	68.30	94.36	94.36
Dark Canyon, cfs	1	1.38	1.38
Pecos R bel Lake Av, cfs	61.70	85.24	85.24
Depletion, cfs			2.0
CID lag seep, cfs			7.19
Return flow, cfs			1.0
Lake Av seep lag, cfs			17.8
PR seepage, cfs			3.0
Carls new water, cfs			-19.3
Carls new wat, TAF			-14.0
Carls new wat monthly, TAF		723.80	-1.2

Table 9. Carlsbad Main Canal Seepage lagged - 1991

1990	1Q	2Q	3Q	4Q
FLOWS, cfs			119.64	36.39
SEVEN %			8.37	2.55
LAG				

1991	1Q	2Q	3Q	4Q
FLOWS, cfs	11.50	193.80	156.90	70.90
SEVEN %	.81	13.57	10.98	4.96
LAG	2.65	7.48	10.15	8.40

Average = 7.19 cfs

Table 10. Lake Avalon leakage lagged - 1991
(revised 6-17-92)

1990	1Q	2Q	3Q	4Q
gage			15.85	16.17
flows, cfs			13.76	15.29
lag				

1991	1Q	2Q	3Q	4Q
gage	17.75	15.99	16.74	16.83
flows, cfs	22.85	14.43	18.02	18.45
lag	18.81	17.38	17.63	17.63
		Total		71.46

Average = 17.86 cfs

Table 11. Evaporation Loss at Lakes Avalon and Brantley - 1991
(5-4-92)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
Avalon gage ht, avg	17.41	17.99	17.86	16.06	15.94	15.97	16.26	15.95	18.04	17.18	17.16	16.17	16.83
Avg area Avalon	714	753	745	576	558	563	607	560	757	696	694	593	7
Brantley gage ht, avg	40.42	41.56	42.12	37.72	41.99	44.37	42.64	52.32	55.28	55.12	52.61	48.26	46.20
Avg Br area	1176	1297	1357	962	1343	1595	1412	2577	3069	3042	2626	2008	
Panevap Brantley	4.65	5.60	10.90	14.03	17.01	16.22	8.99	9.79	8.50	8.61	4.80	4.34	113.44
Lakeevap Brantley	3.58	4.31	8.39	10.80	13.10	12.49	6.92	7.54	6.55	6.63	3.70	3.34	87.35
precipBrantley	1.11	.17	.00	.09	1.20	1.30	5.47	2.42	4.29	.20	.79	3.03	20.07
Netevap	2.47	4.14	8.39	10.71	11.90	11.19	1.45	5.12	2.26	6.43	2.91	.31	67.28
Evaploss Br, TAF	.2	.4	.9	.9	1.3	1.5	.2	1.1	.6	1.6	.6	.1	9.5
Evaploss Av, TAF	.1	.3	.5	.5	.6	.5	.1	.2	.1	.4	.2	.0	3.5
Totalloss A+B,TAF	.4	.7	1.5	1.4	1.9	2.0	.2	1.3	.7	2.0	.8	.1	13.0

Table 12. Change in storage, Lakes Brantley and Avalon 1991
(Gage heights from last day of each month)
(3-28-92)

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Lake Avalon gage, ft	17.00	17.80	18.20	15.80	16.00	16.20	16.10	16.60	16.10	19.60	·15.20	17.00	16.60	16.77
Avalon storage, AF	1608	2178	2480	864	975	1091	1032	1342	1032	3621	573	1608	1342	
Av change stor, AF		570	302	-1616	111	116	-59	310	-310	2589	-3048	1035	-266	-266
Brantley gage, feet	39.70	41.00	42.00	41.70	34.10	46.80	40.20	50.70	53.30	56.50	54.60	52.70	46.30	46.66
Brantley storage, AF	11055	12576	13867	13469	6009	21542	11620	29592	36156	45723	39858	34541	20628	
Brant change stor, AF		1521	1291	-398	-7460	15533	-9922	17972	6564	9567	-5865	-5317	-13913	9573
Total change stor, TAF		2.1	1.6	-2.0	-7.3	15.6	-10.0	18.3	6.3	12.2	-8.9	-4.3	-14.2	9.3

Table 13. Data Required for River Master Manual Calculations, Water Year 1991
(June 19, 1992, Final Report version, corrected per states' objections,
NM's letters dated May 11 and 12 and telefax rec'd from USGS May 12.)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL/ AVG
Streamflow gage records													
Pecos R b Sumner Dam, TAF	1.7	1.2	5.1	13.5	47.5	5.8	2.9	3.1	34.5	7.0	.3	.2	122.7
Fort Sumner Main C, TAF	1.2	1.2	4.7	5.4	6.0	5.7	2.8	2.9	4.0	5.6	.1	.0	39.6
Pecos R nr Artesia, TAF	3.9	3.8	2.7	2.4	38.9	2.6	39.6	30.4	41.8	10.7	7.6	9.4	193.8
Pecos R nr Lkwd (KC), TAF	3.5	3.5	2.3	2.0	38.0	2.4	31.8	25.6	44.5	10.9	7.7	9.5	181.6
Pecos R b Brantley R, TAF	1.4	1.2	1.9	13.4	10.4	14.9	5.5	17.1	29.7	16.1	13.2	28.3	153.0
Pecos R nr DS3	1.3	1.1	1.9	13.3	10.2	14.6	5.7	15.8	29.2	16.1	12.2	25.9	147.2
Pecos bel Avalon Dam, TAF	.0	.0	.0	.0	.0	.0	.0	.0	19.0	5.2	10.7	26.8	61.7
Carlsbad Main Canl, TAF	.0	.0	2.1	11.9	9.8	13.3	5.1	15.5	8.0	12.9	.0	.0	78.6
Dark Canyon at Csbad, TAF	.0	.0	.0	.0	.0	.0	.0	.0	1.0	.0	.0	.0	1.0
Pecos b Dark Canyon, TAF	.9	.8	.7	.5	.4	.4	1.2	1.1	18.6	6.5	11.7	25.5	68.3
Pecos R at Red Bluff, TAF	4.5	3.6	2.3	1.1	.6	1.3	2.8	2.2	25.3	11.6	13.9	38.1	107.3
Delaware R at Red B, TAF	.2	.1	.1	.1	.2	.1	1.3	.4	.5	.1	.2	.2	3.5
Gage heights													
Avalon gage ht, end mo	17.80	18.20	15.80	16.00	16.20	16.10	16.60	16.10	19.60	15.20	17.00	16.60	16.77
Avalon gage ht, avg	17.41	17.99	17.86	16.06	15.94	15.97	16.26	15.95	18.04	17.18	17.16	16.17	16.83
Brantley gage ht, end mo	41.00	42.00	41.70	34.10	46.80	40.20	50.70	53.30	56.50	54.60	52.70	46.30	46.66
Brantley gage ht, avg	40.42	41.56	42.12	37.72	41.99	44.37	42.64	52.32	55.28	55.12	52.61	48.26	46.20
Alamogordo gage ht, avg	49.31	50.45	51	49.39	43.51	34.34	33.67	45.86	60.77	60.54	61.24	63.71	50.32
Lake St Rosa ga ht, avg	15.74	16.46	16.77	18.26	99.28	17.21	21.93	39.98	43.21	43.80	43.93	43.86	35.04
Precipitation													
Precip Brantley, inches	1.11	.17	.00	.09	1.20	1.30	5.47	2.42	4.29	.20	.79	3.03	20.07
Precip LV FAAA AP, inches	.13	.48	1.28	.07	2.96	2.07	3.04	3.65	2.34	.24	1.36	1.33	18.95
Precip Pecos Rang, inches	.24	.10	.95	.00	2.35	2.75	5.96	5.30	3.30	.16	1.20	1.60	23.91
Precip Santa Rosa, inches	.56	.08	.68	.00	1.50	.79	4.49	2.89	3.61	.54	1.69	2.10	18.93
Precip Sumnr lake, inches	.36	.00	.00	.00	2.01	.27	6.12	4.65	4.16	.21	1.42	1.86	21.06
Precip Lake SRosa, inches	.66	.07	.70	.00	1.06	1.39	4.20	2.26	1.76	.28	1.58	2.53	16.49
Evaporation													
PanEvap Lake Sumn, inches	2.33	5.26	9.39	13.73	16.39	15.51	11.38	10.14	8.22	7.81	3.50	2.18	105.84
PanEvap Lk SRosa, inches	3.72	5.04	8.27	8.53	10.40	10.48	7.88	7.72	5.77	6.64	4.80	3.72	82.97
Pan Evap, Brantley, inches	4.65	5.60	10.90	14.03	17.01	16.22	8.99	9.79	8.50	8.61	4.80	4.34	113.44
Other reports													
Base Acme-Artesia, TAFc	3.1	2.7	2.6	1.4	1.0	1.0	.7	1.5	3.4	4.2	4.2	4.6	30.4
Pump depl Ac-Artesia, TAFc	.1	.1	.4	.7	2.9	1.7	.7	1.1	.4	.2	.1	.0	8.4
NM irrigation inv, acres													9057.
NM Transfer water use, TAF													0
NM salvaged water, TAF													0
Texas, water stored NM, TAF													0
Texas, use Del water, TAF													0

APPENDIX: RESPONSE TO OBJECTIONS TO PRELIMINARY REPORT

General Comments

The Final Determination of New Mexico's Article III(a) shortfall for Water Year 1991 is -16.5 TAF. This means that New Mexico now has an accumulated overage of 11.1 TAF since accounting began for Water Year 1987.

This year's final determination differs as follows from the Preliminary Report and the states' recommended figures:

Preliminary Report:	-14.2 TAF
New Mexico's Recommendation:	-15.3 TAF
Texas' Recommendation:	-29.5 TAF
Final Determination:	-16.5 TAF

New Mexico did not compute a recommendation, but I compute that -15.3 TAF would be the result if New Mexico's figures for MJS and Flood Inflow, Carlsbad to Red Bluff had been adopted. Texas did compute a recommended figure, and the differences between Texas' figure and the Final Determination are that Texas' objections about Brantley Bank Storage and Salvage Water were not accepted.

The following are the responses to the individual objections of the states.

New Mexico's Objections

1. <u>Major Johnson Springs New Water Discharge</u>

New Mexico made extensive comments (46 pages) about the estimate of Major Johnson Springs New Water Discharge (MJS). Texas also made comments that must be weighed along with New Mexico's. Responses to both states' objections are presented in a separate section following the response to Texas' objections.

The final determination for MJS is 8.2 TAF for Water Year 1991.

2. <u>Carlsbad to State Line Flood Inflows</u>

A. <u>Delaware River</u>. For flood inflow from the Delaware River the difference between New Mexico's estimate of 1.3 TAF and my estimate of 2.1 TAF is 0.8 TAF. USGS' estimate was 2126 AF, also about 0.8 TAF greater than New Mexico's. The difference is primarily caused by differing estimates of base flows in July, August and September. Figure A-1, given below, shows plots of these differences. After reexamining the rainfall and discharge hydrograph for July, I can partially accept New Mexico's base estimates, and have adjusted the base upward to provide a decrease in the scalped flood inflow of 261 AF for the month. This represents an adjustment of 2/3 of the difference between

New Mexico's base flow judgement and mine for July. For August and September, I do not accept New Mexico's base flow estimates. Rainfall is distributed across many days of those months, without long periods of dry weather to enable the flow to return to base conditions. This suggests that flood flows continue during most of the month, and the base flows shown on Figures A-1(b) and (c) are retained. After adjusting for July, the revised flood inflow for the Delaware River during Water Year 1991 is 2.1 - 0.3 = 1.8 TAF.

B. Carlsbad to Red Bluff. New Mexico made five pages (pp 48-52) of criticism of the methods used for hydrograph scalping, and I have noted New Mexico's opinions. Scalping hydrographs involves considerable judgement, and the more information that can be considered, the greater the chances for valid results. The points made by New Mexico have, for the most part, been advanced before and need no response. However, I would like to repeat that I find the graphical presentation on New Mexico's Figure 2 to be too small to use for any purpose except to summarize the year, and the graphs in the Preliminary Report that New Mexico criticizes have been much more useful to me. In any event, there is little difference between New Mexico's estimates, mine and those originally made by USGS, except for September. Table A-3, presented later, shows shows that my estimate of 2805 AF, NM's of 2713 AF and USGS' estimate of 2992 for the total of all months except September are very close, thus there is no important reason to analyze the differences for those months.

For September two complex events influenced the determinations: Dark Canyon Draw flowed for two days, September 13-14, and flow was released from Lake Avalon beginning on September 14. These occurred during periods of significant rainfall in the reach.

New Mexico correctly noted that I overlooked the one day, September 13, where Dark Canyon Draw was flowing and the RB - CB difference was negative. This requires implementation of the revised language for River Master's Manual Section B.5.a. New Mexico also correctly noted that the version of that section published in the Preliminary Report did not include the correction made to the original text of the Manual modification, and the corrected version has been used for the Final Report.

In addition to the September 13 negative difference, there were several other negative differences in the period immediately after September 15 to the 20th. The following is my analysis of how the negative differences should be handled, including the one caused by Dark Canyon Draw.

For September 13-14 there is a period where Dark Canyon Draw is flowing and the difference in scalped hydrographs is negative (September 13 only). Figure A-2 is presented to show this event. Figure A-2(b) shows that on September 13 the total flow at Red Bluff (P_{RB}) drops below that at Below Dark Canyon (P_{BDC})

due to the surge from Dark Canyon Draw. A negative difference occurs again on September 15-17, but this time it is apparently due to the release from Lake Avalon.

Let the scalped flows be designated as F_{RB} and F_{BDC}. The negative differences in total flows, P_{RB} and P_{BDC}, also produce negative values in the difference of scalped flows, $F_{RB} - F_{BDC}$. This is shown on Figure A-3. On A-3(b), two periods are evident where $F_{RB} - F_{BDC}$ is negative, September 13, caused by DCD, and September 15-17, caused apparently by Lake Avalon releases.

In the first negative period Dark Canyon Draw is to be handled under the provisions of Manual Section B.5.a.(3), as modified. New Mexico has analyzed this, with the result of setting the -223 cfs-days for September 13-14 to zero, and I have accepted this analysis. New Mexico adds back in the 117 cfs-d for September 14, which seems proper, and has the effect of setting the -340 to zero, adding in 117, for a net change of setting -223 cfs-d to zero.

The negative period September 15-20 would ordinarily come under the provisions of Manual Section B.5.a.(2) which requires that if the difference is a negative quantity, to set the flood inflow to zero. However, long and significant periods of negative differences require further analysis, which is provided here. In the past there have been brief periods of negative difference in scalped flood inflow, but there has not been much exchange of analysis of why this might be the case. Here, New Mexico established a six day period, September 15-20, and set the total for the period to zero. This is a period of significant rainfall in the reach and the six day period seems arbitrary, especially when you consider that the period of negative difference is only three days, September 15-17 (River Master's analysis, see Table A-1), or four days if you use New Mexico's analysis. The difference in the two analyses is slight, and on September 18 New Mexico had a -6 cfs difference whereas my analysis gave +6 cfs..

There could be several explanations for the negative differences in the September 15-17 period. After further analysis I have determined that the base flows need adjustment for the period, and that none of the the three analyses (mine, USGS' or New Mexico's) had set the base flows to recognize properly the release from Lake Avalon that occurred at the same time as the significant rainfall and the recession limb of the hydrograph from Dark Canyon Draw. Figure A-4 shows a sketch of how I adjusted the base flows and Table A-1 gives the numerical results. The negative flood inflow that remains has been set to zero for the period September 15-17 only, and the positive flood difference for September 18-20 has been retained.

Figure A-5 shows graphically the difference in the approach I took as opposed to New Mexico's. In setting all of the flood inflow to zero for the period September 15-20, New Mexico did not provide for the rainfall that occurred in the reach and the

hydrograph rise. By setting the negative flood to zero for the period September 15-17, but recognizing the positive flood inflow for September 18-20, recognition for the rainfall-induced flooding is provided, see Figure A-5(a). New Mexico's approach, shown in Figure A-5(b), provides no credit for flood inflow in the reach. There was significant rainfall in the period September 16-20, including 2.52 inches at Carlsbad.

To summarize, the adjustments for September are:

1. Set -223 cfs-d for September 13-14 to zero. This increases the flood inflow for that period by 223 cfs-d from the Preliminary Report, but the 524 cfs-d (1.0 TAF) Dark Canyon Draw flood inflow is eliminated. NM and the River Master agree on this.

2. Recompute the flood inflow for September 15-20. See the comparative analysis on Table A-2. New Mexico would zero out all of the period. I have set only September 15-17 to zero, and readjusted the base and scalped flooding for September 18-20. This adds 678 cfs-d for the flooding that occurred September 18-20 period (see Table A-1).

See Figure A-5 to compare NM's approach with mine for this period, Table A-1 to see my revised base and flood computations, Table A-2 to compare New Mexico's numbers with mine, and Table A-3 to see the revised annual totals.

3. <u>Depletions due to Santa Rosa Reservoir Operations</u>

NM observed a small numerical error in the lake area for Alamogordo Reservoir for June, 1991. I accept NM's calculation.

The revised pan evaporation values for Sumner Lake for November and December 1991 have been entered. NM's revised calculations are accepted.

NM found an error in the line listing the 1947 condition monthly surface areas for Alamogordo Reservoir. I accept NM's corrections; they are identical to those furnished by Texas.

I accept NM's revision in the excess reservoir evaporation caused by operation of Santa Rosa Reservoir, and adopt the figure of 3.3 TAF.

In a footnote on page 57 of their objections, NM offered to submit a motion to clarify the 4600 acre limit on 1947 condition Alamogordo surface areas. Both states seem to agree on the 4600 acre limit, and a motion would clarify this. I encourage NM to initiate the motion.

4. <u>Carlsbad Springs New Water Discharge</u>

New Mexico found a numerical error in the leakage for Lake Avalon. I accept the correction, although the monthly Carlsbad Springs new water did not change.

NM and Texas both discovered that the monthly CB new water of -1.2 TAF was used in error as the annual value. This has been corrected.

5. <u>Acme to Artesia Base Inflow</u>

NM discovered that USGS had misread the value of base flow at Acme for the month of September. I verified this and accept NM's figure of 30.4 TAF for Acme to Artesia Base Inflow.

6. <u>Depletions due to irrigation above Alamogordo Dam</u>

New Mexico made observations about procedures to estimate missing precipitation data. In this case no changes in the estimate of irrigation depletion are indicated. New Mexico's suggestions are directed toward making adjustments for data that may be missing in the future. Since procedures are lacking for making these adjustments it might be well to build up a portfolio of instructions for how to estimate missing data. Rather than engage in that now, perhaps these procedures can be developed on an as needed basis, such as those referred to by New Mexico on page 61-62 of the objections.

Texas' Objections

1. <u>Major Johnson Springs New Water Discharge</u>

Texas also objected to the estimate of Major Johnson Springs New Water Discharge (MJS). Both states' objections are discussed in a separate section following this response to Texas' objections.

2. <u>Carlsbad Springs New Water</u>

Texas found the same error as described previously under New Mexico's objections: the -1.2 TAF monthly figure was incorrectly shown as the annual value. This has been corrected.

3. <u>Brantley Reservoir Bank Storage</u>

Texas objected that 16.5 TAF of Brantley Bank Storage (BBS) was not credited to them. This is the Section B.4.i.(2) issue that is being considered in the Third Motion Process.

I have taken a prior position of recognizing this bank storage, but waiting until a modification for the Manual is implemented before determining the credit that should be provided. The water is basically a one-time quantity, and can be credited the first time that B.4.i.(2) is implemented. For this year's determination, I am still withholding the credit because the existing Manual language requires that USGS make the estimate of BBS.

The principle I am following here is that no error is involved in not recognizing the B.4.i.(2) water; it is a matter that the existing language of the Manual states "as determined by USGS," and USGS has not determined any value for B.4.i.(2). However, since the water is in bank storage, I intend to recognize it when the Third Motion is decided. I will follow the same principle in considering any other needed adjustments that might be indicated by the final form of the decision on the Third Motion.

4. <u>Depletions due to Santa Rosa Reservoir Operations</u>

The errors and data adjustments identified by Texas are the same as those previously discussed under NM's objections, and are accepted.

5. <u>Salvage Water due to Brantley Reservoir</u>

Texas objected that a credit of 9.1 TAF for water salvaged by Brantley Reservoir was not provided. The general issue of salvage water is under consideration in the Third Motion, but has not been decided yet. For this reason, no credit for salvage water is provided in this year's accounting.

Major Johnson Springs New Water Calculation

1. <u>Introduction</u>

In the Preliminary Report I used a value of 8.2 TAF for MJS new water. This value was selected after sending a draft MJS computation to the states and evaluating their comments. As a result of that exercise, I increased MJS from 5.5 to 8.2 TAF.

To arrive at the value for the draft estimate I developed an equation that showed where local channel losses and flood inflows would be required in a MJS water balance equation. This was an attempt to respond to NM's past objections about ignoring channel losses in the MJS water balance computation. However, it was impossible to estimate values for the variables in the equation with certainty. For this basic reason, the equation, and the MJS water balance, while useful to assess the range of values of MJS, could not be used directly to compute a MJS value, and the final

selection had to be based on judgement of all of the factors involved, including what the computations would be using either New Mexico's or Texas' proposed methods.

The reasons for this conclusion were given in the Preliminary Report as: with all of the assumptions required in the current RMM method, there is no way to know the uniquely correct answer, and it is necessary to apply judgement; the estimates are very sensitive to judgements about distribution of flood inflows and channel losses, and these distributions are not known with certainty; New Mexico's method uses measured tributary inflow, but does not allow for any local flood inflow;
Texas' suggestion is entirely qualitative, being based on the observation that little head differential equates to little outflow from the aquifer; New Mexico cites evidence that historically little head differential did not mean little spring discharge; my first estimate was MJS = 5.5 TAF, which would have been about the average of the states' suggestions; however, correcting an error raised my estimate to 8.3 TAF; when the states originally realized that there would be difficulty in estimating MJS in 1988 and 1989 they selected a figure of 8.2 TAF for an interim estimate; all of these factors point to 8.2 TAF as being a reasonably reliable and fair estimate during this time when procedures are still under development in the Third Motion process.

The selection of MJS = 8.2 TAF does not penalize one state or the other much. It reduces the delivery obligation about 1.6 TAF from one based on MJS of 5.6 TAF, the average of the states' suggestions prior to the Preliminary Report, and it increases the delivery obligation only about 2.0 TAF from one based on New Mexico's recommended value of MJS = 11.2 TAF (now given as 11.5 TAF by NM, page 39). It reduces the delivery obligation about 4.8 TAF from one based on Texas' originally suggested value of MJS = 0, but Texas now suggests 4.4 TAF, and the reduction in delivery obligation between MJS of 8.2 and 4.4 TAF would be on the order of 2 TAF.

The Third Motion process is still ongoing, and I have prepared a analysis of the remaining points to be analyzed. This will be distributed to the States shortly, and will form a basis for considering the issues presented by each state in their objections to the Preliminary Report, as well as the issues that have already been presented in the Third Motion process. What is needed now, for the annual accounting, is a final determination for MJS for Water Year 1991.

The equation presented in the draft MJS computation cannot be used for a direct solution for MJS. As I stated, and both states recognized, there is no unique solution, and the results of applying the equation are very sensitive to assumptions about its parameters. Moreover, there was an error by USGS in the gaged flow for Pecos below Brantley Dam. When this error is corrected, and P_{BBD} set to 153.0 TAF rather than 162.3 TAF (also P_{DS} set to

147.1 TAF, a small change), then the indicated value of MJS drops off sharply. This can be seen from the equation for MJS presented in the Preliminary Report and the draft MJS computation:

$$MJS = (1/(1-a_2))*\{CL(a_1-a_2)-(P_{NL}-P_{BBD})+a_2(P_A-P_{DS})-Q_{SP}-Q_{OF}-C_1(1-a_2)\}$$

Applying this equation with the same values used in the Preliminary Report ($a_1 = 0.36$; $a_2 = 0.33$; $Q_{OF} = 6.4$; $Q_{SP} = 2.2$; $C_1 = -25.3$), but correcting for gaged flows ($P_{NL} - P_{BBD} = 28.6$; $P_A - P_{DS} = 46.7$), the revised MJS would be -5.51 TAF, an unreasonably low value.

New Mexico submitted 46 pages of objections to the Preliminary Report's MJS estimate. New Mexico continued to make arguments that advocate their Third Motion approach, and this is the apparent reason for the extensive objections, given that the selected value of MJS of 8.2 TAF only increases their delivery obligation about 2 TAF from the level of their recommended value, MJS = 11.5 TAF.

Texas continued to assert that its proposed cross motion procedure is appropriate, and estimates MJS at 4.4 TAF. Thus, the range of the states' estimates is now 4.4 to 11.5 TAF for MJS.

Based on the analysis given in the draft MJS computation and in the Preliminary Report, I am not convinced to change the value of MJS from 8.2 TAF. I have no analytical basis to compute an exact value, since the Third Motion process is still ongoing I have no basis to approve either state's recommendation over the other's at this time, and I believe, for the reasons given in the Preliminary Report that 8.2 TAF is a fair value.

Thus, the final determination for Water Year 1991 is MJS = 8.2 TAF.

2. <u>Further response to the states' objections</u>

Although the issues behind the states' objections have been and will be treated in detail in the Third Motion process, a brief response to the major points will be presented here for the benefit of anyone reviewing this Final Report without access to the Third Motion documents.

New Mexico's 46 pages of objections are based on their past extensive comments and advocacy to change the water balance method to compute MJS in the Artesia to Damsite 3 reach to a method that would use the sum of flood inflows from four tributaries representing a part of the total tributary area. While New Mexico claims that this method is closer to existing Manual procedures than the one I described and analyzed, it is clear that New Mexico's method is not meant to conform to existing procedures, but to replace them. New Mexico's arguments

on pages 42 and 43 of their objections seem unfounded because neither New Mexico's original version or alternate procedure is a water balance of Brantley Reservoir, but a direct use of tributary flow data for FIF_1. Taking this FIF data and turning around to compute MJS with it is clearly not what is meant by the Manual water balance procedure which calls for using gaged data for the inflows and outflows to Brantley Reservoir, including bank storage, to compute MJS as a residual.

These points will be discussed further in the Third Motion process and in the planned meeting between the states and the River Master to evaluate the issues. A few additional points made by New Mexico also require a response at this time.

New Mexico suggests that I have disregarded their objections to the MJS computation (p. 1, NM Objections). On the contrary, I studied their objections carefully, and the value for MJS in the Preliminary Report of 8.2 TAF is much closer to New Mexico's suggested value of 11.2 TAF than to Texas' suggested value of MJS = 0.

New Mexico suggests that the Preliminary Report does not follow the Manual (page 4). I reject this argument and attempted to use a procedure that conforms as closely as possible to the Manual language. The problem is that the existing Manual language is inadequate and needs modification to be workable; that is what the Third Motion process is about. New Mexico recognizes this (page 34) where they state "New Mexico did not realize difficulties ... in the new water calculation procedure until it studied the problem..." While New Mexico has proposed a method to alleviate these problems, it is still being considered and is disputed by Texas which proposes a completely different method. In fairness to Texas I cannot simply adopt New Mexico's method until the Third Motion process is completed.

New Mexico alleges that the Preliminary Report uses demonstrably unreliable assumptions (page 9). This objection is irrelevant to the final determination of MJS. I have explained that the value selected for MJS is not based purely on the assumptions for parameter values and I have stated that the assumptions were used to study the sensitivity and ranges of values of MJS that result from different parameter values. The final determination of MJS is not based on any arbitrary selection of the channel loss and flood inflow coefficients.

New Mexico refers to the River Master's unilateral denial of New Mexico's request for an evidentiary hearing about the MJS estimate (page 11). The decision was not at all unilateral. The decision process for this is fully documented by correspondence between the states and River Master. There was no reason to hold a hastily arranged meeting when only a small quantity of water is involved, Texas could not be prepared for the meeting, and we intend to hold a meeting on the same issues in the near future

anyway. It is unclear why New Mexico chose to raise this point, and New Mexico was not denied adequate opportunities to comment on and present evidence about the MJS decision.

New Mexico objected to any criteria of using a compromise value for MJS that is between the values presented by the states (page 32). The fact that the value selected is to some extent a compromise between the positions of the states seems fair during this period when the merits of the competing methods of the states are being evaluated. It recognizes that there is potential merit in each state's position. At the same time, I did not simply average the suggested values of the states, although the final determination of 8.2 TAF is close to the average of the states' suggested values of 4.4 and 11.5 TAF for MJS. This closeness to the average strengthens the case for fairness and minimizes the risk that either state will be injured from an incorrect value. With regard to fairness, I would like to point out that Texas' petitions relating to omission of credit for bank storage and for salvage water have been denied.

New Mexico suggests that I do not understand the physical conditions in the reach or how compact accounting works (page 37-38). On the contrary, I have made a careful study of the water balance and data about the reach and believe that my understanding of conditions in the reach is quite good. As far as understanding about how compact accounting works, I have sought to gather information about past decisions by asking questions and studying documents provided by the states. New Mexico's purpose in suggesting that my questions illustrate a lack of understanding is not clear; it is up to the states to explain through the motion process the issues and mechanics of river operation and compact history. As a result of my study of the Third Motion issues, I believe I have a good understanding of how the compact accounting works in the Artesia to Carlsbad reach, including the matters that New Mexico refers to as "misconceptions." My interpretation of these issues will be described in detail in the next round of the Third Motion.

Two of New Mexico's technical objections require a brief response here. New Mexico states that the "joint river-aquifer water balance approach" is not the Manual procedure (page 7). I cannot accept New Mexico's reasoning here; a reading of Manual Section B.4.b.(3) shows that surface water and aquifer data must be considered. I believe that the only difference between my approach to the water balance and New Mexico's is a difference in definition of terms, and the issue involved is whether Texas' cross motion approach to measure MJS by the change in BBS can be accepted. This is a pending issue in the Third Motion and Texas' position cannot be rejected without full consideration in the motion process.

New Mexico presents a computation of the channel loss coefficient a_1 by differencing. New Mexico computes CL_1 and CL_3 by incomplete water balances and then concludes that the value of

CL_2 can be computed by subtracting from the CL computed by the Manual equation, thus providing a method to estimate a_1. While this argument is not relevant in the final determination of the MJS for Water Year 1991, it should be noted that the argument is invalid because it ignores principal issues remaining in the Third Motion, mostly the role of local runoff in the estimation of MJS and FIF_1. These issues will be discussed in the next round of the Third Motion, and both states will have full opportunities to present final arguments.

Texas' objections continue their advocacy of their suggested procedure. Texas recommends a value of MJS = 4.4 TAF. Texas believes that the natural flow of MJS has been reduced or at times reversed. These possibilities are under evaluation in the Third Motion process.

Texas points out that the largest value of MJS since 1953, a period of nearly 40 years, was 10.9 TAF. The inference is that New Mexico's suggested figure of 11.5 TAF would be an unrealistically high value, especially given the added back pressure on the springs caused by Brantley Reservoir water levels.

Texas' cross motion procedure will be discussed in more detail in the next round of the Third Motion process.

3. Final determination

The final determination for Water Year 1991 is MJS = 8.2 TAF.

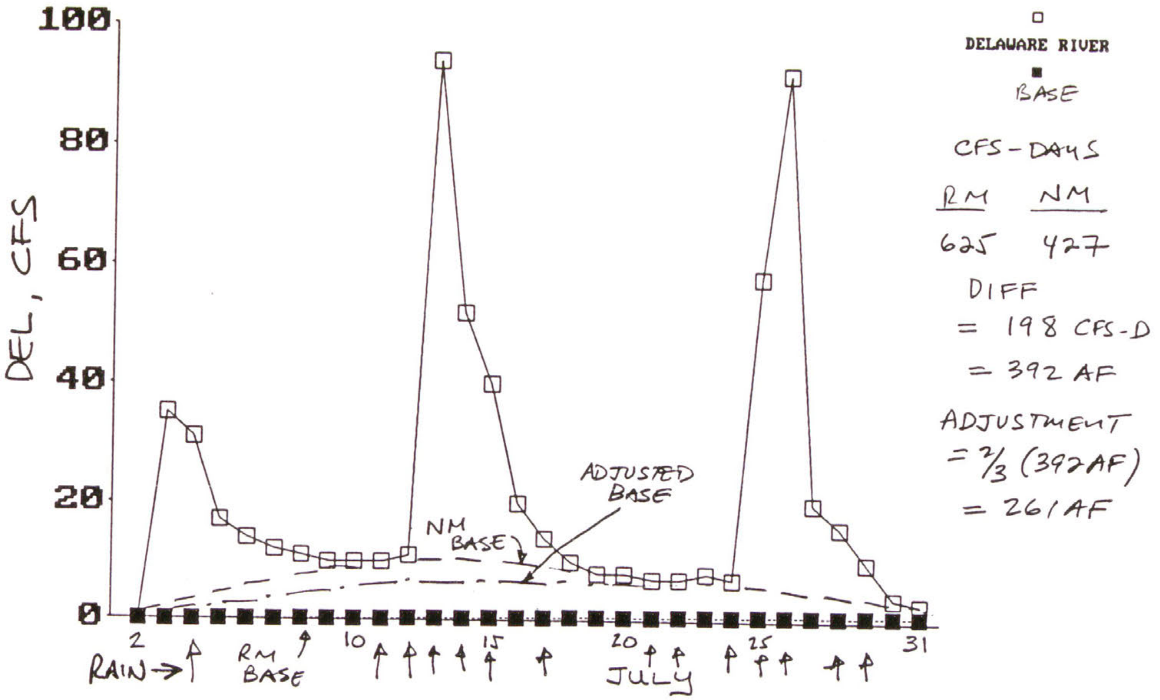


Figure A-1 (a) Delaware River Flooding, July

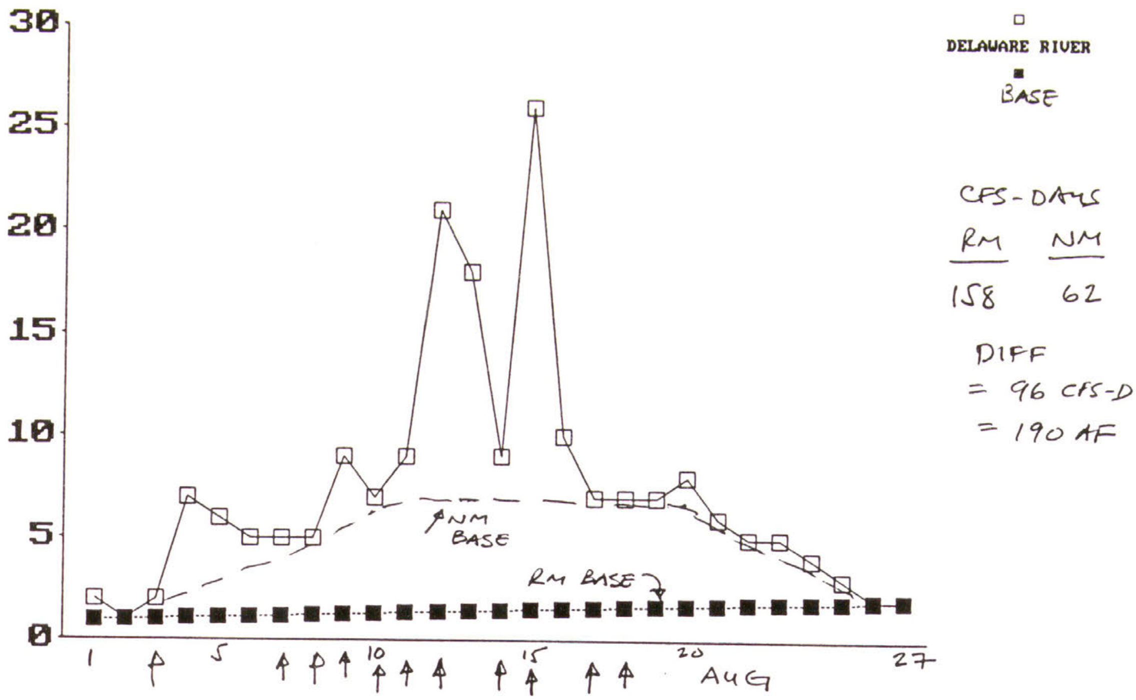


Figure A-1(b). Delaware River Flooding, August

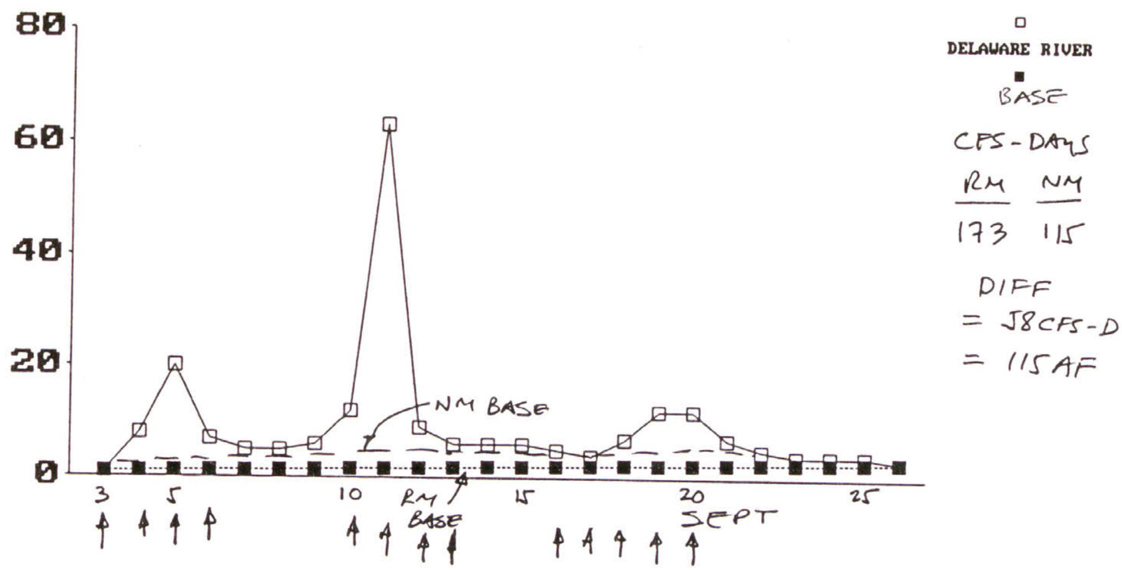


Figure A-1(c). Delaware River Flooding, September

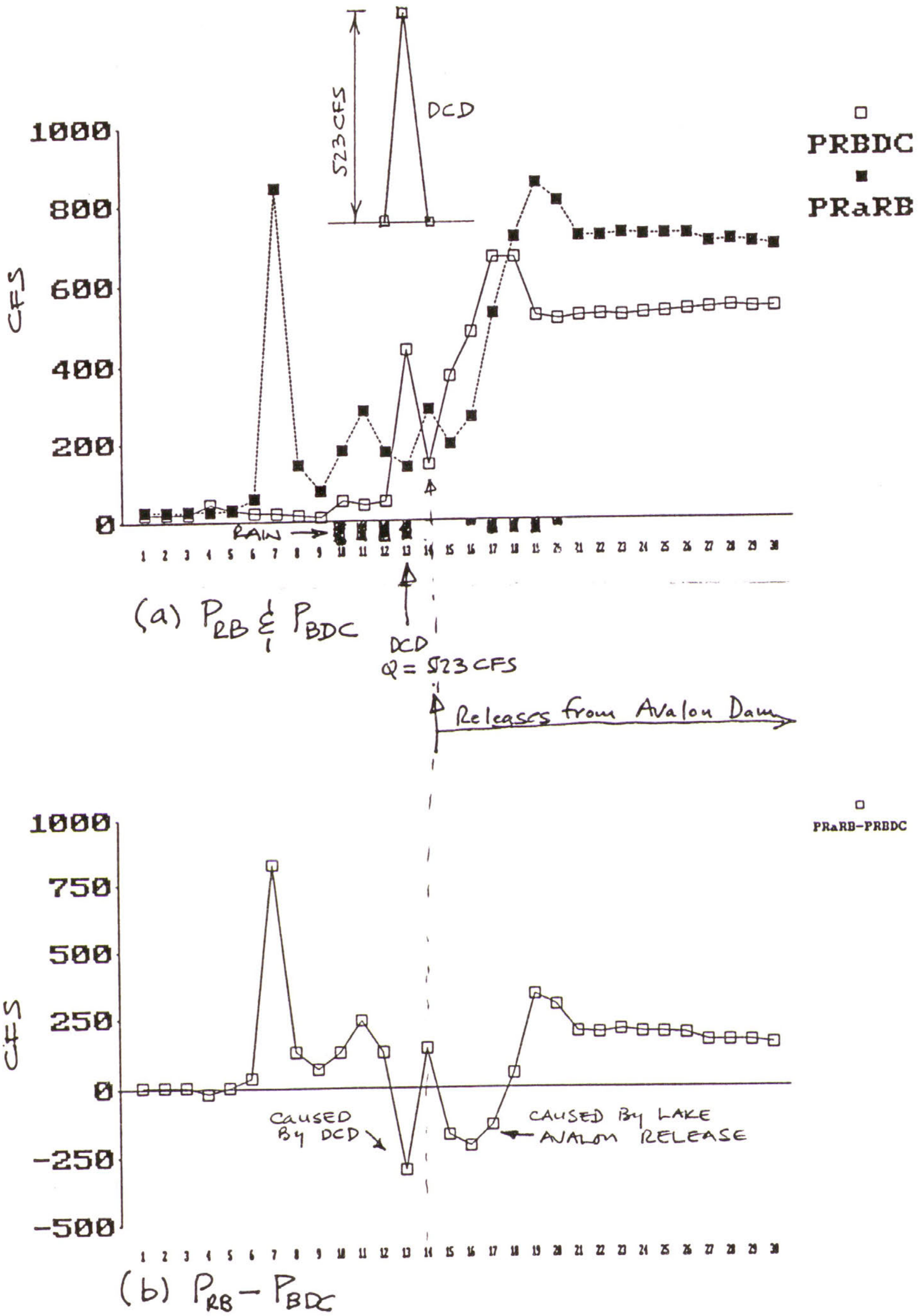
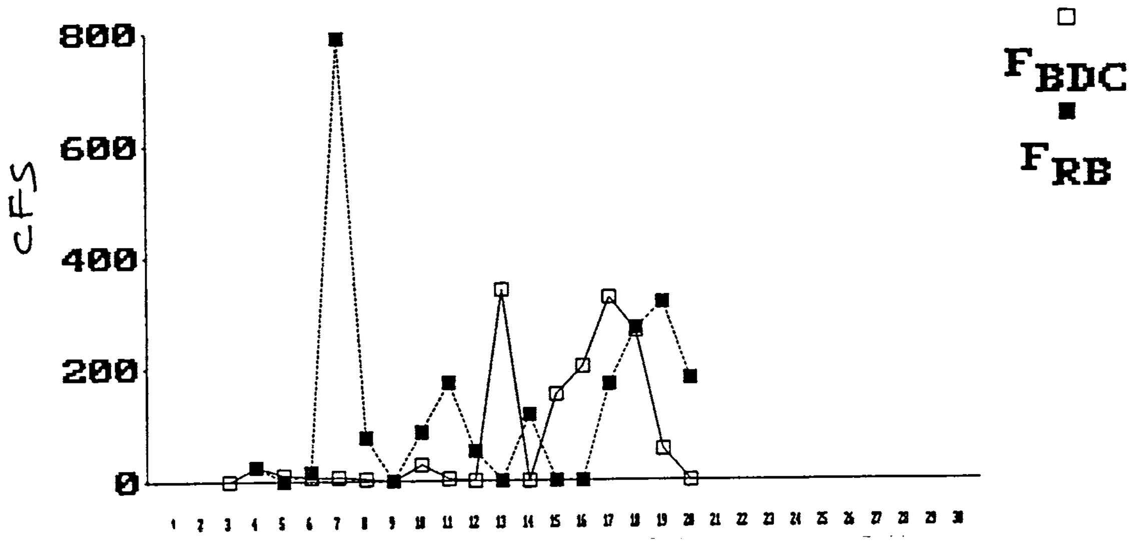


Figure A-2. Pecos River Flows and Differences



(a) F_{RB} & F_{BDC}

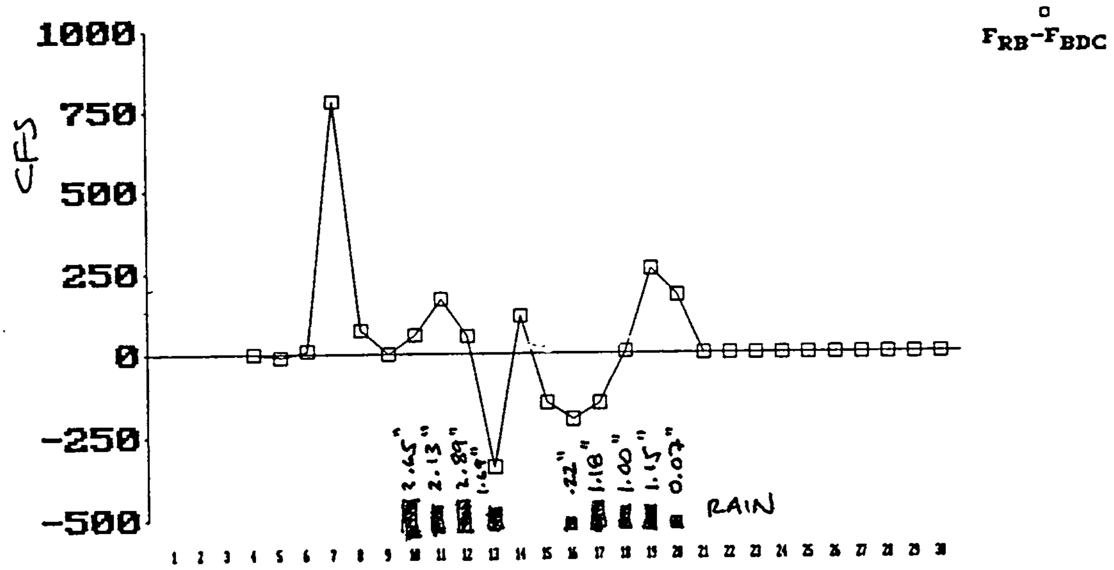


Figure A-3. Scalped Flood Flows and Differences

(b) $F_{RB} - F_{BDC}$

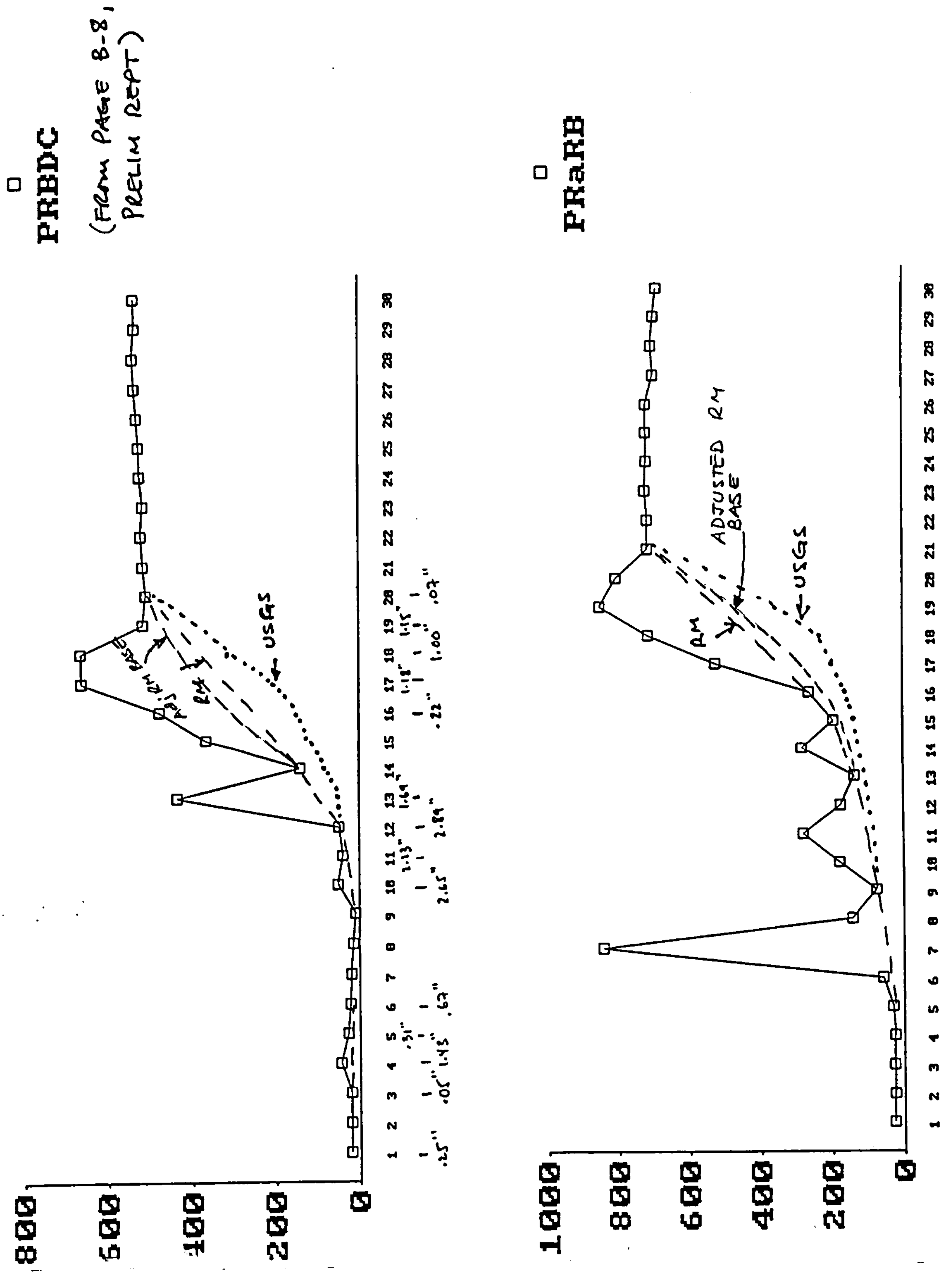


Figure A-4. Pecos River Flows with Base Flows and Adjustments Shown (From Preliminary Report)

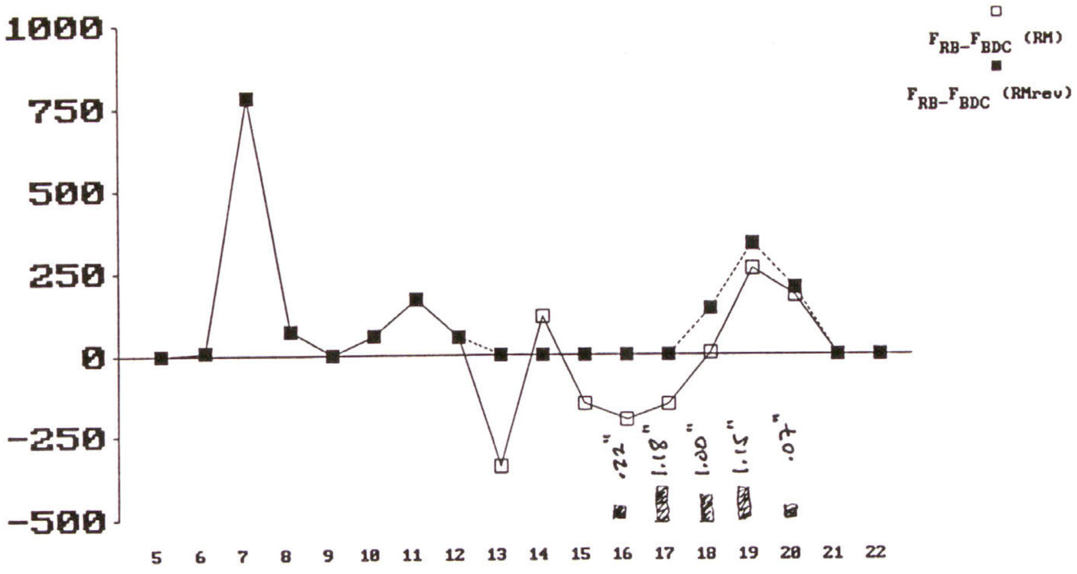


Figure A-5(a). River Master Revised Scalped Flood Flows

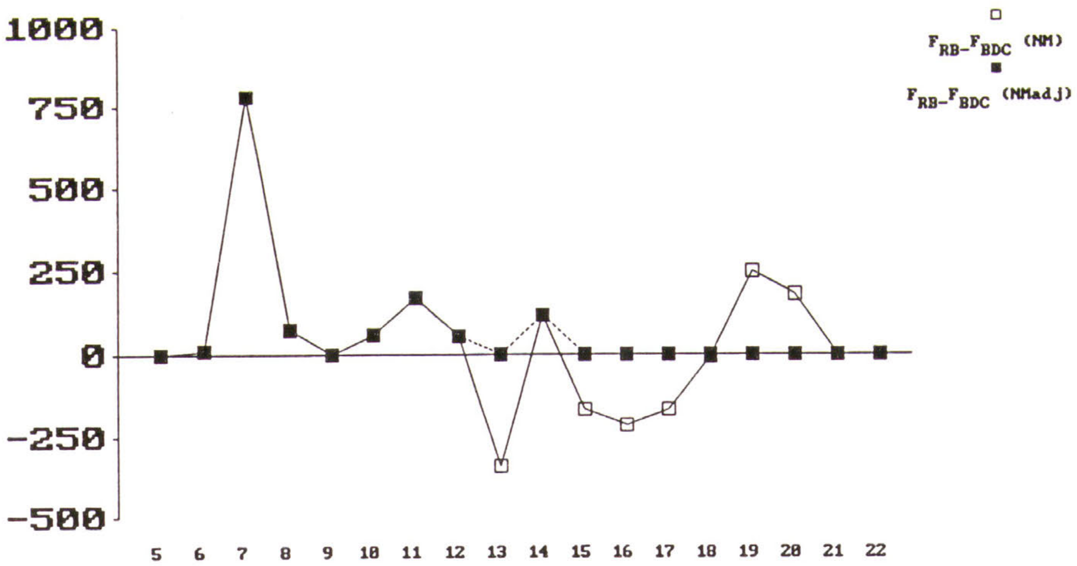


Figure A-5(b). New Mexico's Scalped Flood Flows, Incl Adjustments

Table A-1. Adjustments for period September 13-21, 1991

	PRBDC			PRaRB						
	P_{BDC} Q	B_{BDC} Base	F_{BDC} Diff	P_{RB} Q	B_{RB} Base	F_{RB} Diff	$P_{RB}-P_{BDC}$	$B_{RB}-B_{BDC}$	$F_{RB}-F_{BDC}$	
As shown in Preliminary Report										
12	49	49	0	175	121	54	126	72	54	
13	435	95	340	136	136	0	-299	41	-340	-223
14	141	141	0	282	165	117	141	24	117	
15	367	215	152	194	194	0	-173	-21	-152	-507
16	477	276	201	262	262	0	-215	-14	-201	
17	662	337	325	523	352	171	-139	15	-154	
18	663	399	264	713	443	270	50	44	6	+447
19	516	460	56	850	533	317	334	73	261	
20	509	509	0	804	624	180	295	115	180	
21	516	516	0	714	714	0	198	198	0	
After revision										
12	49	49	0	175	121	54	126	72	54	
13	435	95	340	136	136	0	-299	41	-340	SET -223 TO ZERO
14	141	141	0	282	150	132	141	9	132	
15	367	240	127	194	180	14	-173	-60	-113	SET TO ZERO
16	477	320	157	262	210	52	-215	-110	-105	
17	662	400	262	523	280	243	-139	-120	-19	
18	663	450	213	713	360	353	50	-90	140	+678
19	516	480	36	850	480	370	334	0	334	
20	509	509	0	804	600	204	295	91	204	
21	516	516	0	714	714	0	198	198	0	

NET CHANGE
+340
+507
+(678-447)

Table A-2. Final determination for September hydrograph scalping

Sep	PRBDC Q	Base	Diff (F_{BDC})	PRaRB Q	Base	Diff (F_{RB})	$F_{RB}-F_{BDC}$	$F_{RB}-F_{BDC}$ revised	$F_{RB}-F_{BDC}$ NM adjusted
1	21			27					
2	21			26					
3	21	21	0	27					
4	45	19	26	26		26	0	0	-26
5	28	17	11	31	31	0	-11	0	-11
6	22	15	7	59	42	17	10	10	10
7	20	13	7	843	54	790	783	783	782
8	15	11	4	143	65	78	74	74	74
9	9	9	0	76	76	0	0	0	0
10	51	22	29	178	91	87	58	58	58
11	40	36	4	280	106	174	170	170	170
12	49	49	0	175	121	54	54	54	54
13	435	95	340	136	136	0	-340	0	0
14	141	141	0	282	165	117	117	117	117
15	367	215	152	194	194	0	-152	0	0
16	477	276	201	262	262	0	-201	0	0
17	662	337	325	523	352	171	-154	0	0
18	663	399	264	713	443	270	6	140	0
19	516	460	56	850	533	317	261	334	0
20	509	509	0	804	624	180	180	204	0
21	516			714	714		0	0	0
22	520			714			0	0	0
23	516			721			0	0	0
24	522			717			0	0	
25	525			718			0	0	
26	530			719			0	0	
27	535			698			0	0	
28	539			703			0	0	
29	534			696			0	0	
30	536			689			0	0	
Sep total	cfs-d		1427			2281	854	1944	1228
	af		2829			4522	1693	3854	2435

Reconciliation of NM-RM figures

Add 37 to NM figure for Sept 4-5; add 678 for Sept 18-20, as used by RM; this yields: 1228+37+678 = 1943 cfs-d
RM final value is 1943 cfs-d

Table A-3. Revisions to Hydrograph Scalping

Carlsbad to Red Bluff, Acre-feet

	USGS	RM (Prel R)	NM	RM revised
Jan	139	180	60	180
Feb	28	28	22	28
Mar	0	0	0	0
Apr	0	0	0	0
May	19	22	0	22
Jun	638	661	643	661
Jul	1497	1369	1379	1369
Aug	446	250	292	250
Sep	2815	1694	2435	3854
Oct	0	0	0	0
Nov	0	0	0	0
Dec	226	296	317	296
Total (acre-ft)	5807	4499	5148	6659
months except Sep	2992	2805	2713	
Dark Canyon Draw	0	1000	0	0
total	5807	5499	5148	6659