PECOS RIVER COMPACT

Report of the River Master

Water Year 2021

Accounting Year 2022

Final Report

Neil S. Grigg
River Master of the Pecos River
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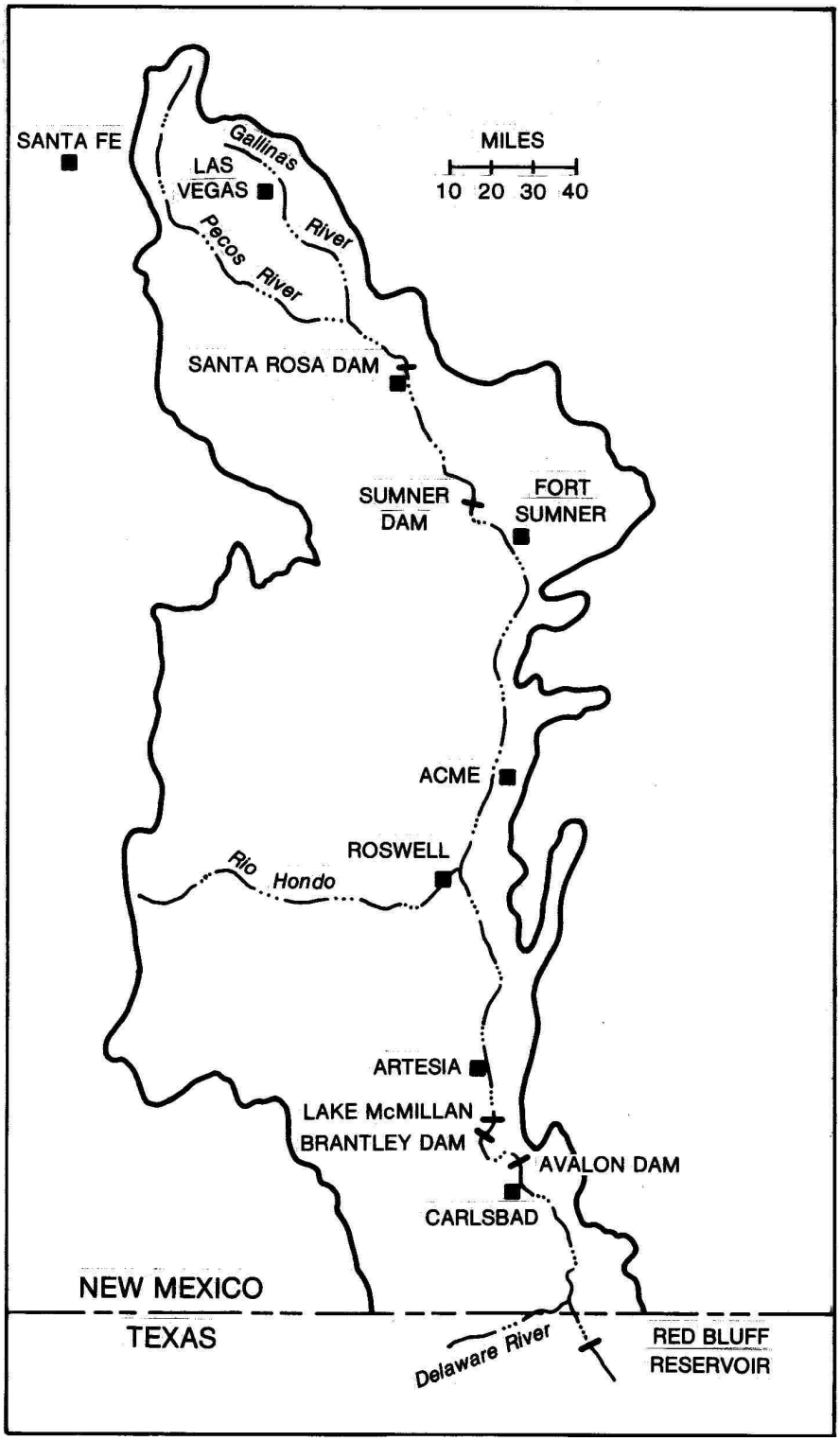

Map of Pecos River Basin Showing Accounting Reaches

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

Final Report of the River Master
Water Year 2021 - Accounting Year 2022
June 25, 2022

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 2021 was a shortfall of 4,400 acre-feet. The accumulated overage since the beginning of Water Year 1987 is 157,200 acre-feet.

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Pecos River Compact		
Accumulated Shortfall or Overage		
	June 25, 2022	
Water Year	Annual Overage or Shortfall, AF	Accumulated Overage or Shortfall, AF
1987	15,400	15,400
1988	23,600	39,000
1989	2,700	41,700
1990	-14,100	27,600
1991	-16,500	11,100
1992	10,900	22,000
1993	6,600	28,600
1994	5,900	34,500
1995	-14,100	20,400
1996	-6,700	13,700
1997	6,100	19,800
1998	1,700	21,500
1999	1,400	22,900
2000	-12,300	10,600
2001	-700	9,900
2002	-3,000	6,900
2003	2,000	8,900
2004	8,300	17,200
2005	24,000	41,200
2006	26,100	67,300
2007	25,200	92,500
2008	6,000	98,500
2009	1,600	100,100
2010	-500	99,600
2011	500	100,100
2012	1,900	102,000
2013	-6,300	95,700
2014	700	96,400
2015	27,300	123,700
2016	27,200	150,900
2017	19,900	170,800
2018	5,300	176,100
2019	-9,800	166,300
2020	-4,700	161,600
2021	-4,400	157,200

Table 1. General Calculation of Annual Departures in TAF (B.1)			
Water Year	2021		
6/25/2022			
	WY 2019	WY 2020	WY 2021
B.1.a. Index Inflows			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	125.8	91.3	53.1
(b) Flood Inflow Alamogordo - Artesia (Table 2)	17.4	-7.8	45.7
(c) Flood Inflow Artesia - Carlsbad (Table 3)	10.0	7.6	45.0
(d) Flood Inflow Carlsbad - State Line (Table 4)	6.7	1.2	29.7
Total (annual flood inflow)	159.9	92.3	173.5
(2) Index Inflow (3-year avg)			141.9
B.1.b. 1947 Condition Delivery Obligation			56.6
(Index Outflow)			
B.1.c. Average Historical (Gaged) Outflow			
(1) Annual historical outflow			
(a) Gaged Flow Pecos River at Red Bluff NM	45.8	36.8	65.2
(b) Gaged Flow Delaware River nr Red Bluff NM	0.9	0.3	10.8
(c) Metered diversions Permit 3254 into C-2713	0.4	0.4	0.4
Total Annual Historical Outflow	47.1	37.4	76.4
(2) Average Historical Outflow (3-yr average)			53.6
B.1.d. Annual Departure			-3.0
C. Adjustments to Computed Departure			
1. Adjustments for Depletions above Alam Dam			
a. Depletions Due to Irrigation (Table 5)	0.4	2.6	-0.4
b. Depl fr Operation of Santa Rosa Reservoir (Table 6)	4.5	3.7	1.9
c. Transfer of Water Use to Upstream of AD	0	0	0
Recomputed Index Inflows			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	130.7	97.6	54.6
(b) Flood Inflow Alamogordo - Artesia	17.4	-7.8	45.7
(c) Flood Inflow Artesia - Carlsbad	10.0	7.6	45.0
(d) Flood Inflow Carlsbad - State Line	6.7	1.2	29.7
Total (annual flood inflow)	164.8	98.6	175.0
Recomputed Index Inflow (3-year avg)			146.1
Recomputed 1947 Condition Del Outflow			59.0
(Index Outflow)			
Recomputed Annual Departures			-5.4
Credits to New Mexico			
C.2 Depletions Due to McMillan Dike			1.0
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
Final Calculated Departure, TAF			-4.4

Table 2. Determination of Flood Inflows, Alamogordo Dam to Artesia (B.3)													
Water Year	2021												
5/7/2022													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
Flow bel Sumner Dam	1.1	1.1	5.4	4.6	14.4	4.8	3.7	5.7	5.6	5.2	0.7	1.0	53.1
FtSumner Irrig Div	0.0	0.0	5.1	4.4	4.8	4.6	3.2	5.4	5.4	5.2	0.0	0.0	38.3
Ft Sumner ID Return	0.8	0.6	1.4	1.6	2.4	2.4	2.4	2.4	2.2	2.0	1.0	0.8	20.3
Flow past FS IDist	1.9	1.7	1.7	1.8	12.0	2.6	2.8	2.8	2.5	2.0	1.7	1.8	35.2
Channel loss	0.2	0.2	0.5	1.3	2.5	1.2	1.0	1.6	0.8	0.8	0.7	0.2	11.0
Residual Flow	1.7	1.5	1.1	0.5	9.5	1.4	1.8	1.2	1.7	1.3	1.0	1.6	24.2
Base Inflow	2.0	1.9	1.9	1.1	0.7	0.7	1.0	1.0	1.0	1.0	1.4	1.8	15.6
River Pump Divers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Residual, Artesia	3.7	3.4	3.0	1.5	10.3	2.0	2.9	2.1	2.7	2.3	2.4	3.4	39.8
Pecos Flow Artesia	3.3	2.8	2.9	1.9	5.4	13.3	36.5	7.9	3.3	2.3	2.7	3.2	85.5
Flood Inflow, AD-Art	-0.4	-0.6	-0.2	0.4	-4.9	11.3	33.7	5.8	0.6	0.1	0.3	-0.2	45.7

Note: Whenever the computed flow past the District is less than the return flow, set the flow past the District equal to the return flow (Manual, B.3.d).

Table 3. Determination of Flood Inflows, Artesia to Carlsbad (B.4)													
Water Year	2021												
5/7/2022													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
Rio Penasco at Dayton	0.0	0.0	0.0	0.0	0.0	0.9	0.8	1.4	0.0	0.0	0.0	0.0	3.2
Fourmile Draw nr Lakew	0.0	0.0	0.0	0.0	0.0	0.6	0.7	0.2	0.0	0.0	0.0	0.0	1.5
South Seven Rivers	0.0	0.0	0.0	0.0	0.0	2.9	0.9	6.7	0.0	0.0	0.0	0.0	10.5
Rocky Arroyo at Hwy Br	0.0	0.0	0.0	0.0	0.0	9.0	2.7	3.4	0.0	0.0	0.0	0.0	15.1
Flood Inflow, Art-DS3	0.0	0.0	0.0	0.0	0.0	13.4	5.1	11.7	0.0	0.0	0.0	0.0	30.2
Pecos R at Dam Site 3	1.4	1.2	1.3	2.3	3.4	11.3	10.4	15.0	8.5	10.4	1.3	1.2	67.6
CB Sprgs New Water (from Table 7)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-5.567
Total Inflow, DS3 - CB	1.0	0.7	0.8	1.8	2.9	10.8	9.9	14.6	8.0	9.9	0.8	0.8	62.1
Evap Loss, Lake Avalon (from Table 10)	0.2	0.3	0.5	0.3	0.4	0.2	0.5	0.4	0.5	0.4	0.2	0.2	4.1
Storage Chg, Lake Avalon (from Table 11)	0.4	0.5	0.6	-2.1	0.1	4.2	-1.9	0.6	-1.8	-1.1	-0.4	1.5	0.6
Carls ID diversions	0.0	0.0	0.0	2.8	2.7	2.8	8.0	7.4	9.1	10.8	0.1	0.0	43.8
93% CID diver	0.0	0.0	0.0	2.6	2.5	2.6	7.5	6.9	8.5	10.1	0.1	0.0	40.7
Other depletions	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	1.4
Dark Canyon at Csbad	0.0	0.0	0.0	0.0	0.5	12.1	4.2	0.0	0.0	0.0	0.0	0.0	16.8
Pecos b Dark Canyon	0.9	0.9	1.0	0.8	1.4	19.2	8.8	6.8	1.8	1.7	1.6	2.1	46.9
Pecos R at Carlsbad	0.9	0.9	1.0	0.8	0.9	7.0	4.6	6.8	1.8	1.7	1.6	2.1	30.1
Total Outflow	1.6	1.7	2.1	1.8	4.1	14.1	10.8	14.9	9.0	11.2	1.5	4.0	76.9
Flood Inflow, DS3-CB	0.7	1.0	1.3	0.0	1.2	3.3	0.9	0.3	0.9	1.2	0.7	3.2	14.8
Flood Inflow, Art-CB	0.7	1.0	1.3	0.0	1.2	16.7	5.9	12.0	0.9	1.2	0.7	3.2	45.0

Table 4. Summary Table for Computations, Carlsbad to State Line (B.5)						
Water Year		2020				
6/25/2022						
		BCB - RB	Del R	DC		
		RM				
Jan		0.0	0.0	0.0		
Feb		0.1	0.0	0.0		
Mar		0.0	0.0	0.0		
Apr		0.0	0.0	0.0		
May		0.1	1.1	0.5		
Jun		5.4	2.9	0.0		
Jul		9.8	0.7	0.0		
Aug		3.1	5.7	0.0		
Sep		0.2	0.1	0.0		
Oct		0.2	0.0	0.0		
Nov		0.0	0.0	0.0		
Dec		0.0	0.0	0.0		
Total		18.8	10.4	0.5		
Summary of flood inflows, Carlsbad to State Line, TAF						
Red Bluff - Carlsbad + Dark C RM calcs)						19.3
Delaware River						10.4
Total Flood Inflow, Carlsbad to State Line						29.7

Table 5. Depletions Due to Irrigation Above Sumner Dam (C.1.a)								
Water Year	2021							
5/7/2022								
	APR	MAY	JUN	JUL	AUG	SEPT	OCT	TOTAL
Precip Las Vegas FAA AP	0.13	2.24	1.75	1.86	1.64	1.72	1.23	10.57
Eff prec Las Veg FAA AP	0.13	2.02	1.62	1.71	1.53	1.60	1.17	9.78
Precip Pecos Natl Monument	0.01	0.14	0.27	5.27	1.25	1.58	0.96	9.48
Eff Precip Pecos RS	0.01	0.14	0.26	3.90	1.19	1.47	0.93	7.90
Precip Santa Rosa	0.10	2.21	2.38	3.33	4.67	0.94	1.96	15.59
Eff Precip Santa Ro	0.10	2.00	2.12	2.83	3.68	0.91	1.80	13.44
Average eff precip, ft	0.01	0.12	0.11	0.23	0.18	0.11	0.11	0.86
Consumptive use, ft	0.19	0.36	0.36	0.30	0.27	0.18	0.11	1.77
Unit depletion rate (CU less eff precip), ft	0.18	0.24	0.25	0.07	0.09	0.07	0.00	0.91
Acres (most recent inventory)	11529							
Streamflow depletion (actual use), AF	10440							
1947 depletion, AF	10804							
Difference (actual use - 1947 depletion), TAF	-0.4							
Adjustment to Gaged Flow, Pecos River below Sumner Dam, TAF =						-0.4		

Table 6. Depletions Due to Santa Rosa Reservoir Operations (C.1.b)													
Water Year	2021												
5/7/2022													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
LS 2013 table (USBR), add 4,200 feet to value shown; LSR 1997 tables used (COE); Add 4,600 feet to value shown													
Lk Sumner ga ht, avg	49.56	51.60	51.67	50.72	48.14	39.44	44.33	42.98	41.70	39.06	40.86	45.09	
LS content, AF, avg	15040	17926	18032	16633	13266	5803	9348	8212	7266	5581	6688	10037	
LS area, acres, avg	1321	1512	1521	1426	1169	590	874	790	713	579	666	938	
LS evap, inches	4.20	4.49	9.08	12.05	12.72	15.45	12.12	11.52	11.22	8.91	6.85	6.76	115.36
.77 LS Evap	3.23	3.46	6.99	9.28	9.79	11.90	9.33	8.87	8.64	6.86	5.27	5.20	88.83
LS Precip, inches	0.12	0.02	0.18	0.30	1.27	2.73	4.98	1.35	0.63	0.96	0.00	0.00	12.54
Net LS Evap, inches	3.11	3.44	6.81	8.98	8.52	9.17	4.35	7.52	8.01	5.90	5.27	5.20	76.29
LSum Evaploss, TAF	0.34	0.43	0.86	1.07	0.83	0.45	0.32	0.50	0.48	0.28	0.29	0.41	6.26
L S Rosa ga ht, avg*	94.02	94.15	94.21	94.09	93.75	93.39	101.91	112.32	116.74	116.43	116.10	115.81	
LSR content, AF, avg	3772	3817	3839	3796	3679	3556	7233	14860	19648	19279	18892	18328	
LSR area, acres, avg	348	351	352	350	343	337	536	969	1199	1182	1163	1136	
LSR evap, inches	3.72	4.98	8.58	10.43	9.06	11.09	10.25	10.50	9.01	6.83	4.77	3.76	92.98
.77 LSR Evap	2.86	3.83	6.61	8.03	6.98	8.54	7.89	8.09	6.94	5.26	3.67	2.90	71.59
LSR precip, inches	0.18	0.46	1.18	0.10	2.21	2.38	3.33	4.67	0.94	1.96	0.00	0.00	17.41
Net LSR Evap, inches	2.68	3.37	5.43	7.93	4.77	6.16	4.56	3.42	6.00	3.30	3.67	2.90	54.18
LSR Evaploss, TAF	0.08	0.10	0.16	0.23	0.14	0.17	0.20	0.28	0.60	0.32	0.36	0.27	2.91
Total evaploss, TAF	0.42	0.53	1.02	1.30	0.97	0.62	0.52	0.77	1.08	0.61	0.65	0.68	9.17
* Indicates below 4700 ft													
Sum contents, AF	18812	21743	21871	20429	16945	9359	16581	23072	26914	24860	25580	28365	
1947 area, acres	1018	1143	1151	1039	1000	700	1000	1198	1440	1330	1384	1492	
1947 evaploss, TAF	0.26	0.33	0.65	0.78	0.71	0.53	0.36	0.75	0.96	0.65	0.61	0.65	7.25
current-1947evaploss	0.16	0.20	0.37	0.52	0.26	0.09	0.16	0.02	0.11	-0.04	0.04	0.03	1.92
						Annual adjustment for excess evaporation =							1.9
ADJUSTMENT FOR EXCESSIVE STORAGE IN SANTA ROSA RESERVOIR													
			2020	2020	2021	2021							
			Gage	Storage	Gage	Storage							
EndYear Sumner Sto			4248.30	13456	4246.73	11681							
EndYear S R Sto			4794.00	3765	4715.67	18397							
Sum				17221		30078							
Sto Adjustment, TAF						0.0							
Adjustm Ex Evap, TAF						1.9							
Total Adjustment,TAF						1.9							
	Storage adjustment												
	Both equal or less than 129.3 TAF, adjustment is zero												
	~~Both greater than 129.3 TAF, subtract previous from current year~~												
	Current year less than 129.3 TAF, previous greater than 129.3 TAF, subtract previous year from 129.3 TAF												
	Current year greater than 129.3 TAF, previous year less than 129.3 TAF, subtract 129.3 TAF from current year												

Table 7. Carlsbad Springs New Water [B.4.c.(2)]					
Water Year	2021				
5/1/2022					
		TAF	AF/day	cfs	Totals
Pecos R bel DC		46.9	128.6	64.8	64.8
Dark Canyon		16.8	45.9	23.1	23.1
Pecos R bel Lake Avalon		15.9	43.3	21.9	21.9
Depletion, cfs					2.0
CID lag seep, cfs (from Table 8)					3.9
Return flow, cfs					1.0
Lake Av lagged seep, cfs (from Table 9)					21.6
PR seepage, cfs					3.0
Carls new water, cfs					-7.69
Carls new wat, TAF					-5.6
Carls new wat monthly, TAF					-0.5

Table 8. Carlsbad Main Canal Seepage Lagged [B.4.c.(2)(e)]													
Water Year	2021												
5/7/2022													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
WY 2021													
CID, TAF	0.0	0.0	0.0	2.8	2.7	2.8	8.0	7.4	9.1	10.8	0.1	0.0	43.8
days/mo	31	28	31	30	31	30	31	31	30	31	30	31	365
cfs	0	0	0.0	47.8	44.2	46.3	130.5	120.6	152.9	175.9	1.4	0.0	60.0
cfs, qtr avg			0.0			46.1			134.5			59.7	
WY 2020		1Q	2Q	3Q	4Q								
FLOWS, cfs				118.7	30.7								
SEVEN %				8.3	2.2								
WY 2021 lagged		1Q	2Q	3Q	4Q								
FLOWS, cfs		0.0	46.1	134.5	59.7								
SEVEN %		0.0	3.2	9.4	4.2								
LAG		2.1	2.0	5.8	5.8	Avg =	3.9	cfs					

Table 9. Lake Avalon Leakage Lagged [B.4.c.(2)(g)]													
Water Year	2021												
6/25/2022													
WY 2021	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
Elev NM rept	74.2	74.8	75.5	73.8	73.1	73.2	77.0	77.0	75.8	74.5	73.5	74.4	
ga ht, avg*	17.2	17.8	18.5	16.8	16.1	16.2	20.0	20.0	18.8	17.5	16.5	17.4	
cfs	20.0	23.2	26.2	18.5	15.0	15.5	33.7	33.4	28.1	21.8	16.7	21.3	
days	31	28	31	30	31	30	31	31	30	31	30	31	365
cfs avg	23.1			16.3			31.7			20.0			22.8
WY 2020		1Q	2Q	3Q	4Q								
cfs				18.8	14.7								
WY 2021 lagged		1Q	2Q	3Q	4Q								
cfs		23.1	16.3	31.7	20.0								
lag cfs		19.6	18.3	25.2	23.3	Avg =	21.6	cfs					
* Computed as WS elev by NM Report minus Gage datum at 3157.0 (USBR datum)													

Table 10. Evaporation Loss at Lake Avalon [B.4.d.(1)]														
Water Year	2021													
5/7/2022														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOT	
Av WS NM Rept	74.16	74.82	75.45	73.84	73.12	73.21	77.01	76.95	75.84	74.52	73.47	74.42		
Avalon ga ht, avg, ft*	17.16	17.82	18.45	16.84	16.12	16.21	20.01	19.95	18.84	17.52	16.47	17.42		
Avg area Avalon, ac**	706	777	814	669	585	596	908	904	829	745	626	734		.
Panevap Brantley, in.	4.65	5.60	9.22	10.11	12.76	14.03	10.16	9.91	9.77	8.45	4.80	4.34	103.80	
Lakeevap Brantley, in.	3.58	4.31	7.10	7.78	9.83	10.80	7.82	7.63	7.52	6.51	3.70	3.34	79.93	
Precip Brantley, in.	0.25	0.20	0.05	1.97	0.75	6.42	1.09	2.12	0.70	0.46	0.42	0.00	14.43	
Netevap, inches	3.33	4.11	7.05	5.81	9.08	4.38	6.73	5.51	6.82	6.05	3.28	3.34	65.50	
Evaploss Av, TAF	0.20	0.27	0.48	0.32	0.44	0.22	0.51	0.42	0.47	0.38	0.17	0.20	4.07	
* Computed as WS elev by NM Report minus Gage datum at 3157.0 (USBR datum)														
** Based on 2006 USBR Area and Capacity Table														

Table 11. Change in Storage, Lake Avalon [B.4.d.(2)]														
(Gage heights are end of month)														
Water Year	2021													
5/7/2022														
	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
	2019	2020												
WS NM Rept	73.9	74.5	75.1	75.8	72.9	73.0	78.2	76.1	76.8	74.6	73.0	74.1	74.7	
Gage EOM, ft*	16.9	17.5	18.1	18.8	15.9	16.0	21.2	19.1	19.8	17.6	16.0	17.1	17.7	
Storage, AF**	1647	2073	2537	3107	1029	1085	5294	3357	3965	2147	1085	699	2223	
Change sto, TAF		0.4	0.5	0.6	-2.1	0.1	4.2	-1.9	0.6	-1.8	-1.1	-0.4	1.5	0.6
* Computed as WS elev by NM Report minus Gage datum at 3157.0 (USBR datum)														
** Based on 2006 USBR Area and Capacity Table														

Table 12. Data Required for River Master Manual Calculations													
Water Year 2021													
5/9/2022	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
.													
STREAMFLOW GAGING RECORDS, TAF													
Pecos R b Sumner Dam	1.1	1.1	5.4	4.6	14.4	4.8	3.7	5.7	5.6	5.2	0.7	1.0	53.1
Fort Sumner Main C	0.0	0.0	5.1	4.4	4.8	4.6	3.2	5.4	5.4	5.2	0.0	0.0	38.3
Pecos R nr Artesia	3.3	2.8	2.9	1.9	5.4	13.3	36.5	7.9	3.3	2.3	2.7	3.2	85.5
Rio Penasco at Dayton	0.0	0.0	0.0	0.0	0.0	0.9	0.8	1.4	0.0	0.0	0.0	0.0	3.2
Fourmile Draw nr Lakewood	0.0	0.0	0.0	0.0	0.0	0.6	0.7	0.2	0.0	0.0	0.0	0.0	1.5
South Seven Rivers nr Lkwd	0.0	0.0	0.0	0.0	0.0	2.9	0.9	6.7	0.0	0.0	0.0	0.0	10.5
Rocky Arroyo at Hwy Br nr	0.0	0.0	0.0	0.0	0.0	9.0	2.7	3.4	0.0	0.0	0.0	0.0	15.1
Pecos R at Dam Site 3	1.4	1.2	1.3	2.3	3.4	11.3	10.4	15.0	8.5	10.4	1.3	1.2	67.6
Pecos bel Avalon Dam	0.0	0.0	0.0	0.0	0.0	5.5	3.5	6.8	0.0	0.0	0.0	0.0	15.9
Carlsbad Main Canal	0.0	0.0	0.0	2.8	2.7	2.8	8.0	7.4	9.1	10.8	0.1	0.0	43.8
Dark Canyon at Carlsbad	0	0	0	0	0.5	12.1	4.2	0.0	0.0	0.0	0.0	0.0	16.8
Pecos below Dark Canyon	0.9	0.9	1.0	0.8	1.4	19.2	8.8	6.8	1.8	1.7	1.6	2.1	46.9
Pecos R at Red Bluff	2.9	2.5	2.2	1.7	2.5	13.1	14.5	11.9	3.5	3.5	3.5	3.4	65.2
Delaware R nr Red Bluff	0.0	0.0	0.0	0.0	1.1	2.9	0.7	5.8	0.1	0.1	0.1	0.1	10.8
GAGE HEIGHTS*													
Avalon gage ht, end mo	74.5	75.1	75.8	72.9	73.0	78.2	76.1	76.8	74.6	73.0	74.1	74.7	
Avalon gage ht, avg	74.2	74.8	75.5	73.8	73.1	73.2	77.0	77.0	75.8	74.5	73.5	74.4	
Sumner Lake ga ht, end mo	50.7	52.4	51.2	50.1	40.3	37.8	44.0	42.8	39.8	37.7	43.2	46.7	
Sumner Lake gage ht, avg	49.6	51.6	51.7	50.7	48.1	39.4	44.3	43.0	41.7	39.1	40.9	45.1	
Lake S Rosa ga ht, end mo	94.1	94.2	94.3	93.9	93.6	93.4	107.6	115.9	116.6	116.2	116.0	115.7	
Lake S Rosa ga ht, avg	94.0	94.2	94.2	94.1	93.7	93.4	101.9	112.3	116.7	116.4	116.1	115.8	
	* Values for Sumner above 4200 feet; for Santa Rosa above 4600 feet												
PRECIPITATION, INCHES													
Brantley Lake	0.25	0.20	0.05	1.97	0.75	6.42	1.09	2.12	0.70	0.46	0.42	0.00	14.43
Las Vegas FAA AP	0.01	0.07	0.19	0.13	2.24	1.75	1.86	1.64	1.72	1.23	0.26	0.00	11.10
Pecos National Monument	0.46	0.70	1.83	0.01	0.14	0.27	5.27	1.25	1.58	0.96	0.01	0.66	13.14
Santa Rosa	0.18	0.46	1.18	0.10	2.21	2.38	3.33	4.67	0.94	1.96	0.00	0.00	17.41
Lake Santa Rosa	0.18	0.46	1.18	0.10	2.21	2.38	3.33	4.67	0.94	1.96	0.00	0.00	17.41
Sumner Lake	0.12	0.02	0.18	0.30	1.27	2.73	4.98	1.35	0.63	0.96	0.00	0.00	12.54
PAN EVAPORATION, INCHES													
Lake Santa Rosa	3.72	4.98	8.58	10.43	9.06	11.09	10.25	10.50	9.01	6.83	4.77	3.76	92.98
Lake Sumner	4.20	4.49	9.08	12.05	12.72	15.45	12.12	11.52	11.22	8.91	6.85	6.76	115.36
Brantley Lake	4.65	5.60	9.22	10.11	12.76	14.03	10.16	9.91	9.77	8.45	4.80	4.34	103.80
OTHER REPORTS													
Base Acme-Art, TAF (USGS)	2.03	1.89	1.91	1.07	0.74	0.66	1.05	0.98	1.01	0.98	1.43	1.85	15.59
Pump depl Ac-Artesia, TAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pumping, C-2713, Malaga B													0.41
NM irrig inv, acres (3/9/2000)													11529
NM Transfer water use, TAF													
NM salvaged water, TAF													0.0
Texas, water stored NM, TAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Texas, use Del water, TAF													

APPENDIX

RESPONSE TO STATES' OBJECTIONS

RESPONSE TO STATES' OBJECTIONS

Final Report, Accounting Year 2022

NEW MEXICO'S OBJECTIONS

Table 4. General Calculations of Annual Departures in TAF.

FIF Calculations

New Mexico found errors in the hydrograph scalping that led to incorrect values in Table 4. The errors were due to a corrupted spreadsheet formula in the scalped discharge values for Pecos River below Dark Canyon (PRbDC) beginning on June 26 and carrying through to August 28. For the monthly scalped flows before Dark Canyon Draw (DCD) flows are subtracted, New Mexico supplied the following estimates from its analysis (monthly totals in cfs-d):

	PR at Red Bluff	PR bel DC	FIF
June	9,293	5,954	3,339
July	5,746	2,559	3,187
August	3,753	2,215	1,538

Converted to AF, the corresponding values are:

	PR at Red Bluff	PR bel DC	FIF
June	18,433	11,810	6,623
July	11,397	5,076	6,321
August	7,444	4,393	3,051

Once the error is corrected it becomes clear that during the period of DCD inflows (June 29 –
Jul 11), the difference in scalped flows of Red Bluff and Below Dark Canyon gages became negative and the River Master's Manual (RMM) Section B.5.a.(3) applies, as New Mexico noted.

The general issue that is addressed by the Section B.5.a.(3) provision in the RMM is that if all DCD flows are added to the FIF for the Carlsbad to Red Bluff reach at the time that the difference in scalped inflows at the upstream and downstream gages goes negative, the overall FIF will be overestimated. The issue was triggered by relocation of the Pecos gage from above the DCD confluence to below it. When the gage was above DCD, the flow from Dark Canyon did not have to be added separately. Now, various hydrologic effects occur when DCD flows are gaged at Dark Canyon. If the gaged DCD flows are translated directly and without modification to the PRbDC gage, then the difference in scalped flows in the BCB to RB reach will be reduced by the DCD flows and adding them back in restores the historical condition. If, however, the difference in scalped

flows is negative while DCD is flowing, then the indication is that the influence of the DCD flows on the PRbDC gage record has influenced the negative reading due to hydraulic effects. By subtracting DCD flows from the PR bel DC gaged flows and not adding them back in later, a new estimate of the actual FIF in the reach is obtained. The deduction of DCD flows can create a hydrograph at PRbDC that lacks a regular rise and fall, but considering this anomaly is implicit in the adjusted procedure.

To recompute the difference in scalped flows, the DCD flows were subtracted from the PRbDC flows to create a new flow record to find scalped flows for that gage. The River Master (RM) interpreted RMM Section B.5.a.(3) differently from NM. NM apparently only recomputed the FIF in June with deducted DCD to reach a new value for the period when the difference in scalped flows was negative for that month. New Mexico did not provide a spreadsheet, so the RM interpreted this from the text description provided. The RM's interpretation is that, because a flood event in the reach may begin before DCD flows appear at the PR bel DC gage, the scalping of flood flows at that gage should begin at the onset of the event causing the negative difference in scalped flows. This means that the new computation carried over into July to the end of the event at the RB gage on July 13.

The RM's calculations are shown on the attached spreadsheet. The resulting differences in cfs-d between New Mexico's and the RM's procedure are shown in this table.

	PRaRB	PRbDC	Diff
RM			
June	5,954	3,254	2,700
July	5,402	467*	4,936*
August	3,753	2,215	1,538
		Sum	9,174
NM			
June	5,954	3,190	2,764
July	5,746	3,099*	4,764*
August	3,753	2,215	1,538
		Sum	9,066

* The RM recomputed the PRbDC scalped flows for July by deducting the DCD flows. NM did not deduct them, but added them back afterwards. This creates a small difference in the results.

Negative sign error
New Mexico noted that the negative sign error for April for the difference in scalped flood inflows. This objection is accepted.

Result after considering New Mexico's objections

A revised Table 4 is included in the Final Report. The overall difference in the RM's (29.7 TAF) and New Mexico's (29.6 TAF) computations is 0.1 TAF.

TEXAS' OBJECTIONS

Table 4. General Calculations of Annual Departures (B.1) in TAF for WY 2021

Texas found the same error for June, July, and August. Texas recomputed the difference in scalped flood flows, but apparently did not deduct the DCD flows as prescribed by RMM Section B.5.a.(3). This resulted in a small difference in Table 4 totals. Texas computed 30.9 TAF and the RM's computation was 29.7 TAF.

Comment on Tables 8 and 9

Texas noted that 29 days was shown incorrectly for February in Table 9. This is accepted, and Tables 3, 7, and 9 were corrected accordingly.

FINAL CALCULATED DEPARTURE

The Preliminary Report had a Final Calculated Departure as a shortfall of 17.2 TAF. After considering the states' objections, the Final Determination is a shortfall of 4.4 TAF.

Revised computations for FIF

2021 Water year															
			Values in cfs-d										Month totals		
		6/25/22	PRaRB			PRbDC			DCD	PRbCB-DCD			PRaRB	PRbDC	FIF
	Day	Yr Day	Q	Base	Diff	Q	Base	Diff		Q	Base	Diff			
JUN	1	152	66	28.0	38	53.1	13.52	40		53.1	13.5	39.6			
	2	153	56.1	27.9	28	30.3	13.38	17		30.3	13.4	16.9			
	3	154	76.1	27.7	48	32.3	13.24	19		32.3	13.2	19.1			
	4	155	77.5	27.6	50	13.1	13.1	0		13.1	13.1	0.0			
	5	156	58.8	27.5	31	13.3									
	6	157	53.1	27.3	26	13.8									
	7	158	40	27.2	13	12.8									
	8	159	32.9	27.1	6	12.4									
	9	160	28.9	26.9	2	12.5									
	10	161	26.8	26.8	0	12.6									
	11	162	25.4			12.4									
	12	163	24.2			11.1									
	13	164	22.5			10.1									
	14	165	21.4			10									
J	15	166	19.7			10.3									
	16	167	19.2			10.2									
	17	168	17.9			9.37									
	18	169	16.8			9.59									
	19	170	15.4			10									
	20	171	14.5			10.8									
	21	172	14			10.7									
	22	173	13.7			8.35									
	23	174	15			12.2									
	24	175	16.2			10.7									
	25	176	16.1			9.84									
	26	177	16.4			11	11.0	0		11	11	0			
	27	178	18.6	18.6	0	16.7	13.6	3		16.7	13	3			
	28	179	635	20.9	614	50.2	16.2	34		50.2	16	34			
	29	180	86.2	23.2	63	6190	18.7	6171	4590	1600	18	1582			
	30	181	5060	25.4	5035	3030	21.3	3009	1450	1580	21	1559	5954	3254	2700
JUL	1	182	1760	27.7	1732	377	23.9	353	126	251	23	228			
	2	183	623	30.0	593	1030	26.5	1004	864	166	26	140			
	3	184	586	32.3	554	549	29.0	520	635	-86	28	-114			
	4	185	752	34.6	717	224	31.6	192	163	61	30	31			
	5	186	353	36.9	316	214	34.2	180	215	-1	33	-34			
	6	187	327	39.1	288	270	36.8	233	88	182	35	147			
	7	188	393	41.4	352	92.2	39.3	53	2.8	89	38	52			
	8	189	273	43.7	229	55.1	41.9	13	2.1	53	40	13			
	9	190	177	46.0	131	45.3	44.5	1	0.0	45	43	3			
	10	191	115	48.3	67	44.5	44.5	0	8.9	36	45	-9			
	11	192	82.3	50.6	32	41.7			0.4						
	12	193	67.7	52.8	15	46.5									
	13	194	60.7	55.1	5.6	183									
x	14	195	57.4			232									
	15	196	167			170									
	16	197	240			121									
	17	198	195			65.7									
	18	199	164			47.5									
	19	200	125			42.4									
	20	201	88			43.4									
	21	202	72.3			43.6									
	22	203	60.4			45.9									
	23	204	61.4			46									
x	24	205	54.4			46.5	46.5	0		46.5	46.5	0			
	25	206	56.9	0.2429	57	51.7	46.4	5		51.7	46.4	5.3			
	26	207	62.4	0.4857	62	51.1	46.3	5		51.1	46.3	4.8			
	27	208	66.5	0.7286	66	46.3	46.3	0		46.3	46.3	0			
	28	209	63.8	0.9714	63	45.6									
	29	210	65.3	1.2143	64	46.7									

Revised computations for FIF

	30	211	61.1	1.4571	60	48.2									
x	31	212	56.1	56.1	0	48.2	48.2	0					5402	467	4936
AUG	1	213	60.9	58.811	2	61.3	48.1	13		61.3	48.1	13.2			
	2	214	253	61.522	191	72.6	47.8	25		72.6	47.8	24.8			
	3	215	256	64.233	192	47.5	47.5	0		47.5	47.5	0.0			
	4	216	168	66.944	101	46.5									
	5	217	111	69.656	41	46.3									
	6	218	89.9	72.367	18	46.8									
	7	219	85.7	75.078	11	46.8									
	8	220	82.1	77.789	4	46.5									
	9	221	80.5	80.5	0	46									
	10	222	80.7			45.5									
	11	223	81.8	81.8	0	45.5									
	12	224	125	81.0	44	46.1	46.1	0		46.1	46.1	0.0			
	13	225	84.2	80.2	4	51.4	43.68	8		51.4	43.7	7.7			
	14	226	103	79.4	24	103	41.26	62		103.0	41.3	61.7			
	15	227	129	78.7	50	639	38.84	600		639.0	38.8	600.2			
	16	228	492	77.9	414	74.4	36.42	38		74.4	36.4	38.0			
	17	229	438	77.1	361	34	34	0		34.0	34.0	0.0			
	18	230	332	76.3	256	32.8									
	19	231	274	75.5	198	31.9									
	20	232	228	74.7	153	33.3	33.3	0		33.3	33.3	0.0			
	21	233	168	74.0	94	105	33.213	72		105.0	33.2	71.8			
	22	234	108	73.2	35	411	33.125	378		411.0	33.1	377.9			
	23	235	241	72.4	169	455	33.038	422		455.0	33.0	422.0			
	24	236	476	71.6	404	431	32.95	398		431.0	33.0	398.1			
	25	237	480	70.8	409	198	32.863	165		198.0	32.9	165.1			
	26	238	380	70.0	310	61.7	32.775	29		61.7	32.8	28.9			
	27	239	225	69.2	156	38.4	32.688	6		38.4	32.7	5.7			
	28	240	141	68.5	73	32.6	32.6	0		32.6	32.6	0.0			
	29	241	101	67.7	33	33									
	30	242	73	66.9	6	35.1									
x	31	243	66.1	66.1	0	35							3753	2215	1538