PECOS RIVER COMPACT

Report of the River Master

Water Year 2017

Accounting Year 2018

Final Report

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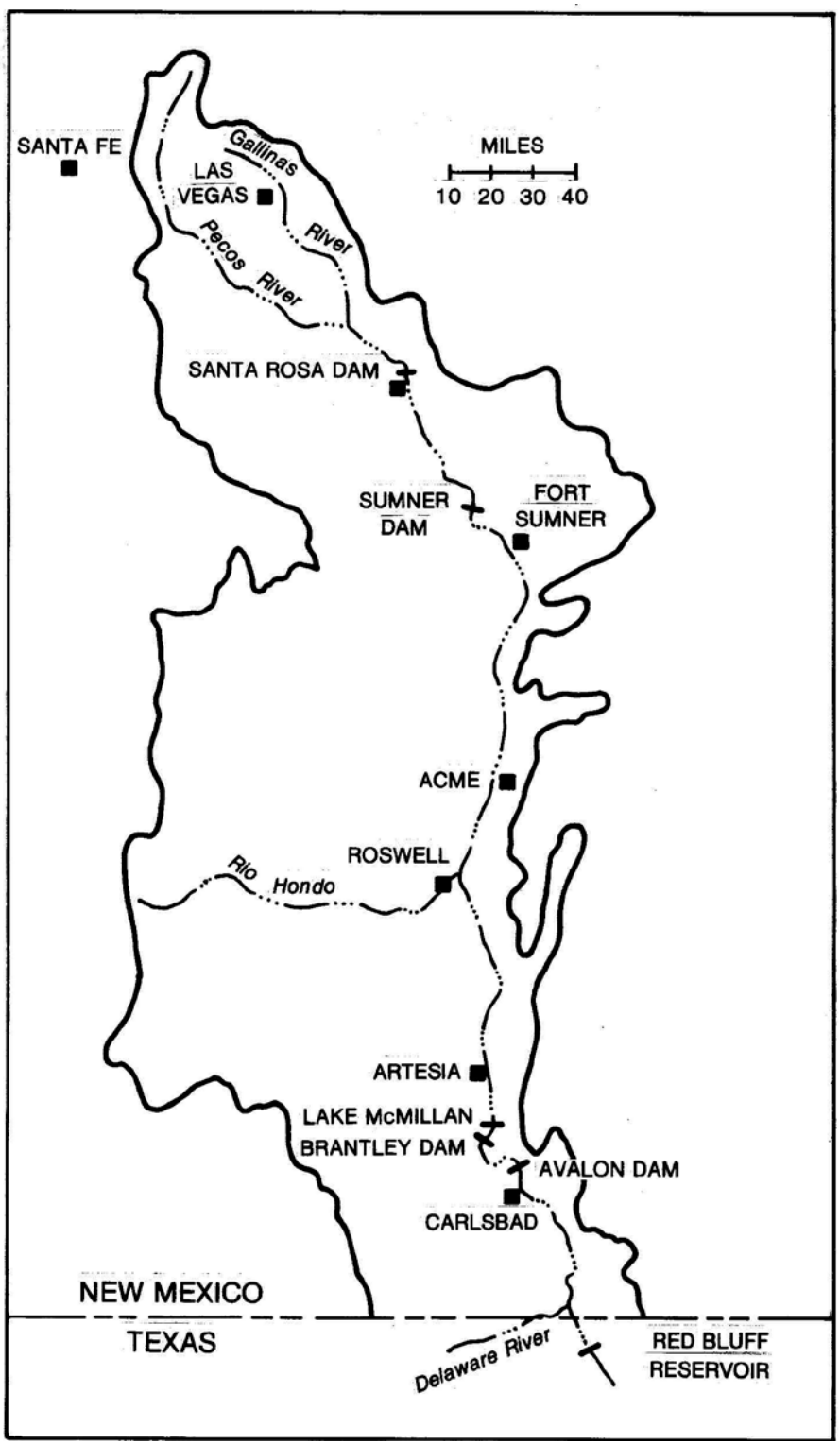

Map of Pecos River Basin Showing Accounting Reaches

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

Final Report of the River Master
Water Year 2017 - Accounting Year 2018
August 18, 2018

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 2017 was an overage of 19,900 acre-feet. The accumulated overage since the beginning of Water Year 1987 is 170,800 acre-feet.

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Neil S. Grigg
River Master of the Pecos River

Pecos River Compact		
Accumulated Shortfall or Overage		
	August 18, 2018	
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

Table 1. General Calculation of Annual Departures in TAF (B.1)			
Water Year	2017		
8/18/2018			
	WY 2015	WY 2016	WY 2017
B.1.a. Index Inflows			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	100.7	128.6	89.7
(b) Flood Inflow Alamogordo - Artesia (Table 2)	28.5	-2.6	33.0
(c) Flood Inflow Artesia - Carlsbad (Table 3)	3.2	15.3	13.1
(d) Flood Inflow Carlsbad - State Line (Table 4)	6.2	9.5	6.2
Total (annual flood inflow)	138.6	150.8	142.0
(2) Index Inflow (3-year avg)			143.8
B.1.b. 1947 Condition Delivery Obligation			57.7
(Index Outflow)			
B.1.c. Average Historical (Gaged) Outflow			
(1) Annual historical outflow			
(a) Gaged Flow Pecos River at Red Bluff NM	101.1	75.4	46.9
(b) Gaged Flow Delaware River nr Red Bluff NM	5.4	6.2	3.3
(c) Metered diversions Permit 3254 into C-2713	0.2	0.2	0.4
Total Annual Historical Outflow	106.7	81.8	50.6
(2) Average Historical Outflow (3-yr average)			79.7
B.1.d. Annual Departure			22.0
C. Adjustments to Computed Departure			
1. Adjustments for Depletions above Alam Dam			
a. Depletions Due to Irrigation (Table 5)	-3.2	1.3	-1.0
b. Depl fr Operation of Santa Rosa Reservoir (Table 6)	16.7	-6.3	9.2
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	114.2	123.6	97.9
(b) Flood Inflow Alamogordo - Artesia	28.5	-2.6	33.0
(c) Flood Inflow Artesia - Carlsbad	3.2	15.3	13.1
(d) Flood Inflow Carlsbad - State Line	6.2	9.5	6.2
Total (annual flood inflow)	152.1	145.8	150.2
Recomputed Index Inflow (3-year avg)			149.4
Recomputed 1947 Condition Del Outflow			60.9
(Index Outflow)			
Recomputed Annual Departures			18.8
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			19.9

Table 2. Determination of Flood Inflows, Alamogordo Dam to Artesia (B.3)													
Water Year	2017												
5/5/2018													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
Flow bel Sumner Dam	1.5	1.1	5.3	6.2	6.1	38.4	15.7	5.5	5.5	3.3	0.2	0.9	89.7
FtSumner Irrig Div	0.0	0.0	4.2	4.9	4.5	5.8	5.4	4.2	4.7	2.6	0.0	0.0	36.4
Ft Sumner ID Return	0.8	0.6	1.3	1.5	2.3	2.3	2.3	2.3	2.1	1.9	1.0	0.8	19.3
Flow past FS IDist	2.3	1.7	2.5	2.8	3.8	34.9	12.7	3.6	2.9	2.6	1.2	1.6	72.6
Channel loss	0.2	0.2	0.7	1.4	1.6	6.5	2.4	1.7	0.9	0.8	0.6	0.2	17.1
Residual Flow	2.0	1.5	1.8	1.4	2.3	28.4	10.3	1.9	2.0	1.8	0.6	1.5	55.6
Base Inflow	1.2	1.9	2.0	0.7	0.6	0.0	0.0	0.2	0.7	1.5	2.1	2.0	12.9
River Pump Divers	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.4
Residual, Artesia	3.3	3.5	3.8	2.0	2.8	28.3	10.2	2.2	2.7	3.2	2.7	3.5	68.0
Pecos Flow Artesia	4.0	3.7	3.9	2.7	2.5	11.9	19.9	13.2	7.3	21.0	6.1	4.7	101.0
Flood Inflow, AD-Art	0.7	0.3	0.1	0.8	-0.3	-16.4	9.7	11.1	4.7	17.8	3.4	1.2	33.0

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	2017												
8/19/2018													
	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fourmile Draw nr Lakew	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
South Seven Rivers	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Rocky Arroyo at Hwy Br	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Flood Inflow, Art-DS3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Pecos R at Dam Site 3	1.5	1.2	5.3	10.2	10.8	14.3	11.4	7.5	9.5	5.0	0.0	0.0	76.6
CB Sprgs New Water (from Table 7)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Inflow, DS3 - CB	1.5	1.2	5.3	10.2	10.8	14.4	11.4	7.5	9.5	5.0	0.0	0.0	76.7
Evap Loss, Lake Avalon (from Table 10)	0.1	0.3	0.5	0.4	0.6	0.6	0.5	0.3	0.4	0.3	0.0	0.0	4.0
Storage Chg, Lake Avalon (from Table 11)	1.5	-0.7	-1.4	0.0	-0.6	1.3	-0.7	0.4	0.4	-1.7	-0.8	0.0	-2.3
Carls ID diversions	0.0	0.0	5.6	8.7	10.1	11.5	10.9	7.1	8.9	6.9	0.5	0.0	70.2
93% CID diver	0.0	0.0	5.2	8.1	9.4	10.7	10.1	6.6	8.3	6.4	0.5	0.0	65.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pecos b Dark Canyon	2.0	1.7	1.9	1.8	1.9	1.8	1.6	1.9	1.8	1.8	1.6	1.5	21.1
Pecos R at Carlsbad	2.0	1.7	1.9	1.8	1.9	1.8	1.6	1.9	1.8	1.8	1.6	1.5	21.1
Total Outflow	3.7	1.4	6.2	10.5	11.4	14.5	11.7	9.3	10.9	6.9	1.4	1.6	89.5
Flood Inflow, DS3-CB	2.2	0.2	1.0	0.3	0.6	0.2	0.3	1.8	1.4	1.9	1.4	1.5	12.8
Flood Inflow, Art-CB	2.2	0.2	1.0	0.6	0.6	0.2	0.3	1.8	1.4	1.9	1.4	1.5	13.1

Table 4. Summary Table for Computations, Carlsbad to State Line (B.5)						
Water Year		2017				
8/19/2018						
		BCB - RB		Del R	DC	
		RM				
Jan		0.1		0.003	0.0	
Feb		0.0		0.000	0.0	
Mar		0.0		0.000	0.0	
Apr		0.2		0.003	0.0	
May		0.3		0.004	0.0	
Jun		0.3		0.007	0.0	
Jul		0.5		0.033	0.0	
Aug		1.2		0.314	0.0	
Sep		1.1		1.661	0.0	
Oct		0.4		0.013	0.0	
Nov		0.1		0.005	0.0	
Dec		0.1		0.001	0.0	
Total		4.1		2.044	0.0	
Summary of flood inflows, Carlsbad to State Line, TAF						
Red Bluff - Carlsbad + Dark C RM calcs)						4.1
Delaware River						2.0
Total Flood Inflow, Carlsbad to State Line						6.2

Table 5. Depletions Due to Irrigation Above Sumner Dam (C.1.a)								
Water Year	2017							
5/6/2018								
	APR	MAY	JUN	JUL	AUG	SEPT	OCT	TOTAL
Precip Las Vegas FAA AP	0.66	1.44	2.21	3.00	6.30	6.28	0.75	20.64
Eff prec Las Veg FAA AP	0.64	1.36	2.00	2.59	4.08	4.08	0.73	15.48
Precip Pecos Natl Monument*	0.00	0.00	0.00	3.39	2.16	3.37	1.66	10.58
Eff Precip Pecos RS	0.00	0.00	0.00	2.87	1.96	2.86	1.54	9.23
Precip Santa Rosa	0.25	1.73	0.80	1.86	3.53	4.32	3.04	15.53
Eff Precip Santa Ro	0.25	1.60	0.78	1.71	2.97	3.49	2.62	13.42
Average eff precip, ft	0.02	0.08	0.08	0.20	0.25	0.29	0.14	1.06
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	0.17	0.28	0.28	0.10	0.02	0.00	0.00	0.85
Acres (most recent inventory)	11529							
Streamflow depletion (actual use), AF	9758							
1947 depletion, AF	10804							
Difference (actual use - 1947 depletion), TAF	-1.0							
Adjustment to Gaged Flow, Pecos River below Sumner Dam, TAF =						-1.0		
* See note on Table 12								

Table 6. Depletions Due to Santa Rosa Reservoir Operations (C.1.b)													
Water Year	2017												
8/19/2018													
	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 4,700 feet to value shown													
Lk Sumner ga ht, avg	57.64	58.86	58.85	57.90	57.20	55.48	55.22	54.47	53.14	59.01	60.20	61.49	
LS content, AF, avg	28556	31327	31107	29179	27741	24472	23924	22673	20294	31548	34287	37456	
LS area, acres, avg	2060	2204	2193	2093	2015	1840	1815	1758	1641	2215	2353	2523	
LS evap, inches	2.79	3.92	10.68	11.29	14.26	16.12	15.70	11.12	10.63	7.60	3.60	2.79	110.50
.77 LS Evap	2.15	3.02	8.22	8.69	10.98	12.41	12.09	8.56	8.19	5.85	2.77	2.15	85.09
LS Precip, inches	0.98	0.07	0.88	1.23	0.53	1.03	1.71	2.68	3.52	6.54	0.00	0.00	19.17
Net LS Evap, inches	1.17	2.95	7.34	7.46	10.45	11.38	10.38	5.88	4.67	-0.69	2.77	2.15	65.92
LSum Evaploss, TAF	0.20	0.54	1.34	1.30	1.75	1.75	1.57	0.86	0.64	-0.13	0.54	0.45	10.82
L S Rosa ga ht, avg	33.97	33.99	34.08	36.24	39.69	39.61	26.65	31.38	33.57	46.88	48.26	48.06	
LSR content, AF, avg	51364	51414	51642	57300	67119	66880	35013	45086	50359	90663	95679	94941	
LSR area, acres, avg	2525	2526	2533	2709	2981	2975	1945	2326	2492	3567	3707	3685	
LSR evap, inches	3.72	4.98	8.58	8.53	10.68	12.89	12.27	8.47	8.71	6.27	4.99	3.72	93.81
.77 LSR Evap	2.86	3.83	6.61	6.57	8.22	9.93	9.45	6.52	6.71	4.83	3.84	2.86	72.23
LSR precip, inches	2.08	0.37	0.84	0.25	1.73	0.80	1.86	3.53	4.32	3.04	0.00	0.00	18.82
Net LSR Evap, inches	0.78	3.46	5.77	6.32	6.49	9.13	7.59	2.99	2.39	1.79	3.84	2.86	53.41
LSR Evaploss, TAF	0.17	0.73	1.22	1.43	1.61	2.26	1.23	0.58	0.50	0.53	1.19	0.88	12.32
Total evaploss, TAF	0.37	1.27	2.56	2.73	3.37	4.01	2.80	1.44	1.13	0.40	1.73	1.33	23.14
Sum contents, AF	79920	82741	82749	86479	94860	91352	58937	67759	70653	122211	129966	132397	
1947 area, acres	3227	3312	3312	3423	3660	3564	2705	2926	3024	4361	4600	4600	
1947 evaploss, TAF	0.31	0.81	2.03	2.13	3.19	3.38	2.34	1.43	1.18	-0.25	1.06	0.82	18.44
current-1947evaploss	0.05	0.46	0.53	0.60	0.18	0.63	0.46	0.01	-0.04	0.65	0.67	0.51	4.70
						Annual adjustment for excess evaporation =							4.7
ADJUSTMENT FOR EXCESSIVE STORAGE IN SANTA ROSA RESERVOIR													
			2016	2016	2017	2017							
			Gage	Storage	Gage	Storage							
EndYear Sumner Sto			4256.90	27141	4262.13	39071							
EndYear S R Sto			4731.80	46070	4748.00	94720							
Sum				73211		133791							
Sto Adjustment, TAF						4.5							
Adjustm Ex Evap, TAF						4.7							
Total Adjustment,TAF						9.2							
	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	2017				
8/19/2018					
		TAF	AF/day	cfs	Totals
Pecos R bel DC		21.1	57.8	29.1	29.1
Dark Canyon		0.0	0.0	0.0	0.0
Pecos R bel Lake Avalon		0.0	0.0	0.0	0.0
Depletion, cfs					2.0
CID lag seep, cfs (from Table 8)					6.8
Return flow, cfs					1.0
Lake Av lagged seep, cfs (from Table 9)					20.1
PR seepage, cfs					3.0
Carls new water, cfs					0.22
Carls new wat, TAF					0.2
Carls new wat monthly, TAF					0.0

Table 8. Carlsbad Main Canal Seepage Lagged [B.4.c.(2)(e)]													
Water Year	2017												
5/5/2018													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
WY 2017													
CID, TAF	0	0.0	5.6	8.7	10.1	11.5	10.9	7.1	8.9	6.9	0.5	0.0	70.2
days/mo	31	28	31	30	31	30	31	31	30	31	30	31	365
cfs	0	0	90.6	146.9	164.4	194.1	176.9	115.1	149.2	112.3	8.2	0.0	96.5
cfs, qtr avg			31.2			168.4			147.0			40.5	
WY 2016		1Q	2Q	3Q	4Q								
FLOWS, cfs				127.8	50.7								
SEVEN %				8.9	3.6								
WY 2017 lagged		1Q	2Q	3Q	4Q								
FLOWS, cfs		31.2	168.4	147.0	40.5								
SEVEN %		2.2	11.8	10.3	2.8								
LAG		3.8	7.2	9.4	6.8	Avg =	6.8	cfs					

Table 9. Lake Avalon Leakage Lagged [B.4.c.(2)(g)]													
Water Year	2017												
5/5/2018													
WY 2017	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
Elev NM rept	75.2	75.8	75.3	74.3	73.9	74.3	74.6	74.6	74.7	74.1	60.4	60.0	
ga ht, avg*	18.22	18.76	18.34	17.34	16.93	17.33	17.55	17.60	17.65	17.06	3.40	3.00	
cfs	25.1	27.7	25.7	20.9	18.9	20.8	21.9	22.1	22.4	19.6	0.0	0.0	
days	31	28	31	30	31	30	31	31	30	31	30	31	365
cfs avg	26.1			20.2			22.1			6.6			18.8
WY 2016		1Q	2Q	3Q	4Q								
cfs				22.4	17.4								
WY 2016 lagged		1Q	2Q	3Q	4Q								
cfs		26.1	20.2	22.1	6.6								
lag cfs		22.6	21.7	22.1	14.0	Avg =	20.1	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	2017													
5/5/2018														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOT	
Av WS NM Rept	75.216	75.761	75.339	74.34	73.926	74.327	74.555	74.597	74.653	74.065	60.4	60		
Avalon ga ht, avg, ft*	18.216	18.761	18.339	17.34	16.926	17.327	17.555	17.60	17.653	17.065	3.40	3.00		
Avg area Avalon, ac**	805	826	810	725	680	724	748	753	759	695	0	0		.
Panevap Brantley, in.	3.89	6.472	9.56	11.85	14.21	15.04	13.92	9.78	10.14	6.86	5.7822	4.5601	112.06	
Lakeevap Brantley, in.	3.00	4.98	7.36	9.12	10.94	11.58	10.72	7.53	7.81	5.28	4.45	3.51	86.29	
Precip Brantley, in.	1.02	0.13	0.03	1.97	0.74	1.67	2.38	3.37	1.41	0.42	0.4	0.25	13.79	
Netevap, inches	1.98	4.85	7.33	7.15	10.20	9.91	8.34	4.16	6.40	4.86	4.05	3.26	72.50	
Evaploss Av, TAF	0.13	0.33	0.49	0.43	0.58	0.60	0.52	0.26	0.40	0.28	0.00	0.00	4.04	
* 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	2017													
5/5/2018														
	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
	2016	2017												
WS NM Rept	74.8	76.6	75.8	74.0	74.0	73.1	75.0	74.0	74.5	75.0	72.4	60.0	60.0	
Gage EOM, ft*	17.8	19.6	18.8	17.0	17.0	16.1	18.0	17.0	17.5	18.0	15.4	3.0	3.0	
Storage, AF**	2300.0	3788.0	3107.0	1715.0	1715.0	1143.0	2457.0	1715.0	2073.0	2457.0	757.0	0.0	0.0	
Change sto, TAF		1.5	-0.7	-1.4	0.0	-0.6	1.3	-0.7	0.4	0.4	-1.7	-0.8	0.0	-2.3
* 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 2017													
8/19/2018	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
.													
STREAMFLOW GAGING RECORDS, TAF													
Pecos R b Sumner Dam	1.5	1.1	5.3	6.2	6.1	38.4	15.7	5.5	5.5	3.3	0.2	0.9	89.7
Fort Sumner Main C	0.0	0.0	4.2	4.9	4.5	5.8	5.4	4.2	4.7	2.6	0.0	0.0	36.4
Pecos R nr Artesia	4.0	3.7	3.9	2.7	2.5	11.9	19.9	13.2	7.3	21.0	6.1	4.7	101.0
Rio Penasco at Dayton	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
Fourmile Draw nr Lakewood	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
South Seven Rivers nr Lkwd	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Rocky Arroyo at Hwy Br nr	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Pecos R at Dam Site 3	1.5	1.2	5.3	10.2	10.8	14.3	11.4	7.5	9.5	5.0	0.0	0.0	76.6
Pecos bel Avalon Dam	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
Carlsbad Main Canal	0.0	0.0	5.6	8.7	10.1	11.5	10.9	7.1	8.9	6.9	0.5	0.0	70.2
Dark Canyon at Carlsbad	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
Pecos below Dark Canyon	2.0	1.7	1.9	1.8	1.9	1.8	1.6	1.9	1.8	1.8	1.6	1.5	21.1
Pecos R at Red Bluff	4.8	3.7	3.7	3.5	3.8	3.4	3.3	4.5	4.3	4.0	4.1	4.0	46.9
Delaware R nr Red Bluff	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.4	1.8	0.2	0.1	0.2	3.3
GAGE HEIGHTS													
Avalon gage ht, end mo	76.6	75.8	74.0	74.0	73.1	75.0	74.0	74.5	75.0	72.4	60.0	60.0	
Avalon gage ht, avg	75.2	75.8	75.3	74.3	73.9	74.3	74.6	74.6	74.7	74.1	60.4	60.0	
Sumner Lake ga ht, end mo	58.3	59.3	58.5	57.1	56.4	55.9	54.6	54.0	53.0	59.5	60.8	62.1	
Sumner Lake gage ht, avg	57.6	58.9	58.8	57.9	57.2	55.5	55.2	54.5	53.1	59.0	60.2	61.5	
Lake S Rosa ga ht, end mo	34.0	33.9	35.1	37.8	41.4	30.2	26.4	33.4	37.9	48.4	48.1	48.0	
Lake S Rosa ga ht, avg	34.0	34.0	34.1	36.2	39.7	39.6	26.6	31.4	33.6	46.9	48.3	48.1	
PRECIPITATION, INCHES													
Brantley Lake	1.02	0.13	0.03	1.97	0.74	1.67	2.38	3.37	1.41	0.42	0.40	0.25	13.79
Las Vegas FAA AP	1.73	0.37	0.18	0.66	1.44	2.21	3.00	6.30	6.28	0.75	0.26	0.01	23.19
Pecos National Monument	1.42	0.29	1.20	0.00	0.00	0.00	3.39	2.16	3.37	1.66	0.15	0.00	13.64
Santa Rosa	2.08	0.37	0.84	0.25	1.73	0.80	1.86	3.53	4.32	3.04	0.00	0.00	18.82
Lake Santa Rosa	2.08	0.37	0.84	0.25	1.73	0.80	1.86	3.53	4.32	3.04	0.00	0.00	18.82
Sumner Lake	0.98	0.07	0.88	1.23	0.53	1.03	1.71	2.68	3.52	6.54	0.00	0.00	19.17
PAN EVAPORATION, INCHES													
Lake Santa Rosa	3.7	5.0	8.6	8.5	10.7	12.9	12.3	8.5	8.7	6.3	5.0	3.7	93.8
Lake Sumner	2.8	3.9	10.7	11.3	14.3	16.1	15.7	11.1	10.6	7.6	3.6	2.8	110.5
Brantley Lake	3.9	6.5	9.6	11.9	14.2	15.0	13.9	9.8	10.1	6.9	5.8	4.6	112.1
OTHER REPORTS													
Base Acme-Art, TAF (USGS)	1.2	1.9	2.0	0.7	0.6	0.0	0.0	0.2	0.7	1.5	2.1	2.0	12.9
Pump depl Ac-Artesia, TAF	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.4
Pumping, C-2713, Malaga B													0.4
NM irrig inv, acres (3/9/2000)													11529
NM Transfer water use, TAF													
NM salvaged water, TAF													0.00
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 A

RESPONSE TO STATES' OBJECTIONS

RESPONSE TO STATES' OBJECTIONS

Final Report, Accounting Year 2018

NEW MEXICO OBJECTIONS

I. WY 2017 Accounting, Accumulated Overage, and Omission of Evaporative Losses from Water Stored at Texas' Request in 2014 and 2015

This objection concerns the unappropriated flood flow issue, which has been the subject of communications, meetings and negotiations between the States since late 2014. New Mexico filed a Motion to address this issue, and it has been addressed through the Modification Determination of that process.

II. USGS Dark Canyon at Carlsbad Gage Data Adjustment for WY 2014

NM explained the status of the correction needed for USGS Dark Canyon at Carlsbad gage adjustment for WY 2014. The States have subsequently submitted a Joint Motion to address this issue for WY 2014 and it has been incorporated retroactively in the revised Final Reports for Water Years 2014, 2015 and 2016.

III. Updated 2017 USACE Santa Rosa Reservoir Area Capacity Table

NM provided the updated USACE Santa Rosa Reservoir tables and stated that it should be used in WY 2017 accounting. The River Master did not have the table for the Preliminary Report, and has used it for this Final Report for Water Year 2017.

IV. Table 6. Depletions Due to Santa Rosa Reservoir Operations (C.1.b)

NM objected to the omission of the required storage adjustment in Table 6. This objection is accepted and the omission has been corrected.

V. Response to River Master Request for Information Regarding Avalon Reservoir Operations in November 2017.

This issue requires no adjustment in the water accounting, and a discussion of it is included in Appendix B of this Final Report.

VI. Table 12. Data Required for River Master Calculations

New Mexico noted that legacy notes were left on the table, and they have been removed.

TEXAS OBJECTIONS

1. Table 4. Summary Table for Computations, Carlsbad to State Line [B.5]:

Texas objected in the omission of a flood period on the Delaware River. Section B.5.b. of the River Master's Manual (Flood Inflow, Delaware River) states: "Use the daily records furnished by the USGS for the gaging station, Delaware River near Red Bluff,

N.M. and select flood inflows by inspection of daily data." This objection is accepted. The additional flood inflow is small but recognizable. TX computation of 2.043 TAF is accepted.

2. Table 7. Carlsbad Springs New Water [B.4.c(2)], TAF for WY 2017

Texas noted that the calculation was done for a 366-day year. The objection is accepted and the change has been made.

3. Table 3. Flood Inflows, Artesia to Carlsbad [B.4], TAF for WY 2017

Table 3 has been updated.

4. Table 6. Depletions due to Santa Rosa Reservoir Operations [C.1.b].
Texas noted the same problem with Table 6 as in New Mexico's objection IV. The objection is accepted, and the change has been made. However, Texas' computation is based on the outdated Santa Rosa elevation-capacity table, and the computation for the correction in this Final Report uses the 2017 table recently provided by New Mexico.

5. Table 1. General Calculation of Annual Departures [B.1] in TAF for WY 2017:
The final departure has been modified. It is different from Texas' computation due to the issue noted above about Table 6.

FINAL CALCULATED DEPARTURE

The Preliminary Report had a Final Calculated Departure as an overage of 20.8 TAF. After considering the states' objections, the Final Determination is an overage of 19.9 TAF.

APPENDIX B

COMMENTS ABOUT AVALON RESERVOIR DRAINAGE OCTOBER-NOVEMBER 2018

Maintenance of Avalon Reservoir November 2017 to February 2018

Background

In the Preliminary Report for AY 2018, the River Master asked New Mexico to report about whether Avalon releases into the main canal instead of into the Pecos River affected quantities of state-line delivery water. New Mexico had explained earlier (April 24, 2018 email) that from November 2017 through February 2018 the Carlsbad Irrigation District (CID) drained Avalon for maintenance by releasing water into their main canal.

New Mexico's explanation

New Mexico replied along with her objections to the Preliminary Report that CID drained Avalon Reservoir through reservoir releases for irrigation during October 2017 and after November 1 the remaining 553 acre-feet were released by November 12 through the CID Main Canal, to be delivered downstream.

NM reported that these releases from the Main Canal to the Pecos occur through CID's Black River Supply Ditch which empties into the Black River between two USGS gages (Black River above Malaga (8405500) and Black River at Malaga (8406000)). The Black River itself discharges to the Pecos River below the USGS Pecos River below Dark Canyon at Carlsbad (8405200) gage and is not captured as inflow on Table 3 of the Pecos River Final Report.

According to NM, no adjustment is needed for the October 2017 releases as they were used for irrigation and CID irrigation water is accounted for in Table 3. November releases of 486.9 AF (USGS gaged value for November) were not for irrigation but were released back to the river. Although they did not flow through the Carlsbad below Dark Canyon gage, they were still accounted as outflow in Table 3, so the result is the same. However, they might not require the 7-percent adjustment that irrigation water receives (although losses are unknown). In any event, NM concluded that 7-percent of 486.9 AF or 34 AF is *de minimis* and does not require any change in Table 3.

Texas' analysis and reply

Texas provided an analysis to consider the effects on changed delivery through the CID Main Canal instead of directly to the Pecos River. This analysis discusses how the changed route of discharge will affect Carlsbad Springs New Water and how changes in Avalon operations also affect changes in lake storage, evaporation and leakage, as well as CID canal flows and seepage. Texas provided a spreadsheet with the results of her computations.

River Master's analysis

The River Master agrees with New Mexico that the change in route of flow for delivery water of only 486.9 AF results in a *de minimis* effect on water delivery. Texas' identification of the effect on Carlsbad Springs New Water is relevant, although we lack an agreed-upon mechanism to quantify this effect. The effects on Avalon storage and evaporation have been considered in the accounting already. New Mexico operates Avalon Reservoir for its own benefit and is not liable for storage and

evaporation changes due to its decisions about operations because they will be accounted under the Rover Master's Manual. Texas' identification of issues with Carlsbad Main Canal seepage and Avalon seepage are relevant, and a change in the route of state-line delivery water will affect their computation. However, as New Mexico has accounted for most of the Avalon release as irrigation water and only 486.9 AF was delivery water, it is apparent that any changes in computation of canal or reservoir seepage will also be *de minimis*.

If for any reason a more significant change in Avalon operations occurred, the observations that resulted from this query would require additional study to determine if adjustments to water accounting will be required. Per the *de minimis* changes described above, no adjustments to the WY 2017 Preliminary Report accounting is required for the November flows described.

APPENDIX **C**

SUMMARY OF REVISIONS
WATER YEARS
2014, 2015, 2016

Summary of revisions for Water Years 2014, 2015, 2016

August 18, 2018

Final Reports for Water Years 2014, 2015, and 2016 have been revised in response to:

- Joint Motion Requesting Review of the River Master's Final Determination for Water Years 2014, 2015, and 2016
- New Mexico's Motion to Reconcile and Account for Texas Water Stored in New Mexico During Water Years 2014 and 2015

The Joint Motion provides revised Dark Canyon Draw flows for September 18-30, 2014 and a revised Table 4 for utilization in the Final Reports for Water Years 2014, 2015, and 2016. These have been incorporated in the revised Table 4 for Water Year 2014 and the revised Table 1 for the three water years (attached).

Water Year 2015 accounting is affected by adjustments for evaporation credits to New Mexico for storage of Texas water. The procedure is explained in the Modification Determination for New Mexico's Motion to Reconcile and Account for Texas Water Stored in New Mexico During Water Years 2014 and 2015. The adjustment has been incorporated into Table 1 for Water Year 2015.

A summary of the revisions is provided in this table:

WY	AY	Original Final Report, TAF	Revised Final Report, TAF	Revisions
2014	2015	1.9	0.7	Revised 2014 DCD gage record
2015	2016	11.9	27.3	Revised 2014 DCD gage record and one-time credit for evaporation loss
2016	2017	28.4	27.2	Revised 2014 DCD gage record

Pecos River Compact		
Accumulated Shortfall or Overage (revised)		
	August 18, 2018	
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

Table 1. General Calculation of Annual Departures in TAF (B.1)			
Water Year	2014		
8/18/2018			
	WY 2012	WY 2013	WY 2014
B.1.a. Index Inflows			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	64.9	63.6	120.6
(b) Flood Inflow Alamogordo - Artesia (Table 2)	-17.2	54.4	57.3
(c) Flood Inflow Artesia - Carlsbad (Table 3)	11.2	39.9	42.5
(d) Flood Inflow Carlsbad - State Line (Table 4)	3.2	23.2	128.3
Total (annual flood inflow)	62.1	181.1	348.7
(2) Index Inflow (3-year avg)			197.3
B.1.b. 1947 Condition Delivery Obligation			90.5
(Index Outflow)			
B.1.c. Average Historical (Gaged) Outflow			
(1) Annual historical outflow			
(a) Gaged Flow Pecos River at Red Bluff NM	17.7	51.0	146.6
(b) Gaged Flow Delaware River nr Red Bluff NM	1.7	12.2	48.3
(c) Metered diversions Permit 3254 into C-2713	0.0	0.2	0.2
Total Annual Historical Outflow	19.4	63.4	195.1
(2) Average Historical Outflow (3-yr average)			92.6
B.1.d. Annual Departure			2.2
C. Adjustments to Computed Departure			
1. Adjustments for Depletions above Alam Dam			
a. Depletions Due to Irrigation (Table 5)	3.2	2	-0.2
b. Depl fr Operation of Santa Rosa Reservoir (Table 6)	1.0	8.6	-1.7
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	69.1	74.2	118.7
(b) Flood Inflow Alamogordo - Artesia	-17.2	54.4	57.3
(c) Flood Inflow Artesia - Carlsbad	11.2	39.9	42.5
(d) Flood Inflow Carlsbad - State Line	3.2	23.2	128.3
Total (annual flood inflow)	66.3	191.7	346.8
Recomputed Index Inflow (3-year avg)			201.6
Recomputed 1947 Condition Del Outflow			93.3
(Index Outflow)			
Recomputed Annual Departures			-0.6
Credits to New Mexico			
C.2 Depletions Due to McMillan Dike			1.4
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			0.7

Table 1. General Calculation of Annual Departures in TAF (B.1)			
Water Year	2015		
8/18/2018			
	WY 2013	WY 2014	WY 2015
B.1.a. Index Inflows			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	63.6	120.6	100.7
(b) Flood Inflow Alamogordo - Artesia (Table 2)	54.4	57.3	28.5
(c) Flood Inflow Artesia - Carlsbad (Table 3)	39.9	42.5	3.2
(d) Flood Inflow Carlsbad - State Line (Table 4)	23.2	128.3	6.2
Total (annual flood inflow)	181.1	348.7	138.6
(2) Index Inflow (3-year avg)			222.8
B.1.b. 1947 Condition Delivery Obligation			107.5
(Index Outflow)			
B.1.c. Average Historical (Gaged) Outflow			
(1) Annual historical outflow			
(a) Gaged Flow Pecos River at Red Bluff NM	51.0	146.6	101.1
(b) Gaged Flow Delaware River nr Red Bluff NM	12.2	48.3	5.4
(c) Metered diversions Permit 3254 into C-2713	0.2	0.2	0.2
Total Annual Historical Outflow	63.4	195.1	106.7
(2) Average Historical Outflow (3-yr average)			121.7
B.1.d. Annual Departure			14.2
C. Adjustments to Computed Departure			
1. Adjustments for Depletions above Alam Dam			
a. Depletions Due to Irrigation (Table 5)	2.0	-0.2	-3.2
b. Depl fr Operation of Santa Rosa Reservoir (Table 6)	8.6	-1.7	16.7
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	74.2	118.7	114.2
(b) Flood Inflow Alamogordo - Artesia	54.4	57.3	28.5
(c) Flood Inflow Artesia - Carlsbad	39.9	42.5	3.2
(d) Flood Inflow Carlsbad - State Line	23.2	128.3	6.2
Total (annual flood inflow)	191.7	346.8	152.1
Recomputed Index Inflow (3-year avg)			230.2
Recomputed 1947 Condition Del Outflow			112.7
(Index Outflow)			
Recomputed Annual Departures			9.1
Credits to New Mexico			
C.2 Depletions Due to McMillan Dike			1.6
C.3 Salvage Water Analysis			0
C.4 Unappropriated Flood Waters			0
C.5 Texas Water Stored in NM Reservoirs			16.6
C.6 Beneficial C.U. Delaware River Water			0
Final Calculated Departure, TAF			27.3

Table 1. General Calculation of Annual Departures in TAF (B.1)			
Water Year	2016		
8/18/2018			
	WY 2014	WY 2015	WY 2016
B.1.a. Index Inflows			
(1) Annual flood inflow			
(a) Gaged flow Pecos R bel Alamogordo Dam	120.6	100.7	128.6
(b) Flood Inflow Alamogordo - Artesia (Table 2)	57.3	28.5	-2.6
(c) Flood Inflow Artesia - Carlsbad (Table 3)	42.5	3.2	15.3
(d) Flood Inflow Carlsbad - State Line (Table 4)	128.3	6.2	9.5
Total (annual flood inflow)	348.7	138.6	150.8
(2) Index Inflow (3-year avg)			212.7
B.1.b. 1947 Condition Delivery Obligation			100.7
(Index Outflow)			
B.1.c. Average Historical (Gaged) Outflow			
(1) Annual historical outflow			
(a) Gaged Flow Pecos River at Red Bluff NM	146.6	101.1	75.4
(b) Gaged Flow Delaware River nr Red Bluff NM	48.3	5.4	6.2
(c) Metered diversions Permit 3254 into C-2713	0.2	0.2	0.2
Total Annual Historical Outflow	195.1	106.7	81.8
(2) Average Historical Outflow (3-yr average)			127.9
B.1.d. Annual Departure			27.2
C. Adjustments to Computed Departure			
1. Adjustments for Depletions above Alam Dam			
a. Depletions Due to Irrigation (Table 5)	-0.2	-3.2	1.3
b. Depl fr Operation of Santa Rosa Reservoir (Table 6)	-1.7	16.7	-6.3
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	118.7	114.2	123.6
(b) Flood Inflow Alamogordo - Artesia	57.3	28.5	-2.6
(c) Flood Inflow Artesia - Carlsbad	42.5	3.2	15.3
(d) Flood Inflow Carlsbad - State Line	128.3	6.2	9.5
Total (annual flood inflow)	346.8	152.1	145.8
Recomputed Index Inflow (3-year avg)			214.9
Recomputed 1947 Condition Del Outflow			102.2
(Index Outflow)			
Recomputed Annual Departures			25.7
Credits to New Mexico			
C.2 Depletions Due to McMillan Dike			1.5
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			27.2

Table 4. Summary Table for Computations, Carlsbad to State Line (B.5)							
Water Year	2014						
8/18/2018							
	BCB - RB	BCB - RB*	Del R***	DC			
	RM	USGS	USGS				
Jan	0.0	0.0	0.0	0.0			
Feb	0.0	0.2	0.0	0.0			
Mar	0.0	0.2	0.0	0.0			
Apr	0.2	0.7	0.0	0.0			
May	0.2	0.1	0.0	0.0			
Jun	0.2	0.2	0.0	0.0			
Jul**	0.1	0.3	0.1	0.0			
Aug	0.2	0.0	0.0	0.0			
Sep**	79.7	59.6	46.3	0.0			
Oct	0.8	1.0	0.0	0.0			
Nov	0.3	0.8	0.0	0.0			
Dec	0.0	0.2	0.0	0.0			
Total	81.9	63.2	46.4	0.0			
Summary of flood inflows, Carlsbad to State Line, TAF							
Red Bluff - Carlsbad + Dark C RM calcs)					81.9		
Delaware River (USGS Computation)					46.4		
Total Flood Inflow, Carlsbad to State Line					128.3		
* USGS calculations BCB-RB for comparison only. Negative FIF reports not included.							
** See separate calculation for BCB to RB in the Preliminary Report							
*** As corrected, see Response to Objections.							

How to record New Mexico's evaporation credit?

The accounting for New Mexico's evaporation credit is retroactive, and how to record the credit must be determined. The River Master's Manual at C.5 addresses the issue of stored Texas water:

5. Texas Water Stored in New Mexico Reservoirs

   If a quantity of the Texas allocation is stored in facilities constructed in New Mexico at the request of Texas, then to the extent not inconsistent with the conditions imposed pursuant to Article IV(e) of the Compact, this quantity will be reduced by the amount of reservoir losses attributable to its storage, and, when released for delivery to Texas, the quantity released less channel losses is to be delivered by New Mexico at the New Mexico–Texas state line.

This general instruction applies to the water storage situation in Water Years 2014 and 2015 but does not specify when and how to account for the released water.

The credit can be entered in either of two ways:

- The gaged flows for the actual time of the releases could be modified, which would change Table 3 and Table 1. In that way, the assumption would be that New Mexico would have been entitled to deliver the water if it had not been evaporated at the same time that it delivered the remaining stored water. This approach would spread the credit over three water years due to the three-year averaging.
- The credit could be entered for item C.5 on Table 1, which is Texas Water Stored in New Mexico Reservoirs. This would apply all of the credit in one year and it would not be spread over the three-years by averaging.

If New Mexico was close to a shortfall situation as described in the Amended Decree, it would matter which approach is taken because the three-year averaging approach might trigger the actions required in Section II.A.2 of the Decree, which outlines requirements for a delivery plan. However, New Mexico has an accumulated overage and neither approach creates an advantage to either state. The second approach, to enter the credit at item C.5 on Table 1, offers more simplicity and was selected by the River Master.