

No. 141, Original

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In the

SUPREME COURT OF THE UNITED STATES

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STATE OF TEXAS,

Plaintiff,

v.

STATE OF NEW MEXICO and

STATE OF COLORADO,

Defendants.

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OFFICE OF THE SPECIAL MASTER

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SECOND DECLARATION OF GREGORY K. SULLIVAN, P.E.

IN SUPPORT OF JOINT MOTION OF THE STATE OF TEXAS,  
STATE OF NEW MEXICO, AND STATE OF COLORADO FOR ENTRY OF  
CONSENT DECREE SUPPORTING THE RIO GRANDE COMPACT

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February 3, 2023

I, Gregory K. Sullivan, P.E., hereby declare as follows:

1. I am over 18 years of age and have personal knowledge of the information stated herein.
2. I am a disclosed expert in this case.
3. My experience, work history and qualifications are set out in my November 14, 2022 declaration at Docket No. 720 (“November Declaration”).
4. I have reviewed the Supreme Court’s 2018 decision in this case and the Special Master’s Order of May 21, 2021.
5. I have reviewed the Consent Decree Supporting the Rio Grande Compact (“Consent Decree”), the Memorandum of Points and Authorities In Support of the Joint Motion of the States of Texas, State of New Mexico, and State of Colorado to Enter Consent Decree Supporting the Rio Grande Compact, and the supporting declarations of representatives and experts for the States submitted on November 14, 2022.
6. I have reviewed the United States’ Memorandum in Opposition to Compacting States’ Joint Motion to Enter Consent Decree and associated declarations filed by Dr. Allie W. Blair, Michelle Estrada-Lopez, William Finn, Dr. Ian Ferguson, Dr. J. Phillip King, and David Palumbo.
7. I have been asked to provide a declaration stating my opinions regarding conditions prior to and subsequent to the signing of the Rio Grande Compact (“Compact”) in 1938, including conditions during the D2 Period (1951-1978) on which the proposed settlement is based, development of groundwater pumping as a supplemental supply, and how the settlement resulted from substantial compromises by New Mexico and Texas. In addition, I have been asked to reply to certain statements in the U.S. response brief and associated declarations. My opinions are supported in part by analyses performed using New Mexico’s Integrated Lower Rio Grande Model (“ILRGM”).

**Historical Water Supply Conditions and Project Deliveries**

8. In paragraphs 13-20 of his Declaration, Dr. Ferguson compares hydrologic conditions in the Lower Rio Grande basin during the 1930s when the Compact was being negotiated to

conditions during the 1951-1978 D2 Period. I generally agree with his conclusion that the D2 period was drier than the 1930s. This is consistent with information that I presented in the 2019 SWE Expert Report in Figure 5-1 attached hereto as declaration **Figure 1**.

9. Importantly, droughts during D2 period were more severe than during (and prior to) the 1930s as shown in the following table summarizing inflows to Elephant Butte Reservoir at the San Marcial Gage.

	San Marcial Gage Flows (AF)		
	Average	% of Time 3-YR Avg<790,000 AF	Min 3-YR Avg
1890-1937	1,131,000	20%	441,000
1951-1978	568,000	89%	205,000

Project storage was sufficient to regulate inflows and deliver Project supplies to meet irrigation demands through the signing and enactment of the Compact. However, the more severe drought conditions in the 1950s, 1960s, and 1970s showed that Project storage was inadequate, prompting farmers to drill supplemental irrigation wells, a practice encouraged by Reclamation.

10. Development of the Rio Grande Project continued after the Compact was signed in 1938 with further development of Project lands in both Districts, changes in crops, changes in irrigation practices, and changes in infrastructure. The concept of a static 1938 Condition is incongruent with the continued Project development after 1938.

**Development of Pumping as Supplemental Supply**

11. Development of supplemental pumping in New Mexico and Texas was a rational response to periodic droughts during the D2 period that exhausted Project storage and resulted in substantial reductions in Project water allocations and deliveries. Advances in well construction and pump technology during the 1940s and 1950s made development and use of groundwater practical and affordable, and conjunctive use of groundwater to supplement surface water supplies became widespread throughout the western United States. Reclamation recognized the utility of groundwater as a supplemental supply during drought periods and advocated for its use in Project bulletins during years with low Project water allocations. (Barroll 2020).

12. The benefit of groundwater use in New Mexico and Texas under the Rio Grande Project is obvious in the annual bar graphs of historical Project water deliveries and estimated supplemental pumping summarized in Figure 5-15 of the SWE Expert Report (SWE 2020), attached hereto as declaration **Figure 2**. The graphs from the SWE expert report show the historical annual farm headgate deliveries of Project water and computing supplemental pumping to meet crop water demands in both EBID and EPCWID. Due to very low deliveries of Project surface water to the Districts during droughts in the 1950s, 1960s, and 1970s, supplemental pumping was instrumental in the continued successful operation of the Rio Grande Project.
13. Prior to enactment of the 2008 Operating Agreement (“2008 OA”), return flows and ground water levels largely recovered between periods of drought and increased pumping. This is seen in the simulated changes in Rincon-Mesilla alluvial groundwater storage in the historical operations run of New Mexico’s ILRGM plotted in **Figure 3** along with the total annual Rincon-Mesilla pumping. This shows that the alluvial groundwater pumping was generally sustainable during the D2 Period and provided a valuable supplemental water supply in both New Mexico and Texas that filled in gaps in the erratic surface water supply provided by the Project.
14. In paragraphs 23-25 of his Declaration, Dr. Ferguson claims there were “significant” increases in groundwater pumping outside of EBID during the D2 Period. However, the referenced increases consisted of an average of 14,800 AF/y of non-EBID irrigation pumping and 20,000 AF/y of DDMI pumping by the end of the D2 period. Assuming 70% of the irrigation pumping and 67% of the DDMI pumping was consumed during the D2 period, the total consumptive use resulting from the non-EBID pumping would be approximately 23,800 AF/y. This represents approximately 3.0% of the normal annual release from Project storage of 790,000 AF. The non-EBID pumping in New Mexico during the D2 Period was much smaller than the irrigation pumping within EBID that averaged approximately 152,000 AF/y.
15. In paragraphs 29-31 of his Declaration, Dr. Ferguson refers to results from New Mexico’s ILRGM simulations of the impacts of New Mexico pumping on EBID and EPCWID diversions, and on flows at the El Paso gage. He states that without New Mexico pumping,

EBID diversions would have increased by 14%, EPCWID diversions would have increased by 14% (this should be 13%<sup>1</sup>), and El Paso gage flows would have increased by 25%. However, the consequences of no New Mexico pumping (and no Texas pumping) during the D2 period would have been devastating to the farmers. **Figure 4** shows the simulated annual farm headgate deliveries of Project water to EBID without New Mexico pumping in acre-feet and in acre-feet per authorized acre during 1951 – 1978. The results show that annual farm headgate deliveries of surface water would have averaged only 0.7 AF/ac during 1954 – 1957. Therefore, while EBID (and EPCWID) farmers would have received modest increases in surface water deliveries without pumping, the total irrigation supply would have been much less without irrigation pumping. This further illustrates the benefits that conjunctive use of groundwater and surface water had on Project operations during the D2 period.

16. In paragraph 28 of his Declaration, Dr. Phil King describes claims that allocation transfers from EBID to EPCWID triggered by exceedance of accrued departure limits could cause EBID to fail. This is hyperbole. As stated in Dr. Barroll’s declaration, annual transfers from EBID to EPCWID could approach roughly 30,000 AF/y under extreme conditions (Barroll Decl. ¶ 21). Assuming a typical conveyance loss of approximately 50 percent in the EBID facilities, the allocation transfer would result in an annual reduction in EBID farm headgate deliveries of approximately 15,000 AF. This represents approximately two inches of irrigation supply spread across EBID’s 88,000 authorized acres. It is inconceivable that the loss of two inches of surface water supply would cause EBID to fail, particularly because EBID farmers could either pump groundwater to make up for the loss of surface water or adjust their irrigation practices (e.g., modify planting decisions, deficit irrigate, etc.). As described above, the complete curtailment of irrigation pumping during drought periods would be far more devastating to EBID farmers than occasional allocation transfers.

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<sup>1</sup> Dr. Ferguson incorrectly computed EBID and EPCWID diversions in Run 1 (Historical Base Run) and Run 3 (No New Mexico Pumping). The tabulated EBID diversions were not reduced for El Paso Valley carriage water or deliveries to EPCWID in the Texas Mesilla. The tabulated EPCWID diversions incorrectly double count El Paso carriage water through the Eastside canal, omit delivery of Project surface water to El Paso Water, and fail to subtract Ascarate Wasteway flows that are later counted as deliveries at the Riverside Canal gage.

17. It is ironic that Dr. Ferguson complains about the impact of New Mexico pumping on Project supply given Reclamation's advocacy for development of groundwater pumping to deal with shortages in Project water deliveries during drought periods and development of the D1/D2 procedure for determining Project water allocations to the Districts and the 1906 Treaty allocation to Mexico. Reclamation's D1/D2 procedure essentially grandfathered the effect of all pumping in the Project area during 1951-1978 in the Project allocation procedure. Historical operations during the D2 Period were further embraced by Reclamation and the Districts in development and implementation of the 2008 OA.
18. In paragraph 33 of his Declaration, Dr. Ferguson cites to New Mexico modeling that shows without New Mexico pumping, annual total combined diversions of Project water by the Districts during 1979 – 2002 would have increased by an average of 13,154 AF (7,817 AF<sup>2</sup>). This represents an average increase of only 1.0% in combined diversions. The increase is relatively small because EBID and EPCWID had generally full allocations of Project water during 1979-2002.
19. In paragraph 38 of his Declaration, Dr. Ferguson asserts that since 2003 persistent dry conditions similar to or worse than the D2 Period combined with non-EBID pumping that is above the D2 Period amounts continues to reduce the Project diversions to EBID and EPCWID and flows at the El Paso gage. Consistent with the proposed settlement that is based on conditions during the D2 Period, New Mexico is committed to assuring compliance with the Consent Decree, including enactment of actions to reduce New Mexico's groundwater depletions to the level that existed during the D2 Period. (Hammon Decl. at ¶ 9).
20. At page 8, the U.S. Response Brief cites to a statement made by New Mexico counsel during oral argument that New Mexico groundwater pumping reduced Project water available to Texas during two water short years in 2003 and 2004 by 105,000 AF. However, what the U.S. brief ignores is that the impacts from enactment of the 2008 OA on deliveries to EBID were far greater. As described in the 2020 SWE Rebuttal Report, the 2008 OA reduced EBID's diversions below New Mexico's 57% apportionment by a

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<sup>2</sup> Dr. Ferguson incorrectly computed EBID and EPCWID diversions. The corrected combined diversions are shown in the parenthetical following the original number.

total of 1,130,000 acre-feet during 2006 - 2017. The proposed Index Methodology in the Consent Decree along with New Mexico administrative tools and actions to manage the impacts of pumping will provide an effective mechanism to deliver and maintain the 57/43 apportionments of New Mexico and Texas below Elephant Butte Reservoir consistent with conditions and operations during the D2 Period.

21. At pages 8-9 of the U.S. Response Brief, the 2008 OA is described as causing EBID to forego some of its D2 allocation to preserve EPCWID's D2 allocation. While the 2008 OA does preserve EPCWID's D2 allocation, it does so at significant cost to the overall Project operating efficiency. Prior to the implementation of the 2008 OA, Project water was allocated 57/43 between EBID and EPCWID under the D1/D2 allocation procedure. The 57/43 allocation provided an equal allocation of water per acre throughout the Project area resulting in substantial irrigation return flows from EBID that added to the supply of water available for delivery to EPWCID. The reuse of return flows that was key to the efficient operation of the Project was gutted by enactment of the 2008 OA which severely reduced deliveries of Project water to EBID resulting in increased EBID pumping and decreased EBID return flows.

### **Compromises by New Mexico and Texas**

22. The settlement outlined in the Consent Decree results in significant compromises and concessions by New Mexico relative to its claims against Texas and by Texas relative to its claims against New Mexico. The New Mexico concessions included i) agreeing to the Index Methodology which provides Texas more certainty as to the delivery of its apportionment, ii) allowing carryover of Project supplies, iii) allowing Texas groundwater pumping in the El Paso Valley, iv) allowing changes in infrastructure in the El Paso Valley, v) allowing the reduction in reuse of return flows within EPCWID, and vi) not requiring metering and administration of EPCWID pumping. Texas concessions included i) allowing New Mexico pumping at the D2 level, ii) additional limitations on carryover of unused Project allocation, and iii) consolidation of the Project delivery points in the El Paso Valley at the El Paso gage which simplifies accounting and eliminates accounting credits favorable to Texas.

23. In paragraph 20 of his Declaration, Dr. Allie Blair, consultant for EPCWID, asserts that under the proposed settlement EPCWID will be allocated more water in wet years when supply is greater than demand and less water in dry years when demand is greater than supply. It appears that Dr. Blair is referring to the effect of changing the procedure for allocating Project water to EPCWID from a 1-year D2 equation (based on available water in Project storage in the current year) to a 2-year D2 equation (based on current year supply and releases from Project storage in the prior year). Comparison of the results from the equations shows that the 2-year D2 equation is much better than the 1-year D2 equation in matching the historical Project water delivery data during the D2 period. Further, while the change to the 2-year D2 equation will increase allocations in some years and decrease allocations in other years, the average allocations over time will be consistent. Finally, EPCWID's carryover storage will buffer the impact of the minor temporal shifts in annual EPCWID allocations.

24. In conclusion, the settlement that is reflected in the Consent Decree reflects substantial concessions given by both States. The terms of the Consent Decree are based on conditions during the D2 Period in which supplemental pumping was needed and encouraged by Reclamation to ensure the continued successful operation of the Project.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed this 3rd day of February 2022, at Sarasota, Florida.



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Gregory K. Sullivan, P.E.

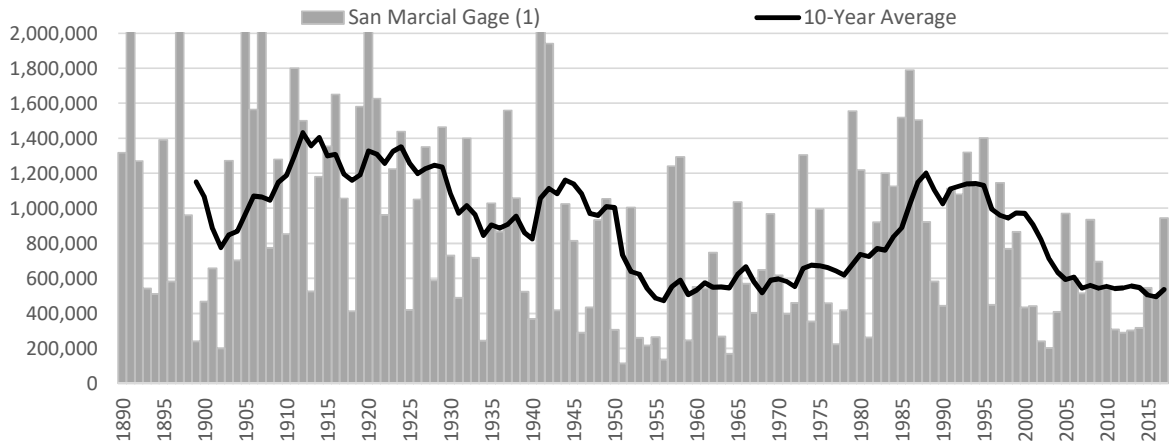


Declaration Figure 1

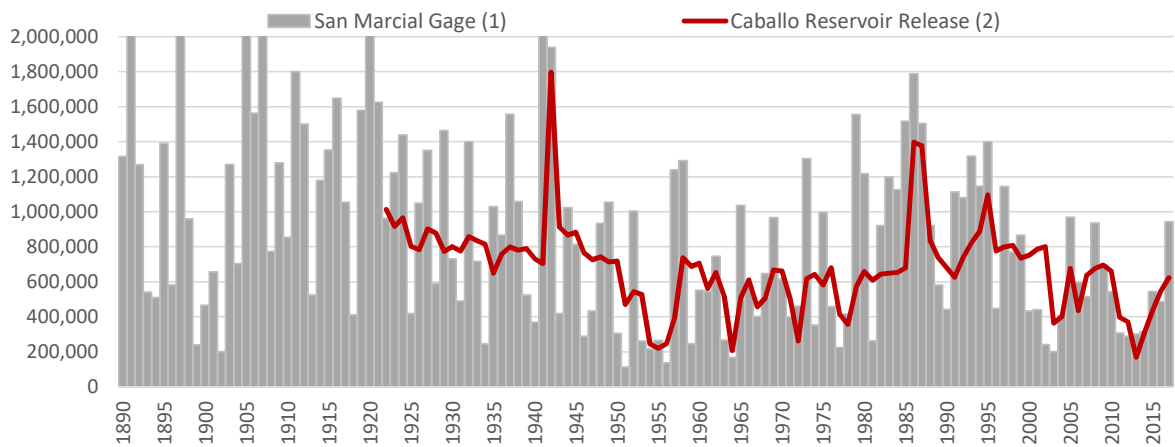
Figure 5-1

Annual Rio Grande Flows  
1890 - 2017  
(acre-feet)

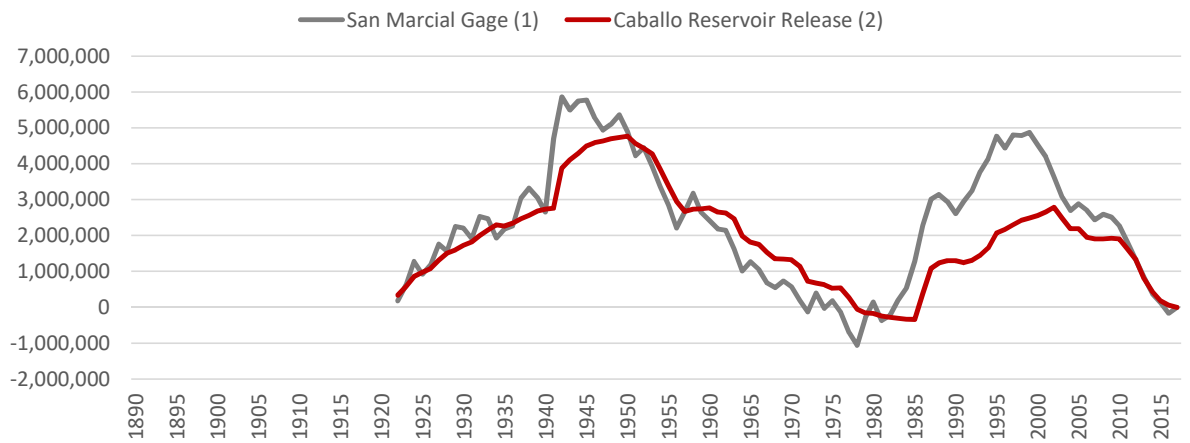
San Marcial Gage



San Marcial Gage and Caballo Reservoir Release



Cumulative Departure from Average



Notes:

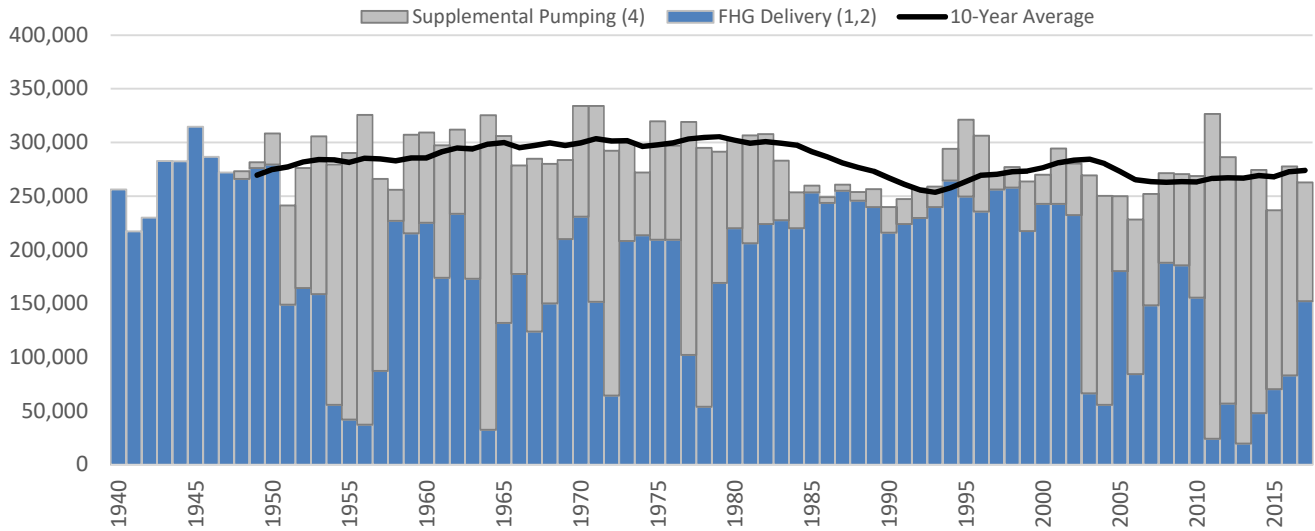
- (1) San Marcial gage data from 1938 RGJI (1890-1924) and LRG SWDataSet (1925-2017).
- (2) Rio Grande above Percha Dam gage used for Caballo Reservoir Release before 1938. Data from LRG SWDataSet.

Declaration Figure 2

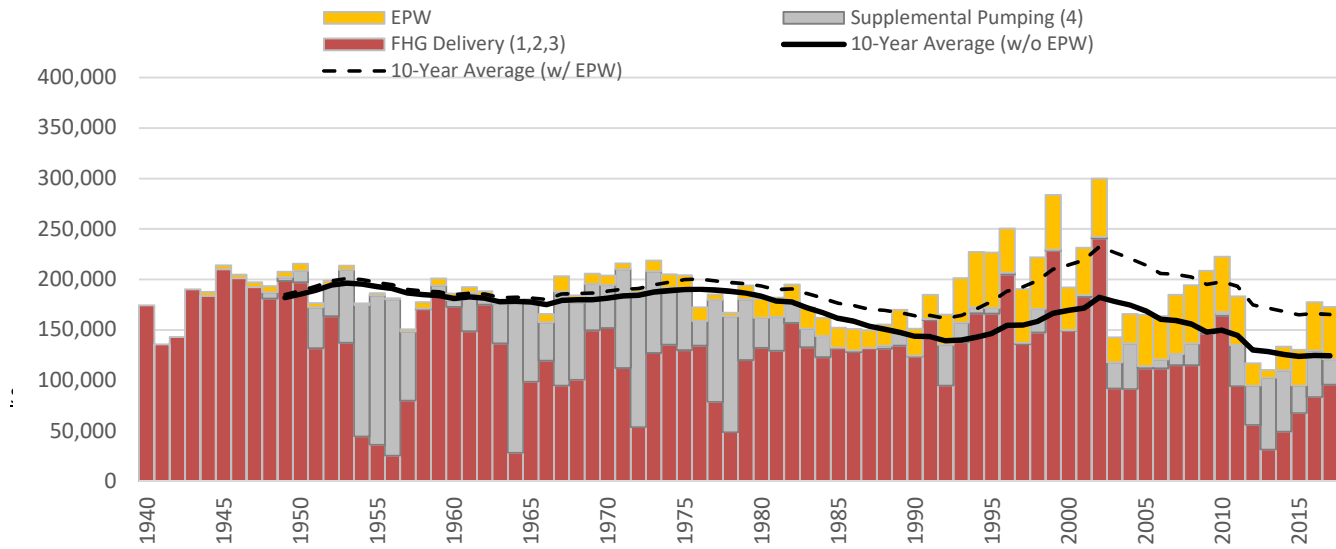
Figure 5-15

**Annual Total Applied Water (SW + GW)  
Irrigation Season (Mar-Oct)  
1940 - 2017  
(acre-feet)**

**EBID**



**EPCWID**

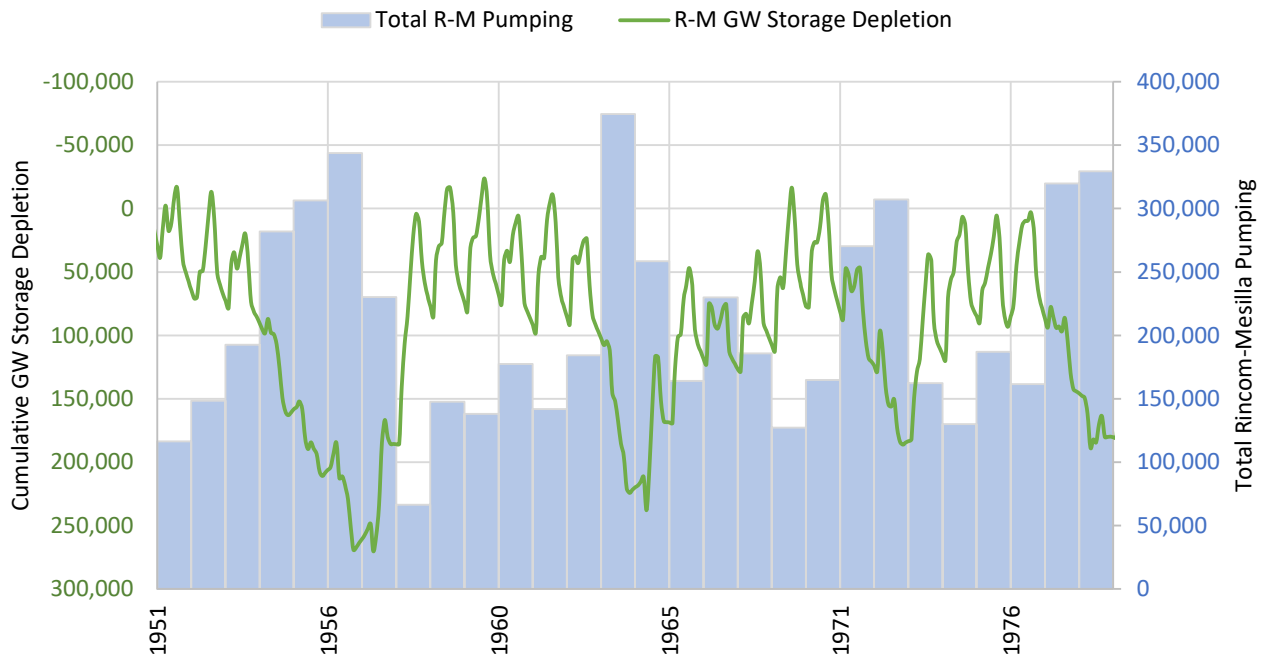


Notes:

- (1) Farm deliveries from records except when missing. For years with no records, farm deliveries were estimated as total diversions minus conveyance loss. Loss estimated using monthly average loss % derived from records.
- (2) Pre-1979, farm deliveries split between Mesilla NM and Mesilla TX proportionally by acreage.
- (3) EPCWID FHG deliveries do not include deliveries to EPW.
- (4) Supplemental pumping computed based on unmet demand from SWE Canal and Farm Budget analysis.

### Declaration Figure 3

#### Rincon-Mesilla Alluvial Groundwater Storage Change and Annual Rincon-Mesilla Pumping 1951-1978 (acre-feet)

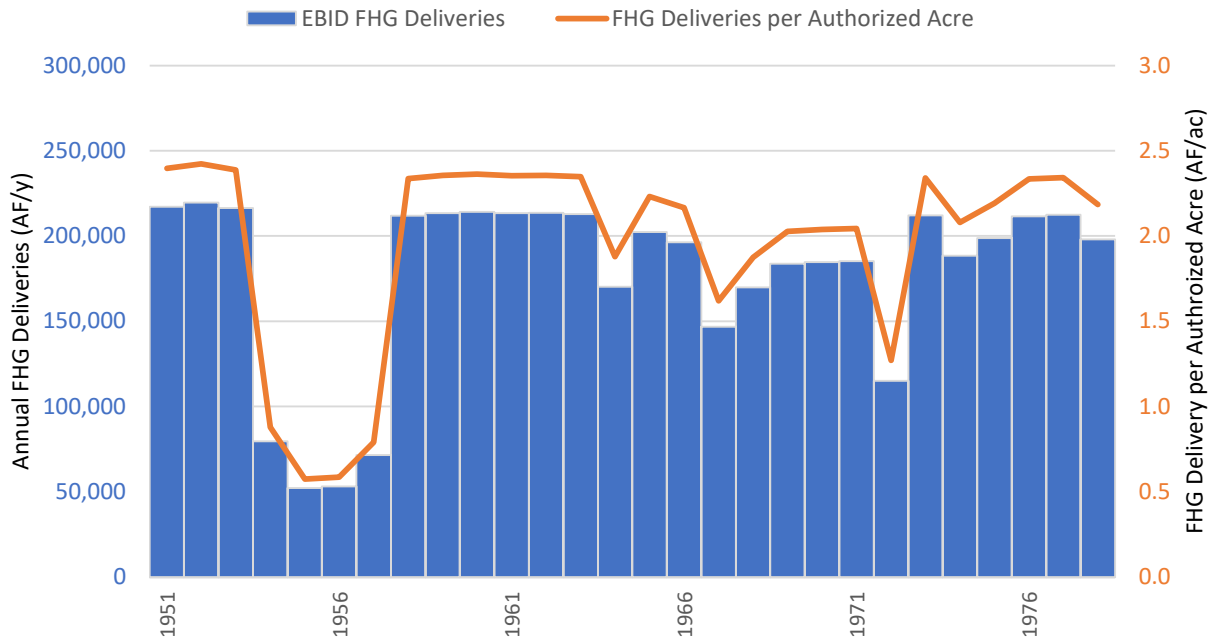


**Notes:**

- (1) R-M Alluvial Groundwater Storage Change from ILRG Model (Run 0 - Historical Calibration Run).
- (2) Annual R-M Pumping includes pumping from EBID, EPCWID-Mesilla, NM GW only lands, NM DCMI, and TX Mesilla DCMI.
- (3) Pumping data from SWE CFB Model for irrigation and NMR-M GW Model for DCMI.

### Declaration Figure 4

**Annual EBID Farm Headgate Deliveries (AF)  
and EBID Farm Headgate Deliveries per uthorized Acre (AF/ac)  
New Mexico ILRG Model  
Run 3 - No New Mexico Pumping  
1951-1978**



Notes:

- (1) EBID farm headgate deliveries from ILRGM - Run 3 No New Mexico Pumping.
- (2) EBID farm headgate deliveries per acre calculated using authorized acres +3% (90,640 acres).