

SPECIAL IMPROVEMENT DISTRICT NO. 2 OF THE
RIO GRANDE WATER CONSERVATION DISTRICT

ANNUAL REPORT FOR
2023 PLAN YEAR

Prepared

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By

Rio Grande Water Conservation District
8805 Independence Way
Alamosa, Colorado 81101

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Abbreviations

ARP	Annual Replacement Plan
DWR	Division of Water Resources
NRCS	Natural Resources Conservation Service
Plan Year	The period May 1, 2023 through April 30, 2024
PWM	Plan of Water Management
PWR	Preliminary Water Report
Response Functions	RFAApplication_B_RioGrandeAlluvium_6P98_V1.1
RGA	Rio Grande Alluvial
RGDSS	Rio Grande Decision Support System
RGWCD	Rio Grande Water Conservation District
Subdistrict No. 2	Special Improvement District No. 2
ARP Wells	Wells Benefitting Subdistrict No. 2 lands
SWSP	Substitute Water Supply Plan
USDA	United States Department of Agriculture
WDID	Water District Structure Identification Number

INTRODUCTION

The purpose of this report is to satisfy the requirements for an Annual Report to analyze the Annual Replacement Plan (ARP) for May 1, 2023 through April 30, 2024 (Plan Year). This Annual Report has been prepared in accordance with the requirements of the State Engineer and the Rules Governing the Withdrawal of Groundwater in Water Division No. 3 (the Rio Grande Basin) and Establishing Criteria for the Beginning and End of the Irrigation Season in Water Division No. 3 for All Irrigation Water Rights (Groundwater Rules).

As required by the Groundwater Rules, this report includes information necessary for the State Engineer and Subdistrict No. 2 staff to calculate stream depletions attributable to Subdistrict No. 2 Wells and Contract Wells (ARP Wells), as those terms are defined in the PWM, and information to assess the replacement operations under the approved ARP. This report includes a series of tables prepared by Subdistrict No. 2 staff utilizing the most current version of the Rio Grande Alluvial Response Functions and the Upper Rio Grande Response Area Response Functions (Response Functions) to tabulate the location and quantities of stream depletions resulting from actual metered 2023 Subdistrict No. 2 ARP Well groundwater withdrawals and 2023 Rio Grande stream flows.

This Annual Report describes the amount and timing of replacements and/or remedies that have been completed by the Subdistrict under the 2023 ARP and the sources used to make those replacements.

1.0 DATABASE OF ALL WELLS COVERED BY THE 2023 ARP

A comprehensive ARP Well List was included in the 2023 ARP to identify the wells DWR permitted to continue operating in accordance with the PWM and the Groundwater Rules. This ARP Well List is necessary for DWR to identify which wells the Subdistrict has included. Further, the ARP Well List is a required input into the RGDSS Groundwater Model and Response Functions.

Appendix A is the most current tabulation of the WDID of each well included in the 2023 ARP and the preliminary groundwater withdrawals reported to DWR for each ARP Well for the 2023 Water Administration Year. The ARP Well List included with this Annual Report includes 270 ARP Wells for 2023.

1.1 SUBDISTRICT WELLS WITH PLANS FOR AUGMENTATION

Subdistrict No. 2's 2023 ARP Well List includes wells that were either fully or partially augmented by an approved plan for augmentation which is administered separately of Subdistrict No. 2's PWM. These plans for augmentation associate surface rights with these Subdistrict Wells and other non-Subdistrict No. 2 wells to remedy some portion or all of each well's injurious stream depletions. These wells were included in the Subdistrict's ARP Well List, and if any portion of their legally decreed groundwater withdrawals was not remedied by an individual plan for augmentation, it was subject to Subdistrict No. 2 fees and Subdistrict No. 2 remedied the injurious stream depletions and post-plan injurious stream depletions attributable to the non-augmented portion of a well's total groundwater withdrawals as part of the 2023 ARP.

San Luis Valley Water Conservancy District Augmentation Certificate No. 784

This augmentation certificate provides the participant 1.873 acre-feet of augmentation water annually to replace out-of-priority depletions caused by participant's water use. The structure is an existing unconfined well, Case No. W-1202, Well No. 1, WDID 2010320. The structure's place of use is the NW1/4SW1/4NW1/4, Section 24, Township 39 North, Range 8 East, N.M.P.M. The structure and water diversions covered by this Agreement and Augmentation Certificate shall be used for the purpose of greenhouse operations, including irrigation inside the greenhouse during the non-irrigation season, evaporative cooling and humidification, miscellaneous washing of product and facilities, and an employee bathroom. The source of water shall be in accordance with Court Decrees 84CW16, 94CW62, 03CW41, 05CW13, 07CW63, and any other appropriate decree the SLVWCD may obtain. The certificate requires a separate metering of the period during the irrigation season and the non-irrigation season. The well is being metered, but the non-irrigation season use of this well is not currently being metered separately, and therefore, the Subdistrict remedied all stream depletions caused by the groundwater withdrawals from this well.

San Luis Valley Water Conservancy District Augmentation Certificate No. 690

This augmentation certificate provides the participant 1.71 acre-feet of augmentation water annually to replace out-of-priority depletions caused by participant's water use. The structure is an existing unconfined well, well permit # 25274-F, WDID 2009593. The structure's place of

use is two (2) tracts of land located in the SW1/4NW1/4, Section 11, Township 38 North, Range 8 East, N.M.P.M. The structure and water diversions covered by this Agreement and Augmentation Certificate shall be used for the purpose of year-round irrigation in sixty thousand (60,000) square foot greenhouse. The source of water is an Unconfined and/or Alluvial Tributary aquifer to the Rio Grande, in accordance with Court Decrees 84CW16, 94CW62, 03CW41, 05CW13, 07CW63, and any other appropriate decree the SLVWCD may obtain. This well is being fully augmented and did not require any remedy of depletions by the Subdistrict during the 2023 Plan Year.

2.0 CALCULATION OF STREAM DEPLETIONS TO THE RIO GRANDE RESULTING FROM ARP WELL GROUNDWATER WITHDRAWALS FOR THE 2023 PLAN YEAR

The purpose of this section of the 2023 Annual Report is to present data the Subdistrict utilized to analyze stream depletions to the Rio Grande as a result of the actual 2023 groundwater withdrawals from Subdistrict No. 2 ARP Wells which were reported to DWR. This analysis compares the projected calculation of depletions presented in the 2023 ARP to the current calculation prepared using the most up-to-date information available from DWR for actual stream flows and groundwater withdrawals. Subdistrict No. 2 was directed by DWR to use the current 6P98 Response Functions to calculate stream depletions for the 2023 ARP.

2.1 2023 STREAM FLOW FORECASTS COMPARED TO ACTUAL FLOWS

2.1.1 2023 RIO GRANDE STREAM FLOW FORECAST

The Division Engineer’s March 31, 2023, Rio Grande Compact forecast was used to estimate groundwater consumption attributable to ARP Wells based upon hydrologic conditions for the current Plan Year. The NRCS also estimated the annual flow of the Rio Grande at the Rio Grande near Del Norte gage in their April 1st, 2023 forecast. These forecasts are shown in Table 1.0.

**Table 1.0
Stream Flow Forecasts
(units in acre-feet)**

Forecast Source	Analysis Date	Apr-Sep Forecast (acre-feet)	% of avg.	Estimated Flow outside of Apr-Sept (acre-feet)	Total Annual Estimated Flow (acre-feet)
		(1)	(2)	(3)	
NRCS	Apr 1, 2023	625,000	130		
DWR	Mar 31, 2023	659,200	137	90,800	750,000

2.1.2 2023 ACTUAL RIO GRANDE STREAM FLOW

Based on the Division 3 Engineer’s Preliminary Rio Grande Compact Ten-Day Report dated January 3, 2024, the April-September flows were **639,600 acre-feet**. This is a decrease of **19,600**

acre-feet below the forecasted amount for the same period. A copy of the Division No. 3 Engineer's Preliminary Rio Grande Compact Ten-Day Report is included as Appendix B.

2.2 PROJECTED 2023 GROUNDWATER WITHDRAWALS COMPARED TO ACTUAL METERED 2023 GROUNDWATER WITHDRAWALS

2.2.1 2023 PROJECTED GROUNDWATER WITHDRAWALS FROM ARP WELLS

The Subdistrict projected groundwater withdrawals from ARP Wells listed in the 2023 ARP by reviewing past years with actual stream flows on the Rio Grande similar to those being forecast for 2023. ARP Well groundwater withdrawals in those years were also reviewed. The Subdistrict also looked at weather predictions and antecedent conditions. The projected 2023 ARP Well groundwater withdrawals were **11,105 acre-feet**. It was anticipated that the vast majority of metered groundwater withdrawals from ARP Wells in 2023 was used for irrigation through center pivot sprinklers.

2.2.2 2023 ACTUAL GROUNDWATER WITHDRAWALS FROM ARP WELLS

Based on information obtained from DWR's published records on June 1, 2024, for 2011 through 2023 metered withdrawals, preliminary meter records for 2023 downloaded from DWR's HBDMC, and estimates made by Subdistrict staff, the actual metered groundwater withdrawals from Subdistrict No. 2 ARP Wells were **13,521 acre-feet** for the 2023 Water Administration Year. The increase in groundwater withdrawals may have been the result of a lack of monsoons that are typical during the summer months. A majority of the groundwater withdrawn from ARP Wells was used for irrigation through center pivot-sprinklers.

2.3 ACTUAL STREAM DEPLETIONS FROM THE WELLS COVERED BY THE 2023 ARP BASED ON THE APPLICABLE RESPONSE FUNCTIONS OR APPROVED ALTERNATIVE METHOD

The purpose of this section is to present the data utilized to project stream depletions to the Rio Grande as a result of the groundwater withdrawals from Subdistrict No. 2 ARP Wells for the Plan Year. The Subdistrict combines the outputs from the RGA and URG Response Functions to identify total projected stream depletions for the Plan Year, a breakdown of the monthly stream depletions for the Plan Year for each of the three reaches of the Rio Grande and the Post-Plan Stream Depletions calculated as a result of the groundwater withdrawals from ARP Wells for the Plan Year. Each Response Function was rerun with updated stream flows and preliminary groundwater withdrawals to analyze what actions, if any, the Subdistrict might take to make any adjustments to its current replacement operations to assure that all injurious stream impacts are remedied under the current ARP.

Subdistrict No. 2 was directed by DWR to use the current 6P98 Response Functions to calculate projected stream depletions for wells within the RGA for this ARP. For wells included in the ARP Well List that are within the URG, the Subdistrict received approval from the State Engineer, in a letter dated February 28, 2020, to use the URG Response Functions to calculate the projected stream depletions from those URG wells included in the ARP Well List. The State

Engineer’s February 28th letter was included as Appendix J in the ARP. Subdistrict No. 2 staff have been instructed by the State Engineer’s Office to predict stream depletions to the Rio Grande for those wells in the Rio Grande Alluvial Response Area utilizing the response functions developed for the Rio Grande Alluvial Response Area under the RGDSS Groundwater Model Phase 6P98. For the 2023 Plan Year, stream depletions attributable to the groundwater withdrawals from Subdistrict ARP Wells were calculated using these Response Functions.

2.3.1 CALCULATING STREAM DEPLETIONS FOR WELLS IN THE RIO GRANDE ALLUVIAL RESPONSE AREA

The RGA Response Functions spreadsheet was built to be used for the whole RGA. Two instruction sheets were prepared by DWR for additional inputs to the RGA Response Functions when there is a need to use it for individual or group of wells. The instruction sheet, “How to Use the Application Workbook for a Subset (individual/group) of Wells” (9/23/2015), describes how to adjust the spreadsheet inputs to stream reaches that have been modeled with point source returns to streams. The instruction sheet, “How to Adjust the Application Workbook for use with a Subset of Wells” (10/15/2015), describes how to use the “Ratio Method” for Response Areas where it is necessary to apply this method. Both instruction sheets are included as Appendix E.

The Subdistrict elected to use the RGA Response Functions spreadsheet for the subset of RGA wells which are included in the 2023 ARP Well List. The RGA Response Functions require adjustments for point source return flows if the Subdistrict’s subset of wells does not have surface water return flow credits. The Subdistrict removed all return flows attributable to the Town of Del Norte and the City of Monte Vista’s wells from Reach 1 (Rio Grande from Del Norte to Excelsior Ditch) from the appropriate sheets within the RGA Response Function spreadsheet.

The next step was to calculate stream depletions by updating the RGA Response Functions table contained in Table 2.1.1 to derive the annual net groundwater consumptive use for the RGA. The consumptive use ratios for sprinkler and flood irrigation used in the RGDSS Model are standard factors of 83% and 60%, respectively. The consumptive use ratio for “other” wells is specific to the uses of those wells and can vary widely. The “Other Consumptive Use Ratio” for the whole RGA is a composite derived from the individual well withdrawals and consumptive uses. The Subdistrict prepared a separate spreadsheet of “other” wells included in the Subdistrict ARP Well List to show the individual well groundwater withdrawals and consumptive use factors used to explain how the composite ratios were determined for the subset of wells represented in Table 2.1.1 and Table 2.2.1. A copy of the spreadsheet used to calculate the consumptive use factor for the “other” ARP Wells is being provided to DWR with this Annual Report.

Historical groundwater withdrawal values for RGA wells included in the ARP Well List were entered in Table 2.1 for years 2011 through 2023. The Subdistrict has no Recharge that Offsets Groundwater for calculation of the Net Groundwater Consumptive Use.

Notes at the bottom of Table 2.1.1 provide a description of the calculations within this table.

The projected Net Groundwater Consumptive Use for the RGA for the 2023 Plan Year is **10,031 acre-feet** as shown in Table 2.1.1

Table 2.1.1
Rio Grande Alluvial Response Area Wells
Estimated Net Groundwater Consumptive Use
 (Units in acre-feet)

Year	RGA ARP Well Groundwater Withdrawals					Recharge that Offsets Groundwater				Net Groundwater Consumptive Use
	Irrigation Pumping to Center Pivots	Irrigation Pumping to Flood Irrigation	Other Pumping	Other Consumptive Use Ratio	Groundwater Consumption	Recharge Source 1	Recharge Source 2	Other Recharge Offsets	Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2011	12,614	636	1,328	10%	10,984	0	0	0	0	10,984
2012	13,513	619	1,203	10%	11,707	0	0	0	0	11,707
2013	12,531	555	1,239	10%	10,857	0	0	0	0	10,857
2014	11,005	528	1,173	10%	9,568	0	0	0	0	9,568
2015	10,336	576	1,240	10%	9,048	0	0	0	0	9,048
2016	9,067	529	1,185	10%	7,962	0	0	0	0	7,962
2017	8,865	432	1,359	10%	7,753	0	0	0	0	7,753
2018	12,890	762	1,293	10%	11,285	0	0	0	0	11,285
2019	8,109	643	1,485	11%	7,280	0	0	0	0	7,280
2020	10,971	634	1,159	13%	9,637	0	0	0	0	9,637
2021	11,163	636	1,318	11%	9,792	0	0	0	0	9,792
2022	10,510	612	1,215	12%	9,236	0	0	0	0	9,236
2023	11,449	690	1,147	10%	10,031	0	0	0	0	10,031
Avg	11,002	604	1,257	11%	9,626	0	0	0	0	9,626

Explanation of Columns

- (1) Calendar Year
- (2) Determined from metered groundwater pumping
- (3) Determined from metered groundwater pumping
- (4) Determined from metered groundwater pumping
- (5) Estimated based on operations metered in Col4
- (6) Calculated as $0.83 \times \text{Col2} + 0.60 \times \text{Col3} + \text{Col4} \times \text{Col5}$
 (0.83 and 0.60 are the consumptive use ratios of total pumping associated with sprinkler and flood irrigation practices, respectively)
- (7) - (9) Determined by engineering consultant to the District from analysis of historic diversions and recharge decrees
- (10) Calculated as $\text{Col7} + \text{Col8} + \text{Col9}$
- (11) Calculated as $\text{Col6} - \text{Col10}$

Wells that are added or deleted to the ARP Well List affect historical groundwater withdrawals figures as follows:

- Any wells that are added to the ARP will have their historical groundwater withdrawals included
- Any wells that are deleted from the ARP will have their historical groundwater withdrawals included in the groundwater withdrawals until the year that the wells are dropped
- If any wells that were deleted from a previous ARP list are added back in, any historical groundwater withdrawals from the years they were out will have to be included in the groundwater withdrawals

The RGA Net Groundwater Consumptive Use for 2023 derived in Table 2.1.1 above is then input into the Response Function table contained in Table 2.1.2 in Column 3 in the row for 2023 to calculate the RGA stream depletions for the 2023 Plan Year and into the future. The annual stream depletions resulting from the groundwater withdrawals of the wells included in the 2023

ARP Well list from the RGA for the respective reaches of the Rio Grande and the total are shown in Columns 4 through 7.

Table 2.1.2
Rio Grande Alluvial Response Area Wells
Estimated Historical and Projected Net Stream Depletions from
Groundwater Withdrawals in Subdistrict No. 2
 (Units in acre-feet)

Year	Rio Grande near Del Norte Stream Gage (Jan-Dec)	Net Groundwater Consumptive Use (Jan-Dec)	Annual Net Stream Depletions (May-Apr) a)			Total
			Rio Grande Del Norte-Excelsior	Rio Grande Excelsior-Chicago	Rio Grande Chicago-State Line	
			(4)	(5)	(6)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1970	561,150	11,325	631	97	-45	683
1971	389,397	11,315	1,158	306	-63	1,401
1972	373,031	13,898	1,560	456	-77	1,939
1973	755,509	11,305	1,525	537	-56	2,006
1974	270,942	14,972	2,029	549	-137	2,441
1975	730,848	10,408	1,773	609	-68	2,314
1976	512,997	10,414	1,640	547	-64	2,123
1977	163,635	16,111	2,247	595	-148	2,694
1978	340,660	12,971	2,204	692	-96	2,800
1979	886,617	9,808	1,804	656	-56	2,404
1980	672,668	10,962	1,677	569	-61	2,185
1981	310,945	12,326	1,991	579	-117	2,453
1982	572,474	8,360	1,746	587	-67	2,266
1983	578,510	8,925	1,567	533	-56	2,044
1984	652,637	8,443	1,464	504	-51	1,917
1985	864,564	8,313	1,268	466	-37	1,697
1986	865,371	7,201	1,061	394	-31	1,424
1987	907,650	9,714	1,043	359	-34	1,368
1988	346,087	12,609	1,348	399	-61	1,686
1989	407,389	12,315	1,594	499	-70	2,023
1990	424,033	11,026	1,647	548	-66	2,129
1991	529,567	8,801	1,543	541	-56	2,028
1992	415,482	10,062	1,518	518	-57	1,979
1993	577,831	8,123	1,436	503	-51	1,888
1994	444,629	12,606	1,592	510	-65	2,037
1995	734,492	7,126	1,367	515	-41	1,841
1996	313,441	14,604	1,867	489	-128	2,228
1997	781,596	8,492	1,606	551	-61	2,096
1998	466,821	11,171	1,553	500	-63	1,990
1999	799,489	6,582	1,300	485	-39	1,746
2000	312,094	15,307	1,887	474	-132	2,229
2001	655,233	9,777	1,832	577	-81	2,328
2002	96,717	18,297	2,483	629	-172	2,940

2003	261,300	15,249	2,791	769	-173	3,387
2004	431,675	10,110	2,323	770	-92	3,001
2005	682,540	9,370	1,943	677	-65	2,555
2006	411,656	9,087	1,719	604	-55	2,268
2007	593,239	9,419	1,610	557	-53	2,114
2008	623,333	7,142	1,421	511	-44	1,888
2009	513,058	7,406	1,288	453	-42	1,699
2010	453,063	7,479	1,228	423	-43	1,609
2011	415,287	10,984	1,378	435	-57	1,756
2012	328,465	11,707	1,557	496	-65	1,988
2013	344,522	10,857	1,618	539	-64	2,093
2014	518,731	9,568	1,565	541	-58	2,048
2015	555,832	9,048	1,488	519	-53	1,953
2016	565,968	7,962	1,384	490	-48	1,826
2017	574,029	7,753	1,302	456	-46	1,712
2018	212,225	11,285	1,656	464	-104	2,016
2019	855,755	7,280	1,387	484	-50	1,820
2020	307,808	9,637	1,528	434	-92	1,870
2021	381,197	9,792	1,527	474	-66	1,935
2022	359,222	9,236	1,494	490	-58	1,926
2023	639,603	10,031	1,498	499	-57	1,940
2024			973	426	-18	1,381
2025			518	247	-2	763
2026			286	138	1	424
2027			159	74	1	234
2028			88	40	1	128
2029			41	18	0	59
2030			16	7	0	23
2031			0	1	0	1
2032			0	0	0	0
2033			0	0	0	0
2034			0	0	0	0
2035			0	0	0	0
2036			0	0	0	0
2037			0	0	0	0
2038			0	0	0	0
2039			0	0	0	0
2040			0	0	0	0
Avg 2001-2015	430,290.6	9,718.8	1,640	531	-70	2,102
Avg 2001- 2010	429,255.8	9,394.2	1,694	543	-74	2,163
Post Plan Depletion			2,081	950	-17	3,014

a) Estimated net stream depletions shown in this table are greater than the stream depletions that potentially cause injury to surface water rights.

Explanation of Columns

- (1) Year
- (2) Rio Grande near Del Norte Gage streamflow in acre-feet for the NRCS streamflow forecast period of April through September 2023.
- (3) Net Groundwater Consumptive Use (NetGWCU) for January through December. NetGWCU values for 2001 through 2010 were

taken from the RGDSS Groundwater Model output. NetGWCU values for 2011 through 2023 were calculated using well meter data. NetGWCU data for 2023 well meter data and diversions are based on the Rio Grande information obtained from DWR sources.

- (4) Net Stream Depletions in the Rio Grande Del Norte to Excelsior Ditch reach for the Plan Year (May through April) in ac-ft.
- (5) Net Stream Depletions in the Rio Grande Excelsior Ditch to Chicago Ditch reach for the Plan Year (May through April) in ac-ft.
- (6) Net Stream Depletions in the Rio Grande Chicago Ditch to the State Line reach for the Plan Year (May through April) in ac-ft.
- (7) Total Net Stream Depletions columns (4 + 5 + 6) in ac-ft.

Table 2.1.3 is an output from the RGA Response Functions that calculates the annual total RGA stream depletions and monthly replacement obligations for the three impacted reaches of the Rio Grande. This table lists the Plan Year stream depletions as required under the Groundwater Rules for those wells included in the 2023 ARP Well List in the RGA.

Table 2.1.3
Rio Grande Alluvial Response Area Wells
Subdistrict No. 2 Monthly Stream Depletions for Plan Year
 (Units in acre-feet)

Stream Reach	Rio Grande Alluvium Response Area Total												Total
	2023								2024				
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Rio Grande Del Norte-Excelsior	122.9	114.0	113.7	113.9	110.7	123.8	131.2	142.2	143.8	130.2	129.7	121.2	1,497.5
Rio Grande Excelsior-Chicago	48.8	41.4	37.5	25.5	27.8	35.2	41.2	48.0	48.7	46.3	52.9	45.7	499.1
Rio Grande Chicago-State Line	7.2	-1.0	-6.4	-18.0	-11.9	-7.8	-5.0	-1.6	-5.3	-3.4	0.1	-3.4	-56.6
Total	179.0	154.5	144.8	121.4	126.6	151.2	167.4	188.6	187.2	173.0	182.7	163.5	1,940.0

Explanation of Columns

- (1) Stream reach
- (2) - (13) Monthly Stream Depletions in acre-feet
- (14) Total Plan Year Stream Depletions in acre-feet

As indicated in the lower right-hand corner of Table 2.1.3, the Response Functions calculated total stream depletions to the Rio Grande during the Plan Year due to both past ARP Well groundwater withdrawals and the preliminary actual 2023 ARP Well groundwater withdrawals for the RGA are **1,940.0 acre-feet**. The locations of the stream depletions and monthly quantities are also tabulated in Table 2.1.3.

According to the RGDSS Groundwater Model, if Subdistrict No. 2 ARP Wells in the RGA were shut off today, there would be a continuing depletion to the river for approximately 8 years. This is the calculated time required to recover to conditions that existed before groundwater withdrawals started. The volume of water required to replace stream depletions during this recovery period is called Post-Plan Stream Depletions. Based on the calculation from the Response Functions, Table 2.1.4 shows there would be a total of **3,014.4 acre-feet** of Post-Plan

Stream Depletions for the RGA. The portion of the total Post-Plan Stream Depletions impacting each of the three designated reaches of the river are also included in the table.

Table 2.1.4
Rio Grande Alluvial Response Area Wells
Subdistrict No. 2 Post-Plan Stream Depletions
 (Units in acre-feet)

Years (May-Apr)	Rio Grande Del Norte-Excelsior	Rio Grande Excelsior-Chicago	Rio Grande Chicago-State Line	Total
2024-2043	2,080.7	950.4	-16.7	3,014.4

2.3.2 CALCULATING STREAM DEPLETIONS FOR WELLS IN THE RIO GRANDE URG RESPONSE AREA

The first step in calculating stream depletions using the URG Response Functions is updating Table 2.2.1 to derive the annual net groundwater consumptive use. For reference, actual ARP Well groundwater withdrawal values for the URG are entered for years 2018-2023. Notes at the bottom of the table provide a description of the calculations within this table. Following determination of the net groundwater consumption data for 2023, the data was applied to the Response Functions table contained in Table 2.2.1 to calculate stream depletions for the 2023 Plan Year and into the future for the URG.

Notes at the bottom of Table 2.2.1 provide a description of the calculations within this table.

Table 2.2.1
Upper Rio Grande Domain Wells
Estimated Net Groundwater Consumptive Use
 (Units in acre-feet)

Year	URG ARP Well Groundwater Withdrawals					Recharge that Offsets Groundwater				Net Groundwater Consumptive Use
	Irrigation Pumping to Center Pivots	Irrigation Pumping to Flood Irrigation	Other Pumping	Other Consumptive Use Ratio	Groundwater Consumption	Recharge Source 1	Recharge Source 2	Other Recharge Offsets	Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2018	641	337	21	40%	743	0	0	0	0	743
2019	525	61	20	41%	480	0	0	0	0	480
2020	664	141	31	40%	648	0	0	0	0	648
2021	530	13	25	40%	458	0	0	0	0	458
2022	278	0	29	40%	242	0	0	0	0	242
2023	204	0	31	40%	182	0	0	0	0	182
Avg	527	110	25	40%	459	0	0	0	0	459

Explanation of Columns

- (1) Calendar Year
- (2) Determined from metered groundwater pumping
- (3) Determined from metered groundwater pumping
- (4) Determined from metered groundwater pumping
- (5) Estimated based on operations metered in Col4
- (6) Calculated as $0.83 \times \text{Col2} + 0.60 \times \text{Col3} + \text{Col4} \times \text{Col5}$
 (0.83 and 0.60 are the consumptive use ratios of total pumping associated with sprinkler and flood irrigation practices, respectively)

(7) - (11) Not applicable in the Upper Rio Grande Model Domain
 (12) Calculated as Col7 + Col8 + Col9 + Col10 + Col11
 (13) Calculated as Col6 - Col12

The URG Net Groundwater Consumptive Use for the Plan Year is **182 acre-feet** as shown in Table 2.2.1.

The URG Net Groundwater Consumptive Use for 2023 derived in Table 2.2.1 above is then input into the Response Function table contained in Table 2.2.2 in Column 3 in the row for 2023 to calculate stream depletions for the Plan Year and into the future. The projected annual stream depletions resulting from the groundwater withdrawals of the wells included in the ARP Well list from the URG for the respective reaches of the Rio Grande and the total are shown in Columns 4 through 7.

Table 2.2.2
Estimated Historical and Projected Net Stream Depletions from
Upper Rio Grande Domain Wells
Groundwater Withdrawals in Subdistrict No. 2
(Units in acre-feet)

Year	Rio Grande near Del Norte Stream Gage (Jan-Dec)	Net Groundwater Consumptive Use (Jan-Dec)	Annual Net Stream Depletions (May-Apr) a)			Total
			Upper Rio Grande above Del Norte			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1970	561,291	1,489	601			601
1971	389,495	1,455	802			802
1972	373,125	1,621	938			938
1973	755,700	1,492	909			909
1974	271,010	1,839	1,038			1,038
1975	731,033	1,556	968			968
1976	513,126	1,344	859			859
1977	163,676	2,001	1,079			1,079
1978	340,746	1,925	1,133			1,133
1979	886,840	1,628	1,035			1,035
1980	672,838	1,863	1,082			1,082
1981	311,024	1,522	964			964
1982	572,618	1,691	995			995
1983	578,655	1,424	895			895
1984	652,801	1,723	985			985
1985	864,782	1,672	994			994
1986	865,589	1,541	949			949
1987	907,878	1,848	1,052			1,052
1988	346,174	1,874	1,100			1,100
1989	407,492	1,752	1,069			1,069
1990	424,140	1,397	910			910
1991	529,700	1,566	921			921
1992	415,586	1,398	860			860

1993	577,977	1,352	826	826
1994	444,741	1,759	974	974
1995	734,677	1,256	829	829
1996	313,520	1,827	1,006	1,006
1997	781,793	1,257	834	834
1998	466,938	1,072	705	705
1999	799,691	865	567	567
2000	312,172	1,344	720	720
2001	655,399	1,036	656	656
2002	96,742	1,878	974	974
2003	261,366	1,490	924	924
2004	431,784	1,067	739	739
2005	682,712	1,055	654	654
2006	411,759	1,042	626	626
2007	593,389	1,072	636	636
2008	623,490	1,010	614	614
2009	513,187	963	588	588
2010	453,177	1,100	633	633
2011	415,287	825	540	540
2012	328,465	715	463	463
2013	344,522	843	484	484
2014	518,731	609	403	403
2015	555,832	405	293	293
2016	565,968	409	254	254
2017	574,029	627	332	332
2018	212,225	743	410	410
2019	855,755	480	332	332
2020	307,808	648	368	368
2021	381,197	458	302	302
2022	359,222	242	196	196
2023	639,603	182	131	131
2024			38	38
2025			9	9
2026			0	0
2027			0	0
2028			0	0
2029			0	0
2030			0	0
2031			0	0
2032			0	0
2033			0	0
2034			0	0
2035			0	0
2036			0	0
2037			0	0
2038			0	0
2039			0	0
2040			0	0

Avg 2001-2017	472,108	950	577				577
Avg 2008- 2017	489,269	751	460				460
Post Plan Depletion			1,044				1,044

- a) Estimated net stream depletions shown in this table are greater than the stream depletions that potentially cause injury to surface water rights.

Explanation of Columns

- (1) Year
- (2) Rio Grande near Del Norte Gage streamflow in acre-feet for the NRCS streamflow forecast period of April through September 2023.
- (3) Net Groundwater Consumptive Use (NetGWCU) for January through December. NetGWCU values for 2001 through 2010 were taken from the RGDSS Groundwater Model output. NetGWCU values for 2011 through 2023 were calculated using well meter data.
- (4) Net Stream Depletions in the Rio Grande Del Norte to Excelsior Ditch reach for the Plan Year (May through April) in ac-ft.
- (7) Total Net Stream Depletions columns (4 + 5 + 6) in ac-ft.

Table 2.2.3 is an output from the URG Response Functions that calculates the annual total stream depletions and monthly replacement obligations for the impacted reach of the Rio Grande. This table lists the Plan Year stream depletions as required under the Groundwater Rules for those wells included in the ARP Well List in the URG.

Table 2.2.3
Upper Rio Grande Domain Wells
Monthly Stream Depletions for Plan Year
(Units in acre-feet)

Stream Reach	Upper Rio Grande Response Area Total												Total
	2023								2024				
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Upper Rio Grande above Del Norte	9.8	10.8	13.1	14.2	14.0	14.0	12.6	11.7	9.3	7.6	7.5	6.3	130.9
Total	9.8	10.8	13.1	14.2	14.0	14.0	12.6	11.7	9.3	7.6	7.5	6.3	130.9

Explanation of Columns

- (1) Stream reach
- (2) - (13) Monthly Stream Depletions in acre-feet
- (14) Total Plan Year Stream Depletions in acre-feet

As indicated in the lower right-hand corner of Table 2.2.3, the URG Response Functions calculated total stream depletions to the Rio Grande during the Plan Year due to both past ARP Well groundwater withdrawals and the 2023 Plan Year ARP Well groundwater withdrawals are **130.9 acre-feet**. The locations of the stream depletions and monthly quantities are also tabulated in Table 2.2.3.

According to the RGDSS Groundwater Model, if the URG wells included in the Subdistrict’s ARP Well List were shut off today, there would be a continuing depletion to the river for approximately 2 years. This is the calculated time required to recover to conditions that existed before groundwater withdrawals started. The volume of water required to replace stream depletions during this recovery period is called Post-Plan Stream Depletions. Based on

predictions from the URG Response Functions, Table 2.2.4 shows there would be a total of **47.3 acre-feet** of Post-Plan Stream Depletions. The portion of the total Post-Plan Stream Depletions impacting each of the three designated reaches of the river are also included in the table.

Table 2.2.4
Upper Rio Grande Domain Wells
Subdistrict No. 2 Post-Plan Stream Depletions
(Units in acre-feet)

Years (May-Apr)	Upper Rio Grande above Del Norte	Total
2024-2043	47.3	47.3

2.3.3 COMBINED TOTAL PROJECTED PLAN YEAR STREAM DEPLETIONS FOR SUBDISTRICT ARP WELLS

Table 2.3.1 is the combined output from the RGA and URG Response Functions that calculates the annual total stream depletions and monthly replacement obligations for the three impacted reaches of the Rio Grande. This table lists the Plan Year stream depletions as required under the Groundwater Rules for all wells included in the Subdistrict’s ARP Well List.

Table 2.3.1
Combined Total Subdistrict No. 2
Monthly Stream Depletions for Plan Year
(Units in acre-feet)

Stream Reach	Combined Stream Depletions for RGA and URG Response Functions												Total
	2023								2024				
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Upper Rio Grande above Del Norte and Rio Grande Del Norte-Excelsior	132.7	124.8	126.8	128.1	124.7	137.8	143.8	153.9	153.1	137.8	137.2	127.5	1,628.4
Rio Grande Excelsior-Chicago	48.8	41.4	37.5	25.5	27.8	35.2	41.2	48.0	48.7	46.3	52.9	45.7	499.1
Rio Grande Chicago-State Line	7.2	-1.0	-6.4	-18.0	-11.9	-7.8	-5.0	-1.6	-5.3	-3.4	0.1	-3.4	-56.6
Total	188.7	165.2	157.9	135.6	140.6	165.2	180	200.3	196.5	180.7	190.2	169.8	2,070.9

As indicated in the lower right-hand corner of Table 2.3.1, the combined RGA and URG Response Functions calculated total stream depletions to the Rio Grande during the Plan Year due to both past ARP Well groundwater withdrawals and the projected Plan Year ARP Well groundwater withdrawals are **2,070.9 acre-feet**. The locations of the stream depletions and

monthly quantities are also tabulated in Table 2.3.1.

Based on the predictions from RGA and URG Response Functions, the volume of water required to replace the combined Post-Plan Stream Depletions is **3,061.7 acre-feet** as shown in Table 2.3.2. The portion of the total Post-Plan Stream Depletions impacting each of the three designated reaches of the river are also included in the table.

**Table 2.3.2
Combined Total Subdistrict No. 2 Post-Plan Stream Depletions
(Units in acre-feet)**

Years (May-Apr)	Upper Rio Grande above Del Norte and Rio Grande Del Norte- Excelsior	Rio Grande Excelsior- Chicago	Rio Grande Chicago-State Line	Total
2024-2043	2,128.0	950.4	-16.7	3,061.7

Table 2.4 below lists the April 2023 projected stream depletions and the July 2024 final calculated obligations to compare projected versus actual calculated depletions for the 2023 ARP Year.

The Response Functions prepared for the 2023 ARP projected **1,995.6 ac-ft.** of combined stream depletions throughout the 2023 ARP year. A Preliminary Water Report in March 2023 recalculated depletions based on DWR’s preliminary end-of-year records for 2023 for both Subdistrict No. 2 ARP Wells 2023 groundwater withdrawals and 2023 surface water flows. With the March calculation, the total combined stream depletions were increased to **2,072.0 ac-ft.** A final calculation of stream depletions was prepared for this Annual Report based on actual metered 2023 groundwater withdrawals as reported to DWR and the actual stream flows for 2023 based on DWR records. The actual total combined depletions for 2023 is **2,070.9 acre-feet.** Table 2.4 below shows these calculated amounts individually for comparison. The final Response Functions showed a very slight change from the amounts calculated in the PWR. Appendix D includes a daily accounting of the amount and source of replacement to each calling right on the Rio Grande for the entire 2023 Plan Year.

Based on actual data, Subdistrict No. 2 calculates that at times during the 2023 Plan Year the Subdistrict may have over- or under-paid depletions at times to the Rio Grande based on information provided in Appendix C showing the projected depletions paid daily by the Subdistrict for the 2023 Plan Year in comparison to the actual daily depletions calculated with actual 2023 data from DWR. Also included in Appendix C is a calculation of the over/underpayment of depletions based on the source of replacement used. The Subdistrict will work with DWR staff to determine the appropriate method for which to remedy any over/under paid injurious depletions as of the end of the 2023 Plan Year. Appendix D includes a daily accounting of the amount and source of replacement to calling rights on the Rio Grande for the 2023 Plan Year.

**Table 2.4
Comparison of Subdistrict No. 2 Combined 2023 Projected and Calculated Stream
Depletions**

(Units in acre-feet)

Month	Rio Grande								
	Stream Reach 1			Stream Reach 2			Stream Reach 3		
	4/15/2023	3/1/2024	7/1/2024	4/15/2023	3/1/2024	7/1/2024	4/15/2023	3/1/2024	7/1/2024
May-23	131.5	132.8	132.7	49.0	48.8	48.8	7.4	7.2	7.2
Jun-23	124.8	124.9	124.8	41.6	41.4	41.4	-0.7	-1.0	-1.0
Jul-23	127.7	126.7	126.8	37.6	37.5	37.5	-6.1	-6.4	-6.4
Aug-23	128.4	128.2	128.1	26.1	25.5	25.5	-17.0	-18.0	-18.0
Sep-23	124.3	124.8	124.7	28.5	27.8	27.8	-10.8	-11.9	-11.9
Oct-23	134.3	137.9	137.8	34.6	35.2	35.2	-6.5	-7.8	-7.8
Nov-23	137.0	143.9	143.8	39.0	41.2	41.2	-4.0	-5.0	-5.0
Dec-23	144.1	154.0	153.9	45.1	48.1	48.0	-0.8	-1.6	-1.6
Jan-24	141.1	153.3	153.1	45.4	48.8	48.7	-4.4	-5.4	-5.3
Feb-24	126.4	137.9	137.8	42.8	46.3	46.3	-2.7	-3.4	-3.4
Mar-24	126.5	137.3	137.2	48.5	52.9	52.9	0.4	0.1	0.1
Apr-24	117.3	127.7	127.5	41.8	45.7	45.7	-2.8	-3.4	-3.4
Total Projected 2023 Plan Year	1563.5			480.1			-48.1		
Preliminary 2023 Plan Year Calculated Total		1629.4			499.2			-56.7	
Actual 2023 Plan Year Total			1628.4			499.1			-56.6

3.0 OPERATION OF THE SUBDISTRICT NO. 2 2023 ANNUAL REPLACEMENT PLAN

All 2023 Projected Plan Year injurious stream depletions were replaced in the time, location and amount that they occurred, beginning May 1, 2023. Releases of water were performed under the provisions of section 37-87-103, C.R.S.

Subdistrict No. 2’s 2023 replacement operations included wet water releases from stored water the Subdistrict maintained in Beaver Reservoir or the Subdistrict utilized Forbearance Agreements with a number of ditches on the Rio Grande. The replacement sources used for the replacement of depletions during the 2023 Plan Year are documented in Table 3.1 below. The replacement sources used by the Subdistrict during the 2023 Plan Year were approved by the State Engineer or by the Division No. 3 Division Engineer for the 2023 Plan Year.

Appendix D shows the calling water rights, as identified by the daily District 20 call sheets, and the daily replacement source used to remedy the injurious stream depletions to those calling rights during the 2023 Plan Year. In total, **1,296.93 acre-feet** of wet water was added to the Rio Grande during the 2023 Plan Year. Forbearance agreements were used when the Subdistrict did not utilize wet water for its replacement source. The Subdistrict remedied **767.43 acre-feet** of

depletions under forbearance agreements the Subdistrict had secured for the irrigation season months of May 1st, 2023-November 8th, 2023 and April 2024. The Subdistrict’s allocation of Closed Basin Project production would have been sufficient to cover all the injurious depletions during the non-irrigation season but the production of the Closed Basin Project between January 1, 2024, and April 30, 2024, was insufficient to cover all of the depletions owed during this same period. The Subdistrict utilized **839.01 acre-feet** of the Subdistrict’s Closed Basin Project allocation to remedy injurious depletions during the non-irrigation season months of November 9, 2023-March 31, 2024. To remedy the remaining non-irrigation season depletions owed by the Subdistrict and not covered by the Closed Basin Project, a release was made from the Subdistrict’s stored water in Beaver Reservoir in the amount of **36.07 acre-feet** during April 2024. It should be noted that between October 19th and November 8th, 2023, due to the curtailment on the Rio Grande being set to zero, the accretions that occurred in Stream Reach 3 could not be aggregated with the depletions that occurred in Stream Reach 2 during this time period. Table 3.1 below shows a summary of the replacement sources used each month for the three individual stream reaches on the Rio Grande.

Table 3.1
Monthly Stream Depletions by Stream Reach for the 2023 ARP
and Replacement Sources Used to Remedy the Depletions
 (Units in acre-feet)

Rio Grande River												
Stream Reach Depletions	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24
SR-1	131.5	124.8	127.7	128.4	124.3	134.3	143.9	154.0	153.3	137.9	137.3	127.7
SR-2	49.0	41.6	37.6	26.1	28.5	34.6	41.2	48.1	48.8	46.3	52.9	45.7
SR-3	7.4	-0.7	-6.1	-17.0	-10.8	-6.5	-5.0	-1.6	-5.4	-3.4	0.1	-3.4
Total Depletions	187.9	165.7	159.2	137.5	142.0	162.4	180.1	200.5	196.7	180.8	190.3	170.0

Replacement Sources	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24
SR-1												
Squaw Pass Transmountain Water	0.000	4.160	17.273	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SLVWCD-Bear Creek	9.426	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SD1 Leased SMRC Water	28.752	37.440	0.000	0.000	0.000	34.664	0.000	0.000	0.000	0.000	0.000	8.514
Rio Grande Ditch #1 Water	0.000	0.000	16.385	31.358	34.482	51.996	9.134	0.000	0.000	0.000	0.000	38.313
Forbearance	93.324	83.200	94.062	97.044	89.838	47.663	27.402	0.000	0.000	0.000	0.000	80.883
CBP Allocation	0.000	0.000	0.000	0.000	0.000	0.000	105.534	154.008	153.326	137.924	137.330	0.000
SR-2												
Squaw Pass Transmountain Water	0.000	1.387	5.086	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SLVWCD-Bear Creek	3.513	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SD1 Leased SMRC Water	10.716	12.483	0.000	0.000	0.000	8.936	0.000	0.000	0.000	0.000	0.000	3.048
Rio Grande Ditch #1 Water	0.000	0.000	4.824	6.278	7.904	12.287	2.600	0.000	0.000	0.000	0.000	13.716
Forbearance	34.782	27.740	27.693	19.730	20.596	12.287	7.800	0.000	0.000	0.000	0.000	28.956
CBP Allocation	0.000	0.000	0.000	0.000	0.000	0.000	30.228	48.112	48.825	46.313	52.917	0.000
SR-3												
Squaw Pass Transmountain Water	0.000	-0.023	-0.822	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SLVWCD-Bear Creek	0.529	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

SD1 Leased SMRC Water	1.620	-0.207	0.000	0.000	0.000	-0.209	0.000	0.000	0.000	0.000	0.000	-0.226
Rio Grande Ditch #1 Water	0.000	0.000	-0.779	-4.150	-2.996	-1.881	0.000	0.000	0.000	0.000	0.000	-1.017
Forbearance	5.258	-0.460	-4.475	-12.838	-7.804	-1.672	0.000	0.000	0.000	0.000	0.000	-2.147
CBP Allocation	0.000	0.000	0.000	0.000	0.000	0.000	-3.652	-1.581	-5.394	-3.393	0.124	0.000
Totals Replacements	187.920	165.720	159.247	137.422	142.020	164.071*	179.046*	200.539	196.757	180.844	190.371	170.040

*Negative Stream Reach 3 depletions were aggregated, or combined, with positive Stream Rach 2 depletions during 2023 Plan Year EXCEPT between October 19 – November 8.

4.0 DOCUMENTATION OF PROGRESS TOWARDS ACHIEVING AND MAINTAINING A SUSTAINABLE WATER SUPPLY

Per Rule 8.4 of the Groundwater Rules, there is no Sustainable Water Supply requirement of the wells that withdraw groundwater from the alluvium of the Rio Grande within the Rio Grande Alluvium Response Area. Subdistrict No. 2 is not currently pursuing the fallowing of any irrigated lands within the boundaries of the Subdistrict. It is anticipated that the imposition of a Pumping Fee will naturally reduce the amount of groundwater withdrawn by ARP Wells in the future. Although there is no specific sustainability requirement, the Board of Managers continues to recognize the importance of conservation and wise and efficient use of water and will continue to work with and educate its well owners and develop conservation programs.

5.0 ADDITIONAL INFORMATION TO EVALUATE 2023 AR

The Subdistrict will provide the DWR with an electronic copy of the Response Functions used in this Annual Report at the same time they submit the Annual Report for review and approval. Additional supplemental information that is generally used by DWR in their evaluation of the Annual Report is also being included with the submission. The supplemental information being provided includes:

1. The list of Subdistrict Wells and the 2023 actual metered groundwater withdrawals for the ARP Wells included in the 2023 ARP in spreadsheet format matching the list provided in Appendix A.
2. Spreadsheet of the breakdown of “sprinkler,” “flood” and “other” wells used to calculate the Consumptive Use Ratio in the Response Functions.