REPORT OF THE ENGINEER ADVISERS
TO THE RIO GRANDE COMPACT COMMISSION
FOR CALENDAR YEAR 2022
April 18, 2023

The Engineer Advisers to the Rio Grande Compact Commission met in person and by video conference on January 19, 2023 and from March 13 to March 17, 2023 to:

- Receive reports;
- Reconcile the 2011 to 2021 Rio Grande Compact (Compact) water accounting pursuant to the November 10, 2022 Rio Grande Compact Commission Credit Water Agreement for Administration and Accounting at Elephant Butte Reservoir (Agreement);
- Prepare the 2022 Compact water accounting;
- Discuss continuing and new issues in preparation for the 2023 annual meeting of the Rio Grande Compact Commission (Commission); and
- Prepare the Engineer Advisers' report.

The Engineer Advisers received the participation of the Colorado Division of Water Resources (CDWR), the U.S. Geological Survey (USGS), the U.S. Bureau of Reclamation (Reclamation), the U.S. Army Corps of Engineers (Corps), the U.S. Bureau of Indian Affairs (BIA), the International Boundary and Water Commission (IBWC), and the U.S. Fish and Wildlife Service (Service) at the meetings. The agencies each presented information about their specific water-related activities in the basin during calendar year 2022.

2011-2021 COMPACT ACCOUNTING RECONCILIATION

Since 2011, there has been a lack of consensus among the Engineer Advisers on finalizing the annual Compact delivery accounting. The lack of consensus is well documented in the annual reports of the Engineer Advisers from 2011 through 2021. At the direction of the Rio Grande Compact Commission, in June of 2022, the Engineer Advisers initiated discussions to reach a consensus on finalizing Compact accounting for 2011 forward. In Fall 2022, the Engineer Advisers developed the Agreement that resolved the dispute over how the evaporative

losses on Credit Water are calculated and tabulated in the accounting for water deliveries. The Agreement also addresses future mandatory relinquishments, accounting of evaporation of Credit Water using the "Constant Credit Water Method," and a one-time adjustment to delivery credits for New Mexico and Colorado to compensate for the 2011 releases of Credit Water.

On November 10, 2022, at a special meeting of the Rio Grande Compact Commission, a resolution was passed which adopted the Agreement. Based on this Agreement, the Engineer Advisers reconciled the annual Compact delivery accounting from 2011 to 2021. The methodology described below was utilized to reconcile the accounting, using the 2010-approved accounting as a starting point. Calculation of evaporation on Credit Water used the following methodology:

- Rio Grande storage and Rio Grande evaporation in Elephant Butte Reservoir data were exported from the final Upper Rio Grande Water Operations Model (URGWOM) files for the years 2011-2021;
- Beginning of Year (BOY) Credit Water in storage for Colorado and New Mexico was held constant throughout each year;
- Evaporation on Colorado and New Mexico's Credit Water was calculated on a daily timestep for each year, in proportion to the total amount of native water physically stored daily in Elephant Butte Reservoir. In previous years, evaporation on Credit Water was calculated on a monthly timestep, but since daily pan evaporation and reservoir storage data are readily available, a more accurate daily timestep method was utilized for the accounting reconciliation.; and
- The daily Credit Water evaporation was totaled for Colorado and New Mexico annually for each year, and the BOY Credit Water storage for each state was reduced by the respective evaporation volumes for 2011 through 2021.

As part of their discussions on reconciliation of the accounting, the Engineer Advisers also agreed to compute evaporation on retained Debit Water in storage on a daily basis and to apply it annually. This method can be used to calculate evaporation on retained Debit Water in any reservoir where it may be in storage:

- The data for Rio Grande storage and evaporation in El Vado Reservoir were exported from the final URGWOM files for the years when New Mexico retained Debit Water (2017, 2018 and 2020);
- Evaporation on New Mexico's retained debit was calculated on a daily timestep in proportion to the total native water stored daily in El Vado; and
- For the years where Debit Water was retained, the daily evaporation on Debit Water was totaled annually and applied as a credit to the Accrued Debit.

The reconciled and Engineer Adviser-approved accounting sheets will be presented to the Commissioners for approval at the 2023 Commission annual meeting, in accordance with the Agreement. The reconciled accounting sheets will be included in a separate document in the Rio Grande Compact Commission Annual Report.

The Engineer Advisers agreed that this will be the method for Credit and Debit water accounting going forward. Based on the reconciled accounting period which ended on December 31, 2021, New Mexico's Accrued Debit was 128,900 acre-feet, and Colorado's Accrued Debit was 4,000 acre-feet.

2022 COMPACT ACCOUNTING

The Engineer Advisers reviewed the streamflow and reservoir storage records and other pertinent data for the Upper Rio Grande Basin during calendar year 2022 and reached a consensus on the Compact accounting. As determined by the Engineer Advisers, scheduled and actual deliveries, release of Usable Water for the year 2022, and balances as of January 1, 2023, are as follows:

a) Deliveries by Colorado at the State Line:

Balance as of January 1, 2022	-4,000 acre-feet
Scheduled delivery from Conejos River	86,200 acre-feet
Scheduled delivery from Rio Grande	109,800 acre-feet
Actual delivery at Lobatos plus 10,000 acre-feet	199,900 acre-feet
One-time adjustment/delivery credit	300 acre-feet
Accrued credit January 1, 2023	200 acre-feet

b) Deliveries by New Mexico at Elephant Butte Dam:

Balance as of January 1, 2023	-128,900 acre-feet
Scheduled delivery	336,600 acre-feet
Actual delivery	340,000 acre-feet
One-time adjustment/delivery credit	32,5000 acre-feet
Accrued debit January 1, 2023	93,000 acre-feet

c) Project Storage and Releases:

Accrued departure (credit) as of January 1, 2023	2,765,800 acre-feet
Actual release of Usable Water	269,900 acre-feet
Normal release for year	790,000 acre-feet
Under Release in excess of 150,000 acre-feet	370,100 acre-feet
Accrued departure (credit) as of January 1, 2023	2,915,800 acre-feet

No Debit Water was stored in 2022.

The Engineer Advisers jointly prepare the Compact accounting based on information provided and presented by state and federal agencies, which is the best available information at the time of report preparation. The Engineer Advisers' Report is considered final upon signature by the three Engineer Advisers.

RIO GRANDE BASIN CONDITIONS

Snowpack and snow-water equivalent (SWE) amounts were near to below average throughout the winter of 2021-2022. The SWE for most headwater areas in both Colorado and New Mexico peaked at slightly below their average peak values. At the end of the winter season the SWE dropped drastically, resulting in a snow-free date for most locations occurring approximately one month earlier than usual. Below-average precipitation in the spring months as well as windy conditions and very low soil moisture were factors preventing much of the SWE from reaching the rivers and streams. As a result, snowmelt runoff levels and yearly streamflow amounts in 2022 were well below the long-term average for most areas across the basin in Colorado and in New Mexico. Multiple summer monsoonal precipitation events were instrumental in increasing most basin streamflows to around the historical average.

Due to the low runoff flows, Platoro Reservoir only reached a high of approximately 44 percent of capacity during late May of 2022. Usable Water in Rio Grande Project (Project)

Storage was below the Article VII trigger of 400,000 acre-feet the entire year, which imposed Article VII storage restrictions on storage in post-Compact reservoirs.

CONTINUING COMPACT ISSUES

This section of the report summarizes new information about issues directly related to the Compact and which were previously addressed by the Engineer Advisers. It reflects information obtained by the Engineer Advisers prior to the writing of the Engineer Advisers' report, and it may contain information obtained from the reports of the federal agencies at the 2023 Engineer Advisers meetings or otherwise reported.

Relinquishment Update

The total amount of Accrued Credit relinquished by Colorado since 2013 is 3,000 acre-feet. Colorado did not store any relinquishment credit water in 2022. Between 2013 and 2021, Colorado stored a total of 2,885 acre-feet of relinquishment credit water in Platoro Reservoir, which leaves a balance of 115 acre-feet in Colorado's relinquishment account.

The total amount of Accrued Credit relinquished by New Mexico since 2003 is 380,500 acre-feet. No relinquishment credit water was stored in New Mexico reservoirs during the 2022 calendar year. Relinquishment-credit water storage to date totals 288,728 acre-feet, leaving a balance of 91,772 acre-feet available to be stored in future years when Article VII storage restrictions are in effect.

Article VII storage restrictions are anticipated to be lifted for several months beginning in the spring of 2023.

Gaging Station Review

At the preliminary Engineer Adviser meeting in January 2023, the Colorado Division of Water Resources (CDWR) reported on activities at Colorado's Compact gages. The Colorado USGS reviewed CDWR gaging station records for the seven Colorado Compact gages and approved all of those records for 2022. The CDWR made an average of 28 measurements at each of these seven Compact gaging stations. The records for most of these stations were rated as "good" except for the periods of estimation, which were rated as "poor."

For the Rio Grande near Otowi streamflow gage (#08313000), the USGS reported that in calendar year 2022 they continued to use the stage discharge rating (#42) which was implemented on February 8, 2021. The USGS reported they made a total of 14 measurements at the Otowi gage in 2022, with nine rated "good," one rated "fair," and one rated "poor." For 2022, the USGS continued to utilize redundant primary sensors (non-contact radar and wire weight) as well as redundant secondary reference gages (bubbler and staff gage) for gage-height readings. There were no equipment changes at the Otowi gage for 2022.

The USGS reported that during the 2022 calendar year, 33 measurements were collected at the Rio Grande below Elephant Butte streamflow gage (#08361000). Of the 33 measurements, 13 were rated "good," five were rated "fair," and two were rated "poor." Aquatic vegetation growth on the streambed at the USGS gaging station section continues to cause a low bias in gaged flow during certain months. This issue has occurred for an undetermined period but began to be addressed in 2016 by utilizing an alternate section which is not impacted by vegetation growth during certain months. After June 1, 2022, all measurements were made at the alternate section below Elephant Butte Dam due to vegetation impacts at the primary section cableway. The gage records for 2016 through 2022 reflect improved precision, and the NMISC will continue to coordinate with the USGS to provide more accurate gage records in the future.

Reclamation reported that they analyzed the data for the Rio Grande Below Caballo gage. A total of 42 measurements were made at the below Caballo gage between June 1st and August 20th, of which 24 measurements were reported as "Compact measurements." The Acoustic Doppler Velocity Meter (ADVM) is no longer being utilized at the site because their analysis has indicated that stage-discharge data are more representative of flow due to the site conditions. The ADVM will be deployed to the alternate section below Elephant Butte.

The USGS also reported that they reviewed and approved the 2022 streamflow gage below Caballo (#08362500) flow records developed by Reclamation, and that all necessary documentation was provided. The USGS reported that the record accuracy looked good, in large part due to the high number of measurements made at the gage.

The NMISC continued its survey of water-level elevations in Elephant Butte and Caballo reservoirs. NMISC's surveyor performed surveys alongside Reclamation staff in June 2022 and

January 2023. Results from both NMISC's surveys indicated that Reclamation's reservoir stage elevations were within the agreed upon threshold criteria of 0.05-foot difference between the surveyed elevation and the stage-discharge recorder (SDR). Reclamation performed routine stage elevation surveys throughout 2022 and adjusted the SDR as needed if the threshold criteria was exceeded.

In 2022, Reclamation continued to measure Elephant Butte elevation via the SDR and a bubbler. The bubbler, which is maintained in conjunction with the USGS, shows more scatter but in general more accurately reflects observed elevation when the reservoir is low. NMISC and Reclamation will continue to perform side-by-side surveys at select times during 2023 to ensure the accuracy of the reservoir elevation data.

Gaging Station Costs

The Engineer Advisers and Compact Commissioners have expressed concern in the past multiple years over the large difference in costs between what Reclamation charges to operate the gage below Caballo Reservoir as compared to what CDWR and USGS charge for other Compact gages. The three Compact states split the costs of their operations in support of the Compact equally, including operation and maintenance of the Compact gaging stations. Therefore, this high cost from Reclamation affects all three states.

The cost charged by Reclamation for the operation of the below Caballo Gage for this coming year is no exception to the recent very large charges that Reclamation submits to the Engineer Advisers. For this upcoming year, Reclamation provided a cost estimate for the operation of this gaging station of $36,581. Of that total, the cost to be borne by the Compact states was $29,265. This is an increase of $14,024, or a 92% increase over last year's costs. Additionally, documentation or justification to support this very large increase was not provided with the initial submission of costs but was only provided after specific requests from the Engineer Advisers. Currently, Reclamation's charges to the Compact states are approaching three times the amount of the average cost charged per gage by CDWR and USGS. The Engineer Advisers remain very concerned with Reclamation's high cost for the operation of this gage and with the large fluctuations in the charged costs year to year.

FEDERAL AND STATE AGENCY REPORTED INFORMATION

This section of the report is for informational purposes only and summarizes new information about issues which are not directly related to Compact administration. It reflects information obtained by the Engineer Advisers prior to the writing of the Engineer Advisers' report, and it may contain information obtained from the reports of the federal and/or state agencies at the 2023 Engineer Advisers' meetings or otherwise reported. This section contains information provided by various entities without analysis or approval by the Engineer Advisers.

Middle Rio Grande Endangered Species Collaborative Program

The Middle Rio Grande Endangered Species Collaborative Program (Collaborative Program) was authorized by the Omnibus Appropriations Act of 2009 (P.L. 111- 8). The Collaborative Program continues to seek innovative and collaborative ways to support Endangered Species Act (ESA) compliance for listed species while protecting water uses in the Middle Rio Grande. Reclamation reported that their federal appropriations in federal fiscal year (FY) 2022 were $2.78 million for Collaborative Program activities, which stayed consistent from the $2.78 million in federal FY 2021 but decreased from $3.84 million in federal FY 2020. Projects funded through Reclamation that remain in the Collaborative Program are several long-term monitoring programs such as the Rio Grande silvery minnow (RGSM) population and genetics monitoring, and Middle Rio Grande bird surveys.

WildEarth Guardian's Litigation over the 2016 Biological Opinion

On November 30, 2022, WildEarth Guardians filed a lawsuit in U.S. District Court against the U.S. Fish and Wildlife Service and Reclamation regarding the 2016 Middle Rio Grande Biological Opinion (2016 BO). The lawsuit claims the 2016 BO is invalid under the ESA and arbitrary under the Administrative Procedure Act. The MRGCD intervened without protest and on February 6, 2023, a 90-day stay was granted for settlement negotiations.

Upper Rio Grande Water Operations Model

The URGWOM is a computational model developed through an interagency effort led by the Corps, Reclamation, and the New Mexico Interstate Stream Commission (NMISC). The effort includes regular meetings to discuss modeling outputs for daily water operations and accounting procedures. During 2022, URGWOM activities included:

- Updating the basin-wide annual operating plan (AOP) in collaboration with Reclamation and the NMISC;
- Updating the database to include data through 2021 for the MRG and the Lower Rio Grande (LRG);
- Developing, calibrating, and implementing deep aquifer objects into the model;
- Updating the five-year plan;
- Updating all URGWOM documentation volumes to the public website;
- Studying the Abiquiu deviation to store Prior and Paramount (P&P) water due to rehabilitation of El Vado Dam; and
- Continuing to develop the real-time operation model by linking URGWOM to the Corps Water Management System (CWMS) and using National Weather Service (NWS) forecasts for real-time operations.

Key objectives for 2023 include:

- Preparing basin-wide AOPs for 2023;
- Continuing to develop CWMS compatibility with partners at the Center for Advanced Decision Support for Water and Environmental Systems to eventually move URGWOM into the CWMS platform; and
- Updating the Real-Time Forecast Model using NWS forecast data (10-day forecast).

Compliance by Federal and State Agencies with State Water Law

The NMISC continues to track habitat restoration projects implemented by various federal and state agencies, and to account and report on related depletions in the Middle Rio Grande. It coordinates with the New Mexico Office of the State Engineer (NMOSE) to determine if a permit is needed and to ensure any new depletions are offset by the projects' sponsors. The NMISC reported that it continues to coordinate with the Corps on several habitat

restoration projects to ensure that those depletions are offset. The NMISC also coordinates with Reclamation in using the State's Strategic Water Reserve for ESA-related water management, including offsetting depletions associated with habitat restoration and river augmentation activities. Below-average snowmelt runoff in 2022 resulted in approximately 2 acre-feet of depletions for habitat restoration projects in the Middle Rio Grande that were offset by New Mexico's Strategic Water Reserve.

Elephant Butte Delta Channel Project

With a below-average snowmelt runoff and an above-average monsoon season the Elephant Butte Delta Channel (Delta Channel) successfully conveyed all flows during 2022. The extended duration of the monsoon season, combined with the lower magnitude of precipitation, generated smaller peak flows that resulted in less degradation of the Delta Channel throughout the year.

During October and November of 2022, the NMISC construction contractor conducted regular maintenance on the Delta Channel in the middle and upper project sections. Since 2003, New Mexico has spent nearly $20 million to construct and maintain the Delta Channel and continues to partner with Reclamation, which provides engineering support, environmental compliance, access-road work, and primary maintenance for the project.

Mass Balance Review

The NMISC conducted a mass balance analysis for the Rio Grande between the Elephant Butte and Caballo gages for calendar year 2022. The mass balance analysis indicated that the reach gained water in nine out of twelve months with a total calculated annual gain of 43,242 acre-feet. The large gain during the year is largely attributed to intervening flows from significant monsoon rains, with August and September inflows exceeding 20,000 acre-feet and 15,000 acre-feet, respectively. Losses occurred in May, June, and July, with May seeing losses of over 5,000 acre-feet as irrigation water started being released.

Colorado Groundwater Regulations

In late 2015, the State Engineer of Colorado completed the development of rules and regulations concerning the use of groundwater in the Upper Rio Grande Basin in Colorado. These rules were approved by the Colorado Division 3 (Rio Grande Basin) Water Court in 2019 and went into full effect on March 15, 2021. As an integral part of these rules, the State Engineer of Colorado has also completed the development of Phase 6 of the Rio Grande Decision Support System Model. Development of Phase 7 began and is currently moving forward along with peer review. This model captures the interaction between surface and groundwater and shows the effect that wells have on senior surface water rights. The owners of non-exempt wells are required to mitigate the injurious depletions that their wells cause to senior surface-water rights and regulate the use of the confined and unconfined aquifers to maintain a sustainable water supply in each aquifer system. There are currently seven groundwater user subdistricts and multiple individual augmentation plans that have been developed as a way for the well owners to comply with the rules. Difficulty meeting sustainability in Subdistrict One has led to the contemplation of a new Plan of Water Management for that subdistrict and the filing of three significant independent Plans of Augmentation in Colorado Water Court.

Aamodt Settlement and Pojoaque Basin Regional Water System

The Aamodt Water Rights Settlement Agreement (Settlement Agreement) was developed through multi-party negotiations, which began in 2000 between the Pueblos of Nambé, Pojoaque, Tesuque and San Ildefonso, the State of New Mexico, the United States of America, Santa Fe, Santa Fe County, and representatives of non-Pueblo water users, to settle the Pueblos' water right claims in the Pojoaque Basin. The Settlement Agreement provides for the funding and construction of the Pojoaque Basin Regional Water System to supply treated water to Pueblo and non-Pueblo parties. As expressly stated in the Settlement Agreement, "Nothing in this agreement shall be construed to limit the authority of the State Engineer to…ensure compliance with the Rio Grande Compact," (Section 6.6.1.6). The Engineer Advisers will continue to evaluate the project as it moves forward, including evaluating potential impacts to the Otowi Index Supply.

The final Pojoaque Basin Regional Water System Environmental Impact Statement was published in the Federal Register in January 2018, and the Record of Decision was signed on September 11, 2019. Construction began on the intake area of the Regional Water System in June 2020. Additional funding and a time extension were authorized in late 2020, and the first portion of Phase I work was completed in January 2022. The next portion of Phase 1 construction was expected to begin in March 2022.

In 2022, about 3 acre-feet were withdrawn from the completed wells for construction purposes, such as dust abatement and compaction.

Reclamation's Lower San Acacia Reach Improvements Project

For FY 2022, Reclamation reported on progress on the Identification of San Acacia Reach Options (ISARO), which advanced to the next stage called the Evaluation of San Acacia Reach Options (ESARO) and is now referred to as the Lower San Acacia Reach Improvements Project (LSARI). This project focuses on the lower section of the San Acacia Reach from Highway 380 bridge just above the Bosque del Apache National Wildlife Refuge (BDANWR), downstream to the Narrows of Elephant Butte Reservoir. As previously reported, this area has historically been problematic for deliveries of water and sediment downstream into the reservoir, and high losses continue to occur in this section of the river. Reclamation has engaged with the NMISC, MRGCD, Service, and local landowners on its conceptual engineering options. A Value Planning Study required by Reclamation for large-scale projects was completed in 2021. In 2022, two alternatives were identified, a feasibility-level study and EIS were started, and a technical team was established that includes nonfederal partners, with an estimated completion date in 2024.

Conversion from a two-channel system consisting of the river channel and Low Flow Conveyance Channel (LFCC) to a single channel is the highest-ranking option in a Feasibility Study, but other options will continue to be evaluated. In addition, the re-operation of the LFCC from the San Acacia Diversion Dam to its terminus will be part of the evaluation as requested by the MRGCD.

Closed Basin Project

The total production of the Closed Basin Project in calendar year 2022 was 11,673 acre-feet. This total includes water that was exchanged for Colorado Parks and Wildlife water to be delivered to the Blanca Wildlife Habitat Area, the Alamosa National Wildlife Refuge and to the San Luis Lakes State Wildlife Area. The amount creditable for Compact purposes from direct delivery and exchange was 8,276 acre-feet. The remainder of the water produced was delivered to various federal lands along the project to be used as mitigation for the project footprint. All the water delivered to the Rio Grande in 2022 was of sufficient quality to qualify for credit under the Compact.

Reclamation continues to address problems of biofouling in the production wells of the Closed Basin Project. During 2022, Reclamation rehabilitated 19 wells and installed four new pumps. Wells will continue to be rehabilitated as budgetary constraints allow to help maintain project production. The Closed Basin Operating Committee continues to monitor groundwater levels and groundwater production and to adjust project operations pursuant to the enabling legislation.

Reclamation's Middle Rio Grande Supplemental Water Program

Reclamation's supplemental water program is intended to provide additional water, primarily obtained through the voluntary leasing of San Juan Chama Project (SJCP) water, for endangered species' needs and compliance with the 2016 BO. The program originally included water acquisition, reservoir storage, and release of water to support river flows. From 2001 to 2020, it also included operation of a pumping network in the San Acacia Reach to pump water from the LFCC to the river.

In 2022, a total of 6,337 acre-feet of supplemental water was released for endangered species purposes. Reclamation reported that the release of supplemental water began on May 24 and continued through June 17. Releases resumed on July 8 through July 27 and again on September 5 through September 21.

Reclamation ended 2022 with a total of 5,016 acre-feet of supplemental water in storage: 1,656 acre-feet of water in Abiquiu Reservoir and 3,360 acre-feet of water in Heron Reservoir,

all leased from 2022 SJCP contractor allocations. Reclamation is negotiating leases of up to 12,000 acre-feet from SJCP contractor allocations for 2023.

In addition to the water released by Reclamation, three other sources of water were reportedly used to support ESA needs:

- 139.61 acre-feet of pre-1907 native rights were permitted for offset via New Mexico's Strategic Water Reserve, released as needed between April 27 and May 5;
- 137 acre-feet of SJCP water leased by Audubon New Mexico, released between June 15 and September 11; and
- 2,551 acre-feet of native water were acquired via the MRGCD's Environmental Water Leasing Program (EWLP), which is a fallowing program funded by Reclamation.

Reclamation reported that 2,554 acres were enrolled in the EWLP and that the program receives a credit, in acre-feet, for all enrolled acres, prorated to account for water availability. According to Reclamation, above average monsoon activity resulted in above average summer and fall inflows, which generated a credit of 7,015 acre-feet for the season. Beginning in June, 2,551 acre-feet of this water were released for ESA needs and Reclamation reported that the remaining 4,464 acre-feet of EWLP credits were not released and did not carry over.

The Neil Cupp pumping site, originally developed by Reclamation for temporary pumping operations from the LFCC to the river, was converted to a permanent pumping site in 2020. It is now owned and operated by MRGCD and is capable of pumping to both the river and to irrigation facilities. In 2022, MRGCD pumped a total of 230 acre-feet to the river between June 2 and June 7 to maintain river connectivity.

Six Middle Rio Grande Pueblos Prior and Paramount Operations

In 2022, due to the limitations of storage in El Vado Reservoir during the repair to El Vado Dam, a request was made by the Corps to the Commission to allow Rio Grande water to be stored in Abiquiu Reservoir for use by the Pueblos in their P&P operations. The three compacting states agreed to allow up to 20,000 acre-feet of storage in Abiquiu Reservoir for P&P operations. Storage began on January 1, 2022, and the entire amount was stored while

Article VII Compact restrictions were in place. Due to significant monsoon rains and sufficient spring runoff, none of the water stored for P&P operations in 2022 was released for irrigation purposes. The P&P water stored in Abiquiu Reservoir had 1,356 acre-feet of evaporative losses, and the remaining 18,644 acre-feet was released downstream to Elephant Butter Reservoir November 15 through December 12, 2022.

Based on the March 2023, most-probable snowmelt runoff forecast, the BIA reported a preliminary storage target of approximately 18,496 acre-feet for their P&P operations in 2023. Additional forecasts may change this storage estimate, and the May 1 forecast is used as the final storage target. If the computed P&P storage based on the May 1 forecast is less than the 20,000 acre-feet permitted for P&P use in 2023, then the computed storage amount would be used. It is anticipated that all P&P storage in 2023 will be made during Article VII restrictions.

The BIA was able to make funding available to the Pueblos to perform work upgrading their irrigation systems. The BIA also provides funds to the MRGCD to perform maintenance work on the systems which serve Pueblo lands.

2022 Rio Chama Water Supply Conditions

Snowpack conditions in the Rio Chama Basin were well-below average during the winter of 2021-2022. The March through July native inflow to El Vado Reservoir was 114,422 acre-feet, or approximately 51 percent of average.

Beginning in early summer, flows on the Rio Chama were insufficient to meet the direct-flow irrigation needs of the Rio Chama Acequia Association (RCAA). RCAA represents 16 acequias on the Rio Chama between Abiquiu Reservoir and the confluence with the Rio Grande that have direct surface flow diversion rights. With insufficient native flows to meet their needs and the absence of sufficient leased SJCP water, the NMOSE curtailed RCAA diversions to the available natural flow of the river from summer through fall of 2022.

Rio Grande Project Operations

The 2022 Rio Grande Project (Project) water accounting amounts were approved by the respective district boards and Reclamation prior to the 2023 Engineer Advisers' Meeting. All accounting information reported by Reclamation is based on URGWOM.

On January 1, 2022, there was 183,512 acre-feet of Usable Water in Project Storage (Elephant Butte and Caballo reservoirs combined) and 275,963 acre-feet on December 31, 2022. Usable Water reached a high of 296,984 acre-feet on May 27 and a low of 89,546 acre-feet on August 18, 2022.

Reclamation's initial allocation for calendar year 2022 for El Paso County Water Improvement District No. 1 (EP No. 1) and Elephant Butte Irrigation District (EBID), was calculated in May after the 2021 water accounting had been finalized.

Mexico was provided an initial allocation of zero acre-feet in December 2021. Based on the provisions of the 1906 Convention for extraordinary drought, the allocations to Mexico were updated monthly, with a final in-season allocation in July 2022 of 14,827 acre-feet, which is about 24 percent of a full allocation.

The final in-season Project allocation of 340,257 acre-feet was given on July 7, 2022, including Mexico's allocation of 14,827 acre-feet. The final calculated charges were: 111,483 acre-feet to EP No. 1; 82,339 acre-feet to EBID; and 14,843 acre-feet to Mexico. A total of 208,665 acre-feet of water deliveries were charged to the Project water users.

Mexico is allocated Project Water for delivery during the year based on the anticipated release of Usable Water. This allocation cannot be reduced once it has been made. The actual release for the 2022 irrigation season was less than the anticipated release forecasted in May. Deliveries to Mexico during the year are made based on the most recent Project allocation. At the end of the year, Mexico's final allocation is determined using the actual annual release from Caballo Dam. If the amount of water delivered to Mexico is larger than Mexico's final allocation, the difference is charged to the two districts based on the proportion of the end-of-year 2022 allocation balances. Therefore, EP No. 1 and EBID were charged with -562 acre-feet and -739 acre-feet, respectively, as adjustments for the difference between Mexico's allocation and measured diversions.

Reclamation reported that the final 2022 allocation balances and beginning balances for 2023 were 71,860 acre-feet and 58,447 acre-feet for EP No. 1 and EBID, respectively.

Reclamation reported final 2022 releases from Caballo Reservoir for Project accounting during the irrigation season of 268,290 acre-feet for all three Project water users: EP No. 1,

EBID, and Mexico. Releases from Caballo Reservoir began on June 1 and ended on August 20, 2022. EBID and EP No. 1 began the irrigation season with coordinated orders and diversions. Mexico delayed their initial order by one week, and their diversions began on June 7. EBID ended their surface water diversions on June 28, Mexico ended on August 9, and EP No. 1 ended diversions on August 31.

During 2022, Reclamation's report indicates drainage flows into Hudspeth County Conservation and Reclamation District No. 1 (HCCRD) during March through September were 16,009 acre-feet. The calendar year total flow data for HCCRD was 25,827 acre-feet. Additionally, 926 acre-feet was delivered from Caballo Reservoir through the Bonita Lateral during calendar year 2022.

The USGS reported that the total annual flow volume at the gage below Elephant Butte dam was 281,815 acre-feet. There was a total of 268,974 acre-feet measured at the Caballo gage which is the amount used in Compact accounting for the calendar year.

For 2023 Project operations, Reclamation determined that the initial 2023 allocation to Mexico is 7,374 acre-feet based on the December 1, 2022, data. Reclamation will continue to evaluate the amount of Usable Water monthly to determine the actual Project allocations, which will occur in April or May.

Based on the March 2023 snowmelt runoff forecast for the Rio Grande and current hydrologic conditions, Reclamation anticipates a shortened irrigation season beginning around June 2, 2023.

U. S. Geological Survey

The Engineer Advisers received reports from the USGS on their Rio Grande Basin studies. The USGS, in cooperation with Reclamation, has developed a model of the transboundary aquifers and interconnected surface waters of the Palomas and Mesilla basins in New Mexico and Texas and the Conejos-Médanos Basin of northern Mexico, known as Rio Grande Transboundary Integrated Hydrologic Model (RGTIHM). A Scientific Investigations Report was published in 2022. USGS is currently extending the simulation period of the historical calibration and incorporating a process to allow dynamic simulation of Rio Grande

Project operations. USGS also reported on a project to study streamflow response to potential changes in climate in the Upper Rio Grande basin.

The USGS listed, but did not give details on, many other New Mexico Water Science Center projects and activities in the Rio Grande Basin, such as the Transboundary Aquifer Assessment Program, the Mesilla Basin Monitoring Program, URGWOM support and other groundwater and surface water monitoring programs.

U.S. Army Corps of Engineers Civil Works Projects

The Corps reported on the status of Civil Works projects under the Water Resources Development Act (WRDA) of 2020, which provided reauthorization for the Rio Grande Environmental Management Program in Colorado, New Mexico, and Texas. Authorization for this program was extended through federal FY 2029. Current projects undergoing either a feasibility study, higher-level planning, or construction include: Abiquiu Reservoir legislation, Bernalillo to Belen Levee Project, and Sandia to Isleta ecosystem restoration.

Legislation related to Abiquiu Reservoir in WRDA 2020 changed the storage limit of SJCP and native Rio Grande water in Abiquiu Reservoir from a total volume of 200,000 acre-feet to an elevation of 6,230 feet MSL (229,199 acre-feet) and to allow concurrent storage of Rio Grande and SJCP water in Abiquiu Reservoir. This would not have an effect on flood control operations at Abiquiu. The Water Control Manual must be updated, and environmental compliance completed, with a target date of the end of 2023. Additionally, future storage easements must be acquired.

The Bernalillo to Belen Levee Project, Espanola Valley Ecosystem Restoration, and Sandia to Isleta Ecosystem Restoration projects are authorized for construction under WRDA 2020. Most received funding to begin work on design and compliance contingent on executing agreements with project sponsors in FY 2023. The Espanola Valley Ecosystem Restoration design agreements were signed in November 2022 and the design is ongoing.

The Tribal Partnership Program is currently underway for San Felipe, Santa Ana, Zia, and Santo Domingo pueblos. These projects include watershed assessments, drought resilience

planning and feasibility studies for irrigation infrastructure. Efforts were initiated in FY 2020 and were completed in FY 2022.

Rio Grande Silvery Minnow

The Service reported on the 2022 monitoring results for the endangered Rio Grande silvery minnow (RGSM) using the October Catch per Unit Effort (CPUE) data used to report long-term trends in relative abundance.

The Service has adopted the use of 30 sites for evaluating RGSM take instead of the standard 20 sites. The 2022 October fish monitoring estimated an RGSM density of 0.17 fish/100 square meter (m^2) for 30 sites. High spring runoff years in 2017 and 2019 had October RGSM densities of 23.2 and 3.4 fish/m^2. However, due to rapid decreases in discharge and extensive drying in 2022, there were no successful spawning events or egg collection, which impacted hatchery production and augmentation. The Service reported that only 129,497 (out of the 269,000 needed) RGSM were augmented to the Middle Rio Grande in 2022, in comparison to 208,772 in 2021, and 310,634 in 2020. Fish were provided by the City of Albuquerque's BioPark, the Service's Southwestern Native Aquatic Resources and Recovery Center located in Dexter, New Mexico, and the NMISC's Los Lunas Silvery Minnow Refugium. The Service expressed concern about the potential CPUE in 2023 because of the lower-than-normal number of augmented fish in 2022. The Service stated that through 2021, the 2016 BO has not been violated nor has Reclamation exceeded its take for RGSM. The Service is waiting for the 2022 final report from Reclamation for a decision on the 2022 CPUE. Only a portion of the RGSM that were stocked in 2020, 2021, and 2022 were tagged because of Covid-19 restrictions, so distinguishing wild and hatchery fish will not be possible until tagging of all the fish is resumed.

The Service, with assistance from the 2016 BO partners, conducted rescue activities in the 49.4 miles of unique drying within the San Acacia, Isleta, and Albuquerque reaches. There were 2,114 RGSM rescued from these reaches in 2022. Drying and fish rescue in the Albuquerque reach extended north to Montano Road.

El Vado Dam Repairs

Reclamation previously reported that substantial degradation of the steel lining system and service spillway has occurred at El Vado Dam. Corrective action studies determined that construction and repair work need to be conducted at the dam. The El Vado Safety of Dams Project is occurring in two phases: 1) installation of a synthetic liner system across the entire face plate of the existing dam to reduce embankment seepage, and 2) repair and refurbishment of the spillway.

Reclamation reported that contractor mobilization occurred in March 2022. During the 2022 construction season, the contractor completed repairs to the steel face plate and below-grade grouting efforts. Reclamation and the contractor also worked through several contract modifications related to material quantities and changes in site conditions. While the project is still on budget, it was reported that the contract changes are likely to add 6-12 months to the first phase of the project schedule.

Reclamation reported that the second phase of the project, the El Vado spillway repair and refurbishment, is going through final design changes and contract solicitation will be posted in late 2023 with construction activities scheduled to begin in spring of 2024.

During both phases of construction, there will be restrictions on storage of water in El Vado Reservoir. In 2022, NMISC and Reclamation each submitted a request to the Corps to deviate from the Water Control Plan at Abiquiu Reservoir to temporarily store native water at Abiquiu Reservoir during El Vado Dam and spillway construction activities under the same rules that would apply to native water storage at El Vado Reservoir. The Corps conducted the necessary regulatory compliance and ultimately stored only P&P water. (The Engineer Advisers note that Colorado and New Mexico approved storing all native water, while Texas approved storing only P&P water). The Corps reported that the deviation from normal operations at Abiquiu Dam is valid through the 2024 calendar year. If the El Vado Dam repairs are not complete within that timeframe, additional requests from the parties will be required, but no additional regulatory compliance would be necessary.

Middle Rio Grande Project Channel Maintenance

Reclamation's report indicates it is pursuing work at 17 active priority sites along the Middle Rio Grande Project reach where bank erosion or reduced channel capacity could cause levee failure.

Reclamation reported that the BDANWR Pilot Realignment Project, which was completed in March 2021, had adaptive maintenance performed starting in October 2022. The adaptive maintenance focused on implementing additional mechanical adjustment of the bed slope, which was necessary because recent spring snow-melt runoff flows were insufficient to scour the project area as originally intended. (The New Mexico Engineer Adviser notes that the current channel continues to be undefined through a significant portion of the project, resulting in extensive open water evaporation that is likely contributing to Compact delivery issues.) Reclamation reported that the BDA upper realignment is currently in the design phase with NEPA compliance to begin in 2023 and construction expected to begin in 2024.

Reclamation reported on the River Mile 60 Project, which will temporarily connect the LFCC to the Rio Grande with controlled outfalls in the Lower San Acacia Reach. This project fulfills one of the 2016 BO Conservation Measures and has an intended goal of improving water delivery to Elephant Butte Reservoir while avoiding negative impacts to southwestern willow flycatcher (flycatcher) habitat nearby. Experimental operations and adaptive management plans have been developed and Reclamation is currently working on drafting a memorandum of understanding for the MRGCD to operate the project gates.

Vegetation Management at Elephant Butte and Caballo Reservoirs

Reclamation reported that it performed vegetation maintenance at Caballo Reservoir during 2022, using federal funding. Reclamation noted that maintenance at Caballo Reservoir included mowing and mulching of approximately 400 acres of phreatophytic vegetation.

(The Engineer Advisers remain concerned about the lack of vegetation management activities by Reclamation at Elephant Butte Reservoir. The State of New Mexico would support vegetation management efforts at Elephant Butte Reservoir through the existing Technical

Services Agreement and encourages Reclamation to work with staff to implement vegetation management projects at Elephant Butte in 2023.)

Southwestern Willow Flycatcher and Yellow-billed Cuckoo

Reclamation and the Service conduct surveys and nest monitoring for the flycatcher and the western yellow-billed cuckoo (cuckoo) during the summer along the Rio Grande from Belen, New Mexico, to El Paso, Texas. Survey efforts were impacted by travel and hiring restrictions during the COVID-19 pandemic that resulted in inconsistent survey efforts in 2020 and 2021. Decreases in reported territories do not represent the actual species condition within the Middle Rio Grande during those years.

For 2022, 504 flycatcher territories were documented in the Middle Rio Grande and 108 territories in the Lower Rio Grande. As usual, most of the flycatcher territories are in the San Marcial and Elephant Butte Reservoir areas; however, increased activity also occurred within the Isleta Reach. While the current number of flycatcher territories in the Middle Rio Grande is well above the recovery goal of 100 territories, habitats in other regions have not hit their recovery targets yet, and downlisting or delisting has not been considered for this species. In 2022, the Upper Rio Grande and San Luis Valley management units had limited survey efforts with 10 flycatchers found by the Bureau of Land Management. The next round of surveys in the San Luis Valley will occur in 2023.

Reclamation has historically conducted surveys for the cuckoo from Belen to El Paso. In 2022, 157 cuckoo territories were observed in the surveyed area. In late 2021, the Service began a Species Status Assessment (SSA), that is still in progress, to inform the future recovery plan. In 2022, the Upper Rio Grande and San Luis Valley management units had limited survey efforts with only one detection. The next round of surveys in the San Luis Valley is scheduled for 2023.

The tamarisk leaf beetle continues to be found in most of the Rio Grande area, and defoliation of salt cedar in occupied territories may result in impacts to nesting success. Although numbers of tamarisk beetles in the Middle Rio Grande have been declining in the past few years, this may be cyclical, and it is uncertain if there is a long-term trend.

Additional Listing Information Provided by the U.S. Fish and Wildlife Service

In 2016, the Service found that listing the Rio Grande chub and the Rio Grande sucker may be warranted. A Conservation Agreement was signed in September 2018 between the Service and the states of New Mexico, Colorado and Texas, the Jicarilla Apache Nation, the Pueblo of Santa Ana, several counties in Colorado, the U.S. Forest Service, BLM, and the National Park Service to reduce the threats to these fishes. The Service will complete an SSA in 2023 and conduct a 12-month review in 2024.

The Service conducts photographic monitoring of the New Mexico meadow jumping mouse (jumping mouse) at BDANWR. In 2022, there were 36 unique photo detections, which is considerably higher than the 23 unique detections in the previous year.

International Boundary and Water Commission Activities

The IBWC provided a report of its activities along the Rio Grande in New Mexico and Texas during 2022 and their projected activities for 2023. The items discussed included their levee rehabilitation work and Federal Emergency Management Agency (FEMA) status, the status of their new hydraulic modeling, the River Management Plan and habitat restoration, flood control issues and activities, sediment removal activities, water accounting operations, IBWC gaging station information and status, as well as information on the border fence projects.

The Sunland Park East Levee sections contracts were awarded, and construction began, in 2022 with completion estimated in 2025. Floodplain maps will be developed for the levee areas which show the reduced flood zones due to the levees.

In 2019, the IBWC began development of a new hydraulic model for three separate reaches between Percha Dam and American Dam. The hydraulic models will be used to analyze sediment accumulation, channel capacities, levee deficiencies, and the amount of sediment required to be removed to maintain channel capacities. IBWC reported that they achieved the 60% design in April 2022, but that additional model calibration is necessary. Contract modifications are underway to complete the project.

IBWC presented updates to the status of the Canalization River Management Plan (RMP). The RMP covers floodplain management, endangered species management, and channel

maintenance. It incorporates the 2009 Record of Decision (ROD) commitments, the 2017 Biological Opinion, and statutory compliance. The last version of the RMP was November 2018, and the update is pending the analysis in the ongoing hydraulic modeling study. The target date for the revised update is now 2024.

Currently, the IBWC has implemented 22 of 30 habitat restoration sites, totaling over 500 acres. Under the River Habitat Restoration Program, the IBWC is treating 246 acres of salt cedar near Hatch, New Mexico. The IBWC completed an Environmental Assessment for aquatic habitat restoration in November 2021 and has identified five potential aquatic habitat restoration sites.

Brief updates were also provided for the IBWC's ongoing channel maintenance projects. The American Canal Lower Reach redesign was completed in 2022, and the contract is out for solicitation with a projected completion date of 2026.

The IBWC estimated that 400,000 cubic yards of silt are deposited into the Rio Grande Canalization Project reach annually. This results in sediment plugs, island formations, raised riverbeds, increased flooding risks, and inhibited irrigation return flows. The Canalization reach is defined as 105 river miles from Percha Dam in New Mexico to El Paso. During 2021, the IBWC utilized both inhouse work crews and outside contractors to remove over 400,000 cubic yards. In 2022, IBWC work crews were able to remove about 275,000 cubic yards, and for 2023, the IBWC anticipates its work crews will remove about 250,000 cubic yards of sediment. IBWC reported that it has spent considerable portions of its budget in 2022 to purchase new equipment to replace aging equipment and to increase its in-house capacity to conduct sediment removal in the Rincon, Canutillo, and El Paso County regions of the Rio Grande.

The IBWC reported that the 2022 allocation to Mexico for the Convention of 1906 was 14,827 acre-feet, which was 24.7 percent of a full allocation. The final delivery charged to Mexico was 14,843 acre-feet. A preliminary February allocation for 2023 to Mexico was reported to be 14,891 acre-feet, which is slightly more than the 2022 final allocation, but this could change before the final allocation is made.

The IBWC provided an update on the border wall projects in the Compact reach. Work was suspended on Customs and Border Protection (CBP) border wall projects in 2021. Border

wall construction activities resumed in 2022 to remediate the negative impacts from previous CBP and Texas border wall construction.

ENGINEER ADVISER RECOMMENDATIONS

On January 1, 2020, Reclamation implemented new area-capacity tables for Elephant Butte Reservoir based on their 2017 sediment survey. These tables account for the sediment buildup within the reservoir and the related loss of storage. They also are used to determine the current total storage volume of the reservoir. The Rio Grande Compact Rules and Regulations describe the now-outdated total storage volume in the reservoir. The Engineer Advisers again recommend that the Commissioners direct the Legal Advisers, in conjunction with the Engineer Advisers, to incorporate the new tables developed by Reclamation for Elephant Butte Reservoir into the Compact Rules and Regulations for potential approval at the 2024 Commission annual meeting.

The Engineer Advisers recommend that the Commissioners again direct the Legal Advisers, in conjunction with the Engineer Advisers, to investigate the need to create an official Rio Grande Compact document repository and report the results of their investigation at the 2024 Commission annual meeting.

The Engineer Advisers recommend that the Commissioners direct the Engineer Advisers and the Legal Advisers to investigate the costs submitted by Reclamation for the yearly operation and maintenance of the Rio Grande Below Caballo Reservoir gaging station, and whether a different method can or should be used to determine the costs for this gage which are allocated equally between the states.

BUDGET

The Engineer Advisers reviewed the cost of operation for the fiscal year ending June 30, 2022 and the budget for the fiscal year ending June 30, 2024.

The Engineer Advisers found that the expenses for gaging stations and administration of the Compact for the year ending June 30, 2022 were $223,929. The U.S. federal government bore $71,840 of this total, with the balance of $152,089 to be borne equally by the three states.

The Engineer Advisers found that the proposed budget for the fiscal year ending June 30, 2024 indicates that a total of $245,825 will be spent for gaging and administration, with a proposed contribution by the U.S. federal government of $74,782.

Craig W. Cotten, P.E.

Engineer Adviser for Colorado

Page Pegram

Engineer Adviser for New Mexico

Suzy Valentine, P.E.

Engineer Adviser for Texas