Draft Environmental Assessment

and

Finding of No Significant Impact

for a

Temporary Deviation in the Operation of

Abiquiu Dam, Rio Arriba County, New Mexico

March 2022

Prepared by

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Draft Finding of No Significant Impact
Temporary Deviation in the Operation of Abiquiu Dam

Rio Arriba County, New Mexico

The U.S. Army Corps of Engineers, Albuquerque District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The final Environmental Assessment (EA) dated 2 May 2022, for the Temporary Deviation in the Operation of Abiquiu Dam addresses water management purposes, opportunities, and feasibility in Rio Arriba County, New Mexico.

The Final EA, incorporated herein by reference, evaluated various alternatives that would allow other responsible agencies to retain and release Rio Grande water at Abiquiu Reservoir while the El Vado Dam is undergoing repair in the study area. The recommended plan includes:

- Retention of up to 45,000 acre-feet per year of Rio Grande water in Abiquiu Reservoir to meet middle Rio Grande irrigation demand
- Retention of up to 20,000 acre-feet per year of Rio Grande water in Abiquiu Reservoir to meet the Six Middle Rio Grande Basin Pueblos' direct flow right

In addition to a "no action" plan, a single deviation alternative was evaluated. The deviation alternative included: 1) allowing New Mexico Interstate Stream Commission (NMISC) to retain Rio Grande water in Abiquiu Reservoir up to 45,000 acre-feet per year and release it later in the season to meet middle Rio Grande irrigation demand; and/or 2) allowing the Bureau of Reclamation (Reclamation) to retain Rio Grande water in Abiquiu Reservoir up to 20,000 acre-feet per year to meet the Six Middle Rio Grande Basin Pueblos' direct flow right.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

Table 1: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation	Resource unaffected by action
Climate change	☐	☐	☒
Hydrology	☒	☐	☐
Water Quality	☐	☐	☒
Vegetation Communities	☐	☐	☒
Fish and Wildlife Habitat	☐	☐	☒
Recreation	☒	☐	☐
Indian Trust Assets	☒	☐	☐
Cultural Resources	☒	☐	☐

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. The proposed action is within normal water operations and doesn't need additional best management practices (BMPs) to minimize impacts.

No compensatory mitigation is required as part of the recommended plan.

Public review of the draft EA and FONSI was completed on 4 April 2022. All comments submitted during the public review period were responded to in the Final EA and FONSI.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the Corps determined that the recommended plan will have no effect on federally listed species or their designated critical habitat.

Pursuant to section 106 of the National Historic Preservation Act of 1966, as amended, the Corps determined that historic properties would not be adversely affected by the recommended plan. The **ENTER THE APPROPRIATE SHPO OR THPO** concurred with the determination on **DATE OF CONCURRENCE LETTER.**

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

Technical, environmental, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State, and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date	Patrick M. Stevens V. Lieutenant Colonel, U.S. Army District Commander

Table of Contents

FIGURES

TABLES

List of Acronyms

ACE	Annual Chance Exceedance
ac	Acres
AF	Acre-feet
AFY	Acre-feet per year
APE	Area of potential effect
ARMS	Archaeological Records Management System
BMPs	Best Management Practices
BLM	U.S. Bureau of Land Management
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
cfs	Cubic feet per second referring to stream flow
Compact	Rio Grande Compact
CWA	Clean Water Act
ESRI	Environmental Systems Research Institute
GCS	Grade control structure
GIS	Geospatial Information System
HTRW	Hazardous, toxic, and radioactive waste
ITA	Indian Trust Asset
LiDAR	Light detection and ranging (aerial laser used to develop topography)
MBTA	Migratory Bird Treaty Act
MRG	Middle Rio Grande
MRGCD	Middle Rio Grande Conservancy District
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMCRIS	New Mexico Cultural Resources Information System
NMDGF	New Mexico Department of Game and Fish
NMISC	New Mexico Interstate Stream Commission
NMED	New Mexico Environment Department
NMLO	New Mexico Land Office
NMSHPO	New Mexico State Historic Preservation Office

NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
OHV	Off-Highway Vehicle
OSE	New Mexico Office of the State Engineer
PCEs	Primary constituent elements
PDT	Project development team
Reclamation	U.S. Bureau of Reclamation
RED	Regional Economic Development
RGCC	Rio Grande Compact Commission
SHPO	State Historic Preservation Office/Officer
SJC	San Juan-Chama
TCP	Traditional cultural property
THPO	Tribal Historic Preservation Office/Officer
TSP	Tentatively selected plan
URGWOPS	Upper Rio Grande Water Operations
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
U.S.C.	U.S. Code
USGS	U.S. Geological Survey
Water Authority	Albuquerque Bernalillo County Water Utility Authority
WCP	Water Control Plan
WRDA	Water Resources Development Act
WSEL	Water surface elevation

1 INTRODUCTION

1.1 Background and Location

The U.S. Army Corps of Engineers (USACE), Albuquerque District is proposing a temporary deviation from the current Water Control Plan (WCP) at the Abiquiu Dam and Reservoir Project, Rio Arriba County, New Mexico. USACE received a request (Appendix C) from the New Mexico Interstate Stream Commission (NMISC), dated 15 December 2021, requesting USACE to deviate from its normal operation schedule at Abiquiu Dam to allow retention of native Rio Grande water (Rio Grande water) in Abiquiu Reservoir while El Vado Dam and Spillway are under repair by the U.S. Bureau of Reclamation (Reclamation). Retained Rio Grande water may be released to meet middle Rio Grande irrigation demand, and/or the Six Middle Rio Grande Basin Pueblos' direct flow right. USACE prepared this Draft Environmental Assessment (DEA) to analyze potential effects that may result from the proposed retention of Rio Grande water in Abiquiu Reservoir.

The Abiquiu Dam and Reservoir is situated on the Rio Chama about 32 river miles upstream from its confluence with the Rio Grande. The project was authorized for construction by the Flood Control Act of 1948, (Pub. L. No. 80-858) and the Flood Control Act of 1950 (Pub. L. No. 81-516). The Abiquiu Dam and Reservoir were authorized for flood and sediment control, recreation, and development of fish and wildlife resources by Public Laws 80-858, 81-516, and 86-645. The Flood Control Act of 1960 (Pub. L. No. 86-645) requires Rio Grande Compact Commission (RGCC) advice and consent when deviating from the current WCP.

The El Vado Dam and Lake are located on the Rio Chama 32 miles upstream of Abiquiu Reservoir, and 30 miles downstream from Chama, NM. The dam was completed in 1935 to supplement irrigation water for the Middle Rio Grande Conservancy District (MRGCD) with a capacity of 198,000 acre-ft. for a 3,200-acre lake. Reclamation will begin conducting repairs and construction on El Vado Dam in spring 2022 for up to three years (USBR 2020). During the repairs and construction, El Vado will not be able to retain any Rio Grande water.

1.2 Purpose and Need for Action

The purpose of the proposed deviation action is to implement a temporary deviation from the WCP for Abiquiu Dam, which will allow other responsible agencies to retain and release Rio Grande water at Abiquiu Reservoir that would normally be retained at El Vado Reservoir while the El Vado Dam is undergoing repair (USBR 2020). The deviation request is for three (3) years until the completion of the El Vado Dam repairs, which are expected to start by the end of May 2022 and continue until December 2024. The water may be retained as Relinquishment Credit to meet middle Rio Grande water users' demand and/or as Prior and Paramount (P&P) water for the Six Middle Rio Grande Basin Pueblos. Responsible agencies retaining Rio Grande water under the deviation shall be subject to applicable state and Federal law. The deviation would be executed subject to advice and consent of the RGCC and any requirements of relevant and applicable permits.

1.3 Regulatory Compliance

This Environmental Assessment (EA) was prepared by the USACE, Albuquerque District, for the proposed deviation action in compliance with all applicable Federal Statutes, Regulations, and Executive Orders, including, but not limited to, the following:

- Archaeological Resources Protection Act (16 U.S.C. § 470aa *et seq.*)
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 C.F.R. Part 1500 *et seq.*)
- Clean Air Act (42 U.S.C. § 7401 § *et seq.*)
- Clean Water Act (33 U.S.C. § 1251 *et seq.*)
- Endangered Species Act (16 U.S.C. § 1531 *et seq.*)
- Executive Order 11593, Protection and Enhancement of the Cultural Environment
- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Executive Order 13112, Invasive Species
- Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance
- Farmland Protection Policy Act (7 U.S.C. § 4201 *et seq.*)
- Federal Noxious Weed Act (7 U.S.C. § 2814)
- Fish and Wildlife Coordination Act (48 Stat. 401; 16 USC § 661 *et. seq.*)
- Migratory Bird Treaty Act (16 U.S.C. § 703 *et seq.*)
- National Environmental Policy Act (NEPA, 42 U.S.C. § 4321 *et seq.*)
- National Historic Preservation Act (54 U.S.C. § 300101 *et seq.*)
- Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 *et seq.*)
- Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 *et seq.*)
- Section 438 of the Energy Independence and Security Act of 2007 (Pub. L. No. 110-140, § 438; 121 Stat. 1492, 1620)
- U.S. Army Corps of Engineers' Procedures for Implementing NEPA (33 C.F.R. Part 230; ER 200-2-2)

The New Mexico Office of the State Engineer (OSE) is charged with administration of all water in the State of New Mexico pursuant to NMSA 1978, § 72-2-1 (1982). In the Rio Grande basin, the OSE performs numerous activities, some of which may be affected by the proposed deviation action. Those activities include, but are not limited to, basic water rights administration under state law and OSE Rules and Regulations, Active Water Resource Management (AWRM), and addressing state water resource policy issues that may impact the river system.

The NMISC is charged with administration of all interstate water compacts for New Mexico, as well as protecting, conserving, and developing the waters and stream systems of the State (NMSA 1978, § 72-14-3, 1953). In the Rio Grande basin, the NMISC performs numerous activities, some of which may be affected by the proposed deviation action. Those activities include monitoring water operations of the USACE and Reclamation, conducting annual accounting of Rio Grande and San Juan-Chama (SJC) Project water, coordinating with the OSE and water users on Rio Chama water administration and active water resource management (shortage sharing), assessing and determining Rio Grande Compact compliance, and addressing Federal natural resource policy issues that may impact the river system.

This EA also reflects compliance with all applicable State and local regulations, statutes, policies, and standards for conserving the environment, such as water and air quality, endangered plants and animals, and cultural resources.

1.3.1 Rio Grande Compact

The Rio Grande Compact (Compact) is an interstate agreement between New Mexico, Colorado, and Texas to equitably apportion the water of the Rio Grande between the three states and the Republic of Mexico (URGWOPS FEIS; USACE, USBR, NMISC, 2007). The Compact was approved by Congress on May 31, 1939 (Pub. L. No. 76-96), and is administered in New Mexico pursuant to NMSA 1978, § 72-15-23 (1945). A Rio Grande Compact Commission was established consisting of one representative from each state and a United States-designated representative.

1.3.2 Federal Trust Responsibilities to Pueblos and Tribes

The Federal Indian trust responsibility is a legal obligation under which the United States "has charged itself with moral obligations of the highest responsibility and trust" toward Indian tribes *Seminole Nation v. United States*, 316 U.S. 286 (1942). The Federal Indian trust responsibility is also a legally enforceable fiduciary obligation on the part of the United States to protect tribal treaty rights, lands, assets, and resources, as well as a duty to carry out the mandates of Federal law with respect to American Indian and Alaska Native tribes and villages.

1.4 Documents Incorporated by Reference

Incorporation of previous analysis by reference is encouraged by NEPA. For NEPA, the CEQ regulations (40 C.F.R. §§ 1500.4, 1502.21) state that agencies shall incorporate material by reference when the effect will be to reduce bulk without impeding agency and public review of the proposed deviation action alternative. The incorporated material shall be cited, and its content summarized. No material may be incorporated by reference unless it is reasonably available for inspection by potentially interested persons within the time allowed for comment. Material based on proprietary data, which are themselves not available for review and comment, shall not be incorporated by reference.

This EA incorporates by reference information contained in the following documents:

- Upper Rio Grande Basin Water Operations Review. Final Environmental Impact Statement. (URGWOPS FEIS; USACE, USBR, NMISC, 2007). This document was prepared by USACE, Reclamation, and NMISC to analyze the effects of water operations by these agencies on the Rio Grande and Rio Chama.

Relevant portions of all documents incorporated by reference into this EA are summarized throughout this EA where specifically noted.

1.5 Abiquiu Dam and Reservoir

The USACE is responsible for operation and maintenance of Abiquiu Dam for flood risk management (flood control) on the Rio Chama (Figure 1). The primary purpose of Abiquiu Dam is flood and sediment control, with water supply and hydropower generation as authorized by Congress. Two Reclamation-operated facilities at Heron Reservoir and El Vado Dam upstream of Abiquiu Reservoir play important roles regulating tributary flow on the Rio Chama.

The Abiquiu Dam and Reservoir Project is situated on the Rio Chama about 32 river miles upstream from its confluence with the Rio Grande. The project was authorized for construction by the Flood Control Act of 1948 (Pub. L. No. 80-858) and the Flood Control Act of 1950 (Pub. L. No. 81-516). The Flood Control Act of 1960 (Pub. L. No. 86-645) requires that all USACE dams in the middle Rio Grande (Abiquiu, Cochiti, Jemez Canyon and Galisteo) work as a unit to reduce flood risk in the MRG. Any deviation from the current WCP will require the advice and consent of the RGCC. Construction of Abiquiu Dam was initiated by the USACE in 1956, and the project was completed and placed into operation in 1963. The dam is a rolled earthfill structure with a crest length of 1,800 feet, and the maximum height above the stream bed is approximately 341 feet. The drainage area contributing flow to Abiquiu Reservoir comprises 2,146 square miles.

Subsequent legislation added authority for water supply storage (specifically, SJC Project water storage). The reservoir's storage allocations include 502,000 acre-feet (AF) for flood control and 77,039 AF for sediment retention. At the end of 2021, an estimated 53,770 AF of the initial 77,039 AF sediment reserve space remained unfilled. Storage of SJC Project water occurs within the flood control space and unused portion of the sediment reserve space. Section 337 of the Water Resources Development Act (WRDA) of 2020 authorized USACE to simultaneously store both Rio Grande and SJC Project water at Abiquiu Reservoir. Section 337 of WRDA 2020 also changed the storage capacity at Abiquiu Reservoir from 200,000 AF to an elevation of 6,230 ft NGVD29. USACE will revise the Abiquiu WCP as necessary, to address the changes authorized by Section 337 of WRDA 2020.

1.5.1 Rio Chama Flood Regulation

Under current operating procedures, Rio Grande basin flow and releases from El Vado Reservoir upstream are passed through Abiquiu Reservoir without regulation. The only situation in which the USACE would take any action would be to maintain the safe channel capacity downstream. Due to reach-specific safe channel capacity constraints, releases from Abiquiu Reservoir are restricted to 1,800 cfs directly below the dam. Flows are regulated so as not to exceed 3,000 cfs at the Chamita gage or 10,000 cfs at the Otowi gage.

Operation of Abiquiu Dam for flood control is coordinated with Cochiti, Galisteo, and Jemez Canyon dams, which are jointly operated for a channel capacity of 7,000 cfs at Albuquerque (Central Avenue Bridge). Flood regulation is initiated at Abiquiu Dam when flows into the reservoir exceed the capacity of the Rio Chama downstream from the Dam or when flows on the Rio Grande equal or exceed its channel capacity. Flood regulation at Abiquiu Dam can be expected from April through June and during the monsoon season from July through September. Historically, storage level at Abiquiu Reservoir reached a maximum water storage to date of 402,258 AF (elevation 6,261.1) in June 1987, which is about 22.4 ft below top of the flood control (elevation 6283.5 ft).

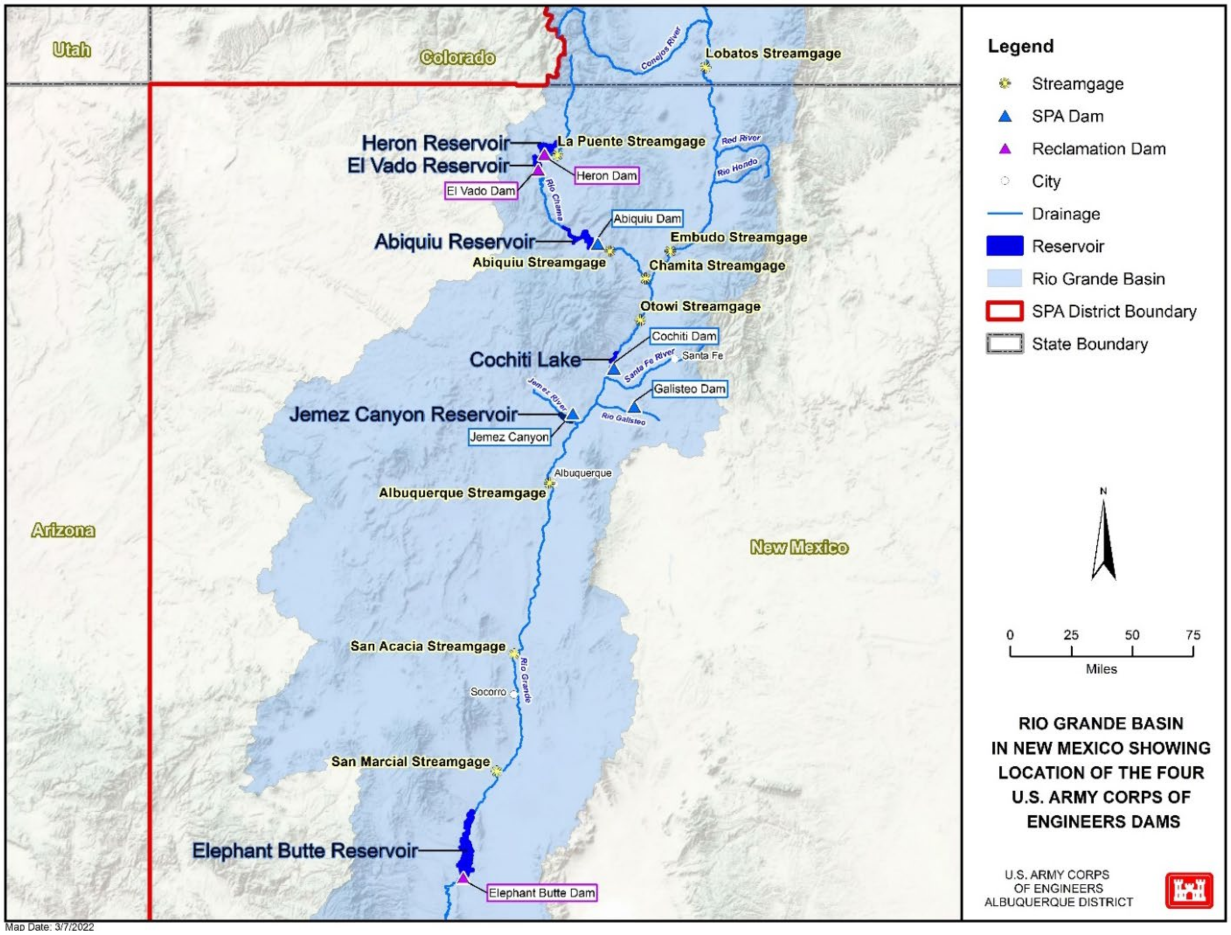

Figure 1 Map of the Rio Grande basin in New Mexico showing location of the four U.S. Army Corps of Engineers dams. USACE 2019.

1.5.2 Rio Chama Hydropower

A hydroelectric power facility was constructed downstream of Abiquiu Dam in 1991. The power plant was constructed and is currently owned and maintained by the incorporated County of Los Alamos. A written agreement between the County and the USACE prior to construction of the plant stipulates that no releases will be made specifically for the benefit of the power plant (USACE 1995). The plant is a run-of-the-river facility that does not impact reservoir storage or releases.

1.5.3 San Juan-Chama Water Retention

Reclamation's SJC Project diverts water from the Navajo, Little Navajo, and Blanco rivers, which are upper tributaries of the San Juan River (of the Colorado River basin), for use in the Rio Grande basin in New Mexico (USACE, USBR, ISC 2007). After being diverted through an underground tunnel, this water is stored at Heron Reservoir, upstream from Abiquiu Dam. Reclamation delivers SJC Project water to users in the middle Rio Grande basin based on contracts with various water-management entities. Delivery of SJC Project water is authorized for municipal, domestic, industrial, recreation, irrigation, and fish and wildlife purposes. The following statutory conditions must be met for use of SJC Project water:

- Must be consumptively and beneficially used in New Mexico.
- Must have a downstream destination.
- Must not harm Rio Grande water.
- Is not subject to provisions of the Rio Grande Compact.

SJC Project water is released from Heron Reservoir by Reclamation to a specific user, who can use such water immediately or store it in other facilities for future use. In 1981, Pub. L. No. 97-140 authorized the Secretary of the Army to enter into agreements with entities that have contracted with the Secretary of the Interior for water from the SJC Project. The authorization allows for up to 200,000 AF of this water to be stored in Abiquiu Reservoir within the flood control space and unused portion of the sediment reserve space. The USACE has entered into agreements with the Albuquerque Bernalillo County Water Utility Authority (Water Authority) and other entities for SJC Project water storage (Table 1.1). Up to 184,753 AF (elevation 6,220 ft.) could currently be stored pursuant to storage easements held by the Water Authority[1]. When full, this pool creates a 4,190-surface-acre reservoir. The authorizing legislation stipulates that storage of this water shall not interfere with the authorized purposes of Abiquiu Reservoir (namely, flood and sediment control). Releases of SJC Project water from Abiquiu Reservoir represent individual decisions made by contractors to call for their water, without any discretionary action by the USACE. The USACE does ensure that such flows are passed in a manner that does not threaten the safety or structural integrity of flood control facilities.

Table 1 San Juan-Chama Project storage allocations at Abiquiu Reservoir, 2021.

San Juan-Chama Project contractor	Allocation (AF)
Albuquerque-Bernalillo County Water Utility Authority	170,900
Middle Rio Grande Conservancy District	2,000
City of Santa Fe	7,542
City of Los Alamos	1,730
City of Española	1,442
Town of Bernalillo	577
County of Santa Fe	541
Twining Water & Sanitation District	22
Total	184,753

In 1988, Pub. L. No. 100-522 authorized the storage of up to 200,000 AF of Rio Grande system water at Abiquiu Reservoir in lieu of SJC Project water to the extent storage space is no longer required for the storage of SJC Project water as authorized by Pub. L. No. 97-140. Presently, all

[1] The upper limit of SJC storage is the 6,220-foot elevation, which corresponds to the vertical extent of the Water Authority's storage easements with surrounding landowners. The actual volume of allowable SJC storage decreases over time as sediment retention in the reservoir increases.

water supply storage at Abiquiu Reservoir consists of SJC Project water; there are no agreements for storage of Rio Grande water. Section 337 of WRDA 2020 authorized USACE to simultaneously store both Rio Grande and SJC Project water at Abiquiu Reservoir. Section 337 of WRDA 2020 also changed the storage capacity at Abiquiu Reservoir from 200,000 AF to an elevation of 6,230 ft NGVD29. USACE will revise the Abiquiu WCP, as necessary, to address the changes authorized by Section 337 of WRDA 2020.

2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

USACE is evaluating the pending deviation request from the Abiquiu WCP to retain Rio Grande water in Abiquiu Reservoir. Abiquiu Reservoir is the area for analysis of the proposed deviation action in this EA.

The retained water will serve two purposes. The first purpose will allow NMISC to retain Rio Grande water in Abiquiu Reservoir up to 45,000 acre-feet per year and release it later in the season to meet middle Rio Grande irrigation demand. The water will be retained in the SJC Project conservation pool below elevation 6,220 ft NGVD. The total amount that will be retained during the deviation period is 90,000 acre-feet, with a maximum annual amount of 45,000 acre-feet. Unused water will be carried over to the following year.

The second purpose will allow Reclamation to retain Rio Grande water in Abiquiu Reservoir up to 20,000 acre-feet/year to meet the Six Middle Rio Grande Basin Pueblos' direct flow right. The water will be retained in the SJC Project conservation pool below elevation 6,220 ft NGVD. Unused water will be released between 01 November and 15 December of each year.

All water management actions performed by the responsible agencies under the proposed deviation shall be subject to applicable state and Federal law including the articles and provisions of the Rio Grande Compact. In addition, responsible agencies must secure the required real property interest for retention of water in Abiquiu Reservoir. Likewise, these agencies shall be responsible for acquiring any and all the appropriate and applicable state permits.

2.2 The No Action Alternative

Under the no action alternative, El Vado Dam, upstream of Abiquiu Dam, will be under repair and therefore not available to retain its typical amount of water starting in May 2022. Absent a deviation at Abiquiu Dam, all water will pass through El Vado and Abiquiu dams during the El Vado Dam repairs. Therefore, the proposed no action (baseline scenario) is to pass all inflow to El Vado and Abiquiu dams to the downstream channel capacity, except SJC Project water, which will follow normal operation at Abiquiu Dam.

2.3 Alternative Actions Evaluated

No other alternatives were considered for inclusion as components of the proposed deviation action.

3 EXISTING ENVIRONMENT AND FORESEEABLE EFFECTS OF THE NO ACTION ALTERNATIVE

The following general summary of the physical environment of the Abiquiu Dam and Reservoir is sufficient for the purposes of analyzing the effects of implementing a deviation to allow for Rio Grande water retention in the reservoir. This section describes the existing environmental resources in the action area and evaluates effects of the no action alternative.

3.1 Environmental Resources Addressed by the U.S. Bureau of Reclamation

3.1.1 Rio Grande Water Delivery

Rio Grande water management operations on the Rio Chama has been previously evaluated under NEPA (USACE, USBR, NMISC 2007), and the Endangered Species Act (ESA) by Reclamation (2015, 2020), and the Fish and Wildlife Service (USFWS 2016). Reclamation (2020) evaluated the effects on the Rio Chama between El Vado Reservoir and Abiquiu Reservoir during construction to repair El Vado Dam.

3.2 Environmental Resources Not Considered in Detail

Initial evaluation of the effects of the proposed deviation action indicated that there would likely be little to no effect on several resources with implementation of the proposed deviation action. This analysis also considers the ‘no action’ or ‘without deviation’ alternative where the proposed action is not implemented. These resources are discussed below to add to the overall understanding of the action area.

Initial evaluation of the effects of the proposed deviation action indicated that there would likely be little to no effect on regional geology, air quality, noise, floodplains and wetlands, noxious and invasive species, land use, aesthetics, socioeconomics demographics, and environmental justice with either “with” or “without” action alternatives. This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) for the effects of water management at Abiquiu Reservoir for these resources. Under the existing conditions (no action), there would likely be little to no effect on regional geology, air quality, ambient noise, aesthetics, hazardous waste, demographics, socioeconomics, and land use.

3.2.1 Regional geology

The action area lies within the Española Basin, a sediment-filled asymmetric west-tilted half-graben that formed as part of the Rio Grande Rift. The Rio Grande Rift created a series of north-south trending faults that resulted in uplifted mountains, widespread volcanism, and large sediment filled basins. The Española Basin is bounded by the Sangre de Cristo Mountains to the east, the Jemez Volcanic Field to the west, the San Luis Valley and Chama basins to the north, and the Albuquerque Basin to the south-southwest (USACE 2017).

The Rio Chama flows through a narrow canyon (~350 feet deep), varying in width from about 300 feet at the bottom to about 1,500 feet at the top (USACE 1987). The upper rim of the canyon is the Poleo Sandstone (Triassic age) underlain by the Abo formation (Permian age). Poleo Sandstone is dominantly white to buff colored, medium to coarse grained, quartzitic, well cemented, and highly jointed. Locally, there are thin seams and zones of conglomerate with cobbles up to four inches in diameter. All sand and gravel size material are well rounded. The upper Abo formation is a massive, red to brown mudstone with irregular lenses and masses of gray green sandy mudstone. The remainder of the Abo formation exposed at the dam site is a series of intermingled lenses of silty mudstone and silty sandstone. The dominant color is red-brown, but some units are purple to green.

3.2.2 Air Quality

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding impacts to air quality. The area is an attainment area for all criteria air pollutants. Non-criteria pollutants, such as those associated with Los Alamos National Laboratory and tailpipe emissions from increasing traffic will continue to be air quality issues. Bandelier National Monument is a Class I Federal air quality area. Future actions within the action area must account for and avoid potential degradation of the air quality at Bandelier. There are no documented air quality non-attainment issues in Rio Arriba County, NM.

3.2.3 Noise

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding impacts to noise. The action area is located in Rio Arriba County, NM. The action area is generally quiet, rural settings, with only limited background noise from major highways, aircraft flyovers, sirens, or other urban noise. Background noise levels would not change under the no action conditions.

The lands adjacent to the reservoir and river are relatively undeveloped. Dominant sounds in the action area originate from natural sources: water, wind, and wildlife. Local traffic noise is generated by various highway crossings. Noise levels and patterns at developed recreation areas and frequently-used informal use areas are localized and typical of campground and day use recreational areas. Beyond these formal and informal recreation areas, the most conspicuous noise producers are power boats and jet skis on the reservoirs that allow these activities. Noise levels above 85 decibels (dB) will harm hearing over time. Noise levels above 140 dB can cause damage to hearing after just one exposure.

3.2.4 Floodplains and Wetlands

Waters of the U.S. (i.e., wetlands and other surface waters) provide important and beneficial functions, including protecting and improving water quality, providing fish and wildlife habitat, and storing floodwaters. Because they provide these important functions, this resource is protected via two Acts: section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act (CWA) of 1972, as amended. These Acts require avoidance of adverse impacts, minimization of adverse impacts, and offsetting of unavoidable adverse impacts to existing aquatic resources; and for wetlands, striving to achieve a goal of no overall net loss of values and functions.

Executive Order 11988 (Floodplain Management) provides Federal guidance for activities within the floodplains of inland and coastal waters. Federal agencies are required to "ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management." Preservation of the natural values of floodplains is of critical importance to the nation and the State of New Mexico. These natural values include preservation of wetlands.

Wetlands are lands transitional between terrestrial and aquatic ecosystems where the water table is at or near the surface or the land is covered by shallow water (Cowardin et al. 1979). Saturation with water determines the nature of soil development and, in turn, the types of plant and animals inhabiting these areas. Scurlock (1998) has summarized trends for historic Rio Grande riparian communities over the last 150 years. The riparian ecosystem has changed with the decline of cottonwood gallery forest, encroachment of upland junipers, and invasion of salt cedar (*Tamarix ramosissima*), Russian olive, and Siberian Elm (*Ulmus pumila*).

The flood control pool at Abiquiu Reservoir consists of upland vegetation described in Section 3.5. The fluctuating water surface elevation doesn't support development of wetlands in the flood control pool.

3.2.5 Noxious Weeds and Invasive Species

The majority of non-native species within the action area are plants. Though some non-native fish and other wildlife may exist, they are not of major concern. The invasive tree species of concern include salt cedar, Russian olive, and Siberian elm.

Executive Order 13112 directs Federal agencies to prevent the introduction of invasive (exotic) species and provides for their control to minimize the economic, ecological, and human health impacts that invasive species cause.

In addition, the New Mexico Department of Agriculture designates and lists certain weed species as being noxious (Nellessen 2000). "Noxious" in this context means plants not native to New Mexico that may have a negative impact on the economy or environment and are targeted for management or control. Class C listed weeds are common, widespread species that are fairly well established within the state. Management and suppression of Class C weeds is at the discretion of the lead agency. Class B weeds are considered common within certain regions of the state but are not widespread. Control objectives for Class B weeds are to prevent new infestations, and in areas where they are already abundant, to contain the infestation and prevent their further spread.

3.2.6 Land Use

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding impacts on land use and agriculture. The flood control space in the Abiquiu Reservoir action area is unmanaged terrestrial habitat. Public lands on both sides of the Rio Chama immediately downstream of Abiquiu Reservoir are managed by USACE, the Bureau of Land Management (BLM), the US Forest Service (USFS), and the New Mexico Land Office (NMLO). Immediately downstream of these public lands are private agricultural lands on one or both sides of the Rio Chama. These agricultural lands use acequias that divert irrigation water from the river. Sixteen irrigation diversion structures exist on the Rio Chama between Abiquiu Dam and the confluence with the Rio Grande (USACE 1996).

3.2.7 Aesthetics

The NEPA and Council on Environmental Quality (CEQ) regulations identify aesthetics as one of the elements that must be considered in determining the effects of an action. Aesthetics include the presence and appearance of landforms, water surfaces, vegetation, and human created features relative to the surroundings and settings of the area. These features are primary characteristics of an area or action that determine visual character and the manner in which people view the setting. Aesthetics analysis considers the existing and future appearance, or perception of views, of the project site and areas surrounding the site, as well as viewer sensitivity. The existing condition for the aesthetics of the Rio Chama and adjacent riparian areas ranges from fair to good.

3.2.8 Socioeconomics

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding impacts to socioeconomics. The leading employment sectors in Rio Arriba County (USACE 2017) are education, health care, and social services (20.9 percent), and public administration (16.4 percent). Agriculture employs about four percent of the county's workers, while hospitality services and construction each employs more than ten percent of the workforce. Implementation of the proposed deviation action would not adversely impact the socioeconomics of the action area. Increased recreational use may contribute to the local economy.

3.2.9 Demographics

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding impacts to demographics. The action area and affected populations is in Rio Arriba County, NM. The population of Rio Arriba County has decreased slightly from 41,190 in 2000 (U.S. Census Bureau 2018). The majority of the surrounding project population is Hispanic/Latino followed by White (not Hispanic), Native American, Black, and Asian (Table 2). New Mexico population projections were developed (Table 3) for the recently approved New Mexico State Water Plan to support regional water planning efforts (USACE 2006).

Table 2 Demographic parameters by heritage and age for the action area (2018).

	Total Population	White, not Hispanic	Hispanic / Latino	Native American	African American	Asian
New Mexico	2,088,070	37.5%	48.8%	10.9%	2.5%	1.7%
Santa Fe County	148,750	43.0%	51.0%	4.3%	1.2%	1.6%
Los Alamos County	18,738	72.0%	17.8%	1.4%	1.2%	6.4%
Rio Arriba County	39,159	12.9%	71.3%	19.0%	0.8%	0.6%
United States	325,719,178	60.7%	18.1%	1.3%	13.4%	5.8%
	Total Population	**0-17 years**	**18-64 years**	**65 and over**	**Below poverty level**	
New Mexico	2,088,070	23.4%	59.7%	16.9%	19.7%	
Santa Fe County	148,750	18.4%	58.4%	23.2%	14.0%	
Los Alamos County	18,738	22.7%	59.9%	17.4%	4.0%	
Rio Arriba County	39,159	23.7%	57.6%	18.7%	22.5%	
United States	325,719,178	22.6%	61.8%	15.6%	12.3%	

Table 3 Projected County Population and Annual Average Growth Rate

2000 to 2040									
Counties/Key Municipalities	**Total County Population by Projection Year (5 year increments)**								
	2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
New Mexico Counties									
Rio Arriba	41,307	43,694	46,030	48,196	50,027	51,451	52,519	53,269	53,676
Los Alamos	18,359	18,722	19,122	19,122	20,099	20,565	20,866	21,034	21,224
Santa Fe	129,936	143,987	158,624	174,400	191,403	208,801	226,112	244,751	264,778

3.2.10 Environmental Justice

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (11 February 1994) was designed to focus the attention of Federal agencies on the human health and environmental conditions of minority and low-income communities. It requires Federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations and proposed deviation action. The 1995 Environmental Protection Agency (EPA) guidance document, Environmental Justice Strategy: Executive Order 12898, defines the approaches by which the EPA will ensure that disproportionately high environmental and/or socioeconomic effects on minority and low-income communities are identified and addressed. Further, it establishes agency-wide goals for all Native Americans with regard to environmental justice issues and concerns. These goals are designed to:

- Focus the attention of Federal agencies on human health and general environmental conditions in minority and low-income communities with the goal of achieving environmental justice;
- Foster nondiscrimination in Federal programs that could substantially affect human health or the environment; and
- Give minority and low-income communities greater opportunities for public participation on matters relating to human health and safety.

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding impacts for Environmental Justice. Environmental justice addresses the issue of disproportionate impacts on minority and/or low-income populations. Therefore, the locations of these populations must be known in order to evaluate potential environmental justice issues. For this analysis, populations with a high percentage of people of Hispanic origin, a high percentage of Native Americans, and a high percentage of low-income households or high poverty rates are identified. The locations of these identified populations are used to evaluate Environmental Justice concerns. The Reservoir is not known to be utilized disproportionately by the groups described above. Additionally, implementation of the Proposed Action would not involve population relocation, health hazards, or property takings. For the reasons described, the Proposed Action would have no adverse human health or environmental effects on minority and low-income populations, nor Indian tribes.

3.2.11 Hazardous, Toxic, and Radioactive Waste (HTRW)

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding impacts from hazardous, toxic, or radioactive waste (HTRW) in the action area.

3.3 Climate

This section provides information on the existing climate in the action area, and on projected changes in future climate conditions. A detailed discussion of regional climate and climate change, along with an assessment of climate impacts to regional hydrology, riparian and aquatic ecosystems can be found in the Española Valley, Rio Grande and Tributaries, New Mexico Final Integrated Feasibility Report and Environmental Assessment (USACE 2017, Appendix G).

Recent overviews of climate change in the Southwestern United States have been provided (Garfin et al. 2013;, Melillo et al. 2014), with important syntheses of climate change impacts to New Mexico (OSE 2006; USBR et al. 2013). These sources indicate that observed trends are likely to continue. Models project substantial warming over the 21st Century of 5-7°F by 2100 as compared to late 20th Century averages; warming may reach as much as 8.5 to 10°F by 2100 under plausible high emissions (large radiative forcing) scenarios. Even with no net changes in total precipitation, warming will affect regional hydrology through changes in the snowpack (Elias et al. 2015). Higher temperatures will delay the date at which precipitation falls as snow in the fall and cause a 4-6 week earlier shift in the date at which precipitation reverts to rain in the spring. The altitude at which a winter snowpack will develop is anticipated to rise. The combination of these trends is an overall reduction in snowpack volume to support ecologically-essential spring runoff flows, as well as reductions in baseflows during the remainder of the year. For the Rio Grande basin above Elephant Butte, declines in snow water equivalence, annual runoff, December-March runoff, and April-July runoff are all anticipated (USBR 2011). Increases in the frequency, intensity, and duration of both droughts and floods are expected (USBR et al. 2013).

Riparian and aquatic ecosystems along the Rio Chama are likely to be affected by changes in stream flow that alter water quantity, seasonal water availability, water quality, and increases in riparian evaporation. Projected reductions in annual maximum monthly flows are likely to reduce the spring runoff hydrograph, and, therefore, reduce the average amount and extent of spring runoff flooding of restoration measures on the floodplain. However, the amount of this projected reduction is small relative to the interannual variability, adding considerable uncertainty to estimates of ecological impacts. Projected impacts to the Middle Rio Grande riparian areas (Friggens et al. 2013) that are likely to be broadly applicable to northern New Mexico riparian areas include:

- Reduced riparian habitat due to decreased stream flows and longer drought;
- Decline in cottonwood gallery forests due to lower flows, more frequent wildfires, and disease;
- Loss/reduction of native vegetation and replacement by invasive tree and grass species due to fire and lower water tables, and changes in spring runoff timing/volumes;
- Increasingly arid conditions would favor replacement of grassland and woodland habitats with scrubland, accompanied by reductions in vegetation cover; and

- Increased duration of drought, with increases in droughts lasting 5 years or more and increases in drought intensity.

3.3.1 Existing Climate

The climate of the Española Valley ranges from semi-arid (approximately 10" of precipitation/year) along the Rio Grande to alpine (approximately 40" of precipitation/year) at the highest elevations of the surrounding mountain peaks. Mountain areas retain snow during the winter months and melting of the snowpack in spring contributes significantly to spring runoff flows on the Rio Grande and Rio Chama.

A National Oceanic and Atmospheric Administration (NOAA) National Weather Service Cooperative Observer station with a relatively complete record is located at Alcalde (Station 290245), along the Rio Grande northeast of Ohkay Owingeh. The period of record for this station is 1953 through October 2012. The climate at Alcalde is arid continental with large daily and seasonal temperature differences (USACE 2017). Summers tend to be hot and dry; winters tend towards cool and humid. Peak precipitation occurs during the late summer/early fall (July, August, September) during the peak of the North American Monsoon (monsoon), with a secondary peak in winter. Spring and fall tend towards warm and dry.

The monthly period of record temperature summary at Alcalde (USACE 2017, Appendix G) shows that monthly average daytime maximum temperatures (Tmax) are above freezing in all months. Winter Tmax averages 47.7°F, with few winter days with Tmax <=32°F. Monthly overnight minimum temperatures (Tmin) average 17.1°F in winter, but can reach as low as -34°F. In summer, Tmax averages 87.4°F. July is the hottest month, with an average of 16 days with temperatures above 90°F and occasional days where temperatures peak as high as 102°F. Monthly overnight low temperatures average 69.9°F in summer.

At Alcalde, precipitation averages 10.01" per year (USACE 2017, Appendix G). In most months, precipitation is 0.75" or less, but is higher during the monsoon season: July receives an average of 1.37", August 1.89", September 1.26", and October 1.04". Precipitation may fall as snow from October through April, with average monthly snowfall peaking in December at 2.8".

Floods occur from April through October and are usually the result of rain alone, rain-augmenting snowmelt runoff, or in some rare cases, extremely high snowmelt runoff events. Local rain events caused by convective storms create flash floods on the tributaries, which accumulate in the Rio Grande's channel. Many of the flood-producing storms on the main stem Rio Grande occur during the transitional periods between spring and summer and between summer and fall. During these periods, the strong intrusion of cool northern air interacts with the moist tropical air to produce the widespread storms over the watershed.

Topography significantly influences local climate in winter and summer. In winter, the dominant pattern is for storms to move into the region from the west or northwest; much of the precipitation falls over the western and central portions of the Jemez Mountains, and the amount declines rapidly moving east of the Sierra de los Valles and down slope to the Rio Grande. During the monsoon season, thunderstorm development is encouraged by daytime surface heating over the Pajarito Plateau and Sierra de los Valles. Daytime surface heating causes air to rise, initiating convection that can pull in air from lower areas to the southeast (Bowen 1996). This convection leads to the formation of thunderstorms over the plateau. Westerly winds in the upper atmosphere can push these storms east towards the Rio Grande as well as advect precipitation into the area. The Sangre de Cristo Mountains prevent moisture from the Plains from entering the region. The region effectively lies in the rainshadow of the Sangre de Cristo Mountains with respect to moisture transported northwestward from the Gulf of Mexico.

Wind direction is generally from the southeast in summer and from the west in winter but varies greatly because of local topography and mountain and valley breezes. Los Alamos National Laboratory researchers have deduced a diurnal pattern of wind movement from observations in the various Pajarito Plateau Canyon systems. During the day, the winds tend to blow up-canyon from the east; at night, the winds tend to blow down-canyon from the west. Shear winds have also been noted across the canyons (Bowen 1996).

In recent decades, temperature increases have been observed regionally (USACE 2017, Appendix G). Annual temperatures in New Mexico warmed at an average rate of 0.219°F (0.10°C) per decade from 1912 to 2011 but at the faster rate of 0.678°F (0.34°C) per decade since 1970 (Tebaldi et al. 2012). The same pattern of faster recent warming was also observed in annual average daytime maximum high temperature (Tmax) and annual average nighttime minimum temperature (Tmin). Higher rates of warming have been observed in high elevation areas, particularly in winter. There has been no detectable trend in precipitation.

In the vicinity of the action area, statistically-significant increases in temperature have been observed over the period 1971-2012, particularly in the months of January and March, and in the summer months from May through September. Daytime high temperatures have risen at about 1°F/decade from May through November in the Middle Rio Grande, and at approximately half that rate along the Rio Chama and Jemez River. Rates of warming have been slower in the Jemez Mountain stations. Only in March is there a significant, region-wide warming trend of approximately 1°F/decade.

Nighttime low temperatures have also risen significantly in many months, particularly in the period April through September when a warming trend of approximately 0.5°F/decade was observed. Increases in Tmin were particularly evident in the Jemez Mountains, with significant rates of increase in excess of >0.59°F/decade in all months except February and December. As a result of this warming, there has been a trend towards increasing numbers of late spring days with night-time temperatures warmer than 32°F. Historic precipitation trends in the action area show little in the way of statistically significant trends. Implementation of the proposed deviation action would not affect climate in the action area. There would be no change to the regional climate in the future with the no-action alternative.

3.4 Water Resources

3.4.1 Hydrology

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding hydrology. Water operations along the Rio Chama have four general purposes: flood control, irrigation supply, municipal and industrial supply, and environmental operations (USACE, USBR, NMISC 2007). Water operations also include downstream monitoring to ensure that desired flows are achieved. Little Rio Grande flow is actually captured and stored in the major reservoirs in this system. On average, only 100,000 AF of Rio Grande water (less than 10% of annual average flow at Otowi gage), is historically stored in El Vado Reservoir. Except for temporarily detained flows due to flood regulation, all of the water stored in Abiquiu Reservoir is imported SJC Project water. When Pub. L. No. 86-645 is triggered, Abiquiu Reservoir is required to retain carryover flood storage because no Rio Grande water may be withdrawn from storage after July 1 (exclusive of water from upstream storage) when the natural flow at the Otowi gage is less than 1,500 cfs. Rio Grande water that is locked into storage is not permanent: it must be released at the end of the irrigation season (November 1) and must be fully evacuated by March 31 of the following year.

Along the Rio Chama, Heron Reservoir manages imported SJC Project waters, passing all Rio Grande flows (USACE, USBR, NMISC 2007). El Vado Reservoir regulates Rio Grande waters for Prior and Paramount (P&P) water needs and retains Rio Grande water when allowed by the Rio Grande Compact for use by the Middle Rio Grande Conservancy District (MRGCD). When space is available, El Vado can also store SJC Project waters. Abiquiu Reservoir is Congressionally authorized for flood control, sediment control, and water supply storage of both SJC Project and Rio Grande waters. However, Abiquiu Reservoir does not currently store Rio Grande water except for flood control purposes.

Flood control operations adjust the rate of releases at Abiquiu Reservoir (USACE, USBR, NMISC 2007). Flood control operations are typically in effect during snowmelt runoff, when mountain snowpack is heavier than normal, and during unusually heavy summer monsoon seasons. Releases from Abiquiu Reservoir is adjusted to take into account flow from Cochiti, Galisteo, and Jemez Canyon reservoirs along the Rio Grande main stem and its tributaries. These four reservoirs are operated as a system to ensure that flows at critical downstream points are not exceeded.

The Rio Grande Compact, in effect, limits the amount of surface water than can be depleted in the Middle Rio Grande based upon the natural flow of the river measured at the Otowi gage downstream of the action area (Rio Grande Compact, 1939). In addition, the OSE has determined the Middle Rio Grande to be fully appropriated. Therefore, any increase in water use in one area of the river must be offset by a reduced use in another area of the river.

The future with the no action alternative would result in water normally retained during spring runoff passing through Abiquiu Reservoir earlier in the year. This increase in spring flow may result in an increased hydrograph or a longer duration of flow at channel capacity. These variations in spring flow are within the normal range of flow for the period of record. The no action alternative would not retain relinquishment credit water for release and use during the irrigation season, or P&P water for use by the Six Middle Rio Grande Basin Pueblos.

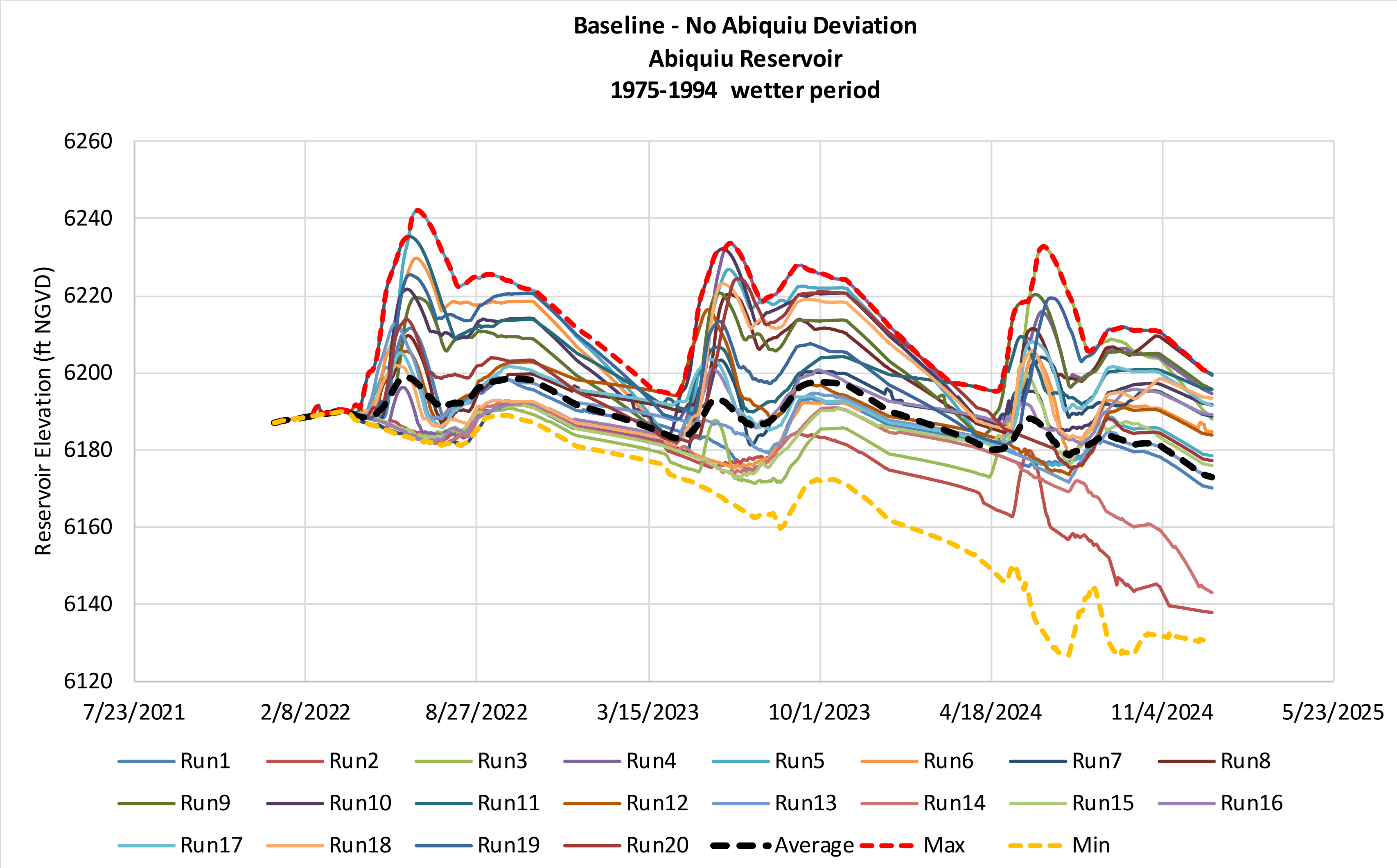

Figure 2 Upper Rio Grande Water Operations Model (URGWOM) runs without a deviation for the wetter 1975-1994 period of record. Labels identify each simulated three-year sequence. The average, maximum, and minimum hydrographs span the 40-year simulation.

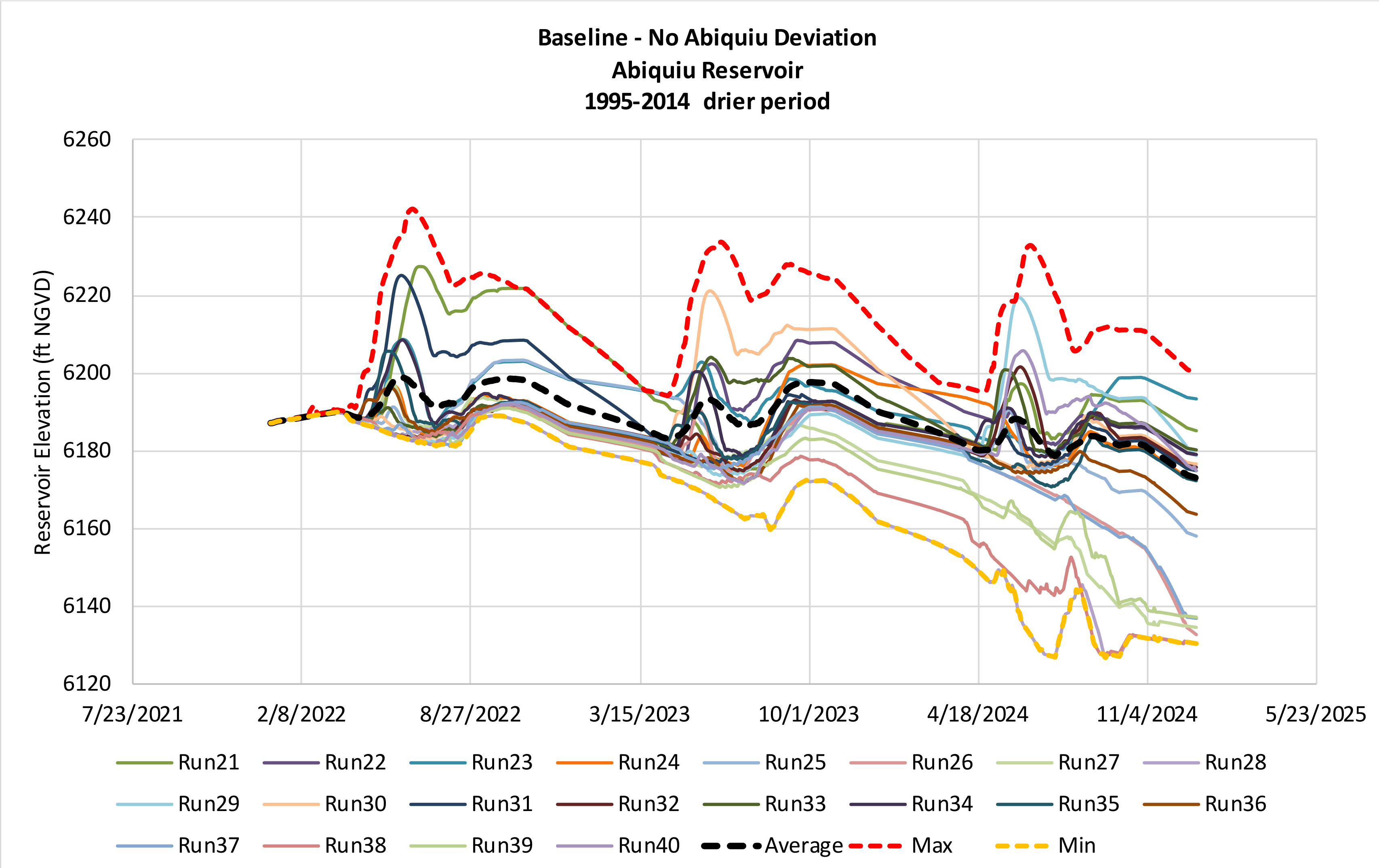

Figure 3 Upper Rio Grande Water Operations Model (URGWOM) runs without a deviation for the drier 1995-2014 period of record. Labels identify each simulated three-year sequence. The average, maximum, and minimum hydrographs span the 40-year simulation.

The Riverware-based reservoir-routing model developed by the Upper Rio Grande Water Operations Modeling (URGWOM) Team was used to project three-year baseline Abiquiu Reservoir water surface elevations using historical hydrologic data from 1975-2014. Each three-year sequence is labeled with the first year of the sequence. The 40-year average, maximum, and minimum hydrographs are included on the figures for comparison. Figure 2 illustrates the baseline conditions (no deviation) for the wetter period of record (1975-1994) while Figure 3 illustrates the drier baseline conditions (1995-2015). Water surface elevations with the deviation are presented in Chapter 4 - FORESEEABLE EFFECTS OF THE PROPOSED ACTION .

Normal operation would continue at Abiquiu Reservoir with regards to flood and sediment control. USACE may evacuate the described temporary pool or any portion thereof as necessary for flood control purposes, in accordance with authorized project purposes. The USACE further reserves the right to take such measures as may be necessary to preserve life and property, including being able to meet emergency situations or to permit maintenance or repair of the dams or appurtenant structures. Regulation and releases will be accomplished with the USACE service gates, and the USACE will not be liable or responsible for any loss of the retained waters resulting from releases made to accomplish Abiquiu Dam and Reservoir's flood control purpose or due to any malfunction of the service gates or inspection and maintenance of the gates that may be necessary to assure the proper and safe operation of Abiquiu Dam and Reservoir. If the proposed deviation request is implemented, the responsible agencies will make release decisions for water delivery.

3.4.2 Water Quality

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding water quality for the Rio Chama and Abiquiu Reservoir. New Mexico Environment Department (NMED) periodically monitors water quality within the state's waterbodies (i.e., lakes rivers, and streams) to determine whether attainment of water quality standards and supporting designated uses is occurring. The results of this assessment are used for reporting through the 303(d)/305(b) Integrated List and the development of total maximum daily load (TMDL) documents for each waterbody not meeting standards. The designated uses for the Rio Chama from Abiquiu Dam to the confluence with the Rio Grande include irrigation, livestock watering, wildlife habitat, coldwater fishery, warmwater fishery, and secondary contact (NMWQCC 2017). The most recent survey for the downstream reach occurred between 2012 and 2014 (NMED 2015). From this assessment, it was determined that this reach fully supports the designated uses (NMED 2018).

The construction of Heron, El Vado, and Abiquiu dams, and the importation of Colorado River Basin water via the SJC Project has had numerous effects on water quality in the Rio Chama watershed (Langman and Anderholm 2004). The coordinated storage and releases from the dams and the additional flows from the SJC Project decreased specific conductance and suspended-sediment concentration and increased pH (Langman and Anderholm 2004).- The hypolimnetic release from Abiquiu Reservoir can also influence the dissolved oxygen (DO) regime on the Rio Chama. For example, exceedances of the water quality standard for DO (6 mg L^{-1}; NMWQCC 2017) occurred once during the summer and twice in the fall of 1999 (NMED 2004). The exceedances were attributed to documented summer stratification and formation of anoxic water within the hypolimnion (Davis and Joseph 1999, Davis 2007) that was subsequently released from the reservoir (NMED 2004). The hypolimnetic release, which dampens thermal regime downstream of the dam, may also facilitate elevated DO concentrations due to physical controls of the solubility of oxygen in water (Wetzel 2001).

It is unclear how the flow-through hydropower facility (See Section 1.4.2) impacts water quality on the Rio Chama downstream of Abiquiu Dam. However, it can be assumed the impacts are less severe than a typical hydroelectric peaking operation, where water is stored at night when electrical demand is relatively low and released through turbines during the day to satisfy demand, with considerable ecological effects downstream (Cushman 1985, Moog 1993, Friedl and Wüest 2002).

Nevertheless, water quality could be impacted under the no action alternative as a result of changing climate (Langman and Nolan 2005;, Vörösmarty et al. 2000;, Murdoch et al. 2000;, Whitehead et al. 2009;, and van Vliet et al. 2013). Lakes and reservoirs are considered sentinels, intergrators, and regulators of a changing climate (Williamson et al. 2009). For example, the El Niño Southern Oscillation, reservoir inflows, and reservoir oxygen content series oscillated in common periods and decreasing inflows reduced the oxygen content by 20% in a Mediterranean reservoir (Marcè et al. 2010). Stefan et al. (2001) quantified the potential reduction of habitat for cold and cool water fishes that is likely to become drastically reduced under conditions of atmospheric CO_2 concentration doubling in greater than 200 North American lakes. Other climate-mediated disturbances such as wildfire activity, which has increased in each of the last two decades in the southwestern U.S. (Westerling et. al. 2006), and impacted water quality of streams and rivers within the Rio Grande basin (Dahm et al. 2015, Reale et al. 2015, Sherson et al. 2015). Wildfires can also impact the physical, biological, and chemical processes in lake ecosystems, but has been less studied than flowing waters (McCullough et al. 2019). However, the hypolimnetic release may dampen the impacts of a wildfire on water quality immediately downstream of the dam (Dahm et al. 2015).

Although important for recreation, tailwater fisheries such as the Rio Chama below Abiquiu Dam rely on a form of thermal pollution (see Dodds and White 2010), differ substantially from the thermal regime of natural river systems (Vanicek and Kramer 1969, Krenkel et al. 1979, Ward and Stanford 1979, Ward 1985) and are often detrimental to native fish species (Neves and Angermeier 1990, Clarkson and Childs 2000). The current operation of Abiquiu Dam will likely result in continued thermal pollution on the Rio Chama downstream and potential impacts to the native fish community. Although, the hypolimnetic releases may reduce thermal impacts from a warming climate (Sherman et al. 2007, Hester and Doyle 2011), but would require coordination (e.g., scheduling of water releases to coincide with peak summer temperatures in the Rio Chama). The future with the no action alternative would not change the existing water quality in the action area, and have no effect on Waters of the United States.

3.5 Vegetation Communities

The area surrounding Abiquiu Reservoir supports upland vegetation typical of the Great Basin Conifer Woodland and Desert Scrub biotic communities (USACE 2017). One-seed juniper is prominent on the steeper slopes of dissected terraces or plateaus. Juniper and piñon pine are both prominent on the shallow, sandy soils found on outcroppings and foothills.

The area has been mapped to classify vegetation, primarily through photo-interpretation from Abiquiu Dam to the confluence with the Rio Grande (USACE 2007). Classification of Rio Grande basin riparian vegetation relies on plant community designations developed by Hink and Ohmart (1984). The river corridor previously supported cottonwoods, willows, New Mexico olives, shrubs, and wetlands. The vegetation surrounding Abiquiu Reservoir would remain unchanged from the existing upland trees and plants.

3.6 Fish and Wildlife

The fish and wildlife species by taxa that potentially occur in Rio Arriba County (BISON-M, NMDGF accessed December 7, 2021) are fish (33), amphibians (12), reptiles (28), birds (251), and mammals (89). The list of all wildlife species is provided in Appendix A.

Mammals associated with the upland areas surrounding Abiquiu Reservoir include mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), Ord's kangaroo rat (*Dipodomys ordii*), piñon mouse (*Peromyscus truei*), rock squirrel (*Otospermophilus variegatus*), and white-throated wood rat (*Neotoma albigula*). The riparian corridors support beaver *(Castor canadensis*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and Botta's pocket gopher (*Thomomys bottae*). Bobcat (*Lynx rufus*) and other large carnivores occur infrequently in the area due to disturbances by humans.

Avifauna that may be found in the Abiquiu Reservoir area include the American Kestrel (*Falco sparverius*), Prairie Falcon (*Falco mexicanus)*, Mourning Dove (*Zenaida macroura*), Great Horned Owl (*Bubo virginianus*), Common Nighthawk (*Chordeiles minor*), Cordilleran Flycatcher (*Empidonax occidentalis*), Horned Lark (*Eremophila alpestris*), Cliff Swallows (*Petrochelidon pyrrhonota*), Rock Wren (*Salpinctes obsoletus*), Canyon Towhee (*Melozone fusca*), House Finch (*Haemorhous mexicanus*), and Western Meadowlark (*Sturnella neglecta*). Flocks of cormorants and wintering Bald Eagles (*Haliaeetus leucocephalus*) utilize the shallow waters, and lands at lower elevations along portions of the northern shoreline. Bald Eagle winter roosting sites have been noted along the Rio Chama drainage, although not in the immediate vicinity of the dam or reservoir. Western Grebe (*Aechmophorus occidentalis*), Great Blue Heron (*Ardea herodias*), Common Merganser (*Mergus merganser*), and Mallard (*Anas platyrhynchos*) are among the most frequently observed waterfowl utilizing the river area.

The Rio Grande is a major migratory flyway for avian species (Yong and Finch, 2002). The peak nesting season for birds is April 15 through August 15. The Migratory Bird Treaty Act (MBTA) (16 U.S.C. § 703 *et seq.*) is the primary legislation in the United States established to conserve migratory birds (USFWS 2004). The list of the species protected by the MBTA appears in Title 50, Section 10.13, of the Code of Federal Regulations (50 C.F.R. § 10.13). The MBTA prohibits taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. The USFWS and the Department of Justice are the Federal agencies responsible for administering and enforcing the statute.

More than 160 bird species, which are Federally protected under the Migratory Bird Treaty Act, may be found in the Rio Chama valley. Since 2001, 152 bird species have been observed at the Los Luceros Important Bird Area (IBA, Audubon Society) on the Rio Grande. Hink and Ohmart (1984) recorded 277 species of birds in the bosque ecosystem. Highest bird densities and species diversity were found in edge habitat vegetation with a cottonwood overstory and an understory of Russian olive (*Elaeagnus angustifolia*) (Hink and Ohmart 1984). Emergent marsh and other wetland habitats also had relatively high bird density and species richness. Thirty of the forty-six species of breeding birds found in the bosque used cottonwood forest habitat. No bird species showed a strong preference for Russian olive stands (Hink and Ohmart 1984).

Most reptiles are found in areas adjacent to the reservoir, while amphibious species generally inhabit marginal lakeside habitats. Amphibian and reptilian species which may occur in the area include the Spadefoot Toads (*Spea multiplicata* and *S. bombifrons*), Northern Sagebrush Lizard (*Sceloporus graciosus*), and Plateau Fence Lizard (*Sceloporus tristichus*). Herptile abundance and diversity was found to be greatest in habitats that lacked dense canopy cover and that were characterized by sandy soils and sparse ground cover (Hink and Ohmart 1984). Many of the species found in the bosque were representative of drier upland habitats. Hink and Ohmart (1984) did describe a distinct assemblage of species associated with denser vegetation cover in mesic or hydric habitats. Common species included tiger salamander (*Ambystoma mavortium*), boreal chorus frog (*Pseudacris maculate*), bullfrog (*Lithobates catesbeianus*), northern leopard frog (*Lithobates pipiens*), many-lined skink (*Plestiodon multivirgatus*), black-necked garter snake (*Thamnophis cyrtopsis*), and western painted turtle (*Chrysemys picta*).

This EA incorporates by reference the URGWOPS FEIS (USACE, USBR, ISC 2007) regarding fish in the Rio Chama and Abiquiu Reservoir. Common fish species in the Abiquiu Reservoir (Sublette et al. 1990) include Rainbow Trout (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*), Kokanee Salmon (*Oncorhynchus nerka*), Common Carp (*Cyprinus carpio*), Rio Grande Chub (*Gila pandora*), Fathead Minnow (*Pimephales promelas*), Flathead Chub (*Platygobio gracilis*), White Sucker (*Catostomus commersoni*), Channel Catfish (*Ictalurus punctaus*), Green Sunfish (*Lepomis cyanellus*), Bluegill (*Lepomis macrochirus*), Smallmouth Bass (*Micropterus dolomieui*), and Walleye (*Stizostedion vitreum*).

There would be no changes to fisheries or terrestrial wildlife or their habitat in the action area from the existing conditions with the no action alternative.

3.6.1 Special Status Species

Three agencies have a primary responsibility for the conservation of animal and plant species in New Mexico: the USFWS, under the authority of the Endangered Species Act of 1973, as amended; the NMDGF, under the authority of the Wildlife Conservation Act of 1974; and the New Mexico Energy, Minerals and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act and 19.21.2 NMAC. Each agency maintains a list of animal and/or plant species that have been classified or are candidates for classification as endangered or threatened based on present status and potential threat to future survival and recruitment.

There are several Federal and State listed threatened or endangered species, species of concern, and rare plants that occur, or could potentially occur, in Rio Arriba County (BISON-M, NMDGF accessed December 7, 2021); however, critical habitat is not present within the action area for these species. Seven Federally listed species potentially may be present in or near the Abiquiu Reservoir and are listed in Table 6. See Appendix A for additional information on wildlife species of concern. There are no special status species that would be affected by the no action alternative at this time.

Table 4 Federally listed Threatened or Endangered Species that occur near the action area (USFWS iPaC accessed February 3, 2022. Additional information in Appendix A).

Common Name	Scientific Name	Status	Present	Critical Habitat
Canada Lynx	*Lynx candensis*	E	N	N
New Mexico Meadow Jumping Mouse	*Zapus hudsonius luteus*	E	N	N
Mexican Spotted Owl	*Strix occidentalis lucida*	T	N	N
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	N	N
Western Yellow-Billed Cuckoo	*Coccyzus americanus*	T	N	N
Rio Grande Cutthroat Trout	*Oncorhynchus clarki virginalis*	C	N	N
Monarch Butterfly	*Danaus plexippus*	C	unknown	N

3.7 Recreation

Abiquiu Reservoir offers fishing for cold, cool, and warmwater species, with trout fishing below Abiquiu Dam on 2.7 miles of river through lands managed by USACE, BLM, USFS, and the NMLO. Other recreational activities may include camping, walking, biking, hiking, wildlife viewing, and picnicking. These activities are anticipated to continue at recent levels with the no action alternative.

3.8 Indian Trust Assets

Indian Trust Assets are legal interests in property held in trust by the United States for Indian tribes or individuals. Examples of trust assets include, but are not limited, to land, minerals, hunting and fishing rights, and water rights. The United States, as part of its Indian Trust Responsibility, must protect and maintain rights reserved by or granted to Indian tribes or individuals by treaties, statues, executive orders, and rights further interpreted by the courts. This trust responsibility requires that all Federal agencies take all actions reasonably necessary to protect such trust assets. The no action alternative would potentially adversely affect the water rights and traditional agricultural practices of the Six Middle Rio Grande Basin Pueblos if it is not possible to retain P&P water to be released when requested by the Six Middle Rio Grande Basin Pueblos.

3.9 Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) [54 U.S.C. § 300101 *et seq.*] and its implementing regulations (36 C.F.R. Part 800) require Federal agencies to take into account the effects of their undertakings (e.g., projects or permits) on historic properties.

Historic properties are legally considered to be those properties (cultural resources) eligible for listing on the National Register of Historic Places (NRHP). To be eligible for listing, a property must have "the quality of significance in American history, architecture, archeology, engineering, and culture" that can be "present in districts, sites, buildings, structures, and objects," must "possess integrity of location, design, setting, materials, workmanship, feeling, and association," and must meet at least one of a set of four criteria relating to (A) association with historical events; (B) historically significant people; (C) distinctive characteristics of a period or style; and/or (D) are likely to yield information important to prehistory or history. There are many possible examples of historic properties, including archaeological sites, historic buildings, traditional cultural properties (TCPs), and historic districts. As such, the identification and evaluation of historic properties (including archaeological sites, historic buildings, and other features constructed or modified by humans in the past) is an important component of this action.

The Section 106 process includes the identification of historic properties that might be affected by an action, the evaluation of those properties, determinations of effect on those properties, consultation with various parties (including the New Mexico State Historic Preservation Officer (NMSHPO), Tribes, local governments, and the public) about those effects, and resolution of any adverse effect on historic properties.

There is a long history of human occupation in the Chama Valley, extending from more than 10,000 years ago to the present day. The prehistory and history of the Chama are divided by archaeologists into the following periods, with associated dates:

- Paleoindian: c. 12,500-5500 BC
- Archaic: 5500 BC – AD 400/600
- Developmental Period: AD 400/600-1200
- Coalition Period: AD 1200-1325
- Classic Period: AD 1325-1540
- Historic Period: AD 1540-Present

Each of these periods is characterized by different lifeways, subsistence strategies, and technologies. These periods can be grouped into two major divisions: Prehistoric (dating before contact with Europeans), and Historic (dating after contact with Europeans). Many archaeological surveys have been conducted in and near Abiquiu Reservoir, including Klager 1980; Schaafsma 1975a, 1975b, 1976, 1977, 1978a, 1978b, 1979; O'Leary 1988; USACE n.d.; Van Hoose 2021.

3.9.1 Area of Potential Effect

The area of potential effect (APE) for the proposed undertaking is defined as the geographic area within which the proposed undertaking could potentially cause direct or indirect effects to historic properties. For the purposes of the current analysis, the Corps determines that the APE consists of the areas where changing lake elevations may affect archaeological sites through inundation, exposure, or wave action, within an elevation range of approximately 6,150 ft to 6,250. As will be described below, URGWOM modeling suggests that the elevation range most likely to experience inundation are elevations at and below 6,220 feet, with a much smaller likelihood of having maximum elevations up to 6,250 ft (Figure 4). In addition, changes in flow regimes could have the potential to affect properties located within the channel downstream of Abiquiu Dam.

Based on an examination of the New Mexico Cultural Resources Information System (NMCRIS) database, as well as USACE records, a total of 148 archaeological sites have been documented within this APE, and these sites represent human use of the landscape ranging from the Archaic to Historic periods. Of these 148 sites, 45 are located above the 6,220 ft level.

In addition, there are numerous historic properties documented near the Rio Chama river channel downstream of Abiquiu Dam, including a wide range of prehistoric and historic resources, including active acequia systems.

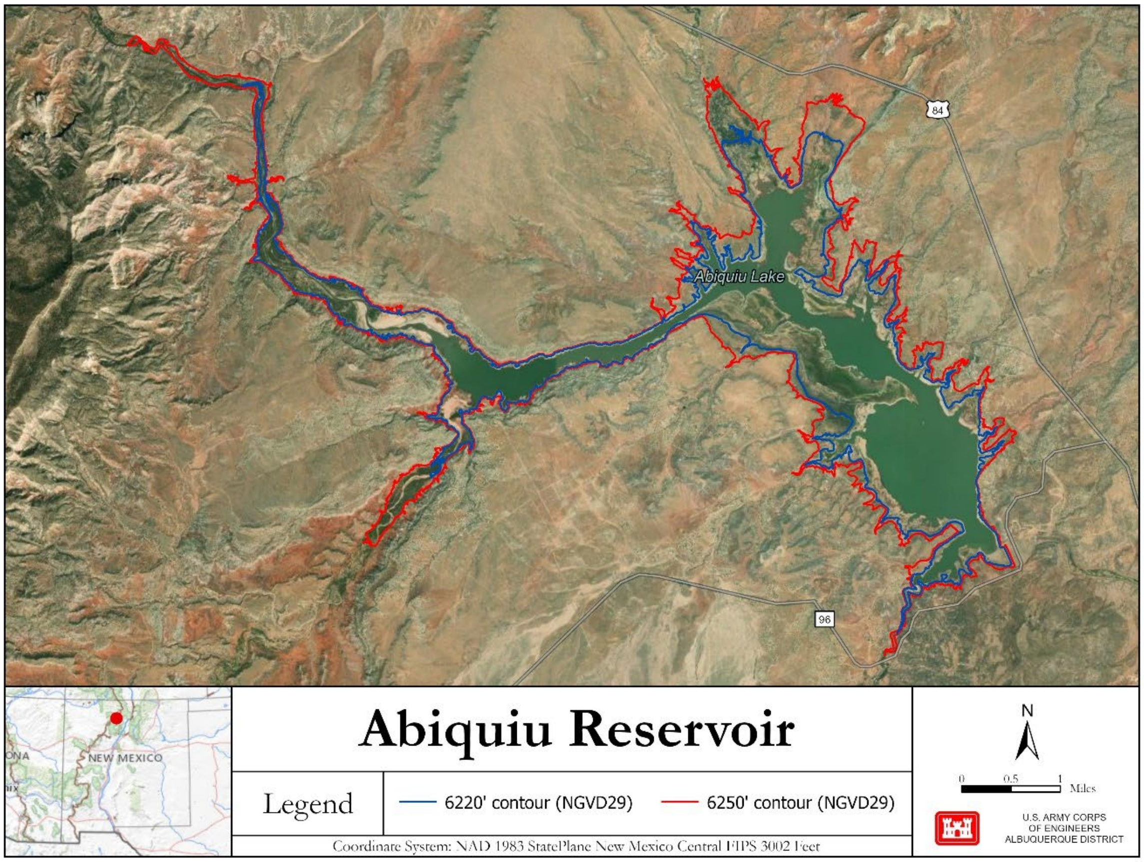

Figure 4 Area of Potential Effect (APE) at Abiquiu Reservoir, showing contour intervals at 6,220 ft and 6,250 ft elevations.

3.9.2 Evaluation of the No Action Alternative

The no action alternative would involve passing all inflows from El Vado and Abiquiu dams downstream, with the exception of SJC Project water. Evaluation of the effects of this alternative requires a consideration of effects on reservoir elevation and on downstream flow regime.

3.9.2.1 Reservoir Elevation

Reservoir elevation can affect archaeological sites by subjecting them to a number of processes, including inundation and wave action. Wave action in particular has been shown to have a significant impact on archaeological sites (e.g., Dunn 1996; Ebert et al. 1989; Lenihan et al. 1977a, 1977b; Phillips and Rozen 1982; and Van Hoose and Lundquist 2019).

The URGWOM model runs presented in Figure 2 and Figure 3 present expectations for reservoir elevations for the duration of the period under consideration based on historic conditions during wetter years (Figure 2) and drier years (Figure 3). The model shows that, while there is a wide range of possible elevations for any given year, the average reservoir elevation over all model runs would be expected to range from approximately 6,170 ft to 6,200 ft.

Figure 5 shows daily reservoir elevations throughout the history of the reservoir. Between the years of 1963 and 1987, reservoir elevations increased from a starting point of around 6,060 ft NGVD to an all-time maximum of approximately 6,260 ft in August 1987. Since late 1987, elevations have remained largely between 6,170 ft and 6,220 ft, spiking above 6,220 only five times. The figure shows that the predicted average range of elevations for the no action alternative is very similar to the elevation range characteristic of the years since 1987. The no action alternative would be unlikely to inundate sites that have not been inundated over the last three decades.

On the question of wave action, Figure 5 shows that the range of elevation in any given year over the last decades has been relatively small (within 20 ft), and the URGWOM modeling shows average potential swings of a similar range. Given that the expected range of fluctuation is expected to remain at a similar scale, and the fact that the average predicted range of water levels for the no action alternative has been subjected to substantial wave zone action over the last several decades, the no action alternative would not be expected to create new impacts to resources in the APE below 6,220 feet at Abiquiu Reservoir over baseline.

In general, reservoir elevations above 6,220 feet have been rare over the last three decades, so large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. The URGWOM model shows that there is the possibility of such spikes occurring under the no action alternative. However, such spikes would be rare and generally unlikely; Figure 3, which shows the model runs for drier years that better reflect the current drought conditions, shows only two runs which exceeded 6,220 ft., and these spikes were both brief and relatively small, exceeding 6,220 ft by less than 10 feet. As such, we do not expect the no action alternative to introduce substantial or new effects to sites above 6,220 ft.

3.9.2.2 Downstream Flow Regime

Because the no action alternative would pass flows from El Vado and Abiquiu Reservoir downstream, this alternative would see the potential for more days of flow at channel capacity (1800 cfs) than the proposed deviation action alternative. However, these flows would still be within the historic range of releases as part of normal water operations, and as such would not be expected to introduce new effects to resources downstream.

Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs.

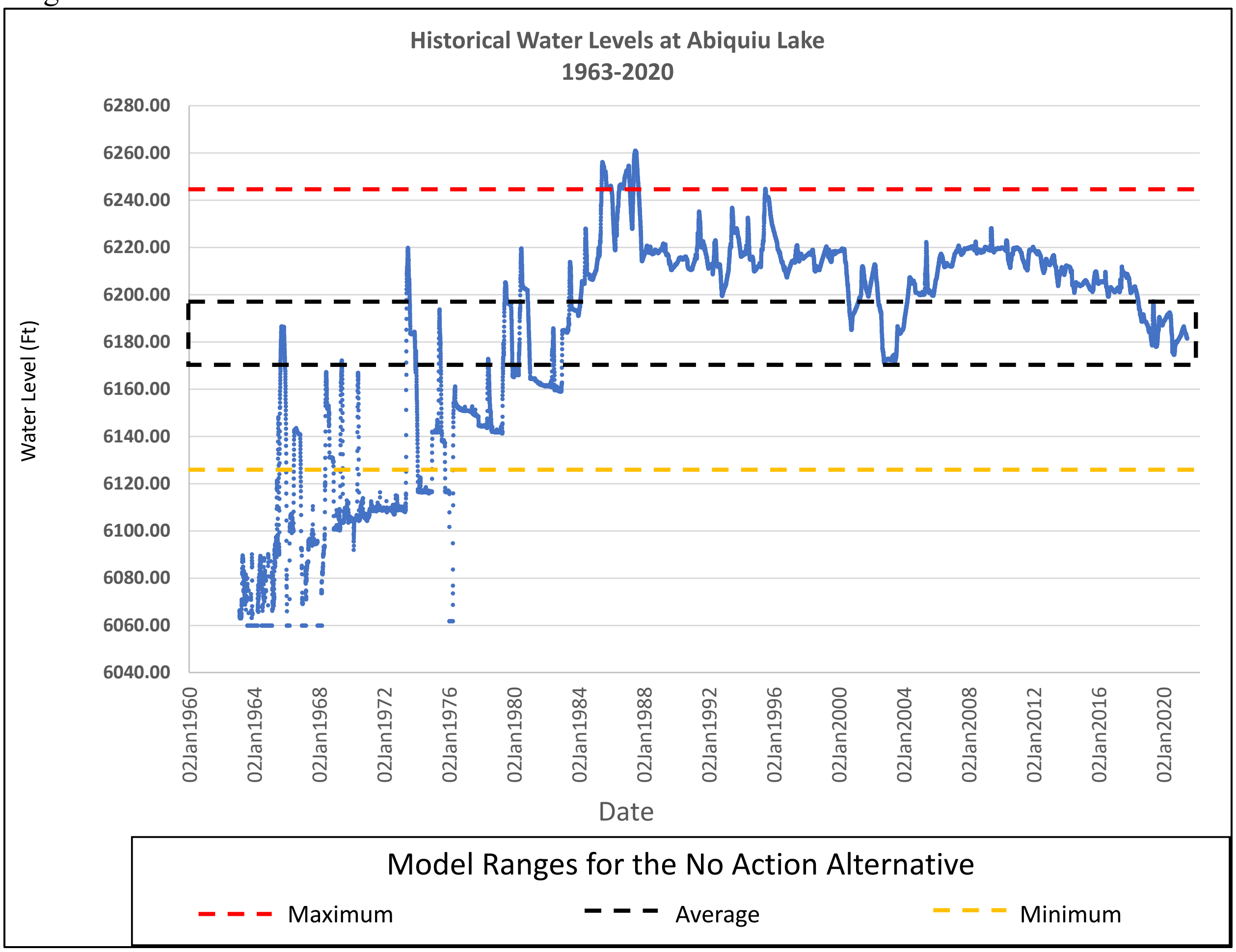

Figure 5 Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs.

4 FORESEEABLE EFFECTS OF THE PROPOSED ACTION

The foreseeable effects of the proposed action would likely be little to no effect on regional geology, air quality, ambient noise, floodplains, wetlands, noxious weed, invasive species, land use, aesthetics, socioeconomics, demographics, environmental justice, and hazardous waste.

4.1 Climate

The proposed deviation action would have no effect on the future regional climate.

4.2 Water Resources

4.2.1 Hydrology

Future with the proposed deviation action would change water management activities at the Abiquiu Dam by retaining limited amount of water during the spring runoff period, which would result in a reduction of the potential number of days with flow at channel capacity below the dam, i.e., the time frame of flood control operations at the dam would be reduced. Specifically, the proposed action would retain relinquishment credit water for release and use during the irrigation season and would retain P&P water for release and use by the Six Middle Rio Grande Basin Pueblos, similar to water management at El Vado Dam. The flow regime later in the year for the proposed action when the retained water is released would be moderately higher than for the no action condition. The effects to hydrology would be insignificant and within the normally variable hydrograph illustrated by the recent period of record (1975-2015).

4.2.2 Water Quality

There would be no effect to long-term water quality within the reach if the proposed deviation action is implemented. Climate-mediated impacts to water quality (Section 3.3) would remain if the proposed deviation action is implemented.

4.3 Vegetation Communities

The vegetation in the action area would remain unchanged from the sparse riparian and upland trees and plants. The proposed deviation action would have no effect on vegetation communities.

4.4 Fish and Wildlife

Under the proposed deviation action alternative, retention of water may occur from April through November. Migratory birds and other wildlife using the area would be able to move away from inundated areas. The effects of retention of water would be similar to the current management and result in no effects for fisheries and terrestrial wildlife.

4.4.1 Special Status Species

There are no special status wildlife species that would be affected by the proposed deviation action.

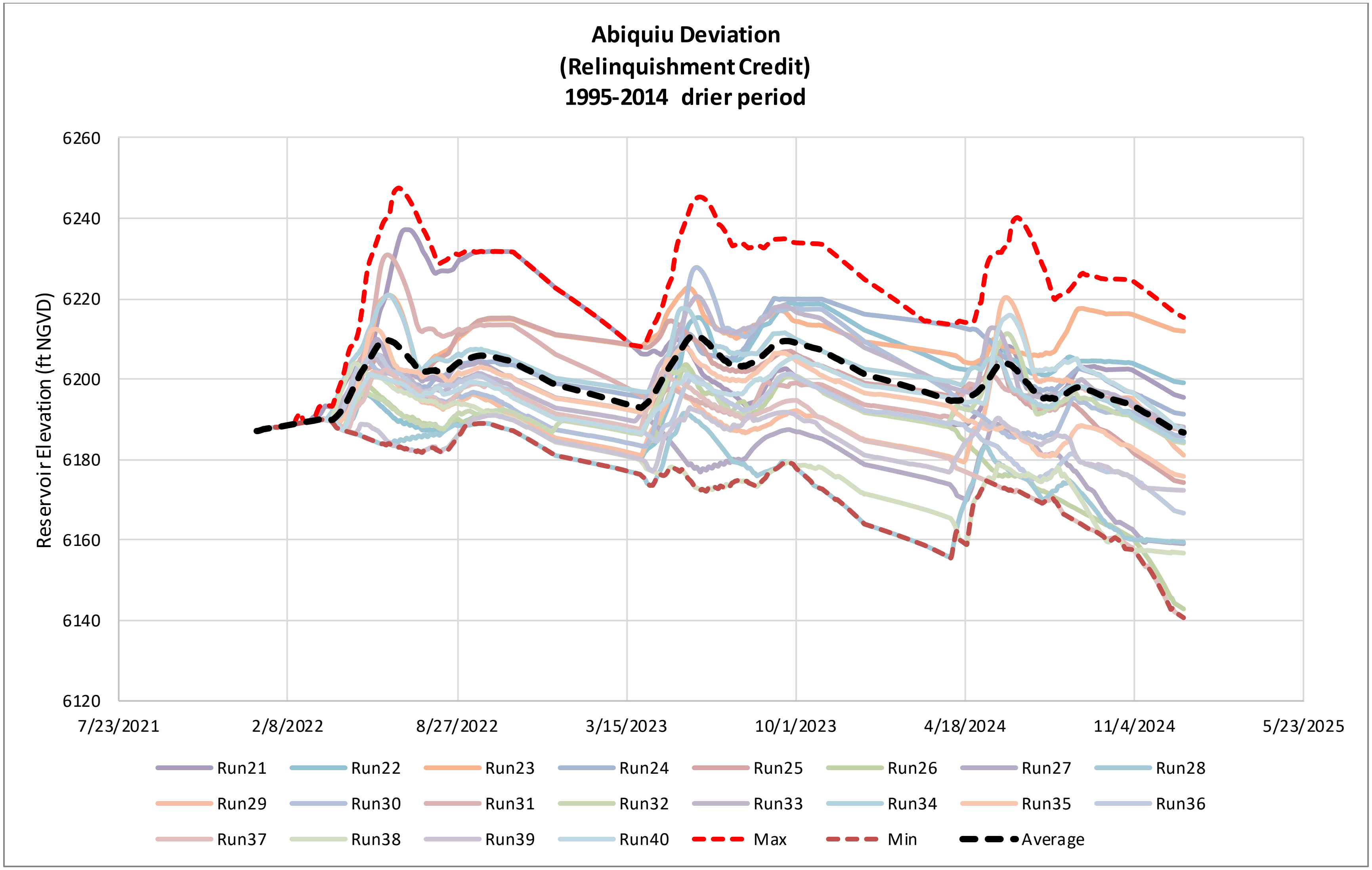

Figure 6 Upper Rio Grande Water Operations Model (URGWOM) runs with a deviation (relinquishment credit) for the drier 1995-2014 period of record. Labels identify each simulated three-year sequence. The average, maximum, and minimum hydrographs span the 40-year simulation.

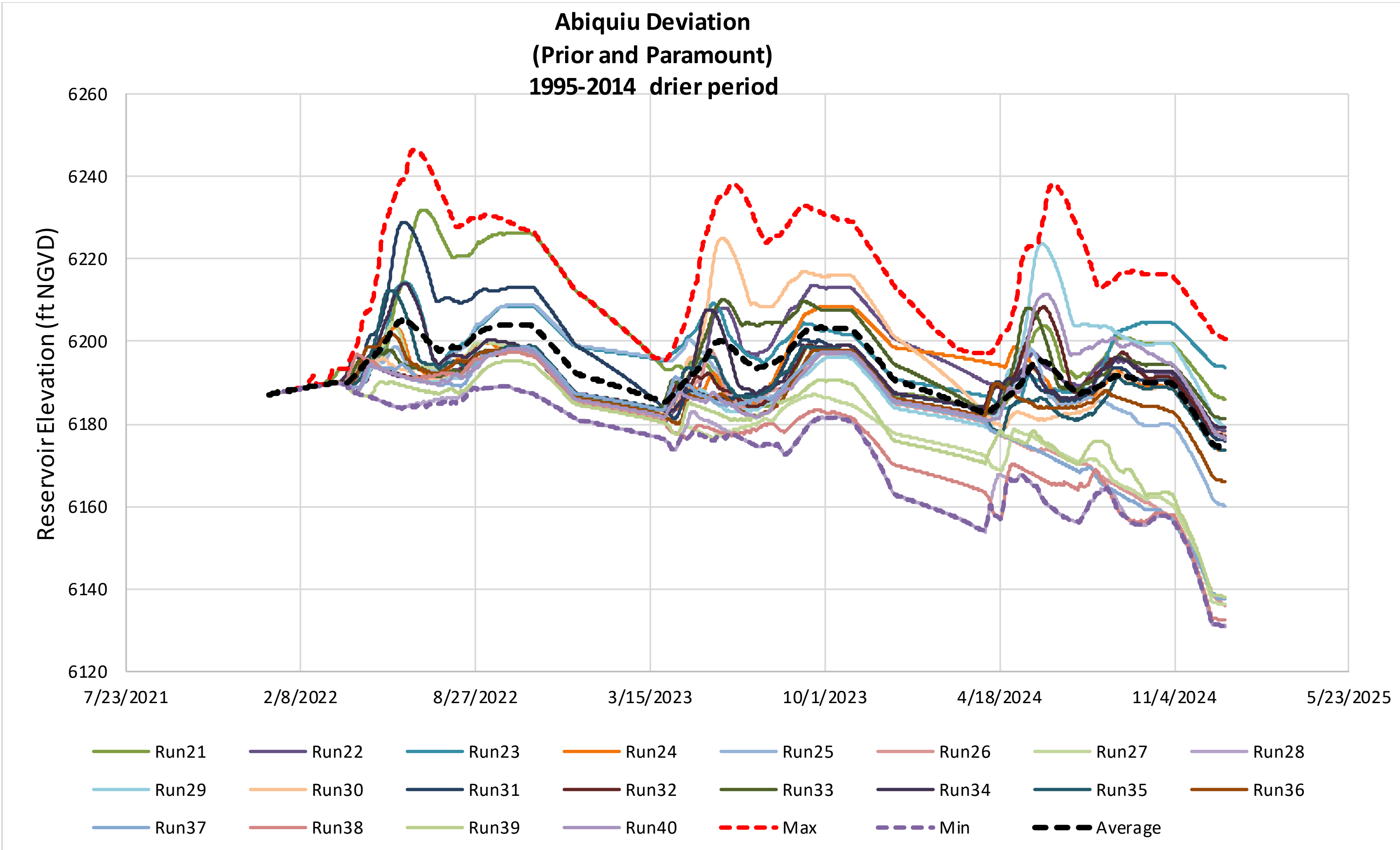

Figure 7 Upper Rio Grande Water Operations Model (URGWOM) runs with a deviation (Prior and Paramount) for the drier 1995-2014 period of record. Labels identify each simulated three-year sequence. The average, maximum, and minimum hydrographs span the 40-year simulation.

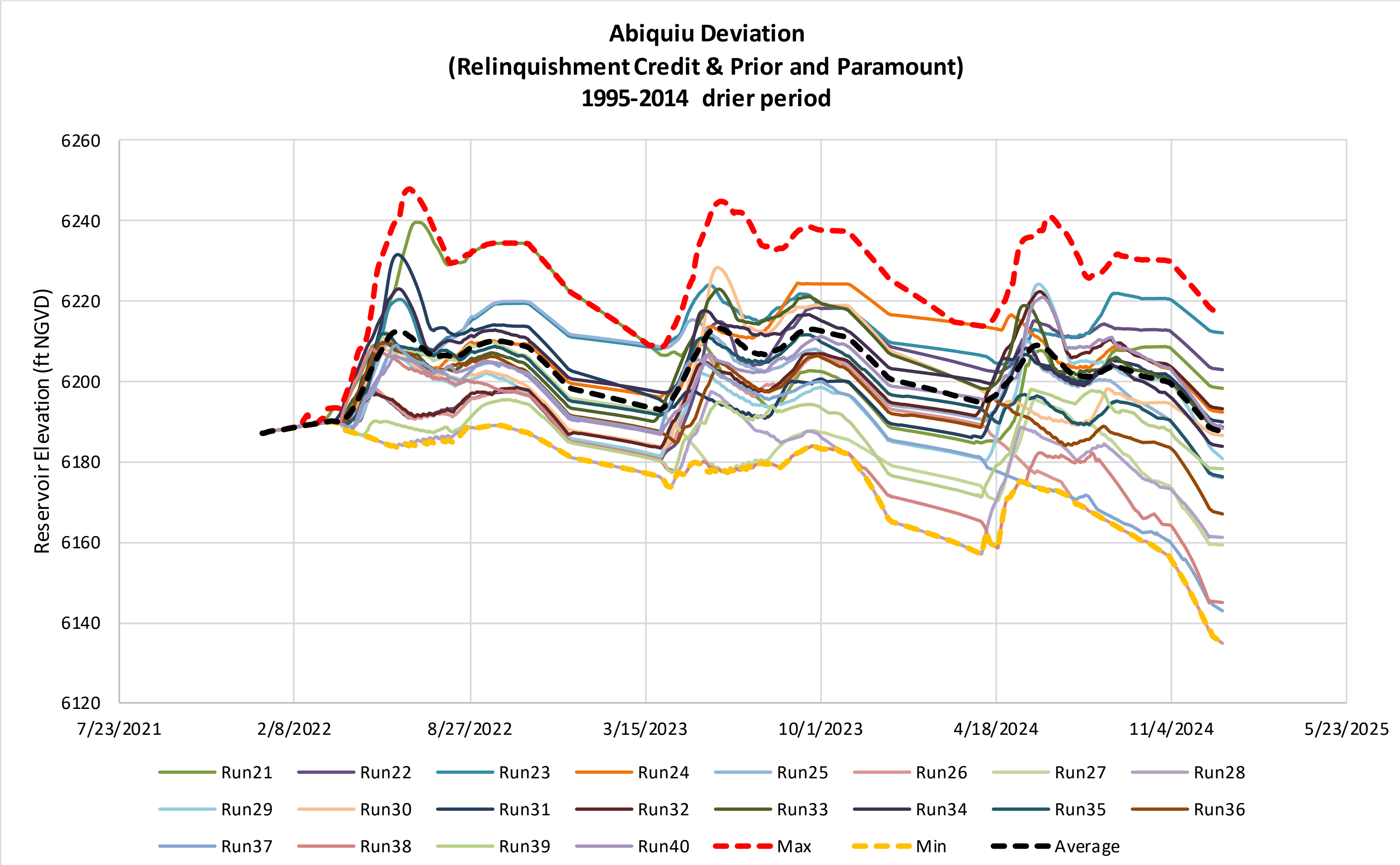

Figure 8 Upper Rio Grande Water Operations Model (URGWOM) runs with a combined deviation (relinquishment credit and Prior and Paramount) for the drier 1995-2014 period of record. Labels identify each simulated three-year sequence. The average, maximum, and minimum hydrographs span the 40-year simulation.

4.5 Recreation

The effects of the proposed deviation action are expected to temporarily increase reservoir water elevations. These changes may increase visits for camping, walking, biking, hiking, wildlife viewing, water sports, and picnicking. The effects to recreation are insignificant.

4.6 Indian Trust Assets

The proposed deviation action has been coordinated with the Six Middle Rio Grande Basin Pueblos, and other tribal nations. The proposed deviation action would not adversely affect Indian Trust Assets. The proposed action would retain P&P water for use by the Six Middle Rio Grande Basin Pueblos. The effects of the proposed action are insignificant and protect Indian Trust Assets.

4.7 Cultural Resources

The proposed deviation action results in three different scenarios. Three primary sources of potential impacts to these resources have been considered: direct impacts from retention of water; indirect impacts from potential changes in flow regime; and potential impacts from increased recreational use of the area. These are each discussed below.

4.7.1 Water Retention

As noted above, reservoir elevation can affect archaeological sites by subjecting them to a number of processes including inundation and wave action. Under the proposed deviation action alternative, water surface elevations at Abiquiu Reservoir are expected to increase in comparison with the no action alternative. Figure 6, Figure 7, and Figure 8 above show URGWOM model runs for predicted ranges of reservoir elevations for three deviation scenarios: relinquishment credit, Prior and Paramount, and a combination of the two (i.e., relinquishment credit and Prior and Paramount). Each of these does show some increase in overall expected water levels over the no action alternative. In order to assess potential effects of these increases on historic properties, it is necessary to compare these predicted elevations to those expected for the no action alternative (see Figure 5).

As with the no action alternative, the average predicted reservoir elevations for each of the deviation scenarios are within the range of reservoir elevations characteristic of the years since 1987, but there are differences. For the relinquishment credit scenario, the average predicted water level ranges from approximately 6,185 ft to 6,210 ft (Figure 9). For the Prior and Paramount scenario, the average level ranges between approximately 6,185 ft and 6,205 ft (Figure 10). For the combined relinquishment credit and Prior and Paramount alternative, average water levels range slightly higher, from approximately 6,190 ft to 6,215 ft (Figure 11).

While slightly higher than the figures for the no action alternative (Figure 5), these predicted average ranges are still similar to the elevation range characteristic of the years since 1987, and in particular still fall below the 6,220 ft level. As such, averages for these alternatives make it unlikely that sites would be inundated that have not been inundated for substantial periods during the last three decades. No new effects would be expected for sites below 6,220 ft.

Because reservoir elevations above 6,220 feet have been rare over the last three decades, large or sustained spikes above this level would have the potential to introduce effects from wave actions that sites at those elevations have not often experienced. As with the no action alternative, the URGWOM model shows that there is the possibility of such spikes occurring under the various scenarios. Under these alternatives, the likelihood of exceeding this elevation is slightly higher than for the no action alternative, but would still be generally rare. As with the no action alternative, Figure 6 and Figure 7 show only two runs exceeding 6,220 ft during the drier years (which better approximate current drought conditions), and Figure 8 shows only three runs with brief periods exceeding this elevation. While brief, these simulated peaks do reach slightly higher elevations than the no action alternative. Figure 12 shows average exceedance curves for the URGWOM simulations for each of the alternatives (no action, and each of the three deviation scenarios), showing the percentage likelihood that each of the scenarios will exceed water level ranges. For the no action alternative, the relinquishment credit alternative, and the Prior and Paramount alternative, likelihood of exceeding 6,220 ft in elevation is less than two percent. For the combined relinquishment credit and Prior and Paramount alternative, likelihood of exceeding 6,220 ft increases to approximately nine percent; however, likelihood of exceeding 6,225 ft drops to less than two percent. In other words, while the combined alternative does raise the likelihood of exceeding 6,220 ft, such exceedance would still be rare, and the magnitude of increases more than five feet above this level are even less likely. As such, any of the three deviation scenarios are unlikely to introduce substantial or new effects from inundation or wave action to sites above 6,220 ft.

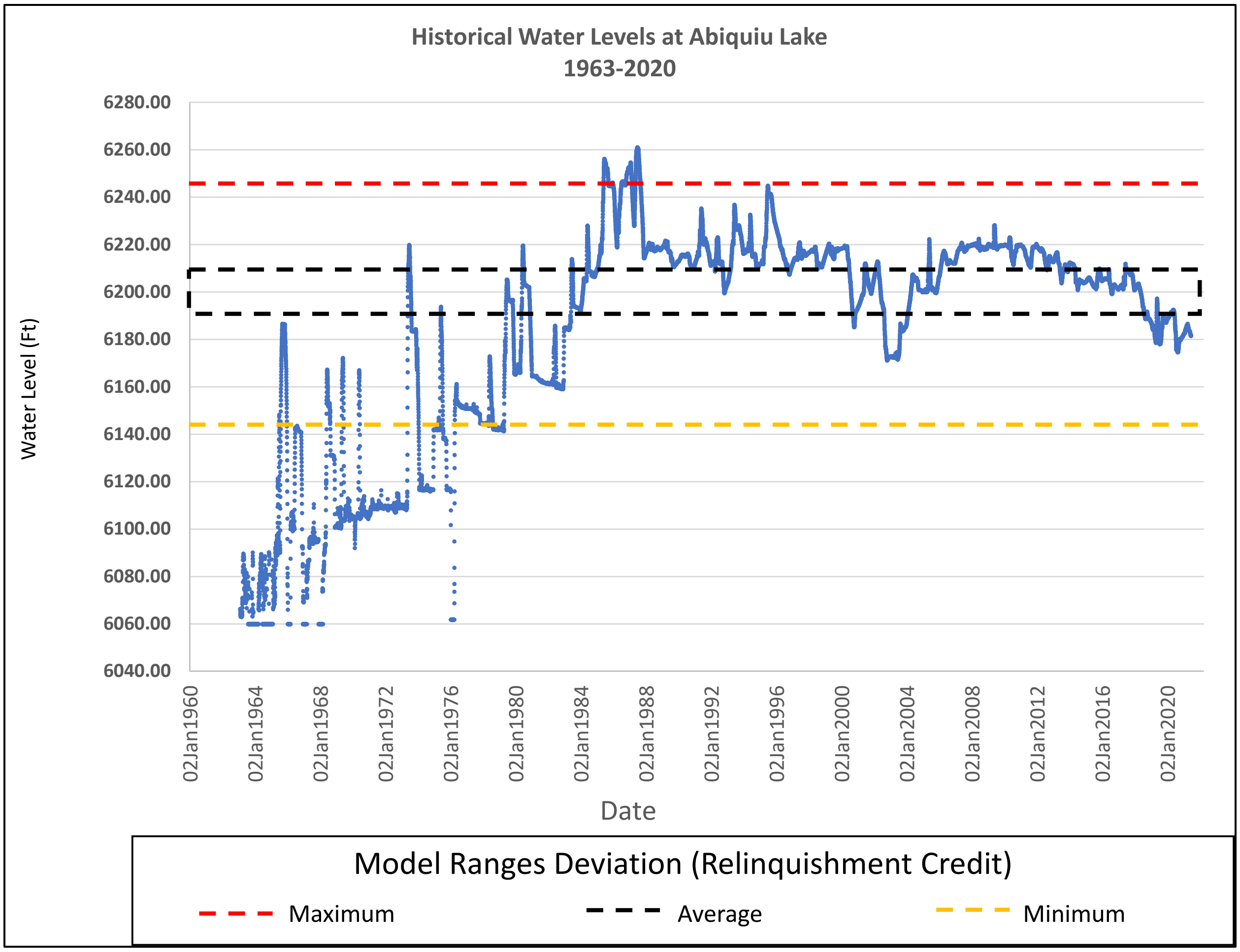

Figure 9 Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs for a deviation (relinquishment credit).

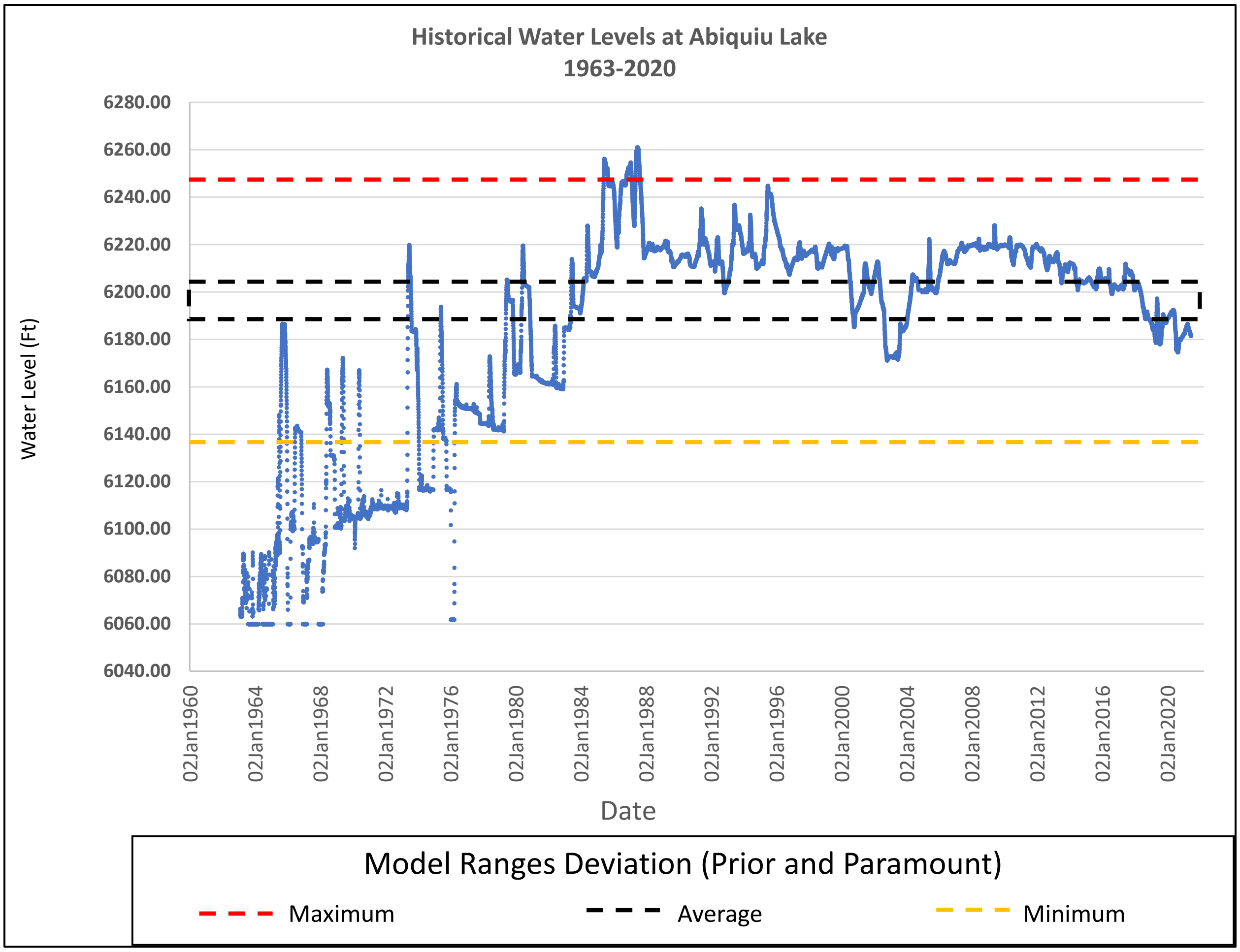

Figure 10 Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs for a deviation (Prior and Paramount).

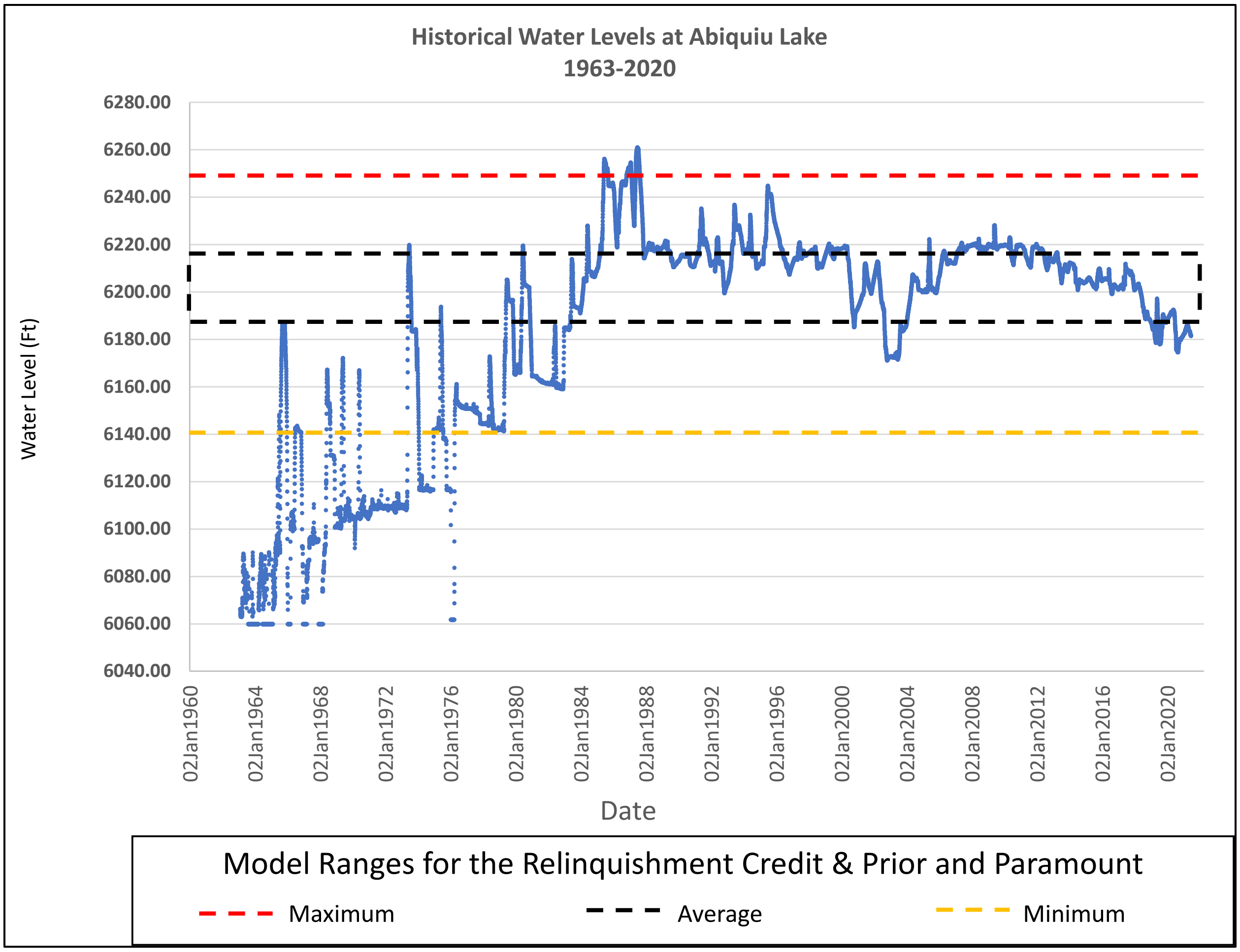

Figure 11 Historic water levels at Abiquiu Reservoir, with predicted average, maximum, and minimum ranges based on URGWOM model runs for a deviation (combined relinquishment credit and Prior and Paramount).

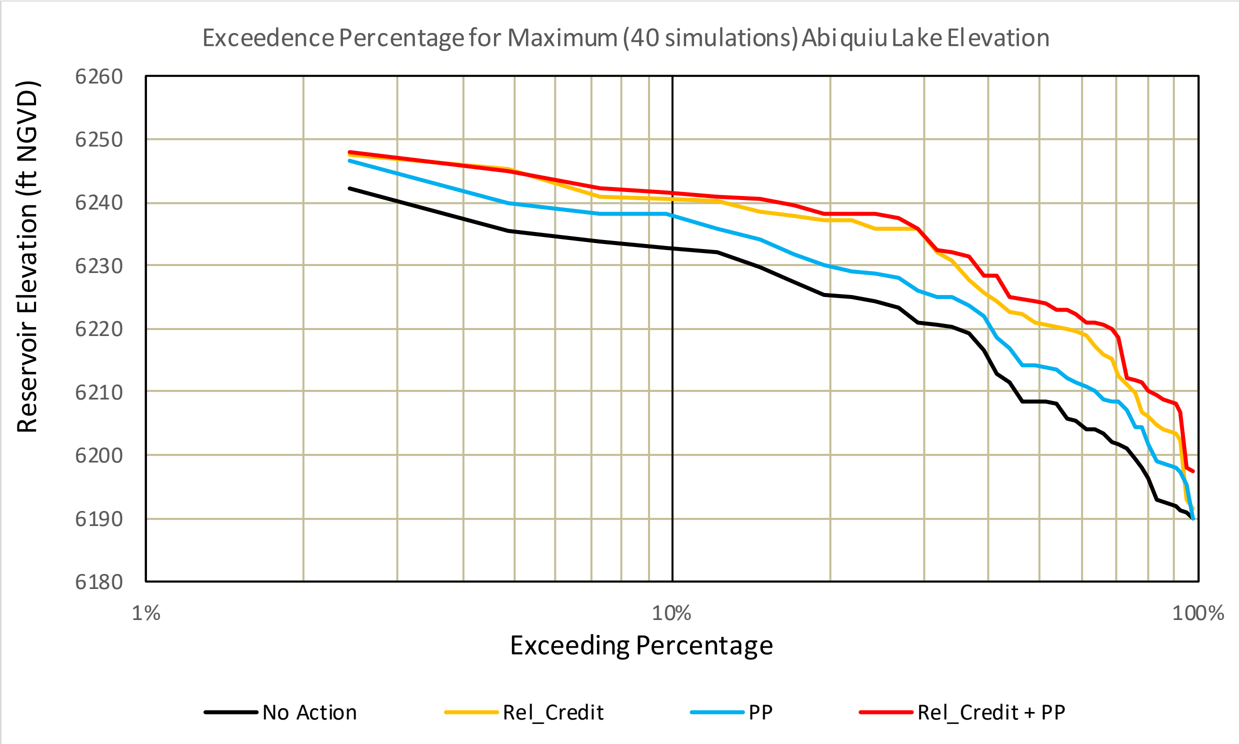

Figure 12 Graph showing percentage of URGWOM runs for each alternative exceeding reservoir elevation levels.

4.7.2 Downstream Flow Regime

As noted above, the fact that the no action alternative passes all Rio Grande inflows downstream of the dam, that alternative would have the potential for a greater number of days of flow at channel capacity (1800 cfs) over baseline. Because the proposed action under consideration would allow retention of Rio Grande water in Abiquiu Reservoir, these scenarios would reduce the number of days of flow at channel capacity downstream of Abiquiu by approximately 25 percent. As with the no action alternative, these flows would be within the historic range of releases as part of normal water operations, and as such would not be expected to introduce new effects to resources downstream.

4.7.3 Recreation

While slightly higher water levels may result in some increases in recreation, the ranges of water levels (and therefore the expected variation in coincident recreation activities) are within historical ranges. As such, we expect potential temporary increases in recreation to be negligible relative to the no action alternative.

4.7.4 Summary of Cultural Resources Analysis for Future With Proposed Action Alternative

Given the above information, USACE has determined that the proposed deviation action would have **no adverse effect** to historic properties. Section 106 consultation is ongoing; this determination was submitted to NMSHPO for review and concurrence on March 8, 2022, and Section 106 consultation is ongoing with Tribes and with other consulting parties concurrently.

5 CONCLUSIONS AND SUMMARY

The proposed deviation action would not affect regional geology, air quality, noise, floodplains, wetlands, noxious weeds, invasive species, land use, aesthetics, socioeconomics, local demographics, environmental justice, and HTRW. The proposed deviation action would not affect climate, hydrology, water management, vegetation communities, fish and wildlife resources, recreation, or Indian Trust Assets. Cultural resources would not be adversely affected by the proposed deviation action.

All releases from Abiquiu Dam will be within the typical historical range of releases as part of normal water operations. Under the No Action Alternative, all Rio Grande water inflow into El Vado and Abiquiu dams will be released downstream. The No Action Alternative has the potential for more days of flow at channel capacity (1800 cfs) below Abiquiu Dam than the proposed deviation action alternative. With the proposed deviation action alternative, retention of Rio Grande water in Abiquiu Reservoir would reduce the number of days of flow at channel capacity downstream of Abiquiu by approximately 25 percent. The retention and release of SJC Project water would be unaffected by either the no action or the proposed deviation action alternative.

6 PREPARATION, CONSULTATION, AND COORDINATION

6.1 Preparation

This EA was prepared by the USACE, Albuquerque District. Personnel primarily responsible for preparation include:

- Michael D. Porter, Fishery Biologist
- Jonathan Van Hoose, Archaeologist

6.2 Quality Control

This Draft EA has been reviewed for quality control purposes. Reviewers include:

- Danielle Galloway, Biologist
- Nabil Shafike, Chief Water Management Section
- Reynalden Delgarito, Rio Grande Basin Manager

6.3 Consultation and Coordination

USACE has coordinated with NMSHPO on cultural resources.

6.4 Public Involvement

6.4.1 Scoping Letter

Letters were sent to the organizations and agencies below on February 8, 2022. Responses to the Scoping Letter are included in Appendix C.

Federal Agencies		**New Mexico Agencies**
U.S. Bureau of Indian Affairs		New Mexico Interstate Stream Commission
U.S. Bureau of Reclamation		New Mexico Office of State Engineer
U.S. Environmental Protection Agency		New Mexico Office of the Governor
U.S. Fish and Wildlife Service		New Mexico Department of Game and Fish
		Albuquerque Bernalillo County Water Utility Authority
Rio Grande Compact Commission		Middle Rio Grande Conservancy District
Federal Chair		Elephant Butte Irrigation District
Commissioner for Colorado		
Commissioner for New Mexico		**Texas Agencies**
Commissioner for Texas		Texas Water Development Board
		El Paso County Water Improvement District No. 1
Non-Governmental Organizations		
Audubon Southwest		**Colorado Agencies**
Rio Chama Acequia Association		Colorado State Engineer Office

Tribal Governments	
Jicarilla Apache Nation	Pueblo of Pojoaque
Kewa Pueblo	Pueblo of San Felipe
Navajo Nation	Pueblo of San Ildefonso
Ohkay Owingeh	Pueblo of Sandia
Pueblo de Cochiti	Pueblo of Santa Ana
Pueblo of Isleta	Pueblo of Santa Clara
Pueblo of Jemez	Pueblo of Taos
Pueblo of Laguna	Pueblo of Tesuque
Pueblo of Nambe	Pueblo of Zia
Pueblo of Picuris	

6.4.2 Summary of the Public Review and Comments

The Notice of Availability was sent to agencies and stakeholders for a 21-day public review starting 14 March 2022 by publication of the Notice of Availability in the Albuquerque Journal and the Santa Fe New Mexican. Comments received from the public review of the Draft EA are included in Appendix C.

The Draft EA was made available online at:
http://www.spa.usace.army.mil/Missions/Environmental/EnvironmentalComplianceDocuments/EnvironmentalAssessmentsFONSI.aspx.

The public can also request a copy of the Draft EA from Michael Porter at:
Abiquiu.Deviation.2022@usace.army.mil or 505-342-3264.

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