White Mountain Apache Tribe Rural Water System Draft Environmental Impact Statement

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July 2022

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The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

White Mountain Apache Tribe Rural Water System Draft Environmental Impact Statement

Proposed action: Reclamation proposes to construct and operate the White Mountain Apache Tribe rural water system to divert, store, and distribute water from the North Fork of the White River for the use and benefit of the White Mountain Apache Tribe in east-central Arizona.

Lead agency: Bureau of Reclamation, Lower Colorado Basin Interior Region 8

Cooperating agencies: White Mountain Apache Tribe
U.S. Bureau of Indian Affairs
U.S. Army Corps of Engineers

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Cover Photo: View of the North Fork of the White River near the Proposed Miner Flat Dam Site

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Acronyms, Abbreviations, and Symbols

Acronym	Definition
°C	degrees Celsius
°F	degrees Fahrenheit
AADT	Annual Average Daily Traffic
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
af	acre-feet
afy	acre-feet per year
AHRRC	Arizona Hospitality Research and Resource Center
APE	area of potential effects
AZGFD	Arizona Game and Fish Department
BA	Biological Assessment
BEA	Bureau of Economic Analysis
BIA	Bureau of Indian Affairs
BMP	best management practice
CAP	Central Arizona Project
CDP	census designated place
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
dBA	A-weighted decibels
DCMI	domestic, commercial, municipal, and industrial
EFWR	East Fork of the White River
EFWRNFA	East Fork of the White River near Fort Apache, Arizona
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
gpm	gallons per minute
HPTP	Historic Properties Treatment Plan
HUC	Hydrologic Unit Code
IHS	Indian Health Service
IR	impounded runoff
ITA	Indian Trust Asset
LOS	level of service
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
mg/L	milligrams per liter
mgd	million gallons per day
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
National Register	National Register of Historic Places
NEC	Navopache Electric Cooperative
NEPA	National Environmental Policy Act
NFWR	North Fork of the White River
NFWRGG	North Fork of the White River below Gold Gulch
NFWRLL	North Fork of the White River at Lower Log

Acronym	Definition
NHPA	National Historic Preservation Act
No.	Number
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity units
OSHA	Occupational Safety and Health Administration
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PVC	polyvinyl chloride
Quantification Act	White Mountain Apache Tribe Water Rights Quantification Act of 2010
Reclamation	Bureau of Reclamation
ReGAP	Regional Gap Analysis Project
Reservation	Fort Apache Indian Reservation
ROI	Region of Influence
ROW	right-of-way
SCADA	Supervisory Control and Data Acquisition
Secretary	Secretary of the Interior
spp.	several species
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TDS	total dissolved solids
THPO	Tribal Historic Preservation Office
Tribe	White Mountain Apache Tribe
TSS	Tribally Sensitive Species
U.S.	United States
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGCRP	United States Global Change Research Program
USGS	United States Geological Survey
Water Quality Protection Ordinance	Water Quality Protection Ordinance of the White Mountain Apache Tribe of the Fort Apache Indian Reservation
Water Treatment Plant	White River Surface Water Treatment Plant
WMAT	White Mountain Apache Tribe
WMATCO	White Mountain Apache Timber Company
WMGFD	White Mountain Game and Fish Department
WRNFA	White River near Fort Apache, Arizona

Executive Summary

ES.1. Introduction

This Draft Environmental Impact Statement (EIS) discloses the potential environmental impacts associated with constructing and operating the proposed White Mountain Apache Tribe (WMAT or Tribe) rural water system. The United States (U.S.) Department of the Interior, Bureau of Reclamation (Reclamation), as the Federal lead agency, has prepared this EIS in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S. Code [U.S.C.] 4321–4347), Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500–1508[1]), and U.S. Department of the Interior NEPA regulations (43 CFR 46). The WMAT, the Bureau of Indian Affairs (BIA), and the U.S. Army Corps of Engineers (USACE) are cooperating agencies in the preparation of this EIS.

In the WMAT Water Rights Quantification Act of 2010 (Quantification Act), the U.S. Congress authorized and directed the Secretary of the Interior (Secretary), acting through Reclamation, to plan, design, and construct the WMAT rural water system to divert, store, and distribute water from the North Fork of the White River (NFWR) for the use and benefit of the WMAT in east-central Arizona. The Quantification Act, as amended, also authorized and appropriated funds to the Secretary to carry out the planning, engineering, design, environmental compliance, and construction of the WMAT rural water system. The proposed action would include construction and operation of the Miner Flat Dam on the NFWR near the community of Whiteriver, Arizona. The construction of the dam would create a new instream reservoir along the NFWR with approximately 8,600 acre-feet (af) of water storage that would be used to modify the existing flow regime of the river to ensure a more reliable flow of water downstream of the dam. This modification of the existing flow regime would include the ability to supplement the flow of the river with stored water from the reservoir when river flow is lower due to seasonal fluctuations and during drought years. Water released from the dam would flow down the NFWR, and up to 7,602 acre-feet per year (afy) would be diverted from the river channel and subsequently treated and conveyed via pipeline to communities across the Fort Apache Indian Reservation (Reservation). Project components would include construction and operation of (1) the dam and storage reservoir, (2) diversion intake facilities and pumping plant, (3) existing water treatment facility upgrades, and (4) a 50-mile-long water distribution system that would provide water to communities located on the Reservation, including Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue. Water would be used for municipal, rural, and industrial use for the benefit of the WMAT, per the Quantification Act.

The proposed dam and water system operations would also accommodate downstream irrigation diversions in the Canyon Day area for farming. Maximum water diversions would be between 2,843 afy and 9,637 afy, depending on the NEPA alternative. This water use is over and above the projected municipal, rural, and industrial water use for the communities of the greater Whiteriver area, Carrizo, and Cibecue.

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[1] The NEPA process for the proposed action started before the CEQ regulations were revised in 2020; therefore, this EIS follows the pre-2020 version of 40 CFR 1500–1508.

ES.2. Purpose and Need

The purpose of the proposed action is to provide a long-term, dependable, and sustainable water supply for residents and businesses on the Reservation. The proposed action would fulfill the requirements of the Quantification Act that the Secretary plan, design, and construct the WMAT rural water system, as well as operate, maintain, and replace the water system until the title is transferred to the WMAT.

Since the early 2000s, the Whiteriver area has experienced water outages, declining water quality, and a diminishing groundwater source. Declining groundwater supplies and existing drinking water infrastructure are unable to keep up with the demands of the residents on the Reservation and the projected future demand of a growing population. The WMAT needs a dependable and sustainable water supply for residents and businesses on the Reservation.

ES.3. Decisions to Be Made

This EIS supports Federal decisions related to the WMAT Rural Water System Project. It provides necessary information for approving, modifying, or denying the proposal. Based on the analysis in this EIS, Reclamation will make the following decisions:

- Whether or not to construct the rural water system, as specified in the Quantification Act and described in this EIS
- How the rural water system will be implemented and operated to prioritize water uses based on available supply, especially with regard to downstream irrigation diversions and the preservation of downstream minimum flows

This EIS also serves to support other Federal decisions, including those of the BIA and USACE. The BIA has a responsibility to respond to applications for rights-of-way (ROWs) over or across lands held in trust for Indian Tribes. The BIA's decision will be to deny, grant, or grant with modifications, the ROW agreements between the WMAT and Reclamation (i.e., applicant). The USACE has a responsibility to respond to permit applications under Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1251 et seq.). The USACE's decision will be to deny or grant the issuance of a Section 404 permit. The BIA and USACE are relying on this EIS to support their decisions.

The proposed action would require other permits, certifications, and/or determinations made by Federal or State agencies that may rely on information in this EIS, as described in **Section 1.6** (*Federal Permits, Licenses, or Other Authorizations*) of this EIS.

ES.4. Project Alternatives

This Draft EIS assesses the potential environmental impacts of five alternatives under consideration: the No Action Alternative and four action alternatives.

ES.4.1 No Action Alternative

Under the No Action Alternative, the proposed WMAT rural water system would not be built, and the residents of the Reservation would continue to rely on existing water systems. The WMAT's current water use is estimated at a depletion rate of less than 8,000 afy, which accounts for less than one third of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.[2] The current depletion rate is based on the amount of water currently used for existing domestic, commercial, and industrial water use; livestock use; streamside irrigation; and evaporation from stock ponds and recreation lakes (Watson 2021a). The existing water system is inadequate to meet current and projected demands based on limited sources of water and expected community growth. Declining groundwater levels and limited surface flows from the NFWR during low flow periods would continue to result in periodic water shortages. Future water demands are also projected to increase over time, which would put additional strain on the existing system. Additionally, the provision of the Quantification Act instructing the Secretary to construct the WMAT rural water system would not be fulfilled. The No Action Alternative is not considered a reasonable alternative because it does not meet the purpose of and need for the proposed action. However, it does provide a benchmark that enables decision makers to evaluate the environmental consequences of the proposed alternatives.

ES.4.2 Action Alternatives

All four of the action alternatives would include construction of a dam and associated facilities along the NFWR near the community of Whiteriver, expansion of the North Fork intake structure, expansion of the White River Surface Water Treatment Plant ("water treatment plant"), and construction of a 50-mile-long water distribution system serving the communities of Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue. The proposed WMAT rural water system would use up to 7,602 afy and 3,030 afy for diversion and depletion, respectively, for municipal, rural, and industrial use for the benefit of the WMAT. These water diversions would start at a lower level (i.e., similar to existing water demands) and would increase over time as population levels increase. It may not reach maximum demand levels for 40 years or more. Under all action alternatives, groundwater extraction from the Miner Flat Wellfield is expected to continue at a rate of about 800 gallons per minute (gpm).

Per Section 307(d)(2) of the Quantification Act, Reclamation would operate the completed rural water system, with the participation of the WMAT, for no less than 3 years. Title to the facilities would be transferred to the WMAT no later than 30 days after the date on which the Secretary publishes certain findings in the *Federal Register*, including that (1) the operating criteria, standard operating procedures, emergency action plan, and first filling and monitoring criteria of the designers have been established and are in place; (2) the WMAT rural water system has operated under the standard operating procedures of the designers, with the participation of the Tribe, for a period of 3 years; and (3) the Secretary has provided the Tribe with technical assistance on the manner by which to operate and maintain the WMAT rural water system. Once title is transferred to the WMAT, the WMAT would manage and operate the completed water system.

The WMAT and Reclamation would work together to develop and approve all operations, maintenance, and safety plans prior to initial operations, and plans would be amended, as needed, based on actual operations and regulatory requirements. The WMAT would also establish a water administrator position and manage water diversions and demands on the Reservation through the development of the WMAT Water Code, per requirements of the Quantification Act. This code, for

[2] A diversion right is the amount of water that can be diverted from a water system, while the depletion right represents the amount of water that is diverted less the return flow to the system from which it was diverted (i.e., the amount taken out of the system). Depletion amount is also referred to as "consumptive use."

example, would codify provisions for issuing conditional permits to divert water for irrigation or other uses following a determination of availability and needs evaluation. The WMAT Water Code would be enacted no later than 18 months after the enforceability date of the Quantification Act.

All of the action alternatives would meet the purpose of and need for the proposed action because each would provide a long-term, dependable, and sustainable water supply for residents and businesses on the Reservation, and each would fulfill Reclamation's responsibilities under the Quantification Act. While the action alternatives include the same construction components, they differ in how the water system would be implemented and operated to prioritize uses based on the water supply. These differences primarily relate to downstream irrigation diversions and the preservation of downstream minimum flows.

Alternative A

Under Alternative A, the dam and water treatment facilities would operate to meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue, per the Quantification Act. The dam and water system operations would accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate farming within 885 acres that had been cultivated in the 1980s. Water use for irrigation would be up to 2,843 afy and 2,491 afy for diversion and depletion, respectively. This water use is over and above the projected municipal, rural, and industrial water use for the communities of the greater Whiteriver area, Carrizo, and Cibecue (i.e., up to 7,602 afy and 3,030 afy for diversion and depletion as noted above). Water system operations would prioritize the preservation of historical minimum flow levels below the dam. This would include operating the dam to prioritize at least an 11 cubic feet per second (cfs) minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other continued and future water uses on the Reservation, the WMAT's projected water use under Alternative A is estimated at a depletion rate of less than 15,000 afy (Watson 2021a), which accounts for about 55 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

Alternative B

Under Alternative B, the rural water system diversions would meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue, similar to Alternative A. The downstream irrigation diversions in the Canyon Day area to irrigate up to 885 acres would also be the same as under Alternative A. Under Alternative B, proposed water system operations would not prioritize the preservation of historical minimum flow levels below the dam, although this alternative would include an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other continued and future water uses on the Reservation, the WMAT's projected water use under Alternative B is estimated at a depletion rate of less than 15,000 afy (Watson 2021a), which accounts for about 55 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

Alternative C

Under Alternative C, the rural water system diversions to meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would be the same as under Alternative A. Unlike Alternatives A and B, proposed dam and water system operations under Alternative C would accommodate downstream irrigation diversions to allow the WMAT to expand farming activities in Canyon Day with sufficient water to irrigate up to 3,000 acres[3] of farmland. Water use for irrigation would be up to 9,637 afy and 8,444 afy for diversion and depletion, respectively. Downstream minimum flows would be the same as under Alternative A. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other continued and future water uses on the Reservation, the WMAT's projected water use under Alternative C is estimated at a depletion rate of less than 20,000 afy (Watson 2021a), which accounts for less than 75 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

Alternative D

Under Alternative D, the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would be met, similar to Alternative A. The downstream irrigation diversions in the Canyon Day area to irrigate up to 3,000 acres would be the same as under Alternative C. Downstream minimum flows would be the same as under Alternative B; operations would not regulate the river flow to preserve historical minimum flow levels below the dam, although this alternative would include an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other continued and future water uses on the Reservation, the WMAT's projected water use under Alternative D is estimated at a depletion rate of less than 20,000 afy (Watson 2021a), which accounts for less than 75 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

Table ES-1 provides a summary of the project components associated with each alternative addressed in this EIS.

ES.5. Connected Actions

Connected actions, as defined in 40 CFR 1508.25(a)(1), are those that are closely related to the proposed action and should be discussed in the same EIS. Connected actions that have been identified for the proposed WMAT rural water system are associated with agricultural activities in the Canyon Day area. Under Alternatives A and B, proposed operations would accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate farming within 885 acres that had been cultivated in the 1980s. Under Alternatives C and D, proposed operations would accommodate downstream irrigation diversions in the Canyon Day area to irrigate up to 3,000 acres. While the water diversions are part of the proposed action, other future actions by the WMAT to reinitiate farming are considered a connected action.

[3] The 3,000 acres would include the 885 acres that were farmed in the 1980s as well as an additional 2,115 acres.

Table ES-1. Summary of Alternatives

Description	No Action	A	B	C	D
WMAT Rural Water System					
Construction of the WMAT rural water system • New Miner Flat Dam and instream reservoir • North Fork intake structure expansion • Water treatment plant expansion • New water distribution system	-	X	X	X	X
WMAT rural water system water diversions • Up to 7,602 afy diversion with 3,030 afy depletion • Used for municipal, rural, and industrial water use for the greater Whiteriver area, Carrizo, and Cibecue	-	X	X	X	X
Downstream Irrigation Diversions					
Water diversions to irrigate up to 885 acres in Canyon Day • Up to 2,843 afy diversion with 2,491 afy depletion	-	X	X	-	-
Water diversions to irrigate up to 3,000 acres in Canyon Day • Up to 9,637 afy diversion with 8,444 afy depletion	-	-	-	X	X
Downstream Minimum Flows					
11 cubic feet per second minimum instream flow to support water diversions for the Alchesay National Fish Hatchery	-	X	X	X	X
Preserving minimum flow levels downstream of the Miner Flat Dam[1]	-	X	-	X	-

Key: afy = acre-feet per year; WMAT = White Mountain Apache Tribe; X = included; - = not included

[1] Historical minimum river flow levels were based on monthly flows over the period from 1958 through 2020 (63 years) calculated from actual and synthetic gage data. Monthly minimums were defined as the historical flow that was exceeded 99 percent of the time (1 percentile flow) plus 1 cubic foot per second for specific locations within the model grid (see JE Fuller 2020 for more information).

The WMAT is still in the planning process regarding future Canyon Day farming, and many details are currently unknown. Water diversions would occur below the point where the NFWR and East Fork of the White River meet. New and/or modified infrastructure would be needed to divert, pump, and distribute water for irrigation, but specific details are not known at this time. If the WMAT chooses to reinitiate or expand farming in Canyon Day, the Tribal Council would approve the planning and construction. The WMAT will follow the *Tribal Plan and Project Review* process to ensure that all projects on the Reservation are consistent with Tribal and Federal laws, policies, and regulations.

ES.6. Alternative Elements Considered but Eliminated

Pursuant to the Quantification Act, the U.S. Congress authorized and directed Reclamation to plan, design, and construct a drinking water system anchored by a dam and reservoir on the NFWR. Because the proposed action is directed by Congress as part of a water right settlement, viable alternatives are limited to those that (1) contain all components of the WMAT rural water system directed by Congress (see Section 307(a) of the Quantification Act); (2) are generally consistent with the water system design set forth in the *Project Extension Report* (WMAT 2007) and ratified in the Act (see Section 307(c) of the Quantification Act); and (3) can be constructed with the appropriation allocation made available by the Quantification Act. Various alternatives to dam construction, as well as alternative project siting and/or alternative design elements, have been considered in the past. However, these alternatives were eliminated from further consideration in this EIS because they do not comply with the specific requirements of the Quantification Act.

As part of the dam operations modeling process for the proposed action, other operational scenarios were modeled in addition to the scenarios associated with Alternatives A through D. For example, a preliminary scenario was modeled based on water demands associated with irrigating up to 5,875 acres of Canyon Day farmland. This would entail an annual irrigation water use up to 16,202 afy and 14,677 afy for diversion and depletion, respectively. However, modeling demonstrated that this scenario led to continuous water shortages for the communities of the greater Whiteriver area, Carrizo, and Cibecue. Therefore, increasing water diversions to support up to 5,875 acres of Canyon Day farmland was rejected because it conflicted with the purpose of and need for the proposed action.

ES.7. Summary Comparison of Alternatives

The purpose of the environmental consequences analysis is to describe the anticipated environmental and socioeconomic impacts that would result from each alternative, including the No Action Alternative. **Chapter 3** (*Affected Environment and Environmental Consequences*) presents the anticipated and potential impacts on the human and natural environment that could occur from implementing the alternatives. Key findings of the impact analysis of the NEPA action alternatives are summarized in **Table ES-2**.

Under the No Action Alternative, the proposed WMAT rural water system would not be built, and the residents of the Reservation would continue to rely on existing water systems. The existing water system is inadequate to meet current and projected demands based on limited sources of water and expected community growth. Declining groundwater levels and limited surface flows from the NFWR during low flow periods would continue to result in periodic water shortages. Continued water shortages would have a detrimental effect on future population growth and economic health of the communities on the Reservation and would adversely affect opportunities for agricultural expansion. Lack of sufficient water supply to meet current and future demands could result in greater reliance on groundwater resources at the Miner Flat Wellfield to serve the greater Whiteriver area. Under these conditions, increased extraction of groundwater could be required to meet water demands, exceeding the sustainable yields and resulting in a drawdown of groundwater elevations and less pumping capability. This could lead to a decline in future wellfield production and would result in a major adverse impact to groundwater resources. Without construction of the rural water system, the WMAT would not be able to fully benefit from their 1871-reserved water rights or use of their trust lands due to a lack of infrastructure needed to divert, store, and distribute water from the NFWR over and above current diversions. Additionally, the provision of the Quantification Act instructing the Secretary to construct the WMAT rural water system would not be fulfilled.

ES.8. Preferred Alternative

At the conclusion of this NEPA analysis process and in accordance with the NEPA implementing regulations (40 CFR 1502.14[e] and 43 CFR 46.425[a]), Reclamation will select one of the alternatives described in this Draft EIS as its preferred alternative. The public is encouraged to comment on specific project components and alternatives described in this EIS. These comments will be used to further refine the analysis for the Final EIS and help develop Reclamation's preferred alternative. The preferred alternative will be identified in the Final EIS. The WMAT has requested that Reclamation identify Alternative C as the preferred alternative. The selection of the preferred alternative will consider public comments and the full analysis in the Final EIS.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Water and Hydrology	Beneficial effects would derive from meeting minimum instream flow requirements and reducing the number of zero flow days (i.e., the number of days with no measurable streamflow). Beneficial effects would also derive from reducing the potential for future depletions of local groundwater resources at the Miner Flat Wellfield and reducing the reliance on aquifers currently serving the communities of Carrizo and Cibecue. Operation of the dam and rural water system would result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 5,521 afy from the White River and attenuating peak flows on a regular basis, primarily during summer months when the reservoir is below full pool level. Adverse impacts would also occur during certain portions of the year (late summer to early winter) when the proposed action would result in temperature increases in dam outflows that exceed the water	Impacts would be similar to Alternative A, although instream flows could drop below historic minimum flow levels more often than under Alternative A.	Impacts would be similar to Alternative A, except that Alternative C would not meet the projected future population and irrigation demands under all conditions. In this case, future population demand would be prioritized over irrigation to ensure the aims of the proposed action could be achieved. Operation of the dam and rural water system would result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 11,474 afy from the White River and attenuating peak flows during summer months and low precipitation years and during regular fluctuations in the reservoir level. Also, satisfying the higher water demands associated with this alternative would likely result in the reservoir being drawn down further and more frequently compared to Alternatives A and B. There would also be more agricultural activities associated with the Canyon	Impacts would be similar to Alternative C, and Alternative D would not meet the projected future population and irrigation demands under all conditions. Also, among the four action alternatives, Alternative D would result in the highest percentage of time that the instream minimum flow requirements would not be met. Satisfying the higher water demands associated with this alternative would likely result in the reservoir being drawn down further and more frequently compared to Alternatives A and B. Impacts from the Canyon Day connected action would be the same as Alternative C.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	quality standards contained in the Water Quality Protection Ordinance. Construction and operation of the Canyon Day connected action would result in water quality changes and risks to designated water uses for surface and groundwaters. Additionally, operation of the dam would result in minimal to moderate changes to the downstream flow regime, primarily increasing minimum instream flows but also attenuating peak flows during summer months when the reservoir is below full pool level and a portion of the inflow is being stored. The majority of peak flows, particularly those associated with spring runoff events, would not be affected.		Day connected action under Alternative C, which could result in water quality changes and risks to designated water uses for surface and groundwaters.	
Geology and Soils	Ground disturbance from construction activities, subsurface treatment options, vegetation removal within the reservoir inundation area, and future farming under the Canyon Day connected action would result in increased soil erosion and sedimentation. Erosion control and monitoring plans,	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the extent of possible soil erosion impacts associated with the Canyon Day connected action would be greater given the larger area proposed for agricultural activities.	Impacts would be the same as Alternative C.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	which would identify construction and post-construction monitoring requirements and BMPs, would minimize or reduce impacts. With incorporation of appropriate engineering design features and compliance with dam safety guidelines, the geologic risks associated with Alternative A would be minimized.			
Biological Resources	Construction and operation of the rural water system would result in direct and indirect adverse impacts to vegetation communities; wildlife; native fishes, semi-aquatic species, and aquatic habitats; wetlands; and sensitive species. Impacts would be minimized or reduced, but not fully resolved, through the use of standard water quality BMPs and biological resource mitigation measures that would include: (1) restoration of disturbed areas such as staging areas and pipeline route; (2) pre-construction surveys, construction monitoring, and project wildlife management; (3) seasonal avoidance and	Construction and operation impacts would be the same as Alternative A. Although Alternative B would not prioritize instream minimum flow requirements, modeling demonstrates that water releases to meet downstream demand under this alternative would provide the same increase in minimum instream flows and, thus, impacts would be comparable to Alternative A.	Impacts would be similar but larger in magnitude as compared to Alternative A because modeling indicates the frequency of flow attenuation would increase. However, under Alternative C, minimum instream flows would be prioritized to ensure that minimum flows would meet or exceed historic minimums. The extent of possible habitat impacts associated with the Canyon Day connected action would also be greater given the larger area proposed for agricultural activities, some of which would likely be previously undisturbed.	Impacts would be similar to other alternatives but would be larger in magnitude because modeling indicates the frequency of flow attenuation would increase. Major and unavoidable long-term adverse impacts on aquatic habitats and fisheries would result from implementation of Alternative D, including an increase in time that the NFWR near Gold Gulch would dry out. Impacts from the Canyon Day connected action would be the same as Alternative C.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	construction planning; (4) long-term habitat monitoring; and (5) avoidance of riparian habitats. Permanent removal and modification of aquatic free-flowing stream habitat and conversion to a reservoir would represent a major unavoidable adverse impact. Removal and loss of potentially jurisdictional features would be mitigated or compensated for as part of the permit process with the USACE, and a CWA Section 404(b)1 analysis will be completed. Construction and operation of the Canyon Day connected action could result in additional impacts on wildlife habitat and nearby aquatic wetlands or riparian habitats.		Conversion to cultivated farmland would reduce diversity and value as wildlife habitat.	
Recreation	Construction-related activities would diminish or displace fishing, hiking, and camping access along the NFWR near the proposed dam, reservoir, and intake structure. Access restrictions would be short-term, except for those areas within the footprint of the reservoir that would be permanently inundated (including the Lower Log	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except proposed farming expansion under Alternative C would focus on undeveloped lands, some of which may be currently used by the public or by WMAT members for general recreational activities (e.g., hiking, horseback riding).	Impacts would be similar to Alternative C. Unlike the other alternatives, Alternative D would result in lower river flow and a localized decrease in available aquatic habitat for fishing, which would be most detectable around the Gold Gulch area below the intake structure. Impacts from the Canyon Day connected action

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	Campground) and at the dam infrastructure. These impacts could be offset by long-term benefits of new and improved fishing opportunities, depending on future stocking strategy, which is one of the primary drivers of recreation visitation to the Reservation. The Canyon Day connected action is expected to have negligible impacts on recreation.			would be the same as Alternative C.
Cultural Resources	Six historic properties, including one traditional cultural property, would be adversely affected because they are located within the area that would be flooded by the new reservoir. Even though data recovery measures would be used to mitigate impacts, where feasible, impacts would remain unavoidable. Other known historic properties along the water distribution pipeline route and within Canyon Day farming areas would be avoided per the agreed-upon measures in the Memorandum of Agreement between Reclamation and the Tribal Historic Preservation Office. Any activities that involve ground/soil	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the extent of possible impacts on historic properties associated with the Canyon Day connected action would be greater given the larger area proposed for agricultural activities.	Impacts would be the same as Alternative C.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	disturbance would also have the potential to damage buried and previously unknown resources, and measures are provided in the Memorandum of Agreement to minimize potential impacts.			
Indian Trust Assets	Operation of the rural water system would be a major beneficial use of trust lands to the WMAT and would allow the WMAT access to some of their 1871-reserved water rights. Construction activities, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect cultural heritage resources, including trust assets related to natural and cultural resources.	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the extent of possible impacts on cultural heritage resources and trust assets related to natural and cultural resources would be greater given the larger area proposed for agricultural activities associated with the Canyon Day connected action. Conversely, expanded agricultural activities would result in a greater beneficial use of trust land and water rights for the WMAT than under Alternatives A or B.	Impacts would be the same as Alternative C.
Energy and Public Utilities	Operation of the rural water system would result in a long-term, major beneficial impact by providing a reliable and sustainable good-quality potable water supply to WMAT residents and businesses. Construction design addressed additional electrical power transmission and distribution	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except there may be an increase in solid waste and energy use given the expanded agricultural activities associated with the Canyon Day connected action compared to Alternatives A and B.	Impacts would be the same as Alternative C.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	facilities needed for operation of the project components. Construction activities would result in only minor disruptions to utilities.			
Transportation	There would be a short-term increase in truck and vehicle traffic over a 3- to 4-year period related to delivery of new equipment, materials, and workers to and from the various construction sites. There would be intermittent, temporary lane closures or other disruptions, especially where project components run parallel to or cross major roadways. There would also be an unknown amount of potential traffic disruptions from construction and operation of the Canyon Day connected action.	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except there may be an increase in long-term traffic from the expanded agricultural activities associated with the Canyon Day connected action compared to Alternatives A and B.	Impacts would be the same as Alternative C.
Public Health and Safety	Construction of the Miner Flat Dam would result in a low but unavoidable adverse risk to public health and safety; however, the dam would be constructed, operated, and maintained in accordance with applicable dam safety guidelines and requirements, which would	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except a greater portion of peak flows would potentially be retained to fill the reservoir, resulting in greater attenuation of downstream peak flows and greater potential reduction on the magnitude or frequency of	Impacts would be the same as Alternative C.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	minimize this risk. There would be a minor beneficial effect on flood safety because the potential for downstream flooding would be reduced when the reservoir is filling, although most flood events would pass through the reservoir with little attenuation and little effect on the magnitude or frequency of flooding. Construction and operations, including future Canyon Day farming activities, would be conducted in accordance with applicable labor safety requirements.		flooding. There may be an increase in the extent of possible safety risks, primarily related to occupational hazards, from the expanded agricultural activities associated with the Canyon Day connected action compared to Alternatives A and B.	
Socio-economics	Construction and operation of the rural water system would result in a major beneficial economic impact for the WMAT by providing a reliable and consistent supply of irrigation water to support up to 885 acres of Canyon Day farming. There would be minor beneficial effects on employment and earnings from the short-term employment of construction workers and expenditures associated with the purchase of materials and equipment. The loss of revenue from the Lower Log	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the project would supply irrigation water to support up to 3,000 acres of Canyon Day farming, which would result in a greater beneficial economic impact for the WMAT than under Alternatives A and B.	Impacts would be similar to Alternative C. Unlike the other alternatives, Alternative D would result in lower river flow and a localized decrease in available aquatic habitat, which would be most detectable around the Gold Gulch area downstream from the intake structure. This may lead to a minor and unquantifiable adverse effect on fisheries revenue. Impacts from the Canyon Day connected action would be the same as Alternative C.

Table ES-2. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	Campground would be balanced by long-term beneficial economic impacts from new and improved fishing opportunities.			
Environmental Justice	The rural water system would provide a long-term, major beneficial economic impact for minority and low-income populations living on the Reservation. There would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children.	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the project would supply irrigation water to support up to 3,000 acres of Canyon Day farming, which would result in greater agriculture-related employment, expenditures, and income that could benefit minority or low-income populations than under Alternatives A and B.	Impacts would be the same as Alternative C.

Key: afy = acre feet per year; BMPs = best management practices; CWA = Clean Water Act; NFWR = North Fork of the White River; Reclamation = Bureau of Reclamation; Reservation = Fort Apache Indian Reservation; USACE = United States Army Corps of Engineers; Water Quality Protection Ordinance = *Water Quality Protection Ordinance of the White Mountain Apache Tribe of the Fort Apache Indian Reservation*; WMAT = White Mountain Apache Tribe

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Chapter 1. Purpose and Need for the Proposed Action

1.1 Introduction

This Draft Environmental Impact Statement (EIS) discloses the potential environmental impacts associated with constructing and operating the proposed White Mountain Apache Tribe (WMAT or Tribe) rural water system. The United States (U.S.) Department of the Interior, Bureau of Reclamation (Reclamation), as the Federal lead agency, has prepared this EIS in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S. Code [U.S.C.] 4321–4347), Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500–1508[4]), and U.S. Department of the Interior NEPA regulations (43 CFR 46). The WMAT, the Bureau of Indian Affairs (BIA), and the U.S. Army Corps of Engineers (USACE) are cooperating agencies in the preparation of this EIS.

In the WMAT Water Rights Quantification Act of 2010 ("Quantification Act"), the U.S. Congress authorized and directed the Secretary of the Interior ("Secretary"), acting through Reclamation, to plan, design, and construct the WMAT rural water system to divert, store, and distribute water from the North Fork of the White River (NFWR) for the use and benefit of the WMAT in east-central Arizona (**Figure 1.1-1**). The Quantification Act, as amended, also authorized and appropriated funds to the Secretary to carry out the planning, engineering, design, environmental compliance, and construction of the WMAT rural water system. The proposed action would include construction and operation of the Miner Flat Dam on the NFWR near the community of Whiteriver, Arizona. The construction of the dam would create a new instream reservoir along the NFWR with approximately 8,600 acre-feet (af) of water storage that would be used to modify the existing flow regime of the river to ensure a more reliable flow of water downstream of the dam. This modification of the existing flow regime would include the ability to supplement the natural flow of the river with stored water from the reservoir when river flow is lower due to seasonal fluctuations and during drought years. Water released from the dam would flow down the NFWR, and up to 7,602 acre-feet per year (afy) would be diverted from the river channel and subsequently treated and conveyed via pipeline to communities across the Fort Apache Indian Reservation ("Reservation"). Project components would include construction and operation of (1) the dam and storage reservoir, (2) diversion intake facilities and pumping plant, (3) existing water treatment facility upgrades, and (4) a 50-mile-long water distribution system that would provide water to communities located on the Reservation, including Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue (**Figure 1.1-2**). Water would be used for municipal, rural, and industrial use for the benefit of the WMAT, per the Quantification Act.

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[4] The NEPA process for the proposed action started before the CEQ regulations were revised in 2020; therefore, this EIS was prepared in compliance with the pre-2020 version of 40 CFR 1500–1508.

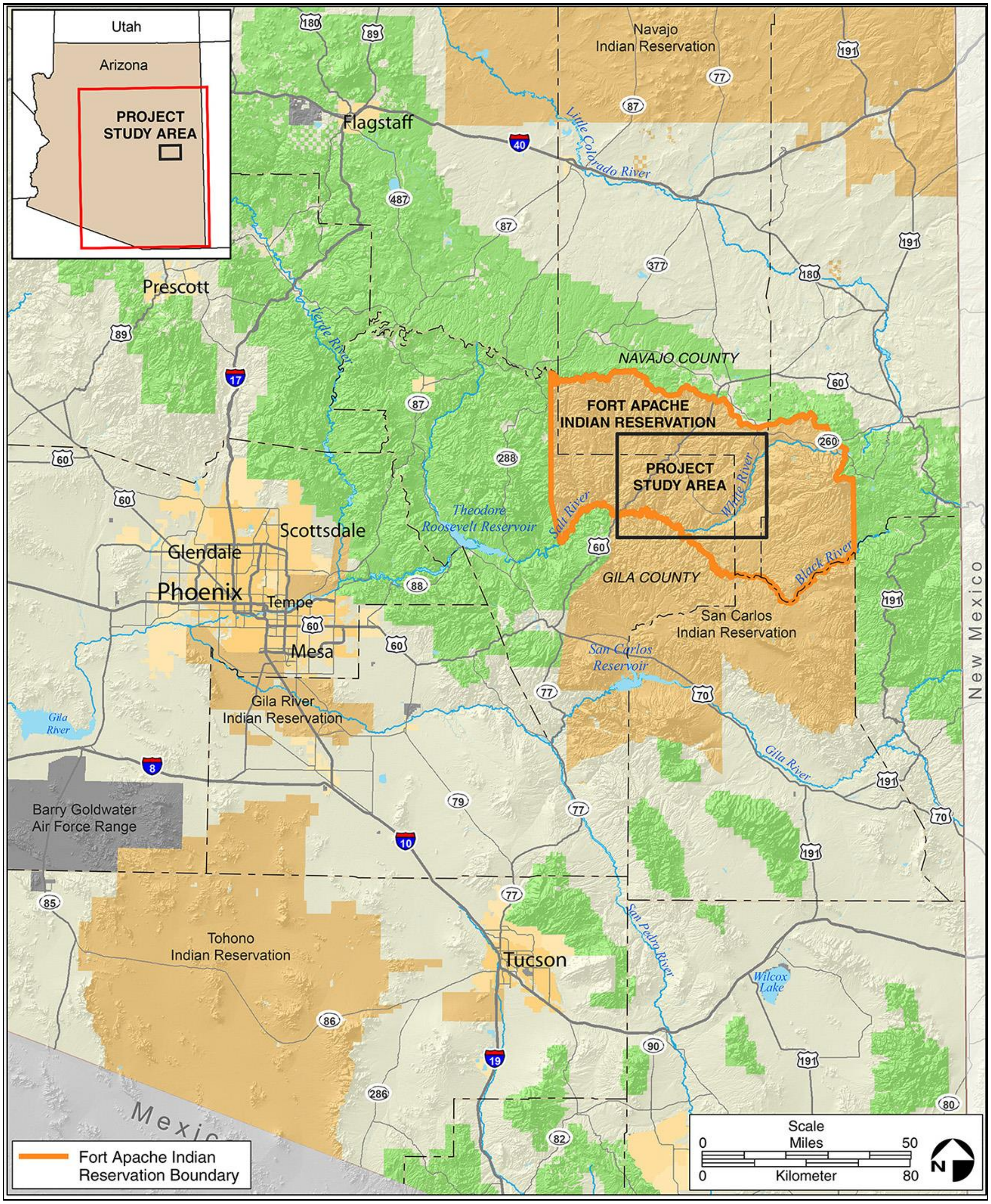

Figure 1.1-1. General Location of the Proposed WMAT Rural Water System

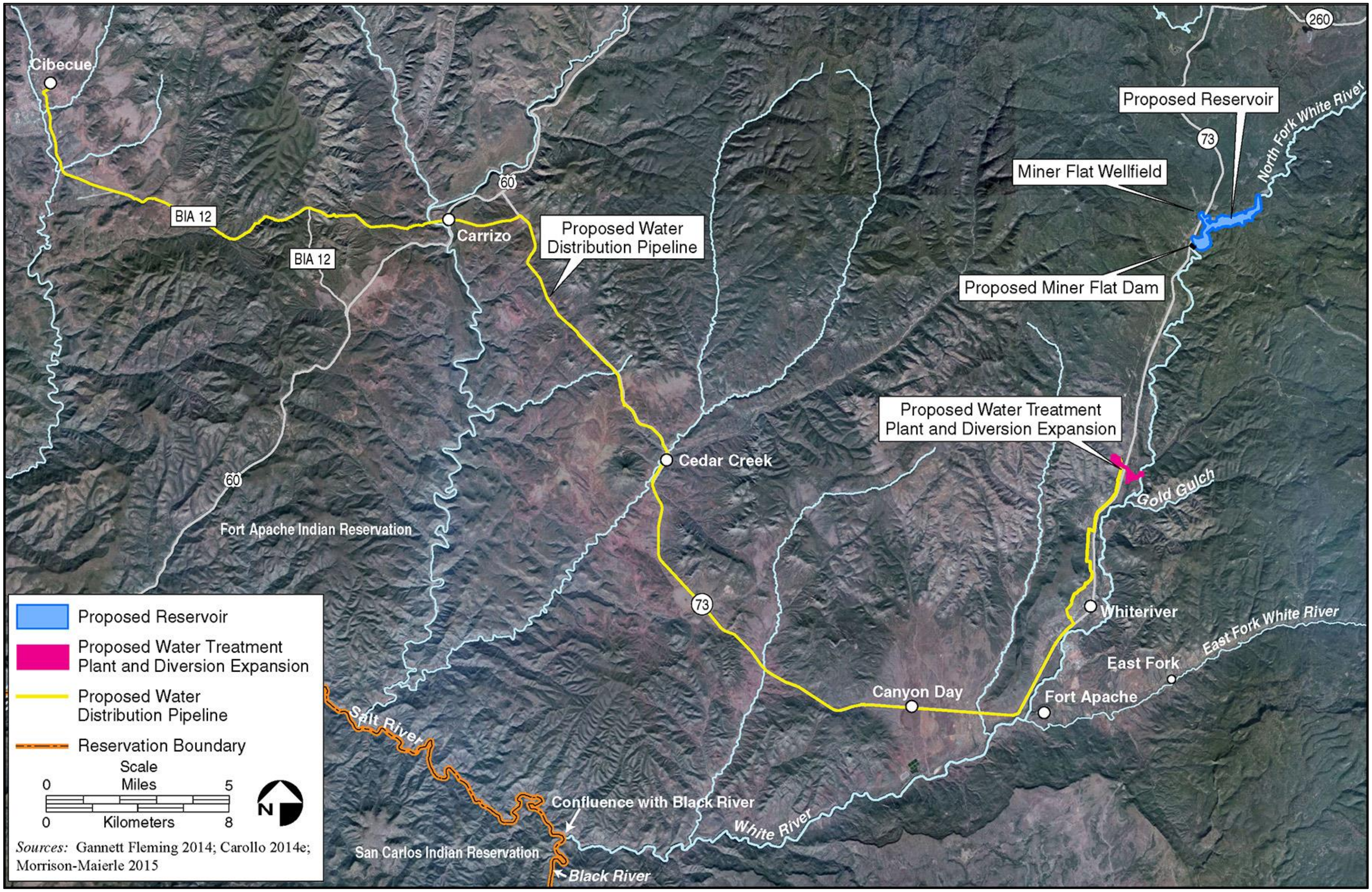

Figure 1.1-2. Major Components of the Proposed WMAT Rural Water System and the Location of the Miner Flat Wellfield

The proposed dam and water system operations would also accommodate downstream irrigation diversions in the Canyon Day area for farming. Maximum water diversions would be between 2,843 afy and 9,637 afy, depending on the NEPA alternative. This water use is over and above the projected municipal, rural, and industrial water use for the communities of the greater Whiteriver area, Carrizo, and Cibecue.

1.2 History and Background of the White Mountain Apache Tribe Rural Water System Project

The WMAT has been working to develop a reliable and high-quality water supply system for several decades, having previously depended on limited groundwater sources, such as those associated with the Miner Flat Wellfield (**Figure 1.1-2**). The Tribe's Rural Water System Project was realized through the quantification of the Tribe's Federal reserved water rights claims in the Little Colorado River general stream adjudication and the Gila River general stream adjudication. The project was further defined through the Quantification Act.

In the second half of the 1900s, the Salt River Valley (Phoenix Metropolitan Area) experienced a dramatic population increase. Increasing municipal and industrial water demand combined with large-scale irrigated agriculture in the metropolitan area put pressure on the Phoenix Valley cities to secure adequate water resources for the future. It also triggered debate and disagreement about regional water rights. Within this regional debate, the WMAT and the United States on behalf of the WMAT claimed Indian reserved water rights to use water that underlies, borders, and traverses the Reservation and asserted that these rights have never been extinguished.

At the request of the WMAT and competing non-Indian water users, a Federal Negotiation Team was appointed in 2004 by the Secretary. Five years later, on January 13, 2009, the WMAT Water Rights Quantification Agreement was formally approved by the Tribal Council and by other settling parties[5] in the Salt River Valley and towns along the WMAT's northern boundary soon thereafter. A major consideration for the agreement was to provide for the long-term water needs of the Reservation. Specifically, the agreement states that the WMAT has an 1871-reserved water right to divert up to 74,000 afy and deplete up to 27,000 afy (i.e., consumptive use).[6] The agreement also includes the right to divert up to an additional 25,000 afy of Salt River system water through a Central Arizona Project (CAP) exchange (up to 25,000 afy depletion) with a priority date of 1968 and allows the WMAT the option to lease the CAP water to existing downstream cities and users. Taken together, the WMAT has a total diversion right of 99,000 afy with a total depletion right of 52,000 afy.

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[5] The settling parties to the WMAT Water Rights Quantification Agreement include the United States of America; the State of Arizona; the White Mountain Apache Tribe; the Salt River Project Agricultural Improvement and Power District; the Salt River Valley Water Users' Association; the Roosevelt Water Conservation District; Arizona Water Company; the Arizona Cities of Phoenix, Mesa, Tempe, Chandler, Glendale, Scottsdale, Avondale, Peoria, and Show Low; the Town of Gilbert; Buckeye Irrigation Company; Buckeye Water Conservation and Drainage District; and the Central Arizona Water Conservation District.

[6] A diversion right is the amount of water that can be diverted from a water system, while the depletion right represents the amount of water that is diverted less the return flow to the system from which it was diverted (i.e., the amount taken out of the system). Depletion amount is also referred to as "consumptive use."

The WMAT Water Rights Quantification Agreement was confirmed by the U.S. Congress in the Quantification Act, which is Title III of the Claims Resolution Act of 2010 (Public Law 111-291, Title III, 124 Statute 3064, 3073 [2010]). The cornerstone of the Quantification Act is construction by Reclamation of the WMAT rural water system to serve Reservation communities. The Quantification Act also authorized a number of funds for construction, operation, and maintenance, and a Tribal settlement fund. Section 304(c) of the Quantification Act designated Reclamation as the lead Federal agency to ensure compliance with applicable environmental laws and regulations associated with implementation of the WMAT rural water system.

1.3 Purpose and Need

The purpose of the proposed action is to provide a long-term, dependable, and sustainable water supply for residents and businesses on the Reservation. The proposed action would fulfill the requirements of the Quantification Act that the Secretary plan, design, and construct the WMAT rural water system, as well as operate, maintain, and replace the water system until title is transferred to the WMAT. Regarding the components of the water system, Section 307(a) of the Quantification Act specifies the following:

"[Reclamation] shall plan, design, and construct the WMAT Rural Water System to divert, store, and distribute water from the NFWR to the Tribe that shall consist of—

1. a dam and storage reservoir, pumping plant, and treatment facilities located along the NFWR near the community of Whiteriver;
2. a distribution system consisting of pipelines extending from the treatment facilities to existing water distribution systems serving the communities of Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue;
3. connections to existing distribution facilities for the communities described in paragraph (2), but not including any upgrades of, or improvements to, existing or future public water systems for the communities described in paragraph (2) that may be necessary to accommodate increased demand and flow rates (and any associated changes in water quality);
4. connections to additional communities along the pipeline, provided that the additional connections may be added to the distribution system described in paragraph (2) at the expense of the Tribe;
5. appurtenant buildings and access roads;
6. electrical power transmission and distribution facilities necessary for operation of the project; and
7. any other project components that the Secretary, in consultation with the Tribe, determines to be necessary."

Since the early 2000s, the Whiteriver area has experienced water outages, declining water quality, and a diminishing groundwater source. Declining groundwater supplies and existing drinking water infrastructure are unable to keep up with the demands of the residents on the Reservation and the projected future demand of a growing population (see **Section 2.3.4**, *Past and Projected Domestic Water*

Demand). The WMAT needs a dependable and sustainable water supply for residents and businesses on the Reservation.

The EIS also serves to support other Federal decisions, including those of the BIA and USACE listed below.

1.4 Cooperating Agencies

1.4.1 White Mountain Apache Tribe

The WMAT is a cooperating agency because they have special expertise with respect to the land on which the proposed action would occur and the resources that could be affected by the proposed action because its environmental effects would occur primarily on and near the Reservation. This project would ensure a long-term and reliable water supply for the Tribe to meet water projections for a population of 35,900 (WMAT 2007).[7] As specified in Section 307(d)(2) of the Quantification Act, after completion of construction, operation of the new facilities for a period of at least 3 years by Reclamation (with the participation of the WMAT), and publication of certain findings by the Secretary in the *Federal Register*, title to the facilities would be transferred to the WMAT, and the Tribe would operate the completed water system. The WMAT entered into a cooperative agreement with Reclamation under the Indian Self-Determination and Education Assistance Act (Public Law 93-638, as amended) and a separate memorandum of understanding to define the WMAT's role in the NEPA process as well as in the design and subsequent construction phases of the project.

1.4.2 Bureau of Indian Affairs

The BIA is a cooperating agency because it has jurisdiction by law as defined at 40 CFR 1508.5 and has special expertise applicable to this EIS effort, pursuant to 40 CFR 1508.26. In particular, the BIA will assist in the identification and approval of rights-of-way (ROWs), easements, and/or permits needed for implementation of the proposed water system between the BIA and other parties involved and address any BIA road encroachment issues involved in the project. The BIA has entered into a memorandum of understanding with Reclamation, which defines BIA's role in the NEPA process.

The need for the BIA action addressed in this EIS is established by the BIA's responsibility to respond to applications for ROWs over or across lands held in trust for Indian Tribes. The BIA must review actions on Tribal lands held in trust for the benefit of the WMAT (25 U.S.C. 323–328 et seq.). The BIA's purpose, pursuant to 25 CFR 169.2, is to deny, grant, or grant with modifications the ROW agreements between the WMAT and Reclamation (i.e., applicant). For more information, see the *Rights-of-Way on Indian Lands Handbook* (BIA 2022) and its corresponding Indian Affairs Manual chapter on processing ROWs (BIA 2021), which provides the general authorities and responsibilities for the BIA and is the official policy for processing ROWs on Indian land. The BIA is relying on this EIS to support their decisions related to the proposed rural water system.

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[7] See Section 2.3.4 (*Past and Projected Domestic Water Demand*) for more information on water requirements calculations.

1.4.3 United States Army Corps of Engineers

The USACE is a cooperating agency on this project because it has regulatory jurisdiction by law under its delegated authority in Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1251 et seq.), as well as special expertise with respect to aquatic ecosystems that could be affected by the proposed action. The USACE has entered into a memorandum of understanding with Reclamation, which defines the USACE's role in the NEPA process.

The need for the USACE action addressed in this EIS is established by the USACE's responsibility under Section 404 of the CWA. Section 404 regulates the discharge of dredged or fill material into waters of the U.S. and requires that a permit be obtained from the USACE prior to the discharge. Because the construction of the WMAT rural water system would result in a discharge of fill material into waters of the U.S., the USACE was invited to be a cooperating agency in the EIS to support its decision for issuance of a Section 404 permit. The 404 permitting process includes Reclamation's submittal of a document called a "404(b)1 alternatives analysis" to the USACE. The purpose of the 404(b)1 alternatives analysis is to identify the least environmentally damaging practicable alternative, which is the only alternative that may be permitted by the USACE. While most of the impacts considered under the USACE process are identical to those considered in this EIS, some impacts are specific only to that permitting process, which may have a different scope of analysis than the EIS. Because of these differences, the 404(b)1 alternatives analysis is a document strongly related to the EIS but also separate. The USACE is relying on this EIS to support a decision for issuance of a Section 404 permit.

1.5 Public Involvement and Scoping Process

Scoping is part of the public participation requirement of NEPA. The purpose of scoping, which must be completed prior to completing a Draft EIS, is to solicit input from interested stakeholders including Federal, State, and local agencies; elected officials; Native Americans; and the general public to help identify pertinent environmental issues to address in the Draft EIS. Project scoping was conducted in 2013 and 2021 because environmental planning efforts were put on hold in 2015 to allow time for additional engineering and design work related to the Miner Flat Dam and reservoir. A summary of the scoping processes and public inputs from both 2013 and 2021 is provided in **Appendix C** (*Scoping Summary*). Reclamation and the cooperating agencies considered comments received during the scoping process in determining the range of issues evaluated in this EIS.

1.6 Federal Permits, Licenses, or Other Authorizations

To implement any alternative, Reclamation and the cooperating agencies would need to apply for and receive various permits, take certain actions, and conform to various laws, regulations, executive orders (EOs), policies, and guidelines. In particular, the proposed action would likely require the following permits, certifications, and/or determinations:

- Biological Opinion from the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.)

- Concurrence from the Tribal Historic Preservation Office (THPO) pursuant to Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. 300101 et seq.)
- Individual permit from the USACE pursuant to Section 404 of the CWA
- Water quality certification administered by the WMAT pursuant to Section 401 of the CWA
- National Pollutant Discharge Elimination System (NPDES) permit for the White River Surface Water Treatment Plant ("water treatment plant") from the U.S. Environmental Protection Agency (USEPA) Region IX pursuant to Section 402 of the CWA
- General permit for stormwater discharges from construction activity from the USEPA pursuant to Section 402 of the CWA and preparation of a Stormwater Pollution Prevention Plan (SWPPP)
- BIA ROW approvals and recording for project facilities, including road realignments, on Tribal trust land
- BIA temporary and permanent encroachment permits during and after construction work along Indian Route 61 (Alchesay Fish Hatchery Road), Indian Route 62 (Lower Log Road), Indian Route 67, and BIA Road 12
- Arizona Department of Transportation (ADOT) encroachment permit for construction work inside the ROW of State Route (SR) 73 per Title 17 of the Arizona Administrative Code (Chapter 3, Article 5)

1.7 Document Organization

This EIS is organized as follows: **Chapter 1** defines the purpose of and need for the proposed action. **Chapter 2** describes the alternatives for accomplishing the proposed action. **Chapter 3** describes the affected environment and presents the potential environmental consequences of each alternative. **Chapter 4** addresses various other considerations required by NEPA. The final chapters of the EIS include a list of references cited, persons and agencies contacted, and the names of preparers and their qualifications. The appendices include additional project details (**Appendix A.1**), project-related best management practices (BMPs) (**Appendix A.2**), a list of ongoing and reasonably foreseeable future actions for the cumulative impacts analysis (**Appendix B**), a summary of scoping activities (**Appendix C**), additional air quality analysis (**Appendix D**), additional noise analysis (**Appendix E**), water resources information (**Appendix F**), biological resources information (**Appendix G**), and cultural resources information (**Appendix H**).

Chapter 2. Description of the Proposed Action and Alternatives

2.1 Introduction

This EIS evaluates the potential impacts that could result from implementing the proposed action, which is the construction and operation of the WMAT rural water system pursuant to the Quantification Act. The CEQ regulations (40 CFR 1500–1508) establish a number of policies for Federal agencies, including "…[An EIS] shall provide full and fair discussion of significant environmental impacts and shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment" (40 CFR 1502.1). Therefore, the EIS addresses a reasonable range of action alternatives that would meet the purpose and need for the action. The action alternatives examined in this EIS all include the construction of a dam and associated facilities along the NFWR near the community of Whiteriver, and the construction of diversion intake facilities, treatment facilities, and water distribution system components serving the communities of Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue, based on the *Project Extension Report* (WMAT 2007).[8] The action alternatives have the same construction components but include variations in how the water system would be implemented and operated. In compliance with 40 CFR 1502.14(d), the EIS also addresses a No Action Alternative, which evaluates the anticipated effects on the quality of the human environment if none of the action alternatives are implemented (see **Section 2.5.1**, *No Action Alternative*).

The CEQ's regulations for implementing NEPA require that parties consider the relationship of the project and its impacts on other area projects and activities and their impacts, including connected actions and cumulative actions. Connected actions, as defined in 40 CFR 1508.25(a)(1), are those that are closely related to the proposed action and should be discussed in the same EIS. Connected actions that have been identified for the proposed WMAT rural water system include downstream agricultural activities in the Canyon Day area, as described in **Section 2.6** (*Connected Actions*). Cumulative actions, as defined in 40 CFR 1508.25(a)(2) and 40 CFR 1508.7, are those past, present, and reasonably foreseeable actions that, when viewed with the project, have cumulatively significant impacts. Cumulative actions are addressed in **Chapter 3** (*Affected Environment and Environmental Consequences*).

[8] See Section 307(c)(1) of the Quantification Act.

2.2 Project Location and Watershed

The proposed WMAT rural water system is located on the Reservation in east-central Arizona (see **Figure 1.1-1**). The project is generally situated approximately 200 miles northeast of Phoenix, Arizona, and is located primarily within the White River watershed of the Upper Salt River system. The major perennial tributaries to the White River include the NFWR (**Figure 2.2-1**) and East Fork of the White River (EFWR). Other major watercourses within the study area include Diamond Creek, Bear Wash, Cedar Creek, Carrizo Creek, Cibecue Creek, and Amos Wash (**Figure 2.2-2**). The White River joins the Black River to form the Salt River.

Figure 2.2-1. Photograph of the North Fork of the White River

The 638-square-mile White River watershed is contained within the boundaries of the Reservation (see **Figure 2.2-2**). Watershed elevations range from just over 4,000 feet near the confluence with the Black River to over 11,000 feet at the headwaters where the NFWR and EFWR emanate from the slopes of Mount Baldy.

The proposed project is associated with the NFWR, which has an annual flow of about 58,500 af (JE Fuller 2022). Existing water diversions along the NFWR include those related to the North Fork diversion and intake structure described in the next section, the Alchesay National Fish Hatchery, and small irrigation diversions (JE Fuller 2022). The Alchesay National Fish Hatchery is operated by the USFWS to raise trout for stocking fish in Arizona, New Mexico, and Colorado. Diversions for the fish hatchery occur upstream of the North Fork intake structure, and the water that is diverted flows back into the NFWR with only minor losses due to evaporation. Most existing irrigation diversions are small, with limited capacity (JE Fuller 2022). They include small side channel diversion structures and headworks that divert flows from the river into either irrigation ditches or pumping stations. According to BIA maps from the 1950s (BIA 1956), there were about 14 irrigation diversion points along the NFWR and White River at that time, but there are fewer active irrigation diversion points today and none along the White River. Irrigation diversion amounts were higher in the 1980s when diversions were operational for the Canyon Day Irrigation Project (see **Section 2.6**, *Connected Actions*, for more information).

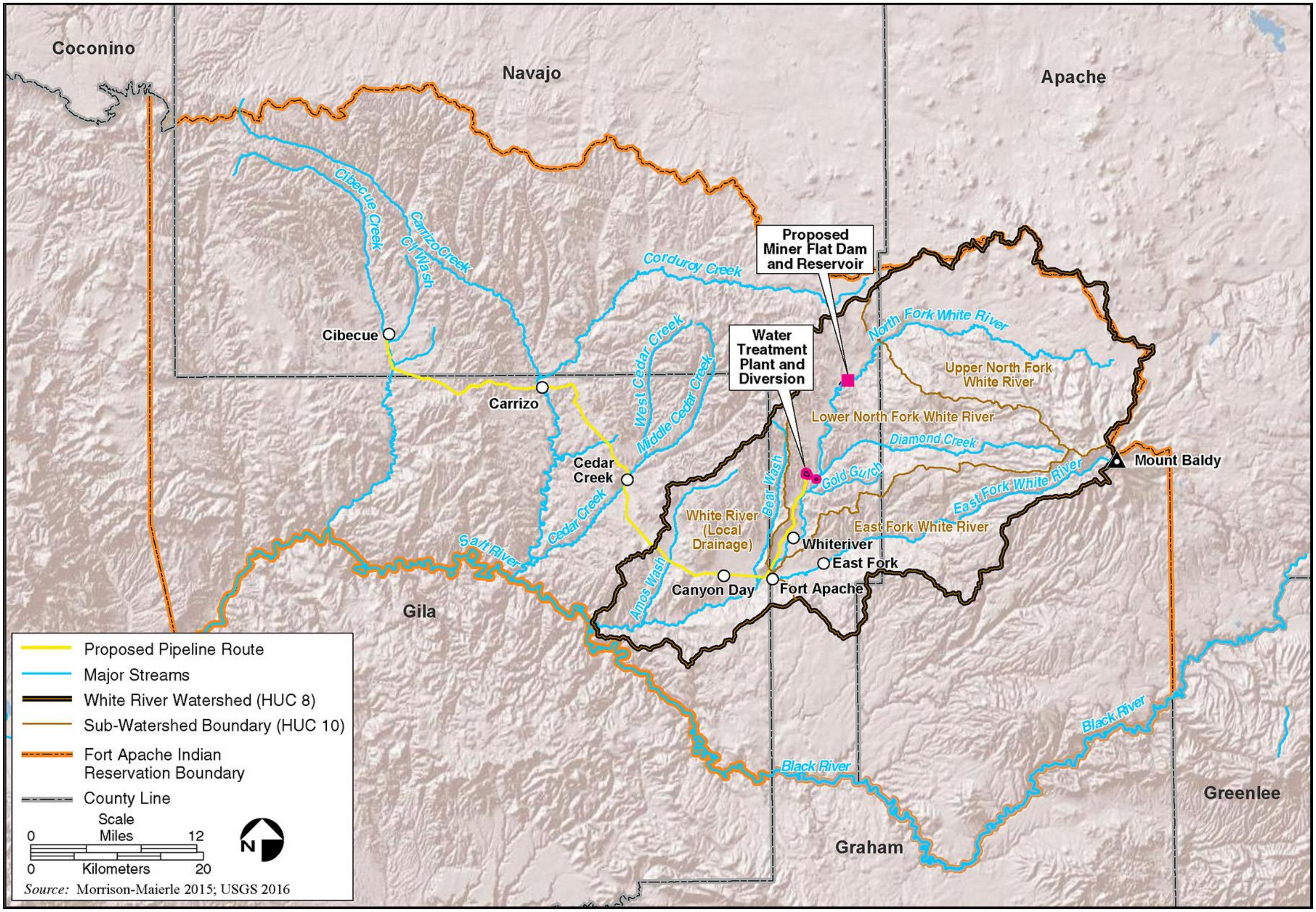

Figure 2.2-2. White River Watershed and Major Watercourses in the Project Area

2.3 Existing White Mountain Apache Tribe Water Systems

Communities on the Reservation are currently served by a mixture of centralized water systems and localized public water systems. The communities around Whiteriver use a centralized water system that is served by the Miner Flat Wellfield (groundwater) and the White River Surface Water Treatment Plant ("water treatment plant"). The water treatment plant draws surface water from the NFWR just north of the community of Whiteriver via the North Fork diversion dam and intake structure. Pipelines provide water service from these two primary sources of water to the communities of Whiteriver, Fort Apache, Canyon Day, and Cedar Creek. Additional information about these existing systems is provided below.

2.3.1 Miner Flat Wellfield (Groundwater)

The Miner Flat Wellfield, which is located about 9 miles north of Whiteriver on the west side of the NFWR (**Figure 1.1-2**), has been a primary source of potable water since 1995 (Lacher 2013). There have been 15 wells drilled under various Indian Health Service (IHS) projects between about 1993 and 2010. WMAT staff observed declining water levels and other wellfield issues (e.g., mechanical wear and tear of equipment) as early as 2000 (Lacher 2013). A 2001 study documented that the average production rate for the existing wells had declined by 42 percent (from 2,940 to 1,159 gallons per minute [gpm]) between 1998 and 2001 (Kaczmarek 2002) due to overpumping the wellfield. The decline in wellfield production led to water shortages during peak demand periods and drought years. In response to these shortages and at the urging of the WMAT, the IHS (2005) constructed the North Fork intake structure and water treatment plant, which IHS turned over to the WMAT to operate and maintain as part of the Tribal community water system, to provide a new source of potable water from surface flows of the NFWR (see **Section 2.3.2**, *Existing North Fork Intake Structure and Water Treatment Plant*).

Wellfield production rates continued to decline but at a slower rate than was measured in 2001 (Lacher 2013, Kaczmarek 2013). The wellfield operated in 2020 with a reduced production of around 864 gpm (about 455 million gallons total for the year) (JE Fuller 2022). The sustainable supply of the wellfield cannot be fully developed due to the inefficiency of current wells and their placement but was estimated at 1,400 gpm (Kaczmarek 2018). Actual production rates fluctuate depending on how many wells are in operation to meet demands. Although the Miner Flat Wellfield is not sufficient on its own to meet the near-term or long-term water demands for the Reservation, as discussed in **Section 2.3.4** (*Past and Projected Domestic Water Demand*), it is an important source of water to supplement current and future use of the surface water treatment system (Watson 2013).

2.3.2 Existing North Fork Intake Structure and Water Treatment Plant

Water from the NFWR is currently diverted through the North Fork diversion dam and intake structure. This facility is located 9 miles downstream from the Miner Flat Wellfield and about 1 mile east of the existing water treatment plant (**Figure 2.3-1**). The diversion dam (**Figure 2.3-2**) uses an inflatable "Obermeyer Weir" that adjusts to river water levels using air-inflated bladders to form an adequate pool elevation for the water intake mechanism. A fish ladder is located on the east bank of the intake structure to allow fish a migration path over the diversion dam.

Figure 2.3-1. Existing North Fork Intake Structure and White River Surface Water Treatment Plant

The design capacity of the North Fork intake structure is 4 million gallons per day (mgd), which equates to 6 cubic feet per second (cfs) (Carollo 2014a). Water flows from the intake to a nearby pump station through an 18-inch pipeline (**Figure 2.3-4**). The pump station, with a design throughput of 4 mgd to match the diversion capacity, pumps the raw diverted water through a 14-inch pipeline to the existing water treatment plant (**Figure 2.3-1**).

Figure 2.3-2. Photograph of the Existing Diversion Dam

The existing water treatment plant (**Figure 2.3-3**) is a conventional plant using pre-packaged water treatment units. The existing plant has a current design capacity of 2 mgd (IHS 2005, Carollo 2014a).[9] Although rated at 2 mgd, the plant operators have reported that the actual production capacity of the plant is closer to around 1,200 gpm or about 1.73 mgd (see **Section 2.3.4**, *Past and Projected Domestic Water Demand,* for more details about current operation rates).

Figure 2.3-3. Photograph of the Existing Water Treatment Plant

Raw water pumped from the intake structure passes into a 10-million-gallon presettling earthen pond that provides storage capacity and presettling of raw water prior to treatment. The pond can hold about 5 days of raw water supply, based on the 2 mgd or 1,200 gpm treatment plant rate (Carollo 2014a). The pond is periodically taken out of service to allow for manual removal of settled solids. Raw water can bypass the presettling pond when it is not in service. There is also an overflow outlet that leads to a nearby wash. The overflow outlet is provided for emergency protection in the event the raw water pumps are on and conveying water to the plant, and the rest of the downstream treatment units are either off or operating at a rate less than the raw water flow rate.

Water from the presettling pond next passes into the plant's existing treatment units (or "trains"). The plant currently has two 1-mgd treatment trains, and each train has a two-stage flocculation[10] compartment at the beginning of the train followed by a rectangular sedimentation basin. Each train also has a single filter, and filtered and disinfected water flows by gravity to the finished water storage tank. Water is currently disinfected using sodium hypochlorite. Finished (treated) water is stored in a 2-million-gallon aboveground tank and then conveyed by gravity to the existing water distribution system. Similar to the presettling pond, the tank has an overflow outlet that can discharge treated water to the nearby wash for emergency, overflow protection.

[9] The existing treatment plant was designed so that it could be enlarged to 2,800 gpm (4 mgd) by adding an additional filter unit in order to match the design capacity of the North Fork intake structure (IHS 2005).

[10] The purpose of flocculation is to allow conditioning and stabilization of suspended particles in the water and to promote settling in the sedimentation basins.

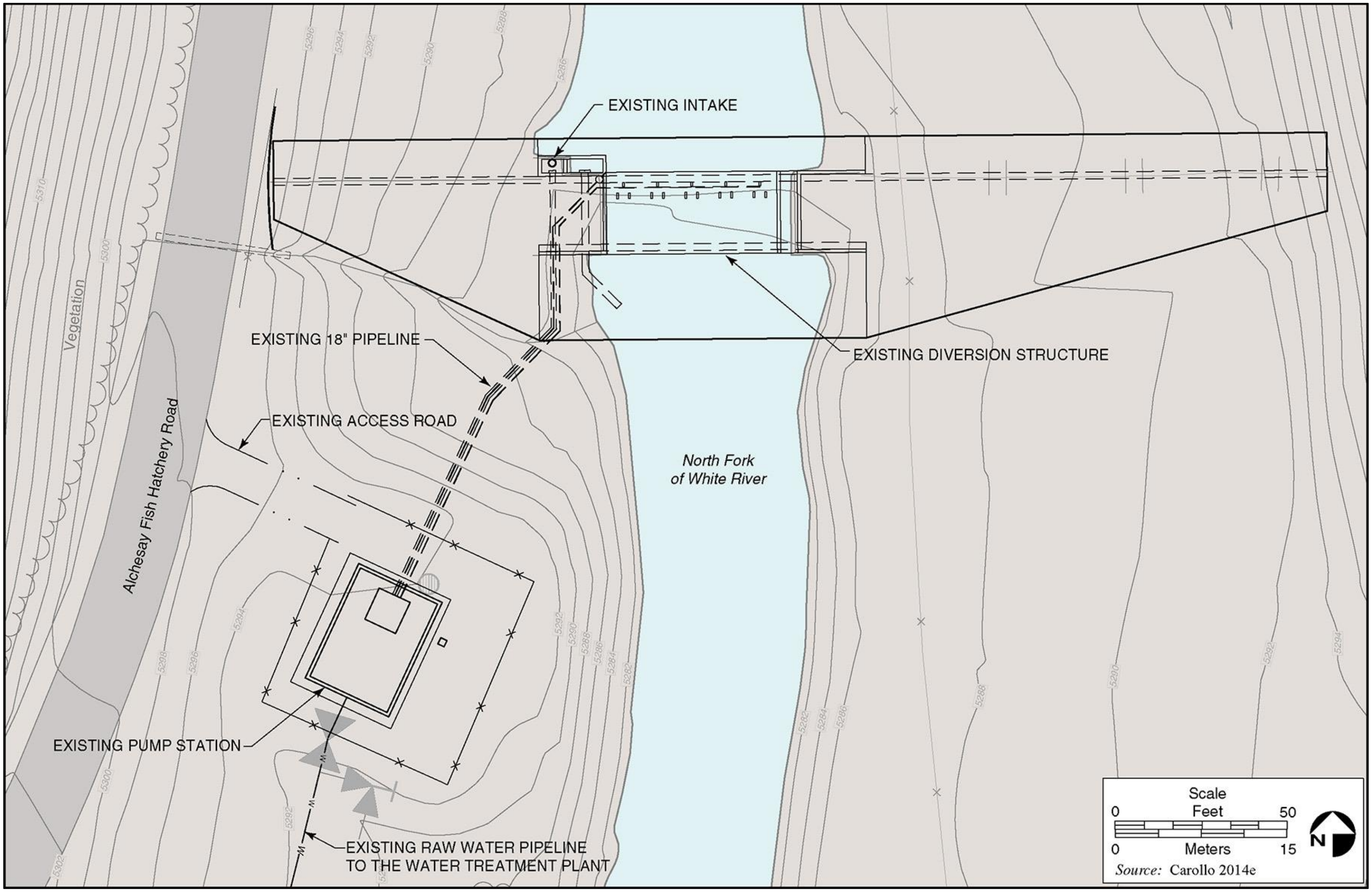

Figure 2.3-4. Close-Up of the Existing Intake Structure and Raw Water Pump Station

2.3.3 Existing Water Distribution System

The existing water distribution system has a series of storage reservoir tanks. Treated (chlorinated) water from the Miner Flat Wellfield is discharged to the Rainbow City Tank through a 12-inch water transmission line. Other tanks, such as the Miner Flat Tank, Amos Tank, and Diamond Creek Tank, can draw water directly off of the 12-inch line. Water from the Miner Flat Wellfield is currently disinfected with chlorine at a facility at the wellfield prior to distribution to any residences (Morrison-Maierle 2015).

Surface water from the NFWR that is treated at the water treatment plant is distributed to 17 different storage tanks (see Table 4.2 in Carollo 2014a). Whiteriver relies primarily on three water storage tanks (Rainbow City, Tan, and Green Tanks) that provide storage for local communities (Morrison-Maierle 2015). Canyon Day is serviced from a 12-inch water line that originates at the Rainbow City Tank and generally follows SR 73. Cedar Creek is serviced by an 8-inch water line that runs along SR 73 and connects to the 12-inch water line in Canyon Day.

The communities of Carrizo and Cibecue are currently served by groundwater wells that extract water from the local underlying aquifers. The groundwater quality of aquifers under Carrizo and Cibecue is poor, and the quantity of groundwater available is not sufficient to meet the growing demands (Morrison-Maierle 2015). For example, the groundwater near Carrizo is from a limited alluvial system that also has high levels of manganese bacteria and sulfate (Lacher 2014).

2.3.4 Past and Projected Domestic Water Demand

Past and projected water demands for the greater Whiteriver area (North Fork, Rainbow City, Whiteriver, Canyon Day, Fort Apache, Turkey Creek, East Fork, and Seven Mile districts), Cibecue, and Carrizo are based on calculations in the *Project Extension Report* (WMAT 2007) for domestic water use.[11] **Table 2.3-1** provides average day water demand (mgd and gpm), maximum day water demand (mgd and gpm), and average annual water demand (afy) estimates based on 2010 and 2020 census populations. The table also shows future demand projections for a population of 35,907 (i.e., the design population) (WMAT 2007).[12]

The water demands in the greater Whiteriver area are currently met by groundwater from the Miner Flat Wellfield (described in **Section 2.3.1**, *Miner Flat Wellfield [Groundwater]*) and surface water diverted from the NFWR and treated at the water treatment plant (described in **Section 2.3.2**, *Existing North Fork Intake Structure and Water Treatment Plant*). During the years 2016 through 2020, the average production rate for the water treatment plant ranged from 0.47 mgd (2020) to 0.84 mgd (2016), with maximum monthly production rates of up to 1.1 mgd (**Table 2.3-2**).[13]

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[11] The *Project Extension Report* (WMAT 2007) uses the term "domestic water" to include the requirements of the public water systems and individual household needs; the term is synonymous with "municipal, rural, and industrial" used in the Quantification Act.

[12] Per Section 307(c)(1) of the Quantification Act, the final project design should be generally consistent with the system described in the *Project Extension Report* (WMAT 2007), which was based on a projected 2030 design population of 35,907. Based on estimated population growth from more recent census data, it is likely that the design population would not be reached for another 40 years or more.

[13] Production rates were generally lower in 2018–2020 compared to prior years because the WMAT implemented a leak prevention program to reduce losses of water in community homes and other facilities.

Table 2.3-1. Past and Projected White Mountain Apache Tribe Domestic Water Demands

Community	2010[1]	2019[2]	Design Population[3]
Population[4, 5, 6]			
Greater Whiteriver[7]	9,541	10,905	30,682
Carrizo	127	82	419
Cibecue	1,713	2,173	4,806
Total	**11,381**	**13,160**	**35,907**
Average Annual Water Demand (afy)			
Greater Whiteriver[7]	1,678	2,113	6,496
Carrizo	22	16	89
Cibecue	301	421	1,017
Total	**2,001**	**2,550**	**7,602**
Average Day Water Demand (mgd)			
Greater Whiteriver[7]	1.50	1.89	5.80
Carrizo	0.02	0.01	0.08
Cibecue	0.27	0.38	0.91
Total	**1.79**	**2.28**	**6.79**
Average Day Water Demand (gpm)[8]			
Greater Whiteriver[7]	1,135	1,429	4,393
Carrizo	15	11	60
Cibecue	204	285	688
Total	**1,354**	**1,725**	**5,141**
Maximum Day Water Demand (mgd)[9]			
Greater Whiteriver[7]	3.37	4.24	13.05
Carrizo	0.04	0.03	0.18
Cibecue	0.61	0.85	2.04
Total	**4.02**	**5.12**	**15.27**
Maximum Day Water Demand (gpm)[8, 9]			
Greater Whiteriver[7]	2,553	3,216	9,885
Carrizo	34	24	135
Cibecue	458	641	1,548
Total	**3,045**	**3,881**	**11,568**

Key: afy = acre-feet per year; gpm = gallons per minute; mgd = million gallons per day; U.S. = United States; USCB = United States Census Bureau

1 2010 calculations are based on an average of 157 gallons per capita per day (Table 3-1 of WMAT 2007).

2 2019 calculations are based on an average of 173 gallons per capita per day (2020 data in Table 3-1 of WMAT 2007).

3 Design population calculations are based on an average of 189 gallons per capita per day (2030 data in Table 3-1 of WMAT 2007).

4 2010 population data from the U.S. Department of Commerce, Census Bureau, 2010 Census (USCB 2010).

5 2019 population data from the U.S. Department of Commerce, Census Bureau, 2015–2019 American Community Survey 5-Year Estimates (USCB 2019a).

6 Design population data are based on the projected 2030 population in the *Project Extension Report* (WMAT 2007).

7 Greater Whiteriver includes the North Fork, Rainbow City, Whiteriver, Canyon Day, Fort Apache, Turkey Creek, East Fork, and Seven Mile districts.

8 Calculations for gpm are based on 22 hours of operations per day.

9 Maximum day demands are based on a factor of 2.25 times average day demands (Table 3-1 of WMAT 2007).

Table 2.3-2. Existing Water Treatment Plant Production Rates

Month	2016			2017			2018			2019			2020		
	Annual % [1]	Total Gallons [2]	Average Day (mgd) [3]	Annual % [1]	Total Gallons [2]	Average Day (mgd) [3]	Annual % [1]	Total Gallons [2]	Average Day (mgd) [3]	Annual % [1]	Total Gallons [2]	Average Day (mgd) [3]	Annual % [1]	Total Gallons [2]	Average Day (mgd) [3]
January	8.5%	26,241,530	0.85	8.7%	25,927,790	0.84	7.4%	18,275,210	0.59	10.9%	19,068,920	0.62	5.5%	9,554,260	0.31
February	7.1%	21,884,080	0.78	5.7%	17,016,880	0.61	5.9%	14,593,640	0.52	7.7%	13,542,460	0.48	6.0%	10,289,530	0.37
March	8.3%	25,399,550	0.82	9.1%	26,946,010	0.87	8.7%	21,388,860	0.69	9.1%	15,955,760	0.51	6.7%	11,637,530	0.38
April	7.5%	22,899,130	0.76	11.1%	32,970,820	1.10	8.1%	20,124,360	0.67	9.7%	17,049,810	0.57	5.2%	8,923,590	0.30
May	9.5%	29,230,856	0.94	10.5%	31,373,001	1.01	11.0%	27,174,440	0.88	8.8%	15,436,520	0.50	8.7%	15,106,890	0.49
June	10.5%	32,348,690	1.08	9.2%	27,332,440	0.91	10.7%	26,310,850	0.88	15.7%	27,585,760	0.92	8.8%	15,260,670	0.51
July	8.6%	26,354,730	0.85	8.4%	25,038,960	0.81	7.5%	18,475,890	0.60	6.3%	11,107,890	0.36	12.5%	21,529,330	0.69
August	5.8%	17,800,160	0.57	6.6%	19,536,990	0.63	5.5%	13,511,120	0.44	8.5%	14,958,700	0.48	13.5%	23,399,900	0.75
September	6.1%	18,697,480	0.62	7.8%	23,269,380	0.78	7.4%	18,165,040	0.61	5.7%	10,062,414	0.34	10.9%	18,887,400	0.63
October	9.9%	30,279,650	0.98	5.9%	17,493,110	0.56	8.1%	20,011,190	0.65	8.2%	14,400,530	0.46	7.6%	13,136,430	0.42
November	9.6%	29,347,510	0.98	8.7%	25,752,000	0.86	10.9%	26,952,310	0.90	6.8%	11,964,290	0.40	6.3%	10,861,150	0.36
December	8.6%	26,435,850	0.85	8.4%	24,853,540	0.80	8.9%	21,976,960	0.71	2.5%	4,345,750	0.14	8.2%	14,194,850	0.46
Total	**100.0%**	**306,919,216**	**0.84**	**100.0%**	**297,510,921**	**0.82**	**100.0%**	**246,959,870**	**0.68**	**100.0%**	**175,478,804**	**0.48**	**100.0%**	**172,781,530**	**0.47**

Key: mgd = million gallons per day

[1] Annual % = the percentage of water produced for that year (i.e., based on total gallons produced for the month divided by total gallons for the year)

[2] Source: Walker (2021)

[3] Average Day = the total gallons produced for the month divided by the number of days in the month

Production rates were usually higher between April and August. When combined with the Miner Flat Wellfield, water produced for the greater Whiteriver area in 2020 averaged about 1.4 mgd. This is less than the projected amount needed to serve the existing population for both average daily demand (1.9 mgd) and maximum daily demand (4.2 mgd). This resulted in shortfalls for some communities, especially during peak times and during drought years (e.g., shortfalls were experienced during the summers of 2018 and 2020). Even if the water treatment plant was working at production capacity (1.73 mgd), there would still be shortfalls in the system. Moreover, existing systems would not be able to meet projected average daily water demand (5.8 mgd) or maximum daily demand (13.1 mgd) for the future design population in the greater Whiteriver area.

Similarly, as discussed in **Section 2.3.3** (*Existing Water Distribution System*), the groundwater quality of aquifers under Carrizo and Cibecue is poor, and the quantity of groundwater available is not sufficient to meet the growing water demands in these communities (Morrison-Maierle 2015).

2.4 The Proposed Action

The proposed action consists of construction and operation of the WMAT rural water system pursuant to the Quantification Act. This includes a dam, instream storage reservoir, intake and diversion structures, pumping plant, treatment facilities, and a distribution system that would be designed to meet Reclamation standards. A general schematic for how the water system would work is shown in **Figure 2.4-1**. All of the NEPA action alternatives would meet the purpose of and need for the proposed action because each would provide a long-term, dependable, and sustainable water supply for residents and businesses on the Reservation, and each would fulfill Reclamation's responsibilities under the Quantification Act.

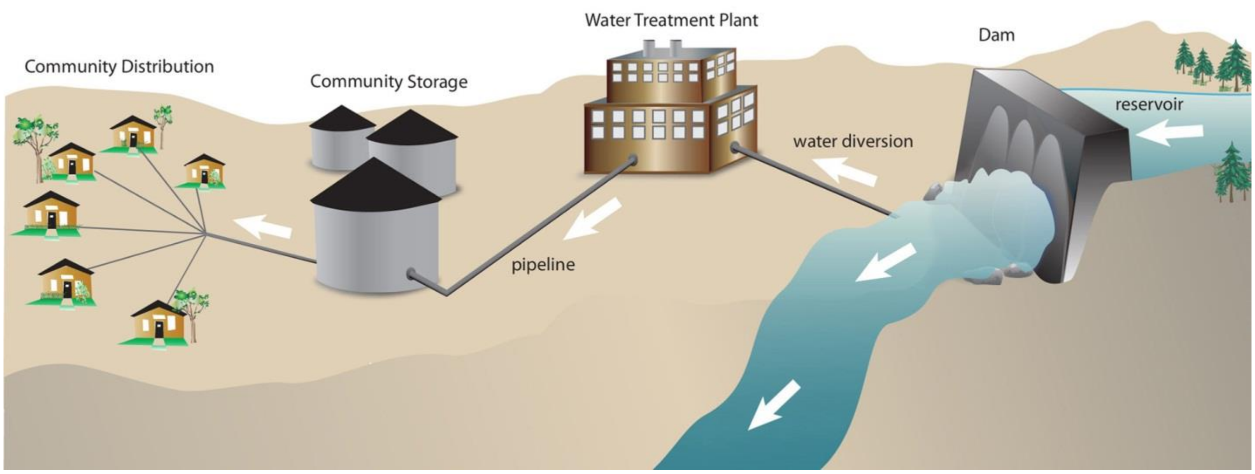

Figure 2.4-1. General Schematic of the Proposed Water System

The proposed action would provide connection to existing WMAT community water systems at the storage tanks (**Figure 2.4-1**), but it does not include upgrades or modification to other WMAT community water supply systems (e.g., water pipelines that connect individual houses to the water system), although these may be considered by the WMAT under separate actions outside the EIS and outside the funding approved by the U.S. Congress for the WMAT rural water system. Similarly, Section 312 of the Quantification Act, as amended,[14] authorizes a WMAT Settlement Fund, from which amounts may be used for the WMAT rural water system and/or (1) fish production, including hatcheries, (2) rehabilitation of recreational lakes and existing irrigation systems, (3) water-related economic development projects, and (4) protection, restoration, and economic development of forest and watershed health. However, any such activities the Tribe may pursue in the future are not part of the proposed action addressed in this EIS. If these activities are pursued in the future, the WMAT and Federal agencies, if appropriate, will comply with all applicable environmental requirements, which may include additional NEPA review if appropriate.

2.5 Description of Alternatives

2.5.1 No Action Alternative

NEPA requires the analysis of a No Action Alternative in an EIS (per 40 CFR 1502.14[d]). No action means that an action would not take place, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed action to go forward. Under the No Action Alternative, the proposed WMAT rural water system would not be built, and the residents of the Reservation would continue to rely on existing water systems. The WMAT's current water use is estimated at a depletion rate of less than 8,000 afy, which accounts for less than one third of the WMAT's 1871-reserved water right to deplete up to 27,000 afy. The current depletion rate is based on the amount of water currently used for existing domestic, commercial, and industrial water use; livestock use; streamside irrigation; and evaporation from stock ponds and recreation lakes (Watson 2021a). The existing water system is inadequate to meet current and projected demands based on limited sources of water and expected community growth, as described in **Section 2.3.4** (*Past and Projected Domestic Water Demand*). Declining groundwater levels and limited surface flows from the NFWR during low flow periods would continue to result in periodic water shortages. Future water demands are also projected to increase over time, which would put additional strain on the existing system. Additionally, the provision of the Quantification Act instructing the Secretary to construct the WMAT rural water system would not be fulfilled. The No Action Alternative is not considered a reasonable alternative because it does not meet the purpose of and need for the proposed action. However, it does provide a benchmark that enables decision makers to evaluate the environmental consequences of the proposed alternatives.

2.5.2 Action Alternatives

All of the NEPA action alternatives include construction of the proposed WMAT rural water system. The general layout of the proposed project components, including the location of the proposed dam, instream storage reservoir, intake and diversion structures, pumping plant, treatment facilities, and a distribution system, are shown in **Figure 1.1-2**. Each of these components is described in detail in **Section 2.5.3** (*Project Details under All Action Alternatives*) based on available engineering design studies (HDR 2021; Gannett Fleming 2013a, 2013b, 2014; Carollo 2014a–e; Morrison-Maierle 2015). However, access roads, staging areas, and other design components may

[14] Public Law 115-227 (August 1, 2018) amends the Quantification Act to specify that settlement funds may be used for the planning, design, and construction of the WMAT rural water system. Settlement funds are authorized but not appropriated.

change based on future engineering refinement. Additional information on employment opportunities, expected waste materials, vehicle trips, road disruptions, construction schedules, and easements is provided in **Appendix A.1** (*Additional Project Details*). Expected construction equipment for each project component is provided in **Appendix D** (*Air Quality Emissions*). The proposed action also includes provisions to record all water diversions and depletions related to the WMAT rural water system to meet the requirements of the Quantification Act (see **Appendix A.1**, *Additional Project Details*, for more information). Under all action alternatives, groundwater extraction from the Miner Flat Wellfield is expected to continue at a rate of about 800 gpm.

Per Section 307(d)(2) of the Quantification Act, Reclamation would operate the completed rural water system, with the participation of the WMAT, for no less than 3 years. Title to the facilities would be transferred to the WMAT no later than 30 days after the date on which the Secretary publishes certain findings in the *Federal Register*, including that (1) the operating criteria, standard operating procedures, emergency action plan, and first filling and monitoring criteria of the designers have been established and are in place; (2) the WMAT rural water system has operated under the standard operating procedures of the designers, with the participation of the Tribe, for a period of 3 years; and (3) the Secretary has provided the Tribe with technical assistance on the manner by which to operate and maintain the WMAT rural water system. Once title is transferred to the WMAT, the WMAT would manage and operate the completed water system. The WMAT would allow shore-based fishing and hiking along the reservoir, similar to existing fishing and hiking along the NFWR.

The WMAT and Reclamation would work together to develop and approve all operations, maintenance, and safety plans based on the selected alternative prior to initial operations, and plans would be amended, as needed, based on actual operations and regulatory requirements. The WMAT would also establish a water administrator position and manage water diversions and demands on the Reservation through the development of the WMAT Water Code, per requirements of the Quantification Act. This code, for example, would codify provisions for issuing conditional permits to divert water for irrigation or other uses following a determination of availability and need evaluation. The WMAT Water Code would be enacted no later than 18 months after the enforceability date of the Quantification Act.

While the action alternatives include the same construction components, they differ in how the water system would be implemented and operated to prioritize uses for the WMAT rural water system, instream flows, and irrigation. These differences primarily relate to downstream irrigation diversions and the preservation of downstream minimum flows, as described below for Alternatives A through D. The following also references the results of streamflow and dam operations modeling of the operating scenarios under each alternative (JE Fuller 2022). Modeling results are discussed in greater detail in **Section 3.2** (*Water Resources and Hydrology*).

Alternative A

Rural Water System Diversions. The dam and water treatment facilities would operate to meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue, per the Quantification Act. This would result in the use of up to 7,602 afy and 3,030 afy for diversion and depletion, respectively, to meet the average annual water demand projected for the design population (see **Section 2.3.4**, *Past and Projected Domestic Water Demand*). These rural water system diversions would be the same under all action alternatives.

Downstream Irrigation Diversions. Under Alternative A, proposed dam and water system operations would accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate farming within 885 acres that had been cultivated in the 1980s (**Section 2.6**, *Connected Actions*, for more details). Water use for irrigation would be up to 2,843 afy and 2,491 afy for diversion and depletion, respectively. This water use is over and above the projected municipal, rural, and industrial water use for the communities of the greater Whiteriver area, Carrizo, and Cibecue. While the proposed action incorporates downstream irrigation diversions as part of operations of the WMAT rural water system because it affects the operations of the proposed Miner Flat Dam (i.e., the need for sufficient water releases from the dam to ensure water is available downstream for irrigation diversion), other issues related to Canyon Day farming (e.g., new infrastructure or infrastructure upgrades) are considered a connected action as described in **Section 2.6**.

Downstream Minimum Flows. Under Alternative A, proposed water system operations would prioritize the preservation of minimum instream flows downstream of the dam. This would include operating the dam to prioritize at least an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. It would also include preserving historical minimum flow levels below the dam. For modeling purposes, this meant calculating the average minimum river flow level each month of the year over a period of 63 years at three locations along the river and then instructing the model to prioritize that sufficient water is in the system so that water levels would not go below these historical average minimum river flows.[15]

Dam Modeling Results. The dam operations modeling for Alternative A used the following water allocation priorities in this order: (1) preserve minimum instream flows so that water levels would not go below the calculated minimum existing conditions, (2) meet the maximum rural water system diversions for the design population, and (3) meet the maximum Canyon Day irrigation water demands associated with 885 acres of farming. Modeling results demonstrate that there would be sufficient water storage and supply in the system to meet all three priorities. In addition, modeling results indicate that, under this alternative, reaches of the river below the North Fork intake structure and near the confluence of Amos Wash and the White River would experience fewer days of extremely low water flow compared to existing conditions. This is likely a result of system requirements to push sufficient water downstream to meet diversion requirements and additional return flow from agricultural activities in the Canyon Day area.

The Alternative A modeling is based on the maximum diversion rates anticipated for this scenario. For actual operations, water diversions to meet rural water system demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would start at a lower level (i.e., similar to existing water demands provided in **Section 2.3.4**, *Past and Projected Domestic Water Demand*) and would increase over time as population levels increase. Based on historic population growth, it is likely that

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[15] Historical minimum river flow levels were based on monthly flows over the period from 1958 through 2020 (63 years) calculated from actual and synthetic gage data. Monthly minimums were defined as the historic flow that was exceeded 99 percent of the time (1 percentile flow) plus 1 cfs for specific locations within the model grid (see JE Fuller 2022 for more information). The two locations downstream from the dam included in this analysis were the NFWRGG gage and WRNFA gage locations shown in Figure 3.2-3.

rural water system demands would not reach maximum levels for the design population for another 40 years or more.

Consumptive Use. As discussed in **Section 1.2** (*History and Background of the White Mountain Apache Tribe Rural Water System Project*), the WMAT has an 1871-reserved water right to divert up to 74,000 afy and deplete 27,000 afy based on the WMAT Water Rights Quantification Agreement. The WMAT currently uses less than a third of this amount. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other continued and future water uses on the Reservation, the WMAT's projected water use under Alternative A is estimated at a depletion rate of less than 15,000 afy (Watson 2021a), which accounts for about 55 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

Alternative B

Rural Water System Diversions. The rural water system diversions to meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would be the same as under Alternative A.

Downstream Irrigation Diversions. The downstream irrigation diversions in the Canyon Day area to irrigate up to 885 acres would be the same as under Alternative A.

Downstream Minimum Flows. Under Alternative B, proposed water system operations would not prioritize the preservation of minimum instream flows downstream of the dam. While this alternative would include an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery, it would not regulate the river flow to preserve historical minimum flow levels below the dam.

Dam Modeling Results. The dam operations modeling for Alternative B used the following water allocation priorities in this order: (1) meet the maximum rural water systems diversions for the design population, and (2) meet the maximum Canyon Day irrigation water demands associated with 885 acres of farming. Modeling results demonstrate that there would be sufficient water storage and supply in the system to meet both priorities. While this modeling scenario was not designed to regulate minimum downstream flow levels, the outcome of pushing water downstream to meet Alchesay National Fish Hatchery requirements and irrigation diversions at Canyon Day resulted in higher minimum flows throughout the system compared to existing conditions as indicated by fewer days of extremely low water flow.

Similar to Alternative A, the modeling for Alternative B is based on the maximum diversion rates anticipated for this scenario. For actual operations, water diversions to meet rural water system demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would start at a lower level (i.e., similar to existing water demands) and would increase over time as population levels increased.

Consumptive Use. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other continued and future water uses on the Reservation, the WMAT's projected water use under Alternative B is estimated at a depletion rate of less than 15,000 afy (Watson 2021a), which accounts for about 55 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

Alternative C

Rural Water System Diversions. The rural water system diversions to meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would be the same as under Alternative A.

Downstream Irrigation Diversions. Unlike Alternatives A and B, proposed dam and water system operations under Alternative C would accommodate downstream irrigation diversions to allow the WMAT to expand farming activities in Canyon Day with sufficient water to irrigate up to 3,000 acres[16] of farmland. Water use for irrigation would be up to 9,637 afy and 8,444 afy for diversion and depletion, respectively. This water use is over and above the projected municipal, rural, and industrial water use for the communities of the greater Whiteriver area, Carrizo, and Cibecue. The consumptive use of 8,444 afy for irrigation represents about 31 percent of the WMAT's 1871-reserved water right under the WMAT Water Rights Quantification Agreement. Meeting the rural water system diversions would have priority over meeting downstream irrigation diversions, as noted below under *Dam Modeling Results*.

Downstream Minimum Flows. Downstream minimum flows would be the same as under Alternative A.

Dam Modeling Results. The dam operations modeling for Alternative C used the following water allocation priorities in this order: (1) preserve minimum instream flows so that water levels would not go below existing conditions, (2) meet the maximum rural water systems diversions for the design population, and (3) meet the maximum Canyon Day irrigation water demands associated with 3,000 acres of farming. Modeling results demonstrate that there would not be sufficient water storage and supply in the system to meet all three priorities. While this scenario preserved minimum instream flows, the maximum rural water system demand for the design population could only be met 99 percent of the time, and maximum Canyon Day irrigation demand could only be met approximately 75 percent of the time. The modeling also shows higher fluctuations in reservoir levels compared to Alternatives A and B, including extended periods when the reservoir reaches minimum operating levels.

However, as noted above, water diversions to meet rural water system demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would start at a lower level (i.e., similar to existing water demands) and would increase over time as population levels increased. It may not reach maximum demand levels for 40 years or more. Meanwhile, there would be sufficient water storage and supply in the system to accommodate Canyon Day irrigation water demands. As rural water system demands increased over time, the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet minimum instream flows and rural water system demands while reducing permitted amounts for irrigation diversions.

Consumptive Use. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other

[16] The 3,000 acres would include the 885 acres that were farmed in the 1980s as well as an additional 2,115 acres described in Section 2.6.3 (*Expansion of Canyon Day Farming*).

continued and future water uses on the Reservation, the WMAT's projected water use under Alternative C is estimated at a depletion rate of less than 20,000 afy (Watson 2021a), which accounts for less than 75 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

Alternative D

Rural Water System Diversions. The rural water system diversions to meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would be the same as under Alternative A.

Downstream Irrigation Diversions. The downstream irrigation diversions in the Canyon Day area to irrigate up to 3,000 acres would be the same as under Alternative C.

Downstream Minimum Flows. Downstream minimum flows would be the same as under Alternative B.

Dam Modeling Results. The dam operations modeling for Alternative D used the following water allocation priorities in this order: (1) meet the maximum rural water systems diversions for the design population and (2) meet the maximum Canyon Day irrigation water demands associated with 3,000 acres of farming. Modeling results demonstrate that there would almost be sufficient water storage and supply in the system to meet both priorities. Maximum rural water system demand for the design population could be met 99.5 percent of the time, and maximum Canyon Day irrigation demand could be met approximately 99 percent of the time. However, under this modeling scenario, sections of the river dry up at a much higher rate than under existing conditions. The modeling also shows higher fluctuations in reservoir levels compared to Alternatives A and B, including extended periods when the reservoir reaches minimum operating levels.

As noted above, water diversions to meet rural water system demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue would start at a lower level (i.e., similar to existing water demands) and would increase over time as population levels increased. It may not reach maximum demand levels for 40 years or more. Under this alternative, as rural water system demands increased over time, the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet rural water system demands before permitting irrigation diversions, but the WMAT water administrator would not regulate dam operations to meet minimum instream flow requirements.

Consumptive Use. Assuming maximum depletion rates for the projected municipal, rural, and industrial water use and maximum irrigation diversions in the Canyon Day area, along with other continued and future water uses on the Reservation, the WMAT's projected water use under Alternative D is estimated at a depletion rate of less than 20,000 afy (Watson 2021a), which accounts for less than 75 percent of the WMAT's 1871-reserved water right to deplete up to 27,000 afy.

2.5.3 Project Details under All Action Alternatives

Proposed Miner Flat Dam and Instream Reservoir

Overview. The proposed site for the Miner Flat Dam (**Figure 2.5-1**) and associated instream reservoir is on the NFWR, approximately 2 miles north of the confluence with Diamond Creek on the north side of Whiteriver, Arizona. The dam would be constructed in a narrow gorge downstream from a sharp bend in the river. Water impounded by the dam would inundate the canyon of the NFWR (**Figure 2.5-2**). The proposed reservoir would create a water surface area of approximately 170 acres at a reservoir elevation of 6,065 feet (Gannett Fleming 2014). The total reservoir storage capacity at that elevation would be approximately 8,600 af. Water released from the dam would flow downstream in the natural watercourse of the NFWR.

Figure 2.5-1. Visual Simulation of the Proposed Miner Flat Dam

The dam would be constructed using roller-compacted concrete, to an approximate height of 160 feet with a crest length of about 400 feet. The current design of the dam includes an intake tower and wet well that is drained by a large-diameter gated outlet, a spillway over the top of the dam equipped with fuse gate overflow weirs, and a stilling basin at the downstream base of the spillway and outlet (Gannett Fleming 2014) (**Figure 2.5-3**). The foundation and abutments would be designed to address geological hazards, such as reducing seepage and eliminating potential for piping and dissolution of materials underlying the dam (HDR, Inc. 2021). Possible subsurface treatment options are described in **Appendix A.1** (*Additional Project Details*), and potential areas of disturbance are shown in **Figure 2.5-4**.[17] Foundation treatment options will be further addressed in the pending Miner Flat Dam feasibility study and final engineering design.

Water would flow through the outlet works and be released to the river downstream of the dam. The intake tower would be installed within the reservoir (not visible in **Figure 2.5-3**) with three intake gates at different elevations to allow control over the temperature of water released from the reservoir. In general, water from lower gates would be colder than water from higher gates because the water would be from deeper reaches of the reservoir.

The gated primary outlet would control the release of water from the intake tower to the stilling basin at the bottom of the dam (**Figure 2.5-3**). The stilling basin's primary function is to dissipate energy from the water as it passes through the basin and slow the velocity of water released to the river downstream of the dam. The piping for the outlet works would also serve as the diversion works during construction and would likely be sized for a 10-year to 25-year flood event.

[17] The actual area disturbed by the subsurface treatment options should be less than what is shown in the figure because the area shown includes all the options described in Appendix A.1 (*Additional Project Details*).

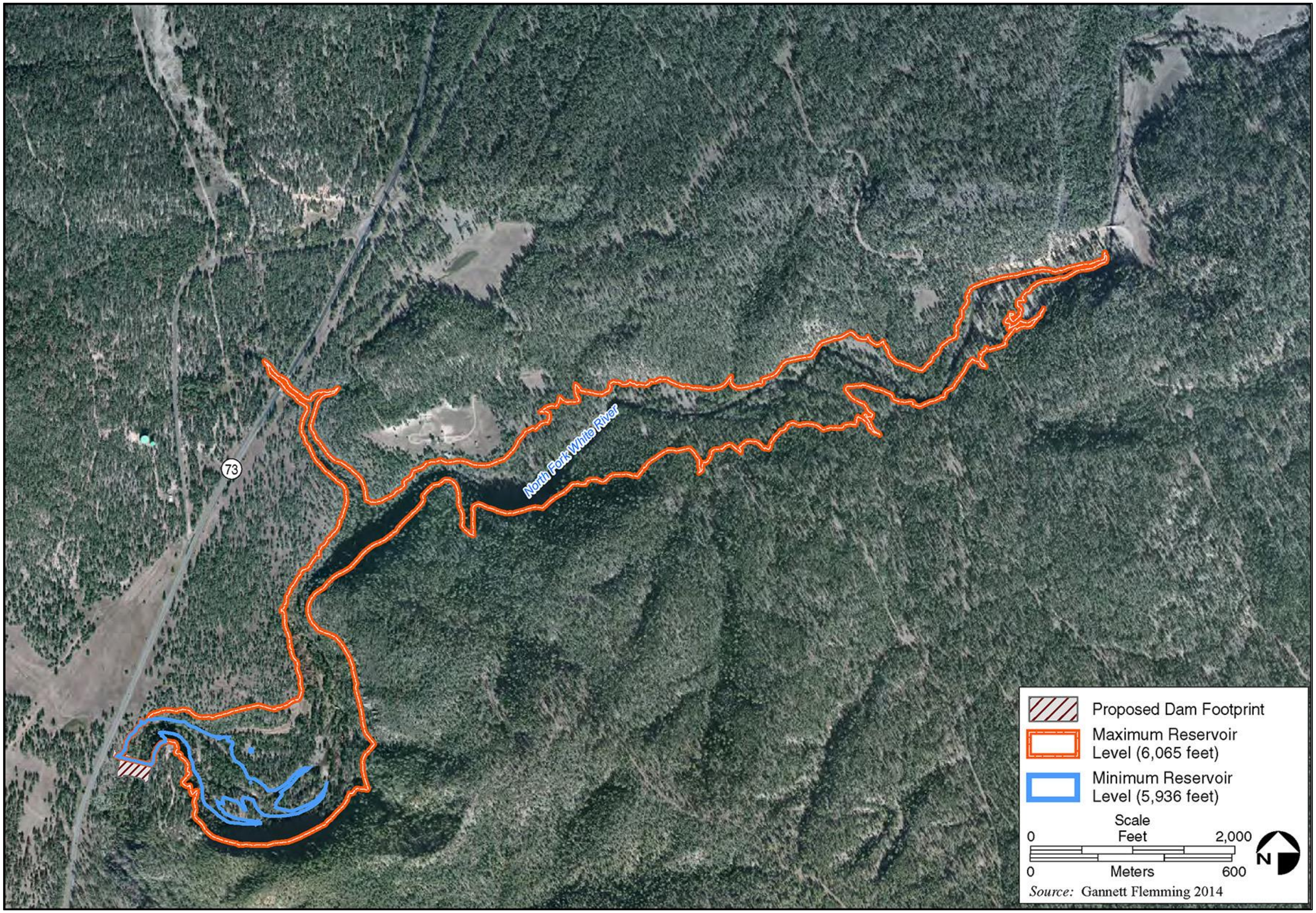

Figure 2.5-2. Overview of the Proposed Miner Flat Dam and Reservoir

Source: Gannett Fleming 2014

Figure 2.5-3. Rendering of the Proposed Miner Flat Dam

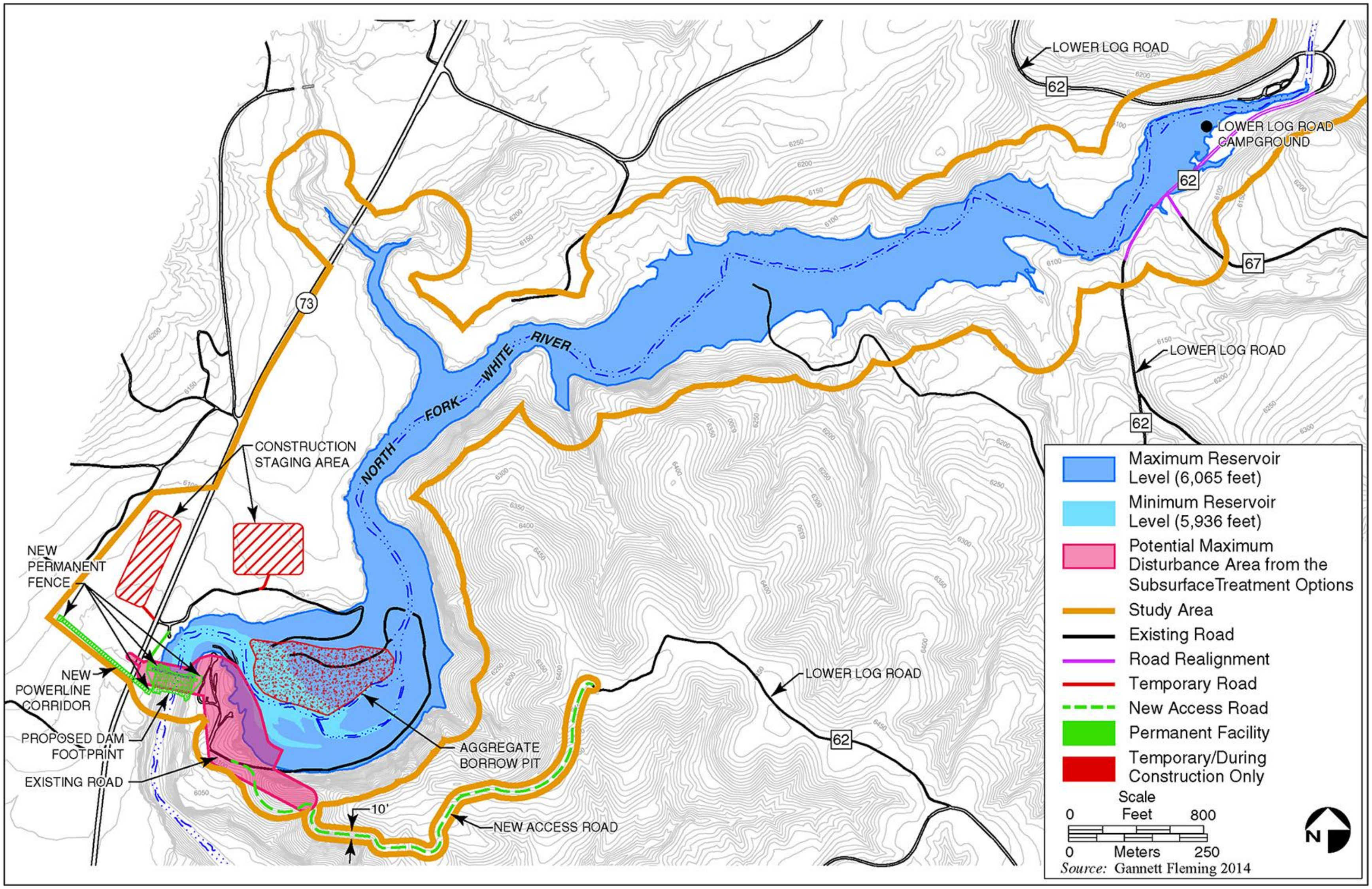

Figure 2.5-4. Location of Facilities Related to the Miner Flat Dam

Water would flow over the spillway (**Figure 2.5-3**) when the reservoir is full and the natural flow upstream of the dam exceeds the capacity of the outlet works. In this case, water would flow down the face of the dam and into the stilling basin before flowing into the river downstream of the dam. The spillway would mainly be necessary for flood events with 25-year to 1,000-year frequencies.

During flood events, water would be released over the spillway via the fuse gate overflow weirs. Each fuse gate weir unit would be designed to hold water at the design pool elevation of 6,065 feet and remain stable with the passage of flood flows up to 10,000 cfs (Gannett Fleming 2014). The fuse gate weir units would be designed to tip during extreme flood events when spillway discharges exceed 10,000 cfs (i.e., greater than a 1,000-year flood event per Reclamation 2013a), tumble down the spillway with the flood flows, and come to rest within or near the stilling basin. With the fuse gate weir units washed away, the resultant spillway capacity would be increased to 34,500 cfs (Gannett Fleming 2014). The intent of the fuse gate weirs is to raise the normal pool to an elevation of 6,065 feet and to pass extreme flood events through a larger spillway, when needed, instead of overtopping the dam crest and associated access road (at an elevation of 6,072 feet). Deployment of the fuse gate weir units would temporarily lower the storage capacity in the reservoir by approximately 1,700 af until new units are installed on the dam.

The dam design would include Supervisory Control and Data Acquisition (SCADA) controls on the gates of the outlet works to monitor water temperature and other water quality parameters (e.g., dissolved oxygen). See **Section 3.2** (*Water Resources and Hydrology*) for more information about water temperatures and dissolved oxygen concentrations.

Other dam components include a log boom (**Figure 2.5-3**) that would be located within the reservoir approximately 300 feet upstream from the spillway crest, which would function as a security barrier and would prevent floating debris from nearing the dam.

Dam Construction Footprint. Figure 2.5-4 shows the location of proposed facilities associated with construction of the Miner Flat Dam, including areas potentially disturbed by subsurface treatment options. The study area shown in the figure includes a 250-foot buffer around the reservoir and captures all proposed facilities and staging areas as well as sufficient buffers to accommodate final engineering design refinements (i.e., final dam footprint and change in staging area locations).

In addition to the footprint of the dam and reservoir, ancillary facilities would include new access roads, a power line corridor, security features, and a road realignment (**Figure 2.5-4**) (Gannett Fleming 2014). There would be about 1.1 miles of new access roads to allow access to both the left and right abutments of the dam. A new power line would be constructed to connect the dam facilities to an existing power line located approximately 1,000 feet west of the project site. General security features for the dam and reservoir would include about 900 feet of chain link security fencing around the left and right dam abutments, controlled access to the left and right abutments, and continuous video surveillance of the intake tower and downstream side of the dam. A small parking area within the secured area would be used for operations and maintenance. No permanent offices would be constructed at the dam.

A portion of Indian Route 62 (Lower Log Road) and Indian Route 67 near the northern end of the reservoir would be inundated by reservoir waters. About a 1,700-foot portion of Indian Route 62, along with its intersection with Indian Route 67, would be relocated above the water line as part of this action. The current alignment of the road segments that need to be relocated are shown in purple on **Figure 2.5-4**. Engineering designs are not available to show the proposed realignment, but the new route is expected to be roughly parallel to its current alignment and at least 10 feet above the new water line. The new route is expected to be within the study area shown on **Figure 2.5-4**.

Construction activity footprints would also include staging and temporary parking areas, construction fencing, and temporary lighting (**Figure 2.5-4**) (Gannett Fleming 2014). The preliminary locations of two construction staging areas, measuring approximately 11 acres, are shown in **Figure 2.5-4**. Staging areas would be used for temporary parking as well as stockpiling of equipment and construction materials. Some staging activities may also occur within the reservoir footprint. Staging areas outside the reservoir footprint would be stabilized and revegetated at the end of the construction project to match pre-construction conditions. Temporary security fencing, including about 4,000 feet of portable chain link fencing, would be used throughout the construction site for safety and security. Portable light towers would be used where needed for nighttime work activities and general security.

Current engineering plans propose to use material excavated from the dam footprint and a borrow pit of previously identified gravel in the reservoir area (**Figure 2.5-4**) to supply aggregate for dam construction. One engineering study estimated that the borrow pit and dam site would yield about 200,000 and 135,000 cubic yards of structural grade aggregate, respectively (Morrison-Maierle 1987). Although the exact amount of aggregate needed for structural concrete is unknown at this time, it is speculated that this could account for about 80 percent of the needed aggregate (Gannett Fleming 2014). Aggregate needed beyond what is available in the construction area would be imported by truck from other aggregate sources on the Reservation (e.g., existing gravel pits in the Canyon Day area).

Dam Construction Activities. Construction would begin with initial vegetation removal and clearing of the access roads, staging areas, and stockpile areas. Ultimately, vegetation would be removed from the entire dam footprint and most of the reservoir footprint (to about the 6,061-foot elevation level), although this might be done incrementally over a 6- to 12-month period to avoid unnecessary stormwater contamination from exposed, unvegetated ground (Gannett Fleming 2014). Commercial grade timber would be marked and harvested as a timber sale using practices specified in the Reservation's Forest Management Plan (WMAT 2005a).

Early construction activities would include a river diversion scheme using a cofferdam and diversion channel, to divert water away from construction areas. During the different stages of construction, the diversion would need to be relocated periodically to accommodate all foundation excavation and installation of the outlet works. Once the outlet works are completed, they would serve as the diversion works for the rest of the construction effort. These procedures would ensure that river flow would continue downstream during construction of the dam.

The dam abutment excavations would proceed from the top toward the valley floor and would require blasting with explosives and excavating in benches using bulldozers, excavators, and other construction equipment. Blasting operations would remove about 1,500 cubic yards per blast, and it is estimated that 80 blasts would be needed for this project (Gannett Fleming 2014).

On-site aggregate processing would require substantial crushing operations, likely including primary, secondary, and tertiary crushing and screening operations. It is possible that aggregate washing would be required for the conventional concrete aggregates, and the washwater effluent would be discharged in accordance with the discharge requirements in the Construction General Permit. On-site crushing operations would be fed from both the borrow area and from the dam foundation excavation. Processed aggregates would be stockpiled on-site by means of conveyors and radial stackers. There would also be two batch/mixing plants on site, one for conventional concrete and one for the roller-compacted concrete. These on-site operations would occur within the proposed reservoir footprint.

Construction activities would rely on diesel generators for the power needed to operate the crushing and batch plant operations, office and shop facilities, lighting, and dewatering. Backup generators would likely be associated with dewatering operations, where a shutdown would have severe consequences. Backup generators would generally be on standby and would be equipped with an auto-transfer switch that calls on the backup generator to start when the active generator fails.

Dam Operations. The dam and associated instream reservoir are designed to provide storage capacity to help regulate the flow of the NFWR. This includes the ability to supplement the natural flow of the river with stored water when river flow is lower due to seasonal fluctuations and during drought years.

After the dam is constructed, the streamflow of the NFWR would immediately begin filling the new reservoir. It would take about 5 or 6 months or more to fill the reservoir, depending on the level of flows upstream of the dam. While the reservoir fills, dam operators would continue to release water downstream of the dam through the outlet works. The intake gates of the dam are designed to allow releases of water even when reservoir levels are low. When the reservoir is full, inflow amounts would mirror release amounts downstream of the dam.

When flow is insufficient to meet downstream water demands, such as during drier summer months or during drought periods, dam operators would release stored water from the reservoir. Release of stored water would temporarily lower the level of the reservoir causing reservoir levels to fluctuate up and down over time. The reservoir would typically refill when upstream flows were higher, such as during snowmelt runoff in the spring and monsoon events in the summer. The same process would occur during drought years, although it is possible the reservoir would not fully refill until after the drought was over.

In general, dam operators would release stored water, when necessary, to accommodate the following downstream water demands: (1) rural water system diversions at the expanded intake structure to meet the water demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue; (2) preservation of 11 cfs minimum instream flow downstream of the dam for diversion to the Alchesay National Fish Hatchery; (3) preservation of variable minimum instream flow below the rural water system diversions (*Alternatives A and C only*); and (4) water diversions for agricultural activities in the Canyon Day farming area to irrigate up to 885 acres of land (*Alternatives A and B only*) or 3,000 acres of land (*Alternatives C and D only*). In practice, rural water system diversions and irrigation diversions would start out lower than the maximum estimates accounted for under the action alternatives and would increase over time based on population growth and other increases in demand from WMAT residents, businesses, and farming.

Proposed North Fork Intake Structure Expansion

Overview. The existing North Fork diversion dam and intake structure (see **Section 2.3.2**, *Existing North Fork Intake Structure and Water Treatment Plant*) would remain in service, and a new intake with a capacity of 10.55 mgd or 16.2 cfs would be installed immediately upstream of the existing intake (**Figure 2.5-5** and **Figure 2.5-6**). No changes would be made to the existing diversion dam (inflatable "Obermeyer Weir") and associated fish ladder (Carollo 2014b). The existing diversion dam would be used as the primary pooling structure for both the existing and new intake systems. The existing fish ladder is on the opposite bank from the existing and proposed intake and is expected to continue to function as designed to allow fish passage past the diversion dam.

The new intake would draw water from the existing diversion pool on the west side of the river and route it through a 50-foot-long concrete diversion channel that discharges excess water back into the river below the diversion dam. The diversion channel is designed to carry five times more water than needed for diverting to the water treatment plant (Carollo 2014b). The channel would help divert water toward the inlet openings while the stream current carries debris away from the inlet locations and toward the diversion dam. A floating debris boom would also help channel debris toward the diversion dam and away from the inlet structures. The new intake would also be oriented to minimize intake of sediment in the diverted water. A new 36-inch diameter pipeline would carry diverted water from the new intake to a new wet well (underground water holding area) underneath the new 10.55-mgd raw water pump station. The new wet well and pump station would be constructed on the west side of the river just downstream from the existing pump station (see **Figure 2.5-6**).

The new pump station would include three pumps, with one pump serving as a backup. The new pump station would tie into electrical power that currently runs along the existing access road. The existing access road would be extended with a short gravel driveway to the new pump station (see **Figure 2.5-6**). The new pump station would be enclosed in a perimeter fence for safety and security, and there would be exterior cameras for remote observation of the facility.

The new pump station would pump the raw water through a new 24-inch pipeline to the existing water treatment plant (Carollo 2014b). The new raw water pipeline would run parallel to the existing raw water pipeline that currently leads to the water treatment plant from the existing pump station (see **Figure 2.5-5**). Raw water from both intake structures would be combined in a junction box at the inlet to the presettling pond at the expanded water treatment plant.

The existing and new intakes and associated pump stations would operate independently, with each station having standby pumps for redundancy. For example, pumps at one station can be serviced and maintained while the other pump station remains in service. The existing and proposed diversion facilities would have a combined diversion capacity of 14.55 mgd, or 22.6 cfs (Carollo 2014b).

North Fork Intake Structure Construction Footprint. Figure 2.5-5 shows the location of the new intake structure, new raw water pump station, and new raw water pipeline. The study area shown on the figure includes at least a 250-foot buffer around the outer edge of all project components to accommodate final engineering design refinements (i.e., final pipeline alignment) and staging areas. Staging areas would be used for stockpiling equipment and construction materials as well as temporary parking. Staging areas would be stabilized and restored at the end of the construction project to match pre-construction conditions.

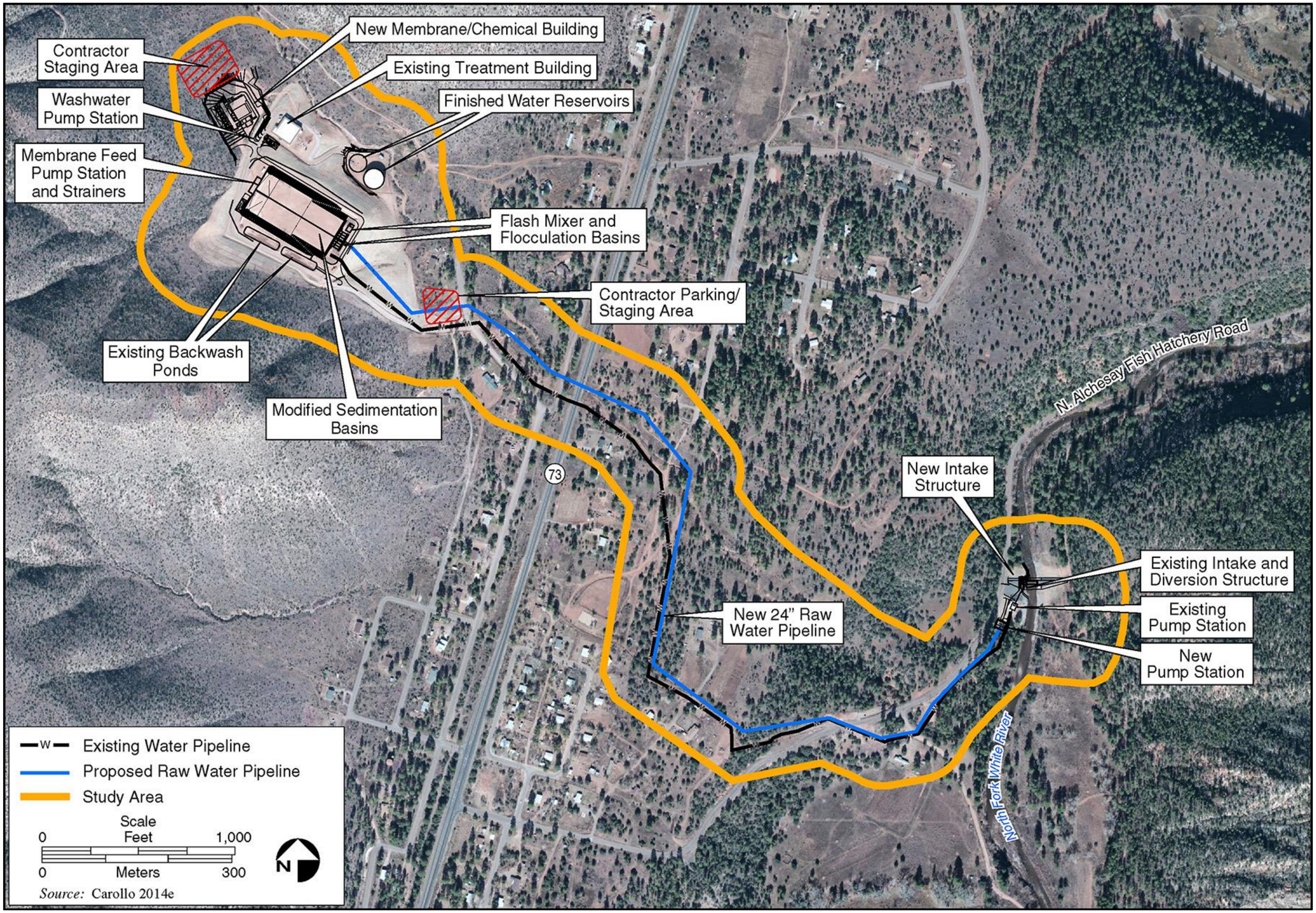

Figure 2.5-5. Proposed Changes to the North Fork Intake Structure and White River Surface Water Treatment Plant

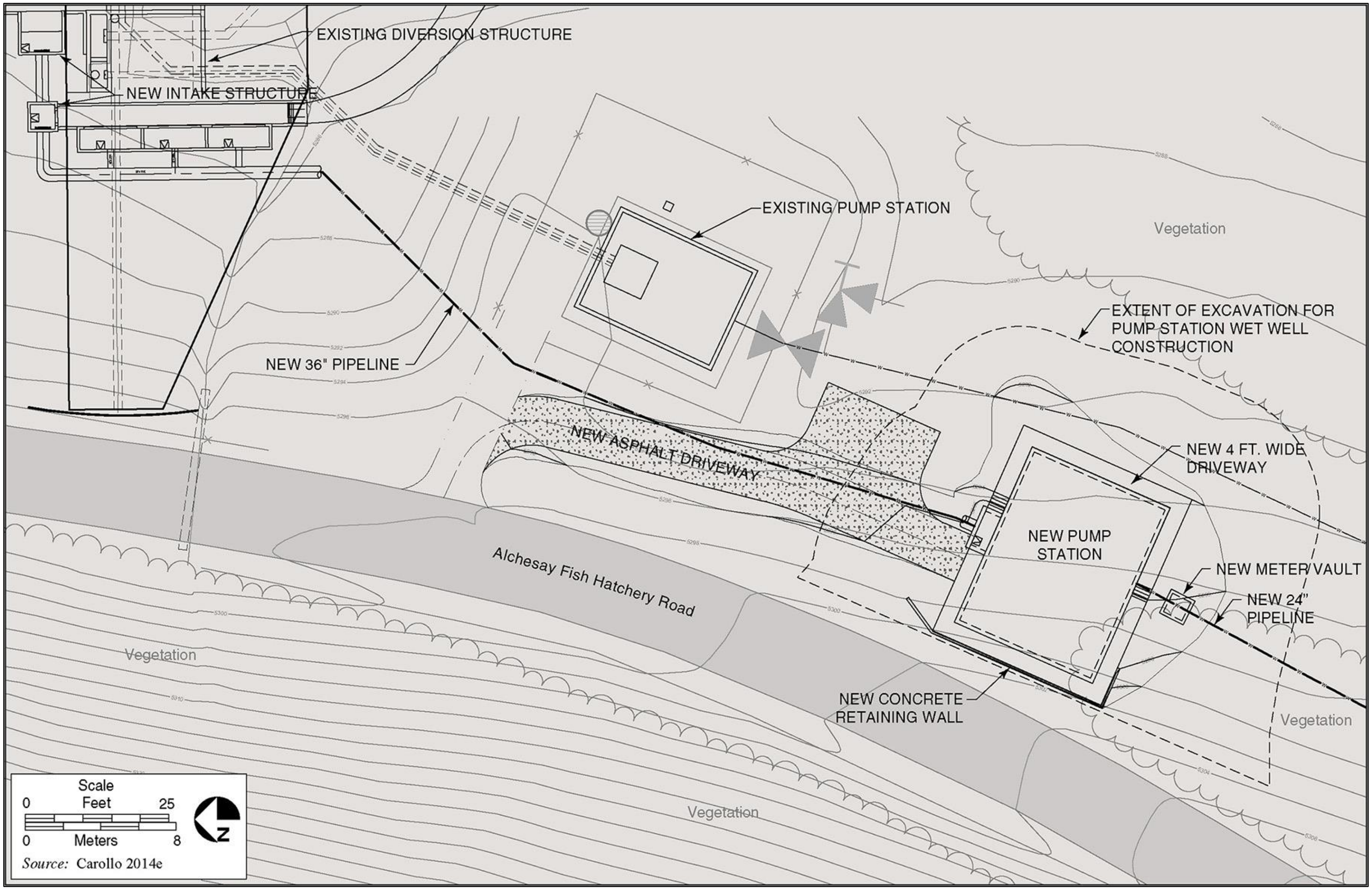

Figure 2.5-6. Proposed New Intake Structure and Raw Water Pump Station

North Fork Intake Structure Construction Activities. Construction activities would include water diversions, conventional excavation, rock excavation, and road crossings, as described below. Construction fencing and temporary lighting would likely be used for safety and security.

Construction of the new intake would require diverting a small portion of the river. A temporary cofferdam or water barriers (e.g., sandbags) would be installed on the west side of the river to allow the installation of the proposed intake structure and piping (Carollo 2014b). The construction area along the west bank would be dewatered, as needed, using pumps. Because water would have to be diverted away from the existing intake, the existing raw water diversion may be taken out of service for 5 or 6 months during construction. The WMAT would use water from the Miner Flat Wellfield to meet water demands during this period.

Although the existing diversion dam would not be modified, the existing grouted riprap that protects the dam from scour would be extended downstream to protect the extension of the new concrete diversion channel structure. Additionally, areas along the river disturbed during construction would be returned to their prior condition.

The pipeline from the new intake to the new wet well would be constructed using conventional equipment for excavation and backfill. Construction for the new wet well and pump station would require excavating 7 to 13 feet below grade and would likely entail rock excavation (using heavy-duty, specialized excavation equipment), in addition to conventional excavation methods. With the proximity to the river, dewatering may be required during the excavation work, as well as shoring along the adjacent roadway.

Construction of the new 24-inch raw water pipeline leading to the water treatment plant would cross two roadways (Alchesay Fish Hatchery Road and SR 73) as well as several utilities and one creek near the water treatment plant. Some crossings would likely use open cut methods (e.g., trenching) because soils are generally too rocky for boring or jacking (Carollo 2014f). Rock excavation may be required for some segments of the new pipeline. Horizontal directional drilling would be required to cross streams and creeks when flowing to avoid impacts on aquatic species.

North Fork Intake Structure Operations and Maintenance. The raw water pump station would be monitored and operated remotely from the water treatment plant. The raw water diversion may need periodic removal of sediment upstream of the existing diversion dam, similar to existing conditions. The frequency and amount of material to be removed is expected to remain the same or decrease after construction of the new intake structure (Carollo 2014f).

Proposed Water Treatment Plant Expansion

Overview. The existing water treatment plant would be expanded from its current production capacity of 1,200 gpm (1.73 mgd) of treated water to a rated production capacity of 10,104 gpm (14.55 mgd) (Carollo 2014a). This would match the design capacity of the expanded North Fork intake structure. The layout of the proposed site development is shown in **Figure 2.5-5** and **Figure 2.5-7**. The following information describes the proposed processes and facility changes for key components of the water treatment plant (Carollo 2014a–e).

Raw water from the NFWR would be pumped to the expanded water treatment plant for treatment. Raw water would enter a new flash mixer, which would add chemicals to condition and destabilize particles in the raw water, and then the water would flow to two new flocculation basins for gentle

Proposed site improvements at the water treatment plant include the following (Carollo 2014e):

- Connect the existing 14-inch and new 24-inch raw water pipelines to the new flash mixing area located adjacent to the flocculation basins.
- Construct a new flash mixer at the inlet to the new flocculation basins.
- Construct two new flocculation basins with vertical turbine flocculators.
- Construct a concrete floor and concrete divider wall in the existing presettling basin to allow the basin to function as two separate sedimentation basins.
- Construct ramps into the modified sedimentation basins, for vehicular access and periodic removal of solids from the basins.
- Construct new sedimentation basin outlet junction boxes to allow withdrawal from varying water depths in the basins and full dewatering of the basins.
- Construct a new membrane feed pump station at the outlet of the new sedimentation basins.
- Construct a new membrane feed water pipeline from the membrane feed pump station to the new membrane treatment facilities.
- Install three new self-cleaning strainers inside the membrane feed pump station.
- Install a new immersed membrane system.
- Construct a new Membrane/Chemical Building to house the membranes and related appurtenances.
- Install a new system for on-site generation of sodium hypochlorite.
- Construct a new baffled steel water storage tank similar to the existing steel storage tank.
- Retrofit the existing steel water storage tank with internal baffles to improve mixing efficiency.
- Construct a new washwater pump station.
- Construct a new washwater recovery pipeline from the pump station to the washwater ponds.
- Install a pipeline to convey washwater supernatant from the ponds back to the head of the plant.
- Install additional inlet and outlet piping to allow greater flexibility in operating the ponds.

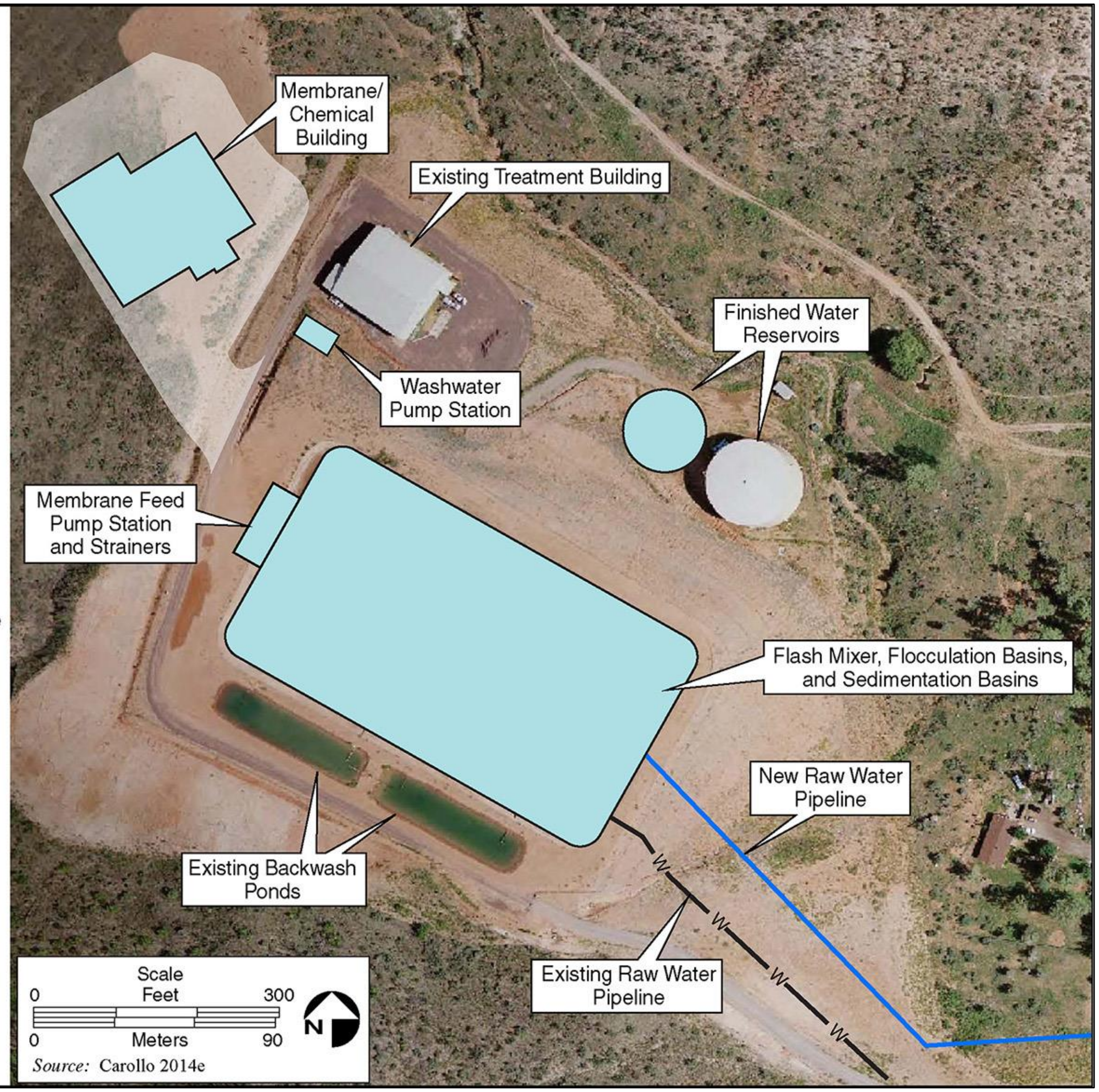

Figure 2.5-7. Proposed Water Treatment Plant Expansion

mixing before entering the sedimentation basins. The existing presettling basin would be modified with a concrete floor and a divider wall to create two separate sedimentation basins. The sedimentation basins would provide preliminary treatment of the raw water by providing a large area for suspended solids to settle out into the basin. The sludge that settles out at the bottom of the basins would need to be dredged periodically and disposed of, similar to the presettling basin at the existing plant (see *Water Treatment Plant Operations and Maintenance* below). A bypass would be provided allowing a basin to be drained for periodic solids removal. Similar to the existing presettling pond, the new basins would also have an overflow outlet that can discharge raw water to a nearby wash for emergency overflow protection.

A new membrane feed pump station would convey settled water from the sedimentation basins to a new 14.55 mgd membrane filtration facility for water treatment. The membranes would be housed inside a new membrane/chemical building located northwest of the existing treatment building in the area that was used by the contractor as a lay-down area during construction of the existing plant.

The building would also contain the cleaning chemicals for the membranes, an on-site sodium hypochlorite generation facility for secondary disinfection, an electrical room, and a mechanical room. A siphon system would use gravity to convey water from the membranes to the finished water reservoirs (storage tanks) and backwash water from the reservoirs to the membranes.

Use of a membrane plant was selected because it results in consistent finished water quality and a near absolute barrier to suspended solids, microorganisms, and certain dissolved contaminants as long as membrane integrity is maintained. Other advantages of a membrane plant include a highly automated process and smaller footprint. The useful life of membranes is about 10 years, and timely membrane replacement is necessary for maintaining membrane performance and reliability.

A new 1.5-million-gallon finished water reservoir together with the existing finished water reservoir would provide a total storage capacity of 3.5 million gallons. The reservoirs would be connected with a common influent pipeline and would operate in parallel. Finished water would then be conveyed by gravity to the water distribution system (see *Proposed Water Distribution System*), similar to current conditions. The new reservoir would have a bypass for draining the tank for periodic maintenance and cleaning. Similar to the existing reservoir, an overflow outlet would be added to the new reservoir for overflow protection and would drain to a nearby wash.

Washwater from "backwashing" or cleaning various systems (e.g., strainers, membranes) would be recycled back to the head of the plant through a new washwater pump station for further treatment. The washwater would be pumped to two existing backwash ponds, which would be modified to serve as washwater clarifiers where solids can settle out into the ponds. From there, water flows back to the new flash mixer to start the treatment process over again. Settled solids would be removed manually from the ponds periodically, similar to the existing backwash ponds.

The new treatment process would not use the existing treatment building, which houses the existing packaged treatment units. There are currently no plans to decommission or remove the existing treatment building or associated recycle water pump, and these components can serve as a backup system to the new treatment process, as needed.

One issue that is currently being studied is the potential formation of disinfection byproducts in the water distribution system given the amount of time water would remain in the 50 miles of distribution pipeline that connects the water treatment plant to Cibecue. There are various strategies for minimizing formation of these byproducts, some of which include adding granular activated carbon (GAC) at the water treatment plant. For example, a new GAC system could be constructed in the existing treatment building or elsewhere within the project footprint. Other strategies would involve additional water treatment within the water distribution system, itself, (see *Proposed Water Distribution System*). Final selection of an optimal strategy will be reflected in the final engineering designs for the project.

Water Treatment Plant Construction Footprint. Figure 2.5-5 shows the location of the new facilities associated with expanding the water treatment plant. The study area shown on the figure includes a 250-foot buffer around the outer edge of the new facilities to accommodate final engineering design refinements and staging areas. Staging areas would be used for stockpiling equipment and construction materials as well as temporary parking. Two potential staging areas, measuring about 2 acres, are shown on the figure. Staging areas would be stabilized and restored at the end of the construction project to match pre-construction conditions. Depending on space limitations, off-site parking for construction workers could be implemented, with crew shuttled to and from the construction site.

Water Treatment Plant Construction Activities. Most of the construction work for the expanded water treatment plant would use conventional equipment for excavation and backfill. However, rock excavation (using heavy-duty, specialized excavation equipment) may be required for some components, such as the new washwater pump station and the new membrane/chemical building. Construction fencing and temporary lighting would likely be used for safety and security.

During construction, the existing water treatment plant would need to be taken offline periodically, especially to facilitate work in the existing presettling basin and to establish new electrical service. The WMAT would use water from the Miner Flat Wellfield to meet water demands during this period.

Water Treatment Plant Operations and Maintenance. Similar to current operations, the water treatment plant would require monitoring, inspections, general maintenance, and periodic adjustment of chemical additives. Most operations would be controlled from a plant control center within the water treatment plant.

As noted above, the sludge that settles out at the bottom of the sedimentation basins would need to be dredged periodically and disposed of, similar to the existing presettling basin. The basins would need to be cleared out one or two times a year. About 860,000 pounds of solids is expected to be removed each year and taken to a landfill on the Reservation (e.g., Geronimo Pass Landfill) for disposal (Carollo 2014b). Similarly, about 90,000 pounds of solids is expected to be removed each year from the backwash ponds.

Neutralized waste (e.g., neutralized cleaning solutions) would be disposed of in the sewer system, similar to existing conditions. This includes about 77,000 to 92,000 gallons per month of neutralized waste (Carollo 2014b). Additionally, the water softener system uses a brine solution, which would also be disposed of in the sewer system.

Proposed Water Distribution System

Overview. The proposed water distribution system would include the construction of 50 miles of new water transmission pipeline from the water treatment plant to Cibecue (**Figure 2.5-8** through **Figure 2.5-11**). The pipeline would deliver treated surface water from the NFWR to the communities of Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue (Morrison-Maierle 2015). The pipeline would start at the expanded water treatment plant, about 4 miles north of Whiteriver. It would run roughly parallel to SR 73 for about 32 miles, cross overland for about 7 miles, and run parallel with BIA Road 12 for about 11 miles. The pipeline would end at an existing 500,000-gallon water tank in Cibecue (Cibecue Tank). Along this route, the new pipeline would connect to existing water mains near each community and would also connect to the Tan and Green water storage tanks near Whiteriver (Morrison-Maierle 2015).

The majority of the pipeline would consist of polyvinyl chloride (PVC) pipe (about 238,000 feet), and the balance would consist of ductile iron and steel pipe (about 16,600 and 9,600 feet, respectively). The pipes would range from 12 to 30 inches in diameter (Morrison-Maierle 2015). Approximately 190 vaults, the majority of which would be constructed of PVC, would be installed along the pipeline to allow access for maintenance, testing, and repairs. A variety of valves that perform different functions (e.g., reducing pressure, flow control, isolation, draining) would be located along the pipeline based on safety, operational control, and pipe protection parameters. A fiber optic line also would be installed along the pipeline to aid communication between the various pipeline features. Connections between tanks and the new pipeline would include a flow meter and electric actuated control valve to provide flexibility and control over water distribution to accommodate varying demands along the pipeline route (Morrison-Maierle 2015).

The proposed water distribution would also include two booster pump stations and three new storage tanks to ensure adequate pressure and flow throughout the 50-mile system (Morrison-Maierle 2015) (see **Figure 2.5-8** through **Figure 2.5-13**). Water from the expanded water treatment plant would flow by gravity to the new Cedar Gap Tank, then feed down the pipeline to the new Cedar Creek Pump Station. The Cedar Creek Pump Station would boost water to the new Cedar Creek Tank and to the new Carrizo Pump Station. The Carrizo Pump Station would then boost water to the new Cibecue Ridge Tank and to the end of the distribution line at the existing Cibecue Tank. **Figure 2.5-12** provides an example of a site layout for one of the proposed pump stations (Cedar Creek Pump Station). The feasibility design includes electrical plug-ins at each pump station so that a portable trailer-mounted engine generator could be used during a prolonged power outage.

The three new ground-level storage tanks would be located between Canyon Day and Cibecue, along the new water transmission pipeline (Morrison-Maierle 2015). The tanks would serve to attenuate distribution demands, reduce the pump cycling at the pump stations, and provide emergency water storage. The Cedar Gap Tank would hold about 240,000 gallons (33 feet high and 36 feet in diameter); the Cedar Creek Tank would hold about 140,000 gallons (33 feet high and 28 feet in diameter); and the Cibecue Ridge Tank would be the largest tank and hold about 1,300,000 gallons (38 feet high and 78 feet in diameter). **Figure 2.5-13** provides an example of a site layout for one of the proposed tanks (Cibecue Ridge Tank).

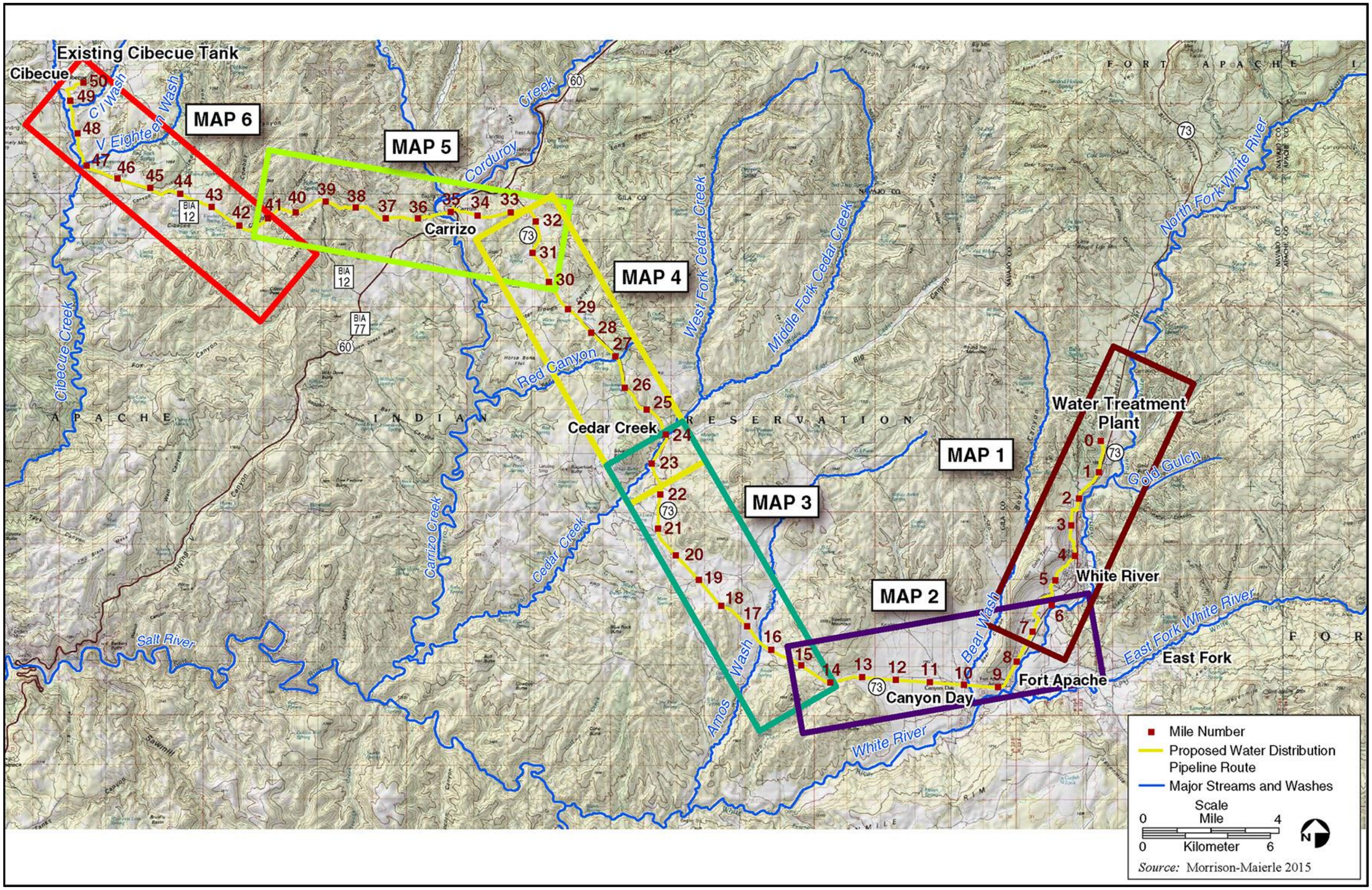

Figure 2.5-8. Overview of the Proposed Water Distribution System

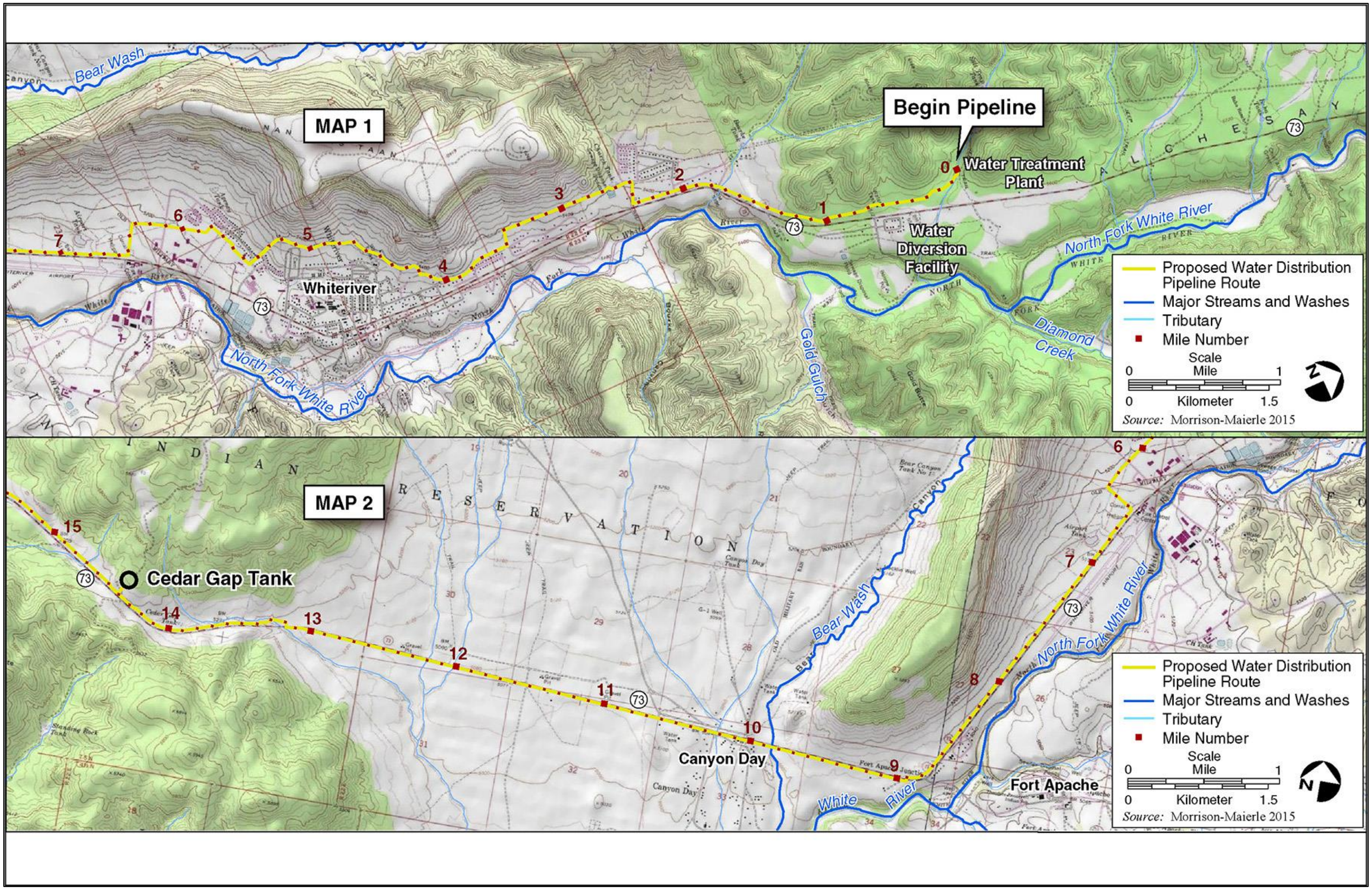

Figure 2.5-9. Proposed Water Distribution System – Detailed Maps 1 and 2

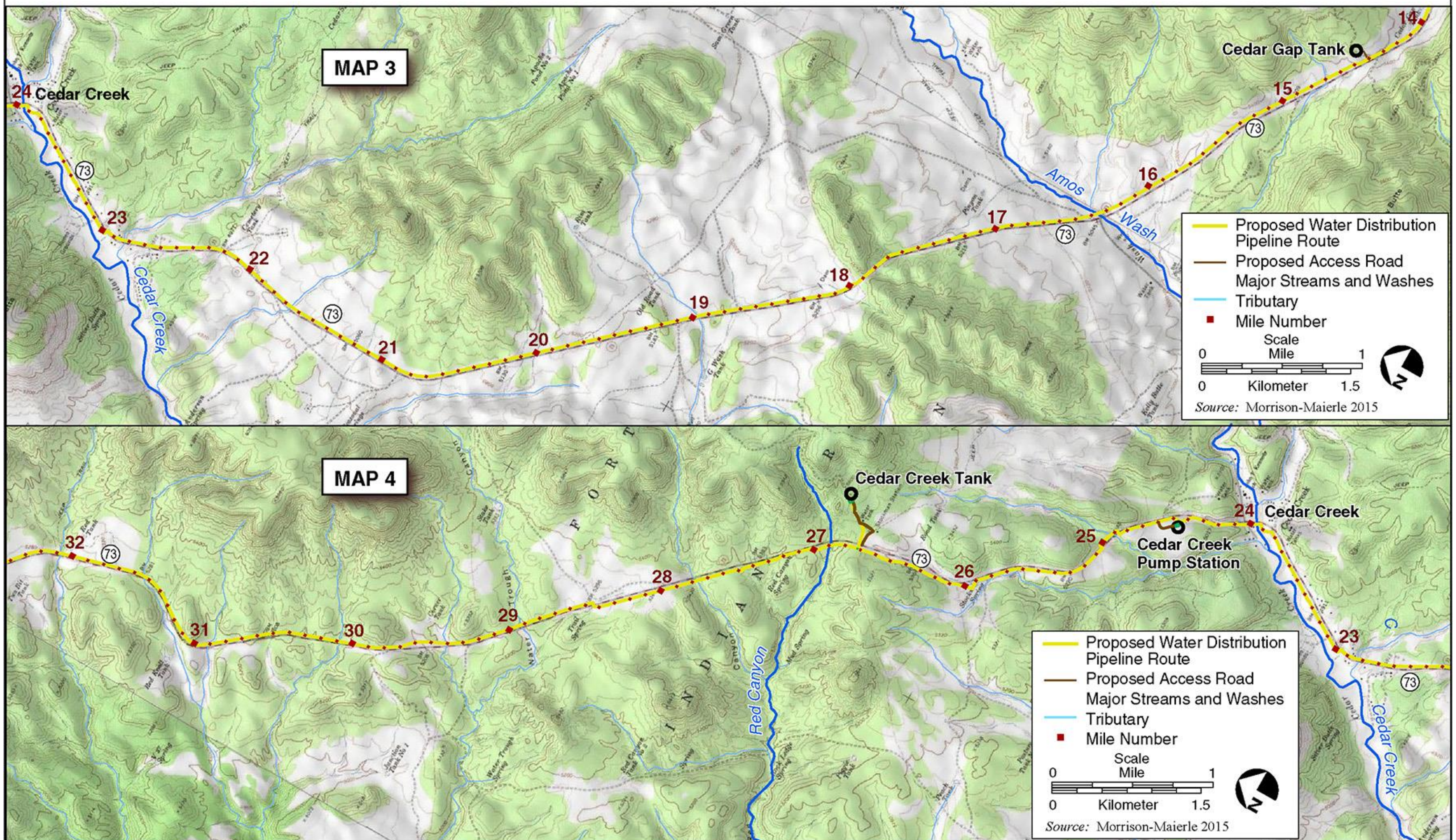

Figure 2.5-10. Proposed Water Distribution System – Detailed Maps 3 and 4

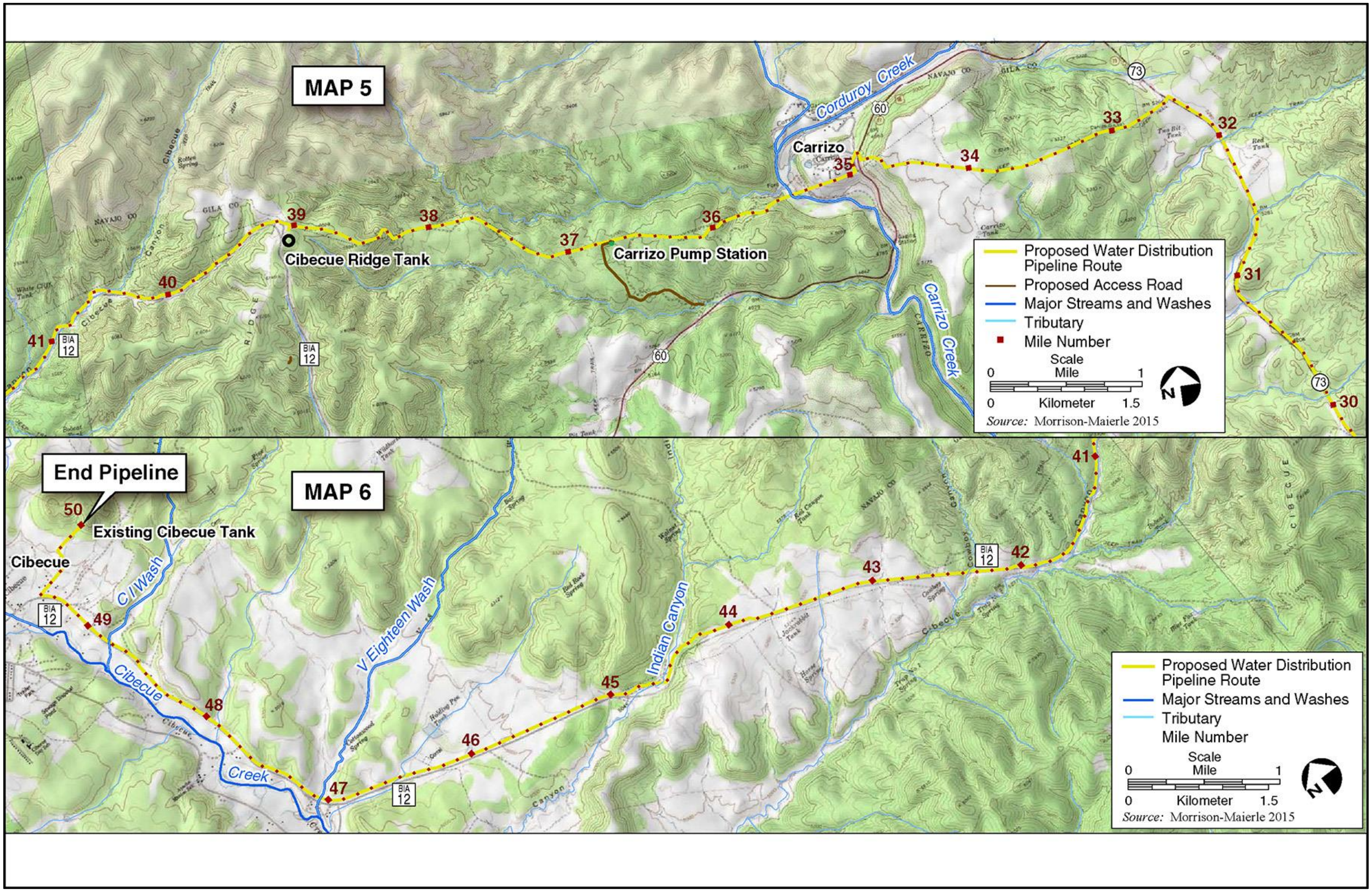

Figure 2.5-11. Proposed Water Distribution System – Detailed Maps 5 and 6

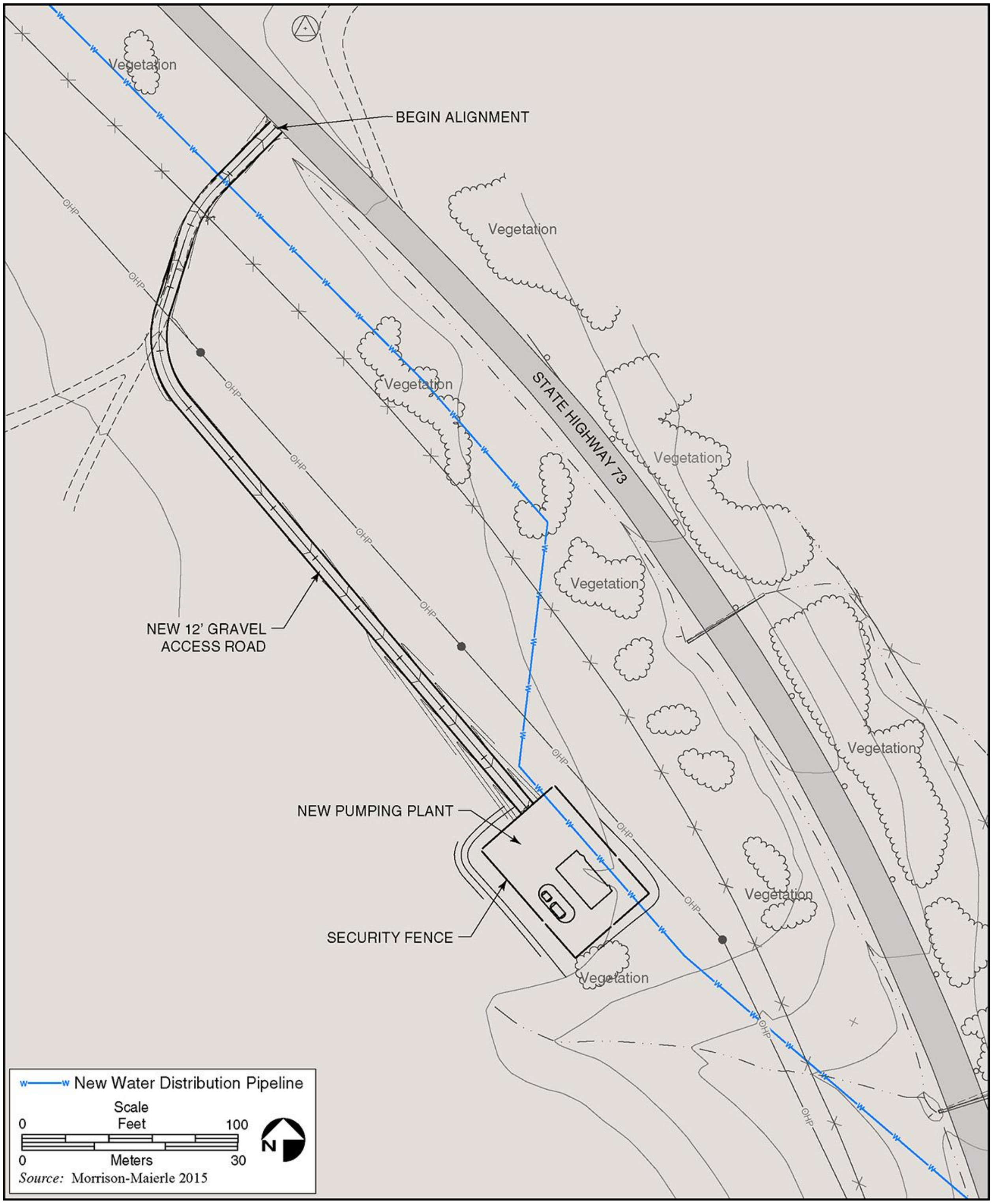

Figure 2.5-12. Construction Plans for the Proposed Cedar Creek Pump Station

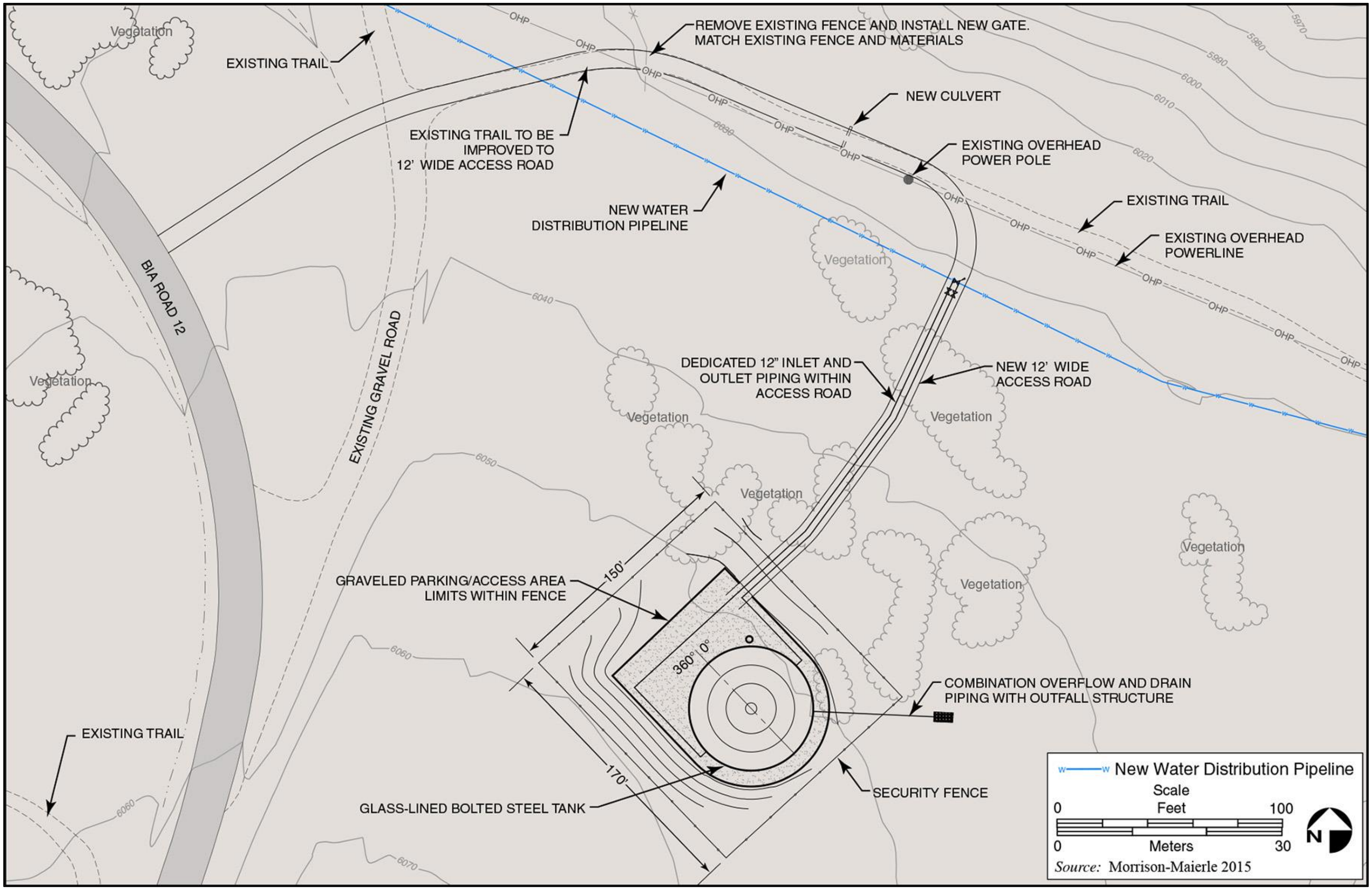

Figure 2.5-13. Construction Plans for the Proposed Cibecue Ridge Tank

Electrical power would be supplied from nearby high voltage power lines, where available (Morrison-Maierle 2015). Electrical facilities located within the greater Whiteriver service area are sufficient to handle the electrical needs of the pipeline improvements in this area. Electrical facilities located outside of the greater Whiteriver area are capable of supporting pipeline improvements that only require single-phase power. The local electric utility company, Navopache Electric Cooperative (NEC), would need to install a new three-phase power line from the greater Whiteriver area to Cedar Creek for the new Cedar Creek Pump Station (Morrison-Maierle 2015). The new power line (with new poles) would run parallel to the proposed water distribution pipeline along SR 73.

As noted in the section on the *Proposed Water Treatment Plant Expansion*, one issue that is currently being studied is the potential formation of disinfection byproducts in the water distribution system given the amount of time ("water age") water would remain in the 50-mile system. To address the water quality issues associated with a long water age, the system may include disinfection booster stations at the water storage tanks to raise residual chlorine levels. If so, chlorine and ammonia would be stored at these locations. If final project designs use chloramine instead of chlorine to disinfect the treated water, the disinfection booster stations would likely not be required (Morrison-Maierle 2015).

There are currently no plans to decommission or remove components of the existing water distribution system (e.g., existing pipelines, water tanks, pumping stations, or related existing public water system facilities within or leading to Canyon Day and Cedar Creek).

Water Distribution Construction Footprint. The study area for the water distribution system includes a 50-foot buffer on both sides of the proposed pipeline (100-foot corridor). There would be staging areas for stockpiling of equipment and construction materials and temporary parking areas. The exact location of the staging and parking areas is unknown, but most would likely be within or adjacent to the construction footprint. For the pump stations and storage tanks, about 1 to 1.5 acres would be disturbed at each location from construction and staging activities, including developing areas for maintenance parking, electrical power line connections, and security fencing (Morrison-Maierle 2014). The new pump stations and storage tanks also would require new gravel access roads (12-feet wide, 12-inches deep) ranging from about 850 feet to 1 mile in length.

Pipeline construction would need about 20 staging areas along the 50-mile route (about one every 2.5 miles), and each would require about 1 acre of level ground that is cleared of vegetation (Morrison-Maierle 2014). The staging areas for the new pump stations and storage tanks could serve as staging areas for nearby pipeline construction. Any staging areas outside the construction footprint would be stabilized and revegetated at the end of the construction project to match pre-construction conditions.

Water Distribution Construction Activities. The water distribution pipeline would be buried at a minimum depth of 5 feet (Morrison-Maierle 2015). In developed areas (in communities or near highways), trench boxes would be used during construction when feasible to minimize disturbance to existing roads/infrastructure. Following trenching and burial of the pipeline, the surface of the disturbed areas would be restored through re-seeding and revegetation to pre-construction conditions.

The pipeline would cross Cedar and Carrizo Creeks, and other smaller streams and drainage features, over its 50-mile length (Morrison-Maierle 2015). For most of these crossings, the pipeline would be buried 7 feet below the ground surface to limit the potential for scour (Morrison-Maierle

2015). When feasible, directional drilling techniques such as jack and bore and horizontal directional drilling would be used instead of open cut methods (e.g., trenching). Horizontal directional drilling would be required to cross Carrizo Creek, which is perennial in most segments, as well as Cedar Creek or other ephemeral streams when flowing to avoid impacts on aquatic species. Dewatering is not anticipated for pipeline trenching (Morrison-Maierle 2015). Similar methods would be used for highway and utility crossings.

During work within or near drainages or creeks, erosion and sedimentation control BMPs would be used to minimize sedimentation and pollution, as described in the measures under *Water Resources* and *Soils and Geology* in **Appendix A.2** (*Best Management Practices*). In a few locations, improvements downstream of roadway culverts may be needed to prevent erosion of the pipeline trench.

Most of the construction work would use conventional equipment for excavation and backfill. However, rock excavation (e.g., drilling, blasting, and hydraulic hammers) may be required in some areas along the pipeline (Morrison-Maierle 2015). Construction fencing and temporary lighting would likely be used in some areas for safety and security.

During construction, there could be periodic disruptions to the existing water distribution system, such as when connections are being made between the existing and new systems (Morrison-Maierle 2014). For example, existing storage tanks would need to be drained before connecting to the new system. It could take several days for a tank to be put back into service. During that time, alternative methods for serving the affected community would need to be implemented (e.g., trucking in water).

Water Distribution Operations and Maintenance. Similar to current operations, the water distribution pipeline, booster pump stations, and storage tanks would require monitoring, inspections, and general maintenance. This would include monitoring the control system readings and outputs to ensure the system pressures and water elevations are within the proper ranges. Operations would also include taking samples to check water quality throughout the distribution system.

Groundwater from the Miner Flat Wellfield would be used primarily to serve rural water system communities north of the water treatment plant. If groundwater was needed for communities south of the water treatment plant (e.g., the water treatment plant was under repair or inoperable), an actuated valve could be opened, and groundwater could be routed south through a new 30-inch water line (Morrison-Maierle 2015).

2.5.4 Summary of Alternatives

Table 2.5-1 provides a summary of the project components associated with each alternative addressed in this EIS.

Table 2.5-1. Summary of Alternatives

Description	No Action	A	B	C	D
WMAT Rural Water System					
Construction of the WMAT rural water system • New Miner Flat Dam and instream reservoir • North Fork intake structure expansion • Water treatment plant expansion • New water distribution system	-	X	X	X	X
WMAT rural water system water diversions • Up to 7,602 afy diversion with 3,030 afy depletion • Used for municipal, rural, and industrial water use for the greater Whiteriver area, Carrizo, and Cibecue	-	X	X	X	X
Downstream Irrigation Diversions					
Water diversions to irrigate up to 885 acres in Canyon Day • Up to 2,843 afy diversion with 2,491 afy depletion	-	X	X	-	-
Water diversions to irrigate up to 3,000 acres in Canyon Day • Up to 9,637 afy diversion with 8,444 afy depletion	-	-	-	X	X
Downstream Minimum Flows					
11 cubic feet per second minimum instream flow to support water diversions for the Alchesay National Fish Hatchery	-	X	X	X	X
Preserving minimum flow levels downstream of the Miner Flat Dam[1]	-	X	-	X	-

Key: afy = acre-feet per year; WMAT = White Mountain Apache Tribe; X = included; - = not included

[1] Historical minimum river flow levels were based on monthly flows over the period from 1958 through 2020 (63 years) calculated from actual and synthetic gage data. Monthly minimums were defined as the historical flow that was exceeded 99 percent of the time (1 percentile flow) plus 1 cubic foot per second for specific locations within the model grid (see JE Fuller 2020 for more information).

2.6 Connected Actions

Connected actions, as defined in 40 CFR 1508.25(a)(1), are those that are closely related to the proposed action and should be discussed in the same EIS. Connected actions that have been identified for the proposed WMAT rural water system are associated with downstream agricultural activities in the Canyon Day area.

2.6.1 History of Canyon Day Farming

The following history is based on the *Project Extension Report* (WMAT 2007). The WMAT began irrigating lands above the valley floors around Canyon Day in the early 1980s. The Tribe chose this area based on a 1979 land classification study that identified potentially suitable land for irrigation farming. Based on this study and further geographic information system refinement, about 7,073 acres were identified as potentially suitable irrigation farmland in the Canyon Day area (**Figure 2.6-1**). Under the Canyon Day Irrigation Project in the early 1980s, the WMAT developed 885 acres of this land for farming, located just west of the community of Canyon Day and south of SR 73 (**Figure 2.6-1**). The Tribe primarily grew feed base for livestock, such as pasture grasses and alfalfa. Water for irrigation came from two sources: (1) water pumped from the White River below the confluence of the NFWR and EFWR and (2) treated wastewater pumped from the Whiteriver Wastewater Lagoons. The Canyon Day Irrigation Project was discontinued after a few years of operation and is not currently active, although there are smaller individual farms still active in the Canyon Day area. The 885 acres are currently available for future farming activities.

2.6.2 Reinitiation of Canyon Day Farming (Connected Action under Alternatives A and B)

Under Alternatives A and B of the proposed action addressed in this EIS, proposed dam and water system operations would accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate farming activities in the 885 acres that were cultivated under the Canyon Day Irrigation Project. While the water diversions are part of the proposed action, other future actions by the WMAT to reinitiate farming are considered a connected action.

The WMAT is still in the planning process regarding future Canyon Day farming, and many details are currently unknown. Future farming activities would occur within the 885 acres previously established by the Canyon Day Irrigation Project (see **Figure 2.6-1**). The WMAT would likely focus on specialty crops, such as apples, berries, corn, cantaloupe, chili, dry beans, and onions, mixed with grains and alfalfa. The typical irrigation season is expected to begin in April and end in September, with water demand volumes dependent on a number of factors including crop type, irrigation efficiency, weather, and runoff forecasts (WMAT 2007). Water diversions would occur below the point where the NFWR and EFWR meet and would likely include the site where diversions occurred in the 1980s. New and/or modified infrastructure would be needed to divert, pump, and distribute water for irrigation, but specific details are not known at this time. For example, the WMAT would likely need to install a new diversion structure or upgrade the one used in the 1980s. It is currently unknown whether or not treated wastewater from the Whiteriver Wastewater Lagoons would be used to irrigate forage crops (i.e., those not grown for human consumption).

If the WMAT chooses to reinitiate 885 acres of farming in Canyon Day, the Tribal Council would approve the planning and construction. The WMAT will follow the *Tribal Plan and Project Review* process to ensure that all projects on the Reservation are consistent with Tribal and Federal laws, policies, and regulations.

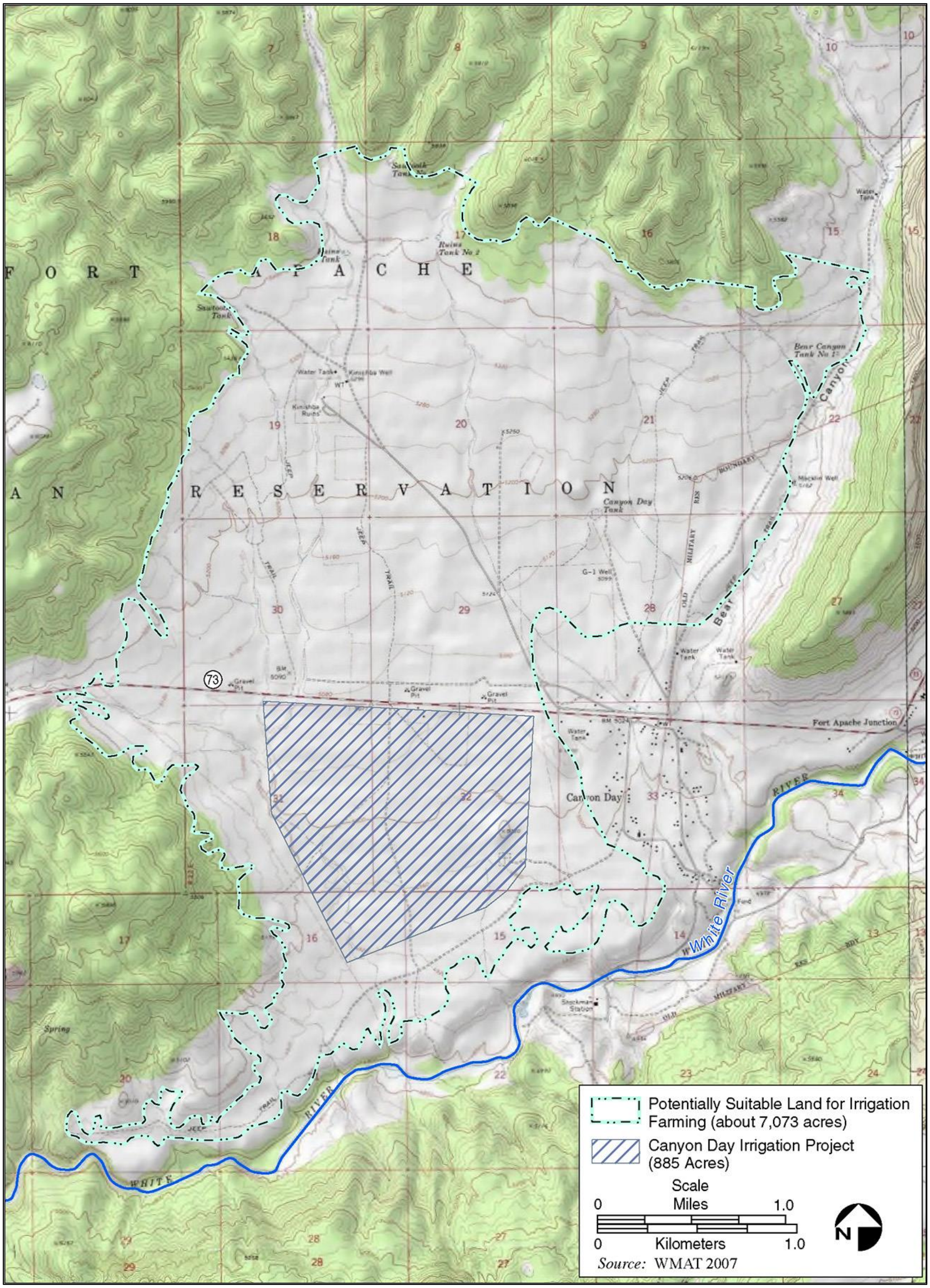

Figure 2.6-1. Canyon Day Farming

2.6.3 Expansion of Canyon Day Farming (Connected Action under Alternatives C and D)

Under Alternatives C and D of the proposed action addressed in this EIS, proposed dam and water system operations would accommodate downstream irrigation diversions that would allow the WMAT to expand farming activities in Canyon Day beyond what had been developed in the 1980s. These diversions would provide sufficient water for the WMAT to irrigate up to 3,000 acres of farmland. While the water diversions are part of the proposed action, other future actions by the WMAT to expand farming are considered a connected action.

As noted above, the WMAT is still in the planning process regarding future Canyon Day farming, so many details are currently unknown. If the Tribe chooses to expand farming, the 3,000 acres would include the 885 acres that were farmed in the 1980s as well as an additional 2,115 acres to be located within the area shown as potentially suitable for irrigation farming in **Figure 2.6-1**. The area identified as potentially suitable is large enough to provide flexibility in the final siting of the additional acreage. It is expected that final selection of the acreage would focus on undeveloped lands that would avoid existing housing, other assigned land uses (e.g., smaller individual farms), and other sensitive areas (e.g., cultural resources and sensitive species habitat). The WMAT would likely focus on specialty crops, such as apples, berries, corn, cantaloupe, chili, dry beans, and onions, mixed with grains and alfalfa. Water diversions would occur below the point where the NFWR and EFWR meet and would likely include the site where diversions occurred in the 1980s. New and/or modified infrastructure would be needed to divert, pump, and distribute water for irrigation, but details are not known at this time. It is currently unknown whether or not treated wastewater from the Whiteriver Wastewater Lagoons would be used to irrigate forage crops (i.e., those not grown for human consumption).

If the WMAT chooses to expand farming in the Canyon Day area, the Tribal Council would approve the planning and construction. The WMAT will follow the *Tribal Plan and Project Review* process to ensure that all projects on the Reservation are consistent with Tribal and Federal laws, policies, and regulations.

2.7 Alternatives Considered and Eliminated from Further Study

Pursuant to the Quantification Act, the U.S. Congress authorized and directed Reclamation to plan, design, and construct a water system to distribute water from the NFWR. Because the proposed action is directed by Congress as part of a water right settlement, viable alternatives are limited to those that (1) contain all components of the WMAT rural water system directed by Congress (see Section 307(a) of the Quantification Act); (2) are generally consistent with the water system design set forth in the *Project Extension Report* (WMAT 2007) and ratified in the Quantification Act (see Section 307(c) of the Quantification Act); and (3) can be constructed with the appropriation allocation made available by the Quantification Act. Various alternatives to dam construction, as well as alternative project siting and/or alternative design elements, have been considered in the past. However, these alternatives were eliminated from further consideration in this EIS because they do not comply with the specific requirements of the Quantification Act. More details are provided in **Section 2.7.1** (*Alternatives to Dam Construction*) and **Section 2.7.2** (*Alternative Project Siting and Design Elements*).

2.7.1 Alternatives to Dam Construction

Alternatives to dam construction for supplying current or future WMAT water needs have been considered and rejected during past projects, and some of these are summarized below:

- Drilling additional wells in the Miner Flat Wellfield was rejected because this option would rely on source water from the Coconino Aquifer that is currently experiencing drawdown and depletion (Kaczmarek 2002). As described in **Section 2.3.1** (*Miner Flat Wellfield [Groundwater]*), the Miner Flat Wellfield does not have the capacity to meet near-term or long-term water demands for the Reservation. Drilling additional wells would still rely on a limited groundwater source and would not meet the projected average daily water demand or maximum demand for the rural water system design population. Even with additional wells, the sustainable supply of the wellfield was estimated at 1,400 gpm (Kaczmarek 2018).
- During environmental review for the development of the existing North Fork intake structure and water treatment plant (IHS 2005), one alternative included development of deep wells into the Coconino Aquifer along the northern boundary of the Reservation along the Mogollon Rim near Pinetop and Hondah, treating the water at a central plant, and delivering the water via a new 9-mile transmission line, to join the water produced from the Miner Flat Wellfield. That alternative was rejected due to high cost and limited production capacity of the Coconino Aquifer along the northern boundary of the Reservation and further south. Drilling additional wells would not meet the projected average daily water demand or maximum demand for the rural water system design population. However, well development in this area may be considered by the WMAT as a future project to help meet domestic and commercial water requirements along the northern boundary of the Reservation (i.e., water demands not addressed by the proposed action).
- Use of shallow wells in the NFWR alluvium as a water source was considered but rejected based on limited water storage and production capacity of the alluvium (IHS 2005). Drilling alluvial wells would not increase production capacity to the level needed to satisfy the water demands of the Reservation.
- Feasibility of a water system that relies on increased use of both groundwater and unregulated surface flow sources of the NFWR (without construction of a dam) has been considered but rejected. Without the added storage capacity of a dam, this approach would not meet the projected average daily water demand or maximum demand for the rural water system design population.

2.7.2 Alternative Project Siting and Design Elements

Alternative Dam Locations and Designs

In the early 1980s, four alternative dam and reservoir sites (along with the Miner Flat Dam site) were identified and evaluated: Kinishba, Stockman, Canyon Day, and Airport. A comparative evaluation of these sites considered water storage capacity, recreational potential, hydroelectric generating potential, irrigation supply, and the need to relocate facilities and structures due to reservoir inundation. The four alternative dam sites were rejected as alternatives for this action, in part because these sites are located downstream from the majority of water users and, therefore, there would be high electricity demand to deliver water to the various communities. The Miner Flat Dam site, located upstream from most water users, was determined to be the most acceptable siting location.

To further refine the siting of the Miner Flat Dam, a 1987 Design Memorandum (Morrison-Maierle 1987) recommended a dam location in a narrow gorge along the NFWR, downstream from a sharp bend in the river. In 2013, Gannett Fleming (2013c) reviewed the original dam location from the 1987 study as well as three alternate siting locations (183 feet downstream, 220 feet downstream, and 349 feet downstream of the original location). Potential dam locations further south than about 350 feet downstream were rejected because the geological conditions would only support a dam with a lower crest height and, therefore, would result in a much lower total reservoir storage capacity compared to the original dam location. The final selection of the dam site, as shown in **Figure 2.5-4** (about 350 feet downstream from the original location), was based on optimizing local geological and hydraulic site conditions.

The 1987 Design Memorandum (Morrison-Maierle 1987) also evaluated alternative types of dams, including earth-filled, rock-filled, concrete thin arch, and concrete gravity (conventional concrete gravity and roller-compacted concrete). The earth-filled, rock-filled, and concrete thin arch dam alternatives were rejected due to lack of suitable source materials in the vicinity of the dam site, lowered storage capacity, and/or local geological constraints. The study recommended a roller-compacted concrete design as the most economical, practical, low maintenance, and safe dam design for this location.

Gannett Fleming (2013c) again reviewed the roller-compacted concrete design and rock-filled dam design for the current dam location and concluded that the rock-filled dam alternative would have significantly reduced reservoir capacity and would be subject to risk of failure due to overtopping during flood events. Additional design elements could be added to the rock-filled dam to increase safety (e.g., construct a separate spillway and concrete or geomembrane facing system), but this would significantly increase the cost of a rock-filled dam compared to a roller-compacted concrete dam design. Therefore, the rock-filled dam design was rejected from further consideration.

Alternative Water Treatment Plant and Intake Diversion

A thorough evaluation process, including a pilot study, led to the selection of the proposed treatment plant site, diversion and intake locations, and water treatment processes, as described in **Section 2.5.3** (*Project Details under All Action Alternatives*). This evaluation process is documented in the *Rural Water System 30% Water Treatment Plant Design* (Carollo 2014a–e). The choice of water treatment methods was made first and influenced the siting and configuration for the water treatment plant and diversion and intake decisions. The site evaluation process reviewed 15 alternative candidate sites for a new treatment plant, as an alternative to expanding the existing water treatment plant (Carollo 2014a). The evaluation considered the following: site topography; availability; accessibility; constructability; site hydrology; proximity to utilities; environmental impacts; cultural resources impacts; site security; and life cycle costs. The alternative site locations for a new treatment plant were rejected for various reasons, including poorer water quality, issues with land ownership, noncompatible land use, limited site accessibility, and higher construction and/or operational costs (see Carollo 2014a).

The decision to expand the existing water treatment plant influenced the subsequent decision to use the existing North Fork intake structure, as described in **Section 2.5.3** (*Project Details under All Action Alternatives*). For example, an option that was rejected involved constructing a new diversion dam, intake, and pump station just north of Diamond Creek. That alternative was rejected due to higher construction and permitting costs (Carollo 2014a).

Alternative Water Distribution System

Alternatives for water distribution pipeline design were evaluated in conjunction with the water treatment plant evaluation process described above (Morrison-Maierle 2015). Each potential water treatment plant alternative required different pipeline capacities and pumping requirements to provide water distribution from the water treatment plant to Cibecue. Twelve different options for the water distribution system were analyzed as part of the evaluation for the water treatment plant. The decision to expand the existing water treatment plant allowed for lower system pressures than the other alternatives and significantly lower power demands for the water distribution system because no pump station was required in the initial stretch of the pipeline distribution system (Morrison-Maierle 2015).

Alternative Dam Operations and Water Diversions

As part of the dam operations modeling process for the proposed action, other operational scenarios were modeled in addition to the scenarios associated with Alternatives A through D. For example, a preliminary scenario was modeled based on water demands associated with irrigating up to 5,875 acres of Canyon Day farmland. This would entail an annual irrigation water use up to 16,202 afy and 14,677 afy for diversion and depletion, respectively. However, modeling demonstrated that this scenario led to continuous water shortages for the communities of the greater Whiteriver area, Carrizo, and Cibecue (JE Fuller 2022). Therefore, increasing water diversions to support up to 5,875 acres of Canyon Day farmland was rejected because it conflicted with the purpose and need for the proposed action.

2.8 Preferred Alternative

At the conclusion of this NEPA analysis process and in accordance with the NEPA implementing regulations (40 CFR 1502.14[e] and 43 CFR 46.425[a]), Reclamation will select one of the alternatives described in this Draft EIS as its preferred alternative. The public is encouraged to comment on specific project components and alternatives described in this EIS. These comments will be used to further refine the analysis for the Final EIS and help develop Reclamation's preferred alternative. The preferred alternative will be identified in the Final EIS. The WMAT has requested that Reclamation identify Alternative C as the preferred alternative. The selection of the preferred alternative will consider public comments and the full analysis in the Final EIS.

2.9 Summary Comparison of Alternatives

Chapter 3 (*Affected Environment and Environmental Consequences*) presents the anticipated and potential impacts on the human and natural environment that could occur from implementing the alternatives. Key findings of the impact analysis of the NEPA action alternatives are summarized in **Table 2.9-1**.

Under the No Action Alternative, the proposed WMAT rural water system would not be built, and the residents of the Reservation would continue to rely on existing water systems. The existing water system is inadequate to meet current and projected demands based on limited sources of water and expected community growth. Declining groundwater levels and limited surface flows from the NFWR during low flow periods would continue to result in periodic water shortages. Continued water shortages would have a detrimental effect on future population growth and economic health of the communities on the Reservation and would adversely affect opportunities for agricultural expansion. Lack of sufficient water supply to meet current and future demands could result in greater reliance on groundwater resources at the Miner Flat Wellfield to serve the greater Whiteriver area. Under these conditions, increased extraction of groundwater could be required to meet water demands, exceeding the sustainable yields and resulting in a drawdown of groundwater elevations and less pumping capability. This could lead to a decline in future wellfield production and would result in a major adverse impact to groundwater resources. Without construction of the rural water system, the WMAT would not be able to fully benefit from their 1871-reserved water rights or use of their trust lands due to a lack of infrastructure needed to divert, store, and distribute water from the NFWR over and above current diversions. Additionally, the provision of the Quantification Act instructing the Secretary to construct the WMAT rural water system would not be fulfilled.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Water and Hydrology	Beneficial effects would derive from meeting minimum instream flow requirements and reducing the number of zero flow days (i.e., the number of days with no measurable streamflow). Beneficial effects would also derive from reducing the potential for future depletions of local groundwater resources at the Miner Flat Wellfield and reducing the reliance on aquifers currently serving the communities of Carrizo and Cibecue. Operation of the dam and rural water system would result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 5,521 afy from the White River and attenuating peak flows on a regular basis, primarily during summer months when the reservoir is below full pool level. Adverse impacts would also occur during certain portions of the year (late summer to early winter) when the proposed action would result in temperature increases in dam outflows that exceed the water	Impacts would be similar to Alternative A, although instream flows could drop below historic minimum flow levels more often than under Alternative A.	Impacts would be similar to Alternative A, except that Alternative C would not meet the projected future population and irrigation demands under all conditions. In this case, future population demand would be prioritized over irrigation to ensure the aims of the proposed action could be achieved. Operation of the dam and rural water system would result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 11,474 afy from the White River and attenuating peak flows during summer months and low precipitation years and during regular fluctuations in the reservoir level. Also, satisfying the higher water demands associated with this alternative would likely result in the reservoir being drawn down further and more frequently compared to Alternatives A and B. There would also be more agricultural activities associated with the Canyon	Impacts would be similar to Alternative C, and Alternative D would not meet the projected future population and irrigation demands under all conditions. Also, among the four action alternatives, Alternative D would result in the highest percentage of time that the instream minimum flow requirements would not be met. Satisfying the higher water demands associated with this alternative would likely result in the reservoir being drawn down further and more frequently compared to Alternatives A and B. Impacts from the Canyon Day connected action would be the same as Alternative C.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	quality standards contained in the Water Quality Protection Ordinance. Construction and operation of the Canyon Day connected action would result in water quality changes and risks to designated water uses for surface and groundwaters. Additionally, operation of the dam would result in minimal to moderate changes to the downstream flow regime, primarily increasing minimum instream flows but also attenuating peak flows during summer months when the reservoir is below full pool level and a portion of the inflow is being stored. The majority of peak flows, particularly those associated with spring runoff events, would not be affected.		Day connected action under Alternative C, which could result in water quality changes and risks to designated water uses for surface and groundwaters.	
Geology and Soils	Ground disturbance from construction activities, subsurface treatment options, vegetation removal within the reservoir inundation area, and future farming under the Canyon Day connected action would result in increased soil erosion and sedimentation. Erosion control and monitoring plans,	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the extent of possible soil erosion impacts associated with the Canyon Day connected action would be greater given the larger area proposed for agricultural activities.	Impacts would be the same as Alternative C.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	which would identify construction and post-construction monitoring requirements and BMPs, would minimize or reduce impacts. With incorporation of appropriate engineering design features and compliance with dam safety guidelines, the geologic risks associated with Alternative A would be minimized.			
Biological Resources	Construction and operation of the rural water system would result in direct and indirect adverse impacts to vegetation communities; wildlife; native fishes, semi-aquatic species, and aquatic habitats; wetlands; and sensitive species. Impacts would be minimized or reduced, but not fully resolved, through the use of standard water quality BMPs and biological resource mitigation measures that would include: (1) restoration of disturbed areas such as staging areas and pipeline route; (2) pre-construction surveys, construction monitoring, and project wildlife management; (3) seasonal avoidance and	Construction and operation impacts would be the same as Alternative A. Although Alternative B would not prioritize instream minimum flow requirements, modeling demonstrates that water releases to meet downstream demand under this alternative would provide the same increase in minimum instream flows and, thus, impacts would be comparable to Alternative A.	Impacts would be similar but larger in magnitude as compared to Alternative A because modeling indicates the frequency of flow attenuation would increase. However, under Alternative C, minimum instream flows would be prioritized to ensure that minimum flows would meet or exceed historic minimums. The extent of possible habitat impacts associated with the Canyon Day connected action would also be greater given the larger area proposed for agricultural activities, some of which would likely be previously undisturbed.	Impacts would be similar to other alternatives but would be larger in magnitude because modeling indicates the frequency of flow attenuation would increase. Major and unavoidable long-term adverse impacts on aquatic habitats and fisheries would result from implementation of Alternative D, including an increase in time that the NFWR near Gold Gulch would dry out. Impacts from the Canyon Day connected action would be the same as Alternative C.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	construction planning; (4) long-term habitat monitoring; and (5) avoidance of riparian habitats. Permanent removal and modification of aquatic free-flowing stream habitat and conversion to a reservoir would represent a major unavoidable adverse impact. Removal and loss of potentially jurisdictional features would be mitigated or compensated for as part of the permit process with the USACE, and a CWA Section 404(b)1 analysis will be completed. Construction and operation of the Canyon Day connected action could result in additional impacts on wildlife habitat and nearby aquatic wetlands or riparian habitats.		Conversion to cultivated farmland would reduce diversity and value as wildlife habitat.	
Recreation	Construction-related activities would diminish or displace fishing, hiking, and camping access along the NFWR near the proposed dam, reservoir, and intake structure. Access restrictions would be short-term, except for those areas within the footprint of the reservoir that would be permanently inundated (including the Lower Log	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except proposed farming expansion under Alternative C would focus on undeveloped lands, some of which may be currently used by the public or by WMAT members for general recreational activities (e.g., hiking, horseback riding).	Impacts would be similar to Alternative C. Unlike the other alternatives, Alternative D would result in lower river flow and a localized decrease in available aquatic habitat for fishing, which would be most detectable around the Gold Gulch area below the intake structure. Impacts from the Canyon Day connected action

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	Campground) and at the dam infrastructure. These impacts could be offset by long-term benefits of new and improved fishing opportunities, depending on future stocking strategy, which is one of the primary drivers of recreation visitation to the Reservation. The Canyon Day connected action is expected to have negligible impacts on recreation.			would be the same as Alternative C.
Cultural Resources	Six historic properties, including one traditional cultural property, would be adversely affected because they are located within the area that would be flooded by the new reservoir. Even though data recovery measures would be used to mitigate impacts, where feasible, impacts would remain unavoidable. Other known historic properties along the water distribution pipeline route and within Canyon Day farming areas would be avoided per the agreed-upon measures in the Memorandum of Agreement between Reclamation and the Tribal Historic Preservation Office. Any activities that involve ground/soil	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the extent of possible impacts on historic properties associated with the Canyon Day connected action would be greater given the larger area proposed for agricultural activities.	Impacts would be the same as Alternative C.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	disturbance would also have the potential to damage buried and previously unknown resources, and measures are provided in the Memorandum of Agreement to minimize potential impacts.			
Indian Trust Assets	Operation of the rural water system would be a major beneficial use of trust lands to the WMAT and would allow the WMAT access to some of their 1871-reserved water rights. Construction activities, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect cultural heritage resources, including trust assets related to natural and cultural resources.	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the extent of possible impacts on cultural heritage resources and trust assets related to natural and cultural resources would be greater given the larger area proposed for agricultural activities associated with the Canyon Day connected action. Conversely, expanded agricultural activities would result in a greater beneficial use of trust land and water rights for the WMAT than under Alternatives A or B.	Impacts would be the same as Alternative C.
Energy and Public Utilities	Operation of the rural water system would result in a long-term, major beneficial impact by providing a reliable and sustainable good-quality potable water supply to WMAT residents and businesses. Construction design addressed additional electrical power transmission and distribution	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except there may be an increase in solid waste and energy use given the expanded agricultural activities associated with the Canyon Day connected action compared to Alternatives A and B.	Impacts would be the same as Alternative C.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	facilities needed for operation of the project components. Construction activities would result in only minor disruptions to utilities.			
Transportation	There would be a short-term increase in truck and vehicle traffic over a 3- to 4-year period related to delivery of new equipment, materials, and workers to and from the various construction sites. There would be intermittent, temporary lane closures or other disruptions, especially where project components run parallel to or cross major roadways. There would also be an unknown amount of potential traffic disruptions from construction and operation of the Canyon Day connected action.	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except there may be an increase in long-term traffic from the expanded agricultural activities associated with the Canyon Day connected action compared to Alternatives A and B.	Impacts would be the same as Alternative C.
Public Health and Safety	Construction of the Miner Flat Dam would result in a low but unavoidable adverse risk to public health and safety; however, the dam would be constructed, operated, and maintained in accordance with applicable dam safety guidelines and requirements, which would minimize this risk. There would	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except a greater portion of peak flows would potentially be retained to fill the reservoir, resulting in greater attenuation of downstream peak flows and greater potential reduction on the magnitude or frequency of flooding. There may be an	Impacts would be the same as Alternative C.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	be a minor beneficial effect on flood safety because the potential for downstream flooding would be reduced when the reservoir is filling, although most flood events would pass through the reservoir with little attenuation and little effect on the magnitude or frequency of flooding. Construction and operations, including future Canyon Day farming activities, would be conducted in accordance with applicable labor safety requirements.		increase in the extent of possible safety risks, primarily related to occupational hazards, from the expanded agricultural activities associated with the Canyon Day connected action compared to Alternatives A and B.	
Socio-economics	Construction and operation of the rural water system would result in a major beneficial economic impact for the WMAT by providing a reliable and consistent supply of irrigation water to support up to 885 acres of Canyon Day farming. There would be minor beneficial effects on employment and earnings from the short-term employment of construction workers and expenditures associated with the purchase of materials and equipment. The loss of revenue from the Lower Log Campground would be balanced	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the project would supply irrigation water to support up to 3,000 acres of Canyon Day farming, which would result in a greater beneficial economic impact for the WMAT than under Alternatives A and B.	Impacts would be similar to Alternative C. Unlike the other alternatives, Alternative D would result in lower river flow and a localized decrease in available aquatic habitat, which would be most detectable around the Gold Gulch area downstream from the intake structure. This may lead to a minor and unquantifiable adverse effect on fisheries revenue. Impacts from the Canyon Day connected action would be the same as Alternative C.

Table 2.9-1. Summary of Environmental Consequences from the Action Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D
	by long-term beneficial economic impacts from new and improved fishing opportunities.			
Environmental Justice	The rural water system would provide a long-term, major beneficial economic impact for minority and low-income populations living on the Reservation. There would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children.	Impacts would be the same as Alternative A.	Impacts would be similar to Alternative A, except the project would supply irrigation water to support up to 3,000 acres of Canyon Day farming, which would result in greater agriculture-related employment, expenditures, and income that could benefit minority or low-income populations than under Alternatives A and B.	Impacts would be the same as Alternative C.

Key: afy = acre feet per year; BMPs = best management practices; CWA = Clean Water Act; NFWR = North Fork of the White River; Reclamation = Bureau of Reclamation; Reservation = Fort Apache Indian Reservation; USACE = United States Army Corps of Engineers; Water Quality Protection Ordinance = *Water Quality Protection Ordinance of the White Mountain Apache Tribe of the Fort Apache Indian Reservation*; WMAT = White Mountain Apache Tribe

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Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This chapter presents a description of the environmental and socioeconomic resources that could be affected from implementing any of the alternatives and an analysis of the potential effects of each alternative.

3.1.1 Impact Methods

Direct and Indirect Impact Analysis

The affected environment considered in this analysis varies by resource and is defined in the respective sections. The affected environment describes the context for evaluating the potential for resource presence, importance, and impact risk. The impact analysis for each resource is focused only on areas where the applicable resource is likely to be impacted by the proposed action. For most resource areas, impact analyses focus on the proposed study area (i.e., project footprints and buffers defined in **Chapter 2**, *Description of the Proposed Action and Alternatives*). Other resources may look at a broader area, like an entire watershed (water resources) or county (socioeconomics).

For each resource area carried forward for detailed analysis, the resource section describes the current affected environment and provides an impact analysis of the No Action and action alternatives, including a discussion of the connected actions as defined in **Chapter 2** (*Description of the Proposed Action and Alternatives*). In some instances, the level of impact could be reduced through implementation of mitigation measures and/or BMPs. BMPs, including general impact avoidance and minimization measures identified in **Appendix A.2** (*Best Management Practices*), are inherently part of the proposed action and are not potential mitigation measures proposed as a function of the NEPA environmental review process. The proposed mitigation measures are introduced under each resource section, as needed per the NEPA review process, and are summarized in **Appendix A.3** (*Mitigation Measures).* Additionally, impacts remaining after mitigation (i.e., residual impacts) are described for each resource area and compared across alternatives.

Cumulative Impacts Analysis

In addition to assessing the direct and indirect effects, this analysis considers the cumulative impacts, consistent with CEQ NEPA regulations and guidance (40 CFR 1508.25; CEQ 1997). The CEQ defines a cumulative impact as "the impact on the environment which results from the incremental impact of [an] action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The evaluation of cumulative impacts is intended to capture the full range of potential consequences of an action under review, in combination with the additive or combined effects of other actions on the same resources of concern.

Ongoing and reasonably foreseeable actions are described in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*). Effects from past actions are accounted for in the existing environment section of each resource topic. Reclamation guidance states that the assessment of future cumulative impacts should be based on known or reasonably foreseeable long-range plans, regulations, operating agreements, or other information that establishes them as reasonably foreseeable (Reclamation 2012). Ongoing and reasonably foreseeable future actions considered in the cumulative impact analysis are the projects, programs, and plans of the WMAT, Federal, State, local, and private groups that are likely to occur within the next 10 years within the project region.

Incomplete or Unavailable Information

The CEQ's NEPA regulations require that, in an EIS, a Federal agency identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse effects (40 CFR 1502.22). In this EIS, the best available information was used for analyzing potential impacts to resources. Certain information was unavailable because plans and/or engineering designs are still in process (e.g., final engineering designs of the proposed project components) or resource inventories are incomplete or outdated. Types of data that are incomplete or unavailable include the following:

- Descriptions of the proposed project components are based on available engineering design studies (HDR, Inc. 2021; Gannett Fleming 2013a, 2013b, 2013c, 2014; Carollo 2014a–e; Morrison-Maierle 2015). The North Fork intake structure expansion, water treatment expansion, and water distribution system project components are at the 30 percent engineering design level. The 30 percent design of the Miner Flat Dam is currently being prepared. The impact analysis incorporated sufficient buffers around each project component to accommodate final engineering design refinements.
- The WMAT is still in the early planning process regarding future Canyon Day farming, and many details are currently unknown (see **Section 2.6**, *Connected Actions*). Therefore, it is not possible to provide the same level of impact analysis in comparison to the WMAT rural water system components. If the WMAT chooses to farm either 885 acres or up to 3,000 acres in Canyon Day, the Tribal Council would approve the planning and construction, and the WMAT would follow the *Tribal Plan and Project Review* process to ensure that all projects on the Reservation are consistent with Tribal and Federal laws, policies, and regulations. However, without knowing whether there would be a Federal nexus (e.g., Federal encroachment permit or other Federal action), it is unclear at this time which Federal laws, policies, or regulations would apply to the WMAT's action.
- Many project-specific species surveys have been completed, and the White Mountain Game and Fish Department (WMGFD) continually conducts non-project-specific surveys across the Reservation. However, surveys only provide a point-in-time assessment of habitat or species occurrence. In the case of southwestern willow flycatchers (*Empidonax traillii extimus*), aquatic snakes, and other aquatic species, the most recent comprehensive surveys were completed in 2013. Yellow-billed cuckoo (*Coccyzus americanus*) surveys were completed in 2018. For the purposes of this EIS, the status of surveys and information available (i.e., best available information) is described in **Table 3.4-2**. Surveys will continue for many of the species after publication of the EIS. In addition, no sensitive species surveys of the future Canyon Day farming area have been completed because that project is still in the early

planning process, and many details are currently unknown (see **Section 2.6**, *Connected Actions*).

3.1.2 Impact Terminology

This EIS discusses both direct and indirect effects as defined in 40 CFR 1508.8. Direct effects are caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. When determining whether an effect is "significant," as used in NEPA, the analysis considers both the context and intensity of the effect as defined in 40 CFR 1508.27. Context means that the significance of an action must be analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality. Intensity refers to the severity of impact. Where appropriate to help define the effects of the proposed action, potential impacts are characterized using the following descriptors:

- **Negligible or Inconsequential** — This indicates no measurable or observable change from existing conditions. The impact on the resource would be at or below the levels of detection.
- **Minor or Minimal** — This indicates a small, detectable, or measurable change. The impact could be outside the range of natural or typical variability but occur for a very brief duration, or could be within the natural or typical range of variability but occur for a longer period of time. Mitigation, if implemented, or the implementation of BMPs would be easily applied and successful with a high degree of certainty.
- **Moderate** — This indicates an easily discernible or measurable change. The effects may be readily apparent and result in measurable impacts on the resource such that it affects the availability or natural recovery of those environmental elements over the long term. Alternatively, these effects could be substantial but of a short duration with no permanent impact on the resource. It is anticipated that implementation of BMPs and/or mitigation would be successful with a high degree of certainty.
- **Major** — This indicates a large observable or measurable change. The effects would result in substantial impacts to the resource that would be readily apparent, consequential, and outside the natural or typical range of variability. Mitigation, if implemented, would be uncertain in its success, or ineffective with consequent long-term and permanent changes in the availability or natural recovery of the resource.
- **Beneficial** — This indicates a positive change in the condition, appearance, or function of the resource.
- **Adverse** — This indicates a negative change that moves the resource away from or detracts from its condition, appearance, or function.
- **Short-term** — This indicates a temporary change, generally occurring during construction. Specific time periods relating to short-term impacts are not defined for this project but would likely occur during construction or for a limited time thereafter (generally 1 to 3 years).

- **Long-term** — This indicates a permanent change. Long-term impacts typically last beyond the construction period, and the resources impacted may not regain their preconstruction conditions for a longer period of time.

3.1.3 Resource Areas Retained and Dismissed from Further Consideration and Analysis in this Environmental Impact Statement

All potentially relevant environmental resource areas were initially considered for analysis. In compliance with NEPA, the CEQ, and Reclamation guidelines, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

This chapter provides a detailed analysis of the following environmental and socioeconomic resource areas: water resources, geology and soils, biological resources, recreation, cultural resources, Indian Trust Assets (ITAs), energy and public utilities, transportation, public health and safety, socioeconomics, and environmental justice. Several additional potential issues and resource topics were raised during the project scoping and planning phase. After careful consideration and in accordance with 40 CFR 1502.1, Reclamation determined that some of the potential issues and resource topics did not warrant detailed discussion in this EIS, given that they would not be significantly affected by the construction and implementation of the proposed WMAT rural water system and their further consideration would not aid in the discernment among alternatives. Consequently, the following issues and resource topics are briefly evaluated in this section, then dismissed from further analysis in this EIS.

Air Quality

Air quality at a given location can be described by the concentrations of various air pollutants in the atmosphere. The USEPA establishes the National Ambient Air Quality Standards (NAAQS) to regulate criteria air quality pollutant levels. The USEPA classifies the portions of Navajo and Gila Counties that surround the project area as in attainment for all NAAQS.

Air quality impacts resulting from construction activities under the action alternatives would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and haul trucks and (2) fugitive dust emissions (PM_{10} [particulate matter less than or equal to 10 microns in diameter] or $PM_{2.5}$ [particulate matter less than or equal to 2.5 microns in diameter]) due to the operation of equipment on exposed soil. Emissions mainly would impact areas surrounding a given construction activity and would cease when construction ends. Any temporary disturbance areas would be revegetated or restored to previous conditions.

Appendix D (*Air Quality Emissions*) presents estimates of emissions and resulting impacts that would occur from proposed construction under all action alternatives. The largest contributors to emissions in any annual period would include pipeline installation and construction of the Miner Flat Dam. Operation of equipment and trucks on unpaved surfaces would be the main sources of PM_{10}/$PM_{2.5}$ emissions. Peak annual construction emissions would equate to no more than 1.2 percent of the annual emissions generated within either Gila or Navajo County in 2017 for any criteria air pollutant (nitrogen oxides). Combustive emissions produced from the mobile and intermittent operation of construction equipment and trucks over a large project area would quickly disperse in the atmosphere to levels that would not contribute to an exceedance of a NAAQS at any location. Implementation of standard dust control measures described under *Air Quality* in **Appendix A.2** (*Best Management Practices*) would ensure that PM_{10}/$PM_{2.5}$ emissions from construction would remain below NAAQS levels. Additionally, the on-site concrete batch plant used for proposed construction activities would be subject to emission limitation requirements through New Source Review permitting and Best Available Control Technology.

Proposed construction equipment would emit hazardous air pollutants that potentially could impact public health. The main source of hazardous air pollutants would occur in the form of particulates from the combustion of diesel fuel. Project construction would emit a maximum of 2.18 tons per year of diesel particulate matter, which equates to less than 0.03 percent of the combined hazardous air pollutants emitted in either Gila or Navajo County in 2017. The mobile and intermittent release of these emissions over a large project area would result in very low ambient concentrations of hazardous air pollutants in a localized area and, therefore, would produce minimal impacts to public health.

Appendix D (*Air Quality Emissions*) also presents estimates of emissions that would occur from operation and maintenance under the action alternatives. These data show that the operation of proposed mobile equipment would generate minor amounts of air emissions and, therefore, would not contribute to an exceedance of a NAAQS at any location. As such, air quality is not discussed further, and additional analysis in this EIS is not warranted.

Climate Change

Greenhouse gases trap heat in the atmosphere by absorbing infrared radiation. The most common greenhouse gases emitted from natural processes and human activities include carbon dioxide, methane, and nitrous oxide. The main source of greenhouse gases from human activities is the combustion of fossil fuels, such as fuels from crude oil and coal. Recent scientific evidence indicates a correlation between increasing global temperatures over the past century and the worldwide proliferation of greenhouse gas emissions by humans (U.S. Global Change Research Program [USGCRP] 2018). Climate change associated with global warming is predicted to produce negative environmental, economic, and social consequences across the globe.

Observed changes due to global warming include rising temperatures, shrinking glaciers and sea ice, thawing permafrost, sea level rise, a lengthened growing season, and shifts in plant and animal ranges. In the Southwest region (Arizona, California, Colorado, Nevada, New Mexico, and Utah), observed changes include an increase in drought and wildfire conditions, a reduction in winter snowpack, and lower streamflows in major drainage basins (USGCRP 2017). Recent assessments of climate change conclude that global warming will continue into the foreseeable future and will intensify as a function of anthropogenic greenhouse gas emissions and changes in land uses. Predictions of long-term negative environmental impacts to Arizona from global warming include (1) longer and hotter heat waves, which will produce more severe and frequent droughts; (2) an increase in wildfires, particularly in more wooded and higher elevations such as the project region; (3) a decrease in average seasonal precipitation by year 2100 under the highest greenhouse gas emission scenario (Representative Concentration Pathway 8.5); (4) a continuation in the decrease of winter snowpacks; and (5) a continuation in the decline in river flow and soil moisture (Gonzalez et al. 2018). Cumulative impacts for hydrology with regard to climate change are analyzed in **Section 3.2** (*Water Resources and Hydrology*).

Appendix D (*Air Quality Emissions*) presents estimates of greenhouse gas emissions that would occur from construction and operation under all action alternatives. The greenhouse gas emissions from proposed construction and operation would incrementally contribute to future climate change.

However, these emissions would equate to an infinitesimal amount of the total worldwide greenhouse gas inventory. As such, climate change, as a stand-alone resource, is not discussed further, and additional analysis in this EIS is not warranted.

Noise Impacts on the Human Environment

Under the action alternatives, noise from construction, operation, and maintenance of the proposed WMAT rural water system has the potential to cause disruption and annoyance to nearby noise-sensitive locations (e.g., residences). A detailed noise analysis was conducted to determine expected noise levels for the various project components, giving special attention to construction equipment, blasting, and hauling of materials as these activities are most likely to result in increased noise levels (**Appendix E**, *Noise*). Construction noise would be temporary, lasting for the duration of the construction project, and most construction activities near noise-sensitive receptors would be limited to normal working hours. Based on the distance to noise-sensitive receptors, impacts are expected to be limited to annoyance, and annoyance levels would be minimized with implementation of public notifications outlined under *Noise* in **Appendix A.2** (*Best Management Practices*) to alert people ahead of particular construction activities (e.g., blasting). There would be no risk of damage to structures or hearing loss due to noise and vibration generated by any action alternative.

Operation and maintenance of the rural water system would generate noise of minimal intensity and duration. Machinery in the water diversion facility, water treatment plant, and pumping plants would generate a hum that could be audible immediately outside of the facilities but would be similar in nature to noise from existing facilities. Maintenance of the system may involve the operation of certain pieces of equipment (e.g., lawn mowers and trucks), but associated noise would be temporary and localized. Noise from future agricultural activities in Canyon Day would be similar to existing activities in the nearby area. As such, noise impacts on the human environment are not discussed further, and additional analysis in this EIS is not warranted. For noise impacts on wildlife, see **Section 3.4** (*Biological Resources*).

Paleontology

Paleontology is the study of former life forms (fossils) contained within geologic units. Although no fossils have been reported from the project area, vertebrate fossils have been found in similar strata and within the same depositional basin approximately 35 miles away near Payson and Springfield, Arizona (Elliott and Blakely 2005, McCord 2014, Mead et al. 2005). Construction activities under all action alternatives have the potential to uncover and potentially adversely affect (e.g., disturb or destroy) fossils, especially excavations within Pennsylvanian to Permian sedimentary rocks of the Naco Group (primarily of sandstone, shale, and limestone) and Quaternary sediments. These types of soil strata are located in the canyon bottom at the dam site, in the proposed dam borrow area, along dam access roads, at the water treatment plant, and along portions of the water distribution pipeline (pipeline mile markers 10 to 12, 14 to 34, and 35.5 to 50 shown in **Figure 2.5-8**). Implementation of a Paleontological Discovery Plan described under *Paleontology* in **Appendix A.2** (*Best Management Practices*) would ensure that any fossils discovered during construction would be handled appropriately. As such, paleontology is not discussed further, and additional analysis in this EIS is not warranted.

Land Use

Under all action alternatives, some land uses would change based on proposed project components and future farming activities. For example, the project site for the proposed Miner Flat Dam and reservoir is mainly open land (the NFWR and associated riparian and upland vegetation) with some recreational use (see **Section 3.5**, *Recreation*). Additionally, some undeveloped, open land would be converted to new uses for the development of the other components of the WMAT rural water system. For Canyon Day farming operations, future farming activities would occur within 885 acres that were already approved for farming activities in the 1980s (*all action alternatives*), and proposed farming expansion would focus on undeveloped lands that would avoid existing housing, other assigned land uses (e.g., smaller individual farms), and other sensitive areas (e.g., cultural resources and sensitive species habitat) (*Alternatives C and D only*). Overall, proposed activities under all action alternatives would be compatible with existing land uses in the surrounding area. All action alternatives would also be consistent with the WMAT Land Code (WMAT 2005b), which governs the management and administration of lands on the Reservation for beneficial use and occupancy.

There would be no permanent change in zoning, land ownership, or entitlements under any alternatives. All construction activities would take place on the Reservation, which is held in trust for the beneficial use of the WMAT (see **Section 3.7**, *Indian Trust Assets).* Appropriate ROW easements and encroachment permits would be issued prior to construction. Once construction is completed, any temporary disturbance areas would be revegetated or restored to previous conditions. Additionally, ownership of the completed rural water system would be conveyed to the WMAT after Reclamation successfully operates the system for a period of 3 years, after the WMAT has been provided with technical assistance to operate and maintain the system, and after the operating criteria, standard operating procedures, monitoring criteria, emergency action plan, and first filling and monitoring criteria are in place. As such, land use is not discussed further, and additional analysis in this EIS is not warranted.

Visual Resources

Visual resources are generally defined as the natural and built features of the landscape visible from public views that contribute to an area's visual quality. Proposed construction under all action alternatives would affect the visual landscape within the project area. Views of ongoing construction activities (e.g., presence of construction equipment, staging areas, and work-in-progress) would be short-term and temporary, and any temporary disturbance areas would be revegetated or restored to previous conditions. Post-construction, many project elements would have minimal effects on the viewshed because they would be built adjacent to similar existing structures (e.g., expanded footprints for the water diversion structures and water treatment facilities near similar, existing facilities) or buried underground (e.g., pipelines). The new water distribution system would include two booster pump stations and three new storage tanks visible aboveground. However, these aboveground facilities would resemble similar existing water distribution structures so that the visual contrast of these elements within the existing viewshed would be minimal. Similarly, proposed farming activities in Canyon Day would be visually consistent with the rural setting of the area.

The most prominent new feature associated with the proposed action would be the Miner Flat Dam and reservoir. The dam would be built in a canyon below nearby SR 73. Individuals traveling on SR 73 experience prominent foreground views of open grasslands and trees, with distant background views of the undulating ridgelines of the surrounding foothills. Once the dam is built, travelers driving north along the highway would have a brief view of the dam and ancillary structures.[18] Travelers driving both north and south along the highway would also have glimpses of the new reservoir. Given the 55 mile-per-hour speed limit for drivers traveling along this stretch of SR 73 and the short duration the dam and reservoir would be visible to travelers (likely less than 2 minutes), this change would have minimal effect on the overall visual quality from the roadway.

The dam and reservoir would result in a long-term change in the general landscape visible from public views along the NFWR near the dam and reservoir. After construction, the viewshed visible by recreational visitors would include a larger water body and new non-natural structures. While the proposed action does not include development of any new recreational facilities, the WMAT may fund future development projects (e.g., construction of boat ramps, picnic areas, and camping facilities) under separate actions to support future recreational opportunities at the new reservoir. The WMAT and Federal agencies will comply with all applicable environmental requirements, which may include additional NEPA review, if appropriate. Recreation sites would continue to be managed for visual aesthetics, per the recreation standards found in the Forest Management Plan (WMAT 2005a).

All action alternatives would have minimal short-term and long-term impacts on visual resources. As such, this resource is not discussed further, and additional analysis in this EIS is not warranted.

Agriculture

The proposed action would accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities to support up to 885 acres (*Alternatives A and B*) or 3,000 acres (*Alternatives C and D*) of farming, resulting in a long-term beneficial effect. Under Alternatives C and D, if the WMAT chooses to expand farming into undeveloped areas in Canyon Day, it is expected that final selection of the acreage would avoid impacting other assigned land uses (e.g., smaller individual farms) (see **Section 2.6**, *Connected Actions*). Additionally, construction activities associated with the rural water system is not expected to disrupt water distribution for existing agricultural plots. Without the proposed action, future agricultural activities would be adversely affected by continued water shortages. Given the negligible short-term adverse impacts and long-term beneficial effects from the proposed action, this resource is not discussed further, and additional analysis in this EIS is not warranted. For economic effects on the WMAT from agricultural activities, see **Section 3.11** (*Socioeconomics*).

Forestry and Timber Harvesting

Construction under all action alternatives would impact existing forests, primarily by clearing some forested areas during construction, albeit areas that are not currently commercially logged, and such areas could not be reforested. However, the forest clearing would result in a potential short-term benefit in that the WMAT could process and sell any harvestable timber cleared during construction, providing work and revenue for the WMAT. All timber harvesting would follow the BMPs provided in the Forest Management Plan (WMAT 2005a) (see also *Forestry and Timber Harvesting* measures in **Appendix A.2**, *Best Management Practices*). Given the small area of forest that would be cleared under

[18] As a reference point, the elevation of the top of the dam would be 6,085 feet above sea level. About 1,500 feet south of the dam, the elevation of SR 73 is 6,040 feet above sea level.

the action alternatives (less than 200 acres) compared to the amount of forest land on the Reservation (1.36 million acres) (WMAT 2005a), this would be a minor adverse impact. As such, this resource is not discussed further, and additional analysis in this EIS is not warranted. For economic effects on the WMAT from timber and forestry activities, see **Section 3.11** (*Socioeconomics*).

Hazardous Materials and Waste

Under all action alternatives, the chances of encountering subsurface soil contamination during construction are low with implementation of the *Hazardous Materials and Waste* measures listed in **Appendix A.2** (*Best Management Practices*). This includes a requirement to conduct a Phase I environmental site assessment for all project components prior to construction to identify potential areas of soil contamination. Although minor, localized spills could occur during construction and operation, the project components proposed under the action alternatives are not expected to release hazardous materials in the project area. Incidental spills of leaked fuels, lubricants, coolants, and hydraulic fluids during on-site equipment fueling and maintenance could result in adverse water quality impacts; however, the *Hazardous Materials and Waste* measures listed in **Appendix A.2** (*Best Management Practices*) would prevent and minimize impacts and ensure that inadvertent spills are properly contained. Similarly, cleaning chemicals, water disinfectant-related chemicals (e.g., sodium hypochlorite, aluminum sulfate, aluminum chlorohydrate, sulfuric acid, sodium hydroxide, hydrofluosilicic acid, citric acid, sodium bisulfite, and liquid ammonium sulfate), neutralized waste, and other hazardous material used during the operations of the proposed rural water system would comply with applicable transportation, storage, use, and disposal laws following applicable Federal and Tribal regulations. With implementation of the measures in **Appendix A.2** (*Best Management Practices*), short-term and long-term impacts related to hazardous materials and waste would be minimized. Therefore, this resource is not discussed further, and additional analysis in this EIS is not warranted.

3.2 Water Resources and Hydrology

Water resources include surface water, groundwater, water quality, and fluvial geomorphology. Surface water topics include surface water hydrology, water temperature, and flooding. Groundwater topics address aquifer setting and current groundwater use. The water quality topic documents the water quality of the affected environment, including surface water quality, groundwater quality, and constituent loads. Fluvial geomorphology refers to the form and structure of a river or stream, including its channel, banks, floodplain, and drainage area. The area of analysis for water resources focuses on the White River watershed because most of the proposed project components and affected watercourses are located within this watershed. The area of analysis also includes the Cibecue, Carrizo, and Cedar Creek watersheds because the proposed water distribution system would traverse these watersheds.

An overview of past and projected water supply and demand is presented in **Section 2.3** (*Existing White Mountain Apache Tribe Water Systems*). Wetlands are discussed in **Section 3.4** (*Biological Resources*); water rights and trust lands are discussed in **Section 3.7** (*Indian Trust Assets*); potable water systems, including construction-related impacts on the existing water system, are addressed in **Section 3.8** (*Energy and Public Utilities*); and flood safety is addressed in **Section 3.10** (*Public Health and Safety*).

3.2.1 Affected Environment

The proposed project area is primarily located within the 638-square-mile White River watershed (see **Figure 2.2-2**), which ends at the confluence of the White and Black Rivers. The proposed Miner Flat Dam and reservoir are located on the NFWR, a perennial stream approximately 50 miles in length, and located entirely within the boundaries of the Reservation. The watershed area upstream of the proposed Miner Flat Dam site is 236 square miles and comprises 37 percent of the White River watershed. The headwaters of the NFWR begin upstream of the proposed dam site, and the flow is to the southwest toward the community of Fort Apache where it joins with the EFWR and becomes the White River. The White River continues to flow west until it joins with the Black River to become the Salt River. Watershed elevations range from 11,490 feet above sea level at the top of Mount Baldy to just over 4,000 feet at the confluence with the Black River.

Regulatory Context

The WMAT enacted the *Water Quality Protection Ordinance of the White Mountain Apache Tribe of the Fort Apache Indian Reservation* ("Water Quality Protection Ordinance") (WMAT 2008) for governing all waters within the exterior boundaries of the Reservation. The purposes of the Water Quality Protection Ordinance are to:

- Promote the health of Tribal waters and the people, plants, and wildlife that depend on them through holistic management and sustainable use;
- Designate the existing and attainable uses for which the surface waters of the WMAT shall be protected;
- Prescribe water quality standards to protect the designated uses; and
- Assure that degradation of existing water quality does not occur.

Standards contained in the Water Quality Protection Ordinance are intended to be consistent with the Federal CWA.

Jurisdictional wetlands and other waters of the U.S. are protected in accordance with the CWA. Section 401 of the CWA requires all applicants that apply for a Federal license or permit to conduct an activity that may result in a discharge of a pollutant into waters of the U.S. to obtain a Section 401 Water Quality Certification. The WMAT has jurisdiction on the Reservation and issues water quality certifications under Section 401 of the CWA. Section 401 certification is required prior to issuance of a Section 404 permit, which is described in more detail in **Section 3.4** (*Biological Resources*).

In addition, the WMAT would prepare a "water code" as required by the WMAT Water Rights Quantification Agreement. The WMAT Water Code would require the appointment of a WMAT water administrator with the general responsibilities to implement and enforce authorities and activities codified in the WMAT Water Code. In addition to other responsibilities, the WMAT water administrator would have the authority and obligation to conduct periodic studies (once a decade or more frequently as required) and assessments in support of determinations of water availability and needs, and provide recommendations for decision makers. In particular, the WMAT water administrator would have the authority and responsibility to regularly evaluate the adequacy, reliability, and dependability of the storage reservoir created by the Miner Flat Dam and other water resources of the Reservation to meet rural water system demands, minimum flows, and irrigation water requirements.

Designated Uses

In accordance with the Water Quality Protection Ordinance, designated uses of water resources specific to the White River watersheds are the following: marginal coldwater habitat; irrigation; domestic/industrial water supply; groundwater recharge; livestock and wildlife; primary contact; ceremonial primary contact; gathering of medicinal or otherwise culturally significant plants; and cultural significance. Marginal coldwater habitat is defined by the following limits: (1) temperature shall not exceed 25 degrees Celsius (°C; 77 degrees Fahrenheit [°F]); (2) temperature shall not be raised by more than 2°C (3.6°F) due to human-caused impacts; (3) dissolved oxygen shall not be less than 6 milligrams per liter (mg/L); and (4) total ammonia standards shall be calculated as a function of temperature and pH.

The Water Quality Protection Ordinance defines numerical and narrative water quality standards for protecting these designated uses. Water quality standards contained in the Water Quality Protection Ordinance are part of the permitting and management processes, or new processes that may be created, to determine when a designated use is threatened.

The NFWR is not included on Arizona's 303(d) list of water quality limited segments, and no Total Maximum Daily Loads have been developed or approved for this river segment (USEPA Region IX 2019).

Surface Water

Surface Water Features. Surface water features in the area of analysis include perennial and ephemeral watercourses, lakes, and reservoirs. The perennial watercourses include the main stem of the White River, NFWR (where the proposed Miner Flat Dam and instream reservoir would be located), Diamond Creek, and EFWR. Carrizo Creek, which is perennial in most segments, and the ephemeral Cedar Creek, and Cibecue Creek are in separate watersheds (Carrizo Creek watershed, Cedar Creek watershed, and Cibecue Creek watershed, respectively) and are not part of the White River system. Major ephemeral White River watercourses include Gold Gulch, Bear Wash, and Amos Wash.

Twenty reservoirs, with surface areas ranging from 5 to 806 acres, have been constructed in the watershed upstream from the proposed project site. Major reservoirs include Sunrise Lake, Hawley Lake, Horseshoe Cienega Lake, and Earl Park Lake, all of which are created by earthen dams (Reclamation 2013a).

The portion of the White River within the project area consists of a series of bedrock canyons of varying widths and depths, with intervening small alluvial valleys (see **Figure 3.2-1** and **Figure 3.2-2**). The river is characterized by clear, swift-moving, shallow water over gravel and cobble beds (JE Fuller 2015a). In the narrowest canyon reaches, the stream morphology is controlled by bedrock on the walls and in the stream bodies, and the streambed tends to have more cobbles and boulders, with longer, more frequent riffles (or drops) than in the wider canyon reaches.

In other reaches of the river, the canyons are comparatively wider with alluvium deposited on the canyon floor. In these alluvial-dominated sections, the river has more gravel and sand, greater width, longer pools, and shorter riffles than the bedrock-dominated reaches. Throughout this portion of the river, much of the streambed is armored to normal flows with little fine-grained material in transport and minimal fine-grained material on the bed, except on the margins of the channel in slack water zones or in the lee of very large mid-channel clasts.

Figure 3.2-1. Photograph Representative of the White River with a Narrow Bedrock Canyon Reach

Channel vegetation is limited, but the banks are moderately to densely covered by woody and shrubby vegetation. Channel slopes on the NFWR range from 0.5 to 1.8 percent (0.005 to 0.018 feet per foot), generally decreasing in the downstream direction. The NFWR retains a natural morphology despite historical disturbances, such as encroachments, water diversions for irrigation, cattle grazing, and logging (JE Fuller 2015a).

The proposed 50-mile water distribution pipeline route between the proposed water treatment plant expansion and the community of Cibecue would cross over 80 drainages and streams (Leidos 2014). The majority of the drainages along the proposed pipeline route are ephemeral, except for Carrizo Creek which is perennial in most segments, flowing only during rain or snowmelt events, although 28 of the drainages have a contributing area larger than 0.5 square miles, and a few of the drainages are intermittent with water present for long periods during the year. Major tributaries in or adjacent to the proposed pipeline corridor include three that flow into the Salt River (Cibecue Creek, Carrizo Creek, and Cedar Creek) and two that flow into the White River (Bear Canyon/Bear Wash and Amos Wash). The proposed pipeline route parallels roadways (e.g., SR 73, BIA Road 12) for most of its alignment. Therefore, drainage improvements have been constructed already for the roadway in most areas where the planned pipeline route traverses drainages.

Figure 3.2-2. Photograph Representative of the North Fork of the White River with a Wide Canyon Reach

Sources of Surface Water. There are three main sources of surface waters within the White River watershed: rainfall, snowmelt, and springs. Precipitation is variable over the wide range in elevation across the White River watershed and ranges from 16 to 50 inches per year on average (JE Fuller 2022). Precipitation occurs mainly during the late fall and winter months due to cyclonic storms from the Pacific Ocean and during the monsoon season in July, August, and September. Over the winter, snow accumulates at the higher elevations. The snowpack melts in spring, increasing monthly average streamflows until they peak typically in April. Precipitation is minimal in May and June, resulting in seasonally minimal river flows at the end of June or early July. Intense monsoon thunderstorm events can cause temporary pulses of high flows that can result in localized flooding in the watershed.

The base flow in the NFWR is fed by springs emanating from the Fort Apache Limestone and Coconino sandstone formations. Regionally significant springs along the NFWR include Alchesay, Travertine, and Columbine Springs. Other springs contribute to the base flow of Cibecue Creek (e.g., White Spring), Carrizo Creek, Cedar Creek, and Corduroy Creek. Some relatively small springs near the Mogollon Rim support spring flow at the head of the canyons (e.g., Ruin Springs near Forestdale, north of Carrizo).

Studies of the relationship between surface water and groundwater for the NFWR determined that the NFWR contains both losing and gaining reaches (Curry Consulting Services 1996). Gains are associated with tributary and spring inflows. The discharge from Alchesay Spring includes a component of surface water that infiltrates from the streambed of the NFWR into the Fort Apache Limestone at Post Office Farms and returns to the river through Alchesay Spring, combined with groundwater from the Fort Apache Limestone. Surface water losses are attributable to infiltration into alluvium associated with the streambed and riverbanks. The largest loss occurs upstream from Alchesay Spring; however, this loss is balanced by inflow from the spring and additional groundwater inflow through the streambed (Kaczmarek 2007).

Surface Water Quantity and Flow Patterns. Baseline streamflow conditions in the White River watershed are evaluated in *WMAT Rural Water System Hydrology, Hydraulics, Temperature, and Dam Operations Modeling* (JE Fuller 2022). Historical streamflows are based on data from four stream gages within the watershed that are considered most relevant to the proposed action and have the longest periods of data. The locations of the gages are shown in **Figure 3.2-3**.

- *North Fork White River at Lower Log (NFWRLL) – Gage Number (No.) 9491500*. This gage represents the baseline flows near, and upstream of, the location of the proposed Miner Flat Dam and reservoir on the NFWR.
- *North Fork White River below Gold Gulch (NFWRGG) – Gage No. 9491250*. This gage represents the baseline flows 6,700 feet downstream of the existing North Fork diversion dam and intake structure.
- *East Fork of the White River near Fort Apache, Arizona (EFWRNFA) – Gage No. 9492400*. This gage measures flows from the EFWR to the White River system.
- *White River near Fort Apache, Arizona (WRNFA) – Gage No. 9494000*. This gage represents the baseline flows for the White River downstream of the Canyon Day irrigation diversion.

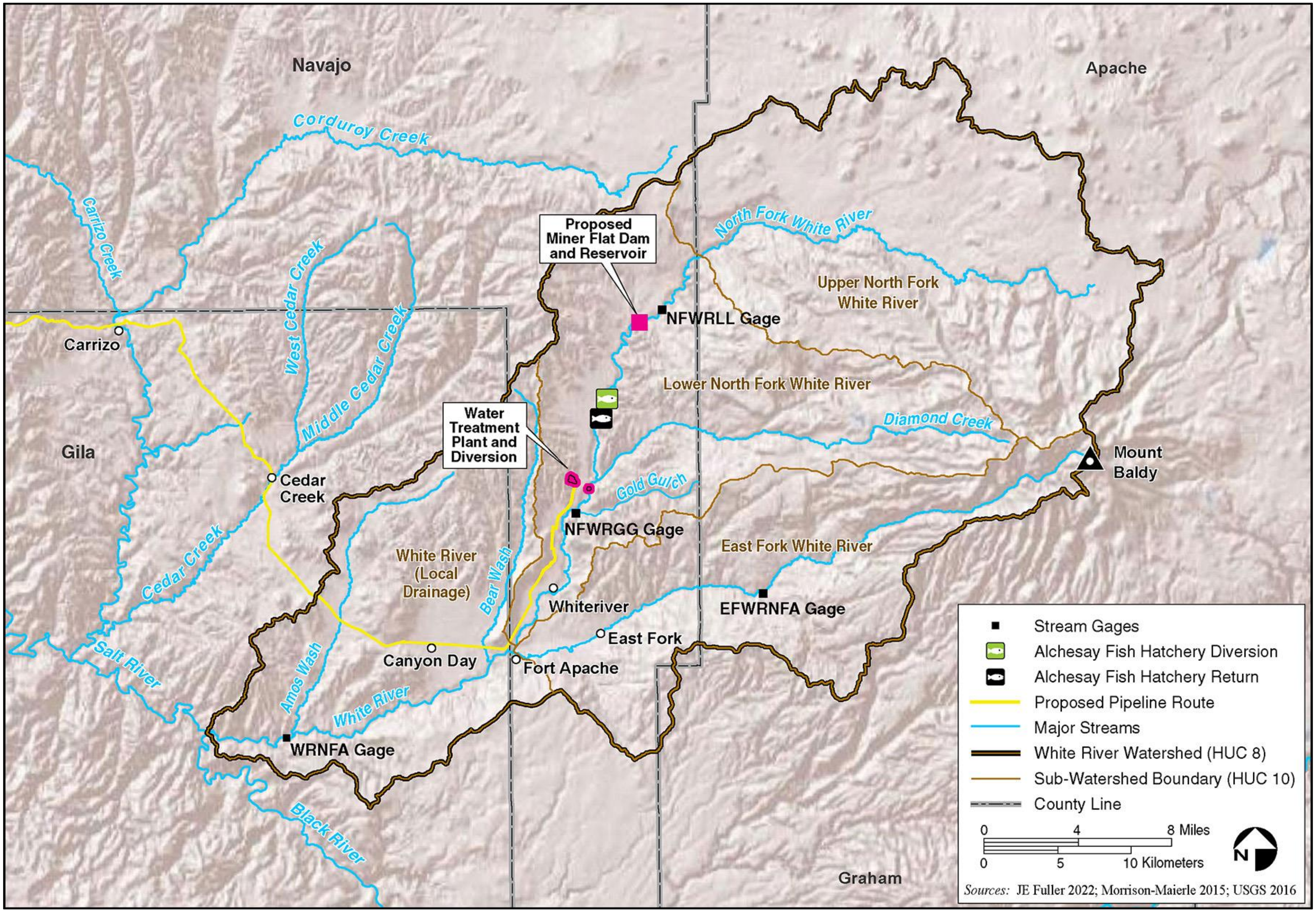

Figure 3.2-3. Location of Stream Gages in the White River System

Long-term records (1957 to 2020) of continuous gage data are available only for the WRNFA and EFWRNFA gages. Available data for NFWRLL and NFWRGG are from 1997 through 2013 and from 2006 through 2013, respectively. A standard correlation process using regression-based trend lines (referred to as "synthetic" data) was utilized to fill the missing data for these two gage locations (JE Fuller 2022). The real and synthetic data covering the 63-year model period are considered a reasonable representation of the range of environmental conditions under which the rural water system would operate and, therefore, represent the baseline upon which the EIS action alternatives are evaluated. Historical baseline flows are provided in **Table 3.2-1** and graphically in **Figure 3.2-4** and **Figure 3.2-5**.

Table 3.2-1. Streamflow Statistics for Three Gage Sites on the White River System

Parameter	NFWRLL	NFWRGG	WRNFA
Minimum Flow (cfs)	0.0	0.0	0.0
Average Flow (cfs)	81	115	178
Median Flow (cfs)	36	52	72
0.5th Percentile Flow (cfs)	4.1	9.3	3.1
10th Percentile Flow (cfs)	17	24	26
Average Annual Volume (afy)	58,588	83,360	129,103
Total Number of Zero Flow Days[1]	12	3	38

Source: JE Fuller (2022)

Key: afy = acre-feet per year; cfs = cubic feet per second; NFWRGG = North Fork White River at Gold Gulch, downstream of the existing North Fork (rural water system) diversion; NFWRLL = North Fork White River at Lower Log (near the proposed Miner Flat Dam site); WRNFA = White River near Fort Apache (downstream of the Canyon Day diversion)

[1] Over the 63-year record based on real and synthetic data

Baseline flows at NFWRLL (gage representing the flows near the site of the proposed Miner Flat Dam and reservoir) average 81 cfs or 58,588 afy. The average flows and annual volumes at the NFWRGG and WRNFA gage locations are relatively higher than those at the NFWRLL gage location due to inflows from tributaries downstream of the NFWRLL gage, including the Alchesay Spring complex, Diamond Creek, and the EFWR. The number of "zero flow days" (i.e., period in days with no measurable flow) at NFWRLL and NFWRGG were 12 and 3, respectively, whereas the number of zero flow days at WRNFA (38) was comparatively higher. Diversions and transpiration losses within riparian zones during summer account for lower flows at the most downstream gage (WRNFA). **Figure 3.2-4** shows the percentage of time that average daily streamflow volumes are exceeded at three of the gage locations. Average daily streamflows exceed 10 cfs over 90 percent of the time at all gage locations, whereas average daily streamflows exceeding 100 cfs occur from 20 to 40 percent of the time (JE Fuller 2022).

The largest streamflow volumes occur during the months of March through late May or early June, which is driven by spring runoff from snowmelt. The lowest streamflow generally occurs in early July before the onset of summer monsoon thunderstorms. From July to September, peak discharges are associated with summer monsoon thunderstorm events. Seasonal patterns in flows near the proposed Miner Flat Dam and reservoir site are shown in **Figure 3.2-5**. Monthly minimum flow statistics based on gage records for the NFWRLL, NFWRGG, and WRNFA gage locations are provided in **Table 3.2-2**.

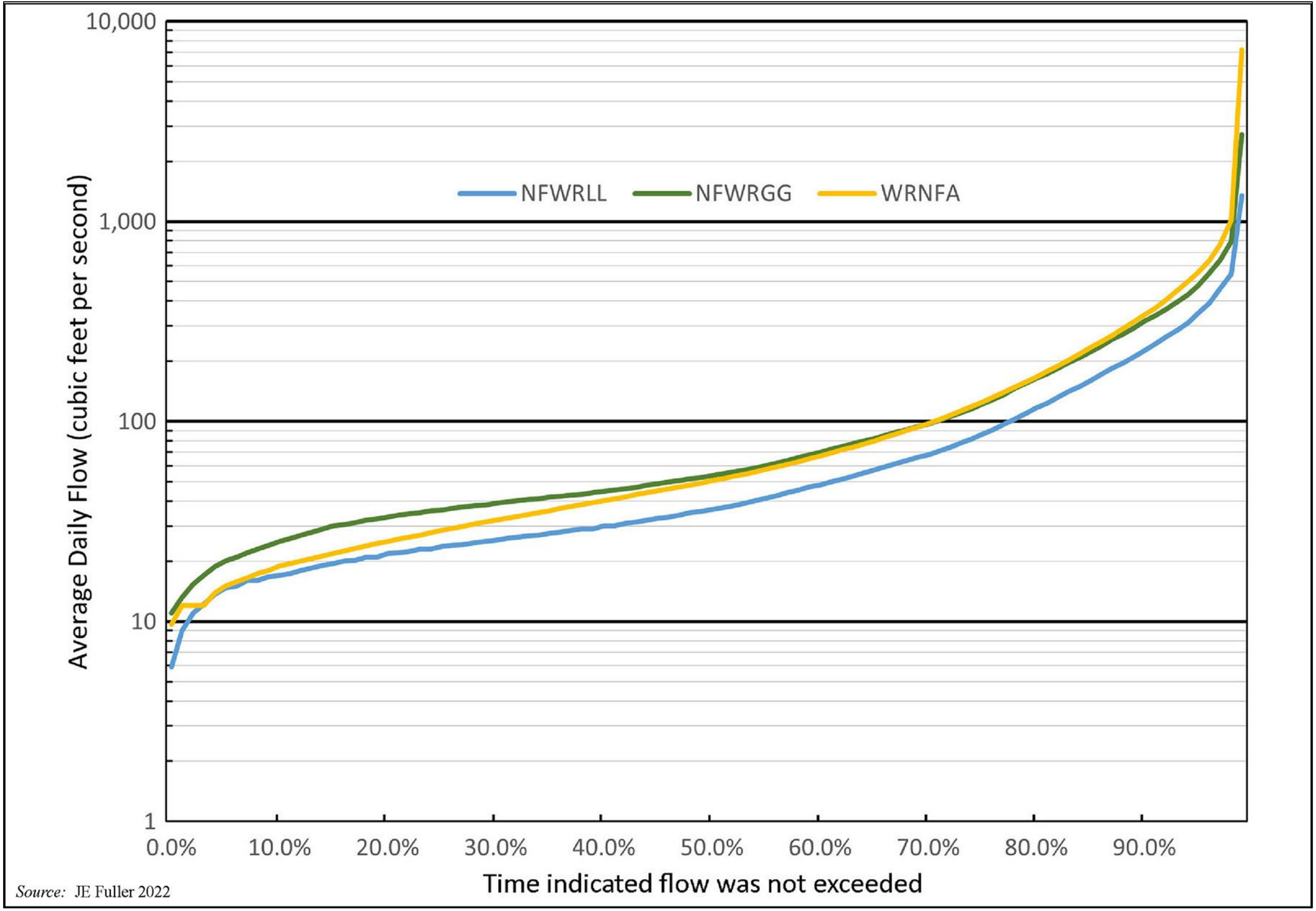

Figure 3.2-4. Flow Duration Curve; Actual and Synthetic Baseline Data for NFWRLL, NFWRGG, and WRNFA Gage Locations

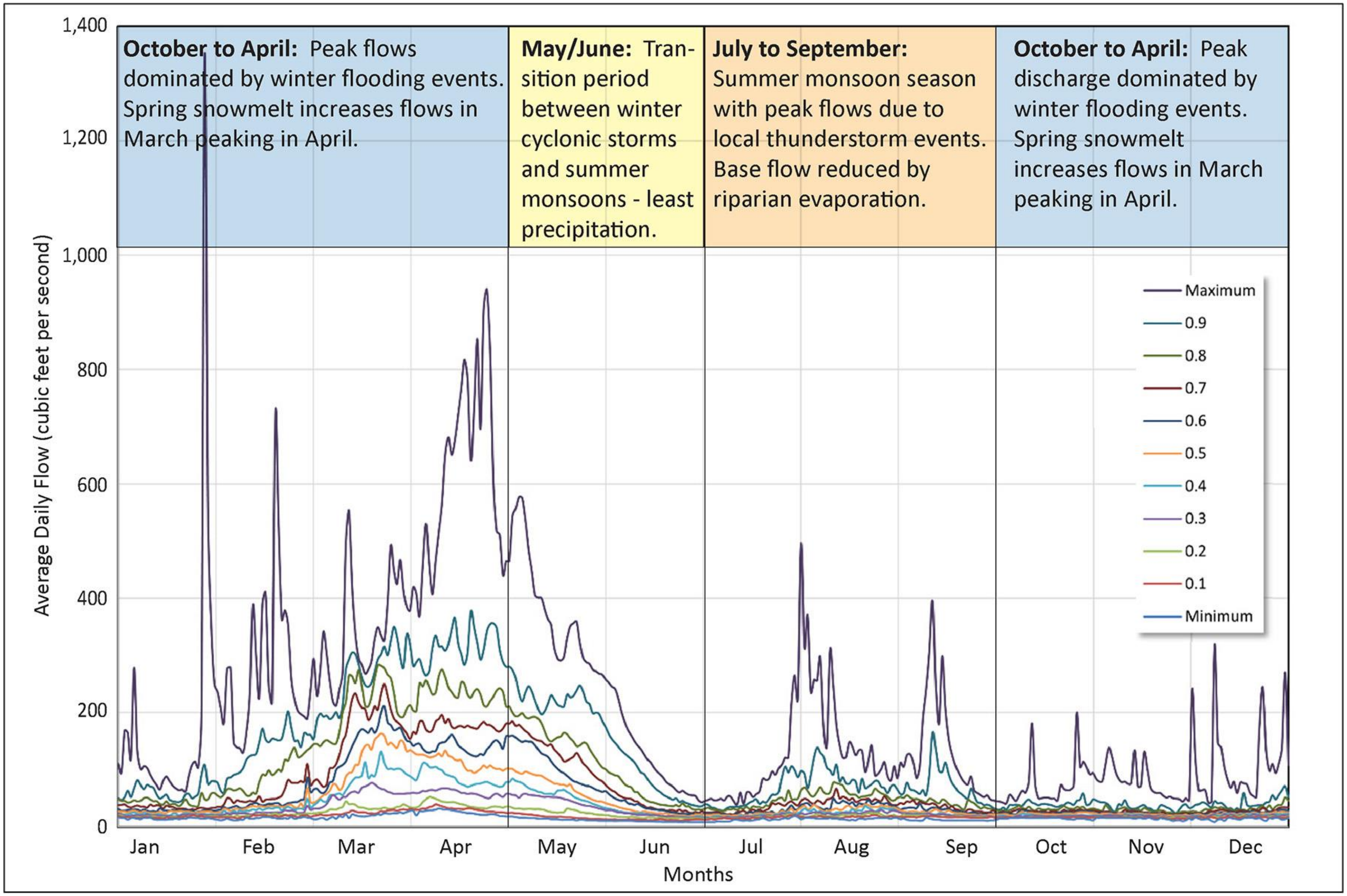

Figure 3.2-5. Daily Minimum, Maximum, and Percentile Distribution for Average Daily Flows at NFWRLL Gage Location

Table 3.2-2. Historic Average Monthly Minimum and First Percentile Flows Based on Gage Records

Month	NFWRLL[1]			NFWRGG[1]			WRNFA[1]		
	Streamflow (cfs)		Consecutive Zero Flow Days[3]	Streamflow (cfs)		Consecutive Zero Flow Days[3]	Streamflow (cfs)		Consecutive Zero Flow Days[3]
	Minimum	First Percentile[2]		Minimum	First Percentile[2]		Minimum	First Percentile[2]	
January	12.0	13.0	0	20.0	23.2	0	14.0	22.0	0
February	11.0	12.0	0	27.0	29.9	0	23.0	26.1	0
March	12.0	15.0	0	38.0	45.5	0	20.0	33.0	0
April	19.0	21.0	0	39.0	41.0	0	24.0	39.0	0
May	10.0	11.0	0	19.0	20.0	0	6.5	9.3	0
June	7.0	8.2	0	10.0	11.0	0	0.0	0.0	13
July	8.5	8.9	0	11.0	12.0	0	0.0	0.3	5
August	11.0	13.3	0	17.0	19.5	0	0.01	12.7	0
September	15.0	15.0	0	19.0	21.0	0	10.0	11.0	0
October	14.0	15.0	0	17.0	17.0	0	8.7	10.0	0
November	9.5	11.0	0	18.0	19.0	0	9.9	19.0	0
December	10.0	12.0	0	11.0	13.0	0	8.0	19.7	0

Source: JE Fuller (2022)

Key: cfs = cubic feet per second; NFWRGG = North Fork White River at Gold Gulch, downstream of the existing North Fork (rural water system) diversion; NFWRLL = North Fork White River at Lower Log (near the proposed Miner Flat Dam site); WRNFA = White River near Fort Apache (downstream of the Canyon Day diversion)

[1] Over the 63-year record based on real and synthetic data.

[2] First percentile represents the statistical point at which 99 percent of the data values exceed this number.

[3] Zero flow days are the period in days with no measurable flow.

Flow volumes for the NFWR and White River also reflect existing stream diversions. Existing diversions along the NFWR include those related to the North Fork diversion and intake structure, the Alchesay National Fish Hatchery, and small irrigation diversions. While the existing diversion capacity of the North Fork intake structure is 4 mgd, which equates to 6 cfs (Carollo 2014a), current diversion rates are lower than capacity because the existing water treatment plant capacity is 2 mgd. In 2020, the diversion was about 1 mgd. During the years 2016 through 2020, the average production rate for the water treatment plant ranged from 0.47 mgd (2020) to 0.84 mgd (2016), with maximum monthly production rates of up to 1.1 mgd (JE Fuller 2022; see **Table 2.3-2**).

The Alchesay National Fish Hatchery is operated by the USFWS to raise trout for stocking fish. The hatchery uses water from Alchesay Spring and surface water diverted from the NFWR to support operations. According to the hatchery manager, the nominal flow from the NFWR needed to support hatchery operations is 11 cfs (Thompson 2021). Diversions for the fish hatchery occur upstream of the North Fork intake structure, and the water that is diverted flows back into the NFWR with only minor losses due to evaporation.

Most existing irrigation diversions are small, with limited capacity. They include small side channel diversion structures and headworks that divert flows from the river into either irrigation ditches or pumping stations (JE Fuller 2022). Based on BIA maps from the 1950s (BIA 1956), eight diversions were used historically for irrigation of 601 acres on the NFWR below the proposed Miner Flat Dam, and three diversions were used for irrigation of 134 acres on the White River below the confluence of the NFWR with the EFWR. The Canyon Day Irrigation Project served an additional 885 acres on the White River for several years in the early 1980s (see **Section 2.6**, *Connected Actions*). The currently irrigated area is estimated at 300 acres along the NFWR (estimated diversion of 825 afy and depletion of 450 afy) and 0 acres along the White River. When operating between 1981 and 1985, the Canyon Day Irrigation Project diverted an estimated 2,870 afy and discharged an estimated 600 afy of return waters to the White River (Watson 2022). Return volumes represented water diverted from the river for irrigation, less water loss due to consumption by crops, evaporation, and percolation below the root zone.

Other return flows are associated with the Whiteriver Wastewater Lagoons, a 95-acre lagoon system located west of the community of Canyon Day. The lagoons treat wastewater from the greater Whiteriver area and then release the effluent via an unnamed stream to the White River just downstream of the irrigation diversion near Canyon Day. The volume of flows released is dependent upon the water diverted to the NFWR water treatment plant and the water pumped from the Miner Flat Wellfield and varies significantly throughout the year. During 2020, the average effluent flow was 0.6 mgd with a maximum flow rate of 1.04 mgd (USEPA Region IX 2021). Effluent limitations for the discharge are specified in NPDES Permit No. AZ0024058. Based on monitoring data for the period 2016 to 2021, effluent from the wastewater lagoons contained concentrations of ammonia, biological oxygen demand, total suspended solids, nitrate, bacteria (*Escherichia coli* [*E. coli*]), and turbidity that exceeded permit effluent limitations, as well as elevated pH and low dissolved oxygen concentrations (USEPA Region IX 2021).

Surface Water Quality. Existing surface water quality within the watershed reflects the effects of natural runoff and erosion, contributions from natural springs, ongoing human disturbances such as logging and mining, and discharges from agricultural operations, wastewater treatment plants, and other point and nonpoint sources. The description of surface water quality for the NFWR is based on available measurements of turbidity, temperature, pH, and total organic carbon taken at the existing North Fork intake structure from August 2012 to October 2013 (**Table 3.2-3**), water temperature measurements from various locations and time periods, and total suspended solids measurements at the NFWRLL gage location in 1982 through 1984.

Table 3.2-3. North Fork White River Water Quality

Parameter	Units	Range[1]	Average[1]
Turbidity	NTU	0.2 – 491	17.8
Temperature	°F	32.4 – 86.4	58.5
pH	pH units	5.4 – 9.8	8.0
Total Organic Carbon	mg/L	0.1 – 4.4	2.1

Key: °F = degrees Fahrenheit; mg/L = milligrams per liter; NTU = nephelometric turbidity units; pH = logarithm of the reciprocal of the hydrogen ion concentration in gram equivalents per liter

[1] Based on monthly samples from August 2012 to October 2013 (Carollo 2014a)

Based on the 2012–2103 measurements, water turbidity in the NFWR averages 17.8 nephelometric turbidity units (NTU) but ranges from 0.2 to 491 NTU, with the highest turbidity occurring during storm events. The pH (acidity/alkalinity) of surface water from the NFWR averages 8.0 and ranges from 5.4 to 9.8. The total organic carbon concentration averages 2.1 mg/L, with maximum concentrations of 4.4 mg/L during the spring and summer storm events (Carollo 2014a).

Water temperature at the NFWRGG gage location varies from approximately 32°F (0°C) in winter to approximately 86°F (30°C) during the summer, with an average annual temperature of 58°F (14°C) (Carollo 2014a). For comparison, average monthly water temperatures reported by the Alchesay National Fish Hatchery (cited in JE Fuller 2022) during the period 2007 to 2013 ranged from 35.7°F (2°C) (in January 2008) to 67.0°F (19°C) (in July 2009).

The WMAT measured total suspended solids concentrations ranging from approximately 2 to 300 mg/L at the NFWRLL gage location in 1982 through 1984 (JE Fuller 2015b). Total suspended solids concentrations were weakly correlated with corresponding average daily streamflows.

The Alchesay National Fish Hatchery discharges effluent from fishponds to the NFWR in accordance with their NPDES Permit No. AZ0000116. Suspended solids in the inflow are allowed to settle and are eventually flushed into an unlined settling basin where they are collected and disposed of off-site. Effluent is discharged back to the NFWR without further treatment. Maximum observed concentrations of total suspended solids, total phosphorus, and ammonia in hatchery effluent samples during 2014 to 2019 were 200 mg/L, 0.11 mg/L, and 1.0 mg/L, respectively (USEPA Region IX 2019).

Flooding. Table 3.2-4 shows the annual peak discharge frequencies and corresponding river stages (i.e., water level) at three stream gaging locations that are based on a flood frequency analysis by Watson (2013) and information collected by the WMAT and U.S. Geological Survey (USGS). The highest peak flows on record, 13,470 cfs at the NFWRGG gage and 23,700 cfs at the WRNFA gage, occurred in 2006 (JE Fuller 2022). While 19 of the 38 annual peak floods between 1958 and 1996 occurred during summer monsoons, the four largest floods on record occurred during winter or late fall cyclonic storms, not during monsoon or spring runoff. Based on a flood frequency analysis and stage discharge relations developed for selected locations on the NFWR (above Post Office Farms and above the Diamond Creek confluence), JE Fuller (2022) determined that flood flows sufficient to cause overbank flooding downstream of the Miner Flat Dam have less than a 1 percent chance of occurrence.

Table 3.2-4. Annual Peak Discharge Frequency and Corresponding Stage in White River Drainage at Three Stream Gaging Locations

Return Period	Stream Gage Locations		
	NFWRLL	**NFWRGG**	**WRNFA**
Drainage (square miles)	202	350	628
Return Period	**Peak Discharge (cfs)**		
2	419	390	2,659
5	827	779	5,569
10	1,163	1,101	8,323
25	1,659	1,578	12,924
50	2,076	1,978	17,268
100	2,529	2,415	22,521
Return Period	**Stage (Feet)**		
2	2.42	2.80	6.96
5	2.97	4.20	9.93
10	3.29	5.16	12.05
25	3.66	6.37	14.90
50	3.91	7.29	17.12
100	4.15	8.19	19.46
Return Period	**Change in Stage (Feet)**		
5	0.55	1.41	2.97
10	0.87	2.36	5.09
25	1.24	3.58	7.93
50	1.49	4.49	10.16
100	1.73	5.40	12.50

Source: Watson (2021b)
Key: cfs = cubic feet per second

Sediment Supply. The sediment yield of the NFWR is low when compared to other rivers in the southwest United States, due mainly to the high resistance to erosion of the volcanic rock units that underlie the majority of the watershed, low-to-moderate soil erodibility in the majority of the watershed, the relatively flat terrain on the northern limits of the watershed, and the conifer forest with understory litter and organic layers that protect the soil in most of the watershed (JE Fuller 2015b). Due to their comparatively steeper slopes, the tributaries to the NFWR are likely to have higher unit rates of sediment yield than the main stem and are likely to induce local sedimentation during tributary floods that have no (or earlier) corresponding peaks on the main stem. A significant portion of the annual sediment load is probably transported by flows above base conditions (JE Fuller 2015b). The White River system is capable of carrying large loads of suspended and bedload sediments that result from flooding, scouring of stream channels, and shifting of alluvial sediment deposits (IHS 2005).

The sediment yield analysis documented in the *White Mountain Apache Tribe Rural Water System EIS Sediment Yield Report* (JE Fuller 2015b) indicated that for nearly all of the watershed characteristics evaluated, there is a clear division of sediment yield potential between the portion of the White River watershed upstream of the proposed Miner Flat Dam site and downstream of the site. Upstream of the proposed dam site, the watershed characteristics indicate that the sediment yield potential for present conditions is relatively low when compared to conditions downstream from the dam site. JE Fuller (2015b) estimated a 90 percent confidence limit sediment volume of 1,373 af (or unit rate of 0.058 af per square mile per year) for the NFWR at the proposed Miner Flat Dam site.

Groundwater

Hydrogeologic Conditions in the General Project Area. The project area, including the water distribution pipeline route, is within the Salt River Basin that is located in the transition zone between the Colorado Plateau province to the north and Basin and Range provinces to the south (Kaczmarek 2005). The groundwater that could potentially be affected by the proposed action is limited to the C-aquifer; alluvial aquifers along the White River, Cedar Creek, Carrizo Creek, and Cibecue Creek; and Alchesay Spring.

The C-aquifer is represented by the Coconino Sandstone and the uppermost layer of cross-bedded sandstone at the top of the Corduroy Member of the Schnebly Hill Formation. The C-aquifer is present in the northeast part of the Reservation at Miner Flat and along the northern margin of the Reservation but is of limited extent due to erosion/dissection along the Mogollon Rim. No major springs are known to be associated with the C-aquifer on the Reservation (Kaczmarek 2005). The Miner Flat Wellfield is developed in the C-aquifer and is currently a major source of municipal water (discussed below).

Alluvial aquifers occur in Reservation streambeds where a sufficient thickness of alluvium and recharge potential exists. Alluvial aquifers may provide water to wells; however, water quality may be poor, and availability may be limited by seasonal fluctuations in runoff. Wells installed in stream alluvium (and partially in the lower Supai Group rocks) currently provide water to the communities of Carrizo and Cibecue (Kaczmarek 2015). Alluvial aquifers may also support a few wells on the Reservation for stock/domestic use.

Most groundwater recharge to the project area aquifers likely occurs in the high terrain of the Mogollon Rim to the north and northeast because of increased precipitation in that area. The springs at the base of the C-aquifer at the head of canyons draining south from the Mogollon Rim, such as Ruin Spring, and springs from the Fort Apache Limestone where it contributes to the base flow of Cibecue Creek, Carrizo Creek, Corduroy Creek, and the NFWR at Alchesay Spring all discharge into a south-flowing system, indicating that the groundwater flow in the area generally is north to south (Kaczmarek 2005).

Hydrogeologic Conditions at Miner Flat. The Miner Flat Wellfield is located about nine miles north of Whiteriver on the west side of the NFWR (see **Section 2.3.1**, *Miner Flat Wellfield [Groundwater]*). The groundwater reservoir that supplies the Miner Flat Wellfield is associated with the C-aquifer described above. The reservoir is bounded to the west where porous rock rises above the groundwater elevation, although the location of this boundary is not well-defined, and to the south where porous strata rise above the groundwater surface elevation. The east side of the porous sandstone reservoir is bounded by relatively impermeable basalt in the ancestral channel of the NFWR. The north side of the structural block containing the aquifer is bounded by a high-angle fault about 1.5 miles north of the Miner Flat Wellfield. The groundwater reservoir is of limited, if not well-defined, extent (Kaczmarek 2013).

The average annual recharge to the aquifer is no more than the amount of annual seepage (about 3 to 4 cfs) that can occur through the basalt bounding the east side of the aquifer and through the low permeability sediments at the base and south end of the aquifer system. The existence of flow along a gradient in the aquifer is diagnostic of natural recharge supporting flow from a recharge area to a natural discharge area. This is most likely from seepage into the aquifer from seasonal surface water flows in the channel where Cottonwood Canyon crosses the porous sandstone strata in the north end of the wellfield area and drainage toward the southern boundary of the aquifer. This shows the aquifer drains toward the river and does not receive recharge from the river (Kaczmarek 2013).

Fifteen wells have been drilled at Miner Flat between about 1993 and 2010 under various IHS projects. The first three wells were put into service in December 1996, with an additional five wells added in 1998, to bring the nominal production capacity to 2,975 gpm (Kaczmarek 2002). By 2001, the capacity of the wellfield had declined significantly from a variety of causes, including dewatering of the aquifer. After 2001, the rate of production decline from the wellfield was relatively slower (Lacher 2013, Kaczmarek 2013). The wellfield operated in 2020 with a reduced production of around 864 gpm (about 455 million gallons total for the year) (JE Fuller 2022). Actual production rates fluctuate depending on how many wells are in operation to meet demands. The sustainable supply of the wellfield cannot be fully developed due to the inefficiency of current wells and their placement but was estimated at 1,400 gpm (Kaczmarek 2018). Although the Miner Flat Wellfield is not sufficient on its own to meet the near-term or long-term water demands for the Reservation, as discussed in **Section 2.3.4** (*Past and Projected Domestic Water Demand*), it is an important source of water to supplement the surface water treatment system (Watson 2013).

Water samples from seven Miner Flat groundwater wells sampled in 1997 contained total dissolved solids (TDS) concentrations ranging from 234 to 304 mg/L (Kaczmarek 2014). Volatile and semi-volatile organic compounds were not detected, with the exception of trace amounts (0.0014 mg/L) of total trihalomethanes (a disinfection byproduct) in one of the seven samples. Groundwater contained arsenic concentrations ranging from 0.006 to 0.016 mg/L, zinc concentrations from 0.15 to 0.54 mg/L, and iron concentrations from 0.039 to 2.333 mg/L. The Federal "primary" drinking water standard maximum contaminant level (MCL) for arsenic is 0.01 mg/L; four of the seven arsenic concentration values exceeded the Federal MCL. Arsenic is a naturally occurring element associated with the extensive volcanism in the White Mountains. The "secondary" drinking water MCLs for TDS, iron, and zinc are 500 mg/L, 0.3 mg/L, and 5.0 mg/L, respectively. Thus, the measured TDS and zinc concentrations were below the respective MCLs, whereas five of the seven measured iron concentrations exceeded the MCL. Two of 13 groundwater samples (15 percent) analyzed in June 2008 had arsenic concentrations greater than 0.01 mg/L, with a maximum concentration of 0.011 mg/L (Lacher 2010). The WMAT manages pumping from wells in combinations to dilute higher arsenic concentrations from some wells with lower concentrations from others to produce a delivery concentration lower than the arsenic MCL to the existing drinking water system. For comparison, in an Arizona Department of Environmental Quality (ADEQ) study of ambient groundwater quality in the Salt River Basin, excluding the White Mountain sub-basin where the proposed project is located, arsenic concentrations exceeded the primary MCLs in 8 of 75 samples (11 percent), while TDS and iron exceeded the secondary MCLs in 19 percent and 8 percent, respectively, of the groundwater samples (ADEQ 2016). The ADEQ study concluded that groundwater in the Salt River Basin is generally suitable for drinking water uses.

3.2.2 Environmental Consequences

Potential impacts from the proposed action to water resources are related to the following: (1) changes to existing flows; (2) minimum acceptable instream flow rates required to maintain designated water uses; (3) water quality changes and risks to designated water uses; (4) flooding; (5) erosion, sediment transport, and stream morphology; and (6) groundwater resources. This section also provides a discussion of water supply compared to water demand under each alternative in terms of whether or not the water system would have sufficient water to meet projected demands. See **Section 3.8** (*Energy and Public Utilities*) for a discussion of the effect of the proposed action on potable water supply for WMAT residents and businesses.

Note that most of the potential impacts addressed in this section relate to the operational phase of the proposed action. The primary exception is consideration of potential impacts to water quality that are associated with both construction and operations. By contrast, project construction activities would not affect water supply (except as addressed in **Section 3.8**, *Energy and Public Utilities*), instream flows, flooding, stream morphology, or groundwater resources.

Modeling Methodology

Assessments of potential impacts to water resources from project alternatives rely on modeling of streamflow and dam operations (*WMAT Rural Water System Hydrology, Hydraulics, Temperature, and Dam Operations Modeling;* JE Fuller 2022). The purpose of the modeling was to determine the capacity and limitations of the Miner Flat Dam and reservoir to meet the existing and future downstream demands through a release of impounded streamflow. Depending on the alternative, downstream demands include the following:

- WMAT rural water system diversion of streamflow at the expanded North Fork intake structure to meet the domestic, commercial, municipal, and industrial (DCMI) water demands[19] for current and projected future populations for the greater Whiteriver area, Cibecue, and Carrizo;
- Maintenance of minimum streamflow regimes (*Alternatives A and C only*);
- Adequate flow for diversion to the Alchesay National Fish Hatchery; and,
- Diversions to provide irrigation water for future agricultural needs in Canyon Day.

Modeling streamflow and dam operations for this project was accomplished by JE Fuller (2022) using the USACE's HEC-ResSim (Reservoir System Simulation) model, Version 3.1. The modeling methodology and assumptions are discussed in the modeling report. The design DCMI water demand volume to be diverted is 7,602 afy of water, of which 3,030 afy would be depleted (consumed). Water use for irrigation would be up to 2,843 afy and 2,491 afy for diversion and depletion, respectively, for Alternatives A and B and up to 9,637 afy and 8,444 afy for diversion and depletion, respectively, for Alternatives C and D. The analysis presented here assumes a design DCMI water demand that is approximately 10 times higher than what is currently being diverted at the North Fork intake structure (about 73 afy based on the most recent 5-year average). This full

[19] The modeling report uses the term "domestic, commercial, municipal, and industrial (DCMI)" water demands. This is synonymous with the term "municipal, rural, and industrial" water demands used in the White Mountain Apache Tribe Water Rights Quantification Act of 2010.

demand diversion is not expected to be reached for 40 years or more. Until that time when the design population is reached, the magnitude of the diversion would only equal the demand, which is expected to increase gradually over time. Similarly, the model also includes the conservative assumption that the full irrigation demands would start at project inception, although diversions to meet the demand would ramp up over time after the dam has been constructed. However, the model only evaluates the maximum diversion associated with the design population and irrigation demands and, therefore, provides conservative estimates of the future demands for domestic water and irrigation. The model does not explicitly account for climate change other than variability that occurred as a result of climate change during the 63-year flow record that was used as the basis for modeling future flows. To the extent that future variability in flows is greater than that reflected in the historic flow records, it is anticipated that some adjustments to the actual operation of the dam and reservoir would be required to meet the project goals. For purposes of modeling streamflows, instream minimum flows at NFWRGG and WRNFA were defined as the historic flow that was exceeded 99 percent of the time (1 percentile flow) plus 1 cfs for specific locations within the model grid. Minimum flows were determined for each month of the year (see **Table 3.2-2**). The model assumed that groundwater extraction from the Miner Flat Wellfield would contribute 800 gpm to meet the DCMI water demands.

The model provides information related to predicted flow rates (e.g., minimum, average, and median), water volumes, numbers of days per year with no measurable flow (i.e., zero flow days), and percentages of time the water supply would be adequate to meet domestic and irrigation demands under different scenarios and allocation priorities, corresponding to the four action alternatives. This information was then used to evaluate the potential impacts of the No Action Alternative and four action alternatives to water resources.

No Action Alternative

The No Action Alternative considers potential impacts to water resources associated with not building the proposed WMAT rural water system, but instead relying on existing water sources to meet current and future water demands. The WMAT currently relies on the Miner Flat Wellfield to provide around 700 to 900 gpm in addition to an average NFWR surface water diversion of about 330 gpm. The combined sources supply a population of over 12,000 with an average daily demand of 140 gallons per person per day.

Water Supply and Demand. Under the No Action Alternative, the existing water system is inadequate to meet current and projected water demands based on limited sources of water and expected community growth. The existing water treatment plant, which obtains water from the North Fork diversion dam and intake structure, has a current design capacity of 2 mgd. As discussed in **Section 2.3.4** (*Past and Projected Domestic Water Demand*), the average production rate for the water treatment plant from 2016 to 2020 ranged from 0.47 mgd (2020) to 0.84 mgd (2016), with maximum monthly production rates of up to 1.1 mgd. When combined with the Miner Flat Wellfield, water produced for the greater Whiteriver area in 2020 averaged about 1.4 mgd. This is less than the projected amount needed to serve the existing population for both average daily demand (1.9 mgd) and maximum daily demand (4.2 mgd), and this resulted in shortfalls for some communities, especially during peak times and during drought years. Even if the water treatment plant was working at design capacity, there would still be shortfalls in the system. Moreover, existing sources would not be able to meet projected average daily water demand (5.8 mgd) or maximum daily demand (13.1 mgd) for the future design population in the greater Whiteriver area. Lack of sufficient water supply from the existing diversion and water treatment system could result in greater reliance on groundwater resources at the Miner Flat Wellfield (discussed below) to serve the greater Whiteriver area. Additionally, the groundwater aquifers under Carrizo and Cibecue are not sufficient to meet the growing water demands in these communities (Morrison-Maierle 2015).

Similarly, the Alchesay National Fish Hatchery would continue to operate under current conditions, without the benefit of a more reliable supply of NFWR surface water to support hatchery operations afforded by the proposed action. Without the proposed action, the current surface water flow of the White River would not accommodate proposed downstream diversions for agriculture in the Canyon Day area.

Minimum Surface Water Flow and Changes to Flow Regime. Under the No Action Alternative, streamflows would not change from existing conditions. Flows would continue to be subjected to the existing diversions and seasonal and annual variability as evidenced by the 63-year actual and synthetic gage record (i.e., baseline conditions). Because the proposed Miner Flat Dam and reservoir would not be built, no managed releases would occur, and instream flows would be unaffected by project activities.

Water Quality. The No Action Alternative would not change the operations of the Alchesay National Fish Hatchery or point source inputs, such as the Whiteriver Wastewater Lagoons, in a way that would substantially alter the volume or composition of effluent discharges to the NFWR or White River. There would be no impact to water quality.

Flooding. The potential risks of flooding and impacts to water resources under the No Action Alternative would not change from existing conditions. There would be no impact due to flooding risks.

Erosion, Sediment Transport, and Stream Morphology. The potential risks of sediment erosion, transport, accumulation, and stream morphology under the No Action Alternative would not change from existing conditions. There would be no impact due to erosion.

Groundwater Resources. Under the No Action Alternative, groundwater would continue to be extracted from the Miner Flat Wellfield as an important part of the WMAT water supply. The wellfield operated in 2020 with a reduced production of around 864 gpm (about 455 million gallons total for the year) (JE Fuller 2022). The sustainable supply of the wellfield cannot be fully developed due to the inefficiency of current wells and their placement but was estimated at 1,400 gpm (Kaczmarek 2018). As noted above, lack of sufficient water supply from the existing diversion and water treatment system to meet current and future demands could result in greater reliance on groundwater resources at the Miner Flat Wellfield to serve the greater Whiteriver area. Residents of Carrizo and Cibecue would continue to use poor quality groundwater that is also insufficient to meet future demands. Under these conditions, increased extraction of groundwater could be required to meet DCMI water demands, exceeding the sustainable yields and resulting in an increasing drawdown of groundwater elevations and less pumping capability. This could lead to a decline in future wellfield production and would result in a major adverse impact to groundwater resources.

Alternative A

Under Alternative A, construction of the Miner Flat Dam would convert (inundate) an approximate 3.7-mile segment of a perennial stream (NFWR) into a reservoir with an estimated surface area of approximately 170 acres and storage capacity of 8,600 af at the full pool elevation of 6,065 feet. This alternative is intended to provide water storage capacity necessary to (1) meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue (up to 7,602 afy diversion, 3,030 afy depletion, and 4,572 afy return flow); (2) accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate up to 885 acres of farming (up to 2,843 afy diversion, 2,491 afy for depletion, and 352 afy of return flow); (3) preserve historical minimum flow levels below the dam;[20] and (4) prioritize at least an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. The results of modeling flow conditions under Alternative A are summarized in **Table 3.2-5**.

Table 3.2-5. Results from Modeling Flow Conditions under the No Action Alternative and Alternative A

Conditions	No Action Alternative[1]			Alternative A[1, 2]		
	NFWRLL	NFWRGG	WRNFA	NFWRLL	NFWRGG	WRNFA
Minimum Flow (cfs)	0.0	0.0	0.0	12.0	9.9	5.3
Average Flow (cfs)	80.9	115.1	178.2	80.0	103.9	174.0
0.5 Percentile Flow (cfs)	4.1	9.3	3.1	12.0	14.3	14.4
10 Percentile Flow (cfs)	16.8	24.0	26.0	17.9	18.4	23.5
Median Flow (cfs)	35.6	52.5	72.0	35.3	40.2	62.4
Average Annual Volume (afy)	58,588.3	83,360.5	129,103.3	57,994.6	75,266.5	123,877.1
Number of Zero Flow Days	12	3	38	0	0	0
Maximum Duration (days) of Zero Flow	2	2	18	0	0	0

Source: JE Fuller (2022)

Key: afy = acre-feet per year; cfs = cubic feet per second; NFWRGG = North Fork White River at Gold Gulch (downstream of the existing North Fork diversion); NFWRLL = North Fork White River at Lower Log (near the proposed Miner Flat Dam site); WRNFA = White River near Fort Apache (downstream of the Canyon Day diversion)

[1] Modeling results are based on a 63-year model period.

[2] Alternative A equates to modeling Scenario 2b in the modeling report.

Water Supply and Demand. Construction and operation of the proposed rural water system under Alternative A would meet current and projected water demands. The model results show that Alternative A would meet the future design population water demand for the communities of the greater Whiteriver area, Carrizo, and Cibecue, as well as water demands to reinitiate up to 885 acres of farming in the Canyon Day area, 100 percent of the time (JE Fuller 2022). Alternative A would also provide a reliable water supply to support operations at the Alchesay National Fish Hatchery, based on a minimum modeled flow of 12 cfs at NFWRLL (**Table 3.2-5**), which is the water gage near the proposed Miner Flat Dam site.

Minimum Surface Water Flow and Changes to Flow Regime. Construction and operation of the proposed rural water system under Alternative A would meet minimum instream flow

[20] The minimum instream flow analysis was based on instructing the model to prioritize that sufficient water is in the system so that water levels would not go below historical average minimum river flows at the NFWRGG gage and WRNFA gage locations shown in Table 3.2-2.

requirements and reduce the number of zero flow days (i.e., the number of days with no measurable streamflow) predicted by the model, and this would represent a moderate beneficial effect. **Figure 3.2-6** shows the modeled flows at the NFWRLL, NFWRGG, and WRNFA gage locations under Alternative A, along with the baseline monthly average and instream minimum (i.e., flow rates that are exceeded 99 percent of the time or 1 percentile) flows. The model results for Alternative A show that flows would exceed the 1 percentile minimum instream flow requirement approximately 95 percent of the time at the NFWRGG gage location and 100 percent of the time at the WRNFA gage locations (JE Fuller 2022). The largest difference between existing and modeled flows would occur during summer months when dam releases would exceed baseline inflows to meet irrigation water demands. Therefore, Alternative A would satisfy the instream minimum flow requirements under most conditions.

Figure 3.2-7 shows changes over time in the modeled reservoir level. As a result of releasing water from the dam during periods of low inflow to meet the water resource demands, the elevation of the reservoir water surface would fluctuate over time. Under Alternative A, the reservoir would remain full (at or above the spillway elevation) approximately 67.8 percent of the time. Note that estimated reservoir volumes account for pool evaporation (JE Fuller 2022). Ten-foot to 20-foot fluctuations below the full pool elevation would occur mainly during summer, with elevation changes of more than 100 feet occurring on three occasions during the 63-year model period. These three periods of low reservoir levels would persist for several months during the summer, corresponding to low seasonal inflows and the highest irrigation demands. Water levels in the reservoir would not drop to the minimum pool levels at any time during the 63-year model assessment period.

Although Alternative A would provide minimum instream flows under most conditions, the presence of a dam and reservoir would also result in a decrease in downstream flow variability, primarily through changes in the timing, magnitude, and frequency of low and high flows. Flow variability is an important characteristic of river systems (Kondolf and Batalla 2005), and alterations to downstream flow patterns can ultimately produce a hydrologic regime that differs significantly from the pre-impoundment natural flow regime (Magilligan and Nislow 2005). For example, based on a study of pre- and post-dam conditions at 21 sites across the United States, Magilligan and Nislow (2005) determined that water impoundments resulted in significant increases in 1-day to 90-day minimum flows but significant decreases in 1-day to 7-day maximum flows. These changes can have both geomorphic and ecological consequences. In particular, the hydrologic regime of a watershed provides the link between rivers and the riparian zone, ultimately maintaining the diversity and function of these habitats. Thus, elimination of peak flood flows can subsequently reduce biodiversity (Magilligan and Nislow 2005).

The magnitude of the dam-related alterations of the hydrologic regime would depend on a number of factors, such as seasonal patterns in precipitation and runoff, the ratio of reservoir capacity to inflow, and dam management (i.e., water releases). The impounded runoff (IR) ratio (reservoir capacity divided by mean annual inflow) has been used as an indicator of the degree to which a reservoir can alter downstream flow regimes and predict reductions in peak flood flows (Kondolf and Batalla 2005). Higher ratio values (i.e., greater storage capacity relative to inflow volumes) generally are associated with greater reductions in peak flood flows and, consequently, greater reductions in sediment transport and frequency of channel scouring. The Miner Flat reservoir would have a relatively low IR value (0.15), indicating high inflow volumes compared to the reservoir storage capacity. Based on relationships examined by Kondolf and Batalla (2005), a low IR value suggests low to moderate potentials for downstream alterations of flow regime. The effects of dams

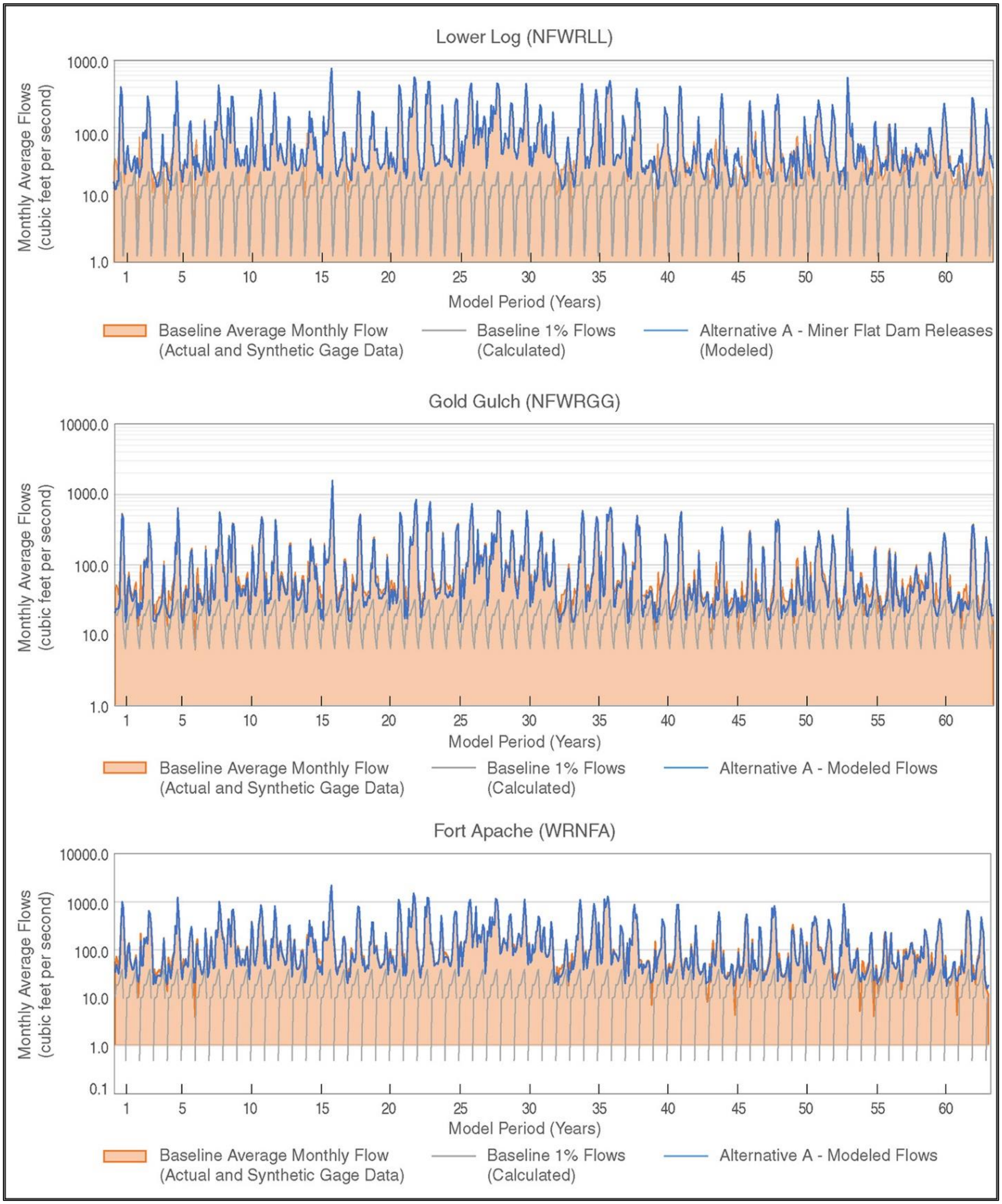

Figure 3.2-6. Comparison of Modeled Flows under Alternative A to Baseline Flows at Lower Log (NFWRLL Near Miner Flat Dam Site), Gold Gulch (NFWRGG), and Fort Apache (WRNFA)

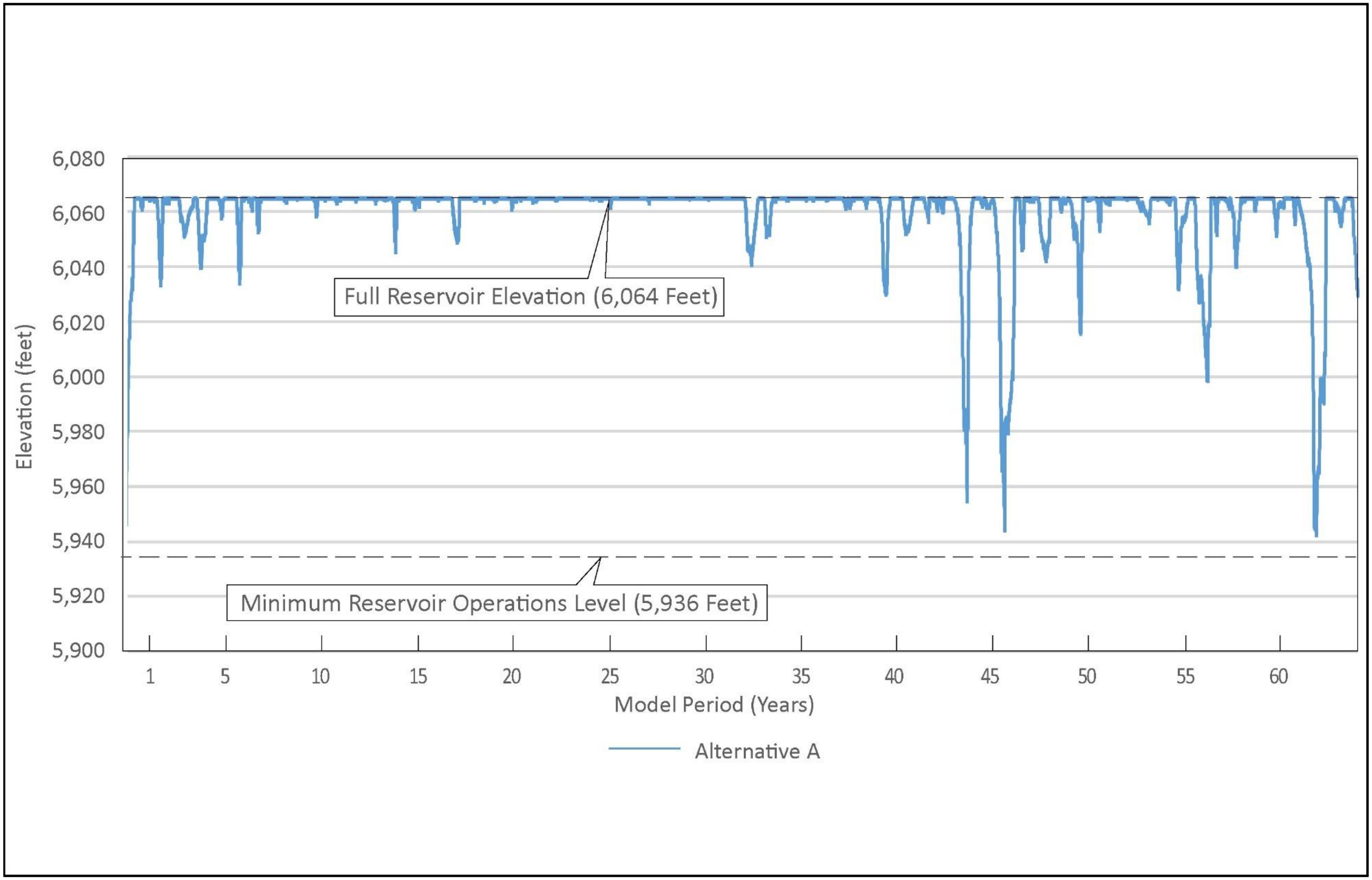

Figure 3.2-7. Modeled Reservoir Level under Alternative A

on muting peak flows also have a time component, such that the most dramatic changes occur to the instantaneous peaks, whereas differences are reduced as the time period for averaging flows increases. For example, as the flow duration window expands for maximum flows, the effect of impoundment diminishes significantly, especially for flows on monthly to seasonal scales (i.e., 30-day to 90-day maximum flows) (Magilligan and Nislow 2005).

Dams can also alter the timing/seasonal phasing of flow cycles. Because the purpose of a dam is to store water for subsequent releases, achieving this objective can significantly affect the release timing such that flow patterns are out of cycle with the natural flow regime's expected timing of flows. In particular, dams constructed in the arid Southwest for purposes of water storage typically function to support irrigation demands, such that base flows are increased during summer months as a result of water releases to meet irrigation demands, whereas peak flows are muted during the winter because the dam is capturing and storing water (Kondolf and Batalla 2005).

In addition to increasing minimum flows, as discussed previously, the proposed Miner Flat Dam would result in some attenuation of peak flow events. In general, potential changes in peak flows would be minor under Alternative A because the dam is not designed as a flood control system. However, the effect of the dam and reservoir would depend somewhat on the level and capacity of the reservoir at the time a peak flow occurs. In cases when the reservoir is full, the incoming peak flow would not be attenuated as it is routed through the reservoir. The effects of the dam on peak flood discharges were evaluated by determining how often the annual peak flood (i.e., highest daily flow for each model year) would occur during the portion of the year when the reservoir level would be below the full pool level and portions of the incoming flows would be retained. For Alternative A, these conditions would occur seven times during the 63-year modeling period. For these seven occurrences, the average flow rate for the dam outflow (18 cfs) was about 11 times lower than the corresponding average daily flow rates if no dam was present (192 cfs) and about 13 times lower than the average instantaneous peak flows. However, the modeling results also indicated that the effect of the dam on attenuating peak flows during periods when the reservoir level is below full pool level diminishes with distance downstream from the dam. For example, at the NFWRGG and WRNFA gage locations, the average flows for these peak flow events following the dam construction were 2.7 and 1.8 times lower, respectively, than the corresponding average daily flows if no dam was present. This is due to other watershed inputs to the NFWR below the dam site, which reduces the influence of the dam on peak flows.

The frequency at which all 24-hour flows would be subjected to attenuation (storage) was also evaluated on a yearly and seasonal/monthly basis. Under Alternative A, during the 63-year modeling period (23,011 days), there are 1,149 single-day events where flows at NFWRLL exceed the 95^{th} percentile of 310.3 cfs. Of those, three events are modeled to coincide with periods when the reservoir would be filling and, thus, expected to be partially retained for water storage. Approximately 8 percent of single-day flows that exceed the 50^{th} percentile in size (35.6 cfs) would be attenuated because the reservoir was refilling. On a seasonal basis, the number of flows exceeding the 5-year flood event level (approximately 80^{th} percentile) that would coincide with periods when the reservoir is filling ranged from 0 to 6 percent during the months of February through June. By contrast, this ranged from 44 to 67 percent for the period of July through September. This seasonal pattern is shown in **Figure 3.2-8**. This suggests that the dam and reservoir would attenuate some peak flows, mainly during summer months, whereas the potential for the dam to modify high flows would be comparatively small during other seasons.

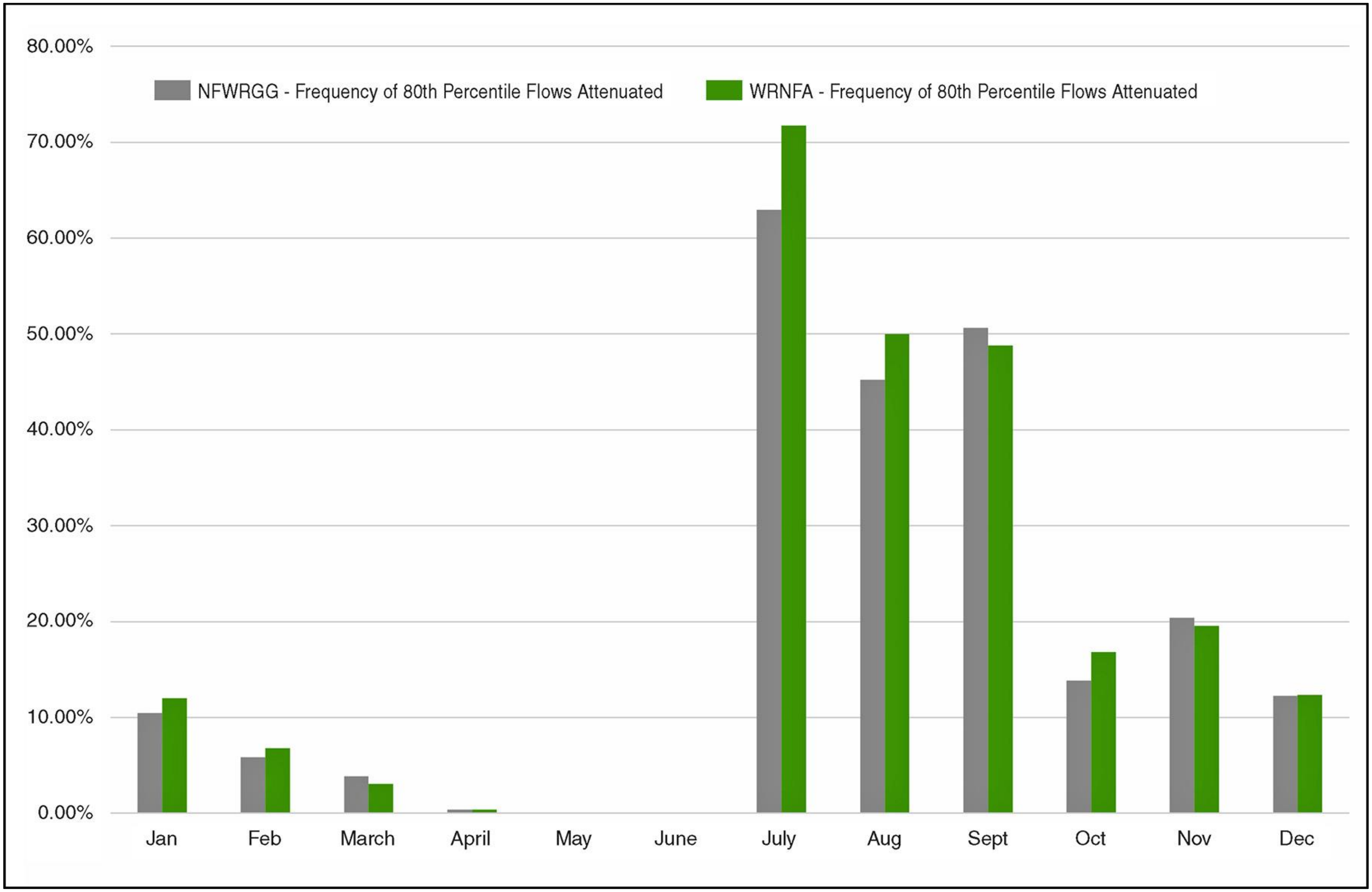

Figure 3.2-8. Frequency of High Flows (80^{th} Percentile) Attenuated through Storage

Watson (2021c) also analyzed a single, historic peak flow event that occurred on July 31 through August 2, 2010, to determine if the reservoir would attenuate the downstream flows. Under the assumption that the reservoir was full at the start of the event, the analysis showed that no attenuation of flows by the reservoir would occur under this scenario. With relatively larger peak flows (e.g., greater than the 10-year flood or about 1,790 cfs), some attenuation would be expected, but release through the outlet works as an operational strategy would eliminate attenuation in all but extremely rare peaks. Under the assumption that the reservoir was not full, the analysis showed that flows released by the dam would be lower than incoming flows due to storage of portions of the inflows.

As shown in **Table 3.2-5**, the modeled average flows, as well as the annual average volumes, under Alternative A would be slightly reduced relative to those for the No Action Alternative at all modeled locations (gage sites). Modeled flow duration curves under all project alternatives, including Alternative A and the No Action Alternative, are provided in **Appendix F** (*Water Resources*).Thus, under Alternative A the proposed Miner Flat Dam and reservoir are expected to result in the following changes to the downstream flow regime: (1) higher minimum flows and reduced zero flow days during summer; (2) reduced peak flows during summer when flows coincide with periods when the reservoir is below full pool level and filling; and (3) slightly reduced annual average flows and flow volumes. The dampening of peak flow events associated with summer storms that coincide with periods when the reservoir is filling means that the magnitude of instantaneous peak flows would be reduced, but this effect would be moderated for longer averaging periods. Of these potential flow regime changes, the impact significance criteria for water resources only applies to the minimum instream flows. As noted above, Alternative A would provide minimum instream flows, and this is considered a beneficial effect. The potential effects of flow regime changes to aquatic habitats are discussed in **Section 3.4** (*Biological Resources*).

Water Quality (Construction-Related Impacts). Under Alternative A, minor to moderate adverse impacts to surface water quality would occur during construction of the proposed rural water system, although minimization measures and BMPs presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize impacts. For example, the construction contractor would be required to comply with applicable Federal and State laws, orders, and regulations concerning the control and abatement of water pollution. Any construction work occurring in streams or associated wetlands would be conducted in compliance with the Section 401 Water Quality Certification. Implementation of measures specified in the Section 401 Water Quality Certification would be expected to limit construction-related impacts to water quality to temporary sediment disturbance and localized and temporary increases in turbidity levels. Under a worst-case scenario, if sediment control facilities temporarily failed and any stream sections were significantly impaired, remediation/restoration work would be implemented to the satisfaction of the appropriate government agencies. Potential project-related impacts associated with soil erosion are addressed in **Section 3.3** (*Geology and Soils*).

Stormwater discharges from construction activities, such as clearing, grading, excavating, and stockpiling, that disturb one or more acres are regulated under the NPDES program. Prior to discharging stormwater on the Reservation, construction operators would have to obtain coverage under an NPDES (construction stormwater) permit. The contractor's construction activities would be performed using methods that would prevent or minimize solid matter, contaminants, debris, and other pollutants and wastes from entering and accidentally spilling into surface waters.

The Construction General Permit would require compliance with effluent limits and other permit requirements, such as the development of a SWPPP, which specifies BMPs, as well as structural and non-structural measures, to control pollutant contact with stormwater. Typical short-term erosion control measures can include use of silt fences, straw wattles, gravel bags, and temporary surface water detention basins, which diffuse runoff and prevent sediments from eroding off-site. Typical long-term erosion control measures can include revegetating denuded areas, installing erosion control fabric on slopes, and constructing permanent drainage features, detention basins, and water velocity reducers. The construction contract would require the contractor to develop and implement an erosion control and monitoring plan; a spill prevention, control, and countermeasure plan; and a SWPPP. The contractor also would be required to implement the BMPs specified in the SWPPP. In addition, as part of the proposed action, staging areas located outside the reservoir footprint would be stabilized and revegetated at the end of the construction project to match pre-construction conditions, thus reducing the potential for erosion-induced sedimentation of the NFWR.

Miner Flat Dam. Grading and construction for the proposed Miner Flat Dam and any of the proposed subsurface treatments would disturb soils within the project footprint (**Figure 2.5-4**) that would be subject to erosion, off-site transport, and siltation, potentially resulting in adverse impacts to water quality. Construction of the dam abutment would require blasting with explosives and excavating in benches using bulldozers, excavators, and other construction equipment, which would disturb soils within the project footprint. As discussed in **Section 2.5.3** (*Project Details under All Action Alternatives*), early construction activities would include a river diversion scheme using a cofferdam and diversion channel to divert water away from construction areas. The conduit beneath the dam in the outlet works would serve as the diversion of the river during construction and would be sized for a 10-year to 25-year flood to reduce the risk of damage to the construction site while it is in progress. During the different stages of construction, the diversion would need to be relocated periodically to accommodate all foundation excavation and installation of the outlet works.

Other related construction activities, such as construction of about 1.1 miles of new access roads to the dam abutments, installation of security fencing around the dam abutments, installation of a new power line to connect the dam facilities to an existing power line, and construction of a small parking area within the secured area to be used for operations and maintenance, would also disturb soils that could be subject to erosion and transport. Construction would begin with initial vegetation removal and clearing of the access roads, staging areas, and stockpile areas. Ultimately, vegetation would be removed from the entire dam footprint and most of the reservoir footprint, although this would be done in a manner that minimizes stormwater contamination from open ground (see *Water Resources* in **Appendix A.2**, *Best Management Practices*).

North Fork Intake Structure Expansion and Expanded Water Treatment Plant. Similar to construction of the Miner Flat Dam, grading and construction for the new diversion system, associated water pipelines, and expanded water treatment plant could potentially disturb soils within the project footprint (**Figure 2.5-5** and **Figure 2.5-6**), with the potential for off-site transport and siltation that could result in adverse water quality impacts within the NFWR. Grading and construction would include conventional excavation and grading equipment; however, heavy-duty, specialized excavation equipment would be required for some rock excavation. In addition to the construction footprint for the new intake, new raw water pump station, new raw water pipeline, and expanded water treatment plant, temporary staging areas would be constructed within or adjacent to the construction footprint.

Similar to the proposed Miner Flat Dam, stormwater management during construction for the new river diversion, associated water pipelines, and expanded water treatment plant would be regulated by a Construction General Permit. Short-term and long-term erosion control measures implemented as part of the SWPPP, as presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*), would control and diffuse stormwater runoff, as well as minimize eroded sediments from silting the NFWR. Early construction activities associated with modifications to the diversion system would include installation of a cofferdam and diversion channel, to divert water away from construction areas.

Proposed Water Distribution System. Grading and construction of the proposed 50-mile water distribution pipeline could also result in soil disturbance, erosion, and transport with the potential for adverse water quality impacts in the NFWR as well as in Cedar Creek, Carrizo Creek, Cibecue Creek, and other smaller creeks. Pipeline construction would need about 20 staging areas along the 50-mile route (about one every 2.5 miles), and each would require about 1 acre of level ground to be cleared of vegetation. Any staging areas outside the construction footprint would be stabilized and revegetated at the end of the construction project to match pre-construction conditions. Similarly, following trenching and burial of the pipeline, the surface of the disturbed areas would be restored through re-seeding and revegetation to pre-construction conditions. Stormwater runoff during construction of the water pipeline would be regulated by the Construction General Permit. Short-term and long-term erosion control measures implemented as part of the SWPPP would control and diffuse stormwater runoff, as well as prevent or minimize eroded sediments from silting the creeks and drainages along the water pipeline corridor.

Water Quality (Operations-Related Impacts). Operation of the proposed rural water system under Alternative A would result in moderate to major adverse impacts to water quality. Proposed operations would not result in any new or modified discharges with the potential to adversely impact surface water quality within the project area. Additionally, as discussed above, operation of the dam structure would reduce the frequency of time that reaches of the NFWR near Gold Gulch and Fort Apache go dry. Maintaining minimum instream flows would reduce potentials for frequent or severe stagnation conditions in the river, which could otherwise result in water quality impacts, such as those potentially associated with water temperature increases, algal blooms, and reductions in dissolved oxygen levels. For example, Sinokrot and Gulliver (2010) determined a clear relationship between river water temperatures and river flow rates on the Central Platte River and found that elevated water temperatures can be reduced but not eliminated by minimum instream flow requirements. Similarly, operations are not expected to result in substantially higher flows that could result in greater sediment resuspension and erosion, leading to comparatively higher total suspended sediment concentrations and turbidity levels. Notably, a stilling basin would be constructed at the downstream toe of the dam to dissipate the energy and slow the velocity of water released from the dam.

Previous studies, reviewed by Caissie (2006), determined that the thermal regime of rivers is influenced downstream of reservoirs. Stream water temperature is dependent on many factors, including, but not limited to, water source, solar radiation, air temperature, riparian vegetation, and the volume of streamflow. Water temperature fluctuations can occur naturally or as a result of anthropogenic perturbations such as thermal pollution, deforestation, climate change, and flow reductions and/or alterations (Caissie 2006).

The results of modeling water temperatures of inflows, reservoir waters, and outflows under the project alternatives (JE Fuller 2022) are shown in **Figure 3.2-9**. These results indicate that under Alternative A, monthly-averaged inflow and outflow water temperatures would vary by more than 2°C (3.6°F) during some portions of the year. Specifically, inflow and outflow temperatures are comparable (i.e., within 2°C/3.6°F) during the months of February through May and August. Outflows are about 1°C to 3°C (1.8°F to 5.4°F) colder than inflows during June and July and are about 3°C to 7°C (5.4°F to 12.6°F) warmer during September through January. Consequently, during certain portions of the year (late summer to early winter), the proposed action would result in a temperature increase that exceeds the water quality standards contained in the Water Quality Protection Ordinance, and this would result in a major impact.

As discussed in **Section 2.5.3** (*Project Details under All Action Alternatives*), the dam design would include SCADA controls on the gates of the outlet works to monitor water temperature and other water quality parameters. The dam would also have intake gates at different elevations to allow control over release of water from different depths (with different temperatures) within the reservoir. A water quality measurement system (i.e., in situ temperature and dissolved oxygen sensors) would provide real-time water quality data for inflow and outflow streams to provide information needed to manage water releases using the SCADA sensing and controls (see *Water Resources* in **Appendix A.2**, *Best Management Practices*). Standard operating procedures for managing the temperature and other water quality parameters of water released from the dam would be included in the dam operations manual. Thus, with 24-hour daily real-time water quality data collection, the temperature (and potentially other water quality indicators, such as dissolved oxygen) of the dam releases would be regulated, when possible, to minimize potentials for adversely altering stream temperatures in portions of the river downstream from the dam during those periods of the year when the reservoir water temperatures are colder than the inflow water temperatures. However, note that the results of the above water temperature modeling assumed that the outflow water would be from the near-bottom layer of the reservoir with the lowest (coolest) water temperatures. Regardless, during September through January, outflows could still be warmer than inflows by more than 2°C (3.6°F) due to heating of reservoir waters. Thus, during September through January, the effectiveness of the SCADA system for matching outflow water characteristics to those of the inflows may be limited during certain periods of the year.

In addition to fluctuations in stream temperatures related to reservoir storage, downstream water temperatures would also reflect changes in flow due to the presence of a dam. Stream discharge mainly influences the heating capacity (volume of water) and/or cooling through mixing of water from different sources (Caissie 2006). As discussed previously, operation of the dam and reservoir would release sufficient quantities of water to supply irrigation demands and maintain minimum instream flows that would minimize potentials for zero flow days and situations in which portions of the river would dry out. Compared to the No Action Alternative, increases in minimum and low flow rates would moderate fluctuations in water temperatures due to solar heating by increasing the volume of water in the river during summer months. However, the dam would also attenuate flows during the summer when the reservoir is filling, which could prolong periods of low flows compared to existing conditions. Compared to existing conditions, low flows could result in elevated water temperatures downstream from the dam during the summer.

The quality of surface waters in the reservoir would reflect various factors, including the quality in the inflows, potential human disturbances (waste discharges) directly into the reservoir, and the effects of natural physical and biological processes, such as vertical temperature stratification that

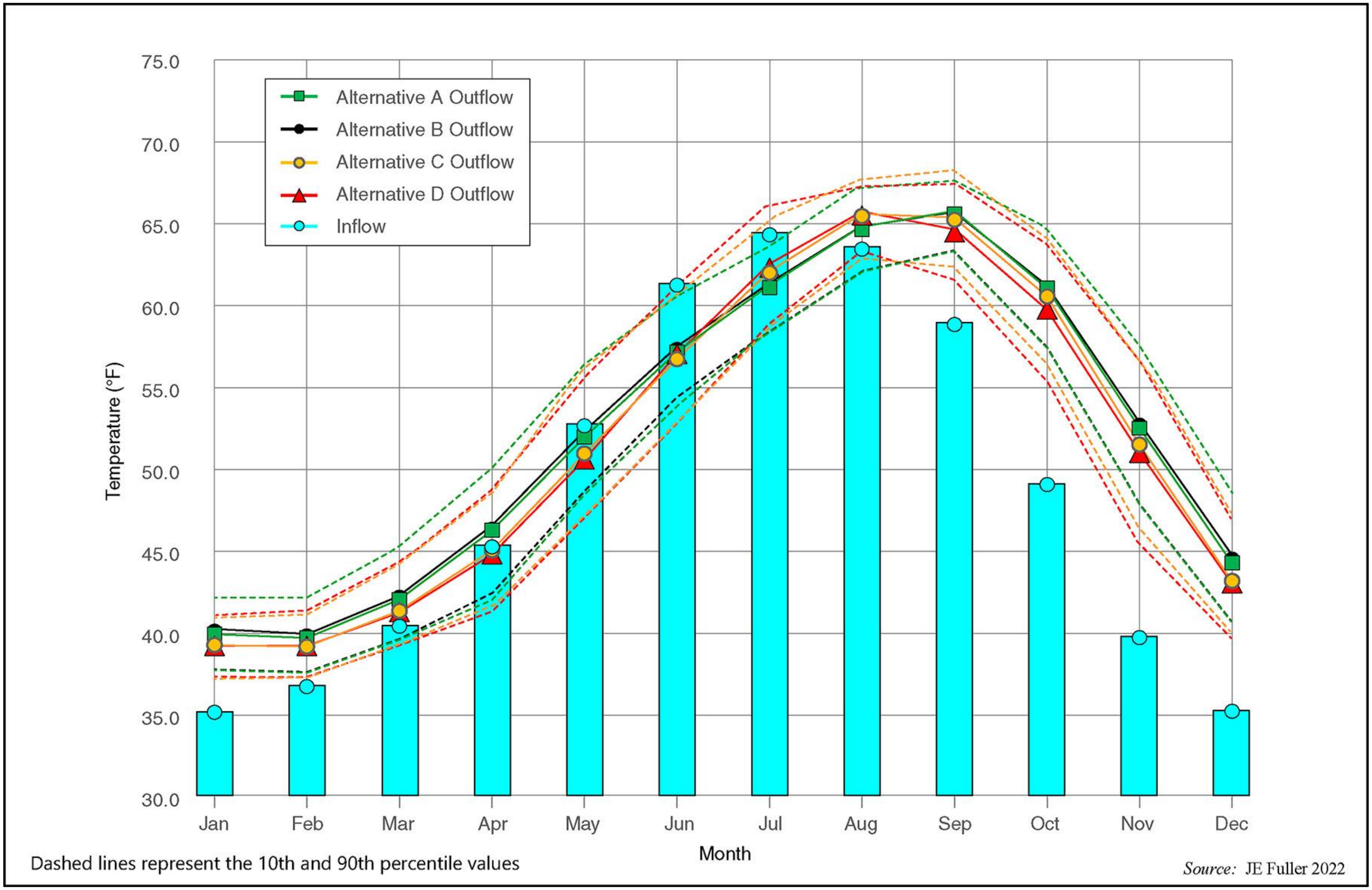

Figure 3.2-9. Comparison of Modeled Monthly Average Inflow (Blue Bars) and Outflow (Solid Lines) Water Temperatures for the Miner Flat Dam Reservoir

affects the extent of mixing between surface and bottom layers. In particular, solar heating during summer months could promote stratification of reservoir waters resulting in warmer, lower-density surface water overlying colder, higher-density bottom waters. Depending on the differences in densities of surface and bottom waters, this stratification could affect the extent of vertical mixing and supply of dissolved oxygen and nutrients, algal densities, and clarity of surface waters. Under stratified conditions, dissolved oxygen concentrations in bottom waters could be reduced below 6 mg/L due to biochemical oxygen demand. These conditions would be temporary, and dissolved oxygen concentrations would increase following vertical mixing associated with fall turnover. Other than differences in water temperatures for the reservoir inflow and outflow during certain periods of the year (late summer to early winter), and potential for temporary reductions in dissolved oxygen concentrations, Alternative A would not prevent or threaten the designated uses of water within or downstream of the reservoir. However, adverse water quality impacts related to Alternative A are considered major because it would result in a 2°C (3.6°F) or more increase in water temperature during certain portions of the year, which would exceed the water quality standards contained in the Water Quality Protection Ordinance.

Regarding indirect water quality effects, increasing the domestic water supply to meet the projected increases in population would result indirectly in increased discharge volumes of treated wastewaters from the wastewater treatment plant. In particular, the Whiteriver wastewater system (NPDES Permit No. AZ0024058) discharges to the White River downstream from the irrigation diversions near Canyon Day. The NPDES permit for the discharge would need to be amended to accommodate the increase in discharge volume. Because the composition of the inflows to the wastewater system, and level of treatment applied, are not expected to change substantially, the characteristics of the treated wastewater effluent are expected to be similar to the current discharge. Assuming future discharges comply with permit limitations, the discharge would not degrade receiving water quality. More information about effects on existing wastewater systems can be found in **Section 3.8** (*Energy and Public Utilities*).

Flooding. Operation of the proposed rural water system under Alternative A would result in a minor beneficial effect with regard to flooding risks to the public. The Miner Flat Dam would provide some flood attenuation, but it would be limited to periods when the reservoir is filling (JE Fuller 2022). In cases when the reservoir is full, the incoming peak discharge would not be attenuated as it is routed through the reservoir. The dam operators may release all outgoing flows through the outlet works without discharging over the spillway for flows approaching the 25-year flood event, for example. The dam operators could also choose to discharge some part of the peak flow through the outlet works and the remainder over the spillway. In this manner, releases would be managed to match the incoming peak discharge without losing storage capacity in the reservoir. As described in **Section 2.5.3** (*Project Details under All Action Alternatives*), during extreme flood events when spillway discharges exceed 10,000 cfs (i.e., greater than a 1,000-year flood event per Reclamation 2013a), the fuse gate weir units on the dam would tumble down the spillway, increasing the spillway capacity to handle these events. This would temporarily increase river flows immediately below the dam, as well as lower the storage capacity in the reservoir until new fuse gate weir units are installed on the dam.

Erosion, Sediment Transport, and Stream Morphology. Operation of the proposed rural water system under Alternative A would result in minor to moderate adverse impacts to river geomorphology. The potential effects of construction of the Miner Flat Dam on stream geomorphology were evaluated by JE Fuller (2015a). The classic stream response to dam construction is deposition of sediment in the pool (i.e., reservoir upstream of the dam) and scour downstream of the dam due to the release of water with relatively low sediment concentrations and increased potential to scour the streambed and banks. Deposition in the pool is controlled by the upstream sediment supply (or "yield"), the grain sizes of the inflowing sediment, the design of the dam (height, volume, spillway, etc.), and the duration (or "residence time") of water stored behind the dam. Although the design specifics for the proposed dam have yet to be finalized, it is likely that much of the incoming sediment load would be deposited in the upstream end of the reservoir pool, creating some level of sediment deficit downstream of the dam (JE Fuller 2015b).

The most common upstream impact is due to the formation of a delta at the transition from a flowing river to a static reservoir pool. Sediment deposition on the delta typically causes increased lateral movement of the inflow channel as the locus of deposition shifts in response to progressive sediment accumulation on the delta. Given the lack of development in the canyon upstream of the proposed reservoir, such lateral channel movement and sediment deposition are unlikely to have any significant impacts on the built environment. Another impact from sediment accumulation in the reservoir pool is the eventual loss of space available for water storage (JE Fuller 2015b). JE Fuller (2015b) estimated that 1,373 af of the Miner Flat Dam's planned reservoir volume (about 8,600 af) would be displaced by sediment deposition, assuming the watershed conditions of the past half century continue to exist over the 100-year design life of the project.

Downstream impacts due to trapping of sediment in the impoundment area are a function of the downstream geology and geomorphology of the stream corridor, as well as the trapping efficiency of the reservoir. Water released from most reservoirs is typically sediment deprived and often replenishes its sediment load in the reach immediately downstream of the dam either by channel downcutting (degradation) or by bank erosion (JE Fuller 2015b).

Based on a geomorphic evaluation of the proposed project area, JE Fuller (2015a) observed that the shallow impoundment areas upstream of the existing diversion dams that span the main channel do trap fine-grained sediment, but they have not filled completely with sediment, suggesting that overall sediment delivery volumes are low along the NFWR upstream of the Gold Gulch confluence. Furthermore, no excessive long-term scour or lateral erosion was noted downstream of existing dams in the watershed, indicating that whatever sediment trapping was occurring upstream of the structures had little effect on either bed or bank stability, even in the immediate vicinity of the dams (JE Fuller 2015a). The bed and banks of the channel downstream from Miner Flat Dam to Post Office Canyon are armored by boulder-sized blocks of basalt, broken off from adjacent cliff faces, which prevent measurable scour. Thus, impacts on the channel bed downstream of the proposed Miner Flat reservoir are likely to be minimal, and limited to a further winnowing of any fine-grained sediment and increased armoring of the bed (JE Fuller 2015a). JE Fuller (2015a) concluded that construction of the dam would likely have a minor impact on stream morphology in the immediate vicinity of the dam.

Groundwater Resources. Operation of the proposed rural water system under Alternative A would result in a major beneficial effect by reducing potentials for future depletions of local groundwater resources at the Miner Flat Wellfield and reducing the reliance on aquifers currently serving the communities of Carrizo and Cibecue. Under Alternative A, the WMAT rural water system would continue to operate Miner Flat Wellfield at sustainable levels to meet project demands. The Miner Flat Wellfield operated in 2020 with a production of around 864 gpm, which is less than the estimated sustainable extraction rate of about 1,400 gpm (see **Section 2.3.1**, *Miner Flat Wellfield*

[Groundwater]). Under all action alternatives, groundwater extraction from the Miner Flat Wellfield is expected to continue at a rate of about 800 gpm. Additionally, Alternative A would not result in any discharges or direct injection of surface water to local aquifers with the potential for altering groundwater quality, and project-related changes to streamflows that could affect groundwater recharge would be minimal.

Alternative A would fully meet the future design population water demand for the communities of the greater Whiteriver area, Carrizo, and Cibecue primarily through surface water diverted from the NFWR combined with a sustainable supply of groundwater from the Miner Flat Wellfield. The communities of Carrizo and Cibecue would no longer rely on limited and poor-quality groundwater from local underlying aquifers, although these wells may serve as a backup source of water unless a decision is made to decommission them. Consequently, no increases in groundwater extraction rates above sustainable levels at the Miner Flat Wellfield would be required to meet the demand for domestic consumption. This would be a major beneficial effect because it would minimize the potential for future "mining" of local groundwater resources beyond sustainable pumping rates.

Project-related changes to streamflows could affect groundwater recharge due to the connectivity of surface and groundwater within the project area. The only areas of alluvium that may potentially be affected by the project are those along the NFWR downstream from the proposed Miner Flat Dam site and at the communities of Carrizo and Cibecue. While the reservoir could contribute to recharge of the C-aquifer in the vicinity of the dam and reservoir, the confluence of Cottonwood Creek with the reservoir, and the C-aquifer in the vicinity of the Miner Flat Wellfield, the project would not impinge on any other areas of the C-aquifer or other local aquifers (Kaczmarek 2015). The potential effect of the project on groundwater recharge in the vicinity of the Miner Flat Wellfield is expected to be minimal because available information (Kaczmarek 2013) suggests that the aquifer drains toward the river and does not receive recharge from the river. Thus, the average annual recharge to the aquifer would continue to be no more than the amount of annual seepage that can occur through the basalt bounding the east side of the aquifer and through the low permeability sediments at the base and south end of the aquifer system (Kaczmarek 2015). Alluvial aquifers along the White River, Cedar Creek, Carrizo Creek, and Cibecue Creek would be affected by increased wastewater discharges from increased diversions from the NFWR for the WMAT rural water system. In the case of alluvial aquifers in Carrizo and Cibecue that are currently relied upon for drinking water, groundwater levels and interconnected streamflows would be restored.

Connected Actions - Canyon Day Farming. As discussed in **Section 2.6** (*Connected Actions*), Alternative A would accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate farming activities in the 885 acres that were cultivated in the 1980s under the Canyon Day Irrigation Project. The WMAT is still in the planning process regarding future Canyon Day farming, and many details are currently unknown. The typical irrigation season is expected to begin in April and end in September, with water demand volumes dependent on a number of factors including crop type, irrigation efficiency, weather, and runoff forecasts (WMAT 2007). Water for irrigation would be diverted from the White River below the point where the NFWR and EFWR meet. It is currently unknown whether or not treated wastewater from the Whiteriver Wastewater Lagoons would be used to irrigate forage crops (i.e., those not grown for human consumption). New and/or modified infrastructure would be needed to divert, pump, and distribute water for irrigation, but specific details are not known at this time.

Similar to the proposed action, potential impacts to water resources from the connected action are related to the following: (1) water supply relative to demand; (2) minimum acceptable instream flow rates required to maintain designated water uses; (3) water quality changes and risks to designated water uses; (4) flooding; (5) erosion, sediment transport, and stream morphology; and (6) groundwater resources.

Irrigation of Canyon Day farmland under Alternative A would divert up to 2,843 afy with 2,491 afy of depletion. Assuming 2,491 afy of depletion, an estimated 352 afy would be returned to the White River. The net volume of water diverted for Canyon Day irrigation would represent approximately 2 percent of the average annual flow volume at WRNFA (129,103 afy; **Table 3.2-1**). Diverting this volume of water from the White River would not adversely impact the supply of DCMI water for the current or future design WMAT populations. Similarly, the irrigation diversions would not affect minimum instream flows. During periods of low river flows (e.g., drought years), the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet minimum instream flows and rural water system demands while reducing permitted amounts for irrigation diversions.

The typical irrigation season (April through September) coincides with periods of increased flows due to spring snowmelt and summer monsoons, interspersed with periods of low flows during the May/June transition period (**Figure 3.2-5**). While the river flows at the Canyon Day diversion may fluctuate during this period, the volumes of water diverted for irrigation would not represent a large enough portion of the river flows to cause major adverse impacts related to flooding, erosion, sediment transport, or stream morphology downstream from the irrigation diversion.

In contrast, construction and operation of the Canyon Day connected action under Alternative A could result in water quality changes and risks to designated water uses for surface and groundwaters. Installation of new and/or modified infrastructure, such as a new diversion structure or upgrades to the existing one, would likely require in-water excavation, construction of a temporary cofferdam and diversion channel, and disturbances to stream bank soils. Any construction work occurring in streams or associated wetlands would be conducted in compliance with the Section 401 Water Quality Certification. Implementation of measures specified in the Section 401 Water Quality Certification would be expected to limit construction-related impacts to water quality to temporary sediment disturbance and localized and temporary increases in turbidity levels. Minimization measures and BMPs similar to those presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize those potential impacts, resulting in a minor adverse impact. The construction contractor would be required to comply with applicable Federal and State laws, orders, and regulations concerning the control and abatement of water pollution. Consequently, the minor adverse impacts to surface waters from construction would be temporary and localized.

Agricultural operations can have major effects on surface and groundwater quality due to the soil-disturbing nature of those activities and associated impacts from runoff of sediment, nutrients, organic matter, pesticides, and herbicides. Runoff, infiltration, and irrigation return flows can move these contaminants into local streams, rivers, and groundwater. The effects of this runoff vary widely, depending on the type of operation, landscape conditions, soils, climate, and farm management practices. Increased levels of nitrogen and phosphorus from fertilizer can stimulate algal blooms in rivers, which can lead to the development of hypoxic (low oxygen) conditions that are harmful to aquatic life. Excessive sedimentation from erosion can overwhelm aquatic ecosystems and smother breeding areas. Pollutants from agricultural operations can also enter groundwater and degrade sources of drinking water (USEPA Region IX 2021).

Conservation practices for agriculture intended to prevent or minimize potential adverse effects to water quality include a range of structural and non-structural approaches, including many that are highly effective and relatively low-cost. For example, farmers can leave the soil surface undisturbed from harvest to planting (using conservation practices such as no-till or conservation tillage) to reduce runoff, plant cover crops to uptake residual nutrients, and/or maintain vegetated buffer strips around fields and streams to intercept runoff. These tillage and conservation cover practices can also improve soil health by building up organic material over time, which helps retain water and excess nutrients and adds crop residue to the soil surface, protecting it from erosion. Nutrient management practices include targeting fertilizer and manure application via soil testing, crop-specific calibration, and timing applications to maximize uptake and minimize runoff. Using drip irrigation instead of furrow irrigation decreases the amount of water lost to ditches or evaporation and allows better control of the amounts of pesticides and nutrients added to irrigation water. Even subsurface cropland drainage systems can be managed to lessen pollutant export to streams (USEPA Region IX 2021). Specific project details regarding agricultural operations and conservation practices at Canyon Day are not currently available. While it is not possible to determine with certainty the potential magnitude and extent of impacts on surface and groundwater quality, adherence to applicable Tribal, Federal, and State laws, orders, and regulations, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize potential adverse effects on water resources.

Residual Impacts. Implementation of Alternative A would result in major beneficial effects to groundwater resources by providing alternative sources of water and reducing future extraction of groundwater. Implementation of standard BMPs, as presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*), water quality monitoring, and compliance with required and existing permits and policies, would protect water resources and beneficial uses. However, there would be an unavoidable adverse water quality impact because implementation of Alternative A would result in a 2°C (3.6°F) or more increase in water temperature and potentially reduced dissolved oxygen concentrations in reservoir outflow waters during certain portions of the year, which would exceed the water quality standards contained in the Water Quality Protection Ordinance. Mitigation measures discussed in **Section 3.4** (*Biological Resources*) would address potential impacts by proposing additional water quality monitoring in support of the Native Fishes Management Plan along with a feedback loop that would provide for updates as appropriate to the dam operations manual as an adaptive management strategy. Although this mitigation measure is not developed, it is intended to reduce the magnitude of potential impacts to water quality.

Operation of the dam and rural water system would also result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 5,521 afy from the White River[21] and attenuating peak flows on a regular basis, primarily during summer months when the

[21] The 5,521 afy depletion rate is based on the maximum depletions associated with municipal, rural, and industrial water use demands (3,030 afy) and maximum depletions associated with Canyon Day irrigation (2,491 afy). Additional depletions may occur from reservoir evaporation, unrecovered dam seepage, and other losses in the system.

reservoir is below full pool level (JE Fuller 2022). As stated previously, the full use of 5,521 afy may take 40 or more years. Ten-foot to 20-foot fluctuations in the reservoir below the full pool elevation would occur on a regular basis and mainly during summer months. Attenuation of peak flows would result in impacts to aquatic habitats and other biological resources (discussed in **Section 3.4**, *Biological Resources*). Beneficial impacts would occur with the implementation of minimum instream flows as part of this alternative.

Alternative B

Alternative B includes construction of the same facilities as under Alternative A. This alternative is intended to provide water storage capacity necessary to (1) meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue (up to 7,602 afy and 3,030 afy for diversion and depletion, respectively); (2) accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate up to 885 acres of farming (up to 2,843 afy and 2,491 afy for diversion and depletion, respectively); and (3) prioritize at least an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. However, unlike Alternative A, Alternative B would not prioritize the preservation of historical minimum flow levels below the dam. The results of modeling flow conditions under Alternative B are summarized in **Table 3.2-6**.

Table 3.2-6. Results from Modeling Flow Conditions under the No Action Alternative and Alternative B

Conditions	No Action Alternative[1]			Alternative B[1, 2]		
	NFWRLL	NFWRGG	WRNFA	NFWRLL	NFWRGG	WRNFA
Minimum Flow (cfs)	0.0	0.0	0.0	12.0	3.3	0.3
Average Flow (cfs)	80.9	115.1	178.2	80.0	103.8	173.9
0.5 Percentile Flow (cfs)	4.1	9.3	3.1	12.0	9.1	8.9
10 Percentile Flow (cfs)	16.8	24.0	26.0	15.5	16.1	21.1
Median Flow (cfs)	35.6	52.5	72.0	35.1	40.6	63.4
Average Annual Volume (afy)	58,588.3	83,360.5	129,103.3	57,957.0	75,230.7	123,836.7
Number of Zero Flow Days	12	3	38	0	0	0
Maximum Duration (days) of Zero Flow	2	2	18	0	0	0

Source: JE Fuller (2022)

Key: afy = acre-feet per year; cfs = cubic feet per second; NFWRGG = North Fork White River at Gold Gulch (downstream of the existing North Fork diversion); NFWRLL = North Fork White River at Lower Log (near the proposed Miner Flat Dam site); WRNFA = White River near Fort Apache (downstream of the Canyon Day diversion)

[1] Modeling results are based on a 63-year model period.

[2] Alternative B equates to Scenario 1 in the modeling report.

Water Supply and Demand. Construction and operation of the proposed rural water system under Alternative B would meet current and projected water demands. The model results show that Alternative B would meet the future design population water demand for the communities of the greater Whiteriver area, Carrizo, and Cibecue, as well as water demands to reinitiate 885 acres of farming in the Canyon Day area, under all modeled flow conditions. Alternative B would also provide an adequate water supply to support operations at the Alchesay National Fish Hatchery, based on a minimum modeled flow of 12 cfs at NFWRLL (**Table 3.2-6**), which is the water gage closest to the proposed Miner Flat Dam site.

Minimum Surface Water Flow and Changes to Flow Regime. Construction and operation of the proposed rural water system under Alternative B would reduce the number of zero flow days predicted by the model, and this would represent a moderate beneficial effect. As shown in **Table 3.2-6**, average flows and average annual flow volumes under Alternative B would be comparable but slightly lower than for the No Action Alternative. Modeled flow duration curves under Alternative B are provided in **Appendix F** (*Water Resources*). Similar to Alternative A, minimum flows for the NFWRLL, NFWRGG, and WRNFA gage locations would be above zero, resulting in fewer zero flow days compared to the No Action Alternative. Although operations under Alternative B do not prioritize the preservation of instream minimum flows, the model results indicate that minimum instream flow requirements would be satisfied under most conditions. This is likely an outcome of pushing water downstream to meet Alchesay National Fish Hatchery requirements and irrigation diversions at Canyon Day. The model results for Alternative B show that flows would be greater than the 1 percentile minimum instream flow requirement approximately 90 percent of the time at the NFWRGG gage location and 98 percent of the time at the WRNFA gage location (JE Fuller 2022), which means that minimum instream flows are met less often than under Alternative A.

With regard to reservoir levels, meeting the water demands for this alternative would require drawing-down the reservoir at times to compensate for natural low flows upstream of the dam. Under Alternative B, the reservoir would be full about 78 percent of the time. During persistent periods of low precipitation and low streamflow, the surface elevation of the reservoir would fluctuate by amounts of approximately 10 to 24 feet, but the reservoir level would never drop to the minimum pool elevation. Compared to Alternative A, these fluctuations would be smaller, and the percentage of time the reservoir remains full would be higher under Alternative B.

As discussed for Alternative A, the proposed Miner Flat Dam would likely result in some attenuation of peak flow events. The magnitude of this effect would depend on the level and capacity of the reservoir at the time a peak flow occurs. In cases when the reservoir is full, the incoming peak flow would not be attenuated as it is routed through the reservoir, whereas some attenuation of peak flows is expected when the reservoir level is below full pool level. Similar to Alternative A, the proposed Miner Flat Dam and reservoir are expected to result in the following changes to the downstream flow regime under Alternative B: (1) higher minimum flows and reduced zero flow days during summer; (2) reduced peak flows during summer when flows coincide with periods when the reservoir is below full pool level and filling; and (3) slightly reduced annual average flows and flow volumes. The dampening of peak flow events associated with summer storms that coincide with periods when the reservoir is filling means that the magnitude of instantaneous peak flows would be reduced, but this effect would be moderated for longer averaging periods.

Water Quality (Construction-Related Impacts). Construction-related impacts to water quality would be the same as under Alternative A. Some impacts to surface water quality could occur during construction of the proposed rural water system, but minimization measures and BMPs presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize those potential impacts, resulting in a minor adverse impact.

Water Quality (Operations-Related Impacts). Operations-related impacts to water quality would be comparable to those discussed under Alternative A. Similar to conditions under Alternative A, the water quality characteristics of impounded waters under Alternative B may vary from those of the inflow waters due to the effects of natural physical and biological processes within the reservoir. Depending on the extent and persistence of reservoir drawdown events, these changes to characteristics such as temperature and dissolved oxygen would be comparatively less than those associated with Alternative A because fluctuations in reservoir levels under Alternative B would be smaller in magnitude and duration. Similar to Alternative A, the temperature of the reservoir outflows would be more than 2°C (3.6°F) higher than the corresponding inflows during some portion of the year (late summer to early winter) under Alternative B (**Figure 3.2-9**). The magnitude of this difference would exceed the water quality standards contained in the Water Quality Protection Ordinance. Other than differences in water temperatures and potentials for seasonally depressed dissolved oxygen conditions, Alternative B would not prevent or threaten the designated uses of water within or downstream of the reservoir. However, adverse water quality impacts are considered major because water temperature changes would exceed the water quality standards contained in the Water Quality Protection Ordinance.

Similar to Alternative A, this alternative would result indirectly in increased discharge volumes of treated wastewater to the White River. Assuming the wastewater discharges comply with discharge permit limitations, the discharge would not degrade receiving water quality.

Flooding. Operations-related impacts with regard to flooding would be the same as under Alternative A, resulting in minor beneficial effects. Spring runoff-related flood flows that coincide with periods when the reservoir is at full pool level would effectively be passed through the reservoir without much of an effect on either extent (magnitude) or frequency of flooding. Peak flow events that occur during periods when the reservoir level is below full pool level and refilling are expected to be muted, and peak flow rates in the river would be reduced relative to existing conditions. The effect would be most pronounced immediately below the dam and would moderate with distance downstream. Regardless, under Alternative B, the dam and reservoir would have minor effects on flooding risks.

Erosion, Sediment Transport, and Stream Morphology. Impacts to river geomorphology would be the same as under Alternative A, resulting in minor to moderate adverse impacts. Some of the sediment transported by the NFWR upstream from the dam would settle out and accumulate in the reservoir, thereby reducing sediment loads downstream of the dam. The dam would likely have a minor impact on stream morphology in the immediate vicinity of the dam.

Groundwater Resources. Impacts on groundwater resources would be the same as under Alternative A and would result in a major beneficial effect by reducing potentials for future depletions of local groundwater resources at the Miner Flat Wellfield and aquifers currently serving the communities of Carrizo and Cibecue. Additionally, Alternative B would not result in any discharges or direct injection of surface water to local aquifers with the potential for altering groundwater quality, and project-related changes to streamflows that could affect groundwater recharge would be minimal.

Connected Actions - Canyon Day Farming. Proposed Canyon Day farming activities under Alternative B would be identical to Alternative A, and the range of potential adverse effects to water resources and hydrology would be the same under both alternatives. While it is not possible to determine with certainty the potential magnitude and extent of impacts on surface and groundwater quality, adherence to applicable Tribal, Federal, and State laws, orders, and regulations, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize potential adverse effects on water resources.

Residual Impacts. Implementation of Alternative B would result in major beneficial effects to groundwater resources by providing alternative sources of water and reducing future extraction of groundwater. Standard BMPs, as presented in **Appendix A.2** (*Best Management Practices*), along with water quality monitoring, and compliance with required and existing permits and policies, would be implemented to protect water resources and beneficial uses. There would be an unavoidable adverse water quality impact because implementation of Alternative B would result in a 2°C (3.6°F) or more increase in water temperature of reservoir outflow waters, and potentially depressed dissolved oxygen concentrations, during certain portions of the year, which would exceed the water quality standards contained in the Water Quality Protection Ordinance. Mitigation measures discussed in **Section 3.4** (*Biological Resources*) would address potential impacts by proposing additional water quality monitoring in support of the Native Fishes Management Plan along with a feedback loop that would provide for updates as appropriate to the dam operations manual as an adaptive management strategy. Although this mitigation measure is not developed, it is intended to reduce the magnitude of potential impacts to water quality.

Under Alternative B, operation of the dam and rural water system would result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 5,521 afy from the White River[22] and attenuating peak flows during summer months and low precipitation years when the reservoir is below full pool level (JE Fuller 2022). As previously stated, the full use of the 5,521 afy may take 40 years or more. During persistent periods of low precipitation and low streamflow, the surface elevation of the reservoir would fluctuate by amounts of approximately 10 to 24 feet. Attenuation of peak flows would result in impacts to aquatic habitats and biological resources (discussed in **Section 3.4**, *Biological Resources*). Although minimum instream flows are not part of this alternative, operation of the dam would decrease zero flow days, thereby providing a beneficial impact to flow and the species that depend on that flow.

Alternative C

Alternative C includes construction of the same facilities as under Alternative A. This alternative is intended to provide water storage capacity necessary to (1) meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue (up to 7,602 afy and 3,030 afy for diversion and depletion, respectively); (2) accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to expand farming activities to irrigate up to 3,000 acres (up to 9,637 afy and 8,444 afy for diversion and depletion, respectively); (3) preserve historical minimum flow levels below the dam; and (4) prioritize at least an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. The results of modeling flow conditions under Alternative C are summarized in **Table 3.2-7**.

Water Supply and Demand. Construction and operation of the proposed rural water system under Alternative C would meet most of the projected water demands under this alternative. The model results show that Alternative C would meet the future design population water demand for the communities of the greater Whiteriver area, Carrizo, and Cibecue about 99 percent of the time and

[22] The 5,521 afy depletion rate is based on the maximum depletions associated with municipal, rural, and industrial water use demands (3,030 afy) and maximum depletions associated with Canyon Day irrigation (2,491 afy). Additional depletions may occur from reservoir evaporation, unrecovered dam seepage, and other losses in the system.

the 3,000-acre irrigation demand 75 percent of the time (JE Fuller 2022). Alternative C would also provide an adequate water supply to support operations at the Alchesay National Fish Hatchery an estimated 99.5 percent of the time, based on a 0.5 percentile modeled flow of 12 cfs at NFWRLL (**Table 3.2-7**), which is the water gage closest to the proposed Miner Flat Dam site. Compared to Alternatives A and B, Alternative C would provide greater volumes of water to support a larger irrigation demand but would not meet demands for both the future design population and irrigation under all conditions.

Table 3.2-7. Results from Modeling Flow Conditions under the No Action Alternative and Alternative C

Conditions	No Action Alternative[1]			Alternative C[1, 2]		
	NFWRLL	NFWRGG	WRNFA	NFWRLL	NFWRGG	WRNFA
Minimum Flow (cfs)	0.0	0.0	0.0	7.2	0.2	0.0
Average Flow (cfs)	80.9	115.1	178.2	80.3	104.2	169.5
0.5 Percentile Flow (cfs)	4.1	9.3	3.1	12.0	9.9	10.0
10 Percentile Flow (cfs)	16.8	24.0	26.0	14.0	19.2	25.8
Median Flow (cfs)	35.6	52.5	72.0	37.3	44.1	57.8
Average Annual Volume (afy)	58,588.3	83,360.5	129,103.3	58,189.5	75,516.4	120,633.9
Number of Zero Flow Days	12	3	38	0	0	2
Maximum Duration (days) of Zero Flow	2	2	18	0	0	0

Source: JE Fuller (2022)

Key: afy = acre-feet per year; cfs = cubic feet per second; NFWRGG = North Fork White River at Gold Gulch (downstream of the existing North Fork diversion); NFWRLL = North Fork White River at Lower Log (near the proposed Miner Flat Dam site); WRNFA = White River near Fort Apache (downstream of the Canyon Day diversion)

[1] Modeling results are based on a 63-year model period.

[2] Alternative C equates to Scenario 4b in the modeling report.

However, as discussed in **Section 2.5.2** (*Action Alternatives*), water diversions to meet rural water system demands would start at a lower level (i.e., similar to existing water demands) and would increase over time as population levels increase. Based on population growth projections, full design population demand may not reach maximum levels for 40 years or more. For a period of time, there would be sufficient water storage and supply in the system to ensure instream minimum flows are met, meet the rural water system demand requirements, and provide irrigation for 3,000 acres of land at Canyon Day when storage and supply are available to accommodate irrigation water demands. As part of the proposed action, the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet instream minimum flows and rural water system demands. The WMAT Water Code would be enacted no later than 18 months after the enforceability date of the Quantification Act and would specifically provide for periodic evaluation of water supply (availability) and demand for minimum instream flow, rural water system requirements, and irrigation. At some point in the future, allocating sufficient water to meet the instream minimum flows and rural water system demands could require the WMAT water administrator to reduce amounts permitted by the water code for irrigation diversions. Meeting the rural water system diversions would have priority over meeting downstream irrigation diversions.

Minimum Surface Water Flow and Changes to Flow Regime. Construction and operation of the proposed rural water system under Alternative C would meet minimum instream flow requirements under most conditions and would reduce the number of zero flow days predicted by the model, and this would represent a moderate beneficial effect. As shown in **Table 3.2-7**, the modeled minimum flows under Alternative C (with as-needed reductions in the irrigation diversion flows to meet instream minimum flow requirements) would be similar to or greater than those for the No Action Alternative. Modeled flow duration curves under Alternative C are provided in **Appendix F** (*Water Resources*). **Figure 3.2-10** shows the modeled flows at the NFWRLL, NFWRGG, and WRNFA gage locations under Alternative C, along with the baseline monthly average and instream minimum flows (i.e., flow rates that are exceeded 99 percent of the time or 1 percentile). The model results for Alternative C show that flows exceeding the 1 percentile minimum instream flow requirement would occur approximately 94 percent of the time at the NFWRGG gage location and 99.5 percent of the time at the WRNFA gage location, which means that minimum instream flows are met at approximately the same frequencies as under Alternatives A and B (JE Fuller 2022). Because the WMAT water administrator would prioritize instream minimum flows under this alternative, minimum flow conditions would improve, and the number of zero flow conditions would be reduced as compared to the No Action Alternative.

Satisfying the water demands for this alternative would likely require drawing down the reservoir at times to compensate for low flows upstream of the dam. Under Alternative C, the reservoir would be full an estimated 55.7 percent of the time, which is a considerably smaller percentage of time compared to Alternatives A and B. As a result of releasing water from the dam during periods of low inflow to meet downstream water demands, modeling indicates water in the reservoir could drop to the minimum pool level on 9 occasions over a 63-year period (1.8 percent of the time) and would be substantially reduced (decreases in water surface elevations of 60 feet or more) on 6 occasions, over the 63-year period. These periods of low reservoir levels would persist for periods of approximately 1 to 2 months per event (**Figure 3.2-11**). However, these predicted changes in reservoir storage volumes are based on the model results assuming that water needs for the design population and the full irrigation demands occur at the time the project is initiated. Realistically, the design population would not be reached for 40 years or more following project initiation. Furthermore, in accordance with the WMAT Water Code, the WMAT water administrator would have the authority to reduce water allocations to ensure that the rural water system demands and instream minimum flow requirements are fully met. This could mean that fluctuations in water levels in the reservoir would be less severe than those predicted by the model.

As with Alternatives A and B, the proposed Miner Flat Dam would likely result in some attenuation of peak flow events under Alternative C. The magnitude of this effect would depend on the level and capacity of the reservoir at the time a peak flow occurs. In cases when the reservoir is full, the incoming peak flow would not be attenuated as it is routed through the reservoir, whereas some attenuation of peak flows is expected when the reservoir level is below full pool level. Compared to Alternatives A and B, the reservoir would be below full pool level for a greater percentage of time under Alternative C. Thus, the potential for the dam and reservoir to affect peak flows would be comparatively greater. Similar to Alternatives A and B, the proposed Miner Flat Dam and reservoir are expected to result in the following changes to the downstream flow regime under Alternative C: (1) similar or higher minimum flows and reduced zero flow days during summer; (2) reduced peak flows during summer when flows coincide with periods when the reservoir is below full pool level and filling; and (3) slightly reduced annual average flows and flow volumes. The dampening of peak flow events associated with summer storms that coincide with periods when the reservoir is filling means that the magnitude of instantaneous peak flows would be reduced, but this effect would be moderated for longer averaging periods.

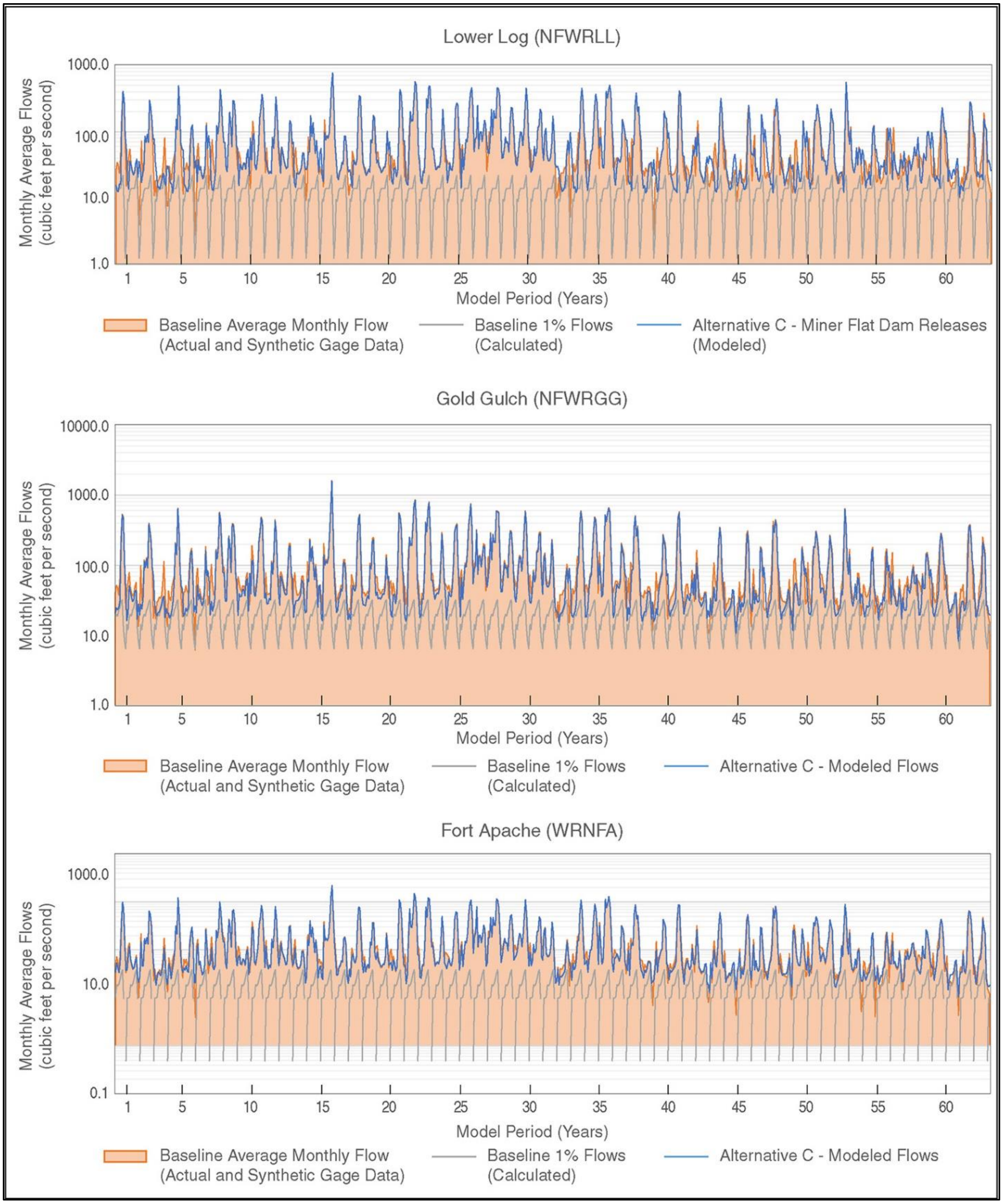

Figure 3.2-10. Comparison of Modeled Flows under Alternative C to Baseline Flows at the Lower Log (NFWRLL near Miner Flat Dam Site), Gold Gulch (NFWRGG), and Fort Apache (WRNFA)

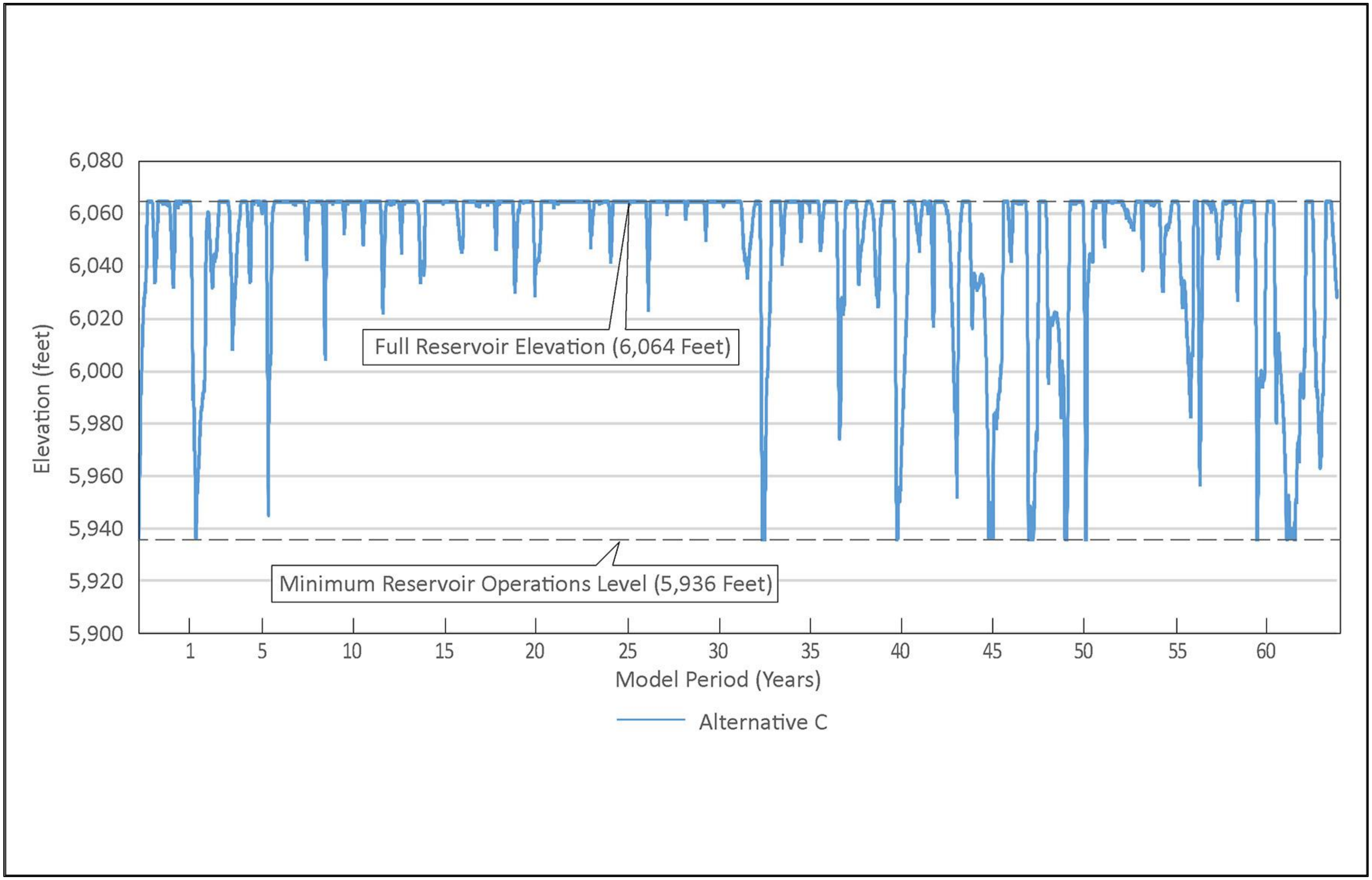

Figure 3.2-11. Modeled Reservoir Level under Alternative C

Water Quality (Construction-Related Impacts). Construction-related impacts to water quality would be the same as under Alternative A. Some impacts to surface water quality could occur during construction of the proposed rural water system, but minimization measures and BMPs presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize those potential impacts, resulting in a minor adverse impact.

Water Quality (Operations-Related Impacts). Operations-related impacts to water quality would be comparable to those discussed under Alternative A. Similar to conditions under Alternative A, the water quality characteristics of impounded waters under Alternative C may vary from those of the inflow waters due to the effects of natural physical and biological processes within the reservoir. Depending on the comparatively greater extent and persistence of reservoir drawdown events under Alternative C, these changes to characteristics such as temperature and dissolved oxygen could be larger than those associated with Alternatives A and B. In particular, drawdown events during the summer months could result in elevated water temperatures at all depths, including near-bottom waters, which would make it more difficult for the dam operators to regulate the temperature of water released from the dam and prevent changes to downstream water temperatures.

Similar to Alternative A, the temperature of the reservoir outflows would be more than 2°C (3.6°F) warmer than the corresponding inflows during some portion of the year (late summer to early winter) under Alternative C (**Figure 3.2-9**). The magnitude of this difference would exceed the water quality standards contained in the Water Quality Protection Ordinance. Similarly, as reservoir water depths are reduced, bottom sediments and/or settled organic matter may be more easily resuspended into the water column, resulting in increased turbidity levels in the reservoir outflows and depressed dissolved oxygen concentrations. Increased water temperatures and elevated nutrient concentrations could also stimulate periodic algal blooms in the reservoir. Nevertheless, other than differences in water temperatures and potentially seasonally depressed dissolved oxygen concentrations, Alternative C would not prevent or threaten the designated uses of water within or downstream of the reservoir. However, adverse water quality impacts are considered major because water temperature and dissolved oxygen changes could exceed the water quality standards contained in the Water Quality Protection Ordinance.

Similar to Alternative A, this alternative would result indirectly in increased discharge volumes of treated wastewater to the White River. Assuming the wastewater discharges comply with discharge permit limitations, the discharge would not degrade receiving water quality.

Flooding. Operations-related impacts with regard to flooding would be similar to those under Alternative A, resulting in minor beneficial effects. Spring runoff-related flood flows that coincide with periods when the reservoir is at full pool level would effectively be passed through the reservoir without much of an effect on either extent (magnitude) or frequency of flooding. However, when peak flow events occur during periods when the reservoir level is below full pool level and refilling, flows exiting the reservoir would be reduced. Compared to Alternative A, reservoir levels under Alternative C would be below the full pool level a higher percentage of the time, which means that a relatively greater portion of the peak flows may be retained to fill the reservoir, potentially resulting in a comparatively higher number of flood flows affected by the dam and reservoir. Regardless, under Alternative C, dam operations would have a minor effect on flood risks.

Erosion, Sediment Transport, and Stream Morphology. Impacts to river geomorphology would be the same as under Alternative A, resulting in minor to moderate adverse impacts. Some of the sediment transported by the NFWR upstream from the dam would settle out and accumulate in the reservoir, thereby reducing sediment loads downstream of the dam. This would not increase erosion potential or changes in stream morphology below the dam.

Groundwater Resources. Impacts on groundwater resources would be similar to Alternative A and would result in a major beneficial effect by reducing potentials for future depletions of local groundwater resources at the Miner Flat Wellfield and aquifers currently serving the communities of Carrizo and Cibecue. While Alternative C is expected to meet the future design population demand 99 percent of the time based on modeling (see above *Water Supply and Demand*), the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet rural water system demands, without relying more heavily on local groundwater resources. Similar to the other alternatives, Alternative C would not result in any discharges or direct injection of surface water to local aquifers with the potential for altering groundwater quality, and project-related changes to streamflows that could affect groundwater recharge would be minimal.

Connected Actions - Canyon Day Farming. Irrigation of Canyon Day farmland under Alternative C would divert up to 9,637 afy with 8,444 afy of depletion. Assuming 8,444 afy of depletion, an estimated 1,193 afy would be returned to the White River. The net volume of water diverted for Canyon Day irrigation would represent approximately 7 percent of the average annual flow volume at WRNFA (129,103 afy; **Table 3.2-1**). Diverting this volume of water from the White River would not adversely impact the supply of DCMI water for the current or future design WMAT populations. Similarly, the irrigation diversions would not affect minimum instream flows. During periods of low river flows (e.g., drought years), the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet minimum instream flows and rural water system demands while reducing permitted amounts for irrigation diversions. While the river flows at the Canyon Day diversion may fluctuate during the summer irrigation period, the volumes of water diverted for irrigation would not represent a large enough portion of the river flows to cause major adverse impacts from flooding, erosion, sediment transport, or stream morphology downstream from the irrigation diversion.

However, construction and operation of the Canyon Day connected action under Alternative C could result in water quality changes and risks to designated water uses for surface and groundwaters. Adverse impacts to water quality could occur during the installation of a new diversion structure or upgrades to the existing one that would require in-water excavation, construction of a temporary cofferdam and diversion channel, and disturbances to stream bank soils. Similar to Alternatives A and B, any construction work occurring in streams or associated wetlands would be conducted in compliance with the Section 401 Water Quality Certification. Implementation of measures specified in the Section 401 Water Quality Certification would be expected to limit construction-related impacts to water quality to temporary sediment disturbance and localized and temporary increases in turbidity levels. Minimization measures and BMPs similar to those presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize those potential impacts, resulting in a minor adverse impact. The construction contractor would be required to comply with applicable Federal and State laws, orders, and regulations concerning the control and abatement of water pollution. Consequently, the minor adverse impacts to surface waters from construction would be temporary and localized.

Under Alternative C, the WMAT may choose to farm up to 3,000 acres in Canyon Day (885 acres under Alternatives A and B plus an additional 2,115 acres to be located within the area shown as potentially suitable for irrigation farming in **Figure 2.6-1**). As discussed previously, farming practices can result in adverse impacts to surface and groundwater due to runoff and/or leaching of nutrients and chemical contaminants into groundwaters. A number of conservation practices and agricultural BMPs can be implemented to minimize or prevent impacts from farming to surface and groundwaters. While it is not possible to determine with certainty the potential magnitude and extent of impacts on surface and groundwater quality, adherence to applicable Tribal, Federal, and State laws, orders, and regulations, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize potential adverse effects on water resources.

Residual Impacts. Implementation of Alternative C would result in major beneficial effects to groundwater resources by providing alternative sources of water and reducing future extraction of groundwater. Standard BMPs, presented in **Appendix A.2** (*Best Management Practices*), along with water quality monitoring, and compliance with required and existing permits and policies, would be implemented to protect water resources and beneficial uses. This conclusion is based on the assumption that the WMAT water administrator would review allocations on a regular basis, in accordance with the WMAT Water Code, and make appropriate adjustments to permits for irrigation necessary to meet rural water system demands and instream flow requirements as well as reduce potential impacts to water resources. However, there would be an unavoidable adverse water quality impact because implementation of Alternative C would result in a 2°C (3.6°F) or more increase in water temperature of dam outflow waters, as well as potential decreases in dissolved oxygen concentrations, during certain portions of the year, which would exceed the water quality standards contained in the Water Quality Protection Ordinance. Mitigation measures discussed in **Section 3.4** (*Biological Resources*) would address potential impacts by proposed additional water quality monitoring in support of the Native Fishes Management Plan along with a feedback loop that would provide updates to the dam operations manual as an adaptive management strategy. Although this mitigation measure is not developed, it is intended to reduce the magnitude of potential impacts to water quality.

Operation of the dam and rural water system under Alternative C would also result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 11,474 afy from the White River[23] and attenuating peak flows during summer months and low precipitation years and during regular fluctuations in the reservoir level (JE Fuller 2022). As stated previously, the full use of the 11,474 afy may take 40 years or more. Attenuation of peak flows would result in impacts to aquatic habitats and other biological resources (discussed in **Section 3.4**, *Biological Resources*). Beneficial impacts would occur with the implementation of minimum instream flows as part of this alternative.

[23] The 11,474 afy depletion rate is based on the maximum depletions associated with municipal, rural, and industrial water use demands (3,030 afy) and maximum depletions associated with Canyon Day irrigation (8,444 afy). Additional depletions may occur from reservoir evaporation, unrecovered dam seepage, and other losses in the system.

Alternative D

Alternative D includes construction of the same facilities as under Alternative A. This alternative is intended to provide water storage capacity necessary to (1) meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue (up to 7,602 afy and 3,030 afy for diversion and depletion, respectively); (2) accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to expand farming activities to irrigate up to 3,000 acres (up to 9,637 afy and 8,444 afy for diversion and depletion, respectively); and (3) prioritize at least an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. Unlike Alternative C, Alternative D would not prioritize the preservation of historical minimum flow levels below the dam. The results of modeling flow conditions under Alternative D are summarized in **Table 3.2-8**.

Table 3.2-8. Results from Modeling Flow Conditions under the No Action Alternative and Alternative D

Conditions	No Action Alternative[1]			Alternative D[1, 2]		
	NFWRLL	NFWRGG	WRNFA	NFWRLL	NFWRGG	WRNFA
Minimum Flow (cfs)	0.0	0.0	0.0	0.0	0.0	0.0
Average Flow (cfs)	80.9	115.1	178.2	80.6	104.5	168.2
0.5 Percentile Flow (cfs)	4.1	9.3	3.1	8.7	0.0	4.5
10 Percentile Flow (cfs)	16.8	24.0	26.0	12.0	15.5	22.7
Median Flow (cfs)	35.6	52.5	72.0	38.5	46.4	56.4
Average Annual Volume (afy)	58,588.3	83,360.5	129,103.3	58,402.3	75,705.9	119,652.3
Number of Zero Flow Days	12	3	38	4	131	5
Maximum Duration (days) of Zero Flow	2	2	18	2	21	1

Source: JE Fuller (2022)

Key: afy = acre-feet per year; cfs = cubic feet per second; NFWRGG = North Fork White River at Gold Gulch (downstream of the existing North Fork diversion); NFWRLL = North Fork White River at Lower Log (near the proposed Miner Flat Dam site); WRNFA = White River near Fort Apache (downstream of the Canyon Day diversion)

[1] Modeling results are based on a 63-year model period.

[2] Alternative D equates to Scenario 3 in the modeling report.

Water Supply and Demand. Construction and operation of the proposed rural water system under Alternative D would meet most of the projected water demands under this alternative. The model results show that Alternative D would meet the future design population water demand for the communities of the greater Whiteriver area, Carrizo, and Cibecue about 99 percent of the time, and it would meet the 3,000-acre irrigation demands 95 percent of the time (JE Fuller 2022). Alternative D would also provide an adequate water supply to support operations at the Alchesay National Fish Hatchery approximately 90 percent of the time, based on a 10th percentile modeled flow of 12 cfs at NFWRLL (**Table 3.2-8**), which is the stream gage closest to the proposed Miner Flat Dam site. Compared to Alternatives A and B, Alternative D would provide greater volumes of water to support a larger irrigation demand but would not meet the full demands for both future design population and irrigation under all conditions.

Similar to Alternative C, water diversions to meet rural water system demands would start at a lower level and would increase over time as population levels increase. For a period of time, there would be sufficient water storage and supply in the system to meet the rural water system demand requirements and provide irrigation for 3,000 acres of land each year when suitable storage and supply exist to accommodate Canyon Day irrigation water demands. As part of the proposed action, the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet rural water system demands. At some point in the future, allocating sufficient water to meet rural water system demands could require the WMAT water administrator to reduce amounts permitted by the water code for irrigation diversions. Meeting the rural water system diversions would have priority over meeting the downstream irrigation diversions.

Minimum Surface Water Flow and Changes to Flow Regime. Construction and operation of the proposed rural water system under Alternative D would have mixed results regarding minimum surface flows and reducing the number of zero flow days predicted by the model. Thus, this alternative would result in both moderate adverse impacts and beneficial effects on surface flows, depending on the river segment downstream of the dam. As shown in **Table 3.2-8**, the minimum and average flows and average annual flow volumes at NFWRLL generally would be comparable to those under the No Action Alternative, whereas flows and annual volumes at NFWRGG and WRNFA would be slightly lower than those under the No Action Alternative. Additionally, operations under Alternative D would result in 4 zero flow days at NFWRLL, 136 zero flow days for NFWRGG, and 6 zero flow days for WRNFA out of the 63-year modeling period. Modeled flow duration curves under Alternative D are provided in **Appendix F** (*Water Resources*). Thus, compared to the No Action Alternative, Alternative D would result in fewer zero flow days at NFWRLL and WRNFA but a much greater number of zero flow days at NFWRGG. The model also predicted that there would be up to 21 days in a row of zero flow days at NFWRGG. The model results for Alternative D show that flows would exceed the 1 percentile minimum instream flow requirement approximately 85 percent of the time at the NFWRGG gage location and 97 percent of the time at the WRNFA gage location. Among the four action alternatives, these are the highest percentages of time that the instream minimum flow requirements would not be met (JE Fuller 2022).

Additionally, satisfying the water demands for this alternative would result in drawing down the reservoir levels at times to compensate for low flows upstream of the dam. Under Alternative D, the reservoir would be full an estimated 56.1 percent of the time, which is a considerably smaller percentage of time compared to Alternatives A and B and slightly higher than Alternative C. As a result of releasing water from the dam during periods of low inflow to meet downstream water demands, water in the reservoir would drop to the minimum pool level on 24 occasions (2.9 percent of the time) and would be substantially reduced (decreases in water surface elevations of 60 feet or more) on 11 occasions, over the 63-year model period. These periods of low reservoir levels would occur during the summer, coinciding with seasonal irrigation demands and low inflow volumes, and persist for periods of approximately 1 to 2 months per event. However, similar to Alternative C, these predicted changes in reservoir storage volumes for Alternative D are based on the model assumption that future design population demands and the full irrigation demands occur at the time the project is initiated. Realistically, the design population would not be reached for several decades following project initiation. Furthermore, in accordance with the WMAT Water Code, the WMAT water administrator would have the authority to reduce amounts of water permitted for irrigation at

Canyon Day to ensure that the rural water system demands are fully met. This could mean that fluctuations in water levels in the reservoir could be less severe than those predicted by the model.

As with the other alternatives, the proposed Miner Flat Dam would likely result in some attenuation of peak flow events under Alternative D. The magnitude of this effect would depend on the level and capacity of the reservoir at the time a peak flow occurs. In cases when the reservoir is full, the incoming peak flow would not be attenuated as it is routed through the reservoir, whereas some attenuation of peak flows is expected when the reservoir level is below full pool level. Compared to Alternatives A and B, the reservoir would be below full pool level for a greater percentage of time under Alternative D. Thus, the potential for the dam and reservoir to affect peak flows would be comparatively greater. The proposed Miner Flat Dam and reservoir are expected to result in the following changes to the downstream flow regime under Alternative D as compared to the No Action Alternative: (1) similar minimum flows; (2) both increases and decreases in the number of zero flow days and duration of zero flow events, depending on location downstream from the dam; (3) reduced peak flows during summer when flows coincide with periods when the reservoir is below full pool level and filling; and (4) slightly reduced annual average flows and flow volumes. The dampening of peak flow events associated with summer storms that coincide with periods when the reservoir is filling means that the magnitude of instantaneous peak flows would be reduced, but this effect would be moderated for longer averaging periods.

Water Quality (Construction-Related Impacts). Construction-related impacts to water quality would be the same as under Alternative A. Some impacts to surface water quality could occur during construction of the proposed rural water system, but minimization measures and BMPs presented under *Water Resources* in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize those potential impacts, resulting in a minor adverse impact.

Water Quality (Operations-Related Impacts). Operations-related impacts to water quality would be comparable to those discussed under Alternative A. Similar to conditions under Alternative A, the water quality characteristics of impounded waters under Alternative D may vary from those of the inflow waters due to the effects of natural physical and biological processes within the reservoir. Depending on the comparatively greater extent and persistence of reservoir drawdown events under Alternative D, these changes to characteristics such as temperature and dissolved oxygen could be larger than those associated with Alternatives A and B and more similar to those associated with Alternative C. In particular, drawdown events during the summer months could result in elevated water temperatures at all depths, including near-bottom waters, which would make it more difficult for the dam operators to regulate the temperature of water released from the dam and prevent changes to downstream water temperatures.

Similar to the other action alternatives, the temperature of the reservoir outflows would be more than 2°C (3.6°F) warmer than the corresponding inflows during some portion of the year (late summer to early winter) under Alternative D (**Figure 3.2-10**). The magnitude of this difference would exceed the water quality standards contained in the Water Quality Protection Ordinance. Additionally, as reservoir water depths are reduced, bottom sediments and/or settled organic matter may be more easily resuspended into the water column, resulting in increased turbidity levels and reduced dissolved oxygen concentrations in the reservoir outflows. Increased water temperatures and elevated nutrient concentrations could also stimulate periodic algal blooms in the reservoir. Nevertheless, other than differences in water temperatures and potentially dissolved oxygen levels, Alternative D would not prevent or threaten the designated uses of water within or downstream of the reservoir. However, adverse water quality impacts are considered major because water temperature and dissolved oxygen changes could exceed the water quality standards contained in the Water Quality Protection Ordinance.

Similar to Alternative A, this alternative would be expected to result indirectly in increased discharge volumes of treated wastewater to the White River. Assuming the wastewater discharges comply with discharge permit limitations, the discharge would not degrade receiving water quality.

Flooding. Operations-related impacts with regard to flooding would be similar to those under Alternative A, resulting in minor beneficial effects. Spring runoff-related flood flows that coincide with periods when the reservoir is at full pool level would effectively be passed through the reservoir without much of an effect on either extent (magnitude) or frequency of flooding. However, flood flow events that occur during periods when the reservoir level is below full pool level and refilling would be muted. Compared to Alternative A, reservoir levels under Alternative D would be below the full pool level a higher percentage of the time, which means that a relatively greater portion of flood flows may be retained to fill the reservoir during these periods. Flood modeling (JE Fuller 2022) indicated that under Alternative D annual peak floods would occur during the portion of the year when reservoir levels are below the full pool level, and portions of the incoming flows would be retained, 17 times during the 63-year modeling period, which is more than twice as frequent as under Alternative A. During these events, the presence of a dam would reduce the magnitude of the average daily flows immediately below the dam by a factor of about 16. Regardless, under Alternative D, the effects of the dam and reservoir on flood risks would be minor.

Erosion, Sediment Transport, and Stream Morphology. Impacts to river geomorphology would be the same as under Alternative A, resulting in minor to moderate adverse impacts. Some of the sediment transported by the NFWR upstream from the dam would settle out and accumulate in the reservoir, thereby reducing sediment loads downstream of the dam. This would not increase erosion potential or changes in stream morphology below the dam.

Groundwater Resources. Impacts on groundwater resources would be similar to Alternative A and would result in a major beneficial effect by reducing potentials for future depletions of local groundwater resources at the Miner Flat Wellfield and aquifers currently serving the communities of Carrizo and Cibecue. While Alternative C is expected to meet the future design population demand about 99 percent of the time based on modeling (see above *Water Supply and Demand*), the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet rural water system demands, without relying more heavily on local groundwater resources. Similar to the other alternatives, Alternative D would not result in any discharges or direct injection of surface water to local aquifers with the potential for altering groundwater quality, and project-related changes to streamflows that could affect groundwater recharge would be minimal.

Connected Actions - Canyon Day Farming. Proposed Canyon Day farming activities under Alternative D would be identical to Alternative C, and the range of potential adverse effects to water resources and hydrology would be the same under both alternatives. While it is not possible to determine with certainty the potential magnitude and extent of impacts on surface and groundwater quality, adherence to applicable Tribal, Federal, and State laws, orders, and regulations, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize potential adverse effects on water resources.

Residual Impacts. Implementation of Alternative D would result in major beneficial effects to groundwater resources by providing alternative sources of water and reducing future extraction of groundwater. Standard BMPs, as presented in **Appendix A.2** (*Best Management Practices*), along with water quality monitoring, and compliance with required and existing permits and policies, would be implemented to protect water resources and beneficial uses. This conclusion is based on the assumption that the WMAT water administrator would review allocations on a regular basis, in accordance with the WMAT Water Code, and make appropriate adjustments to permits for irrigation necessary to meet rural water system demands and reduce potential impacts to water resources. However, there would be an unavoidable adverse water quality impact because implementation of Alternative D would result in a 2°C (3.6°F) or more increase in water temperature along with potential decreases in dissolved oxygen concentrations in dam outflow waters during summer, which would exceed the water quality standards contained in the Water Quality Protection Ordinance. Mitigation measures discussed in **Section 3.4** *(Biological Resource*s) would address potential impacts by proposing additional water quality monitoring in support of the Native Fishes Management Plan along with a feedback loop that would provide updates to the dam operations manual as an adaptive management strategy. Although this mitigation measure is not developed, it is intended to reduce the magnitude of potential impacts to water quality.

Operation of the dam and reservoir under Alternative D would also result in moderate to major adverse impacts to the downstream flow regime by permanently removing up to 11,474 afy from the White River[24] and also attenuating peak flows during summer months and low precipitation years, and with substantial fluctuations in reservoir levels. The number of zero flow days at the NFWRGG would increase from three to 131 under this alternative. Zero flow days at NFWRLL and WRNFA would be slightly reduced (JE Fuller 2022). Attenuation of peak flows would result in impacts to aquatic habitats and other biological resources (discussed in **Section 3.4**, *Biological Resources*).

3.2.3 Cumulative Impacts

Potential impacts of ongoing and reasonably foreseeable future actions on water resources generally fall into three categories: projects with construction or operational activities with potential for affecting water quality; projects that may affect downstream water supplies; and projects that could conflict with the proposed action's prioritized uses of water.

Construction and operation of some of the future actions listed in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), such as proposed recreational facilities at the Miner Flat reservoir, would increase the potential for human disturbances to shoreline and adjacent areas that drain into surface waters within the project area. In particular, as a result of increased human disturbances, runoff could increase inputs of trash, erodible soil, and untreated sewage to the reservoir that could affect water quality. It is reasonable to assume that the recreational facilities would anticipate the need for adequate sanitation and trash collection facilities to minimize the

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[24] The 11,474 afy depletion rate is based on the maximum depletions associated with municipal, rural, and industrial water use demands (3,030 afy) and maximum depletions associated with Canyon Day irrigation (8,444 afy). Additional depletions may occur from reservoir evaporation, unrecovered dam seepage, and other losses in the system.

potential for adverse impacts. Similarly, other projects that would involve ground/soil disturbances, such as construction of WMAT housing, timber harvests, and road improvements, would require compliance with permits and policies protecting water resources and beneficial uses, implementation of SWPPPs, standard BMPs, and water quality monitoring that would minimize potentials for adverse impacts to water quality.

There are many water users, like the WMAT, that would continue to remove water from the river system in accordance with water rights, laws, and court orders. In particular, the San Carlos Apache Tribe water project would focus on water diversions from the Black River. Similar to the proposed action, this future action could contribute to reductions in surface flows in the Salt River downstream from the confluence of the White and Black Rivers. The magnitude and timing of these changes would depend in part on the final design of the project, which is currently ongoing.

Without the proposed action, a future Miner Flat Dam hydropower generation project would not be possible. While speculative at this point, a hydropower generation facility could operate in concert with the water resource management goals of the proposed action. Under certain low inflow conditions, such as prolonged drought events, the priorities of storing water to manage resources may conflict with the need for releases to generate hydropower. To avoid conflicts and potential impacts, the dam management plan would need to be amended to resolve conflicts.

The proposed action would provide a long-term, dependable, and sustainable water supply for residents and businesses within the Reservation and reduce the potential for future impacts to groundwater from overuse. The proposed action would not contribute cumulatively to adverse impacts to surface or groundwater quality, except for the temperature change noted above. The proposed action generally would reduce the number of zero flow days and achieve minimum instream flows to a greater extent than existing conditions (except under Alternative D). Therefore, the proposed action potentially could contribute to beneficial cumulative impacts on surface flows in the Salt River under low flow conditions.

However, the proposed action when combined with water diversions from the Black River (e.g., San Carlos Apache Tribe water project) and climate change induced reductions in flow would adversely affect the quantity of water flowing downstream to the Salt River and Roosevelt Lake. Recent climate change studies reviewed by JE Fuller (2022) concluded that climate-related changes in the Southwest are anticipated to include increases in daily temperatures, decreases in snowpack retention, and changes in seasonal runoff. This means that the Whiteriver watershed may experience slight decreases in annual average streamflow, deeper droughts, and increased precipitation during pluvials (JE Fuller 2022). Climate change induced reductions in flows would also likely affect other rivers and tributaries that supply water to downstream reservoirs. The removal of additional water from the White River, under all action alternatives, when combined with past, present, and reasonably foreseeable future actions and climate change induced reductions, would have an adverse effect on surface water quantity.

3.3 Geology and Soils

The geologic and soil characteristics that may be encountered during construction and implementation of the WMAT rural water system are described in this section. The area of analysis focuses on the soils within the various construction footprints and the stability and solubility of geologic materials underlying and abutting the dam and reservoir pool. A discussion of potential flooding, peak flows, soil erosion, and sedimentation issues downstream of the dam is provided in **Section 3.2** (*Water Resources and Hydrology*).

3.3.1 Affected Environment

Data Sources

Components of the proposed action have been the subject of a number of geotechnical evaluations, engineering studies, and other investigations since the 1980s (HDR, Inc. 2021). The geology and soils of the Miner Flat Dam site, water treatment plant expansion and intake structure, and water distribution system were most recently described in detail in the *Draft Viability Assessment Technical Memorandum for the Miner Flat Dam and Reservoir* (HDR, Inc. 2021), *Rural Water System 30% Water Treatment Plant Design Feasibility Design Report* (Carollo 2014b), and *Final Feasibility Design Report for Miner Flat Municipal Water Pumping Plants, Pipeline and Storage Tanks (Distribution System)* (Morrison-Maierle 2015). Site characteristics will continue to be evaluated as part of the ongoing engineering design process until the final design plans for all project components have been completed and approved. Soil characteristics and unit terminology are primarily derived from the *U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Custom Soil Resource Report for Fort Apache Indian Reservation, Arizona, Parts of Apache, Gila, and Navajo Counties* (USDA NRCS 2013, 2021). The following discussions provide summaries of the investigations completed to date.

Geologic Conditions

The Reservation is generally located in a transitional area between the Colorado Plateau to the north, and the Basin and Range to the south. The transitional area is geologically complex with rock types similar to those found on the Colorado Plateau with local volcanic rock and Cenozoic sedimentary rock and structures such as faults and folds (Gannett Fleming 2013a, HDR, Inc. 2021). The volcanic rocks consist of material from the White Mountain and Springfield volcanic fields. In particular, basaltic flows from the Springfield volcanic fields can be found at the Miner Flat Dam site (Gannett Fleming 2013a).

Geology of the dam site consists of Paleozoic "Supai Group" sandstone and interbedded siltstone, Quaternary basalt, and Quaternary talus, colluvium, and alluvium (HDR, Inc. 2021, Gannett Fleming 2013a). The Supai Group contains gypsum-rich horizons at depths beneath the dam site and future reservoir (HDR, Inc. 2021, Gannett Fleming 2013a). The basalt appears to have flowed down steep-sided valleys previously eroded into the Supai Group, covering previously accumulated talus and alluvium (HDR, Inc. 2021, Gannett Fleming 2013a).

The proposed pumping plant and intake structure would be located in basalt and Permian to Pennsylvanian sedimentary rocks along the canyon of the NFWR, and the proposed treatment plant expansion activities would be located on Permian to Pennsylvanian sedimentary rocks above the canyon of the NFWR. The proposed water distribution pipeline would traverse basalt to the southwest of the water treatment facilities and above the Carrizo Creek crossing, and cross Permian to Pennsylvanian sedimentary rocks, sedimentary rocks, basaltic rock, and Quaternary alluvium.

The project is located within an area of moderate to low earthquake hazard that has been subject to light seismic shaking associated with earthquakes occurring between 1857 and 2000 (Arizona Geological Survey 2012). No Quaternary faults (less than 2.6 million years old) are known within the project area (Arizona Geological Survey 1998). The nearest mapped Quaternary faults are associated with the Vernon fault zone, approximately 35 miles northeast of the proposed dam and reservoir site (USGS 2021). The proposed water distribution pipeline is also aligned nearly parallel to and crosses a northwest trending fault along its middle reach east of Cibecue, but this fault is not listed as active.

Soil Conditions

Soil is the surficial material derived from chemical and physical weathering of underlying geologic materials. Soils play an important role in development projects because soil characteristics, such as erosion potential, soil corrosivity, and suitability for shallow excavations, can affect planning and project engineering requirements. The following descriptions of soil characteristics are primarily derived from the USDA NRCS (2013, 2021). Based on the soil report for the Reservation (USDA NRCS 2013), the project is expected to encounter as many as 17 different soils and soil complexes. Soils across the project area were developed primarily from the parent geologic materials present, including Permian to Pennsylvanian sedimentary rock (interbedded sandstone, shale, and limestone); Holocene to middle Pliocene basalt; Oligocene to Paleocene sedimentary rock; and undivided Quaternary surficial deposits.

The proposed Miner Flat Dam and reservoir site consists primarily of relatively flat-lying to gently sloping eroded Lynx loam, Elledge cobbly sandy loam, and Springerville cobbly clay, which are found on 0 to 8 percent slopes and are well-drained. The Lynx loam is the deepest soil, as it lies on the flattest topography, reaching depths of more than 80 inches. Moderately sloped areas are underlain by Showlow gravelly clay loam, Brolliar cobbly silt loam, and Luna cobbly silt loam, which are found on 8 to 30 percent slopes, are up to 80 inches deep, are well-drained, and are not prone to ponding. In general, the steepest sloped areas within the proposed reservoir area are underlain by Haplustolls-Ustorthents and Brolliar-Cryoborolls complex soils. The Haplustolls-Ustorthents complex soils, which are the most common soil type immediately adjacent to the riverbeds, are found on 5 to 50 percent slopes, are 5 to 20 inches deep, and are well-drained. The Brolliar-Cryoborolls complex soils are found on 30 to 50 percent slopes, are 40 to 60 inches deep, and are not prone to ponding.

The proposed water treatment expansion site is underlain by the Tortugas-Rock outcrop complex, which occurs on 30 to 50 percent slopes and consists of cobbly clay loam, silty clay loam, and weathered bedrock. The existing treatment plant is located on a southwest facing slope. These types of soils are 6 to 20 inches deep, well-drained, and not prone to ponding. The new intake structure and raw water pump station would be located at the same site as the existing diversion and intake facilities. This site is adjacent to the NFWR and is underlain by well-drained, shallow, colluvium typically found on 5 to 50 percent slopes (USDA NRCS 2021), which also occurs adjacent to drainages along the proposed water distribution pipeline route and within the proposed reservoir area.

The route for the proposed 50-mile-long water distribution system is underlain by a wide range of soil types and characteristics, due primarily to the variable topography and conditions encountered. Soils in washes and stream crossings and other lowland areas typically are composed of alluvial deposits developed from parent limestones, sandstones, and shales (Paul C. Rizzo and Associates 2014, USDA NRCS 2013, 2021). More upland soils are well-drained gravelly, silty, clayey, or sandy loam residual soils weathered from the limestones and calcareous sandstones. The transition zone from upland areas to mountainous areas contains a mix of colluvial soils developed from upthrust or outcropping igneous and sedimentary rocks and gravelly clay and clay loam residual soils. The tops of the plateaus generally consist of gravelly clay outcrop complexes with 10 percent or greater area made up of exposed rock.

3.3.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, the WMAT rural water system would not be constructed. Erosion and sedimentation associated with project grading and excavations would not occur. Concerns about stability of geologic materials at the dam site and solubility of sediments would not be encountered.

Alternative A

Geologic Risks. The geologic risks associated with Alternative A would be moderate, although incorporation of appropriate engineering design features should minimize this risk. The potential for project-related geologic risks has been evaluated in several investigations including feasibility studies, otherwise known as 30 percent design, for the water distribution system and water treatment plant expansion (Carollo 2014b, Morrison-Maierle 2015), and the Draft Viability Assessment for the Miner Flat Dam Site (HDR, Inc. 2021), as summarized below.

The Viability Assessment (HDR, Inc. 2021) included a potential failure modes analysis that evaluated the two most critical geologic, hazard-related, failure modes: (1) dam failure with potential risks to the public; and (2) excessive seepage/leakage that would prevent the project from meeting the water supply objectives. Dam failure could result from the load of the dam and impounded reservoir pool. Preexisting weaknesses such as landslide planes or permeable horizons could become subject to stresses that lead to failure. Seepage along such permeable horizons or along other weakened planes could result in karst (i.e., landscape underlain by limestone or other soil types subject to dissolution) development that produces fissures or voids, leading to potential ground failure, damage to the dam foundation, and/or reductions in the amount of water that could be safely stored in the reservoir.

As part of the Viability Assessment, HDR, Inc. (2021) evaluated conceptual dam and reservoir foundation treatments intended to satisfy the Reclamation dam safety Public Protection Guidelines. These engineering designs included: (1) positive grout curtain cutoff through the left abutment ridge, under the dam alignment and extending out in the right abutment basalt; and (2) concrete membrane facing system covering the nose and upstream slope of the left abutment ridge upstream of the dam. The Viability Assessment (HDR, Inc. 2021) concluded that the geologic hazards associated with the Miner Flat Dam without appropriate foundation treatments would be significant, whereas incorporation of the foundation treatments into the engineering designs would result in significant risk reduction and reduce potential seepage rates to the extent that the project's water supply objectives would be achieved.

Another geologic risk is seismic activity because the project area is located in a moderate to low earthquake hazard zone, as described in **Section 3.3.1** (*Affected Environment*). Seismic activity could result in direct damage to project infrastructure or cause conditions (e.g., seiche waves within the reservoir) that could damage infrastructure and/or exacerbate other geologic risks, such as damage to the dam foundation. Project engineering accounts for seismic risks such that final designs would meet the Public Protection Guidelines.

The results of project-specific engineering and geotechnical investigations were and will continue to be addressed and incorporated into site- and project-specific final engineering designs and resulting specifications. These engineering requirements would be reviewed, refined, finalized, and approved during the project's engineering design phase. In addition, and as part of the engineering design, construction of the WMAT rural water system would be subjected to significant Federal and WMAT oversight and inspection. In particular, the Miner Flat Dam would be constructed in accordance with applicable dam safety guidelines and requirements. As a result, compliance with final site-specific investigations and engineering design plans for all WMAT rural water system infrastructure would adequately reduce geologic risks through analysis and design engineering.

Suitability of Soils. The risks and challenges associated with soil suitability in the project area would be minor with standard engineering design and construction procedures. Typical soil suitability issues may include soil corrosivity, shallow depth to bedrock, significant slopes, and clay content. Standard engineering design and construction procedures would employ appropriate excavation and construction techniques based on the depth to bedrock, steepness, clay content, or proximity to drainages. Examples include direct excavation with a trench box, "trenchless" excavation near drainages and roads, and drilling and blasting where depth to bedrock is shallow (Morrison-Maierle 2015). Where steel pipeline may be used, expected only in limited areas, soil corrosivity would be addressed with the use of protective coverings or coatings rated for the design life of the equipment, and corrosion monitoring would minimize risks of equipment failure due to corrosion.

Soil Erosion. During and following construction, adverse impacts associated with the erosion of soils within the various construction footprints would be major without proper management. Grading and excavations related to construction of the dam, expanded treatment plant, pump station, access roads, and other new facilities would result in disruption of the soil profile and creation of soil stockpiles. Similarly, excavations to bury and install pipelines would further result in ground surface disturbance. These construction activities would result in increased erosion of disturbed soils from runoff and wind. This can be particularly problematic near drainages and on slopes where sedimentation can pollute downstream waters and habitats, disturb vegetation, and clog downstream channels. Without proper management, soil erosion would continue after construction and adversely affect the stability of new facilities and could result in further disturbance to downstream waters and habitats.

Additionally, fluctuations of reservoir water levels would affect erosion potential of shoreline soils during operations. In particular, exposure of the shoreline during drawdown periods would result in desiccation of surface material and expose the surface soils of the reservoir bed to wind and precipitation. In addition, refilling the reservoir would temporarily resuspend fine sediment before it settles again; however, resuspension and settling would be focused at the upper end of the proposed reservoir during times of peak inflows.

Regulatory drivers require the implementation of planning and practices to reduce erosion potential associated with construction and infrastructure projects. The Federal CWA as well as water quality standards in Sections 3.5(A) and (G) and Section 3.6 of the Water Quality Protection Ordinance address impacts that could result from excess sedimentation from project construction. In support of the regulatory drivers, erosion control and monitoring plans would be developed for each project component to address erosion control and management of project infrastructure (see *Soils and Geology* measures in **Appendix A.2**, *Best Management Practices*). The erosion control plans would identify construction and post-construction monitoring requirements and BMPs for preventing erosion during and after construction. The erosion control plans would identify and correlate all regulatory drivers to management, monitoring, and reporting activities and ensure through contractual mechanisms that requirements are met and, in addition to design plans and specifications, would adequately address erosion risk. Adherence to these measures would minimize the risk of soil erosion from project activities.

As discussed in more detail in **Section 3.2** (*Water Resources and Hydrology*), future farming practices in Canyon Day could result in soil erosion, and impacts could be major without proper management. In addition to standard agricultural management practices and BMPs related to ground disturbance and erosion-control, conservation practices for agriculture can be implemented to further minimize potential adverse effects to nearby drainages. Strategic planting can reduce erosion near drainages by stabilizing surface soils, and disturbance frequency can be managed to keep land undisturbed for long periods between plantings. While it is not possible to determine with certainty the potential magnitude and extent of impacts associated with the erosion of soils, adherence to applicable Tribal, Federal, and State laws, orders, and regulations, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize the risk of soil erosion.

Residual Impacts. With implementation of final engineering design requirements for the WMAT rural water system as well as the measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts from geologic risks, soil suitability issues, or soil erosion from construction and operation of the new rural water system under Alternative A, and no mitigation measures are required.

Alternative B

Alternative B would include the same construction issues as Alternative A; therefore, there would be no differences in impacts related to geology and soils. Unlike Alternative A, rural water system operations under Alternative B would not prioritize preservation of minimum instream flows downstream of the dam and, therefore, would result in reduced downstream water flow at times. Additional information related to potential soil erosion and sedimentation issues downstream of the dam is provided in **Section 3.2** (*Water Resources and Hydrology*). Soil erosion issues related to Canyon Day farming would be the same as Alternative A. With implementation of final engineering design requirements for the WMAT rural water system as well as the measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts from geologic risks, soil suitability issues, or soil erosion from construction and operation of the new rural water system under Alternative B, and no mitigation measures are required.

Alternative C

Alternative C would include the same construction issues as Alternative A; therefore, there would be no differences in impacts related to geology and soils. Implementation of Alternative C would result in increased downstream water diversions for agricultural use compared to Alternatives A and B, potentially causing more fluctuations in reservoir levels compared to the other action alternatives, although this would result in negligible issues related to soil erosion. Alternative C would have similar soil erosion issues related to Canyon Day farming as Alternative A, but the extent of possible impacts would be greater given the larger area proposed for agricultural activities. With implementation of final engineering design requirements for the WMAT rural water system as well as the measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts from geologic risks, soil suitability issues, or soil erosion from construction and operation of the new rural water system under Alternative C, and no mitigation measures are required.

Alternative D

Alternative D would include the same construction issues as Alternative A; therefore, there would be no differences in impacts related to geology and soils. Unlike Alternatives A and C, rural water system operations under Alternative D would not prioritize preservation of minimum instream flows downstream of the dam and, therefore, would result in reduced downstream water flow at times. Additional information related to potential soil erosion and sedimentation issues downstream of the dam is provided in **Section 3.2** (*Water Resources and Hydrology*). Implementation of Alternative D would also increase water diversions for agricultural use, potentially causing more fluctuations in reservoir levels compared to Alternatives A and B. These fluctuations would result in negligible issues related to soil erosion. Alternative D would have similar soil erosion issues related to Canyon Day farming as Alternative A, but the extent of possible impacts would be greater given the larger area proposed for agricultural activities. With implementation of final engineering design requirements for the WMAT rural water system as well as the measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts from geologic risks, soil suitability issues, or soil erosion from construction and operation of the new rural water system under Alternative D, and no mitigation measures are required.

3.3.3 Cumulative Impacts

A number of the potential future actions identified in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), including the Hon-Dah Resort expansion, construction of WMAT housing, timber harvests, and road improvements, would involve ground disturbance, with the potential for short-term adverse impacts associated with erosion of disturbed soils that could result in impacts to aquatic habitats and biological resources. None of the potential future actions would increase geologic risks from flooding, seismic activity, or dam failures.

As discussed in **Section 3.3.2** (*Environmental Consequences*), the proposed action would not result in significant adverse impacts as a result of ground disturbances. Most construction-related impacts would be short-term and localized, and the potential for impacts associated with possible erosion, off-site transport, and siltation of soils would be controlled by implementation of BMPs and compliance with stormwater permit conditions. In general, potentials for geologic risks associated with construction and operation of the rural water system components would be addressed by incorporating appropriate engineering design features and dam safety guidelines. Compliance with the appropriate guidance and regulations would ensure that the proposed WMAT rural water system would not result in significant adverse impacts from geologic risks or soil suitability issues.

Impacts to geology and soils associated with the other ongoing and reasonably foreseeable future actions would not likely overlap in time or space with those associated with the proposed action sufficiently to result in significant cumulative adverse impacts or beneficial effects.

3.4 Biological Resources

Biological resources include vegetation communities, land cover types, and associated wildlife; aquatic communities and native fishes; migratory birds; wetlands and other waters subject to the jurisdiction of the USACE; and federally listed and Tribal Sensitive Species (TSS). Federally listed species are defined as those potentially present in the study area that are a species, subspecies, or distinct vertebrate population segment that has been added to the Federal lists of Endangered and Threatened Wildlife and Plants as they appear in 50 CFR 17.11 and 17.12. The USFWS provided an *Information for Planning and Consultation* list of federally listed species and other trust resources (USFWS 2021). The WMAT list of TSS species was also reviewed. A TSS is a designation given by the WMAT and subject to ongoing management supporting conservation of the species. The list of TSS species has been approved by the USFWS under the Statement of Relationship and Information Protocol between the USFWS and WMAT.

The study area for the purposes of the biological resources evaluation is defined as all areas subjected to project-specific activities as well as those surrounding areas directly or indirectly affected by the proposed action. The study area varies by species, but generally includes: (1) the NFWR, to include the location of the proposed Miner Flat Dam and upstream approximately 1 mile, encompassing the reservoir inundation area; (2) the NFWR where the proposed North Fork intake structure expansion would be placed; (3) the NFWR and White River downstream of proposed action infrastructure down to the confluence with the Black River, where changes in operations of the dam, diversions, and return flows may affect flood and surface flow conditions; and (4) areas affected by construction, including noise, of the water treatment plant) expansion and new water distribution system between the existing water treatment plant and the community of Cibecue (see **Figure 1.1-2** and **Figure 2.2-2**). This section also presents existing information, when available, related to proposed Canyon Day farming activities, which is a connected action as discussed in **Section 2.6** (*Connected Actions*) and **Figure 2.6-1**.

This analysis draws heavily on information about past and projected water supply and demand presented in **Section 2.3** (*Existing White Mountain Apache Tribe Water Systems*) and hydrology, surface water quality, flooding, and temperature characteristics discussed in **Section 3.2** (*Water Resources and Hydrology*).

3.4.1 Affected Environment

Vegetation Communities

This section includes a description of plant communities identified in the study area. One TSS plant, the Arizona willow (*Salix arizonica*) is also described. The locations of the proposed Miner Flat Dam and reservoir expanded water treatment plant, North Fork intake expansion, and new water distribution system are depicted in **Figure 2.2-2**. The NFWR in the vicinity of proposed new infrastructure consists of a perennial stream made up of a series of generally narrow bedrock canyons of varying width and depth, with intervening small alluvial valleys. Vegetation is primarily ponderosa pine (*Pinus ponderosa*) forest within the elevation range of approximately 5,000 to 6,200 feet. For this community, ponderosa pine is the dominant species, and Douglas fir (*Pseudotsuga menziesii*) and Chihuahua pine (*Pinus leiophylla*) are locally common associates. Deciduous trees, including Gambel oak (*Quercus gambelii*) and Arizona walnut (*Juglans major*), are present in openings within the pine forest, and shrubby junipers (*Juniperus* spp.) and oaks (*Quercus* spp.) are common in the understory. Riparian and wetland vegetation, such as willows (*Salix* spp.), alders (*Alnus* spp.), sedges (*Carex* spp.), and spikerush (*Eleocharis* spp.), is limited to narrow bands and patches along the NFWR and are frequently intermixed with upland species. In the widest part of the canyon, approximately 5 miles upstream of the proposed site for the Miner Flat Dam, a campground and grazed lands occur adjacent to the NFWR.

Vegetation along the NFWR and White River downstream of project components has not been delineated; however, vegetation structure and characteristics were recorded at several locations associated with species surveys and are discussed here. The NFWR supports canyon-bound segments, which include steep canyon walls and narrow riparian corridor or floodplain. In these reaches, vegetation transitions quickly to adjacent upland community types such as ponderosa pine forest and woodland, as described above. The NFWR also includes reaches where a broad floodplain and riparian communities are supported. These segments support native woody riparian species including coyote willow (*Salix exigua*), boxelder (*Acer negunda*), Goodding's willow (*Salix gooddingii*), and Fremont cottonwood (*Populus fremontii*). Non-native tree and shrub plant species are present but uncommon and include Siberian elm (*Ulmus pumila*), Russian olive (*Elaeagnus angustifolia*), and saltcedar (*Tamarix chinensis*) as examples. A riparian corridor is present, at least in patches, throughout many sections of the NFWR ranging from narrow corridors to open floodplain. Specific reaches along the NFWR with wide, riparian-dominated floodplains are present up- and downstream of the confluence with Diamond Creek and in the vicinity of the community of White River. Along the White River, riparian vegetation structure was noted during surveys as diverse near Canyon Day and included patches with mature overstory of Fremont cottonwood and Goodding's willow and dense stands dominated by coyote willow, boxelder, and saplings of Fremont cottonwood and Goodding's willow (Blue Earth 2013a).

Elevations along the proposed water distribution pipeline from the water treatment plant to Cibecue range from 5,000 to 6,000 feet, and vegetation types traversed include woodlands, shrublands, and grasslands. The woodlands and shrublands are dominated by junipers, with Rocky Mountain juniper (*J. scopulorum*) more prevalent at higher elevations, especially in the eastern part of the pipeline corridor, whereas Utah juniper (*J. osteosperma*) and one-seed juniper (*J. monosperma*) are more common at lower elevations and in the western part of the pipeline area. A variety of shrubby species are often associated with these woodlands, including scrub oaks, manzanita (*Arctostaphylos* spp.), mountain mahogany (*Cercocarpus betuloides*), and barberries (*Berberis* spp.). Perennial grasses constitute the understory. Grasslands are prevalent, typically in areas with relatively deep soils along the pipeline alignment. In many areas, grasslands are scattered with shrubs and small trees that have remained from range improvement projects, which removed most of the woody cover to stimulate the growth of grasses. Most of the pipeline route is adjacent to major roads, including SR 73 and Indian Route 12, and the vegetation and soil surface along the road shoulders is frequently disturbed and composed of perennial grasses and a variety of native and introduced upland herbaceous species (i.e., ruderal vegetation type). Between Whiteriver and Canyon Day, the proposed pipeline route is primarily within low to moderately developed areas subjected to prior disturbance.

The proposed water distribution pipeline route also crosses several major tributaries, including three that flow into the Salt River (Cibecue Creek, Carrizo Creek, and Cedar Creek) and two that flow into the White River (Bear Canyon/Bear Wash and Amos Wash), all of which support riparian vegetation dominated by Fremont cottonwood, narrowleaf cottonwood (*Populus angustifolia*), alders, and willows.

The only plant species identified by the WMAT as a TSS is the Arizona willow, which is found in wet alpine meadows, high elevation cienegas, or streamside microsites in some of the drainages in the northeastern part of the Reservation, generally at elevations greater than 2,438 meters (8,000 feet), which is outside the elevational range of the study area and project components. This species and its habitat are currently managed by the Tribe with protection and management guidelines set forth in the WMAT Arizona Willow Management Plan. This species is not present in the project area.

Table 3.4-1 provides a quantification and summary of the vegetation communities/land cover types in the vicinity of the proposed project components. The table categorizes the vegetation communities between those associated with the dam site, such as the proposed reservoir inundation area, dam, and new access road ("Miner Flat Dam and Reservoir" column), and those associated with other project features, including the North Fork intake structure, water treatment plant, and water distribution pipeline ("Water Distribution System" column). The acreages presented represent the footprints of proposed permanent and temporary features. "Temporary" values also include a 100-foot corridor around most project components to account for incidental disturbance. Vegetation mapping is generalized from existing data sources, desktop mapping, and field observations, and values should be considered estimates with assumed transitional communities. **Table 3.4-1** does not quantify any temporary or permanent disturbance associated with subsurface treatment requirements because the specific treatments have not been defined yet. However, some additional disturbance is expected behind the face of the dam overlapping with the inundation and facility footprints as well as adjacent uplands. The total additional area that could be temporarily and/or permanently disturbed behind the dam face is approximately 8 acres.

Table 3.4-1. Vegetation Communities in the Project Feature Footprints

Vegetation Type[1]	Miner Flat Dam and Reservoir[2] (acres)	Water Distribution System[3, 4] (acres)	Comments
Ponderosa Pine Forest and Woodland	151/-	<0.1/19	Forest and woodland communities with ponderosa pine as a dominant species. Includes areas of the upland deciduous forest community, which is intimately associated with ponderosa pine in the proposed reservoir area.
Pinyon-Juniper Woodland	-/-	4.1/303	Includes extensive areas of woodland or shrubland dominated by juniper, in addition to areas dominated by both pinyon and juniper.
Grassland/Meadow	1.3/<1	/89	Dominated by grasses and other herbaceous species, including forbs.
Riparian	21/-	-/-[2]	Includes riparian forest, riparian meadow, rivers, and ponds.
Developed or Ruderal	<1/-	/104	Includes populated areas, modified/managed uplands, and roads, as well as relatively bare

Table 3.4-1. Vegetation Communities in the Project Feature Footprints

Vegetation Type[1]	Miner Flat Dam and Reservoir[2] (acres)	Water Distribution System[3, 4] (acres)	Comments
			areas such as roadsides and recently cleared areas.
Upland/Deciduous	4/-	-/90	Includes pasture and hayfields.
Unknown	2.5/11	/10	Includes unidentifiable areas.
Totals	**180/12**	**4.1/615**	

Key: - = no removal for the community; < = less than

[1] Categories presented are based on publicly available information, combined with in-field refinement where additional information exists. There is likely some overlap and intermixing between communities. Detailed information for all plant communities and representations is not available.

[2] Permanent Removal/Temporary Disturbance

[3] The water distribution system includes the project components associated with the North Fork intake structure, water treatment plant, and water distribution pipeline.

[4] Approximately 1 acre of riparian was mapped along the pipeline route but would be avoided.

As discussed in **Section 2.6** (*Connected Actions*), the proposed action would support downstream irrigation diversions in the Canyon Day area, and an interrelated action may occur if the WMAT chooses to expand farming in the Canyon Day area, including within 885 acres that were cultivated previously under the Canyon Day Irrigation Project in the 1980s (Alternatives A and B) and potentially an additional 2,115 acres (3,000 acres total; Alternatives C and D). Vegetation in the Canyon Day agriculture area has not been surveyed. However, a desktop review of aerial photography and analysis of the Regional Gap Analysis Project (ReGAP) (USGS 2005) within the previously cultivated and potential adjacent expansion area shows evidence of current and past farming, as well as other areas where small farms continue to exist. ReGAP identifies this area as having predominantly grassland (66 percent) and agricultural (14 percent) land cover types. Undisturbed areas are also present within and adjacent to existing and previously farmed land, which is mapped as pinyon-juniper/chaparral and woodland (11 percent), pinyon-juniper/chaparral intermixed with grassland (4 percent), and barren (2 percent), defined as less than 10 percent plant cover. Intergraded upland communities make up the rest of the land cover types, and although not specifically mapped, drainage features and associated riparian vegetation may be present within the larger Canyon Day area.

Wildlife

The natural topographic features, range in elevations, variable soil types, and precipitation patterns of the Reservation provide habitats suitable for a diverse range of wildlife species, including birds, mammals, reptiles, amphibians, and invertebrates. Active wildlife monitoring and management occurs on the Reservation, which is facilitated through the WMGFD.

Over 200 bird species, 30 reptiles and amphibians, and 70 mammals are known to occur on the Reservation (WMAT 2005a), including a number of federally threatened, endangered (see *Species Federally Listed, or Candidates for Listing, as Threatened or Endangered under the Endangered Species Act*), and TSS (described in this section and under *Aquatic Communities and Native Fishes*). Although project-specific surveys were not completed, the Reservation is also known to support a variety of Migratory

Bird Treaty Act (MBTA)-protected species. Under the MBTA, it is unlawful "by any means or manner to pursue, hunt, take, capture or kill" any migratory bird, except as permitted by regulations issued by the USFWS. A complete list of all species of all migratory birds protected by the MBTA is in the *Federal Register* (50 CFR 10.13). EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, further directs Federal agencies to evaluate the effects of Federal actions to migratory birds in NEPA documents, particular birds of management concern. Nine species identified as birds of conservation concern have the potential to occur in the study area (**Appendix G**, *Biological Resources*; USFWS 2021).

Other wildlife includes those species that are of economic importance to the WMAT (i.e., big game animals) and to Tribal members for sustenance, as well as cultural and traditional purposes (WMAT 2005a). Hunting, fishing, gathering, and observation of these animals on the Reservation are important to the Apache people and their culture. Wildlife species of special cultural significance include the golden eagle (*Aquila chrysaetos)*, white-tailed deer (*Odocoileus virginianus*), and black bear (*Ursus americanus*) (WMAT 2005a). Game species include elk (*Cervus canadensis*), mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), wild turkey (*Meleagris gallopavo*), pronghorn (*Antilocapra americana*), javelina, cottontail, squirrel, and migratory and upland game birds (e.g., waterfowl, dove, quail).

Ponderosa pine forests, the most common habitat at the proposed site for the Miner Flat Dam and in adjacent upland areas along the NFWR, are often complex due to their successional phases, vegetation composition, and disturbance regimes, which create important habitats and provide food sources for various wildlife species (Graham and Jain 2005). Mammals including elk and deer use ponderosa pine forests for foraging. Mountain lions and other predators use these forests for habitat and as a food source. Ospreys (*Pandion haliaetus*) and great blue herons (*Ardea herodias*) build their nests in the tree canopies. Acorn woodpeckers (*Melanerpes formicivorus*) and songbirds such as canyon wrens (*Catherpes mexicanus*), red-faced warblers (*Cardellina rubrifrons*), yellow-rumped warblers (*Setophaga coronata*), and painted redstarts (*Myioborus pictus*) also use these forests for foraging and nesting. Although only a few species rely solely on woodland habitats (the most common community type along the proposed 50-mile pipeline route), many species use pinyon-juniper habitats for food, shelter, or breeding during part of the year. In addition, patches of grassland along the pipeline route support habitat for rabbits, pronghorn, foxes, bobcats, coyote (*Canis latrans*), deer, and wintering elk. Lizards and other reptiles are especially visible in sparsely vegetated edge areas such as road margins. Common grassland rodents include squirrels, gophers, and mice. Large raptors such as the red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and turkey vulture (*Cathartes aura*), along with many species of grassland foragers, are also present.

Preferred habitat for the American peregrine falcon (*Falco peregrinus anatum*), a TSS, includes high rocky canyons and cliffs near more open riparian areas for foraging, which are present at upper reaches of the NFWR. There have been sightings of peregrine falcons on the Reservation but not near the proposed Miner Flat Dam site (WMGFD 2022). Observations have been very intermittent, with pairs seen and nesting behavior noted primarily in the Salt River Canyon, with some recent nests observed outside of the canyon. Observations elsewhere on the Reservation may have been of transient or foraging birds (WMAT 2021b).

The Reservation is also within the wintering range of the bald eagle (*Haliaeetus leucocephalus*), another TSS species, with a small resident and nesting population within the Salt River Canyon and some tributaries. Bald eagle populations on the Reservation are highly variable depending upon the severity of the winter season and scarcity of prey. Sightings are especially common during October through March. Most use is associated with foraging near lakes, streams, and ponds. Some foraging of carrion is also observed away from water sources (WMAT 2021b). There is no documentation of bald eagles in the vicinity of the Miner Flat Dam site (WMGFD 2022).

Riparian areas that occur in a narrow band along the NFWR and a few areas along the proposed water distribution pipeline route support a high diversity of wildlife species relative to other vegetation communities. More than half of all reptiles and the majority of all mammals and bird species use riparian areas for food, water, cover, or migration routes. The federally listed yellow-billed cuckoo, southwestern willow flycatcher, narrow-headed gartersnake (*Thamnophis rufipunctatus*), northern Mexican gartersnake (*Thamnophis eques megalops*), and New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) are obligate riparian species and are discussed in detail below under *Species Federally Listed, or Candidates for Listing, as Threatened or Endangered under the Endangered Species Act*.

Surveys in the Canyon Day farming area, as defined under **Section 2.6** (*Connected Actions*), have not been conducted for the proposed action; however, wildlife supported by habitats available would be similar to those encountered throughout other project areas associated with woodland, agriculture, and other sparse vegetation types. Surveys were completed along the White River, approximately 0.5 miles away. However, large raptors, along with many species of grassland foragers, including migratory birds, are expected to utilize this area due to high prey visibility common to sparse vegetation communities. Common species likely present would be those accustomed to grasslands, varying levels of disturbance, and minimal cover, including squirrels, gophers, and mice.

Aquatic Communities and Native Fishes

As previously defined, the study area for aquatic communities and native fish species is associated with the NFWR from the upper end of the proposed reservoir inundation area to its confluence with the EFWR, at which point it becomes the White River. The study area also includes the White River downstream to the confluence with the Black River, at which point it becomes the Salt River (see **Figure 1.1-2**). The proposed 50-mile pipeline route also crosses several major ephemeral tributaries, including Cibecue Creek, Carrizo Creek, Cedar Creek, Bear Canyon/Bear Wash, and Amos Wash. Drainages within the Canyon Day area are also briefly discussed.

Aquatic Communities. An aquatic habitat assessment and fish surveys were conducted (September through October of 2013) along the NFWR and the White River, extending from the proposed Miner Flat Dam site to Amos Wash (see **Figure 2.2-2**), to collect data necessary to characterize the aquatic habitats and communities (Blue Earth 2014). One site, traditionally supporting loach minnow (*Tiaroga cobitis*), was also included in the assessment and survey. Based on survey results, two principal channel segment types along the NFWR and White River were identified—"canyon-bound" and "floodplain"—relating primarily to stream slope, substrate, and unit stream power (**Table 3.4-2**). The distribution of cold and warmwater fish species within these two segment types have led to the determination that four aquatic communities are present within the study area: (1) Canyon-Bound, Cold Water; (2) Canyon-Bound, Warm Water; (3) Floodplain, Cold Water; and (4) Floodplain, Warm Water. The characteristics of these aquatic communities are described in **Table 3.4-2**, and the location of these communities is presented in **Figure 3.4-1**.

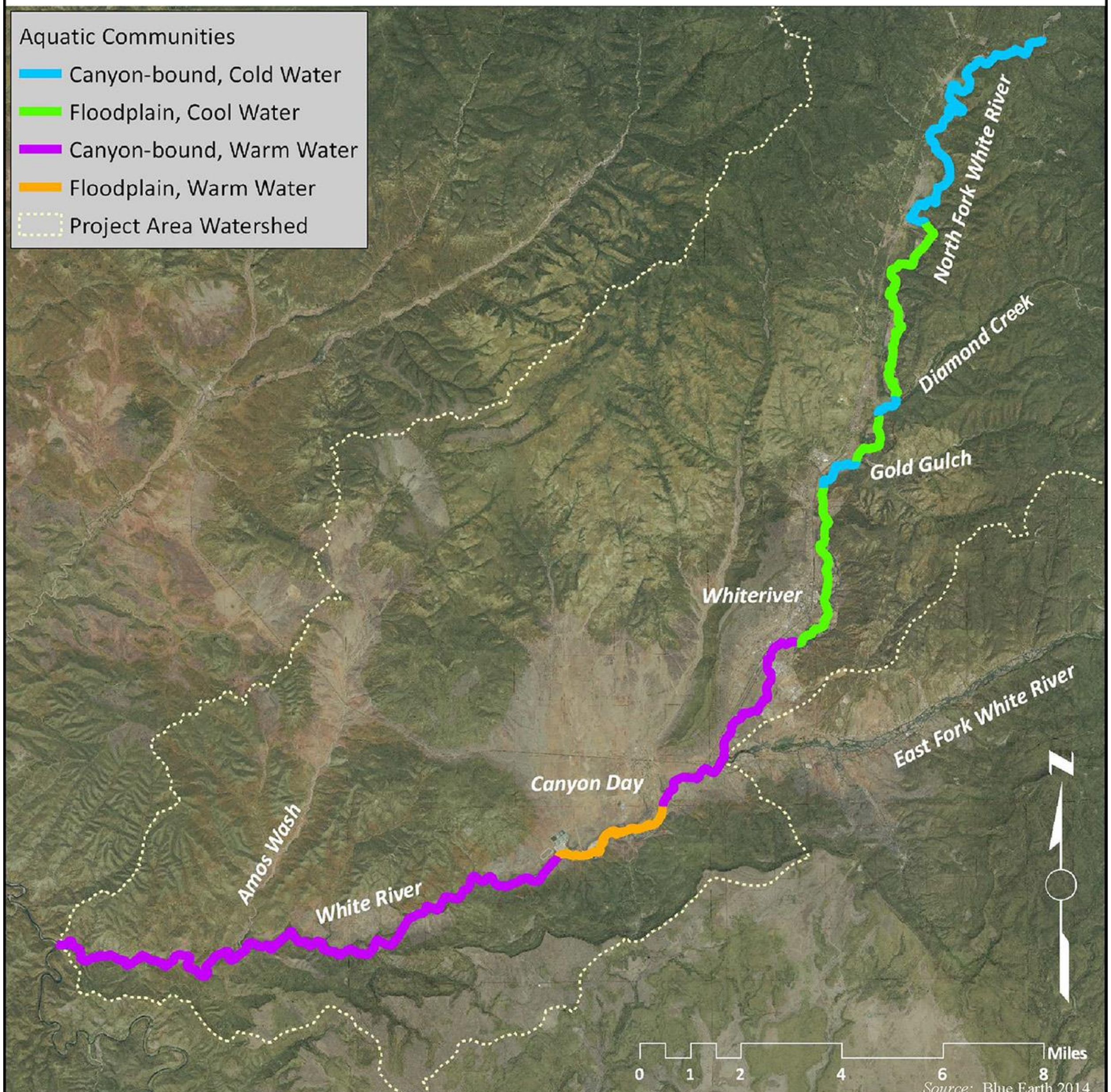

Figure 3.4-1. Distribution of Aquatic Communities in the Project Area

Table 3.4-2. Aquatic Communities Present in the Study Area

Aquatic Community	Channel Length within Survey Area[1] (percent of survey area)		
	NFWR	White River	Total
Canyon-Bound, Cold Water	47,427 feet (41%)	0 feet (0%)	47,427 feet (22%)
Canyon-Bound, Warm Water	17,514 feet (15%)	83,447 feet (85%)	100,961 feet (47%)
Floodplain, Cold Water	50,709 feet (44%)	0 feet (0%)	50,709 feet (24%)
Floodplain, Warm Water	0 feet (0%)	14,890 feet (15%)	14,890 feet (7%)
Total	**115,650 feet (100%)**	**98,337 feet (100%)**	**213,987 feet (100%)**

Source: Blue Earth (2014)
Key: NFWR = North Fork of the White River
[1] Survey area covered a stretch of the NFWR and the White River from the proposed Miner Flat Dam site to Amos Wash.

No aquatic community or native fish surveys have been conducted for the Canyon Day farming area; however, the National Wetland Inventory identifies several drainage features as intermittent and seasonally flooded (USFWS 2018), with drainage to the south into the NFWR. Some unquantifiable amount of aquatic habitat may be present seasonally.

Native Fishes. Data presented in this section are based on WMAT sampling from 2003 to 2011 (**Table 3.4-3**) and project-specific fish sampling and an aquatic community assessment conducted in 2013 (**Table 3.4-4**). Focused loach minnow surveys were completed on the NFWR, EFWR, and the White River in 2014. These survey results, which counted all species identified, are discussed in *Species Federally Listed, or Candidates for Listing, as Threatened or Endangered under the Endangered Species Act (Loach Minnow)*.

Table 3.4-3. Summary of WMAT 2003–2011 Fish Survey Data

Species	Percent Composition of Survey Samples
Salmonids	
Apache trout (*Oncorhynchus apache*) - Threatened	0.8%
Rainbow trout (*Oncorhynchus mykiss*) - **nn**	1.6%
Brown trout *(Salmo trutta)* - **nn**	2.3%
All salmonids	**4.7%**
Catostomids	
Desert sucker (*Catostomus clarkii*) - TSS	47.7%
Sonora sucker (*Catostomus insignis*) - TSS	23.7%
All Catostomids	**71.4%**

Table 3.4-3. Summary of WMAT 2003–2011 Fish Survey Data

Species	Percent Composition of Survey Samples
Ictalurids and Centrarchids	
Channel catfish (*Ictalurus punctatus*) - **nn**	0.4%
Green sunfish (*Lepomis cyanellus*) - **nn**	0.5%
Smallmouth bass (*Micropterus dolomieu*) - **nn**	0.9%
All Ictalurids and Centrarchids	**1.8%**
Cyprinids	
Speckled dace (*Rhinichthys osculus*) - TSS	14.9%
Roundtail chub (*Gila robusta*) - TSS	6.9%
Fathead minnow (*Pimephales promelas*) - **nn**	0.4%
All Cyprinids	**22.2%**

Source: WMAT in Blue Earth (2014)

Key: % = percent; nn = non-native species; Threatened = Federally listed as threatened; TSS= Tribal Sensitive Species; WMAT = White Mountain Apache Tribe

Table 3.4-4. Summary of 2013 Fish Survey Data

Species	Fish Sample Location				Total
	North Fork Miner Flat **(canyon-bound, cold water)**	North Fork Lower Alchesay **(floodplain, cool water)**	White River Upper Ford **(floodplain, warm water)**	White River Amos Wash **(canyon-bound, warm water)**	
Salmonids					
Apache trout (*Oncorhynchus apache*) – Threatened	2	0	0	0	2 (1.3%)
Brown trout (*Salmo trutta*) - **nn**	6	2	1	1	10 (6.3%)
All salmonids	**8**	**2**	**1**	**1**	**12 (7.5%)**
Catostomids					
Desert sucker (*Catostomus clarkii*) - TSS	3	29	15	2	49 (30.8%)
Sonora sucker (*Catostomus insignis*) - TSS	10	24	9	1	44 (27.7%)
All Catostomids	**13**	**53**	**24**	**3**	**93 (58.5%)**

Table 3.4-4. Summary of 2013 Fish Survey Data

Species	Fish Sample Location				Total
	North Fork Miner Flat **(canyon-bound, cold water)**	North Fork Lower Alchesay **(floodplain, cool water)**	White River Upper Ford **(floodplain, warm water)**	White River Amos Wash **(canyon-bound, warm water)**	
Ictalurids and Centrarchids					
Smallmouth bass (*Micropterus dolomieu*) - **nn**	0	0	1	0	1 (0.6%)
All Ictalurids and Centrarchids	**0**	**0**	**1**	**0**	**1 (0.6%)**
Cyprinids					
Speckled dace (*Rhinichthys osculus*) - TSS	31	19	1	0	51 (32.1%)
Roundtail chub (*Gila robusta*) - TSS	0	0	0	2	2 (1.3%)
All Cyprinids	**31**	**19**	**1**	**2**	**53 (33.3%)**
Total	**52**	**74**	**27**	**6**	**159 (100%)**

Source: WMAT in Blue Earth (2014)

Key: % = percent; nn = non-native species; Threatened = Federally listed as threatened; TSS= Tribal Sensitive Species

From 2003 through 2011, fish data were obtained for the NFWR from a data set of 50 temporally or spatially discrete samples collected by the WMAT (WMAT and USFWS 2014, Blue Earth 2014). The samples were taken from locations extending from the proposed Miner Flat Dam site to the confluence of the NFWR and EFWR. Eleven species of fish (five native and six non-native) were identified from the fish survey samples, the most abundant of which were the desert sucker (*Catostomus clarkii*) and Sonora sucker (*Catostomus insignis*), both TSS, accounting for approximately 71 percent of the fish observed.

Fish surveys were also conducted from September to October 2013 along the NFWR and the White River extending from the proposed Miner Flat Dam site to Amos Wash (**Table 3.4-4**). Seven species of fish were identified, the most abundant of which were also the desert sucker and Sonora sucker, accounting for approximately 58 percent of the fish collected, followed by speckled dace (*Rhinichthys osculus*) (32 percent). Other native fishes documented in the NFWR from 2013 surveys include roundtail chub (*Gila robusta*) (6.9 percent) and Apache trout *(Oncorhynchus apache)* (1.3 percent) (WMAT and USFWS 2014, Blue Earth 2014). Non-native species identified in the 2013 survey include brown trout (*Salmo trutta*) (6.3 percent) and smallmouth bass (*Micropterus dolomieu*) (0.9 percent).

As noted in **Table 3.4-3** and **Table 3.4-4**, three non-federally listed but sensitive (species of concern) native fish species have been detected in the NFWR: the desert sucker, Sonora sucker, and speckled dace. In addition, the roundtail chub, a TSS, was previously recognized as a candidate for federal listing, but based on a review of the best available scientific information, the USFWS determined that listing was not warranted at this time (87 *Federal Register* 19657). The desert sucker is generally found in rapids and flowing pools of streams and rivers, primarily over bottoms of gravel rubble with sandy silt in the interstices. Adults live in pools, moving at night to swift riffles and runs to feed. The young inhabit riffles throughout the day, feeding on midge larvae. It occurs throughout the entire Gila River basin and in the Bill Williams tributaries. Its population has decreased rapidly in the southern part of its range (Arizona Game and Fish Department [AZGFD] 2002b). The Sonora sucker is found in a variety of habitats from warmwater rivers to coldwater trout streams. It has an affinity for gravelly or rocky pools or, at the least, for relatively deep, quiet waters. Adults tend to remain near cover in daylight but move to runs and deeper riffles at night. The young live and utilize runs and quiet eddies (AZGFD 2002c). The speckled dace is a bottom dweller, which is found in rocky riffles, runs, and pools of headwaters, creeks, and small-to-medium rivers, rarely in lakes. Speckled dace reside in water less than 0.5 meters (1.6 feet) deep, with currents averaging about 0.4 meters per second (1.3 feet per second). They often congregate below riffles and eddies. Breeding adults prefer swift water (AZGFD 2002a). The roundtail chub is known to occupy cool to warm water, mid-elevation streams and rivers, where typical adult microhabitat consists of pools up to 2.0 meters (6.6 feet) deep, adjacent to swifter riffles and runs. Roundtail chub habitat is essentially eliminated as flows drop below 10 cfs (USFWS 1989), which within the study area represents drought conditions (12^{th} percentile conditions based on the 63-year model period). Based on known historic records and results from 2003–2013 sampling, roundtail chub are considered present in the NFWR and White River. In the NFWR, roundtail chub predominantly occupy habitat downstream of the Alchesay National Fish Hatchery; however, historical records indicated that the species has also been detected upstream of the hatchery, but these higher elevation, canyon-bound, coldwater segments may be less suitable for the species due to its habitat preferences.

All three TSS species were observed throughout the NFWR and/or the White River in surveys conducted from 2003 through 2013 (**Table 3.4-3** and **Table 3.4-4**). Desert sucker and Sonora sucker were detected at the highest relative abundance associated with cool water floodplain habitat along the NFWR above the confluence with Diamond Creek, approximately 15 river miles downstream from the Miner Flat Dam site. Speckled dace frequency and relative abundance decreased with distance downstream, with the highest relative abundance at the Miner Flat Dam site. No specked dace were detected along the White River from 2003 to 2013. All three of these species are managed in accordance with the WMAT Native Fishes Management Plan (WMAT and USFWS 2014).

In general, non-native species known or assumed to be present include brown trout, rainbow trout (*Oncorhynchus mykiss*), channel catfish (*Ictalurus punctatus*), smallmouth bass, green sunfish (*Lepomis cyanellus*), and fathead minnow (*Pimephales promelas*) (WMAT and USFWS 2014, Blue Earth 2014). Rainbow trout, channel catfish, green sunfish, and fathead minnow were recorded in 2003 to 2011 but not in 2013. It is unclear whether the absence of these species is due to a decline in abundance or a result of sampling location selection in 2013 compared to prior efforts. Based on 2003–2011 and 2013 data sets, the most abundant fishes in the NFWR are the speckled dace and sucker species.

The Alchesay National Fish Hatchery raises trout, including Apache trout, for stocking fish on the Reservation and elsewhere in Arizona, New Mexico, and Colorado. Although Apache trout are present in the NFWR and are identified primarily around the proposed Miner Flat Dam site and the hatchery diversion, they represent a reestablished population that has been stocked to maintain a recreational fishery. The stocked population is typically fished out seasonally. There are no known natural occurrences of Apache trout anywhere on the NFWR.

No aquatic fish surveys were conducted for Cibecue Creek, Carrizo Creek, Cedar Creek, or other features crossed by project infrastructure.

All native fishes within the boundaries of the Reservation are currently managed under the Tribe's Native Fishes Management Plan (WMAT and USFWS 2014). The goals of implementing the Native Fishes Management Plan are as follows:

1. Conserve and maintain existing native fish populations and their habitats as part of the natural diversity of the Reservation when consistent with the purpose of the Reservation as a permanent homeland for WMAT members.
2. Enhance native fish populations and degraded natural habitats when appropriate and economically feasible.
3. Prevent, minimize, or mitigate adverse impacts to all native fishes, especially threatened or endangered species, and their habitats when consistent with the Reservation as a permanent homeland for WMAT members.
4. Increase Tribal awareness of native fish conservation and values.

Wetlands and Jurisdictional Waters of the United States

Wetland communities directly relate to both hydrologic and ecological processes that exist in an area. Water resource characteristics associated with the wetlands and other waters of the U.S. are presented in **Section 3.2.1** (*Water Resources and Hydrology, Affected Environment*) including hydrology, surface water quality, flooding, and temperature.

Surveys to delineate jurisdictional wetlands and waters of the U.S. related to the proposed action were conducted in the spring and fall of 2014 (Leidos 2014),[25] which are discussed by project component below. Wetlands and other waters of the U.S. that were delineated at the proposed Miner Flat Dam site and reservoir inundation area are associated with the NFWR. Along the proposed 50-mile pipeline route between Whiteriver and Cibecue, ephemeral drainages, such as Cedar and Carrizo Creeks, support mapped wetlands adjacent to the Relatively Permanent Water, meaning they contain water at least seasonally. The NFWR and the White River surface waters flow for most of the year in most reaches and are defined as a non-navigable, Relatively Permanent Water that is a tributary to the Salt River, a Traditional Navigable Water. The results of the wetland delineation surveys are detailed in the wetland delineation survey report (Leidos 2014).

[25] The survey area included the proposed Miner Flat Dam and reservoir site within the maximum potential reservoir flood zone (based on topographic data); areas potentially affected by project activities associated with improvements to the existing North Fork intake structure and water treatment plant; and the proposed distribution pipeline route, with a 50-foot buffer on both sides of the pipeline (total 100-foot corridor).

Miner Flat Dam and Reservoir. Approximately 80 potentially jurisdictional wetland features were mapped within the reservoir survey area, totaling approximately 2.4 acres and 19,469 linear feet (3.7 miles). About 80 percent of the mapped wetlands were less than 0.05 acres in size, with 13 percent ranging in size from 0.05 to 0.1 acres, and 7 percent ranging in size from 0.1 to 0.16 acres. Nearly all of the areas that met the criteria for jurisdictional determination of wetlands (hydric soils, hydrophytic vegetation, and hydrology) are comprised of a mix of upland and wetland herbaceous plant species such as Parish's spikerush (*Eleocharis parishii*), horsetails (*Equisetum arvense*, *E. laevigatum*), white clover (*Trifolium repens*), bluegrass (*Poa annua*, *P. pretense*), western ragweed (*Ambrosia psilostachya*), hackelia (*Hackelia floribunda*), and black medic (*Medicago lupulina*). Large tussock-forming sedges, such as western rough sedge (*Carex senta*) and Nebraska sedge (*Carex nebrascensis*), are also present as individual plants or small patches along the edges of the river, primarily growing out of boulder and cobble banks. Individuals or small groups of sedges (i.e., just a few square feet of area) growing out of boulders were not mapped as wetlands. In addition, seeps (i.e., shallow surface water flowing from the edge of the bank above the ordinary high water mark) were observed at two locations within the survey area.

Approximately 13.84 acres of other waters of the U.S. are present within the proposed Miner Flat Dam and reservoir area. They include the main flow channel of the NFWR and several major tributaries, including Cottonwood Wash, Black Canyon, Cienega Canyon (a tributary of Cottonwood Wash), Bull Creek, and Bear Flat Creek. Minor tributaries and washes were also observed but were generally less than 1 foot wide and not mapped. The river channel at the proposed dam location is classified as riverine (R), upper perennial (3), unconsolidated bottom (UB), and permanently flooded (H) and was assigned the Cowardin classification code R3UBH (Cowardin et al. 1979).

North Fork Intake Structure and Water Treatment Plant Expansion. No jurisdictional wetlands were recorded at the proposed water treatment plant expansion area. However, other waters of the U.S. were present, including an unnamed tributary of the NFWR that originates north of the existing water treatment plant and flows to the south along the east side of the facility. A total of 0.16 acres of jurisdictional wetlands were mapped near the expanded North Fork intake structure, and 8,540 linear feet and 0.73 acres of other waters of the U.S. were mapped within the proposed water treatment plant expansion and intake structure survey area.

Proposed Water Distribution System. Over 80 drainage features and streams are crossed by or are along the proposed 50-mile pipeline route connecting the water treatment plant and the community of Cibecue. The total area and linear feet of other waters of the U.S. within the pipeline corridor survey area are estimated at 10.1 acres and 7.4 linear miles. This estimate is based on a 100-foot survey corridor (50 feet on either side of the currently projected pipeline route centerline provided by project engineers prior to the field survey). Jurisdictional wetlands were observed at the pipeline crossings of Cedar Creek and Carrizo Creek. Both the Cedar and Carrizo Creeks and adjacent wetland features were classified as jurisdictional waters.

Canyon Day. No wetland surveys have been conducted related to future farming activities in Canyon Day. However, some quantity of emergent wetland features could be present within the stream bed of National Wetland Inventory-mapped (USFWS 2018) drainages, which may persist year-round. Mapped features are primarily characterized as riverine (R), intermittent (4), stream bed (SB), and seasonally flooded (C) or R4SBC classification (Cowardin et al. 1979, USFWS 2018). No field verification has occurred, and the potential for jurisdiction by the USACE has not been assessed. Features are mapped as tributaries to the NFWR.

Species Federally Listed, or Candidates for Listing, as Threatened or Endangered under the Endangered Species Act

The WMAT has authority and responsibility for natural resources within the Reservation boundaries. The WMAT manages these resources through several species and resource-species management plans and routine data collection, which they regularly coordinate with State and Federal agencies and research-focused resource experts. In addition, Section 7 of the ESA requires Federal agencies to consult with the USFWS if an action they fund, authorize, or carry out affects any species listed as threatened or endangered or critical habitat designated under the ESA. On the Reservation, the Federal action agency also acts in coordination with the WMAT. Informal consultation with the USFWS is ongoing, including the preparation of a Biological Assessment (BA). The BA will be used to determine whether the action will adversely affect any listed species and, if so, Reclamation will initiate formal consultation, and the USFWS will issue a Biological Opinion. Results of the Section 7 consultation will be incorporated into the Final EIS.

Jaguar (*Panthera onca*) – Endangered. Jaguars rarely occur above 8,500 feet (2,591 meters) in elevation (AZGFD 2020a). This species has been generally associated with riparian corridors, but historic occurrences in the United States are known from a variety of vegetation communities. Only one occurrence of a jaguar has been documented on the Reservation, in the 1960s, and no other jaguars have been observed at the Reservation since that time. Recent documented occurrences are from the Dos Cabezas Mountains (2017) and the Peloncillo Mountains (1996), more than 100 miles to the south. This species is assumed absent within the study area, and therefore the proposed action would not directly or indirectly affect this species. Should another jaguar migrate onto the Reservation, the WMAT would coordinate with the USFWS to determine the appropriate management action for this species. There is no further evaluation of this species within the EIS.

Mexican Gray Wolf (*Canis lupus baileyi*) – Endangered, Nonessential Experimental Population. The Mexican gray wolf was originally listed as an endangered subspecies in 1976 but was subsequently subsumed into a rangewide listing for the gray wolf species (41 *Federal Register* 17736; 43 *Federal Register* 9607). In the United States, a single population of at least 186 Mexican wolves (estimated as of 2020–2021) inhabits portions of Arizona and New Mexico in an area south of Interstate 40. This area is designated as the Mexican Wolf Experimental Population Area (80 *Federal Register* 2512). This population was originally categorized as experimental and nonessential in 1998 (63 *Federal Register* 1763) and later revised in 2015 to modify the geographic boundaries of managed areas, modify management regulations, and issue a section 10(a)(1)(A) permit. Mexican wolves are not currently present in the wild in the United States outside of the Mexican Wolf Experimental Population Area. No critical habitat has been established for this species.

Habitat for the Mexican gray wolf is primarily associated with forested mountainous terrain historically occurring above 4,500 feet (1,372 meters) in elevation in or near woodlands of pine, oak, or pinyon-juniper, interspersed with grasslands. Wolves were released off-Reservation in March 1998 and were first documented on the Reservation in June of the same year. They have since been allowed by the Tribe to establish home ranges and territories on the Reservation. Den locations are known on the Reservation, and none are in the vicinity of the proposed Miner Flat Dam. The closest 2020 and 2021 dens recorded are in the vicinity of Baldy Peak, approximately 15 miles to the east of the proposed Miner Flat Dam site. Wolves on the Reservation are monitored with radio tracking, aerially, and on the ground and are managed under the WMAT Mexican Wolf Management Plan and a Cooperative Agreement with the USFWS.

New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*) – Endangered. The New Mexico meadow jumping mouse was listed as endangered in 2014 (79 *Federal Register* 33119), and final critical habitat for the subspecies was designated in 2016 (81 *Federal Register* 14263). No critical habitat occurs within the study area. The closest critical habitat for this species is located approximately 25 miles east within the Little Colorado River headwaters watershed (USFWS 2020a). At the time of listing, the USFWS did not include the NFWR in its critical habitat designation because the area was neither determined to be occupied nor was it deemed essential to the conservation of the subspecies (81 *Federal Register* 14263).

The New Mexico meadow jumping mouse is a species of research interest to the WMGFD, and habitat assessments and surveys are planned across the Reservation to better understand occurrences and habitats. Physical and biological features essential to the conservation of the species include the occurrence of riparian communities, discussed in more detail below, flowing water, sufficient space for movement, and adjacent floodplain and uplands (78 *Federal Register* 37328). This mouse species is a habitat specialist most often found near running water up to 9,500 feet (2,896 meters) in elevation (Chambers 2021) and, as noted, requires perennial stream banks and dense riparian/wetland vegetation consisting of two habitat types: (1) persistent emergent herbaceous wetlands with beaked sedges and reed canary grass alliances and (2) scrub-shrub wetlands with willows and alders. Individuals require dense sedges and forbs, and adjacent uplands to support breeding and hibernation (USFWS 2020a). Home ranges are approximately 1/3 to 3 acres, and foraging territories may extend up to 300 feet along stream banks. The USWFS noted that sustained populations need nearly continuous suitable habitat along at least 5.6 miles of adjacent stream and a riparian patch size of at least 68 acres (USFWS 2020a).

Overall status of the species has not been determined on the Reservation; the most recent historic records are from 1933, recorded from approximately 5 miles upstream from the inundation area, and 1967, location unknown (81 *Federal Register* 14263). A preliminary habitat evaluation was conducted in the proposed Miner Flat Dam area in the spring of 2021, which included sites upstream, at, and downstream of the dam site (Chambers 2021). Preliminary results indicate that there are patches of "good quality habitat" (i.e., likely to detect jumping mice) in the vicinity of and upstream of the proposed dam location, as well as one location downstream of the dam. No assessment of habitat suitability has been done past the southernmost location assessed in 2021 to the confluence with the White River. However, additional species surveys are planned again for spring 2022 at the proposed Miner Flat Dam area, and a habitat assessment will be completed at the same time at the North Fork intake structure site.

Based on the 2021 habitat evaluation, a site located near the uppermost area of inundation had the "highest potential as habitat" because of a wider floodplain with more potential understory; however, because this area is grazed by livestock, there is currently little vegetation to support the jumping mouse, and thus current conditions were noted as "poor" (Chambers 2021). Habitat for the jumping mouse improves at locations further upstream from the proposed dam site as grazing and other disturbances are reduced. Based on guidance from Dr. Chambers and information from the habitat assessment, WMGFD biologists completed track plate surveys in July 2021 in accordance with the methodology defined in Harrow et al. (2018). No New Mexico meadow jumping mouse tracks were detected. However, this species is difficult to survey and document in suitable habitat where they are found, and additional survey efforts are needed to determine the status of the species at the dam and reservoir site.

Habitat at the proposed expanded intake structure site and at the proposed crossings of Carrizo and Cedar Creeks has not been evaluated. At the expanded intake structure site, most of the small area is covered in gravel and/or predominantly upland. A habitat assessment by a qualified biologist with knowledge of habitat requirements will be completed to confirm that no habitat is present.

Yellow-Billed Cuckoo (*Coccyzus americanus*) – Threatened. The western distinct population segment of yellow-billed cuckoo was listed as threatened under the Federal ESA in 2014 (79 *Federal Register* 48547). Critical habitat was designated in 2021 (86 *Federal Register* 20798); however, the White River and NFWR are not within designated critical habitat for the western distinct population segment of yellow-billed cuckoo. The closest designated critical habitat area is a segment of the Salt River upstream from the lakebed at Theodore Roosevelt Lake in Gila County, Arizona (86 *Federal Register* 20798), which is located approximately 40 miles west of the downstream end of the study area.

This species is typically observed at elevations of 1,086 to 1,670 meters (3,564 to 5,480 feet) (AZGFD 2021a), with variable home ranges of 2.5 to 200 acres (86 *Federal Register* 20798). The yellow-billed cuckoo's single habitat type consists of willow-cottonwood of any age with high humidity. Suitable breeding habitat contains a matrix of dense patches of trees and openings, and preferred habitat areas are associated with low woody vegetation, with nesting in areas of high canopy closure, high foliage volume, and intermediate basal area and tree height. A formal habitat assessment for this species was completed in 2018, following criteria adapted from the proposed critical habitat designation (Halterman et al. 2016). No suitable habitat for this species was identified at the location of the proposed Miner Flat Dam and reservoir due to the high-gradient stream segment, steep canyons, and lack of floodplain (Blue Earth 2019). Past consultations within the study area validated the lack of suitable habitat determination at the proposed Miner Flat Dam and reservoir area (USFWS 2020c).

While the species has been documented using patches as small as 2.5 acres, habitat downstream on the NFWR was deemed marginal in terms of riparian width, non-fragmented patch size, and vegetation structure (Blue Earth 2019). Cuckoos were detected incidentally during surveys for the southwestern willow flycatcher in Canyon Day in 2013. In 2018, surveys for the yellow-billed cuckoo detected them in the same general location from 2013. During the 2018 survey efforts, there was one possible breeding territory and one probably breeding territory documented. Visual and auditory surveys conducted in 2021 by the WMGFD resulted in no further detection along the NFWR, but no surveys were completed along the main stem of the White River. However, over time and with the maintenance of natural hydrological conditions, the suitability of those identified habitat patches along the NFWR could improve and become utilized or occupied. No additional surveys along the White River were conducted. Occupied habitat was dominated by native woody riparian species including coyote willow, boxelder, false indigo bush (*Amorpha fruticosa*), Goodding's willow, and Fremont cottonwood. Non-native tree and shrub plant species were uncommon. Surface water and saturated soils were prevalent throughout the site (Blue Earth 2019).

Southwestern Willow Flycatcher (*Empidonax traillii extimus*) – Endangered. The southwestern willow flycatcher was listed as an endangered species in 1995 (60 *Federal Register* 10694). Designation of critical habitat for the species was finalized in 2013 (78 *Federal Register* 343). The study area is not within designated critical habitat for the southwestern willow flycatcher. The closest designated critical habitat area is located approximately 22 miles east of the survey area along the West Fork Little Colorado River near Greer, Apache County, Arizona.

In Arizona, this species is found at elevations ranging from 23 to 2,600 meters (75 to 8,520 feet), though most nesting territories occur between sea level and 1,600 meters (0 to 5,250 feet) (AZGFD 2020b). Generally, flycatchers are not found nesting in areas without willows, tamarisk, or both (78 *Federal Register* 343). There have been reported sightings of this bird along the White River and some tributaries, as well as Cibecue Creek near Cibecue, Arizona.

Project-specific surveys were conducted in 2013 to identify potential habitat or occurrences within the study area and vicinity. At that time, 27 suitable habitat patches for this species were delineated (Blue Earth 2013a). Protocol surveys were conducted in 15 of the suitable habitat patches (and one patch not deemed as suitable at the proposed dam site). No suitable habitat for this species was identified at the location of the proposed Miner Flat Dam and reservoir due to the high-gradient stream segment, steep canyons, and lack of floodplain (Blue Earth 2019). Past consultations within the study area validated the lack of suitable habitat determination at the Miner Flat Dam area (USFWS 2020c).

No flycatchers were detected south along the NFWR. Habitat along the NFWR was determined to lack the structure found at other locations with known occurrence of southwestern willow flycatchers, including lower overall willow density, more openings, drier conditions, and no large patches of Fremont cottonwood and Goodding's willow forest with high foliage density in the lower to mid-canopy (Blue Earth 2013a). In addition, visual and auditory surveys conducted in 2021 (June, early August, late August) by the WMAT resulted in no detection of this species along the NFWR; however, over time the suitability of habitat along the NFWR could improve if natural flow regimes are maintained. Previous surveys detected migrant flycatchers at four different sites and two nesting pairs at one site, all located on the White River near its confluence with the NFWR.

Mexican Spotted Owl (*Strix occidentalis lucida*) – Threatened. The USFWS listed the Mexican spotted owl as threatened in 1993 (58 *Federal Register* 14248) and designated critical habitat in 2004 (69 *Federal Register* 53182). No critical habitat is present within the study area or elsewhere on the Reservation (USFWS 2012). The closest critical habitat is located approximately 9 miles north and 23 miles east near Greer, Arizona. However, Mexican spotted owls are found on the Reservation and are managed under the WMAT Mexican Spotted Owl Management Plan. The USFWS approved the plan, determining that it provides significant benefits to the species, which further precluded the need for special management or protection provided through the establishment of critical habitat. The USFWS approved a final Mexican Spotted Owl Recovery Plan in December 2012 (USFWS 2012).

Various elevation ranges have been reported for this species. The minimum elevation reported was 2,700 feet (823 meters), and the maximum was 10,000 feet (3,049 meters) (AZGFD 2020c). Mexican spotted owls generally prefer mountains and canyons with uneven-aged forests having high canopy closure, high stand density, a multilayered canopy, numerous snags, and down woody material. Mixed conifer or ponderosa pine/Gambel oak forests on steep slopes and in rocky canyons are most frequently used.

Some of the available habitat around the proposed Miner Flat Dam area is consistent with known preferences for the species and meets the definition of recovery foraging and dispersal habitat (USFWS 2012). The NFWR at this location is fairly narrow, with steep, rocky slopes that support upland forest vegetation dominated by ponderosa pine, Rocky Mountain juniper, and Gambel oak, and the occasional Douglas fir. Upstream of the proposed dam, the outer banks of the river and surrounding uplands support similar forest vegetation types with some more open areas of grasslands and shrublands. The river channel within most of the survey area is generally very narrow with steep banks and exposed rocky substrate with few understory species. The width of the canyon is about 450 feet at the dam site, 270 feet at the narrowest portion upstream from the dam site, and 1,450 feet in the northeastern part of the survey area where there are campgrounds and grazed lands adjacent to the river.

The WMAT classifies the region around the study area as a Category III Management Area, which includes all regions of the Reservation where surveys have not detected owls. The closest known roost sites are approximately 3 and 4.5 miles to the east (WMGFD 2022). Habitat around the proposed Miner Flat Dam and reservoir area has been evaluated several times since 2012, with varying levels of survey intensity. Project-specific surveys were originally conducted at the location of the proposed Miner Flat Dam reservoir site in 2012 and did not detect the presence of this species; however, the USFWS noted in 2014 and 2020 that it was "reasonably certain that nest/roost habitat for the owl could be present" in the vicinity based on the presence of appropriate forest types and a canyon with key components. Since then, project-specific surveys for the Mexican spotted owl were again conducted in 2020 and 2021 by WMGFD staff, and no individuals were identified. The 2021 surveys were completed in coordination with USFWS biologist Dr. Sarah Rinkevich, who also concluded that the area is not Mexican spotted owl roosting or nesting habitat (Rinkevich 2021). However, this habitat is consistent with the definition of recovery foraging and dispersal habitat. Recovery habitats are identified and managed under the Mexican Spotted Owl Recovery Plan because "recovery foraging/non-breeding habitat currently does or could provide habitat for foraging, dispersing, or wintering life history needs" (USFWS 2012).

Northern Mexican Gartersnake (*Thamnophis eques megalops*) – Threatened. The northern Mexican gartersnake was listed as threatened in 2014 (79 *Federal Register* 38678). Critical habitat was originally designated in 2013 (78 *Federal Register* 41550), then revised in 2021 (86 *Federal Register* 22518). No critical habitat is designated on Reservation lands. The closest designated critical habitat is along the Salt River north of Theodore Roosevelt Lake, approximately 80 miles west of the proposed dam site. Critical habitat was initially proposed along the Black River, upstream of its confluence with the White River, but was excluded under Section 4(b)(2) of the ESA.

Northern Mexican gartersnakes can be found at elevations of approximately 30 to 2,591 meters (100 to 8,500 feet). These snakes are riparian obligates and occur mainly in three habitat types: (1) source-area wetlands such as cienegas at mid-elevations with highly organic basic/alkaline soils, stock tanks, etc.; (2) large river riparian woodlands and forests; and (3) streamside gallery forests with broadleaf deciduous riparian forests with limited herbaceous ground cover or grass (WMAT 2021b). Primary constituent elements identified for the species include: (1) aquatic or riparian habitat; (2) adequate terrestrial space adjacent to designated stream systems; (3) prey base consisting of viable populations of native amphibian and native fish species; and (4) absence of non-native fish species of the families Centrarchidae and Ictaluridae, American bullfrogs (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis, Procambarus clarkii,* etc.). USFWS biologists visited the project area in 2020, and although they did not conduct any surveys, they noted habitat in the Lower Log area (near the upper limit of the proposed inundation footprint) "looked good" (Servoss 2021). All but primary constituent element no. 4 are present along the NFWR and White River, with the northern crayfish (*Orconectes virilis)* characterized as "very abundant" during both aquatic habitat and gartersnake surveys, with at least one and usually a dozen or more individuals collected in each minnow trap (Blue Earth 2015). Crayfish, along with American bullfrogs, are the most significant threat affecting the northern Mexican gartersnake across its range (79 *Federal Register* 38677). Non-native fish species such as the brown trout, smallmouth bass, green sunfish, and channel catfish also pose a threat and were documented from 2003 to 2013 (Blue Earth 2014).

The northern Mexican gartersnake is not known to occur in the White River drainage (79 *Federal Register* 38677). There is a historic record for the northern Mexican gartersnake on Big Bonito Creek from 1986 (Rosen and Schwalbe 1988), approximately 15 miles east in the Black River watershed. Surveys were conducted in 2015 for both northern Mexican and narrow-headed gartersnakes along the NFWR in the vicinity of the proposed Miner Flat Dam site (segments surveyed were at the dam site, near the upper limit of the proposed expected inundation area, and approximately 1 mile downstream of the proposed dam site, representative of canyon-bound river segment). A total of 600 trap nights and 1,739 minutes of visual encounter surveys were conducted in two survey periods in June and July. No occurrences of this species were observed during project-specific diurnal visual and minnow trap surveys in 2015 (Blue Earth 2015) following the methodology described by Nowak (2012) or incidentally during narrow-headed gartersnake surveys in the vicinity of the proposed Miner Flat Dam site (2021). The presence of northern crayfish and highly silted stream bottom was specifically identified, but habitat was otherwise characterized as "suitable," particularly for the narrow-headed gartersnake (Blue Earth 2015). No surveys for northern Mexican gartersnakes were completed along the White River; however, the presence of northern crayfish in the White River may limit species occupation. However, prior to 2012 there were no records for the northern Mexican gartersnake along the Bill Williams River, a system that also has an abundant crayfish and non-native sport fish population. Since 2012 and because of a concerted survey effort, there have been at least 17 documentations of the species (Servoss, Rangewide Population Status Information for the Northern Mexican Gartersnake (Thamnophis eques megalops) through September 2019 2019). In addition, the species has been found coexisting with northern crayfish in the Lower Colorado River, Santa Cruz River, and Tonto Creek in Arizona (79 *Federal Register* 38678).

Due to the lack of overall survey effort and the species' cryptic nature, its presence along the NFWR and White River cannot be ruled out. Additional survey efforts prior to construction are currently planned and are needed to help determine the status of the species at the proposed dam, reservoir site, and further south to the confluence and beyond.

Narrow-Headed Gartersnake (*Thamnophis rufipunctatus*) – Threatened. The narrow-headed gartersnake was listed as threatened in 2014 (79 *Federal Register* 38678). Critical habitat was originally designated in 2013 (78 *Federal Register* 41550), then revised in 2021 (86 *Federal Register* 22518). No critical habitat is designated on Reservation lands. Critical habitat proposed for the narrow-headed gartersnake in the Salt River Subbasin Unit included the White River from the confluence of the EFWR and NFWR downstream to the confluence with the Salt and Black Rivers because it contained most physical or biological features essential to the conservation of the species. However, this reach was excluded under Section 4(b)(2) of the ESA due to ongoing management activities and the associated benefits to the species.

This species is found at elevations of 671 to 2,438 meters (2,200 to 8,000 feet) near or in clear, cool, permanently flowing, rocky streams in pinyon-juniper, oak-pine, or ponderosa pine communities with broadleaf deciduous trees (associations generally of shrub-size/sapling alder, velvet ash [*Fraxinus velutina*], willows, and canyon grape [*Vitis arizonica*]) and is almost strictly aquatic and seen on the stream bank within 1 meter (3 to 4 feet) of water. The species is also known to hibernate in rocky ledges above the floodplain (Nowak 2006). Primary constituent elements identified for the species include: (1) stream habitat; (2) adequate terrestrial space adjacent to designated stream systems; (3) a prey base consisting of viable populations of native fish species or soft-rayed, non-native fish species; and (4) absence of non-native predators and competitors, including northern crayfish, or occurrences of these non-native species at low densities such that recruitment and prey availability remain intact. As noted in the previous section on the northern Mexican gartersnake, all but primary constituent element no. 4 are present along the NFWR and White River, with the northern crayfish characterized as "very abundant" during surveys. Non-native brown trout has also been noted in fish survey data from 2003 to 2011 (the most common salmonid captured) and again in 2013 surveys, noted as frequent at all sites but not abundant (Blue Earth 2014). USFWS biologists visited the Miner Flat Dam project area in 2020, and although they did not conduct any surveys, they noted habitat in the Lower Log area (near the upper limit of the proposed inundation footprint) "looked good" (Servoss 2021). As mentioned in the previous section, the northern Mexican gartersnake was also not documented on the Bill Williams River until 2012, a system that also has an abundant crayfish and non-native sport fish population. Since 2012 and because of a concerted survey effort, there have been at least 17 documentations of that species (Servoss, Rangewide Population Status Information for the Northern Mexican Gartersnake (Thamnophis eques megalops) through September 2019 2019). In addition, there are historic records of the narrow-headed gartersnake in Canyon Creek in 1986 and 1990. The AZGFD began conducting routine surveys on non-Tribal portions of Canyon Creek in 2015 and has detected the species regularly between 2015 and 2021 (Servoss 2022).

There are multiple historic records of the species being documented on the White River near the confluence of the Black River (1967), on the EFWR (1964), at Diamond Creek Camp (1986), and on the NFWR (1986) (Rosen and Schwalbe 1988). There are also records of the species in the major creeks in which the proposed pipeline crosses, including Canyon Creek (1986–Present), Carrizo Creek (1980s–1997), and Cibecue Creek (1960–1991) (Servoss 2022). The exact status of these populations is extremely difficult to discern because of limited survey access and limited survey data. Rosen and Schwalbe (1988) also noted from anecdotal information that effects from game fish predation and direct removal by humans contributed to a local extirpation. No surveys to date have been completed along the White River. Focused surveys were conducted in 2015 for both northern Mexican and narrow-headed gartersnakes along the NFWR but only in the vicinity of the proposed Miner Flat Dam site (segments surveyed were at the dam site, near the upper limit of the proposed expected inundation area, and approximately 1 mile downstream of the proposed dam site). A total of 600 trap nights and 1,739 minutes of visual encounter surveys were conducted in two survey periods in June and July, following the methodology defined in Nowak (2012). No occurrences of this species were observed during project-specific diurnal visual and minnow trap surveys in 2015 (Blue Earth 2015) or during narrow-headed gartersnake surveys in the vicinity of the proposed Miner Flat Dam site (WMAT 2021a). In 2015, surveys noted an abundance of northern crayfish (Blue Earth 2015). It is possible the species has a presence within the study area, but due to its cryptic nature, the lack of overall survey effort, and presence of suitable habitat and conditions, additional surveys are needed to determine its status in the study area.

Chiricahua Leopard Frog (*Lithobates chiricahuensis*) – Threatened. The Chiricahua leopard frog was listed as a threatened species in 2002 (67 *Federal Register* 40790). Designation of critical habitat for the species was finalized in 2012. The NFWR is not within designated critical habitat for the Chiricahua leopard frog. The closest designated critical habitat is approximately 45 miles east at Coleman Creek, east of Highway 191 (77 *Federal Register* 16324).

Chiricahua leopard frog is predominantly aquatic for breeding and overwintering but may move among different isolated aquatic sites, which is an important element of metapopulation dynamics. This species prefers mid-elevation (975 to 2,713 meters [3,200 to 8,900 feet]) wetlands, pools, livestock tanks, lakes, streams, reservoirs, and rivers. There are no currently known occurrences of Chiricahua leopard frog on the Reservation, but there are historical records within the boundaries of the Reservation. Reported sightings on the west end of the Reservation were prior to the leopard frog (*Rana pipiens*) complex being split, and it is not known which species (lowland, northern, or Chiricahua) was documented. Leopard frogs were also historically widespread in the White Mountains (USFWS 2007a) and suitable habitat remains, but occurrences of the species have declined, corresponding with the widespread introduction of crayfish in the region (Fernandez and Rosen 1996). Where crayfish are abundant, leopard frogs are rare or not present (Fernandez and Rosen 1996). Surveys for aquatic gartersnakes and Chiricahua leopard frog noted an abundance of northern crayfish (Blue Earth 2015, Blue Earth 2013b). Chiricahua leopard frogs were nearly always absent from sites supporting non-native predatory fishes, with green sunfish and smallmouth bass as notably effective predators (Sredl and Howland 1994). Green sunfish and smallmouth bass were detected in 2003–2011 fish surveys and smallmouth bass was again detected in 2013 (Blue Earth 2014).

Potential Chiricahua leopard frog habitat in the study area was characterized by narrow, patchy stands of emergent wetland vegetation along the stream margins, undercut banks and overhanging vegetation, large woody debris, and small floodplain wetlands maintained by a high-water table or by seeps or springs (Blue Earth 2013b). Chiricahua leopard frog surveys were conducted using the general visual encounter method (USFWS 2007a) and included emergent vegetation, large woody debris, undercut banks, boulders, and overhanging vegetation. During nocturnal surveys, a digital recording of Chiricahua leopard frog from the Mogollon Rim was broadcast at intervals along the survey path. In total, 21 surveys were completed, including diurnal and nocturnal visual encounter surveys and diurnal electrofishing surveys. No occurrences of Chiricahua leopard frogs were observed along the main channel of the NFWR during surveys conducted in 2013 (Blue Earth 2013b) or during additional general herpetological surveys in the vicinity of the proposed reservoir in 2021. The predaceous northern crayfish was documented as abundant throughout the project area (Blue Earth 2013b). Due to the lack of overall survey effort, the species' presence along the NFWR, related project areas, and nearby suitable habitat cannot be ruled out. Additional surveys are needed to determine its status.

Razorback Sucker (*Xyrauchen texanus*) – Endangered. Razorback suckers are no longer present on the Reservation. Stockings of razorback sucker have regularly occurred in the Verde River since the 1980s, where the natural population had been extirpated. The most recent stocking in the Verde River occurred in 2022. It is unlikely that these fish would traverse upstream past several dams in the Salt River into the NFWR; therefore, the proposed action would not directly or indirectly affect this species.

Apache Trout (*Oncorhynchus apache*) – Threatened. Apache trout is one of two salmonid species native to Arizona and was originally listed as endangered in 1967 (32 *Federal Register* 3961), recognized as *Salmo apache* at that time. The species was downlisted to threatened status in 1975 due to successful culturing in captivity and greater knowledge of existing populations (USFWS 2009). The downlisting included a 4(d) rule, which allows the AZGFD and WMAT to selectively establish sportfishing opportunities. The AZGFD currently regulates take for Apache trout on non-Tribal lands and the WMAT regulates take for Apache trout on Reservation lands. Hatchery-propagated

Apache trout at the Alchesay National Fish Hatchery are produced to stock streams and lakes on Tribal, State, and Federal lands for put-and-take and put-grow-take fisheries only, including the NFWR within the study area, and are not counted toward recovery (USFWS 2009). All native fishes within the boundaries of the Reservation, including Apache trout, are currently managed under the Tribe's Native Fishes Management Plan (WMAT and USFWS 2014).

Apache trout are restricted to elevations of approximately 6,000 feet (1,800 meters) and up (USFWS 2009), which is at the upper elevational range of the study area. The proposed dam site is at approximately 5,900 feet, and the full reservoir elevation would be 6,065 feet. This species prefers cool, clear, high-elevation streams and rivers; Apache trout generally require water temperatures below 25°C (77°F), along with sufficient streamflow and shading to prevent lethal temperatures (USFWS 2009). Large individuals live in pools, while smaller ones remain near obstructions or other cover such as overhanging trees or brush in runs and riffles. All age classes of Apache trout use relatively deep (0.15 to 0.47 meters [0.49 to 1.54 feet]) pools with slow stream velocities (0.00 to 0.22 meters per second [0.00 to 0.72 feet per second]), gravel or smaller substrate, and overhead and instream cover (AZGFD 2021b). The NFWR also supports non-native salmonids, which tend to be predatory and outcompete Apache trout for food and space (USFWS 2009). Northern crayfish is also established in the NFWR and is assumed to be predatory.

Apache trout are found in 19 populations on the Reservation (14 natural and 5 reestablished). In addition, Apache trout are managed as part of a recreational fishery in 13 lakes and 5 streams on the Reservation, including the NFWR. The closest natural relict population is associated with the upper reaches of the EFWR at an elevation of about 6,000 feet; the lower East Fork is a stocked population. Apache trout are also known to occur at the location of the proposed dam site associated with canyon-bound, coldwater habitat, but this is a sport population that has been stocked to maintain a recreational fishery and is typically fished out annually. Stocking is opportunistic on the NFWR but has occurred both upstream and downstream of the dam site in the past. No spawning is known to occur. Adults have the potential/ability to overwinter, but angling pressure makes this scenario unlikely. No future stocking on the NFWR is planned and would not be restarted until after construction of the dam and reservoir.

During 2003–2013 fish sampling, Apache trout were primarily found in the vicinity of the Miner Flat Dam site, and all were upstream of the confluence with Diamond Creek. This reach represents the lower elevational limit of the species. Non-native brown trout and rainbow trout were also present, and the native Apache trout had the lowest abundance of all salmonids. There are no known natural occurrences of Apache trout in the NFWR, and the recreation population is not considered self-sustaining. Therefore, for the purposes of consultation, the NFWR population of Apache trout is considered a non-recovery pure Apache trout community, supported exclusively by annual stocking. While the presence of the species cannot be ruled out entirely, with discontinuation of stocking as of April 2022, Apache trout would likely not be present or would occur in extremely low numbers in the project area.

Loach Minnow (*Tiaroga cobitis*) – Endangered. The loach minnow was listed as threatened in 1986 and reclassified as endangered in 2012 (77 *Federal Register* 10810). Loach minnow on Tribal lands are managed under the WMAT Loach Minnow Management Plan (WMAT 2000). Goals of the plan are to quantify the distribution of the species within the Reservation boundary, including maintaining existing and future data collection; developing and strengthening management actions to sustain existing populations; and applying actions in a manner that promotes long-term conservation of the species and other native fishes (WMAT 2000). In addition, all native fishes within the boundaries of the Reservation are currently managed under the Tribe's Native Fishes Management Plan (WMAT and USFWS 2014) and also benefit directly and indirectly from other activity-specific and general species management plans, such as the Forest Management Plan (WMAT 2005a). Critical habitat for the loach minnow was initially designated in 1994 with the most recent redesignation occurring in February 2012 (77 *Federal Register* 10809). Approximately 18 miles of the White River and 11 miles of the EFWR within Reservation lands met the definition of critical habitat for loach minnow but were excluded under Section 4(b)2 of the ESA. The NFWR was not identified as having met the definition of critical habitat for the species. The closest critical habitat is associated with the East Fork of the Black River, more than 30 miles to the east.

Elevation range for the loach minnow is from 709 to 2,513 meters (2,325 to 8,240 feet). The loach minnow is closely associated with riffle habitat and bottom-dwelling habitat because of a reduced gas bladder (Propst and Bestgen 1991, AZGFD 2020d). Rinne (1989) also found loach minnow to be habitat specialists closely associated with a current velocity of 0.9 to 1.3 feet per second (avoiding habitats with a current velocity greater than 1.3 feet per second), gravel and cobble substrates, and water depth less than about 8 inches. The USFWS expanded these ranges in its definition of primary constituent elements to 0 to 2.6 feet per second for current velocity and stage depth of less than 1 meter (77 *Federal Register* 10809). The lee side of rocks and spaces between are used for resting and spawning. They are rare or absent from habitats where fine sediments fill these interstitial spaces. This species is also associated with dense, filamentous green algae.

The loach minnow is endemic to the Gila River basin of Arizona and New Mexico (USFWS 1990), including the Salt River mainstream, White River, EFWR, Verde River, Gila River, San Pedro River, Aravaipa Creek, San Francisco River, Blue River, and Eagle Creek, plus major tributaries of larger streams (Minckley 1973). This species is known to persist mainly in streams having relatively natural flow regimes and a predominance of native species (Propst and Bestgen 1991). Within the study area, loach minnow have been historically documented in the White River, but a report by Blue Earth (2014) concludes that these captures near the confluence with the EFWR likely represented isolated individuals from the EFWR population. There are no known historical records of loach minnow in the upper NFWR; however, the Loach Minnow Recovery Plan indicates the species was present in the NFWR, as well as the White River and EFWR (USFWS 1990). In 2012, the USFWS listed the species as possibly present in the NFWR, EFWR, and White River (77 *Federal Register* 10810).

An aquatic habitat assessment was conducted at four locations, from the Miner Flat Dam site down to the Amos Wash area on the White River, which were locations believed to be generally representative of the NFWR and White River system (Blue Earth 2014). The habitat assessment was designed to provide information on all aquatic communities and habitat available in the NFWR and White River; however, the final report also included a habitat evaluation specific to loach minnow (Blue Earth 2014). While sites along the NFWR and White River supported many of the physical habitat characteristics, such as velocity, depth, and substrate, as described in Rinne (1989), riffle habitats in conjunction with these characteristics were uncommon (Blue Earth 2014). However, it is assumed that habitat consistent with characteristics described in the primary constituent elements could be present intermittently within the study area. In addition, non-native fish species are present and non-native northern crayfish are reported as abundant in the NFWR and White River within the survey area (Blue Earth 2014) and are known to eat fish eggs, especially those bound to the substrate, such as the loach minnow (Dorn and Mittelbach 2005).

Habitat characteristics of the EFWR site (adjacent to but outside of the study area but located in an area occupied by loach minnow) were unlike those found at the NFWR and White River sites. Among the five sites sampled, the EFWR site had a unique combination of relatively high slope (0.0138 feet per foot), high sinuosity (K=1.19), low bankfull width:depth ratio (10.4), high instream cover, and a substrate dominated by coarse gravels (Blue Earth 2014). Some of the EFWR habitat characteristics were similar to an assessment site downstream of the Alchesay National Fish Hatchery, including sinuosity, canopy cover, some of the stream bank attributes, stream substrate, and instream cover. However, the stream slope and unit stream power were markedly higher at the EFWR site, the width:depth ratio was considerably lower, and the entrenchment ratio was higher. At the time of study, biologists noted that none of the other NFWR or White River sites shared more than a few measured habitat characteristics with the EFWR site (Blue Earth 2014); however, it is assumed that habitat consistent with characteristics described in the primary constituent elements could be present intermittently within the 37-mile study area.

General fish surveys along the NFWR from 2003 to 2011, project-specific surveys in 2013 (n=52) (Blue Earth 2014), and loach minnow-specific surveys in 2014 failed to detect loach minnow in the NFWR and White River (WMGFD 2014). Loach minnow were recorded in atypically low numbers at survey sites along the EFWR, primarily in the upper reaches, approximately 10 river miles upstream from the confluence (WMGFD 2014). Past surveys from the 1990s through early 2000s resulted in dozens of loach minnow at some EFWR sites, compared to a few individuals in 2014 (WMGFD 2014), but no changes in habitat were recognized. At the time of the surveys, biologists speculated that long-term drought and effects from upstream wildfires could be contributors to a population decline at sample locations. Dissimilar to EFWR sites, the NFWR and White River have shown changes in habitat over the past 30 or more years, including sedimentation and modification to riffle habitat (WMGFD 2014), which may further reduce the likelihood of loach minnow occurrences. Surveys of the NFWR and White River are planned for the current season and annually thereafter as feasible, and surveys of the known EFWR sites will continue in accordance with the WMAT Loach Minnow Management Plan (WMAT 2000) and in coordination with the WMGFD director.

Monarch Butterfly (*Danaus plexippus*) – Candidate. This species is identified as a candidate for listing but is not yet listed or proposed for listing. The USFWS has on file "sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions" (85 *Federal Register* 81813). Due to its status as a candidate for listing, no critical habitat or other regulatory drivers have been established.

Monarch butterflies are globally distributed and are well-known for their long-distance migration (USFWS 2020b). Descendants of these migratory monarch populations expanded from North America to other areas of the world where milkweed (their larval host plant) was already present or introduced. Two North American populations, the migratory populations located east and west of the Rocky Mountains, have been monitored at their respective overwintering sites in Mexico and California since the mid-1990s. While monarchs occur across the United States, habitat needs are heavily dependent on life stages. Eggs, larvae, and breeding adults require healthy and abundant milkweed (primarily *Asclepias* spp.) for oviposition and larval consumption. *Asclepias* benefit from broad habitat associations and are found in open woodlands and grasslands, forests, edges of streams and cienegas but can also be found in disturbed areas like roadsides and pastures. Breeding and migrating adults require a sufficient quality and quantity of nectar. Overwintering adults require suitable habitat that provides a specific roosting microclimate. Migrating adults also require interconnected nectar and milkweed resources along the migration route (USFWS 2020b).

No species-specific plant surveys for *Asclepias* spp. have been completed on Reservation lands. The Western Monarch Milkweed Mapper identifies a handful of records/sightings for both milkweed and monarchs along the NFWR (https://www.monarchmilkweedmapper.org/). Monarch sightings are from 2013 and 2014, and milkweed records date back to the 1960s. The source of these sightings and records on Tribal lands are unknown and cannot be verified. However, based on the broad distribution of *Asclepias* spp. and monarchs in Arizona, this species and its host plant(s) are assumed present within the study area.

3.4.2 Environmental Consequences

As defined in **Section 3.1.2** (*Impact Terminology*), this section uses standard terminology in the determination of effects in the context of the region, resource, or species, including negligible (no observable change), minor or minimal (small but detectable change), moderate (easily measurable change), major (large observable change), beneficial, adverse, short-term, and long-term. In addition, for federally listed species, effects determinations are consistent with Section 7 effects determination language including whether or not the proposed action is or is not likely to adversely affect and/or result in the continued existence of the species.

The construction methods for project components are identical under all action alternatives; therefore, the evaluation of construction-specific effects, application of standard control measures described under *Water Resources and Hydrology* in **Appendix A.2** (*Best Management Practices*), and construction-related mitigation measures would also be identical under each action alternative. Construction-related impacts are comprehensively discussed under Alternative A and are referenced under Alternatives B, C, and D.

The evaluation of operational effects under all action alternatives (i.e., downstream effects from changes in reservoir operations, flows, flooding) is based on a design population demand diversion that is 10 times higher than water volumes currently being diverted at the North Fork intake structure. The design population is anticipated to be reached in 40 years or more. Until the design population is reached, the magnitude of the diversion would only equal the demand. As a result, operational impacts would begin at baseline levels and then increase in magnitude commensurate with increases in diversion volumes. Regardless, the analysis in this section is based on diversion of the full design population demand.

No Action Alternative

Under the No Action Alternative, there would be no change to existing biological resources as a result of implementing the proposed action. There would be no temporary ground disturbance associated with construction of new facilities or project-induced changes to instream flow, and the proposed reservoir area would not be inundated with water. The WMAT would continue to manage biological resources in accordance with existing plans and policies. Consequently, the No Action Alternative would result in no impacts to biological resources or habitats.

Alternative A

Vegetation Communities and Associated General Effects on Wildlife and Habitats

When considered as a whole, direct and indirect adverse impacts to vegetation communities and associated wildlife resulting from grading and construction for the proposed Miner Flat Dam and reservoir, installation of the 50-mile pipeline, and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable. However, the magnitude and scale of specific adverse and beneficial effects are highly variable and discussed in detail in the following sections.

Construction-Related Effects

Miner Flat Dam and Reservoir. Approximately 180 acres of vegetated areas would be removed because of grading and construction for the proposed Miner Flat Dam and reservoir and associated infrastructure (**Table 3.4-1**, **Figure 2.5-3**, and **Figure 2.5-4**). Staging areas, new access roads, and realignment of Indian Route 62 (Lower Log Road) and Indian Route 67 would also be required (approximately 1,700 feet). As part of the land clearing phase, vegetation would be removed in stages and include timber harvesting where feasible. Timber harvesting would be conducted in compliance with the Forest Management Plan (see **Appendix A.2** [*Best Management Practices*]). Ultimately, vegetation would be completely removed from the dam footprint and most of the reservoir footprint, which includes approximately 151 acres of predominantly ponderosa pine forest and woodland, as well as approximately 21 acres of riparian habitat, approximately 4 acres of non-specified upland/deciduous habitat, 1.3 acres of grassland, and less than 1 acre of developed/ruderal cover types, all of which would be converted to open water reservoir habitat or infrastructure related to the proposed facilities. An additional 8 acres of primarily upland habitat may also be affected by subsurface treatments as part of dam construction, but the specific treatment option has not been selected and the total acreage impacted could be substantially less. The total acreage of vegetation potentially affected by the project includes approximately 2.4 acres and 19,469 linear feet (3.7 miles) of potentially jurisdictional wetlands and other non-wetland waters of the U.S., which would be subject to additional mitigation.

Vegetation removal can cause increased erosion and removal of topsoil from areas disturbed by the abovementioned activities. Soil compaction from heavy construction equipment can result in an increased potential for the indirect establishment and/or spread of noxious weeds in disturbed areas. Temporarily disturbed areas, such as staging areas outside the reservoir footprint or as part of subsurface treatments, would be stabilized and revegetated at the end of the construction project to match pre-construction conditions. Where permanent facilities are established, such as the reservoir inundation area, dam, concrete curtain if required, and approximately 1.4 miles of new access road and realignments, vegetation would not be replaced or restored.

Removal of habitat adversely affects migratory birds and terrestrial wildlife species present in the vicinity. Removal of vegetation can disturb and destroy nests, nesting behavior, and migratory movement. Noise and construction activity can also result in general avoidance of the area, potentially inducing a startle response and leading to possible injury from trampling or uncontrolled running or flight, increasing expenditure of energy during critical periods, decreasing the amount of time spent on life functions such as seeking food or mates, temporarily masking auditory signals from other animals, and/or otherwise reducing the protection and stability of young animals. Construction work for the dam site would proceed in phases (e.g., land clearance, foundation excavation, and dam construction) over a 2-year period, and the different phases would require different equipment. One of the loudest activities would be rock excavation, with equipment generating a maximum sound level of about 90 A-weighted decibels (dBA) at a distance of 50 feet, attenuating to about 70 decibels (dBA) at 500 feet. Dam construction would also involve about 78 days of blasting (an estimated 80 blasts), causing both audible sound and vibrations. **Table 3.4-5** presents anticipated construction equipment needs and associated noise levels.

Seasonal avoidance typically limits the potential for destruction of active nests; however, due to the duration of construction, seasonal weather, and conflicts with other measures, complete avoidance may not be feasible. The following measures would be implemented to address impacts on migratory birds and nests:

- A WMGFD biological monitor shall be on-site during all vegetation removal from March 1 through August 31.
- Contractors shall remove vegetation suitable for migratory birds outside of the general nesting season (March 1 through August 31), with an emphasis on birds of conservation concern and associated active nesting periods (**Appendix G**, *Biological Resources*), to the maximum extent feasible. If vegetation clearing must occur during that period, the contractor shall avoid any active bird nests. Pre-construction surveys within 10 days of clearing can identify active nests, and the WMGFD biologist/monitor can coordinate additional exclusion and avoidance measures to prevent nest destruction.

Table 3.4-5. Construction Equipment Noise Levels

Equipment	L_{max} (dB) at Distance			Equipment Used for Each Project Component			
	50 feet	500 feet	1,000 feet	Dam and Reservoir	Water Diversion Structure	Water Treatment Plant	Water Distribution Pipeline
Auger Drill Rig	84	64	58	X	X	-	-
Backhoe	78	58	52	X	X	X	X
Compactor (ground)	83	63	57	-	-	X	-
Compressor (air)	78	58	52	X	-	-	-
Concrete Batch Plant	83	63	57	X	-	-	-
Concrete Mixer Truck	79	59	53	-	-	-	X
Concrete Pump Truck	81	61	55	X	X	-	-
Crane	81	61	55	X	-	X	-
Dozer	82	62	56	X	X	X	-
Dump Truck	77	57	50	X	-	X	-
Excavator	81	61	55	X	X	X	X
Flat Bed Truck	74	54	48	X	-	X	-
Front-End Loader	79	59	53	X	X	X	X
Generator	81	61	55	X	-	-	X
Grader	85	65	59	-	X	X	X

Table 3.4-5. Construction Equipment Noise Levels

Equipment	L_{max} (dB) at Distance			Equipment Used for Each Project Component			
	50 feet	500 feet	1,000 feet	Dam and Reservoir	Water Diversion Structure	Water Treatment Plant	Water Distribution Pipeline
Mounted Impact Hammer (hoe ram)	90	70	64	X	-	-	-
Pickup Truck	75	55	49	X	X	X	X
Pneumatic Tools	85	65	59	-	-	-	-
Roller	80	60	54	X	-	-	X
Scraper	84	64	58	X	-	X	-
Vacuum Excavator (vac-truck)	85	65	59	X	-	-	-

Source: Federal Highway Administration (2006)

Key: dB = decibel; L_{max} = maximum sound level; - = not applicable

Following construction, inundation would mostly affect common species associated with ponderosa pine forest and woodland; however, raptors and other predator species utilizing the cliffs associated with the narrow canyon would also be displaced during construction. As the reservoir begins to fill, which is estimated to take 5 to 6 months, wildlife in the area would gradually move to nearby native habitats, resulting in additional competition for resources. While providing important habitat for a variety of species, ponderosa pine forest and woodland are not considered sensitive, and removal represents a modest fraction of the approximately 1.4 million acres of forest on the Reservation and north and south of the proposed dam site and reservoir along the NFWR (WMAT 2005a). Once the reservoir is filled, available habitat would transition to a modified reservoir ecosystem, which is discussed under **Section 3.4.1** (*Affected Environment*, *Aquatic Communities*).

With respect to the peregrine falcon, a TSS, the potential for adverse effects under Alternative A would be minor. No peregrine falcons were observed or are known to nest within the study area, and no impacts to this species are anticipated resulting from implementation of the proposed action. If this species is present in the vicinity of any project components, such as an actively constructed segment of the proposed 50-mile water distribution pipeline, adverse effects would be related to temporary and localized noise and activity associated with construction. All habitats outside of the pipeline right-of-way would be restored following the activity with the exception of the aboveground infrastructure, including the two pump stations, three new storage tanks, and a new utility line along the water distribution pipeline route. As a result, long-term adverse effects would be minor. The WMAT would continue to manage this species in accordance with the Forest Management Plan (WMAT 2005a). Management includes, but is not limited to, protection of nests, monitoring, and protection of suitable habitat, which would continue to occur following development of the proposed project components.

Similarly, the potential for adverse effects to the bald eagle, another TSS, under Alternative A would be minor. Bald eagles nest along the Salt River and tributaries, which would be unaffected by any proposed construction or operation of project components. No eagle nests are known along the NFWR or near any proposed project components. The establishment of a reservoir may increase bald eagle foraging and utilization when suitable prey is available. The WMAT manages this species in accordance with the Forest Management Plan (WMAT 2005a). Management includes, but is not limited to, protection of nests, monitoring, and protection of suitable habitat, which would continue to occur following development of the proposed project components.

North Fork Intake Structure Expansion and Expanded Water Treatment Plant. The footprint of the proposed North Fork intake structure expansion and expanded water treatment plant and associated facilities would result in approximately 0.25 acres of permanent disturbance and loss of primarily mapped developed or ruderal land cover/plant community types. Existing side-bank riprap would also be extended downstream approximately 60 feet. Construction-related activities and staging would result in an additional 2 acres of temporary disturbance. Installation of a 24-inch pipeline connecting the intake structure facility to the expanded water treatment plant would temporarily disturb an additional 22 acres of primarily high and low intensity developed, ruderal, or managed upland community types. Similar to other project construction, temporarily disturbed areas (e.g., the 24-inch raw water pipeline alignment) and staging areas outside of developed areas would be stabilized and revegetated, likely through re-seeding, at the end of the construction project to match pre-construction conditions.

Like the Miner Flat Dam site, seasonal avoidance would limit the potential for destruction of active nests and impacts on migratory birds, but if not feasible, mitigation measures such as biological monitoring and pre-construction surveys during the nesting season could help to limit adverse effects. Noise from construction activity at the North Fork intake structure and water treatment plant would be similar in nature but substantially reduced in scale and magnitude as compared to noise from construction of the proposed Miner Flat Dam. These types of activities would be localized and short-term, and noise would attenuate with distance.

Proposed Water Distribution System. Excavation, installation, and burial would require the removal of vegetation within the construction corridor, which is estimated at approximately 20 feet wide, assuming the use of heavy excavator or trenching equipment to install a 12- to 30-inch pipeline. Additional vegetation may be disturbed within a 100-foot corridor (50-foot buffer) associated with staging (estimated at about 20 staging areas over the 50-mile pipeline route) or other temporary construction purposes. Access would be from the existing roadways, and no new access roads, except as noted for the tanks and pump stations, would be required. Approximately 43 miles of the proposed line would be immediately adjacent to SR 73 or Indian Route 12. The remainder would follow an unnamed dirt road.

Based on a 20-foot construction corridor, approximately 33 acres are developed or ruderal cover types. As noted in **Section 3.4.1** (*Affected Environment*, *Vegetation Communities*), vegetation communities mapped within the construction corridor are dominated by pinyon-juniper woodland (58 acres), followed by grassland (19 acres) with frequent transitional communities such as pinyon-juniper woodland/grassland, and ponderosa pine forest and woodland (4 acres). Including 20 staging areas, approximately 135 acres may be temporarily disturbed. Except for new permanent aboveground infrastructure associated with the new storage tanks, pump stations, and access roads, totaling less than 5 acres, all temporarily disturbed areas would be stabilized and revegetated at the end of the construction project to match pre-construction conditions. By project design, horizontal directional drilling would be required to cross Carrizo Creek, which is perennial in most segments, and Cedar Creek or ephemeral streams, which would preserve riparian and wetland resources. The following measures would reduce long-term effects to vegetation communities:

- Horizontal directional drilling shall be implemented where the proposed 50-mile pipeline crosses any stream systems such as Carrizo and Cibecue Creeks and others. Equipment and staff shall remain outside of the riparian corridor, if present, and shall install the pipe at a depth (estimated at 7 feet) to limit the potential for scour. Trenching shall not occur in these features.
- Disturbed areas along the proposed construction alignments associated with pipelines and other infrastructure shall be revegetated following disturbance. The WMAT shall develop a restoration and monitoring plan for all project restoration requirements that outlines restoration criteria and monitoring protocols, as well as required final compliance approvals. Seed mixes shall be approved by the WMGFD and to the maximum extent feasible be collected from local sources.

Like the Miner Flat Dam site, seasonal avoidance would limit the potential for destruction of active nests and impacts on migratory birds, but if not feasible, mitigation measures would minimize adverse effects. Noise and activity from burial and installation of the 50-mile water distribution pipeline would be similar in nature but substantially reduced in scale and magnitude as compared to noise from construction of the proposed Miner Flat Dam. These types of activities would be localized, with the greatest response by wildlife occurring at the onset and in the immediate vicinity of the activity. Over the construction period, wildlife would adapt and avoid the area until the activity is complete.

Operations-Related Effects

As described in **Section 3.2** (*Water Resources and Hydrology*), the operation of the dam would result in changes to the flow regime in the NFWR downstream of the Miner Flat Dam (see modeled flow duration curves under Alternative A in **Appendix F**, *Water Resources*). The proposed Miner Flat Dam is not a flood control dam. Therefore, operations would be structured so that outflows would match inflows, in near real-time, except when the reservoir is filling and flows are to be stored, or in cases when safety or infrastructure concerns require manual operation. Electronic sensors would be installed at inflow and outflow locations, and most day-to-day operations would be computer-controlled. Outflows would be released through the outlet works in most situations; however, dam operators could release some or all of the outflows over the crest of the dam depending on the situation.

Potential indirect adverse effects are difficult to quantify due to the time horizon associated with proposed changes. Following construction of the dam, no immediate change in diversion amounts would occur. Over time, diversions would increase commensurate with population growth with the design population demand reached in 40 years or more. Thus, as previously discussed, operational impacts would begin at baseline levels and then increase in magnitude commensurate with increases in diversion volumes. Regardless, some consequences of proposed system operations are likely to occur, even if the timing is not fully understood.

With respect to low flow periods, under existing conditions segments of the NFWR and White River dry out infrequently, generally in summer (**Table 3.2-5**). Under Alternative A, the dam would be operated to ensure priority releases of minimum instream flows as well as sufficient water to meet diversion demands. Thus, one of the consequences of Miner Flat Dam operations would be to reduce the frequency in which the NFWR and White River dry out. Based on the model results, under Alternative A, the dam would also result in decreases in annual average flows of 10 percent at

NFWRGG and 2 percent at WRNFA. However, the magnitude and frequency of changes to the flow regime would be strongly seasonally dependent. Flows would be most affected in summer months when the reservoir is below full pool level (i.e., natural flows would be reduced through retention of inflows by the reservoir). By comparison, retention of inflows, and reductions in downstream flows, would be more infrequent during spring because the reservoir is modeled to be full during spring runoff in the range of 82 to 87 percent of the time.

The hydrologic regime of a watershed provides the link between rivers and the riparian zone, ultimately maintaining the diversity and function of these habitats. As a result, changes to flow characteristics, including elimination of peak flood flows, can subsequently reduce biodiversity and ecosystem processes (Magilligan and Nislow 2005). Potential adverse effects on riparian communities along the NFWR between the proposed Miner Flat Dam and Alchesay National Fish Hatchery (from the proposed dam site to approximately 5 river miles downstream) would be moderated by the release of minimum instream flows, as defined in **Section 2.5.2** (*Action Alternatives*), and planned diversion requirements for both Alchesay National Fish Hatchery and the North Fork Intake structure. In addition, this reach is primarily canyon-bound, lacking the large floodplain riparian zones that exist downstream in some floodplain-dominated reaches, such as immediately up- and downstream of the confluence with Diamond Creek, in the vicinity of the town of White River, and in the Canyon Day area.

Dam operations would maintain minimum instream flows downstream of the rural water system diversion point, while reducing potential for zero flow days. Modeled low flows would only exceed existing conditions in the summer supported by additional releases to meet minimum instream flow requirements, which would reduce seasonal drought stress. Average flows would be comparable to existing conditions in the spring and early summer, then start to substantially decrease associated with high demand and storage requirements in the summer. Reducing average flows would contribute to a variety of longer-term trends, including changes to the species composition of riparian communities. Drier conditions favor species that are normally limited by saturated or near-saturated conditions, erosion, and frequent flows; thus, typical upland species may become more common in riparian corridors. Although some canyon-bound reaches with steep transitions to upland communities could be modestly affected, changes would be most likely to occur in wider floodplain areas with shallow groundwater.

Riparian communities also depend on flood events, primarily those that overbank the regular channel and flood riparian areas and floodplains, to support seed dispersal, germination, and successful establishment of new successional phases. Flooding also reduces the competition from non-natives such as saltcedar and Russian olive. Reductions in peak flood flows can also lead to reductions in the frequency of channel scouring. This in turn can result in encroachment of vegetation into formally active channels and greater accretion of sediments and can encourage development of non-native species that were previously excluded due to low tolerance for variability in flow conditions (Kondolf and Batalla 2005). While 19 of the 38 annual peak floods between 1958 and 1996 occurred during summer monsoons, the four largest floods on record occurred during winter or late fall cyclonic storms. Under Alternative A, the largest single-day flows were typically modeled to pass through the system without attenuation. For example, there are 1,149 single-day events where flows at NFWRLL exceed the 95^{th} percentile of 310.3 cfs. Of those, three events are modeled to be attenuated. This is attributable to seasonal weather patterns in the region. The reservoir is modeled to be full most years during spring, when high flows are common. Spring high flows would not typically be affected, and thus no substantial reduction in peak events would occur during most years. However, summer monsoonal events would be stored because the reservoir is expected to be below maximum elevation. This, in combination with lower average flows, would over time favor the establishment of non-natives and channel encroachment, although the frequency of these peak flow events during summer is substantially lower than during other parts of the year (during the 63-year model record, there were 36 95th percentile events during summer months compared to 985 95th percentile events during spring months).

Aquatic Communities and Native Fishes

Impacts on aquatic communities and native fisheries (including TSS species) were assessed based on changes to streamflow and conditions resulting from construction of the proposed Miner Flat Dam and other project components, as well as future operations of the rural water system that could impact habitat quality (temperature and turbidity), water availability, flooding, and the potential for disturbance, injury, or mortality to aquatic wildlife. Impacts were assessed for both short-term construction-related impacts and long-term operations-related impacts. A summary of the modeling results, surface waters, water quality, and other environmental conditions that affect the quality of habitat are described in detail in **Section 3.2** (*Water Resources and Hydrology*).

When considered as a whole, direct and indirect adverse impacts to aquatic communities and fish resulting from grading and construction for the proposed Miner Flat Dam and reservoir and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable. However, the magnitude and scale of specific adverse and beneficial effects are highly variable and discussed in detail in the following sections.

Construction-Related Effects

Miner Flat Dam and Reservoir. Approximately 3.7 linear miles of canyon-bound, coldwater (Blue Earth 2014) lotic habitat would be converted to a 170-acre reservoir habitat. Within the footprint of the inundation area, areas adjacent to the NFWR would be subjected to initial disturbance associated with aggregate collection, the dam construction footprint, and the manipulation of the active channel for diversions. This habitat type is known to support several species of native and non-native fishes including Apache and brown trout, Sonoran and desert suckers, and speckled dace. Amphibians and aquatic reptiles within the area would also be affected. A constructed conduit beneath the dam in the outlet works would initially serve as the diversion of the river during construction and would be sized for a 10-year to 25-year flood to reduce the risk of damage to the construction site while in progress. During the different stages of construction, the diversion would be relocated periodically to accommodate all foundation excavation and installation of the outlet works. Following construction of the dam, portions of the flows would be stored, although minimum flows would continue to be released downstream. The reservoir would fill over a period of 5 to 6 months to a year depending on the season and current flows, eventually converting the existing habitat to managed reservoir habitat. While some individual fishes or other aquatic species that occur within the active construction and diversion area may escape upstream, or downstream through river diversions, the reduction of habitat quality resulting from active construction, management of diversions, and eventual removal of all existing habitat would inevitably result in the direct loss of aquatic species.

In addition, grading and construction for the proposed Miner Flat Dam would disturb soils within the project footprint, thereby increasing susceptibility to erosion, off-site transport, and downstream siltation, resulting in adverse water quality impacts. Changes to water quality during construction, even temporarily, may cause changes to distribution, behavioral disruptions, and general physiological stress on aquatic organisms. The magnitude of effects would depend on a variety of factors, such as weather, flow volume, proximity of disturbance to the active channel, and effectiveness of BMPs. The magnitude of effects would also decrease with distance downstream, with increases in turbidity and sedimentation dissipating quickly. Regardless, individuals present at the time and location of water quality changes would be subjected to temporary and localized degradation of the habitat. Standard control measures described under *Water Resources and Hydrology* in **Appendix A.2** (*Best Management Practices*) would be implemented to further avoid or minimize erosion and sedimentation in accordance with required applicable Tribal, Federal, and State laws, orders, and regulations concerning the control and abatement of water pollution.

The permanent conversion of the free-flowing system to a reservoir would create an environment in which native habitat-specialist species would not be adapted. Reservoirs typically favor generalist lentic species and the construction of the Miner Flat Dam reservoir may result in the replacement of a native stream fish dominated system with one dominated by non-native generalist species (Rinne and Janisch 1995). In the southwestern United States, native fish populations and communities have been observed to be dramatically altered both upstream and downstream of diversions and dams (Pool and Olden 2014, Olden and Poff 2005) even in locations where changes to flow and temperature were minimal (Martinez et al. 1994). Brown trout and northern crayfish, which occur in this reach of the NFWR, are known to prosper in managed and unmanaged ecosystems (Budy and Gaeta 2018, Blue Earth 2014). Other species of non-native fishes including rainbow trout, channel catfish, green sunfish, smallmouth bass, and fathead minnow have also been recorded on the NFWR and could establish populations in the reservoir. Over time native species may continue to persist but likely at a lower level due to competition with and predation from non-native species. Additionally, the eventual change in the hydrological function of the system where significant storm flow events are captured and the downstream velocity of those flows reduced would transform the system into increasingly favorable for non-native species. The decline in zero flow days due to the management of minimum flow releases is also anticipated to favor the establishment and management of non-native sport fish. Although no non-native sport fish would be introduced into the reservoir, the reservoir would likely attract recreational anglers who may unintentionally or intentionally introduce new or additional fish species into the system, which may outcompete or depredate upon native fishes. Measures including revisions to the WMAT Game and Fish Code to restrict non-native fish stocking and enforce bait and accidental release regulations would be applied to minimize, but would not likely totally prevent, the potential for an increase in the existing non-native fish and northern crayfish populations in the reservoir.

- The WMAT shall revise and expand the existing WMAT Game and Fish Code restricting non-native fish stocking and enforcement of bait, accidental release, and other game and fish regulations designed to minimize the introduction of non-native fish to the Reservation. Signage and information shall be made available to members, identifying bait and release restrictions and enforcement actions.

Construction of the dam would also result in the permanent loss of connectivity for fish populations and other aquatic and terrestrial species in the NFWR. Construction of the dam would block passage both upstream and downstream limiting fish that move up or down the river to find suitable spawning, rearing, and foraging habitat. Impassible barriers fragment the river corridor, isolating populations. With respect to fish communities, the movement habits and requirements of fish vary by species. For example, Apache trout have maximum movements of 1.3 miles (2.1 kilometers) upstream and 1.5 miles (2.4 kilometers) downstream, with the average distances substantially less

(Kitcheyan 1999). Booth et al. (2014) reported that sucker species in New Mexico were limited to movements of 0.1 miles (0.2 kilometers) or less. Brouder et al. (2000) also noted that most roundtail chub movements were within 0.6 miles (1 kilometer) or less, although this species is not known to occur in the vicinity of the proposed dam site. Limiting movement would result in a reduction in availability of suitable habitat for affected species and increased competition and pressure. It would also limit the natural exchange of genes among individuals, resulting in the creation of new subpopulations and their eventual genetic drift.

The following measures would reduce but not avoid/prevent adverse effects associated with habitat fragmentation:

- The WMAT shall revise the Native Fishes Management Plan to incorporate the Miner Flat reservoir into long-term objectives toward sustaining native fisheries. Monitoring and data from all existing management activities and proposed conservation measures shall be incorporated into an adaptive management strategy. Data collection shall include regular sampling in the reservoir and below the dam to understand species diversity changes, if any, and help identify additional management actions required. As part of the management plan, existing and future data shall be utilized to develop invasive aquatic species eradication strategies, as needed.
- The WMGFD shall establish an annual reporting process to assess the downstream function of the NFWR and White River, incorporate all survey data, and review alignment with management recommendations in the Native Fishes Management Plan.

Three sensitive non-federally listed native fish species (species of concern) are known to occur in the NFWR and/or White River: the desert sucker, Sonora sucker, and speckled dace (Blue Earth 2014). Potential adverse effects to these species of concern under Alternative A would be associated primarily with construction and removal of stream habitat within the footprint of the reservoir. All of these species are managed in accordance with the Native Fishes Management Plan (WMAT and USFWS 2014). Temporary and permanent impacts are consistent with those related to other native fishes described in this section, including increased sedimentation during construction, loss of habitat due to construction and operation of the dam, loss of connectivity, and habitat fragmentation. Due to the limited mobility of these species (Booth et al. 2014, AZGFD 2002b) and the temporary and localized nature of the impact, only individuals in the immediate vicinity of construction activities would be affected, and following the temporary disturbances, they would likely recolonize. Regardless, loss of 3.7 miles of aquatic habitat and changes in water quality, even temporarily, causing the loss of an unquantifiable number of individuals in the vicinity of construction activities, would be major and unavoidable.

North Fork Intake Structure Expansion and Expanded Water Treatment Plant. Similar to construction of the Miner Flat Dam, changes to water quality, even temporarily, may cause short-term changes to distribution, behavioral disruptions, and physiological stress in aquatic organisms. While individuals present at the time and location of water quality changes would be subjected to additional stress, anticipated impacts would be short-term and localized, and downstream increases in turbidity and sedimentation would dissipate quickly after completion of the in-water construction activities for the new intake structure. Standard control measures described in *Water Resources and Hydrology* in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize those potential impacts in accordance with required applicable Tribal, Federal, and State laws, orders, and regulations concerning the control and abatement of water pollution, including compliance with Sections 401 and 404 of the CWA. Following construction, inlet velocities at the main inlet point would be low. The proposed trash rack would have openings approximately 1.5 to 3 inches in size. Any fish swimming through these openings would be further excluded by the 0.1-inch (100 slot) openings of the fine screens and the very low (0.30 to 0.35 feet per second) inlet velocity at the screen opening (Carollo 2014b). Thus, the likelihood of entrainment and/or loss of individuals at the inlets would be low. In addition, expansion of this infrastructure would not create any permanent barriers that would otherwise alter aquatic habitats; however, depending on the stage of the river and specific placement of armoring, riprap may provide some limited shelter and cover in the short section where it would be placed.

Proposed Water Distribution System. The proposed pipeline route would cross two major streams, Carrizo Creek and Cedar Creek, between the expanded water treatment plant and the community of Cibecue. No aquatic habitat or fish count surveys were completed along the pipeline route; however, as noted in **Section 3.4.1** (*Affected Environment*), there are historic records of roundtail chub in Carrizo Creek. Surface disturbance and the associated inducement of erosion and sedimentation in aquatic habitats from construction adjacent to these creeks could occur but would be localized. Horizontal directional drilling would be required to install the pipeline across perennial streams and major ephemeral streams, which would further reduce the potential for sedimentation of any aquatic habitats associated with Carrizo and Cedar Creeks. Construction activities disturbing more than 1 acre would also be regulated under the NPDES program and would require coverage under an NPDES permit and development of a construction SWPPP. Avoidance of potential aquatic habitats along the route and incorporation of BMPs proposed in *Water Resources and Hydrology* in **Appendix A.2** (*Best Management Practices*) would further reduce the magnitude of effects.

- Horizontal directional drilling shall be implemented where the proposed 50-mile pipeline crosses any stream systems such as Carrizo and Cibecue Creeks and others. Equipment and staff shall remain outside of the riparian corridor, if present, and shall install the pipe at a depth (estimated at 7 feet) to limit the potential for scour. Trenching shall not occur in these features.

Operations-Related Effects

Following construction of the dam, no immediate increases in downstream diversions would occur. Diversions would gradually increase over time pacing with population increases over approximately 40 years or more. However, because future water demand would be approximately 10 times higher than what is currently being diverted at the North Fork intake structure, future operation of the Miner Flat Dam would alter downstream flow patterns resulting in a number of likely changes to existing conditions, including persistence of minimum instream flows throughout the summer months, changes in the frequency and magnitude of summer peak events, warming of reservoir outflows, and others. The magnitude of potential adverse and beneficial effects described in this section would gradually increase as actual demand increases up to the design population demand.

As previously described, the NFWR and White River are subject to natural low flows in the summer and infrequently dry out under existing lowest flow conditions. According to modeling, under Alternative A, operation of the Miner Flat Dam would increase minimum instream flows downstream of the dam and would prevent the NFWR from drying out. Persistent flow at these locations would provide a benefit to native and non-native fish due to the preservation of habitat through the driest months (reduced risk of seasonal die-off) and would add thermal protection from changes in air temperature. The dam operation would also result in a modeled reduction in average flows, primarily in late summer through winter. Reductions in average flows can cause or exacerbate a number of direct and indirect ecological changes, including less overall habitat, and provide more favorable conditions for non-native fish species that may otherwise be limited by natural temperature and flow extremes.

Disturbance from flood events is an important ecological component. Many native aquatic organisms are adapted to seasonal and inter-annual variations in flows, including high flow conditions (Kondolf and Batalla 2005). Nearly all late summer peak flows, including significant monsoonal storms, would be muted, which would reduce the frequency of events causing ecologically important disturbance. Extreme conditions, such as spring high flows and summer storms, put important stresses on biological communities and, within some bounds of tolerance, can greatly enhance biodiversity. Dramatic shifts such as the timing of minimum or maximum flows that are outside the bounds of natural variation can greatly diminish aquatic biodiversity. The greater the deviation in flow regime from pre-disturbance conditions, the greater the expected ecological response (Magilligan and Nislow 2005). In the context of broader climate trends, changes in the disturbance regime can exacerbate an existing trend toward more erratic and extreme rainfall events. Changes in the phasing of water releases from a reservoir also could affect numerous ecological functions, including spawning and migration cues that depend on timing predictability. Modeling indicates during most years, spring high flows would generally pass through the reservoir without attenuation; however, adjustments to the magnitude and timing of peak flows during other parts of the year may diminish faunal heterogeneity of the channel bed that can ripple up community food webs.

Changes in water temperature in the river downstream from the dam would also occur (**Figure 3.2-9**). The temperature of the modeled reservoir outflows would be warmer than the corresponding inflows during some portion of the year (particularly late summer to early winter). Peak seasonal temperatures of outflows would be approximately 65°F (18°C) modeled to occur in August to September. The greatest increase would be associated with winter temperatures, which coincides with when the reservoir would hold and then release warmer water as compared to inflows. The water temperature of dam releases in the spring would be comparable to inflows. Annual average peak temperatures of outflows would also increase, although modeled changes in average temperatures would be limited to approximately 2°C (3.5°F) (JE Fuller 2022); however, the seasonal warming would be slowed by the reservoir, and peak temperatures would occur later in the season. The modeled increase in minimum water temperature in winter and peak summer temperatures are not outside of the known thresholds for generalists or federally threatened and endangered aquatic species present in the NFWR, but maintaining warmer temperatures longer into winter, particularly in the reach immediately downstream of the dam, would result in a delayed annual temperature cycle, which decreases the physical capacity of water to carry oxygen and disproportionately favors species with greater temperature tolerances, including non-native competitor species. The effect of warmer outflow temperatures would attenuate downstream with distance. However, warming temperatures in the winter would favor species with broader or higher temperature preferences, particularly non-native species, which could alter species interactions and community composition.

Dissolved oxygen concentrations could also be affected by dam operations. Water temperature has an inverse relationship to the concentration of dissolved oxygen; therefore, warming can exacerbate seasonally lower dissolved oxygen concentrations for longer periods of time, particularly in the summer. Poorly mixed reservoir water could also result in temporarily low dissolved oxygen at depths with settling and decomposition of organic matter, although this is more common with larger, deeper reservoirs. A depletion of dissolved oxygen can result in a variety of adverse effects to organisms including, for example, stress during critical life functions and die-off. These conditions, if they occur, would be temporary, and dissolved oxygen concentrations would increase following vertical mixing associated with fall turnover and releases from the bottom of the reservoir. Temperature modeling shows that the reservoir would be relatively well mixed, with little permanent stratification of temperatures; this results in more exposure to surface oxygen and would reduce the potential to release low dissolved oxygen to downstream flows (JE Fuller 2022).

As previously noted, additional water quality monitoring in support of the Native Fishes Management Plan and adaptive management planning for aquatic communities are proposed:

- The WMAT shall revise the current Native Fishes Management Plan to assess and monitor changes in species distribution and water quality in the reservoir and downstream of the Miner Flat Dam. The plan shall update current and proposed management measures to minimize impacts on native fish, as needed, including implementation of a water quality monitoring program on the NFWR. Key elements shall include the collection/assessment of pre- and post-construction dissolved oxygen and temperature data relative to existing WMAT beneficial use criteria (see **Section 3.2**, *Water Resources and Hydrology*).
- The WMAT shall revise the Native Fishes Management Plan to incorporate the Miner Flat reservoir into long-term objectives toward sustaining native fisheries. Monitoring and data from all existing management activities and proposed conservation measures shall be incorporated into an adaptive management strategy. Data collection shall include regular sampling in the reservoir and below the dam to understand species diversity changes, if any, and help identify additional management actions required. As part of the management plan, existing and future data shall be utilized to develop invasive aquatic species eradication strategies, as needed.
- The WMGFD shall establish an annual reporting process to assess the downstream function of the NFWR and White River, incorporate all survey data, and review alignment with management recommendations in the Native Fishes Management Plan.
- The WMAT shall incorporate a formal feedback loop with dam operators into any future dam operations manual changes to ensure that operations are consistent with conservation objectives detailed in existing management plans and measures proposed herein.

In addition, standard control measures described in **Appendix A.2** (*Best Management Practices*) would be implemented, such as installing a temperature and water quality measurement system (i.e., in situ temperature and dissolved oxygen sensors) to provide real-time water temperature data for dam inflow and outflow streams. This would also include monitoring, recording, and managing temperature and water quality through dam operations (i.e., managing water releases from different depths within the reservoir to regulate the temperature of the outflow releases), as needed, to ensure native stocked populations are maintained. While monitoring would not reduce the magnitude of effects, resulting data could be incorporated into long-term strategies for management of native fish on the Reservation.

Wetlands and Other Jurisdictional Waters of the United States

Changes in hydrologic characteristics that support wetlands and other waters of the U.S. are presented in **Section 3.2.2** (*Water Resources and Hydrology, Environmental Consequences*) including hydrology, surface water quality, flooding, and temperature. Adverse impacts to wetlands and other waters of the U.S. under Alternative A would be major and unavoidable, but implementation of mitigation measures, standard BMPs, and compensatory mitigation would reduce the scale and magnitude of adverse impacts.

Miner Flat Dam and Reservoir. Direct adverse impacts to wetlands and jurisdictional waters of the U.S., including the conversion and permanent loss of features, are anticipated to result from the construction of the Miner Flat Dam and the associated reservoir. Approximately 0.02 acres of potentially jurisdictional emergent herbaceous wetlands, primarily adjacent to the NFWR, would be lost within the footprint of new dam infrastructure. An additional 2.4 acres of potentially jurisdictional emergent herbaceous wetlands, primarily adjacent to the NFWR and tributaries, would be permanently converted to open water as a result of inundation within the reservoir footprint. An additional approximate 3.7 miles of non-wetland waters of the U.S. would also be converted from a free-flowing river system to the reservoir. Wetland features occur in fragments generally not exceeding 0.05 acres in size (80 percent are smaller). Acreage presented here conservatively includes all features within the 6,080-foot contour, which is approximately 15 feet above the maximum pool elevation; therefore, actual impacts may be smaller. In addition, some wetlands and other waters may be avoided during the final design of the project and, thus, reduce the overall impact to these features. Conversion of emergent wetland features within the inundation area to open water is considered unavoidable. Although unlikely, some unquantifiable amount of new fringe emergent wetland may become established around the perimeter of the proposed reservoir or immediately downstream of the proposed dam where suitable conditions exist. Construction activities exceeding more than 1 acre in disturbance would be regulated under the NPDES program and would require coverage under an NPDES permit and development of a construction SWPPP. Standard control measures described under *Water Resources and Hydrology* in **Appendix A.2** (*Best Management Practices*) would be implemented to minimize potential short-term impacts in accordance with required applicable Tribal, Federal, and State laws, orders, and regulations concerning the control and abatement of water pollution, including compliance with Sections 401 and 404 of the CWA.

As discussed under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*), potential indirect adverse effects to wetlands and other waters of the U.S. are difficult to assess due to the timing associated with proposed changes. Following construction of the dam, no immediate change in diversion amounts would occur. Over time, diversions would increase commensurate with population growth with the design population demand reached in 40 years or more. Under Alternative A, the dam would be operated to ensure priority releases of minimum instream flows as well as sufficient water to meet diversion demands. Thus, one of the consequences of Miner Flat Dam operations would be to reduce the frequency in which the NFWR and White River dry out, which would reduce seasonal stress on any associated unmapped downstream obligate fringe emergent wetlands. Based on the model results, under Alternative A, the dam would also result in modest decreases in average flows and average annual flow volumes. However, the magnitude of changes is seasonally dependent with winter and spring flows consistent during most but not all years (modeled 84 to 89 percent of the time). Non-minimum instream flows would be most affected in summer months when the reservoir is below full pool level (i.e., natural flows would be reduced through retention of inflows by the reservoir).

The following measure would be used as mitigation for all project components to further reduce potential loss of jurisdictional features:

- During the final design and engineering phase, jurisdictional wetlands and other non-wetland waters of the U.S. shall be avoided through modification or realignment of infrastructure to the maximum extent feasible. Unavoidable loss or conversion of wetlands shall be mitigated or compensated for through the CWA Section 404 permitting process and may include a banking or in-lieu fee program. A 404(b)(1) analysis shall be completed to further define impacts to the aquatic environment under jurisdiction of the USACE.
- Construction equipment and contractors shall be staged outside of the riparian communities (including mapped wetlands), which are to be flagged, monitored, and avoided. A construction monitor familiar with riparian habitats, wetland habitats, project wetland delineations, spill prevention, and avoidance measures shall be present for all instream work, with the authority to stop work as needed. Specific BMPs and measures to be included in contractor documents as part of USACE permits and/or under NPDES permits (see *Water Resources and Hydrology* in **Appendix A.2**, *Best Management Practices*) shall also be implemented (e.g., site-specific flagging and avoidance, restoration of contours of temporarily dewatered areas at the North Fork intake structure).

Compensatory mitigation requirements would likely be satisfied through the purchase of credits from an approved in-lieu fee program. With the implementation of the abovementioned permitting process, Section 404(b)(1) and associated mitigation, adverse impacts associated with the conversion and/or loss of jurisdictional features would be minor.

North Fork Intake Structure Expansion and Expanded Water Treatment Plant. No jurisdictional wetlands are present in the construction footprint associated with the North Fork intake structure or water treatment plant; therefore, no direct loss would occur as a result of construction of those facilities. However, construction of the new intake structure would require temporarily diverting a small portion of the river. A temporary cofferdam or water barriers (e.g., sandbags) would be installed on the west side of the river to allow the installation of the proposed intake structure and piping, and the construction area along the west bank would be temporarily dewatered, as needed, using pumps. Measures presented under the *Miner Flat Dam and Reservoir* section above would be applied for the temporary activities associated with the North Fork intake structure.

An unnamed drainage feature was mapped in the study area associated with the proposed 24-inch raw water pipeline, connecting the North Fork intake structure to the water treatment plant. Similar to other project components, construction activities exceeding more than 1 acre in disturbance would be regulated under the NPDES program and would require coverage under an NPDES permit and development of a construction SWPPP. If the drainage feature is determined to be jurisdictional, or if incidental in-water effects in the NFWR could occur, standard control measures described under *Water Resources and Hydrology* in **Appendix A.2** (*Best Management Practices*) would be implemented to minimize those potential impacts in accordance with required applicable Tribal, Federal, and State laws, orders, and regulations concerning the control and abatement of water pollution, including compliance with Sections 401 and 404 of the CWA. In addition, the same mitigation measures applied to the Miner Flat Dam site would also apply to the North Fork intake structure, as needed, for all project components to further reduce potential loss of jurisdictional features.

Proposed Water Distribution System. No impacts to wetlands or other jurisdictional waters are anticipated as a result of the construction of the proposed water distribution system. By project design and the following measure, drilling would be required to cross Carrizo Creek, which is perennial in most segments, and Cedar Creek or ephemeral streams, to avoid potential impacts to aquatic habitats.

- Horizontal directional drilling shall be implemented where the proposed 50-mile pipeline crosses any stream systems such as Carrizo and Cibecue Creeks and others. Equipment and staff shall remain outside of the riparian corridor, if present, and shall install the pipe at a depth (estimated at 7 feet) to limit the potential for scour. Trenching shall not occur in these features.
- Construction equipment and contractors shall be staged outside of the riparian communities (including mapped wetlands), which are to be flagged, monitored, and avoided. A construction monitor familiar with riparian habitats, wetland habitats, project wetland delineations, spill prevention, and avoidance measures shall be present for all instream work, with the authority to stop work as needed.

Federally Listed and Candidates for Listing as Threatened or Endangered under the Endangered Species Act

As previously noted, the WMAT has authority and responsibility for natural resources within the Reservation boundaries. In addition, Section 7 of the ESA requires Federal agencies, in this case Reclamation, to consult with the USFWS if an action they fund, authorize, or carry out affects any species listed as threatened or endangered or critical habitat designated under the ESA. A BA is being prepared and will be used to determine whether the action would adversely affect any federally listed species. This section provides a summary of impacts on federally listed species. The results of the Section 7 consultation will be incorporated into the Final EIS. Under the proposed action, sensitive species would continue to be managed and monitored under WMAT management plans, and consultation with the USFWS would continue.

Mexican Gray Wolf (*Canis lupus baileyi*). The closest den is more than 15 miles from the proposed Miner Flat Dam and reservoir site. However, wolves on the Reservation are wide-ranging, and it is possible that individuals on occasion have used and would continue to use or pass through the proposed dam and reservoir area or other associated project sites within the study area. If wolves are present or near project sites within the study area when construction is occurring, adverse effects under Alternative A would be consistent with those described under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*) and most likely would result in avoidance of the area. However, construction sites can also result in an attractive nuisance if trash is not managed effectively. Construction work for the dam site would proceed in phases (e.g., land clearance, foundation excavation, and dam construction) over a 3- to 4-year period. No nighttime activity is proposed. Contractors would be required to develop a series of plans related to noise, lighting, and site management, to define site management requirements to limit wildlife interactions and nuisance as discussed in **Appendix A.2** (*Best Management Practices*). Following construction-related noise and activity, habitat suitability would return except for those habitats permanently removed. The primary loss of access to habitat associated with the proposed action would occur at the location of the Miner Flat Dam and reservoir which, as noted, includes the conversion of approximately 180 acres to a reservoir, dam, and associated infrastructure. This predominantly forested and river habitat represents a modest fraction of the approximately 1.4 million acres of forest on the Reservation (WMAT 2005a) and is considered a minor loss of habitat for the Mexican gray wolf. As a result, under Alternative A, while wolves could be present and occasionally use the area, there would be no loss of individual wolves, dens, or wolf packs, and no critical habitat was established on the Reservation. Any avoidance by individuals would be temporary and unquantifiable. All wolves on the Reservation are considered part of a non-essential experimental population. As a result, adverse effects on this species are considered negligible.

New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*). An identified "high potential" but currently poor habitat site upstream of the proposed dam site is expected to be inundated as part of the new reservoir. This individual location was not identified as potentially occupied due to the lack of historic records and ongoing disturbance from livestock grazing, which was noted as "…unlikely to support much of a population unless grazing is variable and patches of adequate habitat remain" (Chambers 2021). A second site was assessed as "good quality" immediately upstream of the proposed dam site within the inundation footprint and within the planned aggregate borrow pit to be used during construction. A third site within the construction footprint of the actual dam location would be cleared then removed as a result of site preparation and disturbance. These sites identified as good quality habitat for the species would be permanently lost. Additional surveys prior to construction would increase confidence as to whether identified suitable habitat is occupied. Methodology should follow Harrow et al. (2018) or other methodology proposed in coordination between the WMGFD and USFWS:

- New Mexico meadow jumping mouse surveys at the proposed Miner Flat Dam site shall be completed annually until the start of construction. A habitat assessment shall also be conducted at the intake structure site where proposed expansion would occur. In addition, in the appropriate season and immediately prior to ground-disturbing activities, the WMGFD shall conduct pre-construction species surveys in the vicinity of the proposed Miner Flat Dam, and at the intake structure site if suitable habitat is identified, for the New Mexico meadow jumping mouse.

If occupied, the development of a species-specific conservation plan would occur and include specific measures to minimize the unexpected loss of individuals, if they occur, prior to initial disturbance. These would include, but not be limited to, mapping and flagging of habitat and avoidance to the maximum extent feasible, seasonal disturbance restrictions, phased vegetation removal, and biological monitoring supporting removal/relocation of individuals out of harm's way.

If potentially suitable habitat within the dam and reservoir footprint is not occupied by the species, direct adverse effects under Alternative A would be the permanent loss and fragmentation of habitat, and the downstream degradation of suitable jumping mouse habitat found outside of the construction and reservoir footprint. If suitable habitat is determined occupied at these locations, disturbance, noise, and removal of habitat would result in the annoyance and loss of any individuals present. It is unlikely that take of the species through harassment and direct mortality could be avoided. If the species is determined to be present, the magnitude of effects could be minimized to some extent with construction and disturbance planning, as follows:

- If occurrences of New Mexico meadow jumping mice are detected, the WMGFD shall develop a species-specific conservation plan for construction activities. The plan shall include minimization and avoidance measures including, but not limited to, the following:
    - Ensure ground disturbance within potentially suitable habitat occurs within the active period but outside of the nesting period (late summer), to the maximum extent feasible.
    - Phase vegetation removal and suitable habitat disturbance from the dam site to the north to maximize escape opportunities.
    - Map occupied or suitable habitat within the construction footprint and avoid temporary damage to the site, such as staging or clearing.
    - Ensure a qualified biological monitor with the authority to stop work and with expertise with the species is present during all ground-disturbing activities.

This species is a true hibernator and is active from late May/early June into October, and nesting typically occurs from June through August. Ground disturbance when individual mice are in a torpor state would likely result in mortality. Ground disturbance occurring during the active period but outside of nesting would maximize the potential for individuals to move away from harm. Biological monitoring at the onset of construction could also support avoidance and minimization efforts outside the disturbance footprint. In addition, removal of suitable riparian habitat during the active season for the species, in coordination with an on-site biological monitor, could allow individuals in the vicinity of the dam site to escape to upstream or downstream locations. Phased ground disturbance and clearing starting at the dam site and moving north upstream, as described, would further maximize the ability of the species to move out of harm's way.

A fourth site downstream of the proposed dam site, near Post Office Farms, was also characterized as good quality habitat for the New Mexico meadow jumping mouse. No direct disturbance or removal of habitat is proposed at this location or at other suitable locations along the NFWR where they may be found; however, as discussed under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*), some habitat modification could would likely occur gradually over time. For the spring months of March to May, the reservoir is modeled to be at a maximum capacity in the range of 84 to 89 percent of the time. There would be some years where spring high flows will not be affected, but there would be years where they will be affected to some level. Changes in high flows do not have to occur every year for there to be downstream effects and those effects can be gradual and take several years to decades before they can be seen. Summer flows would be attenuated by reservoir operations, coinciding with high demand and low flow conditions. Under Alternative A, low to medium flows would be most affected by attenuation during the summer. Maintaining minimum flows at this downstream site would ensure this site would not dry out, which would be a benefit from existing conditions. Regardless, reduced flows in summer would likely favor establishment of non-natives. Habitat degradation, including channel crowding/narrowing, and an increase in non-native competition are unquantifiable but would likely be exacerbated. As noted for other sites supporting suitable habitat, additional survey efforts would increase our understanding of presence/absence of the species and potentially suitable habitat.

Habitat at the proposed crossings of Carrizo and Cedar Creeks has not been evaluated; however, disturbance in riparian areas would be avoided through use of underground boring, and thus direct adverse effects to this species could occur. There would be disturbance adjacent to both locations from human presence, ground disturbance from boring, and noise from machinery that could cause individuals to temporarily flee or abandon their territories. If suitable habitat is present at the intake structure site and/or if occupancy can be determined through surveys, adverse effects would include the installation of riprap along the shoreline and similar disturbances to those described for the dam and reservoir but reduced in scale to less than 0.25 acres.

Stabilizing downstream hydrological conditions with consistent instream flows, fewer zero flow days, reduction in high summer flows, and the presence of a reservoir would create and maintain suitable conditions for the establishment of non-native sport fishery. The New Mexico meadow jumping mouse is a semi-aquatic rodent that frequently swims across streams to access streamside habitat and patches within its territory and home range. Its frequent presence within the channel makes juveniles and adults vulnerable to predation by non-native sport fish such as brown trout and other large species that may become established.

As previously mentioned, Dr. Chambers conducted a site visit and habitat assessment in 2021 and noted the availability of suitable habitat at the Miner Flat Dam site and north and south of its location. Due to its cryptic nature, the New Mexico meadow jumping mouse is challenging to survey for and assess. Preliminary surveys that result in no detections are not an indication of its prospective presence in the area. It will take multiple years of reoccurring surveys with no documented detections before it could be concluded that it is not present within the immediate area, but there would still be a possibility of its presence north and further south of the proposed dam site on the NFWR. Removal of suitable habitat within and upstream of the dam would result in the harassment and loss of individuals. The construction of a dam would also result in additional adverse effects along the NFWR to other prospective populations and their habitat due to habitat degradation and the barrier effect the dam would have on their natural movement and gene flow. Adverse effects on this species are considered minor because of possible lethal contact with construction equipment, direct loss of potential habitat, fragmentation of the river, downstream degradation of potentially suitable and/or occupied habitat, and/or other disturbances from project implementation activities. The project area falls outside of critical habitat, and therefore it would not adversely affect critical habitat.

Yellow-Billed Cuckoo (*Coccyzus americanus*). As noted in the species account for the yellow-billed cuckoo, a habitat analysis concluded that the canyon segments in the location of the Miner Flat Dam and reservoir with high-gradient, steep canyon walls, and narrow floodplains did not meet suitable habitat for the cuckoo (79 *Federal Register* 48547, Blue Earth 2019). Therefore, there would be no direct impacts to habitat or territories associated with the construction of the Miner Flat Dam or where other project components would occur. At proposed creek crossings, riparian habitat would be avoided through the use of horizontal directional drilling, but there would be disturbance from human presence, ground disturbance from boring, and noise from machinery for up to 3 days that could cause individuals to temporarily flee or abandon their territories.

With respect to post-construction operations, downstream effects on riparian bird species such as the yellow-billed cuckoo would be associated with the degradation of and future loss of riparian habitat on the NFWR and White River, consistent with those described for riparian communities under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*). Under Alternative A, modeling indicates that average flows from June through September would decrease from 98 cfs to 87 cfs along the White River. Cuckoos arrive early to mid-June and normally depart mid to late-August. Average minimum flows would be less but comparable to existing conditions until natural reductions in summer flows occur, at which point the release of minimum instream flows would increase summer flows. As a result, existing life functions, predator/prey relationships, and suitability for nesting birds would remain intact, or potentially improve in early summer.

Reductions in flows can directly affect habitat utilization through changes such as a reduction in invertebrate productivity and humidity. This would lead to an overall reduction in habitat suitability and availability over time. Drier conditions generally favor species that are normally limited by saturated or near-saturated conditions, erosion, and frequent flows; thus, typical upland species may expand within riparian corridors. Spring high flows would be more stable but would still experience some reductions during years where the reservoir is not at maximum elevation. During those years there would be reductions in downstream flows and a reduction in the velocity of those peak flow events, which would limit scouring of the river. However, lower average flows in the summer would over time favor the establishment of non-natives, although prioritized minimum instream flows would maintain flows within historic hydrologic conditions. This in turn can result in encroachment of vegetation into formally active channels, greater accretion of sediments, and development of non-native species that were previously excluded due to low tolerance for variability in flow conditions (Kondolf and Batalla 2005). As a result of changes in flows, patches previously identified and surveyed along the NFWR may never reach a level of suitability for the yellow-billed cuckoo. Due to a reduction in scouring, other areas may never have the ability to transition from a non-suitable vegetation community to potentially suitable cuckoo habitat. Over the long-term, changes could result in a general unquantifiable degradation of riparian habitat potentially utilized by this species.

Cuckoos were detected incidentally during surveys for the southwestern willow flycatcher in Canyon Day in 2013. In 2018, surveys for the yellow-billed cuckoo detected them in the same general location from 2013. During the 2018 survey efforts there was one possible breeding territory and one probably breeding territory documented. This location is on the main channel of the White River and downstream from its confluence with the NFWR. Flows that pass downstream on the NFWR would eventually pass through Canyon Day and contribute to conditions that have created and maintained suitable cuckoo habitat. The change and decline in average flows, high flows, and seasonal flows may lead to changes in that patch and may prevent other surveyed patches from transitioning to suitable conditions.

Adverse effects on this species are considered minor because of anticipated changes in flows and the resulting downstream degradation of occupied habitat and prospective habitat. The project area falls outside of critical habitat, and therefore it would not adversely affect critical habitat.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*). This species is not known to be present along the NFWR, and suitable habitat does not occur where project components would be developed. As a result, there would be no direct removal of habitat or territories associated with the Miner Flat Dam and reservoir or water treatment plant expansion. At proposed creek crossings for the water distribution system, riparian habitat would be avoided through the use of horizontal directional drilling. There would be disturbance adjacent to those locations from human presence, ground disturbance from boring, and noise from machinery for up to 3 days that could cause individuals, if present, to temporarily flee or abandon territories.

Due to close similarities described above for the yellow-billed cuckoo, anticipated hydrological changes for flow volume, average and seasonal flows, and high flows from storm events would result in the same effects to downstream habitat on the NFWR and White River. While flycatchers were not documented on the NFWR, there were a series of 27 habitat patches totaling 67.31 acres that were evaluated for suitability. They were only documented at four different patches, but the remaining locations that were evaluated and surveyed could provide prospective opportunities for their future occupation, if given the chance and time for natural growth, succession, and development into suitable habitat. However, as a result of anticipated changes in flows, which reduce scouring and other natural processes, those areas may never reach a level of suitability. It is also anticipated that locations where migrants and residents were documented may degrade over time resulting in those four patches becoming unsuitable. Over the long term, changes are anticipated to result in a general unquantifiable degradation of downstream riparian habitat.

Adverse effects on this species are considered minor because of anticipated changes in flows and the resulting downstream degradation of occupied habitat and prospective habitat. The project area falls outside of critical habitat, and therefore it would not adversely affect critical habitat.

Mexican Spotted Owl (*Strix occidentalis lucida*). As noted under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*), the construction of the dam and other project components would generate localized noise associated with standardized construction activities, which can cause a response by wildlife, including Mexican spotted owls, if present. Delaney et al. (1999) noted that Mexican spotted owl flush responses increased due to closer and louder noise sources. Noise (chainsaws) below 46 dBA did not generate a flush response. **Table 3.4-5** estimates that noise would attenuate below 69 dBA at 500 feet. The recovery plan for the species recommends that activities that generate noise levels exceeding 69 dBA be restricted within 165 feet (50 meters) of an owl site during the breeding season. As noted, the two closest known Mexican spotted owl sites (roosting) are approximately 3 and 4.5 miles to the east, and the project vicinity is not considered Mexican spotted owl roosting or nesting habitat (Rinkevich 2021, WMGFD 2022). Therefore, no individuals, nests, or roosting habitat would be subjected to increased temporary noise associated with construction. The project would not be associated with long-term industrial noise for the operation of Miner Flat Dam.

No Mexican spotted owls were documented during protocol surveys in 2020 and 2021, and therefore it is unlikely that noise and associated disturbances related to construction of the dam would result in direct adverse impacts to individuals. If individuals took up temporary residence prior to construction, it is expected they would flee and abandon their newly established territory. Individuals present within 500 feet of construction activity would be subjected to daytime noise exceeding recommendations in the recovery plan for breeding individuals (USFWS 2012). If adverse effects did occur, they would be more prominent at night when owls are active; however, no nighttime construction is planned.

Under Alternative A, the proposed action would also remove approximately 180 acres of predominantly ponderosa pine forest and woodland (151 acres) and riparian (21 acres), all of which would be converted to open water reservoir habitat or infrastructure related to the proposed facilities at the proposed dam and reservoir site. If individuals were present within the proposed reservoir, they would be forced to flee when the trees are removed or when the area is inundated. While habitat around the proposed Miner Flat Dam area is consistent with known preferences for the species, the area was determined not to be roosting or nesting habitat but identified as recovery foraging and dispersal habitat (USFWS 2012, Rinkevich 2021). As identified within the recovery plan, "the collective goal of guidelines for Forested Recovery Habitat is to provide spotted owl habitat that is well distributed over space and time. Accomplishing this goal requires maintaining or creating stand structures typical of nesting and roosting habitats, and sustaining them in sufficient amounts and distribution to support a healthy population of Mexican spotted owls" (USFWS 2012). Therefore, under the perception of the recovery plan, the removal of recovery foraging/non-breeding habitat at the proposed dam and reservoir area is the loss of future spotted owl habitat.

The proposed action would result in minor adverse effects to Mexican spotted owl because of the direct loss and inundation of recovery foraging and dispersal habitat. The project area falls outside of critical habitat, and therefore it would not adversely affect critical habitat.

Northern Mexican Gartersnake (*Thamnophis eques megalops*). Potential effects to this species' aquatic, riparian, and adjacent habitat would be consistent with those described under **Section 3.4.2** (*Environmental Consequences*). Because the presence of this species is unknown, the analysis of effects primarily focuses on changes to habitat; however, surveys are identified to increase our understanding of the status of the species in the study area:

- Northern Mexican gartersnake surveys at the proposed Miner Flat Dam site shall be completed annually until the start of construction, following Nowak (2012). In addition, in the summer immediately prior to ground-disturbing activities, the WMGFD shall conduct pre-construction species surveys in the vicinity of the proposed Miner Flat Dam for the northern Mexican gartersnake.

If northern Mexican gartersnakes are present at the time of construction, the use of heavy equipment and site preparation would likely injure and/or kill individuals. If construction occurs during the species' active period (spring and summer between about 70°F and 90°F [21°C and 32°C]), some individuals may be able to escape up or downstream. Similar to other species, biological monitoring at the onset of construction could also support avoidance and minimization efforts outside the disturbance footprint. In addition, planning disturbance of suitable riparian habitat during the active season for the species, in coordination with an on-site biological monitor, could allow individuals in the vicinity of the dam site to escape to upstream locations or be physically relocated elsewhere. Phased ground disturbance and clearing starting at the dam site and moving upstream would further maximize the ability of the species to move out of harm's way:

- If occurrences of the northern Mexican gartersnake are detected, the WMGFD shall develop a species-specific conservation plan for construction activities. The plan shall include minimization and avoidance measures including, but not limited to, the following:
    - Ensure ground disturbance within potentially suitable habitat occurs within the active period but outside of the nesting period (late summer), to the maximum extent feasible.
    - Phase vegetation removal and suitable habitat disturbance from the dam site to the north to maximize escape opportunities.
    - Map occupied or suitable habitat within the construction footprint and avoid temporary damage to the site, such as staging or clearing.

  - Ensure a qualified biological monitor with the authority to stop work and with expertise with the species is present during all ground-disturbing activities to identify and relocate any individuals detected.

Grading and construction for the proposed Miner Flat Dam, consistent with the discussion of construction effects under **Section 3.4.2** (*Environmental Consequences*), would further disturb soils within the project footprint, which would increase susceptibility to erosion, off-site transport, and siltation, potentially resulting in adverse water quality impacts downstream of the activity. Changes to water quality during construction, even temporarily, would affect distribution, and likely result in behavioral disruptions and physiological stress to aquatic species, including the northern Mexican gartersnake. However, construction-related changes to water quality would dissipate quickly and would be limited to the vicinity of the activity. In addition, measures identified in **Appendix A.2** (*Best Management Practices*), including the development of plans and implementation of erosion control measures, would further reduce the scale and magnitude of any effect.

Following construction, approximately 3.7 linear miles of NFWR habitat would be converted to reservoir habitats. Habitat in this reach of the NFWR is suitable, except for an abundance of crayfish and potentially other non-native predator fish. Conversion of lotic habitat to deepwater reservoir habitat would not preclude the survival of aquatic gartersnakes; however, the availability of reservoir habitat would favor non-native species currently in the NFWR over those native species adapted to the historical aquatic habitat on the Reservation. Brown trout and northern crayfish, which occur in this reach of the NFWR, are known to prosper in managed and unmanaged ecosystems (Budy and Gaeta 2018, Blue Earth 2014). In addition, no non-native sport fish would be introduced into the reservoir, but the reservoir would likely attract recreational anglers who may unintentionally or intentionally introduce new or additional predators into the system. Measures including revisions to the WMAT Game and Fish Code to restrict non-native fish stocking and enforce bait and accidental release regulations would be applied to minimize the potential for an increase in the existing non-native fish and northern crayfish populations in the reservoir.

- The WMAT shall revise and expand the existing WMAT Game and Fish Code restricting non-native fish stocking and enforcement of bait, accidental release, and other game and fish regulations designed to minimize the introduction of non-native fish to the Reservation. Signage and information shall be made available to members, identifying bait and release restrictions and enforcement actions.

As noted under **Section 3.4.1** (*Affected Environment*, *Aquatic Communities*), reservoirs and dams can also result in the permanent loss of connectivity for native aquatic species, such as gartersnakes. Impassible barriers fragment the river corridor, isolating populations, which can lead to a number of adverse habitat and individual population effects including a reduction in the species' resiliency when isolated and, for smaller populations, an increase in vulnerability threats and stochastic events. While the species has not been documented at this location, construction of the dam and reservoir would reduce the potential for the species to recolonize.

Downstream flows would also be affected by construction of the dam and reservoir (**Section 3.2.2**, *Water Resources and Hydrology, Environmental Consequences*), which can cause both geomorphic and ecological consequences. Reductions and changes in flows can directly affect habitat suitability and availability over time. Flows during late winter and spring are expected to be consistent during most but not all years, which would coincide with when the species, if present, comes out of torpor to begin its active and breeding season. The reservoir and dam would be operated to maintain base flows throughout the season and higher average minimum flows through the summer, which would extend the availability of aquatic habitat over existing conditions. Late summer and fall average flows would decrease from approximately 90 cfs to 74 cfs and would be reduced even further when the reservoir is below full pool level and summer monsoon storm flows are captured and retained. When summer monsoonal events are stored, there is a reduction in peak flow events and the associated velocity of those flows, which limits scouring of the river. The reduction or absence of those events is expected to lead to changes in the suitability, availability, and distribution of gartersnake habitat downstream from the proposed dam, including a degradation of streamside habitat and aquatic conditions that favor non-native species. It can also cause or exacerbate several other direct and indirect ecological changes including more favorable conditions for non-native fish species that may otherwise be limited by natural temperature and flow extremes.

Northern Mexican gartersnakes were found to be active in water temperatures ranging from 54 to 72 degrees Fahrenheit (79 *Federal Register* 38677). The modeled increase in peak summer temperatures are not outside of the known thresholds for this species but would alter the existing annual temperature cycle, particularly in the reach immediately downstream of the dam. The timing of spring warming temperatures would be consistent with historical records but fall decreases would be slowed. Modeling indicates that warmer temperatures would persist longer into winter, extending the period gartersnakes could be active. The effect of warmer outflow temperatures would attenuate downstream with distance.

Adverse effects on this species, if present, are considered minor because of possible lethal contact with construction equipment, permanent fragmentation of the river, direct habitat loss and inundation of the area, downstream degradation of habitat, establishment of non-native predatory fish species, and/or other disturbances from project implementation activities. The project area falls outside of critical habitat, and therefore the proposed action would not adversely affect critical habitat.

Narrow-Headed Gartersnake (*Thamnophis rufipunctatus*). Potential effects to this species' aquatic, riparian, and adjacent habitat would be consistent with those described under **Section 3.4.1** (*Affected Environment*, *Aquatic Communities*) and for the northern Mexican gartersnake. Due to a lack of documentation and historic survey effort, it is unknown if the species is present. Therefore, the analysis of effects will primarily focus on changes to habitat, disturbance along the proposed pipeline route, and the proposed dam and reservoir site; however, pre-construction surveys are identified to increase our understanding of the status of the species in the study area. If detected, measures would be implemented to further reduce the magnitude of potential effects, including phased habitat disturbance maximizing escape opportunities and presence of a qualified biological monitor conducting clearance, removal, and relocation activities prior to work within the active channel.

- Narrow-headed gartersnake surveys at the proposed Miner Flat Dam site shall be completed annually until the start of construction, following Nowak (2012). In addition, in the summer immediately prior to ground-disturbing activities, the WMGFD shall conduct pre-construction species surveys in the vicinity of the proposed Miner Flat Dam for the narrow-headed gartersnake.

- If occurrences of narrow-headed gartersnakes are detected, the WMGFD shall develop a species-specific conservation plan for construction activities. The plan shall include minimization and avoidance measures including, but not limited to, the following:
  - Ensure ground disturbance within potentially suitable habitat occurs within the active period but outside of the nesting period (late summer), to the maximum extent feasible.
  - Phase vegetation removal and suitable habitat disturbance from the dam site to the north to maximize escape opportunities.
  - Map occupied or suitable habitat within the construction footprint and avoid temporary damage to the site, such as staging or clearing.
  - Ensure a qualified biological monitor with the authority to stop work and with expertise with the species is present during all ground-disturbing activities to identify and relocate any individuals detected.
- The WMAT shall revise and expand the existing WMAT Game and Fish Code restricting non-native fish stocking and enforcement of bait, accidental release, and other game and fish regulations designed to minimize the introduction of non-native fish to the Reservation. Signage and information shall be made available to members, identifying bait and release restrictions and enforcement actions.

Adverse effects on this species are considered moderate because of possible lethal contact with construction equipment, permanent fragmentation of the river, direct habitat loss and inundation of the area, downstream degradation of habitat, establishment of non-native predatory fish species, and/or other disturbances from project implementation activities. The project area falls outside of critical habitat, and therefore the proposed action would not adversely affect critical habitat.

Chiricahua Leopard Frog (*Lithobates chiricahuensis*). Due to a lack of documentation and historic survey effort, it is unknown if the species is present. Therefore, the analysis of effects will primarily focus on changes to habitat, disturbance along the proposed pipeline route, and the proposed dam and reservoir site; however, pre-construction surveys are identified to increase our understanding of the status of the species in the study area. If Chiricahua leopard frogs are present at the time of construction, the use of heavy equipment and site preparation would likely injure and/or kill individuals. Similar to other species, biological monitoring at the onset of construction could also support avoidance and minimization efforts outside the disturbance footprint. In addition, disturbance of suitable riparian habitat during the active season for the species, in coordination with an on-site biological monitor, could allow individuals in the vicinity of the dam site to escape to upstream and downstream locations. Phased ground disturbance and clearing starting at the dam site and moving upstream would further maximize the ability of the species to move out of harm's way:

- The WMGFD, in coordination with the USFWS, shall resurvey sites from the upper end of the inundation area to approximately 1 mile downstream from the proposed Miner Flat Dam site to determine presence/absence of the Chiricahua leopard frog. Surveys shall occur prior to any ground-disturbing activities and in accordance with the general visual encounter method (USFWS 2007b). If surveys conclude the species is not present, no additional pre-construction surveys are required.

- If occurrences of Chiricahua leopard frogs are detected, the WMGFD shall develop a species-specific conservation plan for construction activities. The plan shall include minimization and avoidance measures including, but not limited to, the following:
  - Ensure ground disturbance within potentially suitable habitat occurs within the active period but outside of the breeding and egg laying period (season and temperature dependent), to the maximum extent feasible.
  - Phase vegetation removal and suitable habitat disturbance from the dam site to the north to maximize escape opportunities.
  - Map occupied or suitable habitat within the construction footprint and avoid temporary damage to the site, such as staging or clearing.
  - Ensure a qualified biological monitor with the authority to stop work and with expertise with the species is present during all ground-disturbing activities.
- The WMAT shall revise and expand the existing WMAT Game and Fish Code restricting non-native fish stocking and enforcement of bait, accidental release, and other game and fish regulations designed to minimize the introduction of non-native fish to the Reservation. Signage and information shall be made available to members, identifying bait and release restrictions and enforcement actions.

Grading and construction for the proposed Miner Flat Dam would further disturb soils within the project footprint, which would increase susceptibility to erosion, off-site transport, and siltation, potentially resulting in adverse water quality impacts downstream of the activity. Erosion and the resulting sedimentation can disrupt and impair natural and physiological processes such as the filling of adjacent pools, respiration, foraging, and the suitability of habitat. Incorporation of BMPs and conservation measures as proposed in **Appendix A.2** (*Best Management Practices*) would attempt to reduce the potential likelihood of adverse effects (and the magnitude of any residual effect).

Under all alternatives, creation of a new deepwater reservoir would provide and expand suitable habitat for leopard frogs, but it would also favor non-native species currently in the NFWR over those native species adapted to the historical aquatic habitat found on the Reservation. Chiricahua leopard frogs are known to use reservoirs, but the presence of non-native predators such as northern crayfish and fish species would limit the establishment of a population. Measures noted previously would limit intentional stocking of game fish in the reservoir and enact restrictions on incidental establishment of bait species, but the removal of crayfish from the NFWR is unlikely. Construction of the dam would also act as a barrier and would isolate populations and prevent travel between sites similar to those discussed for gartersnakes.

Under Alternative A, outflows from the Miner Flat Dam during late winter and spring are expected to be consistent during most but not all years. Base flows would be maintained all year, and minimum summer flows would increase over existing conditions. However, some late summer peak flows, including important monsoonal storms, would be muted, which would reduce the frequency of events causing potentially ecologically important disturbance. Persistence of minimum flows would benefit this predominantly aquatic species, but the reduction in peak flows from storm events would reduce the availability and suitability of adjacent and isolated wetland habitat. During the late summer and fall, flows would be reduced when the reservoir is storing, with some inflows captured and only minimum flows released to meet downstream minimum flow priorities, including operations at the Alchesay National Fish Hatchery and anticipated downstream diversions. However, overall, there would be a reduction in average annual flows as a result of system operations.

Changes in water quality in the river downstream from the dam would also occur. The temperature of the modeled reservoir outflows would be warmer than the corresponding inflows during some portion of the year, particularly late summer to early winter. Overall, modeling also indicates a modification to the existing annual temperature cycle, including the persistence of warmer temperatures longer into the winter and a more gradual increase toward summer peaks. The general timing of spring temperatures would be consistent with existing conditions. With respect to the Chiricahua leopard frog, Zweifel (1968) found the minimum-maximum water temperatures for Chiricahua leopard frog embryos to be 53.6 to 88.7°F. Embryo development and tadpole growth are also affected by water temperature with accelerated cycles in warmer water (USFWS 2007a). Under existing conditions, suitable conditions within this range occur from approximately May through September/October. Under modeled conditions, this period would expand and occur from May through November. The water temperature of dam releases in the spring would be comparable to that of the inflows. Seasonal warming would be slowed by the reservoir, and peak temperatures would occur later in the season, which may shift active periods for this species. Reduced average flows could also increase water temperatures, reduce stream velocities, change the frequency of habitat maintenance flow events, and benefit native and non-native predators, such as brown trout and northern crayfish.

Adverse effects on this species, if present, are considered minor because of possible lethal contact with construction equipment, permanent fragmentation of the river, direct habitat loss and inundation of the area, downstream degradation of habitat, establishment of non-native predatory fish species, and/or other disturbances from project implementation activities. The project area falls outside of critical habitat, and therefore the proposed action would not adversely affect critical habitat.

Arizona Toad (*Anaxyrus microscaphus*). The potential for adverse effects on this species of concern under Alternative A would be discountable. The Reservation is in the historic range of the species, but the Arizona toad has never been documented anywhere on the Reservation. No incidental occurrences of the Arizona toad occurred along the main channel of the NFWR during surveys conducted in 2013 (Blue Earth 2014, Blue Earth 2015), nor in additional 2021 general herpetological surveys conducted in the vicinity of the proposed reservoir (WMGFD 2022). However, these surveys did not specifically target the species. In the event that this species is encountered in the NFWR at or downstream of the Miner Flat Dam and reservoir site or other project activities, the potential for and magnitude of potential effects would be comparable to those previously described for other species, including removal of aquatic and upland habitat. However, as previously discussed, this species is considered absent. Similar to the jaguar, should this species be detected within the study area, the WMAT would consult with the USFWS to determine the appropriate management action for this species.

Apache Trout (*Oncorhynchus apache*). Potential adverse effects to this federally listed threatened species under Alternative A would be primarily associated with construction and removal of stream habitat within the footprint of the reservoir. Any effects on Apache trout habitat in the vicinity of the Miner Flat Dam would also be consistent with those described under **Section 3.4.1** (*Affected Environment, Aquatic Communities and Native Fishes*). Construction of the dam would result in the permanent loss of connectivity for fish populations present in the NFWR. Stocked Apache trout downstream would be limited to the approximately 9 river miles between Diamond Creek and the dam site. Apache trout have maximum movements of 1.3 miles (2.1 kilometers) upstream and 1.5 miles (2.4 kilometers) downstream, with the average distances substantially less (Kitcheyan 1999). Assuming existing fishing trends continue, angler pressure would fish the population out seasonally in this area, and annual stocking would continue opportunistically in the NFWR.

Following construction of the dam, the permanent conversion of the free-flowing system to a reservoir would still support stocked Apache trout, but as noted, brown trout and northern crayfish prosper in managed ecosystems (Budy and Gaeta 2018). In addition, non-native rainbow trout, channel catfish, green sunfish, smallmouth bass, and fathead minnow have all been documented in the NFWR and could persist within the reservoir. If Apache trout are stocked in the reservoir in the future, they would likely persist; however, competition with and predation from non-native species over time would limit their success. In addition, while only Apache trout would be introduced into the reservoir, it would likely attract recreational anglers who may unintentionally introduce new or additional predators into the system.

Measures including revisions to the WMAT Game and Fish Code to restrict non-native fish stocking and enforce bait and accidental release regulations would be applied to minimize the potential for an increase in the existing non-native fish and northern crayfish populations in the reservoir, and the success of future stocking upstream of the reservoir, if it occurs, would be impacted by any non-native species in the reservoir.

- The WMAT shall revise and expand the existing WMAT Game and Fish Code restricting non-native fish stocking and enforcement of bait, accidental release, and other game and fish regulations designed to minimize the introduction of non-native fish to the Reservation. Signage and information shall be made available to members, identifying bait and release restrictions and enforcement actions.

The reach of the NFWR between the dam site and Diamond Creek, where Apache trout have been stocked historically, would only be subjected to flow diversions at the Alchesay National Fish Hatchery. The hatchery diverts flows about a mile upstream of the facility then returns essentially all flows to the NFWR at the site, which affects approximately 1 mile of stream segment and is consistent with current practices. Low and average flows in this reach would be consistent with or slightly higher compared to existing conditions, but changes to high flows and peaks in this reach would be seasonally variable. This species is not known to spawn in the NFWR; thus, minor changes to spring high and peak flows would have negligible effects on spawning.

Changes in modeled outflow temperatures would also occur resulting in warmer water temperatures than the corresponding inflows during some portion of the year (particularly late summer to early winter). Peak seasonal temperatures of outflows would be approximately 65°F (18°C) at the dam, modeled to occur in August to September. Apache trout prefer cool, clear, high-elevation streams and rivers and generally require water temperatures below 77°F (25°C), along with sufficient streamflow and shading to prevent lethal temperatures (AZGFD 2021b). The modeled temperature of water stored in the reservoir and released downstream would not exceed the known range (see **Figure 3.2-9** in **Section 3.2**, *Water Resources and Hydrology*). No changes to spring temperatures are predicted. However, warming temperatures in the winter would favor species with broader or higher temperature preferences, particularly non-native species, which could alter species interactions and community composition.

Construction impacts in the immediate vicinity of the dam site would be consistent with those previously described. With cessation of stocking in April 2022, the potential for any individuals to be present would be extremely low. Regardless, standard control measures described in **Appendix A.2** (*Best Management Practices*) would be implemented to avoid or minimize erosion and sedimentation, which would benefit all species present. While its presence cannot be completely ruled out, with cessation of stocking prior to construction, any individuals present would be overwintering adults that have evaded angler pressure. Following construction, any individuals stocked along the NFWR would be part of the sport population.

As a result, adverse effects on this species are considered minor because of possible lethal contact with construction equipment, upstream and downstream changes in hydrology and habitat that favor the establishment and proliferation of non-native species, permanent fragmentation of the river, and/or other disturbances from project implementation activities.

Loach Minnow (*Tiaroga cobitis*). Due to the lack of recent detections, it is unknown if the species is present in the project area; however, a known population of loach minnow persists upstream in the EFWR, and suitable habitat for the species is present within the project area. Therefore, the analysis of effects will primarily focus on changes to habitat and the proposed dam and reservoir site.

Under Alternative A, downstream flows would be affected by construction of the dam and reservoir (**Section 3.2.2**, *Water Resources and Hydrology, Environmental Consequences*), which can cause both geomorphic and ecological consequences. Reductions and changes in flows can directly affect habitat suitability and availability over time. When changes to the flow and flood regime occur, riffles are among the first habitats to be diminished or lost (Propst and Bestgen 1991). However, modeling indicates that flows for an average year, but not all years, would be consistent with existing conditions from January through July. This suggests that effects to key spring life functions for this species, such as spawning cues, would be minimal. However, a modeled flow reduction would occur in late summer through winter with the maximum average reduction in flow occurring in August (64 cfs under existing conditions and 44 cfs under modeled conditions).

As described under **Section 3.4.1** (*Affected Environment, Aquatic Communities and Native Fishes)*, an overall reduction in average flow can cause or exacerbate a number of direct and indirect ecological changes including a reduction and change in aquatic habitat, streamside riparian habitat, slower velocities, and potentially warmer temperatures that can disrupt native aquatic species' life cycles and affect their abundance, distribution, and composition (Poff et al. 1997, Bunn and Arthington 2002). In terms of riffle habitat, Bradford and Heinohen (2008) found that low summer and winter flows affected physical attributes, such as depth and velocity, of riffles and shallow habitats more rapidly than other macrohabitat types. As a result, riffle specialists are often more at risk to changes in low flows than generalist species or those that use slower, deeper habitats (Bradford and Heinohen 2008, Jowett and Biggs 2006, Propst and Bestgen 1991). Low flows in summer are modeled to increase rather than decrease at this location except during drought years; however, an overall reduction in low to average flows is predicted during late summer through winter. Overall, summer flows would be attenuated through storage between 42 and 65 percent of the time. Therefore, existing suitable riffle habitat for the species may be diminished or lost during this period due to reductions in water depth, velocity, and wetted channel width.

Extreme conditions would also be affected by dam and reservoir operations. Modeling indicates spring peak flows would generally remain unaffected during most years, and a fraction of late summer peak flows, including significant monsoonal storms, would be muted, which would reduce the frequency and magnitude of events with the potential for ecologically important disturbance. Floods are important for a variety of ecological reasons, including differentially reducing non-native fish populations and associated competition and predation (Minckley and Meffe 1987). Propst and Bestgen (1991) noted that where natural flooding has been eliminated by stream regulation, riffles are reduced, and habitat quality is diminished. Changes to the natural flow regime can also alter the processing of fine sediments within a stream system, and long-term deposition of fine sediments within riffle habitat can negatively affect native fish populations, particularly species that rely on the interstitial spaces within this habitat type for spawning and egg deposition (Stefferud et al. 2011, Propst and Bestgen 1991).

Changes in modeled outflow temperatures would also occur resulting in warmer water temperatures than the corresponding inflows during a portion of the year (particularly late summer to early winter). Peak seasonal temperatures of outflows would be approximately 65°F (18°C) at the dam, modeled to occur in August to September. Minimal changes to spring temperatures are predicted. Overall, changes to water temperatures are not expected to exceed reported temperature preferences for loach minnow (Propst and Bestgen 1991, Widmer et al. 2006). However, warmer winter temperatures (in conjunction with fewer zero flow days and increased flows in summer) would most likely result in more favorable conditions for non-native species that may otherwise be limited by natural temperature and flow extremes. As a result, this action could indirectly increase competition with and predation of loach minnow by non-native species.

Anticipated changes to habitat at the dam site are discussed under **Section 3.4.1** (*Affected Environment, Aquatic Communities and Native Fishes*). Any individual aquatic organisms present at or downstream of construction would be subjected to general physiological stress resulting from temporary changes to water quality. Due to the limited suitable microhabitats (Blue Earth 2014), lack of recent occurrences for the species (WMGFD 2014, Blue Earth 2014), occurrences of predators and competitor species, and temporary and localized nature of the changes to water quality, the loach minnow is not expected to be present and, therefore, would likely not be subjected to these adverse effects. Similarly, conversion of 3.7 miles of the NFWR and conversion to reservoir habitat would not affect this species. While some suitable microhabitat may be present, these reaches have not been known to support loach minnow, and the loss of unoccupied habitat at this scale would not affect the current distribution of the species. However, construction of the dam would also result in the permanent loss of connectivity and would prevent this species from establishing in the future if habitat conditions change. Given the distance of known occupied habitat is more than 20 river miles downstream, the magnitude of potential adverse effects to loach minnow is negligible.

In conclusion, although 2003–2014 surveys failed to capture loach minnow within the study area, the species is known to be difficult to detect, especially in low densities (Marsh et al. 2003). Habitat surveys conducted by Blue Earth (2014) during that time also determined that suitable habitat along the NFWR and White River was uncommon; however, the assessment was limited to four sites (ranging in length from roughly 750 to 1,000 feet) within the approximately 75 miles of the NFWR and EFWR within the study area. As a result, the presence of loach minnow and extent of suitable habitat in the project area cannot be ruled out entirely. The lack of known occurrences in the NFWR may suggest that other factors may be limiting expansion into this area.

Adverse effects on this species, if present, are considered moderate because of the possible lethal contact with construction equipment, downstream changes in hydrology that favor the establishment and proliferation of non-native species, permanent fragmentation of the river, and/or other disturbances from project implementation activities. The project area falls outside of critical habitat, and therefore it would not adversely affect critical habitat.

Razorback Sucker (*Xyrauchen texanus*). No adverse or beneficial impacts would occur from implementation of Alternative A because razorback suckers (a federally listed endangered species) are no longer considered present on the Reservation.

Monarch Butterfly (*Danaus plexippus*). Several elements of the proposed action would have the potential to adversely affect host plants (*Asclepias* spp.), including construction of the 50-mile pipeline between White River and Cibecue, construction of the Miner Flat Dam, and the associated changes to downstream flows. Construction activities would damage or destroy any *Asclepias* spp. that occur in the footprint of the activity. For the 50-mile pipeline, the route mostly follows and is adjacent to existing roads and avoids riparian areas through the use of horizontal directional drilling. Effects on *Asclepias* spp., if present, would be consistent with those described under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*). Except for new permanent aboveground infrastructure associated with the new storage tanks, pump stations, and access roads, totaling less than 5 acres, all temporarily disturbed areas would be stabilized and revegetated, likely through native seeding, at the end of the construction project to match pre-construction conditions (see **Appendix A.2**, *Best Management Practices*). Construction of the dam and development of the 170-acre reservoir would result in the removal and loss of all *Asclepias* spp. present. Given the vast available upland habitat suitable for *Asclepias* spp. in the region, the temporary disturbance associated with the pipeline and the permanent removal within the inundation area would not represent a significant reduction in resources available for monarchs.

As described in **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*), potential indirect effects on downstream vegetation, which may include *Asclepias* spp., are difficult to assess due to the time horizon associated with proposed changes. Regardless, reducing flows in the NFWR downstream of the reservoir would likely contribute to a variety of longer-term trends, including changes to the species composition of riparian communities. Changes to flow characteristics, including elimination of peak flood flows, can also subsequently reduce biodiversity (Magilligan and Nislow 2005). As previously discussed in **Section 3.4.2** (*Environmental Consequences*), drier conditions favor species that are normally limited by saturated or near-saturated conditions, erosion, and frequent flows; thus, typical upland species and non-native invasive species such as Russian olive and *Tamarisk* spp. may become more common in riparian corridors. Riparian communities supporting *Asclepias* spp. also depend on flood events, primarily those that overbank the regular channel and flood riparian areas and floodplains, to support seed dispersal, germination, and successful establishment of new successional phases. Flooding also reduces the competition from non-natives. This in turn can result in encroachment of vegetation into formally active channels, greater accretion of sediments, and development of non-native species that were previously excluded due to low tolerance for variability in flow conditions (Kondolf and Batalla 2005).

While none of these activities would directly remove *Asclepias* spp., some degradation of supporting riparian habitat can be presumed.

Due to the abundance of undeveloped upland habitat in the region capable of supporting *Asclepias* spp., the direct removal, followed by restoration for all but a small fraction, of upland and riparian areas along the 50-mile pipeline route and at the Miner Flat Dam site would be minor. With respect to indirect adverse effects from changes to the broad habitat suitability for the host plant species, the project would result in a minor to moderate reduction in resources available for monarchs. In summary, adverse effects on this species resulting from the direct and indirect effects of the proposed action are considered minor.

Connected Actions – Canyon Day Farming. As discussed in **Section 2.6** (*Connected Actions*), Alternative A (and Alternative B) would accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to reinitiate farming activities in the 885 acres that were previously cultivated as part of the Canyon Day Irrigation Project in the 1980s. The planning process regarding future Canyon Day farming is ongoing, and specific areas of disturbance, infrastructure, and other key details are unknown. Water for irrigation would be diverted from the White River below the confluence of the NFWR and EFWR. New and/or modified infrastructure would be needed to divert, pump, and distribute water for irrigation, but specific details are not known at this time. Impacts discussed in this section are generalized based on typical agricultural activities.

As discussed in **Section 3.4.1** (*Affected Environment*), surveys have not been conducted in the Canyon Day agriculture area, and no plans have been developed on when active farming in the area would be reinitiated. However, a desktop review of aerial photography and analysis of ReGAP (USGS 2005) indicates the area has been previously disturbed and cultivated. This includes indications of current and past (1980s) farming practices within and adjacent to the 885-acre previously cultivated area. Vegetation in the area is primarily grassland and likely ruderal vegetation communities that have been subjected to past disturbance. Some quantity of emergent wetland features may also be present associated with mapped (National Wetland Inventory) ephemeral drainages. Under Alternative A, restarting agricultural practices would result in the permanent conversion of existing or previously farmed lands to actively managed agricultural areas, which would remove existing vegetation through mechanical cultivation, resulting in adverse, but minor, effects to vegetation communities and associated wildlife. There are likely, but unverified, sections of grassland and woodland communities intermixed within the previously cultivated area. Existing habitat likely supports common wildlife typical of previously disturbed areas and grasslands, including rabbits, pronghorn, foxes, bobcats, coyote, and deer. Prey species such as rabbits, lizards, squirrels, gophers, and mice would be visible in sparsely vegetated areas and would attract large raptors such as red-tailed hawks. Grassland and previously disturbed areas are not considered sensitive communities and are abundant on the Reservation; however, conversion to cultivated farmland would reduce diversity and abundance and once again subject the area to routine disturbance, which would reduce the value as wildlife habitat.

Re-establishment of actively cultivated areas could also destroy and fill drainages/erosional features, permanently removing/filling any minimal aquatic habitats and damaging associated wetlands or riparian habitats. These features have not been assessed. Agricultural operations can also have adverse effects on nearby aquatic habitats or wetlands due to the soil-disturbing nature of those activities and associated impacts from runoff of sediment or other agricultural contaminants. Runoff without management can move these contaminants into intermittent drainage features and eventually into the NFWR if uncontrolled; however, the magnitude of adverse effects could vary widely, depending on the type of operation, environmental conditions, and farm management practices. Any construction work occurring in drainages or associated wetlands would be conducted in compliance with the Section 401 Water Quality Certification. Implementation of measures specified in the Section 401 Water Quality Certification would be expected to limit construction-related impacts to sensitive resources and water quality. In addition, the construction contractor would be required to comply with applicable Tribal, Federal, and State laws, orders, and regulations that are intended to reduce adverse effects to the environment through avoidance or minimization.

With respect to federally listed species, surveys have not been completed for the areas proposed for cultivation. However, for monarchs, *Asclepias* spp. have broad habitat associations and are found in open woodlands and grasslands, forests, and edges of streams and cienegas, but they can also be found in disturbed areas like roadsides and pastures. Thus, milkweed host plants could be present in the footprint of previously cultivated areas or within the expansion area. If the WMAT chooses to reinitiate agricultural activities in this area, effects on *Asclepias* spp., if present, would be consistent with those described under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*). Any incidental removal of *Asclepias* spp. would be limited to areas subjected to direct disturbance. Given the vast available upland habitat suitable for *Asclepias* spp. in the region, any incidental removal of milkweed associated with potential agricultural activities would not represent a significant reduction in resources available for monarchs.

No suitable aquatic habitat is present for northern Mexican or narrow-headed gartersnakes, Chiricahua leopard frogs, roundtail chub, Apache trout, or loach minnow. The proposed site is more than 0.5 miles from the White River.

No suitable habitat for the New Mexico meadow jumping mouse is likely present. The site is more than 0.5 miles from the White River, well beyond the known adjacent floodplain and upland reach for the species. Blue-line and National Wetland Inventory features skirting the edges of the site do not appear to support persistent aquatic habitat or structure for the species. No suitable habitat for the Mexican gray wolf or Mexican spotted owl is present at this location. The site is predominantly agriculture, fallow, or grassland intermixed with previously cultivated areas. Forested and rocky canyon habitats are not present. Both the southwestern willow flycatcher and yellow-billed cuckoo are known or assumed present along the White River, approximately 0.5 miles south. At this distance, temporary installation of agriculture infrastructure and future operations are unlikely to affect the quality or function of riparian habitat associated with the White River, and riparian habitat is not known to be present within the areas proposed for cultivation.

Implementation of measures specified in the Section 401 Water Quality Certification would be expected to limit impacts to sensitive resources and water quality. In addition, the construction contractor would be required to comply with applicable Tribal, Federal, and State laws, orders, and regulations that are intended to reduce adverse effects to the environment through avoidance or minimization. In addition to standard agricultural management practices and BMPs related to ground disturbance and erosion control, conservation practices for agriculture could be implemented to further minimize potential adverse effects to nearby drainages and to maximize the benefit of cultivated lands to native wildlife. Strategic planting could reduce erosion near drainages by stabilizing surface soils, wildlife could be integrated into pest management such as the installation of raptor perches, and disturbance frequency could be managed to keep land undisturbed for long periods between plantings.

Under Alternative A, if the WMAT chooses to reinitiate 885 acres of farming in Canyon Day, the Tribal Council would approve the planning and construction. The WMAT would follow the *Tribal Plan and Project Review* process to ensure that all projects on the Reservation were consistent with Tribal and Federal laws, policies, and regulations. While it is not possible to determine with certainty the potential magnitude and extent of impacts on wildlife habitat, potential adverse effects on biological resources would be reduced or minimized by using historically disturbed agricultural lands, and with adherence to applicable Tribal, Federal, and State laws, orders, and regulations; standard management practices; and any additional measures or conservation practices imposed through the project planning process.

Residual Impacts. Implementation of Alternative A would result in permanent direct and indirect adverse impacts to vegetation communities, wildlife, native fishes and aquatic habitats, wetlands, and TSS and federally listed species. When considered as a whole, direct and indirect adverse impacts to vegetation communities and associated wildlife resulting from grading and construction for the proposed Miner Flat Dam and reservoir, the expanded intake structure, installation of the 50-mile pipeline, and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable. The project would convert/remove approximately 180 acres of vegetated areas by grading and construction for the proposed Miner Flat Dam. New infrastructure would permanently fragment habitat along the NFWR for both common and federally listed fish and wildlife, which cannot be mitigated. The magnitude of effects from other activities such as noise and construction, temporary and permanent disturbance along the pipeline route, and reduction in water quality in the vicinity of construction would be reduced with implementation of restoration and standard water quality BMPs. With additional measures to avoid riparian habitats, adverse impacts would be reduced to minor residual effects.

The scale of indirect adverse effects to plant communities are difficult to assess due to the time horizon associated with proposed changes and the dynamic nature of Southwest ecosystems. Following construction of the dam, no immediate change in diversion amounts would occur. However, over time, diversions would increase commensurate with population growth with the design population demand reached in 40 years or more. Under Alternative A, the dam would also result in decreases in average and annual volumes within the channel of the NFWR. Drier conditions favor species that are normally limited by saturated or near-saturated conditions, erosion, and frequent flows. Compared to the other alternatives listed, changes in flow regime would be modest under Alternative A. However, as diversions increase over time, and thus average flows decrease, upland species could become more common in riparian corridors resulting in an unquantifiable degradation of downstream vegetation communities. Conversion of riparian communities would further be exacerbated by other global climate changes and would become more susceptible to stochastic events, such as wildfires and droughts.

Permanent removal and modification of aquatic free-flowing stream habitat and conversion to a reservoir would represent an unavoidable adverse impact to aquatic and riparian communities and the species they support that cannot be reduced with mitigation. Removal and loss of potentially jurisdictional features associated with the conversion to a reservoir would also occur. During the final design and engineering phase, jurisdictional wetlands and other non-wetland waters of the U.S. would be avoided to the maximum extent feasible, and any unavoidable loss or conversion of wetlands would be mitigated or compensated for through the CWA Section 404 permitting process. Compensatory mitigation requirements would likely be satisfied through the purchase of credits from an approved in-lieu fee program.

As a result, while some adverse effects could be reduced with implementation of standard BMPs and prescribed mitigation and minimization measures, adverse residual impacts associated with biological resources would remain after mitigation and over time increase in severity corresponding to increases in demand population diversions.

Alternative B

The construction methods for project components would be identical under all action alternatives. As a result, the evaluation of construction-specific effects, application of standard control measures described under *Water Resources and Hydrology* in **Appendix A.2** (*Best Management Practices*), and construction-related mitigation measures would be as described under Alternative A. The rest of this section focuses on operational effects resulting from implementation of Alternative B.

Similar to Alternative A, Alternative B is intended to meet the design population domestic water demand and provide water to irrigate 885 acres of land in Canyon Day. Although Alternative B would not prioritize instream minimum flow requirements, modeling demonstrates that water releases to meet downstream demand under this alternative would provide a similar increase in minimum instream flows. As summarized in **Section 3.2** (*Water Resources and Hydrology*), the proposed Miner Flat Dam and reservoir would be expected to result in the following changes to the downstream flow regime under Alternative B: (1) higher minimum flows and reduced zero flow days during summer; (2) reduced peak flows during summer when flows coincide with periods when the reservoir is below full pool level and filling; and (3) slightly reduced annual average flows and flow volumes. The capture and reduction in downstream peak flow events associated with summer storms coincide with periods when the reservoir is filling. Out of 1,154 95th percentile flows (considered peak flood events for the purposes of this analysis) during the 63-year model period, none are modeled to be attenuated through storage, compared to three events attenuated under Alternative A. However, approximately 12 percent of higher-than-average flows in summer would be subjected to attenuation (198 out of 1,614 events that equal or exceed the 60th percentile flow rate), which is comparable to but less than Alternative A.

Under Alternative B, the reservoir would be full approximately 78 percent of the time, compared to approximately 68 percent of the time under Alternative A. Modeling indicates the reservoir is most frequently full in the late winter and spring (full 96 percent of the time) and least frequently full in summer (full 22 percent of the time). Similar to conditions under Alternative A, the water quality characteristics of impounded waters, such as temperature and dissolved oxygen concentrations, may vary from those of the inflow waters due to the effects of natural physical and biological processes within the reservoir. Depending on the extent and persistence of reservoir drawdown events, these changes would be comparatively less than those associated with Alternative A because fluctuations in reservoir levels under Alternative B would be smaller in magnitude and duration. Similar to Alternative A, the temperature of the reservoir outflows would be more than 2°C (3.6°F) higher than the corresponding inflows during some portion of the year (late summer to early winter) under Alternative B.

Overall, these operational effects are similar to those under Alternative A and, thus, provide similar benefits and adverse impacts to habitats and species, as discussed below. The same mitigation measures proposed to minimize biological resources impacts defined under Alternative A would also apply to Alternative B (see **Appendix A.3**, *Mitigation Measures*).

Vegetation Communities and Associated Wildlife. The construction methods for project components would be identical under all alternatives; as a result, the evaluation of construction-specific effects, such as due to disturbance to and the direct loss of vegetation and wildlife habitat, and fragmentation of habitat and populations for common, TSS, and federally listed species, are identical to those described under Alternative A. Similarly, as noted, operations modeling indicates that key components of the hydrologic environment would be comparable to Alternative A. Therefore, the evaluation of operations-specific effects would be comparable to, or reduced from, Alternative A due to a modeled reduction in overall frequency of attenuated flows. For example, summer monsoonal flows would frequently be stored which, when combined with potentially lower average flows, would over time favor the establishment of non-natives and channel encroachment. As a result, when considered as a whole, direct and indirect adverse impacts to vegetation communities and associated wildlife resulting from grading and construction for the proposed Miner Flat Dam and reservoir, the expanded intake structure, installation of the 50-mile pipeline, and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable.

Aquatic Communities and Native Fishes. Direct and indirect adverse impacts to aquatic communities and fish resulting from grading and construction for the proposed Miner Flat Dam and reservoir and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable, although the magnitude and scale of specific adverse and beneficial effects are highly variable as described under Alternative A. While the magnitude and scale of effects could be reduced through implementation of standard control measures described in **Appendix A.2** (*Best Management Practices*), as well as measures previously described, adverse residual impacts to aquatic communities and native fishes would remain after mitigation.

Wetlands and Other Jurisdictional Waters of the United States. Construction of the project components would result in the loss of approximately 2.4 acres of wetlands and the conversion of 3.7 miles of the NFWR to open water. Adverse effects under Alternative B would be moderate and unavoidable, but implementation of mitigation measures, standard BMPs, and compensatory mitigation would reduce the scale and magnitude of adverse effects. Unavoidable loss or conversion of wetlands shall be mitigated or compensated for through the CWA Section 404 permitting process, and could include a banking or in-lieu fee program. A 404(b)(1) analysis would also be completed to further define impacts to the aquatic environment under jurisdiction of the USACE. Compensatory mitigation requirements would likely be satisfied through the purchase of credits from an approved in-lieu fee program, which would compensate for, but not fully resolve, all adverse effects.

Federally Listed Species. Potentially suitable and suitable habitat for several TSS and federally listed aquatic species would be converted from lotic to lentic habitat, benefiting habitat generalists and non-native predators and competitors. Operations-specific effects would be comparable to, or reduced from, Alternative A due to a modeled reduction in overall frequency of attenuated flows. While minimum instream flows are not prioritized under Alternative B, modeling indicates the reservoir would be full more frequently and minimum instream flows and other flow characteristics would be comparable or improved from Alternative A; thus, habitat changes would be consistent with those discussed for Alternative A. Under this alternative, native, TSS, and federally listed species, if present, would continue to be managed and monitored under WMAT management plans, and ongoing consultation with the USFWS would continue. Therefore, the evaluation of effects and associated determinations described for each species under Alternative A would be the same for Alternative B.

Because implementation of the proposed action would likely result in take of a federally listed species through a Federal action, a Federal interagency consultation, under Section 7 of the ESA, is required, regardless of alternative selected. Consultation efforts with the USFWS are ongoing including the preparation of a BA. The BA considers impacts to federally listed species to determine if this action is likely to cause take (harass, impact, affect, etc.) or jeopardize the continued existence of federally listed species.

The magnitude and scale of effects on federally listed species could be reduced through implementation of standard control measures described in **Appendix A.2** (*Best Management Practices*). Other measures used to minimize impacts to biological resources discussed under Alternative A would also apply to Alternative B (see **Appendix A.3**, *Mitigation Measures*). Regardless, adverse residual impacts to potentially suitable habitat would remain after mitigation.

Connected Actions – Canyon Day Farming. Because the proposed Canyon Day farming activities would be identical to Alternative A, the range of potential adverse effects would be the same under both alternatives.

Residual Impacts. Similar to Alternative A, implementation of Alternative B would result in permanent direct and indirect adverse impacts to vegetation communities, wildlife, native fishes and aquatic habitats, wetlands, and TSS and federally listed species. While some adverse effects could be reduced with implementation of standard BMPs and prescribed mitigation and minimization measures, adverse residual impacts associated with biological resources would remain after mitigation.

Alternative C

The construction methods for project components would be identical under all action alternatives; as a result, the evaluation of construction-specific effects, application of standard control measures described in **Appendix A.2** (*Best Management Practices*), and construction-related mitigation measures would be as described under Alternative A. The rest of this section focuses on operational effects resulting from implementation of Alternative C.

Similar to Alternative A, Alternative C is intended to meet the design population domestic water demand. However, Alternative C (and D) would further accommodate downstream irrigation diversions in the Canyon Day area in sufficient quantities for the WMAT to expand farming activities to irrigate up to 3,000 acres. As summarized in **Section 3.2** (*Water Resources and Hydrology*), under Alternative C, operation of the proposed rural water system would meet most of the projected water demands about 99 percent of the time and the 3,000-acre irrigation demand 75 percent of the time (JE Fuller 2022). Alternative C would also provide an adequate water supply to support operations at the Alchesay National Fish Hatchery an estimated 99.5 percent of the time. Similar to Alternatives A and B, the proposed Miner Flat Dam and reservoir are expected to result in the following changes to the downstream flow regime under Alternative C: (1) similar or higher minimum flows and reduced zero flow days during summer (i.e., a reduction in the frequency of days that the NFWR and White River would dry out; (2) reduced peak flows primarily during summer and fall when flows coincide with periods when the reservoir is below full pool level and filling; and (3) reduced annual average flows (9 percent reduction at NFWRGG and 7 percent reduction at WRNFA) and average flow volumes (10 percent at NFWRGG and 5 percent at WRNFA).

The dampening of peak flow events associated with summer storms that coincide with periods when the reservoir is filling means that the frequency and magnitude of most instantaneous summer peak flows would be reduced or erased. As noted, the magnitude of effect on peak flows would depend on the level and capacity of the reservoir at the time a peak flow occurs. In cases when the reservoir is full, such as during the spring, the incoming peak flow would not be attenuated as it is routed through the reservoir, except in rare occasions, whereas some attenuation of peak flows is expected when the reservoir level is below full pool level, primarily in summer and fall. Compared to Alternatives A and B, the reservoir would be full an estimated 56 percent of the time, which is a considerably smaller percentage of time compared to Alternatives A and B. In order to maintain/meet downstream water demands and minimum instream flow priorities, water would be released from the dam during periods of low inflow, and modeling indicates the reservoir could drop to the minimum pool level on 9 occasions over a 63-year period. Similar to other alternatives, modeling indicates the reservoir is most frequently full in the late winter and spring (full an average of 84 percent of the time) and least frequently full in summer (full 22 percent of the time). The total number of peak flows subjected to attenuation would remain small. Out of 1,154 95th percentile flows during the 63-year model period (considered peak flood events for the purposes of this analysis), 15 are modeled to be attenuated through storage, which is more than Alternatives A (3) and B (0) and represents approximately 1 percent of total comparable events in the historic record. However, approximately 38 percent of higher-than-average flows in summer would be subjected to attenuation (608 out of 1,614 events that equal or exceed the 60th percentile flow rate), which is substantially more than Alternative A.

As a result, the potential for the dam and reservoir to affect peak flows would be comparatively greater. However, the scale and magnitude of effects related to Alternative C would be consistent with, although unquantifiably greater than, those described under Alternative A. The same mitigation measures used to minimize biological resources impacts defined under Alternative A would also apply to Alternative C (see **Appendix A.3**, *Mitigation Measures*).

Vegetation Communities and Associated Wildlife. Operations modeling indicates that key components of the hydrologic environment would be greater than Alternative A, including greater variability and frequency of reduced flows. Therefore, the evaluation of operations-specific effects, as noted, would also be the same scope but greater magnitude as described under Alternative A, due to a modeled increase in overall frequency of attenuated flows. Portions of the flows associated with summer monsoonal events would be stored, which, in combination with potentially lower average flows, would over time favor the establishment of non-natives and channel encroachment and represent a reduction in habitat quality. As a result, when considered as a whole, direct and indirect adverse impacts to vegetation communities and associated wildlife resulting from grading and construction for the proposed Miner Flat Dam and reservoir, the expanded intake structure, installation of the 50-mile pipeline, and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable.

Aquatic Communities and Native Fishes. An overall reduction in flow can cause or exacerbate a number of direct and indirect ecological changes including less overall habitat, slower velocities, and potentially warmer water temperatures. When also considering increased average flows in summer and warmer winter temperatures, the most likely resulting effect would be more favorable conditions for non-native fish species that may otherwise be limited by natural temperature and flow extremes, leading to a reduction in and modification of aquatic habitat quality for native species and, over time, a reduction in abundance of native species. Thus, direct and indirect adverse impacts to aquatic communities and fish resulting from grading and construction for the proposed Miner Flat Dam and reservoir and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable under Alternative C, although the magnitude and scale of specific adverse and beneficial effects would be highly variable as described under Alternative A. The magnitude and scale of effects could be reduced through implementation of standard control measures described in **Appendix A.2** (*Best Management Practices*), as well as measures previously described. Regardless, adverse residual impacts to aquatic communities and native fishes would remain after mitigation.

Wetlands and Other Jurisdictional Waters of the United States. Construction of the project components would result in the loss of approximately 2.4 acres of wetlands and the conversion of 3.7 miles of the NFWR to open water. Adverse effects under Alternative C would, thus, be similarly moderate and unavoidable, but implementation of mitigation measures, standard BMPs, and compensatory mitigation would reduce the scale and magnitude of adverse effects. Unavoidable loss or conversion of wetlands shall be mitigated or compensated for through the Section 404 permitting process and may include a banking or in-lieu fee program. A 404(b)(1) analysis would also be completed to further define impacts to the aquatic environment under jurisdiction of the USACE. Compensatory mitigation requirements would likely be satisfied through the purchase of credits from an approved in-lieu fee program, which would compensate for, but not fully resolve all adverse effects.

Federally Listed Species. Potentially suitable habitat for several TSS and federally listed aquatic and semi-aquatic species would be converted from lotic to lentic habitat, benefiting habitat generalists and non-native predators and competitors. Operations modeling indicates that changes to key components and characteristics of the hydrologic environment would be comparable to, but at an increased frequency or magnitude to, those described for Alternative A (i.e., muting of summer monsoonal peak flows, limited reduction in spring peak flows, and general reduction in annual average flow volume and average flows). As previously discussed, an overall reduction in flow can cause or exacerbate several direct and indirect ecological changes including less overall habitat, increased opportunity for invasive species such as *Tamarisk* and Russian olive, slower velocities, and a modification to the annual temperature cycle leading to atypically warmer and cooler water temperatures, with the most likely consequence of more favorable conditions for non-native fish species that may otherwise be limited by natural temperature and flow extremes.

Because implementation of the proposed action may result in take of a federally listed species through a Federal action, a Federal interagency consultation, under Section 7 of the ESA, is required, regardless of alternative selected. Consultation efforts with the USFWS are ongoing including the preparation of a BA. The BA considers impacts to federally listed species to determine if this action is likely to cause take (harass, impact, affect, etc.) or jeopardize the continued existence of federally listed species.

While the magnitude and scale of effects on federally listed species could be reduced through implementation of standard control measures described in **Appendix A.2** (*Best Management Practices*), as well as measures used to minimize biological resources impacts defined under Alternative A (see **Appendix A.3**, *Mitigation Measures*), adverse residual impacts to potentially suitable habitat would remain after mitigation.

Connected Actions – Canyon Day Farming. As discussed in **Section 2.6** (*Connected Actions*), and in contrast to Alternatives A and B, Alternative C would support downstream irrigation diversions in the Canyon Day area and an interrelated action if the WMAT chooses to expand farming in the Canyon Day area, including 885 acres that were cultivated previously under the Canyon Day Irrigation Project in the 1980s and potentially an additional 2,115 acres (3,000 acres total). Under Alternative C, restarting and expanding agricultural practices would result in the permanent conversion of existing or previously farmed lands to actively managed agricultural areas, which would remove existing vegetation through mechanical cultivation, resulting in long-term minor adverse effects to vegetation communities and associated wildlife. There are likely, but unverified, sections of grassland and woodland communities intermixed within the previously cultivated area, which likely supports common wildlife typical of previously disturbed areas and grasslands. Grasslands and previously disturbed areas are not considered sensitive communities and are abundant on the Reservation; however, conversion to cultivated farmland would reduce diversity and abundance and once again subject the area to routine disturbance, which would reduce the value as wildlife habitat.

Re-establishment of actively cultivated areas could also destroy and fill drainages/erosional features, permanently removing/filling any minimal aquatic habitats and damaging associated wetlands or riparian habitats. These features have not been assessed. Agricultural operations can also have adverse effects on nearby aquatic habitats or wetlands due to the soil-disturbing nature of those activities and associated impacts from runoff of sediment or other agricultural contaminants. Runoff without management can move these contaminants into intermittent drainage features and eventually into the NFWR if uncontrolled. However, the magnitude of adverse effects could vary widely, depending on the type of operation, environmental conditions, and farm management practices. Any construction work occurring in drainages or associated wetlands would be conducted in compliance with the Section 401 Water Quality Certification. Implementation of measures specified in the Section 401 Water Quality Certification would be expected to limit construction-related impacts to sensitive resources and water quality. In addition, the construction contractor would be required to comply with applicable Tribal, Federal, and State laws, orders, and regulations that are intended to reduce adverse effects to the environment through avoidance or minimization.

With respect to federally listed species, surveys have not been completed for the areas proposed for cultivation. However, for monarch host plants, *Asclepias* spp., have broad habitat associations and are found in open woodlands and grasslands, forests, and edges of streams and cienegas, but can also be found in disturbed areas like roadsides and pastures. Thus, milkweed host plants could be present in the footprint of previously cultivated areas or within the expansion area. If the WMAT chooses to reinitiate agricultural activities in this area, effects on *Asclepias* spp., if present, would be consistent with those described under **Section 3.4.2** (*Environmental Consequences*, *Vegetation Communities and Associated General Effects on Wildlife and Habitats*). Any incidental removal of *Asclepias* spp. would be limited to areas subjected to direct disturbance. Given the vast available upland habitat suitable for *Asclepias* spp. in the region, any incidental removal of milkweed associated with potential agricultural activities would not represent a significant reduction in resources available for monarchs.

No suitable aquatic habitat for the northern Mexican gartersnake, narrow-headed gartersnake, New Mexico meadow jumping mouse, Mexican gray wolf, or Mexican spotted owl is present at this location. The site is predominantly agricultural, fallow, or grassland intermixed with previously cultivated areas. Forested and rocky canyon habitats are not present. Both the southwestern willow flycatcher and yellow-billed cuckoo are known or assumed present along the White River, approximately 0.5 miles south. At this distance, temporary installation of agriculture infrastructure and future operations are unlikely to affect the quality or function of riparian habitat associated with the White River, and riparian habitat is not known to be present within the areas proposed for cultivation.

In addition to standard agricultural management practices and BMPs related to ground disturbance and erosion control, conservation practices for agriculture could be implemented to further minimize potential adverse effects to nearby drainages and to maximize the benefit of cultivated lands to native wildlife. Strategic planting could reduce erosion near drainages by stabilizing surface soils, wildlife could be integrated into pest management such as the installation of raptor perches, and disturbance frequency could be managed to keep land undisturbed for long periods between plantings.

Under Alternative C, if the WMAT chooses to reinitiate 885 acres of farming in Canyon Day and expand to an additional 2,115 acres, the Tribal Council would be required to approve the planning and construction. The WMAT would follow the *Tribal Plan and Project Review* process to ensure that all projects on the Reservation are consistent with Tribal and Federal laws, policies, and regulations. While it is not possible to determine with certainty the potential magnitude and extent of impacts on wildlife habitat, potential adverse effects on biological resources would be reduced or minimized with adherence to applicable Tribal, Federal, and State laws, orders, and regulations; standard management practices; and any additional measures or conservation practices imposed through the project planning process.

Residual Impacts. Similar to Alternative A, implementation of Alternative C would result in permanent direct and indirect adverse impacts to vegetation communities, wildlife, native fishes and aquatic habitats, wetlands, and TSS and federally listed species. While some adverse effects can be reduced with implementation of standard BMPs and prescribed mitigation and minimization measures, adverse residual impacts associated with biological resources would remain after mitigation.

Alternative D

The construction methods for project components are identical under all alternatives; as a result, the evaluation of construction-specific effects, application of standard control measures described in **Appendix A.2** (*Best Management Practices*), and construction-related mitigation measures would be as described under Alternative A. This section focuses on operational effects resulting from implementation of Alternative D.

Similar to Alternative C, Alternative D is intended to meet the design population domestic water demand and provide water to irrigate 3,000 acres of land in Canyon Day. Unlike Alternative C, Alternative D would not prioritize the preservation of historical minimum flow levels below the dam. The results of modeling flow conditions under Alternative D are summarized in **Section 3.2** (*Water Resources and Hydrology*), **Table 3.2-8**. For a period of time, there would be sufficient water storage and supply in the system to meet the rural water system demand requirements and provide irrigation for 3,000 acres of land each year when suitable storage and supply exist to accommodate Canyon Day irrigation water demands. As part of the proposed action, the WMAT water administrator would use the provisions in the WMAT Water Code to prioritize demand requirements and regulate water diversions to ensure that there is sufficient water storage and supply in the system to meet rural water system demands. At some point in the future, allocating sufficient water to meet rural water system demands could require the WMAT water administrator to reduce amounts permitted by the water code for irrigation diversions. Meeting the rural water system diversions would have priority over meeting the downstream irrigation diversions.

Under Alternative D, the minimum and average flows and average annual flow volumes at NFWRLL generally would be comparable to those under the No Action Alternative, whereas flows and annual volumes at NFWRGG (9 percent reduction) and WRNFA (7 percent reduction) would be lower. Additionally, operations under Alternative D would result in 4 zero flow days at NFWRLL, 136 zero flow days for NFWRGG, and 6 zero flow days for WRNFA out of the 63-year modeling period, which is an increase compared to other alternatives. One hundred thirty-six zero flow days represents less than 1 percent of the historic record but is substantially more than other alternatives. Modeled flow duration curves under Alternative D are provided in **Appendix F** (*Water Resources*). Thus, compared to the No Action Alternative, Alternative D would result in fewer zero flow days at NFWRLL and WRNFA but a much greater number of zero flow days at NFWRGG. The reservoir would be full an estimated 56.1 percent of the time under this alternative, which is a considerably smaller percentage of time compared to Alternatives A and B and slightly higher than Alternative C. As with the other alternatives, the proposed Miner Flat Dam would result in some attenuation of peak flow events under Alternative D. The magnitude of this effect would depend on the level and capacity of the reservoir at the time a peak flow occurs and would be seasonally variable. In cases when the reservoir is full (in the winter and spring primarily), the incoming peak flow would not be attenuated as it is routed through the reservoir, whereas some attenuation of peak flows is expected when the reservoir level is below full pool level. Compared to Alternatives A and B, the reservoir would be below full pool level for a greater percentage of time under Alternative D. Thus, the potential for the dam and reservoir to affect peak flows would be comparatively greater. Similar to other alternatives, modeling indicates the reservoir is most frequently full in the late winter and spring (full an average of 89 percent of the time) and least frequently full in summer (full 21 percent of the time). Out of 1,154 95th percentile flows during the 63-year model period (considered peak flood events for the purposes of this analysis), 15 are modeled to be attenuated through storage, which is more than Alternatives A (3) and B (0) and represents approximately 1 percent of total comparable events in the historic record. However, approximately 39 percent of higher-than-average flows in summer would be subjected to attenuation (630 out of 1,614 events that equal or exceed the 60th percentile flow rate), which is substantially more than Alternative A but comparable to Alternative C.

As a result, the potential for the dam and reservoir to affect peak flows would be comparatively greater than Alternatives A and B, and consistent with Alternative C. Overall, the scale and magnitude of effects related to Alternative D would be consistent with, although greater than, those described under Alternative A. The same mitigation measures proposed to minimize biological resources impacts defined under Alternative A would also apply to Alternative C (see **Appendix A.3**, *Mitigation Measures*).

Vegetation Communities. As described in **Section 3.2** (*Water Resources and Hydrology*), the operation of the dam under this alternative would result in changes in the flow regime of the NFWR downstream of the Miner Flat Dam. Adverse effects would be most acute in reaches of the NFWR that support wide floodplains and riparian communities, which benefit from, and are dependent on, flood events, surface water, and near-surface groundwater. Extended and more frequent dry periods would result in system changes to riparian communities over time, including reduced establishment and seedling success, stress-induced reduction of biomass and productivity, increased likelihood of invasive species establishment, and overall reduction in function and value of the riparian system. As a result, persistent dry periods over time would likely reduce the quality and extent of riparian vegetation and habitat along the NFWR. Conversely, modeling indicates that operations under Alternative D would reduce the frequency at which the WRNFA would dry out compared to existing conditions. Maintenance of persistent summer low flows through typically dry or low flow periods could reduce seasonal stress of riparian communities, similar to those related to minimum instream flows described under Alternatives A through C. However, consistent with other alternatives, summer monsoonal events would also be frequently stored, which, in combination with potentially lower average flows, would over time further favor the establishment of non-natives and channel encroachment and represent a reduction in habitat quality.

When considered as a whole, direct and indirect adverse impacts to vegetation communities and associated wildlife resulting from grading and construction for the proposed Miner Flat Dam and reservoir, installation of the 50-mile pipeline, and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable under Alternative D.

Aquatic Communities and Native Fishes. Implementation of this alternative would result in more dry days in the river system and periods with more consecutive dry days than other action alternatives. While the precise impacts to aquatic resources would depend upon a number of interrelated variables, including seasonal factors, this alternative would result in major and unavoidable adverse impacts to aquatic habitats and native fishes due to the impacts to base flows in the NFWR and the associated reduction in and modification of available aquatic habitat. The most likely resulting effect would be more favorable conditions for non-native fish species adapted to a wider variety of environmental conditions, which under existing conditions may otherwise be limited by natural temperature and flow extremes. This could lead to a reduction in aquatic habitat quality and, over time, reductions in the abundance of native species. Thus, direct and indirect adverse impacts to aquatic communities and fish resulting from grading and construction for the proposed Miner Flat Dam and reservoir and future operations to meet the long-term requirements of the rural water system are considered major and unavoidable under Alternative D. While the magnitude and scale of effects could be reduced through implementation of standard control measures described in **Appendix A.2** (*Best Management Practices*), as well as measures previously described, adverse residual impacts to aquatic communities and native fishes would remain after mitigation.

Wetlands and Other Jurisdictional Waters of the United States. Construction of the project components would result in the loss of approximately 2.4 acres of wetlands and the conversion of 3.7 miles of the NFWR to open water. Operations modeling indicates that this alternative would affect key components of the hydrologic environment to a greater extent than Alternative A. Adverse effects under Alternative D would be moderate and unavoidable, but implementation of mitigation measures, standard BMPs, and compensatory mitigation would reduce the scale and magnitude of adverse effects. Unavoidable loss or conversion of wetlands shall be mitigated or compensated for through the CWA Section 404 permitting process and may include a banking or in-lieu fee program. A 404(b)(1) analysis would also be completed to further define impacts to the aquatic environment under jurisdiction of the USACE. Compensatory mitigation requirements would likely be satisfied through the purchase of credits from an approved in-lieu fee program, which would compensate for, but not fully resolve, all adverse effects.

Connected Actions – Canyon Day Farming. Because the proposed Canyon Day farming activities would be identical to Alternative C, the range of potential adverse effects would be the same under both alternatives.

Residual Impacts. Similar to those detailed under Alternative A, implementation of Alternative D would result in permanent direct and indirect adverse impacts to vegetation communities, wildlife, native fishes and aquatic habitats, wetlands, and TSS and federally listed species. While some adverse effects could be reduced with implementation of standard BMPs and prescribed mitigation and minimization measures, adverse residual impacts associated with biological resources would remain after mitigation.

3.4.3 Cumulative Impacts

A number of the potential future actions identified in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), including proposed recreational facilities at the Miner Flat reservoir, the Hon-Dah Resort expansion, construction of WMAT housing, timber harvests, and road improvements, would involve ground disturbance, with the potential for short-term adverse impacts on terrestrial and aquatic biological resources, as well as a long-term loss of habitat. The Miner Flat Dam Recreational Facilities Project could stock the reservoir to improve recreational fishing. Only Apache trout is used for stocking on the Reservation, thus any future stocking in the proposed reservoir could serve to support the existence of this federally listed species in the NFWR upstream of the dam. The San Carlos Apache Tribe Distribution System Project could have similar beneficial effects and adverse impacts on aquatic species in the White River and Salt River as the proposed action has on the NFWR and White River, but it is still too early in the planning stage to evaluate these impacts. The Black River Landscape Restoration Project, which is intended to restore forest resiliency and ecosystem function, could have beneficial effects on biological resources along the eastern boundary of the Reservation. The Flying V&H Prescribed Fire Project and other U.S. Forest Service projects are designed to improve forest health along the Reservation's boundaries. Most of these adverse impacts and beneficial effects would not overlap in time or space with those associated with the proposed action.

As discussed in **Section 3.4.2** (*Environmental Consequences*), most construction-related impacts associated with the proposed action, such as vegetation removal, habitat disturbances (noise), and displacement of wildlife, would be localized. Major and unavoidable adverse impacts to vegetation and wildlife habitat and aquatic species would result from operation of the dam and reservoir and anticipated changes to downstream flow characteristics. While these changes to water quality could cause direct adverse impacts to aquatic species, they would not eliminate spatially limited habitat, jeopardize the existence of any federally listed species, or lead to listing of TSS or other species.

Construction of the Miner Flat Dam and reservoir would also adversely affect wildlife that require or utilize habitat that would be inundated by the new reservoir. Inundation would mostly affect common species associated with ponderosa pine forest and woodland. Once the reservoir is filled, available habitat would transition to a modified reservoir ecosystem. Creation of permanent, deepwater habitat in the dam reservoir would have major and unavoidable adverse impacts on native species that are dependent on lotic (free-flowing) aquatic systems. Creation of a deepwater reservoir would favor any non-native species currently in the NFWR over those native species adapted to the historical aquatic habitat. The presence of the dam would also result in the loss of connectivity for fish and wildlife populations in the NFWR by blocking passage for fish, as well as contribute to habitat fragmentation.

Depending on the action alternative, minimum flows would increase or decrease compared to existing conditions. Average flows at NFWRLL would generally decrease by 10 percent, and average flows at WRNFA would decrease by 2 percent. As a result, unavoidable long-term adverse impacts on aquatic habitats, fishes, and other semi-aquatic or riparian species would result from changes in streamflows under all alternatives; however, modeling indicates strong seasonal and spatial variability within the system. For example, flow changes are expected to be most detectable in the Gold Gulch area. In addition, changes to flood and high flows are expected to occur almost exclusively in the summer and winter, with spring peak flows consistent during most but not all years under all alternatives. Importantly, the magnitude of potential changes is based on a design population demand diversion that is 10 times higher than water volumes currently being diverted at the North Fork intake structure. Until the design population is reached in about 40 years or more, the magnitude of the diversion would only equal the demand; thus, operational impacts would begin at baseline levels and then increase in magnitude commensurate with increases in diversion volumes.

As noted in **Section 3.1.3** (*Purpose and Need for the Proposed Action*), climate change associated with global warming is predicted to produce negative environmental, economic, and social consequences across the globe. In the Southwest region (Arizona, California, Colorado, Nevada, New Mexico, and Utah), observed changes include an increase in drought and wildfire conditions, a reduction in winter snowpack, and lower streamflows in major drainage basins (USGCRP 2017). In the future, it is generally acknowledged that the study area would experience an increase in temperature, reduction in precipitation, and an increase in extreme weather events, such as droughts. As a result, identified project-specific effects to the NFWR and White River, such as the modification to the annual temperature cycle and the range of fluctuations, habitat fragmentation, non-native species abundance, and modifications to flow regime, would be likely exacerbated by climate change (Caissie 2006). In addition, TSS or federally listed species with limited distribution or narrow habitat requirements would be more susceptible to population threats because of stochastic events that may be exacerbated by habitat disturbance or climate change. As a result, climate change has the potential to exacerbate potential effects on aquatic species and terrestrial wildlife, particularly native, TSS, or federally listed species that have limited distribution.

Under the ESA, the USFWS has authority over projects that may result in take of a species listed as threatened or endangered under the Act. Because implementation of the proposed action may result in take of a federally listed species through a Federal action, a Federal interagency consultation, under Section 7 of the ESA, would be required. Consultation efforts with the USFWS are ongoing including the preparation of a BA that determines if the action is likely to cause take (harass, impact, affect, etc.) or jeopardize the continued existence of federally listed species. Following implementation of the project, sensitive species would continue to be managed and monitored under the WMAT's management plans, such as the Native Fishes Management Plan, and coordination with the USFWS would continue.

While the proposed action under all alternatives could result in major and unavoidable adverse effects, the identified future projects would not exacerbate changes in streamflows, temperature, or flooding along the NFWR. The San Carlos Apache Tribe Distribution System Project could have similar beneficial effects and adverse impacts on aquatic species in the White River and Salt River, but these are expected to have minimal overlap in space with changes associated with the proposed action.

3.5 Recreation

This section covers recreational resources on the Reservation (the area of analysis), including fishing, camping, hunting, and other outdoor activities. There would be no effect to recreational opportunities outside the Reservation. See **Section 3.11** (*Socioeconomics*) for an evaluation of economic impacts from tourism and recreation.

3.5.1 Affected Environment

The Reservation consists of approximately 1.6 million acres of undeveloped land, much of which is available for outdoor recreation for the public and WMAT members (Entrix 2007a). The majority of the public recreation areas are concentrated in the northeast and southern portions of the Reservation (**Figure 3.5-1**). The primary recreation activities are fishing, camping, hunting, river rafting, skiing, and general outdoor recreation (e.g., hiking and sightseeing). Swimming is prohibited in all Reservation streams and lakes. The peak recreation season is May through July, with the majority of visitors being overnight users from other parts of Arizona that come to recreate for the weekend (Entrix 2007a).

Recreational activities within the Reservation are managed through a comprehensive permit system. Visitors are required to obtain a permit for any recreation activity (WMAT 2009, Entrix 2007a). There are also areas (e.g., the Black and Salt Rivers) that require Special Use Permits. Although the WMAT does not track recreation by use in Special Use Areas, most recreation in these areas consists of camping, fishing, and river rafting. WMAT members are not required to obtain recreation permits and can recreate anywhere on the Reservation. Anecdotal information suggests that the recreation use levels for WMAT members is approximately equal to levels for non-members and consists mainly of family-oriented trips and activities (Entrix 2007a).

Fishing

The high quality of fishing (bait and cast, fly fishing, and ice fishing) is the primary driver of recreation visitation to the Reservation, and fishing permit sales represent the largest source of recreation-based income to the WMAT (Entrix 2007a). The prime fishing season is in the fall. There are 16 lakes available for fishing, in addition to a number of streams and creeks. Aquatic species found and caught include rainbow trout, brown trout, Apache trout, brook trout, cutthroat trout, largemouth and smallmouth bass, sunfish, northern pike, waterdogs and crayfish, and channel, flathead, and bullhead catfish. Between 2003 and 2006, rainbow trout accounted for 93 percent of fish caught followed by brown trout, Apache trout, and brook trout (Entrix 2007a).

Fish stocking is facilitated by the Alchesay-Williams Creek National Fish Hatchery complex located on the Reservation. This facility consists of two hatcheries operated by the USFWS, which raises Apache trout for stocking in Arizona, New Mexico, and Colorado. The Williams Creek hatchery obtains water from springs and the headwaters of Williams Creek, and the Alchesay hatchery obtains water from Alchesay Spring and the NFWR. In 2004, nearly 770,000 fish were stocked on the Reservation, accounting for over 60 percent of the total output from the hatchery complex (Entrix 2007a). Only Apache trout are currently stocked on the Reservation. The hatchery production rate

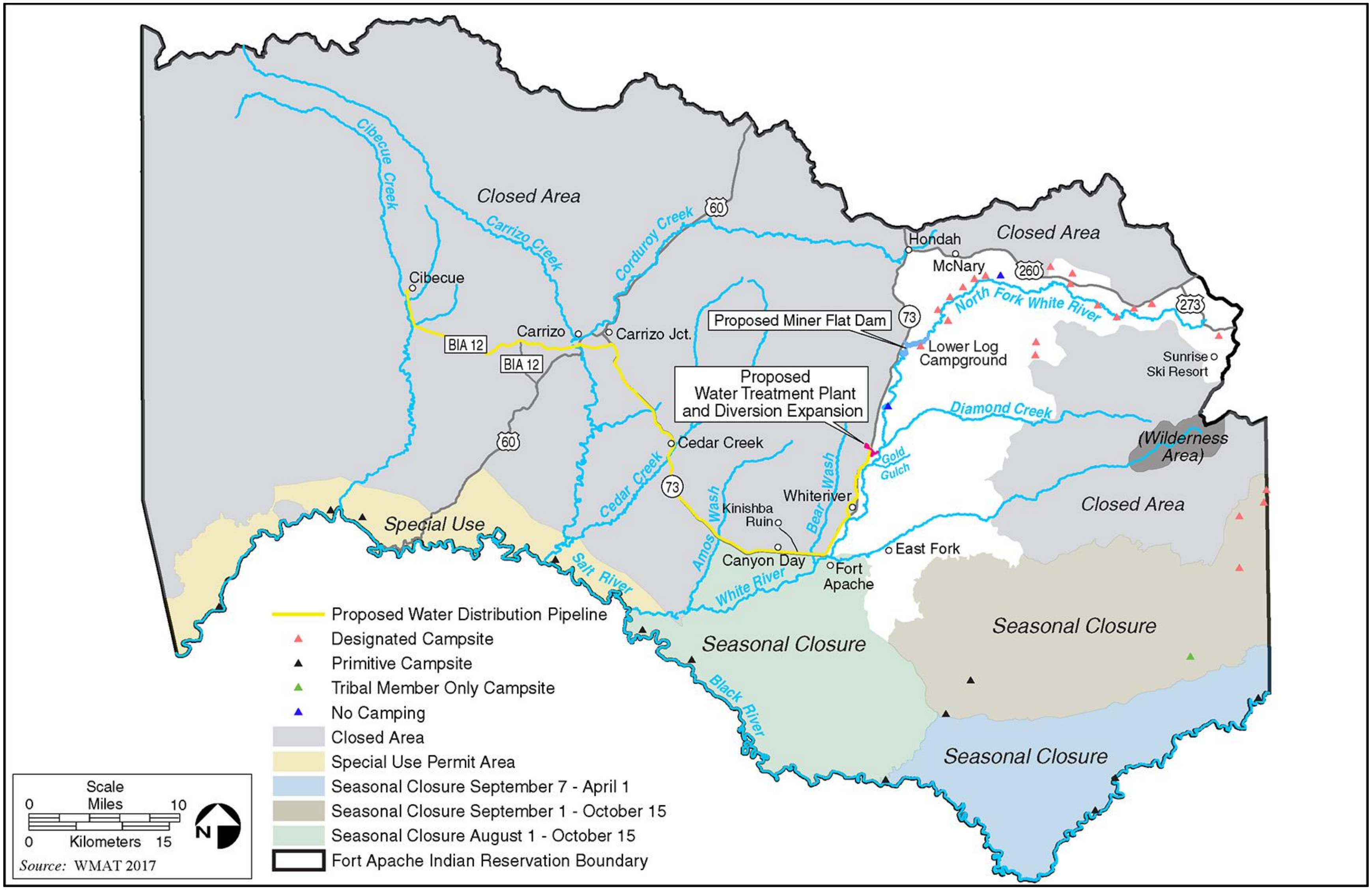

Figure 3.5-1. Recreational Areas on the Fort Apache Indian Reservation

does not currently meet on- or off-Reservation demands for stocked fish. The most recent survey of recreationists conducted by the WMGFD occurred between 2003 and 2006, and the report indicated that the number one concern among visitors is the low catch rates (Entrix 2007b). Stocking quantity and frequency on the NFWR is ad-hoc and variable based on the availability of the hatchery but is exclusively Apache trout. Stocking of the NFWR has stopped but may continue following construction of the reservoir at the discretion of the WMAT.

Camping

Camping represents the second most popular recreation activity on the Reservation based on permit revenues (Entrix 2007a). There are 15 designated camping areas that provide 730 campsites. The largest campground is located at Sunrise Lake, which has 150 campsites and a recreational vehicle park. Hawley and Horseshoe Lakes also have relatively high campground capacities with approximately 125 campsites each. There are also primitive camping areas in more remote and secluded areas with no designated campsites, facilities, or services (e.g., no toilets or garbage facilities). Although demand for camping has been increasing in recent years, particularly in the Miner Flat and North Fork areas, campgrounds on the Reservation generally do not reach carrying capacity in terms of the number of visitors except on major holidays like the Fourth of July holiday weekend (Entrix 2007a).

The only campground within one of the project components is the Lower Log Campground located within the eastern portion of the proposed reservoir (**Figure 3.5-1**). This campground provides 40 campsites and is open mid-May to mid-September. A survey conducted by the WMAT Wildlife and Outdoor Recreation Division between 2003 and 2006 indicated that the Lower Log Campground has the highest satisfaction rates among visitors for recreation locations on the Reservation (Entrix 2007b).

Hunting

Hunting activity on the Reservation is seasonal, running mainly from September through December. It is regulated by a comprehensive set of hunting regulations and permit fees, which are separate from the standard recreation regulations and permit fee structure (Entrix 2007a). The WMAT offers a range of guided big game hunts, which require a WMAT Wildlife and Outdoor Recreation Division licensed guide. These include elk, pronghorn antelope, bighorn sheep, spring gobbler, black bear, mountain lion, and bobcat. There are also self-guided big game hunting opportunities, hunts of predator species (e.g., coyote and fox), and small-game hunts (e.g., cottontail rabbit, tree squirrel, quail, and migratory birds) (Entrix 2007a).

Other Outdoor Recreation

Other outdoor activities include hiking, bicycling, horseback riding, river rafting, and skiing. Activities like hiking, bicycling, horseback riding, and sightseeing are allowed in conjunction with any type of permit (i.e., outdoor recreation, fishing, hunting, and camping). River rafting is only allowed on the Salt River through one of four commercial businesses running rafting trips under license to the WMAT (WMAT 2021c). The extent of rafting activity fluctuates depending on water flows in the Salt River, with stretches of the river containing Class 3 and 4 rapids under normal conditions, making it a popular destination for whitewater enthusiasts. In the winter, the Sunrise Ski Park in the northeast corner of the Reservation (**Figure 3.5-1**) offers skiing, snowboarding, and other winter activities including use of 65 trails, 10 ski lifts, and a full-service ski school.

Besides the Lower Log Campground noted previously, there are no other developed recreational facilities located in the project area. Areas along the NFWR, including those by the proposed dam, reservoir, and intake structure, are open for recreational uses such as fishing and hiking. The construction areas for the proposed water treatment plant expansion and proposed water distribution system are located within or border the boundary of a "closed area" that is not available for public recreation (**Figure 3.5-1**), although WMAT members may use the areas for general outdoor activities (e.g., hiking and horseback riding). The potential area for future Canyon Day farming activities is located in the "closed area" and an area with seasonal closures with regard to public recreation.

3.5.2 Environmental Consequences

The primary issue of concern is whether or not the proposed action would preclude, displace, or diminish the quality of existing or planned recreational facilities, uses, or opportunities within the Reservation. The proposed action includes creation of a reservoir that would provide new shore-based fishing opportunities for visitors and WMAT members. As described in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), the WMAT is in the early planning process for developing new recreational facilities adjacent to the proposed reservoir, as well as designs for future fish stocking of the reservoir. New facilities may include a campground, picnic areas, a boat ramp, and associated access roads. These future actions are addressed in **Section 3.5.3** (*Cumulative Impacts*).

No Action Alternative

Under the No Action Alternative, there would be no change to existing recreational facilities, and no construction activities would occur that could diminish or displace current recreational opportunities. The Alchesay-Williams Creek National Fish Hatchery complex would continue to operate under current conditions with no minimum NFWR diversion requirements. Similarly, there would be no new recreational opportunities associated with the use of the proposed reservoir by WMAT members and the public.

Alternative A

Approximately 3.7 linear miles of the NFWR and adjacent upland areas within the inundation footprint of the new reservoir would no longer be available for hiking. Additional short-term access restrictions for fishing and hiking during construction would temporarily limit opportunities in the vicinity but would not preclude use of other areas of the Reservation for fishing and hiking. Changes to water quality during construction, even temporarily, may also cause short-term direct impacts on local fisheries. Apache trout, brown trout, and desert and Sonora sucker occur in the vicinity of the proposed Miner Flat Dam site and, thus, would be most susceptible to short-term water quality changes. However, these areas would be restricted to anglers while construction is occurring.

Construction activities would not affect river rafting or skiing because these activities do not occur in or near the project area. Construction activities would also have negligible impacts on hunting activities. Similarly, the short-term and localized nature of the construction activities for the proposed water treatment plant expansion and proposed water distribution system, which would be in areas not open to the public, would have negligible impacts on general outdoor activities of WMAT members.

Creation of the reservoir would result in a moderate adverse impact that would diminish or displace current camping opportunities. Water impounded by the dam would inundate an existing recreational facility (Lower Log Campground) located in the northeastern portion of the proposed reservoir footprint (see **Figure 2.5-4**). Campers would still have access to 14 designated campgrounds and additional primitive camping sites on the Reservation. While the proposed action does not include development of any new recreational facilities, the WMAT may fund future development projects (e.g., construction of boat ramps, picnic areas, and camping facilities) under separate actions to support future recreational opportunities at the new reservoir (see the *Cumulative Impacts* discussion below).

Fishing is one of the primary drivers of recreation visitation to the Reservation, and the proposed rural water system would result in the creation of a reservoir that would provide new shore-based fishing opportunities for visitors and WMAT members. No fish stockings are currently planned in the NFWR or new reservoir; however, opportunistic stockings have occurred in the NFWR both upstream and downstream of the proposed dam site in the past. If stockings are reinitiated in the NFWR, they would not occur until after construction of the dam and reservoir. Furthermore, measures in **Section 3.4** *(Biological Resources)* include modifications to the WMAT Game and Fish Code codifying requirements that would limit any stocking on the NFWR, or future reservoir if contemplated, to native fish species. Additionally, the proposed operation of the rural water system would prioritize at least an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay National Fish Hatchery. This action would provide a more reliable water supply for hatchery operations, which supports local fisheries within and outside the Reservation.

Under Alternative A, following construction, operation of the Miner Flat Dam would also result in a more consistent and reliable minimum flow of water downstream of the dam. The NFWR and White River infrequently dry out under existing conditions; however, according to modeling, dam operations would ensure minimum instream flows downstream of the dam that would prevent the NFWR and White River from drying out both when the reservoir is full and when the reservoir is filling. Persistent flow would provide a benefit to game fish (Marchetti and Moyle 2001) due to the preservation of habitat through the driest months (reduced risk of seasonal die-off) and adds thermal protection from changes in air temperature. A comprehensive analysis of potential impacts on aquatic species under Alternative A is included in **Section 3.4** (*Biological Resources*).

Future Canyon Day farming activities under Alternative A are expected to have negligible impacts on recreation because the proposed 885 acres of future farming is in an area that was previously designated for farming and is not located near a designated recreation area.

Residual Impacts. Implementation of Alternative A would result in minor to moderate adverse impacts on hiking and camping, and could result in long-term beneficial effects on fishing for visitors and WMAT members, depending on future recreation-specific management strategies. There would be no significant adverse impacts on recreation from construction and operation of the new rural water system under Alternative A, and no mitigation measures are required.

Alternative B

Alternative B would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Future Canyon Day farming would also be the same under both alternatives. Although Alternative B would not prioritize instream minimum flow requirements, modeling demonstrates that water releases to meet downstream demand under this alternative would provide a similar increase in minimum instream flows and, thus, provide similar benefits to habitat, species, and hatchery operations as discussed under Alternative A. Overall, implementation of Alternative B would result in minor to moderate adverse impacts on hiking and camping, and could result in long-term beneficial effects on fishing for visitors and WMAT members, depending on future recreation-specific management strategies. There would be no significant adverse impacts on recreation from construction and operation of the new rural water system under Alternative B, and no mitigation measures are required.

Alternative C

Alternative C would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Similar to Alternative A, operation of the Miner Flat Dam would also result in a more consistent and reliable minimum flow of water downstream of the dam. The NFWR and White River infrequently dry out under existing conditions; however, according to modeling, dam operations would ensure minimum instream flows downstream of the dam that would prevent the NFWR and White River from drying out both when the reservoir is full and when the reservoir is filling. Persistent flow provides a benefit to game fish (Marchetti and Moyle 2001) due to the preservation of habitat through the driest months (reduced risk of seasonal die-off) and adds thermal protection from changes in air temperature. Regarding future Canyon Day farming, the proposed farming expansion under Alternative C would focus on undeveloped lands, some of which may be currently used by the public (except in the "closed areas") or by WMAT members for general recreational activities (e.g., hiking, horseback riding). However, adherence to applicable Tribal guidelines, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize potential impacts on recreation. Overall, implementation of Alternative C would result in minor to moderate adverse impacts on hiking and camping, and long-term beneficial effects on fishing for visitors and WMAT members. There would be no significant adverse impacts on recreation from construction and operation of the new rural water system under Alternative C, and no mitigation measures are required.

Alternative D

Alternative D would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Future Canyon Day farming would also be the same as under Alternative C. In contrast to Alternative C, rural water system operations under Alternative D would not prioritize preservation of minimum instream flows downstream of the dam, resulting in a modeled increase in the frequency and duration of dry conditions near the NFWRGG gage along the NFWR (131 modeled dry days during the 63-year model period compared to 3 under existing conditions). These dry conditions are typically associated with about 11 multiday events, primarily occurring in July and August, and represent a decrease in available aquatic habitat for fishing. Sites near the proposed Miner Flat Dam and then downstream along the White River are not modeled to have any negative changes in flow conditions. While reductions in aquatic habitat and, thus, available sportfishing opportunities would be unavoidable and long-term, impacted areas would be most detectable around the Gold Gulch area below the intake structure, leaving a range of other fishing opportunities available and unaffected. Overall, implementation of Alternative D would result in minor to moderate adverse impacts on hiking and camping and localized unavoidable adverse impacts related to fishing in some areas along the NFWR.

3.5.3 Cumulative Impacts

Of the potential future actions identified in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), proposed recreational facilities at the Miner Flat reservoir and expansion of the Hon-Dah Resort would provide beneficial effects to recreational resources within the Reservation. As described in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), the WMAT is in the early planning process for developing new recreational facilities adjacent to the proposed reservoir, as well as designs for future fish stocking of the reservoir. New facilities may include a campground, picnic areas, a boat ramp, and associated access roads. None of the other future actions would be expected to benefit or adversely impact recreational resources on the Reservation.

As discussed in **Section 3.5.2** (*Environmental Consequences*), the proposed action could result in long-term beneficial effects on fishing for visitors and WMAT members, depending on future recreation-specific management strategies. Construction of the proposed action would temporarily restrict access to some existing recreational areas (i.e., fishing near construction areas along the NFWR), and water impounded by the dam would inundate an existing recreational facility (Lower Log Campground). However, the WMAT Miner Flat Dam Recreational Facilities Project would build recreational facilities at the Miner Flat reservoir and may include a new campground and stocking the reservoir with game fish, which would, in concert with the proposed action, benefit recreational resources. Therefore, ongoing and reasonably foreseeable future actions in combination with construction and operation of the WMAT rural water system would not result in significant cumulative adverse impacts on recreation.

3.6 Cultural Resources

Cultural resources are comprised of districts, buildings, sites, structures, areas of traditional use, and objects with historical, architectural, archaeological, cultural, or scientific importance. They include archaeological sites, architecture, and traditional cultural resources that are important to Native Americans for religious, spiritual, ancestral, or traditional reasons. The following section addresses cultural resources within the area of potential effects (APE) as described below. ITAs and other Tribal interests are discussed in **Section 3.7** (*Indian Trust Assets*).

3.6.1 Affected Environment

The NHPA of 1966, as amended, sets forth national policy and procedures regarding historic properties. Federal regulations define historic properties as prehistoric and historic sites, buildings, structures, districts, or objects listed or eligible for inclusion on the National Register of Historic Places ("National Register"), as well as artifacts, records, and remains related to such properties (NHPA, as amended [54 U.S.C. 300101 et seq.]). To be considered eligible for listing on the National Register, a site must be at least 50 years old (with exceptions), possess "integrity of location, design, setting, materials, workmanship, feeling, and association" (36 CFR 60.4, *National Register of Historic Places, Criteria for Evaluation*), and must meet one or more of the following eligibility criteria:

A. Is associated with events that have made a significant contribution to the broad patterns of history; or
B. Is associated with the lives of persons significant in our past; or

C. Embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Has yielded or may be likely to yield information important in prehistory or history.

A traditional cultural property can generally be defined as a prehistoric or historic district, site, building, structure, object, or property of traditional religious and cultural importance that is eligible for listing on the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community.

Definition of the Area of Potential Effects

The NHPA and 36 CFR 800 requires Reclamation, as the lead Federal agency, to consider effects on historic properties within the APE. The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist" (36 CFR 800.16[d]). The APE for the proposed action includes all construction footprints, staging areas, access roads, and borrow areas associated with the proposed Miner Flat Dam, new reservoir, new intake structure at the North Fork diversion dam, new raw water pump station and associated pipelines, expanded water treatment plant, and new water distribution system as described in **Section 2.5.2** (*Action Alternatives, Alternative A*). The APE also includes areas associated with proposed agricultural activities in the Canyon Day area as described in **Section 2.6** (*Connected Actions*). Buffer areas around the various project components were incorporated into the APE to capture potential indirect effects. For this analysis, the APE does not include the natural watercourse of the NFWR or White River below the dam, except where affected by proposed construction activities, because proposed operations of the Miner Flat Dam would not change the minimum or maximum surface level of the river compared to existing conditions.

Data Sources

A Class I records search and literature review was conducted by PaleoWest Archaeology at the WMAT THPO to determine the presence of previously recorded and/or documented cultural resources within the proposed action study areas shown in **Figure 2.5-4** and **Figure 2.5-5** (Mitchell, et al. 2013). The study areas covered the construction footprints, staging areas, and buffer areas for the proposed Miner Flat Dam, new reservoir, new intake structure at the North Fork diversion dam, new raw water pump station and associated pipelines, and expanded water treatment plant. PaleoWest Archaeology (Clark et al. 2015) also conducted a Class III cultural resources survey of the study areas shown in **Figure 2.5-4** and **Figure 2.5-5** (about 700 acres total), following WMAT best practices inventory standards and the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 *Federal Register* 44716). Cultural resources documented in the survey area were evaluated for National Register eligibility.

The WMAT THPO completed a separate Class I records search and Class III cultural resources survey for the proposed water distribution system (Laluk and Altaha 2013). The WMAT THPO used their Class I literature review to identify previously recorded sites that might be impacted by the new water distribution system, evaluate the National Register eligibility of these sites, and assess effects to the eligible or potentially eligible historic properties that could result from the current project (Laluk and Altaha 2013). The majority of the pipeline APE had been previously surveyed.

Other areas along the APE for the proposed water distribution system that exhibited high potential for the presence of cultural resources were resurveyed (Laluk and Altaha 2013) in accordance with pedestrian survey strategies outlined in the *White Mountain Apache Cultural Heritage Resource - Best Management Practices* (WMAT 2004) and the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 *Federal Register* 44716).

The WMAT THPO also completed a separate Class I records search and Class III cultural resources survey related to the proposed agricultural activities in the Canyon Day area (Altaha 2022). The goals of the survey were to identify, evaluate, and report cultural resources that may have the potential to be adversely impacted by proposed agricultural activities in the Canyon Day area. The report documented the results of prior cultural studies along with newly identified resources. The 2021 survey, when combined with prior surveys, covered the 885 acres previously established by the Canyon Day Irrigation Project (except for developed areas) and the majority of the potentially suitable lands for future irrigation farming (see **Figure H.2-1** in **Appendix H**, *Cultural Resources*).

The WMAT Cultural Resource Director also conducted an inventory for cultural heritage resources and traditional cultural properties related to the WMAT rural water system (Riley 2015).

Appendix H (*Cultural Resources*) includes a cultural history overview to provide a broader context for understanding the cultural resources recorded within the APE. **Appendix H** also has a list of the recorded resources in the APE.

Cultural Resources within the Area of Potential Effects

Based on the studies noted above, there are 101 cultural resources (**Table H.2-1**) and 41 isolated occurrences recorded in the APE. The 101 cultural resources are based on the number of resources recorded within the study areas shown in **Figure 2.5-4** and **Figure 2.5-5** (about 700 acres total), the proposed water distribution system shown in **Figures 2.5-9** through **2.5-11**, and the surveyed areas shown in **Figure H.2-1** in **Appendix H** (*Cultural Resources*) (about 8,425 acres). The 101 sites consist of both prehistoric and historical-period sites, as well as traditional ceremonial sites. The prehistoric sites indicate use of the area possibly beginning in the Archaic period (6500–1500 B.C.) and continuing through the late Formative period (2000 B.C.–A.D. 1539). Prehistoric site types within the APE include artifact scatters, rock rings, habitation sites, and villages. Historical-period use (post–A.D. 1539) of the area was associated with habitation, logging, camping, ranching, and farming. Historical-period site types include the structural remains of buildings, habitation sites, trash dumps, artifact scatters, campfire rings, petroglyphs, agricultural fields, and artifact scatters. Five cultural resources are also defined as traditional cultural properties, including two historical-period ranches, a historical-period house, and two traditional ceremonial sites (Riley 2015) (see **Table H.2-1**).

Table H.2-1 lists the National Register eligibility of the 101 cultural resources that were recorded in the APE. Cultural resources determined to be not eligible for listing on the National Register either do not meet any of the National Register criteria or lack physical integrity (i.e., have been significantly altered or destroyed by previous human activity or natural processes). Cultural resources listed as "unevaluated" need additional information that may be gathered by means of limited excavation and/or testing to determine the presence and extent of significant buried cultural material or, in the case of historical-period sites, additional archival research. Unevaluated cultural resources are considered eligible for the purposes of analysis. Isolated occurrences are, by definition, not eligible for inclusion on the National Register and, therefore, are not discussed further.

3.6.2 Environmental Consequences

Reclamation's responsibility regarding cultural resources is primarily based on the NHPA and Reclamation Policy (LND P01) and Directives and Standards (LND 02-01). Section 106 of the NHPA and its implementing regulations under 36 CFR 800 (*Protection of Historic Properties*) require all Federal agencies to consider effects of Federal actions on cultural resources eligible for or listed on the National Register. Examples of adverse effects include physically altering, damaging, or destroying all or part of a resource; altering characteristics of, or introducing elements to, the surrounding environment that contribute to the significance of the resource; or neglecting the resource to the extent that it deteriorates or is destroyed.

No Action Alternative

Under the No Action Alternative, there would be no ground disturbance associated with construction of new facilities for the WMAT rural water system, and the proposed reservoir area would not be inundated with water. Therefore, there would be no effect on historic properties within the APE.

Alternative A

There would be adverse impacts on historic properties with implementation of Alternative A. **Table 3.6-1** provides a summary of the number of cultural resources (including National Register-eligible sites, not eligible sites, and unevaluated sites) and historic properties (National Register-eligible sites and unevaluated sites) that are located within the APE. For this analysis, historic properties include both National Register-eligible sites as well as unevaluated sites.

Table 3.6-1. Cultural Resources Recorded with the Area of Potential Effects for Each Project Component

Project Component (with Buffer)	Number of Cultural Resources[1]	Number of Historic Properties[2]
Miner Flat Dam and Reservoir	16	11
Water Diversion from North Fork of the White River	3	2
Water Treatment Plant Expansion	2	0
Water Distribution System	6	6
Canyon Day Farming – 885 acres (*Alternatives A and B*)	8	3
Canyon Day Farming – 3,000 acres (*Alternatives C and D*)[3]	74	39

[1] This includes National Register of Historic Places-eligible sites, not eligible sites, and unevaluated sites.
[2] This includes National Register of Historic Places-eligible sites and unevaluated sites.
[3] These numbers are based on recorded resources within the surveyed areas shown in Figure H.2-1 in Appendix H (*Cultural Resources*).

There are 11 historic properties, including four traditional cultural properties, identified within the APE for the proposed Miner Flat Dam and reservoir. Of these, five historic properties, including three traditional cultural properties, would not be directly affected because they are located within the buffer area surrounding the new reservoir (i.e., above the new high water line). The other six historic properties, including one traditional cultural property, would be adversely affected because they are located within the area that would be flooded by the new reservoir, and rising waters and long-term inundation could damage or destroy the sites. One of these sites is also located within a dam construction area and may be affected by construction-related ground disturbance. There are two historic properties, including one traditional cultural property, identified within the APE for the proposed water diversion structure and associated water pipeline, but neither property would be directly impacted because they are located within part of the buffer area that would not be used as a staging area or for any other construction-related activities.[26] No historic properties are located within or near the proposed water treatment plant expansion area. There are six historic properties identified within the APE for the proposed water distribution system, and they could be adversely affected (i.e., damaged or destroyed) by construction-related ground disturbance unless they are avoided based on the final pipeline alignment.

Operations of the WMAT rural water system would have minimal adverse effects on historic properties. Reservoir levels would fluctuate depending on environmental conditions (e.g., seasonal fluctuations and changes in river flow from year to year). Shore-based fishing and hiking along the reservoir would have minimal effects on historic properties, similar to existing recreational activities along the NFWR. Additionally, there are three recorded historic properties within the 885 acres of proposed future farming in Canyon Day. Infrastructure that would be needed to divert, pump, and distribute water for irrigation would be situated within the area covered by the WMAT THPO's Canyon Day survey; however, designs for this infrastructure have not yet been developed. The three recorded historic properties could be adversely affected (i.e., damaged or destroyed) by ground disturbance unless activities are designed to avoid them. Similarly, any activities that involve ground/soil disturbance would also have the potential to damage intact subsurface cultural deposits.

In compliance with Section 106 of the NHPA, Reclamation has been conducting and will continue to conduct consultations with the WMAT THPO and other consulting parties. Reclamation developed a draft Memorandum of Agreement (MOA), following 36 CFR 800.6, and is currently consulting with the WMAT THPO, BIA, USACE, Hopi Tribe, and Pueblo of Zuni on the draft language. The draft MOA includes the following types of measures to avoid, minimize, or mitigate adverse effects on historic properties:

- Reclamation, in coordination with the WMAT and BIA, shall, when possible, avoid adverse effects to historic properties. Avoidance measures for historic properties may include, but are not limited to, redesigning components, fencing of sites during construction, monitoring of construction near site areas within a buffer zone, or placing infrastructure outside of site boundaries.
- Reclamation shall ensure that the WMAT, or the WMAT's selected cultural resources contractor, develops and implements a Historic Properties Treatment Plan (HPTP) to mitigate adverse effects to historic properties, including traditional cultural properties, within the APE prior to construction of the undertaking. The HPTP shall be consistent with the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 *Federal Register* 44716). The HPTP and shall minimally include the following:

[26] The two historic properties are located near an alternative pipeline alignment that was eliminated from consideration in the *Feasibility Design Report* (Carollo 2014b).

- A research design detailing methods for eligibility testing, data recovery, and/or other relevant analyses for each affected historic property.
- Incorporation of recommended traditional cultural property treatment measures.
- Cultural sensitivity training for construction personnel.
- Methods for artifact curation.
- Development of a Monitoring and Discovery Plan and a Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq., as amended) Plan of Action.
- Reporting requirements.

Residual Impacts. Implementation of Alternative A would result in adverse effects to historic properties. When the MOA is fully executed, it is legally binding on Reclamation and the other signatory parties, and the signatories will fully carry out all legal obligations to which they have agreed. Completing the Section 106 process through the execution of an MOA may resolve the adverse effects under the NHPA, but there would still be unavoidable impacts under NEPA, such as those associated with eligibility testing, data recovery, and long-term inundation by the new reservoir. As a result, while some adverse effects can be reduced or avoided with implementation of standard BMPs and relevant mitigation measures incorporated into the MOA, adverse residual impacts would remain after mitigation.

Alternative B

Alternative B would include the same issues related to construction and operation of the proposed rural water system as under Alternative A. Future Canyon Day farming would also be the same under both alternatives. Completing the Section 106 process through the execution of an MOA may resolve the adverse effects under the NHPA, but there would still be unavoidable impacts under NEPA, such as those associated with eligibility testing, data recovery, and long-term inundation by the new reservoir. As a result, while some adverse effects can be reduced or avoided with implementation of standard BMPs and relevant mitigation measures incorporated into the MOA, adverse residual impacts would remain after mitigation.

Alternative C

Alternative C would include similar issues related to construction and operation of the proposed rural water system as under Alternative A. Implementation of Alternative C would result in increased downstream water diversions for agricultural use compared to Alternatives A and B, potentially causing more fluctuations in reservoir levels, meaning that historic properties within the reservoir area may be covered and then uncovered by water more often than under Alternatives A and B. Alternative C would also support up to 3,000 acres of Canyon Day farming, so the extent of possible impacts on historic properties would be greater than under Alternatives A and B given the larger area proposed for agricultural activities. There are 39 recorded historic properties within the Canyon Day survey area shown in **Figure H.2-1** in **Appendix H** (*Cultural Resources*) that could potentially be used for expanded agricultural operations under this alternative. Historic properties could be adversely affected (i.e., damaged or destroyed) by ground disturbance unless activities are designed to avoid them. Completing the Section 106 process through the execution of an MOA may resolve the adverse effects under the NHPA, but there would still be unavoidable impacts under NEPA, such as those associated with eligibility testing, data recovery, and long-term inundation by the new reservoir. As a result, while some adverse effects can be reduced or avoided with implementation of standard BMPs and relevant mitigation measures incorporated into the MOA, adverse residual impacts would remain after mitigation.

Alternative D

Alternative D would include the same issues related to construction and operation of the proposed rural water system as under Alternative C. Future Canyon Day farming would also be the same under both alternatives. Completing the Section 106 process through the execution of an MOA may resolve the adverse effects under the NHPA, but there would still be unavoidable impacts under NEPA, such as those associated with eligibility testing, data recovery, and long-term inundation by the new reservoir. As a result, while some adverse effects can be reduced with implementation of standard BMPs and relevant mitigation measures incorporated into the MOA, adverse residual impacts would remain after mitigation.

3.6.3 Cumulative Impacts

A number of the potential future actions identified in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), including proposed recreational facilities at the Miner Flat reservoir, the Hon-Dah Resort expansion, construction of WMAT housing, timber harvests, and road improvements, would involve ground disturbance that could adversely affect known and unrecorded cultural resources, including historic properties.

As discussed in **Section 3.6.2** (*Environmental Consequences*), construction of the WMAT rural water system would result in adverse effects to historic properties. Six historic properties, including one traditional cultural property, would be adversely affected because they are located within the area that would be flooded by the new reservoir, and rising waters and long-term inundation could damage or destroy the sites. One of these sites is also located within a dam construction area and may be affected by construction-related ground disturbance. Even though data recovery measures would be used to mitigate adverse effects to properties within the reservoir area, where feasible, effects would remain unavoidable. Any activities that involve ground/soil disturbance would also have the potential to damage buried and previously unrecorded resources. Reclamation is currently consulting on a draft MOA, following 36 CFR 800.6, which includes measures to avoid, minimize, or mitigate adverse effects on historic properties.

Because the number of cultural resources is finite, limited, and non-renewable, any assessment of cumulative impacts must take into consideration the impacts of the proposed action on the resources within the general region, the extent to which those impacts degrade the integrity of the region's resource base, and impacts other projects may have on the regional resource base. If these impacts, taken together, result in a collective degradation of the resource base, then those impacts would be cumulatively significant. For cultural resources, the geographic extent of cumulative impacts encompasses a relatively broad area because the importance of any individual resource can only be judged in terms of its regional context and relationship to other resources of a similar nature.

The level of impacts, and effectiveness of possible mitigation measures, for the future action projects is not fully understood as many of the projects are in the planning stage and/or environmental documents are still pending completion. However, any project on the Reservation would comply with applicable and mandated Federal and Tribal legal requirements as well as those outlined in the *White Mountain Apache Cultural Heritage Resource - Best Management Practices* (WMAT 2004). These BMPs state that, except in circumstances involving the compelling interests of the

WMAT and an absence of reasonable alternatives, cultural heritage resources shall be fully avoided and preserved in their pre-project condition, without any project-related damage or other adverse effects. Therefore, collective degradation of the resource base, at least on the Reservation, is not expected to result in cumulatively significant adverse impacts on cultural resources.

3.7 Indian Trust Assets

ITAs are legal interests in property and other assets held in trust by the United States for the benefit of federally recognized Indian Tribes or individual Tribal members. The Department of the Interior defines ITAs as "lands, natural resources, money, or other assets held by the Federal Government in trust or that are restricted against alienation for Indian Tribes and individual Indians (303 Departmental Manual 2.5C)." ITAs can include trust lands, natural resources, minerals, federally reserved water rights, federally reserved hunting and fishing rights, or other assets held by the Federal Government in trust. The United States, as trustee, protects and maintains the specific rights reserved by, or granted to, Indian Tribes or individuals by treaties, statutes, and EOs. This trust responsibility requires that all Federal agencies ensure their actions protect ITAs. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. The following section covers ITAs and other Tribal interests (e.g., cultural heritage resources). The area of analysis centers on the ITAs held in trust for the benefit of the WMAT.

3.7.1 Affected Environment

Trust Lands

The lands of the Reservation are held in trust by the United States for the benefit of the WMAT. The WMAT has an unbroken chain of aboriginal title to their reservation land. The Reservation was established by President Ulysses S. Grant within the aboriginal territory of the WMAT on November 9, 1871. The WMAT has full beneficial title, with bare legal title[27] held by the United States, to 1.66 million acres of trust land. This includes a small amount of off-Reservation lands (less than 100 acres).

Water Rights

Water rights associated with the Reservation are held in trust by the United States for the benefit of the WMAT and are not subject to abandonment, forfeiture, or loss for non-use. The WMAT made the decision as a Tribal sovereign government recognized by the United States to quantify their water rights in the 2009 WMAT Water Rights Quantification Agreement, which was subsequently confirmed by the U.S. Congress in the Quantification Act (Public Law 11-291). The WMAT Water Rights Quantification Agreement and the Quantification Act recognize and entitle the WMAT to a November 9, 1871-reserved water right priority date associated with the establishment of the Reservation and a priority date of November 4, 1985, for the off-Reservation trust lands. A water

[27] A *bare legal title* is having a title to a property without the typical rights associated with full property ownership. For example, when a trustee (the United States) holds the legal title to a property, the law recognizes that the beneficiaries (the WMAT) are the ones who truly exercise the ownership rights.

right granted to a Tribe under the Winters doctrine[28] is given a priority date no later than the time when the reservation was established. Unlike water rights permitted, licensed, or adjudicated under State statutes, such rights under the Winters doctrine cannot be lost through non-use.

Specifically, the WMAT Water Rights Quantification Agreement states that the WMAT has an 1871-reserved water right to divert up to 74,000 afy with a 27,000 afy depletion. The WMAT currently uses less than a third of this amount. The WMAT Water Rights Quantification Agreement also includes the right to divert up to an additional 25,000 afy of Salt River system water through a CAP exchange (25,000 afy depletion) and allows the WMAT the option to lease the CAP water to existing downstream cities and users. Taken together, the WMAT has a total diversion right of 99,000 afy with a total depletion right of 52,000 afy.

Other Tribal Interests

The WMAT includes everything linked to or produced by their ancestors as cultural heritage resources, such as all history, customs, traditions, ceremonies, beliefs, stories, songs, language, arts, crafts, artifacts, sacred objects, funerary objects, archaeological and human remains, as well as every plant, animal, mineral, spring, stream, artifact, structure, fossil, landform, cave, and viewscape (Laluk and Altaha 2013). The WMAT considers cultural heritage resources to include both tangible and intangible resources, such as grave sites, sacred sites, and medical plant gathering areas (Riley 2015). Several areas within the project area were identified as cultural heritage resources because of their tie to Apache worldviews (Riley 2015), but the specific nature of these heritage resources is considered confidential information by the WMAT.

3.7.2 Environmental Consequences

The U.S. Department of the Interior requires that all impacts to trust assets be analyzed in NEPA documentation, as stated in Secretarial Order 3175 (*Departmental Responsibilities for Indian Trust Resources*) and 512 Department of the Interior Manual, Chapter 2 (*Departmental Responsibilities for Indian Trust Resources*). Consistent with this, Reclamation's ITA policy and NEPA handbook state that it will carry out its activities in a manner that protects ITAs and avoids adverse impacts, when possible, or provides appropriate mitigation or compensation when avoidance is not possible (Reclamation 2012). When impacts are identified, Reclamation must consult with the recognized Tribal government having jurisdiction over the affected ITAs, the BIA, and the Department of the Interior Office of the Solicitor.

No Action Alternative

Under the No Action Alternative, there would be no new construction of facilities associated with the WMAT rural water system on trust lands requiring easements, ROWs, construction activities, or future operations, and therefore there would be no change to trust lands, water rights, or other Tribal interests. However, without construction of the rural water system, the WMAT would not be able to fully benefit from their 1871-reserved water rights or use of their trust lands due to a lack of infrastructure needed to divert, store, and distribute water from the NFWR over and above current diversions.

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[28] The Winters doctrine refers to a water rights doctrine derived from the Supreme Court opinion in *Winters versus the United States*, 207 U.S. 564 (1908), which addressed water rights on American Indian reservations.

Alternative A

Trust Lands and Associated Assets. While construction-related activities would result in adverse impacts to trust assets related to natural and cultural resources, as described in **Section 3.2** (*Water Resources and Hydrology*), **Section 3.3** (*Geology and Soils*), **Section 3.4** (*Biological Resources*), and **Section 3.6** (*Cultural Resources*), operation of the proposed rural water system would be a major beneficial use of trust lands. All proposed project lands and ROWs would continue to be held in trust by the United States for the benefit of the WMAT. Construction of the project components and creation of the reservoir would result in permanent changes in the use of the trust lands, although there would be no permanent change in land ownership or entitlements. While Reclamation operates the completed rural water system, the system infrastructure would be considered a trust asset. Title to the facilities would be subsequently transferred to the WMAT per the Quantification Act. Once operational, the new rural water system would accommodate current water usage and projected future demand, providing a long-term, major beneficial effect for the WMAT. Additionally, the new Miner Flat Dam would allow for the diversion of a reliable and consistent supply of irrigation water to support beneficial agricultural activities within up to 885 acres of trust lands in the Canyon Day area (see **Section 3.11**, *Socioeconomics*).

Water Rights. No adverse impacts on WMAT water rights are anticipated under Alternative A, and operation of the proposed rural water system would allow the WMAT access to some of their 1871-reserved water rights, which would be a major beneficial effect. The proposed rural water system, along with continued use of the Miner Flat Wellfield, would accommodate the water diversion of up to 7,602 afy, with a depletion of 3,030 afy, from the NFWR. This water would be used for municipal, rural, and industrial use for the greater Whiteriver area, Carrizo, and Cibecue to meet current and future water demands. The consumptive use of 3,030 afy represents less than 6 percent of the WMAT's 1871-reserved water right under the WMAT Water Rights Quantification Agreement. Additionally, Alternative A would include up to 2,843 afy and 2,491 afy for diversion and depletion, respectively, for Canyon Day farming. The consumptive use of 2,491 afy represents about 9 percent of the WMAT's 1871-reserved water right. Given the WMAT currently uses less than a third of their 1871-reserved water rights, the total water use under Alternative A falls well within the diversion and depletion quantities associated with their 1871-reserved water rights.

Other Tribal Interests. There would be adverse impacts on cultural heritage resources under Alternative A. In general, the permanent changes to trust lands due to construction of new facilities would not result in net loss, depletion, or waste of assets, property, or property rights. Most of the anticipated surface disturbance would be short term and construction related. Once construction is completed, any temporary disturbance areas would be revegetated or restored to previous conditions. However, long-term disturbance from construction of the rural water system, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect cultural heritage resources within the project area, such as plant and animal habitat and archaeological sites. Implementation of BMPs and project mitigation measures provided in **Section 3.2** (*Water Resources and Hydrology*), **Section 3.3** (*Geology and Soils*), **Section 3.4** (*Biological Resources*), and **Section 3.6** (*Cultural Resources*) would avoid or minimize impacts to some heritage resources, where possible. These measures were developed in coordination with WMAT's Cultural and Natural Resources Departments.

Residual Impacts. Implementation of Alternative A would result in major beneficial effects on ITAs because it would provide a new use of trust lands and better utilization of 1871-reserved water rights, both of which would be for the benefit of the WMAT. Construction of the rural water system and creation of a new reservoir would change the landscape and adversely affect cultural heritage resources within the project area. With implementation of the BMPs outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, adverse residual impacts on cultural heritage resources would be minimized where possible.

Alternative B

Alternative B would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Similar to Alternative A, implementation of Alternative B would result in major beneficial effects on ITAs because it would provide a new use of trust lands and better utilization of 1871-reserved water rights, both of which would be for the benefit of the WMAT. Construction of the rural water system, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect cultural heritage resources within the project area. With implementation of the BMPs outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, adverse residual impacts on cultural heritage resources would be minimized where possible.

Alternative C

Alternative C would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Unlike Alternatives A or B, Alternative C would include up to 9,637 afy and 8,444 afy for diversion and depletion, respectively, to support up to 3,000 acres of Canyon Day farming. This would result in a greater beneficial use of trust land and water rights for the WMAT than under Alternatives A or B. The consumptive use of 8,444 afy represents about 31 percent of the WMAT's 1871-reserved water right. Given that the WMAT currently uses less than a third of their 1871-reserved water rights, the total water use under Alternative C falls well within the diversion and depletion quantities associated with their 1871-reserved water rights. Similar to the other alternatives, implementation of Alternative C would result in major beneficial effects on ITAs because it would provide a new use of trust lands and better utilization of 1871-reserved water rights, both of which would be for the benefit of the WMAT. Construction of the rural water system, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect cultural heritage resources within the project area. With implementation of the BMPs outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, adverse residual impacts on cultural heritage resources would be minimized where possible.

Alternative D

Alternative D would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Similar to Alternative C, Alternative D would include up to 9,637 afy and 8,444 afy for diversion and depletion, respectively, to support up to 3,000 acres of Canyon Day farming. This would result in a greater beneficial use of trust land and water rights for the WMAT than under Alternatives A or B. Similar to the other alternatives, implementation of Alternative D would result in major beneficial effects on ITAs because it would provide a new use of trust lands and better utilization of 1871-reserved water rights, both of which would be for the benefit of the WMAT. Construction of the rural water system, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect cultural heritage resources within the project area. Rural water system operations under Alternative D would not prioritize preservation of minimum instream flows downstream of the Miner Flat Dam, and this would lead to additional adverse impacts to vegetation communities, wildlife, native fishes and aquatic habitats, wetlands, and sensitive species compared to the other alternatives, as described in **Section 3.4** (*Biological Resources*). With implementation of the BMPs outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, adverse residual impacts on cultural heritage resources would be minimized where possible.

3.7.3 Cumulative Impacts

The majority of the potential future actions identified in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*) would occur on the Reservation. Future projects on the Reservation that involve construction or ground disturbance could change the landscape and adversely affect natural and cultural trust assets and cultural heritage resources on the Reservation, similar to the proposed action. However, foreseeable projects on the Reservation are not expected to result in a permanent change in land ownership or entitlements nor would they affect WMAT water rights. Most of the foreseeable projects off the Reservation (e.g., on adjacent national forest lands) would not affect the WMAT's trust lands, water rights, or other Tribal interests. The San Carlos Apache Tribe Distribution System project would affect streamflows on the Black and Salt Rivers and is discussed further below.

As discussed in **Section 3.7.2** (*Environmental Consequences*), the proposed action would result in major beneficial effects on WMAT ITAs because it would provide a new use of trust lands and better utilization of the WMAT's 1871-reserved water rights. Long-term disturbance from construction of the rural water system, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect natural and cultural trust assets and cultural heritage resources on the Reservation. With implementation of BMPs and project mitigation measures, adverse impacts would be minimized where possible but not fully avoided. The same would likely be true for the other foreseeable projects on the Reservation.

The San Carlos Apache Tribe Distribution System Project would include continuance of past and present diversions from the Black River and expanded and increased diversions from the Black and Salt Rivers in accordance with Federal statute and agreements among affected parties. The proposed action would not affect Indian water rights or access to water resources associated with the Black River. However, water diversions associated with the WMAT rural water system could affect flows in the Salt River, downstream from the confluence of the White and Black Rivers. In general, these potential changes to the Salt River can be characterized as increased flows during low-flow conditions (e.g., prolonged drought) and somewhat reduced flows during median and high-flow conditions. These changes would not prevent or impinge on the WMAT or San Carlos water rights. Therefore, ongoing and reasonably foreseeable future actions in combination with the WMAT rural water system would not result in significant cumulative adverse impacts on trust lands, water rights, or other Tribal interests.

3.8 Energy and Public Utilities

Energy and public utilities are basic services available to users within serviced areas. These services are dependent on public (and in some cases, private) infrastructure and delivery systems to distribute services to businesses, industries, community facilities, and residences. Utility infrastructures have inherent capacities to serve a population or geographic service area. The following section covers potable water, wastewater, solid waste, and energy (electricity and propane). The area of analysis centers on the energy and public utilities that would service or otherwise be affected by the proposed action.

3.8.1 Affected Environment

Potable Water

The Tribal Water Quality Program has overall responsibility for ensuring that waters within the Reservation are in compliance with Federal and Tribal regulations to protect water quality for present and future generations. As described more fully in **Section 2.3** (*Existing White Mountain Apache Tribe Water Systems*), communities on the Reservation are currently served by a mixture of centralized water systems and localized public water systems. The communities around Whiteriver use a centralized water system that is served by the Miner Flat Wellfield (groundwater) and the water treatment plant. The water treatment plant draws surface water from the NFWR just north of the community of Whiteriver via the North Fork diversion dam and intake structure. Pipelines provide water service from these two primary sources of water to the communities of Whiteriver, Fort Apache, Canyon Day, and Cedar Creek. The communities of Carrizo and Cibecue are currently served by local groundwater wells that extract water from the underlying aquifers, some of which have existing water quality issues (e.g., high levels of manganese bacteria and sulfate for Carrizo communities) (Morrison-Maierle 2015, Lacher 2014).

Section 2.3.4 (*Past and Projected Domestic Water Demand*) and **Table 2.3-1** provide more information about past and projected water demands on the Reservation. Existing systems fall short of meeting 2019 average daily demand and maximum daily demand for the greater Whiteriver area, resulting in shortfalls for some communities especially during peak times and during drought years.

Wastewater and Sewer System

Five wastewater treatment facilities are located on the Reservation that treat water in lagoon systems. The systems in Cibecue, Cedar Creek, and Carrizo do not discharge water after treatment (Dehose 2014). The systems in Hon-dah and Whiteriver discharge treated water under NPDES permits. The Hon-dah system (NPDES Permit No. AZ0024589) is above Miner Flat and discharges into Bootleg Lake that flows into Carrizo Creek, outside the proposed study area. The Whiteriver system (NPDES Permit No. AZ0024058) discharges to the White River, as described below.

The Whiteriver regional sewer system collects wastewater from the communities of Diamond Creek, Whiteriver, Seven Mile, Fort Apache Junction, and Canyon Day. This sewer system consists of 30 miles of 6- to 18-inch sewer mains and two lift stations (IHS 2005). Wastewater collected from the greater Whiteriver area is treated at the Whiteriver Wastewater Lagoons, a 95-acre lagoon system located west of the community of Canyon Day. The facility uses a series of facultative ponds to produce effluent that is roughly equivalent to secondary treatment standards (USEPA Region IX 2021). The effluent is then released to the White River at Outfall 001, an unnamed wash immediately downstream from the irrigation diversions near Canyon Day. The facility has been operating as a continuous flow-through system to the White River, although treated effluent had been reused to irrigate adjacent fields in the past (USEPA Region IX 2016). The facility has a design flow of 0.7 mgd. Last year, the annual average flow rate was approximately 0.6 mgd, with a maximum daily flow rate of 1.04 mgd (USEPA Region IX 2021). The IHS and WMAT are working on a planning study, in conjunction with a separate hospital project, that will assess the existing capacity of the Whiteriver Wastewater Lagoons and make recommendations regarding suggested upgrades (see *Cumulative Impacts* below).

Cibecue, Cedar Creek, and Carrizo have their own community-based sewer systems consisting of 8- to 12-inch sewer mains and retention ponds/lagoons. In addition, about 20 percent of homes in the greater Whiteriver area and those in lower Carrizo use septic tanks and leach fields for wastewater treatment and disposal. These homes are far from or lower in elevation than existing sewer mains (IHS 2005).

Solid Waste

The Tribal Solid Waste Department manages the Tribal Geronimo Pass Landfill and solid waste pickup services, which include residential and commercial use, dumpsters, and roll-off services. The department works closely with the Environmental Protection Office to address recycling, illegal dumping, and keeping the landfill in compliance with Federal landfill regulations. The Environmental Protection Office's Waste Regulatory Program encourages recycling paper and plastics, informs WMAT members on proper disposal of hazardous materials and e-waste, and holds regular hazardous waste collection events.

The Geronimo Pass Landfill, opened in 1995, is located on South Chief Avenue (SR 73), about 10 miles west of Canyon Day, and has four full-time staff (Brooks 2014). The landfill is open Monday through Thursday from 7:00 AM to 3:30 PM and accepts garbage, agricultural waste, and appliances. The landfill covers about 16 square acres and currently has two operating cells measuring about 4 square acres each. The landfill has sufficient capacity to remain operable for another 10 years, and the WMAT is currently working with the IHS on plans for expansion (Pailzote 2021). Daily traffic is about two trucks of residential trash, one front-end loader truck from commercial facilities, and two roll-off bin deliveries. The landfill does not accept hazardous waste, automotive batteries, used oil and solvents, fluorescent light bulbs, or needles. All recyclables are hauled to a facility in Pinetop (Brooks 2014). The original municipal landfill, located in Canyon Day, was closed and reclaimed about 20 years ago (Brooks 2014), and a secondary facility (Stago Road Pit) that collected timber, clippings, and other debris was closed in 2021.

Other facilities are located on the Reservation that process solid materials and wood. For example, Canyon Day has an aggregate and materials facility, located on Farm Road, where sand and gravel and other materials are crushed, processed, and sold (Brooks 2014).

Energy

Reservation energy needs are met by electricity and propane tanks (Dehose 2014). Electricity is supplied to the Reservation through power lines operated by NEC (Morrison-Maierle 2015). NEC is an electric cooperative serving over 43,000 meters in communities throughout the White Mountains of Arizona and into western New Mexico (NEC 2021). Outside the greater Whiteriver area, the electrical facilities currently only support single-phase power (120 volt). There are no underground natural gas service lines on the Reservation, so propane tanks are used for residences and commercial facilities (Dehose 2014).

3.8.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no change to existing energy and public utility use. The WMAT would continue to have inadequate water supplies, and water quality would continue to be poor in some communities. As discussed in **Section 2.3.4** (*Past and Projected Domestic Water*

Demand), existing systems meet 2019 average daily demand for the greater Whiteriver area but not the maximum daily demand, resulting in shortfalls for some communities during some peak times and during drought years. Additionally, existing water systems would not be able to meet projected average daily water demand or maximum daily demand for the future design population at the Reservation. This would result in a detrimental effect on future population growth and health of the communities and would adversely affect opportunities for agricultural expansion.

Alternative A

Potable Water. During construction, there would be minor disruptions in water distribution on the Reservation, as described in **Chapter 2** (*Description of the Proposed Action and Alternatives*). The WMAT would use alternative methods for serving affected communities during these temporary periods. This may include trucking in water to affected areas, relying more heavily on water from the Miner Flat Wellfield for short periods of time, and trying to schedule water disruptions in the winter months when water demands are low. Effects from water disruptions would be minimized by implementation of public notifications outlined under *Energy and Public Utilities* in **Appendix A.2** (*Best Management Practices*) to alert people ahead of planned disruptions. Once operational, the new water supply system would be able to keep up with the demands of current potable water usage and projected future demand, providing a long-term, major beneficial effect to the WMAT. The new water supply system would be managed in compliance with applicable Federal and Tribal regulations, such as the Safe Drinking Water Act. This includes complying with the WMAT Environmental Code water quality standards, which require a higher finished water quality than Federal regulations for disinfection byproducts and other constituents (Carollo 2014c).

There may be minor operational issues with mixing the Miner Flat Wellfield groundwater with the White River surface water at the expanded water treatment plant if the two systems use different means of disinfection (Morrison-Maierle 2015). For example, the Miner Flat Wellfield water is currently disinfected with chlorine, while the expanded water treatment plant may add chloramines (chlorine plus ammonia) to minimize disinfection byproduct formation. To minimize potential operational issues with mixing two sources of water with different chemistry, groundwater would be isolated from surface water until appropriate flushing and monitoring procedures are in place, as outlined under *Energy and Public Utilities* in **Appendix A.2** (*Best Management Practices*).

Future Canyon Day farming activities under Alternative A is expected to have negligible impacts on potable water because potable water would not be used for irrigation. As discussed under **Section 3.2** (*Water Resources and Hydrology*), diverting water from the White River for irrigation would not adversely impact the supply of DCMI water for the current or future design WMAT populations.

Wastewater and Sewer System. Short-term construction-related impacts on existing wastewater and sewer system facilities would be minor. During construction, it is estimated that up to 200 construction workers would temporarily live on or near the Reservation. Each job site would have portable toilets and trailers. Because the Whiteriver Wastewater Lagoons serve a population of about 12,000 people (USEPA Region IX 2021), this additional sewage would not cause a noticeable increase to the demands on the wastewater treatment facility. During operations, discharge of neutralized waste (e.g., neutralized cleaning solutions) and brine waste from the expanded water treatment plant may negatively impact sewage treatment at the Whiteriver Wastewater Lagoons. However, preliminary results indicate that the effects of the neutralized waste and brine waste on the pond effluent quality would be minor (Carollo 2014c, Ardizzone 2021). To minimize adverse effects, procedures at the water treatment plant would follow best practices for waste disposal, as outlined under *Energy and Public Utilities* and *Hazardous Materials and Waste* in **Appendix A.2** (*Best Management Practices*). As noted above, the Whiteriver Wastewater Lagoons are currently running near capacity. However, the WMAT is working with the IHS on plans to assess the existing capacity of the Whiteriver Wastewater Lagoons and make recommendations regarding suggested upgrades (see **Section 3.8.3**, *Cumulative Impacts* below).

As noted above, Cibecue, Cedar Creek, and Carrizo have their own community-based sewer systems that adequately serve existing population levels. As population levels and associated water use grow, the WMAT and IHS would evaluate capacity issues and determine the need to enlarge or upgrade existing facilities, but these types of enlargements are not currently in the planning stages (see **Section 3.8.3**, *Cumulative Impacts*, below).

Regarding future Canyon Day farming activities under Alternative A, it is currently unknown whether or not treated wastewater from the Whiteriver Wastewater Lagoons would be used to irrigate forage crops (i.e., those not grown for human consumption). If so, the WMAT would follow all "land application" requirements for growing a crop or other vegetation as directed in the Whiteriver Wastewater Lagoons NPDES permit (USEPA Region IX 2021).

Solid Waste. Short-term construction-related impacts on existing solid waste facilities would be moderate. As described in **Appendix A.1** (*Additional Project Details*), waste materials from construction of the rural water system would primarily consist of byproducts from vegetation and site clearing. Construction debris disposal would be in compliance with the Tribal Solid Waste Ordinance, which prohibits dumping construction debris on the Reservation other than at a Tribal-authorized disposal unit. Merchantable timber would be removed and sold. Remaining timber debris, other waste material, and demolition debris not suitable for recycling would be hauled to a landfill on the Reservation (e.g., the Geronimo Pass Landfill) for disposal. Depending on the type of waste and how the construction schedules for the different project components overlap, there would be an increase in daily truck trips for hauling waste and debris to the Geronimo Pass Landfill compared to current usage. As noted above, the landfill has sufficient capacity to remain operable for another 10 years, although the addition of solid waste from the rural water system may decrease the number of operatable years left in the system. However, the WMAT is currently working with the IHS on plans for expansion of the Geronimo Pass Landfill (see *Cumulative Impacts* below).

During operation of the expanded water treatment plant, additional sludge from the sedimentation basins and backwash ponds would be disposed of periodically at a landfill on the Reservation, similar to existing practices. To minimize adverse effects, operators of the water treatment plant would coordinate with the Tribal Solid Waste Department for scheduling and capacity issues for disposal of the annual load of solids removed from the expanded water treatment plant basins and ponds, as outlined under *Energy and Public Utilities* in **Appendix A.2** (*Best Management Practices*).

There would also be an unknown quantity of solid waste from construction activities and operations associated with future Canyon Day farming, but these are expected to be accounted for when planning for future expansion of the Geronimo Pass Landfill.

Energy. Short-term construction-related impacts on the electrical system would be minimal. During construction, contractors would rely on diesel generators (5 kilowatts to 1,000 kilowatts) for the power needed to operate the crushing and batch plant operations, office and shop facilities, lighting, and dewatering operations, along with backup generators where needed. There may be minor outages in electrical service to nearby communities while new electrical lines are installed and connected, but all outages would be planned in advance. Effects from electrical disruptions would be minimized by implementation of public notifications outlined under *Energy and Public Utilities* in **Appendix A.2** (*Best Management Practices*) to alert people ahead of planned outages.

Long-term impacts on the electrical network and energy usage would be minimal due to planned electrical upgrades incorporated into the project design. Construction design addressed additional electrical power transmission and distribution facilities needed for operation of the project components, as described in **Chapter 2** (*Description of the Proposed Action and Alternatives*). For example, the design of the dam includes construction of a short power line to connect the dam facilities to an existing power line located approximately 1,000 feet west of the project site. Additionally, the project design includes construction of power poles and overhead 3-phase 490-volt power lines from the greater Whiteriver area to Cedar Creek running parallel to the proposed water distribution pipeline along SR 73 to provide the necessary electrical services to the new Cedar Creek Pump Station (Morrison-Maierle 2015). These improvements and standard utility connections would minimize strain on the existing electrical system and ensure that all project components receive the necessary electrical services for operations.

It is expected that planning efforts for future Canyon Day farming would account for all energy requirements and would incorporate any needed electrical upgrades into the project design.

Residual Impacts. Implementation of Alternative A would result in a long-term, major beneficial effect by providing a reliable and sustainable good-quality water supply to WMAT residents and businesses. With implementation of the measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts associated with energy and public utilities from construction and operation of the new rural water system under Alternative A, and no mitigation measures are required.

Alternatives B, C, and D

For energy and public utilities, Alternatives B, C, and D would include the same construction and operational issues related to the rural water system as Alternative A; therefore, there would be no differences in impacts. Alternatives C and D would include up to 3,000 acres of farming in Canyon Day, which could mean an increase in solid waste and energy use compared to the other action alternatives. Implementation of Alternatives B, C, or D would result in a long-term, major beneficial effect by providing a reliable and sustainable good-quality water supply to WMAT residents and businesses. With implementation of the measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts associated with energy and public utilities from construction and operation of the new rural water system, and no mitigation measures are required.

3.8.3 Cumulative Impacts

Several of the potential future actions identified in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), including the Hon-Dah Resort expansion, WMAT housing, Whiteriver Unified School District High School, and other development projects, would require energy resources and/or public utilities. The WMAT is also considering projects that would add capacity to existing systems, such as the Miner Flat Dam Hydropower Generation Project (generate electricity), the Geronimo Pass Landfill Expansion (increase capacity for solid waste disposal), and the Whiteriver Wastewater Lagoons study (evaluate wastewater system capacity). As population grows on the

Reservation, the WMAT would also continue to evaluate utility capacities and work to upgrade systems, as needed.

As discussed in **Section 3.8.2** (*Environmental Consequences*), construction of the proposed action could result in short-term disruptions to and/or increased demand for some utilities, such as energy and water distribution. However, none of these short-term disruptions would result in adverse long-term impacts to energy and public utilities. In contrast, the proposed action would provide major long-term improvements to the current WMAT water distribution system that would result in a reliable and sustainable supply of domestic water for residents and businesses, including those associated with the future actions like housing developments.

The ongoing and reasonably foreseeable future actions in combination with the construction and operation of the new rural water system would not result in significant cumulative adverse impacts on energy and public utilities. On the contrary, if all these projects were implemented, there would be potential long-term benefits in water supply, electrical generation, solid waste disposal, and wastewater capacity on the Reservation.

3.9 Transportation

Transportation infrastructure includes the public roadway network, public transportation systems, airports, railroads, pedestrian/bicycle facilities, and other transportation required for the movement of people, materials, and goods. For the proposed action, the area of analysis centers on the public roadways that pass through the Reservation and provide access to the various communities located on the Reservation.

3.9.1 Affected Environment

Roadway Classifications and Traffic Metrics

Roadways are typically assigned a functional classification by State departments of transportation. The three main functional classifications include arterial, collector, and local. Arterial roadways provide a network of continuous routes that typically accommodate long trips and heavy traffic demand (i.e., high traffic volumes) and primarily serve interregional travel. Arterials can be further divided into principal arterial and minor arterial categories. Principal arterials are major highways of regional and statewide significance intended to serve large amounts of traffic traveling relatively long distances at higher speeds. These routes have the highest mobility and lowest level of land access compared to the other functional classifications. Minor arterials interconnect with and augment the principal arterial system by distributing traffic to smaller geographic areas, providing service between and within communities.

Collector roadways serve a dual purpose, whereby they provide a large amount of relatively long-distance travel and also provide more frequent access to abutting properties. Basically, they link arterials and local roads and perform some of the duties of each. Collector roadways are usually divided into major collector or minor collector categories. Major collector routes are longer in length and have higher speed limits and higher annual average traffic volumes than minor collector roadways. Local roadways provide access to homes, businesses, and other properties.

Traffic is commonly measured through average daily traffic and design capacity. These two measures are used to assign a roadway with a corresponding level of service (LOS). The LOS designation is a professional industry standard used to describe the operating conditions of a roadway segment or intersection (Transportation Research Board 2010). The LOS is defined on a scale of A to F that describes the range of operating conditions on a particular type of roadway facility.[29] In addition, this analysis uses Annual Average Daily Traffic (AADT) for the potentially affected roadways, which is a simple measurement of the level of demand for a roadway in terms of total trips per day averaged over a year.

Affected Roadways

The major roads and highways that would potentially be affected by the proposed action include Arizona SR 73, U.S. Highway 60, and BIA Road 12 (see **Figure 1.1-2**).

SR 73 (Chief Road). This State route is a 46.8-mile-long highway that begins at the junction with SR 260 just west of McNary and ends at the junction with U.S. Highway 60. The ADOT classifies SR 73 as a minor arterial from the SR 260 junction to the Gila County line, at which point the classification changes to major collector (ADOT 2021). For most of its length, SR 73 is a two-lane highway with short sections of passing and turning lanes; however, within the community of Whiteriver, there is a 5-lane section with a continuous turn lane. Most intersections along SR 73 are stop-controlled on the side streets and uninterrupted flow on the mainline, which has a posted speed limit of 35 miles per hour. There are sidewalks along some sections of SR 73, along with some marked pedestrian crosswalks at intersections and at mid-block locations away from intersections. There are signalized intersections at SR 73 and East Fork Road, East Fatco Road, and SR 260. The SR 73 AADT volume estimate for 2018 varies from a low of 1,777 vehicles per day for the sections between Cedar Creek and the U.S. Highway 60 junction to a high of 12,124 vehicles per day between the Whiteriver Hospital entrance and BIA Road 55, also known as East Fatco Road (ADOT 2018a). The segments of interest for SR 73 currently run at LOS B and C.

U.S. Highway 60. This highway runs from Interstate 25 in Socorro, New Mexico, to Interstate 10 near Phoenix, Arizona. Within the project area, U.S. Highway 60 is classified as a minor arterial from Show Low to just south of the junction with BIA Road 12 (ADOT 2021). Within this section, U.S. Highway 60 is a two-lane highway for the entire length except for short sections where there are passing and turning lanes. The 2018 AADT for U.S. Highway 60 in the vicinity of the junction with SR 73 is 3,053 vehicles per day (ADOT 2018b). The segment of interest for U.S. Highway 60 currently runs at LOS B.

BIA Road 12. Within the project area, BIA Road 12 is a two-lane paved road classified as a major collector that runs from its junction with U.S. Highway 60 to the community of Cibecue (ADOT 2021). The AADT measurement and LOS designation are not available for BIA Road 12.

Indian Routes 62 and 77. Two additional routes, Indian Route 62 and Indian Route 67, are unpaved roadways that carry primarily logging truck traffic. Indian Route 62 includes a concrete structure over the NFWR that connects the unpaved sections on either side of the bridge.

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[29] LOS A through LOS B indicate free flow travel. LOS C indicates stable traffic flow. LOS D indicates the beginning of traffic congestion. LOS E indicates the nearing of traffic breakdown conditions. LOS F indicates stop-and-go traffic conditions and represents unacceptable congestion and delay.

Several local roads and streets near specific construction areas also have the potential to be affected by the proposed action. These roads are maintained by the BIA Fort Apache Agency Road Office, which works closely with the WMAT on transportation issues (Federal Highway Association 2021).

3.9.2 Environmental Consequences

Transportation impacts may come from physical changes to circulation (closing, rerouting, or establishing roads), construction-related traffic delays, and changes in daily or peak hour traffic volumes. For roadways that currently operate at a baseline LOS C or better, such as the SR 73 and U.S. Highway 60 roadway segments discussed below, the ADOT Traffic Impact Guidelines (ADOT 2015) require the project to mitigate, if needed, any traffic impacts so that the roadway remains at LOS C or better.

No Action Alternative

Under the No Action Alternative, there would be no change to the existing transportation network on the Reservation; no construction activity would occur, and no trips would be added to the network. The local transportation network would likely experience greater demand in future years through ambient growth in the region.

Alternative A

Changes in traffic from project operations and maintenance activities would be negligible and would primarily include daily trips associated with about 12 to 15 new employees needed to operate the expanded water system. This analysis, therefore, focuses on expected transportation-related impacts during construction. Details of the construction footprints, construction activities, construction-related traffic and highway disruptions, and construction schedule and working shifts for each major project component are described in **Chapter 2** (*Description of the Proposed Action and Alternatives*) and **Appendix A.1** (*Additional Project Details*). The following analysis addresses potential traffic disruptions during construction and provides a quantitative AADT and LOS analysis of major road segments.

Traffic Disruptions. Short-term construction-related traffic disruptions would result in moderate adverse impacts on the local transportation network. There would be a short-term increase in truck and vehicle traffic over a 3- to 4-year period related to delivery of new equipment, materials, and workers to and from the various construction sites, although this increase would ebb and flow depending on construction scheduling. The greatest impact would be on SR 73, U.S. Highway 60, and BIA Road 12, although other local roads and streets on the Reservation would also experience short-term, localized impacts. The majority of the truck trips needed for the delivery of materials and construction workers would likely use SR 73 from Show Low to Whiteriver. As construction efforts for the water distribution pipeline get closer to Carrizo and Cibecue, some of the truck deliveries would likely shift to U.S. Highway 60. Trucks hauling waste to the Geronimo Pass Landfill west of Canyon Day would use SR 73.

There would be intermittent, temporary lane closures or other disruptions, especially where project components run parallel to or cross major roadways. In particular, there would be intermittent, temporary lane closures or other disruptions to SR 73 near the Miner Flat Dam construction site (**Figure 2.5-4**) and the water treatment plant (**Figure 2.5-5**), associated with dam-related subsurface treatment options, installation of a new power line, and construction of a 24-inch raw water pipeline, all of which cross SR 73. The longest SR 73 lane closure (about a month) would occur during construction of the subsurface treatments due to the need for drilling across the roadway. Other disruptions along SR 73 near the Miner Flat Dam construction site could occur during construction of temporary and permanent access roads that connect to SR 73 and use of nearby staging areas on either side of SR 73 (**Figure 2.5-4**). There would be short disruptions to Alchesay Fish Hatchery Road, which is the only access road to the Alchesay hatchery and land belonging to other property owners, during installation of a 24-inch raw water pipeline that crosses the road to connect to the new raw water pump station (**Figure 2.5-5** and **Figure 2.5-6**). There also would be lane closures, temporary rerouting, and other disruptions along SR 73, BIA Road 12, U.S. Highway 60, and various residential and local streets during construction of the 50-mile-long water distribution system (**Figure 2.5-8** through **Figure 2.5-11**), but these disruptions would be localized to the area of active pipeline construction. The project would also include construction of a mile-long access road that would connect to an existing logging road off of Indian Route 62 (**Figure 2.5-4**) to facilitate access to both sides of the dam. Finally, the project would realign an approximately 1,700-foot portion of Indian Route 62 (Lower Log Road) and Indian Route 67 that would be inundated by the new reservoir (**Figure 2.5-4**) so that the road system would be at least 10 feet above the reservoir water line to avoid long-term disruptions to local circulation.

Because the majority of construction activities would occur north of the main part of Whiteriver (i.e., dam, water diversion, and water treatment plant expansion), most local residents should experience minimal to moderate, intermittent traffic. Residents living closest to an active construction zone would experience the most impacts, including the need for periodic lower speed limits, delays from slower truck traffic, and localized lane closures for short periods of time. Full roadway closures during construction are not foreseen, and no major disruptions to traffic flow are anticipated with the implementation of the mitigation measure provided below. Traffic disruptions would diminish with distance from a construction site, and per the AADT and LOS analysis below, estimated truck trips on SR 73 and U.S. Highway 60 would only minimally affect traffic congestion of these major access routes on and off the Reservation.

The following measure would be used as mitigation to reduce and minimize short-term construction-related traffic disruptions:

- The WMAT, or the WMAT's selected contractor, shall develop traffic management and safety plans for each project component and get approval of the plans by the BIA and ADOT, as applicable, prior to the start of construction of that component. The plans may incorporate the following:
    - Specify material haul routes and construction traffic patterns that minimize local traffic impacts and account for localized traffic obstacles (e.g., cattle gates).
    - Phase construction to minimize the duration of necessary temporary lane closures and detours.
    - Provide signage to indicate the duration and dates of project activity along main roadways.
    - Provide appropriate traffic control when workers and equipment are active along a roadway.
    - Install steel plates over open trenches in inactive construction areas to maintain existing bicycle and pedestrian access after construction hours.
    - Enforce speed limits of construction vehicles on all roads.
    - Notify emergency response providers of lane closures at least 1 week prior to closures and include the location, date, time, and duration of the closure.

- Specify truck routes to ensure heavy load movements would not result in increased road repair/maintenance requirements.
- Abide by encroachment permit conditions, which should supersede conflicting provisions in the plans.

There would also be an unknown amount of potential traffic disruptions from construction activities and operations associated with future Canyon Day farming. While it is not possible to determine with certainty the potential magnitude and extent of traffic impacts, adherence to applicable Tribal, Federal, and State laws, orders, and regulations, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize potential traffic disruptions to the local and regional road network.

AADT and LOS Analysis. Short-term construction-related truck and vehicle trips would result in minimal adverse impacts on the local transportation network based on the AADT and LOS analysis. Estimated truck trips were calculated for waste hauling, deliveries, and construction worker trips to and from a construction site based on the details and assumptions provided in **Appendix A.1** (*Additional Project Details*) and **Table 3.9-1**.

Table 3.9-1. Estimated Construction-Related Daily Truck and Vehicle One-Way Trips for Each Project Component

Project Component	Duration of Activity	Waste Hauling (Truck Trips)	Construction Deliveries (Truck Trips)	Construction Worker (Vehicle Trips)
New Miner Flat Dam and Reservoir	24 months	16	220	140
North Fork Intake Structure Expansion	12 months	110		20
Water Treatment Plant Expansion	30 months	6	64	150
New Water Distribution System	24 months	2–10	30–40	80–100
Total Daily (One-Way) Trip "Worst-Case" Scenario	**36–48 months**	**Up to 466**		**Up to 410**

The proposed action would add up to 876 daily one-way trips on the network (466 truck trips and 410 worker vehicle trips), if all project components were constructed at the same time.[30] In practice, not all construction activities would occur concurrently, not all trips would occur at the same time of day, and trips would not use all of the road segments in the AADT and LOS analysis. Therefore, the estimated 876 daily one-way trips to and from the site is considered a "worst-case" scenario and actual traffic on any particular day and on any particular road segment would be less than this estimate.

Table 3.9-2 outlines the AADT and LOS for roadways in the Region of Influence (ROI) for the baseline and under the "worst-case" construction scenario. The analysis includes AADT values for three locations on SR 73 in the ROI because SR 73 would be the primary route used by haul trips and construction worker trips. SR 73 intersects Indian Route 61, which would provide an access

[30] Note these numbers are double the round-trip numbers shown in Table A.1-1 because they account for trips to and from a construction site (i.e., one round trip equates to two one-way trips).

route to the project sites east of SR 73. The *Highway Capacity Manual* (Transportation Research Board 2010) includes tables for service volumes for roadway segments based on facility type (two-lane or multi-lane). The tables provide generalized daily service volumes for these facilities, along with LOS values based on demand. As shown in **Table 3.9-2**, even under the "worst-case" construction scenario, which adds 876 daily one-way trips on all roadway segments, there would be no change to the LOS on any roadway segment, and, therefore, no mitigation measures are required to address LOS changes.

Table 3.9-2. Traffic Characteristics and Level of Service for Roadways within the Region of Influence

Roadway Segment	Description	AADT	K[1]	D[1]	Baseline LOS[2]	Proposed Action Trips Added	AADT with Proposed Action	Proposed Action LOS[2]
SR 73	5-lane segment[3] south of Indian Route 61	5,398	0.08	0.60	B	876	6,274	B
SR 73	5-lane segment[3] south of Indian Route 61 with highest volumes	12,124	0.09	0.52	B	876	13,000	B
SR 73	2-lane segment north of Indian Route 61	5,041	0.10	0.63	C	876	5,917	C
U.S. Highway 60	Segment near SR 73 intersection	3,053	0.07	0.60	B	876	3,929	B

Sources: ADOT (2018a, 2018b)

Key: AADT = Annual Average Daily Traffic; ADOT = Arizona Department of Transportation; D = Directional Distribution; K = Proportion of AADT in the Peak Hour; LOS = Level of Service; SR = State Route; U.S. = United States

[1] K and D factors are part of the LOS assessment due to their impact to the volumes used in the analysis, and these values are included in the ADOT data.

[2] LOS B indicates free flow travel; LOS C indicates stable traffic flow.

[3] A five-lane segment is a four-lane divided highway with a continuous two-way left turn lane.

Residual Impacts. With the implementation of the above mitigation measures, minimal adverse residual impacts associated with traffic and circulation would remain after mitigation.

Alternatives B, C, and D

With respect to traffic, Alternatives B, C, and D would include the same rural water system construction and operational issues on the transportation network as Alternative A; therefore, there would be no differences in impacts. Alternatives C and D would include up to 3,000 acres of farming in Canyon Day, which could mean a potential increase in traffic issues compared to the other action alternatives. With the implementation of the above mitigation measures, minimal adverse residual impacts associated with traffic and circulation would remain after mitigation.

3.9.3 Cumulative Impacts

Several of the potential future actions identified in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*), including development projects (e.g., Miner Flat Dam Recreational Facilities, Hon-Dah Resort Expansion, WMAT Housing), transportation plans and road maintenance projects (e.g., ADOT 5-Year Plan, various BIA and WMAT transportation projects, Road Safety Audit Plan, Apache-Sitgreaves Public Motorized Travel Management Plan, Tonto National Forest Travel Management), and events (e.g., WMAT Tribal Fair and Rodeo and Hon-Dah Casino Pow Wow) would potentially affect traffic and transportation resources within the Reservation.

As discussed in **Section 3.9.2** (*Environmental Consequences*), the proposed action would result in short-term construction-related traffic disruptions on the local transportation network. Disruptions would mainly be associated with intermittent, temporary lane closures and rerouting. The greatest impact would be on SR 73, U.S. Highway 60, and BIA Road 12, although other local roads and streets on the Reservation would also experience short-term, localized impacts. Traffic management and safety plans would be prepared to minimize short-term traffic disruptions from the proposed action.

Short-term construction-related traffic from the proposed action (e.g., worker trips, construction deliveries) would not affect the LOS of local roadway segments, and long-term changes in traffic from project operations and maintenance activities would be negligible. Moreover, the proposed action LOS within the ROI is identified as 'B' on three segments and 'C' on a fourth segment. This implies that the surrounding roadway system could absorb significant additional traffic before reaching near-capacity conditions.

Disruptions from the proposed action would only interact cumulatively with traffic issues from the other foreseeable projects on the Reservation if they occurred at the same time and in the same general area. Even if they overlapped, the LOS in the ROI should be able to accommodate short-term and localized increases in traffic. Additionally, the proposed transportation plans and road maintenance projects that are included as ongoing and reasonably foreseeable future actions are intended to improve the transportation system within the Reservation. These improvements would offset some of the potential adverse effects associated with future development and events. Overall, the ongoing and reasonably foreseeable future actions in combination with the construction and operation of the WMAT rural water system would not result in significant adverse cumulative impacts on transportation.

3.10 Public Health and Safety

This section provides a description of existing public health and safety conditions within the project area, as well as an evaluation of potential effects associated with constructing and operating the WMAT rural water system. Specific issues include dam safety, occupational hazards, flood safety, recreational safety, and effects on emergency services. The area of analysis includes the geographic footprint of each project component, as described in **Chapter 2** (*Description of the Proposed Action and Alternatives*), areas near the project components that are occupied by or accessible to the public, and downstream and adjacent areas susceptible to inundation during flooding events. Information on other aspects of public health and safety are addressed elsewhere in this EIS, including dust and air pollutant emissions (**Section 3.1.3**, *Resource Areas Retained and Dismissed from Further Consideration and*

Analysis in this Environmental Impact Statement, *Air Quality*); construction noise (**Section 3.1.3**, *Noise Impacts on the Human Environment*); hazardous spills (**Section 3.1.3**, *Hazardous Materials and Waste*); traffic safety (**Section 3.9**, *Transportation*); and protection of children (**Section 3.12**, *Environmental Justice*).

3.10.1 Affected Environment

Nearby Population Centers, Residences, and Schools

The project is located on the Reservation, with project components located within or near Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue. The construction site for Miner Flat Dam is in a relatively remote location away from population centers. The closest residence to the proposed dam site that is clearly visible in available aerial photography is located about 8,200 feet away. The construction sites for the proposed water diversion structure and the expansion of the water treatment plant are near populated portions of Whiteriver, with the closest residences that are clearly visible in available aerial photography located about 800 feet away. The 50-mile-long proposed water distribution system would pass through or near several populated areas as well as several more remote areas. Cradleboard Elementary School is the closest school to the proposed dam site (4.7 miles away), intake structure/pump station (2.1 miles away), and water treatment plant (1.7 miles away). Other schools are located within 1,500 feet of the proposed water distribution system.

Federal Emergency Management Agency Flood Zones

The Federal Emergency Management Agency (FEMA) identifies flood zones to support development of Flood Insurance Rate Maps and flood insurance requirements. Special flood hazard areas are subject to inundation by a flood that has a 1 percent or greater chance of being equaled or exceeded in any given year (100-year flood). Within special flood hazard areas, FEMA identifies various zones based on factors such as elevation, probable flood depth, and coastal proximity. Locations outside the special flood hazard area are considered to have low-to-moderate flood risk and are subject to inundation by a flood with a 0.2 percent or lower chance of being equaled or exceeded in any given year (500-year flood). The entire project area is designated as Zone X (minimal flood hazard), which is outside the special flood hazard area. Although flood insurance is generally not required for structures located in Zone X, there is still potential for flood risk.

Emergency Services

The White Mountain Apache Police Department has a staff of 57, which includes patrol officers, dispatchers, forest ranger, livestock officer, branding officer, and administrative staff (WMAT 2021d). The department also partners with the law enforcement division of the San Carlos Apache Tribe, Navajo Nation, Navajo County Sheriff's office, and the nearby town of Pinetop for additional support, as needed. The White Mountain Apache Fire and Rescue Department provides protection from three fire stations located in Cibecue, Whiteriver, and Hon Dah (20 miles north of Whiteriver) (WMAT 2018). The fire and rescue department responds to structure fires, vehicle fires, brush fires, motor vehicle crashes, search and rescue, hazardous incidents, medical calls, and other emergencies. The White Mountain Apache Emergency Medical Services Department is separate from the police and the fire and rescue department, and is headquartered in Whiteriver, with additional locations in Cibecue and Hon-Dah.

3.10.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, the WMAT rural water system would not be constructed, and there would be no change to public health and safety compared to existing conditions. There would be no additional safety risks from flooding, wildfires, or recreational activities, and there would be no effect on emergency services.

Alternative A

Dam Safety. Dam safety refers to impacts on public health and safety resulting from potential dam failure. Generally, there are various possible reasons for dam failure, including extreme reservoir flooding, seismic activity, embankment failure, equipment malfunction (e.g., spillways), sediment erosion at the dam's base, and deterioration of components over time. Dam failure may result in a rapid, uncontrolled release of impounded water that causes potentially catastrophic downstream flooding and associated loss of human life, damage to private property and public infrastructure, and environmental impacts.

A flood inundation study prepared in 2013 evaluated potential consequences of failure of the Miner Flat Dam under a specific scenario with respect to weather, dam material and design parameters, and breach conditions (Reclamation 2013b). The inundation area generally consists of a combination of small communities and rural landscape and wilderness area. Assuming complete dam failure at normal reservoir water elevation, modeling results indicated that flood flows could affect the communities of Whiteriver and Canyon Day, dwellings in other areas outside these communities, and various roadways. Given the maximum flood boundary associated with the modeling scenario, a total of 82 residences were calculated to be within the inundation area extending from the Alchesay National Fish Hatchery to the bridge near Fort Apache (approximately 11 linear miles) (Pailzote 2021).

In the context of generally accepted risk assessment principles, construction of the Miner Flat Dam would result in minor adverse impacts on public health and safety because the risk of dam failure is low. The probability of dam failure was not estimated in the inundation study, but such a scenario was referred to as an "unlikely event" (Reclamation 2013b). Although the risk is low, any incident could result in substantial impacts on human health and safety. Because risks related to dam placement cannot be eliminated entirely (BIA 2014, FEMA 2004), dam safety is typically evaluated in the context of risk analysis and risk management (Reclamation and USACE 2019). The BIA considers a dam to be adequately safe if it meets all essential engineering guidelines, has no confirmed safety issues, and has a risk level that is considered as low as reasonably practicable (BIA 2014).

The Miner Flat Dam would be constructed, operated, and maintained in accordance with applicable dam safety guidelines and requirements. The WMAT, in conjunction with Reclamation's Denver Technical Service Center, would be responsible for developing initial Miner Flat Dam operations, maintenance, and safety plans (see *Public Health and Safety* measures in **Appendix A.2**, *Best Management Practices*). The plans would address operating criteria, standard operating procedures, and monitoring criteria. Plan elements would be consistent with U.S. Department of Interior dam safety guidelines (Reclamation and USACE 2019, FEMA 2015, 2005, 2004) and BIA dam safety policies and requirements, including procedures and guidelines contained in the *Safety of Dams Program Handbook* (BIA 2014). The plans would also include an emergency action plan, which would identify measures to prevent dam failure and minimize downstream threats. Adherence to these measures would minimize the risk associated with construction of the Miner Flat Dam.

Occupational Hazards. Construction-related occupational hazards would be moderate and would cease once all project components are built. Health and safety risks would generally be associated with contractors and construction workers, although members of the public could also potentially enter work areas or encounter hazardous materials outside of work areas. Potential hazards would result from equipment operation, earth-moving and water diversion activities (including placement of new or upgraded diversion infrastructure to support Canyon Day farming), blasting, and use of hazardous materials.

Operation of earth-moving equipment, aggregate crushing equipment, concrete mixing equipment, drilling equipment and hydraulic hammers, bulldozers, and various types of vehicles would present potential physical impact hazards. Some project components would also involve hazards associated with work near or over water. Construction of the Miner Flat Dam would be the primary issue, but other examples of activities near water include construction of cofferdams or diversion channels, riprap placement, and pipeline construction at stream crossings.

Construction of all project components would be designed to meet or exceed requirements of the U.S. Department of Labor, the Occupational Safety and Health Administration (OSHA), and Tribal regulations for safety and protection of residents and workers. Contractors would implement safety plans in accordance with all applicable requirements, and these plans would address construction site safety and security practices such as placement of security fencing and temporary lighting around applicable construction areas (see *Public Health and Safety* measures in **Appendix A.2**, *Best Management Practices*). Several schools are located within 1,500 feet of the proposed water pipeline. The construction safety plans would address specific measures to prevent children from entering construction areas if located within 0.25 miles of a school or other area where children are present, such as signage, site monitoring, and physical barriers (see *Public Health and Safety* measures in **Appendix A.2**, *Best Management Practices*).

Blasting would be required for rock excavation during dam construction and could potentially be required during pipeline construction. Blasting operations involve placing explosive materials into a borehole and igniting the explosives. The resulting explosion fractures the surrounding rock and often projects rock fragments and other materials (called flyrock) through the air. Flyrock may be thrown beyond the expected distance. Flyrock and lack of blast area security are the primary causes of injury and death during blasting activities. To reduce the potential for injury or death due to blasting, construction contractors would implement a blasting safety plan, as per the *Public Health and Safety* measures in **Appendix A.2** (*Best Management Practices*). The plan would be prepared in accordance with all applicable requirements. In addition, contractors would obtain all required blasting permits.

Some project components would involve the use, handling, storage, and disposal of hazardous materials such as fuel, solvents, oil, and other lubricants, and construction workers could potentially be exposed to such materials. The use, storage, and disposal of hazardous materials and wastes would be conducted in accordance with a hazardous materials and waste management plan that would be developed prior to initiation of construction activities (see *Hazardous Materials and Waste* measures in **Appendix A.2**, *Best Management Practices*). Some of the measures designed to protect water quality would further limit the potential for accidental releases or exposure to hazardous materials (see **Section 3.2**, *Water Resources and Hydrology*). The safety plans and requirements identified above and in **Appendix A.2** (*Best Management Practices*) would minimize the potential for health and safety risks during construction activities.

Long-term occupational hazards resulting from operations of the WMAT rural water system would be minor. All operations would be conducted in accordance with applicable labor safety requirements, including U.S. Department of Labor, OSHA, and Tribal requirements. Cleaning chemicals, water disinfectant-related chemicals (e.g., sodium hypochlorite, aluminum sulfate, aluminum chlorohydrate, sulfuric acid, sodium hydroxide, hydrofluosilicic acid, citric acid, sodium bisulfite, and liquid ammonium sulfate), neutralized waste, and other hazardous material used during the operations of the proposed rural water system would comply with applicable transportation, storage, use, and disposal laws following applicable Federal and Tribal regulations. With implementation of the *Hazardous Materials and Waste* measures in **Appendix A.2** (*Best Management Practices*), long-term safety impacts related to hazardous materials and waste would be minimized.

Regarding future Canyon Day farming, construction and operations would be conducted in accordance with applicable labor safety requirements, including U.S. Department of Labor, OSHA, and Tribal requirements. While it is not possible to determine with certainty the potential for occupational hazards at this planning stage, adherence to applicable Tribal, Federal, and State laws, orders, and regulations, standard management practices, and any additional measures or conservation practices imposed through the project planning process would reduce or minimize safety risks.

Flood Safety. Under Alternative A, there would be an overall minor beneficial effect on flood safety as a result of the proposed rural water system. As discussed in **Section 3.2** (*Water Resources and Hydrology*), the effect of the Miner Flat Dam on downstream flood risk would be minimal. The dam would provide flood attenuation and reduced risk for downstream flooding during periods when the reservoir is filling. When the reservoir is full, incoming discharge would be routed through the outlet works or over the spillway, so that releases would match the incoming peak flow. Under these conditions, flood potential and the associated threats to property and infrastructure would not differ substantively from existing conditions. Flood modeling for selected locations downstream of the dam determined that there would be less than a 1 percent chance of overbank flooding (JE Fuller 2022). The potential to affect flood risk in other portions of the area of analysis, including the expanded water treatment plant and water distribution pipeline route, would be negligible. Failure of any components such as a pipeline segment or water storage tank would be unlikely, and any associated water release would not present a substantial threat to the public or to structures outside the immediate vicinity.

Recreational Safety. Once the dam and reservoir are constructed, there would be minimal health and safety issues related to recreation. Consistent with existing policies on the Reservation, swimming would not be allowed in the reservoir. Shore-based fishing would be allowed at the reservoir and downstream along the NFWR (see **Section 3.5**, *Recreation*, for more details). Water level fluctuations at the reservoir and within the downstream river would normally be gradual and would not pose an onshore safety risk. Similar to existing conditions, it is anticipated that members of the public would not engage in fishing during extreme weather events when rapid water level rise and flooding are possible.

Effects on Emergency Services. Short-term construction-related impacts on emergency services would be minor. Even with the safety measures described above, construction activities could result in an increased number of accidents and incidents requiring emergency services, and construction-related traffic disruptions could cause delays in emergency response. Implementation of the mitigation measure to develop traffic management and safety plans described in **Section 3.9** (*Transportation*) requires notifications to emergency response providers of lane closures at least 1 week prior to closures; the notifications would include the location, date, time, and duration of the closure. This would minimize potential delays in emergency responses. Additionally, the WMAT would evaluate whether staffing levels and hours are adequate for the potential increase in demand on emergency services during construction. If necessary, additional temporary staff would be provided during the construction period to supplement the WMAT's emergency and medical staff. Long-term impacts (post-construction) on emergency services would be inconsequential because requests for emergency services in the area of analysis would return to levels comparable to existing conditions.

Residual Impacts. With implementation of applicable safety plans and other safety measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts associated with public health and safety from construction and operation of the new rural water system under Alternative A, and no mitigation measures are required.

Alternative B

Operations-related impacts would be similar to those under Alternative A, resulting in minor beneficial effects in the context of flooding. The dam would provide flood attenuation during periods when the reservoir is filling. When the reservoir is full, incoming discharge would be routed through the outlet works or over the spillway, so that releases would typically match the incoming peak flow. Alternative B would include the same construction issues as Alternative A; therefore, there would be no differences in construction-related impacts. Future Canyon Day farming would also be the same under both alternatives. Unlike Alternative A, rural water system operations under Alternative B would not prioritize preservation of minimum instream flows downstream of the dam and, therefore, would result in reduced downstream water flow at times. Reduced water flow would result in negligible changes to flood potential and would not affect other health and safety conditions. With implementation of applicable safety plans and other safety measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts associated with public health and safety from construction and operation of the new rural water system under Alternative B, and no mitigation measures are required.

Alternative C

Operations-related impacts with regard to flooding would be similar to those under Alternative A in the context of flooding, resulting in minor beneficial effects. However, under Alternative C, reservoir levels would be below capacity a higher percentage of the time than under Alternative A. Therefore, a greater portion of peak flows would potentially be retained to fill the reservoir, resulting in greater attenuation of downstream peak flows and greater potential reduction on the magnitude or frequency of flooding. Alternative C would include the same construction issues as Alternative A; therefore, there would be no differences in construction-related impacts. Alternative C would also support up to 3,000 acres of Canyon Day farming, so the extent of possible safety risks, primarily related to occupational hazards, would be greater than under Alternatives A and B given the increased amount of proposed agricultural activities. With implementation of applicable safety plans and other safety measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts associated with public health and safety from construction and operation of the new rural water system under Alternative C, and no mitigation measures are required.

Alternative D

Operations-related impacts with regard to flooding would be similar to those under Alternative A in the context of flooding, resulting in minor beneficial effects. However, reservoir levels would be below capacity a higher percentage of the time than under Alternative A. Therefore, a greater portion of peak flows would potentially be retained to fill the reservoir, resulting in greater attenuation of downstream peak flows and greater potential reduction of the magnitude or frequency of flooding. Alternative D would include the same construction issues as Alternative A; therefore, there would be no differences in construction-related impacts. Future Canyon Day farming would be the same as Alternative C. Unlike Alternatives A or C, rural water system operations under Alternative D would not prioritize preservation of minimum instream flows downstream of the dam and, therefore, would result in reduced downstream water flow at times. Implementation of Alternative D would also increase water diversions for agricultural use for Canyon Day, potentially causing more fluctuations in reservoir levels compared to Alternatives A or B. These actions would result in negligible changes to flood potential and would not affect other health and safety conditions. With implementation of applicable safety plans and other safety measures in **Appendix A.2** (*Best Management Practices*), there would be no significant adverse impacts associated with public health and safety from construction and operation of the new rural water system under Alternative D, and no mitigation measures are required.

3.10.3 Cumulative Impacts

Cumulative effects to public health and safety consist of combined potential effects resulting from the proposed action in conjunction with ongoing and reasonably foreseeable future actions described in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*). Cumulative effects would be associated with activities resulting in a long-term or temporary increase in the number of people potentially exposed to safety risks related to recreational activities; construction and operation of new system components; dam failure; and flooding downstream of the dam.

The Miner Flat Dam Recreational Facilities Project would develop new recreational facilities adjacent to the reservoir, and this could increase the potential for accidents near the dam. In general, boating activities are involved in a large portion of safety incidents near dams in the United States (Association of State Dam Safety Officials 2021). Although this project is still in the early planning stages, it is expected that the WMAT would develop and implement safety plans for boating and other activities near the dam and reservoir, including imposing distance requirements between boats and the dam.

The addition of hydroelectric power generation at the dam and other proposed development projects on the Reservation would result in potential temporary health and safety risks to construction personnel. However, it is expected that any construction project on the Reservation would occur in accordance with requirements of the U.S. Department of Labor, OSHA, and Tribal regulations for safety, similar to the proposed action.

Some of the actions described in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*) would result in temporary or long-term increases in the number of people present in the general vicinity of the project area, especially projects located in Whiteriver and Canyon Day, potentially increasing the number of people affected in the event of a construction accident, dam failure, or flooding. The percentage of additional members of the public who would be present in areas affected would likely be low at any given time.

As discussed in **Section 3.10.2** (*Environmental Consequences*), the proposed action would result in minimal health and safety issues related to recreation. Construction-related occupational hazards would be moderate and would cease once all project components were built. Adherence to requirements of the U.S. Department of Labor, OSHA, Tribal regulations, safety plans, and other applicable plans (e.g., the hazardous materials and waste management plan) would minimize the potential for health and safety risks during construction activities. Long-term occupational hazards resulting from operations of the WMAT rural water system would be minor. The risk of dam failure is extremely small, and there would be little change in the potential for flooding downstream of the dam. With implementation of safety plans and requirements, the cumulative effects resulting from the proposed action and other ongoing and reasonably foreseeable future actions are unlikely to significantly affect public health and safety.

3.11 Socioeconomics

The following section covers socioeconomic issues related to population and housing, employment and earnings, tourism and recreation, timber and forestry, and agriculture. The WMAT resides on the Reservation, which overlaps portions of Apache, Gila, and Navajo Counties in the east central region of Arizona. The ROI for socioeconomic resources includes these three counties with emphasis on the WMAT where information is available. The analysis includes the primary communities of interest (i.e., those affected by the proposed action) on the Reservation: Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue.

3.11.1 Affected Environment

Population and Housing

The total estimated population in the three-county ROI is 234,327 persons (USCB 2019g). Navajo County is the largest in terms of population followed by Apache County and Gila County. Navajo County experienced the greatest percent change between 2000 and 2019 followed by Gila County and Apache County. During this time period, all three counties experienced an average annual population growth less than the State of Arizona (USCB 2012). **Table 3.11-1** provides the population in the ROI. The three-county ROI is relatively rural with 6.4 persons per square mile in Apache County, 10.8 in Navajo County, and 11.3 in Gila County compared to the State of Arizona, which has 56.3 persons per square mile (USCB 2020).

Population counts for the WMAT are estimated at 15,492, which represent an average annual increase of 1.5 percent between 2000 and 2015 (Combrink et al. 2015). A large proportion of the WMAT reside in Whiteriver in Navajo County. The other primary communities of interest have lower population numbers compared to Whiteriver, as shown in **Table 3.11-1**.

Table 3.11-1. Population Data for the Region of Influence

Community	Population			Average Annual Percent Change (2000–2019)
	2000	2010	2019	
Population Data by State[1] and County[2]				
Arizona	5,130,632	6,392,017	7,050,299	1.69%
Apache County	69,423	71,518	71,511	0.16%
Gila County	51,335	53,597	53,546	0.22%
Navajo County	97,470	107,449	109,270	0.60%
Three-County Total	218,228	232,564	234,327	0.38%
Population Data by Primary Communities of Interest on the Fort Apache Indian Reservation[3]				
Canyon Day CDP (Gila County)	1,103	1,209	1,629	2.1%
Carrizo CDP (Gila County)	135	127	82	-2.6%
Cedar Creek CDP (Gila County)	149	318	517	6.8%
Cibecue CDP (Navajo County)	1,331	1,713	2,173	2.6%
Fort Apache CDP (Navajo County)	67	143	189	5.6%
Whiteriver CDP (Navajo County)	3,329	4,104	4,296	1.4%

Key: CDP = census designated place

[1] Source: USCB (2012)

[2] Source: USCB (2019g)

[3] Source: USCB (2019b)

Table 3.11-2 provides selected housing details for Apache, Gila, and Navajo Counties. There are approximately 124,444 housing units in the three-county ROI. The median housing value of owner-occupied units in each county is lower than the median value for the State of Arizona. **Table 3.11-2** also shows the housing characteristics for the primary communities of interest on the Reservation.

The median housing value of owner-occupied units is consistent with Apache County but lower than the median value for the other two counties and the State of Arizona. Also of note is the lower rate of vacant housing units on the Reservation compared to county levels, although they are more in line with the State of Arizona.

Employment and Income

The most recent employment data available from the Bureau of Economic Analysis (BEA) shows that the total number of jobs in the three-county ROI totaled 90,609 jobs as of 2019 (BEA 2020). Navajo County had 41,746 jobs followed by Apache County with 27,848 jobs, and Gila County with 21,015 jobs. Within each county, the largest industry (in terms of the number of jobs) was the government and government enterprises, in particular the local government (BEA 2020).

The primary communities of interest on the Reservation had a combined total employment of 1,741 jobs as of 2019. The largest industry in terms of the number of jobs in the primary communities combined included the "educational services, health care, and social assistance" industry (631 jobs) followed by "the arts, entertainment, and recreation, and accommodation and food services" industry (296 jobs), and the "public administration" industry (201 jobs) (USCB 2019d).

Table 3.11-2. Housing Characteristics in the Region of Influence

Housing Type	Data by County and State					Data by Primary Communities of Interest on the Fort Apache Indian Reservation				
	Apache County	Gila County	Navajo County	Arizona	Canyon Day CDP	Carrizo CDP	Cedar Creek CDP	Cibecue CDP	Fort Apache CDP	Whiteriver CDP
Total Housing Units	32,891	33,542	58,011	3,003,286	408	28	138	427	63	1,098
Occupied Housing Units Count (%)	20,867 (63.4%)	21,945 (65.4%)	34,990 (60.3%)	2,571,268 (85.6%)	333 (81.6%)	28 (100.0%)	112 (81.2%)	393 (92.0%)	52 (82.5%)	972 (88.5%)
Owner-Occupied	16,462	16,581	24,067	1,656,756	219	21	101	243	23	449
Renter-Occupied	4,405	5,364	10,923	914,512	114	7	11	150	29	523
Vacant Housing Units Count (%)	12,024 (36.6%)	11,597 (34.6%)	23,021 (39.7%)	432,018 (14.4%)	75 (18.4%)	0 (0%)	26 (18.8%)	34 (8.0%)	11 (17.5%)	126 (11.5%)
Median Value of Owner-Occupied Units (Dollars)	$59,900	$165,800	$126,100	$225,500	$59,800	-	$75,900	$59,700	$70,800	$59,800

Source: USCB (2019c)

Key: CDP = census designated place; "-" = information not available

Selected economic characteristics for the ROI are shown in **Table 3.11-3**. Unemployment rates throughout the three counties and primary communities were higher than the State average of 5.9 percent and the national average of 5.3 percent (USCB 2019d). Except for the Fort Apache census designated place (CDP), unemployment in the primary communities of interest on the Reservation were higher than their respective counties. Additionally, the median household income in each area, with the exception of the Fort Apache CDP, had a lower median household income compared to the State or Nation (USCB 2019d). There were similar trends for per capita income and poverty levels.

Table 3.11-3. Selected Economic Characteristics for the Region of Influence

Location	Unemployment Rate (Percent)	Median Household Income (Dollars)	Per Capita Income (Dollars)	Families Below Poverty Level (Percent)
Country, State, and County				
United States	5.3%	$62,843	$34,103	9.5%
Arizona	5.9%	$58,945	$30,694	10.8%
Apache County	10.5%	$32,508	$15,128	28.8%
Gila County	8.8%	$43,524	$24,251	14.6%
Navajo County	12.7%	$40,067	$18,935	21.5%
Primary Communities of Interest on the Fort Apache Indian Reservation				
Canyon Day CDP	19.8%	$29,042	$6,522	48.7%
Carrizo CDP	38.7%	-	$9,906	25.0%
Cedar Creek CDP	18.1%	$32,222	$7,892	45.5%
Cibecue CDP	23.5%	$15,417	$5,357	58.6%
Fort Apache CDP	7.8%	$76,250	$18,890	10.9%
Whiteriver CDP	33.9%	$30,536	$10,438	38.6%

Source: USCB (2019d)

Key: CDP = census designated place; "-" = information not available

Tourism and Recreation

The tourism and recreation industries play a critical role in the economies of Apache, Gila, and Navajo Counties and the Reservation. In particular, Arizona State parks have a significant economic impact on the local communities and counties in which they are located and serve as an important tourism resource. A report prepared by the Arizona Hospitality Research and Resource Center (AHRRC) analyzes the economic impact of Arizona State parks based on the survey results of visitors to 27 Arizona State parks throughout the 13 counties in which they are located (AHRRC 2015). **Table 3.11-4** shows the results of the study for Apache, Gila, and Navajo Counties for 2014. Both Apache and Gila Counties contain one Arizona State park, while Navajo County contains two State parks. The table provides information on park visitation, county impact in terms of dollars, and total State jobs.

Several recreational programs also generate revenue for the WMAT, such as the Alchesay-Williams Creek National Fish Hatchery complex. The hatchery complex, which is located on the Reservation, is the lead facility for the production of Apache trout (USFWS 2015). Four types of trout species are raised and stocked in Arizona and New Mexico. A 2011 Fisheries Economic Report concluded that the stocking program at the Alchesay-Williams Creek complex resulted in over 149,000 angling days that generated $10.4 million in retail sales and $19.3 million in total economic output. Approximately 196 jobs and $4.8 million in income were generated from the program (USFWS 2015).

Table 3.11-4. Economic Impact of Selected State Parks in the Region of Influence

County	Park	Type of Park	Park Visitation			Total County Impact (Dollars)	Total State Jobs
			FY2007	FY2014	Percent Change		
Apache County	Lyman Lake	Recreation	36,298	13,238[1]	-63.5%	$403,162	5.5
Gila County	Tonto Natural Bridge	Recreation	94,026	109,969	17.0%	$3,469,230	44
Navajo County	Fool Hollow	Recreation	95,495	94,309	-1.2%	$4,258,489	56.9
Navajo County	Homolovi Ruins	Historical	15,953	17,194	7.8%	$1,309,742	14.5

Source: AHRRC (2015)

Key: FY = Fiscal Year

[1] Visitation during FY2014 was lower due to the State park being open only a part of the year compared to during FY2007 in which the park was open all year.

As discussed in **Section 3.5** (*Recreation*), recreational activities within the Reservation are managed through a comprehensive permit system, which generates revenue for the WMAT. The sale of outdoor recreation permits is the second largest revenue generator next to the Hon-Dah Resort and Casino (Entrix 2007a). A permit is required for all non-WMAT members for each recreation activity on the Reservation. The WMGFD uses the funds generated by permit sales from public fishing to support the department and manage natural resources on the Reservation.

The WMAT also relies on tourism and outdoor recreation to support their economy. Hawley Lake on the Reservation is a popular summer tourist attraction where visitors may go fishing or boating. The major tourist attraction during the winter months is the Sunrise Ski Park Resort. The resort, owned and operated by the WMAT, is located 3 miles south of McNary and generates approximately $9 million in revenue per year to the WMAT (Birchfield 2014). Another major attraction in the area that contributes to local jobs and tourist dollars is the Hon-Dah Resort and Casino, which employs approximately 425 people as of 2012 (Taylor 2012).

Timber and Forestry

The WMAT's timber and forestry activities are also an important economic contributor to the Reservation. The White Mountain Apache Timber Company (WMATCO) (formerly known as Fort Apache Timber Company) is located in Whiteriver. The company is owned and operated by the WMAT. During the height of its operation, WMATCO was one of the largest employers for the Reservation, employing 400 local workers. The company produced approximately 100 million board feet of lumber annually from the 720,000 acres of timberland on the Reservation, which generated a gross annual income of approximately $30 million (Birchfield 2014). In 2010, the WMATCO sawmill closed, which resulted in large losses in revenue and employment for the WMAT. However, the mill was later reopened in 2014 and has created 164 jobs that provide income for families accounting for about 800 WMAT members (RDP 2021).

Agriculture

The USDA publishes a comprehensive summary of agricultural activity for the United States and for each State every 5 years. The most recent publication is based on the 2017 Census. A summary of agricultural activity in the three-county ROI as of 2017 is provided in **Table 3.11-5**. The majority of agricultural producers in both Apache and Navajo Counties are identified as "American Indian/Alaska Native." Agricultural production on the Reservation has been historically concentrated in the Canyon Day area (WMAT 2007), which is described in **Section 2.6.1** (*History of Canyon Day Farming*).

Table 3.11-5. Selected Agricultural Characteristics in the Region of Influence

Item	Apache County	Gila County	Navajo County
Farms (Number)	5,551	298	4,205
Total Farm Market Value of All Products Sold (Dollars)	$18,003,000	$7,260,000	$49,917,000
Average Per Farm (Dollars)	$3,243	$24,363	$11,871
Total Farm-Related Income (Dollars)	$2,308,000	$1,746,000	$1,661,000
Total Farm Production Expense (Dollars)	$45,985,000	$9,897,000	$7,000,600
Average Per Farm (Dollars)	$8,284	$33,212	$16,648
Total Producers	8,979	484	7,557
Total American Indian/Alaska Native Producers	8,408 (94%)	84 (17%)	6,724 (89%)

Sources: USDA (2017a, 2017b, 2017c)

3.11.2 Environmental Consequences

Potential impacts from the proposed action on the local and regional economy may result from construction of the proposed rural water system and future operations and maintenance of the proposed system. Impacts may also result from industries affected by the presence of the new facilities and availability of consistent and sustainable potable water. These issues are analyzed below. There are no specific guidelines on assessment of socioeconomic resources, but in general, any Federal action that would result in a change in the spatial distribution of populations, spending patterns, employment, or income would be considered an impact.

No Action Alternative

Under the No Action Alternative, current concerns over water outages, declining water quality, and a diminishing groundwater source would continue to affect Reservation communities. There would be no economic stimulus or employment opportunities associated with construction and operation of the rural water system. Continued water shortages would have a detrimental effect on future population growth and economic health of the communities of interest and would adversely affect opportunities for agricultural expansion.

Alternative A

Population and Housing. During construction, there would be negligible adverse impacts on population and housing from the short-term introduction of construction workers. Based on **Table 3.11-6**, approximately 205 construction jobs would be required if all project components were constructed simultaneously. In practice, the number of construction jobs at any one time would ebb and flow depending on scheduling, and likely would not reach as high as 205 at any one time. Based on the unemployment rate in each local county and on the Reservation as well as the number of construction-related employees living in these areas, it is expected that construction employment would be fulfilled locally within the three-county ROI and that some positions would be filled by those already living on the Reservation. Even if 205 construction workers migrated to the area for employment, this would represent a population increase of less than 0.001 percent. Although there is a limited number of rental housing vacancies available in the primary communities of interest on the Reservation, the local housing market in the three-county ROI would have sufficient capacity to house the additional workers. In addition, some non-local workers would likely occupy nearby transient housing (i.e., hotels, lodges, etc.) instead of housing rentals.

Table 3.11-6. Projected Short-Term Employment during Construction

Action	Projected Number of Construction Workers	Duration of Activity
Miner Flat Dam	70	24 months
Water Diversion from North Fork of the White River	10	12 months
Water Treatment Plant Expansion	75	30 months
Water Distribution System	50	24 months
Total	**205**	**3–4 years**

As noted in **Appendix A.1** (*Additional Project Details*), operations of the new rural water system would likely generate 12 to 15 new full-time, direct positions to provide operation, maintenance, and replacement activities for all elements of the proposed rural water system. There may be another 10 to 12 additional indirect, full-time employment opportunities related to recreation opportunities at the reservoir, agricultural opportunities in Canyon Day, and general regional economic growth related to implementation of the new rural water system. Many of these positions would be filled by local labor and, therefore, the number of new long-term positions would have a negligible impact on population and housing.

Employment and Earnings. During construction, there would be minor beneficial effects on employment and earnings from the short-term employment of construction workers (see **Table 3.11-6**) and expenditures associated with the purchase of materials and equipment. This change in employment would represent an increase in total employment in the region of less than 0.001 percent. Due to the high rate of unemployment and the availability of the labor force, it is anticipated that the new construction jobs would be filled by the labor supply in the three-county ROI. There would also be minor indirect beneficial effects from expenditures on goods and services by industries that produce construction items, as well as induced expenditures on goods and services by households of workers involved in the construction process. Direct, indirect, and induced expenditures and employment related to construction would be temporary, lasting only for the duration of the activity.

Similarly, the number of new long-term positions would have a minor beneficial effect on employment and earnings. Operations of the new rural water system would likely generate 12 to 15 new full-time, direct positions, and there may be another 10 to 12 additional indirect, full-time employment opportunities related to recreation, agriculture, and other general regional economic growth. The creation of new long-term employment opportunities would benefit the WMAT and three-county region.

Tourism and Recreation. Construction-related activities would result in minor adverse economic impacts due to localized restrictions on recreational access, especially tourism revenue from fishing and camping along the NFWR near the construction areas (see **Section 3.5**, *Recreation*, for more details). Access restrictions for fishing would be short-term and localized. The Lower Log Campground would be flooded by the new reservoir, but campers would still have access to 14 designated campgrounds and primitive camping sites on the Reservation. The loss of revenue from the Lower Log Campground would be balanced by long-term beneficial economic impacts from new and improved fishing opportunities. The reservoir would provide new shore-based fishing opportunities. The proposed operation of the rural water system would prioritize at least an 11 cfs minimum instream flow immediately downstream of the dam to support water diversions for the Alchesay fish hatchery, providing a more reliable water supply for hatchery operations, which in turn supports local game fisheries. The total future recreational benefits associated with increased visitation (e.g., revenue from additional permit sales, profits from angler expenditures, and labor benefits) has been estimated at $34 million based on a 100-year project life (WMAT 2007). An increase in new recreation spending would also generate business income and increase local sales tax revenue.

Timber and Forestry. Construction-related activities would result in minor adverse and beneficial economic impacts related to timber and forestry due to the need to clear some forested areas during construction. The area of forest that would be cleared is small (less than 200 acres) compared to the amount of forest land on the Reservation (1.36 million acres) (WMAT 2005a). Although the cleared area would not be available for future harvesting (a minor adverse impact), the forest clearing would result in a potential benefit in that the WMAT could process and sell any harvestable timber cleared from the site, providing work and revenue for WMAT members. All timber harvesting would follow the BMPs provided in the Forest Management Plan (WMAT 2005a) (see also *Forestry and Timber Harvesting* measures in **Appendix A.2**, *Best Management Practices*). The total revenue of the merchantable timber to the WMAT would depend on the number of trees per acre on the forested tract and the volume per acre of wood that could be extracted from those trees. Additionally, operations of the dam and downstream water diversions would have no noticeable effect on forested land along the NFWR.

Agriculture. During construction of the dam and water diversion structure, disruption to downstream streamflows and/or water distribution to existing agricultural plots is expected to be negligible and, if it occurs at all, would only be for very short periods of time. In the long term, the new rural water system would result in a major beneficial economic impact related to agriculture by accommodating downstream irrigation diversions in the Canyon Day area in sufficient quantities to support up to 885 acres of farming. Although the net economic impact of redevelopment of 885 acres is unknown at this time, an earlier study estimated an $8.25 million annual net return for the Canyon Day Irrigation Project based on development of 5,875 acres (WMAT 2007). Agriculture-related employment, expenditures, and income would represent a major economic benefit to the WMAT and local economies.

Residual Impacts. Implementation of Alternative A would result in a major beneficial economic impact for the WMAT related to agriculture by providing a reliable and consistent supply of irrigation water to support up to 885 acres of Canyon Day farming. There would be no significant adverse impacts on population and housing, employment and earnings, tourism and recreation, timber and forestry, and agriculture from construction and operation of the new rural water system under Alternative A, and no mitigation measures are required.

Alternative B

Alternative B would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Similar to Alternative A, implementation of Alternative B would result in a major beneficial economic impact for the WMAT related to agriculture by providing a more reliable and consistent supply of irrigation water to support up to 885 acres of Canyon Day farming. There would be no significant adverse impacts on population and housing, employment and earnings, tourism and recreation, timber and forestry, and agriculture from construction and operation of the new rural water system under Alternative B, and no mitigation measures are required.

Alternative C

Alternative C would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Unlike Alternatives A or B, Alternative C would provide a more reliable and consistent supply of irrigation water to support up to 3,000 acres of Canyon Day farming. This would result in a greater beneficial economic impact for the WMAT than under Alternatives A or B. Similar to the other alternatives, there would be no significant adverse impacts on population and housing, employment and earnings, tourism and recreation, timber and forestry, and agriculture from construction and operation of the new rural water system under Alternative C, and no mitigation measures are required.

Alternative D

Alternative D would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Similar to Alternative C, Alternative D would provide a more reliable and consistent supply of irrigation water to support up to 3,000 acres of Canyon Day farming. This would result in a greater beneficial economic impact for the WMAT than under Alternatives A or B. Rural water system operations under Alternative D would not prioritize preservation of minimum instream flows downstream of the dam, and this would lead to additional adverse impacts to terrestrial and aquatic wildlife compared to the other alternatives, as described in **Section 3.4** (*Biological Resources*). This, in turn, could result in a minor, localized adverse impact on fishing in some areas along the NFWR, as described in **Section 3.5** (*Recreation*). This could have a minor, but unquantifiable, negative effect on the local economy. Similar to the other alternatives, there would be no significant adverse impacts on population and housing, employment and earnings, tourism and recreation, timber and forestry, and agriculture from construction and operation of the new rural water system under Alternative D, and no mitigation measures are required.

3.11.3 Cumulative Impacts

Ongoing and reasonably foreseeable future actions in the project region described in **Appendix B** (*Ongoing and Reasonably Foreseeable Future Actions*) that involve construction activities (e.g., Miner Flat Dam Recreational Facilities, Hon-Dah Resort Expansion, WMAT Housing, Whiteriver Unified School District High School, Convenience Store and Tire Shop Project) would result in additional direct, indirect, and induced employment and earnings to the region. While each construction activity is temporary, lasting only for the duration of the activity, continuous construction employment opportunities could lead to long-term employment and migration of workers to the area. Projects such as WMAT Housing (provide additional housing), Miner Flat Dam Hydropower Generation Project (generate electricity), Geronimo Pass Landfill Expansion (increase capacity for solid waste disposal), and the Whiteriver Wastewater Lagoons study (evaluate wastewater system capacity), among others, would support overall population growth. Ongoing and improved recreational opportunities in the area such as the construction of the Miner Flat Dam Recreational Facilities, the WMAT Tribal Fair and Rodeo, and the Hon-Dah Casino Pow Wow event would generate additional spending, business income, and local sales tax revenue from tourism, which would be beneficial to the project region.

As discussed in **Section 3.11.2** (*Environmental Consequences*), construction activities associated with the proposed action would have temporary minor beneficial direct, indirect, and induced impacts to the region from additional employment, earnings, and spending. Construction activities associated with the proposed action may interfere with recreational opportunities if they occur simultaneously, but this would be temporary and localized. Operation of the dam would provide benefits to additional visitors and residents in the short-term and the long-term. The proposed action would also result in a major beneficial economic impact for the WMAT related to agriculture by providing a reliable and consistent supply of irrigation water to support Canyon Day farming.

Therefore, ongoing and reasonably foreseeable future actions in combination with the proposed action would not result in significant adverse impacts on population and housing, employment and earnings, tourism and recreation, timber and forestry, and agriculture.

3.12 Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Federal agencies identify and address any disproportionately high and adverse human health or environmental impacts of their actions on minority and low-income populations. Similarly, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires that Federal agencies identify, assess, and address environmental health risks and safety risks that may disproportionally affect children. This section provides an analysis to determine whether or not the proposed action has disproportional impacts on these populations.

The WMAT resides on the Reservation, which overlaps portions of Apache, Gila, and Navajo Counties in the east central region of Arizona. The ROI for environmental justice areas of concern includes the census tracts wholly or partially located within the Reservation. The community of comparison is defined as the counties in which those census tracts are located (Apache, Gila, and Navajo Counties). Information is also provided on the Reservation, as a whole.

3.12.1 Affected Environment

For the purpose of this analysis, minority populations are defined as those individuals who classify themselves as other than "white alone, not Hispanic or Latino." Children are defined as persons age 17 and younger, as enumerated by the U.S. Census Bureau. The percentage of low-income persons is calculated as a percentage of all persons for whom the U.S. Census Bureau determines poverty status, which is generally a slightly lower number than the total population as it excludes institutionalized persons, persons in military group quarters and in college dormitories, and unrelated individuals under 15 years old. The American Community Survey 5-year estimate data for the period 2015 to 2019 was used to report minority and low-income populations as well as the number of children.

Minority and Low-Income Populations

Table 3.12-1 identifies the total population and percentage of minority and low-income populations in Apache County, Gila County, Navajo County, and Arizona as of the most recent American Community Survey 5-year estimates (2015 to 2019).

Table 3.12-1. Minority and Low-Income Populations in the Region of Influence

Location	Total Population	Minority[1]		Low-Income[2]		
		Number Minority	Percent Minority	Population for Whom Poverty Status is Determined[3]	Number Low-Income	Percent Low-Income
Apache County	71,511	58,489	81.8%	70,403	24,963	35.5%
Gila County	53,546	20,212	37.7%	52,641	11,367	21.6%
Navajo County	109,270	64,161	58.7%	106,309	29,663	27.9%
State of Arizona	7,050,299	3,193,292	45.3%	6,891,224	1,043,764	15.1%
Fort Apache Indian Reservation	15,487	15,139	97.8%	15,487	5,792[4]	37.4%[5]

[1] Source for County and State: (USCB 2019g); Source for Fort Apache Indian Reservation: (USCB 2019f)
[2] Source for County and State: (USCB 2019e); Source for Fort Apache Indian Reservation: (USCB 2019f)
[3] *Population for Whom Poverty Status is Determined* is from the American Community Survey 5-year estimate and does not take into consideration institutionalized persons, persons in military group quarters and in college dormitories, and unrelated individuals under 15 years old and, therefore, may differ from the total population.
[4] The low-income population number for the Fort Apache Indian Reservation was calculated by using the percentage of families and people whose income in the past 12 months was below the poverty level for all families and applied to the total population in the Fort Apache Indian Reservation as provided by the U.S. Census Bureau (USCB 2019f).
[5] Percentage of families and people whose income in the past 12 months is below the poverty level; all families as reported by the U.S. Census Bureau (USCB 2019f).

As shown in the table, Apache County (81.8 percent) and Navajo County (58.7 percent) have a higher percentage of the population that classifies themselves as minority compared to the State (45.3 percent). The percentage is even higher on the Reservation, where 97.8 percent classify themselves as minority. Persons that classify themselves as "American Indian and Alaska Native alone" are the predominant minority group in each county. The "American Indian and Alaska Native alone" population, as a share of the total population, is 16.3 percent in Gila County, 44.7 percent in Navajo County, and 73.8 percent in Apache County (USCB 2019g).

All three counties have a higher proportion of the population classified as low-income individuals than the State (see **Table 3.12-1**). The percent of low-income individuals account for 21.6 percent of the population in Gila County, 27.9 percent in Navajo County, and 35.5 percent in Apache County compared to the State of Arizona average of 15.1 percent (USCB 2019e). The percentage of low-income individuals on the Reservation is similar to Apache County, with 37.4 percent of families and people whose income in the past 12 months is below the poverty level.

Children

Table 3.12-2 identifies the total population and percentage of children in Apache County, Gila County, Navajo County, and Arizona as of the most recent American Community Survey 5-year estimates (2015 to 2019). As shown in the table, Apache County (27.3 percent) and Navajo County (27.0 percent) have a higher percentage of children than the State of Arizona (23.2 percent). Gila County (20.0 percent) has the lowest proportion of children of the total county population compared to the other areas, and the Reservation (36.8 percent) has a higher percentage of children than the counties or State.

Table 3.12-2. Children (Under 18 Years Old) in the Region of Influence

Location	Total Population	Children (Under 18 Years Old)	
		Number	Percent
Apache County	71,511	19,551	27.3%
Gila County	53,546	10,732	20.0%
Navajo County	109,270	29,450	27.0%
State of Arizona	7,050,299	1,635,344	23.2%
Fort Apache Indian Reservation	15,487	5,694	36.8%

Source for County and State: (USCB 2019g)
Source for Fort Apache Indian Reservation: (USCB 2019f)

There are 10 schools and daycares located within Whiteriver, Fort Apache, and Cibecue, including the following: East Fork Lutheran Grade School and High School, Alchesay High School, Canyon Day Junior High School, Whiteriver Elementary School, Cradleboard Elementary School, Seven Mile Elementary School, John F. Kennedy Day School, Theodore Roosevelt School, Dishchii'bikoh Community School, and Alchesay Beginnings Child Development Center. Cradleboard Elementary School is the closest school to the proposed dam site (4.7 miles away), intake structure/pump station (2.1 miles away), and water treatment plant (1.7 miles away). Many of the schools are located within 1,500 feet of the proposed water distribution system.

3.12.2 Environmental Consequences

Given that the intent of this action is to improve living conditions on the Reservation and that the primary beneficiaries are minority and low-income communities, the analysis below discusses both beneficial effects as well as short-term adverse impacts from construction on surrounding environmental justice populations including communities, individuals, and children.

No Action Alternative

Under the No Action Alternative, current concerns over water outages, declining water quality, and a diminishing groundwater source would continue to impact minority and low-income populations as well as children on the Reservation. While adverse construction-related impacts would be avoided, there would be no socioeconomic benefits (e.g., employment opportunities and increased revenue from agricultural expansion, tourism, and timber processing; see **Section 3.11**, *Socioeconomics*) that could help minority and low-income populations in the region. Continued water shortages would have a detrimental effect on future population growth and economic health of Reservation communities, including minority and low-income populations.

Alternative A

During construction, potential adverse human health or environmental effects on the local residents and others who may commute or travel near the construction sites would occur during the construction period. This includes short-term adverse impacts from dust and air emissions (**Section 3.1**, *Introduction*), construction noise (**Section 3.1**), hazardous spills (**Section 3.1**), recreation restrictions (**Sections 3.5**, *Recreation*, and **3.11**, *Socioeconomics*), utility disruptions (**Section 3.8**, *Energy and Public Utilities*), traffic (**Section 3.9**, *Transportation*), and construction-related safety issues (**Section 3.10**, *Public Health and Safety*). While these adverse impacts would disproportionately affect minority and low-income populations, using construction-related BMPs as outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures would minimize impacts on all affected communities, including minority and low-income populations so there would be no "high and adverse" impacts. Communities outside the Reservation would not be exposed to adverse construction-related impacts.

Once operational, the new rural water system would be able to accommodate current water usage and projected future demand, providing a long-term, major beneficial economic impact for the WMAT, including associated minority and low-income populations, in terms of employment and revenue from recreation, timber harvesting, and agriculture (**Section 3.11**, *Socioeconomics*). In particular, the new rural water system would provide a reliable and consistent supply of irrigation water to support up to 885 acres of Canyon Day farming, which would result in agriculture-related employment, expenditures, and income. Beneficial effects would diminish with distance from the Reservation, and benefits to minority and low-income populations outside the Reservation would be less than benefits to the communities on the Reservation.

There are no nearby schools, daycares, or other areas where children regularly congregate near the construction sites for the dam, intake structure/pump station, and water treatment plant. Some schools are located near construction activities for the water distribution system, which often follows SR 73 and BIA Road 12. Implementation of construction-related safety requirements and procedures provided in **Section 3.10** (*Public Health and Safety*) would minimize risks to children in nearby areas including schools and family residences. Therefore, there would be no disproportional environmental health or safety risk on children from construction activities.

Residual Impacts. The new rural water system would be able to accommodate current water usage and projected future demand, providing a long-term, major beneficial economic impact for the WMAT, including associated minority and low-income populations. With implementation of the construction-related BMPs as outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children.

Alternative B

Alternative B would include the same issues related to construction and operation of the proposed rural water system as under Alternative A. Future Canyon Day farming would also be the same under both alternatives. The new rural water system would be able to accommodate current water usage and projected future demand, providing a long-term, major beneficial economic impact for the WMAT, including associated minority and low-income populations. With implementation of the construction-related BMPs as outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children.

Alternative C

Alternative C would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Unlike Alternatives A or B, Alternative C would support up to 3,000 acres of Canyon Day farming. This would result in a greater beneficial economic impact for the WMAT than under Alternatives A or B and, therefore, greater agriculture-related employment, expenditures, and income that could benefit minority or low-income populations. The new rural water system would be able to accommodate current water usage and projected future demand, providing a long-term, major beneficial economic impact for the WMAT, including associated minority and low-income populations. Similar to the other alternatives, with implementation of the construction-related BMPs as outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children.

Alternative D

Alternative D would include the same construction-related issues as Alternative A; therefore, there would be no differences in construction-related impacts. Similar to Alternative C, Alternative D would support up to 3,000 acres of Canyon Day farming. This would result in a greater beneficial economic impact for the WMAT than under Alternatives A or B and, therefore, greater agriculture-related employment, expenditures, and income that could benefit minority or low-income populations. Unlike Alternative C, rural water system operations under Alternative D would not prioritize preservation of minimum instream flows downstream of the dam, and this would lead to additional adverse impacts to terrestrial and aquatic wildlife compared to the other alternatives. This, in turn, could result in a minor, localized adverse effect on recreational opportunities (e.g., fishing), as described in **Section 3.4** (*Biological Resources*) and **Section 3.5** (*Recreation*). Similar to the other alternatives, the new rural water system would be able to accommodate current water usage and projected future demand, providing a long-term, major beneficial economic impact for the WMAT, including associated minority and low-income populations. With implementation of the construction-related BMPs as outlined in **Appendix A.2** (*Best Management Practices*) and project mitigation measures, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children.

3.12.3 Cumulative Impacts

There are no disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children as a result of the proposed action. Thus, there would be no cumulative disproportionately high and adverse human health or environmental effects on minority or low-income populations and no disproportional environmental health or safety risks on children as a result of the proposed action in combination with ongoing and reasonably foreseeable future actions in the project region.

3.13 Short-Term Uses and Long-Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). This involves using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare; create and maintain conditions under which humans and nature can exist in productive harmony; and fulfill the social, economic, and other requirements of present and future generations of Americans. "Short-term" refers to the temporary phase of construction of the WMAT rural water system, while "long-term" refers to the operational life of the WMAT rural water system. All action alternatives analyzed in this EIS would result in short- and long-term disturbance to the natural environment in the project area, as described earlier in this chapter. Impacts would be mitigated to the extent possible to lessen or eliminate these impacts. Mitigation measures are described within each resource section discussion in **Chapter 3** (*Affected Environment and Environmental Consequences*), as applicable. See also **Appendix A.2** (*Best Management Practices*) for a full list of BMPs and standard operating procedures that would be applied to the proposed action to help reduce impacts.

Short-term uses related to implementation of the action alternatives would include construction activities resulting in temporary impacts such as impediments to recreational resources, traffic delays, and interruptions in energy and public utilities. These impacts would be balanced through the implementation of BMPs listed in **Appendix A.2** (*Best Management Practices*). Short-term benefits would result from increased employment (in construction jobs and businesses that would provide materials to the construction effort and service-related industries that would provide food, beverages, and other goods to construction workers) and revenue generated for the local economy during the construction phases.

Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site. The proposed action consists of construction and operation of the WMAT rural water system that would be designed to meet Reclamation standards and fulfill Reclamation's responsibilities under the Quantification Act. While the action alternatives evaluated in this EIS include the same construction components and have the same project footprints, they differ in how the water system would be implemented and operated to prioritize uses for the WMAT rural water system, instream flows, and irrigation. The locations of the project components were selected based on compliance with the Quantification Act, results of engineering design studies (see **Section 2.5.2**, *Action Alternatives*), compliance with Reclamation design standards, and utilization of existing water supply/distribution infrastructure within the Reservation.

The potential long-term benefits of the action alternatives include providing a reliable and sustainable source of water for domestic use and businesses, as well as for increased agricultural productivity for current and future design populations. An additional long-term benefit of the proposed action is decreased reliance on groundwater to supply potable water during periods of low flows in the NFWR. The proposed action would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

3.14 Unavoidable Adverse Impacts

Unavoidable adverse impacts are environmental consequences of an action that could not be avoided, either by changing the nature of the action or through mitigation if the action is taken. After consideration of actions, operations, and features to avoid, mitigate, or compensate for adverse effects, the action alternatives would likely result in the following types of unavoidable direct and indirect impacts (discussed in detail within each resource section in **Chapter 3**, *Affected Environment and Environmental Consequences*). These unavoidable adverse impacts would occur under all action alternatives, unless otherwise noted.

Water Resources. Construction of the Miner Flat Dam would convert (inundate) an approximate 3.7-mile segment of the NFWR into a reservoir. The reservoir would retain a portion of the sediment load in the incoming streamflow and interrupt the existing sediment transport process. However, this is not expected to result in increased stream bank erosion or substantial changes to the stream bed characteristics downstream of the dam. The proposed action would divert water to meet the municipal, rural, and industrial water use demands for the communities of the greater Whiteriver area, Carrizo, and Cibecue and would accommodate downstream irrigation diversions in the Canyon Day area, resulting in the removal of water from the river system. Some minor impacts to surface water quality, such as increased suspended sediment concentrations and turbidity levels, would occur as a result of construction of the dam and expansion of the diversion intake structure. These impacts would be minimized through implementation of BMPs and compliance with applicable permits and SWPPPs. There would be an unavoidable adverse water quality impact under all action alternatives because implementation of the proposed action would result in a 2°C (3.6°F) or more increase in water temperature of dam outflow waters, as well as possible reductions in dissolved oxygen concentrations in reservoir waters, during certain portions of the year, which would exceed the water quality standards contained in the Water Quality Protection Ordinance. The dam and reservoir would also result in changes to the downstream flow regime, such as (1) higher minimum flows and reduced zero flow days during summer; (2) reduced peak flows during summer when flows coincide with periods when the reservoir is below full pool level and filling; and (3) slightly reduced annual average flows and flow volumes. The dampening of peak flow events associated with summer storms that coincide with periods when the reservoir is filling means that the magnitude of instantaneous peak flows would be reduced, but this effect would be moderated for longer averaging periods. The extent of these flow regime changes would vary among the alternatives.

Geology and Soils. The geologic risks associated with dam construction would be moderate, although incorporation of appropriate engineering design features should minimize this risk. Without proper management, grading and excavations related to construction of the dam, expanded treatment plant, pump station, access roads, and other new facilities would cause ground surface disturbance that could result in increased erosion from runoff and wind. This would be particularly problematic near drainages and on slopes where sediment loadings can affect downstream waters and habitats, disturb vegetation, and clog downstream channels. Erosion control and monitoring plans would be developed for each project component to address erosion control and management of project infrastructure (see *Soils and Geology* measures in **Appendix A.2**, *Best Management Practices*). The erosion control and monitoring plans would identify construction and post-construction monitoring requirements and BMPs for preventing erosion during and after construction. As a result, adherence to these measures would minimize the risk of soil erosion from project activities.

Biological Resources. Construction of the WMAT rural water system would result in unavoidable adverse impacts on biological resources due to disturbance to and the direct loss of vegetation and wildlife habitat. These actions would also result in an increased potential for noxious and invasive weed establishment and spread, soil compaction, physical obstructions to fish passage, and loss of aquatic habitat quantity and connectivity.

The total estimated permanent removal of vegetation associated with the dam and reservoir would be approximately 180 acres of primarily ponderosa pine forest and woodland but also includes approximately 21 acres of narrow and scattered riparian, among other plant communities. While loss of these wetland features is considered unavoidable, avoidance followed by compensatory mitigation, likely through the purchase of credits from an approved in-lieu fee program, would reduce the scale and magnitude of potential effects.

Temporarily disturbed areas, such as staging areas outside the reservoir footprint, would be stabilized and revegetated at the end of the construction project to match pre-construction conditions. A conservatively estimated 615 acres (assuming a 100-foot construction corridor) of undeveloped, non-ruderal communities and other land cover types adjacent to the proposed water distribution pipeline also may be temporarily disturbed during construction. All but approximately 4 acres of the temporarily disturbed areas would be stabilized and revegetated at the end of the construction project to match pre-construction conditions.

Grading and construction for the Miner Flat Dam would disturb soils within the project footprint that would be subject to erosion, off-site transport, and siltation, potentially resulting in adverse water quality impacts. BMPs (**Appendix A.2**, *Best Management Practices*) would be implemented to avoid or minimize those potential impacts in accordance with required applicable Tribal, Federal, and State laws, orders, and regulations concerning the control and abatement of water pollution.

Construction of the dam and reservoir would fragment existing fish and wildlife populations and also adversely affect wildlife that require or utilize habitat that would be inundated by the new reservoir. Inundation would mostly affect common species associated with ponderosa pine forest and woodland. Once the reservoir is filled, available habitat would transition to a modified reservoir ecosystem. Creation of a deepwater reservoir would favor any non-native species currently in the NFWR over those native species adapted to the historical aquatic habitat. The number and diversity of non-native fish would be modest given the availability of suitable habitat upstream of the dam and the barrier the dam would impose. To minimize the potential for an increase in non-native fish in the reservoir, the current Native Fishes Management Plan would be revised to assess and monitor changes in species distribution and water quality in the reservoir and downstream of the dam. Major and unavoidable long-term adverse impacts on aquatic habitats and fisheries would result from implementation of all alternatives. Mitigation requiring monitoring, avoidance, additional survey and habitat assessment, and coordination with the WMGFD as part of operational planning would reduce the scale and magnitude of, but not resolve, all adverse effects.

Unavoidable adverse impacts on threatened or endangered species from implementation of the proposed action would be similar to those for aquatic and terrestrial wildlife. They may also include an increase in non-native predators that could prey upon threatened or endangered species, and a loss of habitat resulting from reservoir inundation and changes in downstream flows. Because implementation of the proposed action may result in take of a federally listed species through a Federal action, a Federal interagency consultation, under Section 7 of the ESA, is required. Consultation efforts with the USFWS are ongoing including the preparation of a BA. The BA will consider impacts to federally listed species to determine if this action is likely to cause take (harass, impact, affect, etc.) or jeopardize the continued existence of federally listed species.

Recreation. Construction-related activities would result in minor to moderate unavoidable adverse impacts that could diminish or displace fishing, hiking, and camping access along the NFWR near the proposed dam, reservoir, and intake structure. Access restrictions for fishing and hiking would be short-term, except for those areas within the footprint of the dam and reservoir that would be permanently inundated, and the proposed action would not preclude use of other areas of the Reservation for fishing, hiking, and camping. Under Alternative D, there would be additional minor and localized adverse impacts related to fishing in some areas along the NFWR due to adverse impacts to aquatic wildlife from dam operations.

Cultural Resources. Construction of the WMAT rural water system would result in unavoidable adverse impacts on historic properties under all action alternatives**.** Six historic properties, including one traditional cultural property, would be adversely affected because they are located within the area that would be flooded by the new reservoir, and rising waters and long-term inundation could damage or destroy the sites. Even though data recovery measures would be used to mitigate impacts of properties within the reservoir area, where feasible, impacts would remain unavoidable. Other known historic properties along the water distribution pipeline route and within Canyon Day farming areas would be avoided per the agreed-upon measures in the MOA between Reclamation and the THPO. Any activities that involve ground/soil disturbance would also have the potential to damage buried and previously unknown resources, and measures are provided in the MOA to minimize potential impacts.

Indian Trust Assets. Construction of the WMAT rural water system would result in unavoidable adverse impacts to trust assets related to natural and cultural resources. In particular, long-term disturbance from construction of the rural water system, creation of a new reservoir, and proposed Canyon Day agricultural activities would change the landscape and adversely affect cultural heritage resources within the project area, such as plant and animal habitat and archaeological sites. With implementation of BMPs and project mitigation measures, adverse impacts would be minimized where possible but not fully avoided.

Energy and Public Utilities. Construction of the WMAT rural water system would result in minor, unavoidable impacts associated with temporary disruptions in services and increased volumes of solid wastes for disposal. Effects would be minimized by implementation of measures outlined under *Energy and Public Utilities* in **Appendix A.2** (*Best Management Practices*).

Transportation. Short-term construction-related traffic disruptions would result in unavoidable adverse impacts on the local transportation network. Disruptions primarily would be associated with intermittent, temporary lane closures and rerouting, especially where project components run parallel to or cross major roadways. The greatest impact would be on SR 73, U.S. Highway 60, and BIA Road 12, although other local roads and streets on the Reservation would also experience short-term, localized impacts. Residents living closest to an active construction zone would experience the most impacts, including the need for periodic lower speed limits, delays from slower truck traffic, and localized lane closures for short periods of time. Traffic management and safety plans would be prepared for each project component and approved by the BIA and ADOT, as applicable, prior to the start of construction of that component. This would minimize short-term construction-related traffic disruptions.

Public Health and Safety. Construction of the Miner Flat Dam would result in a low but unavoidable adverse risk to public health and safety due to dam safety. Although the risk of dam failure is low, any incident could result in substantial impacts on human health and safety. The Miner Flat Dam would be constructed, operated, and maintained in accordance with applicable dam safety guidelines and requirements. Construction-related occupational hazards also represent unavoidable health and safety risks that would mainly be associated with contractors and construction workers. Contractors would implement safety plans in accordance with all applicable requirements (see *Public Health and Safety* measures in **Appendix A.2**, *Best Management Practices*).

Socioeconomics. Under the No Action Alternative, continued water shortages would have a detrimental effect on future population growth and economic health of the communities of interest, and would adversely affect opportunities for agricultural expansion.

Environmental Justice. Under the No Action Alternative, current concerns over water outages, declining water quality, and a diminishing groundwater source would continue to impact minority and low-income populations as well as children on the Reservation.

3.15 Irreversible and Irretrievable Commitment of Resources

NEPA requires consideration of "any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented" (40 CFR 1502.16). Irreversible and irretrievable resource commitments involve the use of nonrenewable resources and the effects of that use on future generations. Irreversible commitment of resources refers to actions resulting in the loss of production or use of natural resources that cannot be restored as a result of the action, such as extinction of a threatened or endangered species or the disturbance of a cultural resource.

The action alternatives would result in the irreversible and irretrievable commitment of the following resources during construction and operation of the rural water system:

- Construction materials, including resources such as soil and rocks
- The land area committed to new and expanded project components
- Electricity, gasoline, diesel fuel, and oil expended for equipment and transportation vehicles needed for construction and operations

General commitments of construction materials are largely irreversible because most construction materials are unsalvageable. Nonrenewable resources are expected to account for a minimal portion of the region's resources; the project's use of nonrenewable resources would not affect the availability of these resources for other needs in the region. Construction activities would not result in the inefficient use of energy or natural resources.

The selected construction contractors would use best available engineering techniques, construction and design practices, and equipment-operating procedures. The irreversible and irretrievable commitment of these resources is offset by the benefits associated with the WMAT rural water system, especially the provisions of a reliable and sustainable source of domestic water in the near term and to future generations.

The potential for construction of the WMAT rural water system to disturb known and unknown cultural resources and cultural heritage resources, as discussed in **Section 3.6** (*Cultural Resources*) and **Section 3.7** (*Indian Trust Assets*), is another irretrievable commitment of resources that is common to all of the action alternatives. Measures specified in the MOA in compliance with Section 106 of the NHPA would avoid, minimize, or mitigate adverse effects on historic properties, where possible. Nevertheless, damaged or displaced resources would not be fully restored and, therefore, represent an irretrievable commitment.

Chapter 4. Consultation and Coordination

4.1 Introduction

This chapter describes the consultation and coordination among Reclamation and the WMAT, other Federal, State, and local agencies, other Native American Tribes, and the public in preparing this EIS. The proposed action is the cornerstone element of the Quantification Act (Public Law 111-291), which authorized and directed the Secretary, through Reclamation, to construct the WMAT rural water system to serve Reservation communities. Reclamation followed the public involvement requirements documented in the CEQ regulations implementing NEPA (40 CFR 1501.7 for scoping and 40 CFR 1506.6 for public involvement). NEPA and associated laws, regulations, and policies require Reclamation to seek public involvement early and throughout the EIS process, to develop a reasonable range of alternatives to the proposed action, and to prepare environmental documents that disclose the potential impacts of the proposed action and alternatives.

4.2 Consultation and Coordination

Federal laws require Reclamation to consult with certain Federal and State agencies and other entities and Native American Tribes during the NEPA decision-making process (40 CFR 1502.25). Reclamation is also directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 CFR 1500.4-5).

4.2.1 Cooperating Agencies

Cooperating agencies are those Federal, State, and local agencies, and Tribes, that have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project or project alternative (40 CFR 1508.5). As described further in **Section 1.4** (*Cooperating Agencies*) there are three cooperating agencies involved with this action: the WMAT, BIA, and USACE. The WMAT is a cooperating agency because they are the beneficiary of the proposed action and because the action and its environmental effects will occur primarily on and near the Reservation. The BIA is a cooperating agency because it has jurisdiction by law as defined in 40 CFR 1508.5 and has special expertise applicable to this EIS effort, pursuant to 40 CFR 1508.26. The USACE is a cooperating agency because it has regulatory jurisdiction by law under its delegated authority in Section 404 of the CWA, as well as special expertise with respect to aquatic ecosystems that could be affected by the proposed action. Reclamation has held numerous meetings with the cooperating agencies throughout the EIS development process and will continue to do so through development of the Record of Decision. The purpose of these meetings was to inform and receive input from cooperating agencies respective to their jurisdiction, special expertise, or interests.

4.2.2 Tribal Consultation

EO 13175 requires Federal agencies to coordinate and consult on a government-to-government basis with sovereign Native American Tribal governments whose interests may be directly and substantially affected by activities on government-administered lands. In addition to the WMAT, coordination and consultation with other Native American Tribes was part of the NEPA scoping process (see **Section 4.3**, *Public Collaboration and Outreach*, for a list of Tribal governments).

In compliance with Section 106 of the NHPA, Reclamation has been conducting and will continue to conduct consultations with the WMAT THPO and other consulting parties. Reclamation developed a draft MOA, following 36 CFR 800.6, and is currently consulting with the WMAT THPO, Hopi Tribe, and Pueblo of Zuni on the draft language.

4.2.3 United States Fish and Wildlife Service Consultation

Reclamation held early coordination meetings with the USFWS, beginning as early as 2014. Because implementation of the proposed action may result in take of a federally listed species through a Federal action, a Federal interagency consultation, under Section 7 of the ESA, is required. Consultation efforts with the USFWS are ongoing including the preparation of a BA. The BA will consider impacts to federally listed species to determine if this action is likely to cause take (harass, impact, affect, etc.) or jeopardize the continued existence of federally listed species.

4.3 Public Collaboration and Outreach

4.3.1 Project Scoping

As summarized in **Section 1.5** (*Public Involvement and Scoping Process*) and in **Appendix C** (*Scoping Summary*), Reclamation involved the public, Tribes, and other agencies during project scoping activities in 2013 and 2021. Project scoping was conducted in 2013 and 2021 because environmental planning efforts were put on hold in 2015 to allow time for additional engineering and design work. **Table 4.3-1** documents the methods of notifications and engagement in both 2013 and 2021.

Table 4.3-1. Summary of the Scoping Process for the WMAT Rural Water System Project

Outreach Type	2013	2021
Notice of Intent	Published in the *Federal Register* on September 6, 2013	Published in the *Federal Register* on April 19, 2021
Notification Letters	Distributed by Reclamation on September 5, 2013, and October 15, 2013	Distributed by Reclamation on April 15, 2021
Press Releases	Pushed out to media outlets on September 6, 2013	Pushed out to media outlets on April 16, 2021
Newspaper Advertisements	Published in the *White Mountain Independent* on September 13, 2013, and *Fort Apache Scout* on September 20, 2013	Published in the *White Mountain Independent* on April 20, 23, 27, and 30, 2021; articles published in *White Mountain Independent* and *Fort Apache Scout* on May 7, 2021

Table 4.3-1. Summary of the Scoping Process for the WMAT Rural Water System Project

Outreach Type	2013	2021
Public Service Announcements	Ad hoc broadcasts on local radio prior to scoping meetings	Ad hoc broadcasts on local radio prior to scoping meeting
Websites	Used Reclamation's Phoenix Area Website for project information (*www.usbr.gov/lc/phoenix/*)	Used a project website (*www.wmat-rws-eis.com*) as a centralized location for project information and all scoping activities
Scoping Meetings	Held in-person meetings in Whiteriver (September 20, 2013) and Cibecue (September 21, 2013)	Held a virtual scoping meeting (May 1, 2021) via a Facebook Live event

Key: Reclamation = Bureau of Reclamation; WMAT = White Mountain Apache Tribe

Notifications during the 2021 scoping efforts were sent to the following Federal and State agencies, Tribal governments, and other interested parties on the project mailing list:

Federal Agencies

- Elected officials (U.S. Congress, U.S. Senate)
- National Park Service
- U.S. Army Corps of Engineers
- U.S. Bureau of Indian Affairs
- U.S. Bureau of Land Management
- U.S. Department of Agriculture
- U.S. Department of Health and Human Services
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

State Agencies

- Arizona Department of Environmental Quality
- Arizona Department of Transportation
- Arizona Department of Water Resources
- Arizona Game and Fish Department
- Arizona State Land Department
- Arizona State Parks

- State Historic Preservation Office
- State of Arizona (Governor)

Tribal Governments

- Hopi Tribe
- Mescalero Apache Tribe
- Navajo Nation
- Pueblo of Zuni
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- White Mountain Apache Tribe
- Yavapai Apache Nation

Other Interested Parties

- Local agencies (cities and counties)
- Associations, societies, clubs
- Individuals

4.3.2 Draft Environmental Impact Statement Distribution

Information about the availability of the Draft EIS was distributed to the cooperating agencies, participating agencies, interested parties, as well as individuals and businesses on the project mailing list. The Draft EIS was also posted on the project website for viewing and download: *www.wmat-rws-eis.com*.

4.4 Preparers and Contributors

The Draft EIS was prepared by the individuals identified in **Table 4.4-1**.

Table 4.4-1. List of Preparers and Contributors

Name	Project Role/Responsibility
U.S. Bureau of Reclamation	
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Table 4.4-1. List of Preparers and Contributors

Name	Project Role/Responsibility
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Table 4.4-1. List of Preparers and Contributors

Name	Project Role/Responsibility
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Appendix A
Additional Project Details, Best Management Practices, and Mitigation Measures

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Appendix A. Additional Project Details, Best Management Practices, and Mitigation Measures

A.1 Additional Project Details

The following section provides additional project details that apply to all National Environmental Policy Act action alternatives, unless otherwise noted.

Short-Term Employment. Projected short-term employment is related to the various construction activities. Construction of the Miner Flat Dam is estimated to employ about 70 construction workers during peak construction periods, of which 20 are likely to be local employees. The local jobs may include highway truck drivers, water truck drivers, flaggers, a secretary, and/or carpenters (Gannett Fleming 2014). Construction of the intake structure, raw water pump station, and raw water pipeline to the water treatment plant is estimated to employ an average of 10 workers per day, while construction of the expanded water treatment plant would likely need about 75 workers per day (Carollo 2014f). Construction of the water distribution pipeline, booster pump stations, and storage tanks may employ about 40 to 50 workers per day, of which 20 percent are likely to be local employees (Morrison-Maierle 2014).

Long-term Employment. Most jobs related to dam operations would be part-time or periodic. Possible positions include the following (Gannett Fleming 2013b):

- Dam operations manager (*part time*)
- Dam tender (to informally observe operations at the dam) (*part time*)
- Equipment maintenance contractor(s) for gates, valves, instrumentation, security, electrical, etc. (*periodic*)
- Surveyors for control point monitoring and recording; technical inspector(s) for periodic technical inspections (structural engineer, roller-compacted and conventional concrete specialist, equipment specialist, geotechnical engineer, geologist, dam engineers, etc.) (*periodic*)
- Inspector(s) for periodic maintenance inspections (*periodic*)
- Inspector(s) for routine and annual inspections and reporting (*periodic*)
- Inspector(s) for event monitoring and inspections (high-water conditions, flood events, post-earthquakes, etc.) (*as needed*)
- Engineer/technician for permit reporting (*periodic*)
- Site security personnel (*part time*)

The White Mountain Apache Tribe (WMAT) currently employs five full-time employees to manage the existing water distribution system (e.g., water diversions, water treatment plant operations, well management, etc.). The expanded system would likely generate 12 to 15 new full-time, direct positions, including a general manager, financial/procurement manager, four United States (U.S.) Environmental Protection Agency-certified Class 1 water treatment plant operators, three certified distribution operators, two dam operators, and supporting staff members. The staff would provide operation, maintenance, and replacement activities for all elements of the proposed rural water system.

Between 10 to 12 additional indirect, full-time employment opportunities are expected from construction of the WMAT rural water system, related to recreation opportunities at the reservoir, agricultural opportunities in Canyon Day, and general regional economic growth.

Water Metering, Measurements, and Evaporation Calculations. The proposed action includes provisions for measurement, calculation, and recording of all diversions and depletions related to the WMAT rural water system. The WMAT currently maintains a gaging station on the North Fork of the White River (NFWR) at the upper end of the reservoir behind the proposed Miner Flat Dam, which would account for inflow at that location. The WMAT currently maintains a gaging station on the NFWR at Gold Gulch just downstream from the proposed diversion at the North Fork intake structure, which would account for stream flows to determine compliance with minimum flows below the diversion. The WMAT currently maintains meters on the diversion to the water treatment plant, as well as pumping from the Miner Flat Wellfield, and would continue to measure production from the wellfield and the expanded water treatment plant to account for water diversions. The WMAT currently maintains measuring devices on the wastewater entering the lagoons at Canyon Day and the discharge from the lagoons to Kinishba Wash immediately upstream from its confluence with the White River to account for depletion and returns flows, not including the Cedar Creek, Carrizo, and Cibecue communities. Similar devices would be placed ahead of and at the discharge points for those communities during implementation of the WMAT rural water system. The WMAT installed a meter on the Canyon Day irrigation diversion built in the 1980s and would install a similar meter for future irrigation diversions in the Canyon Day area to monitor water use for 885 acres of farming (Alternatives A and B) or 3,000 acres of farming (Alternatives C and D). Many residential, commercial, governmental, and other users are metered, but the coverage is not currently complete. The WMAT would add meters to users of existing systems as a water conservation measure.

The WMAT would perform calculations of evaporation from the new reservoir created by the proposed Miner Flat Dam as well as the evaporation from wastewater lagoons for each community served by the WMAT rural water system based on the WMAT water code and procedures established in the WMAT Water Rights Quantification Agreement. Similarly, procedures established in the Quantification Agreement would be used to compute beneficial and non-beneficial evapotranspiration and return flow from irrigation use in Canyon Day.

Possible Subsurface Treatment Options for the Miner Flat Dam. Subsurface treatment options are currently being developed to control foundation erosion and dissolution due to seepage and, to a lesser degree, control seepage volumes through the dam's left abutment ridge (see **Figure 2.5-4**). Left abutment treatments may include a concrete platform, known as a plinth, at the base of a 1,400-foot concrete membrane on the upstream face of the left abutment ridge. Cement-based grouting would be performed below the plinth across as much as 800 feet of the plinth to a required depth to reach and penetrate the underlying massive gypsum layers known as the basement complex. Left abutment treatments would also include a combination of a secant cutoff wall from the plinth level to the basement complex over a distance of as much as 660 feet and a soil-concrete mixing technique below the plinth for depths of 50 to 75 feet over a distance of up to 800 feet followed by grouting into the basement complex.

Grouting is the proposed treatment beneath the dam and across the right abutment for a distance between 200 and 500 feet from the right end of the dam depending on subsurface findings. Grouting would be accomplished with cement-based or environmentally approved chemical-based grout from the top of the dam level (6,072 feet) to a variable depth necessary to penetrate the basement complex. Choice of grout would be dictated by the underlying formations.

The concrete membrane on the left abutment would start at the top of the dam (elevation 6,072 feet) and extend down an excavated slope of 1:1 to 1.5:1 to an elevation near the bottom of the reservoir at an approximate elevation of 5,900 feet. The concrete membrane would be approximately 12 inches thick and would be constructed atop a 24-foot-wide filter/drainage system designed to provide drainage and lower hydraulic pressures behind the facing and throughout the left abutment ridge. The facing would extend over a distance of about 1,400 feet from a connection to the left side of the dam. A concrete plinth would be constructed at the base of the concrete facing with a width of about 30 feet. The plinth would provide a foundation for the concrete membrane and provide a platform for a deeper secant wall, soil-concrete mixing, and grouting.

The three types of cutoff wall construction below the plinth and along the 1,400-foot distance along the base of the left abutment's concrete membrane are to provide a barrier to reduce seepage and prevent erosion of foundation material. The three types of treatment are:

1. A soil-concrete mixing technique with subsurface equipment would be used for depths of 50 to 75 feet in the upper portions of the strata below the plinth elevation of 5,900 feet for as much as 800 feet of the 1,400 feet at the base of the concrete membrane.
2. A "secant" or concrete wall would be built in locations across and near two offsets caused by ancient faults in the underlying formations. The secant wall would be made of continuous concrete. Depending on the construction method (panels versus drilled shafts), the secant cutoff wall could vary from a minimum of 2 to 3 feet to as much as 5 to 6 feet thick and would be constructed to depths ranging from 100 to 200 feet, depending on location. The foundation secant cutoff system would extend over as much as 600 feet of the 1,400 feet of the concrete membrane treatment.
3. A grout curtain would be used below the soil-concrete mixing areas in the 800 feet not provided with secant wall along the concrete facing. The grout curtain would consist of 2 to 3 lines of grout-filled drill holes ranging from 5 to 10 feet apart with a spacing of about 5 to 10 feet between each line. The grout curtain would extend downward into the lower Schnebly Hill formation and into the massive gypsum layers.

The grout curtain described above would also be installed under the dam and for some distance into the right abutment of the dam. The grout curtain would provide a seepage barrier in the basalt, paleo alluvium and colluvium, interbedded sandstone, and into the basement complex rock (i.e., the massive gypsum layers). The orientation of grout holes (inclined required for basalt versus vertical for the lower formation materials) as well as the type of grouting (cement versus environmentally approved chemical grout) would be adapted to maximize the effectiveness of grouting in these areas.

One alternative approach that is being considered would eliminate the need to construct the concrete facing, filter/drain behind the facing, and plinth along the left abutment ridge. Instead, the center of the left abutment ridge would be excavated to the depth feasible given spatial constraints and stable excavation requirements, a working platform established, then a cutoff wall constructed over a distance of about 1,400 feet. A combination of soil-concrete mixing, secant wall, and/or grouting would be employed below the excavated working platform and would extend into the massive gypsum layers. A concrete wall would be constructed above the bottom of the excavated working platform and backfilled with the excavated material. The upstream face of the left abutment ridge (where the concrete membrane is proposed as described above) would be stabilized to prevent slope instability as the reservoir rises and falls. Tiers would be constructed and armored with basalt material excavated from the right and left abutments of the dam. The remainder of the cutoff beneath the dam and extending into the right abutment would be the same as that described above for the configuration with the concrete membrane option for the left abutment ridge.

Treatment types and dimensions will be finalized during construction of the dam when underground formations are actually exposed, and decisions can be finalized based on the actual materials that are encountered. The pre-construction drilling programs have been extensive and informative for design but leave some uncertainties.

Construction Schedule. The contractor(s) selected to oversee construction would set the work schedule for the project. Although overall construction schedules may change based on future engineering refinement, **Table A.1-1** provides an estimated construction schedule for each project component.

Table A.1-1. Estimated Construction Schedules

Project Component	Duration of Activity
New Miner Flat Dam and Reservoir	24–36 months
North Fork Intake Structure Expansion	12 months
Water Treatment Plant Expansion	30 months
New Water Distribution System	24 months
Total[1]	**36–48 months**

[1] The total time it would take to construct the entire rural water system depends on how many components are constructed at the same time.

Additional details are as follows:

- *New Miner Flat Dam and Reservoir*. Dam construction is likely to occur over a 2- to 3-year period and may include a suspension of activities during the winter months. Work may occur using a 6-day workweek and 10-hour per day schedule. There is potential for using a 7-day work schedule during peak roller-compacted concrete construction activities, and crushing operations may also require double shifts and/or a day and night shift (Gannett Fleming 2014).
- *North Fork Intake Structure Expansion*. Construction of the new intake, pump station, and raw water pipeline leading to the water treatment plant is likely to occur over a 12-month period (Carollo 2014d). The existing raw water diversion would need to be taken offline during construction of the new intake. If possible, constructing these elements when water demands are low would allow the WMAT to meet current water demands using water from the Miner Flat Wellfield.

- *Water Treatment Plant Expansion*. Construction of the expanded water treatment plant is likely to occur over a 30-month period (Carollo 2014d). The existing water treatment plant would need to be taken offline during part of the construction period. If possible, this shutdown would occur when water demands are low. Any other temporary plant shutdowns would be for short periods of time (e.g., 2 to 4 hours) to minimize disruption to water deliveries.
- *New Water Distribution System*. The construction of the new water distribution system is estimated to take about 24 months to complete. Each pump station and storage tank would take approximately 1 month to construct and could be constructed at the same time as the new pipeline. Pipeline construction is estimated to take about 20 months (Morrison-Maierle 2015). Potential intermittent and relatively short delays (e.g., a few days) may occur due to weather. Pipeline construction during the monsoon season would require careful planning to ensure pipeline trenches are not left open for considerable distances to prevent trench erosion during a storm.

Construction-Related Waste Materials and Disposal. Waste materials during construction would primarily consist of byproducts from vegetation and site clearing, especially for the dam and reservoir. Other typical construction debris includes packing and shipping materials (e.g., pallets, cardboard, and foam); cut pipe, scrap metal, and other excess building materials; excess excavation material; asphalt (i.e., related to road crossings or new access roads); fuel, oil, grease, and other equipment maintenance materials; and general trash from the construction crew. Merchantable timber would be removed and sold. Hazardous materials and waste would be disposed of at an authorized disposal facility (see *Hazardous Materials and Waste* measures in **Section A.2**, *Best Management Practices*). Remaining timber debris and other construction debris not suitable for recycling would be hauled to a landfill on the Fort Apache Indian Reservation ("Reservation") (e.g., Geronimo Pass Landfill) for disposal.

Construction-Related Water Use. The following provides estimates of construction-related water use for each project component. This water use is likely to occur over a 3- to 4-year period, depending on how many components are constructed at the same time (see **Table A.1-1** for an estimated construction schedule). Construction-related water use would comply with all applicable Tribal and Federal laws, policies, and regulations.

- *New Miner Flat Dam and Reservoir*. Dam construction is estimated to use 28 to 50 million gallons (100 to 180 acre-feet) of water from local groundwater sources or water from the NFWR. This includes water for dust control, aggregate processing, concrete mixing, and other water needs (Brown 2022).
- *North Fork Intake Structure Expansion and Water Treatment Plant Expansion*. Construction of the new intake, pump station, raw water pipeline leading to the water treatment plant, and expanded water treatment plant is expected to use about 21.6 million gallons (66 acre-feet) of water (Ardizzone 2022). Most of the water would come from the NFWR, with the exception of water for concrete, which would be treated water from the water treatment plant.
- *New Water Distribution System*. About 17.5 million gallons (54 acre-feet) of treated water from the water treatment plant would be needed to flush, test, and disinfect the new water distribution pipeline system and tanks (Mercer 2022).

Construction-Related Truck and Vehicle Trips. Table A.1-2 is an estimate of construction-related traffic associated with construction of the new dam and reservoir (Gannett Fleming 2014), the expansion of the North Fork intake structure (Carollo 2014f), the expansion of the water treatment plant (Carollo 2014f), and the new water distribution system (Morrison-Maierle 2015).

Table A.1-2. Estimated Construction-Related Daily Truck and Vehicle Round Trips for Each Project Component

Project Component	Waste Hauling (Truck Trips)	Construction Deliveries (Truck Trips)	Construction Worker (Vehicle Trips)
New Miner Flat Dam and Reservoir	8	110	70
North Fork Intake Structure Expansion	55		10
Water Treatment Plant Expansion	3	32	75
New Water Distribution System	1 to 5	15 to 20	40 to 50

Additional details are as follows, with estimates representing average daily truck trips unless otherwise noted:

- *New Miner Flat Dam and Reservoir*. For construction of the dam and reservoir, the amount of materials (and, therefore, travel) that would be required from off-site areas would largely depend on the outcome of ongoing and future engineering studies related to the dam project. However, the following is an estimate of construction-related traffic (Gannett Fleming 2014):
  - **Waste Hauling** – 8 truck trips per day to a landfill on the Reservation
  - **Imported Aggregate** – 70 truck trips per day (peak demand) coming from north of the Reservation along State Route (SR) 73
  - **Cement and Fly Ash (for concrete production)** – 40 truck trips per day (peak demand) coming from north of the Reservation along SR 73
  - **Construction Workers** – about 70 workers during peak construction periods
- *North Fork Intake Structure Expansion*. The following is an estimate of construction-related traffic associated with the new intake, raw water pump station, and raw water pipeline leading to the water treatment plant (Carollo 2014f):
  - **Waste Hauling and Materials Delivery/Cement Trucks** – 55 truck trips per day, including waste hauling to a landfill on the Reservation and materials delivery/cement trucks coming from north of the Reservation along SR 73
  - **Construction Workers** – about 10 workers during peak construction periods
- *Water Treatment Plant Expansion*. The following is an estimate of construction-related traffic associated with expanding the existing water treatment plant, based on building multiple components of the water treatment plant simultaneously (Carollo 2014f):
  - **Waste Hauling** – 3 truck trips per day to a landfill on the Reservation
  - **Materials Delivery/Cement Trucks** – 32 truck trips per day coming from north of the Reservation along SR 73
  - **Construction Workers** – about 75 workers during peak construction periods

- *New Water Distribution System*. The following is an estimate of construction-related traffic for the water distribution system (Morrison-Maierle 2015):
  - **Waste Hauling** – 1 to 5 truck trips per day (peak demand) to a landfill on the Reservation
  - **Delivery Trucks** – 15 to 20 truck trips per day (peak demand) coming from north of the Reservation along SR 73
  - **Construction Workers** – about 40 to 50 workers during peak construction periods

Construction-Related Road Disruptions. The following provides information on anticipated road disruptions during construction for each project component:

- *New Miner Flat Dam and Reservoir*. Lane closures or other disruptions to SR 73 would be intermittent and short-lived, and would likely involve construction of the power line, construction of temporary and permanent access roads that connect to the highway, and possible short-term disruptions from use of nearby staging areas. The longest SR-73 lane closure (about a month) would occur during construction of the dam-related grout curtain due to the need for drilling across the roadway.
- *North Fork Intake Structure Expansion*. The existing pump station is located just east of Alchesay Fish Hatchery Road, which is the only access road to the fish hatchery and other properties north of the site. Additionally, construction of the new 24-inch raw water pipeline would cross two roadways (Alchesay Fish Hatchery Road and SR 73). Therefore, periodic lane closures or other disruptions to SR 73 and Alchesay Fish Hatchery Road would occur during construction.
- *Water Treatment Plant Expansion*. Access to the construction site is through an existing road that can be reached from two alternative roads off of SR 73. Construction activities would not cause lane closures or other disruptions to SR 73, except a short-term increase in traffic related to delivery of new equipment, concrete, and construction materials to and from the site.
- *New Water Distribution System*. Much of the proposed pipeline route follows (and crosses) SR 73 and Bureau of Indian Affairs (BIA) Road 12. It also crosses U.S. Highway 60 near Carrizo and various residential and local streets. Lane closures and temporary rerouting during construction would be localized to the area of active pipeline construction, and full roadway closures would likely not be required (Morrison-Maierle 2015).

Easements, Rights-of-Way (ROW), and Encroachment Permits. BIA approves and records ROW easements for project facilities on trust lands. WMAT, Reclamation, and their construction contractors would comply with the process defined under *Rights-of-Way Over Indian Land* (25 CFR 169), which streamlines the procedures and conditions under which BIA will consider a request to approve (i.e., grant) ROW over and across Tribal lands. For this proposed action, all project components would be constructed on lands held in trust by the United States for the benefit of the WMAT and, therefore, the process defined in 25 CFR 169 applies to this action. The final ROW land descriptions would be prepared after the NEPA Record of Decision and would be based on final engineering designs.

In addition to ROW approvals, encroachment permits would be needed for any work within an existing public ROW or easement, such as construction work within an existing roadway ROW. BIA would issue encroachment permits for roads under their jurisdiction (e.g., BIA Road 12), and the

Arizona Department of Transportation (ADOT) would issue encroachment permits for roads and highways under their jurisdiction (e.g., SR 73).

ROW easements and encroachment permits would be needed for the following:

- *New Miner Flat Dam and Reservoir*. ROW easements would be needed for the footprint for the dam, reservoir, construction areas, and future operation, maintenance, and replacement areas. Total footprint would be about 200 acres and would be located within the study area shown on **Figure 2.5-4**. ADOT encroachment permits would be needed during dam construction (e.g., drilling for the grout curtain across SR 73, constructing a power line across SR 73) for any work that takes place within the SR 73 ROW. BIA ROW easements and encroachment permits would be needed for the realignment of Indian Route 62 (Lower Log Road) and Indian Route 67.
- *North Fork Intake Structure and Water Treatment Plan Expansion*. ROW easements would be needed for the footprint for the expanded intake and diversion structure, raw water pipeline, expanded water treatment plant, and related construction areas. Total footprint would be less than 5 acres and would be located within the study area shown on **Figure 2.5-5**. ADOT and BIA encroachment permits would be needed for construction activities taking place within roadway ROWs (e.g., construction of the raw water pipeline across Alchesay Fish Hatchery Road and SR 73).
- *New Water Distribution System*. ROW easements would be needed for the footprint for the 50-mile-long water transmission pipeline, three water storage tanks, two booster pump stations, a new three-phase power line, and related construction areas, as shown on **Figures 2.5-8** through **2.5-11**. The ROW for the pipeline would include a 100-foot corridor along a centerline. Total footprint would be about 600 acres. While much of the pipeline would run parallel to SR 73 and BIA Road 12, most of it would be constructed outside the existing road ROW. ADOT and BIA encroachment permits would be needed for any work taking place within roadway ROW (e.g., construction of the pipeline across SR 73, BIA Road 12, and U.S. Highway 60).

A.2 Best Management Practices

A.2.1 Best Management Practices/Minimization Measures

Table A.2-1 lists the best management practices and general impact avoidance and minimization measures that will be implemented under all action alternatives.

Table A.2-1. Best Management Practices/Minimization Measures

Resource Topic	Best Management Practice/Minimization Measure
Air Quality	• ***Apply the following during construction:*** o Use water application to keep areas of vehicle movement damp enough to minimize the generation of fugitive dust. o Minimize the amount of ground area disturbed at a given time. o Stabilize previously disturbed but inactive areas of exposed soils with a non-toxic soil stabilizer or soil wetting agent that would not result in loss of vegetation or increase other environmental impacts. o Stabilize heavily used unpaved construction roads with a non-toxic soil stabilizer or soil wetting agent. o Cover or treat soil storage piles with a non-toxic soil stabilizer or soil wetting agent. Install windbreaks to further reduce windblown dust emissions. o Cover truckloads of aggregate materials that have the potential to cause visible emissions. Alternatively, sufficiently wet and load materials onto trucks in a manner to provide at least 1 foot of freeboard. o Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site and stabilize all disturbed areas with water application. o Ensure that the construction contractor designates personnel to monitor the dust control measures and to increase watering, as necessary, to minimize the generation of dust.
Noise	• ***Apply the following during construction:*** o Notify residences in northern Whiteriver of expected dates and times of blasting at least 5 days prior to initiating blasting operations during construction of the Miner Flat Dam. o Notify residences within 1,000 feet of proposed construction activities at least 5 days prior to initiation of construction work in their area. o Ensure that construction workers use appropriate hearing protection in compliance with all applicable laws and regulations.
Paleontology	• ***Apply the following during construction:*** o Develop and implement a paleontological monitoring and discovery plan by a qualified paleontological consultant, with experience in Arizona paleontology, prior to the initiation of construction activities. The plan will describe where monitoring is needed, what methods will be used for monitoring, and procedures to follow if a fossil is uncovered during construction.
Forestry and Timber Harvesting	• ***Apply the following during forest clearing:*** o Abide by the recommendations, policies, and best management practices in the Forest Management Plan (WMAT 2005a), including those related to relevant Management Emphasis Areas (e.g., Sensitive Fish, Sensitive Plants, Water, Sensitive Wildlife, Cultural Heritage Sites, Developed Recreation, Scenic Byways, Community, Fuels, and Forest Products). o Ensure timber will be harvested, processed, and sold in coordination with the White Mountain Apache Timber Company's policies, economic value, and employment opportunities. o Obtain approval by the Tribal Council for sales of timber.

Table A.2-1. Best Management Practices/Minimization Measures

Resource Topic	Best Management Practice/Minimization Measure
	o Obtain timber cutting permits or a contract for all timber cutting. o Obtain necessary permits as specified in the WMAT Natural Resources Code (WMAT 2018b) for forest products and construction projects. o Ensure that all construction activities have procedures in place to manage and control the threat of introducing and spreading noxious and invasive weeds and species. o During the Tribal elk hunt, schedule all timber-related activities to minimize disturbance to the elk herd.
Hazardous Materials and Waste	• ***Apply the following before construction:*** o Complete a Phase I environmental site assessment for all project components prior to project construction (e.g., prior to issuing ROW easements as applicable) to identify potential areas of soil contamination. • ***Apply the following in the event areas of potential soil contamination are identified:*** o Notify the WMAT Environmental Protection Office in the event that contaminated soil is encountered and ensure that all on-site personnel handling or working in the vicinity of the contaminated material are trained in accordance with OSHA regulations for hazardous waste operations. o Segregate all potentially contaminated soil into separate stockpiles pending analytical results of soil samples. o Cover stockpiles with plastic sheeting and surround with spill containment booms to prevent erosion and off-site runoff of contaminated soil. o Dispose soils determined to be contaminated at a facility designated for disposal of such materials. o Submit copies of hazardous waste manifests or other documents indicating the amount, nature, and disposition of such materials to the WMAT Environmental Protection Office. • ***Apply the following during construction:*** o Develop a hazardous materials and waste management plan for the use, handling, storage, and disposal of hazardous materials. o Locate staging areas at least 100 feet away from any drainage, creek, or river. o Implement spill prevention and containment best management practices during construction, including fueling and maintenance of construction equipment on plastic tarps; use of spill containment booms and absorbent pads; and establishment of contingency plans to be utilized in the event of a spill. o Remove all construction waste, including trash, construction debris, petroleum products, and potentially hazardous materials to authorized disposal facilities. • ***Apply the following during operations of the WMAT rural water system:*** o Operate the water treatment facilities, pumping plants, tanks, and conveyance systems in accordance with applicable Federal regulations and the operations, maintenance, and safety plans developed for each facility. These plans will

Table A.2-1. Best Management Practices/Minimization Measures

Resource Topic	Best Management Practice/Minimization Measure
	include applicable emergency response procedures related to hazardous materials and waste. ○ Prepare a spill prevention and containment plan in association with storage of chemical disinfectants. ○ Transport regulated materials, such as hazardous chemicals, in accordance with all applicable U.S. Department of Transportation and State of Arizona regulations. ○ Handle solid waste generated from the water treatment process as special waste and periodically test to ensure that the materials do not contain regulated contaminants. ○ Store surface water chemical disinfectants at the water treatment plant and remote booster stations in covered areas with secondary containment to prevent migration of incidental spills to nearby drainages during operations. ○ Follow chemical use, storage, handling, and emergency procedures in accordance with Material Safety Data Sheets, the U.S. Department of Transportation, the International Building Code for each chemical, and WMAT ordinances.
Water Resources	• ***Apply the following during and/or after construction:*** ○ Comply with applicable Federal laws, orders, and regulations concerning the control and abatement of water pollution. ○ Comply with the Section 404 Water Quality Certification for any construction work occurring in streams or associated wetlands. ○ Comply with water quality certification administered by the WMAT pursuant to Section 401 of the Clean Water Act. ○ Obtain coverage under a National Pollutant Discharge Elimination System (construction stormwater) permit prior to discharging stormwater on the Reservation. ○ Use construction methods that would prevent solid matter, contaminants, debris, and other pollutants and waters from entering and accidentally spilling into surface waters. ○ Comply with Construction General Permit including compliance with effluent limits and other permit requirements. ○ Develop and implement an erosion control and monitoring plan, a spill prevention, control, and countermeasure plan, and stormwater pollution prevention plan. ○ Remove vegetation in the dam and reservoir footprint using methods that minimize stormwater contamination (e.g., remove vegetation incrementally over a 6- to 12-month period). ○ Stabilize and re-vegetate staging areas located outside the reservoir footprint at the end of the construction project to match pre-construction conditions.

Table A.2-1. Best Management Practices/Minimization Measures

Resource Topic	Best Management Practice/Minimization Measure
	• ***Apply the following during operations of the WMAT rural water system:*** o Comply with the dam operations manual, including standard operating procedures for managing the temperature and other water quality parameters of water released from the dam. o Install a water quality measurement system (i.e., in situ temperature and dissolved oxygen sensors) to provide real-time water temperature data for inflow and outflow streams. o Monitor, record, and manage temperature and water quality for inflow and outflow streams through dam operations (i.e., manage water releases from different depths within the reservoir to regulate the temperature of the outflow releases) as needed. o Conduct periodic water quality monitoring of the North Fork of the White River and reservoir.
Soils and Geology	• ***Apply the following during and after construction:*** o Develop and implement erosion control and monitoring plans in accordance with all applicable requirements and include these as obligations in any future construction contracts. ▪ Identify construction monitoring requirements and best management practices for preventing erosion during construction. Typical short-term erosion control measures can include use of geotextiles, silt fences, straw wattles, gravel bags, and temporary surface water detention basins, which diffuse runoff and prevent sediments from eroding off-site. ▪ Identify post construction monitoring and best management practices for preventing erosion after construction. Typical long-term erosion control measures can include revegetating denuded areas, installing erosion control fabric on slopes, and constructing permanent drainage features, detention basins, and water velocity reducers. ▪ Identify and correlate all regulatory drivers to management, monitoring, and reporting activities and ensure through contractual mechanisms that requirements are met.
Energy and Public Utilities	• ***Apply the following during construction:*** o Notify affected residences and businesses of dates and times of planned electrical and water disruptions during construction at least 5 days prior to expected events. o Coordinate with the Tribal Solid Waste Department for scheduling and capacity issues for disposal of construction solid waste and vegetation. • ***Apply the following during operations of the WMAT rural water system:*** o Isolate the Miner Flat Wellfield groundwater from surface water, if necessary, to eliminate concerns and operational issues with mixing waters with different chemistry, and ensure the two systems are mixed only after careful evaluation and flushing and monitoring are established. o Implement procedures at the expanded water treatment plant to minimize negative impacts to the sewage treatment plant at Canyon Day, such as

Table A.2-1. Best Management Practices/Minimization Measures

Resource Topic	Best Management Practice/Minimization Measure
	holding cleaning chemicals from the expanded water treatment plant in a separate tank after each cleaning cycle and then neutralizing and bleeding them into the sewer system over 3 to 7 days. Blend the brine waste stream into the sewer system over a period of time. o Coordinate with the Tribal Solid Waste Department for scheduling and capacity issues for disposal of the annual load of solids removed from the expanded water treatment plant basins and ponds.
Public Health and Safety	• ***Apply the following during construction:*** o Meet or exceed requirements of the U.S. Department of Labor, OSHA, and Tribal regulations for safety and protection of residents and workers. o Implement construction-related safety plans in accordance with all applicable requirements. ▪ Address construction site safety and security practices, such as placement of security fencing and temporary lighting around applicable construction areas. ▪ Include specific measures to prevent children from entering construction areas, such as signage, site monitoring, and physical barriers, if working within 0.25 miles of a school or other area where children are present. ▪ Provide measures to minimize fire risk including specific procedures to follow during very high, extreme, and red flag fire danger periods to decrease the potential for fire ignition from construction activities. ▪ Include procedures to follow in the event an off-site wildfire approaches a construction area to ensure worker safety. o Develop a blasting safety plan in accordance with all applicable requirements and secure required blasting permits. • ***Apply the following during operations of the WMAT rural water system:*** o Develop operations, maintenance, and safety plans for all project components. ▪ Plans for the Miner Flat Dam will be consistent with U.S. Department of Interior dam safety guidelines (Bureau of Reclamation and U.S. Army Corps of Engineers 2019, FEMA 2015, FEMA 2005, FEMA 2004) and BIA dam safety policies and requirements, including procedures and guidelines contained in the *Safety of Dams Program Handbook* (BIA 2014). ▪ Miner Flat Dam plans will include an emergency action plan to identify measures to prevent dam failure and minimize downstream threats. ▪ Meet or exceed requirements of the U.S. Department of Labor, OSHA, and Tribal regulations for safety and protection of workers.

Key: BIA = Bureau of Indian Affairs; FEMA = Federal Emergency Management Agency; OSHA = Occupational Safety and Health Administration; ROW = right-of-way; U.S. = United States; WMAT = White Mountain Apache Tribe

A.2.2 Potential Construction Contractor Plan Submittals

The list of plans that will need to be prepared before project construction could begin for a specific project component may include, but is not limited to, the following:

- Traffic management and safety plans
- Pollution prevention plan, including a stormwater pollution prevention plan
- Hazardous materials and waste management plan
- Spill prevention, control, and countermeasure plan
- Blasting safety plan
- Water control plan
- Cofferdam construction plan
- Erosion control and monitoring plan
- Landscape rehabilitation and seeding plan
- Tree and plant protection plan
- Paleontological monitoring and discovery plan
- Construction program plan (e.g., baseline schedules, updated schedule reports, time impact analysis)
- Environmental control plans if applicable (air quality permits, dust control, air pollution control, noise control, light control)

A.3 Mitigation Measures

Table A.3-1 lists the proposed mitigation measures that would be implemented under all action alternatives.

Table A.3-1. Proposed Mitigation Measures

Resource Topic	Proposed Mitigation Measure
Biological Resources	***The following measures would be used as mitigation to minimize impacts on species, vegetation, riparian, and wetland resources:*** o A WMGFD biological monitor shall be on-site during all vegetation removal from March 1 through August 31. o Contractors shall remove vegetation suitable for migratory birds outside of the general nesting season (March 1 through August 31), with an emphasis on birds of conservation concern and associated active nesting periods, to the maximum extent feasible. If vegetation clearing must occur during that period, the contractor shall avoid any active bird nests. Pre-construction surveys within 10 days of clearing can identify active nests, and the WMGFD biologist/monitor can coordinate additional exclusion and avoidance measures to prevent nest destruction. o Horizontal directional drilling shall be implemented where the proposed 50-mile pipeline crosses any stream systems such as Carrizo and Cibecue Creeks and others. Equipment and staff shall remain outside of the riparian

Table A.3-1. Proposed Mitigation Measures

Resource Topic	Proposed Mitigation Measure
	corridor, if present, and shall install the pipe at a depth (estimated at 7 feet) to limit the potential for scour. Trenching shall not occur in these features. o Disturbed areas along the proposed construction alignments associated with pipelines and other infrastructure shall be revegetated following disturbance. The WMAT shall develop a restoration and monitoring plan for all project restoration requirements that outlines restoration criteria and monitoring protocols, as well as required final compliance approvals. Seed mixes shall be approved by the WMGFD and to the maximum extent feasible be collected from local sources. o Construction equipment and contractors shall be staged outside of the riparian communities (including mapped wetlands), which are to be flagged, monitored, and avoided. A construction monitor familiar with riparian habitats, wetland habitats, project wetland delineations, spill prevention, and avoidance measures shall be present for all instream work, with the authority to stop work as needed. Specific best management practices and measures to be included in contractor documents as part of USACE permits and/or under National Pollutant Discharge Elimination System permits (see *Water Resources and Hydrology* in Appendix A.2, *Best Management Practices*) shall also be implemented (e.g., site-specific flagging and avoidance, restoration of contours of temporarily dewatered areas at the North Fork intake structure). o During the final design and engineering phase, jurisdictional wetlands and other non-wetland waters of the U.S. shall be avoided through modification or realignment of infrastructure to the maximum extent feasible. Unavoidable loss or conversion of wetlands shall be mitigated or compensated for through the Clean Water Act Section 404 permitting process and may include a banking or in-lieu fee program. A 404(b)(1) analysis shall be completed to further define impacts to the aquatic environment under jurisdiction of the USACE. ***The following measures would be used as mitigation to monitor and minimize impacts on native fishes and aquatic habitats:*** o The WMAT shall revise the current Native Fishes Management Plan to assess and monitor changes in species distribution and water quality in the reservoir and downstream of the Miner Flat Dam. The plan shall update current and proposed management measures to minimize impacts on native fish, as needed, including implementation of a water quality monitoring program on the NFWR. Key elements shall include the collection/assessment of pre- and post-construction dissolved oxygen and temperature data relative to existing WMAT beneficial use criteria. o The WMAT shall revise the Native Fishes Management Plan to incorporate the Miner Flat reservoir into long-term objectives toward sustaining native fisheries. Monitoring and data from all existing management activities and proposed conservation measures shall be incorporated into an adaptive management strategy. Data collection shall include regular sampling in the reservoir and below the dam to understand species diversity changes, if any,

Table A.3-1. Proposed Mitigation Measures

Resource Topic	Proposed Mitigation Measure
	and help identify additional management actions required. As part of the management plan, existing and future data shall be utilized to develop invasive aquatic species eradication strategies, as needed. o The WMGFD shall establish an annual reporting process to assess the downstream function of the NFWR and White River, incorporate all survey data, and review alignment with management recommendations in the Native Fishes Management Plan. o The WMAT shall incorporate a formal feedback loop with dam operators into any future dam operations manual changes to ensure that operations are consistent with conservation objectives detailed in existing management plans and measures proposed herein. o The WMAT shall revise and expand the existing WMAT Game and Fish Code restricting non-native fish stocking and enforcement of bait, accidental release, and other game and fish regulations designed to minimize the introduction of non-native fish to the Reservation. Signage and information shall be made available to members, identifying bait and release restrictions and enforcement actions. ***The following measures would be used as conservation measures to monitor and minimize impacts on the New Mexico meadow jumping mouse:*** o New Mexico meadow jumping mouse surveys at the proposed Miner Flat Dam site shall be completed annually until the start of construction. A habitat assessment shall also be conducted at the intake structure site where proposed expansion would occur. In addition, in the appropriate season and immediately prior to ground-disturbing activities, the WMGFD shall conduct pre-construction species surveys in the vicinity of the proposed Miner Flat Dam, and at the intake structure site if suitable habitat is identified, for the New Mexico meadow jumping mouse. o If occurrences of New Mexico meadow jumping mice are detected, the WMGFD shall develop a species-specific conservation plan for construction activities. The plan shall include minimization and avoidance measures including, but not limited to, the following: ▪ Ensure ground disturbance within potentially suitable habitat occurs within the active period but outside of the nesting period (late summer), to the maximum extent feasible. ▪ Phase vegetation removal and suitable habitat disturbance from the dam site to the north to maximize escape opportunities. ▪ Map occupied or suitable habitat within the construction footprint and avoid temporary damage to the site, such as staging or clearing. ▪ Ensure a qualified biological monitor with the authority to stop work and with expertise with the species is present during all ground-disturbing activities.

Table A.3-1. Proposed Mitigation Measures

Resource Topic	Proposed Mitigation Measure
	The following measures would be used as conservation measures to monitor and minimize impacts on the northern Mexican gartersnake and narrow-headed gartersnake: o Northern Mexican gartersnake and narrow-headed gartersnake surveys at the proposed Miner Flat Dam site shall be completed annually until the start of construction, following Nowak (2012). In addition, in the summer immediately prior to ground-disturbing activities, the WMGFD shall conduct pre-construction species surveys in the vicinity of the proposed Miner Flat Dam for the northern Mexican and narrow-headed gartersnake. o If occurrences of the northern Mexican gartersnake or narrow-headed gartersnake are detected, the WMGFD shall develop a species-specific conservation plan for construction activities. The plan shall include minimization and avoidance measures including, but not limited to, the following: ▪ Ensure ground disturbance within potentially suitable habitat occurs within the active period but outside of the nesting period (late summer), to the maximum extent feasible. ▪ Phase vegetation removal and suitable habitat disturbance from the dam site to the north to maximize escape opportunities. ▪ Map occupied or suitable habitat within the construction footprint and avoid temporary damage to the site, such as staging or clearing. ▪ Ensure a qualified biological monitor with the authority to stop work and with expertise with the species is present during all ground-disturbing activities to identify and relocate any individuals detected. ***The following measures would be used as conservation measures to monitor and minimize impacts on the Chiricahua leopard frog:*** o The WMGFD, in coordination with the USFWS, shall resurvey sites from the upper end of the inundation area to approximately 1 mile downstream from the proposed Miner Flat Dam site to determine presence/absence of the Chiricahua leopard frog. Surveys shall occur prior to any ground-disturbing activities and in accordance with the general visual encounter method (USFWS 2007). If surveys conclude the species is not present, no additional pre-construction surveys are required. o If occurrences of Chiricahua leopard frogs are detected, the WMGFD shall develop a species-specific conservation plan for construction activities. The plan shall include minimization and avoidance measures including, but not limited to, the following: ▪ Ensure ground disturbance within potentially suitable habitat occurs within the active period but outside of the breeding and egg laying period (season and temperature dependent), to the maximum extent feasible. ▪ Phase vegetation removal and suitable habitat disturbance from the dam site to the north to maximize escape opportunities.

Table A.3-1. Proposed Mitigation Measures

Resource Topic	Proposed Mitigation Measure
	▪ Map occupied or suitable habitat within the construction footprint and avoid temporary damage to the site, such as staging or clearing. ▪ Ensure a qualified biological monitor with the authority to stop work and with expertise with the species is present during all ground-disturbing activities.
Cultural Resources	***The following types of measures from the draft Section 106 Memorandum of Agreement would be used to avoid, minimize, or mitigate adverse effects on historic properties:*** o Reclamation, in coordination with the WMAT and BIA, shall, when possible, avoid adverse effects to historic properties. Avoidance measures for historic properties may include, but are not limited to, redesigning components, fencing of sites during construction, monitoring of construction near site areas within a buffer zone, or placing infrastructure outside of site boundaries. o Reclamation shall ensure that the WMAT, or the WMAT's selected cultural resources contractor, develops and implements an HPTP to mitigate adverse effects to historic properties, including traditional cultural properties, within the APE prior to construction of the undertaking. The HPTP shall be consistent with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 Federal Register 44716–44737). The HPTP shall minimally include the following: ▪ A research design detailing methods for eligibility testing, data recovery, and/or other relevant analyses for each affected historic property. ▪ Incorporation of recommended traditional cultural property treatment measures. ▪ Cultural sensitivity training for construction personnel. ▪ Methods for artifact curation. ▪ Development of a Monitoring and Discovery Plan and a Native American Graves Protection and Repatriation Act (25 U.S. Code 3001 et seq., as amended) Plan of Action. ▪ Reporting requirements.
Transportation	***The following measure would be used as mitigation to minimize short-term construction-related traffic disruptions:*** o The WMAT, or the WMAT's selected contractor, shall develop traffic management and safety plans for each project component and get approval of the plans by the BIA and ADOT, as applicable, prior to the start of construction of that component. The plans may incorporate the following: ▪ Specify material haul routes and construction traffic patterns that minimize local traffic impacts and account for localized traffic obstacles (e.g., cattle gates). ▪ Phase construction to minimize the duration of necessary temporary lane closures and detours. ▪ Provide signage to indicate the duration and dates of project activity along main roadways.

Table A.3-1. Proposed Mitigation Measures

Resource Topic	Proposed Mitigation Measure
	▪ Provide appropriate traffic control when workers and equipment are active along a roadway. ▪ Install steel plates over open trenches in inactive construction areas to maintain existing bicycle and pedestrian access after construction hours. ▪ Enforce speed limits of construction vehicles on all roads. ▪ Notify emergency response providers of lane closures at least 1 week prior to closures and include the location, date, time, and duration of the closure. ▪ Specify truck routes to ensure heavy load movements would not result in increased road repair/maintenance requirements. ▪ Abide by encroachment permit conditions, which should supersede conflicting provisions in the plans.

Key: ADOT = Arizona Department of Transportation; APE = area of potential effects; BIA = Bureau of Indian Affairs; HPTP = Historic Properties Treatment Plan; NFWR = North Fork of the White River; Reclamation = Bureau of Reclamation; U.S. = United States; USACE = United States Army Corps of Engineers; WMAT = White Mountain Apache Tribe; WMGFD = White Mountain Game and Fish Department

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Appendix B
Ongoing and Reasonably Foreseeable Future Actions

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Appendix B. Ongoing and Reasonably Foreseeable Future Actions

This section describes activities that could contribute to cumulative effects when combined with the resource-specific effects of the National Environmental Policy Act (NEPA) alternatives that are described in **Chapter 3** (*Affected Environment and Environmental Consequences*) of this Environmental Impact Statement (EIS). Bureau of Reclamation ("Reclamation") guidance states that the assessment of future cumulative impacts should be based on known or reasonably foreseeable long-range plans, regulations, operating agreements, or other information that establish them as reasonably foreseeable (Reclamation 2012). **Table B-1** lists the relevant ongoing and reasonably foreseeable future actions that are considered in the cumulative effects analysis. The list includes projects, programs, and plans of various Federal agencies and other non-Federal entities that are likely to occur within the next 10 years. Based on a review of proposed projects and in coordination with cooperating agencies, Reclamation has determined that 10 years adequately captures what is reasonably foreseeable. Most regional planning documents do not go beyond 10 years, so identifying projects farther out becomes speculative. Therefore, the list does not include possible future projects on the Fort Apache Indian Reservation (FAIR or "Reservation") that are not currently in the planning stages, given they will likely occur beyond the time frame considered in this analysis. This includes potential utility upgrades to existing housing and wastewater treatment facility expansions, except where noted below.

The proposed action anticipates future population growth, and this may cause indirect impacts on some resources. Regional growth, per se, is not considered a "cumulative action," but it does factor into understanding the context of any future actions in the region. The cumulative impact assessment area also has many water users that operate in accordance with water rights, laws, and court orders. There are many factors that influence the timing, location, and volume of water use, including climate change. The cumulative impact assessment recognizes the continued use and variability of existing water supplies and demand, and climate change, in addition to the specific actions listed in **Table B-1**.

Table B-1. Ongoing and Reasonably Foreseeable Future Actions in the Project Region

Project	Description	Location	Time Frame	Lead Entity
Miner Flat Dam Recreational Facilities	The WMAT is in the early planning process for developing new recreational facilities adjacent to the proposed reservoir, as well as designs for future fish stocking of the reservoir. New facilities may include a campground, picnic areas, a boat ramp, and associated access roads. The new campground could replace the Lower Log Campground that would be inundated by the reservoir. Plans will take into account fees for fishing, boating, and camping.	FAIR (Miner Flat Dam reservoir)	5–10 years	WMAT
Miner Flat Dam Hydropower Generation	The WMAT is considering using the Miner Flat Dam for possible future generation of hydroelectric power, if economically feasible. A hydropower analysis of the Miner Flat Dam indicates that, with a design discharge of 200 cubic feet per second, hydropower production at the damsite would average 5,220 megawatt-hours per year (WMAT 2007).	FAIR (Miner Flat Dam)	Unknown	WMAT
Hon-Dah Resort Expansion	This project will expand the Hon-Dah RV park located north of the Hon-Dah Casino, east of Highway 260, with 200 additional RV sites to add to the current 508 sites. Longer-term planning includes increasing the park to 1,000 RV sites.	FAIR (Hondah)	2–10 years	WMAT
Whiteriver Unified School District High School	The school district is moving forward with a master plan for the Alchesay High School, including construction of a 10,000-square-foot fitness center and upgrades to the athletic complex (e.g., new artificial turf). The district is also planning on adding 20 to 30 additional teacher housing units in Canyon Day.	FAIR (Whiteriver, Canyon Day)	2–10 years	WMAT
WMAT Housing	The Housing Authority is currently working on a major housing project in Hondah with 38 homes. They are also working on plans for the next 5 years.	FAIR (Hondah)	5 years	WMAT
Convenience Store and Tire Shop	This project will construct a new 3,000-square-foot tire shop building, which includes a 2,000-square-foot shop and customer area and a 1,000-square-foot tire storage area. The convenience store will include a gasoline operation. The exterior will consist of eight two-hose diesel dispensers and one underground storage tank.	FAIR (Whiteriver)	3–5 years	WMAT

Table B-1. Ongoing and Reasonably Foreseeable Future Actions in the Project Region

Project	Description	Location	Time Frame	Lead Entity
WMAT Tribal Fair and Rodeo	This is an annual event that takes place at the WMAT Fairgrounds over Labor Day weekend. There is increased traffic throughout Whiteriver to the fairgrounds on BIA Route 44 for the duration of the event, including a few days pre- and post-event. Part of SR 73 closes for a parade. Note that the fair was cancelled in 2020 and 2021 due to COVID-19.	FAIR (Whiteriver)	Ongoing	WMAT
Hon-Dah Casino Pow Wow	This is an annual pow wow event held the first weekend in June at the Hon-Dah Casino. It involves additional traffic and pedestrians in the immediate vicinity of the event and increased demand for lodging and services in the local area.	FAIR (Hondah)	Ongoing	WMAT
Dialysis Building	A new 10,840-square-foot dialysis building will be constructed near the Indian Health Center and will include a parking lot, access road, and detention basin.	FAIR (Whiteriver)	2022	WMAT - ABHS
Clinical Buildings	Two additional clinical buildings are in the planning phase, one in the community of McNary and one in a location to be determined.	FAIR (McNary)	2025	WMAT - ABHS
Geronimo Pass Landfill Expansion	The WMAT is currently working with the IHS on plans to expand the Geronimo Pass Landfill. The landfill has sufficient capacity to remain operable for another 10 years.	FAIR (Canyon Day)	5–10 years	IHS and WMAT
New IHS Quarters and Hospital/Whiteriver Wastewater Lagoons Study	Initial plans are underway to construct a new IHS quarters and hospital. A water and sewer system capacity study is currently underway to determine sewer main capacity for the hospital to the Whiteriver Wastewater Lagoons. The sewer study will also look at the capacity of the lagoons and provide upgrade recommendations.	FAIR (Hondah and Whiteriver)	Sewer study expected in Fall 2022	IHS and WMAT
ADOT 5-Year Plan	The ADOT maintains a 5-year plan of projects for maintenance and upgrades of roads on the Reservation, such as pavement milling[1], pavement replacement, restriping, slope repair, lighting improvements, etc. Work is currently planned along SR 73 (Flying V, Hondah to Post Office), SR 260 (Hondah to McNary), and the intersection of SR 73 and SR 260.	FAIR	Ongoing	ADOT
FAIR Timber Harvest	Programmed timber harvests and sales through 2030 are based on an estimated net allowable annual cut of 47.9 million board feet. Projected	FAIR	Ongoing	BIA and WMAT

Table B-1. Ongoing and Reasonably Foreseeable Future Actions in the Project Region

Project	Description	Location	Time Frame	Lead Entity
	harvest areas include Lone Pine, Tonto South, Tonto North, South Faught Ridge, Lofer North, Sunrise North, Paradise, McKays, Mount Ord/Ord Creek, Coyote East, Diamond Butte, Coyote West, Odart, Beaver, Soldier Butte East, Soldier Butte West, Lame Deer, Perry Creek, Willow Creek, Black River, Hondah, Elk Canyon, and Turkey Creek.			
FAIR Tribal Transportation Planning #3 and #4	The BIA's transportation program includes funds to pay for transportation planning staff, equipment, office space, and vehicles (#3) and plans for updating long-range transportation plans and road inventories (#4).	FAIR (Reservation-wide)	2021–2024	BIA and WMAT[2]
FAIR Transit #1 and #2	This includes funds to pay for transit staff, operations, and maintenance of the transit program and to purchase transit vehicles (#1). This includes preparing plans, specifications, and estimates and then constructing a transit facility in Whiteriver (#2).	FAIR (Reservation-wide/Whiteriver)	2021–2024	BIA and WMAT[2]
FAIR Road Safety Audit Plan	A road safety study will be conducted on 15.3 miles of roadway along Routes 1, 42, 44, 46, and 55.	FAIR	2021–2024	BIA and WMAT[2]
FAIR Road Maintenance	Routine road maintenance activities will be performed, including purchasing heavy equipment.	FAIR (Reservation-wide)	2021–2024	BIA and WMAT[2]
FAIR Safety #1 Paved Walkways and Trails	This includes preparing plans, specifications, and estimates and then constructing 4 miles of a 6-foot-wide paved walkway along SR 260 from milepost 0 to milepost 4.	FAIR	2021–2024	BIA and WMAT[2]
FAIR 12(24)	This includes preparing plans, specifications, and estimates and then reconstructing 12 miles of road to Cibecue.	FAIR (Cibecue)	2021–2024	BIA and WMAT[2]
FAIR SR 73(4)	This includes designing and installing 0.6 miles of street lighting along SR 73 from milepost 333.1 to 333.7.	FAIR	2021–2024	BIA and WMAT[2]
San Carlos Apache Tribe (Tribe) Distribution System Project	The San Carlos Apache Water Rights Settlement Act directed the Secretary of the Interior (acting through Reclamation) to construct a system to deliver the Tribe's 12,700-afy CAP allocation. In 2013, an MOU between the Tribe and Reclamation established the parameters and a plan of action to design and construct new facilities to deliver the Tribe's 12,700 afy of CAP water via a system that diverts water from the	San Carlos Reservation	Ongoing	Reclamation

Table B-1. Ongoing and Reasonably Foreseeable Future Actions in the Project Region

Project	Description	Location	Time Frame	Lead Entity
	Black River. The Tribe's preferred alternative (Black River diversion and tunnel) cannot be constructed in a manner that is beneficial to the Tribe and feasible within the cost, funding, engineering, and economic constraints outlined in the MOU. In January 2021, Reclamation and the Tribe began a Value Planning Study to identify additional alternatives that may have lower construction cost and/or be more cost-effective.			
Temporary Modifications of Water Storage Operations at Lake Roosevelt	The Salt River Project is seeking Reclamation approval of planned, temporary deviation from the *Water Control Manual for Lake Roosevelt* that would allow the Salt River Project, in 3 out of 5 years (preliminarily beginning in 2023 and ending in 2028), up to 120 days to evacuate water from the first 5 feet of the Flood Control Space (up to an elevation of 2,155.78 feet above mean sea level) of Roosevelt Lake.	Roosevelt Dam and Lake on the Salt River and Tonto Creek	2023–2028	Reclamation
Salt River Project - Targeted Herbicide Treatments for Power Line Rights-of-Way on Tonto and Apache-Sitgreaves National Forests in Arizona	The USFS prepared an EA to authorize the use of USFS- and United States Environmental Protection Agency-approved herbicides within existing power line corridors (about 368 miles) to remove non-compatible vegetation to ensure a reliable and safe power supply. For more information, see http://www.fs.fed.us/nepa/nepa_project_exp.php?project=60147.	Tonto National Forest and Apache-Sitgreaves National Forest (near FAIR western boundary)	2021	USFS
Black River Landscape Restoration Project	The USFS prepared an EA to authorize the Black River Landscape Restoration Project, which is a planning effort designed to restore forest resiliency and ecosystem function in the project planning area in the Alpine and Springerville Ranger Districts. For more information, see http://www.fs.fed.us/nepa/nepa_project_exp.php?project=52740.	Apache-Sitgreaves National Forest (along FAIR eastern boundary)	2022	USFS

Table B-1. Ongoing and Reasonably Foreseeable Future Actions in the Project Region

Project	Description	Location	Time Frame	Lead Entity
Apache-Sitgreave Public Motorized Travel Management Plan	The USFS prepared an EIS for the Apache-Sitgreaves Public Motorized Travel Management Plan to designate which routes (roads and trails) and areas on Federal lands administered by the USFS are open to motorized travel. This action was designed to provide for a system of National Forest System roads, motorized trails, and motorized areas designed for motor vehicle use and for that system to reduce impacts to biological, physical, and cultural resources. For more information, see http://www.fs.fed.us/nepa/nepa_project_exp.php?project=22692.	Apache-Sitgreaves National Forest (along FAIR northern and eastern boundaries)	2022	USFS
Tonto National Forest Travel Management	The USFS prepared an EIS to address a Tonto National Forest proposal to designate a system of roads and motorized trails, in addition to prohibiting motorized cross-country travel, except in designated motorized areas and fixed-distance corridors solely for the purpose of motorized dispersed camping or motorized big game retrieval. For more information, see http://www.fs.fed.us/nepa/nepa_project_exp.php?project=28967.	Tonto National Forest (along FAIR western boundary)	2022	USFS
Flying V&H Prescribed Fire	The Pleasant Valley Ranger District proposes to conduct prescribed burning on 59,124 acres and create shaded fuel breaks on 1,798 acres to reduce fire hazard within both forest and woodland stands and private property, improve forest health, and create conditions conducive to the reintroduction of low-to-moderate severity prescribed fire. For more information, see http://www.fs.fed.us/nepa/nepa_project_exp.php?project=53190.	Pleasant Valley Ranger District, Tonto National Forest (along FAIR western boundary)	2021	USFS

Key: ABHS = Apache Behavioral Health Services; ADOT = Arizona Department of Transportation; afy = acre-feet per year; BIA = Bureau of Indian Affairs; CAP = Central Arizona Project; COVID-19 = coronavirus disease of 2019; EA = Environmental Assessment; EIS = Environmental Impact Statement; FAIR = Fort Apache Indian Reservation; IHS = Indian Health Service; MOU = Memorandum of Understanding; Reclamation = United States Bureau of Reclamation; Reservation = Fort Apache Indian Reservation; RV = recreational vehicle; SR = State Route; Tribe = San Carlos Apache Tribe; USFS = United States Forest Service; WMAT = White Mountain Apache Tribe

[1] Pavement milling is the process of removing at least part of the surface of a paved area such as a road, bridge, or parking lot. Milling removes anywhere from just enough thickness to level and smooth the surface, to a full-depth removal. Milling is widely used for pavement recycling, where the pavement is removed and ground up to be used as the aggregate in new pavement.

[2] Activities are conducted under Public Law 93-638, *Indian Self-Determination and Education Assistance Act*.

B.1 References

Reclamation (United States Bureau of Reclamation). 2012. Reclamation's NEPA Handbook. February.

WMAT (White Mountain Apache Tribe). 2007. Project Extension Report for Development of Miner Flat Dam and Canyon Day Irrigation Project in Conjunction with Bonito Creek and Cibecue Creek Development, White Mountain Apache Tribe, Fort Apache Indian Reservation. February.

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Appendix C
Scoping Summary

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Appendix C. Scoping Summary

C.1 Scoping Process

Scoping is part of the public participation requirement of the National Environmental Policy Act (NEPA). The purpose of scoping, which must be completed prior to completing a Draft Environmental Impact Statement (EIS), is to solicit input from interested stakeholders including Federal, State, and local agencies; elected officials; Native Americans; and the general public to help identify pertinent environmental issues to address in the Draft EIS. Project scoping was conducted in 2013 and 2021 because environmental planning efforts were put on hold in 2015 to allow time for additional engineering and design work. This summary documents the actions taken to implement scoping for the Draft EIS in both 2013 and 2021, and summarizes the input received from agencies and the public.

In accordance with 40 Code of Federal Regulations 1506.6(b), Tribal members and other groups, agencies, or organizations that could be interested or affected by the proposed the White Mountain Apache Tribe (WMAT) rural water system were identified and notified of the Bureau of Reclamation's ("Reclamation's") intent to prepare an EIS and the scoping process. Several methods of notification and engagement were conducted, as summarized in **Table C.1-1**.

Table C.1-1. Summary of the Scoping Process for the WMAT Rural Water System Project

Outreach Type	2013	2021
Notice of Intent	Published in the *Federal Register* on September 6, 2013	Published in the *Federal Register* on April 19, 2021
Notification Letters	Distributed by Reclamation on September 5, 2013, and October 15, 2013	Distributed by Reclamation on April 15, 2021
Press Releases	Pushed out to media outlets on September 6, 2013	Pushed out to media outlets on April 16, 2021
Newspaper Advertisements	Published in the *White Mountain Independent* on September 13, 2013, and *Fort Apache Scout* on September 20, 2013	Published in the *White Mountain Independent* on April 20, 23, 27, and 30, 2021; articles published in *White Mountain Independent* and *Fort Apache Scout* on May 7, 2021
Public Service Announcements	Ad hoc broadcasts on local radio prior to scoping meetings	Ad hoc broadcasts on local radio prior to scoping meeting

Table C.1-1. Summary of the Scoping Process for the WMAT Rural Water System Project

Outreach Type	2013	2021
Websites	Used Reclamation's Phoenix Area Website for project information (www.usbr.gov/lc/phoenix/)	Used a project website (www.wmat-rws-eis.com) as a centralized location for project information and all scoping activities
Scoping Meetings	Held in-person meetings in Whiteriver (September 20, 2013) and Cibecue (September 21, 2013)	Held a virtual scoping meeting (May 1, 2021) via a Facebook Live event

Key: Reclamation = Bureau of Reclamation; WMAT = White Mountain Apache Tribe

A Notice of Intent (NOI) to prepare the EIS was originally published in the *Federal Register* on September 6, 2013, with a scoping period occurring from September 6 to November 12, 2013[1]. The scoping process was reinitiated in 2021, and an updated NOI was published in the *Federal Register* on April 19, 2021, with a scoping period from April 19 to May 19, 2021. The publication of the NOI officially marked the beginning of the scoping period, during which time Reclamation requested and accepted public comments on the scope, or range of issues, to be considered during the preparation of the Draft EIS.

Reclamation distributed a scoping notice memorandum to potentially interested Federal, State, and local agencies and government representatives as part of both the original 2013 and 2021 scoping efforts. The notifications included a brief project description, information on the scoping meetings, and an attachment providing the history of the project and a map. Reclamation distributed press releases to a number of local and regional media outlets in both 2013 and 2021. The press releases provided information about the time and location of the scoping meetings and requested public input. The WMAT also published advertisements in two local newspapers: the *White Mountain Independent* and the *Fort Apache Scout*. Informational flyers were posted about the 2013 in-person meetings at several venues on the Fort Apache Indian Reservation ("Reservation"). Due to coronavirus disease of 2019 (COVID-19) restrictions, no physical notices were posted in 2021 advertising the virtual event. Approximately 1 week prior to the scoping meetings, the WMAT arranged for public service announcements on a local radio station. Additionally, the *White Mountain Independent* and *Fort Apache Scout* also ran stories about the project during the 2021 scoping period.

The WMAT and Reclamation held two in-person scoping meetings in 2013 as part of the scoping process. The first meeting took place at Cibecue, Arizona, on September 20, 2013, and a second meeting was held at Whiteriver, Arizona, on September 21, 2013. The format for the community scoping meetings was an open house, initiated with an oral presentation with slides followed by an opportunity for attendees to look at informational displays and ask questions one-on-one with specialists from Reclamation and the WMAT. Resource specialists were on hand to provide

[1] The scoping period was set for a 60-day period (September 6 to October 28, 2013) but was extended until November 12, 2013, due to a Federal Government partial shutdown that occurred on October 1, 2013 (reopening on October 17, 2013).

information, answer questions, facilitate identification of issues, and encourage public involvement. Twenty-one people signed in during the meetings and provided four written comments.

In 2021, due to the COVID pandemic, the WMAT and Reclamation hosted a virtual scoping meeting via Facebook Live, in conjunction with WMAT Chairwoman Gwendena Lee-Gatewood's weekly Saturday Morning Address (**Figure C.1-1**). The virtual scoping meeting was held on May 1, 2021, and included a project introduction by the Chairwoman, and presentations by the WMAT Project Manager Cheryl Pailzote and Reclamation Project Manager Dominic Graziani. The Chairwoman also provided translations in the Apache language. The slide deck presentation was managed by Chief of Staff Jerry Gloshay Jr. The scoping meeting was simulcast live on YouTube and Facebook, and a recording of the meeting was linked to the project website and the Chairwoman's Facebook page. Approximately 45 viewers participated "live" on May 1, 2021. The scoping meeting recording has received over 1,500 views on Facebook and about 80 views on YouTube. The presentation has garnered about 42 chat posts, most of which came during the live event. Meeting attendees were encouraged to visit the project website to review additional information, watch a recording of the scoping meeting, and formally submit any questions and/or comments.

Figure C.1-1. Virtual Scoping Meeting via Facebook

A summary of comments from both the 2013 in-person meetings and the 2021 virtual scoping meeting is included in **Section C.2** (*Comment Summary*).

C.2 Comment Summary

In 2013, four written comments were submitted during the in-person scoping meetings, and four written comments were submitted directly to Reclamation. Of the eight written comments, five were from interested public members, and the other three were from government or tribal agencies. Comments received in 2021 were similar in scope to the eight written comments received in 2013. Six written comment letters were received during the 2021 scoping period, in addition to the chat "comments" posted during the 2021 virtual scoping meeting. Of the six written comment letters, two were from interested public members, and four were from government, tribal, or public utility agencies.

The following sections represent a consolidation and summary of all written comments received in 2013 and 2021. Comments were categorized by EIS topic, such as Purpose and Need, NEPA Process, Proposed Action and Alternatives, or resource area, such as Socioeconomics (primarily job opportunities), Cultural Resources, Water Resources and Hydrology, Recreation, Transportation, Biological Resources, Fisheries, etc. Commenters frequently addressed more than one topic and/or resource area in their comments. Discrete (separate) comments were categorized by their relevant topic/category to allow for their full consideration in the EIS preparation.

C.2.1 Public Input and Comments

The primary concerns expressed by public comments were as follows:

- **NEPA Process** – Communicate with simple English and, where possible, provide Apache translations (2013).
- **Description of Proposed Action and Alternatives**
  - Provide details on the pipeline alignment in the Draft EIS (2013).
  - Describe how each alternative was developed, how it addresses each project objective, and how it will be implemented (2021).
  - Consider alternatives that use the Cibecue Creek because it is much closer to the Cibecue community (2013).
  - Provide a thorough description of new components and how they will function (e.g., new water storage towers, existing tanks) (2013).
- **Land Use, Physical Resources** – The Draft EIS should assess impacts on land (2013).
- **Fisheries, Recreation**
  - Evaluate impacts on fisheries in the Draft EIS. The North Fork of the White River is popular for fishing by Tribal members (2013).
  - Consider recreational opportunities associated with the proposed reservoir (2021).
- **Socioeconomics**
  - Address the project's potential for creating jobs (2013, 2021).
  - Address the project's potential for sourcing construction materials on Tribal lands (2021).
- **Water Resources/Hydrology** – Provide a thorough description of existing diversion operations and downstream flow and compare to proposed dam operations (2021).

C.2.2 Government Agency / Tribal Government Input and Comments

Scoping comments were provided by one Federal agency (the United States [U.S.] Environmental Protection Agency [USEPA]), one State agency (the Arizona State Historic Preservation Officer), and two Tribal governments (the Hopi Tribe and San Carlos Apache Tribe). Primary areas of concern are summarized below by category:

- **Air Quality** – The EIS should evaluate potential emissions effects, with a clear description of emission sources (including fugitive dust), current ambient air quality conditions, and a description of any construction or operational phase mitigation plans. The evaluation should quantify changes in criteria pollutants particularly in consideration of National Ambient Air Quality Standards and changes in criteria pollutant and non-attainment status (if applicable). The EIS should also consider how climate change could exacerbate the project effects, or conversely, how the project could lessen or exacerbate climate change, using USEPA and Reclamation climate change information.
- **Biological Resources** – The EIS should identify listed and petitioned threatened and endangered species and critical habitat and evaluate any changes to these resources, such as habitat fragmentation, obstructions to wildlife, loss of habitat, including relevant information

and conclusions from consultation efforts for this project under Section 7 of the Endangered Species Act, with the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and WMAT Biological Resource Managers. The EIS should identify and describe current or project-related mitigation measures, including monitoring and compensatory actions.

- **Connected Actions (Cumulative) and Mitigation Measures** – Comments specifically mention the use of mitigations for water quality and aquatic resources for this project. The EIS should clearly address cumulative/connected actions and indirect effects on ecosystems and communities, especially "at risk" resources or resources significantly impacted by the project. The EIS connected actions/cumulative effects analysis should focus on aquatic and biological resources, habitat, and cultural resources. The use of adaptive management techniques is highly encouraged, particularly those that are effective and feasible for the implementing entities. Comments from 2013 placed an emphasis on the *Guidance from the Council on Environmental Quality's Modernizing NEPA Implementation*, 2003. Additional comments were received encouraging a robust connected action/cumulative effects analysis related to downstream flow and source waters for downstream users identifying potential connected actions related to adjacent Tribal lands.
- **Cultural Resources** – Agencies specify the need to consult with the State Historic Preservation Officer for affected resources outside of the Fort Apache Indian Reservation and with the Tribal Historic Preservation Office for areas within the Reservation. The EIS analysis should demonstrate compliance with all applicable laws and executive orders pertaining to cultural and historic resources with a focus on those pertaining to sacred sites, traditional cultural properties, and ancestral remains (human and funerary objects). The EIS should clearly describe protocols for ceasing work when cultural resources are discovered during construction activities, for full evaluation by the appropriate regulatory officers.
- **Description of Proposed Action and Alternatives** – This topic received the most attention from government agencies in 2013, mostly to ensure that the EIS provides clear and adequate detail about the proposal to support analysis of impacts and identification of a range of reasonable alternatives. In 2021, several of the comments were repeated/reinforced by government agencies. The EIS should clearly state the purpose and need and how it relates to the selection of alternatives. The EIS should provide details on the siting and selection criteria for the various project components. It should also include details on implementation of the action, such as protocols and monitoring for the construction and operational phases to conserve and protect biological, cultural, and water resources, and community services and activities. The EIS should also identify alternatives and concepts considered but not carried forward in the EIS with documentation of the reasons for not analyzing these alternatives, including any siting or screening criteria.
- **Environmental Justice** – The Draft EIS should include an evaluation of environmental justice populations within the geographic scope of the project and any impacts on these populations.
- **Hydrology and Water Resources** – The EIS should clearly describe the amount of water needed and sources (surface and groundwater) and include a full description of surface water and groundwater sources. Analysis should identify any impacts on water quality and beneficial use from specific discharges, dredging and fill, and stormwater runoff, particularly for impaired waters, based on Total Maximum Daily Loads. The cumulative impact analysis should identify potential impacts on groundwater and aquatic resources, particularly considering interactions with climate change. The EIS should also identify potentially

affected jurisdictional waters of the U.S. and demonstrate how the project would comply with applicable permits under Section 404 of the Clean Water Act (CWA). The EIS should describe any requisite restoration, compensatory actions, and mitigations under the CWA. The EIS should describe water reliability resulting from the action compared to the No Action Alternative and in the context of climate change.

- **NEPA Process** – Comments for this category focused on adherence to the administrative process required under NEPA, project schedule, the adequacy of the analysis of alternatives in the context of the action at hand, and determination of the significance of impacts. A comment encouraged the lead agency to consider conducting the NEPA process for potentially connected actions to maximize information sharing. Additional comments also focused on intergovernmental and government-to-government coordination (under Executive Order 13175, Consultation and Coordination with Indian Tribal Governments), particularly to ensure that the decision supports actions and mitigations that are feasible and within the capacity of existing authorities and WMAT resources.
- **Purpose and Need** – The EIS should show a clear relationship between the proposal and the purpose and need for the action with an objective statement of the rationale for the project.
- **Socioeconomics and Community Services** – The EIS should evaluate the potential changes in jobs and population from a more reliable water system.

Appendix D
Air Quality Emissions

Abbreviations and Acronyms

Acronym	Definition
ADEQ	Arizona Department of Environmental Quality
CAA	Clean Air Act of 1970 and its subsequent amendments
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
EIS	Environmental Impact Statement
GHG	greenhouse gas
GWP	global warming potential
HAP	hazardous air pollutant
IPCC	Intergovernmental Panel on Climate Change
MOVES	Motor Vehicle Emission Simulator
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
ppm	parts per million
RCP	Representative Concentration Pathway
Reservation	Fort Apache Indian Reservation
SO_2	sulfur dioxide
U.S.	United States
USEPA	United States Environmental Protection Agency
USGCRP	United States Global Change Research Program
VOC	volatile organic compound
WMAT	White Mountain Apache Tribe

Appendix D. Air Quality Emissions

D.1 Introduction

Air quality at a given location can be described by the concentrations of various air pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing its concentration to an appropriate Federal and/or State ambient air quality standard. These standards represent the allowable atmospheric concentrations at which public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The United States (U.S.) Environmental Protection Agency (USEPA) established the National Ambient Air Quality Standards (NAAQS) to regulate what are known as criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. Units of concentration for these standards are generally expressed in parts per million or micrograms per cubic meter. The Arizona Department of Environmental Quality (ADEQ) has adopted the NAAQS to regulate sources of air pollution in Arizona. **Table D.1-1** presents the NAAQS.

The main pollutants of concern considered in this air quality analysis include volatile organic compounds (VOCs), O_3, CO, nitrogen oxides (NO_x), PM_{10}, and $PM_{2.5}$. Although VOCs or NO_x (other than NO_2) have no established ambient standards, they are important as precursors to O_3 formation.

Identifying the area of analysis for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. Air emissions produced from proposed construction and operational activities mainly would affect air quality within the immediate project area, which occurs within the counties of Navajo and Gila. Emissions generated from truck traffic due to the transport of materials to and from the project site would produce more dispersed effects as they travel on roadways through adjacent portions of Arizona.

The area of analysis for inert pollutants (such as CO and particulates in the form of dust) generally is limited to a few miles downwind from a source. The area of analysis for reactive pollutants, such as O_3, could extend much farther downwind than for inert pollutants. Ozone is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. Ozone precursors are mainly NO_x and photochemically reactive VOCs. In the presence of sunlight, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from their source.

Table D.1-1. National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards	
		Primary[1]	Secondary[2]
Ozone (O_3)	8-hour	0.070 ppm	Same as primary
Carbon Monoxide (CO)	8-hour	9 ppm	—
	1-hour	35 ppm	—
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm	Same as primary
	1-hour	100 ppb	—
Sulfur Dioxide (SO_2)	3-hour	—	0.5 ppm
	1-hour	75 ppb	—
Respirable Particulate Matter (PM_{10})	24-hour	150 μg/m^3	Same as primary
Fine Particulate Matter ($PM_{2.5}$)	Annual	12 μg/m3	15 μg/m3
	24-hour	35 μg/m3	—
Lead	Rolling 3-month average	0.15 μg/m3	Same as primary

Key: μg/m^3 = micrograms per cubic meter; ppb = parts per billion; ppm = parts per million; — = not applicable

[1] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect public health

[2] National Secondary Standards: The levels of air quality necessary to protect public welfare from any known or anticipated adverse effects of a pollutant

D.2 Regional Air Emissions

USEPA designates all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. Former nonattainment areas that have attained the NAAQS are designated as maintenance areas. USEPA classifies the portions of Navajo and Gila Counties that surround the project site as in attainment of all NAAQS.

Ozone concentrations are highest during warmer months of the year and coincide with the period of maximum insolation. Maximum O_3 concentrations tend to be homogeneously spread throughout a region since it often takes several hours to convert precursor emissions to O_3 in the atmosphere. Inert pollutants, such as CO, tend to have the highest concentrations during the colder months of the year, when light winds and nighttime/early morning surface-based temperature inversions inhibit atmospheric dispersion. Maximum inert pollutant concentrations are usually found near an emission source (ADEQ 2021a).

Ambient PM_{10} concentrations within the project region occur from emissions of fugitive dust and the combustion of fuel in vehicles. Maximum PM_{10} impacts occur in combination with fugitive dust generated by ground-disturbing activities (such as the operation of vehicles on unpaved surfaces) and high wind events (ADEQ 2021a).

The ADEQ maintains a network of stations within Arizona that monitors air quality and compliance with the NAAQS. The nearest ADEQ air monitoring stations to the project site are in Miami, Gila

County, about 50 miles to the southwest (ADEQ 2020). The White Mountain Apache Tribe (WMAT) Air Program also monitors ambient PM_{10} at locations in Whitewater and McNary (WMAT 2017).

Table D.2-1 presents estimations of annual emissions generated within Gila and Navajo Counties for calendar year 2017 (USEPA 2021). The majority of emissions within the two-county region occur from (1) fuel combustion (coal) (NO_x and SO_2), (2) metal processing (SO_2), (3) miscellaneous sources (prescribed burns, wildfires, and fugitive dust) (VOCs, CO, PM_{10}, and $PM_{2.5}$), (4) natural resources (biogenics from vegetation and soil) (VOCs and CO), and (5) on-road vehicles and nonroad vehicles/equipment (CO and NO_x).

Table D.2-1. 2017 Annual Air Emissions for Gila and Navajo Counties

County/Emission Source Category-Type	Air Pollutant Emissions (Tons/Year)						
	VOC	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Gila County							
Stationary Sources							
Chemical & Allied Product Manufacturing	0	2	2	0	0	0	-
Fires - Prescribed/Wild	-	-	-	-	-	-	474,227
Fuel Combustion	115	260	126	5	33	33	-
Metals Processing	3	53	146	24,426	443	412	-
Miscellaneous	7,997	33,541	622	302	7,769	3,516	-
Natural Resources	42,455	6,974	1,002	-	-	-	-
Other Industrial Processes	8	34	0	0	2,572	380	45,302
Solvent Utilization	400	-	-	-	-	-	-
Storage & Transport	170	-	-	-	1	0	-
Waste Disposal & Recycling	30	193	9	2	50	45	-
Stationary Source Subtotal	**51,179**	**41,057**	**1,908**	**24,736**	**10,868**	**4,386**	**519,529**
Mobile Sources							
On-Road Vehicles	750	6,432	1,281	3	60	34	351,220
Nonroad Vehicles/Equipment	1,141	3,983	243	1	37	34	46,635
Mobile Source Subtotal	**1,891**	**10,415**	**1,524**	**5**	**97**	**67**	**397,854**
Total Gila County Emissions	**53,070**	**51,472**	**3,432**	**24,740**	**10,965**	**4,454**	**917,384**
Navajo County							
Stationary Sources							
Fires - Prescribed/Wild	-	-	-	-	-	-	132,514
Fuel Combustion	138	1,458	4,317	1,759	338	273	-
Miscellaneous	3,605	14,362	128	87	9,424	2,246	-
Natural Resources	42,734	8,835	1,684	-	-	-	-
Other Industrial Processes	14	59	0	-	4,244	662	4,682,711
Solvent Utilization	853	-	-	-	-	-	-
Storage & Transport	318	-	-	-	0	0	-
Waste Disposal & Recycling	115	389	22	4	131	110	-
Stationary Source Subtotal	**47,777**	**25,101**	**6,152**	**1,851**	**14,136**	**3,292**	**4,815,226**

Table D.2-1. 2017 Annual Air Emissions for Gila and Navajo Counties

County/Emission Source Category-Type	Air Pollutant Emissions (Tons/Year)						
	VOC	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Mobile Sources							
On-Road Vehicles	1,316	12,835	2,829	8	137	80	841,578
Nonroad Vehicles/Equipment	375	2,904	1,973	3	77	74	40,403
Mobile Source Subtotal	**1,691**	**15,739**	**4,802**	**11**	**214**	**154**	**881,981**
Total Navajo County Emissions	**49,468**	**40,840**	**10,954**	**1,862**	**14,350**	**3,445**	**5,697,206**

Source: (USEPA 2021)

Key: CO = carbon monoxide; CO_2e = carbon dioxide equivalent; mt = metric tons; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_x = sulfur oxides; VOC = volatile organic compound; — = not applicable

[1] CO_2e emissions not available for most sources

D.3 Regional Climate and Meteorology

The project region has a semi-arid climate (annual precipitation totals between 10 and 20 inches) with relatively wet summers and dry springs. Due to its location in the interior of the continent and a mean elevation of about 5,300 feet, the project region has warm summers and cool winters. Seasonal variations in the position and strength of atmospheric high-pressure systems in the Western United States are key factors in weather conditions for the area. Climate and meteorological data collected at Whiteriver are used to describe the climatic conditions of the project area (Western Region Climate Center 2021).

From roughly July through September, high pressure centered in the central Rockies region circulates humid tropic air into the Southwest. This “monsoon” regime produces the majority of annual precipitation in the project region. During the winter months, a weakening of high pressure over the Rockies and along the West Coast of the United States allows polar storm systems to affect the project region. These winter storms produce a secondary peak of annual precipitation. Spring in the project region is relatively dry, as it is a period of weak polar storm activity and occurs prior to the monsoon. The average annual precipitation at Whiteriver is 18 inches. This location also averages about 17 inches of snow per year.

The average high and low temperatures in Whiteriver in July are about 90 and 58 degrees Fahrenheit, respectively. January average high and low temperatures are 53 and 21 degrees Fahrenheit, respectively.

D.4 Greenhouse Gases and Climate Change

It is well-documented that the Earth’s climate has fluctuated throughout its history. However, scientific evidence indicates a correlation between increasing global temperatures over the past century and the worldwide proliferation of greenhouse gas (GHG) emissions by humans (U.S.

Global Change Research Program [USGCRP] 2018). Climate change associated with global warming is predicted to produce negative environmental, economic, and social consequences across the globe.

GHGs are gases that trap heat in the atmosphere by absorbing infrared radiation. GHG emissions occur from natural processes and human activities. Water vapor is the most important and abundant GHG in the atmosphere. However, human activities produce only a small amount of the total atmospheric water vapor. The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The main source of GHGs from human activities is the combustion of fossil fuels, such as crude oil and coal. Examples of GHGs created and emitted primarily through human activities include fluorinated gases (hydrofluorocarbons and perfluorocarbons) and sulfur hexafluoride. **Table D.2-1** presents estimations of annual GHG emissions generated within Gila and Navajo Counties for calendar year 2017.

Each GHG is assigned a global warming potential (GWP). The GWP is the ability of a gas or aerosol to trap heat in the atmosphere. The GWP rating system is standardized to CO_2, which has a value of one. For example, CH_4 has a GWP of 28, which means that it has a global warming effect 28 times greater than CO_2 on an equal-mass basis (Intergovernmental Panel on Climate Change [IPCC] 2014). To simplify GHG analyses, total GHG emissions from a source are often expressed as a CO_2 equivalent (CO_2e). The CO_2e is calculated by multiplying the emissions of each GHG by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. While CH_4 and N_2O have much higher GWPs than CO_2, CO_2 is emitted in such higher quantities that it is the overwhelming contributor to CO_2e from both natural processes and human activities.

Observed changes due to global warming include rising temperatures, shrinking glaciers and sea ice, thawing permafrost, sea level rise, a lengthened growing season, and shifts in plant and animal ranges (IPCC 2014, USGCRP 2018). In the Southwest region (Arizona, California, Colorado, Nevada, New Mexico, and Utah), observed changes include increases in drought and wildfire conditions, a reduction in winter snow pack, and lower streamflows in major drainage basins (USGCRP 2017).

Assessments of climate change conclude that global warming will continue into the foreseeable future and will intensify as a function of anthropogenic GHG emissions and changes in land uses. Predictions of long-term negative environmental impacts to Arizona from global warming include the following (Gonzalez et al. 2018):

- Longer and hotter heat waves, which will produce more severe and frequent droughts.
- An increase in wildfires, particularly in more wooded and higher elevations such as the project region.
- A decrease in average seasonal precipitation by year 2100 under the highest GHG emission scenario (Representative Concentration Pathway [RCP] 8.5). This decrease in precipitation mainly will occur during the colder months due to a reduction in polar storm activity. However, it is uncertain how global warming will affect precipitation produced from the regional monsoon regime.

- A continuation in the decrease of late-season snow packs.
- Continuations in the declines in river flow and soil moisture.

D.5 Regulatory Setting

The Federal Clean Air Act of 1970 and its subsequent amendments (the CAA) establish air quality regulations and the NAAQS and delegate the enforcement of these standards to the States. The CAA establishes air quality planning processes and requires areas in nonattainment of a NAAQS to develop a State Implementation Plan that details how the State will attain the standard within mandated time frames. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area.

The Air Quality Division of the ADEQ is responsible for controlling sources of air pollution within Arizona, excluding Tribal lands. Title 18, Chapter 2 of the Arizona Administrative Code identifies the rules used by the ADEQ's Air Quality Division to regulate air quality (ADEQ 2021b). The Air Program of the WMAT Environmental Protection Office uses the NAAQS to regulate air quality on the Fort Apache Indian Reservation (the Reservation). USEPA Region 9 is responsible for issuing air quality permits on the Reservation.

Federal agencies address emissions of GHGs by reporting and meeting reductions mandated in Federal laws, executive orders, and agency policies. One of these requirements includes the USEPA Final Mandatory Reporting of Greenhouse Gases Rule. Under the Mandatory Reporting of Greenhouse Gases Rule, stationary sources that emit 25,000 metric tons or more per year of CO_2e are required to report their annual GHG emissions to USEPA.

D.6 Impact Assessment

Under the No Action Alternative, the proposed WMAT rural water system would not be built, and no construction activity would occur. The No Action Alternative would not result in any new air quality impacts.

For the action alternatives, the air quality analysis considered the magnitude of emissions that would result from construction and operation of the project alternatives and whether these emissions would contribute to an exceedance of a NAAQS. If proposed emissions would not be expected to contribute to an exceedance of a NAAQS, then impacts would not be significant.

Air quality impacts resulting from proposed construction and operational activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and haul trucks and (2) fugitive dust emissions (PM_{10} or $PM_{2.5}$) due to the operation of equipment on exposed soil. The air quality analysis estimated the magnitude of emissions that would result from these proposed activities. Activity and scheduling data were developed to estimate construction and operational equipment and haul truck usages and their associated combustive and fugitive dust emissions for each project activity. The analysis assumed that construction would begin in year 2024 and would end in year 2026. In practice, the dam construction may start and end later than the other project components, but this assumption provides a more conservative estimate for projected air emissions given it assumes all construction occurs at the same time.

To estimate criteria pollutant emissions from trucks that would haul materials to and from the construction sites, the analysis focused on trips that would occur within 50 miles of the project area. Emissions generated from project truck traffic at more distant locations would produce more dispersed and inconsequential air quality impacts. However, for the calculation of GHGs (CO_2e), the analysis considered entire truck trip travel distances.

Factors needed to derive source emission rates were obtained from the *Compilation of Air Pollutant Emission Factors, AP-42, Volume I* (USEPA 1995, 2006) for fugitive dust and the USEPA Motor Vehicle Emission Simulator (MOVES3) model for on-road vehicles and nonroad construction equipment (USEPA 2020). **Attachment D-1** of this appendix includes assumptions and factors used to estimate criteria pollutant and GHG emissions that would occur from the action alternatives.

Proposed construction activities would implement standard construction practices to reduce fugitive dust emissions generated from the use of construction equipment and trucks on exposed soils (see *Air Quality* measures in **Appendix A.2** (*Best Management Practices*) of the Environmental Impact Statement. The analysis reduced the estimation of proposed fugitive dust emissions by 50 percent from uncontrolled levels to simulate use of these measures.

D.6.1 Air Emissions from Construction

Construction activities would be the same under all action alternatives. **Table D.6-1** presents estimates of annual emissions that would occur from construction of the proposed project components. The largest contributors to emissions in any annual period would include pipeline installation and construction of the Miner Flat Dam. Operation of equipment and trucks on unpaved surfaces would be the main sources of PM_{10}/$PM_{2.5}$ emissions during proposed construction.

Comparison of the data in **Table D.6-1** to **Table D.2-1** shows that peak annual construction emissions would equate no more than 1.2 percent of the annual emissions generated within either Gila or Navajo County in 2017 for any criteria air pollutant (NO_x). Combustive emissions produced from the mobile and intermittent operation of construction equipment and trucks over a large project area would quickly disperse in the atmosphere to low ambient levels. As discussed above in **Section D.2**, the project area is in attainment of all NAAQS. Therefore, combustive emissions from construction, in combination with emission from existing sources, would not result in an exceedance of a NAAQS at any location. Fugitive dust sources would be stationary in nature and implementation of the standard dust control measures described in **Appendix A.2** (*Best Management Practices*) would minimize their emissions. Additionally, an on-site concrete batch plant used for proposed construction activities would be subject to emission limitation requirements through New Source Review permitting and Best Available Control Technology. Compliance with these requirements would ensure that the ambient impact of emissions from proposed construction would remain below NAAQS levels.

Proposed construction equipment would emit hazardous air pollutants (HAPs) that could potentially impact public health. The main source of HAPs would occur in the form of particulates from the combustion of diesel fuel. Project construction would emit a maximum of 2.18 tons per year of diesel particulate matter, which equates to less than 0.03 percent of the combined HAPs emitted in either Gila or Navajo County in 2017 (USEPA 2021). Similar to the above discussion, the mobile and intermittent operation of proposed diesel-powered construction equipment over a large project area would produce very low ambient concentrations of HAPs in a localized area and, therefore, would produce minimal impacts to public health.

Table D.6-1. Annual Emissions Generated from Construction of the Proposed White Mountain Apache Tribe Rural Water System

Year/Activity	Air Pollutant Emissions (Tons/Year)						
	VOC	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Year 2024							
Pipeline Installation	0.45	11.92	3.25	0.00	2.11	0.32	1,211
Water Diversion System	0.00	0.03	0.06	0.00	0.41	0.04	20
Water Treatment Plant	0.12	0.95	2.01	0.00	0.85	0.16	697
Miner Flat Dam	-	-	-	-	-	-	-
Total Emissions – Year 2024	**0.58**	**12.91**	**5.32**	**0.01**	**3.36**	**0.53**	**1,928**
Year 2025							
Pipeline Installation	1.29	37.35	7.77	0.01	4.81	0.72	2,744
Water Diversion System	0.01	0.11	0.25	0.00	0.85	0.09	72
Water Treatment Plant	0.22	1.66	3.55	0.00	1.47	0.29	1,193
Miner Flat Dam	2.08	12.50	36.89	0.04	15.34	2.90	11,964
Total Emissions – Year 2025	**3.59**	**51.62**	**48.46**	**0.05**	**22.47**	**4.00**	**15,973**
Year 2026							
Pipeline Installation	0.22	5.86	1.60	0.00	1.02	0.16	597
Water Diversion System	-	-	-	-	-	-	-
Water Treatment Plant	0.04	0.24	0.61	0.00	0.21	0.05	205
Miner Flat Dam	2.31	13.38	39.78	0.04	38.27	5.39	13,025
Total Emissions – Year 2026	**2.57**	**19.47**	**41.99**	**0.05**	**39.50**	**5.59**	**13,827**

Key: CO = carbon monoxide; CO_2e = carbon dioxide equivalent; mt = metric tons; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_x = sulfur oxides; VOC = volatile organic compound; — = not applicable

D.6.2 Air Emissions from Operations

Operation activities would be similar under all action alternatives. **Table D.6-2** presents estimates of emissions that would occur from operation and maintenance of the proposed WMAT rural water system. These data show that the operation of proposed mobile equipment would generate minor amounts of air emissions and, therefore, would not contribute to an exceedance of a NAAQS at any location.

Table D.6-2. Annual Emissions Generated from Operation and Maintenance of the Proposed Rural Water System

Source Type	Air Pollutant Emissions (Tons/Year)						
	VOC	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Operations/Maintenance Equipment	0.01	0.40	0.04	0.00	0.00	0.00	11

Key: CO = carbon monoxide; CO_2e = carbon dioxide equivalent; mt = metric tons; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_x = sulfur oxides; VOC = volatile organic compound

D.6.3 Greenhouse Gas Emissions

Table D.6-1 and **Table D.6-2** present estimates of GHG emissions (CO_2e) that would occur from construction and operation under all action alternatives. The GHG emissions from proposed construction and operation would incrementally contribute to future climate change. However, these emissions would equate to an infinitesimal amount of the total worldwide GHG inventory.

The proposed WMAT rural water system would alleviate recent water outages, declining water quality, and diminishing groundwater sources and would provide an adequate water supply to future residents on the Reservation. Therefore, in terms of water supply, the action alternatives would help to alleviate the impact of increasing aridity due to climate change in the project region.

D.7 References

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Attachment D-1: Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project

Appendix D-1 - Air Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project

	A	B	C	D	E	F	G	H	I
1	**Table D-1.1 - Air Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project**								
2		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
3	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
4	*Pipeline Installation - Crew #1*								
5	Compactor - Trench	20	D	0.25	1	4	20	525	10,506
6	Excavator - Lead	300	D	0.75	1	8	1,800	525	945,503
7	Excavator - Support	200	D	0.50	2	8	1,600	525	840,447
8	Generator	15	G	0.25	1	8	30	525	15,758
9	Loader	300	D	0.25	1	8	600	525	315,168
10	Trucks - Crew	350	G	0.10	3	4	420	525	220,617
11	*Pipeline Installation - Crew #2*								
12	Compactor - Trench	20	D	0.25	1	4	20	525	10,506
13	Excavator - Lead	300	D	0.75	1	8	1,800	525	945,503
14	Excavator - Support	200	D	0.50	2	8	1,600	525	840,447
15	Generator	15	G	0.25	1	8	30	525	15,758
16	Loader	300	D	0.25	1	8	600	525	315,168
17	Trucks - Crew	350	G	0.10	3	4	420	525	220,617
18	*ARV & Valve Installation*								
19	Excavator	200	D	0.25	1	4	200	581	116,200
20	Generator	15	D	0.25	1	2	8	581	4,358
21	Loader	300	D	0.25	1	4	300	581	174,300
22	Trucks - Crew	350	G	0.10	2	4	280	581	162,680
23	*Tank & Pump Station Installation*								
24	Cement Mixer	350	D	0.25	2	8	1,400	71	99,400
25	Compactor - Ride-On	50	D	0.10	1	8	40	356	14,240
26	Excavator	200	D	0.25	1	8	400	356	142,400
27	Generator	15	D	0.10	1	8	12	356	4,272
28	Loader	300	D	0.25	1	8	600	356	213,600
29	Telehandler	100	D	0.10	1	8	80	356	28,480
30	Trucks - Crew	350	G	0.10	2	8	560	712	398,720
31	*Road Work*								
32	Compactor - Ride-On	150	D	0.25	1	6	225	162	36,450
33	Grader	250	D	0.50	1	8	1,000	162	162,000
34	Loader	300	D	0.25	1	8	600	162	97,200
35	Skid-steer	400	D	0.10	1	2	80	162	12,960
36	Trucks - Crew	350	G	0.10	4	4	560	162	90,720
37	Water Truck	350	D	0.10	1	2	70	162	11,340
38	Note: (1) Number Active = average daily acres disturbed on a continuous basis and Total Hp-Hrs = total acre-days for the entire activity.								

	A	B	C	D	E	F	G	H	I
40	**Table D-1.2. Nonroad Equipment Activity Data for Water Diversion System Construction - WMAT Rural Water System**								
41		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
42	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
43	*Pump House*								
44	Cat 950K Front-end Loader	221	D	0.25	1	6	332	15	4,973
45	Cat 420F Backhoe/loader	93	D	0.25	1	6	140	15	2,093
46	Cat 329E Excavator	241	D	0.90	1	8	1,735	15	26,028
47	Cat 730C Equipment Maintenance & Fuel Truck	367	D	0.25	1	2	184	15	2,753
48	Cat D6T Dozer	207	D	0.90	1	8	1,490	2	2,981
49	Putzmeister 58-Meter Concrete Boom Pump	405	D	0.90	1	6	2,187	4	8,748
50	Cat 160M2 Motor Grader	213	D	0.75	1	8	1,278	2	2,556
51	*Diversion Structure*								
52	Cat 950K Front-end Loader	221	D	0.25	1	6	332	3	995
53	Cat 420F Backhoe/loader	93	D	0.25	1	6	140	3	419
54	Cat 329E Excavator	241	D	0.90	1	8	1,735	3	5,206
55	Cat 730C Equipment Maintenance & Fuel Truck	367	D	0.25	1	2	184	3	551
56	Putzmeister 58-Meter Concrete Boom Pump	405	D	0.90	1	6	2,187	2	4,374
57	*Raw Water Pipeline*								
58	Cat 950K Front-end Loader	221	D	0.25	1	4	221	15	3,315
59	Cat 420F Backhoe/loader	93	D	0.25	1	4	93	15	1,395
60	Cat 329E Excavator	241	D	0.90	1	6	1,301	15	19,521
61	Cat 730C Equipment Maintenance & Fuel Truck	367	D	0.25	1	2	184	15	2,753
62	Cat CP44 Vibratory Compactor	100	D	0.95	1	6	570	15	8,550
63	Cat MD5150C Track Drill	385	D	0.90	1	6	2,079	7	14,553

	A	B	C	D	E	F	G	H	I
65	**Table D-1.3. Nonroad Equipment Activity Data for Water Treatment Plant Construction - WMAT Rural Water System - (page 1 of 2)**								
66		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
67	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
68	*Removal of Grass & Shrubs*								
69	Cat 623K Elevating Scraper	407	D	0.50	3	8	4,884	15	73,260
70	Cat D8T Dozer	317	D	0.80	1	8	2,029	15	30,432
71	Cat D6T Dozer	207	D	0.80	1	8	1,325	15	19,872
72	Cat 330D Excavator	268	D	0.50	1	6	804	15	12,060
73	Cat 990H Front-end Loader	627	D	0.50	1	4	1,254	15	18,810
74	Cat 160M2 Motor Grader	213	D	0.80	1	8	1,363	15	20,448
75	Cat 730C Dump truck	367	D	0.80	2	8	4,698	15	70,464
76	LiuGong Lrg Water Truck	525	D	0.50	1	4	1,050	15	15,750
77	*Yard Piping*								
78	Cat 330D Excavator	268	D	0.80	1	8	1,715	22	37,734
79	Cat 323D Excavator	150	D	0.80	1	8	960	22	21,120
80	Cat 990H Front-end Loader	627	D	0.50	1	8	2,508	22	55,176
81	Cat 420F Backhoe/loader	93	D	0.80	1	8	595	22	13,094
82	Cat CP44 Vibratory Compactor	100	D	0.80	2	6	960	22	21,120
83	LiuGong Lrg Water Truck	525	D	0.50	1	8	2,100	22	46,200
84	Freightliner 122SD Dump Truck	350	D	0.80	4	8	8,960	22	197,120
85	*Pretreatment Bldg. & Flocculation Basins*								
86	Cat D6T Dozer	207	D	0.80	1	8	1,325	4	5,299
87	Cat 330D Excavator	268	D	0.50	1	8	1,072	4	4,288
88	Cat 990H Front-end Loader	627	D	0.50	1	8	2,508	4	10,032
89	Cat 160M2 Motor Grader	213	D	0.80	1	8	1,363	4	5,453
90	LiuGong Lrg Water Truck	525	D	0.50	1	6	1,575	4	6,300
91	Freightliner 122SD Dump Truck	350	D	0.80	1	4	1,120	4	4,480
92	*Sedimetation Basins*								
93	Cat 623K Elevating Scraper	407	D	0.50	2	8	3,256	48	156,288
94	Cat D8T Dozer	317	D	0.80	1	8	2,029	48	97,382
95	Cat D6T Dozer	207	D	0.80	1	8	1,325	48	63,590
96	Cat 330D Excavator	268	D	0.50	1	8	1,072	48	51,456
97	Cat 990H Front-end Loader	627	D	0.50	1	8	2,508	48	120,384
98	Cat 160M2 Motor Grader	213	D	0.80	1	8	1,363	48	65,434
99	Cat 730C Dump truck	367	D	0.80	1	8	2,349	48	112,742
100	LiuGong Lrg Water Truck	525	D	0.50	1	8	2,100	48	100,800
101	Freightliner 122SD Dump Truck	350	D	0.80	2	8	4,480	48	215,040
102	Cat 323D Excavator	150	D	0.80	1	8	960	48	46,080
103	Cat CS54B Vibratory Compactor	131	D	0.80	1	8	838	48	40,243
104	Cat CP44 Vibratory Compactor	100	D	0.80	1	8	640	48	30,720

	A	B	C	D	E	F	G	H	I
106	**Table D-1.4. Nonroad Equipment Activity Data for Water Treatment Plant Construction - WMAT Rural Water System - (page 2 of 2)**								
107		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
108	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
109	*Membrane Bldg., Fd Pmp Sta & strainers*								
110	Cat 623K Elevating Scraper	407	D	0.50	2	8	3,256	65	211,640
111	Cat D8T Dozer	317	D	0.80	1	8	2,029	65	131,872
112	Cat D6T Dozer	207	D	0.80	1	8	1,325	65	86,112
113	Cat 330D Excavator	268	D	0.50	1	8	1,072	65	69,680
114	Cat 990H Front-end Loader	627	D	0.50	1	8	2,508	65	163,020
115	Cat 160M2 Motor Grader	213	D	0.80	1	8	1,363	65	88,608
116	Cat 730C Dump truck	367	D	0.80	1	8	2,349	65	152,672
117	LiuGong Lrg Water Truck	525	D	0.50	1	8	2,100	65	136,500
118	Freightliner 122SD Dump Truck	350	D	0.80	2	8	4,480	65	291,200
119	Cat 323D Excavator	150	D	0.80	1	8	960	65	62,400
120	Cat CS54B Vibratory Compactor	131	D	0.80	1	8	838	65	54,496
121	Cat CP44 Vibratory Compactor	100	D	0.80	1	8	640	65	41,600
122	Manitowac 8500-1 80TON crane	213	D	0.25	1	8	426	135	57,510
123	*Finished Water Reservoirs*								
124	Cat D6T Dozer	207	D	0.80	1	8	1,325	5	6,624
125	Cat 323D Excavator	150	D	0.80	1	8	960	5	4,800
126	Cat 990H Front-end Loader	627	D	0.50	1	8	2,508	5	12,540
127	Cat 160M2 Motor Grader	213	D	0.80	1	8	1,363	5	6,816
128	LiuGong Lrg Water Truck	525	D	0.50	1	8	2,100	5	10,500
129	Freightliner 122SD Dump Truck	350	D	0.80	1	8	2,240	5	11,200
130	Cat CP44 Vibratory Compactor	100	D	0.80	1	8	640	5	3,200
131	Manitowac 8500-1 80TON crane	213	D	0.25	1	8	426	50	21,300
132	*Wash Water Pump Sta.*								
133	Cat 323D Excavator	150	D	0.80	1	8	960	10	9,600
134	Cat 990H Front-end Loader	627	D	0.50	1	8	2,508	10	25,080
135	Freightliner 122SD Dump Truck	350	D	0.80	1	8	2,240	10	22,400
136	Cat CP44 Vibratory Compactor	100	D	0.80	1	8	640	10	6,400

	A	B	C	D	E	F	G	H	I
138	**Table D-1.5. Nonroad Equipment Activity Data for Miner Flats Dam Construction - WMAT Rural Water System - (page 1 of 3)**								
139		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
140	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
141	*Clearing*								
142	Cat D8 Dozer	310	D	0.75	1	10	2,325	43	98,813
143	Cat 330 Excavator	232	D	0.75	1	10	1,740	43	73,950
144	*Foundation Excavation (Common)*								
145	Cat D8 Dozer	310	D	0.60	1	10	1,860	3	5,580
146	Cat 345 Excavator	404	D	0.75	1	10	3,030	4	11,363
147	Cat 740 Articulated 40T Truck	489	D	0.75	3	10	11,003	11	123,778
148	*Foundation Excavation (Rock)*								
149	Cat 365 Excavator	476	D	0.60	2	10	5,712	94	534,643
150	ECM 370 Drill with compressor	515	D	0.50	2	10	5,150	78	401,700
151	Cat D8 Dozer	310	D	0.20	1	10	620	16	9,672
152	Cat 330 Excavator with Breaker	232	D	0.60	1	10	1,392	47	65,146
153	Cat D9 Dozer	410	D	0.80	2	10	6,560	125	818,688
154	Cat 740 Articulated 40T Truck	489	D	0.75	2	10	7,335	117	858,195
155	*Dental Excavation*								
156	Cat 305 Excavator	42	D	0.40	1	10	168	2	336
157	Cat 312 Excavator With Breaker	90	D	0.40	1	10	360	2	720
158	*Foundation Preparation*								
159	Air Compressor, 175 CFM	56	D	0.75	1	10	420	9	3,780
160	Vacuum Truck, 3500 gal, 3170 CFM	350	D	0.75	1	10	2,625	9	23,625
161	*Blanket (Consolidation) and Curtain Grouting*								
162	ECM 370 Drill with compressor	515	D	0.70	1	10	3,605	2	7,210
163	*Foundation and Dam Drain Holes*								
164	ECM 370 Drill with compressor	515	D	0.80	1	20	8,240	4	32,960
165	*Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)*								
166	Large Crushing and Screening Plant	500	D	0.80	1	20	8,000	42	336,000
167	500 kw Gen Set	713	D	0.80	2	20	22,816	84	1,916,544
168	Cat 988 Loader	555	D	0.80	1	20	8,880	42	372,960
169	*RCC Plant Operation*								
170	500 kw Gen Set	713	D	0.60	2	20	17,112	48	828,221
171	Cat 980 Loader	407	D	0.70	1	20	5,698	28	160,874

	A	B	C	D	E	F	G	H	I
173	**Table D-1.6. Nonroad Equipment Activity Data for Miner Flats Dam Construction - WMAT Rural Water System - (page 2 of 3)**								
174		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
175	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
176	*RCC Conveying*								
177	500 kw Gen Set	713	D	0.60	2	20	17,112	48	821,376
178	200 kw Gen Set	375	D	0.60	1	20	4,500	28	126,000
179	*RCC Placement (includes Bedding, Jointing and Curing)*								
180	Cat 950 Loader	232	D	0.60	1	20	2,784	24	67,373
181	Cat D5 LGP Dozer	104	D	0.60	2	20	2,496	48	120,806
182	Cat CB 634 SDD Roller	145	D	0.60	2	20	3,480	48	168,432
183	Cat 740 Articulated 40T Truck	489	D	0.60	3	20	17,604	73	1,278,050
184	Cat 446 Backhoe/Loader	137	D	0.60	1	20	1,644	24	39,785
185	Water Truck, 4000 gal On-Road	310	D	0.60	1	20	3,720	24	90,024
186	Cat 312 Excavator	90	D	0.60	1	20	1,080	24	26,136
187	*Installation of Facing Systems*								
188	150 Ton Rough Terrain Crane	533	D	0.75	1	10	3,998	33	131,918
189	Rough Terrain Forklift	141	D	0.75	1	10	1,058	33	34,898
190	Schwing 28M Concrete Pump Truck	210	D	0.50	1	10	1,050	22	23,100
191	*Galleries and Adits*								
192	165 Ton Rough Terrain Crane	600	D	0.50	1	10	3,000	3	9,000
193	Schwing 28M Concrete Pump Truck	210	D	0.50	1	10	1,050	3	3,150
194	Rough Terrain Forklift	141	D	0.50	1	10	705	3	2,115
195	*Ogee Concrete*								
196	150 Ton Rough Terrain Crane	533	D	0.60	1	10	3,198	3	9,594
197	Rough Terrain Forklift	141	D	0.60	1	10	846	3	2,538
198	Schwing 28M Concrete Pump Truck	210	D	0.50	1	10	1,050	3	3,150
199	*New Access Road Constrution*								
200	Cat D9 Dozer	410	D	0.75	1	10	3,075	17	53,505
201	Cat 14 Blade	259	D	0.75	1	10	1,943	17	33,800
202	Cat 330 Excavator	232	D	0.65	1	10	1,508	15	22,741
203	Cat CS 583 Single Drum Smooth Roller	150	D	0.80	1	10	1,200	19	22,272
204	Water Truck, 4000 gal On-Road	310	D	0.80	1	10	2,480	19	46,029
205	*Staging and Recreation Areas*								
206	Cat D9 Dozer	410	D	0.75	1	10	3,075	15	46,125
207	Cat 14 Blade	259	D	0.75	1	10	1,943	15	29,138
208	Cat 330 Excavator	232	D	0.65	1	10	1,508	13	19,604
209	Cat CS 583 Single Drum Smooth Roller	150	D	0.80	1	10	1,200	16	19,200
210	Water Truck, 4000 gal On-Road	310	D	0.80	1	10	2,480	16	39,680

	A	B	C	D	E	F	G	H	I
212	**Table D-1.7. Nonroad Equipment Activity Data for Miner Flats Dam Construction - WMAT Rural Water System - (page 3 of 3)**								
213		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
214	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
215	*Mobilization, Demobilization and General Conditions*								
216	25 kw Gen Set	36	D	0.50	1	10	180	250	45,000
217	Rough Terrain Fork Lift	141	D	0.60	1	10	846	30	25,380
218	Cat 966 Loader	296	D	0.60	1	10	1,776	30	53,280
219	Cat 14 Blade	259	D	0.60	1	10	1,554	30	46,620
220	*Miscellaneous Support Equipment*								
221	Light Plant	13	D	0.90	20	10	2,340	120	280,800
222	200 kw Gen Set	375	D	0.90	3	10	10,125	350	3,543,750
223	Water Truck, 4000 gal On-Road	310	D	0.80	1	10	2,480	250	620,000
224	*Piers and Bridge Over Spillway*								
225	165 Ton Rough Terrain Crane	600	D	0.60	1	10	3,600	42	151,200
226	Schwing 28M Concrete Pump Truck	210	D	0.10	1	10	210	7	1,470
227	Rough Terrain Forklift	141	D	0.50	1	10	705	35	24,675

	A	B	C	D	E	F	G	H	I
231	**Table D-1.7a. Nonroad Equipment Activity Data for Miner Flats Dam Construction - Foundation Treatment/Engineering Feature - WMAT Rural Water System - (page 1 of 3)**								
232		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
233	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
234	*Drains - Gallery, Abutment, Tunnel + Drainage Tunnel/Adit and Shafts*								
235	Drill Rig for Gallery Work (Foundation Drains)	200	D	0.70	1	10	1,400	10.0	14,000
236	Epiroc Airroc Drill	400	D	0.70	1	10	2,800	15.0	42,000
237	150 Ton Rough Terrain Crane (includes all access support)	533	D	0.40	1	10	2,132	15.0	31,980
238	Cat 950 Loader (IT Support)	130	D	0.50	1	10	650	25.0	16,250
239	*F3 - Downstream Seepage Blanket*								
240	Cat 345 Excavator	404	D	0.75	1	10	3,030	72.0	218,160
241	Cat D8 Dozer	310	D	0.60	1	10	1,860	65.0	120,900
242	Cat 740 Articulated Dump Truck	489	D	0.75	3	10	9,169	57.6	528,120
243	*Drainage fill w Pipe (17k cy; 600lft pipe)*								
244	Cat D8 Dozer	310	D	0.60	1	10	1,860	29.0	53,940
245	Cat CV 634 SDD Roller	145	D	0.60	1	10	870	18.0	15,660
246	Cat 966 Loader	311	D	0.60	1	10	1,866	24.0	44,784
247	Cat 446 Backhoe/Loader	137	D	0.60	1	10	822	24.0	19,728
248	Unlisted Equipment	200	D	0.50	1	10	1,000	24.0	24,000
249	*F4 - Dam Axis and All Curtain Grouting*								
250	Epiroc Airroc Drill	400	D	0.70	2	10	5,600	648.5	3,631,600
251	300 kw Generator Set	375	D	0.80	2	10	6,000	648.5	3,891,000
252	Mini Excavator CAT 312	90	D	0.40	2	10	720	454.0	326,880
253	Rough Terrain Forklift	141	D	0.40	2	10	1,128	389.5	439,356
254	Compressor	50	D	0.50	2	10	500	324.5	162,250
255	Unlisted Equipment	200	D	0.50	2	10	2,000	324.5	649,000
256	*F6 - Dam Axis and All Structural Cutoff Walls*								
257	Drill Rig BG 45	580	D	0.80	1	12	5,568	250.0	1,392,000
258	500 kW Generator Set	713	D	0.80	1	12	6,845	250.0	1,711,200
259	Mini Excavator CAT 312	90	D	0.40	1	12	432	175.0	75,600
260	Cat 950 Loader	232	D	0.30	1	12	835	175.0	146,160
261	Cat 740 Articulated 40T Truck	489	D	0.50	2	12	5,868	150.0	880,200
262	150 Ton Rough Terrain Crane	533	D	0.40	1	12	2,558	150.0	383,760
263	Rough Terrain Forklift	141	D	0.40	1	12	677	150.0	101,520
264	Air Compressor, 175 CFM	56	D	0.75	1	12	504	150.0	75,600
265	Vacuum truck 3500 gal, 3170 CFM	350	D	0.75	1	12	3,150	75.0	236,250
266	Schwing 28M Concrete Pump Truck	210	D	0.50	1	12	1,260	50.0	63,000
267	Unlisted Equipment	300	D	0.50	1	12	1,800	125.0	225,000

	A	B	C	D	E	F	G	H	I
272	**Table D-1.7a. Nonroad Equipment Activity Data for Miner Flats Dam Construction - Foundation Treatment/Engineering Feature - WMAT Rural Water System - (page 2 of 3)**								
273		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
274	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
275	*F8 - Left Downstream Bank Basalt/SS Contact Drain System*								
276	Comacchio C12	400	D	0.70	1	10	2,800	22.0	61,600
277	150 Ton Rough Terrain Crane	533	D	0.40	1	10	2,132	16.0	34,112
278	Rough Terrain Forklift	141	D	0.40	1	10	564	14.0	7,896
279	Unlisted	200	D	0.80	1	10	1,600	18.0	28,800
280	*Excavation and Foundation Preparation*								
281	Cat 345 Excavator	404	D	0.80	1	10	3,232	196.0	633,472
282	Cat 312 Excavator with Breaker	90	D	0.40	1	10	360	79.0	28,440
283	Cat 740 Articulated Dump Truck	489	D	0.75	5	10	18,338	196.0	3,594,150
284	Dozer D8	310	D	0.80	1	10	2,480	157.0	389,360
285	*Left End Closure Allowance (4 11 205 grout)*								
286	F3 - Downstream Seepage Blanket	400	D	0.70	2	10	5,600	70.0	392,000
287	Cat 345 Excavator	375	D	0.80	2	10	6,000	70.0	420,000
288	Cat D8 Dozer	90	D	0.40	2	10	720	42.0	30,240
289	Cat 740 Articulated Dump Truck	141	D	0.40	2	10	1,128	42.0	47,376
290	Drainage fill w Pipe (17k cy; 600lft pipe)	50	D	0.50	2	10	500	35.0	17,500
291	Cat D8 Dozer	200	D	0.50	2	10	2,000	35.0	70,000
292	*Left End Closure Allowance (4 11 307 cutoff)*								
293	Mini Excavator CAT 312	580	D	0.80	1	12	5,568	66.7	371,200
294	Rough Terrain Forklift	713	D	0.80	1	12	6,845	67.0	458,602
295	Compressor	90	D	0.40	1	12	432	47.0	20,304
296	Unlisted Equipment	232	D	0.30	1	12	835	47.0	39,254
297	F6 - Dam Axis and All Structural Cutoff Walls	489	D	0.50	2	12	5,868	40.5	237,654
298	Drill Rig BG 45	533	D	0.40	1	12	2,558	41.0	104,894
299	500 kW Generator Set	141	D	0.40	1	12	677	41.0	27,749
300	Mini Excavator CAT 312	56	D	0.75	1	12	504	41.0	20,664
301	Cat 950 Loader	350	D	0.75	1	12	3,150	21.0	66,150
302	Cat 740 Articulated 40T Truck	210	D	0.50	1	12	1,260	14.0	17,640
303	*Plinth Construction*								
304	500 kw Generator Set	713	D	0.70	1	10	4,991	32.0	159,712
305	ECM 370 Drill	515	D	0.70	1	10	3,605	7.0	25,235
306	Mini Excavator CAT 312	90	D	0.40	1	10	360	7.0	2,520
307	Rough Terrain Forklift	141	D	0.40	1	10	564	26.0	14,664
308	Schwing 28M Concrete Pump Truck	210	D	0.70	1	10	1,470	7.0	10,290
309	Grove RT 770T Crane	240	D	0.40	1	10	960	26.0	24,960
310	Boom Truck	300	D	0.40	1	10	1,200	26.0	31,200
311	Mixer Truck	320	D	0.70	4	10	8,960	13.0	116,480

	A	B	C	D	E	F	G	H	I
315	**Table D-1.7a. Nonroad Equipment Activity Data for Miner Flats Dam Construction - Foundation Treatment/Engineering Feature - WMAT Rural Water System - (page 3 of 3)**								
316		*Hp*	*Fuel*	*Ave. Daily*	*Number*	*Hours/*	*Daily*	*Work*	*Total*
317	*Construction Activity/Equipment Type*	*Rating*	*Type*	*Load Factor*	*Active*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
318	*Drain and filter zones*								
319	Cat 966 Loader	311	D	0.80	1	10	2,488	111.0	276,168
320	Cat 740 Articulated 40T Truck	489	D	0.70	3	10	8,558	88.8	759,906
321	Telebelt 110	405	D	0.80	1	10	3,240	89.0	288,360
322	D4 Dozer	130	D	0.80	2	10	2,080	111.0	230,880
323	Compaction	145	D	0.80	2	10	2,320	89.0	206,480
324	Water truck 4000ga	300	D	0.70	1	10	2,100	111.0	233,100
325	*Gallery and drain collection manifold/pipe*								
326	500 kw gen set	713	D	0.70	1	10	4,991	15.0	74,865
327	Mini Excavator Cat 312	90	D	0.80	1	10	720	60.0	43,200
328	Rough Terrain Forklift	141	D	0.70	1	10	987	68.0	67,116
329	Grove RT 770T Crane	240	D	0.60	1	10	1,440	60.0	86,400
330	Boom truck	300	D	0.40	1	10	1,200	68.0	81,600
331	Excavator Cat 329	200	D	0.60	1	10	1,200	45.0	54,000
332	Kom WA 250 IT loader	140	D	0.60	1	10	840	60.0	50,400
333	Unlisted	300	D	0.50	1	10	1,500	143.2	214,800
334	*Face Construction*								
335	500 kw Generator Set	713	D	0.50	1	10	3,565	125.0	445,625
336	Mini Excavator CAT 312	90	D	0.70	1	10	630	200.0	126,000
337	Rough Terrain Forklift	141	D	0.60	1	10	846	200.0	169,200
338	Schwing 28M Concrete Pump Truck	210	D	0.50	2	10	1,575	125.0	196,875
339	Manitowoc 888 - 250 tn crawler crane	330	D	0.50	1	10	1,650	200.0	330,000
340	Compressor 350 cfm	75	D	0.60	2	10	900	225.0	202,500
341	Generator/welder	30	D	0.60	3	10	540	225.0	121,500
342	Grove RT 770T Crane	240	D	0.60	1	10	1,440	200.0	288,000
343	Boom truck - 20 ton	350	D	0.60	1	10	2,100	200.0	420,000
344	Vacuum Truck	350	D	0.80	1	10	2,800	75.0	210,000
345	Mixer Trucks	320	D	0.70	5	10	11,200	150.0	1,680,000
346	Unlisted	400	D	0.50	1	10	2,000	125.0	250,000

	K	L	M	N	O	P	Q	R	S
1	**Table D-1.8. Air Pollutant Emission Factors for Nonroad Equipment - WMAT Rural Water System Construction**								
2		*Fuel*	*Emission Factors (Grams/Horsepower-Hour)*						
3	*Project Year/Source Type*	*Type*	*VOC*	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*	*CO2*
4	**Year 2024**								
5	Nonroad Equipment - 12-16 Hp	D	0.45	1.91	3.96	0.00	0.23	0.22	615
6	Nonroad Equipment - 17-25 Hp	D	0.43	1.82	3.91	0.00	0.22	0.21	610
7	Nonroad Equipment - 25-40 Hp	D	0.16	0.62	2.80	0.00	0.09	0.09	611
8	Nonroad Equipment - 41-50 Hp	D	0.15	0.57	2.71	0.00	0.08	0.07	612
9	Nonroad Equipment - 51-75 Hp	D	0.25	1.30	3.30	0.00	0.18	0.18	608
10	Nonroad Equipment - 76-100 Hp	D	0.23	1.33	2.16	0.00	0.20	0.19	609
11	Nonroad Equipment - 101-175 Hp	D	0.16	0.51	1.40	0.00	0.11	0.10	547
12	Nonroad Equipment - 176-300 Hp	D	0.08	0.24	0.92	0.00	0.05	0.05	539
13	Nonroad Equipment - 301-600 Hp	D	0.08	0.46	1.50	0.00	0.06	0.06	535
14	Nonroad Equipment - 12-16 Hp	G	4.27	261.35	2.16	0.01	0.12	0.11	1,046
15	Nonroad Equipment - 17-25 Hp	G	4.18	261.59	2.18	0.01	0.12	0.11	1,047
16	Nonroad Equipment - 26-40 Hp	G	0.38	14.06	1.52	0.00	0.07	0.06	701
17	Nonroad Equipment - 41-50 Hp	G							
18	Nonroad Equipment - 51-75 Hp	G	0.91	32.26	3.10	0.00	0.07	0.06	717
19	Nonroad Equipment - 76-100 Hp	G	0.44	16.16	1.69	0.00	0.07	0.06	703
20	Nonroad Equipment - 101-175 Hp	G	0.97	34.29	3.27	0.00	0.07	0.06	718
21	Notes: Data estimated with the use of the EPA MOVES3 model for an average nonroad fleet in Navajo County, AZ.								

	U	V	W	X	Y	Z	AA	AB
1	**Table D-1.9. Nonroad Equipment Total Emissions - Water Pipeline Construction for the WMAT Rural Water System**							
2		*Tons*						
3	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
4	*Pipeline Installation - Crew #1*							
5	Compactor - Trench	0.00	0.02	0.05	0.00	0.00	0.00	7.06
6	Excavator - Lead	0.09	0.25	0.96	0.00	0.05	0.05	562.26
7	Excavator - Support	0.08	0.22	0.85	0.00	0.04	0.04	499.79
8	Generator	0.07	4.54	0.04	0.00	0.00	0.00	18.17
9	Loader	0.03	0.08	0.32	0.00	0.02	0.02	187.42
10	Trucks - Crew	0.24	8.34	0.80	0.00	0.02	0.02	174.66
11	**Subtotal**	**0.50**	**13.45**	**3.01**	**0.00**	**0.13**	**0.13**	**1,449.37**
12	*Pipeline Installation - Crew #2*							
13	Compactor - Trench	0.00	0.02	0.05	0.00	0.00	0.00	7.06
14	Excavator - Lead	0.09	0.25	0.96	0.00	0.05	0.05	562.26
15	Excavator - Support	0.08	0.22	0.85	0.00	0.04	0.04	499.79
16	Generator	0.07	4.54	0.04	0.00	0.00	0.00	18.17
17	Loader	0.03	0.08	0.32	0.00	0.02	0.02	187.42
18	Trucks - Crew	0.24	8.34	0.80	0.00	0.02	0.02	174.66
19	**Subtotal**	**0.50**	**13.45**	**3.01**	**0.00**	**0.13**	**0.13**	**1,449.37**
20	*ARV & Valve Installation*							
21	Excavator	0.01	0.03	0.12	0.00	0.01	0.01	69.10
22	Generator	0.00	0.01	0.02	0.00	0.00	0.00	2.95
23	Loader	0.02	0.05	0.18	0.00	0.01	0.01	103.65
24	Trucks - Crew	0.17	6.15	0.59	0.00	0.01	0.01	128.79
25	**Subtotal**	**0.20**	**6.23**	**0.90**	**0.00**	**0.03**	**0.03**	**304.50**
26	*Tank & Pump Station Installation*							
27	Cement Mixer	0.01	0.05	0.16	0.00	0.01	0.01	58.65
28	Compactor - Ride-On	0.00	0.01	0.04	0.00	0.00	0.00	9.61
29	Excavator	0.01	0.04	0.14	0.00	0.01	0.01	84.68
30	Generator	0.00	0.01	0.02	0.00	0.00	0.00	2.89
31	Loader	0.02	0.06	0.22	0.00	0.01	0.01	127.02
32	Telehandler	0.01	0.04	0.07	0.00	0.01	0.01	19.12
33	Trucks - Crew	0.42	15.07	1.44	0.00	0.03	0.03	315.67
34	**Subtotal**	**0.48**	**15.27**	**2.09**	**0.00**	**0.06**	**0.06**	**617.64**
35	*Road Work*							
36	Compactor - Ride-On	0.01	0.02	0.06	0.00	0.00	0.00	21.99
37	Grader	0.01	0.04	0.16	0.00	0.01	0.01	96.34
38	Loader	0.01	0.03	0.10	0.00	0.01	0.00	57.80
39	Skid-steer	0.00	0.01	0.02	0.00	0.00	0.00	7.65
40	Trucks - Crew	0.10	3.43	0.33	0.00	0.01	0.01	71.82
41	Water Truck	0.00	0.01	0.02	0.00	0.00	0.00	6.69
42	**Subtotal**	**0.13**	**3.53**	**0.69**	**0.00**	**0.03**	**0.03**	**262.29**
43	**Total Emissions**	**1.81**	**51.94**	**9.70**	**0.01**	**0.38**	**0.36**	**4,083.17**

	U	V	W	X	Y	Z	AA	AB
45	**Table D-1.10. Nonroad Equipment Total Emissions - Water Diversion System Construction for the WMAT Rural Water System**							
46		*Tons*						
47	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
48	*Pump House*							
49	Cat 950K Front-end Loader	0.00	0.00	0.01	0.00	0.00	0.00	2.96
50	Cat 420F Backhoe/loader	0.00	0.00	0.00	0.00	0.00	0.00	1.40
51	Cat 329E Excavator	0.00	0.01	0.03	0.00	0.00	0.00	15.48
52	Cat 730C Equipment Maintenance & Fuel Truck	0.00	0.00	0.00	0.00	0.00	0.00	1.62
53	Cat D6T Dozer	0.00	0.00	0.00	0.00	0.00	0.00	1.77
54	Putzmeister 58-Meter Concrete Boom Pump	0.00	0.00	0.01	0.00	0.00	0.00	5.16
55	Cat 160M2 Motor Grader	0.00	0.00	0.00	0.00	0.00	0.00	1.52
56	**Subtotal**	**0.00**	**0.02**	**0.06**	**0.00**	**0.00**	**0.00**	**29.92**
57	*Diversion Structure*							
58	Cat 950K Front-end Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.59
59	Cat 420F Backhoe/loader	0.00	0.00	0.00	0.00	0.00	0.00	0.28
60	Cat 329E Excavator	0.00	0.00	0.01	0.00	0.00	0.00	3.10
61	Cat 730C Equipment Maintenance & Fuel Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.32
62	Putzmeister 58-Meter Concrete Boom Pump	0.00	0.00	0.01	0.00	0.00	0.00	2.58
63	**Subtotal**	**0.00**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**	**6.87**
64	*Raw Water Pipeline*							
65	Cat 950K Front-end Loader	0.00	0.00	0.00	0.00	0.00	0.00	1.97
66	Cat 420F Backhoe/loader	0.00	0.00	0.00	0.00	0.00	0.00	0.94
67	Cat 329E Excavator	0.00	0.01	0.02	0.00	0.00	0.00	11.61
68	Cat 730C Equipment Maintenance & Fuel Truck	0.00	0.00	0.00	0.00	0.00	0.00	1.62
69	Cat CP44 Vibratory Compactor	0.00	0.01	0.02	0.00	0.00	0.00	5.74
70	Cat MD5150C Track Drill	0.00	0.01	0.02	0.00	0.00	0.00	8.59
71	**Subtotal**	**0.01**	**0.03**	**0.08**	**0.00**	**0.00**	**0.00**	**30.47**
72	**Total Emissions**	**0.01**	**0.05**	**0.15**	**0.00**	**0.01**	**0.01**	**67.26**

	U	V	W	X	Y	Z	AA	AB
74	**Table D-1.11. Nonroad Equipment Total Emissions - Water Treatment Plant Construction for the WMAT Rural Water System (page 1 of 2)**							
75		*Tons*						
76	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
77	*Removal of Grass & Shrubs*							
78	Cat 623K Elevating Scraper	0.01	0.04	0.12	0.00	0.01	0.00	43.23
79	Cat D8T Dozer	0.00	0.02	0.05	0.00	0.00	0.00	17.96
80	Cat D6T Dozer	0.00	0.01	0.02	0.00	0.00	0.00	11.82
81	Cat 330D Excavator	0.00	0.00	0.01	0.00	0.00	0.00	7.17
82	Cat 990H Front-end Loader	0.00	0.01	0.03	0.00	0.00	0.00	11.10
83	Cat 160M2 Motor Grader	0.00	0.01	0.02	0.00	0.00	0.00	12.16
84	Cat 730C Dump truck	0.01	0.04	0.12	0.00	0.00	0.00	41.58
85	LiuGong Lrg Water Truck	0.00	0.01	0.03	0.00	0.00	0.00	9.29
86	**Subtotal**	**0.02**	**0.12**	**0.40**	**0.00**	**0.02**	**0.02**	**154.31**
87	*Yard Piping*							
88	Cat 330D Excavator	0.00	0.01	0.04	0.00	0.00	0.00	22.44
89	Cat 323D Excavator	0.00	0.01	0.03	0.00	0.00	0.00	12.74
90	Cat 990H Front-end Loader	0.00	0.03	0.09	0.00	0.00	0.00	32.56
91	Cat 420F Backhoe/loader	0.00	0.02	0.03	0.00	0.00	0.00	8.79
92	Cat CP44 Vibratory Compactor	0.01	0.03	0.05	0.00	0.00	0.00	14.18
93	LiuGong Lrg Water Truck	0.00	0.02	0.08	0.00	0.00	0.00	27.26
94	Freightliner 122SD Dump Truck	0.02	0.10	0.33	0.00	0.01	0.01	116.32
95	**Subtotal**	**0.04**	**0.22**	**0.65**	**0.00**	**0.03**	**0.03**	**234.29**
96	*Pretreatment Bldg. & Flocculation Basins*							
97	Cat D6T Dozer	0.00	0.00	0.01	0.00	0.00	0.00	3.15
98	Cat 330D Excavator	0.00	0.00	0.00	0.00	0.00	0.00	2.55
99	Cat 990H Front-end Loader	0.00	0.01	0.02	0.00	0.00	0.00	5.92
100	Cat 160M2 Motor Grader	0.00	0.00	0.01	0.00	0.00	0.00	3.24
101	LiuGong Lrg Water Truck	0.00	0.00	0.01	0.00	0.00	0.00	3.72
102	Freightliner 122SD Dump Truck	0.00	0.00	0.01	0.00	0.00	0.00	2.64
103	**Subtotal**	**0.00**	**0.01**	**0.05**	**0.00**	**0.00**	**0.00**	**21.22**
104	*Sedimetation Basins*							
105	Cat 623K Elevating Scraper	0.01	0.08	0.26	0.00	0.01	0.01	92.22
106	Cat D8T Dozer	0.01	0.05	0.16	0.00	0.01	0.01	57.46
107	Cat D6T Dozer	0.01	0.02	0.06	0.00	0.00	0.00	37.82
108	Cat 330D Excavator	0.00	0.01	0.05	0.00	0.00	0.00	30.60
109	Cat 990H Front-end Loader	0.01	0.06	0.20	0.00	0.01	0.01	71.04
110	Cat 160M2 Motor Grader	0.01	0.02	0.07	0.00	0.00	0.00	38.91
111	Cat 730C Dump truck	0.01	0.06	0.19	0.00	0.01	0.01	66.53
112	LiuGong Lrg Water Truck	0.01	0.05	0.17	0.00	0.01	0.01	59.48
113	Freightliner 122SD Dump Truck	0.02	0.11	0.36	0.00	0.01	0.01	126.89
114	Cat 323D Excavator	0.01	0.03	0.07	0.00	0.01	0.01	27.80
115	Cat CS54B Vibratory Compactor	0.01	0.02	0.06	0.00	0.00	0.00	24.28
116	Cat CP44 Vibratory Compactor	0.01	0.04	0.07	0.00	0.01	0.01	20.62
117	**Subtotal**	**0.11**	**0.55**	**1.72**	**0.00**	**0.08**	**0.08**	**653.65**

	U	V	W	X	Y	Z	AA	AB
119	**Table D-1.12. Nonroad Equipment Total Emissions - Water Treatment Plant Construction for the WMAT Rural Water System (page 2 of 2)**							
120		*Tons*						
121	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
122	*Membrane Bldg., Fd Pmp Sta & strainers*							
123	Cat 623K Elevating Scraper	0.02	0.11	0.35	0.00	0.01	0.01	124.89
124	Cat D8T Dozer	0.01	0.07	0.22	0.00	0.01	0.01	77.82
125	Cat D6T Dozer	0.01	0.02	0.09	0.00	0.00	0.00	51.21
126	Cat 330D Excavator	0.01	0.02	0.07	0.00	0.00	0.00	41.44
127	Cat 990H Front-end Loader	0.01	0.08	0.27	0.00	0.01	0.01	96.20
128	Cat 160M2 Motor Grader	0.01	0.02	0.09	0.00	0.00	0.00	52.69
129	Cat 730C Dump truck	0.01	0.08	0.25	0.00	0.01	0.01	90.09
130	LiuGong Lrg Water Truck	0.01	0.07	0.23	0.00	0.01	0.01	80.55
131	Freightliner 122SD Dump Truck	0.02	0.15	0.48	0.00	0.02	0.02	171.83
132	Cat 323D Excavator	0.01	0.03	0.10	0.00	0.01	0.01	37.64
133	Cat CS54B Vibratory Compactor	0.01	0.03	0.08	0.00	0.01	0.01	32.88
134	Cat CP44 Vibratory Compactor	0.01	0.06	0.10	0.00	0.01	0.01	27.93
135	Manitowac 8500-1 80TON crane	0.01	0.02	0.06	0.00	0.00	0.00	34.20
136	**Subtotal**	**0.15**	**0.76**	**2.38**	**0.00**	**0.11**	**0.11**	**919.35**
137	*Finished Water Reservoirs*							
138	Cat D6T Dozer	0.00	0.00	0.01	0.00	0.00	0.00	3.94
139	Cat 323D Excavator	0.00	0.00	0.01	0.00	0.00	0.00	2.90
140	Cat 990H Front-end Loader	0.00	0.01	0.02	0.00	0.00	0.00	7.40
141	Cat 160M2 Motor Grader	0.00	0.00	0.01	0.00	0.00	0.00	4.05
142	LiuGong Lrg Water Truck	0.00	0.01	0.02	0.00	0.00	0.00	6.20
143	Freightliner 122SD Dump Truck	0.00	0.01	0.02	0.00	0.00	0.00	6.61
144	Cat CP44 Vibratory Compactor	0.00	0.00	0.01	0.00	0.00	0.00	2.15
145	Manitowac 8500-1 80TON crane	0.00	0.01	0.02	0.00	0.00	0.00	12.67
146	**Subtotal**	**0.01**	**0.03**	**0.11**	**0.00**	**0.01**	**0.01**	**45.91**
147	*Wash Water Pump Sta.*							
148	Cat 323D Excavator	0.00	0.01	0.01	0.00	0.00	0.00	5.79
149	Cat 990H Front-end Loader	0.00	0.01	0.04	0.00	0.00	0.00	14.80
150	Freightliner 122SD Dump Truck	0.00	0.01	0.04	0.00	0.00	0.00	13.22
151	Cat CP44 Vibratory Compactor	0.00	0.01	0.02	0.00	0.00	0.00	4.30
152	**Subtotal**	**0.01**	**0.04**	**0.11**	**0.00**	**0.01**	**0.01**	**38.11**
153	**Total Emissions**	**0.34**	**1.74**	**5.40**	**0.01**	**0.26**	**0.25**	**2,066.83**

	U	V	W	X	Y	Z	AA	AB
155	**Table D-1.13. Nonroad Equipment Total Emissions - Miner Flats Dam Construction for the WMAT Rural Water System (page 1 of 3)**							
156		*Tons*						
157	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
158	*Clearing*							
159	Cat D8 Dozer	0.01	0.05	0.16	0.00	0.01	0.01	58.31
160	Cat 330 Excavator	0.01	0.02	0.08	0.00	0.00	0.00	43.98
161	**Subtotal**	**0.01**	**0.07**	**0.24**	**0.00**	**0.01**	**0.01**	**102.28**
162	*Foundation Excavation (Common)*							
163	Cat D8 Dozer	0.00	0.00	0.01	0.00	0.00	0.00	3.29
164	Cat 345 Excavator	0.00	0.01	0.02	0.00	0.00	0.00	6.70
165	Cat 740 Articulated 40T Truck	0.01	0.06	0.20	0.00	0.01	0.01	73.04
166	**Subtotal**	**0.01**	**0.07**	**0.23**	**0.00**	**0.01**	**0.01**	**83.04**
167	*Foundation Excavation (Rock)*							
168	Cat 365 Excavator	0.04	0.27	0.88	0.00	0.04	0.04	315.48
169	ECM 370 Drill with compressor	0.03	0.20	0.66	0.00	0.03	0.03	237.04
170	Cat D8 Dozer	0.00	0.00	0.02	0.00	0.00	0.00	5.71
171	Cat 330 Excavator with Breaker	0.01	0.02	0.07	0.00	0.00	0.00	38.74
172	Cat D9 Dozer	0.07	0.42	1.35	0.00	0.06	0.05	483.09
173	Cat 740 Articulated 40T Truck	0.07	0.44	1.42	0.00	0.06	0.06	506.41
174	**Subtotal**	**0.22**	**1.35**	**4.40**	**0.00**	**0.18**	**0.18**	**1,586.47**
175	*Dental Excavation*							
176	Cat 305 Excavator	0.00	0.00	0.00	0.00	0.00	0.00	0.23
177	Cat 312 Excavator With Breaker	0.00	0.00	0.00	0.00	0.00	0.00	0.48
178	**Subtotal**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.71**
179	*Foundation Preparation*							
180	Air Compressor, 175 CFM	0.00	0.01	0.01	0.00	0.00	0.00	2.53
181	Vacuum Truck, 3500 gal, 3170 CFM	0.00	0.01	0.04	0.00	0.00	0.00	13.94
182	**Subtotal**	**0.00**	**0.02**	**0.05**	**0.00**	**0.00**	**0.00**	**16.48**
183	*Blanket (Consolidation) and Curtain Grouting*							
184	ECM 370 Drill with compressor	0.00	0.00	0.01	0.00	0.00	0.00	4.25
185	**Subtotal**	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**4.25**
186	*Foundation and Dam Drain Holes*							
187	ECM 370 Drill with compressor	0.00	0.02	0.05	0.00	0.00	0.00	19.45
188	**Subtotal**	**0.00**	**0.02**	**0.05**	**0.00**	**0.00**	**0.00**	**19.45**
189	*Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)*							
190	Large Crushing and Screening Plant	0.03	0.17	0.55	0.00	0.02	0.02	198.27
191	500 kw Gen Set	0.16	0.97	3.17	0.00	0.13	0.13	1,130.92
192	Cat 988 Loader	0.03	0.19	0.62	0.00	0.03	0.02	220.08
193	**Subtotal**	**0.22**	**1.33**	**4.34**	**0.00**	**0.18**	**0.18**	**1,549.27**
194	*RCC Plant Operation*							
195	500 kw Gen Set	0.07	0.42	1.37	0.00	0.06	0.06	488.72
196	Cat 980 Loader	0.01	0.08	0.27	0.00	0.01	0.01	94.93
197	**Subtotal**	**0.08**	**0.50**	**1.63**	**0.00**	**0.07**	**0.07**	**583.65**

	U	V	W	X	Y	Z	AA	AB
199	**Table D-1.14. Nonroad Equipment Total Emissions - Miner Flats Dam Construction for the WMAT Rural Water System (page 2 of 3)**							
200		*Tons*						
201	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
202	*RCC Conveying*							
203	500 kw Gen Set	0.07	0.42	1.36	0.00	0.06	0.05	484.68
204	200 kw Gen Set	0.01	0.03	0.13	0.00	0.01	0.01	74.93
205	**Subtotal**	**0.08**	**0.45**	**1.48**	**0.00**	**0.06**	**0.06**	**559.61**
206	*RCC Placement (includes Bedding, Jointing and Curing)*							
207	Cat 950 Loader	0.01	0.02	0.07	0.00	0.00	0.00	40.06
208	Cat D5 LGP Dozer	0.02	0.07	0.19	0.00	0.01	0.01	72.88
209	Cat CB 634 SDD Roller	0.03	0.09	0.26	0.00	0.02	0.02	101.61
210	Cat 740 Articulated 40T Truck	0.11	0.65	2.11	0.00	0.09	0.09	754.16
211	Cat 446 Backhoe/Loader	0.01	0.02	0.06	0.00	0.00	0.00	24.00
212	Water Truck, 4000 gal On-Road	0.01	0.05	0.15	0.00	0.01	0.01	53.12
213	Cat 312 Excavator	0.01	0.04	0.06	0.00	0.01	0.01	17.55
214	**Subtotal**	**0.18**	**0.93**	**2.90**	**0.00**	**0.14**	**0.14**	**1,063.38**
215	*Installation of Facing Systems*							
216	150 Ton Rough Terrain Crane	0.01	0.07	0.22	0.00	0.01	0.01	77.84
217	Rough Terrain Forklift	0.01	0.02	0.05	0.00	0.00	0.00	21.05
218	Schwing 28M Concrete Pump Truck	0.00	0.01	0.02	0.00	0.00	0.00	13.74
219	**Subtotal**	**0.02**	**0.09**	**0.30**	**0.00**	**0.01**	**0.01**	**112.63**
220	*Galleries and Adits*							
221	165 Ton Rough Terrain Crane	0.00	0.00	0.01	0.00	0.00	0.00	5.31
222	Schwing 28M Concrete Pump Truck	0.00	0.00	0.00	0.00	0.00	0.00	1.87
223	Rough Terrain Forklift	0.00	0.00	0.00	0.00	0.00	0.00	1.28
224	**Subtotal**	**0.00**	**0.01**	**0.02**	**0.00**	**0.00**	**0.00**	**8.46**
225	*Ogee Concrete*							
226	150 Ton Rough Terrain Crane	0.00	0.00	0.02	0.00	0.00	0.00	5.66
227	Rough Terrain Forklift	0.00	0.00	0.00	0.00	0.00	0.00	1.53
228	Schwing 28M Concrete Pump Truck	0.00	0.00	0.00	0.00	0.00	0.00	1.87
229	**Subtotal**	**0.00**	**0.01**	**0.02**	**0.00**	**0.00**	**0.00**	**9.07**
230	*New Access Road Constrution*							
231	Cat D9 Dozer	0.00	0.03	0.09	0.00	0.00	0.00	31.57
232	Cat 14 Blade	0.00	0.01	0.03	0.00	0.00	0.00	20.10
233	Cat 330 Excavator	0.00	0.01	0.02	0.00	0.00	0.00	13.52
234	Cat CS 583 Single Drum Smooth Roller	0.00	0.01	0.03	0.00	0.00	0.00	13.44
235	Water Truck, 4000 gal On-Road	0.00	0.02	0.08	0.00	0.00	0.00	27.16
236	**Subtotal**	**0.02**	**0.08**	**0.26**	**0.00**	**0.01**	**0.01**	**105.79**
237	*Staging and Recreation Areas*							
238	Cat D9 Dozer	0.00	0.02	0.08	0.00	0.00	0.00	27.22
239	Cat 14 Blade	0.00	0.01	0.03	0.00	0.00	0.00	17.33
240	Cat 330 Excavator	0.00	0.01	0.02	0.00	0.00	0.00	11.66
241	Cat CS 583 Single Drum Smooth Roller	0.00	0.01	0.03	0.00	0.00	0.00	11.58
242	Water Truck, 4000 gal On-Road	0.00	0.02	0.07	0.00	0.00	0.00	23.41
243	**Subtotal**	**0.01**	**0.07**	**0.22**	**0.00**	**0.01**	**0.01**	**91.20**

	U	V	W	X	Y	Z	AA	AB
245	**Table D-1.15. Nonroad Equipment Total Emissions - Miner Flats Dam Construction for the WMAT Rural Water System (page 3 of 3)**							
246		*Tons*						
247	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
248	*Mobilization, Demobilization and General Conditions*							
249	25 kw Gen Set	0.01	0.03	0.14	0.00	0.00	0.00	30.29
250	Rough Terrain Fork Lift	0.00	0.01	0.04	0.00	0.00	0.00	15.31
251	Cat 966 Loader	0.00	0.01	0.05	0.00	0.00	0.00	31.68
252	Cat 14 Blade	0.00	0.01	0.05	0.00	0.00	0.00	27.72
253	**Subtotal**	**0.02**	**0.07**	**0.28**	**0.00**	**0.01**	**0.01**	**105.01**
254	*Miscellaneous Support Equipment*							
255	Light Plant	0.14	0.59	1.22	0.00	0.07	0.07	190.24
256	200 kw Gen Set	0.30	1.80	5.85	0.01	0.24	0.24	2,091.11
257	Water Truck, 4000 gal On-Road	0.05	0.31	1.02	0.00	0.04	0.04	365.85
258	**Subtotal**	**0.49**	**2.71**	**8.10**	**0.01**	**0.36**	**0.35**	**2,647.20**
259	*Piers and Bridge Over Spillway*							
260	165 Ton Rough Terrain Crane	0.01	0.08	0.25	0.00	0.01	0.01	89.22
261	Schwing 28M Concrete Pump Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.87
262	Rough Terrain Forklift	0.00	0.01	0.04	0.00	0.00	0.00	14.89
263	**Subtotal**	**0.02**	**0.09**	**0.29**	**0.00**	**0.01**	**0.01**	**104.98**
264	**Total Emissions**	**1.40**	**7.87**	**24.83**	**0.03**	**1.09**	**1.05**	**8,752.92**

	U	V	W	X	Y	Z	AA	AB
267	**Table D-1.15a. Nonroad Equipment Total Emissions - Miner Flats Dam Construction - Foundation Treatment/Engineering Feature - WMAT Rural Water Sys**							
268		*Tons*						
269	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
270	*Drains - Gallery, Abutment, Tunnel + Drainage Tunnel/Adit and Shafts*							
271	Drill Rig for Gallery Work (Foundation Drains)	0.00	0.00	0.01	0.00	0.00	0.00	8.33
272	Epiroc Airroc Drill	0.00	0.02	0.07	0.00	0.00	0.00	24.78
273	150 Ton Rough Terrain Crane (includes all access support)	0.00	0.02	0.05	0.00	0.00	0.00	18.87
274	Cat 950 Loader (IT Support)	0.00	0.01	0.03	0.00	0.00	0.00	9.80
275	**Subtotal**	**0.01**	**0.05**	**0.16**	**0.00**	**0.01**	**0.01**	**61.78**
276	*F3 - Downstream Seepage Blanket*							
277	Cat 345 Excavator	0.02	0.11	0.36	0.00	0.01	0.01	128.73
278	Cat D8 Dozer	0.01	0.06	0.20	0.00	0.01	0.01	71.34
279	Cat 740 Articulated Dump Truck	0.04	0.27	0.87	0.00	0.04	0.04	311.63
280	**Subtotal**	**0.07**	**0.44**	**1.43**	**0.00**	**0.06**	**0.06**	**511.71**
281	*Drainage fill w Pipe (17k cy; 600lft pipe)*							
282	Cat D8 Dozer	0.00	0.03	0.09	0.00	0.00	0.00	31.83
283	Cat CV 634 SDD Roller	0.00	0.01	0.02	0.00	0.00	0.00	9.45
284	Cat 966 Loader	0.00	0.02	0.07	0.00	0.00	0.00	26.43
285	Cat 446 Backhoe/Loader	0.00	0.01	0.03	0.00	0.00	0.00	11.90
286	Unlisted Equipment	0.00	0.01	0.02	0.00	0.00	0.00	14.27
287	**Subtotal**	**0.02**	**0.08**	**0.24**	**0.00**	**0.01**	**0.01**	**93.88**
288	*F4 - Dam Axis and All Curtain Grouting*							
289	Epiroc Airroc Drill	0.30	1.84	6.00	0.01	0.25	0.24	2,142.95
290	300 kw Generator Set	0.32	1.98	6.43	0.01	0.27	0.26	2,296.02
291	Mini Excavator CAT 312	0.08	0.48	0.78	0.00	0.07	0.07	219.44
292	Rough Terrain Forklift	0.08	0.24	0.68	0.00	0.05	0.05	265.05
293	Compressor	0.03	0.10	0.49	0.00	0.01	0.01	109.45
294	Unlisted Equipment	0.06	0.17	0.66	0.00	0.03	0.03	385.94
295	**Subtotal**	**0.87**	**4.82**	**15.02**	**0.02**	**0.69**	**0.67**	**5,418.85**
296	*F6 - Dam Axis and All Structural Cutoff Walls*							
297	Drill Rig BG 45	0.12	0.71	2.30	0.00	0.10	0.09	821.40
298	500 kW Generator Set	0.14	0.87	2.83	0.00	0.12	0.11	1,009.75
299	Mini Excavator CAT 312	0.02	0.11	0.18	0.00	0.02	0.02	50.75
300	Cat 950 Loader	0.01	0.04	0.15	0.00	0.01	0.01	86.92
301	Cat 740 Articulated 40T Truck	0.07	0.45	1.45	0.00	0.06	0.06	519.39
302	150 Ton Rough Terrain Crane	0.03	0.19	0.63	0.00	0.03	0.03	226.45
303	Rough Terrain Forklift	0.02	0.06	0.16	0.00	0.01	0.01	61.24
304	Air Compressor, 175 CFM	0.02	0.11	0.28	0.00	0.02	0.01	50.69
305	Vacuum truck 3500 gal, 3170 CFM	0.02	0.12	0.39	0.00	0.02	0.02	139.41
306	Schwing 28M Concrete Pump Truck	0.01	0.02	0.06	0.00	0.00	0.00	37.46
307	Unlisted Equipment	0.02	0.06	0.23	0.00	0.01	0.01	133.80
308	**Subtotal**	**0.48**	**2.73**	**8.66**	**0.01**	**0.38**	**0.37**	**3,137.27**

	U	V	W	X	Y	Z	AA	AB
312	**Table D-1.15a. Nonroad Equipment Total Emissions - Miner Flats Dam Construction - Foundation Treatment/Engineering Feature - WMAT Rural Water Sys**							
313		*Tons*						
314	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
315	*F8 - Left Downstream Bank Basalt/SS Contact Drain System*							
316	Comacchio C12	0.01	0.03	0.10	0.00	0.00	0.00	36.35
317	150 Ton Rough Terrain Crane	0.00	0.02	0.06	0.00	0.00	0.00	20.13
318	Rough Terrain Forklift	0.00	0.00	0.01	0.00	0.00	0.00	4.76
319	Unlisted	0.00	0.01	0.03	0.00	0.00	0.00	17.13
320	**Subtotal**	**0.01**	**0.06**	**0.20**	**0.00**	**0.01**	**0.01**	**78.37**
321	*Excavation and Foundation Preparation*							
322	Cat 345 Excavator	0.05	0.32	1.05	0.00	0.04	0.04	373.80
323	Cat 312 Excavator with Breaker	0.01	0.04	0.07	0.00	0.01	0.01	19.09
324	Cat 740 Articulated Dump Truck	0.30	1.83	5.94	0.01	0.25	0.24	2,120.85
325	Dozer D8	0.03	0.20	0.64	0.00	0.03	0.03	229.75
326	**Subtotal**	**0.39**	**2.39**	**7.69**	**0.01**	**0.32**	**0.31**	**2,743.50**
327	*Left End Closure Allowance (4 11 205 grout)*							
328	F3 - Downstream Seepage Blanket	0.03	0.20	0.65	0.00	0.03	0.03	231.31
329	Cat 345 Excavator	0.04	0.21	0.69	0.00	0.03	0.03	247.84
330	Cat D8 Dozer	0.01	0.04	0.07	0.00	0.01	0.01	20.30
331	Cat 740 Articulated Dump Truck	0.01	0.03	0.07	0.00	0.01	0.01	28.58
332	Drainage fill w Pipe (17k cy; 600lft pipe)	0.00	0.01	0.05	0.00	0.00	0.00	11.80
333	Cat D8 Dozer	0.01	0.02	0.07	0.00	0.00	0.00	41.63
334	**Subtotal**	**0.09**	**0.51**	**1.61**	**0.00**	**0.07**	**0.07**	**581.46**
335	*Left End Closure Allowance (4 11 307 cutoff)*							
336	Mini Excavator CAT 312	0.03	0.19	0.61	0.00	0.03	0.02	219.04
337	Rough Terrain Forklift	0.04	0.23	0.76	0.00	0.03	0.03	270.61
338	Compressor	0.01	0.03	0.05	0.00	0.00	0.00	13.63
339	Unlisted Equipment	0.00	0.01	0.04	0.00	0.00	0.00	23.34
340	F6 - Dam Axis and All Structural Cutoff Walls	0.02	0.12	0.39	0.00	0.02	0.02	140.24
341	Drill Rig BG 45	0.01	0.05	0.17	0.00	0.01	0.01	61.90
342	500 kW Generator Set	0.00	0.02	0.04	0.00	0.00	0.00	16.74
343	Mini Excavator CAT 312	0.01	0.03	0.08	0.00	0.00	0.00	13.86
344	Cat 950 Loader	0.01	0.03	0.11	0.00	0.00	0.00	39.03
345	Cat 740 Articulated 40T Truck	0.00	0.00	0.02	0.00	0.00	0.00	10.49
346	**Subtotal**	**0.12**	**0.72**	**2.27**	**0.00**	**0.10**	**0.10**	**808.88**
347	*Plinth Construction*							
348	500 kw Generator Set	0.01	0.08	0.26	0.00	0.01	0.01	94.24
349	ECM 370 Drill	0.00	0.01	0.04	0.00	0.00	0.00	14.89
350	Mini Excavator CAT 312	0.00	0.00	0.01	0.00	0.00	0.00	1.69
351	Rough Terrain Forklift	0.00	0.01	0.02	0.00	0.00	0.00	8.85
352	Schwing 28M Concrete Pump Truck	0.00	0.00	0.01	0.00	0.00	0.00	6.12
353	Grove RT 770T Crane	0.00	0.01	0.03	0.00	0.00	0.00	14.84
354	Boom Truck	0.00	0.01	0.03	0.00	0.00	0.00	18.55
355	Mixer Truck	0.01	0.06	0.19	0.00	0.01	0.01	68.73
356	**Subtotal**	**0.03**	**0.18**	**0.59**	**0.00**	**0.03**	**0.03**	**227.92**

	U	V	W	X	Y	Z	AA	AB
359	**Table D-1.15a. Nonroad Equipment Total Emissions - Miner Flats Dam Construction - Foundation Treatment/Engineering Feature - WMAT Rural Water Sys**							
360					*Tons*			
361	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
362	*Drain and filter zones*							
363	Cat 966 Loader	0.02	0.14	0.46	0.00	0.02	0.02	162.96
364	Cat 740 Articulated 40T Truck	0.06	0.39	1.26	0.00	0.05	0.05	448.41
365	Telebelt 110	0.02	0.15	0.48	0.00	0.02	0.02	170.16
366	D4 Dozer	0.04	0.13	0.36	0.00	0.03	0.03	139.28
367	Compaction	0.04	0.12	0.32	0.00	0.02	0.02	124.56
368	Water truck 4000ga	0.02	0.06	0.24	0.00	0.01	0.01	138.62
369	**Subtotal**	**0.21**	**0.98**	**3.10**	**0.00**	**0.15**	**0.15**	**1,183.99**
370	*Gallery and drain collection manifold/pipe*							
371	500 kw gen set	0.01	0.04	0.12	0.00	0.01	0.00	44.18
372	Mini Excavator Cat 312	0.01	0.06	0.10	0.00	0.01	0.01	29.00
373	Rough Terrain Forklift	0.01	0.04	0.10	0.00	0.01	0.01	40.49
374	Grove RT 770T Crane	0.01	0.02	0.09	0.00	0.00	0.00	51.38
375	Boom truck	0.01	0.02	0.08	0.00	0.00	0.00	48.53
376	Excavator Cat 329	0.00	0.01	0.05	0.00	0.00	0.00	32.11
377	Kom WA 250 IT loader	0.01	0.03	0.08	0.00	0.01	0.01	30.40
378	Unlisted	0.02	0.06	0.22	0.00	0.01	0.01	127.74
379	**Subtotal**	**0.08**	**0.28**	**0.85**	**0.00**	**0.05**	**0.05**	**403.82**
380	*Face Construction*							
381	500 kw Generator Set	0.04	0.23	0.74	0.00	0.03	0.03	262.96
382	Mini Excavator CAT 312	0.03	0.18	0.30	0.00	0.03	0.03	84.59
383	Rough Terrain Forklift	0.03	0.09	0.26	0.00	0.02	0.02	102.07
384	Schwing 28M Concrete Pump Truck	0.02	0.05	0.20	0.00	0.01	0.01	117.08
385	Manitowoc 888 - 250 tn crawler crane	0.03	0.17	0.55	0.00	0.02	0.02	194.73
386	Compressor 350 cfm	0.06	0.29	0.74	0.00	0.04	0.04	135.78
387	Generator/welder	0.02	0.08	0.37	0.00	0.01	0.01	81.79
388	Grove RT 770T Crane	0.03	0.08	0.29	0.00	0.01	0.01	171.27
389	Boom truck - 20 ton	0.04	0.21	0.69	0.00	0.03	0.03	247.84
390	Vacuum Truck	0.02	0.11	0.35	0.00	0.01	0.01	123.92
391	Mixer Trucks	0.14	0.85	2.77	0.00	0.12	0.11	991.34
392	Unlisted	0.02	0.13	0.41	0.00	0.02	0.02	147.52
393	**Subtotal**	**0.46**	**2.47**	**7.67**	**0.01**	**0.35**	**0.34**	**2,660.87**
394	**Total Emissions**	**2.83**	**15.63**	**49.26**	**0.05**	**2.23**	**2.16**	**17,818.42**

Table D-1.16 - Air Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project

Construction Activity/Vehicle Type	*Fuel Type*	*Miles/ Round Trip*	*Total Trips*	*Total Miles (1)*	*Miles within 50-Mile Radius (2)*
Pipe Delivery					
Tractor with Flat-Bed Trailer	D	400	275	110,000	27,500
Bedding Aggregate Delivery					
Tractor with Side-Dump Trailer	D	80	2,897	231,760	231,760
Road Aggregate Delivery					
Tractor with Side-Dump Trailer	D	80	210	16,800	16,800
Pump Station Delivery					
Tractor with Flat-Bed Trailer	D	400	4	1,600	400
Tank Delivery					
Tractor with Flat-Bed Trailer	D	3,000	3	9,000	300
Surge Tank Stations					
Tractor with Flat-Bed Trailer	D	400	6	2,400	600
Construction - Worker commuting					
Personal Vehicle	G	43	19,179	824,697	824,697

Notes: (1) Used to estimate GHGs and criteria pollutant emissions if Miles/Round Trip <100 miles.
(2) Used to estimate criteria pollutant emissions if Miles/Round Trip >100 miles.

Table D-1.17. On-road Vehicle Activity Data for Water Diversion System Construction - WMAT Rural Water System

Construction Activity/Vehicle Type	*Fuel Type*	*Miles/ Round Trip*	*Total Trips*	*Total Miles (1)*	*Miles within 50-Mile Radius (2)*
Material Deliveries, Aggregates, etc.					
Freightliner 122SD Dump Truck	D	20	653	13,060	13,060
18 Wheel Flatbed Equipment Delivery Trucks	D	70	16	1,120	1,120
Cat 730C Cement Truck	D	70	35	2,450	2,450
Construction - Worker commuting					
Passenger Car/Pickup	G	43	264	11,352	11,352

Notes: (1) Used to estimate GHGs and criteria pollutant emissions if Miles/Round Trip <100 miles.
(2) Used to estimate criteria pollutant emissions if Miles/Round Trip >100 miles.

Table D-1.18. On-road Vehicle Activity Data for Water Treatment Plant Construction - WMAT Rural Water System

Construction Activity/Vehicle Type	Fuel Type	Miles/ Round Trip	Total Trips	Total Miles (1)	Miles within 50-Mile Radius (2)
Removal of Grass & Shrubs					
Dual Axle tandum Dump Trucks	D	30	30	900	900
Yard Piping					
18 Whl. Fltbed Equip. Del.Trucks	D	70	16	1,120	1,120
Pretreatment Bldg. & Flocculation Basins					
18 Whl. Fltbed Equip. Del.Trucks	D	70	50	3,500	3,500
8-10 CY cement Trucks	D	70	112	7,840	7,840
Sedimetation Basins					
18 Whl. Fltbed Equip. Del.Trucks	D	70	60	4,200	4,200
8-10 CY cement Trucks	D	70	180	12,600	12,600
Membrane Bldg., Fd Pmp Sta & Strainers					
18 Whl. Fltbed Equip. Del.Trucks	D	70	162	11,340	11,340
8-10 CY cement Trucks	D	70	240	16,800	16,800
Finished Water Reservoirs					
18 Whl. Fltbed Equip. Del.Trucks	D	70	12	840	840
8-10 CY cement Trucks	D	70	194	13,580	13,580
Wash Water Pump Station					
18 Whl. Fltbed Equip. Del.Trucks	D	70	18	1,260	1,260
8-10 CY cement Trucks	D	70	48	3,360	3,360
Excess Site Concrete & Debris					
Dual Axle tandum Dump Trucks	G	60	13	780	780
Construction - Worker commuting					
Passenger Car/Pickup	G	43	8,366	359,738	359,738

Notes: (1) Used to estimate GHGs and criteria pollutant emissions if Miles/Round Trip <100 miles.
(2) Used to estimate criteria pollutant emissions if Miles/Round Trip >100 miles.

Table D-1.19. On-road Vehicle Activity Data for Miner Flats Dam Construction - WMAT Rural Water System

Construction Activity/Vehicle Type	Fuel Type	Miles/ Round Trip	Total Trips	Total Miles (1)	Miles within 50-Mile Radius (2)
Fine Agregate Haul					
Belly Dump Train	D	50	700	35,000	35,000
Cement / Flyash Haul					
Pneumatic Tank Truck	D	360	920	331,200	92,000
Surfacing Gravel Haul					
Belly Dump Truck	D	65	400	26,000	26,000
Other Material Deliveries					
Semi Truck	D	65	250	16,250	16,250
Removal of Merchantable Timber					
Log Truck	D	60	340	20,400	20,400
Removal of Clearing Operation Waste					
Side Dump Truck	D	60	85	5,100	5,100
Construction - Worker commuting					
Passenger Car/Pickup	G	60	10,000	600,000	600,000

Notes: (1) Used to estimate GHGs and criteria pollutant emissions if Miles/Round Trip <100 miles.
(2) Used to estimate criteria pollutant emissions if Miles/Round Trip >100 miles.

Table D-1.20. Emission Factors for On-road Vehicles - Construction of the White Mt. Rural Water System Project

Project Year/Source Type	*Fuel Type*	*Emission Factors (Grams/Mile)*							*References*
		VOC	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*	*CO2*	
Year 2024									
Passenger Car - 25 mph	G	0.03	3.27	0.09	0.00	0.07	0.01	311	(1)
Passenger Car - 55 mph	G	0.02	2.20	0.09	0.00	0.02	0.00	242	(1)
Truck <10k Lb. - 25 mph	G	0.04	3.11	0.12	0.00	0.07	0.01	387	(1)
Truck <10k Lb. - 55 mph	G	0.02	2.26	0.12	0.00	0.02	0.00	309	(1)
Composite - Car and Truck	**G**	**0.03**	**2.47**	**0.10**	**0.00**	**0.03**	**0.01**	**294**	**(2)**
Short Haul Truck >33k Lb. - 10 mph	D	0.80	6.58	15.96	0.01	1.49	0.57	2,430	(1)
Short Haul Truck >33k Lb. - 25 mph	D	0.37	3.66	9.88	0.01	0.71	0.39	1,835	(1)
Short Haul Truck >33k Lb. - 55 mph	D	0.27	2.06	6.60	0.00	0.22	0.16	1,400	(1)
Composite - Short Haul Truck >33k Lb.	**D**	**0.35**	**2.99**	**8.52**	**0.01**	**0.50**	**0.27**	**1,633**	**(3)**
Long Haul Truck >33k Lb. - 10 mph	D	2.55	9.78	26.11	0.01	2.19	1.21	2,680	(1)
Long Haul Truck >33k Lb. - 25 mph	D	1.24	5.67	17.05	0.01	1.09	0.74	1,946	(1)
Long Haul Truck >33k Lb. - 55 mph	D	0.73	3.14	14.04	0.01	0.46	0.38	1,475	(1)
Composite - Long Haul Truck >33k Lb.	**D**	**0.92**	**3.98**	**15.25**	**0.01**	**0.67**	**0.49**	**1,629**	**(4)**

Notes: (1) Estimated with the use of the EPA MOVES3 model and based upon default parameters for Navajo County and year 2024.

(2) Equal to a fleet of 50/50 percent passenger car/light truck and 25/75 percent 25/55 mph factors.

(3) Equal to 10/30/60 percent 10/25/55 mph factors.

(4) Equal to 5/20/75 percent 10/25/55 mph factors.

Table D-1.21. Total Emissions for Onroad Vehicle - Water Pipeline

	Tons						
Construction Activity/Vehicle Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Pipe Delivery							
Tractor with Flat-Bed Trailer	0.03	0.12	0.46	0.00	0.02	0.01	197.58
Subtotal	**0.03**	**0.12**	**0.46**	**0.00**	**0.02**	**0.01**	**197.58**
Bedding Aggregate Delivery							
Tractor with Side-Dump Trailer	0.09	0.76	2.18	0.00	0.13	0.07	417.22
Subtotal	**0.09**	**0.76**	**2.18**	**0.00**	**0.13**	**0.07**	**417.22**
Road Aggregate Delivery							
Tractor with Side-Dump Trailer	0.01	0.06	0.16	0.00	0.01	0.01	30.24
Subtotal	**0.01**	**0.06**	**0.16**	**0.00**	**0.01**	**0.01**	**30.24**
Pump Station Delivery							
Tractor with Flat-Bed Trailer	0.00	0.00	0.01	0.00	0.00	0.00	2.87
Subtotal	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**2.87**
Tank Delivery							
Tractor with Flat-Bed Trailer	0.00	0.00	0.01	0.00	0.00	0.00	16.17
Subtotal	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**16.17**
Surge Tank Stations							
Tractor with Flat-Bed Trailer	0.00	0.00	0.01	0.00	0.00	0.00	4.31
Subtotal	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**4.31**
Construction - Worker commuting							
Personal Vehicle	0.02	2.25	0.10	0.00	0.03	0.00	267.15
Subtotal	**0.02**	**2.25**	**0.10**	**0.00**	**0.03**	**0.00**	**267.15**
Total Emissions	**0.15**	**3.19**	**2.91**	**0.00**	**0.18**	**0.09**	**935.53**

Table D-1.22. Total Emissions for Onroad Vehicle - Water Diversion System

	Tons						
Construction Activity/Vehicle Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Material Deliveries, Aggregates, etc.							
Freightliner 122SD Dump Truck	0.01	0.04	0.12	0.00	0.01	0.00	23.51
18 Wheel Flatbed Equipment Delivery Trucks	0.00	0.00	0.01	0.00	0.00	0.00	2.02
Cat 730C Cement Truck	0.00	0.01	0.02	0.00	0.00	0.00	4.41
Subtotal	**0.01**	**0.05**	**0.16**	**0.00**	**0.01**	**0.00**	**29.94**
Construction - Worker commuting							
Passenger Car/Pickup	0.00	0.03	0.00	0.00	0.00	0.00	3.68
Subtotal	**0.00**	**0.03**	**0.00**	**0.00**	**0.00**	**0.00**	**3.68**
Total Emissions	**0.01**	**0.09**	**0.16**	**0.00**	**0.01**	**0.01**	**33.61**

Table D-1.23. Total Emissions for Onroad Vehicle - Water Treatment Plant

	Tons						
Construction Activity/Vehicle Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Removal of Grass & Shrubs							
Dual Axle tandum Dump Trucks	0.00	0.00	0.01	0.00	0.00	0.00	1.62
Subtotal	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**1.62**
Yard Piping							
18 Whl. Fltbed Equip. Del.Trucks	0.00	0.00	0.01	0.00	0.00	0.00	2.02
Subtotal	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**2.02**
Pretreatment Bldg. & Flocculation Basins							
18 Whl. Fltbed Equip. Del.Trucks	0.00	0.01	0.03	0.00	0.00	0.00	6.30
8-10 CY cement Trucks	0.00	0.03	0.07	0.00	0.00	0.00	14.11
Subtotal	**0.00**	**0.04**	**0.11**	**0.00**	**0.01**	**0.00**	**20.41**
Sedimetation Basins							
18 Whl. Fltbed Equip. Del.Trucks	0.00	0.01	0.04	0.00	0.00	0.00	7.56
8-10 CY cement Trucks	0.00	0.04	0.12	0.00	0.01	0.00	22.68
Subtotal	**0.01**	**0.06**	**0.16**	**0.00**	**0.01**	**0.01**	**30.24**
Membrane Bldg., Fd Pmp Sta & Strainers							
18 Whl. Fltbed Equip. Del.Trucks	0.00	0.04	0.11	0.00	0.01	0.00	20.41
8-10 CY cement Trucks	0.01	0.06	0.16	0.00	0.01	0.01	30.24
Subtotal	**0.01**	**0.09**	**0.26**	**0.00**	**0.02**	**0.01**	**50.66**
Finished Water Reservoirs							
18 Whl. Fltbed Equip. Del.Trucks	0.00	0.00	0.01	0.00	0.00	0.00	1.51
8-10 CY cement Trucks	0.01	0.04	0.13	0.00	0.01	0.00	24.45
Subtotal	**0.01**	**0.05**	**0.14**	**0.00**	**0.01**	**0.00**	**25.96**
Wash Water Pump Station							
18 Whl. Fltbed Equip. Del.Trucks	0.00	0.00	0.01	0.00	0.00	0.00	2.27
8-10 CY cement Trucks	0.00	0.01	0.03	0.00	0.00	0.00	6.05
Subtotal	**0.00**	**0.02**	**0.04**	**0.00**	**0.00**	**0.00**	**8.32**
Excess Site Concrete & Debris							
Dual Axle tandum Dump Trucks	0.00	0.00	0.01	0.00	0.00	0.00	1.40
Subtotal	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**1.40**
Construction - Worker commuting							
Passenger Car/Pickup	0.01	0.98	0.04	0.00	0.01	0.00	116.53
Subtotal	**0.01**	**0.98**	**0.04**	**0.00**	**0.01**	**0.00**	**116.53**
Total Emissions	**0.04**	**1.24**	**0.78**	**0.00**	**0.05**	**0.03**	**257.16**

Table D-1.24. Total On-Road Vehicle Activity Data for Construction of the WMAT Rural Water System - Miner Flats Dam

	Tons						
Construction Activity/Vehicle Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Fine Agregate Haul							
Belly Dump Train	0.01	0.12	0.33	0.00	0.02	0.01	63.01
Subtotal	**0.01**	**0.12**	**0.33**	**0.00**	**0.02**	**0.01**	**63.01**
Cement / Flyash Haul							
Pneumatic Tank Truck	0.09	0.40	1.55	0.00	0.07	0.05	594.89
Subtotal	**0.09**	**0.40**	**1.55**	**0.00**	**0.07**	**0.05**	**594.89**
Surfacing Gravel Haul							
Belly Dump Truck	0.01	0.09	0.24	0.00	0.01	0.01	46.81
Subtotal	**0.01**	**0.09**	**0.24**	**0.00**	**0.01**	**0.01**	**46.81**
Other Material Deliveries							
Semi Truck	0.01	0.05	0.15	0.00	0.01	0.00	29.25
Subtotal	**0.01**	**0.05**	**0.15**	**0.00**	**0.01**	**0.00**	**29.25**
Removal of Merchantable Timber							
Log Truck	0.01	0.07	0.19	0.00	0.01	0.01	36.72
Subtotal	**0.01**	**0.07**	**0.19**	**0.00**	**0.01**	**0.01**	**36.72**
Removal of Clearing Operation Waste							
Side Dump Truck	0.00	0.02	0.05	0.00	0.00	0.00	9.18
Subtotal	**0.00**	**0.02**	**0.05**	**0.00**	**0.00**	**0.00**	**9.18**
Construction - Worker commuting							
Passenger Car/Pickup	0.02	1.63	0.07	0.00	0.02	0.00	194.36
Subtotal	**0.02**	**1.63**	**0.07**	**0.00**	**0.02**	**0.00**	**194.36**
Total Emissions	**0.15**	**2.38**	**2.58**	**0.00**	**0.14**	**0.08**	**974.22**

Table D-1.25 - Air Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project

Construction Activity/Source Type	*Unpaved Road Round Trip Distance (Mi)*	*Total Truck Trips*	*Daily Disturbed Acres*	*Work Days*	*Total Miles (1)*
Pipeline Installation					
Unpaved Road Dust - Pipe Delivery	0.25	275			69
Unpaved Road Dust - Bedding Agg. Delivery	0.25	2,897			724
Fugitive Dust - Crew #1			0.25	525	131
Fugitive Dust - Crew #2			0.25	525	131
ARV & Valve Installation					
Fugitive Dust			0.10	581	58
Tank & Pump Station Installation					
Unpaved Road Dust - Pump Station Delivery	0.25	4			1
Unpaved Road Dust - Tank Delivery	0.25	3			1
Unpaved Road Dust - Surge Tank Stations Delivery	0.25	6			2
Fugitive Dust			0.10	356	36
Road Work					
Unpaved Road Dust - Road Agg. Delivery	0.25	210			53
Fugitive Dust			0.50	162	81

Note: (1) = total acre-days of fugitive dust activity.

Table D-1.26. Fugitive Dust Activity Data for Water Diversion System Construction - WMAT Rural Water System

Construction Activity/Source Type	*Unpaved Road Round Trip Distance (Mi)*	*Total Truck Trips*	*Daily Disturbed Acres*	*Work Days*	*Total Miles (1)*
Pump House					
Unpaved Road Dust - Aggregate Dump Truck	1	653			653
Unpaved Road Dust - Equipment Delivery Trucks	1	16			16
Unpaved Road Dust - ConcreteTrucks	1	35			35
Fugitive Dust			0.25	15	4
Diversion Structure					
Fugitive Dust			0.10	3	0.3
Raw Water Pipeline					
Fugitive Dust			0.25	15	4

Note: (1) = total acre-days of fugitive dust activity.

Table D-1.27. Fugitive Dust Activity Data for Water Treatment Plant Construction - WMAT Rural Water System

Construction Activity/Source Type	*Unpaved Road Round Trip Distance (Mi)*	*Total Truck Trips*	*Daily Disturbed Acres*	*Work Days*	*Total Miles (1)*
Removal of Grass & Shrubs					
Unpaved Road Dust - Dump Trucks	0.33	30			10
Fugitive Dust			1	15	15
Yard Piping					
Unpaved Road Dust - Equipment Delivery Trucks	0.33	16			5
Fugitive Dust			0.50	22	11
Pretreatment Bldg. & Flocculation Basins					
Unpaved Road Dust - Equipment Delivery Trucks	0.33	50			17
Unpaved Road Dust - ConcreteTrucks	0.33	112			37
Fugitive Dust			0.50	4	2
Sedimetation Basins					
Unpaved Road Dust - Equipment Delivery Trucks	0.33	60			20
Unpaved Road Dust - ConcreteTrucks	0.33	180			59
Fugitive Dust			1	48	48
Membrane Bldg., Fd Pmp Sta & strainers					
Unpaved Road Dust - Equipment Delivery Trucks	0.33	162			53
Unpaved Road Dust - ConcreteTrucks	0.33	240			79
Fugitive Dust			0.50	65	33
Finished Water Reservoirs					
Unpaved Road Dust - Equipment Delivery Trucks	0.33	12			4
Unpaved Road Dust - ConcreteTrucks	0.33	194			64
Fugitive Dust			1	5	5
Wash Water Pump Station					
Unpaved Road Dust - Equipment Delivery Trucks	0.33	18			6
Unpaved Road Dust - ConcreteTrucks	0.33	48			16
Unpaved Road Dust - Debris Hauling Trucks	0.33	48			16
Fugitive Dust			0.25	10	3

Note: (1) = total acre-days of fugitive dust activity.

Table D-1.28. Fugitive Dust Activity Data for Miner Flats Dam Construction - WMAT Rural Water System

Construction Activity/Source Type	Unpaved Road Round Trip Distance (Mi)	Total Truck Trips	Daily Disturbed Acres	Work Days	Total Miles (1)
Clearing					
Unpaved Road Dust	2	85			170
Fugitive Dust		NA	4	43	172
Foundation Excavation (Common)					
Unpaved Road Dust	0.60	375			225
Fugitive Dust		NA	1	11	11
Foundation Excavation (Rock)					
Unpaved Road Dust - Foundation Rock to CBP	0.60	4,388			2,633
Fugitive Dust		NA	1	125	125
Dental Excavation					
Unpaved Road Dust	0.60	8			5
Fugitive Dust		NA	0.1	2	0
Foundation Treatment/Engineering Features					
Fugitive Dust		NA	2.00	260	520
Foundation Preparation					
Fugitive Dust		NA	0.25	9	2
Blanket (Consolidation) and Curtain Grouting					
Fugitive Dust		NA	0.1	2	0
Foundation and Dam Drain Holes					
Fugitive Dust		NA	0.1	4	0
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)					
Aggregate Processing Plant	See Table D-1.29 for Activty data				
Unpaved Road Dust - Surface Gravel Off-site Source	0.40	400			160
Unpaved Road Dust - Fine Agg. Off-site Source	0.40	700			280
Unpaved Road Dust - Pit Source	0.80	425			340
Fugitive Dust		NA	3	42	126
RCC Plant Operation					
Concrete Batch Plant	See Table D-1.29 for Activty data				
Unpaved Road Dust - Cement/Fly Ash Off-site Source	0.40	920			368
Fugitive Dust		NA	1	48	48
RCC Placement (includes Bedding, Jointing and Curing)					
Unpaved Road Dust - Concrete Trucks	0.60	6,050			3,630
Fugitive Dust		NA	1	48	48
Installation of Facing Systems					
Unpaved Road Dust - Concrete Trucks	0.60	264			158
Fugitive Dust		NA	0.1	73	7
Galleries and Adits					
Unpaved Road Dust - Concrete Trucks	0.60	20			12
Fugitive Dust		NA	0.1	3	0.3
Ogee Concrete					
Unpaved Road Dust - Concrete Trucks	0.60	18			11
Fugitive Dust		NA	0.1	3	0.3
New Access Road Constrution					
Fugitive Dust		NA	2	19	38
Staging and Recreation Areas					
Fugitive Dust		NA	1	16	16
Mobilization, Demobilization and General Conditions					
Fugitive Dust		NA	0.25	30	7.5
Piers and Bridge Over Spillway					
Unpaved Road Dust - Concrete Trucks	0.60	18			11
Fugitive Dust		NA	0.1	42	4.2

Note: (1) = total acre-days of fugitive dust activity.

Table D-1.29. Fugitive Dust Activity Data for Construction of the WMAT Rural Water System - Aggregate Processing and Concrete Batch Plants

Construction Activity/Source Type	*Throughput (Tons)*	*Emission Factor (Lb/Ton)*		*Total Emissions (Tons)*	
		PM10	*PM2.5*	*PM10*	*PM2.5*
Aggregate Processing Plant					
Primary Crushing/Screening	210,000	0.0024	0.0002	0.25	0.03
Secondary Crushing/Screening	210,000	0.0024	0.0002	0.25	0.03
Tertiary Crushing/Screening	210,000	0.0024	0.0002	0.25	0.03
Conveyor Transfer to Pile	210,000	0.0011	0.0001	0.12	0.01
Total Fugitive Dust				**0.87**	**0.09**
Concrete Batch Plant					
Aggregate Transfer	205,700	0.0033	0.0003	0.34	0.03
Cement Unloading	36,300	0.47	0.0470	8.53	0.85
Weigh Hopper Loading	242,000	0.0028	0.0003	0.34	0.03
Mixer Loading	242,000	0.156	0.0156	18.88	1.89
Total Fugitive Dust				**28.08**	**2.81**

Notes: Estimated with the methods identified in AP-42 Sections 11.19.2 and 11.12.

Table D-1.30. Fugitive Dust Emission Factors for Construction of the WMAT Rural Water System Project

	Weight	*Emission Factors*						
Project Year/Source Type	*(Tons)*					*PM10*	*PM2.5*	*References*
Unpaved Road Dust	35.0					3.21	0.32	(1)
Disturbed Ground - Fugitive Dust						27.50	2.75	(2)

Notes: (1) From Section 13.2.2 of AP-42 (USEPA 2006). Units in Lb/VMT.

(2) Units in lbs/acre-day from section 11.2.3 of AP-42 (USEPA 1995). Emissions reduced by 50% from uncontrolled levels to simulat implementation of best management practices for fugitive dust control.

Table D-1.31. Fugitive Dust Emissions - Water Pipeline Construction for the WMAT Rural Water System

	Tons						
Construction Activity/Equipment Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Pipeline Installation - Crew #1							
Unpaved Road Dust - Pipe Delivery					0.11	0.01	
Unpaved Road Dust - Bedding Agg. Delivery					1.16	0.12	
Fugitive Dust - Crew #1					1.81	0.18	
Fugitive Dust - Crew #2					1.80	0.18	
Subtotal					**4.88**	**0.49**	
ARV & Valve Installation							
Fugitive Dust					0.80	0.08	
Subtotal					**0.80**	**0.08**	
Tank & Pump Station Installation							
Unpaved Road Dust - Pump Station Delivery					0.00	0.00	
Unpaved Road Dust - Tank Delivery					0.00	0.00	
Unpaved Road Dust - Surge Tank Stations Delivery					0.00	0.00	
Fugitive Dust					0.49	0.05	
Subtotal					**0.49**	**0.05**	
Road Work							
Unpaved Road Dust - Road Agg. Delivery					0.08	0.01	
Fugitive Dust					1.11	0.11	
Subtotal					**1.20**	**0.12**	
Total Emissions					**7.38**	**0.74**	

Table D-1.32. Fugitive Dust Emissions - Water Diversion System Construction for the WMAT Rural Water System

	Tons						
Construction Activity/Source Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Pump House							
Unpaved Road Dust - Aggregate Dump Truck					1.05	0.10	
Unpaved Road Dust - Equipment Delivery Trucks					0.03	0.00	
Unpaved Road Dust - ConcreteTrucks					0.06	0.01	
Fugitive Dust					0.05	0.01	
Subtotal					**1.18**	**0.12**	
Diversion Structure							
Fugitive Dust					0.00	0.00	
Subtotal					**0.00**	**0.00**	
Raw Water Pipeline							
Fugitive Dust					0.05	0.01	
Subtotal					**0.05**	**0.01**	
Total Emissions					**1.24**	**0.12**	

Table D-1.33. Fugitive Dust Emissions - Water Treatment Plant Construction for the WMAT Rural Water System

	Tons						
Construction Activity/Source Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Removal of Grass & Shrubs							
Unpaved Road Dust - Dump Trucks					0.02	0.00	
Fugitive Dust					0.21	0.02	
Subtotal					**0.22**	**0.02**	
Yard Piping							
Unpaved Road Dust - Equipment Delivery Trucks					0.01	0.00	
Fugitive Dust					0.15	0.02	
Subtotal					**0.16**	**0.02**	
Pretreatment Bldg. & Flocculation Basins							
Unpaved Road Dust - Equipment Delivery Trucks					0.03	0.00	
Unpaved Road Dust - ConcreteTrucks					0.06	0.01	
Fugitive Dust					0.03	0.00	
Subtotal					**0.11**	**0.01**	
Sedimetation Basins							
Unpaved Road Dust - Equipment Delivery Trucks					0.03	0.00	
Unpaved Road Dust - ConcreteTrucks					0.10	0.01	
Fugitive Dust					0.66	0.07	
Subtotal					**0.79**	**0.08**	
Membrane Bldg., Fd Pmp Sta & strainers							
Unpaved Road Dust - Equipment Delivery Trucks					0.09	0.01	
Unpaved Road Dust - ConcreteTrucks					0.13	0.01	
Fugitive Dust					0.45	0.04	
Subtotal					**0.66**	**0.07**	
Finished Water Reservoirs							
Unpaved Road Dust - Equipment Delivery Trucks					0.01	0.00	
Unpaved Road Dust - ConcreteTrucks					0.10	0.01	
Fugitive Dust					0.07	0.01	
Subtotal					**0.18**	**0.02**	
Wash Water Pump Station							
Unpaved Road Dust - Equipment Delivery Trucks					0.01	0.00	
Unpaved Road Dust - ConcreteTrucks					0.03	0.00	
Unpaved Road Dust - Debris Hauling Trucks					0.03	0.00	
Fugitive Dust					0.03	0.00	
Subtotal					**0.09**	**0.01**	
Total Emissions					**2.22**	**0.22**	

Table D-1.34. Fugitive Dust Emissions - Miner Flats Dam Construction for the WMAT Rural Water System

	Tons						
Construction Activity/Source Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
Clearing							
Unpaved Road Dust					0.27	0.03	
Fugitive Dust					2.37	0.24	
Subtotal					**2.64**	**0.26**	
Foundation Excavation (Common)							
Unpaved Road Dust					0.36	0.04	
Fugitive Dust					0.15	0.02	
Subtotal					**0.51**	**0.05**	
Foundation Excavation (Rock)							
Unpaved Road Dust - Foundation Rock to CBP					4.23	0.42	
Fugitive Dust					1.72	0.17	
Subtotal					**5.95**	**0.59**	
Dental Excavation							
Unpaved Road Dust					0.01	0.00	
Fugitive Dust					0.00	0.00	
Subtotal					**0.01**	**0.00**	
Foundation Treatment/Engineering Features							
Fugitive Dust					7.15	0.72	
Subtotal					**7.15**	**0.72**	
Foundation Preparation							
Fugitive Dust					0.03	0.00	
Subtotal					**0.03**	**0.00**	
Blanket (Consolidation) and Curtain Grouting							
Fugitive Dust					0.00	0.00	
Subtotal					**0.00**	**0.00**	
Foundation and Dam Drain Holes							
Fugitive Dust					0.01	0.00	
Subtotal					**0.01**	**0.00**	
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)							
Aggregate Processing Plant					0.87	0.09	
Unpaved Road Dust - Surface Gravel Off-site Source					0.26	0.03	
Unpaved Road Dust - Fine Agg. Off-site Source					0.45	0.04	
Unpaved Road Dust - Pit Source					0.55	0.05	
Fugitive Dust					1.73	0.17	
Subtotal					**3.86**	**0.39**	
RCC Plant Operation							
Concrete Batch Plant					28.08	2.81	
Unpaved Road Dust - Cement/Fly Ash Off-site Source					0.59	0.06	
Fugitive Dust					0.66	0.07	
Subtotal					**29.34**	**2.93**	
RCC Placement (includes Bedding, Jointing and Curing)							
Unpaved Road Dust - Concrete Trucks					5.83	0.58	
Fugitive Dust					0.66	0.07	
Subtotal					**6.49**	**0.65**	
Installation of Facing Systems							
Unpaved Road Dust - Concrete Trucks					0.25	0.03	
Fugitive Dust					0.10	0.01	
Subtotal					**0.35**	**0.04**	
Galleries and Adits							
Unpaved Road Dust - Concrete Trucks					0.02	0.00	
Fugitive Dust					0.00	0.00	
Subtotal					**0.02**	**0.00**	
Ogee Concrete							
Unpaved Road Dust - Concrete Trucks					0.02	0.00	
Fugitive Dust					0.00	0.00	
Subtotal					**0.02**	**0.00**	
New Access Road Constrution							
Fugitive Dust					0.52	0.02	
Subtotal					**0.52**	**0.02**	
Staging and Recreation Areas							
Fugitive Dust					0.22	0.02	
Subtotal					**0.22**	**0.02**	
Mobilization, Demobilization and General Conditions							
Fugitive Dust					0.10	0.01	
Subtotal					**0.10**	**0.01**	
Piers and Bridge Over Spillway							
Unpaved Road Dust - Concrete Trucks					0.02	0.00	
Fugitive Dust					0.06	0.01	
Subtotal					**0.07**	**0.01**	
Total Emissions					**57.30**	**5.70**	

Table D-1.35 - Air Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project

	Monthly Construction Schedule for Years 2024, 2025, and 2026																															*Annual Fraction of Total Activity*		
Construction Activity/Task	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	2024	2025	2026
Pipe Installation																																		
Pipe Installation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1								0.33	0.50	0.17
ARV & Valve Installation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1								0.33	0.50	0.17
Tank & Pump Station Installation													1	1	1		1	1	1													-	1.00	-
Road Work								5				10		2		14	30	30	9													0.05	0.95	-
Water Diversion System																																		
Raw Water Pump Station					1	1	1	1	1	1	1	1	1	1	1	1																0.33	0.67	-
Diversion Structure													1	1	1	1																-	1.00	-
Raw Water Pipeline							1	1	1	1	1	1	1	1	1	1																0.20	0.80	-
Water Treatment Plant																																		
Removal of Grass & Shrubs			1	1																												1.00	-	-
Yard Piping				1	1	1	1	1	1	1	1	1	1	1	1	1																0.38	0.62	-
Pretreatment Bldg. & Flocculation Basins									1	1	1	1	1	1	1	1	1	1														-	1.00	-
Sedimetation Basins				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1											0.28	0.67	0.06
Membrane Bldg., Fd Pmp Sta & Strainers			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1								0.27	0.55	0.18
Finished Water Reservoirs								1	1	1	1	1				1	1	1	1	1	1											0.09	0.82	0.09
Wash Water Pump Station						1	1	1	1	1	1																					0.50	0.50	-
Construction of Miner Flat Dam																																		
Clearing														0.5	1	1	0.5															-	1.00	-
Foundation Excavation (Common)														0.5	1	1	1	1														-	1.00	-
Foundation Excavation (Rock)														0.5	1	1	1	1														-	1.00	-
Dental Excavation																			0.5													-	1.00	-
Foundation Treatment/Engineering Features															1	1	1	1	1					1	1	1	1	1	1	1		-	0.42	0.58
Foundation Preparation																			0.5													-	1.00	-
Blanket (Consolidation) and Curtain Grouting																			0.5													-	1.00	-
Foundation and Dam Drain Holes																			0.5													-	1.00	-
Aggregate Production/Stockpile (Coarse/Fine for RCC)																	1	1	0.5													-	1.00	-
RCC Plant Operation																								0.5	1	0.5						-	-	1.00
RCC Conveying																								0.5	1	0.5						-	-	1.00
RCC Placement (includes Bedding, Jointing and Curing)																								0.5	1	0.5						-	-	1.00
Installation of Facing Systems																								0.5	1	0.5						-	-	1.00
Galleries and Adits																									1	0.5						-	-	1.00
Ogee Concrete																										0.5						-	-	1.00
New Access Road Constrution															0.5	1	0.5															-	1.00	-
Staging and Recreation Areas															1									1								-	0.50	0.50
Mobilization, Demobilization and General Conditions													0.5	0.5																0.5	0.5	-	0.50	0.50
Miscellaneous Support Equipment													0.5	1	1	1	1	1	1					1	1	1	1	1	1	0.5		-	0.50	0.50
Piers and Bridge Over Spillway																											1	1	1	0.5		-	-	1.00

Note: 0.5 = half a month of activity.

Table D-1.36 - Air Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project

	Tons							
Construction Component/Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Pipeline Installation								
Pipeline Installation - Crew #1	0.50	13.45	3.01	0.00	0.13	0.13	1,449	1,315
Pipeline Installation - Crew #2	0.50	13.45	3.01	0.00	0.13	0.13	1,449	1,315
ARV & Valve Installation	0.20	6.23	0.90	0.00	0.03	0.03	304	276
Tank & Pump Station Installation	0.48	15.27	2.09	0.00	0.06	0.06	618	560
Road Work	0.13	3.53	0.69	0.00	0.03	0.03	262	238
Total Emissions - Pipeline Installation	**1.81**	**51.94**	**9.70**	**0.01**	**0.38**	**0.36**	**4,083**	**3,704**
Water Diversion System								
Pump House	0.00	0.02	0.06	0.00	0.00	0.00	30	27
Diversion Structure	0.00	0.00	0.02	0.00	0.00	0.00	7	6
Raw Water Pipeline	0.01	0.03	0.08	0.00	0.00	0.00	30	28
Total Emissions - Water Diversion System	**0.01**	**0.05**	**0.15**	**0.00**	**0.01**	**0.01**	**67**	**61**
Water Treatment Plant								
Removal of Grass & Shrubs	0.02	0.12	0.40	0.00	0.02	0.02	154	140
Yard Piping	0.04	0.22	0.65	0.00	0.03	0.03	234	213
Pretreatment Bldg. & Flocculation Basins	0.00	0.01	0.05	0.00	0.00	0.00	21	19
Sedimetation Basins	0.11	0.55	1.72	0.00	0.08	0.08	654	593
Membrane Bldg., Fd Pmp Sta & strainers	0.15	0.76	2.38	0.00	0.11	0.11	919	834
Finished Water Reservoirs	0.01	0.03	0.11	0.00	0.01	0.01	46	42
Wash Water Pump Sta.	0.01	0.04	0.11	0.00	0.01	0.01	38	35
Total Emissions - Water Treatment Plant	**0.34**	**1.74**	**5.40**	**0.01**	**0.26**	**0.25**	**2,067**	**1,875**
Miner Flats Dam								
Clearing	0.01	0.07	0.24	0.00	0.01	0.01	102	93
Foundation Excavation (Common)	0.01	0.07	0.23	0.00	0.01	0.01	83	75
Foundation Excavation (Rock)	0.22	1.35	4.40	0.00	0.18	0.18	1,586	1,439
Dental Excavation	0.00	0.00	0.00	0.00	0.00	0.00	1	1
Foundation Treatment/Engineering Feature								
Foundation Preparation	0.00	0.02	0.05	0.00	0.00	0.00	16	15
Blanket (Consolidation) and Curtain Grouting	0.00	0.00	0.01	0.00	0.00	0.00	4	4
Foundation and Dam Drain Holes	0.00	0.02	0.05	0.00	0.00	0.00	19	18
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)	0.22	1.33	4.34	0.00	0.18	0.18	1,549	1,405
RCC Plant Operation	0.08	0.50	1.63	0.00	0.07	0.07	584	529
RCC Conveying	0.08	0.45	1.48	0.00	0.06	0.06	560	508
RCC Placement (includes Bedding, Jointing and Curing)	0.18	0.93	2.90	0.00	0.14	0.14	1,063	965
Installation of Facing Systems	0.02	0.09	0.30	0.00	0.01	0.01	113	102
Galleries and Adits	0.00	0.01	0.02	0.00	0.00	0.00	8	8
Ogee Concrete	0.00	0.01	0.02	0.00	0.00	0.00	9	8
New Access Road Constrution	0.02	0.08	0.26	0.00	0.01	0.01	106	96
Staging and Recreation Areas	0.01	0.07	0.22	0.00	0.01	0.01	91	83
Mobilization, Demobilization and General Conditions	0.02	0.07	0.28	0.00	0.01	0.01	105	95
Miscellaneous Support Equipment	0.49	2.71	8.10	0.01	0.36	0.35	2,647	2,402
Piers and Bridge Over Spillway	0.02	0.09	0.29	0.00	0.01	0.01	105	95
Total Emissions - Miner Flats Dam	**1.40**	**7.87**	**24.83**	**0.03**	**1.09**	**1.05**	**8,753**	**7,941**

Table D-1.37. Summary of Total Emissions for On-road Vehicle Usage - Construction of the WMAT Rural Water System Project

	Tons							
Construction Component/Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Pipeline Installation								
Pipe Delivery	0.03	0.12	0.46	0.00	0.02	0.01	198	179
Bedding Aggregate Delivery	0.09	0.76	2.18	0.00	0.13	0.07	417	378
Road Aggregate Delivery	0.01	0.06	0.16	0.00	0.01	0.01	30	27
Pump Station Delivery	0.00	0.00	0.01	0.00	0.00	0.00	3	3
Tank Delivery	0.00	0.00	0.01	0.00	0.00	0.00	16	15
Surge Tank Stations	0.00	0.00	0.01	0.00	0.00	0.00	4	4
Construction - Worker commuting	0.02	2.25	0.10	0.00	0.03	0.00	267	242
Total Emissions - Pipeline Installation	**0.15**	**3.19**	**2.91**	**0.00**	**0.18**	**0.09**	**936**	**849**
Water Diversion System								
Freightliner 122SD Dump Truck	0.01	0.04	0.12	0.00	0.01	0.00	24	21
18 Wheel Flatbed Equipment Delivery Trucks	0.00	0.00	0.01	0.00	0.00	0.00	2	2
Cat 730C Cement Truck	0.00	0.01	0.02	0.00	0.00	0.00	4	4
Construction - Worker commutes	0.00	0.03	0.00	0.00	0.00	0.00	4	3
Total Emissions - Water Diversion System	**0.01**	**0.09**	**0.16**	**0.00**	**0.01**	**0.01**	**34**	**30**
Water Treatment Plant								
Removal of Grass & Shrubs	0.00	0.00	0.01	0.00	0.00	0.00	2	1
Yard Piping	0.00	0.00	0.01	0.00	0.00	0.00	2	2
Pretreatment Bldg. & Flocculation Basins	0.00	0.04	0.11	0.00	0.01	0.00	20	19
Sedimetation Basins	0.01	0.06	0.16	0.00	0.01	0.01	30	27
Membrane Bldg., Fd Pmp Sta & strainers	0.01	0.09	0.26	0.00	0.02	0.01	51	46
Finished Water Reservoirs	0.01	0.05	0.14	0.00	0.01	0.00	26	24
Wash Water Pump Sta.	0.00	0.02	0.04	0.00	0.00	0.00	8	8
Excess Site Concrete & Debris	0.00	0.00	0.01	0.00	0.00	0.00	1	1
Construction - Worker commutes	0.01	0.98	0.04	0.00	0.01	0.00	117	106
Total Emissions - Water Treatment Plant	**0.04**	**1.24**	**0.78**	**0.00**	**0.05**	**0.03**	**257**	**233**
Miner Flats Dam								
Fine Agregate Haul	0.01	0.12	0.33	0.00	0.02	0.01	63	57
Cement / Flyash Haul	0.09	0.40	1.55	0.00	0.07	0.05	595	540
Surfacing Gravel Haul	0.01	0.09	0.24	0.00	0.01	0.01	47	42
Other Material Deliveries	0.01	0.05	0.15	0.00	0.01	0.00	29	27
Removal of Merchantable Timber	0.01	0.07	0.19	0.00	0.01	0.01	37	33
Removal of Clearing Operation Waste	0.00	0.02	0.05	0.00	0.00	0.00	9	8
Construction - Worker commutes	0.02	1.63	0.07	0.00	0.02	0.00	194	176
Total Emissions - Miner Flats Dam	**0.15**	**2.38**	**2.58**	**0.00**	**0.14**	**0.08**	**974**	**884**

Table D-1.38. Summary of Total Fugitive Dust Emissions - Construction of the WMAT Rural Water System Project

	Tons							
Construction Component/Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Water Pipeline								
Pipeline Installation					4.88	0.49		
ARV & Valve Installation					0.80	0.08		
Tank & Pump Station Installation					0.49	0.05		
Road Work					1.20	0.12		
Total Emissions - Pipeline Installation					**7.38**	**0.74**		
Water Diversion System								
Pump House					1.18	0.12		
Diversion Structure					0.00	0.00		
Raw Water Pipeline					0.05	0.01		
Total Emissions - Water Diversion System					**1.24**	**0.12**		
Water Treatment Plant								
Removal of Grass & Shrubs					0.22	0.02		
Yard Piping					0.16	0.02		
Pretreatment Bldg. & Flocculation Basins					0.11	0.01		
Sedimetation Basins					0.79	0.08		
Membrane Bldg., Fd Pmp Sta & strainers					0.66	0.07		
Finished Water Reservoirs					0.18	0.02		
Wash Water Pump Sta.					0.09	0.01		
Total Emissions - Water Treatment Plant					**2.22**	**0.22**		
Miner Flats Dam								
Clearing					2.64	0.26		
Foundation Excavation (Common)					0.51	0.05		
Foundation Excavation (Rock)					5.95	0.59		
Dental Excavation					0.01	0.00		
Foundation Treatment/Engineering Feature					7.15	0.72		
Foundation Preparation					0.03	0.00		
Blanket (Consolidation) and Curtain Grouting					0.00	0.00		
Foundation and Dam Drain Holes					0.01	0.00		
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)					3.86	0.39		
RCC Plant Operation					29.34	2.93		
RCC Placement (includes Bedding, Jointing and Curing)					6.49	0.65		
Installation of Facing Systems					0.35	0.04		
Galleries and Adits					0.02	0.00		
Ogee Concrete					0.02	0.00		
New Access Road Constrution					0.52	0.02		
Staging and Recreation Areas					0.22	0.02		
Mobilization, Demobilization and General Conditions					0.10	0.01		
Piers and Bridge Over Spillway					0.07	0.01		
Total Emissions - Miner Flats Dam					**57.30**	**5.70**		

Table D-1.39. Summary of Total Emissions for Construction of the WMAT Rural Water System Project

	Tons							
Construction Component/Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Pipeline Installation								
Pipeline Installation	1.13	28.35	8.69	0.01	5.30	0.82	3,580.32	3,248
ARV & Valve Installation	0.21	6.80	0.92	0.00	0.83	0.11	371.29	337
Tank & Pump Station Installation	0.48	15.84	2.14	0.00	0.57	0.11	707.78	642
Road Work	0.14	4.15	0.87	0.00	1.24	0.15	359.32	326
Total Emissions - Pipeline Installation	**1.96**	**55.14**	**12.62**	**0.02**	**7.94**	**1.20**	**5,019**	**4,553**
Water Diversion System								
Pump House	0.01	0.05	0.11	0.00	1.19	0.12	41.12	37
Diversion Structure	0.00	0.03	0.07	0.00	0.01	0.00	18.08	16
Raw Water Pipeline	0.01	0.06	0.13	0.00	0.06	0.01	41.67	38
Total Emissions - Water Diversion System	**0.02**	**0.14**	**0.31**	**0.00**	**1.26**	**0.14**	**101**	**92**
Water Treatment Plant								
Removal of Grass & Shrubs	0.02	0.25	0.41	0.00	0.24	0.04	170.67	155
Yard Piping	0.04	0.35	0.66	0.00	0.19	0.05	251.05	228
Pretreatment Bldg. & Flocculation Basins	0.01	0.17	0.16	0.00	0.12	0.02	56.38	51
Sedimetation Basins	0.11	0.73	1.88	0.00	0.88	0.16	698.63	634
Membrane Bldg., Fd Pmp Sta & strainers	0.16	0.97	2.65	0.00	0.79	0.18	984.75	893
Finished Water Reservoirs	0.01	0.20	0.25	0.00	0.19	0.03	86.61	79
Wash Water Pump Sta.	0.01	0.18	0.16	0.00	0.10	0.02	61.16	55
Total Emissions - Water Treatment Plant	**0.37**	**2.85**	**6.17**	**0.01**	**2.53**	**0.50**	**2,309**	**2,095**
Miner Flats Dam								
Clearing	0.03	0.24	0.49	0.00	2.66	0.28	159.96	145
Foundation Excavation (Common)	0.01	0.16	0.24	0.00	0.52	0.06	94.81	86
Foundation Excavation (Rock)	0.23	1.44	4.41	0.00	6.13	0.77	1,598.24	1,450
Dental Excavation	0.00	0.09	0.01	0.00	0.01	0.00	12.48	11
Foundation Treatment/Engineering Feature	2.83	15.63	49.26	0.05	2.23	2.16	17,818.42	16,165
Foundation Preparation	0.00	0.11	0.06	0.00	0.03	0.01	28.24	26
Blanket (Consolidation) and Curtain Grouting	0.00	0.09	0.02	0.00	0.00	0.00	16.02	15
Foundation and Dam Drain Holes	0.00	0.11	0.07	0.00	0.01	0.00	31.22	28
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)	0.33	1.94	6.22	0.01	4.13	0.62	2,218.93	2,013
RCC Plant Operation	0.08	0.59	1.65	0.00	29.41	3.00	595.42	540
RCC Conveying	0.08	0.54	1.50	0.00	0.06	0.06	571.38	518
RCC Placement (includes Bedding, Jointing and Curing)	0.19	1.02	2.91	0.00	6.64	0.79	1,075.15	975
Installation of Facing Systems	0.02	0.18	0.31	0.00	0.37	0.05	124.40	113
Galleries and Adits	0.00	0.10	0.03	0.00	0.03	0.00	20.23	18
Ogee Concrete	0.00	0.10	0.03	0.00	0.02	0.00	20.83	19
New Access Road Constrution	0.03	0.25	0.51	0.00	0.55	0.04	164.37	149
Staging and Recreation Areas	0.02	0.16	0.23	0.00	0.23	0.03	102.97	93
Mobilization, Demobilization and General Conditions	0.02	0.16	0.29	0.00	0.12	0.02	116.78	106
Miscellaneous Support Equipment	0.49	2.80	8.11	0.01	0.36	0.35	2,658.97	2,412
Piers and Bridge Over Spillway	0.02	0.18	0.30	0.00	0.09	0.02	116.75	106
Total Emissions - Miner Flats Dam	**4.39**	**25.87**	**76.67**	**0.08**	**53.62**	**8.29**	**27,546**	**24,989**
Total Construction Emissions	**6.74**	**84.00**	**95.77**	**0.11**	**65.34**	**10.12**	**34,974**	**31,729**

Table D-1.40. Summary of Year 2024 Emissions for Construction of the WMAT Rural Water System Project

	Tons							
Construction Component/Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Pipeline Installation								
Pipeline Installation	0.38	9.45	2.90	0.00	1.77	0.27	1,193.44	1,083
ARV & Valve Installation	0.07	2.27	0.31	0.00	0.28	0.04	123.76	112
Tank & Pump Station Installation	-	-	-	-	-	-	-	-
Road Work	0.01	0.21	0.04	0.00	0.06	0.01	17.97	16
Total Emissions - Pipeline Installation	**0.45**	**11.92**	**3.25**	**0.00**	**2.11**	**0.32**	**1,335**	**1,211**
Water Diversion System								
Pump House	0.00	0.02	0.04	0.00	0.40	0.04	13.71	12
Diversion Structure	-	-	-	-	-	-	-	-
Raw Water Pipeline	0.00	0.01	0.03	0.00	0.01	0.00	8.33	8
Total Emissions - Water Diversion System	**0.00**	**0.03**	**0.06**	**0.00**	**0.41**	**0.04**	**22**	**20**
Water Treatment Plant								
Removal of Grass & Shrubs	0.02	0.25	0.41	0.00	0.24	0.04	170.67	155
Yard Piping	0.02	0.13	0.25	0.00	0.07	0.02	96.56	88
Pretreatment Bldg. & Flocculation Basins	-	-	-	-	-	-	-	-
Sedimetation Basins	0.03	0.20	0.52	0.00	0.24	0.05	194.06	176
Membrane Bldg., Fd Pmp Sta & strainers	0.04	0.27	0.72	0.00	0.22	0.05	268.57	244
Finished Water Reservoirs	0.00	0.02	0.02	0.00	0.02	0.00	7.87	7
Wash Water Pump Sta.	0.01	0.09	0.08	0.00	0.05	0.01	30.58	28
Total Emissions - Water Treatment Plant	**0.12**	**0.95**	**2.01**	**0.00**	**0.85**	**0.16**	**768**	**697**
Miner Flats Dam								
Clearing	-	-	-	-	-	-	-	-
Foundation Excavation (Common)	-	-	-	-	-	-	-	-
Foundation Excavation (Rock)	-	-	-	-	-	-	-	-
Dental Excavation	-	-	-	-	-	-	-	-
Foundation Treatment/Engineering Feature	-	-	-	-	-	-	-	-
Foundation Preparation	-	-	-	-	-	-	-	-
Blanket (Consolidation) and Curtain Grouting	-	-	-	-	-	-	-	-
Foundation and Dam Drain Holes	-	-	-	-	-	-	-	-
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)	-	-	-	-	-	-	-	-
RCC Plant Operation	-	-	-	-	-	-	-	-
RCC Conveying	-	-	-	-	-	-	-	-
RCC Placement (includes Bedding, Jointing and Curing)	-	-	-	-	-	-	-	-
Installation of Facing Systems	-	-	-	-	-	-	-	-
Galleries and Adits	-	-	-	-	-	-	-	-
Ogee Concrete	-	-	-	-	-	-	-	-
New Access Road Constrution	-	-	-	-	-	-	-	-
Staging and Recreation Areas	-	-	-	-	-	-	-	-
Mobilization, Demobilization and General Conditions	-	-	-	-	-	-	-	-
Miscellaneous Support Equipment	-	-	-	-	-	-	-	-
Piers and Bridge Over Spillway	-	-	-	-	-	-	-	-
Total Emissions - Miner Flats Dam	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Construction Emissions - 2024	**0.58**	**12.91**	**5.32**	**0.01**	**3.36**	**0.53**	**2,125.52**	**1,928.28**

Table D-1.41. Summary of Year 2025 Emissions for Construction of the WMAT Rural Water System Project

	Tons							
Construction Component/Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Pipeline Installation								
Pipeline Installation	0.57	14.18	4.34	0.01	2.65	0.41	1,790.16	1,624
ARV & Valve Installation	0.10	3.40	0.46	0.00	0.42	0.05	185.64	168
Tank & Pump Station Installation	0.48	15.84	2.14	0.00	0.57	0.11	707.78	642
Road Work	0.13	3.94	0.82	0.00	1.18	0.14	341.35	310
Total Emissions - Pipeline Installation	**1.29**	**37.35**	**7.77**	**0.01**	**4.81**	**0.72**	**3,025**	**2,744**
Water Diversion System								
Pump House	0.00	0.03	0.08	0.00	0.79	0.08	27.42	25
Diversion Structure	0.00	0.03	0.07	0.00	0.01	0.00	18.08	16
Raw Water Pipeline	0.01	0.05	0.10	0.00	0.05	0.01	33.34	30
Total Emissions - Water Diversion System	**0.01**	**0.11**	**0.25**	**0.00**	**0.85**	**0.09**	**79**	**72**
Water Treatment Plant								
Removal of Grass & Shrubs	-	-	-	-	-	-	-	-
Yard Piping	0.03	0.22	0.41	0.00	0.12	0.03	154.49	140
Pretreatment Bldg. & Flocculation Basins	0.01	0.17	0.16	0.00	0.12	0.02	56.38	51
Sedimetation Basins	0.08	0.48	1.25	0.00	0.59	0.11	465.76	423
Membrane Bldg., Fd Pmp Sta & strainers	0.09	0.53	1.45	0.00	0.43	0.10	537.14	487
Finished Water Reservoirs	0.01	0.17	0.20	0.00	0.16	0.02	70.86	64
Wash Water Pump Sta.	0.01	0.09	0.08	0.00	0.05	0.01	30.58	28
Total Emissions - Water Treatment Plant	**0.22**	**1.66**	**3.55**	**0.00**	**1.47**	**0.29**	**1,315**	**1,193**
Miner Flats Dam								
Clearing	0.03	0.24	0.49	0.00	2.66	0.28	159.96	145
Foundation Excavation (Common)	0.01	0.16	0.24	0.00	0.52	0.06	94.81	86
Foundation Excavation (Rock)	0.23	1.44	4.41	0.00	6.13	0.77	1,598.24	1,450
Dental Excavation	0.00	0.09	0.01	0.00	0.01	0.00	12.48	11
Foundation Treatment/Engineering Feature	1.18	6.51	20.53	0.02	0.93	0.90	7,424.34	6,735.36
Foundation Preparation	0.00	0.11	0.06	0.00	0.03	0.01	28.24	26
Blanket (Consolidation) and Curtain Grouting	0.00	0.09	0.02	0.00	0.00	0.00	16.02	15
Foundation and Dam Drain Holes	0.00	0.11	0.07	0.00	0.01	0.00	31.22	28
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)	0.33	1.94	6.22	0.01	4.13	0.62	2,218.93	2,013
RCC Plant Operation	-	-	-	-	-	-	-	-
RCC Conveying	-	-	-	-	-	-	-	-
RCC Placement (includes Bedding, Jointing and Curing)	-	-	-	-	-	-	-	-
Installation of Facing Systems	-	-	-	-	-	-	-	-
Galleries and Adits	-	-	-	-	-	-	-	-
Ogee Concrete	-	-	-	-	-	-	-	-
New Access Road Constrution	0.03	0.25	0.51	0.00	0.55	0.04	164.37	149
Staging and Recreation Areas	0.01	0.08	0.12	0.00	0.12	0.02	51.48	47
Mobilization, Demobilization and General Conditions	0.01	0.08	0.15	0.00	0.06	0.01	58.39	53
Miscellaneous Support Equipment	0.24	1.40	4.06	0.00	0.18	0.17	1,329.48	1,206
Piers and Bridge Over Spillway	-	-	-	-	-	-	-	-
Total Emissions - Miner Flats Dam	**2.08**	**12.50**	**36.89**	**0.04**	**15.34**	**2.90**	**13,187.97**	**11,964**
Total Construction Emissions - 2025	**3.59**	**51.62**	**48.46**	**0.05**	**22.47**	**4.00**	**17,606.94**	**15,973**

Table D-1.42. Summary of Year 2026 Emissions for Construction of the WMAT Rural Water System Project

	Tons							
Construction Component/Activity	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Pipeline Installation								
Pipeline Installation	0.19	4.73	1.45	0.00	0.88	0.14	596.72	541
ARV & Valve Installation	0.03	1.13	0.15	0.00	0.14	0.02	61.88	56
Tank & Pump Station Installation	-	-	-	-	-	-	-	-
Road Work	-	-	-	-	-	-	-	-
Total Emissions - Pipeline Installation	**0.22**	**5.86**	**1.60**	**0.00**	**1.02**	**0.16**	**659**	**597**
Water Diversion System								
Pump House								
Diversion Structure								
Raw Water Pipeline								
Total Emissions - Water Diversion System								
Water Treatment Plant								
Removal of Grass & Shrubs	-	-	-	-	-	-	-	-
Yard Piping	-	-	-	-	-	-	-	-
Pretreatment Bldg. & Flocculation Basins	-	-	-	-	-	-	-	-
Sedimetation Basins	0.01	0.04	0.10	0.00	0.05	0.01	38.81	35
Membrane Bldg., Fd Pmp Sta & strainers	0.03	0.18	0.48	0.00	0.14	0.03	179.05	162
Finished Water Reservoirs	0.00	0.02	0.02	0.00	0.02	0.00	7.87	7
Wash Water Pump Sta.	-	-	-	-	-	-	-	-
Total Emissions - Water Treatment Plant	**0.04**	**0.24**	**0.61**	**0.00**	**0.21**	**0.05**	**226**	**205**
Miner Flats Dam								
Clearing	-	-	-	-	-	-	-	-
Foundation Excavation (Common)	-	-	-	-	-	-	-	-
Foundation Excavation (Rock)	-	-	-	-	-	-	-	-
Dental Excavation	-	-	-	-	-	-	-	-
Foundation Treatment/Engineering Feature	1.65	9.12	28.74	0.03	1.30	1.26	10,394.08	9,429.51
Foundation Preparation	-	-	-	-	-	-	-	-
Blanket (Consolidation) and Curtain Grouting	-	-	-	-	-	-	-	-
Foundation and Dam Drain Holes	-	-	-	-	-	-	-	-
Aggregate Production and Stockpiling On Site (Coarse and Fine for RCC)	-	-	-	-	-	-	-	-
RCC Plant Operation	0.08	0.59	1.65	0.00	29.41	3.00	595.42	540.16
RCC Conveying	0.08	0.54	1.50	0.00	0.06	0.06	571.38	518.35
RCC Placement (includes Bedding, Jointing and Curing)	0.19	1.02	2.91	0.00	6.64	0.79	1,075.15	975.37
Installation of Facing Systems	0.02	0.18	0.31	0.00	0.37	0.05	124.40	112.86
Galleries and Adits	0.00	0.10	0.03	0.00	0.03	0.00	20.23	18.35
Ogee Concrete	0.00	0.10	0.03	0.00	0.02	0.00	20.83	18.90
New Access Road Constrution	-	-	-	-	-	-	-	-
Staging and Recreation Areas	0.01	0.08	0.12	0.00	0.12	0.02	51.48	46.71
Mobilization, Demobilization and General Conditions	0.01	0.08	0.15	0.00	0.06	0.01	58.39	52.97
Miscellaneous Support Equipment	0.24	1.40	4.06	0.00	0.18	0.17	1,329.48	1,206.11
Piers and Bridge Over Spillway	0.02	0.18	0.30	0.00	0.09	0.02	116.75	105.92
Total Emissions - Miner Flats Dam	**2.31**	**13.38**	**39.78**	**0.04**	**38.27**	**5.39**	**14,357.59**	**13,025**
Total Construction Emissions - 2026	**2.57**	**19.47**	**41.99**	**0.05**	**39.50**	**5.59**	**15,241.93**	**13,827**

Table D-1.43 - Air Emission Calculations for Construction and Operation of the White Mountain Apache Tribe Rural Water System Project

Equipment Type	*Hp Rating*	*Fuel Type*	*Ave. Daily Load Factor*	*Number Active*	*Hours/ Day*	*Daily Hp-Hrs*	*Work Days*	*Total Hp-Hrs*
Backhoe	125	D	0.50	1	4	250	26	6,500
Compactor -Whacker	7	G	0.25	1	2	3	26	85
End-Dump and Trailer	400	D	0.50	1	4	800	26	20,800
Front-End Loader	200	D	0.50	1	4	400	26	10,400
Mower	40	G	1.00	1	6	240	26	6,240
Portable Generator	15	G	0.50	2	2	30	26	780
Skid-steer	60	D	0.50	1	2	60	65	3,900
Trucks - Crew	350	G	0.10	3	4	420	261	109,620

Table D-1.44. Emission Factors for Nonroad Equipment - Operation/Maintenace of the WMAT Rural Water System

	Fuel	*Emission Factors (Grams/Horsepower-Hour)*						
Project Year/Source Type	*Type*	*VOC*	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*	*CO2*
Nonroad Equipment - 12-16 Hp	D	0.41	1.76	3.89	0.00	0.21	0.20	615
Nonroad Equipment - 17-25 Hp	D	0.40	1.70	3.86	0.00	0.20	0.19	610
Nonroad Equipment - 25-40 Hp	D	0.14	0.49	2.69	0.00	0.06	0.06	611
Nonroad Equipment - 41-50 Hp	D	0.13	0.45	2.64	0.00	0.05	0.05	612
Nonroad Equipment - 51-75 Hp	D	0.21	1.05	3.13	0.00	0.15	0.14	608
Nonroad Equipment - 76-100 Hp	D	0.18	1.04	1.86	0.00	0.16	0.15	609
Nonroad Equipment - 101-175 Hp	D	0.13	0.40	1.10	0.00	0.08	0.08	547
Nonroad Equipment - 176-300 Hp	D	0.06	0.17	0.68	0.00	0.03	0.03	540
Nonroad Equipment - 301-600 Hp	D	0.06	0.33	1.12	0.00	0.05	0.04	535
Nonroad Equipment - 12-16 Hp	G	4.26	261.28	2.16	0.01	0.12	0.11	1,046
Nonroad Equipment - 17-25 Hp	G	4.16	260.99	2.16	0.01	0.12	0.11	1,047
Nonroad Equipment - 26-40 Hp	G	0.36	13.26	1.45	0.00	0.07	0.06	701
Nonroad Equipment - 41-50 Hp	G							
Nonroad Equipment - 51-75 Hp	G	0.79	28.31	2.73	0.00	0.07	0.06	713
Nonroad Equipment - 76-100 Hp	G	0.38	14.28	1.53	0.00	0.07	0.06	701
Nonroad Equipment - 101-175 Hp	G	0.83	29.82	2.86	0.00	0.07	0.06	714

Notes: Data estimated with the use of the EPA MOVES3 model for an average nonroad fleet in Navajo County, AZ in year 2026.

Table D-1.45. Nonroad Equipment Total Emissions - Operation/Maintenace of the WMAT Rural Water System

	Tons							
Construction Activity/Equipment Type	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*	*CO2 (mt)*
Backhoe	0.00	0.00	0.00	0.00	0.00	0.00	0.4	0.4
Compactor -Whacker	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0
End-Dump and Trailer	0.00	0.00	0.00	0.00	0.00	0.00	1.2	1.1
Front-End Loader	0.00	0.00	0.00	0.00	0.00	0.00	0.6	0.6
Mower	0.00	0.01	0.00	0.00	0.00	0.00	0.5	0.4
Portable Generator	0.00	0.02	0.00	0.00	0.00	0.00	0.1	0.1
Skid-steer	0.00	0.00	0.00	0.00	0.00	0.00	0.3	0.2
Trucks - Crew	0.01	0.36	0.03	0.00	0.00	0.00	8.6	7.8
Total Annual Emissions	**0.01**	**0.40**	**0.04**	**0.00**	**0.00**	**0.00**	**11.7**	**10.6**

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Appendix E
Noise

Abbreviations and Acronyms

Acronym	Definition
dB	decibel
dB(A)	A-weighted decibel
DNL	Day-Night Average Sound Level
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
L_{eq-24}	equivalent sound level over a 24-hour period
L_{max}	maximum sound level
$L_{pk-un-weighted}$	un-weighted peak noise level
mph	miles per hour
RCNM	Roadway Construction Noise Model
SR	State Route
USEPA	United States Environmental Protection Agency
WMAT	White Mountain Apache Tribe

Appendix E – Noise

E.1 Introduction

Noise is unwanted sound. Responses to noise vary widely according to the sensitivity and expectations of the receptor as well as characteristics of the sound source, the distance between the noise source and the receptor, and the time of day.

Sound is defined physically as fluctuations in air pressure within a certain range of intensities and frequencies. Because the range of audible noise levels is enormous, sound intensity levels are measured using the logarithmic decibel (dB) scale. The quietest sound that can be heard is 0 dB, normal conversation is conducted at around 65 dB, and sounds become painful at about 130 dB. Audible sound frequencies range from 20 cycles per second to 20,000 cycles per second. However, not all frequencies are heard equally well by the human ear. For example, people experience a sound at 100 cycles per second as being 20 dB less loud than a sound of equivalent noise energy at 1,000 cycles per second.

Sound levels that have been adjusted to de-emphasize sounds in frequencies that are not heard well by humans are described as “A-weighted.” Examples of typical A-weighted sound levels of common sounds are shown in **Figure E.1-1**. In the right-hand side of the figure is a scale that shows typical perceptions of loudness relative to a 70 A-weighted dB (dB[A]) sound. While A-weighted noise level measurements are the most common metric used in community noise studies, low frequency components are the defining feature of some types of noise (e.g., explosions), and noise levels for these noise types are often expressed using un-weighted sound levels. In this analysis, sound levels can be assumed to be A-weighted unless specifically described as “un-weighted.”

Several noise metrics have been developed to describe noise levels that vary over time.

Maximum Sound Level (L_{max}). The L_{max} is the highest sound level measured during a noise event. In the case of a vehicle pass-by, for example, the noise level increases as the vehicle moves closer to an observer and then decreases as the vehicle moves farther away. Construction equipment, on the other hand, may be stationary or may move from one location to another. In either case, the L_{max} is the noise level during the loudest single second of the noise event. The L_{max} is a useful metric for judging a noise event’s interference with conversation and other activities.

Equivalent Sound Level over a 24-Hour Period (L_{eq-24}). The sound environment can also be characterized by its average energy level over a period of time. In this analysis, time-averaged noise levels will be described using a 24-hour average, denoted as L_{eq-24}.

Day-Night Average Sound Level (DNL). This metric combines all noise events over a 24-hour period with a 10 dB penalty added to late-night sounds (10:00 PM to 7:00 AM) to account for greater potential for community disruption. For a noise source with no noise events during the late night, the DNL is equivalent to the L_{eq-24}.

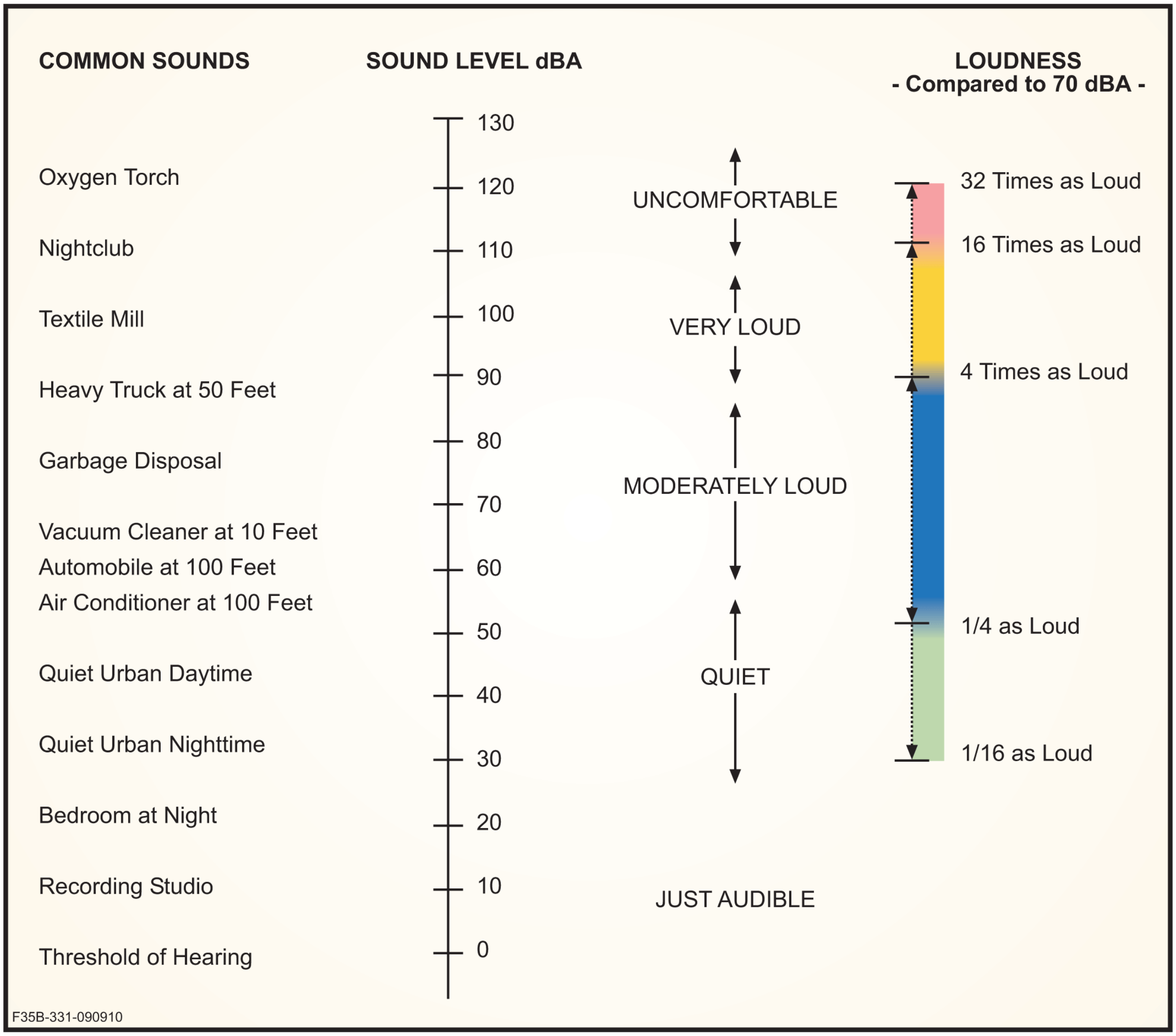

Figure E.1-1. Typical A-Weighted Levels of Common Sounds

Un-weighted Peak Noise Level ($L_{pk\text{-}un\text{-}weighted}$). This metric is often used to describe impulsive noise events, such as banging, clapping, or explosions, which reach their maximum very quickly and then end. Because these noises often consist largely of low-frequency sound that can be felt as well as heard, un-weighted decibels are used to communicate these noise levels. Use of un-weighted noise levels does not de-emphasize low-frequency sound that is inaudible or close to inaudible to the human ear and, therefore, avoids under-representing the perceived intensity of the event.

Peak Particle Velocity. This metric does not describe audible noise but rather vibrations induced in the ground, structures, and other objects. Peak particle velocity is expressed in units of inches per second indicating the speed at which objects are displaced from their resting position. Noise and vibrations associated with construction include many oscillations per second, and so the actual displacement of surfaces from their resting position is a fraction of the displacement that would occur over an entire second.

E.2 Regulatory Overview

The Federal Noise Control Act of 1972 (Public Law 92-57) directs Federal agencies, such as the Bureau of Reclamation, to administer their programs in ways that reduce noise pollution, thereby promoting an environment free from noise that jeopardizes health and welfare. It is within the purview of State and local governments to establish regulations relating to noise levels within their jurisdictions should they see fit to do so. However, there are no apparent statutes or regulations that have been enacted by Arizona or local counties that would affect proposed activities relating to the proposed White Mountain Apache Tribe (WMAT) rural water system.

In 1974, the United States Environmental Protection Agency (USEPA) identified outdoor and indoor noise levels to protect public health and welfare with a margin of safety (USEPA 1974). A long-term DNL of 55 dB outdoors and a DNL of 45 dB indoors were identified as preventing activity interference or annoyance in residential areas. The noise levels stated in the 1974 USEPA document are not regulatory but are intended only as indications of instances where noise would be more likely to be perceived as problematic.

The USEPA established 75 dB for an 8-hour exposure and 70 dB for a 24-hour exposure as the average noise level standard requisite to protect 96 percent of the population from greater than a 5 dB permanent threshold shift (USEPA 1978). This threshold noise level is protective for a lifetime of exposure and is highly conservative.

E.3 Current Noise Levels

The proposed WMAT rural water system includes several project components, each of which would affect a different area. The affected environment in each of these areas is described below.

Miner Flat Dam and Reservoir. The site selected for the proposed Miner Flat Dam and Reservoir is remote from human population centers and is fairly quiet most of the time. Vehicles driving on nearby State Route (SR) 73 and on smaller roads in the area are one of the most notable human-generated sound sources. Natural sounds include sounds generated by the stream and wind in the pines. Noise levels in quiet wilderness settings are typically about 20 to 30 dB DNL (USEPA 1974).

Proposed Water Diversion from the North Fork of the White River. The proposed site of the water diversion structure is about 1/3 mile from the more heavily populated parts of the town of Whiteriver. Human-generated sounds are more prevalent than at the dam site. Still, noise levels can be assumed to be low in this area with sounds of running water being a major component of the acoustic environment.

Proposed Water Treatment Plant Expansion. The proposed site of the water treatment plant expansion is adjacent to populated portions of Whiteriver. Measured noise levels in a small-town neighborhood are generally about 50 dB DNL (USEPA 1974).

Proposed Water Distribution System. The proposed water distribution system would be about 50 miles long and would pass through or near several populated areas as well as several areas with no human inhabitants. Sound levels along the length of the pipeline vary between those typical of extremely rural settings and those typical of populated areas.

E.4 Impact Assessment

Under the No Action Alternative, the proposed WMAT rural water system would not be built, and no construction activity would occur. The No Action Alternative would not result in any new noise impacts.

For the action alternatives, the primary issues and concerns are the potential for disruption and annoyance caused by noise generated from construction, operation, and maintenance of the proposed WMAT rural water system. Of particular concern are those places where construction would take place in close proximity to noise-sensitive locations (e.g., residences). The analysis focuses on the noise generated by construction equipment, blasting, and hauling of materials, as these are the most likely to result in noise impacts.

Noise is a subjective experience, and a noise that one person may perceive as highly annoying may not be noticed by another person. Conclusions about the significance of noise impacts reflect the findings of studies conducted on large numbers of people and imply only whether or not the noise impacts would be expected to be perceived to be significant in nature by a large percentage of the affected population. It is impossible to know the response that an individual will have to a certain noise, and therefore estimates must be made based on the response of others to similar types, intensities, and durations of noise.

In this analysis, construction equipment noise levels were estimated using the Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM). The RCNM uses measured noise levels for several equipment types, and calculated maximum (i.e., L_{max}) and time-averaged (i.e., $L_{eq\text{-}24}$) noise levels at specified distances from the construction site (FHWA 2006). In the FHWA noise model, all equipment is assumed to be operating at the closest point within the construction site. In fact, equipment would be operating at varying distances from the edge of the construction site. In addition, the FHWA noise model assumes that all pieces of equipment that would be involved in a particular phase of construction would operate on each day in which construction is under way. In fact, on many days only one or two pieces of equipment would be in operation. As actual distances would be greater than the minimum distance and as not all pieces of equipment would be operating on all of the construction days, actual L_{max} and $L_{eq\text{-}24}$ noise levels would be expected to be somewhat lower than modeled noise levels. Noise levels were assessed for each of the phases of construction according to the equipment types expected to be needed for that phase of construction. Material hauling noise levels were estimated based on heavy truck pass-by noise levels published in the *Traffic Noise Model User's Guide* (FHWA 1998).

As mentioned previously, for a noise source that does not generate events during the late-night period between 10:00 PM and 7:00 AM, the DNL is equivalent to the $L_{eq\text{-}24}$. Most activities related to the proposed action would be expected to occur during normal working hours (i.e., little or no activity expected during the late-night time period), so the DNL is equivalent to the $L_{eq\text{-}24}$ in this case.

Blasting noise and vibration levels were estimated using a set of widely used equations (Bender 2007). Certain details of how the blasting would be conducted will not be known with certainty until the final blasting program design is completed. For analytical purposes, a conservative estimate of 500 pounds of explosive per single instantaneous blast was used to estimate vibration and airblast noise levels. It is assumed that detonation of multiple delay charges would be timed such that subsequent charge detonations do not add appreciably to the overall vibration or airblast overpressure. The noise and vibration associated with blasting activities are highly dependent on a number of environmental parameters as well. These parameters include atmospheric conditions at the time of the blast and details of the geology between the blast site and noise/vibration-sensitive locations. A detailed accounting of parameters and equations used to estimate blast intensity are provided in **Attachment E-1** (*Estimation of Peak Particle Velocity and Overpressure*).

The United States Bureau of Mines has identified 0.5 inches per second peak particle velocity to be safe for all structure types (USBM 1980). A peak particle velocity of 0.01 inches per second was the threshold above which vibrations are generally described as "slightly perceptible," while 0.1 inches per second was the threshold above which vibrations are often described as "strongly perceptible" (USBM 1980). Airblast intensities of 90 dB $L_{pk\text{-}un\text{-}weighted}$ are typically described as "strongly perceptible," while intensities of 120 dB $L_{pk\text{-}un\text{-}weighted}$ are more likely to be described as "mildly unpleasant."

In this analysis, noise levels are listed for the closest noise-sensitive location (e.g., residence) that is apparent in available aerial photography. This method has the potential to overstate impacts because the closest residence may or may not be occupied. The method provides a conservative assessment of noise impacts. Residences and other noise-sensitive locations (e.g., schools) that are further from the noise source would be affected by lower noise levels.

Construction activities would be the same under all action alternatives. Construction noise would be temporary, lasting for the duration of the construction project, and is expected to be limited to normal working hours. Based on the distance to noise-sensitive receptors, impacts are expected to be limited to annoyance only, and annoyance levels would be minimized with implementation of public notifications outlined in **Appendix A.2** (*Best Management Practices*) of this Environmental Impact Statement (EIS) to alert people in advance of particular construction activities (e.g., blasting). There would be no risk of damage to structures or hearing loss due to noise and vibration generated by any action alternative. The following provides more details related to each project component.

E.4.1 Proposed Miner Flat Dam and Reservoir

Construction equipment would generate elevated noise levels at the proposed dam and reservoir while land clearance and construction are under way. Noise levels generated by equipment types expected to be used in construction of the dam and reservoir are listed in **Table E.4-1**. Construction work would proceed in phases (e.g., land clearance, foundation excavation, and dam construction), and the different phases would require different equipment types. The excavation of rock would be the loudest of the phases. Equipment involved in this phase would generate about 70 dB L_{max} at a distance of 500 feet from the construction site. The closest residence to the proposed dam site that is clearly visible in available aerial photography is located about 8,200 feet away and is not within direct line-of-sight of the construction site. At this residence, the noise level generated by equipment during the loudest phase of construction would be estimated to be about 38 dB L_{max}. The time-averaged noise level ($L_{eq\text{-}24}$) during a typical workday at locations 500 feet and 8,200 feet from the construction site would be approximately 63 dB and 31 dB, respectively. Construction equipment noise would be expected to be audible at the nearest residence but would not be expected to be considered disruptive.

Table E.4-1. Construction Equipment Noise Levels

	L_{max} (dB) at distance			Equipment Used for Each Project Component			
	50 feet	500 feet	1,000 feet	Dam and Reservoir	Water Diversion Structure	Water Treatment Plant	Water Distribution Pipeline
Auger Drill Rig	84	64	58	X	X	-	-
Backhoe	78	58	52	X	X	X	X
Compactor (ground)	83	63	57	-	-	X	-
Compressor (air)	78	58	52	X	-	-	-
Concrete Batch Plant	83	63	57	X	-	-	-
Concrete Mixer Truck	79	59	53	-	-	-	X
Concrete Pump Truck	81	61	55	X	X	-	-
Crane	81	61	55	X	-	X	-
Dozer	82	62	56	X	X	X	-
Dump Truck	77	57	50	X	-	X	-
Excavator	81	61	55	X	X	X	X
Flat Bed Truck	74	54	48	X	-	X	-
Front-End Loader	79	59	53	X	X	X	X
Generator	81	61	55	X	-	-	X
Grader	85	65	59	-	X	X	X
Mounted Impact Hammer (hoe ram)	90	70	64	X	-	-	-
Pickup Truck	75	55	49	X	X	X	X
Pneumatic Tools	85	65	59	-	-	-	-
Roller	80	60	54	X	-	-	X
Scraper	84	64	58	X	-	X	-
Vacuum Excavator (Vac-truck)	85	65	59	X	-	-	-

Source: (FHWA 2006)

Key: dB = decibel; L_{max} = maximum sound level; - = not applicable

Campsites located upstream of the proposed reservoir could be affected by noise generated during land clearance. The closest recreational facility (Lower Log Campground) is located in the eastern portion of the proposed reservoir footprint. Because the campground would be flooded by reservoir waters, the WMAT would close the campground at some point before the dam becomes operational. If it remains open during nearby land clearance activities, noise levels at a distance of 500 feet would be 62 dB L_{max} and 59 dB $L_{eq\text{-}24}$ during a typical workday. This noise level could be annoying to campers. However, land clearance work would cease during nighttime hours when campers are typically sleeping. Land clearance would require an estimated 57 days to complete, but a small percentage of these days would involve clearance work at locations that are close to the campsite.

Blasting operations would be part of the dam foundation excavation activities. An estimated 80 total blasts would be conducted during approximately 78 days. At the closest residence visible in aerial photography, the peak particle velocity would not be expected to exceed 0.05 inches per second. This level of vibration would be expected to be perceived by most people as "slightly perceptible" and would not pose any risk of damage to structures (USBM 1980). Air overpressure at the closest known residence would not be expected to exceed 106 dB $L_{pk\text{-}un\text{-}weighted}$ on a day with calm winds. This airblast would be expected to be "strongly perceptible" to most people (Bender 2007). Some people may find the audible sound and vibration generated by excavation blasts to be annoying. Annoyance levels would be minimized with implementation of public notifications outlined in **Appendix A.2** (*Best Management Practices*) of this EIS to alert people in advance of blasting.

Transportation of materials to and from the proposed dam site would require use of heavy trucks, which would drive along existing roadways (e.g., SR 73). The pass-by noise level of a heavy truck varies with the speed of the truck. A truck cruising at 35 miles per hour (mph) generates about 78 dB L_{max}, a truck cruising at 55 mph generates about 84 dB L_{max}, and a truck cruising at 75 mph generates about 88 dB L_{max} (FHWA 1998). Heavy trucks currently use SR 73 near the proposed dam site. The increased truck traffic on SR 73 would be expected to be noticed, and noise generated by the additional traffic may be annoying to some people.

E.4.2 Proposed Water Diversion from the North Fork of the White River

Noise levels generated by equipment types expected to be used in construction of the water diversion facility are listed in **Table E.4-1**. The closest residence to the water diversion facility site that is clearly visible in aerial photography is located about 800 feet away and is not within direct line-of-sight of the construction site. Construction of the pump station would be the loudest phase of construction generating about 58 dB L_{max} and 57 dB $L_{eq\text{-}24}$ at the closest residence. These noise levels could be considered annoying but would only last for a short period of time, while construction is under way.

The raw water pipeline would extend from the diversion facility to the water treatment plant crossing ground that is close to certain residences (see **Figure 2.5-5** [Proposed Changes to the North Fork Intake Structure and Water Treatment Plant]). Construction of the raw water pipeline is expected to require use of a front-end loader, backhoe, excavator, pickup trucks, ground compactor, and drill rig. The ground compactor and drill rig, which are the loudest of these pieces of equipment, would generate about 78 dB L_{max} at a distance of 100 feet. This noise level could be disruptive of activities that involve listening, such as conversation. Construction of a pipeline typically involves equipment working at various locations along the pipeline rather than all equipment operating in one area, and multiple pieces of equipment would not typically be operating at one place at one time. If the loudest single piece of equipment were to spend an entire construction day operating at one location, the L_{eq-24} would be approximately 74 dB.

Typical residential construction provides, on average, about 20 dB outdoor-to-indoor noise level reduction on average. Indoor noise levels at the closest residence to the pipeline construction would be expected to be about 58 dB L_{max} and the L_{eq-24} would be about 53 dB. The entire raw water pipeline construction process would be expected to take about 15 workdays, but construction equipment would only operate in any one location along the pipeline route for a fraction of this total time. Given the relatively short duration of the construction activity and the fact that most people spend at least some portion of the day indoors (where noise levels are reduced relative to the outdoors), there would be no risk of hearing loss and limited potential for activity interference due to construction noise. Residences further from the construction activity than 100 feet would experience lower noise levels. Annoyance levels would be minimized with implementation of public notifications outlined in **Appendix A.2** (*Best Management Practices*) of this EIS to alert people in advance of nearby construction.

Construction of the water diversion facility and pipeline would require transport of materials to and from the construction site using heavy trucks. Noise generated by movement of heavy trucks could be annoying to people living along the haul route, particularly those portions of the route along smaller residential roads.

E.4.3 Proposed Water Treatment Plant Expansion

Construction of the water treatment plant expansion would involve many of the same types of equipment used in construction of other elements of the WMAT rural water system (see **Table E.4-1**). The closest residence to the water treatment plant facility visible in aerial photography is located about 800 feet away. Because the water treatment plant is on a plateau, the facility is not within direct line-of-sight of residences located downhill, and construction equipment operating on the plateau would not be within direct line-of-sight of these residences most of the time. A proposed staging area located downhill of the water treatment plant is adjacent to what appears to be residential structures (see **Figure 2.5-5** [Proposed Changes to the North Fork Intake Structure and Water Treatment Plant]). However, most of the noise generated during construction would be generated at the construction site itself and not at the staging area. During the loudest phase of the water treatment plant construction, the loudest piece of equipment would generate about 53 dB L_{max} at the closest residence, and the overall average noise level during the workday would be about 55 dB L_{eq-24}. Noise levels generated would be noticed and could be annoying to people living near the construction site. Noise levels would not be sufficiently high to disrupt typical daytime activities such as conversation and listening to the radio. Annoyance levels would be minimized with implementation of public notifications outlined in **Appendix A.2** (*Best Management Practices*) to alert people in advance of nearby construction.

Hauling of materials to and from the water treatment plant site using heavy trucks would generate noise along the haul route. Heavy truck noise would be most annoying along portions of the haul route that are on residential streets. Residents would likely notice the sound of trucks passing by and may be annoyed.

E.4.4 Proposed Water Distribution System

Noise levels associated with types of equipment proposed to be used in construction of the water distribution system are listed in **Table E.4-1**. The majority of the 50-mile pipeline would be constructed in areas that are remote from all human development, and noise generated in these areas would have little effect. Where the pipeline passes through or near the towns of Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue, people may hear the construction noise and could potentially become annoyed by it. The maximum noise level at a location 100 feet from the construction activities would be 79 dB. Construction of a pipeline typically involves equipment working at various locations along the pipeline rather than all equipment operating in one area, and multiple pieces of equipment would not typically be operating at one place at one time. If the loudest single piece of equipment were to spend an entire construction day operating at one location, the L_{eq-24} at a distance of 100 feet would be approximately 72 dB. Given the relatively short duration of the construction activity and the fact that most people spend at least some portion of the day indoors (where noise levels are reduced relative to the outdoors), there would be no risk of hearing loss and limited potential for activity interference due to construction noise. The pump stations would be constructed at a distance of 350 feet (Cedar Creek) and 1,400 feet (Carrizo) from the nearest residence visible in aerial photography. Noise levels at the closest residence in Cedar Creek would be 64 dB L_{max} and 59 dB L_{eq-24}. The noise levels experienced in Carrizo would be lower due to the greater distance. Annoyance levels would be minimized with implementation of public notifications outlined in **Appendix A.2** (*Best Management Practices*) to alert people in advance of nearby construction.

As the proposed pipeline is primarily located adjacent to existing roads, the majority of the proposed hauling would take place along major roads. Noise generated by heavy trucks would be more likely to be annoying and disruptive in those few instances when it takes place on residential streets.

E.4.5 Operation and Maintenance

Operation and maintenance of the proposed rural water system would generate noise of minimal intensity and duration. Machinery in the water diversion facility, water treatment plant, and pumping plants would generate a hum that could be audible immediately outside of the facility. Maintenance of the system may involve the operation of certain pieces of equipment (e.g., lawn mowers) that generate temporary and localized noise increases. Waste material dredged from the water treatment plant as part of regular maintenance would be hauled by truck to a landfill. The trucks involved in dredge material transport may be noticed while traveling along relatively small roads near the water treatment plant but would not be expected to result in a noticeable increase in traffic flow along SR 73.

E.5 References

Bender, W.L. 2007. Understanding Blast Vibration and Airblast, Their Causes, and Their Damage Potential.

FHWA (Federal Highway Administration). 1998. *Traffic Noise Model User's Guide.* FHWA-PD-96-009. January.

—. 2006. *Roadway Construction Noise Model User's Manual.*

USBM (United States Bureau of Mines). 1980. Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting, Report of Investigation 8507.

USEPA (United States Environmental Protection Agency). 1974. Information on Levels of Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. 550/9-74-004. March.

—. 1978. Protective Noise Levels. USEPA Report 550/9-79-100. USEPA, Office of Noise Abatement and Control, Washington, DC. November.

Attachment E-1: Estimation of Peak Particle Velocity and Overpressure

Blast Scaling: The following formulas are appropriate for a linear charge (i.e., a charge where length is more than four times the diameter) (Bender 2007).

Scaled Distance (D_s) = Distance / Explosive Weight $^{1/2}$ Source: Bender 2007, pg 9

Distance = 8,077 feet to closest known inhabited residence Source: Aerial photo 9/29/14

Explosive Weight = 500 pounds (lbs)*

* First two charges detonated simultaneously are assumed to be ≤ 500 lbs total explosive weight

** As per Gannett Fleming letter received September 30, 2014, about 80 blasts are expected to be required to move 117,000 cubic yards of material. This equates to 2,194 lbs per blast. However, blasts are typically conducted by filling several boreholes with explosive and detonating either one or two at a time seperated by 8 milliseconds. The separation in detonation time results in the detonations after the first detonation not increasing overall overpressure or peak particle velocity (PPV). Actual charge weights would be determined as part of the blast planning process. However, for the purposes of noise level estimation, a nominal blast pattern of 10 boreholes containing about 250 lbs each of explosive would be used and two of these boreholes would be detonated simultaneously followed by the others after the standard 8 microsecond delay.

D_s = **361** scaled distance for closest known residence assuming 500 lb explosive weight

Estimating Blast Vibration: Calculations using prediction curves developed by Lewis L. Oriard, as described in Bender 2007.

Peak Particle Velicity (PPV) = H X $(D_s)^{-1.6}$ X K Source: Bender 2007, pg 11

* "H" is a value specific to the geology and topography of the area in which the detonation would take place. Since this factor is not known, typical lower and upper bounds will be used to generate an expected range of potential PPV.

Lower bound H = 24.2

Upper bound H = 242

Unusually high H = 605

** The value "-1.6" is an attenuation slope. The value may vary slightly due to location-specific factors, but -1.6 is typical.

*** "K" are location-specific factors that can potentially decrease PPV. Examples are decreasing confinement of the explosive energy; decreased coupling of the energy source, etc. Because factors potentially decreasing PPV are not quantifiable given available data, none are applied in calculating potential PPV.

PPV_{Low} =	**0.002**	inches per second
PPV_{High} =	**0.020**	inches per second
$PPV_{Highest}$ =	**0.049**	inches per second

Thresholds: < 0.5 inches per second PPV is considered safe for all structure types (Bureau of Mines 1980); 0.01 inches per second was lower threshold of "slightly perceptable," while 0.1 inches per second was threshold for "strongly perceptible," and 5 to 10 percent of neighbors can be expected to perceive 0.5 to 0.75 inches per second as "less than acceptable."

Note: The values estimated above are likely higher than actual PPV experienced by a residence west of the North Fork of the White River for those blasts that take place on the east bank of the river valley. Ground vibrations must be transmitted through the ground, and vibrations from detonations on the east bank would need to pass under the river before reaching the closest residence.

Estimating Air Overpressure: Air overpressure can be expected to vary widely based on atmospheric conditions (e.g., winds, temperature inversions, etc.)

Peak Air Overpressure (P, in PSI) = K $(D_s)^{-1.2}$

* K is a factor that accounts for several location-specific (e.g., local topography) and time-specific (e.g., atmosperic) conditions. Listed below are low-end and high-end estimates for K.

K_{Low} = 0.78

K_{High} = 2.5

$K_{Unconfined}$ = 82

Scaled Distance (D_s) = Distance / Explosive Weight $^{1/3}$ [NOTE: for overpressure calculation, cube root of explosive weight is used rather than square root; Source: Bender 2007, pg 16]

D_s =	**1039**	overpressure D_s for closest known residence assuming 500 lb explosive weight

*** The value "-1.2" is an attenuation slope. This value may vary due to location-specific and explosive charge-specific factors, but -1.2 is typical.

P_{Low} =	0.0002	lbs per square inch
P_{High} =	0.0006	lbs per square inch

Note: Intervening terrain would block much of the sound energy. For those blasts on the west bank of the North Fork of the White River, noise energy would be directed primarily toward the east resulting in less noise energy reaching the closest residence. Winds could have a strong effect on noise levels experienced at the nearest residence potentially increasing or decreasing the level depending on whether wind is blowing toward or away from the residence.

dB_{Low} =	96	dB overpressure (flat weighted)
dB_{High} =	106	dB overpressure (flat weighted)

REGULATORY THRESHOLD: Bureau of Mines Report of Investigations 8507 (1980), "Structure Response and Damage Produced by Airblast from Surface Mining" generally recommends a maximum safe overpressure of **0.014 psi (134 dB)** for airblast recorded at residential structures.

References:

Bender, Wesley L. 2007. Understanding Blast Vibration and Airblast, their Causes, and the Damage Potential. Available online at http://www.iseegoldenwest.org/Blast%20Effects.pdf.

United States Bureau of Mines. 1980. Report of Investigations 8507, "Structure Response and Damage Produced by Airblast from Surface Mining."

Appendix F
Water Resources

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Appendix F. Water Resources

Modeled flow duration curves under all project alternatives, including the No Action Alternative, at locations NFWRLL (Miner Flat Dam), NFWRGG (Gold Gulch), and WRNFA (near Fort Apache) are provided in **Figure F-1**, **Figure F-2**, and **Figure F-3**, respectively. Solid lines represent the cumulative percent time that modeled average daily flows (in cubic feet per second) are not exceeded.

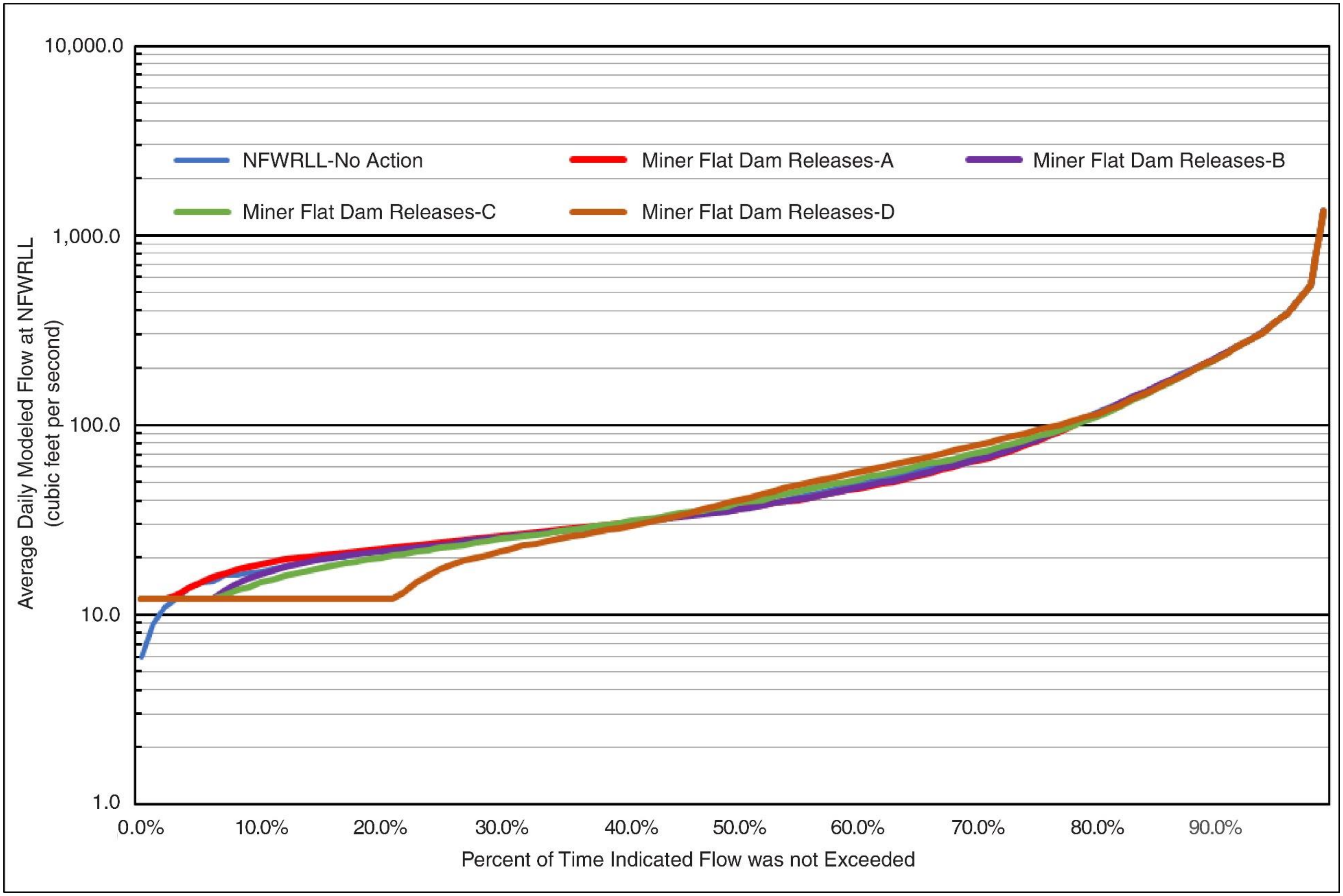

Figure F-1. Flow Duration Curves for NFWRLL (Average Daily Modeled Flow under National Environmental Policy Act Alternatives A through D as Compared to No Action Alternative)

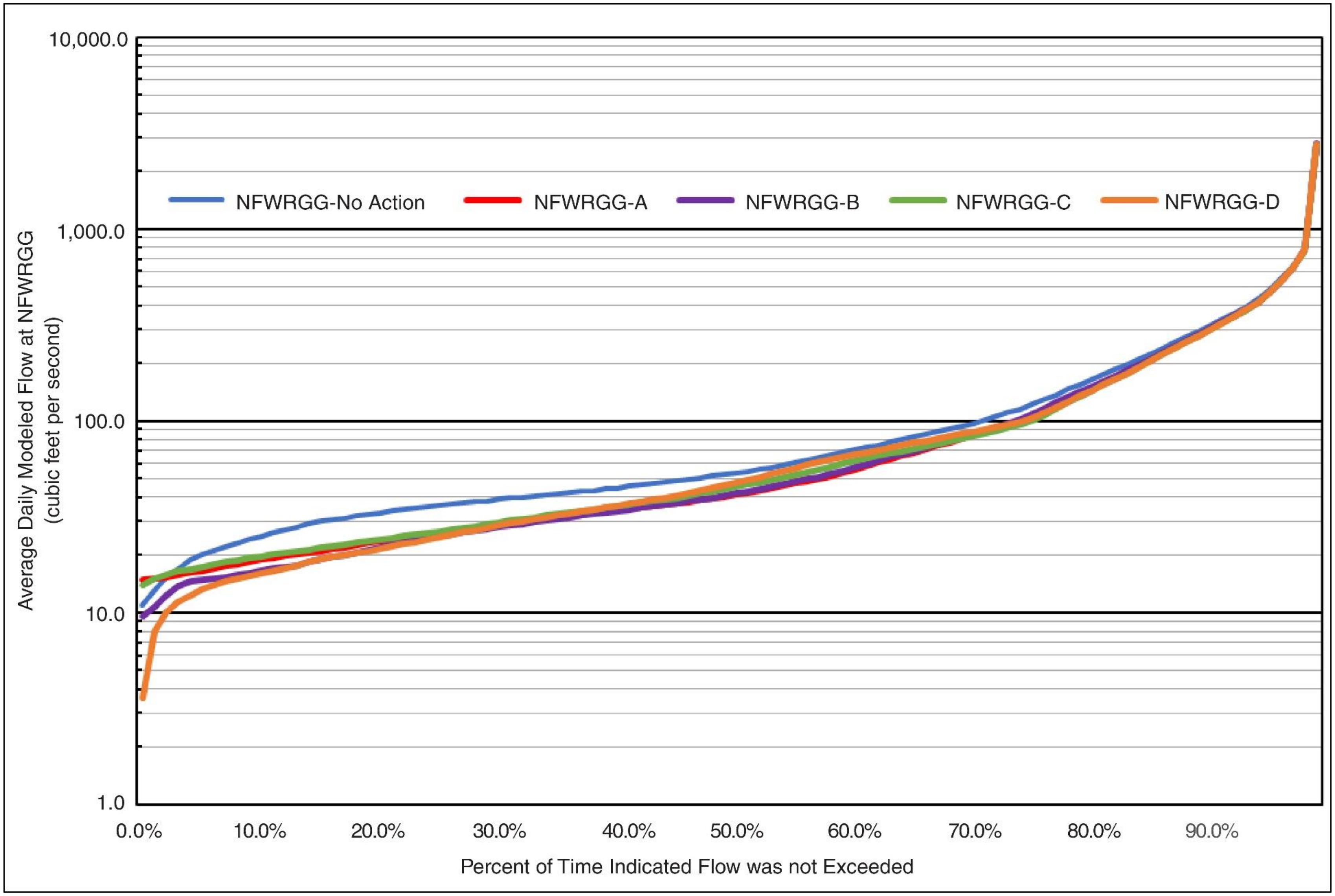

Figure F-2. Flow Duration Curves for NFWRGG (Average Daily Modeled Flow under National Environmental Policy Act Alternatives A through D as Compared to No Action Alternative)

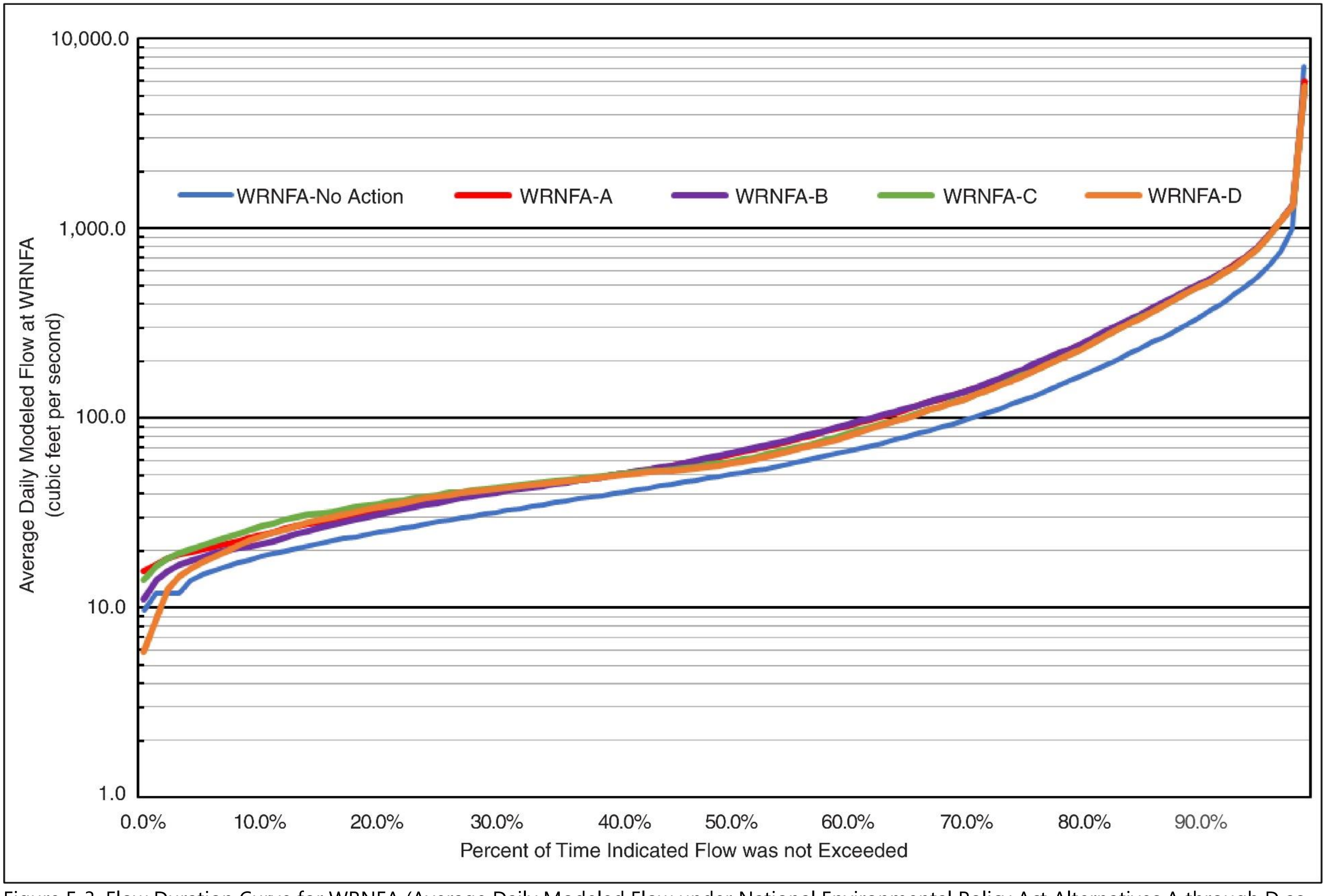

Figure F-3. Flow Duration Curve for WRNFA (Average Daily Modeled Flow under National Environmental Policy Act Alternatives A through D as Compared to No Action Alternative)

Appendix G
Biological Resources

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Appendix G. Biological Resources

G.1 Vegetation Communities

This section provides a summary of the vegetation communities/land cover types in the vicinity of the proposed project components, as summarized in **Table 3.4-1** in **Section 3.4** (*Biological Resources*) of the Environmental Impact Statement. Mapping and descriptions are derived from several sources, including NatureServe (2005), Fort Apache Agency (2005), aerial photography analysis, and field reconnaissance during wetland delineation surveys (Leidos 2014).

Ponderosa Pine Forest and Woodlands. Forests in the vicinity of the reservoir site are dominated by ponderosa pine, and they locally have Douglas-fir (*Pseudotsuga menziesii*) and Chihuahua pine (*Pinus leiophylla*) as associates. Deciduous trees, including Gambel oak (*Quercus gambellii*) and Arizona walnut (*Juglans major*), may also be present within the pine forest or in openings on suitable soils. Shrubby junipers and oaks are commonly in the understory. They may exist as woodlands in which the ponderosa pines are scattered among lower-growing tree and shrub species or grasses.

Pinyon-Juniper Woodland. Woodlands and shrublands along the pipeline are dominated by junipers, with Rocky Mountain juniper (*Juniperus scopulorum*) more prevalent at higher elevations and in the eastern part of the pipeline corridor, and Utah juniper (*Juniperus osteosperma*) and possibly one-seed juniper (*Juniperus monosperma*) more prevalent at lower elevations and in the western part of the pipeline area. Pinyon pines (*Pinus edulis*) are present with junipers especially in the western portion of the proposed pipeline alignment. A variety of shrubby associated species are often present. These species include scrub oaks (*Quercus* spp.), manzanita (*Arctostaphylos* spp.), mountain mahogany (*Cercocarpus betuloides*), and barberries (*Berberis* spp.). Perennial grasses constitute the understory.

Grassland/Meadow. Grasslands comprised mainly of native perennial bunchgrasses and sod-forming grasses are prevalent, typically on deeper soils, along the pipeline alignment. In some areas, grasslands with scattered shrubs and small trees have resulted from range improvement projects, which have removed most of the woody cover in order to stimulate the growth of grasses.

Riparian. Major streams at the proposed Miner Flat reservoir site and those crossed by the proposed pipeline (e.g., Carrizo Creek; Map 5 on **Figure 2.5-11**) are vegetated by riparian forest, typically dominated by Fremont cottonwood (*Populus fremontii*), narrowleaf cottonwood (*Populus angustifolia*), alders (*Alnus* spp.), and willows (*Salix* spp.).

Developed or Ruderal. This category includes paved or developed areas including roads and populated areas, as well as recently cleared areas. Along frequently disturbed road shoulders, herbaceous vegetation composed of grasses and a variety of native and introduced forbs is seasonally present. Because they are periodically mowed or bladed, roadsides are included in this category.

Most personal agricultural crops are associated with residences in rural-residential areas and are smaller than the 5-acre mapping size limit. These are included in the Developed or Ruderal category.

Agriculture. Included in this category are croplands used for pasture or hay production, as well as areas used for production of crops such as corn, small grains, sunflowers, and vegetables.

G.2 Flood Frequency and Cross-Sections

JE Fuller (2022) conducted a flood frequency analysis, which was used to identify flow stages that could overbank the channel of the North Fork of the White River (NFWR) or the White River. Three locations were selected based on proximity to project components, reach type (Canyon-bound or floodplain), and proximity to sensitive plant communities. A frequency analysis for flows at NFWRLL, NFWRGG, and WRNFA gage locations, among others, was also performed by the White Mountain Apache Tribe (WMAT) to estimate flood discharge magnitudes at various return intervals. The following figures (**Figure G.2-1** through **Figure G.2-10**) present the locations, topography, and cross-sections (with associated flood stages) at the representative locations (JE Fuller 2022).

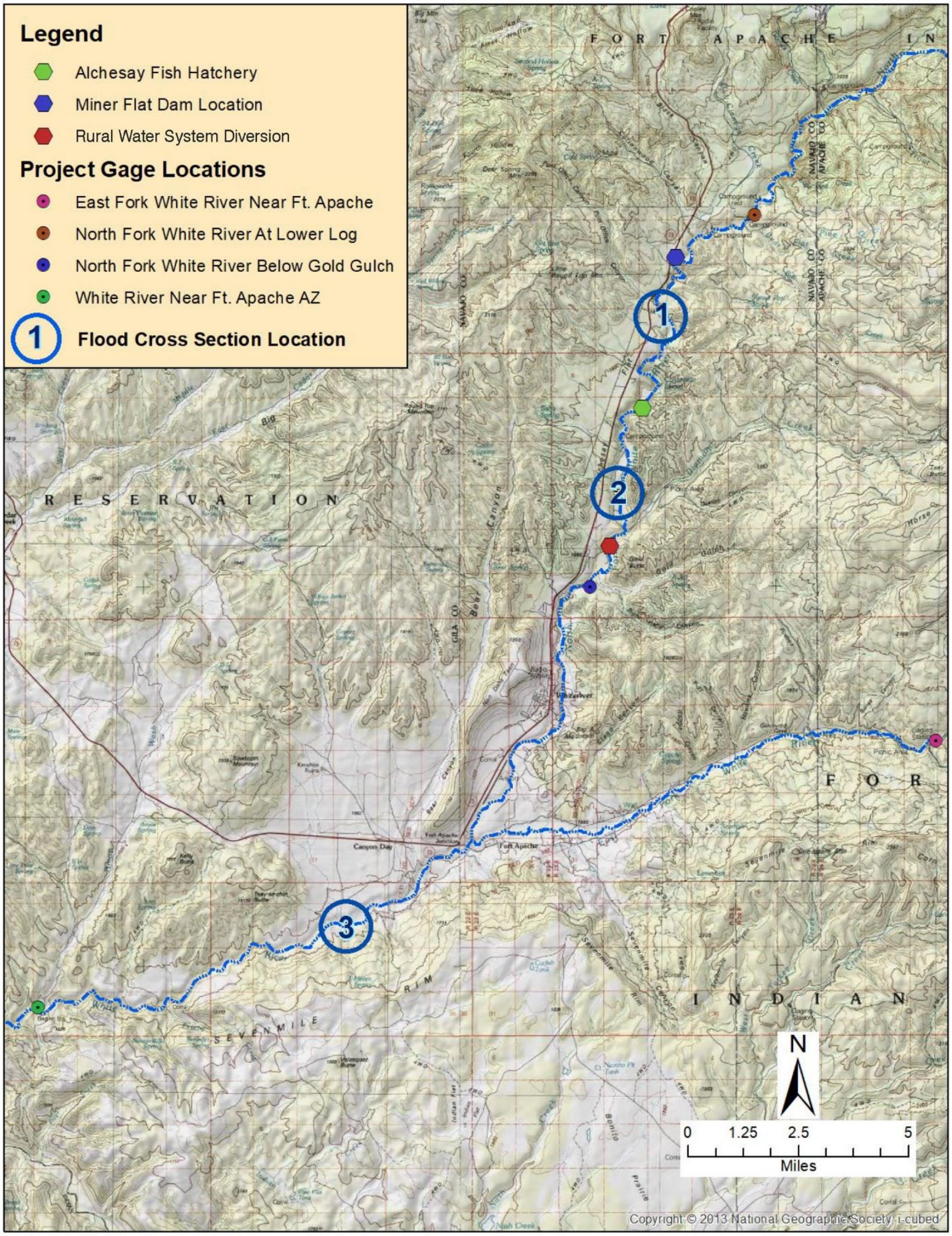


Figure G.2-1. Locations of Representative Cross-Sections

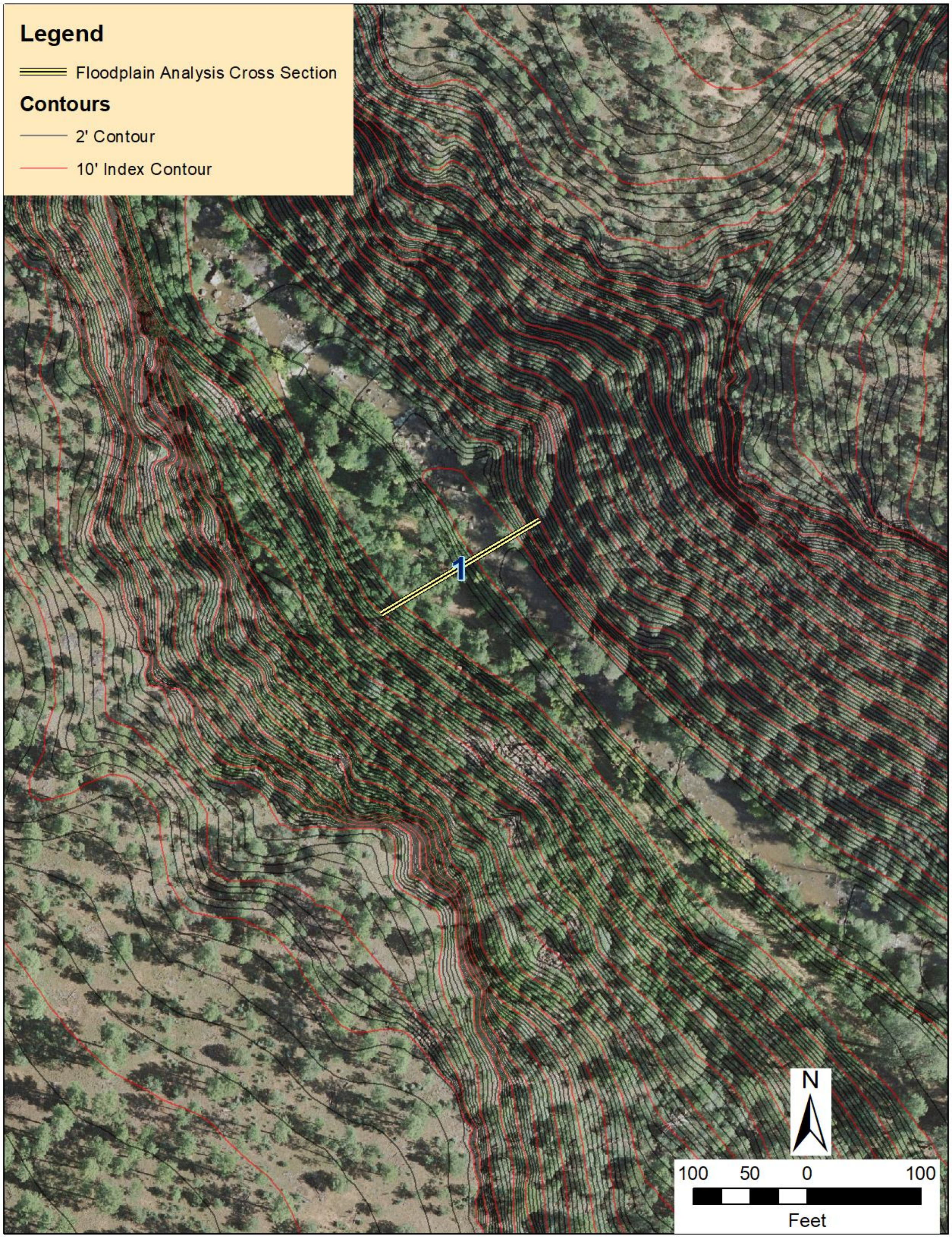


Figure G.2-2. North Fork White River Cross-Section 1 Contours and Aerial View

Figure G.2-3. North Fork White River Cross-Section 2 Contours and Aerial View

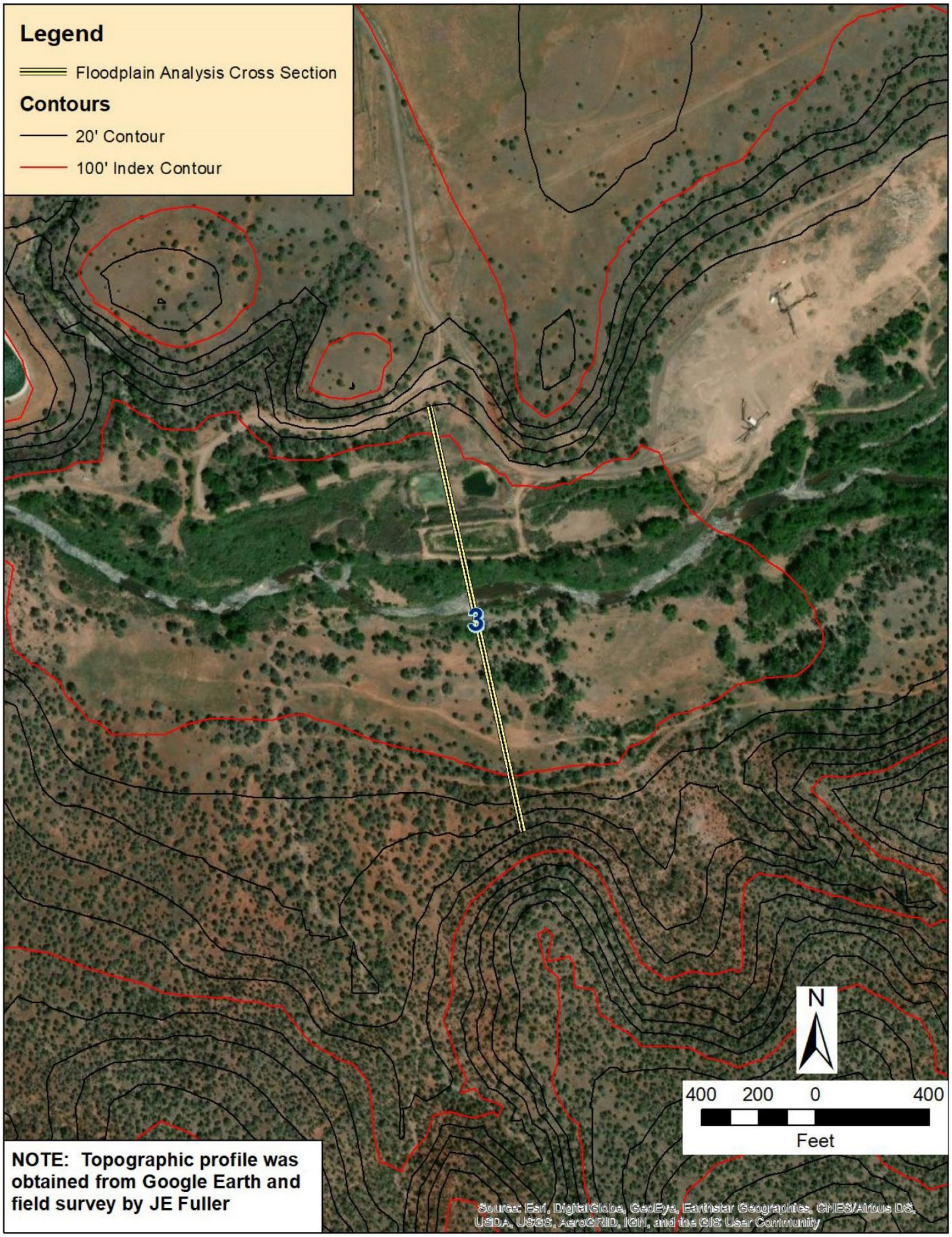
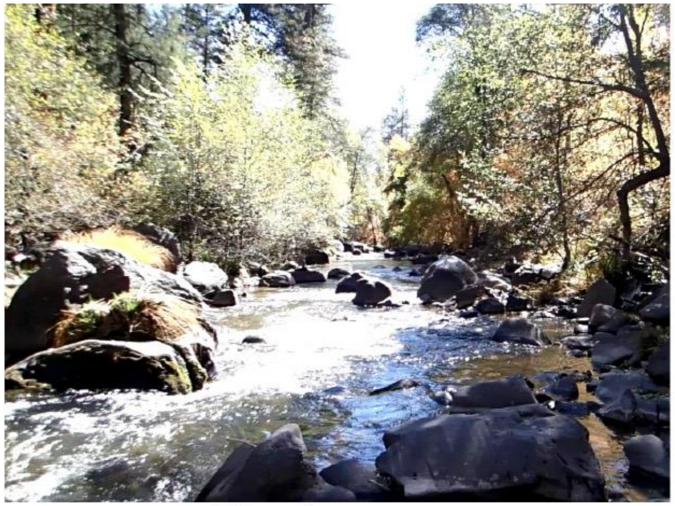


Figure G.2-4. White River Cross-Section 3 Contours and Aerial View

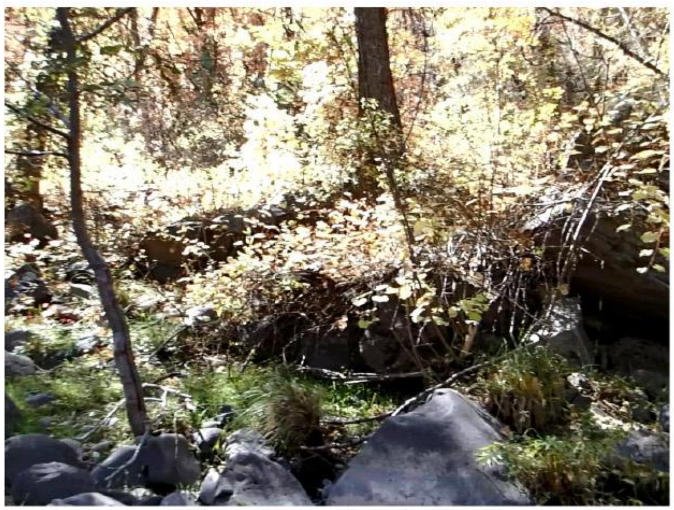
Flow	Depth
0	0.0
1	0.5
8	1.0
39	1.5
89	2.0
167	2.5
267	3.0
393	3.5
548	4.0
724	4.5
922	5.0
1,140	5.5
1,380	6.0
1,639	6.5
1,919	7.0
2,218	7.5
2,538	8.0
2,877	8.5
3,237	9.0
3,617	9.5
4,017	10.0

Figure G.2-5. Cross-Section 1 (North Fork of the White River above Post Office Farms) with Reference Flow Values (with flow in cubic feet per second and depth in feet)

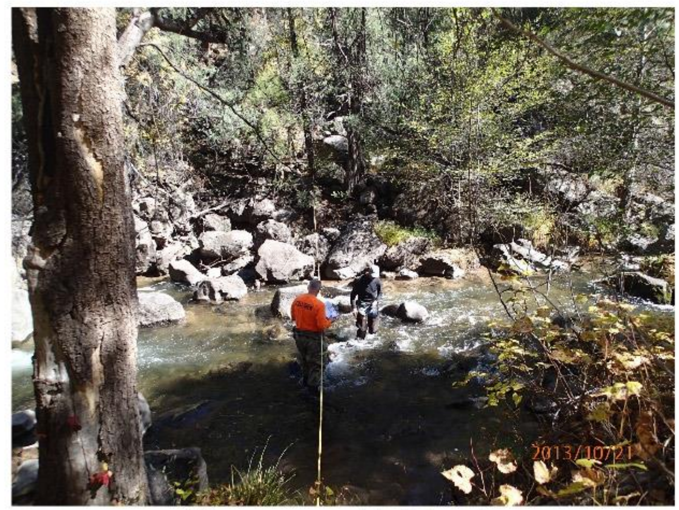


View downstream

View upstream



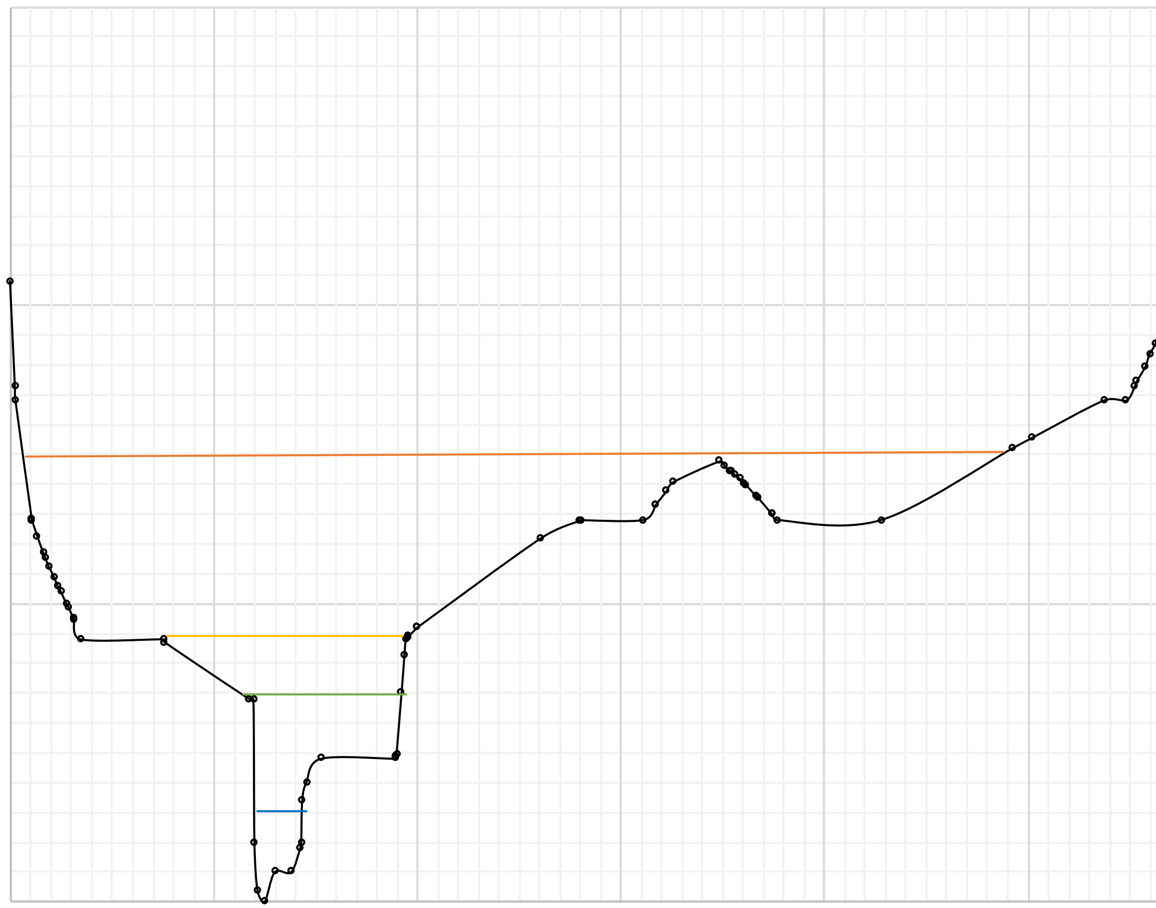
View toward right bank



View toward left bank

Note: NFWRLL gage at time of survey was 30 cubic feet per second.

Figure G.2-6. Cross-Section 1 (North Fork of the White River above Post Office Farms) Representative Photos



Flow	Depth
0	0.0
8	0.5
58	1.0
165	1.5
302	2.0
457	2.5
789	3.0
1,226	3.5
1,778	4.0
2,430	4.5
3,247	5.0
4,325	5.5
5,668	6.0
6,803	6.5
8,967	7.0
11,550	7.5
14,834	8.0
18,515	8.5
23,049	9.0
28,088	9.5
33,598	10.0

Figure G.2-7. Cross-Section 2 (North Fork of the White River above Diamond Creek) with Reference Flow Values (with flow in cubic feet per second and depth in feet)

View downstream

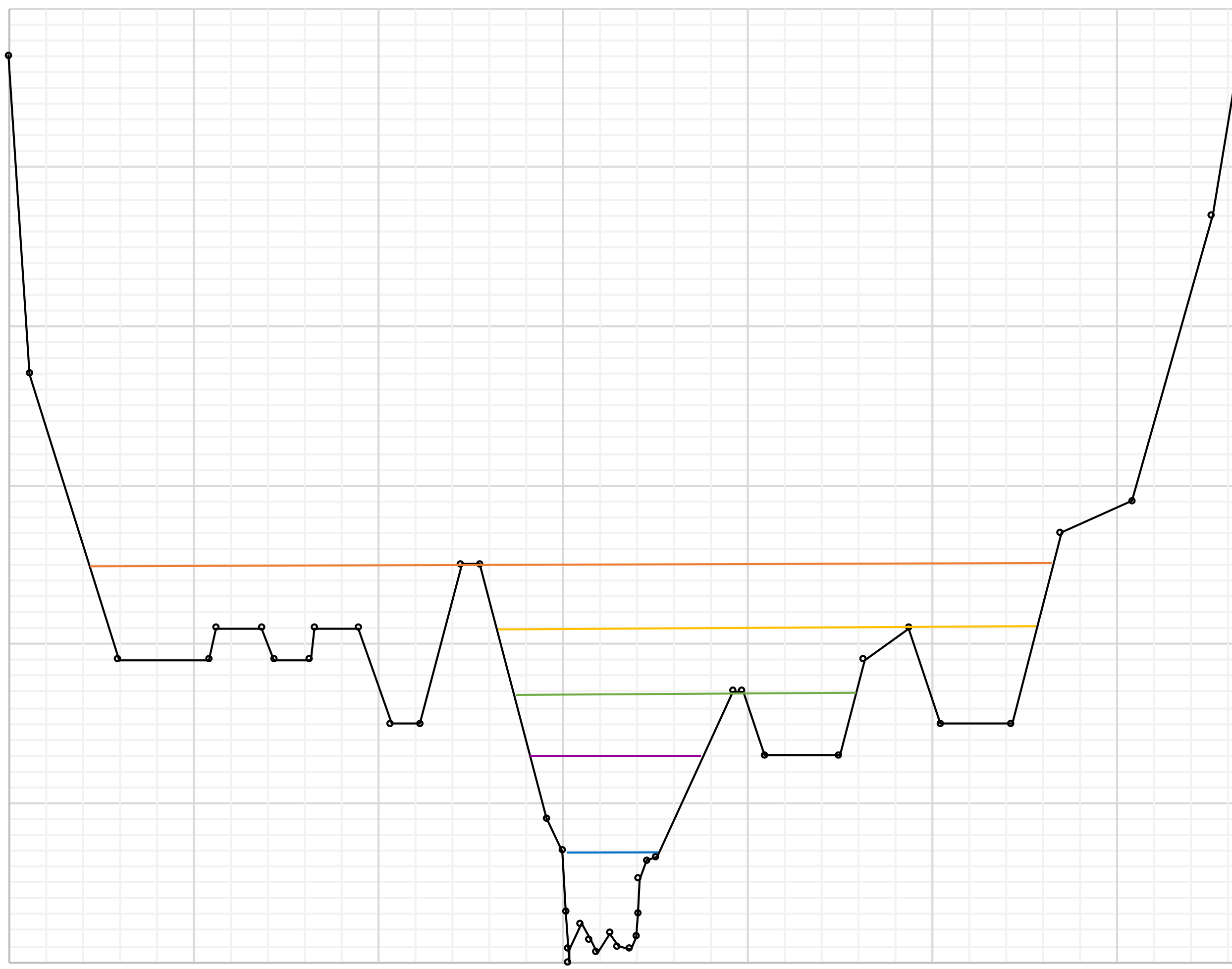
View upstream

View downstream

View toward left bank

Note: NFWRGG gage at time of survey was 38 cubic feet per second.

Figure G.2-8. Cross-Section 2 (North Fork of the White River above Diamond Creek) Representative Photos



Flow	Depth
0	0.0
1	0.5
33	1.0
132	1.5
287	2.0
487	2.5
704	3.0
920	3.5
1,245	4.0
1,629	4.5
2,076	5.0
2,590	5.5
3,172	6.0
3,826	6.5
4,598	7.0
5,501	7.5
6,466	8.0
7,767	8.5
9,459	9.0
11,371	9.5
13,201	10.0
15,712	10.5
18,589	11.0
22,082	11.5
25,907	12.0
30,055	12.5

Figure G.2-9. Cross-Section 3 (White River near Canyon Day) with Reference Flow Values
(with flow in cubic feet per second and depth in feet)

View downstream

View upstream

View toward right bank


View toward left bank

Note: NFWRGG gage at time of survey was 45 cubic feet per second.

Figure G.2-10. Cross-Section 3 (White River near Canyon Day) Representative Photos

G.3 Information Planning and Consultation Report

The attached report was generated from the Information Planning and Consultation Report (IPaC) portal on the United States Fish and Wildlife Service's (USFWS) website and includes a listing of trust resources under the jurisdiction of the USFWS that may occur within the action area, such as species listed as threatened or endangered under the Endangered Species Act, migratory birds, and USFWS facilities, such as the Alchesay National Fish Hatchery.

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

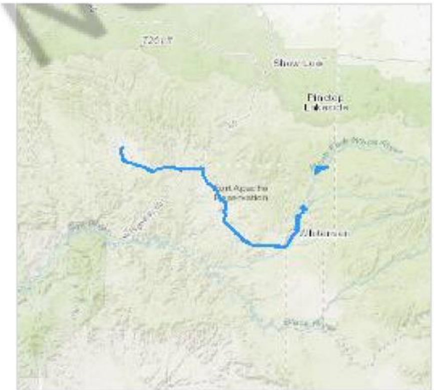
Project information

NAME

White Mountain Apache Tribe Rural Water System

LOCATION

Gila and Navajo counties, Arizona



DESCRIPTION

Some(Pursuant to the WMAT Water Rights Quantification Act of 2010, the U.S. Congress authorized and directed Reclamation to plan, design, and construct the WMAT Rural Water System to divert, store, and distribute water from the North Fork of the White River for the use and benefit of the WMAT in east-central Arizona. The proposed action would include construction and operation of a dam, storage reservoir, stream diversion dam and intake, treatment facilities, and a distribution system that would provide water to communities located on the Fort Apache Indian Reservation (Reservation), including Whiteriver, Fort Apache, Canyon Day, Cedar Creek, Carrizo, and Cibecue (Figure 1.1 2). The construction of the Miner Flat Dam would create a new reservoir with approximately 8,530 acre-feet of water storage. Water from the new reservoir would be released to the North Fork of the White River, diverted from the stream channel upstream from the community of Whiteriver and subsequently treated and conveyed via pipeline to downstream Reservation communities. While the primary objective of the reservoir would be to provide a more reliable and sustainable fresh-water supply to WMAT residents and businesses, the project is anticipated to provide multipurpose benefits, including recreational
opportunities, hydropower potential, limited flood control, irrigation, improved in-stream flows for riparian and aquatic habitat, and improved stream temperatures for production of trout at the Alchesay National Fish Hatchery.)

Local office

Arizona Ecological Services Field Office

(602) 242-0210
(602) 242-2513

9828 North 31st Ave
#c3
Phoenix, AZ 85051-2517

http://www.fws.gov/southwest/es/arizona/
http://www.fws.gov/southwest/es/EndangeredSpecies_Main.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Wolf Canis lupus No critical habitat has been designated for this species.	PEXPN
Mexican Wolf Canis lupus baileyi No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3916	Endangered

Birds

NAME	STATUS
Mexican Spotted Owl Strix occidentalis lucida Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/8196	Threatened
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Northern Mexican Gartersnake *Thamnophis eques megalops* Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/7655	Threatened

Amphibians

NAME	STATUS
Chiricahua Leopard Frog *Rana chiricahuensis* Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/1516	Threatened

Fishes

NAME	STATUS
Apache Trout *Oncorhynchus apache* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3532	Threatened
Razorback Sucker *Xyrauchen texanus* Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/530	Endangered

Roundtail Chub Gila robusta No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2782	Under Review

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus — Breeds Oct 15 to Jul 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1626

Black-chinned Sparrow Spizella atrogularis — Breeds Apr 15 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9447

Black-throated Gray Warbler Dendroica nigrescens — Breeds May 1 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Chestnut-collared Longspur Calcarius ornatus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Grace's Warbler Dendroica graciae — Breeds May 20 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Red-faced Warbler Cardellina rubrifrons — Breeds May 10 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Rufous-winged Sparrow Aimophila carpalis — Breeds Jun 15 to Sep 30

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

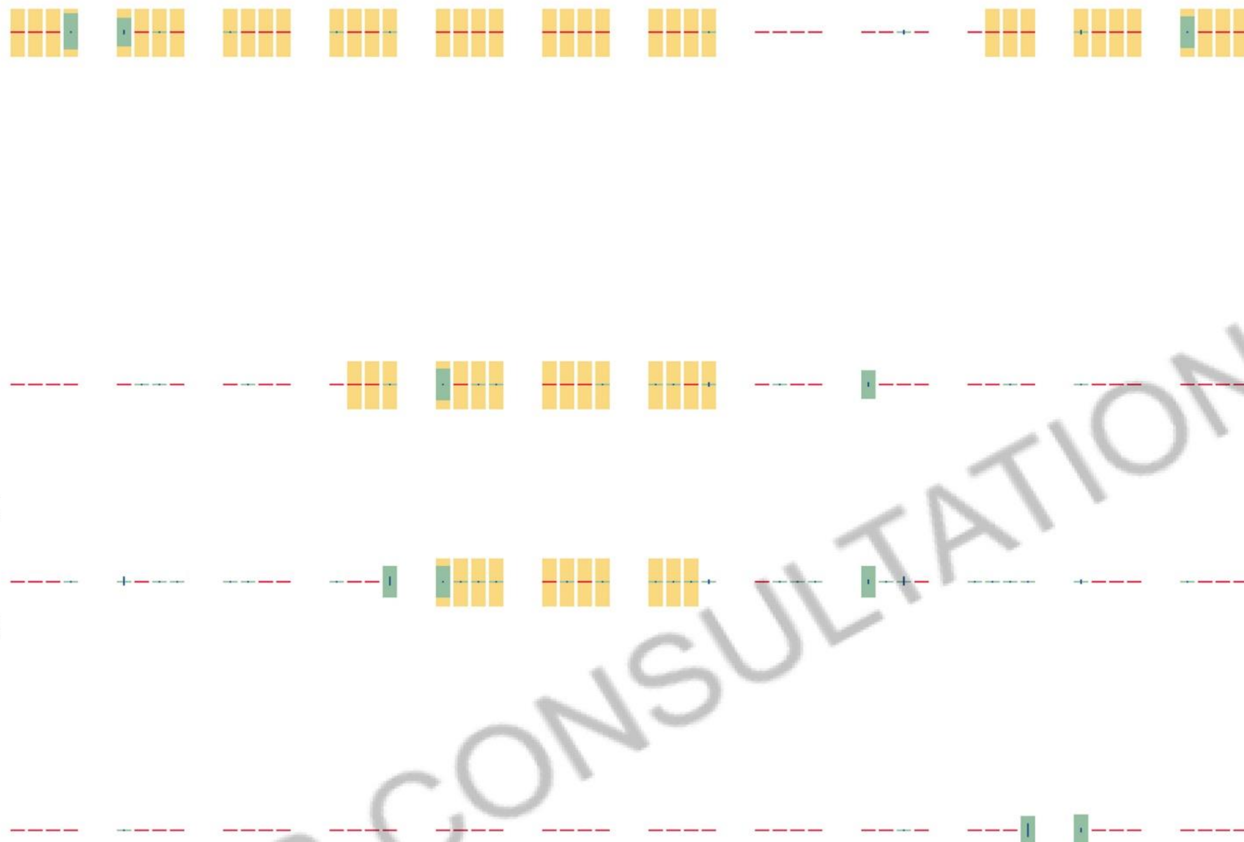
SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Bald Eagle
Non-BCC Vulnerable
(This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

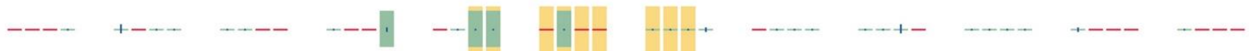
Black-chinned Sparrow
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Black-throated Gray Warbler
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

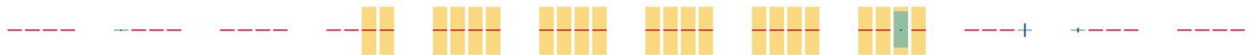
Chestnut-collared Longspur
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



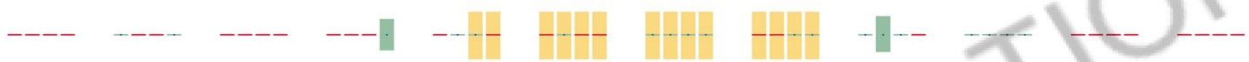
Grace's Warbler
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



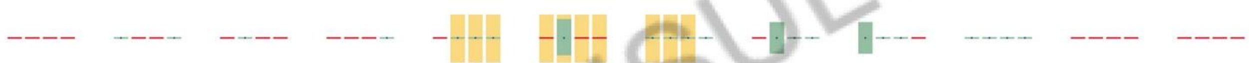
Lewis's Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



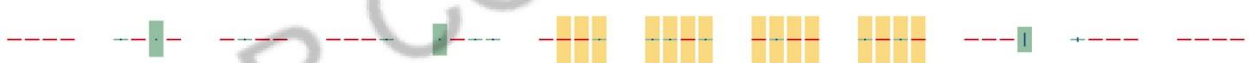
Olive-sided Flycatcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Red-faced Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Rufous-winged Sparrow
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

- PSSC

FRESHWATER POND

- PUSC

RIVERINE

- R2UBH
- R4SBC
- R2UBF
- R4SBJ
- R3UBH
- R2USC
- R3UBF

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

G.4 References

Fort Apache Agency. 2005. Forest Inventory Analysis. Fort Apache Indian Reservation, White River, Arizona.

JE Fuller (JE Fuller Hydrology and Geomorphology, Inc.). 2022. Streamflow and Dam Operations Modeling for the White Mountain Apache Tribe Rural Water System Environmental Impact Statement. *[pending final report]*

Leidos. 2014. Preliminary Jurisdictional Determination for the White Mountain Apache Tribe Rural Water System Project. February.

NatureServe. 2005. Field Key to Ecological Systems and Target Alliances of the Mongolian Rim, United States. NatureServe Terrestrial Ecology Department. July.

Appendix H
Cultural Resources

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Appendix H. Cultural Resources

H.1 Cultural History Overview

The following section summarizes the cultural history overview provided in PaleoWest Archaeology's Class I (Mitchell et al. 2013) and Class III studies (Clark et al. 2015), unless otherwise indicated, to provide a broader context for understanding the cultural resources recorded within the area of potential effects (APE).

Archaeologists have divided the local cultural chronology into five major periods: Paleoindian period (9500–6500 B.C.), Archaic period (6500–2000 B.C.), Formative period (2000 B.C.–A.D. 1539), Contact (or Protohistoric) period (A.D. 1539–1863), and Arizona Territorial and Statehood period (A.D. 1863–present). The Paleoindian adaptation to the American Southwest is generally considered to have been oriented around the hunting of large game using spears with distinctive projectile points. Paleoindian archaeological remains are concentrated in the upper reaches of the Little Colorado River (above Holbrook, Arizona), with the greatest concentration being in the Concho area. Most evidence of Paleoindian activities in this area come from isolated projectile points.

The Archaic period (6500–1500 B.C.) followed the end of the big-game-hunting tradition with a subsistence strategy dominated by nomadic hunting of smaller game animals and the exploitation of a variety of economically important wild plants. Although hunting remained important, the artifact assemblage indicates an increasing dependence upon wild plants due to the presence of plant-processing equipment such as one-hand *manos* (upper stone tool held while milling food) and simple *metates* (flat stone on which food is milled). Jennings (1968) has labeled the Archaic period in the American Southwest as the Desert Culture, and the expression of Desert Culture found in the Little Colorado River valley is known as the Concho complex. Archaic sites in the Little Colorado River basin are rare but are more common than Paleoindian sites. Additionally, archaeological sites lacking temporally diagnostic artifacts[1] have been reported frequently, including several in the region east of the Fort Apache Indian Reservation. It is possible that these sites may represent the remains of Archaic activities, but without temporally diagnostic artifacts or dated features, these types of sites remain problematic and cannot be placed in the regional chronology.

The Formative or Sedentary period (2000 B.C.–A.D. 1539) was characterized by dependence on maize horticulture, construction of permanent dwellings, and, after about A.D. 300, manufacture of pottery. Maize was introduced to the region as early as about 2000 B.C., making possible a more sedentary subsistence and settlement system in which seasonally occupied pit house dwellings were constructed throughout a family's annual range. The introduction of pottery about A.D. 300 further reinforced the trend toward increased sedentism (year-round occupations), and by about A.D. 700, most of the population was beginning to live in farmsteads and hamlets that were occupied year-round. Although farmsteads and hamlets were fairly dispersed, distinct communities or site

[1] Temporally diagnostic artifacts are artifacts that can be associated with a particular time period.

clusters began to form around large (50-foot diameter), circular, semi-subterranean structures (called great kivas) as early as A.D. 800.

Archaeologists generally consider the Formative peoples of the present-day Fort Apache Indian Reservation to have been part of the Mogollon archaeological tradition of the Mogollon Highlands (south of the Mogollon Rim). Changes from A.D. 200 to 800 include increasing reliance on plant domesticates, the construction of surface dwellings, and increasing sedentism. The settlement system included both habitation sites and special activity loci related to the exploitation of dispersed resources. Between A.D. 800 and 1000, the archaeological record seems to take on elements of the Ancestral Pueblo cultural complex characterized by the Cibola region north and east of the project area. Surface architecture became common, corrugated ceramics appeared, and black-on-white ceramic types made up an increasing part of the ceramic assemblage. By A.D. 1000 to 1100, black-on-red ceramics became part of the assemblage. More aggregated and formalized surface pueblos were built throughout most of the region, which seem to exhibit Puebloan-like concepts of site planning.

From about A.D. 1025 to 1130, many communities on the Colorado Plateau constructed multi-storied community buildings (called great houses) with floor plans, masonry, and associated great kivas similar to what was being built in the large pueblos of Chaco Canyon. Moreover, some of the communities that had great houses and great kivas were linked by roads to Chaco. In the mid-1100s, the settlement system of communities of dispersed hamlets and farmsteads surrounding a great kiva, a great house, or both, began to be replaced by a settlement system in which the entire community lived in a single pueblo village. The migration of dispersed farmers into villages resulted in the depopulation of large portions of the region, although these areas probably continued to be used for hunting and gathering. By A.D. 1300, most people in the Mogollon Rim country of east-central Arizona were living in approximately 50 villages, ranging in size from 25 to more than 800 ground-floor rooms. These villages were clustered along Silver Creek, the Little Colorado River between present-day Eager and St. Johns, and the Mogollon Highlands south of the Mogollon Rim. In Canyon Day, the Kinishba ruins, a National Historic Landmark, represents the remains of a village from this time period, located near arable land and fresh water. By about A.D. 1450, no permanent villages remained in the region, as virtually the entire population had moved to Zuni and Hopi areas.

White Mountain Apache history holds that they have occupied and lived on these lands since time immemorial and have an unbroken chain of aboriginal title to the land within the present-day Fort Apache Indian Reservation. For many archaeologists, distinctively Apachean archaeological sites in the White Mountains date sometime after about A.D. 1450, and linguistics, historical documentation, and archaeology contribute information on how Apachean culture developed in the region. Sites of this period consist of wickiup (a traditional dwelling) circles, roasting features, Apachean ceramics, imported Puebloan ceramics, and flaked and ground stone. Ndee or Western Apache settlements are found near the headwaters of the Gila, Salt, and Verde Rivers (Welch 2016). By 1700 and likely earlier, the White Mountain Apaches were farming along the North and East Forks of the White River, and the Canyon Day, Cibecue, and Carrizo bands were farming areas from Cedar Creek to the Salt River (Welch 2016). Permanent, year-round residences were rare at this time, with households moving around to take advantage of wild plant and wildlife resources and to sustain wide-ranging kinship relations.

Spanish exploration of the region began in February 1540, when Francisco Vázquez de Coronado set out from Compostela, Mexico, leading an expedition to explore what is now the southwestern United States (U.S.). With the 1598 establishment of Spanish colonies on the Rio Grande in New Mexico, Spanish and Mexican travel through Arizona north of the Mogollon Rim was almost entirely restricted to the Zuni-Hopi Trail, and no accounts of Spanish or Mexican travel in the Rim country are known. Although the United States acquired the Southwest from Mexico after the Mexican War (1846) and the Treaty of Guadalupe Hidalgo (1848), U.S. colonization of northern Arizona did not begin in earnest until the establishment of the Arizona Territory in 1863. Euro-American colonization of the Little Colorado River valley may have begun as early as the 1860s. Mormon settlement of the Little Colorado River valley began in 1876 with the establishment of four colonies between present-day Winslow and St. Joseph. In 1877 and 1878, the Mormons established colonies along Silver Creek. In 1879 and 1880, the Mormons began to colonize the upper Little Colorado River, around St. Johns and Springerville, which had previously been colonized by non-Mormons.

The U.S. colonization of the region led to conflict with the Apache people. The military post that later became Fort Apache began in 1870 with the establishment of Camp Ord. Within a year the name changed from Camp Ord to Camp Mogollon to Camp Thomas and, in 1871, to Camp Apache. The camp was finally named Fort Apache in 1879. In 1871, General Cook enlisted the first Apache Scouts at Camp Apache, many of which were Cibecue Ndee (Welch 2016). The Scouts were instrumental in the Army's conflicts during the Apache Wars, which ultimately led to the surrender of Geronimo, the leader of the Chiricahua Apache, in 1886 (White Mountain Apache Tribe [WMAT] 2022).

Early military accounts indicate that the main military route into Camp Apache was via the Little Colorado River and Silver Creek. This route was later followed by stage service, freight companies, and mail service. Along with ranching, logging was one of the first commercial enterprises in the region. The major logging company in the area was the Apache Lumber Company, with headquarters at Cluff Cienega (renamed Cooley in 1918 and McNary in 1923). In 1917, the Apache Railway Company was established to construct a railroad from the Atchison, Topeka and Santa Fe Railroad at Holbrook, south into the National Forest and the Fort Apache Indian Reservation. Eventually the line reached all the way to Maverick, on the Fort Apache Indian Reservation, with railroads branching into various timber-cutting areas.

The Fort Apache Indian Reservation was established in 1871, encompassing most of the traditional homeland of the Mountain and Cibecue Ndee. Other groups of Apaches and their neighbors were pushed together on the San Carlos Division of the Reservation. For more information about the White Mountain and Cibecue Apache history through 1881, see Welch (2016). After the U.S. Army abandoned Fort Apache in 1922, the site became the home of the Bureau of Indian Affair's Theodore Roosevelt Indian Boarding School. The school continues to serve as a middle school but under the administration of a school board selected by the Tribal Council. The WMAT created the Fort Apache Historic Park and have reclaimed Fort Apache as a place to remember, reconcile, and celebrate Apache culture and history. The Fort Apache and Theodore Roosevelt School became a U.S. National Historic Landmark in 2012 (Welch 2016).

H.2 Cultural Resources Recorded in the Area of Potential Effects

Based on the studies noted in **Section 3.6** (*Cultural Resources*), there are 101 identified cultural resources (**Table H.2-1**) and 41 isolated occurrences recorded in the APE. The 101 sites consist of both prehistoric and historical-period sites, as well as traditional ceremonial sites. The prehistoric sites indicate use of the area possibly beginning in the Archaic period (6500–1500 B.C.) and continuing through the late Formative period (2000 B.C.–A.D. 1539). Prehistoric site types within the APE include artifact scatters, rock rings, habitation sites, and villages. Historical-period use (post–A.D. 1539) of the area was associated with habitation, logging, camping, ranching, and farming. Historical-period site types include the structural remains of buildings, habitation sites, trash dumps, artifact scatters, campfire rings, petroglyphs, agricultural fields, and artifact scatters. Five resources are also defined as traditional cultural properties, including two historical-period ranches, a historical-period house, and two traditional ceremonial sites (Riley 2015) (see **Table H.2-1**).

Table H.2-1 lists the National Register of Historic Places ("National Register") eligibility of the 101 cultural resources that were recorded in the APE. The 101 cultural resources are based on the number of resources recorded within the study areas shown on **Figures 2.5-4** and **2.5-5** (about 700 acres total), the proposed water distribution system shown on **Figures 2.5-9** through **2.5-11**, and the surveyed areas shown in **Figure H.2-1** (about 8,425 acres). Cultural resources determined to be not eligible for listing on the National Register either do not meet any of the National Register criteria or lack physical integrity (i.e., have been significantly altered or destroyed by previous human activity or natural processes). Cultural resources listed as "unevaluated" need additional information that may be gathered by means of limited excavation and/or testing to determine the presence and extent of significant buried cultural material or, in the case of historical-period sites, additional archival research. Unevaluated resources are considered eligible for the purposes of this analysis. Isolated occurrences are, by definition, not eligible for inclusion on the National Register and, therefore, are not discussed further.

Table H.2-1. Cultural Resources Recorded with the Proposed Action Area of Potential Effects

No.	Site Number	General Description	National Register Eligibility
1	20-065	Prehistoric burial, artifact scatter, and historic building remains	Eligible
2	24-078	Historic ranch	Eligible[1]
3	32-036	Prehistoric or historic artifact scatter	Unevaluated
4	35-028	Prehistoric roomblock and artifact scatter	Eligible
5	35-107	Prehistoric rock pile and artifact scatter	Unevaluated
6	35-108	Prehistoric rockshelter and artifact scatter	Unevaluated
7	35-109	Prehistoric rock rings and artifact scatter	Eligible
8	35-110	Historic petroglyphs	Eligible
9	35-111	Isolated mound feature, no associated artifacts	Not Eligible

Table H.2-1. Cultural Resources Recorded with the Proposed Action Area of Potential Effects

No.	Site Number	General Description	National Register Eligibility
10	35-112	Prehistoric roomblock and artifact scatter	Eligible
11	35-113	Historic trash dump	Not Eligible
12	35-114	Historic outhouse shaft	Not Eligible
13	35-125	Historic house	Eligible[1]
14	35-126	Prehistoric rubble mound and artifact scatter	Eligible
15	35-147	Agricultural field	Not Eligible
16	35-148	Historic camp	Not eligible
17	35-156	Historic ranch and structural remains	Eligible[1]
18	35-181	Prehistoric artifact scatter, mostly destroyed	Not Eligible
19	35-182	Prehistoric rooms, artifacts; previously destroyed	Not Eligible
20	35-228	Prehistoric artifact scatter	Not Eligible
21	35-238	Traditional ceremonial site	Eligible[1]
22	35-239	Traditional ceremonial site	Eligible[1]
23	45-003	Prehistoric artifact scatter	Eligible
24	45-004	Prehistoric roomblock and artifact scatter	Eligible
25	45-010	Prehistoric pueblo	Eligible
26	45-041	Historic trash dump	Not Eligible
27	46-003	Prehistoric Kinishba Ruins	Eligible
28	46-004	Prehistoric ancestral pueblo	Not Eligible
29	46-009	Prehistoric sherd scatter	Not Eligible
30	46-010	Historic artifacts	Not Eligible
31	46-011	Historic debris	Not Eligible
32	46-012	Historic artifacts	Not Eligible
33	46-013	Prehistoric sherd - lithic scatter	Not Eligible
34	46-014	Prehistoric ancestral pueblo	Eligible
35	46-016	Prehistoric sherd scatter	Not Eligible
36	46-017	Prehistoric habitation	Eligible
37	46-018	Prehistoric habitation	Eligible
38	46-019	Historic campfire ring	Not Eligible
39	46-020	Historic campfire ring	Not Eligible
40	46-021	Prehistoric sherd scatter	Not Eligible
41	46-023	Prehistoric sherd scatter	Not Eligible
42	46-024	Prehistoric sherd scatter	Not Eligible
43	46-027	Historic campfire ring	Not Eligible

Table H.2-1. Cultural Resources Recorded with the Proposed Action Area of Potential Effects

No.	Site Number	General Description	National Register Eligibility
44	46-030	Historic trash dump	Not Eligible
45	46-031	Prehistoric sherd - lithic scatter	Not Eligible
46	46-032	Prehistoric sherd - lithic scatter	Not Eligible
47	46-033	Dirt roads	Not Eligible
48	46-034	Dirt roads	Not Eligible
49	46-035	Prehistoric possible pit house	Eligible
50	46-036	Prehistoric sherd - lithic scatter	Eligible
51	46-037	Prehistoric sherd - lithic scatter	Eligible
52	46-038	Prehistoric sherd - lithic scatter	Eligible
53	46-039	Historic artifacts	Eligible
54	46-040	Historic artifacts	Eligible
55	46-042	Prehistoric sherd - lithic scatter	Eligible
56	46-043	Historic artifacts	Eligible
57	46-044	Historic artifacts	Eligible
58	46-045	Prehistoric sherd - lithic scatter	Eligible
59	46-046	Historic artifacts	Eligible
60	46-047	Historic artifacts	Eligible
61	46-048	Prehistoric sherd - lithic scatter	Eligible
62	46-049	Historic artifacts	Eligible
63	46-050	Historic artifacts	Eligible
64	46-051	Historic artifacts	Eligible
65	46-052	Prehistoric sherd - lithic scatter	Eligible
66	46-053	Prehistoric sherd - lithic scatter	Eligible
67	46-054	Prehistoric sherd - lithic scatter	Eligible
68	46-055	Historic artifacts	Not Eligible
69	46-056	Prehistoric sherd - lithic scatter	Not Eligible
70	46-069	Prehistoric Bu Be Laa Village	Not Eligible
71	46-071	Historic holy ground	Eligible
72	46-073	Historic habitation - Apache	Not Eligible
73	46-074	Historic habitation - Apache	Not Eligible
74	46-075	Historic debris	Not Eligible
75	46-076	Prehistoric possible walls	Unevaluated
76	46-077	Historic habitation - Apache	Not Eligible
77	46-078	Historic habitation - Apache	Eligible

Table H.2-1. Cultural Resources Recorded with the Proposed Action Area of Potential Effects

No.	Site Number	General Description	National Register Eligibility
78	46-079	Historic habitation - Apache	Not Eligible
79	46-080	Historic habitation - Apache	Not Eligible
80	46-081	Historic habitation - Apache	Not Eligible
81	46-082	Historic habitation - Apache	Not Eligible
82	46-085	Historic cemetery	Not Eligible
83	46-094	Historic agriculture field	Not Eligible
84	46-101	Historic structural remains and artifact scatter	Eligible
85	46-104	Prehistoric ancestral pueblo	Eligible
86	46-122	Prehistoric rooms sherd scatter	Eligible
87	46-126	Historic habitation - Apache	Not Eligible
88	46-127	Prehistoric ancestral pueblo	Eligible
89	46-128	Prehistoric sherd scatter	Eligible
90	46-129	Prehistoric ruin	Eligible
91	46-131	Prehistoric ancestral pueblo	Eligible
92	46-132	Historic debris	Not Eligible
93	46-133	Historic habitation - Apache	Eligible
94	46-136	Prehistoric ancestral pueblo	Eligible
95	46-140	Prehistoric sherd - lithic scatter	Not Eligible
96	46-143	Prehistoric ancestral pueblo	Eligible
97	46-144	Prehistoric ancestral pueblo	Eligible
98	46-145	Prehistoric ancestral pueblo	Eligible
99	46-146	Prehistoric ancestral pueblo	Eligible
100	46-150	Historic habitation - Apache	Eligible
101	12-29-01	Prehistoric rock ring and artifact scatter, historic artifact scatter	Unevaluated

Key: National Register = National Register of Historic Places

[1] Also qualifies as a traditional cultural property

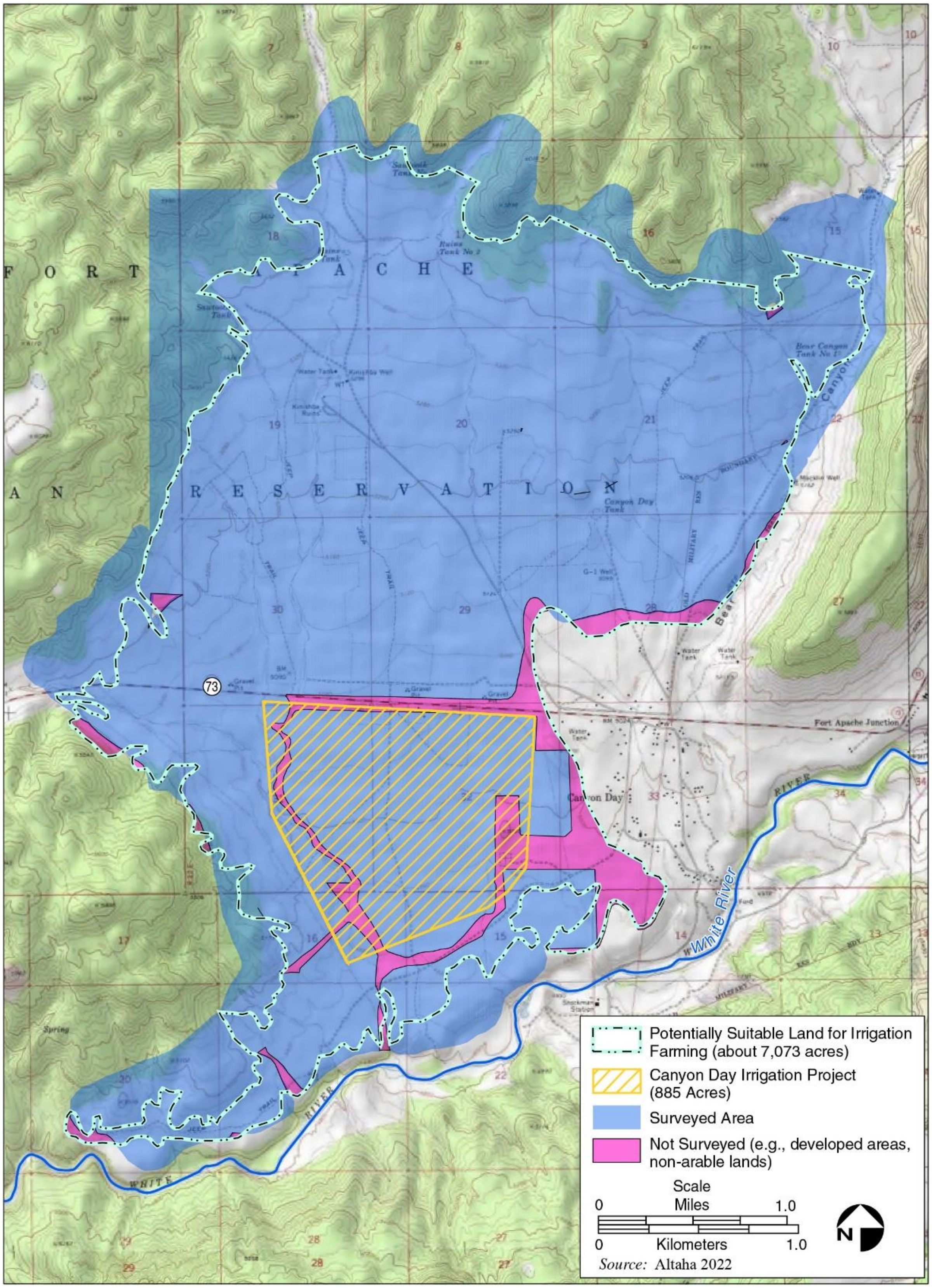

Figure H.2-1. Areas Surveyed for Cultural Resources in the Canyon Day Area

H.3 References

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