RECLAMATION

Managing Water in the West

Final Environmental Assessment

San Carlos Irrigation Project Facilities
Phase 2 Rehabilitation, Reaches 1–3

Pinal County, Arizona

U.S. Department of the Interior
Bureau of Reclamation
Phoenix Area Office
Phoenix, Arizona

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Mission Statements

The mission of the U.S. Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

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.

San Carlos Irrigation Project
Phase 2 Rehabilitation, Reaches 1–3
Final Environmental Assessment
Pinal County, Arizona

Lead Agency:
Prepared by the U.S. Department of the Interior, Bureau of Reclamation, Lower Colorado Region, Phoenix Area Office

Cooperating Agencies:
Bureau of Indian Affairs–San Carlos Irrigation Project
San Carlos Irrigation and Drainage District
Gila River Indian Community

Abstract:
This Final Environmental Assessment (EA) describes and analyzes the potential effects of the proposed rehabilitation of Phase 2 Reaches 1–3 of the San Carlos Irrigation Project (SCIP). The proposed project includes consolidation and concrete lining of primary irrigation canals, and construction of a regulating reservoir within the SCIP system in order to conserve surface water, reduce operational and maintenance costs, and improve irrigation water delivery service to the San Carlos Irrigation and Drainage District and the Gila River Indian Community. The desired goal is to achieve maximum conservation of water by reducing seepage and spillage within the delivery system.

The EA evaluates three alternatives: (a) No Action, (b) Florence Canal Alternative (Proposed Action), and (c) Florence–Casa Grande Canal Alternative.

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ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
ACS	American Community Survey
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AF	acre-feet
AFY	acre-feet per year
AGFD	Arizona Game and Fish Department
AMA	Active Management Area
APE	area of potential effects
AQI	air quality index
ARHP	Arizona Register of Historic Places
ASM	Arizona State Museum
AWSA	Arizona Water Settlements Act
AZGS	Arizona Geological Survey
AZPDES	Arizona Pollutant Discharge Elimination System
BE	Biological Evaluation
BG	Block Group
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CAA	Clean Air Act
Canal Act	Canal Act of 1890
CAP	Central Arizona Project
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
CT	Census Tract
Curis	Curis Resources (Arizona), Inc.
CWA	Clean Water Act
dBA	A-weighted noise in decibels
District (also SCIDD)	San Carlos Irrigation and Drainage District
DM	Departmental Manual
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
FCG Canal	Florence–Casa Grande Canal
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
FR	Federal Register
GHG	greenhouse gas
GMA	Groundwater Management Act

HAER	Historic American Engineering Record
HPTP	Historic Properties Treatment Plan
I-10	Interstate 10
IPaC	Information for Planning and Conservation
ITA	Indian Trust Asset
L_{eq}	equivalent sound level
LUST	leaking underground storage tank
MBTA	Migratory Bird Treaty Act
mg/l	milligrams per liter
MOA	Memorandum of Agreement
MSATs	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PEIS	Programmatic Environmental Impact Statement
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than 10 but more than 2.5 microns in diameter
P-MIP	Pima-Maricopa Irrigation Project
Reclamation	Bureau of Reclamation
SCADA	supervisory control and data acquisition
SCIDD (also District)	San Carlos Irrigation and Drainage District
SCIP	San Carlos Irrigation Project
Settlement Agreement	Gila River Indian Community Water Rights Settlement Agreement
SGCN	AGFD Species of Greater Conservation Need
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SR	State Route
SR 79B	State Route 79 Business
SWPPP	Storm Water Pollution Prevention Plan
TDS	total dissolved solids
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WSC	Wildlife of Special Concern in Arizona
WUS	Waters of the United States

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This Final Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] §§ 1500–1508), and U.S. Department of the Interior NEPA regulations (43 CFR § 46). As designated by Section 203 of the Arizona Water Settlements Act (AWSA) of 2004 (Public Law 108-451), the Bureau of Reclamation (Reclamation) is the lead Federal agency responsible for NEPA compliance. The Gila River Indian Community Pima-Maricopa Irrigation Project (P-MIP), the Bureau of Indian Affairs (BIA) San Carlos Irrigation Project (SCIP), and the San Carlos Irrigation and Drainage District (SCIDD or District) are cooperating agencies in the preparation of this document.

This EA describes and evaluates the proposed rehabilitation of SCIP Phase 2 Reaches 1–3. The EA tiers from the Programmatic Environmental Impact Statement (PEIS) for P-MIP, which was completed in 1997 (Reclamation 1997). The PEIS addressed Gila River Indian Community plans to construct and operate a common-use irrigation system, place up to 146,330 acres of land into agricultural production, and rehabilitate selected SCIP Joint Works, which included a new canal to be constructed between Ashurst–Hayden Diversion Dam and a new regulating reservoir to be constructed north of Picacho Reservoir. The PEIS allowed for a programmatic-level evaluation of the SCIP Joint Works and P-MIP at full implementation. Because adequate details had not yet been determined when the PEIS was prepared, the PEIS included commitments to prepare subsequent NEPA documentation to address rehabilitation of SCIP Joint Works. A Final EA and Finding of No Significant Impact, which tiered to this PEIS, were completed in August 2010 for SCIP Rehabilitation Phase 1 (Reclamation 2010). This Phase 1 EA is referred to in this document as the 2010 EA.

The NEPA process for SCIP Rehabilitation Phase 2 was initiated in 2010 to address proposed rehabilitation of SCIP Reaches 1–4. The conceptual design information available at that time indicated project-related environmental impacts had the potential to be significant; therefore, Reclamation determined that an Environmental Impact Statement (EIS) was appropriate. Subsequent to public scoping for the EIS, refinements to the preliminary designs indicated that potential environmental impacts of the project would be less than originally thought. With the new design, delivery of irrigation flows during construction could be scheduled during routine outages, thereby reducing potential adverse impacts to sensitive riparian habitat and bird species on the Gila River. Furthermore, based on engineering and construction timelines, Reach 4 was eliminated from the current NEPA process, removing 15 miles of canal rehabilitation from the Proposed Action. Given the reduction in scope and construction footprint, the lessened potential impacts, and the lack of substantive comments received during public scoping, Reclamation concluded that preparation of an EA was appropriate to evaluate whether a Finding of No Significant Impact is appropriate or an EIS must be prepared.

1.2 BACKGROUND

1.2.1 San Carlos Irrigation Project

SCIP was authorized by Congress in the San Carlos Act of June 7, 1924 (Ch. 288, 43 Stat. 475) and is managed by the BIA on behalf of the U.S. government. SCIP irrigation infrastructure consists of three components: the Joint Works, the District Works, and the Indian Works. SCIP Joint Works divert and convey irrigation water from the Gila River to the Indian Works and to the District Works. The Indian Works begin at the reservation boundary and deliver irrigation water from the Joint Works to 50,546 acres of Indian farmland on the Gila River Indian Reservation. The District Works deliver irrigation water from the Joint Works to 50,000 acres of non-Indian farmland served by SCIDD. The Joint Works were modified in the 1990s to create four interconnections with the Central Arizona Project (CAP), enabling CAP water to be delivered to SCIDD and Gila River Indian Community lands served by SCIP. Operation and maintenance of SCIP is defined by a number of governing documents, including the 1924 Act, the 1938 Secretarial Joint Works Order issued by the U.S. Secretary of the Interior, and the Joint Control Board Agreement. SCIP's governing authorities remain in effect, except to the extent modified by the AWSA and the Gila River Indian Community Water Rights Settlement Agreement (Settlement Agreement).

1.2.2 AWSA and Gila River Indian Community Water Rights Settlement Agreement

Section 203 of the AWSA directed the U.S. Secretary of the Interior to execute the Settlement Agreement (Amended and Restated, Final Version, October 1, 2005). Section 203 of the AWSA also directed the U.S. Secretary of the Interior to provide for the rehabilitation and replacement of SCIP water diversion and delivery infrastructure using Reclamation funds under Section 403(f)(2) of the Colorado River Basin Project Act of 1968 (Public Law 90-537, as amended).

Exhibit 20.1 of the Settlement Agreement, incorporated by reference in Section 203 of the AWSA, also provides for the estimation and allocation of water conserved with the rehabilitation and replacement of District Works serving SCIDD lands. The Settlement Agreement also provides for the rehabilitation and replacement of specified SCIP Joint Works water delivery and diversion facilities serving District and Gila River Indian Community lands. SCIDD is authorized to rehabilitate certain project delivery facilities identified in Exhibit 20.1.

The Settlement Agreement incorporated the findings of the Draft Loan Application Report for Distribution System Rehabilitation and Concrete Lining (Harza Engineering Company 1993), which provided a preliminary estimate of 47,000 acre-feet per year (AFY) as the amount of water that could be conserved from the rehabilitation of District Works main canals and numerous laterals serving SCIDD lands. Pursuant to the Third Supplement to the Repayment Contract (included as Attachment 6.2 of Exhibit 20.1 of the Settlement Agreement), an Engineering Board, consisting of three registered professional engineers with expertise in hydrologic evaluations, was established to update the conserved water assessment for District Works rehabilitation. The results of the Engineering Board analysis are discussed in

Section 3.9.2.[1] The Engineering Board analysis, however, provided conserved water estimates based on the assumption that all District canals and laterals will be lined and that 300 acre-feet (AF) of regulating reservoir capacity will be constructed in one or more locations where it can be effectively operated.

1.2.3 Rehabilitation Efforts

Rehabilitation of the canal system was planned in phases because it was anticipated that not all of the necessary funding would be available at one time. It was envisioned that the phases would proceed from upstream to downstream, and each phase would provide independent utility. Rehabilitation of Ashurst–Hayden Diversion Dam and associated headworks and construction of a coarse sediment removal and storage facility comprised Phase 1. Completing this work first greatly improves SCIP's ability to control Gila River water diversions under normal and storm flow conditions and removes most of the coarse sediment from the diverted surface water, thereby protecting the future investment of canal lining downstream in Phase 2.

Phase 1 was addressed in the 2010 EA, which was tiered to the P-MIP PEIS. Construction of Phase 1 was initiated in fall 2010 and is nearly complete. Rehabilitation of Ashurst–Hayden Diversion Dam and associated headworks was completed in 2011. Construction of the sediment settling basin was also completed in 2011. In fall 2015, Reclamation issued a Supplemental Information Report to the 2010 EA to support construction of three decanting basins to aid with sediment handling adjacent to the sediment basin constructed under Phase 1. The three decanting basins were completed in December 2015 to remove most of the coarse sediment from diverted Gila River water. The water entering the SCIP conveyance system downstream of Phase 1 would continue to carry fine sediments, which would get deposited downstream onto agricultural fields. Depending on the flows, some of these sediments may settle-out in the canals at points of low-water velocities, such as upstream of check structures. When flow rates increase during deliveries, corresponding flow velocities would increase, causing previously deposited sediment to be entrained and carried downstream. If sedimentation becomes a problem for water operations, mechanical removal may be necessary, especially during the interim flow operations.

Phase 2 would include rehabilitation of the main canal system and construction of cross-drainage facilities, separate storm water drainage facilities, and a mid-system regulating reservoir. Phase 2 begins at the end of the Phase 1 improvements (at the sediment settling basin) and ends where the Casa Grande Canal crosses Interstate 10 (I-10). The portion of Phase 2 from the sediment settling basin to just west of Picacho Reservoir (referred to as Reaches 1–3) is the focus of this EA, which is also tiered to the P-MIP PEIS. Rehabilitation of Phase 2 Reaches 1–3 is described in more detail in Chapter 2 of this document. It is envisioned that work on Phase 2 Reaches 1–3 would be implemented over the next several years.

Work on Phase 2 Reach 4 would involve the rehabilitation of the Casa Grande Canal from just west of Picacho Reservoir to just beyond the canal's crossing of I-10. Drainage facilities using the alignment of the FCG Canal Extension between Picacho Reservoir and I-10 may also be proposed under Phase 2 Reach 4. Phase 3 would improve segments of the remaining main canal

[1] Section 3.9 addresses surface water conservation that would result from the rehabilitation of the Joint Works covered by Phase 2 Reaches 1–3.

system between I-10 and the City of Casa Grande and various laterals within the SCIDD service area.

Phase 2 Reach 4 and Phase 3 are not addressed in this EA. Supplemental NEPA compliance would be undertaken for these additional rehabilitation activities once specific design elements and actions are proposed and funding becomes available.

1.3 PURPOSE AND NEED FOR ACTION

The purpose of this action is to conserve surface water, reduce operation and maintenance costs, and improve irrigation water delivery service to SCIDD and Gila River Indian Community farmland by implementing Phase 2 Reaches 1–3 in accordance with Congress' direction under the AWSA to provide for the rehabilitation and replacement of SCIP diversion and delivery facilities. The rehabilitation and replacement activities are needed to update the aging structures, improve the hydraulic efficiency of the system, and minimize canal system water losses. Separate storm water drainage facilities are needed to protect and preserve the rehabilitated conveyance system.

1.4 PROJECT LOCATION

The EA addresses rehabilitation of SCIP water delivery and storage facilities from the sediment settling basin just downstream of Ashurst–Hayden Diversion Dam to just west of Picacho Reservoir in Pinal County, Arizona (Figure 1). Two additional areas are included in the study area. The San Carlos Reservoir at Coolidge Dam is included in the study area because the U.S. Secretary of the Interior would have the option to retain a portion of the conserved water to maintain a minimum pool. The reach of the Gila River from Coolidge Dam to Ashurst–Hayden Diversion Dam in Gila and Pinal counties is included in the study area because the proposed project could affect water releases to the Gila River from the San Carlos Reservoir at Coolidge Dam during construction and following construction during periods when conserved water is being retained in the reservoir to maintain a minimum pool (Figure 2).

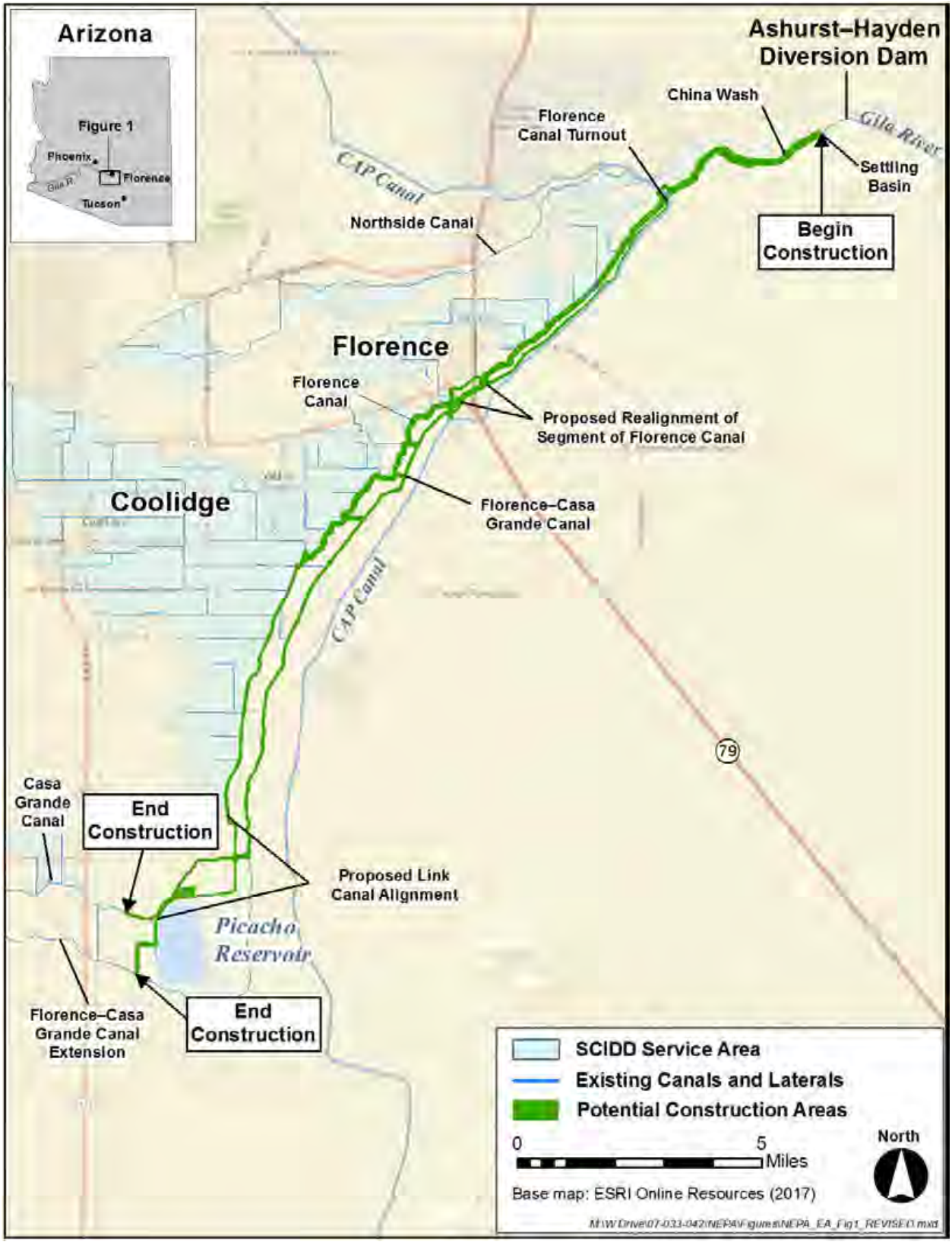

Figure 1. Study area, settling basin to Picacho Reservoir

Figure 2. Study area, Gila River, San Carlos Reservoir to Ashurst–Hayden Diversion Dam

1.5 DECISIONS TO BE MADE/FEDERAL ACTIONS

As designated by Section 203 of the AWSA, Reclamation is the lead Federal agency responsible for NEPA compliance. This EA will include all the information required for Reclamation and the BIA to approve their respective Federal actions for any action alternative(s) selected for rehabilitation of SCIP facilities in Phase 2 Reaches 1–3 to meet the purpose and need and legal requirements of the AWSA and the Settlement Agreement.

Congress designated Reclamation as the lead Federal agency for oversight of the construction and rehabilitation of SCIP authorized by the AWSA. Congress also provided that, except as expressly provided by Section 203 of the AWSA, nothing in the AWSA affects the responsibility of the U.S. Secretary of the Interior under the San Carlos Act of June 7, 1924, or any other financial responsibility of the U.S. Secretary of the Interior relating to operation and maintenance of SCIP existing on the date of enactment of the AWSA. The BIA is the delegated authority for the U.S. Secretary of the Interior's obligations and responsibilities for SCIP. Federal actions necessary to the rehabilitation of SCIP facilities in Phase 2 Reaches 1–3, which are addressed in this EA, include:

- Review and approve final engineering designs for construction under Phase 2 Reaches 1–3 (Reclamation)
- Award funds and approve contractual documents for construction of the irrigation facilities under Phase 2 Reaches 1–3 (Reclamation)
- Where necessary, issue easements/rights-of-way for new encroachments to CAP facilities (Reclamation)
- Review and accept title on behalf of the United States (Reclamation/BIA), and, where necessary, acquire land (Reclamation), consistent with the February 11, 2010, Memorandum of Agreement entered into between the Department of the Interior and SCIDD (2010 MOA), to new lands and easements/rights-of-way acquired for the final footprint of the irrigation facilities constructed as part of Phase 2 Reaches 1–3
- Approve encroachment permits for new third-party facilities or existing third-party facilities that require relocation (BIA)
- Approve temporary or permanent relocations of BIA utility facilities affected by construction (BIA)
- Approve dry-up schedules required for construction of the irrigation facilities under Phase 2 Reaches 1–3 (BIA)
- Enter into certain agreements with third-party beneficiaries for joint use of certain facilities and access as addressed in this EA (e.g., joint use agreement with Pinal County for Diversion Dam road) (BIA)

1.6 PUBLIC INVOLVEMENT

1.6.1 Scoping

The CEQ defines scoping as "an early and open process for determining the scope of issues to be addressed and for identifying significant issues related to a proposed action" (40 CFR § 1501.7).

Scoping, which encourages public input and helps focus the environmental impact analysis on relevant issues, is an important foundation to the NEPA process. Distribution of scoping information typically announces the beginning of the public component of the NEPA process.

As mentioned in Section 1.1, public scoping for the originally proposed Phase 2 Reaches 1–4 was initiated in 2010. A Notice of Intent (NOI) to prepare EIS and notice of public scoping meeting was published in the Federal Register on August 31, 2010 (75 FR 168:53332–53333). Reclamation also distributed an initial scoping notice soliciting public comment on the proposal to potentially interested individuals, organizations, Tribes, and agencies on that same date, posted it on Reclamation's Phoenix Area Office website (http//:www.usbr.gov/lc/phoenix), and submitted a news release regarding the proposal to 12 news media outlets, including *The Arizona Republic* and the *Florence Reminder & Blade-Tribune* newspapers on August 25, 2010. The news release, the Federal Register NOI, and Reclamation's scoping notice are included in Appendix A. The NOI described a proposal to rehabilitate and line up to 40 miles of major canals, such as the Florence–Casa Grande, Casa Grande, and North Side canals, along with construction of new check structures and cross-drainage features.

Reclamation held a scoping meeting to solicit public and agency input on September 18, 2010, at the City Council Chambers in Coolidge, Arizona. Notification of this meeting was included in each of the previously referenced outreach efforts. Three individuals attended the scoping meeting: one local rancher and two representatives of the City of Casa Grande.

In addition to the previously referenced scoping meeting, SCIDD hosted an open house on May 17, 2012, at the SCIP office in Coolidge. Representatives from SCIDD, Reclamation, and the engineering team were available to meet with interested members of the public to discuss the project. A list of attendees to the two public meetings is on file at Reclamation's Phoenix Area Office as part of the administrative record for the project.

The lead agency is ultimately responsible for determining the scope of an environmental document (36 CFR § 46.235). During internal and external (public) scoping, environmental issues identified by program specialists, other agency staff, and the public helped Reclamation define the range of resource topics that are addressed in the NEPA document and served as the basis for developing mitigation.

The following environmental issues were identified as a result of internal and public scoping:

- Effects to biological resources, including special status species (Section 3.11)
- Effects to air quality (Section 3.14)
- Effects to land use and ownership (Section 3.2)
- Socioeconomic considerations (Section 3.5)
- Effects to cultural resources (Section 3.6)
- Effects to Indian Trust Assets (ITAs) (Section 3.7)
- Effects to water resources (Section 3.9)

Public and agency responses received during the scoping process and a table summarizing the comments and Reclamation's responses are included in Appendix B. Eight agencies submitted written responses. No written responses were received from the public.

1.6.2 Notice of Cancellation to Prepare a Draft EIS

Subsequent to the EIS scoping process, notable changes were made to the design and size of the Proposed Action (refer to Section 1.1). Based on the reduction in scope and construction footprint, potential impacts, and the lack of substantive comments received during public scoping, Reclamation concluded that an EA would be appropriate for the redesigned Proposed Action and that no further scoping beyond that conducted for the initial EIS would be necessary.

A Notice of Cancellation to Prepare a Draft EIS for the San Carlos Irrigation Project, Arizona, was published in the Federal Register on September 14, 2016 (81 FR 178:63204) (Appendix C).

1.6.3 Draft EA

A Draft EA was prepared addressing the change in project scope and construction footprint. Reclamation made the Draft EA available for public review during a formal public comment period from May 17 through June 2, 2017. Two methods were used to notify the public and agencies of the Draft EA's availability and the opportunity to attend a public meeting:

- A Notice of Availability of Draft EA and Public Meeting (Appendix C) was mailed on May 15, 2017, to 44 agencies and entities and 92 adjacent landowners.
- A public notice was published in the Coolidge Examiner on May 17, 2017, and in the Florence Reminder & Blade on May 18, 2017 (Affidavits of Publication, Appendix C).

The Draft EA was posted on Reclamation's Phoenix Area Office website at http://www.usbr.gov/lc/phoenix/. Paper copies of the Draft EA were available for public review and inspection at the Bureau of Reclamation Phoenix Area Office (6150 West Thunderbird Road, Glendale, Arizona). Reclamation made paper copies and CDs of the Draft EA available upon request.

The public meeting was held during the formal public comment period (6 to 8 p.m. on Wednesday, May 24, 2017, in the Coolidge Council Chambers, 911 South Arizona Boulevard, Coolidge, Arizona). No guests attended the meeting.

One public response and two agency responses to the Draft EA were received during the formal comment period via email on May 24, 2017. A summary of the comments received and Reclamation's responses are included in Appendix C.

2.0 DESCRIPTION OF ALTERNATIVES

This chapter describes the alternatives considered for rehabilitation of Phase 2 Reaches 1–3 of the San Carlos Irrigation Project: the No Action alternative, the Proposed Action, and one additional action alternative. At the end of this chapter, the alternatives considered but eliminated are summarized.[2]

The main distinctions between the Proposed Action and the other "action" alternative evaluated in this EA are the proposed alignments of the main canal system and drainage management facilities, and the management of irrigation water during construction. Under the Proposed Action, the main canal system would follow the alignment of the Florence Canal. Under the other action alternative, the main canal system would follow the alignment of the existing FCG Canal. With either action alternative, the main canal system would be concrete-lined to reduce water seepage and conveyance losses. To the extent practicable, each alternative would establish dedicated (i.e., separate) facilities for the conveyance of cross drainage from storm runoff and excess flows diverted from the Gila River. These facilities would be generally parallel to, and separate from, the main canal.

2.1 EXISTING INFRASTRUCTURE AND OPERATIONS

The existing main canal system is 71.7 miles long and extends from Ashurst–Hayden Diversion Dam to I-10. It is composed of the FCG Canal (which currently functions as the main canal system), the Florence Canal (which currently functions as a primary lateral), the FCG Canal Extension, and the Casa Grande Canal. The construction of Phase 2 Reaches 1–3 would improve the portion of this system from the sediment settling basin just downstream of Ashurst–Hayden Diversion Dam to just west of Picacho Reservoir (a prominent water storage facility located about midpoint in the main canal system) (refer to Figure 3).

Historically, BIA schedules an annual dry-up for the SCIP system for a 5-week period in November to allow for the annual inspection and maintenance of BIA's facilities. During this time, water is not released by the BIA from San Carlos Reservoir (except as required under the Gila Decree to meet a call by Asarco), diverted from the Gila River into the project, or released into the project from the CAP.

In collaboration with the agricultural water users who rely on the Joint Works delivery system, a modified water outage for construction and maintenance, now known as the 5-3-5 dry-up schedule, was developed to accommodate construction. This refers to a water system outage of five weeks to allow for accelerated construction, inspection, and maintenance, followed by three weeks of sufficient irrigation flows through the targeted reach to rotate and serve lands that need to be irrigated (referred to as the wet-up period), followed by a second outage of five weeks for continued accelerated construction, inspection, and maintenance. At the conclusion of the 5-3-5 dry-up schedule, the system operations return to normal service and the contractor can proceed with construction of facilities for which a water outage is not required.

[2] Due to the length of the canal system, it has been divided into reaches for ease of discussion in the EA. The reach terminology was developed for use in the EA and does not necessarily reflect the terminology used in the project plans.

Figure 3. Existing SCIP irrigation system

Use of the 5-3-5 dry-up schedule began in 2010 and continued through 2016. Rehabilitation of Joint Works facilities and Gila River Indian Community P-MIP facilities, including the CAP Connection Pima Feeder Canal, FCG Canal Confluence, Pima Canal Chute, Pima Main Stem Off-Reservation, and portions of the Joint Works laterals, were constructed under this 5-3-5 dry-up schedule. The 5-3-5 dry-up schedule would be the normal pattern of dry-ups to the system in the future for those years when construction is required.

2.1.1 Existing Main Canal Infrastructure—Ashurst–Hayden Diversion Dam to Picacho Reservoir

FCG Canal

The FCG Canal, which currently serves as the main irrigation canal in the system, begins at Ashurst–Hayden Diversion Dam and extends west and then south a distance of 22.1 miles to an inlet to Picacho Reservoir. From there, the continuation of this canal is referred to as the FCG Canal Extension. The capacity of the FCG Canal is estimated to be approximately 1,250 cubic feet per second (cfs). Under the current condition, storm water flows from the east and excess flows from the Gila River are conveyed in the FCG Canal along with irrigation water to Picacho Reservoir. Roughly 4.6 miles downstream of Ashurst–Hayden Diversion Dam, a turnout from the FCG Canal facilitates water delivery to the Northside Canal, and 0.2 mile farther downstream, a turnout structure diverts water to the Florence Canal.

A key component of the SCIP water conveyance system is China Wash Flume, an open-channel in-line flume structure of the FCG Canal that conveys irrigation water diverted from the Gila River over the China Wash streambed for deliveries downstream. It was constructed around 1925. It has far exceeded its design life, and poses a notable risk of failure in the future. The flume was rehabilitated in 2006 to extend its useful life by 10 to 15 years, with the expectation that the flume would be addressed as part of Phase 2 SCIP rehabilitation. The flume is a reinforced concrete structure with four 12-foot-diameter by 6-inch-thick reinforced concrete semicircular barrels. The barrels are suspended from five reinforced concrete arches by nominal steel suspension rods encased in concrete.

Just upstream of China Wash Flume is a critical flow concrete Parshall flume that serves as the legal measurement station for the Call System of the Gila Decree to account for diversions from the Gila River to SCIP. The unit is an adopted U.S. Geological Survey (USGS) gaging station under contract with the Gila Water Commissioner and is used to record flow measurement data for administration and enforcement of the Gila Decree. An active direct-current electric fish barrier with a concrete structure control section is also located just upstream of the China Wash crossing. The electric fish barrier is operated in accordance with a 2008 Biological Opinion. The barrier was installed to hinder or prevent upstream movement of nonindigenous fish and other aquatic organisms from the CAP canal to surface waters of the Gila River basin.

Florence Canal

The 17.2-mile Florence Canal currently serves as a primary lateral that parallels the FCG Canal. It delivers water from the FCG Canal to irrigation laterals and field turnouts along its length. It originates at the turnout from the FCG Canal, which is just downstream of the CAP crossing, and

extends southwest and then south, where it currently dead-ends north of Picacho Reservoir. The capacity of the Florence Canal is estimated to range between 40 and 80 cfs.

Picacho Reservoir

Picacho Reservoir was built in the late 1880s for water storage and flow regulation (Pfaff 1996). Prior to completion of the FCG Canal in 1928, the reservoir received water from the Florence Canal and discharged water to the Casa Grande Canal. The current configuration of the reservoir reflects a major rehabilitation completed in 1956 that increased the storage capacity of the reservoir to 18,000 AF. Under current operations, Picacho Reservoir receives water from the FCG Canal through a gated inlet structure and discharges to the Casa Grande Canal through a gated outlet works. The gated inlet structure and the reservoir embankments are in poor condition. Siltation and vegetation have significantly reduced storage capacity and hampered operational efficiency. Water levels are highly variable with little to no water storage occurring in some years.

2.1.2 Existing Main Canal Infrastructure—Picacho Reservoir to I-10

The rehabilitation of the FCG Canal Extension and the Casa Grande Canal downstream of Picacho Reservoir are not part of the current action evaluated in this EA. Because the Phase 2 Reach 1–3 improvements would tie into these canals for downstream deliveries, a description of them follows (refer to Figure 3).

FCG Canal Extension

The FCG Canal Extension begins at the Picacho Reservoir inlet and ends downstream just beyond I-10—a distance of 18 miles. It is used to supplement conveyance capacity of the Casa Grande Canal and to carry intercepted cross drainage and excess flows downstream. Storm water from the south is intercepted by the FCG Canal Extension and conveyed to a Federal Emergency Management Agency (FEMA) drainage channel west of I-10. The capacity of the FCG Canal Extension is estimated to be approximately 150 cfs.

Casa Grande Canal

The Casa Grande Canal is the main irrigation canal downstream of Picacho Reservoir. It begins at the outlet on the west side of Picacho Reservoir and extends beyond the study area to the west. From Picacho Reservoir to I-10, the Casa Grande Canal totals 14.3 miles. The capacity of the Casa Grande Canal is estimated to be approximately 200 cfs.

2.2 NO ACTION

A No Action alternative must always be evaluated in a NEPA document (40 CFR § 1502.14). "No action" represents a projection of current conditions and reasonably foreseeable actions to the most reasonable future conditions that could occur during the 50-year life of the project without any action alternatives being implemented. The No Action alternative provides a baseline for comparing the environmental effects associated with the Proposed Action and any other action alternatives.

Other than the potential to rehabilitate or replace China Wash Flume, the No Action alternative assumes that, no reconstruction, realignment, or lining of the canal system, as proposed under Phase 2 Reaches 1–3, would be implemented. With the No Action alternative, irrigation water and storm water would continue to be combined and conveyed through a system of parallel, unlined canals. Repair and maintenance of existing facilities would continue into the foreseeable future.

It is assumed that China Wash Flume would either be rehabilitated or replaced at some point in the future based on its age and condition. The existing China Wash Flume structure was constructed around 1925 with a 50-year design life, which has been extended through minor rehabilitation projects. Due to age and wear, its deterioration has accelerated as its structural elements (concrete and steel) have been subjected to physical and natural effects.

To date, the flume has been subjected only to superficial investigations and resulting types of mitigation. A more analytical and/or invasive forensic investigation (e.g., X-ray, coring, chemical testing, finite analysis) would be necessary to determine the condition of the elements that are not visible. Though rehabilitation could postpone the need, it is assumed that full replacement of the flume would be required at some future time. If the forensic analysis results indicate there are unsafe and substantial structural integrity issues that require major structural rehabilitation to prevent failure, then rehabilitation may be infeasible. No specific plans have yet been developed for rehabilitation or replacement under the No Action alternative.

It is also assumed that some segments of District laterals would be relocated, lined, piped, and/or abandoned, as needed, to accommodate roadway improvements and new residential, commercial, and industrial development in, and adjacent to, the communities of Coolidge and Florence. If needed, separate NEPA compliance would be undertaken at the time Federal actions are proposed to address the impacts of any such rehabilitation, replacement, relocation, and related activities.

With the No Action alternative, water would not be conserved, water delivery would not be improved, and the operational efficiencies and economies of consolidating the conveyance infrastructure into a shorter system of adequately sized canals would not be realized. The No Action alternative would not be consistent with the purpose and need to implement the rehabilitation activities for SCIP and would violate the AWSA (refer to Section 1.2).

2.3 FLORENCE CANAL ALTERNATIVE (PROPOSED ACTION)

Under the Proposed Action, the upper segments of the FCG Canal and the entire alignment of the Florence Canal would be rehabilitated and lined to serve as the new main canal system. Irrigation laterals would be fed directly from this main canal system. Downstream of the existing turnout with the Florence Canal, the existing FCG Canal would be used to manage cross drainage and irrigation flow mismatches that occur. This would protect the canal system when there is more flow diverted from the Gila River than is needed to fill irrigation orders—during emergency conditions, for example.

The Proposed Action would maximize operational efficiencies and economies of scale by reducing the total number of miles of the main canal delivery system from that of the existing system (described in Section 2.1). Additional considerations in developing the Proposed Action

focused on reducing the size of construction areas and improving constructability (the ease with which a project can be constructed). With this alternative, the FCG Canal could be used to convey irrigation deliveries during rehabilitation of the Florence Canal.

With this alternative, the main delivery system in Reaches 1–3 would total 26.0 miles of canal delivery system (24.4 miles of concrete-lined canal and 1.6 miles of temporary earthen canal). This length is 16.1 miles less than the existing unlined main canal delivery system in Phase 2 Reaches 1–3, which is composed of the FCG Canal, the Florence Canal, and a segment of the FCG Canal Extension. Components of the Proposed Action are described in Sections 2.3.1–2.3.7.

The existing Casa Grande Canal and FCG Canal Extension in Phase 2 Reach 4 (beyond the limits of this Proposed Action) would be used for water deliveries downstream of Reaches 1–3 until such time as the planned improvements to the Casa Grande Canal are undertaken. The Casa Grande Canal currently does not have adequate capacity to serve as the main canal west of Picacho Reservoir.

The overall construction duration of Phase 2 Reaches 1–3 under the Proposed Action would be expected to be roughly five years (refer to Section 2.3.7), assuming an inverted siphon system is used to cross China Wash. The duration would be longer with the option to cross China Wash with a flume. Section 2.3.1 describes these two subalternatives for crossing China Wash. Section 2.3.7 describes the management of water delivery during construction.

2.3.1 Proposed Action Reach 1—Settling Basin Outlet to Florence Canal Turnout

Reach 1 of the Proposed Action is 3.8 miles long. It would begin at the downstream limits of the recently completed Phase 1 project on the FCG Canal (near the outlet of the settling basin downstream of the headworks of the FCG Canal). For discussion purposes, Reach 1 has been divided into three sub-reaches (Figure 4). Reach 1 would be designed to convey 950 cfs, lined with 3.0-inch-thick unreinforced concrete to minimize seepage losses, and constructed with a more hydraulically efficient cross section than the existing FCG Canal through this segment. The cross section would have 1.5-foot horizontal to 1-foot vertical (1.5:1) side slopes. In Reaches 1A and 1B, under certain conditions, the reconstructed canal would commingle irrigation water and drainage[3].

The downstream limit of Reach 1 is defined by a new bifurcation structure that would be located in the vicinity of the existing turnout to the Florence Canal. Under normal operating conditions, this bifurcation structure would direct irrigation water into the Florence Canal, which would serve as the main canal. Floodwaters or flows in excess of the capacity of the new canal segment would be conveyed downstream in the FCG Canal to Picacho Reservoir. For larger storm events, floodwaters could be released to the Gila River from Reach 1.

[3] "Drainage" is used in this document to refer to cross drainage collected from runoff downstream of Ashurst–Hayden Diversion Dam and excess flows from the Gila River.

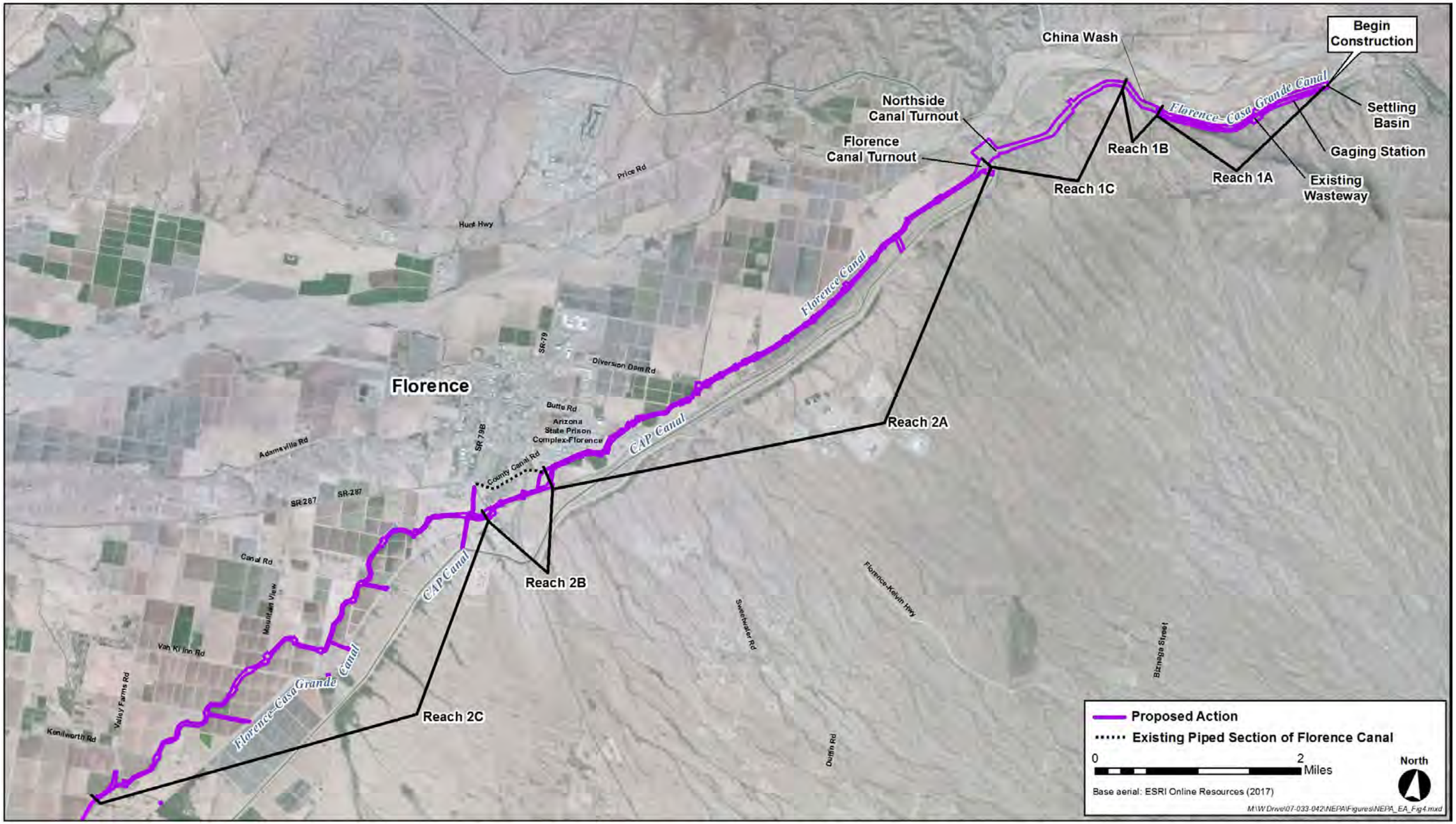

Figure 4. Proposed Action Reaches 1 and 2

For the entire length of Reach 1, an operation and maintenance road with a 16-foot minimum width would be constructed on each side of the main canal. Bridges across the canal would be spaced at appropriate locations for maintenance and to facilitate the movement of wildlife.

Upstream of the CAP canal crossing, wildlife and tortoise fencing would be installed along portions of both sides of the new concrete-lined main canal, combined with animal escape ramps to minimize the potential for wildlife drowning. The typical width of the reserved (existing) right-of-way for Reach 1 is 225 feet.

Reach 1A

Reach 1A work would consist of construction of a new concrete-lined main canal within the FCG Canal right-of-way, for a distance of 1.9 miles. The new canal would be north of the existing FCG Canal, running parallel, adjacent to, and, in some portions, partially overlapping the existing FCG Canal section.

Following construction of this segment of the new main canal, the existing, unlined FCG Canal in this reach would be dedicated to storm water management and conveyance. Cross-drainage flows from storm water runoff would be collected in this existing segment of the FCG Canal. For minor storm events, these drainage flows would be impounded; for larger storm events, they would discharge to the new, lined main canal. A berm would be constructed on the south side of the FCG Canal, south of the end of Reach 1A, to impound and direct cross drainage to the FCG Canal through a spillway. Excess FCG Canal flows would then be discharged to the Gila River through an existing irrigation wasteway (channel) (refer to Figure 4). The existing radial gate at this location would be replaced with a new multi-slide gate and spillway structure.

Reach 1B

At the beginning of Reach 1B, the new parallel main canal segment constructed in Reach 1A would tie back into the existing FCG Canal channel. The segment of main canal in Reach 1B would extend approximately 0.3 mile downstream from the end of Reach 1A.

The China Wash open-channel, in-line flume structure, which carries canal flows over China Wash, is in Reach 1B. Under either action alternative, this existing structure would be replaced. Two replacement subalternatives are being considered: Subalternative A—replacement of the existing flume with an inverted siphon system, and Subalternative B—replacement of the existing flume with a new open-channel in-line flume structure.

Subalternative A—Replacement of China Wash Flume with an Inverted Siphon System

Under Subalternative A, the existing China Wash Flume would be removed. A siphon system consisting of two 9-foot-diameter pipes would be constructed in place of the flume to convey irrigation water under China Wash. The pipes would be buried below the scour depth of China Wash for added protection. The new installation would extend beyond the current footprint to allow for a smooth hydraulic transition. One pipe would have no flow control gates; the other pipe would have a flow control gate on the inlet and on the outlet. To address water quality and sediment management concerns, most of the time only one pipe (the pipe barrel without the flow control gates) would be open

to keep flow velocities as high as possible to pass the sediment through the pipes. When irrigation flows are higher, the flow control gates on the second pipe would be opened to accommodate the higher flows. The siphon system was designed in conjunction with a modified canal profile and a new flow measurement structure. A siphon alternative evaluated in 2014 and documented in Draft Technical Memorandum No. 1, China Wash Structural Evaluation and Replacement Options (GEI Consultants, Inc. 2014), identified sediment management and the potential for plugging as possible operations and maintenance concerns. The two-pipe siphon of Subalternative A was designed to be self-scouring. Under Subalternative A, flows below 130 cfs, however, may result in sediment deposition, which would require monitoring and possibly mechanical removal (refer to Indian Trust Assets, Section 3.7, for discussion of how these operation and maintenance issues would be addressed).

The modified canal profile would incorporate new hydraulic conditions that would create passive fish barriers (physical drop) at the turnout to the Northside Canal and at the end of Reach 1C. These passive physical fish barriers would replace the existing electric fish barrier, which would be removed.

The existing USGS flow measurement structure/gaging station would also be removed. A new measurement structure/gaging station, possibly a broad-crested weir (ramp flume), would be installed upstream of the new siphon in a straight segment of canal. The gaging station would meet irrigation industry measurement standards and the specifications requested by the USGS. This type of device is currently used in other locations of the project because of its accurate flow measurement, hydraulic efficiency, and ability to pass sediment. Construction of this type of flow measurement structure farther upstream would reduce the potential effects of any backwater generated from the wash crossing, enhance the accuracy of measurement, and reduce the need for calibration.

Construction could be accommodated using a modified water outage for construction and maintenance (refer to Section 2.3.7), without additional canal outages. This subalternative would provide a 50-year design service life.

Subalternative B—Replacement of China Wash Flume with a New Open-Channel Flume

Under Subalternative B, the existing China Wash Flume would be replaced with a new open-channel in-line flume, which would carry project water downstream within the FCG Canal. This subalternative assumes that the existing abutments, footings, and flume associated with the existing structure would be replaced.

Sediment deposition in China Wash would continue to reduce flow capacity of the wash under the flume, which would be expected to require ongoing maintenance to clean out the sediment. The existing profile is limiting, restricting maintenance to small, inefficient equipment. Under Subalternative B, the flume would continue to be subjected to uplift forces from China Wash during high flows. The structure would need to be designed to handle additional lateral pressures from China Wash flows against the structure.

Under current conditions, access to the settling basin and Ashurst-Hayden Dam is cut off whenever there are runoff flows through China Wash. With Subalternative B, a box culvert could be constructed in the wash to pass China Wash flows under the flume. An access road could be constructed adjacent to the flume to provide vehicular access to the settling basin and Ashurst–Hayden Diversion Dam when China Wash is flowing. The existing low-water crossing could then be abandoned.

As with Subalternative A, the canal profile would be altered. The new hydraulic conditions would allow the design of a passive fish barrier (physical drop) at the end of Reach 1 and at the turnout to the Northside Canal. These passive fish barriers would replace the existing electric fish barrier, which would be removed.

Maintaining canal deliveries during construction of the open-channel in-line flume is not considered feasible due to the prohibitive cost of using bypass pumping; therefore, construction of the new flume could require a full shutdown of the canal for the duration of the flume's construction (estimated at six months). Double-shift construction manpower could be employed for Subalternative B to reduce the duration of construction and reduce the potential for associated impacts on water users during full shutdowns of the canal system.

Cast-in-place methods could be used to construct the box culverts beneath the existing flume structure. This could be done while flows continued to be conveyed through the existing flume, thereby eliminating the need to discontinue water deliveries during this stage of construction.

A box culvert would restrict the flow capacity of the wash and would cause water to pond upstream of the flume, similar to the existing structure. The flow capacity in the wash beneath the flume would be slightly less than the existing structure, and the new flume would need to be designed to handle the transverse loads imposed by water ponding upstream of the flume. The box culverts would likely require frequent clearing of sediment deposits and debris. Access to the wash by heavy equipment upstream of the flume would also be restricted.

The USGS flow measurement structure/gaging station would not necessarily need to be relocated under Subalternative B. Following construction of the new open-channel in-line flume, the measuring flume would need to be checked and recalibrated if it is not replaced. Subalternative B would provide a 50-year design service life.

Downstream of China Wash, the reconstructed main canal would continue within the existing FCG Canal channel through a section of difficult terrain (bedrock and a mix of soil and boulders). This difficult terrain would limit the use of traditional canal construction methods in this area; therefore, the canal cross section would be wider than in other areas and would be concrete-lined by hand instead of using machine methods.

Reach 1C

Reach 1C extends approximately 1.6 miles downstream from the end of Reach 1B. The new canal would be constructed in the existing right-of-way of the FCG Canal, parallel to and north

of the existing FCG Canal channel. A new bifurcation structure would be constructed at the end of Reach 1C, in the vicinity of the existing turnout to the Florence Canal. The new bifurcation structure would be composed of overshot gates. Under normal operating conditions, this bifurcation structure would direct irrigation water into the Florence Canal. Flood waters or flows in excess of the capacity of the new canal segment would be directed to the existing FCG Canal, which would convey the flows to Picacho Reservoir.

The new bifurcation structure would be composed of overshot gates and would provide an effective barrier to fish migration upstream. The height of the gates would range from 5.00 to 7.25 feet above the downstream canal bottom. The velocity of flows over the top of the gates would also strengthen its barrier effect through the range of operational flows in the canal. The previously referenced physical drop at the turnout to the Northside Canal in a similar concept would also serve the function of the existing electric fish barrier.

2.3.2 Proposed Action Reach 2—Florence Canal Turnout to Pima Lateral

Under the Proposed Action, Reach 2 would total 11.6 miles in length. Throughout Reach 2, the new main canal would use the Florence Canal alignment; it would be designed to convey 950 cfs and would be lined with 3.0-inch-thick unreinforced concrete. The canal section would have 1.5:1 side slopes. For the entire length of Reach 2, a minimum 16-foot-wide operation and maintenance road would be constructed on each side of the canal. No wildlife fencing is proposed in Reach 2; much of this reach would parallel the CAP canal, which provides a barrier to wildlife access. In addition, other portions pass through urbanized and agricultural lands, and do not extend through sensitive habitat for tortoise or other wildlife. The typical width of the reserved (existing) right-of-way for Reach 2 is 200 feet.

At the end of Reach 2, a new 625-cfs-capacity interconnect (turnout and check structure) would be installed to allow conveyance of a portion of project water to the Pima Lateral, a canal that serves Gila River Indian Community farmland and, to a lesser extent, SCIDD farmland.

After rehabilitation, the primary function of the FCG Canal through Reach 2 would shift to the conveyance of storm drainage and excess irrigation flows.

For purposes of the EA, Reach 2 has been divided into three sub-reaches (refer to Figure 4).

Reach 2A

A 5.2-mile segment of the existing Florence Canal—Reach 2A—would be enlarged and lined with concrete.

Reach 2B

Downstream of Reach 2A, a segment of the existing Florence Canal falls within a particularly narrow section of right-of-way through the town of Florence where flows are run through a buried pipeline. For Reach 2B, the main canal alignment would be relocated south of the town in a new, open concrete-lined channel for a distance of 0.9 mile, as depicted in Figure 5. The realignment would require new crossings of State Route (SR) 79 and SR 79 Business (SR 79B). Three crossing methods for this option are under consideration: (1) tunnel under the roadway, (2) cut an open trench and install the pipeline across the roadway, or (3) bridge the canal. Following construction, the existing pipeline would be maintained as a lateral to deliver irrigation water to adjacent farmland.

Reach 2C

In Reach 2C, the main canal would return to the existing Florence Canal alignment. The existing canal would be enlarged and lined with concrete for 5.5 miles, similar to the work proposed in Reach 2A.

As mentioned, a new 625-cfs-capacity interconnect (turnout and check structure) would be installed to allow conveyance of a portion of project water to the Pima Lateral. The Gila River Indian Community has the first right to receive up to 625 cfs of project water in times of flow that would have produced 1,250 cfs or greater, should the Gila River Indian Community wish to call for that water at that time. SCIDD would have rights to 175 cfs, or up to 375 cfs in surcharged channel conditions (those limited times when water is allowed to flow through the canal at a higher than standard design capacity).

2.3.3 Proposed Action Reach 3—Pima Lateral to Picacho Reservoir

Under the Proposed Action, Reach 3 would total 10.4 miles in length and would use the Florence Canal alignment (Figure 6). The typical width of the reserved (existing) right-of-way in Reach 3 is 200 feet. In Reach 3, irrigation water not diverted to the Pima Lateral would continue downstream in the Florence Canal, crossing under the Pima Lateral through a new, 400-cfs siphon, which was constructed as part of the P-MIP Pima Canal project. The main canal would continue along the Florence Canal to its existing terminus. From there, new canal segments would be constructed to connect the new main canal system to the Casa Grande Canal and the Florence Casa Grande Canal Extension. A minimum 14-foot-wide operation and maintenance road would be constructed on each side of the canal throughout Reach 3. The primary function of the FCG Canal along Reach 3 would be the conveyance of storm drainage and excess Gila River flows; it would remain unlined. The existing inlet to Picacho Reservoir would be rehabilitated, including the replacement of gates and minor repairs to the structure, if needed. The existing outlet from Picacho Reservoir to the Casa Grande Canal would be maintained for future use, as warranted.

Figure 5. Realignment of Florence Canal and land acquisitions with Proposed Action

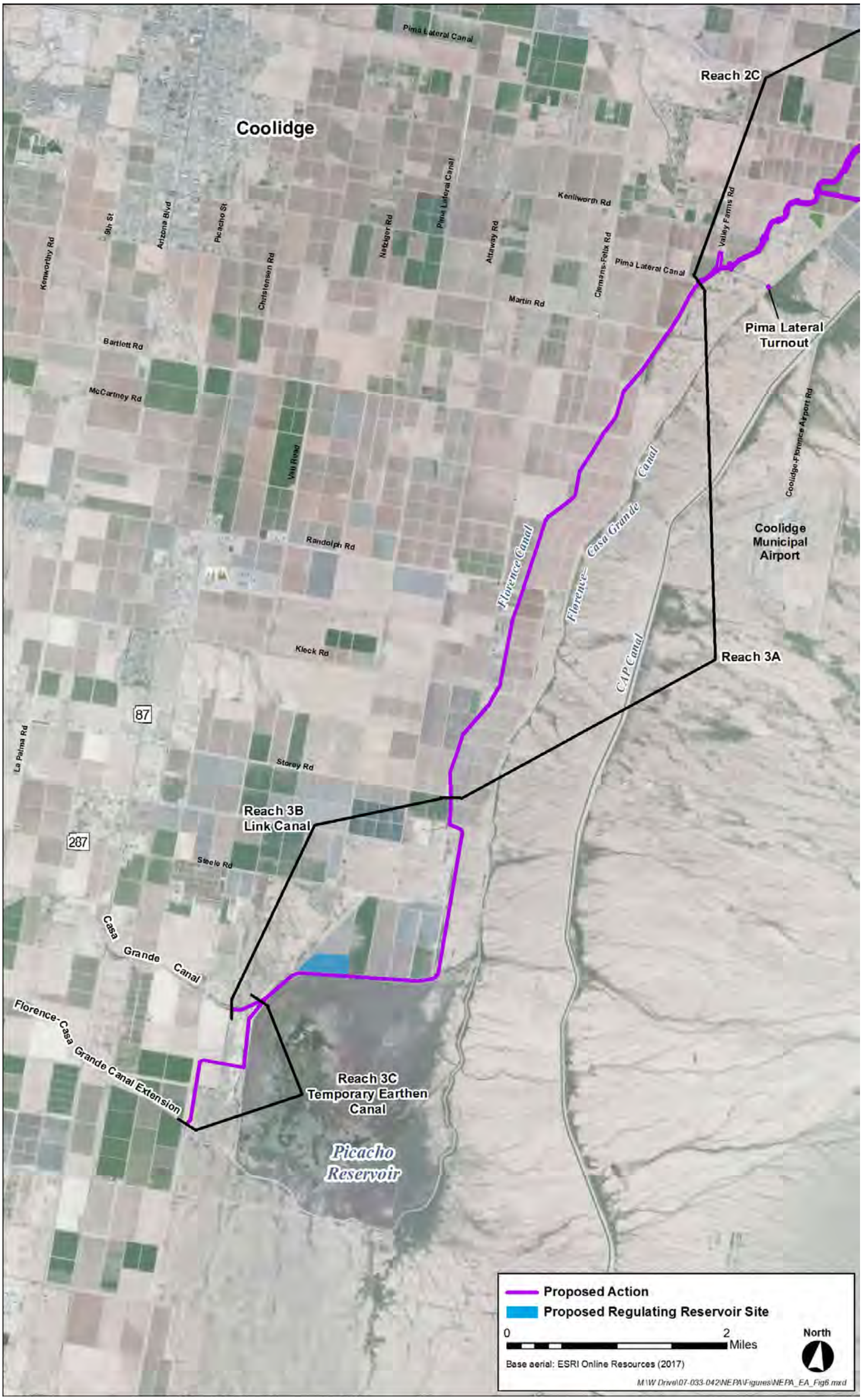

Figure 6. Proposed Action Reach 3

Reach 3A

In Reach 3A, 5.3 miles of the Florence Canal would be reconstructed and lined to a design capacity of 400 cfs, from the end of Reach 2 to the existing terminus of the Florence Canal (north of Picacho Reservoir at Storey Road).

Cross drainage upslope of the FCG Canal along Reach 3A would be intercepted by the FCG Canal and conveyed downstream to Picacho Reservoir. Cross drainage from the area between the FCG Canal and the Florence Canal would be passed under or over the new main canal.

Reach 3B

A new 3.5-mile segment of canal, referred to in this document as the link canal—Reach 3B—would be constructed. It would extend due south from the existing terminus of the Florence Canal to the Picacho Reservoir, then go west and south following the northern berm of the reservoir to connect to the Casa Grande Canal (refer to Figure 6). The link canal would not be affected by cross drainage because those flows would be intercepted by Picacho Reservoir.

In Reach 3B, the new main canal would be designed to convey 400 cfs. The new main canal would be lined with 3.0-inch-thick unreinforced concrete and would have 1.5:1 side slopes.

Along the proposed link canal, a mid-system regulating reservoir would be constructed on a site of approximately 46 acres (refer to Figure 6). The reservoir itself would be about 19 acres in size, and would be lined with soil cement or a geomembrane lining (an impermeable membrane used to block the migration of fluids) topped with shotcrete slope protection or other suitable liner. Storage capacity of the reservoir would be approximately 300 AF.

The reservoir would provide a means to regulate flows to reduce variability and to allow improved delivery flexibility. This regulating reservoir would supplement the water storage capacity of Picacho Reservoir. Controls would be installed in the link canal to ensure conveyance of irrigation water downstream; excess flow would spill to the new reservoir by gravity. Water stored in the new reservoir could be supplied to downstream farmland by gravity releases, as needed, in response to water delivery demand.

Reach 3C

The capacity of the existing Casa Grande Canal is approximately 200 cfs. It would not be able to handle all the flows being carried by the new main canal, which would have a capacity of 400 cfs. Rehabilitation of the Casa Grande Canal is planned to occur during Phase 2 Reach 4 of SCIP Rehabilitation. To allow downstream water deliveries after construction of Phase 2 Reaches 1–3, a 900-foot-long (0.2 mile) segment of new lined canal will be constructed to connect the link canal with the existing Casa Grande Canal. In addition, a new, interim earthen canal of 1.6 miles in length would be constructed to temporarily convey irrigation water in excess of 200 cfs from the end of new link canal to the existing FCG Canal Extension. Under Phase 2 Reaches 1–3, the Casa Grande Canal and the FCG Canal Extension would be used for downstream delivery until such time as the planned improvements to the Casa Grande Canal (Phase 2 Reach 4) are undertaken.

2.3.4 Proposed Action—Land Acquisition

Approximately 144 acres of land would need to be acquired for the Proposed Action. Fifteen acres of this land would be needed to realign the piped segment of the Florence Canal in Reach 2 south of Florence (1 acre of Arizona Department of Transportation land and 14 acres of private land) (refer to Figure 5). Also in Reach 2, 1 acre of private land would need to be acquired for a new future pipeline between the Florence Canal and Well 80 (Figure 7). In Reach 3, 129 acres would be needed for the link canal, the regulating reservoir, and the new temporary earthen canal (30 acres of Arizona State Land Department trust land, 26 acres of Pinal County Flood Control District land, 18 acres owned by the City of Mesa, and 55 acres of private land)(Figure 8).

The construction area evaluated in this EA includes land outside the reserved right-of-way that could be used by the contractor during construction for stockpiling, utility relocations, etc. In Reach 2, 107 potential temporary construction easement areas have been identified, totaling 50 acres. In Reach 3, 34 potential temporary construction easement areas have been identified, totaling 10 acres. These potential temporary construction easement areas are reflected in the mapping in Appendix D.

2.3.5 Proposed Action—Additional Project-Related Actions

The rehabilitated main canal system would include multiple turnouts to laterals for irrigation water delivery throughout the SCIDD service area. A number of new check structures would be incorporated into this system to control the water level, facilitate canal operations, and measure flows. Downstream of Reach 1, all laterals would be served directly by turnouts from the rehabilitated Florence Canal.

Supervisory control and data acquisition (SCADA) infrastructure, including repeater towers, would be installed along the canal alignments to allow remote control and monitoring of check structures and other facilities. Approximately ten 15-foot-tall repeater towers would be required.

Escape ladders would be installed at 375-foot intervals on alternating sides of the new concrete-lined main canal. Safety buoys and escape ladders would be installed at the entrances to siphons, large check and drop structures, and major road crossings.

Upstream of the CAP canal crossing, wildlife and tortoise fencing would be installed along both sides of the new concrete-lined main canal, where terrain permits, to minimize the potential for wildlife drowning. Wildlife escape ramps would be constructed in areas where fencing is not feasible. In addition, SCIDD has committed to implementing an adaptive management program that would assess wildlife mortality once the new facilities are placed into operation. Additional escape ramps would be constructed, if warranted. Bridges across the canal would be spaced at appropriate locations for maintenance and to facilitate wildlife movement.

Figure 7. Land acquisition—Well 80, Reach 2

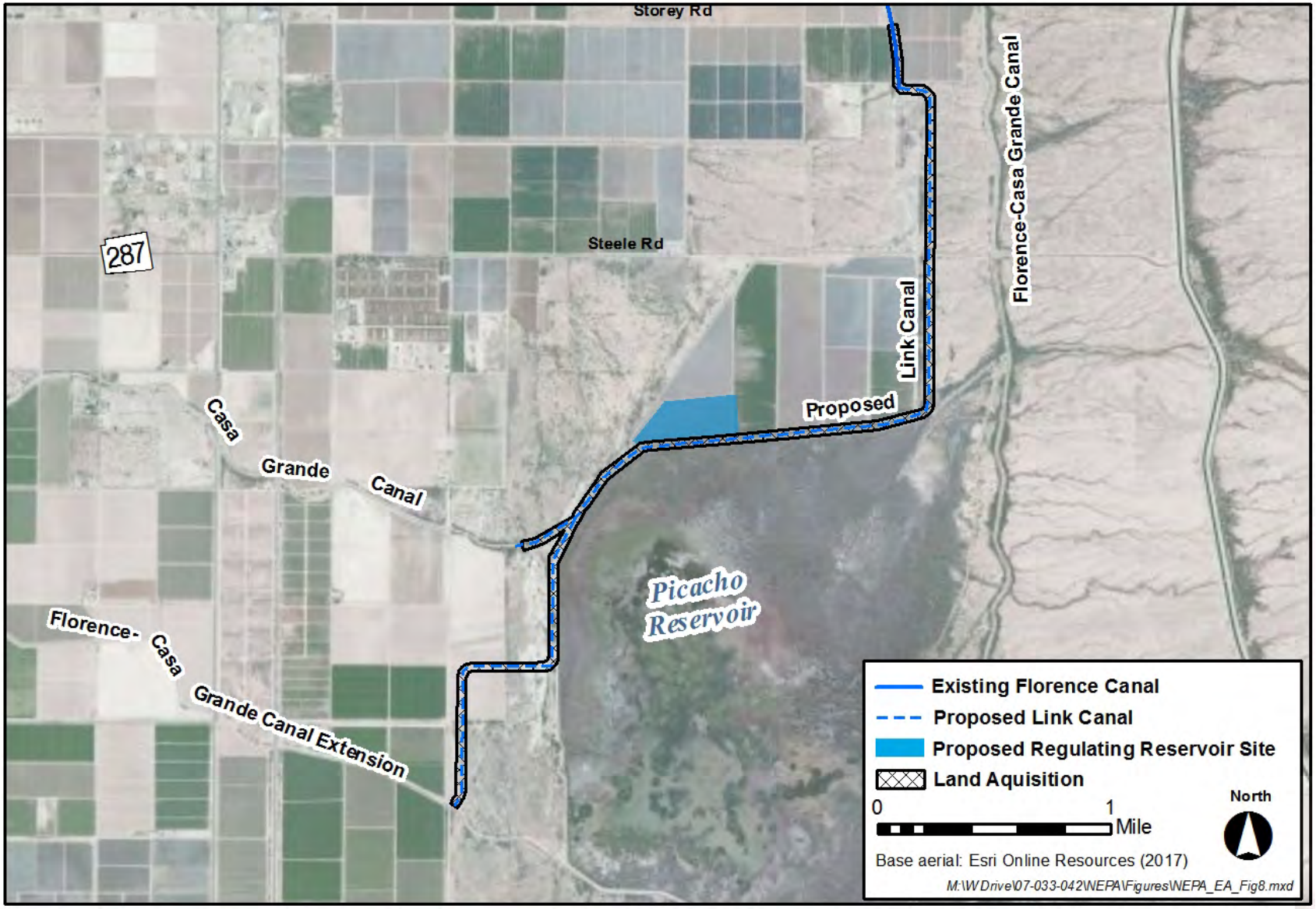

Figure 8. Land acquisitions—Reach 3

The Proposed Action would remove or plug three wasteways in the FCG Canal: two in Reach 2 and one in Reach 3. Three crosscut canals, Crosscuts 4, 5, and 7, would be retained and rehabilitated for use under the Proposed Action. Crosscut 6 would not be retained and its connections with the FCG Canal would be plugged or removed. Improvements associated with two existing wells (Well 80 and Well 89) along the FCG Canal would be undertaken: one (Well 80) would require construction of a new connection between the well and the Florence Canal; the other (Well 89) would require rehabilitation of an existing connection. Appendix E depicts the locations of the referenced wasteways, crosscut canals, and existing wells.

2.3.6 Proposed Action—Utility and Roadway Crossings, Encroachments, and Relocations

A number of third-party utilities and roadways cross the SCIP reserved right-of-way within the project limits. Tables in Appendix F list the known utility and roadway crossings by reach, including any potentially affected by construction, and identify the type of crossing and location of each. Included in Appendix F is a BIA program guidance document describing how different types of encroachments are handled. This BIA program guidance document will govern how the various crossings and encroachments, and applicable encroachment permits, on SCIP would be resolved prior to construction. The footprint of each of the known utility and roadway crossings and any potential relocations falls within the construction area evaluated in this EA. Appendix F also includes figures that locate these crossings along the right-of-way.

BIA encroachment permits would be issued for those third-party utilities or roadways affected by the Proposed Action.

2.3.7 Proposed Action—Management of Irrigation Water During Construction

Portions of both action alternatives must be constructed when the system is dry, requiring extended periods of dewatering using the 5-3-5 dry-up schedule. Though the 5-3-5 dry-up schedule may need to be modified to fit the construction schedule; dry-ups would not exceed two 5-week periods. Some portions could be constructed with only a localized dewatering of the canal system outside the 5-3-5 period. This would be accomplished by using ground water for irrigation supply, or by using smaller pump bypasses or other potential hydraulic linkages to convey water around the construction zone.

As used in this EA, the term dry-up refers to the dry-up of the canal system (as a whole or parts thereof) and does not necessarily affect releases from Coolidge Dam. Depending on where the construction is occurring in the system, the dry-up may or may not result in the dry-up of the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam.

The following paragraphs describe the anticipated approach to water delivery during construction and estimated construction duration by reach.

Reach 1

Reach 1 has no parallel delivery facilities yet serves as the uppermost connection from the Gila River to the water users. For this reason, the use of the 5-3-5 dry-up is especially critical for

construction in this reach. For Reach 1 specifically, no releases from Coolidge Dam would occur for irrigation diversion at Ashurst–Hayden Diversion Dam during either of the two 5-week dry-ups, except as required to satisfy a call by Asarco under the Gila Decree. However, water would be released downstream from Coolidge Dam, as normal, during the 3-week wet-up.

The contractor would line the upper portions of the canal with concrete and replace China Wash Flume and flow measurement structure in the first 5-week dry-up. During the second 5-week dry-up, the contractor would line the remainder of Reach 1 downstream of China Wash Flume with concrete and construct turnouts and the bifurcation structure. The balance of the construction would be completed after the 5-3-5 dry-up. As in all reaches, there are elements/locations of construction that could be completed with localized dewatering outside the 5-3-5 dry-up.

The contract period for Reach 1 would allow for two seasons of 5-3-5 dry-up, in the event that a second season is needed due to unforeseen conditions (e.g., inclement weather, unsuitable soils), with an overall construction duration of roughly 1 year. During the 3-week wet-up period, flows to meet irrigation needs could be in the range of 150 to 300 cfs. If a second season of dry-up is needed, an interim connection would be constructed between the completed segment and the remaining segment to be constructed.

For the China Wash crossing, water delivery during construction and construction duration would vary depending on which subalternative is selected. In addition to the dry-up schedules described above, Subalternative B would require a full shutdown of the canal for the duration of the flume's construction (estimated at six months). Refer to discussion of Subalternative B in Section 2.3.1.

Reach 2

Portions of Reach 2 would need to be constructed when the system is dry, requiring extended periods of dewatering. The 5-3-5 approach would be used for the Proposed Action to accommodate this need. Construction of Reach 2 is envisioned with two contractors: one for the canal lining and construction of in-line structures, and one for the road crossings and appurtenant features. The road crossings would be constructed parallel to, and ahead of, the canal lining to avoid interference between contractors. The balance of the work would be completed after the 5-3-5 dry-up.

As with Reach 1, some elements/locations of construction could be completed with localized dewatering outside the 5-3-5 dry-up. Furthermore, upon completion of Reach 1, the FCG Canal and nonconstructed segments of the Florence Canal, existing intertie connections, and ground water or CAP supplies could be used to deliver irrigation water to the downstream service areas, increasing opportunities for construction outside the 5-3-5 dry-up schedule. It is anticipated that the construction of Reach 2 would require three seasons of 5-3-5 dry-up. The first five weeks would be the traditional 5-week maintenance dry-up, and no releases would be made from Coolidge Dam. For the second 5-week dry-up in the sequence, the construction zone would be dry but there likely would be limited releases from the San Carlos Reservoir to supply water to other parts of the system. The overall construction duration of Reach 2 improvements is expected to be roughly two years.

Reach 3

Portions of Reach 3 would need to be constructed when the system is dry, requiring extended periods of dewatering. The 5-3-5 dry-up schedule would be used for the Proposed Action to accommodate this need. As with Reach 2, construction of Reach 3 is envisioned with two contractors: one for the canal lining and construction of in-line structures, and one for the road crossings and appurtenant features. The road crossings would be constructed parallel to, and ahead of, the canal lining to avoid interference between contractors.

The opportunities for construction outside the 5-3-5 dry-up schedule increase for Reach 3, with greater flexibility and reduced risk, compared with Reaches 1 and 2. Upon completion of Reaches 1 and 2, Reach 3 facilities of the SCIDD main canal system could be constructed without interruption of flow through upstream Joint Works system facilities. Construction of specific segments of canal outside the 5-3-5 dry-up could be accomplished while water deliveries are made through the completed facilities in Reaches 1 and 2. The parallel Florence and FCG Canal system, including the crosscut canals conveying flows between the two canals, can be used to make water deliveries while construction activities continue through Reach 3. Flows could serve all downstream service areas directly from the FCG Canal, or from the Florence Canal using existing crosscut canal connections. Ground water or CAP water supplies can also be used to fill irrigation water demand, as needed. It is anticipated that construction of Reach 3 would require three seasons of 5-3-5 dry-up. The first five weeks would be the traditional 5-week maintenance dry-up, during which time no releases would be made from Coolidge Dam. For the second 5-week dry-up in the sequence, the construction zone would be dry but there would still likely be releases from the San Carlos Reservoir to supply water to other parts of the system. The overall construction duration of Reach 3 improvements is expected to be roughly two years.

2.4 FLORENCE–CASA GRANDE CANAL ALTERNATIVE

The FCG Canal Alternative would use the existing FCG Canal alignment for the main canal upstream of Picacho Reservoir. To convey water from the FCG Canal to the primary SCIDD laterals for distribution, this alternative would require construction of an additional 1.8 miles of new concrete-lined lateral connections and continued use of 16.9 miles of the Florence Canal. It would require the construction of new flood control/passage structures to prevent uncontrolled entry of cross drainage into the new concrete-lined main canal.

The FCG Canal Alternative was considered because it would follow the historical main canal alignment and would take advantage of the existing canal right-of-way.

Under this alternative, the concrete-lined main delivery system, including the previously referenced laterals and portions of the Florence Canal, would total 41.9 miles— roughly the same as the existing condition, but 17.7 miles more than the Proposed Action.

With the FCG Canal Alternative, a number of components would be the same as the Proposed Action. In the following sections (2.4.1–2.4.7), references are provided to the discussion of the Proposed Action, as appropriate, and notable distinctions between the action alternatives are described.

The overall construction duration of Phase 2 Reaches 1–3 under the FCG Canal Alternative would be expected to be roughly 7 years (refer to Section 2.4.7), assuming an inverted siphon system is used to cross China Wash. The duration would be longer with the option to cross China Wash with a new open-channel in-line flume. Section 2.3.1 describes the two subalternatives for crossing China Wash. Section 2.4.7 describes the management of water delivery during construction.

2.4.1 FCG Canal Alternative Reach 1—Settling Basin Outlet to Florence Canal Turnout

In Reach 1, depicted in Figure 6, the FCG Canal Alternative is essentially the same as the Proposed Action (at 3.8 miles in length) and would require the same construction of new facilities, as described in Section 2.3.1, with one notable exception—the bifurcation system proposed with the Proposed Action would not be required for the FCG Canal Alternative. As with the Proposed Action, no new right-of-way would need to be acquired in Reach 1. Similar to the Proposed Action, wildlife fencing would be installed. The same two subalternatives would be considered for crossing China Wash as under the Proposed Action.

2.4.2 FCG Canal Alternative Reach 2—Florence Canal Turnout to Pima Lateral

With the FCG Canal Alternative, Reach 2 extends a total of 10.7 miles. The reconstructed FCG Canal would be designed to convey 950 cfs and would be lined with 3.0-inch-thick unreinforced concrete. The canal section would have 1.5:1 side slopes.

For Reaches 2A and 2B (Figure 9), the first 6.1 miles of the existing FCG Canal corridor would be reconstructed to function as the new concrete-lined main canal. For Reach 2C, for a distance of 4.6 miles from SR 79, the reconstructed FCG Canal and a new parallel drainage channel would be centered in the existing FCG Canal right-of-way. The new drainage channel, which would be constructed south and east of the new FCG Canal, would intercept and convey cross drainage downstream. This drainage channel would be designed for a capacity of 2,500 cfs and would have a bottom width of 20 feet. The new drainage channel would be armored to reduce the potential for uncontrolled flood volumes being carried by the drainage channel to breach the reconstructed and concrete-lined FCG Canal.

With this alternative, 16.9 miles of the Florence Canal, a primary lateral that parallels the FCG Canal for the majority of its length, would continue to be used as a lateral to distribute irrigation water to adjacent farmland and would be lined with concrete. Any unnecessary segments of this lateral would be eliminated to reduce water losses, and operation and maintenance costs. From the Florence Canal turnout to the intersection with SR 79, cross drainage and excess flows would be commingled with irrigation water in the reconstructed FCG Canal.

For the entire length of Reach 2, a minimum 16-foot-wide operation and maintenance road would be constructed on each side of the new main canal. This reach parallels the CAP canal, which provides a barrier to wildlife access; therefore, no wildlife fencing is proposed in this reach. At the end of Reach 2, the existing interconnect to the Pima Lateral would be modified to provide better control of flows to the Pima Lateral.

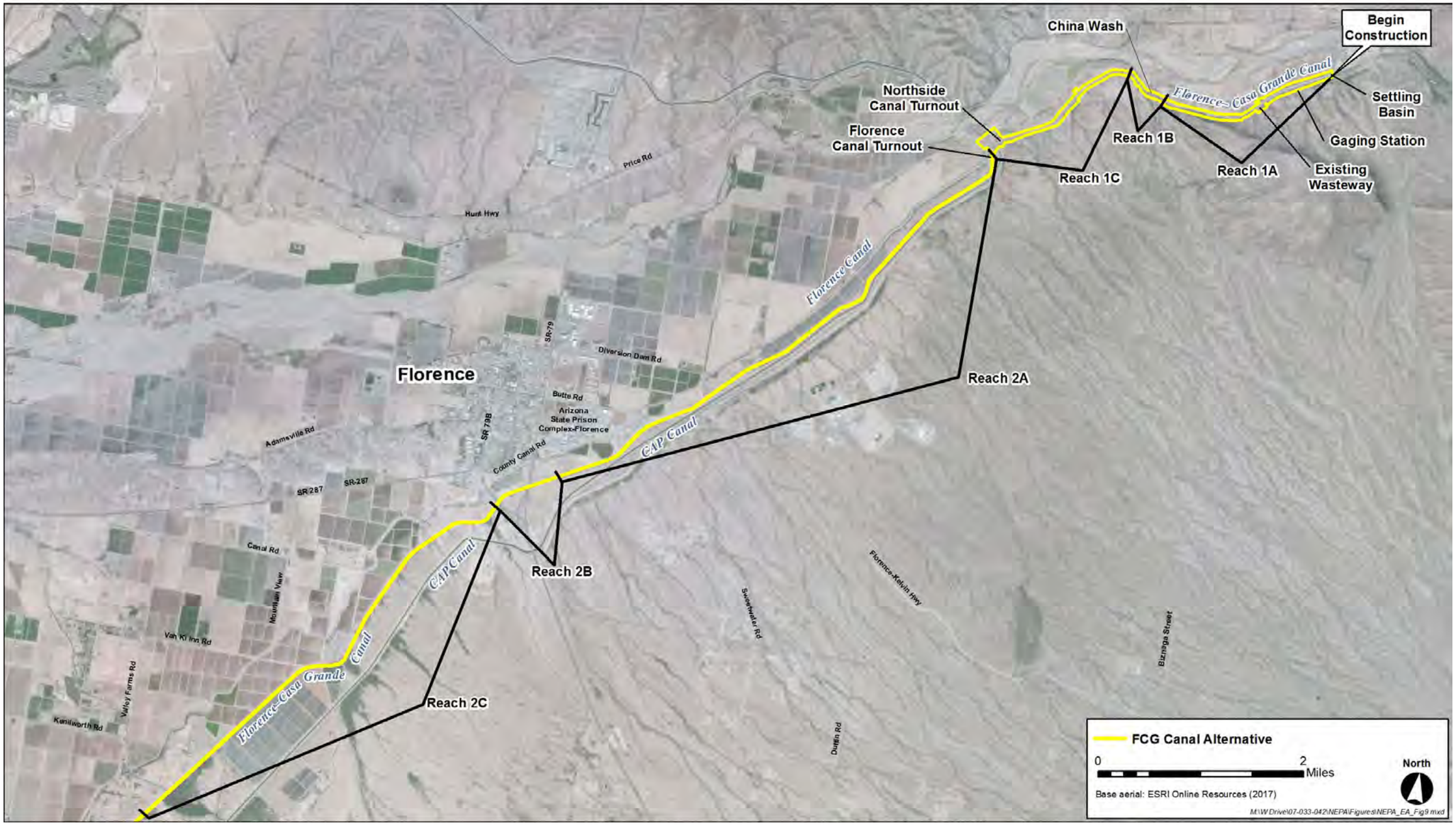

Figure 9. FCG Canal Alternative Reaches 1 and 2

2.4.3 FCG Canal Alternative Reach 3—Pima Lateral to Picacho Reservoir

In Reach 3A (Figure 10), a 6.2-mile segment of the existing FCG Canal alignment would be reconstructed to accommodate a concrete-lined main canal with a capacity of 400 cfs and an adjacent drainage channel similar to Reach 2. The new drainage channel would be continued downstream from Reach 2 and outlet into Picacho Reservoir. Necessary segments of the Florence Canal would be lined with concrete and used to distribute irrigation water to adjacent farmland.

In Reach 3B, a new 2.5-mile link canal would be constructed north of Picacho Reservoir from the reconstructed FCG Canal to the Casa Grande Canal (refer to Figure 10). This new canal segment could accommodate a new regulating reservoir, estimated at 19 acres, on a 46-acre site, as depicted in Figure 10. The purpose of the regulating reservoir would be the same as with the Proposed Action (Section 2.3.3). The existing inlet to Picacho Reservoir would be rehabilitated, including the replacement of gates and minor repairs to the structure, if needed. The existing outlet from Picacho Reservoir to the Casa Grande Canal would be maintained for future use.

In Reach 3C, as with the Proposed Action, a 900-foot-long segment of new lined canal would be constructed to connect the link canal with the existing Casa Grande Canal, and a new, 1.6-mile interim earthen channel would be constructed from the end of the link canal to the FCG Canal Extension.

A minimum 14-foot-wide operation and maintenance road would be constructed on each side of the canal throughout Reach 3.

2.4.4 FCG Canal Alternative—Land Acquisition

Approximately 313 acres of land would need to be acquired for the FCG Canal Alternative. Of the 313 acres, roughly 194 would be needed to expand the existing FCG Canal right-of-way to accommodate the new lined irrigation canal and the new drainage channel. The remaining 119 acres would be needed for the new link canal, regulating reservoir, and temporary earthen canal. As with the Proposed Action, the contractor may require temporary construction easements, as needed, outside the reserved right-of-way for staging, stockpiling, utility relocations, etc.

2.4.5 FCG Canal Alternative—Additional Project-Related Actions

The FCG Canal Alternative would require construction or installation of the additional project-related actions identified for the Proposed Action (Section 2.3.5), for example, SCADA infrastructure, escape ladders, and safety buoys. However, in contrast to the Proposed Action, which would feed laterals directly from the main canal, the FCG Canal Alternative would also require the construction of lateral extensions to convey water from the reconstructed FCG Canal to the main SCIDD laterals for distribution. The FCG Canal Alternative, which generally skirts farmland and open desert areas, would require fewer road crossings than the Proposed Action, which would pass through an urbanized area in Florence.

Figure 10. FCG Canal Alternative Reach 3

2.4.6 FCG Canal Alternative—Utility and Roadway Crossings, Encroachments, and Relocations

Similar to the Proposed Action, a number of third-party utilities and roadways cross the SCIP reserved right-of-way within the project limits. Some of these would be in conflict with the project construction and would need to be relocated. The footprint of each of the known utility and roadway crossings and any potential relocations falls within the construction area evaluated in this EA.

BIA encroachment permits are required for most utilities or roadways that cross the SCIP right-of-way. BIA encroachment permits would be issued for any third-party utilities or roadways relocated as part of the FCG Canal Alternative. The EA may be used in the future by the BIA to record the remaining unpermitted third-party utilities within the right-of-way.

2.4.7 FCG Canal Alternative—Management of Irrigation Water During Construction

In Reach 1, the management of irrigation water during construction with the FCG Canal Alternative is the same as described for the Proposed Action with Subalternative A. The 5-3-5 dry-up schedule would be employed over up to two seasons. The construction duration would be roughly one year.

As in all reaches, there are elements/locations of construction that could be completed with only a localized dewatering of the canal system outside the 5-3-5 dry-up. This could be accomplished by using ground water for irrigation supply, or by using smaller pump bypasses or other potential hydraulic linkages to convey water around the construction zone.

Construction in Reaches 2 and 3 under the FCG Canal Alternative would require additional seasons of 5-3-5 dry-up to accommodate construction, which would extend the overall construction duration with the FCG Canal Alternative to seven years, or two years longer than the Proposed Action. Construction of the main canal under the FCG Canal Alternative in Reaches 2 and 3 would rely more heavily on the use of 5-3-5 dry-ups because there is no feasible means to bypass irrigation deliveries around the construction site. The Florence Canal does not currently have adequate capacity for this purpose, and it dead-ends north of Picacho Reservoir.

2.5 RIGHT-OF-WAY ACQUISITION PROCESS

Under the Rights of Way Reserved to United States for Canals and Ditches Act of August 2, 1890 (Canal Act) (Ch. 837, 26 Stat. 371), the United States holds a reserved right-of-way for ditches and canals over lands west of the 100th meridian patented after August 30, 1890. Reclamation and the BIA can use these lands by exercising these Reserved Rights. Under the Compensation for Canal Rights-of-way Act of September 2, 1964 (78 Stat. 808), just compensation, including severance damages, must be paid to the owners of private land used for ditches or canals in connection with any Reclamation project, or any unit or any division of a Reclamation project, provided the construction of said ditches or canals commenced after January 1, 1961, and such compensation shall be paid notwithstanding the execution of any agreements or any judgments entered in any condemnation proceeding prior to September 2, 1964.

Under the Canal Act, the United States has an existing reserved right-of-way for the full length of the FCG Canal, which includes all areas needed to operate and maintain the system. These lands can generally be described as consisting of the canal prism, the associated operation and maintenance roads, the outer banks of these roads, drainage features that protect the canal (e.g., berms and drainage swales), sediment management areas, and access pads to check structures, turnouts, and wells. A 1920 Land Owners' Agreement established a 200-foot-wide right-of-way for the full length of the Florence Canal.

For future facilities and operations of the canal system, however, additional right-of-way beyond the existing right-of-way would need to be acquired. Additional land would be required for either action alternative in order to construct the following: (1) a new segment of canal (the link canal) in Reach 3B, (2) the regulating reservoir (Reach 3B), and (3) the interim earthen canal to connect the link canal to the FCG Canal Extension (Reach 3C). For the Proposed Action, land would also be required to realign the existing piped segment of the Florence Canal (Reach 2B). For the FCG Canal Alternative, a strip of land adjacent to the existing FCG Canal right-of-way would also need to be acquired to make room for construction of an irrigation canal and a drainage channel. Landowners would be compensated for these acquisitions. Three potential ways to acquire these lands have been identified:

- Reclamation would claim new lands on behalf of the United States under the Canal Act, records the new right-of-way in the name of the United States, and compensates the landowners. The management of these Federal rights-of-way would be transferred to the BIA through an administrative action. It is anticipated that this process would be used for most of the land acquired.
- SCIDD would acquire right-of-way under its own authority using project funds from Reclamation and the transfer these lands to the United States.
- SCIDD would purchase specific parcels through fee simple title and then transfer these lands to the United States. This type of acquisition would be employed on a case-by-case basis, if warranted. An example of a condition that might warrant purchase by fee simple title is when the entire parcel must be acquired.

All acquisition of right-of-way, including those made by SCIDD on behalf of the United States, would require compliance with U.S. Department of the Interior property acquisition standards and guidelines. Title reports, appraisals, and Phase I hazardous substances site assessments would be completed for these lands before the rights-of-way are recorded, in accordance with the U.S. Department of the Interior environmental compliance memorandum *ECM-10-2, Pre-Acquisition Environmental Assessment Guidelines for Federal Land Transactions* (U.S. Department of the Interior 2010). Negotiations on compensation would occur with affected landowners.

2.6 ENVIRONMENTAL COMMITMENTS

The following environmental commitments (Table 1) would be employed during implementation of either action alternative. These commitments were developed by Reclamation in cooperation with the Arizona State Historic Preservation Office (SHPO), the U.S. Fish and Wildlife Service (USFWS), the Arizona Game and Fish Department (AGFD), the BIA, the Gila River Indian Community, P-MIP, and SCIDD. Comments received during preparation of the NEPA document

from the public, Federal, state, tribal, and local agencies, including the cooperating agencies, provided valuable feedback to Reclamation regarding identification of appropriate measures to reduce environmental impacts.

Table 1. Summary of environmental commitments.

Environmental Commitment	Commitment Specification
Transportation	
Provide traffic controls	Contractor Responsibility • Flaggers, physical barriers, or electric signals will be employed to bypass traffic around lane closures on public roads with minimal delay. Reasonable measures will be implemented to avoid blocking private roads.
Cultural Resources	
Identification of historic properties	Reclamation Responsibility • All lands within the area of potential effects (APE) will be surveyed, historic properties will be identified, and eligibility and effect for these lands will be consulted on before construction begins.
Treatment/mitigation of adverse effects on historic properties	Reclamation Responsibilities • Reclamation will develop a Historic Properties Treatment Plan (HPTP) to mitigate adverse effects on historic properties, evaluate the eligibility of sites that cannot be assessed based on their surface remains, and identify the extent of sites within the APE, where appropriate. The HPTP will be reviewed by and submitted for concurrence to the consulting parties per Section 106 of the National Historic Preservation Act (NHPA). • Reclamation will summarize the terms of the accepted HPTP in a Memorandum of Agreement (MOA), which will be reviewed and signed by the consulting parties per Section 106 of the NHPA. • The results of Phase I data testing, eligibility testing, and boundary testing will determine whether Phase II data recovery is required. Mitigation measures that are developed as a result of data testing will take into consideration future adverse impacts to the portions of the sites adjacent to the right-of-way, especially if construction would affect surface flow, runoff, off-road activities, realignment of existing utilities, or any other potential impact. Reclamation will oversee Phase I and Phase II data recovery. • Reclamation will develop an MOA specifically for the treatment of China Wash Flume, a unique resource on SCIP. A Historic American Engineering Record (HAER) and interpretive displays will be developed to mitigate adverse effects of the Proposed Action to the flume. SCIDD Responsibilities • SCIDD will be responsible for funding implementation of the MOA(s) and HPTP, including archival research, HAER development, Phase I data testing, eligibility testing, boundary testing, Phase II data recovery, and monitoring at all sites within the APE. • All cultural resources within the APE will be treated according to the terms and conditions set forth in the MOA(s) and HPTP. • SCIDD will fund the preparation of a HAER and interpretive media for China Wash Flume prior to any alteration of that historic structure.

Table 1. Summary of environmental commitments.

Environmental Commitment	Commitment Specification
Halt to construction in the event of discovery	Contractor Responsibility • In the event of discovery of human remains or a burial, or other cultural resources during ground-disturbing activities, the construction contractor will immediately stop work in the immediate area, leave the material in place, restrict access to the location, and notify Reclamation's Phoenix Area Office and BIA/SCIP to arrange for a professionally qualified archaeologist to evaluate and recommend appropriate treatment of the discovery. Construction will not resume until Reclamation has cleared the discovery. Reclamation Responsibility • In the event of discovery of human remains or a burial, or other cultural resources during ground-disturbing activities, Reclamation will send a professionally qualified archaeologist to evaluate and recommend appropriate treatment of the discovery. Reclamation will authorize resumption of construction activities in the vicinity of the discovery once it has been cleared.
Geology and Soils	
Soil stabilization	Contractor Responsibility • The contractor will implement erosion control measures and post-construction site stabilization in the construction area, as necessary. Measures for controlling sediment and erosion would include placement of silt fences, straw dikes, and other structural controls, as appropriate.
Seeding	Contractor Responsibility • Where appropriate, disturbed soils that are not landscaped or otherwise permanently stabilized by construction will be seeded by the contractor using a certified weed-free seed mix of species native to the project vicinity.
Water Resources	
Clean Water Act (CWA) Section 402 compliance	SCIDD Responsibility • The SCIDD Engineer will review and approve the contractor's Storm Water Pollution Prevention Plan (SWPPP), NOI, and Notice of Termination (NOT) prior to submission to the Arizona Department of Environmental Quality (ADEQ). Contractor Responsibilities • The contractor will develop a SWPPP to describe erosion controls in accordance with a CWA Section 402 Arizona Pollutant Discharge Elimination System (AZPDES) construction general permit for storm water discharges. The contractor shall submit the SWPPP to the SCIDD Engineer for approval. • The contractor will prepare a NOI and NOT and submit it to the SCIDD Engineer for approval. • The contractor, upon approval from the SCIDD Engineer, will submit the NOI and NOT to the ADEQ.
Floodplains and Flooding	
Selection of stockpile locations	Contractor Responsibility • Whenever feasible, the contractor will locate equipment storage and material stockpiling areas outside the 100-year floodplain to minimize the potential of the project to raise the elevation of floodwaters.

Table 1. Summary of environmental commitments.

Environmental Commitment	Commitment Specification
Biological Resources	
Protection of migratory birds	SCIDD Responsibility • Upon completion of burrowing owl surveys, SCIDD will contact the Phoenix Area Office of Reclamation to provide survey results. If any burrowing owls are located during preconstruction surveys or construction, SCIDD will employ a biologist holding a permit from the USFWS to relocate burrowing owls from the construction area, as appropriate. Organizations such as Wild at Heart and Liberty Wildlife may also be contacted to remove/relocate burrowing owls. Contractor Responsibilities • The contractor will employ a qualified biologist to ensure compliance with the Migratory Bird Treaty Act. Every attempt will be made to complete land-clearing activities between September 1 and February 28 to avoid the breeding season of migratory birds. Between the dates of March 1 and August 31, all vegetation scheduled to be disturbed by the proposed project that may contain active bird nests will be surveyed immediately prior (within 48 hours) to being disturbed. If an active nest is discovered, vegetation clearing activities will not be allowed to proceed in the vicinity of the nest(s). No activities will occur within an appropriate buffered distance from active nests until after the young birds have fledged from the nest. • A biologist who possesses a burrowing owl survey protocol training certificate issued by the AGFD will conduct burrowing owl surveys 4 days or 96 hours before construction. If burrowing owls or active burrows are identified during the preconstruction surveys or during construction, no construction activities will take place within 100 feet of any active burrows until the owls are relocated.
Protection of Sonoran Desert tortoises	Contractor Responsibility • If Sonoran Desert tortoises are encountered during construction, the contractor will follow the "Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects" (AGFD 2014a). A biologist trained under the "Guidelines" will relocate tortoises, as needed.

Table 1. Summary of environmental commitments.

Environmental Commitment	Commitment Specification
Wildlife exclusion fence	<u>SCIDD Responsibility</u> • Project design plans will include specifications for deer and tortoise exclusionary fencing on both sides of the length of the main canal in Reach 1 from the sediment settling basin just downstream of Ashurst–Hayden Diversion Dam to a point upstream of the CAP siphon. Fencing will be built to Reclamation's specifications, designed to exclude deer and tortoise and other smaller wildlife, and include one-way gates that allow deer and other larger mammals to escape from within the fencing. Design plans will also include specifications for wildlife escape devices for areas where installation of exclusionary fencing is not feasible and these devices will be built to Reclamation specifications. <u>Contractor Responsibility</u> • The contractor will install deer and tortoise fencing on both sides of the length of the main irrigation canal in Reach 1 from the sediment settling basin just downstream of Ashurst–Hayden Diversion Dam to a point upstream of the CAP siphon. Fencing will be built to Reclamation's specifications, designed to exclude deer and tortoise and other smaller wildlife, and include one-way gates that allow deer and other larger mammals to escape from within the fencing. In areas where fencing is not feasible due to terrain, wildlife escape ramps will be constructed to Reclamation specifications, and buoys will be installed across the canal to guide wildlife to the ramps. The effectiveness of wildlife fencing will be addressed through an adaptive management approach. If the use of buoys and escape ramps does not minimize wildlife drowning, alternative or additional measures will be evaluated by Reclamation and SCIDD, in coordination with the AGFD.
Wildlife crossings	<u>SCIDD Responsibility</u> • The design plans will include construction of a new 6-foot-wide wildlife bridge at the lower end of Reach 1. The crossing design will generally conform to guidelines provided by the Federal Highway Administration (FHWA) *Wildlife Crossing Structure Handbook: Design and Evaluation in North America,* Publication No. FHWA CFL/TD-11-003, March 2011 (FHWA 2011a). <u>Contractor Responsibilities</u> • The contractor will construct a new 6-foot-wide wildlife bridge at the lower end of Reach 1. The crossing design will generally conform to guidelines provided by the FHWA *Wildlife Crossing Structure Handbook: Design and Evaluation in North America,* Publication No. FHWA CFL/TD-11-003, March 2011 (FHWA 2011a). • Wildlife crossings at China Wash and at existing public, private, and farm road crossings will be retained.

Table 1. Summary of environmental commitments.

Environmental Commitment	Commitment Specification
Monitoring of canal operations	SCIDD Responsibilities • For the first three years of canal operations following construction, SCIDD ditch tenders will monitor the lined canal system in Reaches 2 and 3 on a daily basis, coincidental to normal operation and maintenance activity. Tenders will be equipped with pole-mounted hooks to retrieve any animals from the canal. A standardized form will be used to report the detection of any dead animals and the sightings of wildlife in or along the canal. SCIDD will prepare and submit a summary of the monitoring results monthly to Reclamation. • Consultation between SCIDD, Reclamation, and the AGFD will be conducted annually to review the results of monitoring, determine the need for remedial actions, and identify the type and location of remediation required (fencing, escape ramps, drinkers, or others to be determined).
Wildlife impact mitigation financial assurance fund	SCIDD Responsibility • A financial assurance fund will be maintained by SCIDD on deposit with Reclamation to ensure that funds are readily available to pay for implementation of remedial measures, if needed, during the first three years of operation following construction. Those measures will be based on the results of canal monitoring and may include installation of wildlife escape ramps and additional fencing and/or crossings. The amount of the financial assurance fund will be determined in consultation with Reclamation. Funds remaining at the end of the three-year period that are not needed for implementation of remedial measures will be returned to SCIDD.
Transplant saguaro cacti	SCIDD Responsibility • All single-stem saguaros will be transplanted by the contractor from proposed disturbance areas to adjacent or nearby undisturbed areas. The contractor will monitor these saguaros through the term of construction and replace any saguaros that do not survive over this period. Following construction, SCIDD will assume responsibility for the monitoring of transplanted saguaros to provide a total of 10 years of monitoring, including the contractor's term of monitoring. SCIDD will replace any saguaros that do not survive over this period. Transplanting of saguaros will not occur from July 1 to September 30 to avoid potential effects on lesser long-nosed bats that may be foraging in the area. Contractor Responsibility • The contractor shall transplant all single-stem saguaros from proposed disturbance areas to adjacent or nearby undisturbed areas. The contractor shall monitor the transplanted saguaros during the term of construction and replace any saguaros that do not survive during this period. Transplanting of saguaros will not occur from July 1 to September 30 to avoid potential effects on lesser long-nosed bats that may be foraging in the area.
Prevent introduction of invasive plants	Contractor Responsibility • To prevent the spread of invasive plant species, all construction equipment will be washed at the contractor's storage facility prior to entering the construction site. In addition, the contractor will inspect construction equipment and remove all attached plant debris prior to leaving the construction site to prevent the spread of invasive plant species to off-site locations.

Table 1. Summary of environmental commitments.

Environmental Commitment	Commitment Specification
Installation of wildlife drinker	SCIDD Responsibility • SCIDD will include in the project plans the installation of one new drinker near the China Wash wildlife crossing. Design of the drinker will conform to AGFD standards and will include ramp edges sloped for easy access and escape, and a float valve to avoid overflow and spill-induced vegetation growth (AGFD Wildlife Water Construction Standards, revised August 2008) (AGFD 20014b). Contractor Responsibility • The contractor will install one new drinker near the China Wash wildlife crossing. Design of the drinker will conform to AGFD standards and will include ramp edges sloped for easy access and escape, and a float valve to avoid overflow and spill-induced vegetation growth (AGFD Wildlife Water Construction Standards, revised August 2008) (AGFD 2014b).
Noise	
Ensure noise control devices are properly functioning	Contractor Responsibility • The contractor will ensure that exhaust systems on equipment are muffled in accordance with manufacturer's specifications, and engine enclosures and intake silencers are functioning properly. The purchase of new equipment by the contractor will be subject to new product noise emission standards.
Compliance with Pinal County Noise Control Ordinance	Contractor Responsibility • The contractor will comply with the Pinal County Noise Ordinance. In populated areas, construction activities will be limited to daytime hours as specified in the ordinance.
Restrictions on staging area locations	Contractor Responsibility • The contractor will site staging areas and stationary equipment away from residences and other noise-sensitive receptors.
Air Quality	
Dust suppression in construction areas	Contractor Responsibility • The contractor will obtain a Pinal County Nonattainment Area Dust Permit and comply with its terms and conditions as codified in the Pinal County Air Quality Control District Code of Regulations Chapter 4, Article 7, and Arizona Revised Statute Section 49-480. All active construction areas, including on-site haul roads, staging areas, and storage piles, will be effectively stabilized against dust emissions by applying water, chemical suppressants, and/or other reasonable measures. Land disturbances will be limited to areas needed for construction.
Dust suppression on unpaved haul roads outside construction areas	Contractor Responsibilities • The contractor will apply water and/or chemical suppressants on all unpaved haul roads that are not public roads. Speeds of less than 25 miles per hour will be maintained on unpaved public roads that are used for construction haulage. • To suppress dust on staging areas and to stabilize open stockpiles, the contractor will use watering trucks, chemical dust suppressants, or other reasonable precautions.
Reduce dust emissions from haul trucks	Contractor Responsibilities • Trucks hauling soil or sediment will be covered. • Speeds of non-earthmoving equipment will be limited to 15 miles per hour and earthmoving equipment to 10 miles per hour in areas where there are no dust control measures in place. • Construction traffic plans will be developed where warranted.

Table 1. Summary of environmental commitments.

Environmental Commitment	Commitment Specification
Engine exhaust control	Contractor Responsibility • The contractor will not operate equipment and vehicles that show excessive emissions of exhaust gases until corrective repairs or adjustments are made to reduce such emissions to acceptable levels. Unnecessary idling of diesel-powered construction equipment will be minimized.
Track-out monitoring and cleanup	Contractor Responsibility • The contractor will immediately clean up any track-out onto a paved public roadway that exceeds 25 feet in length or exhibits a track-out pack-depth greater than 0.25 inch. All visible track-out will be removed at the end of each work day.
Reduce public exposure to diesel exhaust	Contractor Responsibility • As noted under Noise, staging areas will be placed in areas that are not adjacent to populated areas. This commitment will also reduce public exposure to diesel exhaust and its hazardous constituents.
Limitations on burning	Contractor Responsibility • The contractor will not be permitted to dispose of construction materials by burning. Burning of cleared plant materials will comply with local regulations and terms and conditions of a burn permit.
Hazardous Materials	
Management of hazardous wastes and materials	Contractor Responsibility • Materials and wastes defined as hazardous by 40 CFR § 261.3 or other Federal, state, or local laws or regulations, used by the contractor will be containerized, labeled, and disposed of in accordance with applicable Federal, state, and local laws and regulations. The contractor will test any unknown waste materials that may be hazardous and submit the test results to Reclamation's hazardous materials coordinator and the Contracting Officer for review.
Storage of fuels	Contractor Responsibility • The contractor will provide lined secondary containment for any fuels stored in the construction area. Fuels and lubricants will be stored in clearly marked above-ground containers.
Remedial action for spills	Contractor Responsibility • Spills of hazardous material will require immediate notification to Reclamation's hazardous materials coordinator and immediate cleanup, and any contaminated soils will be appropriately containerized and labeled. Contaminated material will be disposed of in accordance with Federal, state, and local laws and regulations.
Safety and Health	
Compliance with Occupation Health and Safety Administration requirements	Contractor Responsibility • The contractor will ensure that appropriate Occupational Safety and Health Administration recommendations and other Federal guidelines are followed for levels of personal protective equipment (i.e., dust masks and protective eyewear to minimize contact with airborne dust) to be used by all persons entering or working in the construction area.
Provide exclusionary fencing and warning signs	Contractor Responsibility • The contractor will use exclusionary fencing to minimize the potential for public access onto the construction site during the workday or after hours. Signage will warn the public of the dangers present.

2.7 ALTERNATIVES CONSIDERED BUT ELIMINATED

One design option and one alternative alignment were considered and eliminated prior to detailed evaluation because of anticipated technical inferiority. Documentation of the design process and corresponding engineering decisions are in the project file at Reclamation. Design alternatives that were eliminated and the primary reason for their rejection follow.

2.7.1 Using Picacho Reservoir as Regulating Reservoir

Picacho Reservoir is broad, shallow, and heavily vegetated. Over the years, siltation and vegetation have reduced storage capacity and impeded the flow regulation function of the reservoir. Continued use of this reservoir for regulating flows within the main canal system without major alteration would result in high seepage and evapotranspiration losses. These high seepage and evapotranspiration losses would directly conflict with the AWSA and its primary goal to conserve irrigation water. Substantial alteration of Picacho Reservoir would be expected to have significant adverse effects on cultural and biological resources, including riparian and wetland habitat.

2.7.2 Constructing a New Main Canal Parallel and Adjacent to the FCG Canal in Reaches 2 and 3

Because this alternative would construct a new main canal rather than rehabilitating an existing canal, it would result in the largest area of new disturbance and the highest construction cost of the action alternatives considered and had no notable advantages over the other action alternatives.

2.8 ALTERNATIVES SUMMARY

Table 2 outlines the primary elements of the alternatives under consideration. Table 3 compares the environmental consequences anticipated with construction and implementation of these alternatives.

Table 2. Summary of alternatives.

Elements	No Action	Florence Canal Alternative (Proposed Action)	FCG Canal Alternative
Main canals that would be used for irrigation conveyance by reach	Reach 1: FCG Canal Reaches 2 and 3: Existing FCG Canal and existing Florence Canal	Reaches 1A and 1C: New FCG Canal constructed in existing canal right-of-way adjacent and north of existing FCG Canal Reach 1B: Existing FCG Canal Reaches 2 and 3: Existing Florence Canal and new link canal Temporary earthen canal connection to FCG Canal Extension	Reaches 1A and 1C: New FCG Canal constructed in existing canal right-of-way adjacent and north of existing FCG Canal Reach 1B: Existing FCG Canal Reaches 2 and 3: Existing FCG Canal, Florence Canal, and new link canal Temporary earthen canal connection to FCG Canal Extension

Table 2. Summary of alternatives.

Elements	No Action	Florence Canal Alternative (Proposed Action)	FCG Canal Alternative
Canals that would be used primarily for storm water drainage	No canals dedicated to storm water drainage; storm water would commingle with irrigation water	Reaches 1A and 1C: Existing FCG Canal Reach 1B: None Reaches 2 and 3: Existing FCG Canal	Reaches 1A and 1C: Existing FCG Canal Reach 1B: None Reach 3: New channel parallel to existing FCG Canal
Total length of main canal system, including primary laterals	42.1 miles	Concrete-lined main canal system: 24.2 miles. Temporary earthen canal: 1.6 miles. Dedicated drainage canals: 17.2 miles	Concrete-lined main canal system: 41.9 miles. Temporary earthen canal: 1.6 miles. Dedicated drainage canals: 17.2 miles
China Wash crossing	Existing flume over China Wash would be periodically rehabilitated	Subalternatives under consideration for crossing China Wash: • Subalternative A—new inverted siphon system • Subalternative B—new open-channel flume	Subalternatives under consideration for crossing China Wash: • Subalternative A—new inverted siphon system • Subalternative B—new open-channel flume
Fish barrier	Retains electric fish barrier	Replaces electric fish barrier with passive fish barrier (physical drop) at end of Reach 1 and turnout to Northside Canal	Replaces electric fish barrier with passive fish barrier (physical drop) at end of Reach 1 and turnout to Northside Canal
USGS flow measurement structure/gaging station	Existing flow measurement structure retained	• Subalternative A—flow measurement structure removed and replaced • Subalternative B—flow measurement structure checked and recalibrated, if it is not replaced	• Subalternative A—flow measurement structure removed and replaced • Subalternative B—flow measurement structure checked and recalibrated, if it is not replaced
Estimated length of construction duration	Not applicable	Approximately five years based on Subalternative A; longer duration with Subalternative B	Approximately seven years based on Subalternative A; longer duration with Subalternative B

Table 3. Summary of environmental consequences of alternatives.

Resource Topic	No Action	Florence Canal Alternative (Proposed Action)	FCG Canal Alternative
Land ownership	No new right-of-way required	Requires 144 acres of new right-of-way	Requires 313 acres of new right-of-way
Land use	No change in land use	Converts 92 acres of prime or unique farmland to irrigation conveyance	Converts 60 acres of prime and unique farmland
Transportation	No effect	Results in traffic congestion and delays during some construction activities	Same as Proposed Action

Table 3. Summary of environmental consequences of alternatives.

Resource Topic	No Action	Florence Canal Alternative (Proposed Action)	FCG Canal Alternative
Visual resources	No effect	Adds regulating reservoir and 5.1 miles of new canal on new alignments not adjacent to existing canals	Adds regulating reservoir and 5.9 miles of new canal on new alignments not adjacent to existing canals
Environmental justice	No effect	Would not result in disproportionate impacts on protected populations	Same as Proposed Action
Cultural resources	Ongoing maintenance and repair of the existing main canal system would have few adverse effects on cultural resources because the areas around the canals are already disturbed and the SCIP system and its features have been recorded in a HAER	Sites eligible or of unknown eligibility identified to date along corridor within the APE: 30	Expected to impact a greater number of eligible and potentially eligible sites due to substantially more ground disturbance
Indian Trust Assets	No effect; existing water source is less reliable due to aged infrastructure and significant water losses during delivery	Provides beneficial effect by improving operational efficiencies, increasing reliability of water deliveries, reducing operational and maintenance costs, and reducing water losses	Same as Proposed Action
Geology and soils	Continues to deposit fine sediments on downstream farmland	Continues to deposit fine sediments on downstream farmland; results in temporary soil disturbance and compaction Disturbs soils during construction, including 92 acres of agricultural land and 268 acres of desertscrub	Same as Proposed Action Expected to disturb more acres of soil during construction due to substantially more ground disturbance than Proposed Action
Water resources—surface	No water conservation realized	Conserves approximately 20,150 AFY of water in a normal year with proposed improvements to SCIDD and Joint Works main canals	Same as Proposed Action
	Uses 5-3-5 dry-up schedule for those years when construction is required; uses traditional 5-week maintenance dry-up other years	Uses 5-3-5 dry-up schedule each year of construction; requires roughly five years to construct based on Subalternative A	Uses 5-3-5 dry-up schedule each year of construction; requires roughly seven years to construct based on Subalternative A

Table 3. Summary of environmental consequences of alternatives.

Resource Topic	No Action	Florence Canal Alternative (Proposed Action)	FCG Canal Alternative
Water resources—ground	No change in water infiltration patterns	Shifts water infiltration to broader portion of study area, resulting in only minor impacts to the Pinal Active Management Area as a whole; loss of seepage along newly lined segments of the canal system could adversely affect some individual wells	Same as Proposed Action
Water quality	No change	No change	No change
Floodplains and flooding	Maintains existing drainage patterns with small-scale localized flooding occurring periodically	Improves control and capacity of system; protects system up to 50-year flood event; reduces frequency for localized flooding Reduces risk of flood damage to lined system during construction and implementation compared with other action alternative	Same as Proposed Action Increases risk of flood damage to lined system during construction and implementation compared with the Proposed Action
Biological resources—vegetation	No removal or disturbance of Arizona Upland or Lower Colorado River Valley Subdivision Sonoran Desertscrub vegetation	Removes or disturbs up to 98 acres of Arizona Upland and up to 170 acres of Lower Colorado River Valley Subdivision Sonoran Desertscrub vegetation	Expected to disturb more vegetation during construction due to substantially more ground disturbance than Proposed Action
Biological resources—wildlife	No removal or disturbance of Sonoran Desertscrub wildlife habitat	Removes or disturbs up to 268 acres of Sonoran Desertscrub wildlife habitat	Expected to disturb more Sonoran Desertscrub wildlife habitat during construction due to substantially more ground disturbance than Proposed Action
Biological resources—threatened and endangered species	No effect on threatened or endangered species and no adverse modification of proposed or designated critical habitat	May affect but is not likely to adversely affect the endangered lesser long-nosed bat, the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, the endangered Yuma Ridgway's rail, the endangered spikedace, and the endangered loach minnow No adverse modification of proposed or designated critical habitat	May affect but is not likely to adversely affect the endangered lesser long-nosed bat, the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, the endangered Yuma Ridgway's rail, the endangered spikedace, and the endangered loach minnow No adverse modification of proposed or designated critical habitat

Table 3. Summary of environmental consequences of alternatives.

Resource Topic	No Action	Florence Canal Alternative (Proposed Action)	FCG Canal Alternative
	No change in potential habitat for the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, or the endangered Yuma Ridgway's rail at Picacho Reservoir	Compared with No Action alternative, has potential to decrease habitat for the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, and the endangered Yuma Ridgway's rail as a result of less storm water discharge to Picacho Reservoir	Compared with Proposed Action, this alternative is more likely to reduce potential habitat for the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, and the endangered Yuma Ridgway's rail at Picacho Reservoir
Biological resources—other special status species	No removal or disturbance of desertscrub or other potential nesting habitat for migratory birds, including the Western burrowing owl	Removes or disturbs up to 268 acres of desertscrub that serves as potential nesting habitat for migratory birds Potential disturbance or displacement of Western burrowing owls that may be nesting along the existing canal banks	Greater effects on migratory bird nesting habitat and Western burrowing owls compared with Proposed Action due to substantially more ground disturbance
Biological resources—invasive species	No increase in introduction or spread of invasive plant species	Promotes introduction or spread of invasive plant species on up to 268 acres of newly disturbed area	Greater effects with regard to invasive species compared with Proposed Action due to substantially more ground disturbance
Riparian zones and wetlands	No change in the total area of wetland or riparian vegetation at Picacho Reservoir or along the Gila River below Coolidge Dam	Limited effects on riparian vegetation along the Gila River below Coolidge Dam as a result of 5-3-5 dry-ups implemented in fall/winter Potentially reduces the total area of wetland and riparian vegetation as a result of less storm water discharge to Picacho Reservoir	Similar to Proposed Action but more likely to reduce the total area of wetlands and riparian vegetation at Picacho Reservoir
Noise	No construction noise	Noise-sensitive receptors close to construction area subjected to up to 94 A-weighted decibels of intermittent typical exterior noise	Same as Proposed Action
Air quality and climate	No construction-related generation of particulate matter or greenhouse gases (GHGs)	Generation of particulate matter and GHG emissions from construction over five years would not affect regional attainment status or contribute substantially to climate change	Generation of particulate matter and GHG emissions from construction over seven years would not affect regional attainment status or contribute substantially to climate change

Table 3. Summary of environmental consequences of alternatives.

Resource Topic	No Action	Florence Canal Alternative (Proposed Action)	FCG Canal Alternative
	Particulate matter and GHG emissions from maintenance activities higher than the action alternatives due to additional canal length (71.7 miles) to maintain	Particulate matter and GHG emissions from maintenance activities lower than the No Action alternative due to reduced canal length and fewer maintenance requirements due to concrete lining	Particulate matter and GHG emissions from maintenance activities lower than the No Action alternative due to fewer maintenance requirements due to concrete lining, but higher than the Proposed Action due to longer canal length
Hazardous materials	Generation of hazardous materials limited to ongoing maintenance and repair of existing system	Requires short-term use of hazardous materials to operate equipment during construction, with potential to contaminate soil and water; disturbs about 92 acres of agricultural land, with potential agricultural chemical residue	Similar to Proposed Action but disturbs less agricultural land
	No generation of hazardous materials and no change in exposure to the public; ongoing maintenance and repair activities not expected to generate hazardous materials or alter or disperse any existing hazardous materials	Residual concentrations of pesticides/herbicides, which could be present in soils in agricultural lands, could be dispersed with construction activities	Similar to Proposed Action but disturbs less agricultural land
Public health and safety	No change in public health and safety; existing potential for human injury or drowning persist	Increases potential for human injury or drowning with canal's steeper sides, concrete lining, and higher flows compared with the No Action alternative; less than 1 percent of the new main canal would be near residential development	Increases potential for human injury or drowning similar to the Proposed Action but has fewer miles of main canal near residential development

[1] More sites could potentially be detected if a Class III survey were conducted of the FCG Canal alignment between the bifurcation and the proposed link canal.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter describes the affected environment (existing setting or baseline conditions) and analyzes the potential environmental consequences (impacts or effects) that would occur as a result of implementing the Proposed Action. Direct, indirect, and cumulative effects are analyzed for each resource topic carried forward. Potential impacts are described in terms of type, context, duration, and intensity of impact.

The potential effects are examined as they relate to the following 15 resource areas:

3.2 Land Ownership and Land Use
3.3 Transportation
3.4 Visual Resources
3.5 Environmental Justice
3.6 Cultural Resources
3.7 Indian Trust Assets
3.8 Geology and Soils
3.9 Water Resources and Water Quality
3.10 Floodplains and Flooding
3.11 Biological Resources
3.12 Riparian Zones and Wetlands
3.13 Noise
3.14 Air Quality and Climate
3.15 Hazardous Materials
3.16 Public Health and Safety

Throughout the EA, the term "construction area" is used to refer to the area directly affected by construction, including staging and stockpiling areas and right-of-way acquisition. Construction could occur on either side of the canal centerline along the entire length of the main canal system, along new canal alignments, and at the site of the new regulating reservoir, as defined in Chapter 2, and within areas needed for material and equipment staging or stockpiling.

The term "study area" is used to refer to the construction area as well as adjacent or surrounding lands where indirect effects of the project are likely to occur. For biological resources, water resources, and land use, the study area includes the reach of the Gila River from Coolidge Dam to Ashurst–Hayden Diversion Dam (refer to Figure 2). Because the Proposed Action and the FCG Canal Alternative would be expected to affect irrigation water delivery to downstream users on the Gila River Indian Community and SCIDD, beneficial and adverse indirect effects to these users are noted in this document where appropriate.

Within the study area, short-term or temporary impacts would result from construction, where environmental conditions generally revert to preconstruction levels within a relatively short period of time. Long-term or permanent impacts would result from operation of the constructed facility and occur through the life of the project.

Construction and operation of the proposed project would also result in direct or indirect impacts, and could contribute to cumulative impacts. Direct impacts occur at the same time and

place where the action is occurring. Indirect impacts occur later in time or at a location that is spatially separated from the action. Cumulative impacts result from the impact of the action, together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.

Cumulative Impact Scenario

The CEQ regulations that implement NEPA require assessment of cumulative impacts in the decision-making process for Federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the 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). Therefore, a cumulative impact analysis captures the effects that result from the Proposed Action in combination with the effects of other actions in the Proposed Action's region of influence.

Cumulative impacts are determined by combining the impacts of the alternatives with other past, present, and reasonably foreseeable future actions; therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects in the study area and, if applicable, the surrounding region. The geographic scope for this analysis includes actions inside and outside the study area, depending on the resource. The temporal scope includes projects within a range of approximately 10 years in the past and 10 years in the future.

Table 4 lists cumulative projects that were identified in the study area based on readily available information. A search was conducted within each county and Federal regulatory agency jurisdiction encompassing the study area. The number of search results obtained and the amount of detail acquired about each project varies due to the extent of information made available by each information source. The current status of these cumulative projects may change and proposals for new projects may be developed. Table 4 indicates the project/activity name, general location, status, and description for each project. The projects/activities identified generally involve irrigation water delivery and storage facilities, mining, agricultural cultivation and grazing, rural development, transportation infrastructure, and utilities, including power generation and transmission lines.

Table 4. Cumulative project list.

Project/Activity Name	Location	Status	Description
Pima-Maricopa Irrigation Project Programmatic EIS (1998)	Pinal County	Ongoing implementation, operation and maintenance	This Programmatic EIS evaluated construction of a common-use irrigation system and rehabilitation of existing facilities. The proposed action included construction, rehabilitation, and betterment of canals, laterals, and wells; land subjugation; construction of protective channels, dikes, and levees; on-farm development; and riparian habitat.
Blackwater Area P-MIP EA/Project (2003)	Pinal County	Operation and maintenance	This project upgraded the existing unlined Pima and Southside canals with concrete lining, new siphons, a regulating reservoir, and support facilities in the Blackwater Area.

Table 4. Cumulative project list.

Project/Activity Name	Location	Status	Description
Casa Blanca Canal Lining and Rehabilitation P-MIP EA/Project (2013)	Pinal County	Operation and maintenance	This project lined and rehabilitated the Casa Blanca Canal, including modifying the canal prism, straightening segments of the alignment, and installing modernized measurement and control devices.
Phase 1 SCIP Rehabilitation EA/Project	Pinal County	Operation and maintenance	This project included the rehabilitation of Ashurst–Hayden Diversion Dam and Headworks, construction and operation of a settling basin and ancillary sediment management and storage facilities, acquisition of land for sediment storage, and application of riprap to the south bank of the Gila River near the diversion dam.
SCIP Canal 1 Improvement Project	Pinal County	Ongoing	This project will rehabilitate approximately 1 mile of canal with either new piping or concrete lining, install a new outlet, and replace three existing turnout structures.
Agriculture (e.g., farming, grazing)	Pinal County	Ongoing	Pinal County has approximately 1.2 million acres in agriculture use. The major crops in Pinal County are cotton, barley, wheat, and alfalfa. Livestock production also occurs in the county.
Rural Residential Development	Pinal County	Ongoing	In recent decades, urban expansion associated with the Town of Florence and the City of Coolidge has resulted in a gradual reduction in agricultural land and rangeland/desertscrub.
Solar Development	Pinal County	Ongoing	Solar facilities have been constructed and will continue to be constructed in Pinal County.
Central Arizona Project	Statewide	Operations and maintenance	Existing 336-mile water delivery system, including 14 pumping plants and one pump/generating plant, 10 siphons carrying water under riverbeds and large washes, three tunnels, more than 45 turnouts connecting the CAP aqueduct with customers' delivery systems, and a large storage reservoir.
ADOT/FHWA I-10, Early Road to Junction I-18	City of Casa Grande	Design stage	ADOT plans to widen I-10 and reconstruct the Jimmie Kerr traffic interchange in Casa Grande.
ADOT/FHWA/Town of Florence, Traffic Signal Project, SR 79 at Diversion Dam Road	Town of Florence	Preconstruction stage	Traffic signal project at the intersection of SR 79/ Diversion Dam Road, Florence.
ADOT/FHWA, SR 79/ SR 79B Intersection Reconstruction	Town of Florence	Preconstruction stage	Reconstruction of intersection, widening of SR 79B west of the intersection, and adding turn lanes on SR 79 north of the intersection. No change in roadway capacity.
Pinal Central Generating Facility	Pinal County	Future	This facility is projected to be a combined-cycle, natural gas-fueled power plant of up to approximately 1,150 megawatts.
Abel Generating Facility	Florence	Future	This facility is projected to be a simple-cycle, natural gas-fueled power plant of up to approximately 900 megawatts.

Table 4. Cumulative project list.

Project/Activity Name	Location	Status	Description
Florence Copper Project	Florence	Future	An in-situ copper recovery operation on 510 acres, 1 to 3 miles northwest of the center of Florence, will first initiate a Product Test Facility in advance of overall site development in the northeastern portion of the SCIDD service area. The extraction operation is expected to operate for 25 years.
Sunzia Transmission Line Project	New Mexico, Pinal County, Arizona	Future	This planned project consists of two, single-circuit 500 kV transmission lines. The transmission line corridor is approximately 515 miles in length and is designed to connect and deliver electricity generated in Arizona and New Mexico to population centers in the Desert Southwest.
4-Mile Post Lift Station and Pipeline Improvements EA/Project	Pinal County	Future/EA in progress	This project will construct a 1-mile water pipeline and a new lift station.
ADOT/FHWA North–South Corridor Study	Pinal County	Future/study and planning stage	A highway corridor study in Pinal County for a 45-mile north–south transportation corridor in Pinal County to improve regional connectivity, provide an alternative route for a growing area of the Sun Corridor, and address current and future transportation needs. The study area is bounded by US 60 on the north; I-10 on the south; roughly the SR 202 Loop, the Gila River Indian Community, and SR 87 on the west; and roughly SR 79 on the east.

3.2 LAND OWNERSHIP, JURISDICTION, AND LAND USE

3.2.1 Affected Environment

Land Ownership and Jurisdiction

Land in the study area is owned by private parties, municipal and county governments, Native American Tribes, the State of Arizona, the Bureau of Land Management (BLM), Reclamation, and the BIA. A 20-mile reach of the Gila River downstream of Coolidge Dam forms the boundary between the Needles Eye Wilderness managed by the BLM and the San Carlos Apache Tribe. Figure 11 depicts the general land ownership in the study area.

The study area encompasses portions of Gila and Pinal counties. From the east end of the study area at Coolidge Dam to just west of Hayden, Arizona, the county line follows the Gila River, with Gila County to the north and Pinal County to the south. From this point west, the study area is in Pinal County.

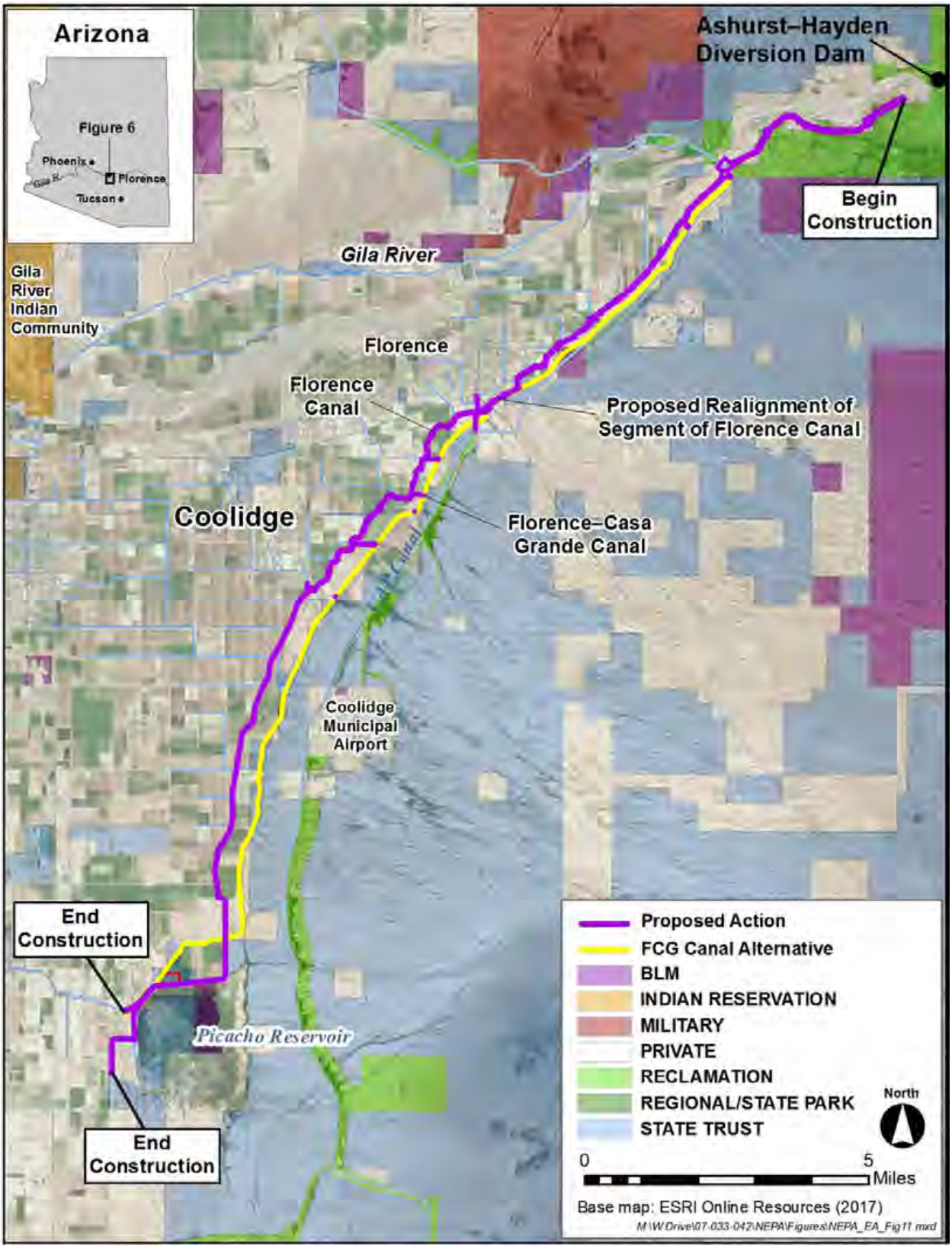

Figure 11. Land ownership

Land Use

With the exception of several small towns (e.g., Hayden, Winkelman, and Kearny), land uses proximal to the Gila River above Ashurst–Hayden Diversion Dam consist mostly of grazing and dispersed recreation (refer to Figure 2).

The Shores and Christmas recreation areas along the Gila River, 6 and 10 miles upstream of Winkelman, respectively, are managed by the BLM and provide access to the Gila River for river-related recreation. Recreation opportunities include small-craft floating, tubing, fishing, bird-watching, picnicking, and camping. The quality of the visitor experience is affected by the availability of adequate flow in the river.

Two BLM-managed wilderness areas are in close proximity to the study area. The Needles Eye Wilderness Area abuts the north side of the study area along the Gila River downstream of Coolidge Dam. The White Canyon Wilderness Area is in close proximity to the study area on the north side of the Gila River downstream of Kelvin. No national parks, wildlife refuges, wild and scenic rivers, or other special status lands or waters are in the study area.

The general character of the study area below Ashurst–Hayden Diversion Dam is rural. Though surrounding lands include large areas of native, undeveloped desert, agriculture and ranching are predominant land uses in areas outside urban centers of Florence and Coolidge. The City of Casa Grande is west of the study area. Land devoted to agriculture varies from active cultivation to fallow fields. Below Ashurst–Hayden Diversion Dam, a network of SCIP and SCIDD canals convey irrigation water from the Gila River and the CAP canal to farmland in the SCIDD service area and the Gila River Indian Reservation. Ground water wells are also integrated into the local canal grid and contribute to the water entitlement afforded SCIDD and Gila River Indian Community lands (refer to Section 3.9.1). Overhead electric distribution lines, some providing power to project wells, cross the service area. Picacho Reservoir, a BIA water storage facility for return flow and flood flow, supports wildlife habitat (Section 3.11). Residential development outside the urban centers consists of widely scattered single-family homes and several small unincorporated communities.

The existing alignment of the Florence Canal passes through the southern part of Florence. Between SR 79 and SR 79B, the Florence Canal is piped and buried. This segment of canal is bordered by residences and a single industrial facility (refer to Figure 5); however, the bulk of the residential, commercial, recreational, governmental, and institutional (e.g., churches and schools) development is north of the canal alignment. Immediately east of Florence, the Arizona State Prison Complex–Florence abuts the Florence Canal (refer to Figure 5). Figure 12 depicts the general categories of land use in the study area.

Existing utility infrastructure that crosses the construction area is listed in Appendix F.

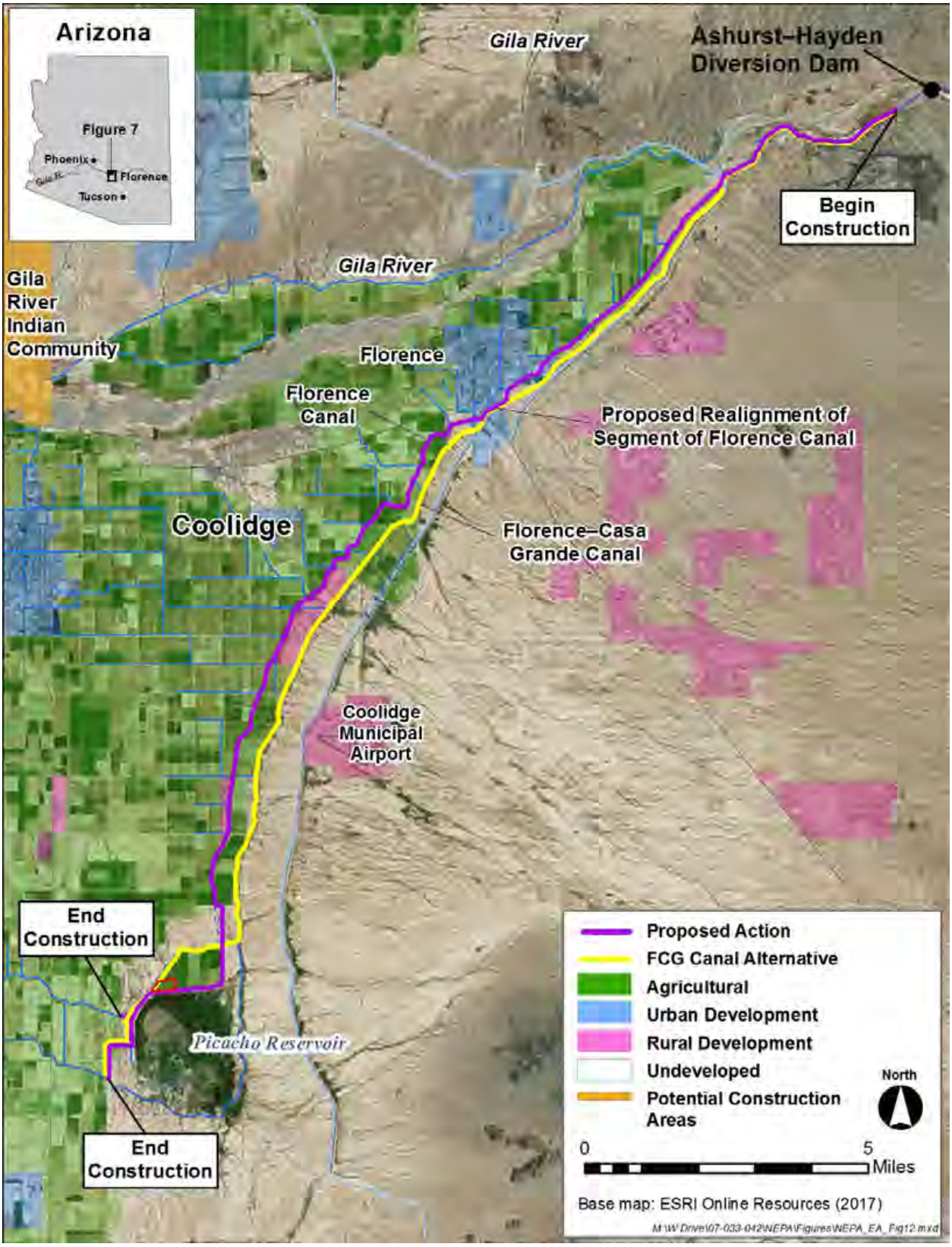

Figure 12. General land use

Prime Farmland

The Farmland Protection Policy Act (FPPA) (7 CFR § 658) governs the definition and identification of farmlands. The FPPA states that the purpose of the act is to minimize the extent to which Federal programs "contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses." As defined by the FPPA, "farmland" is land that is not already in or committed to urban development. The FPPA requires that Federal agencies identify proposed actions that would affect any land classified as farmland before Federal approval of any activity that would convert farmland into nonagricultural uses.

A notable portion of the study area and vicinity has been used for agriculture. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, and other agricultural crops. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. Designation of prime or unique farmland is made by the U.S. Department of Agriculture. Farmland of statewide or local importance is land, in addition to prime and unique farmlands, that is important for the production of food, feed, fiber, forage, and oilseed crops. Designation of this farmland is determined by the appropriate state or local agency. The Natural Resources Conservation Service (NRCS) website was reviewed for soil types that would be considered prime or unique. According to the website, irrigated agricultural lands adjacent to the existing canal right-of-way in Reaches 2 and 3 are considered prime or unique farmland. In addition, some of the vacant land in the vicinity of Picacho Reservoir is considered unique farmland. The land proposed for construction of the regulating reservoir is considered prime farmland because it is irrigated.

3.2.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no direct impact to ownership and jurisdiction. It is assumed that current management and operation of the SCIP and SCIDD irrigation systems would continue and there would be no significant change in existing patterns of land use. The No Action alternative would not cause the conversion of farmland. No impacts to land ownership, jurisdiction, and land use are anticipated with the No Action alternative.

Effects Common to Both Action Alternatives

Much of the reconstruction of the main conveyance system with the action alternatives would be accommodated within existing canal right-of-way/easement under BIA/SCIP ownership. Both of the action alternatives would require acquisition of new rights-of-way to construct a new connection to Well 80 (refer to Figure 7), and to construct a new link canal, regulating reservoir, and temporary earthen canal (refer to Figure 8).

Livestock on BLM land adjoining Reach 1 currently have unrestricted access to water in the canal. The rehabilitated canal, with its concrete lining, steeper side slopes, increased flow velocities, and fencing along Reach 1 would preclude livestock access to this water. Concern regarding this loss of access was expressed by an existing grazing permittee during the scoping process. Subsequently, the BLM and the affected grazing permittee have agreed to share in the cost of drilling a well on BLM land for production of livestock water.

The total acreage in cultivation would continue to vary from year to year, depending on the supply of water; however, a slight increase in average acres cultivated could occur in years when surface water supplies are abundant and water conservation is maximized as a result of the proposed project. Generally, surface water supplies alone are not adequate to irrigate the full acreage (50,000 acres) of the SCIDD service area, though all of the 50,000 acres have been in production at one time or another. No new lands would be converted to agriculture as a result of the project. The long-term trend for the area is expected to be declining acreage in agriculture due to changes in land use in the SCIDD service area.

No residences or commercial businesses are in the proposed construction area of either action alternative. Therefore, none would have to be acquired, and no residents or businesses would need to be relocated.

The proposed project would cross and potentially conflict with existing utility infrastructure in a number of locations. Appendix F includes a list of known utility and roadway conflicts and maps depicting the locations. The affected third-party utilities would require relocation to accommodate construction and operation of the Proposed Action. Many of these third-party utilities would be relocated at a greater depth to accommodate the new canal. For the existing bridges that would require improvements, third-party utilities that hang on these facilities would likely require relocation. Overhead power lines and poles may need to be relocated out of the canal right-of-way. Relocations of third-party utilities would be expected to require short-term, temporary disruptions of service to customers, unless the utility company can reroute service temporarily. Any third-party utilities relocated within the SCIP right-of-way would require an encroachment permit from the BIA.

Farmland that is affected by the proposed project is exempt from the FPPA because the project could return fallow agricultural fields to production when water supplies are adequate and would not develop or convert prime or unique farmland to a nonagricultural use (D. L. Yancey, Arizona State Soil Scientist, NRCS, email communication, June 13, 2017). In addition, the proposed project improves the agricultural infrastructure necessary to provide irrigation water to adjoining farmland.

Florence Canal Alternative (Proposed Action)

In addition to the land acquisition requirements described previously for both action alternatives, if the Proposed Action is implemented, a new canal right-of-way would be acquired in Reach 2 on undeveloped land near the southern boundary of the Town of Florence to bypass residential and industrial properties farther north (refer to Figure 5). The other lands impacted by these new facilities are undeveloped range land/desertscrub. It is possible that other areas of right-of-way acquisition may be identified as project designs are refined. If new areas are identified outside the study area evaluated in the EA, subsequent NEPA review would be undertaken as appropriate.

The acquisition of new right-of-way under the Proposed Action would total approximately 144 acres. Fifteen acres would be needed to realign the piped segment of the Florence Canal south of Florence (1 acre of Arizona Department of Transportation land and 14 acres of private land). The remaining 129 acres would be needed for the link canal, the regulating reservoir, and the new temporary earthen canal (30 acres of Arizona State Land Department trust land, 26 acres

of Pinal County Flood Control District land, 18 acres of City of Mesa land, and 55 acres of private land). The acreage of right-of-way on private land to be acquired under the Proposed Action (69 acres), however, represents only 0.008 percent of the total acreage of privately owned land in the county as a whole (877,900 acres).

Active or fallow agricultural land classified as prime or unique farmland would be affected by the Proposed Action: approximately 3 acres in Reach 1, 24 acres in Reach 2, and 65 acres in Reach 3. As noted in the preceding section, the resulting loss of agricultural lands would be exempt from the FPPA (D. L. Yancey, Arizona State Soil Scientist, NRCS, email communication, June 13, 2017). The remaining lands potentially impacted by the Proposed Action would be located on rangeland/desertscrub (including relatively undisturbed to highly fragmented segments).

A map of the Pinal County Open Space and Trails Master Plan (Pinal County 2016) depicts existing, planned, and proposed trail corridors across the county. With the Proposed Action, a new segment of canal to be constructed in Reach 3B would cross the alignment of a planned east–west multi-use trail depicted on the previously referenced plan. Kent A. Taylor, Director, Pinal County Open Space and Trails Department, stated that this planned trail was identified by the City of Coolidge. If this planned trail were to be developed, the new canal segment could serve as a barrier to future trail users.

There would be no impacts to land jurisdiction from the Proposed Action. Impacts to land ownership and land use would be direct, localized, long-term, minor, and adverse.

FCG Canal Alternative

In addition to the land acquisition requirements described previously for both action alternatives, the FCG Canal Alternative would require acquisition of a strip of new right-of-way along the length of the FCG Canal to provide adequate width to reconstruct the FCG Canal and construct a new parallel drainage channel. New right-of-way acquisition with the FCG Canal Alternative would be substantially higher than with the Proposed Action. Right-of-way acquisition requirements for this alternative were estimated at 313 acres.

Active or fallow agricultural land classified as prime or unique farmland would be affected by the FCG Canal Alternative, though to a somewhat lesser extent than the Proposed Action. In Reaches 1 and 3, the acreage of farmland potentially affected would be of similar magnitude to the Proposed Action; however, no farmland would be impacted by the FCG Canal Alternative in Reach 2, compared with 24 acres of loss for the Proposed Action in Reach 2. As with the Proposed Action, the resulting loss of agricultural lands would be exempt from the FPPA (D. L. Yancey, Arizona State Soil Scientist, NRCS, email communication, June 13, 2017). The remaining lands potentially impacted by the FCG Canal Alternative would be located on rangeland/desertscrub (including relatively undisturbed to highly fragmented segments).

There would be no impacts to land jurisdiction from the FCG Canal Alternative. Impacts to land ownership and land use would be direct, localized, long-term, minor, and adverse.

Cumulative Impacts

Past actions, especially urban expansion and rural development, have resulted in the gradual, yet permanent, conversion of farmland and rangeland to other uses. Reasonably foreseeable future projects would further contribute to the long-term conversion of irrigated farmland in the study area and surrounding lands. These would include additional residential, commercial, and industrial development surrounding the existing urbanized cores; planned development of mining operations and power generating and transmission facilities; and new corridor-scale transportation improvements (e.g., the North–South Corridor). Past, present, and reasonably foreseeable future actions, in combination with the localized, long-term, minor, and adverse effects of the action alternatives, would result in a minor to moderate cumulative effect on farmland and rangeland/desertscrub.

3.3 TRANSPORTATION

3.3.1 Affected Environment

Several state highways access the study area. SR 77 parallels the north bank of the Gila River from Christmas to Winkelman, and SR 177 parallels the north bank from SR 77 at Winkelman to Kelvin. SR 79 crosses the study area, including the construction area, in a general north–south orientation through Florence (refer to Figure 4). SR 87 crosses the study area from north–south through Coolidge. SR 287 and SR 387, which originate in Casa Grande, intersect SR 87 in the study area (refer to Figure 6). The study area contains numerous other roadways—paved and unpaved. Because the project is in a rural area, traffic volumes are quite low, with the exception of the state highways previously referenced. The Coolidge Airport is east of the study area approximately 7 miles south of Florence (refer to Figure 6).

The Arizona Department of Transportation is currently conducting a North–South Corridor Study in support of a future continuous north to south transportation corridor through central Pinal County. The North–South Corridor is a proposed 45-mile transportation corridor that would link US 60 near Apache Junction to I-10 near Eloy.

A Union Pacific Railroad line begins in the community of Picacho and extends north, traversing Coolidge. The main line of the Copper Basin Railway, which extends from Magma to Winkelman north of the Gila River, traverses the project vicinity in an east–west direction.

3.3.2 Environmental Consequences

No Action

With the No Action alternative, there would be no impact to existing or planned transportation infrastructure.

Effects Common to Both Action Alternatives

Construction activities would result in a temporary increase in truck traffic on highways and roads in the study area for the transport of construction materials and equipment to and from the active construction zone. The action alternatives would cross numerous municipal, county, and state roads and highways (Appendix F provides a list of the roads that would be crossed by the Proposed Action). Temporary road or lane closures could be required during construction

of these crossings, depending on the type of structure to be installed, the construction technique, and the construction phasing. Tunneling under the roadway would be less likely to disrupt traffic than cutting a trench across the roadway.

Any required lane closures could result in temporary traffic congestion and delays for motorists, and would require permits from the Arizona Department of Transportation, Pinal County, and/or local municipalities. The severity of the delays would vary based on the volume of traffic on the roadway at the time of the lane closures. Full road closures, if needed, would require the establishment and signing of detour routes. During construction at these crossings, traffic control and public safety measures would be required.

State highways, with generally higher traffic volumes and higher posted speed limits, would require more detailed plans for traffic control and detours during construction. The action alternatives would cross SR 79, which consists of two travel lanes in each direction and a two-way center-turn lane. If construction of this crossing involves tunneling under the highway, impacts on traffic would be minimal. If trenching is used, temporary lane closures would be required. Typically, at least two travel lanes would remain open during construction, allowing one lane of traffic for each direction of travel. Because SR 79 in this area generally parallels SR 79B, the business route could be used as a traffic detour for full highway closures, if required. SR 79B has one travel lane in each direction and a two-way center-turn lane.

Similar to the SR 79 crossing, construction of the crossing at SR 79B could involve tunneling or trenching. If trenching is used on SR 79B, traffic could be detoured temporarily to SR 79, or one lane of SR 79B could be closed at a time, with the remaining lane used to carry traffic in alternating directions of travel using traffic control measures (e.g., flaggers and lead vehicles). Close coordination with the responsible road agency would be required before construction of any road crossings.

Both action alternatives would cross a number of county and farm roads; however, the Proposed Action would cross the most. No permanent change in access to adjacent properties would result with either action alternative. Except as noted, the effects on transportation would be slightly more with the Proposed Action than the FCG Canal Alternative; however, no long-term impacts would result from either action alternative.

Impacts on transportation with the action alternatives would be direct, site-specific, short-term, minor, and adverse.

Cumulative Impacts

Impacts on transportation and traffic under the action alternatives would be short-term and temporary; therefore, the only potential for cumulative impacts to transportation and traffic would be if the construction of the action alternatives impacted roadway traffic in the same area and at the same time as other roadway improvement projects. Of the roadway improvement projects identified for the future, the reconstruction of the SR 79/SR 79B intersection and the traffic signal project at SR 79 and Diversion Dam Road are in close proximity to the construction limits with the action alternatives. The specific timing of these future roadway projects is unknown. Potential future actions, in combination with the site-specific, short-term, minor, and adverse effects of the action alternatives, would be site-specific, short-term, minor, and adverse.

3.4 VISUAL RESOURCES

3.4.1 Affected Environment

A viewshed is the area of land, water, or other physical elements visible to the human eye from a fixed vantage point. Visual resources constitute a composite of cultural and natural landscape features that characterize an area and influence the public's perception of that area. Visual resources are described in terms of the foreground, midground, and background.

Landscape preservation is occasionally enforced by local or regional regulations or policies. Upstream of Ashurst–Hayden Diversion Dam, the BLM has jurisdiction over lands along the study area. The BLM uses specific visual management objectives for lands under its jurisdiction. Downstream of Ashurst–Hayden Diversion Dam, the project's construction area falls under the jurisdiction of Pinal County, and a small percentage falls within the jurisdiction of the Town of Florence. Neither of these governments has plans, policies, or regulations that govern the preservation of visual resources.

The following paragraphs describe the visual setting of the study area from Coolidge Dam on the east to Picacho Reservoir on the west. Downstream of Coolidge Dam, the Gila River is narrowly confined in canyons as it flows through the Mescal Mountains and Needles Eye Wilderness (managed by the BLM). These mountains block views of the midground or background, with the exception of openings due to side canyons. At SR 77, the Gila River turns south. SR 77 parallels the river in this area.

SR 77 is a two-lane highway with occasional guardrail and is situated above the Gila River floodplain. The foreground to the west consists of SR 77, with hills immediately beyond the highway. Views of hills in the foreground are also present to the east. Between Winkelman and Kelvin, the Gila River flows through a broader floodplain flanked by hillsides. As it flows through communities in this area, the foreground views include mining facilities and commercial and residential buildings. The midground opens up in these areas, with a view of mountains in the background to the southeast.

Downstream of Kelvin, the Gila River floodplain becomes constricted by the Tortilla Mountains to the south and the White Canyon Wilderness (managed by the BLM) to the north. Just upstream of Ashurst–Hayden Diversion Dam, the terrain opens up to a relatively flat foreground and midground, with hills visible in the background to the north.

From Ashurst–Hayden Diversion Dam to Picacho Reservoir, the foreground and midground views are dominated by relatively flat agricultural lands, interspersed with undeveloped lands with low desertscrub and occasional residential or industrial development. Background views include a flat horizon interrupted by low, volcanic mountains.

Several towns and small cities are along the length of the study area, generally north of the construction area. In these communities, the foreground views include roads, traffic, commercial buildings, residential buildings, and parks, in addition to agriculture.

The construction area with both action alternatives is predominantly flat agricultural land with expanses of low desertscrub. The construction area does not contain any special status land uses

such as national wilderness areas, national wild and scenic rivers, national parks, or other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape.

3.4.2 Environmental Consequences

Visual resource impacts are generally defined by the extent to which a project would modify the perceived characteristics of the landscape. Effects on visual resources with the action alternatives would be associated with the alteration of existing facilities and the construction of new facilities in the construction area downstream of Ashurst–Hayden Diversion Dam. No change to visual resources would occur in the area between Coolidge Dam and Ashurst–Hayden Diversion Dam because no construction is proposed for this area.

No Action

The No Action alternative would rehabilitate or replace China Wash Flume, which would result in a negligible alteration of the foreground views consistent with the existing visual setting and quality. No other construction would occur with the potential to impact visual resources. Operation and maintenance of SCIP irrigation facilities would occasionally produce minor modifications that would be consistent with the existing visual setting. Impacts on visual resources with the No Action alternative would be direct, site-specific, short-term, negligible, and adverse.

Effects Common to Both Action Alternatives

Rehabilitation of existing canal segments throughout the construction area would result in only minor alterations of foreground views, consistent with the existing visual character and quality of the agricultural landscape. Because these alterations would generally be of low profile, no noticeable change to midground or background views would be expected.

The new link canal segment (Reach 3B) and the new interim earthen canal (Reach 3C) would add new man-made, low-profile features on the landscape and would constitute a minor to moderate change in the visual character of foreground views. The new regulating reservoir would result in a moderate change to the visual character of the site, transforming previously cultivated farmland to a relatively large manufactured facility that would intermittently store surface water. The size of this facility would make it more visible in midground and background views, though these views would be somewhat limited due to the relatively flat landscape surrounding the site.

Other improvements include new culverts or bridges needed for crossing highways and roadways. In general, these improvements would be consistent with the existing visual character of the transportation corridor being crossed. Due to their profile, bridges may be more noticeable than culverts.

The installation of approximately ten 15-foot-tall repeater towers would constitute the highest profile feature of the action alternatives but would be consistent with other utility and transportation infrastructure crossing the study area. Approximately ten 15-foot-tall repeater towers would be needed for either action alternative.

Under Subalternative A, China Wash Flume would be removed and replaced with an inverted siphon system, which would be buried below ground. This would constitute a moderate change in visual setting due to the removal of a prominent man-made structure from foreground and midground views. Under Subalternative B, the existing flume would be replaced with a similar structure; no notable change in visual setting or character would be anticipated.

Proposed Action

Most of the Proposed Action would be constructed on or adjacent to existing canal alignments consistent with the existing visual setting and character. Key exceptions include the construction of 3.5 miles of new concrete-lined canal on new alignment in Reach 3B (link canal) and construction of 1.6 miles of an interim new earthen canal in Reach 3C to connect the link canal to the FCG Canal Extension. These exceptions would contribute new features to the foreground and, in some cases, midground views. No special status lands would be affected by the Proposed Action. Impacts on visual resources with the Proposed Action would be direct, site-specific, long-term, minor to moderate, and adverse.

FCG Canal Alternative

Most of the FCG Canal Alternative would be constructed on or adjacent to existing canal alignments consistent with the existing visual setting and character. Key exceptions include the construction of 1.8 miles of new crosscut canals to connect the FCG Canal with SCIDD laterals, construction of 2.5 miles of new concrete-lined canal on new alignment in Reach 3B (link canal), and construction of 1.6 miles of an interim new earthen canal in Reach 3C to connect the link canal to the FCG Canal Extension. Similar to the Proposed Action, these exceptions would contribute new features to the foreground and midground views. Unlike the Proposed Action, the FCG Canal Alternative would also require the construction of 17.2 miles of new drainage channel. Though this would be a new feature on the landscape, it would be similar in nature and in close proximity to the lined main canal. With the exception of the repeater towers, the remaining improvements would be of low profile and, therefore, would be less noticeable in the midground and background views. No special status lands would be affected by the FCG Canal Alternative. Impacts on visual resources with the FCG Canal Alternative would be direct, site-specific, long-term, minor to moderate, and adverse.

Cumulative Impacts

Past actions, including urban expansion, other rural development, and the construction of transportation, irrigation, water, and power infrastructure, have resulted in minor and scattered changes in the visual character and setting of the surrounding area. Reasonably foreseeable future projects would further contribute to changes in the visual character and setting of the area. These would include additional residential, commercial, and industrial development surrounding the existing urbanized cores; planned development of mining operations and power generating and transmission facilities; and new corridor-scale transportation improvements (e.g., the North–South Corridor). Past, present, and reasonably foreseeable future actions, in combination with the site-specific, long-term, minor to moderate and adverse effects of the action alternatives, would result in a moderate impact on visual resources.

3.5 ENVIRONMENTAL JUSTICE

3.5.1 Affected Environment

Title VI of the Civil Rights Act of 1964 ensures that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving Federal financial assistance on the basis of race, color, or national origin. Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, signed by President Clinton on February 11, 1994, directs that Federal programs, policies, and activities not have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

Data used in the EA for the environmental justice analysis were taken from the American Community Survey (ACS) provided by the U.S. Census Bureau (2014). The ACS uses a random sample design to collect data representative of the overall population in an area. Data used in the EA are from the most recent five-year running average (2010–2014). These data were used in place of the 2010 decennial census data for three reasons: ACS data are more recent, ACS data for race and low-income populations are available for block groups (geographic subdivisions of census tracts that contain the most finite data), and the 2010 census does not currently include information on low-income populations for all block groups in the construction area.

Consideration was given in this environmental justice analysis to those block groups that are adjacent to or overlap any segment of the construction area. Table 5 provides the data for total minority populations and low-income populations for each of the selected block groups and the comparison populations.

Total Minority

For the purpose of environmental justice evaluations, a racial or ethnic minority population is an aggregate composed of the following categories: Black/African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Some Other Race, Two or More Races, and Hispanic.

Data from the 2010–2014 ACS indicate that minority populations occur in the selected block groups, as shown in Table 5. The percentages of minorities for Census Tract (CT) 9.02 Block Group (BG) 1 (64.2 percent) and CT 8.03 BG 2 (62.8 percent) are meaningfully higher than the corresponding percentages for Pinal County (41.9 percent) and the State of Arizona (43.1 percent), and represent a majority of the population in these block groups. The percentages of minorities for CT 8.03 BG 1 (60.4 percent) and CT 12 BG 2 (51.4 percent) are not meaningfully higher than the comparison populations but represent a majority of the population in these block groups. For this EA, the four referenced block groups are considered protected populations, warranting environmental justice analysis.

Table 5. 2010–2014 American Community Survey total minority and below poverty level populations.

Area	Total Population	Total Minority[a]		Total Population for Whom Poverty Is Determined	Below Poverty Level	
		#	%		#	%
CT 8.02, BG 1	1,270	456	35.9	879	62	7.1
CT 8.03, BG 1	4,213	2,543	60.4	83	0	0.0
CT 8.03, BG 2	7,557	4,749	62.8	753	91	12.1
CT 9.02, BG 1	3,307	2,122	64.2	3,225	811	25.1
CT 12, BG 2	2,314	1,190	51.4	2,289	640	28.0
Pinal County	390,160	163,322	41.9	364,937	61,397	16.8
Arizona	6,561,516	2,826,663	43.1	6,411,354	1,169,309	18.2

Source: U.S. Census Bureau 2014

CT = Census Tract, BG = Block Group, # = No., % = Percentage

[a] "Total Minority" is composed of all people who consider themselves Non-White racially plus those who consider themselves White Hispanic. Shaded areas denote percentages notably higher than comparison areas' percentages or percentages representing a majority of the population in the Census Tract.

Below Poverty Level

Data from the 2010–2014 ACS indicate that individuals living below the poverty level reside in the selected block groups. As shown in Table 5, the percentages of people living below the poverty level in all block groups are not meaningfully higher than the corresponding percentages for Pinal County (16.8 percent) and the State of Arizona (18.2 percent) and do not represent majorities of the populations of these block groups. Though these populations would not be protected based on their percentages of population living below the poverty level, they are considered protected populations in this EA because they contain minority population concentrations (refer to Total Minority).

3.5.2 Environmental Consequences

Where populations defined under EO 12898 are present in the project's area of potential direct and indirect effects, consideration is given to whether the effects on these protected populations would be disproportionately high and adverse.

No Action

The rehabilitation or replacement of China Wash Flume would not affect populations or communities protected under EO 12898 because there are no residential populations in the vicinity of the proposed construction. Under the No Action alternative, there would be no impacts on the populations or communities defined under EO 12898.

Effects Common to Both Action Alternatives

The effects on environmental justice would be essentially the same under both action alternatives.

Though residential development is present in the larger study area, it is in the proximity of the proposed construction area only in one location—in Florence. This area is considered to be a protected population (CT 9.02, BG 1). The segment of the project in proximity to this protected

population is approximately 0.9 mile long, or 3.7 percent of the 24.2-mile new main canal under the Proposed Action. It is expected that the action alternatives could require the relocation of some infrastructure and facilities, such as fencing; however, residences and businesses can be avoided. The action alternatives would not displace residences or businesses.

With either action alternative, short-term construction-related impacts would be expected when construction is ongoing in the vicinity of residential populations. These impacts could include the generation of air pollutants (e.g., dust), an increase in noise levels, and public safety risk associated with the construction site. Because these effects would occur in the entire construction area, not just the area adjacent to a protected population, populations protected under EO 12898 would not be disproportionately affected. In accordance with local and regional rules, regulations, and ordinances, mitigation measures (refer to Table 1) would be implemented to minimize these effects throughout the construction area.

Impacts on populations protected under EO 12898 would not be disproportionate; therefore, there will be no environmental justice–related impacts with the action alternatives.

Cumulative Impacts

There would be no cumulative impacts on protected populations because the project would not result in a disproportionate impact on these populations.

3.6 CULTURAL RESOURCES

Cultural resources are the physical remains of past human activity. They include any prehistoric or historic sites, districts, buildings, structures, objects, landscapes, and natural features that are significant to groups associated with them, specifically communities, states, Native American Tribes, and nations. Cultural resources that (1) are at least 50 years of age, (2) retain integrity of location, design, setting, materials, workmanship, feeling, and association, and (3) are identified as significant because they are associated with important events or people, embody a distinctive style, or have the potential to yield important information about the past, are termed "historic properties." Historic properties are afforded certain protections in accordance with state and Federal legislation, specifically the NHPA. These regulations also include consideration for Traditional Cultural Properties, which are historic properties that are associated with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community (often, but not always, Native American groups).

Section 106 of the NHPA requires Federal agencies to take into account the effects of their actions and programs on historic properties. In 2014, Public Law 113-287 moved NHPA's provisions from Title 16 of the U.S. Code to Title 54. Section 106 was retained within Title 54 as Section 306108. Regulations for Protection of Historic Properties (36 CFR § 800), which primarily implement Section 106, were most recently amended in 2004. These regulations define a process for responsible Federal agencies to consult with SHPO, Native American groups, other interested parties, and, when necessary, the Advisory Council on Historic Preservation, to ensure that historic properties are identified, that they are evaluated for potential adverse effects, and that these effects are mitigated during the project planning and implementation process.

3.6.1 Affected Environment

Culture History

The Middle Gila River Valley has a rich and diverse history of human occupation. Though uncommon in the study area, Paleoindian and Archaic archaeological sites, which are the remnants of the earliest human occupations in Arizona, may be deeply buried in the alluvial soils of the Valley. Cultural resources associated with the Hohokam occupation (also referred to as the Huhugam) are much more common in the study area and comprise the majority of historic properties investigated as part of this project. The study area is located in the ancestral territory of the Akimel O'odham (Pima) and Piipaash (Maricopa) peoples. Likewise, the area also was settled and used by nonindigenous populations in the historic period, including people with European, African, and Chinese ancestral ties. Cultural resources associated with these groups are present in the study area.

Several recent, detailed cultural histories have been prepared for the Middle Gila River Valley by Archaeological Consulting Services, Ltd. (Florie et al. 2010; Florie and Luhnow 2009; Gregory et al. 2016; Ryan et al. 2010; Schilling et al. 2009a, 2009b) and others (Craig 2001a; Woodson 2000, 2010), and farther south for the Eloy and Casa Grande areas (Florie and Fangmeier 2009). A brief discussion of the current understanding of the culture history of the Phoenix Basin/Middle Gila River Valley follows.

Prehistoric Period

The Paleoindian period (10,000–7500 B.C.) represents the earliest well-documented human occupation of North America. Paleoindian lifeways were characterized by small, nomadic bands that hunted megafauna and gathered wild plants. Numerous sites from this period have been found in southern Arizona (Cordell 1984; Haury 1950; Huckell 1982, 1984), but evidence for Paleoindian occupation farther north is sparse and largely limited to isolated projectile points (e.g., Crownover 1994; North et al. 2005). No Paleoindian sites have been reported in the project vicinity.

The Archaic period (7500 B.C.–A.D. 300/500) is divided into Early, Middle, and Late. People living during the Early Archaic (7500–4800 B.C.) followed a generalized hunter-gatherer lifeway and employed a subsistence-settlement strategy involving high residential mobility, annual procurement rounds, and a wide interaction sphere. By the Middle (4800–1500 B.C.) and Late Archaic (or Early Agricultural) (1500 B.C.–A.D. 300) period, populations began settling in semi-permanent and/or permanent villages of circular pit houses where inhabitants focused on cultivating maize and foraging for wild plants (Huckell 1990; Mabry et al. 1997; Roth 1992). Substantial Archaic occupations have been reported from east-central and southern Arizona and the Tucson Basin (e.g., Bayham et al. 1986; Doyel 1993; Huckell 1990; Mabry and Archer 1997; Matson 1991; Roth 1992; Whalen 1971). Though few Archaic sites have been found in the project vicinity, several have been recorded farther downstream on the Gila River Indian Community, and upstream at Kearny (Clark 2000).

The Hohokam archaeological culture spread throughout the region following the Late Archaic/Early Agricultural period. Archaeologists have identified three general periods of growth and change for the Hohokam (Doyel 1979; Haury 1976). The Early Formative (Pioneer)

period (ca. A.D. 1–A.D. 700) is characterized by the development of agriculture and pottery, and the establishment of settled villages, leading to a more sedentary lifestyle (Cable and Doyel 1985; Doyel 1993; Wilcox et al. 1981). The large village site of Snaketown, situated downstream on the Gila River Indian Community, was occupied during the Early Formative period (Gladwin et al. 1937, 1948; Haury 1976). The Late Formative (Colonial and Sedentary) period (A.D. 700–1050) is characterized by the development of extensive irrigation systems, large villages, ornate arts and crafts industries, public architecture such as ball courts and trash/flat topped mounds, formalized mortuary ritual, and geographic expansion (Gregory 1987, 1991; Wilcox and Sternberg 1983). Several large Late Formative sites occur in the study area and vicinity, including Grewe (Craig 2001b) and the Preclassic phase of Casa Grande Ruins, which has a large impressive ballcourt (Wilcox and Sternberg 1983).

The last period in the Hohokam sequence is the Classic period (A.D. 1050–1350), during which populations further expanded their irrigation systems in some areas; shifted settlement patterns and architectural styles from pit houses to above-ground walled villages; constructed platform mounds, and, in the Middle Gila River Valley, multistory adobe great houses; manufactured and used different pottery and craft assemblages; shifted burial patterns from primarily cremation to extended inhumation; and reorganized their exchange networks (Downum and Bostwick 2003; Doyel 1981; Gregory 1987; McGuire and Howard 1987).

Though the Classic period was originally described as a time of increased Hohokam power, wealth, and cultural achievements, others have interpreted the Classic period as a time during which people adopted more complex social structures, expanded their trading relationships, and in some cases moved to new areas in an attempt to adapt to the uncertainties associated with unprecedented social and environmental stress (Abbott 2000). In the Middle Gila River Valley, many large Classic period sites were regularly spaced along the south side of the river, from Pinal Pueblo west to Florence Ruin/Saturday Site to Adamsville Ruin and Casa Grande Ruins in and around Coolidge. All of these sites were aligned along major canals and attest to the vitality of the land and water in this area (Woodson 2010).

A Post-Classic Polvorón phase has been proposed (A.D. 1350–1450/1500) for the Hohokam sequence (Crown and Sires 1984; Sires 1984), but the validity of the phase remains the subject of some debate (e.g., Andresen 1985; Bostwick et al. 1996; Chenault 2000; Doyel et al. 1995; Henderson and Hackbarth 2000; Zyniecki 1996). Polvorón phase components suggest a decline in complexity and a trend toward more egalitarian, possibly household-based, social organization. Evidence for large-scale irrigation and organized ritual disappears, and the distribution of sites suggests varied subsistence strategies. The phase is characterized by a return to pit house architecture, low frequencies of buffware ceramics, high frequencies of Salado polychrome and red ware, and an apparent increase in obsidian use, suggesting a reorganization of trade networks. Polvorón phase components have been identified at many sites in the Lower Salt and middle Gila river valleys (Andresen 1985; Bostwick et al. 1996; Chenault 1996, 2000; Doyel 1991a; Doyel et al. 1995; Henderson and Hackbarth 2000; Sires 1987; Zyniecki 1996), but have not been found in areas to the south.

Protohistoric Period

The Protohistoric period (A.D. 1450–1750) is defined as the transition from the prehistoric period to the historic period. In the Middle Gila River Valley, this stretches from the end of the Hohokam Classic period to the establishment of Spanish missions and presidios farther south (Doelle 1981; Gilpin and Phillips 1998; Wilcox and Masse 1981). The descendants of those who lived along the Salt and Gila rivers at the time of the Spanish *entrada* became known as the Akimel O'odham (Doyel 1991a). The descendants of those who left Arizona prior to or during the Protohistoric period have been linked via archaeological remains, oral histories, and linguistic data with the Hopi (Bahr 2007; Bahr et al. 1994; Teague 1993), Yuman and Piman speakers (Shaul and Andresen 1989) (though refer to Malhi et al. 2003 for a different interpretation based on mitochondrial DNA evidence), and Zuni (Hale and Harris 1979; Shaul and Hill 1998).

Some protohistoric sites have been found in southeastern Arizona, including the Tucson Basin (Effland et al. 1989; Ravesloot and Whittlesey 1987), and on the Ak-Chin Indian Community (Gasser 1990), but fewer sites from this period have been identified in the Salt and Gila river valleys (Loendorf 2012; Wells 2006). Until recently, the Protohistoric period was relatively uncontroversial; however, this time span is becoming increasingly intriguing as investigations reveal the complex patterns of human behavior following the end of the Hohokam Classic period (Bostwick et al. 1996; Chenault 1996, 2000; Zyniecki 1996). Recent discoveries of protohistoric remains at Pueblo Salado in the Salt River Valley post-date the proposed A.D. 1450 end of the Polvorón phase by 150 years or more, and link the Hohokam and Akimel O'odham occupations of the Salt River Valley (Bostwick et al. 1996; BRW 1989; Greenwald et al. 1996).

Many similarities link the prehistoric Hohokam and protohistoric O'odham cultures, including habitation structures, council houses, and public plazas; ball games; subsistence practices and domesticated crops; plain brown, polished red, and red-on-buff pottery; and inhumation and cremation burials (Doyel 1991a). Though the Piipaash could have influenced the Akimel O'odham production of red-on-buff pottery and cremation burial patterns (Bahr 1983; Doyel 1981, 1989; Ezell 1963, 1983; Haury 1976), Hohokam cemeteries uncovered at late Classic period sites reveal striking parallels to historic O'odham burial patterns (Doyel 1991b; Mitchell 1992).

The Bachi phase (A.D. 1450–1750) has been proposed for the Akimel O'odham occupation of the Picacho Mountains and the Middle Gila River Valley (Doyel 1991a, 1991b). Phase characteristics include pit houses, possibly round houses or *ki* styles; polished red ware ceramics; small village and ranchería settlement patterns; and a mixed subsistence strategy. In the late seventeenth century, the Spanish documented six Pima villages along the Middle Gila River Valley west of Casa Grande Ruins. Another village was found along the Santa Cruz River near Picacho Peak. Villages were self-sufficient, politically autonomous, and organized as patrilineal extended families. Each had a community leader and possibly a shaman. The O'odham population was estimated between 2,000 and 3,000, though the number of villages and the population estimates may be low (Ezell 1983).

Doyel (1991a) proposed the term Blackwater phase (A.D. 1750–1870) to designate the period of Akimel O'odham occupation of the Middle Gila River Valley between Pima Butte and

Casa Grande Ruins. In this phase, earlier characteristics persisted while new elements were introduced. Around A.D. 1750, the O'odham acquired horses and began growing wheat in irrigated fields (Doyel 1991a). The newly adopted crop provided them with a reliable winter food source, and the horse helped to promote a highly integrated militaristic society to combat invading Apaches (Doyel 1991a).

Nucleated villages developed in response to Apache aggression (Doyel 1989). Residents cultivated corn, beans, squash, and cotton, and foraged for mesquite beans, cactus fruits, and other native products. Other adaptations included horses, cattle, and other livestock; metal implements; trade; and raiding. Akimel O'odham agricultural technology included dams, dikes, ditches, and perhaps irrigation canals, but whether they used canals at the time of contact is still debated (Doelle 1981; Ezell 1961, 1983; Haury 1976). By A.D. 1840, the Akimel O'odham were participating in cash markets by supplying beef and wheat to nonnative people passing through the area (Ezell 1983). The Mexican-American War (A.D. 1846–1848) and the subsequent Gadsden Purchase (A.D. 1853) resulted in the American takeover of some Akimel O'odham homelands, but no Euro-American religious or military facilities were constructed in the Middle Gila River Valley area (Barnes 1984; Weber 1982).

Historical Period

Beginning in the seventeenth century, the Spanish Empire asserted loose control of the territory that would become Arizona and held it until 1821, when Mexico gained its independence. In the brief period of Mexican control (1821–1848), the nonindigenous population in northern Sonora and southern Arizona was sparse; many of the Sonoran missions were abandoned or severely depleted. Euro-American settlements in southern Arizona were essentially limited to the isolated presidios of Tubac and Tucson.

In 1848, the bulk of lands north of the Gila River that would later be designated Arizona Territory became part of the United States through the Treaty of Guadalupe Hidalgo. However, all of southern Arizona (including Tucson and Tubac) south of the river remained under the jurisdiction of Mexico until 1854, when it was acquired through the Gadsden Purchase. Euro-American interest in the territory was sparse until 1848–1849, when gold was discovered in California and speculators began traveling in larger numbers across Arizona Territory to reach the West Coast.

Conflict between Native Americans—especially the Apache in the highlands to the east and southeast—and Euro-American miners and settlers was inevitable. Despite a government policy of peaceful negotiations, soldiers and settlers embarked on hostile campaigns against the Apache. Retaliation by Apache-Yavapai coalitions throughout central Arizona led to the establishment of Fort McDowell on the lower Verde River in 1865. Eventually, Euro-American settlers would count on a defensive line of forts stretching throughout the Apache-Yavapai territories, from Prescott to present-day Silver City, New Mexico (Spicer 1986), though no forts were built on the Gila River.

Euro-American development of the Middle Gila River Valley was slow, even after the Apache were relocated to their present-day reservations, because of a limited water supply. The initial development (1860s) and completion (1880s) of the original Florence Canal system took virtually all of the water from the Gila River at the expense of downstream O'odham and

Piipaash farmers on the Gila River Indian Community (Introcaso 1986). A new Florence Canal system was built in the 1880s (Baldwin 1941) comprising an enlarged main canal that extended 15 miles south of Florence to a basin known as the Picacho Reservoir. Another canal was extended west to irrigate lands southwest of Florence, including the Casa Grande Valley. Flood damage and financial problems hindered the canal company's ability to properly maintain the system, however, and by 1900, the initial irrigated acreage had not been substantially expanded (P-MIP 2002a). This had the effect of limiting the growth of Florence and nearby communities.

The San Carlos Project

Euro-American settlers considered the fertile soil of the Middle Gila River Valley the greatest resource in Pinal County, but they struggled to develop the means to deliver sufficient water for farming. Since the 1890s, the residents of Florence and Casa Grande, as well as others who had an interest in developing the region, had been promoting the development of a large-scale irrigation system that they called the San Carlos Project. The proposed irrigation system required construction of a dam on the Gila River near the Apache Agency at San Carlos to store the floodwaters that typically washed through the Valley every spring (Introcaso 1986). The passage of the National Reclamation Act of 1902 raised hopes of getting Federal funding for the project, but Pinal County was unable to compete successfully against the Salt River Valley, where extensive farmland had already been developed. Therefore, while the Salt River Project was funded, the San Carlos Project remained conceptual.

Federal projects on the Gila River Indian Community had focused on developing ground water and capturing floodwaters, but these proved to be ineffective, supplying little water, though the Federal government had promised to provide enough to irrigate 50,000 acres (P-MIP 1999). Initially, non-Indian interests opposed allowing the reservation to receive *any* surface water from the Gila River and instead promoted more ground water development, even suggesting that tribal lands be sold to pay for the project (Introcaso 1986).

Casa Grande Valley farmers eventually changed their views, however, and recognized that a combined effort to supply the reservation with water as well as bring irrigation to new private lands might be the best approach to securing Federal funding. At that time, the San Carlos Project was promoted as a means to supply water for 40,000 acres on the reservation and 55,000 acres of nonreservation lands (Introcaso 1986; P-MIP 2002b). Water was in even higher demand as the population increased with the relocation of the Territorial Prison to Florence in 1907 (Gregory et al. 2016).

Senator Henry Ashurst and Representative Carl Hayden introduced a bill for the San Carlos Project in both houses of Congress in 1914. It provided funds to build a dam at San Carlos and a diversion dam above Florence, as well as cover the cost of lining canals with concrete to cut the loss of water from seepage. The bill had the support of Pinal Mutual Irrigation (successor to the Florence Canal Company) and the Casa Grande Valley Water Users' Association, but it was not passed. Nonetheless, Ashurst and Hayden were successful in getting an appropriation in 1916 to build the Florence Diversion Dam, the first component of the planned irrigation system.

In anticipation of this construction, the current FCG Canal was begun east of, and parallel to, the old Florence Canal in 1915, and the Pima Lateral from it flowed west to supply the Gila River Indian Community during times when the flow in the river channel was too low. Construction of

the diversion dam began in 1921 and was completed in 1922. The dam was dedicated on May 10, 1922, when it was renamed Ashurst–Hayden Diversion Dam. Construction of the Sacaton Diversion Dam was then initiated farther downstream; that diversion structure was completed in June 1925 (P-MIP 2002b).

By the mid-1920s, the Federal government had a considerable investment in water development in Pinal County, but the Gila River Indian Community was still not receiving an adequate supply of water. In 1924, Congress approved the San Carlos Act, which authorized construction of a storage dam and reservoir (Introcaso 1986). After that, the project became known as the San Carlos Irrigation Project (SCIP). Construction was completed in 1929, and two distinct organizations were formed to manage the distribution of the water: the Indian Works served the Indian lands and SCIDD provided water for non-Indian lands. The common canals and facilities became known as the Joint Works.

By the time the San Carlos (now Coolidge) Dam and reservoir were completed, an extended drought curtailed the total amount of water flowing through the watershed, and the reservoir never filled as anticipated. As a result, SCIDD started relying on pumping ground water from wells along the canal for a considerable portion of the water needed for irrigation (Introcaso 1986). Nevertheless, this had a large impact on central Pinal County. From 1928 to 1938, irrigated land nearly doubled from 75,000 to 132,000 acres (Weisiger 1995).

As a result of a more reliable supply of water for irrigation, the existing towns grew, and new settlements were established. The existing and new agricultural towns, including Coolidge, Randolph, La Palma, and Eloy, were linked by transportation networks to facilitate movement of produce. Smaller agricultural centers were established near cotton gins. Land speculation was rampant leading up to the Great Depression. The irrigated land in Pinal County doubled from 150,000 acres in 1920 to nearly 300,000 in 1930 (Keane 1991).

Throughout the 1930s, most new agricultural lands that were developed in Arizona were located in Pinal County, though agricultural development was proceeding at a slower pace, and most were irrigated with pumped ground water (Sheridan 1995). In 1950, the permanent workforce in the county was 12,000, but that number more than doubled each year as migrant farm workers arrived for the fall cotton harvest (Arizona Employment Security Commission 1955). After 1960, however, fewer laborers were employed (LeSeur 2000), though agriculture continued to dominate the economy of Pinal County.

Cultural Resources in the Study Area

The Middle Gila River Valley has been, and remains, an important region for past and present inhabitants who have left their mark on the landscape and the history of the area. The information that follows summarizes the cultural resources recorded within the APE of the Proposed Action.

One of the initial tasks undertaken for the project was the preparation of an updated Class I literature review for the entirety of the Joint Works system, which includes not only the main canals, such as the FCG Canal, Florence Canal, and the FCG Canal Extension, but the network of primary laterals that come off of them, with exclusions limited to alignments that were not part of the project, including the Pima and Blackwater laterals. The purpose of the Class I

literature review was to identify all previous archaeological projects and recorded cultural resources within 1 mile of the Joint Works system to (1) gain an understanding of the nature of cultural resources in the area and (2) evaluate the nature of previous investigations within the APE to guide further investigations for this project.

Archaeological Consulting Services, Ltd., prepared the updated Class I document (Florie et al. 2010), which demonstrated that more than 100 documented cultural resource sites occur in the Joint Works system and vicinity. The Class I document concluded that additional sites would likely be identified during pedestrian survey of the APE given the unevenness of previous research coverage and the age of many of those prior projects. For example, many historical-period resources that were not 50 years of age when originally identified may be considered historical-period sites now under National Register of Historic Places (NRHP) criteria. Subsequent completion of the Class III pedestrian survey confirmed this assumption, resulting in the identification of 21 new archaeological sites.

To identify all cultural resources within the Proposed Action APE, Archaeological Consulting Services, Ltd., completed Class III pedestrian survey from the edge of the settling basin to the western edge of Picacho Reservoir (Jones and Rich 2016a, 2016b, 2017; Ryan et al. 2012). This resulted in the identification of 43 cultural resources within the Proposed Action APE (Table 6). Of this total, 20 are previously recorded archaeological sites, two are cultural resources listed in the Arizona Register of Historic Places (ARHP) that do not have assigned Arizona State Museum site numbers, and 21 are newly recorded archaeological sites. Seventeen historic properties have been determined eligible for inclusion in the NRHP, 11 archaeological sites have been determined ineligible, and 15 sites lack sufficient data to adequately evaluate them for NRHP eligibility. Six of the 15 sites listed as unevaluated were not relocated during archaeological investigations—four archaeological sites and two ARHP-listed properties.

Table 6. Cultural resources data and management recommendations from the Proposed Action Class III survey, settling basin outlet to Picacho Reservoir.

Site Number/ Site Name[1]	Site Type	Comments	Eligibility (Criterion)	Management Recommendations
Previously Recorded				
AA:2:130 Pima Lateral	Historical-period canal	Constructed 1925–1928	Determined eligible (A and D)	Features within APE have been adequately mitigated by field documentation and SCIP HAER. No additional cultural resources work required.
AA:2:133 Florence–Casa Grande Canal Extension	Historical-period canal	Constructed 1928–1930	Determined eligible (A and D)	Features within APE have been adequately mitigated by SCIP HAER and field documentation. No additional cultural resources work recommended.
AA:2:216 Bartlett Road	Historical-period road	Constructed ca. 1920	Determined ineligible	No additional cultural resources work recommended.
AA:3:117[2]	Prehistoric lithic scatter	Archaic	Unevaluated	Not relocated within APE. No additional cultural resources work recommended.

Table 6. Cultural resources data and management recommendations from the Proposed Action Class III survey, settling basin outlet to Picacho Reservoir.

Site Number/ Site Name[1]	Site Type	Comments	Eligibility (Criterion)	Management Recommendations
AA:3:209 Casa Grande Canal	Historical-period canal	Constructed in 1889	Determined eligible (A, C, and D)	Features within APE have been adequately mitigated by SCIP HAER and field documentation. No additional cultural resources work recommended.
AA:3:211 Florence Canal	Historical-period canal	Constructed 1886–1889	Determined eligible (A and D)	Features within APE have been adequately mitigated by SCIP HAER and Phase 1 archival research. No additional cultural resources work required.
AA:3:215 Florence–Casa Grande Canal	Historical-period canal	Constructed 1928–1930	Determined eligible (A and C)	Features within APE have been adequately mitigated by SCIP HAER, archival research, and field documentation, except China Wash Flume. No additional cultural resources work on the canal required. HAER and exhibit required for China Wash Flume.
AA:3:324 Picacho Reservoir	Historical-period reservoir	Constructed 1889–1890	Determined eligible (A and C)	Features within APE have been adequately mitigated by SCIP HAER and field documentation. No additional cultural resources work recommended.
AA:16:303 Ashurst–Hayden Diversion Dam Maintenance Facility	Historical-period structures	ca. A.D. 1920s–1950s	Determined eligible (A and D)	Features within APE have been adequately mitigated by SCIP HAER and field documentation. No additional cultural resources work required.
FF:9:17 US 80/89	Historical-period road	Site has been heavily modified within the APE	Determined eligible (A, C, and D)	Features within APE have been adequately mitigated by previous documentation. No additional cultural resources work required.
U:15:5[2]	Prehistoric artifact scatter	Not relocated within APE	Unevaluated	Eligibility testing revealed no cultural deposits within APE. No additional cultural resources work required.
U:15:6(ARS)[2]	Historical-period structure	ca. A.D. 1912; not relocated within APE	Unevaluated	Not relocated within APE. No additional cultural resources work required.
U:15:13 U:15:46 U:15:31 (MNA) Aqueduct 14	Prehistoric artifact scatter	A.D. 300–1450; Hohokam	Determined eligible (D)	Site is heavily disturbed within the APE. No additional cultural resources work required.
U:15:47[2] NA 15671 U:15:35(MNA)	Prehistoric artifact scatter with features	A.D. 300–1450; Hohokam	Unevaluated	Eligibility testing revealed no cultural deposits within the APE. No additional cultural resources work required.

Table 6. Cultural resources data and management recommendations from the Proposed Action Class III survey, settling basin outlet to Picacho Reservoir.

Site Number/ Site Name[1]	Site Type	Comments	Eligibility (Criterion)	Management Recommendations
U:15:124 Florence Ruin, Saturday site, Florence Pueblo (U:16:664)	Prehistoric village with a historic component	A.D. 300–1450, 1870–1962; Hohokam; only a few sherds visible within APE	Determined eligible (D)	Initial Phase 1 data recovery within the APE did not identify any subsurface deposits. Additional Phase 1 data recovery required within the expanded APE.
U:15:661 U:15:7(REC) SCIP Utility Line	Historical-period utility line	Post–A.D. 1930; numerous segments occur within APE	Determined ineligible	No additional cultural resources work required.
U:15:662 U:15:5(REC) Diversion Dam Road	Historical-period road	A.D. 1892–present; parallels the Florence–Casa Grande Canal	Determined ineligible	No additional cultural resources work required.
U:15:676 U:15:1(REC)	Prehistoric artifact scatter	A.D. 300–1450; Hohokam	Determined eligible (D)	Boundary testing revealed one feature within the APE. Phase 2 data recovery required.
U:15:678 U:15:5(ARS)	Prehistoric artifact scatter	A.D. 300–1450; Hohokam	Determined eligible (D)	Eligibility testing revealed no cultural deposits within the APE. No additional cultural resources work required. Avoidance in expanded APE required.
V:5:198 Eastern Mining Area Hayden–Coolidge Transmission Line	Historical-period utility line	A.D. 1961–present for this newly recorded segment	Determined eligible (A and D)	The entire Eastern Mining Area Transmission Line is eligible; however, this segment has been determined noncontributing to the site's overall eligibility. No additional cultural resources work required.
90-I (SHPO)[2] Florence Archaeological District	Prehistoric artifact scatter	B.C. 1200–A.D. 1450; unidentified archaeological culture(s)	ARHP-listed (C)	No data about this district was available from SHPO, and the district was not relocated within the APE. No additional cultural resources work required.
131-I (SHPO)[2] Arizona State Prison Captain of the Guards House	Historical-period structure	A.D. 1908–1967	ARHP-listed (A and C)	No data about this site was available from SHPO, and the site was not relocated within the APE. No additional cultural resources work required.
Newly Recorded for This Project				
AA:3:280	Historical-period trash dump	A.D. 1870–1962	Determined ineligible	No additional cultural resources work required.
AA:3:283	Historical-period road	A.D. 1920s–1962	Determined ineligible	No additional cultural resources work required.
AA:3:284	Historical-period road	A.D. 1920s–1962	Determined ineligible	No additional cultural resources work required.

Table 6. Cultural resources data and management recommendations from the Proposed Action Class III survey, settling basin outlet to Picacho Reservoir.

Site Number/ Site Name[1]	Site Type	Comments	Eligibility (Criterion)	Management Recommendations
AA:3:285	Historical-period trash scatter	A.D. 1870–1962	Determined ineligible	No additional cultural resources work required.
AA:3:286	Historical-period road	A.D. 1920s–1962	Determined ineligible	No additional cultural resources work required.
AA;3:287	Historical-period trash scatter	A.D. 1870–1962	Determined ineligible	No additional cultural resources work required.
U:15:663 U:15:253	Prehistoric and historical-period artifact scatter	A.D. 300–1450, A.D. 1870–1962	Determined eligible (D)	Phase 1 data recovery identified additional subsurface deposits. Additional Phase 1 data recovery in the expanded APE and Phase 2 data recovery required.
U:15:665	Historical-period wagon road	A.D. 1870–1920s	Determined eligible (A and D)	Archival research mitigated effects related to Criteria A and D. No additional cultural resources work required.
U:15:666 Arizona State Prison	Historical-period structure	A.D. 1910s–1920s	Determined eligible (A and D)	Archival research mitigated effects related to Criteria A and D. No additional cultural resources work required.
U:15:667	Historical-period road	A.D. 1920s–1962	Determined ineligible	No additional cultural resources work required.
U:15:852	Prehistoric artifact scatter	A.D. 300–1450; Hohokam	Determined ineligible	No additional cultural resources work required.
U:15:853	Prehistoric artifact scatter	A.D. 300–1450; Hohokam	Unevaluated	Portions within APE noncontributing to overall eligibility. No additional cultural resources work required.
U:15:854	Prehistoric artifact scatter	A.D. 300–1450	Unevaluated	Features within the APE have been adequately mitigated during field recording. No additional cultural resources work required.
U:15:855	Prehistoric artifact scatter	A.D. 300–1450	Unevaluated	Features within the APE have been adequately mitigated during field recording. No additional cultural resources work required.
U:15:856	Prehistoric lithic scatter	B.C. 12000–A.D. 1450; unidentified archaeological culture(s)	Unevaluated	Features within the APE have been adequately mitigated during field recording. No additional cultural resources work required.
U:15:857	Prehistoric artifact scatter	A.D. 300–1450	Unevaluated	Features within the APE have been adequately mitigated during field recording. No additional cultural resources work required.

Table 6. Cultural resources data and management recommendations from the Proposed Action Class III survey, settling basin outlet to Picacho Reservoir.

Site Number/ Site Name[1]	Site Type	Comments	Eligibility (Criterion)	Management Recommendations
U:15:858	Prehistoric artifact scatter	A.D. 300–1450	Unevaluated	Features within the APE have been adequately mitigated during field recording. No additional cultural resources work required.
U:15:859	Prehistoric artifact scatter	A.D. 300–1450	Unevaluated	Features within the APE have been adequately mitigated during field recording. No additional cultural resources work required.
U:15:860	Prehistoric artifact scatter	A.D. 300–1450	Determined eligible (D)	Features within the APE have been adequately mitigated during field recording. No additional cultural resources work required.
U:15:861	Prehistoric artifact scatter	A.D. 300–1450, Hohokam	Unevaluated	Eligibility testing required.
U:15:862	Prehistoric artifact scatter	A.D. 300–1450, Hohokam	Unevaluated	Avoidance required.

[1] Site numbers are AZ…(ASM) unless otherwise noted.
[2] Denotes previously recorded sites that were not relocated during survey

Based on Class I and Class III survey data, the majority of the previously and newly documented prehistoric sites within the APE are associated with the Hohokam archaeological culture. Though one previously recorded site reportedly is associated with the Archaic culture, several other sites cannot be accurately characterized based on the observed surface remains, and some sites may contain later occupations. These later occupations form a cultural and physical bridge between the Hohokam and the modern Native American groups in the area today, specifically the Akimel O'odham and Piipaash groups of the Gila and Salt river valleys. Thus, it is not unexpected that these modern groups maintain a fundamental interest in the ancient villages, resource procurement sites, and irrigation canals that can be found throughout these river valleys and adjacent desert lands and mountains. These Native American groups maintain continuing long-term cultural and social ties to these ancient sites on the landscape; to them, the past is not an abstraction but an ongoing, tangible part of their everyday lives (Bahr 2007; Darling and Lewis 2007; Lopez 2007). Because the descendants of the Hohokam remain in the study area and vicinity, the cultural environment and the archaeological sites documented in the construction area take on added meaning and relevance that must be taken into consideration.

The historical-period sites range from irrigation features associated with the SCIP system to homesteads, ranches, and businesses of settlers and entrepreneurs, to territorial prison buildings, to linear transportation resources such as wagon roads, farm roads, and railroads. Euro-Americans began settling the region in the latter half of the nineteenth century, focusing primarily on mining and farming activities. The potential productivity of the land was recognized early on, and preliminary attempts at irrigation and development of agricultural fields involved reusing available Hohokam canals and engineering new canals, such as the original Florence

Canal to supply water from the Gila River. With the construction of Ashurst–Hayden Diversion Dam in the 1920s, existing towns such as Florence grew in size and importance, while others, such as Coolidge, were established to take advantage of the now reliable water source. During the Great Depression, the area's abundant cotton fields attracted migrant workers fleeing the Dust Bowl states. Many migrant workers stayed and established small towns, such as Randolph and La Palma. Many of the little towns, buildings, and facilities they built are now gone, leaving behind only foundations and artifact scatters, while other built features of the cultural environment remain, such as irrigation features associated with the SCIP system.

In the early 1990s, Reclamation prepared two documents on SCIP. The first was an overview and evaluation of significance of SCIP (Pfaff 1994), which was followed by a HAER (Pfaff 1996) that served as mitigation for the planned future rehabilitation of the Joint Works. The Arizona SHPO accepted the draft HAER document (Appendix G letter dated October 3, 1995) and the National Park Service accepted the final HAER document (Appendix G letter dated April 18, 1996) as mitigation for the rehabilitation of the Joint Works.

3.6.2 Environmental Consequences

No Action

With the No Action alternative, there would be no rehabilitation or significant new construction on the existing main canals, except for the anticipated rehabilitation or replacement of China Wash Flume—a feature of the FCG Canal that was constructed between 1924 and 1925 with a 50-year design life, which has been extended through minor rehabilitation projects. Due to age and wear, its deterioration has accelerated because its structural elements have been subjected to prolonged physical and natural forces. Rehabilitation or replacement would require consultation on the effect the action would have on the feature and mitigation of any adverse effects. In addition, ongoing maintenance and repair of the SCIP system would have the potential to affect some or all of the cultural resources located along the existing main canals.

Impacts to historic properties within the APE for the No Action Alternative, with the exception of the FCG Canal's China Wash Flume, would be indirect, site-specific, long-term, and negligible. The impacts to historic properties would be indirect because no new construction would take place and any disturbance would be from visitation for regular maintenance activities. The impacts would be site-specific because the canal is narrow and the historic properties contained therein are diverse, so the No Action alternative would not adversely impact an entire cultural landscape or local cultural expression. The impacts would be long-term because historic properties are unique by nature and they cannot be replicated if disturbed even through maintenance activities. The impacts would be negligible because no new construction would take place.

Impacts to China Wash Flume, a feature of the FCG Canal, for the No Action alternative would be direct, site-specific, long-term, moderate, and adverse. The impacts to China Wash Flume would be direct because the integrity and association would be destroyed by rehabilitation activities. The impacts would be site-specific because the flume is only one component of the FCG Canal and its rehabilitation would not adversely impact the integrity of the canal or SCIP system. The impacts would be long-term because China Wash Flume is unique and cannot be replicated through rehabilitation. The impacts would be moderate because the flume would be

rehabilitated or replaced. The impacts would be adverse because the integrity would be destroyed by rehabilitation; however, these impacts would be mitigated through a HAER and an interpretive exhibit.

Effects Common to Both Action Alternatives

Both action alternatives would use similar upper FCG Canal and link canal alignments. Consequently, the number of sites potentially affected along these alignments is similar between the action alternatives. Mitigation of adverse effects on historic properties requires that the strategy be tailored to the site, specifically to address adverse effects on the NRHP criteria under which it is eligible. To mitigate adverse effects on historic properties located within the APE, sites can be avoided or those eligible under Criterion A or B would likely require archival research; properties eligible under Criterion C, such as the FCG Canal's China Wash Flume, would require archival research and HAER documentation; and sites eligible under Criterion D would require Phase 1 data recovery. Avoidance or eligibility testing would be required for sites where the eligibility is unknown while boundary testing would be necessary in cases where it is unclear whether a site extends into the APE.

Within the existing canal right-of-way, cultural resources have been severely disturbed, with lesser disturbance along the outer margins of the alignments. Disturbances along these margins are expected where access roads, drainage outflow channels, and utility lines occur, and from agricultural activities, which can disturb sediments as deep as several feet below the surface. The degree of disturbance to sites can vary as a result. For example, some components of prehistoric sites tend to be deeper than the plow zone, such as burials, canals, and structural floors and subfloor features, and, therefore, remnants can still exist along the margins. Given the depth and width of the existing canal alignments, little survived within and directly adjacent to them. However, beyond the previously impacted areas, some sites have significant data remaining along the outer margins of the canal right-of-way.

ACS completed Class III survey for the Proposed Action APE, and Reclamation has received concurrence on eligibility determination and effect for the cultural resources identified therein.

Reclamation submitted an HPTP to all consulting parties outlining its recommendations for mitigation of adverse effects on all identified historic properties and potentially eligible sites. Reclamation, BIA/SCIP, and SHPO entered into an MOA for mitigation of adverse effects to China Wash Flume, a feature of the FCG Canal. In addition, Reclamation, BIA/SCIP, and SHPO entered into a separate MOA for mitigation of adverse effects to the remaining cultural resources on Reaches 1 and 2 (Reach 3 does not have any historic properties that require mitigation). An amendment to this MOA was proposed to accommodate recommendations to mitigate sites in the expanded APE. The MOA amendment was signed by all concurring parties prior to issuance of a Final EA.

Florence Canal Alternative (Proposed Action)

The Proposed Action would involve 25.8 miles of canal construction. Excluding the six sites not relocated during archaeological investigations, at least 26 eligible or potentially eligible sites occur within the Proposed Action APE, of which 13 are prehistoric sites, 11 are historical-period sites, and two are multicomponent sites. Ashurst–Hayden Diversion Dam, the FCG Canal, the

Florence Canal, the Pima Lateral, and Picacho Reservoir are included among the historical-period sites.

The Florence Canal, the upper FCG Canal, and highways and transmission lines, which constitute a majority of the historical-period sites along the Proposed Action alignment, will not have significant subsurface deposits associated with them; their significant data lie with archival data detailing their construction and social histories.

Further archaeological investigations are required at 10 of the 26 sites within the Proposed Action APE. The remaining 16 sites have been previously mitigated or avoided. Some mitigation for adverse effect to properties in the Proposed Action APE has already been completed or is currently underway. ACS undertook eligibility testing at two sites (AZ U:15:5[ASM] and AZ U:15:47[ASM]), Phase 1 data recovery at three sites (AZ U:124[ASM], AZ U:663[ASM], and AZ U:15:678[ASM]), boundary testing at one site (AZ U:15:676[ASM]), and archival research at three sites (AZ AA:3:211[ASM], AZ U:15:655[ASM], and AZ U:15:666[ASM]) (Gregory et al. 2016). North Wind Resource Consulting developed a HAER and interpretive exhibits for China Wash Flume, a feature of the FCG Canal. Additional data recovery is required at three sites (AZ U:124[ASM], AZ U:663[ASM], and AZ U:15:676[ASM]) while eligibility testing is required at one site (AZ U:15:861[ASM]) before mitigation would be considered complete.

Though it is clear that this alternative requires a substantial level of cultural resources mitigation, it should not be considered a fatal flaw given the general high density of prehistoric and historical-period sites along the Gila River and surrounding Florence and Picacho Reservoir. That is, it is likely that any alignment through these areas would encounter the same number, or even a larger number, of sites, especially in areas that have not been previously developed. Because this alternative would primarily use existing canal right-of-way, most of the historic properties along the right-of-way were already impacted by development, with the following exceptions: the segment of the Florence Canal to be relocated to a new alignment in Reach 2, the new link canal and new regulating reservoir in Reach 3B, and the new earthen canal in Reach 3C. The Proposed Action would require rehabilitation/reconstruction of 16.3 miles of canal on existing alignment and 9.5 miles of canal construction on new alignment. No construction of new drainage channels would be required with this alternative.

Impacts to historic properties within the APE for the Proposed Action, with the exception of the FCG Canal's China Wash Flume, would be direct, site-specific, long-term, minor, and adverse. The impacts to historic properties would be direct because the integrity and association would be destroyed by construction activities. The impacts would be site-specific because the APE is narrow and the historic properties contained therein are diverse, so the Proposed Action would not adversely impact an entire cultural landscape or local cultural expression. The impacts would be long-term because historic properties are unique by nature and they cannot be replicated. The impacts would be minor because data testing has shown that few historic properties within the APE contain intact subsurface deposits. In addition, most historic properties extend beyond the boundaries of the APE; therefore, those portions would not be impacted and would retain integrity. The impacts would be adverse because the integrity and association would be destroyed by construction activities; however, these impacts would be mitigated through avoidance and data recovery.

Impacts to China Wash Flume, a feature of the FCG Canal, for the Proposed Action would be direct, site-specific, long-term, moderate, and adverse. The impacts China Wash Flume would be direct because the integrity and association would be destroyed by construction activities. The impacts would be site-specific because the flume is only one component of the FCG Canal and its replacement would not adversely impact the integrity of the canal or SCIP system. The impacts would be long-term because China Wash Flume is unique and cannot be replicated through replacement. The impacts would be moderate because the flume would be replaced. The impacts would be adverse because the integrity and association would be destroyed by replacement; however, these impacts would be mitigated through a HAER and an interpretive exhibit.

FCG Canal Alternative

The FCG Canal Alternative would require more ground disturbance than the Proposed Action. The FCG Canal Alternative would involve construction of 24.8 miles of new canal and/or drainage channels on new alignment (15.3 miles more than the Proposed Action), and the rehabilitation/reconstruction of 35.9 miles of existing canals and laterals (19.6 miles more than the Proposed Action). Compared with the Proposed Action, the FCG Canal Alternative would potentially affect a greater number of eligible and potentially eligible sites because more miles of canal would be constructed. Extension of the FCG Canal to connect with the proposed link canal could affect previously recorded sites north of Picacho Reservoir and widening of the canal would be expected to result in the identification of new sites.

Impacts to historic properties within the APE for the FCG Canal Alternative, with the exception of the FCG Canal's China Wash Flume, would be direct, site-specific, long-term, moderate, and adverse. The impacts to historic properties would be direct because the integrity and association would be destroyed by construction activities. The impacts would be site-specific because the APE is narrow and the historic properties contained therein are likely diverse, so the FCG Canal Alternative would not be likely to adversely impact an entire cultural landscape or local cultural expression. The impacts would be long-term because historic properties are unique by nature and they cannot be replicated. The impacts would be moderate because many areas that have not been developed or disturbed and likely have cultural resources will be impacted. However, data suggests that most historic properties extend beyond the boundaries of the narrow APE; therefore, some portions of those properties would not be impacted and would retain integrity. The impacts would be adverse because the integrity and association would be destroyed by construction activities; however, these impacts would be mitigated through avoidance and data recovery.

Impacts to China Wash Flume, a feature of the FCG Canal, for the Proposed Action would be direct, site-specific, long-term, moderate, and adverse. The impacts to China Wash Flume would be direct because the integrity and association would be destroyed by construction activities. The impacts would be site-specific because the flume is only one component of the FCG Canal and its replacement would not adversely impact the integrity of the canal or SCIP system. The impacts would be long-term because China Wash Flume is unique and cannot be replicated through replacement. The impacts would be moderate because the flume would be replaced. The impacts would be adverse because the integrity and association would be destroyed by

replacement; however, these impacts would be mitigated through a HAER and an interpretive exhibit.

Cumulative Impacts

The action alternatives would incrementally contribute to adverse effects on historic properties in the study area. Those effects would add to the effects from other major actions, such as past urban expansion and rural development, road construction, and installation of utilities. Additional sites are likely to be impacted by reasonably foreseeable future actions, such as the construction of Phase 3 canal and lateral improvements; widening of I-10 near the Jimmie Kerr traffic interchange; highway improvement projects; installation of electric transmission lines; development of the in-situ copper recovery operation; development of power generation projects, and development of future planned residential, commercial, and industrial land uses surrounding Florence and Coolidge.

The Proposed Action would have fewer cumulative adverse effects on historic properties compared with the FCG Canal Alternative because it would require the construction of 15.3 fewer miles of canal on new alignment and 19.6 fewer miles of canal rehabilitation/ reconstruction on existing alignments.

Consultation

Consultation with SHPO and interested Native American Tribes has been initiated and is ongoing. Reclamation initially contacted several Native American Tribes (refer to list in Section 4.1.2) that potentially had interests or concerns associated with the proposed undertaking, as well as SHPO. The Ak-Chin Indian Community, the Hopi Tribe, SHPO, and the White Mountain Apache Tribe responded to Reclamation's initial notice. The Hopi Tribe and SHPO requested continuing consultation on the project. The Ak-Chin Indian Community deferred to the Gila River Indian Community, and the White Mountain Apache Tribe stated that the project would not affect its cultural heritage resources (Appendix B). Reclamation has continued to consult with the Gila River Indian Community, the Hopi Tribe, and SHPO as well as other project partners, such as BIA/SCIP, SCIDD, and P-MIP, in compliance with Section 106 of the NHPA. The Hopi Tribe has stated that it considers all Hohokam archaeological sites Traditional Cultural Properties. The Gila River Indian Community has not identified any sites within the APE as Traditional Cultural Properties.

Reclamation completed a Class III cultural resources survey of the Proposed Action's APE for Reaches 1–3 and forwarded it to all consulting parties for consultation. SHPO concurred with Reclamation's determinations regarding NRHP eligibility and that the Proposed Action would have an adverse effect on cultural resources (Appendix G). Reclamation developed an MOA with stipulations for treatment of historic properties identified during the survey that was signed by the consulting parties and implemented. Reclamation consulted on the results of the HPTP and received concurrence on its determinations and recommendations. Reclamation entered into a separate MOA regarding mitigation for China Wash Flume, a feature of the FCG Canal.

Subsequent revision and expansion of the APE necessitated additional survey on portions of Reaches 1–3 that Reclamation completed in 2016. Reclamation forwarded these reports to all consulting parties for consultation, and SHPO concurred with Reclamation's determinations and

recommendations. Reclamation developed an amendment to the MOA for treatment of those historic properties identified within the expanded APE following receipt of concurrence on eligibility and effect. Additional detail on compliance requirements under Section 106 of the NHPA is provided in Section 6.0.

3.7 INDIAN TRUST ASSETS

3.7.1 Affected Environment

ITAs are legal interests in assets held in trust by the United States for Native American Tribes or individual Native Americans. These assets are held by the U.S. Secretary of the Interior as the trustee. ITAs can include, but are not limited to, land resources, water rights, minerals, and hunting and fishing rights. The United States, including all of its bureaus and agencies, has a fiduciary responsibility to protect and maintain rights reserved by or granted to Indian Tribes or individual tribal members by treaties, statutes, and EOs. This trust responsibility requires that all Federal agencies ensure their actions protect ITAs. Secretarial Order 3175 (incorporated into the Departmental Manual [DM] at 512 DM 2) requires that the potential impacts of U.S. Department of the Interior bureau actions on ITAs must be addressed in planning and decision documents, such as this EA.

In 1935, the U.S. District Court for the District of Arizona issued the Globe Equity No. 59 Decree (Gila River Decree), which recognized the right of the United States to demand and divert Gila River water for irrigation of 50,546 acres of Indian farmland on the Gila River Indian Community. Water rights described in the Globe Equity Decree and the Settlement Agreement are held in trust by the United States on behalf of the Gila River Indian Community and are considered an ITA. Gila River water associated with these water rights is conveyed through the SCIP Joint Works and Indian Works facilities to the Gila River Indian Community.

3.7.2 Environmental Consequences

No Action

With the No Action alternative, most of the rehabilitation planned with the action alternatives would not be undertaken, water conservation would not be realized, there would be no improvements to operational efficiencies or surface water reliability, and the control, measurement, and storage of surface waters would not be improved. Without concrete lining, water losses through seepage from the canal would continue throughout Reaches 1–3 and would represent a negative effect on irrigation water supplies important to protecting and fulfilling the Gila River Indian Community's surface water rights. Furthermore, with the No Action alternative, water losses due to evaporation from the surface of the canal system would not be reduced, as it would with the Proposed Action (which is 16.3 miles shorter than the existing canal system). The No Action alternative would not include improvements in the measurement and control of surface water supplies and, therefore, would be more prone to water losses due to water spillage than either of the action alternatives.

With the No Action alternative, the BIA would continue to address sediment management problems by enforcing best practices for project maintenance against the Joint Control Board at the settling basin and in the Pima Canal. With BIA's actions to address sediment management

problems, there would be no long-term impact to gauge readings and water flows, or from sediment deposition affecting the Indian lands and water rights held under trust.

With the No Action alternative, China Wash Flume would need to be rehabilitated or replaced at some point in the future due to its age and condition, though no specific plans have been developed for this effort under this alternative. Until such time as the flume is rehabilitated or reconstructed, there would be a risk of its failure. If the flume fails, water delivery to Gila River Indian Community farmland downstream would be halted until a temporary pump bypass system or new flume could be constructed (estimated at four weeks).

With the No Action alternative, there would be no construction on Indian lands and, therefore, there would be no direct impact to Indian lands held under trust. Impacts on other ITAs with the No Action alternative would be indirect, regional, short-term and long-term, moderate, and adverse.

Effects Common to Both Action Alternatives

From the bifurcation of the Florence Canal/FCG Canal to the Pima Lateral Canal, the proposed rehabilitation would have a beneficial effect on the Gila River Indian Community's access to water from the Gila River and the associated water rights (PEIS Record of Decision, Reclamation 1997). Due to reduced canal mileage, concrete lining, improved flow measurement, and improved control and storage features, the action alternatives would improve operational efficiencies of the SCIP main conveyance system, increase the reliability of water deliveries, and reduce water losses from the system (i.e., conserve water). By lining the canals with concrete, water losses through seepage would be reduced throughout Reaches 1–3, conserving surface water important to protecting and fulfilling the Gila River Indian Community's surface water rights (refer to the following section on the effects of the Proposed Action for additional reductions in water losses associated with evaporation). The action alternatives would include improvements designed to control surface water, such as new check structures, the SCADA, and the mid-system regulating reservoir and, therefore, would reduce water losses related to water spillage. The conserved water would enable the Gila River Indian Community to develop additional on-reservation land and put more of its SCIP water to beneficial use.[4] Refer to Section 3.9.2 for a description of conserved water estimates associated with the action alternatives. The improvements associated with the Proposed Action and the FCG Canal Alternative would not be within the jurisdiction of the Gila River Indian Community and, therefore, construction would not directly affect lands held under trust.

Replacement of China Wash Flume—Subalternatives A and B

Under Subalternative A, the risk is high for sediment deposition into the siphon due to naturally occurring sediment in, and the level of historic flows diverted from, the Gila River. Sediment deposition into the siphon will impede flow of water and affect the upstream gauge reading if BIA does not enforce appropriate sediment management and maintenance against the Joint Control Board. If Subalternative A is selected, the BIA would continue to address sediment management problems by enforcing best practices for project maintenance against the Joint Control Board at the settling basin and in the Pima Canal. With the BIA's actions to address

[4] The PEIS completed in 1997 for P-MIP addressed on-Reservation development that would result from rehabilitation of SCIP canals.

sediment management problems, there would be no long-term impact to gauge readings and water flows, or from sediment deposition affecting the Indian lands and water rights held under trust.

Under Subalternative B, sediment management and maintenance would continue, similar to what is described under the No Action alternative. Sediment removal from an open-channel flume is easier to maintain and would be consistent with the 80-year history of maintenance of the current open-channel flume. If Subalternative B is selected, the BIA would continue to address sediment management problems by enforcing best practices for project maintenance against the Joint Control Board at the settling basin and in the Pima Canal. With the BIA's actions to address sediment management problems, there would be no long-term impact to gauge readings and water flows, or from sediment deposition affecting the Indian lands and water rights held under trust.

Florence Canal Alternative (Proposed Action)

Evaporation losses from the surface of the canals would be reduced with implementation of the Proposed Action because the Proposed Action would consolidate the system and would be 16.3 miles shorter than the existing system and 17.7 miles shorter than the FCG Canal Alternative.

Impacts on ITAs with the Proposed Action would generally be indirect, regional, short-term and long-term, minor, and beneficial.

FCG Canal Alternative

The evaporation losses from the surface of the canal system with the FCG Canal Alternative would be greater than the Proposed Action because the length of the main canal system with the FCG Canal Alternative would be 17.7 miles longer.

Impacts on ITAs with the FCG Canal Alternative would generally be indirect, regional, short-term and long-term, minor, and beneficial.

Cumulative Impacts

Past and ongoing actions on the SCIP, an P-MIP system, including concrete lining, upgrading, and modernizing of the SCIP and P-MIP irrigation systems, have resulted in beneficial effects on ITAs. These past and ongoing actions include rehabilitation/concrete lining of the 11-mile off-reservation Pima Canal, the 11-mile on-reservation Pima Lateral, an additional 80 miles of on-reservation delivery system improvements, and the rehabilitation of Ashurst–Hayden Diversion Dam and Headworks and the installation of facilities to remove coarse sediment from irrigation water before being discharged to the FCG Canal.

As a result of the irrigation system improvements made to date, Tribal growers are receiving an increased volume of water (due to conserved water with concrete lining of the canals) and are enjoying a much more efficient delivery system. As an example, SCIP Canal 13 once experienced 70 percent water loss and took a typical tribal grower 24 to 36 hours to irrigate a 40-acre field. With past system improvements, water losses are now negligible, and those same fields can be irrigated in 6 to 8 hours, demonstrating increased system efficiencies. The sediment

basin at the headworks has captured and removed from the canal system a conservatively estimated 200,000 cubic yards of sediment since 2015—sediment that would otherwise have been transported downstream and throughout the SCIP system (D. DeJong, PhD, Project Director, P-MIP, personal communication, May 30, 2017). System improvements have resulted in conserved water supplies estimated at over 25,000 AFY. Future irrigation system improvements would include more modernization and lining of canals and laterals with concrete.

These past, present, and reasonably foreseeable irrigation system improvements contribute positive effects on the ITA by improving conveyance efficiency and reliability, improving water quality, conserving water, reducing maintenance requirements and associated operating costs, and extending the life of the SCIP system. In combination with the regional, short-term and long-term, minor, and beneficial impacts of the action alternatives, cumulative effects to the ITA would be moderate and beneficial.

3.8 GEOLOGY AND SOILS

3.8.1 Affected Environment

The Lower Basin and Range Province of Arizona is characterized by numerous mountain ranges that rise from broad, plain-like valleys or basins. The study area consists of plains with low mountains that range from 1,000 to 3,000 feet in elevation.[5] Potentially active faults that could generate 6.5 to 7.2 magnitude quakes are scattered throughout southeastern and central Arizona. All of those faults have low slip rates, long intervals between rupture, and have had little historic activity. The study area has a low, or moderate to low, earthquake hazard level (Arizona Geological Survey [AZGS] 2000; USGS 2014).

Quaternary and upper Tertiary sedimentary deposits characterize the study area and vicinity (Hendricks 1985). Four soil types occur in the study area. Soils from the Picacho Reservoir to the Florence vicinity are in the Casa Grande–Mohall–La Palma Association. These are well-drained soils formed in mixed old alluvium on valley plains and lower slopes. Soils southeast of Coolidge and northeast of Florence are in the Torrifluvents Association. This association consists of well-drained to somewhat excessively drained soils in sandy or clayey alluvium. Soils east of Coolidge are in the Mohall-Vecont-Pinamt Association. These are well-drained soils formed in mixed old alluvium on broad valley plains. Soils near Ashurst–Hayden Diversion Dam are in the Chiricahua-Cellar Association. These soils consist of well-drained soils formed on low granitic mountains and pediments of strongly weathered, coarse-grained granite. Soils generally consist of loam, clay loam, and sandy to fine sandy loam.

The Phase 2 Reaches 1–3 study area includes documented areas of land subsidence (the collapse and lowering of the land elevation) and earth fissuring (cracks at or near the earth's surface). Land subsidence in the region is generally due to compaction of the alluvium from the lowering of the water table, typically from ground water pumping. When adjacent areas subside at differing levels, earth fissures can form and then expand with the effects of surface water erosion. Land subsidence and earth fissuring can alter floodplain drainage and the flows within canals and drains, and can damage buildings, structures, and other facilities. The Arizona Department of Water Resources (ADWR) has been monitoring subsidence since 2002, and the

[5] Elevations in this document are referenced to mean sea level.

AZGS has been monitoring and mapping earth fissures in Arizona since 2006. Land subsidence and earth fissuring are known within the Phase 2 Reaches 1–3 study area from the area of Coolidge to south of Picacho Reservoir (ADWR 2013a). Refer to Section 3.2.2, pages 3–5, of the P-MIP PEIS for additional information (Reclamation 1997).

3.8.2 Environmental Consequences

No Action

The No Action alternative would require the rehabilitation or replacement of China Wash Flume, requiring earthwork and soil compaction, but to a much lesser extent than the action alternatives. In addition, approximately 950 acres would be subjected to recurrent maintenance (e.g., sediment dredging and spoiling, canal bank maintenance, road maintenance). The SCIP Phase 1 sediment removal facilities, which became operational in the first quarter of 2012, were designed to allow coarse sediment to be removed from Gila River water and stockpiled near Ashurst–Hayden Diversion Dam. Fine sediments (silt and clay) suspended in irrigation water would continue to be conveyed through the canal system and deposited on agricultural fields downstream. Depending on the flows, some of these sediments may settle-out in the canals at points of low-water velocities, such as upstream of check structures. When flow rates increase during deliveries, corresponding flow velocities would increase, causing previously deposited sediment to be entrained and carried downstream.

Under the No Action alternative, excess irrigation or storm water would continue to be conveyed to Picacho Reservoir, where the water would be stored for an undefined length of time, depending on downstream irrigation orders and storage capacity. The level of sedimentation in Picacho Reservoir would continue to increase over time, based on the amount and size of sediment carried in the flows directed to the reservoir and the length of time water is impounded.

Impacts on soils and geology with the No Action alternative would be direct, localized, long-term, minor, and adverse.

Effects Common to Both Action Alternatives

The main impacts to geology and soils through implementation of the project would be related to excavation and compaction and the transport of sediment in the study area. The action alternatives would require the reconstruction of existing canal segments, construction of new canal segments, and construction of a regulating reservoir. Construction of the adjacent maintenance roads on both sides of the new main canal would also require earthwork and soil compaction.

As described under the No Action alternative, much of the coarse sediment would be removed from Gila River water, and fine sediments (silt and clay) suspended in irrigation water would continue to be conveyed through the canal system and deposited on agricultural fields downstream. Some of these sediments may settle-out in the canals at points of low-water velocities. When flow rates increase during deliveries, corresponding flow velocities would increase, causing previously deposited sediment to be entrained and carried downstream.

Under the action alternatives, storm runoff carrying sediment would be conveyed downstream to Picacho Reservoir. The level of sedimentation in Picacho Reservoir would continue to increase

over time, based on the amount and size of sediment carried in the flows directed to the reservoir and the length of time water is impounded.

The potential for ground subsidence and earth fissuring would not increase with the action alternatives because the action does not involve the extraction of ground water. With the study area's low seismic potential, the project would not likely be affected by seismic activity.

The use and storage of heavy equipment and other vehicles during construction would result in temporary soil disturbance and compaction in the construction area and at locations used for staging and stockpiling. However, these soils would be expected to recover in the long-term once equipment is removed and vehicular traffic ceases.

Florence Canal Alternative (Proposed Action)

The Proposed Action would require the reconstruction of the existing canal segments along the length of the proposed main canal alignment (from the settling basin outlet to Picacho Reservoir), the construction of a new parallel concrete-lined canal in Reaches 1A and 1C, a realignment of the existing piped segment of the Florence Canal in Florence (Reach 2B), a new link canal (Reach 3B), a new regulating reservoir (Reach 3B), and a new interim earthen canal (Reach 3C). Impacts to geology and soils would be greater when constructing canal or drainage channels on new alignments. Of the 24.2 miles of canals and drainage channels associated with the Proposed Action, 9.5 miles would be constructed on new alignment in Reaches 1A, 1C, 2B, 3B, and 3C. Construction of the regulating reservoir in Reach 3B would also represent an impact to geology and soils.

Impacts associated with excavation and soil compaction would be permanent but would not extend beyond the immediate area of construction. The Proposed Action would be expected to impact soils on 268 acres of desertscrub and 92 acres of agricultural land; the other disturbances would be on existing canals and associated features, including maintenance roads.

Impacts on geology and soils with the Proposed Action would generally be direct, localized, long-term, minor, and adverse.

FCG Canal Alternative

The types of permanent and temporary excavation and soil compaction impacts anticipated with the FCG Canal Alternative would be similar to the Proposed Action, though the FCG Canal Alternative would involve additional disturbance, excavation, and compaction with the construction of additional miles of canal and drainage channels. The FCG Canal Alternative would place 24.8 miles of the canal and drainage channel on new alignments, compared with 9.5 miles for the Proposed Action, an additional 15.3 miles of new disturbance. The primary difference is the need to construct an entirely new drainage channel on new alignment with the FCG Canal Alternative. The impacts to geology and soils from construction of the regulating reservoir would be the same as with the Proposed Action.

Impacts on geology and soils with the FCG Canal Alternative would generally be direct, localized and regional, long-term, minor to moderate, and adverse.

Cumulative Impacts

Past actions that have affected soils in the project area and vicinity include urban expansion and rural development, and construction of transportation, irrigation, and utility infrastructure. Ongoing agricultural activities (including field preparations, irrigating, and harvesting) continue to impact soils over a broad area, including portions of the proposed construction area for the action alternatives. Soils would be further impacted by reasonably foreseeable future actions, including continued urban expansion and rural development, and development of new power generation and transmission line projects, rehabilitation of additional irrigation project facilities on- and off-reservation, completion of new transportation projects, including reconstruction of the SR 79/SR 79B intersection and development of a new north–south transportation corridor, and operation of the in-situ copper recovery mine. Past, present, and reasonably foreseeable future actions, in combination with the localized and regional, long-term, minor to moderate, and adverse effects of the action alternatives, would result in a moderate cumulative effect on soils and geology.

3.9 WATER RESOURCES AND WATER QUALITY

3.9.1 Affected Environment

Surface Water Resources

The study area is in the Middle Gila River watershed, which includes the Gila River between Coolidge Dam and Painted Rock Dam. The 649-mile Gila River originates in western New Mexico, flows generally west–southwest across Arizona, and outlets in the Colorado River near the city of Yuma. In its upper reaches, above Coolidge Dam, the Gila River is free-flowing. Coolidge Dam, which impounds the San Carlos Reservoir, is at the northeast end of the study area.

The Gila River flows east to west through the study area from Coolidge Dam to Ashurst–Hayden Diversion Dam—a distance of approximately 70 miles. A review of topographic maps identified more than 100 ephemeral tributaries of the Gila River in this area. In addition to the identified tributaries, a number of smaller ephemeral washes drain into the Gila River. West of Ashurst–Hayden Diversion Dam, the Gila River flows parallel to, and north of, the study area before turning northwest and diverging from the study area near Coolidge, Arizona.

Stream flow in the Gila River upstream of Ashurst–Hayden Diversion Dam is highly variable and is dependent on upstream releases from Coolidge Dam; flows from tributaries, including the San Pedro River (downstream of Coolidge Dam); and precipitation in the watershed. Today, releases from Coolidge Dam are based almost entirely on irrigation water orders from SCIDD and the Gila River Indian Community. Except during large flood events, all of the water that reaches Ashurst–Hayden Diversion Dam is diverted to the FCG Canal for irrigating farmland downstream; therefore, the Gila River downstream of the diversion dam is usually dry. An overall 17-year average annual Gila River water delivery to SCIDD and the Gila River Indian Community is 112,575 and 140,459 AF, respectively, based on unpublished data provided by SCIP in 2012 (L. Nelson, BIA/SCIP, personal communication, March 5, 2012). Due to transit losses and evapotranspiration, an average of only 56,654 and 89,825 AF, respectively, is actually delivered to the croplands of each part. These averages are lower than historic averages that occurred prior to 2000 due to persistent drought. Deliveries to each entity can exceed

200,000 AF in years when water supplies are not constrained by drought. The acreage of agricultural land cultivated varies from year to year, mainly dependent on water availability.

Occasionally, water stored above Coolidge Dam is depleted due to drought conditions and, despite water orders from downstream farmers, little or no water can be released from the dam, leaving the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam relatively dry. Historically, the SCIP system has been shut down for a 5-week period in November to allow for annual inspection and maintenance of facilities. During that time frame, water is not released from San Carlos Reservoir for irrigation deliveries to SCIDD and P-MIP agricultural users. Starting in 2010 and continuing through 2016, a modified seasonal water outage was developed to accommodate construction (refer to Section 2.1). This modified water outage is now known as the 5-3-5 dry-up schedule, and consists of two 5-week water outages separated by a 3-week period of irrigation delivery. The first of the 5-week outages would coincide with the annual 5-week maintenance dry-up. The 5-3-5 dry-up sequence is expected to be the normal pattern of dry-ups to the system in the future for those years when construction is required.

The suspension of irrigation water releases from Coolidge Dam during these construction and maintenance dry-ups results in temporary but substantial reductions of flow in the Gila River downstream of Coolidge Dam. During these dry-ups, the Gila River still experiences low levels of flow from several sources, including minor leakage from the Coolidge Dam spillway, flows into the Gila River from tributaries downstream of Coolidge Dam, and occasional surfacing of shallow subsurface flows due to localized geologic conditions. With increasing distance downstream, however, surface flow becomes negligible and often disappears before reaching the community of Kelvin, approximately 20 river miles upstream of Ashurst–Hayden Diversion Dam.

Data on stream flows for the period from 1999 to 2013 were collected from the USGS stream gauge on the Gila River below Coolidge Dam (Station No. 09469500) and the USGS stream gauge on the FCG Canal near Florence (Station No. 09475500) below Ashurst–Hayden Diversion Dam (USGS 2015). These data show that the greatest flow levels occurred from March through August, with a monthly average flow rate of 328.8 cfs in the Gila River and 318.7 cfs in the FCG Canal. The highest average monthly flow rate of 894.1 cfs in the Gila River and 847.4 in the FCG Canal occurred in July 2010. Comparatively, the average monthly flow for January and February of that year was 76.6 cfs in the Gila River and 177.5 cfs in the FCG Canal. These numbers indicate that agricultural interests rely most heavily on irrigation water from Coolidge Dam in the spring and summer months. The annual 5-week maintenance dry-up or 5-3-5 dry-up sequence begins at the end of October or early November and thus limits the effect of the dry-up on agricultural interests.

The average monthly flows in October are 127 cfs in the Gila River and 111 cfs in the FCG Canal. For November, the average monthly flows are 5 cfs and 1 cfs, respectively. Table 7 details the average monthly flow at the USGS gaging station below Coolidge Dam and at the USGS gaging station at the FCG Canal near Florence for the 15-year period of 1999 through 2013 (USGS 2015).

Table 7. Average monthly flows (cfs) from the USGS station on the Gila River below Coolidge Dam (Below Coolidge) and the USGS station on the FCG Canal below Ashurst–Hayden Diversion Dam (FCG Canal) from 1999 through 2013 and identification of the scheduled annual dry-up for canal maintenance.

Year	USGS Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Scheduled Annual Dry-Up Period
1999	Below Coolidge	72.5	160.4	355.1	156	250.8	0.918	47.1	321.8	125.4	84.5	1.88	168.8	Oct. 25–
	FCG Canal	105.9	167.6	329.1	174.7	218.8	15.4	121.7	361.4	183.5	74.6	0	149.6	Dec. 3
2000	Below Coolidge	72.4	131.4	277.7	357.1	121	3.42	4.87	21.6	18.7	0.345	3.54	229.1	Oct. 23–
	FCG Canal	84.6	148.9	259.9	329.5	119.1	17.7	11.2	108.8	32	97.1	0.41	229.1	Nov. 30
2001	Below Coolidge	41.3	122.6	403.8	462.8	543.7	627.8	704.9	462.3	269.6	204.1	0.81	258.4	Oct. 28–
	FCG Canal	83.1	161	390.3	504.9	508.7	580	718.9	486.6	244.4	194.6	0	215.8	Dec. 1
2002	Below Coolidge	96.5	142.7	235.9	22.9	21.8	1.09	1.32	56.7	58.1	112.9	12.6	117.9	Oct. 26–
	FCG Canal	109.9	129.2	239.1	29.9	0.466	0	0	35.2	32.2	82.6	0	104	Nov. 29
2003	Below Coolidge	72.9	152.3	326.5	218.2	95.5	7.53	32.8	1.05	1.25	0.781	0.59	70.5	Oct. 27–
	FCG Canal	76.5	173	357.4	209.3	80.7	1.8	38.6	30.7	5.97	0	0	29.5	Dec. 3
2004	Below Coolidge	98.1	146.3	284.9	405.5	238.3	1.38	1	115.1	79.2	38	20.1	125	Oct. 24–
	FCG Canal	71.9	122.7	274.4	346.8	197.1	0	2.58	104.2	54.9	22.3	0	106.9	Nov. 26
2005	Below Coolidge	106.6	69	379.9	641.2	564	721.3	817.5	519.2	471.3	223.2	1.12	304	Oct. 31–
	FCG Canal	114.7	287.7	348.3	581.6	498.6	644.1	756.4	535.4	486.5	222.7	0.24	275.8	Dec. 1
2006	Below Coolidge	176.1	228	218.3	399.3	491.6	500.9	383.8	336.5	293	230.7	0.954	306.6	Oct. 30–
	FCG Canal	174.4	237	218.6	375.9	435.6	439	406	561.6	407	258.5	0	266.9	Dec. 9
2007	Below Coolidge	194.1	201.1	439.4	490.7	536.4	666.4	665.4	413.9	204.4	153.5	0.392	101	Oct. 29–
	FCG Canal	209	211.4	398.5	453.5	461.6	578	646.3	451.4	198.1	151.9	0	176.6	Dec. 3
2008	Below Coolidge	138.2	166.1	532.6	674.1	521.9	616.9	589.3	379	241	236.5	0.945	220.9	Oct. 27–
	FCG Canal	256.6	317.3	516.3	634.5	467.9	504	589.2	424.3	245.3	230.5	0	215.4	Dec. 1
2009	Below Coolidge	164.2	229.6	503.9	550.2	587	370.8	453.8	560	196.6	187.1	0.837	58.9	Oct. 26–
	FCG Canal	172.3	272.1	484.2	531.8	548.2	343.3	415	512	196.2	191.4	0	44.9	Nov. 30
2010	Below Coolidge	41.8	111.4	239.4	584.2	622.5	837.9	894.1	635.7	397.6	264.2	0.96	317.1	Nov. 1–
	FCG Canal	136.1	218.8	429.8	576.8	540.2	732.2	847.4	661.9	402.9	278.0	13.3	289.8	Dec.5; Dec. 27– Jan. 29 (2010/2011)
2011	Below Coolidge	52.4	228.1	372.8	678.7	361.3	357.3	312.2	120.4	1.06	0.995	3.89	38.9	Oct. 31–
	FCG Canal	21.6	255.5	346.7	362.5	329.9	298.0	325.5	149.4	48.8	0	0	20.1	Dec. 5; Dec. 26–Jan. 30 (2011/2012)

Table 7. Average monthly flows (cfs) from the USGS station on the Gila River below Coolidge Dam (Below Coolidge) and the USGS station on the FCG Canal below Ashurst–Hayden Diversion Dam (FCG Canal) from 1999 through 2013 and identification of the scheduled annual dry-up for canal maintenance.

Year	USGS Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Scheduled Annual Dry-Up Period
2012	Below Coolidge	38.1	157.5	138.3	175.3	179.1	52.5	0.797	8.14	54.9	40.0	9.87	48.2	Oct. 29–Dec. 3; Dec. 24–Jan. 28 (2012/2013)
	FCG Canal	4.9	140.3	117.8	154.9	164.3	52.7	21.1	47.1	58.8	32.0	2.37	46.2	
2013	Below Coolidge	13.6	99.7	110.5	262.0	17.1	0.9	28.3	204.2	126.8	130.4	18.5	103.4	Oct. 28–Dec. 2; Dec. 23–Jan. 27 (2013/2014)
	FCG Canal	31.2	102.2	115.8	222.2	38.0	0	22.9	159.4	118.1	110.6	0	85.3	
1999–2013 (cfs)[1]	Below Coolidge	92	156	321	385	343	318	329	277	169	127	5	165	NA
	FCG Canal	110	196	322	366	307	280	328	309	181	111	1	150	NA
1999–2013 (AF)[2]	Below Coolidge	5,647	8,648	19,702	22,869	21,053	18,889	20,194	17,002	10,038	7,795	297	10,127	NA
	FCG Canal	6,752	10,866	19,764	21,740	18,844	16,632	20,133	18,966	10,751	6,813	59	9,207	NA

Source: USGS 2015

[1] Flow rate in the study area averaged by month across all years

[2] AF per month averaged across all years

From the Pima Lateral to the north end of Picacho Reservoir, four ephemeral washes flow from the east and cross the CAP canal via overchutes or siphons before outfalling (discharging) to the FCG Canal, where they are conveyed to Picacho Reservoir. An unidentified number of smaller ephemeral washes enter the proposed construction area and greater study area between Ashurst–Hayden Diversion Dam and Picacho Reservoir. These smaller washes may flow along the CAP canal before crossing at an overchute and flowing into the FCG Canal or the FCG Diversion Drainage Channel.

Implementation of the action alternatives must ensure compliance with the CWA. An investigation of potential Waters of the United States (WUS) in the study area identified Picacho Reservoir (because it may support wetlands) and two prominent cross drainages (Bogart and China washes) that likely were jurisdictional for purposes of CWA Section 404 compliance.

Currently, the CAP is a minor secondary source of surface water available to SCIDD. There are five existing turnouts that can deliver CAP water to SCIDD: one to the North Side Canal, two to the FCG Canal upstream of the Pima Lateral, one to the Pima Lateral, and one to the Hohokam Main Canal. Colorado River water from the CAP is used to supplement ground water during the annual maintenance dry-ups and when there are water shortages on the Gila River. Total CAP water supplied to SCIDD from 2000 through 2013 was 52,446 AF, with an annual average of 5,245 AF. Unlike the Gila River Indian Community, which has a CAP water entitlement under a contract with the United States, SCIDD has no entitlement and must purchase excess (Agricultural Settlement Pool) CAP water on an annual basis from the Central Arizona Water Conservation District.

Surface Water Quality

Water supplied through the SCIP system is used almost exclusively for crop irrigation. Relatively minor amounts of water are delivered for landscape irrigation in Florence and Coolidge. With respect to these water uses, there are no water quality restrictions on surface water supplies. The primary surface water quality issue is the sediment load conveyed by the Gila River, particularly during flood events. Approximately 1,320 AF of sediment (equaled or exceeded 75 percent of the time) is diverted annually into the FCG Canal at Ashurst–Hayden Diversion Dam. As a result of this high sediment load, sediment is deposited throughout the distribution system in the headworks, canals, reservoirs, and on irrigated fields within SCIP, resulting in increased operation and maintenance costs, and reduced conveyance capacities. The new sediment settling basin completed in the Phase 1 rehabilitation efforts is designed to remove coarser sediment from Gila River water before it is discharged to the SCIP main canal system for downstream delivery. Suspended concentrations of fine sediment will continue to be conveyed throughout the system. Depending on the flows, some of these sediments may settle-out in the canals at points of low-water velocities, such as upstream of check structures. It is anticipated that these sediments would be entrained and carried downstream as canal deliveries increase. If sediment deposition becomes a problem for water operations, mechanical removal may be necessary.

Though no quantitative measurement has been made, anecdotal sources suggest that another potential source of water quality concern stems from animal access to the canals. Much of the canal system is unfenced, and domestic livestock and wildlife are known to enter canals to obtain

water. On occasion, animals are unable to escape from the canal and drown. The carcasses can remain in the canal for days until maintenance crews discover and remove them. Decaying remains could affect water quality downstream.

The salt content of surface water supplies is within an acceptable range for irrigation of crops and turf. The average total dissolved solids (TDS) of Gila River water at Ashurst–Hayden Diversion Dam is 550 milligrams per liter (mg/l) (Central Arizona Salinity Study 2003).[6] Salt buildup is managed on agricultural fields in the SCIDD service area by farmers, who apply additional water to the fields, as needed, to leach salt out of the plant root zone.

Salinity of water supplied by the CAP varies considerably, depending on where in the system the water is sampled. For 2013, the salt content of CAP water at the McKellips Road sampling location ranged from 540 to 640 mg/l of TDS (CAP 2013).

Ground Water Resources

Ground water resources in Arizona are defined and managed pursuant to the Arizona Groundwater Management Act (GMA), which was created in 1980 by the Arizona State Legislature in recognition of the need to manage the state's finite water resources. The GMA identified specific areas with depleting ground water resources and designated these as Active Management Areas (AMAs) under the oversight of the ADWR. The SCIDD service area is in one of these areas—the Pinal AMA. The statutory goal identified for the management of the Pinal AMA is to preserve the agriculture-based economy for as long as feasible while considering the need to preserve ground water for future non-irrigation uses.

The Pinal AMA covers approximately 4,000 square miles in south-central Arizona and is divided into five subbasins. The study area for this EA is within the Eloy Subbasin. The Eloy Subbasin covers approximately 1,260 square miles (ADWR 2010).

Four geologic units with the potential to yield ground water are identified in the Pinal AMA: hydrologic bedrock, lower basin fill, upper basin fill, and stream alluvium. The ADWR estimates 22.6 million AF of ground water are in storage in the Eloy Subbasin to a depth of 1,000 feet (ADWR 2010). Groundwater flow is generally to the north toward the Gila River and the Phoenix AMA (ADWR 2010). Three ground water zones have been identified in the Eloy Subbasin: the lower water zone, the upper water zone, and local water zone. The lower water zone is the most extensive and is contained in the lower basin fill. The upper water zone is the most productive for wells and is contained in the upper basin fill. Local water zones within the study area include the Casa Grande zone and the Picacho Reservoir zone. The local water zones are recharged by incidental recharge from agricultural irrigation and seepage from the SCIP canal system and Picacho Reservoir (Towne 2008).

Predevelopment hydrologic conditions in the Pinal AMA were in dynamic equilibrium (roughly equal ground water inflow and outflow). This equilibrium was altered beginning in the 1930s when depletion of ground water occurred because ground water pumping exceeded ground water recharge, mostly due to large-scale ground water withdrawals from irrigation wells for agricultural purposes. Prior to the availability of CAP water in 1987, nearly all agricultural

[6] Noticeable effects of TDS begin around 800 mg/l (Anderson et al. 1978).

demand within the Pinal AMA was met with ground water or with surface water supplies from the Gila River. CAP water represented a significant shift in the source of water supply (ADWR 2010), resulting in documented periods of increased ground water levels in some areas in recent years. During this period, ground water conditions were substantially affected by CAP water use in agricultural areas where overall agricultural pumping declined (Corkhill 2012). Incidental recharge from irrigation water and recharge from Gila River flood events also substantially impacted ground water conditions in the Pinal AMA (Corkhill 2012). In the Eloy Subbasin, ADWR observed a general rise in water levels in irrigation districts using CAP water and a general decline in water levels outside the CAP service area, including the SCIDD service area, and in other non-irrigation district agricultural areas (Corkhill 2012).

Approximately 5,000 ground water wells are registered in the Eloy Subbasin, according to the ADWR well registration database (ADWR 2013b). Well yields in excess of 500 gallons per minute to more than 2,000 gallons per minute are common (ADWR 2010). Of the total number of registered wells, roughly 3,000 are non-exempt (i.e., wells with a pump capacity of greater than 35 gallons per minute). For the 2012 annual reporting year, the approximate makeup of the non-exempt wells is 86 percent for irrigation, 10 percent for industry, and 3 percent for municipalities (L. Williams, ADWR, personal communication, February 11, 2013).

SCIP operates approximately 100 irrigation wells, identified as project wells in the two Appendix H figures. SCIP uses ground water from these wells to supplement available surface water supplies from the Gila River up to the amount of the annual water entitlements for SCIDD and the Gila River Indian Community. In drought years, ground water is the predominant source of irrigation water for the SCIDD service area. For example, for the 2012 irrigation season, ground water represented 95 percent of the total water apportionment due to a lack of surface water (A. Fisher, BIA/SCIP, personal communication, September 3, 2015). In contrast, in years when surface water supplies are not limited by drought, ground water use is generally less than 25 percent of the total water apportionment) (D. Mason, SCIDD, personal communication, December 31, 2012).

Approximately half, or about 50, of the SCIP-operated wells primarily serve SCIDD farmland. Roughly 15–20 of these wells are located immediately along the main canal system. Most of the SCIP wells immediately adjacent to the main canal system pump ground water to supply agriculture in two ways: (1) pumping water into the main canal for conveyance to downstream farms, and (2) pumping water directly into farm sub-laterals (C. Begay, BIA/SCIP, personal communication, February 4, 2013).

The remaining 30–35 SCIP wells that serve SCIDD are farther removed from the main canal system. These wells supply irrigation water directly to farmland in the well vicinity—farmland for which delivery from the main canal system is inefficient. Ground water is the sole source of SCIP irrigation water for some of these lands (C. Begay, BIA/SCIP, personal communication, February 4, 2013).

The remaining wells registered in the Eloy Subbasin are privately owned. These wells are identified as non-project wells in the two Appendix H figures.

To determine whether the Pinal AMA will meet the previously referenced statutory goal, future demand, supply utilization, and ground water overdraft are projected by the ADWR in a Demand and Supply Assessment (water budget). The basic budget components are demand, supply, artificial recharge, and offsets to overdraft. The seepage from the main canal system—the subject of this EA—is represented in the artificial recharge component as incidental recharge. Incidental recharge is defined as a byproduct of human activities resulting from storm runoff, agricultural irrigation, and seepage from unlined canals and laterals. The incidental recharge from agriculture (percolation of water below the root zone of irrigated crops) is the largest single source of ground water recharge in the Eloy Subbasin (E.F. Corkhill, ADWR, personal communication, January 31, 2013).

Ground Water Quality

According to the ADWR (1999), ground water quality in the Eloy Subbasin is suitable, in most cases, for agricultural use, and no major water quality concerns were identified. Isolated areas with high levels of nitrate-nitrogen (>10 mg/l) occur in the vicinity of Florence, Coolidge, and Casa Grande. TDS concentrations normally range from <500 mg/l to 1,000 mg/l; however, TDS concentrations up to 10,000 mg/l have been recorded near Coolidge and Casa Grande. In areas where ground water TDS concentrations exceed 1,000 mg/l, the effects of these levels on soils and agriculture are mitigated by leaching and crop rotation.

3.9.2 Environmental Consequences

No Action

With the No Action alternative, separate conveyance systems would not be developed for irrigation water and storm water. In Reaches 1, 2, and 3, irrigation water and storm water would continue to be combined in the FCG Canal, which is the only canal currently available to collect and convey irrigation waters and storm drainage. With a single canal system, the No Action alternative would have less capacity than the action alternatives to collect and convey captured storm water downstream for storage in Picacho Reservoir. Storm waters in the Gila River in excess of what could be safely conveyed in the canal system would not be diverted at Ashurst–Hayden Diversion Dam but directed downstream in the Gila River instead. These waters would be effectively lost for irrigation purposes.

The main canal system would not be lined with concrete and loss of irrigation water through seepage would continue along the length of the unlined canals and laterals. No conservation of surface water would be realized. With the No Action alternative, ground water infiltration would continue as it is currently, with only minor impacts to the Pinal AMA as a whole.

Under the No Action alternative, canal seepage would continue to supply subsurface flows and may contribute to localized ground water mounding along the canals, depending on hydrogeological conditions. With the continuation of seepage from the canal system, there would be no potential to impact individual wells that may tap this subsurface flow.

With the No Action alternative, there would be no resulting change in ground water resources because the canal system would not be lined. Without improvements to the canal system, irrigation water would continue to be lost through seepage and spillage from the canal system.

Impacts on surface water resources with the No Action alternative would be direct, localized and regional, long-term, moderate, and adverse.

Effects Common to Both Action Alternatives

With the implementation of either action alternative, the quantity of surface water available to SCIDD farmers would increase with the conservation of water. The action alternatives would shift the pattern of water infiltration across the study area; rather than seeping along the canals, the water would be applied for agricultural irrigation and a portion of that water would percolate below the agricultural fields. However, ground water recharge would continue from the unlined drainage channels when conveying excess river flows and storm cross drainage, and from Picacho Reservoir.

From a localized perspective, however, the loss of seepage along newly lined segments of the canal system could, over time, tend to flatten or dissipate ground water mounding if it is present beneath these canals. The dissipation or flattening of any ground water mounding could adversely impact ground water recovery from individual wells in close proximity to the canals, depending on individual well features (e.g., well depth, location of screen interval, pumping rate, and frequency). The detailed hydrogeological information needed to identify potential impacts to specific wells is not available. No hydrogeological study was undertaken for this project.

A shallow water table is present along major rivers and washes in the study area (i.e., Gila River above Ashurst–Hayden Diversion Dam and China Wash) (ADWR 2011). These localized areas would not be expected to be impacted by the shift in seepage because the shallow water table is sustained primarily by the presence of water in the river/wash and is not dependent on the water seeping into the ground water from the canal system.

In general, the existing patterns of cross drainage intercepted by the FCG Canal would be maintained with the action alternatives; however, there would be more capacity in the SCIP system to convey flows associated with storm events. In Reach 1, a change in cross-drainage management would occur with implementation of either of the action alternatives, which could result in an increase in surface water discharge to the Gila River. Cross drainage currently intercepted by the FCG Canal along Reach 1A and conveyed downstream in the canal would instead be collected and conveyed to the Gila River through a wasteway. Some intercepted cross drainage would also be conveyed to the new main canal for irrigation purposes. With the action alternatives, under normal conditions, storm flows collected in the newly dedicated storm channel (i.e., the existing FCG Canal) would be conveyed downstream to Picacho Reservoir.

The action alternatives could affect the volume of water discharged to Picacho Reservoir. Based on design and engineering evaluations completed to date, it is anticipated that storm flows into Picacho Reservoir would be reduced compared with the existing condition. However, plans to rehabilitate the inlet structure would facilitate the capture of storm flows that do reach the reservoir, and this water would not be withdrawn for irrigation purposes. Water levels in this reservoir would continue to fluctuate based on the magnitude and frequency of storm events.

Under the action alternatives, irrigation flows carrying finer sediment would be conveyed in a dedicated and lined irrigation canal system and deposited on irrigated fields in SCIDD and the Gila River Indian Community. Storm water runoff from upslope terrain, which tends to carry

coarser sediment and suspended solids, would be captured and conveyed in a dedicated storm water channel (i.e., the existing unlined FCG Canal). Unlike the No Action alternative, the separation of these flows under the action alternatives would prevent the introduction of coarser sediment from storm flows into irrigation water supplies, protecting water quality. Irrigation water quality could be temporarily affected if livestock or wildlife perish and decay in the canal system.

Temporary impacts to surface water quality could result due to construction activities associated with the action alternatives. Excavation materials would be stockpiled away from the canals and natural drainages to minimize the risk of unintentional transport of excavated materials into surface water supplies. Project construction would require the short-term use of fuels, lubricants, and other fluids to operate construction equipment, which would have the potential to contaminate water resources if spilled.

The use of fertilizers and pesticides on farmland can be a source of pollutants to the water supply. With project implementation, the volume of fertilizers and pesticides applied to cultivated lands in the service area would vary from year to year, proportionate to the number of acres cultivated. No change in the quality of ground water and associated potable water supplies is expected as a result of the project.

Agricultural fields in the service area are designed and managed to allow all applied irrigation water to soak in; therefore, irrigation runoff from the fields does not typically occur and is not expected to increase with the project.

Portions of the Proposed Action or FCG Canal Alternative would need to be constructed when the canal system is dry, requiring annual periods of dewatering. This dewatering refers to the dry-up of the canal system (as a whole or parts thereof) and would not necessarily result in the dry-up of the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam.

For those portions of the action alternatives that would need to be constructed when the canal system is dry, construction would use the same annual 5-3-5 dry-up schedule (Section 2.2.7) used for other system construction projects over the past six years. Under the Proposed Action, releases from Coolidge Dam would continue to be suspended each construction year during these dry-ups. Because the dry-ups occur during times of minimal irrigation demand in fall through early winter, and because the dry-ups are limited to 5-week durations separated by three weeks of irrigation delivery, the impact to agricultural lands and irrigation demand would be minor and comparable to that of the current condition. Subalternative A, construction of an inverted siphon in place of the existing flume, would require a shorter construction duration than Subalternative B, construction of a new open-channel flume in place of the existing flume. The longer the construction duration, the longer the canal system dry-up; this would be a potential impact on downstream irrigation water users.

Other portions of the action alternatives could be constructed through the use of localized dewatering and could, therefore, be conducted outside the 5-3-5 dry-up. Localized dewatering would be accomplished through the use of ground water, smaller pump bypasses, and other potential hydraulic linkages, and would affect fewer water users than a full-system dry-up. The

construction duration for the FCG Canal Alternative would be two years longer than the Proposed Action, a potential minor impact on downstream irrigation water users.

Section 404 of the CWA identifies conditions under which a permit is required for actions that result in placement of fill or dredged material into jurisdictional WUS. The only activities identified that would involve work within a wash potentially under the jurisdiction of the U.S. Army Corps of Engineers (USACE) would involve Bogart Wash and China Wash. At the crossing of Bogart Wash and the main canal (just northeast of Valley Farms Road), Bogart Wash flows would be diverted into the unlined drainage channel for conveyance to Picacho Reservoir. With the action alternatives, the FCG Canal would cross China Wash either by means of a siphon system or a new flume, requiring construction in WUS.

Coordination with USACE regulatory personnel (W. Miller, USACE, personal communication, December 20, 2012) was undertaken regarding the applicability of a CWA exemption for construction and maintenance of irrigation ditches (40 CFR § 232.3(c)(3)—Exempt Activities Not Requiring 404 Permits). Due to the nature of the project activities, Reclamation subsequently determined that this exemption applies to the project and that no further consultation with the USACE or Section 404 permitting is required for either action alternative (refer to Chapter 6.0).

A CWA Section 402 National Pollutant Discharge Elimination System (NPDES) permit would be required for activities that discharge pollutants to WUS.

Florence Canal Alternative (Proposed Action)

Under the current condition, the four primary SCIP canals are not lined; therefore, water infiltration to the aquifer occurs along their full lengths. Lining of the future main canal system (totaling 24.2 miles under the Proposed Action) and the regulation reservoir would reduce seepage losses from irrigation supplies to ground water. Relegation of the FCG Canal to primarily storm drain status would also result in reduced infiltration along this canal because flows in this channel would be periodic.

The Engineering Board developed a model for quantifying water seepage and potential water savings in each reach of District main and lateral canals based on soil texture measurements and information provided by ditch masters. Seepage measurements were conducted on selected lateral canal reaches to supplement soil texture–based estimates. District surface water supplies (excluding ground water) were calculated for dry, normal, and wet years, as required under the Third Supplement to the Repayment Contract (Exhibit 20.1 of the Settlement Agreement). The three-year types and associated water supply quantities used in the model are: (1) dry–45,000 AFY, (2) normal–115,000 AFY, and (3) wet–175,000 AFY.

Following construction of Phase 2 Reaches 1–3, the quantity of surface water available to SCIDD farmers would increase relative to the amount of conserved water. In normal to wet years, the quantity of surface water available (including that conserved with the project) could offset the amount of ground water that would be pumped to supplement surface water supplies. In drought years, however, when SCIDD farmers would receive only a small percentage of their full entitlement of irrigation water from surface supplies, the pumping of ground water would not

likely be reduced as a result of the action alternatives because pumping would remain critical for supplementing surface water supply.

Though the Settlement Agreement addresses the conservation of water specifically from the rehabilitation of District Works, this EA also considers the additional surface water that would be conserved as a result of the rehabilitation of the Joint Works described in Exhibit 20.1 of the Settlement Agreement, because the rehabilitation of these Joint Works would further contribute to surface water conservation. Table 8 provides a breakdown of the estimated surface water that would be conserved under the Proposed Action, differentiating between dry, normal, and wet years. This table provides the combined savings from rehabilitation of the Joint Works main canals (i.e., FCG Canal from the Diversion Dam to the bifurcation, and the Florence Canal to the Pima Lateral) and the Florence Canal below the Pima Lateral that serves SCIDD). The estimates of total surface water conserved (District and Joint Works) for Phase 2 Reaches 1–3 would range from 12,750 AFY in dry years to 26,230 AFY in wet years.

Table 8. Estimates of surface water conserved for District and Joint Works main canals with implementation of the Proposed Action for Phase 2 Reaches 1–3 in dry, normal, and wet years.

Surface Water Supply[1]	Joint Works Main Canals Conserved Water (AFY)		District Works Main Canals Conserved Water (AFY)	Total (AFY)
	Florence Canal (above Pima Lateral)	FCG Canal (above bifurcation)	Florence Canal (below Pima Lateral)[2]	
Dry year (45,000 AF)	5,900[3]	2,500	4,350	12,750
Normal year (115,000 AF)	6,600[3]	2,800	10,750	20,150
Wet year (175,000 AF)	7,000[4]	3,000	16,230	26,230

[1] Surface water supply based on year type (Clemmens et al. 2013)

[2] Includes water savings from abandonment of two cross cuts and construction of mid-system regulating reservoir (Clemmens et al. 2013)

[3] B. Clemmens, West Consultants, Inc., Engineering Board, personal communication, March 1, 2013

[4] B. Clemmens, West Consultants, Inc., Engineering Board, personal communication, March 6, 2013

The Third Supplement to the Repayment Contract, as included in Exhibit 20.1 of the Settlement Agreement, describes the apportionment of conserved water that would be derived from rehabilitation of District Works. Under this apportionment, SCIDD has an annual priority to the first 25,000 AF of conserved water. The U.S. Secretary of the Interior has the right to use the next increment of 8,000 AF of conserved water by exchange to maintain a permanent minimum pool of water in San Carlos Reservoir to benefit fish and wildlife. If the conserved water exceeds 33,000 AF in any year, the U.S. Secretary of the Interior may exercise an option to exchange 2 AF of project-stored water for each additional 3 AF of conserved water, up to 10,000 AF, to maintain a permanent pool in San Carlos Reservoir, but only pursuant to a water rights settlement with the San Carlos Apache Tribe to be negotiated at a future date. The allocation allowed by Exhibit 20.1 of the Settlement Agreement (Third Supplement to the Repayment Contract), based on year type and proposed improvements, is shown in Table 9.

Table 9. Allocation of conserved water under Phase 2 based on priorities established by the Third Supplement to the Repayment Contract.

Surface Water Supply	Allocation of Water Conserved from District Works Under Phase 2 (AFY)	
	To San Carlos Reservoir	To SCIDD
Dry year (45,000 AF)	0	11,260
Normal year (115,000 AF)	0	21,020
Wet year (175,000 AF)	4,380	25,000

Since 2008, San Carlos Reservoir has fluctuated between approximately 370,000 AF of storage and empty. Periods of low storage (empty to nearly empty) occurred in 2009 and 2011–2014. Maximum storage capacity of the reservoir is currently estimated to be 910,000 AF. The existing and proposed amended allocations of conserved water that would be available for retention in San Carlos Reservoir in any given year represents less than 1 percent of the maximum storage capacity. There is a dead pool of approximately 3,000 AF that remains in San Carlos Reservoir when the reservoir is technically empty. The dead pool represents water that physically cannot be drained from the lowest portion of the reservoir. Any conserved water that is retained in the reservoir would be in addition to the dead pool.

Based on the USGS gaging station below Coolidge Dam, there was an annual mean discharge to the Gila River from San Carlos Reservoir of approximately 162,261 AF for the period from January 1999 to Dec 2014 (refer to Table 7). During that period, the lowest annual discharge was 53,004 AF in 2002, and the highest annual discharge was 299,372 AF in 2010. Under the existing priority and allocation, no conserved water could be retained in the San Carlos Reservoir in dry to normal years. Up to 8,000 AF of conserved water could be retained in the reservoir in a wet year. Conserved water that is retained in San Carlos Reservoir by the U.S. Secretary of the Interior would not be available for release to the Gila River.

With surface water conservation, impacts to surface water resources with the Proposed Action would generally be direct, localized and regional, long-term, moderate, and beneficial. With the dedication of separate irrigation and drainage facilities and the lining of the main canal system, impacts to surface water quality with the Proposed Action would be direct, localized and regional, long-term, minor, and beneficial. After the lining of the main canal system, impacts to ground water resources would generally be direct, site-specific and localized, long-term, minor, and adverse.

FCG Canal Alternative

The FCG Canal Alternative would contribute two new sources of cross drainage to the Gila River, from Reach 1A (as described under the Proposed Action) and from an additional watershed subbasin in Reach 1C.

Similar to the Proposed Action, the lining of the main canals (totaling 41.9 miles under the FCG Canal Alternative) would reduce the infiltration along the main irrigation canals. The regulating reservoir would also be lined to minimize future seepage losses. With this alternative, the new drainage channel (a total of 17.2 miles in length) would be relegated to primarily storm water conveyance and would not be lined. The segments of the Florence Canal that would be needed under this alternative to function as primary laterals to deliver irrigation water to agricultural

fields (16.9 miles) would be lined; the remainder would be abandoned. The quantities of water that would be conserved as a result of implementation of the FCG Canal Alternative would be similar to those of the Proposed Action, as reported in Table 8.

The FCG Canal Alternative would be somewhat more limited than the Proposed Action in its capacity to convey additional storm water to Picacho Reservoir because it must commingle (combine) storm water with irrigation water in Reach 2. If irrigation orders are being filled at the same time that storm water is available in the Gila River, irrigation water would tie up some of the canal capacity, limiting the capacity available to convey excess storm water. Currently, the cross drainage that is intercepted along Reach 2 is conveyed to Picacho Reservoir, but under the FCG Canal Alternative, this intercepted cross drainage would be discharged instead to the Gila River through existing drainages such as Bogart Wash.

With surface water conservation, impacts to surface water resources with the FCG Canal Alternative would generally be direct, localized and regional, long-term, moderate, and beneficial. With the dedication of separate irrigation and drainage facilities and the lining of the main canal system, impacts to water quality would be direct, localized and regional, long-term, minor, and beneficial. After lining of the main canal system, impacts to ground water resources with the FCG Canal Alternative would generally be direct, site-specific and localized, long-term, minor, and adverse.

Cumulative Impacts

Past and present actions have contributed the conservation of surface water irrigation supplies from the reduction in seepage losses and accidental system spillage. These are most notably associated with past and ongoing irrigation system improvements, including Phase 1 rehabilitation of Ashurst–Hayden Diversion Dam and Headworks and installation of sediment removal facilities and a settling basin at the headworks, and rehabilitation and concrete lining of multiple canals and laterals that serve Gila River Indian Community and SCIDD farmlands. Reasonably foreseeable future actions to continue these rehabilitation efforts, including rehabilitation actions outlined in the P-MIP Programmatic EIS, the planned rehabilitation of SCIP Canal 1, the SCIP Phase 2 rehabilitation of the Casa Grande Canal, and SCIP Phase 3 improvements to laterals serving SCIDD farmlands, would contribute to the conservation of surface water supplies.

The total amount of water conserved from proposed improvements under Phase 2 Reaches 1–3 and anticipated improvements under Phase 2 Reach 4 and Phase 3 would be approximately 12,330 AF for dry years, 24,120 AF for normal years, and 34,210 AF for wet years (Clemmens et al. 2013). Based on these cumulative totals and the allocation prescribed in Exhibit 20.1 of the Settlement Agreement, the U.S. Secretary of the Interior could exercise an option to exchange approximately 8,000 AF for wet years in San Carlos Reservoir for the benefit of fish and wildlife. Conserved water not otherwise exchanged by the U.S. Secretary of the Interior in San Carlos Reservoir would be available to irrigate farmland in the SCIDD service area.

Ongoing actions, including Phase 1 rehabilitation of Ashurst–Hayden Diversion Dam and Headworks and installation and operation of sediment removal facilities and the settling basin, would reduce coarse sediment in irrigation water supplies, improving water quality. The action

alternatives would contribute to improvements in irrigation water quality by conveying intercepted cross drainage and storm flows, which are often heavily laden with sediment, in an earthen-lined drainage channel separate from the main conveyance canal.

Past and ongoing expansion of residential, commercial, and industrial development in the area, and past and ongoing agricultural production, have contributed to the consumption of surface and ground water supplies in the region. In the future, a gradual shift in water demand from agriculture to other uses is anticipated as some agricultural lands are converted for development.

The conservation of surface water irrigation supplies with past, ongoing, and future lining of canals and laterals would reduce the seepage to the ground water along the canals; however, conserved water would supplement water supplies and potentially reduce the need for ground water pumping.

The long-term effect of water conservation on ground water levels would be offset near urban centers where cones of depression associated with municipal ground water extraction would be expected to gradually enlarge as a result of urban growth and increased water consumption.

Global climate change could also affect water supplies in the region. In the Desert Southwest, climatic projections include warmer temperatures with prolonged periods of drought interspersed with episodic rain events. The proposed project would be better equipped to deal with the effects of drought and episodic storms through improved flow management and water conservation.

Past, present, and reasonably foreseeable future actions, in combination with the localized and regional, long-term, minor, and beneficial effects of the action alternatives, would result in a moderate and beneficial cumulative effect on surface water supplies with surface water conservation and a minor to moderate cumulative effect on surface water quality with the dedication of separate irrigation and drainage facilities and the lining of the canals and laterals in the system. Past, present, and reasonably foreseeable future actions, in combination with the site-specific and localized, long-term, minor, and adverse effects of the action alternatives, would result in a minor to moderate, adverse, cumulative effect on ground water distribution.

3.10 FLOODPLAINS AND FLOODING

3.10.1 Affected Environment

EO 11988, *Floodplain Management,* which was signed by President Carter on May 24, 1977, requires Federal agencies to avoid, where practicable alternatives exist, the short- and long-term adverse impacts associated with floodplain management. In carrying out its responsibilities, Federal agencies are required to reduce the risk of flood loss; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. FEMA provides floodplain and flood hazard boundary maps through the Flood Insurance Rate Map program that identify flood hazard areas, base flood elevations, and flood insurance risk zones.

According to a review of FEMA floodplain and flood hazard boundary maps, several 100-year floodplains intersect or run parallel to the construction area (FEMA 2011a). Upstream of Ashurst–Hayden Diversion Dam, the study area is entirely within the Gila River channel and its

associated 100-year floodplain. Though the riverbed downstream of Ashurst–Hayden Diversion Dam is usually dry due to water diversions to the FCG Canal, the regulation gates in the headworks structure at the dam are closed off during large flood events to cease water diversions and to allow sediment-laden floodwater to flow downstream of the diversion dam in the Gila River channel. These floodwater flows occur infrequently.

Data from the USGS Gila River at Attaway gauge in Coolidge, Arizona (USGS gauge 09477570), indicate that flows occurred in the Gila River downstream of Ashurst–Hayden Diversion Dam in seven of the 84 months in the period of record (October 2002 to September 2009) (USGS). These flows occurred in January and February 2005, July and August 2006 and 2007, and January 2008). No other flows were recorded at this gauge during the period of record.

From Ashurst–Hayden Diversion Dam downstream to the point where the Florence Canal diverges from the FCG Canal, the Gila River 100-year floodplain is parallel to, and occasionally overlaps, the construction area. Across from the sediment basin, large man-made sediment piles along the southeast side of the FCG Canal form a dike, which prevents runoff from the south from reaching the FCG Canal and serves as a retention area in the low spots, retaining both the 50-year and 100-year storm events from the associated drainage basin (GCE 2016). Downstream of the man-made sediment piles, cross drainage flowing generally southeast to northwest drains into the existing FCG Canal at various points through this area and some ponds along the east bank of the canal. The China Wash 100-year floodplain also crosses under the FCG Canal in this area, conveying its flows to the Gila River. An existing wasteway structure upstream of China Wash was designed to allow the release of unwanted canal inflows, protecting the canal from overtopping China Wash Flume during large inflows from the Gila River and from large storm events. The spilled flows discharge to the Gila River.

Farther downstream, from the start of the Florence Canal to Picacho Reservoir, three braided floodplains associated with ephemeral washes flow from the east across the CAP canal and end at the eastern side of the FCG Canal. An additional two braided floodplains associated with ephemeral washes flow from the east across the CAP canal, the FCG Canal, and the Florence Canal and continue to the west toward the Gila River.

Storm water and excess flows in the FCG Canal are conveyed to Picacho Reservoir for storage. Picacho Reservoir is surrounded by dikes and is entirely within a 100-year floodplain. If the volume of water discharged to Picacho Reservoir exceeds its capacity, water will overtop an existing spillway and drain to McClellan Wash. If storm flows in FCG Canal exceed what can safely be discharged to Picacho Reservoir, storm water could be directed to the FCG Canal Extension and conveyed downstream to the Arizola Drain.

When there is an excess of water in the system downstream of Picacho Reservoir, water can be conveyed from the FCG Canal Extension to the Casa Grande Canal for irrigation use downstream or released to one of three existing outlets. West of Reach 3 and outside the study area, excess drainage could be released to an existing crosscut canal along SR 87. Currently, this crosscut canal conveys irrigation water to the Casa Grande Canal. When excess flows from the FCG Canal Extension exceed the capacity of the Casa Grande Canal, excess water spills over the canal banks and flows north in an existing drainageway along the east side of the highway. Farther west, cross drainage or excess in-canal flows can be released to the existing Clark Drain.

The Clark Drain originates near the end of the FCG Canal Extension, flows north to cross the Casa Grande Canal, and continues north then west to outlet in the Arizola Drain parallel to, and west of, I-10. Excess flows can also be released directly to the Arizola Drain just west of I-10.

The Arizola Drain, which accumulates flows from the mountains north of Casa Grande and drainage from adjacent developments, ultimately outlets to the North Branch of Santa Cruz Wash. The Dave White Municipal Golf Course is within the floodway of the North Branch of Santa Cruz Wash (FEMA 2011b). As a result of this accumulation of flow, the drain is sometimes overtopped, resulting in localized flooding of the golf course grounds.

3.10.2 Environmental Consequences

No Action

With the No Action alternative, there would be no increase in canal capacity for conveyance of cross drainage or flood flows; existing drainage patterns would continue. The regulation gates in the headworks of Ashurst–Hayden Diversion Dam would be closed during larger storm events to direct sediment-laden flood flows from the Gila River and its tributaries downstream via the river channel.

The FCG Canal and the FCG Canal Extension would continue to convey commingled irrigation water, intercepted cross-drainage flows, and flood flows through the study area and further downstream. Under the existing condition, excess flows periodically overtop the canal system and result in small-scale localized flooding. Because no regulating reservoir would be constructed and no measurement or control facilities would be installed, periodic overtopping of the canal would not be reduced under the No Action alternative.

Excess flows and intercepted drainage would continue to be stored in Picacho Reservoir when not needed to satisfy irrigation orders. Excess flows could also be released, as necessary, to the unnamed drain west of Picacho Reservoir, the Clark Drain, or the Arizola Drain. Releases to the Clark and Arizola drains during flood events would be the same as under the existing condition. Therefore, the potential for flooding of the Dave White Municipal Golf Course, which crosses the floodplain and floodway of the North Branch of Santa Cruz Wash (FEMA 2011b), would not be reduced.

The No Action alternative would maintain existing drainage patterns with small-scale localized flooding occurring periodically. Impacts to floodplains and flooding with the No Action alternative would be direct, localized, long-term, minor, and adverse.

Effects Common to Both Action Alternatives

Multiple drainage studies and reports have been completed for the project area, including those specifically conducted in support of SCIP Facilities Rehabilitation, Phases 1 and 2, and those conducted by others for a number of other projects (GCE 2016). Project engineers have analyzed and quantified the existing off-site drainage that enters into or crosses the FCG Canal (Reaches 1–3) and identified improvements to existing drainage features and designed new facilities to improve the management of flood flows/cross drainage, protect SCIP facilities, and capture, convey, and store additional excess flows in Picacho Reservoir. The action alternatives would be

designed to protect the new canal system from the 50-year flood, 24-hour design storm discharges.

Both action alternatives would necessitate construction within the 100-year floodplain. Based on the nature of the project, it would not be expected to decrease floodplain capacity or raise the 100-year flood elevation. Though expected to be less frequent than with the No Action alternative, when flows exceed capacity, flows would spill over the canal banks, resulting in small-scale localized flooding along the canal system.

In Reach 1, some cross drainage would flow directly to the Gila River (such as through China Wash), some would pond in low areas along the east or south side of the existing unlined FCG Canal, and some would be conveyed to the new main canal. During larger storm events, drainage could overtop the FCG Canal and the new lined main canal. A wasteway or drainageway would direct these flows to the Gila River. The contribution of additional storm flows of this magnitude to the Gila River would not be expected to create additional flood hazards or bank overtopping.

From the beginning of Reach 2, the dedicated drainage channel would be designed to carry excess flows downstream to Picacho Reservoir. For both action alternatives, this setup would protect the system up to at least the 50-year flood event. As under the current conditions, with the 100-year flood event (estimated at 2,200 cfs), drainage flows in Reach 3 would overtop the left bank (east bank) of the FCG Canal and pond or flow along the canal downstream to Picacho Reservoir.

The approximate 4,500-AF capacity of Picacho Reservoir would not be altered as part of the project, but the level of water stored in it would continue to fluctuate, depending on precipitation levels and drought conditions. Based on design and engineering evaluations completed to date, it is anticipated that storm flows into Picacho Reservoir would be reduced. However, the planned rehabilitation of the inlet structure would facilitate the capture of storm flows that do reach the reservoir, and this water would not be withdrawn for irrigation purposes. In flood emergencies, as under the existing condition, excess flood flows could be spilled over to the FCG Canal Extension and ultimately discharged to the Arizola Drain, or could be released from Picacho Reservoir through the existing emergency spillway to McClellan Wash.

Compared with the existing condition, the action alternatives would potentially divert and deliver more water from the Gila River during storm events.

Downstream of Reach 3, under the action alternatives, irrigation water would be conveyed in the unlined Casa Grande Canal, allowing the existing capacity of the FCG Canal Extension to be used for the conveyance of storm flows and cross drainage. The new regulating reservoir would reduce the frequency for spillage along the system by providing a place to temporarily store irrigation water overruns. The new measurement and control devices along the system and at the regulating reservoir could further reduce the potential for spillage. The action alternatives would be expected to reduce the potential for localized flooding compared with the existing condition and the No Action alternative.

As under the existing condition, cross drainage or excess flows that cannot be used for irrigation or stored would be manually released, as necessary, to two existing outlets: the Clark Drain and

the Arizola Drain. The Clark Drain drains into the Arizola Drain, which ultimately drains to the North Branch of Santa Cruz Wash. The action alternatives would not increase flood flows to these drains or appreciably reduce the potential for flooding of the Dave White Municipal Golf Course downstream in the North Branch of Santa Cruz Wash.

Construction of the action alternatives would require the operation of heavy equipment and other vehicles within the 100-year floodplain. Whenever feasible, equipment storage and material stockpiling would be sited outside the 100-year floodplain to minimize the potential of the project to raise the elevation of floodwaters.

Florence Canal Alternative (Proposed Action)

With the Proposed Action, reconstructing existing canal segments and constructing a new parallel, concrete-lined canal in Reaches 1A and 1C, a new crossing at China Wash (Subalternatives A or B), and a canal segment on a new alignment in Reach 2B would require construction within the 100-year floodplain. In most areas, canal alignments cross the floodplain; however, the new parallel canal in Reach 1 would overlap the 100-year floodplain of the Gila River for approximately 2 miles.

Based on the nature of the improvements, the Proposed Action would not impact the 100-year floodplain; however, project improvements would provide additional capacity to convey and store diverted surface water and intercepted cross drainage. Impacts on flooding with the Proposed Action would be direct, site-specific and localized, long-term, minor, and beneficial.

FCG Canal Alternative

With the FCG Canal Alternative, reconstructing existing canal segments and constructing a new parallel drainage channel would require construction within the 100-year floodplain. As with the Proposed Action, canal alignments mainly cross the floodplain; however, the new parallel canal in Reach 1 would overlap the 100-year floodplain of the Gila River for approximately 2 miles.

Due to construction constraints, a new drainage channel cannot be constructed in the segment between China Wash and the Florence Canal turnout with the FCG Canal Alternative. Cross drainage intercepted in this reach (estimated at 1,300 cfs) would be discharged to the Gila River via a box culvert or overchute and a new drainageway. Though this would result in the discharge of more water to the Gila River during storm events, it is not expected to cause flooding.

Unlike the Proposed Action, the FCG Canal Alternative would construct a new drainage channel parallel to the existing FCG Canal. The new drainage channel would have a capacity of 500 cfs at its starting point—just downstream of SR 79—and would ramp up to 2,000 cfs before discharging to Picacho Reservoir. With the new drainage channel under this alternative, the system could be protected from a larger storm event (more than the 50-year flood) than with the Proposed Action, though flows from a 100-year flood event may still overtop the east bank of the channel.

Distinct from the Proposed Action, the FCG Canal Alternative would operate a drainage channel close (approximately 20 feet from bank to bank) to the new concrete-lined main canal. If storm flows breach the drainage channel, the surrounding banks could become saturated and cause the

concrete lining of the main canal to buckle or fail. Due to the close proximity between the new concrete-lined main canal and the new drainage channel, the risk of damage to the lined system would be greater with the FCG Canal Alternative than the Proposed Action and could extend to surrounding private properties. Armoring and strengthening of the embankments between the two canals would be required to reduce this potential.

The risk of flooding during construction of the FCG Canal Alternative would be greater than under the Proposed Action. During construction of a bypass canal under this alternative, there would be no means to control cross drainage, increasing the risk of flood damage. Following construction of the bypass canal, construction of the main canal would occur while the adjacent bypass channel conveys irrigation flows around the construction zone, requiring extensive dewatering efforts to keep water from seeping into the work zone.

The FCG Canal Alternative would not impact the 100-year floodplain; however, project improvements would provide additional capacity to convey and store diverted surface water and intercepted cross drainage. Impacts on flooding with the FCG Canal Alternative would be direct, site-specific and localized, long-term, minor, and beneficial.

Cumulative Impacts

There would be no cumulative effects on the 100-year floodplain because the project would not affect floodplain capacity or flood elevation. Past, present, and reasonably foreseeable future actions, in combination with the site-specific and localized, long-term, minor, and beneficial effects of the action alternatives, would result in a minor to moderate cumulative effect on flooding.

3.11 BIOLOGICAL RESOURCES

The following section evaluates potential impacts to vegetation; wildlife; federally listed endangered and threatened, and other special status species; and invasive species.

3.11.1 Affected Environment

The study area is in the Middle Gila River watershed and extends from Coolidge Dam at an elevation of 2,990 feet to the community of Casa Grande at an approximate elevation of 1,400 feet and includes biological resources that use the Gila River.

The study area has considerable variation in landform and natural features. The reach of the Gila River downstream of Coolidge Dam is narrowly confined in canyons as it flows along the south end of the rugged and remote Mescal Mountains and Needles Eye Wilderness to the confluence with the San Pedro River near Winkelman. Between Winkelman and Kelvin, the Gila River flows through a broader floodplain flanked by hillsides. Downstream of Kelvin to Ashurst–Hayden Diversion Dam, the Gila River floodplain again becomes constricted by the Tortilla Mountains to the south and the rugged White Canyon Wilderness to the north. At Ashurst–Hayden Diversion Dam, flows in the river are diverted into the FCG Canal, which flows southwest to Picacho Reservoir and into the Casa Grande Valley. This broad valley supports the rural, agricultural, and municipal areas that comprise Florence, Coolidge, Casa Grande, and the Gila River Indian Community.

Vegetation

The study area occurs within the Sonoran Desertscrub biome. Based on the classification system developed by Brown (1994), the upper portion of the study area (roughly upstream of Florence, Reach 1, and a small portion of Reach 2A) is mapped as Arizona Upland Subdivision Sonoran Desertscrub, and adjacent upland areas support primarily Paloverde–Cacti–Mixed Scrub Series vegetation. Dominant plant species in adjacent upland areas include creosote bush *(Larrea tridentata),* foothills paloverde *(Parkinsonia microphylla),* ironwood *(Olneya tesota)*, saguaro *(Carnegiea gigantea),* and other cactus species.

The lower portion of the study area, within the Casa Grande Valley (Reaches 2 and 3), is mapped as Lower Colorado River Valley Subdivision Sonoran Desertscrub. Upland areas at the slightly higher elevations at the eastern edges of the Casa Grande Valley support Creosote Bush–Bursage Series vegetation dominated by creosote bush and bursage (*Ambrosia* spp.), while the lower elevations support Saltbush Series vegetation dominated by cattle saltbush *(Atriplex polycarpa),* with interspersed velvet mesquite *(Prosopis velutina)* and desert-thorn (*Lycium* spp.).
A substantial portion of the study area in the Casa Grande Valley (i.e., the SCIDD service area) consists of actively cultivated or fallow agricultural lands. Riparian and wetlands vegetation in the study area is described in Section 3.12.1.

Wildlife

Wildlife habitat type and quality varies in the study area. Arizona Upland Sonoran Desertscrub, which occurs adjacent to the upper and middle portions of the study area, typically supports a diverse assemblage of species. Mammals likely include desert mule deer *(Odocoileus hemionus crooki),* javelina *(Tayassu tajacu),* mountain lion *(Puma concolor),* bobcat *(Felis rufus),* gray fox *(Urocyon cinereoargenteus),* coyote *(Canis latrans),* and ringtail cat *(Bassariscus astutus).* The more remote upper and middle portions of the study area (i.e., between Coolidge Dam and Ashurst–Hayden Diversion Dam) are expected to provide the best habitat for these species, which likely rely to some extent on the Gila River as a source for water and as a travel corridor, and use the associated riparian habitat for cover and prey/forage. Smaller mammals that are less reliant on surface water availability include black-tailed jackrabbit *(Lepus californicus),* cottontail *(Sylvilagus auduboni),* white-throated woodrat *(Neotoma albigula),* and several species of pocket mouse (*Perognathus* spp.) and kangaroo rat (*Dipodomys* spp.).

Bird species typically associated with this biome include roadrunner *(Geococcyx californianus),* mourning dove *(Zenaida macroura),* lesser nighthawk *(Chordeiles acutipennis),* verdin *(Auriparus flaviceps),* cactus wren *(Campylorhynchus brunneicapillus),* black-tailed gnatcatcher *(Polioptila melanura),* phainopepla *(Phainopepla nitens),* black-throated sparrow *(Amphispiza bilineata),* Gambel's quail *(Callipepla gambelii),* Costa's hummingbird *(Calypte costae),* and Gila woodpecker *(Melanerpes uropygialis)* (Brown 1994). Riparian habitat along the perennial upper and middle reaches of the Gila River in the study area supports important habitat for riparian-associated bird species such as Bell's vireo *(Vireo bellii),* yellow warbler *(Dendroica petechia),* summer tanager *(Piranga rubra),* hooded oriole *(Icterus cucullatus),* and yellow-breasted chat *(Icteria virens).*

Reptile species in the study area and adjacent uplands are expected to include rattlesnakes (*Crotalus* spp.) and other snake species, Sonoran Desert tortoise *(Gopherus agassizii),* zebra-tailed lizard *(Callisaurus draconoides),* desert spiny lizard *(Sceloporus magister),* and other

lizard species. The Gila River in the middle and upper portions of the study area supports a primarily nonnative fish assemblage that includes, in general order of abundance, red shiner *(Cyprinella lutrensis),* mosquitofish *(Gambusia affinis),* channel catfish *(Ictalurus punctatus),* common carp *(Cyprinus carpio),* green sunfish *(Lepomis cyanellus),* and flathead catfish *(Pylodictis olivaris).* Native fish species in this reach of the river are generally limited to desert suckers *(Pantosteus clarki)* (Kesner and Marsh 2010), though Gila longfin dace *(Agosia chrysogaster chrysogaster)* and Sonora suckers *(Catostomus insignis)* have also been recorded. The FCG Canal and other canals downstream of Ashurst–Hayden Diversion Dam (and Picacho Reservoir when surface water is present) support a number of the same fish species.

The lower portions of the study area, in and surrounding the community of Coolidge, provide only limited habitat for certain wildlife due to extensive agricultural and rural development. Nevertheless, these areas continue to support some species, such as coyote, gray fox, burrowing owl *(Athene cunicularia hypugaea),* water birds attracted to perennial surface water in the canals (e.g., great blue herons [*Ardea herodias*], great egrets [*A. alba*]), and migrating ducks, geese, and shorebirds attracted to periodically flooded farm fields. The limited remaining patches of undisturbed natural area support predominantly saltbush and scattered mesquite. Though mostly fragmented, these areas may continue to provide habitat for coyote, kit fox *(Vulpes macrotis),* black-tailed jackrabbit, round-tailed ground squirrel *(Spermophilus tereticaudus),* burrowing owl, other bird species, and a relatively diverse assemblage of lizards.

Picacho Reservoir, near the end of Reach 3, provides important wildlife habitat due to the periodic collection and storage of surface water that results in at least temporary aquatic habitats and associated riparian vegetation. In past years when surface water has been present and relatively extensive, the reservoir has supported a high number of breeding birds and has provided habitat for wintering and migrating land and shorebirds. The reservoir has supported reproducing populations of nonnative fish, likely originating from the FCG Canal, providing forage for water birds such as ducks (Anatidae); grebes (Podicipedidae); cormorants (*Phalacrocorax* spp.); and herons, egrets, and bitterns (Ardeidae). The tamarisk habitat surrounding the reservoir has been considered an important area for nesting white-winged doves *(Zenaida asiatica)* (Jakle and Baucom 1983). In more recent years, the reservoir has been dry more than wet due to diminished precipitation, increased vegetation and sedimentation, and impaired function of the inlet structure that allows periodic conveyance of flows into the reservoir from the FCG Canal.

No wildlife linkages have been identified in the study area.

Threatened and Endangered Species

Table 10 summarizes the potential occurrence of threatened and endangered species identified in a USFWS Information for Planning and Conservation (IPaC) Trust Resources Report generated for the study area on April 7, 2017 (USFWS 2017a) (Appendix I). Though it does not appear in the IPaC report, the endangered loach minnow was added to Table 10 due to its known occurrence in Aravaipa Creek, 11 miles upstream of the study area.

Table 10. Potential or known occurrence of federally listed and proposed species in the study area or project vicinity.

Name	Status	Habitat Requirements	Known or Potential Occurrence
Acuña cactus *Echinomastus erectocentrus* var. *acunensis* Designated critical habitat	E	Tops or upper slopes of granite or andesite hills in Arizona Uplands Sonoran Desertscrub. Elevation: 1,300 to 2,600 feet.	The species is not known or expected to occur in the study area. Occurrence has been documented in the hills north and south of the Gila River between Florence and Kearny. In the project vicinity, potentially suitable soils/substrates occur only in upland areas between Ashurst–Hayden Diversion Dam and Kearny, outside the study area and where no activities are proposed. Critical habitat Units 5 and 6 (Mineral Mountain and Box O Wash) occur in these areas but would not be affected by proposed activities.
Arizona hedgehog cactus *Echinocereus triglochidiatus* var. *arizonicus*	E	Ecotone between interior chaparral and Madrean evergreen woodland. Elevation: 3,200 to 5,200 feet.	The species is not known or expected to occur in the study area. The study area lies at 500 feet or more below the species' elevational range. The nearest known population is at least 25 miles from the study area
Gila topminnow *Poeciliopsis occidentalis*	E	Warm waters with slow currents and abundant aquatic vegetation along shallow margins of main river channels, backwaters, tributaries, and associated natural springs. Elevation: <4,500 feet.	The species is not known or expected to occur in the study area. The species historically occurred in backwaters of large rivers, including the Gila River, but is currently isolated to small streams and springs. The Middle Gila River supports a diverse population of introduced fish, some of which represent predators of this species.
Gray wolf *Canis lupus*	NE	Oak and pine/juniper savannahs in the foothills and mixed-conifer woodlands. Elevation: >4,000 feet.	The species is not known or expected to occur in the study area. The species historically ranged throughout Arizona, except in desert areas. No known records are from the study area or vicinity. The species has been reintroduced into portions of eastern Arizona. The species is not expected to occur because the study area is at elevations of less than 4,000 feet and is dominated by desertscrub habitats.
Headwater chub *Gila nigra*	PT	Medium-sized streams in large, deep pools often associated with cover such as undercut banks or deep places created by trees or rocks. Elevation: 3,000 to 6,700 feet.	The species is not known or expected to occur in the study area. The study area is below the known elevational range of this species and outside the known occupied habitat (East Verde River and tributaries, Fossil Creek, Wet Bottom Creek, Deadman Creek, Tonto Creek and tributaries, San Carlos River, Ash Creek, and the upper Gila River in New Mexico).

Table 10. Potential or known occurrence of federally listed and proposed species in the study area or project vicinity.

Name	Status	Habitat Requirements	Known or Potential Occurrence
Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*	E	Desertscrub habitat with agave and columnar cacti present as food plants. Elevation: <6,000 feet.	There are no records from the immediate project vicinity, but this species may occur seasonally in the study area. Upland areas in the upper portions of the study area support potential foraging habitat (i.e., saguaros) and potential roost sites (i.e., caves and abandoned mines) for this species. The nearest historic roost site (record dating to 1988) is about 8 miles from Picacho Reservoir. The nearest known maternity roost is more than 50 miles from the study area.
Loach minnow *Tiaroga cobitis* Designated critical habitat	E	Rivers and perennial streams with shallow areas, gravel to cobble-dominated substrate, and moderate to swift current. Elevation: <7,200 feet.	The species is not known to occur in the study area. Current distribution includes Aravaipa Creek, about 11 miles upstream of the study area. There are no records of loach minnows from the Middle Gila River. The perennial reach of the Gila River in the study area supports a diverse population of introduced fish, some of which represent predators of this species. There is no designated critical habitat for this species in the study area.
Northern Mexican garter snake *Thamnophis eques megalops* Proposed critical habitat	T	Cienegas, stock tanks, large-river riparian woodlands and forests, streamside gallery forests. Elevation: 130 to 8,500 feet.	The species is not known or expected to occur in the study area. Occurrence is limited to the southeast corner of Arizona and the Agua Fria River, Oak Creek, the Verde River, and the upper Salt and Black rivers and tributaries. The species is considered likely to be extirpated from the Gila and San Pedro rivers and, therefore, is not anticipated to occur in the study area. Proposed critical habitat occurs along the San Pedro River, which flows into the Gila River at Winkelman, near the center of the action area. No critical habitat has been proposed along the Gila River in the study area.
Ocelot *Leopardus pardalis*	E	Desertscrub habitats with dense cover. Elevation: <8,000 feet.	The species is not known or expected to occur in the study area. One occurrence record is from Gila County and three records are from Cochise County since 2009. Regular occurrence in the study area is unlikely.

Table 10. Potential or known occurrence of federally listed and proposed species in the study area or project vicinity.

Name	Status	Habitat Requirements	Known or Potential Occurrence
Razorback sucker *Xyrauchen texanus* Designated critical habitat	E	Medium and large streams and rivers at intermediate to low elevations. Elevation: 181 to 5,000 feet.	The species is not known or expected to occur in the study area. Natural adult populations exist only in Lake Mohave, Lake Mead, and Lake Havasu on the lower Colorado River. Reintroduced in large numbers through the 1980s into the Gila River near Clifton (in eastern Arizona, well upstream of Coolidge Dam) but with little recorded survival. Not anticipated to occur in the reach of the Gila River in the study area. Designated critical habitat for the razorback sucker includes the Gila River upstream of Coolidge Dam, including San Carlos Reservoir.
Roundtail chub *Gila robusta*	PT	Cool to warm waters of rivers and streams; often occupy the deepest pools and eddies of large streams. Elevation: 1,000 to 7,500 feet.	The species is not known or expected to occur in the study area. The study area is outside the geographic range of this species. No known populations are along the Gila River downstream of Coolidge Dam.
Southwestern willow flycatcher *Empidonax traillii extimus* Designated critical habitat	E	Cottonwood/willow and tamarisk vegetation communities along rivers and streams. Elevation: <8,500 feet.	The species is known to occur in the study area. Breeding habitat occurs along the Gila River in the study area between Coolidge Dam and Ashurst–Hayden Diversion Dam, where the species has been recorded as recently as 2015. Designated critical habitat in the study area occurs along the Gila River from Ashurst–Hayden Diversion Dam to Dripping Springs Wash.
Spikedace *Meda fulgida* Designated critical habitat	E	Moderate to large perennial streams, with moderate- to fast-velocity waters over gravel and rubble substrates. Elevation: <6,000 feet.	The species is not expected to occur in the study area. Current distribution is restricted to the upper reaches of the Gila River in New Mexico, Aravaipa Creek, Eagle Creek, and the Verde River. Spikedace have not been reported in the Middle Gila River since 1991 despite repeated surveys. The perennial reach of the Gila River in the study area supports a diverse population of introduced fish, some of which represent predators of this species. There is no designated critical habitat for this species in the study area.

Table 10. Potential or known occurrence of federally listed and proposed species in the study area or project vicinity.

Name	Status	Habitat Requirements	Known or Potential Occurrence
Yellow-billed cuckoo *Coccyzus americanus* Proposed critical habitat	T	Large blocks of riparian woodlands. Cottonwood, willow, or tamarisk galleries. Elevation: <6,500 feet.	The species is known to occur in the study area. Occurrence has been recorded along the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam, where the species has been recorded as recently as 2015, and at Picacho Reservoir, where the species was recorded prior to 1998 and in 1998 and 1999. Critical habitat has been proposed for Picacho Reservoir and the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam.
Yuma Ridgway's rail (formerly Yuma clapper rail) *Rallus longirostris (obsoletus) yumanensis*	E	Fresh-water marshes dominated by cattail or bulrush. Elevation: <4,500 feet.	The species is known to occur in the study area. Occurrence has been recorded at Picacho Reservoir in some years, most recently in 2011.

E = Endangered; NE = Proposed Experimental Population, Non-Essential; PT = Proposed Threatened; T = Threatened

Lesser Long-Nosed Bat

The lesser long-nosed bat was listed as endangered in 1988 without proposed or designated critical habitat (USFWS 1988). In January 2017, the USFWS proposed the delisting of this species (USFWS 2017b).

Lesser long-nosed bats are found in southern Arizona from the Picacho Mountains southwest to the Agua Dulce Mountains, southeast to the Galiuro and Chiricahua mountains, and south into Mexico. This species is seasonally present in Arizona in the saguaro-dominated desert of south-central Arizona as far north as the Picacho Mountains of southern Pinal County, with isolated records as far north as Phoenix and the Bill Williams River (USFWS 1995a) and late summer occurrences in the agave-rich grasslands of southeastern Arizona (Hoffmeister 1986) and southwestern New Mexico (USFWS 1995a).

Critical resources for this species are day roosts and concentrations of food plants. Day roosts, including maternity roosts, are found primarily in caves and mines. Primary food plants vary, depending on the time of year and blooming season, but consist of columnar cacti flowers and fruit, and the flowers of paniculate agave. This bat is usually found below 3,500 feet elevation from April through July and ranges up to 5,500 feet elevation from about late July to October. Males and pregnant females arrive in Arizona between April and early May to feed on the nectar and pollen of columnar cacti, especially saguaros. Between late July and early August, adults and young disperse from maternity roosts to feed on the nectar and pollen of agave (*Agave* spp.) (USFWS 1995a).

Lesser long-nosed bats are not known to occur in the study area. Several lesser long-nosed bats were noted roosting in a mine in 1988 in the Picacho Mountains, which are within 8 miles of Picacho Reservoir in the lower portion of the study area. This site was monitored for the presence of this species between 1996 and 2002, but no lesser long-nosed bats were detected

(Scott Richardson, USFWS Supervisory Fish and Wildlife Biologist, personal communication, June 16, 2017). There are additional records from southeastern Arizona and at least one historic record of an individual bat from the Phoenix metropolitan area. Potential foraging resources (i.e., saguaros) occur in the upper portions of the study area.

Southwestern Willow Flycatcher

The Southwestern willow flycatcher was listed as endangered in 1995 (USFWS 1995b). Critical habitat was designated in 2013 and within the study area includes 50 miles of the middle Gila River from Ashurst–Hayden Diversion Dam to the confluence of the Gila River and Dripping Springs Wash (USFWS 2013).

The historic range in Arizona included portions of all major river systems (i.e., Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro rivers) and probably their major tributaries (USFWS 1995b). This species lives and nests in dense willow and tamarisk thickets and riparian woodlands. Primary habitat elements necessary for this species are dense, closed canopy riparian woodlands.

In the study area, Southwestern willow flycatchers have been recorded along the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam and at Picacho Reservoir. Based on recent surveys extending from 2008 to 2015, they are known to occur in substantial numbers of breeding pairs along the Gila River between Winkelman and Dripping Springs Wash. A migrant Southwestern willow flycatcher was recorded at Picacho Reservoir in 2008, but no breeding was observed during surveys conducted there between 1994 and 2011.

Yellow-Billed Cuckoo

The Western yellow-billed cuckoo was listed as threatened in 2014 (USFWS 2014a). Critical habitat was proposed in 2014 (USFWS 2014b) and in the study area includes Picacho Reservoir and the reach of the Gila River from the confluence of the San Pedro River to Ashurst–Hayden Diversion Dam.

The current breeding range of the yellow-billed cuckoo in the western United States includes riparian woodland habitat in portions of Arizona, California, and New Mexico (Halterman 1991). This species arrives in Arizona in late May and June, with peak nesting activity in southeastern Arizona occurring from mid-June to September (Corman 2005; Corman and Magill 2000; Halterman 2002). Nesting habitat is predominantly dense lowland riparian woodland consisting of cottonwood, willow, velvet ash, Arizona walnut, mesquite, and tamarisk (Corman 2005).

There are historic breeding records (based on surveys prior to 1998) of yellow-billed cuckoos from the vicinity of Winkelman and Grayback Mountain, between Ashurst–Hayden Diversion Dam and Kelvin, and from Picacho Reservoir. There are also breeding season records from 1998 and 1999 for the Gila River above Winkelman, near Kearny, and at Picacho Reservoir (Corman and Magill 2000). More recently, probable breeding habitat has been identified along the Gila River in the reach at, and downstream of, the San Pedro River confluence (Corman 2005). Cuckoos have been detected incidentally during Southwestern willow flycatcher surveys and monitoring in low numbers throughout the reach from just upstream of Ashurst–Hayden Diversion Dam to Dripping Springs Wash as recently as 2015. Nesting by yellow-billed cuckoos

was documented at Dripping Springs Wash in 2009 (personal communication, Allen Graber, SWCA, Inc., to Alexander Smith, Reclamation, June 1, 2011).

Yuma Ridgway's Rail

The Yuma Ridgway's rail (formerly Yuma clapper rail) was listed in 1967 without critical habitat (USFWS 1967).

This species occurs along the Colorado River from Lake Mead to Mexico; on the Gila and Salt rivers upstream to the area of the Verde River confluence; on the Tonto Creek arm of Roosevelt Lake; and at Picacho Reservoir (USFWS 2002). Though up to 70 percent of the population overwinters in the breeding range during mild winters, some depart from the breeding range by late September, presumably west to coastal Sonora, Sinaloa, and Nayarit in Mexico, returning around March or April (Todd 1986). Yuma Ridgway's rails require a wet substrate, such as a mudflat, sandbar, or slough bottom, supporting dense stands of bulrush and cattail adjacent to shorelines.

Yuma Ridgway's rails were recorded during surveys conducted annually at Picacho Reservoir from 1975 to 1984 and from 1988 to 1995, with the exception of 1990. The most recent record of this species at Picacho Reservoir is from 2011. The remainder of the study area is not expected to support suitable habitat for this species.

Other Special Status Species

The AGFD Arizona Environmental Online Review Tool was used to generate lists of other special status species with documented occurrence within 3 miles of the study area (Appendix I). Table 11 lists records of species, by project segment classified as Species of Greater Conservation Need (SGCN) or Wildlife of Special Concern in Arizona (WSC) by the AGFD, and/or covered under a Candidate Conservation Agreement (CCA). This table does not include federally listed threatened or endangered species; these are identified in the previous section.

Table 11. Documented occurrence of other special status species within 3 miles of the study area, by segment.

Name	Status	Habitat	Recorded in Study Area or Vicinity Above Ashurst–Hayden Diversion Dam	Recorded in Study Area or Vicinity Below Ashurst–Hayden Diversion Dam
Fish				
Desert sucker *Catostomus clarkii*	SGCN	Aquatic	✓	✓
Gila longfin dace *Agosia chrysogaster chrysogaster*	SGCN	Aquatic	✓	✓
Sonora sucker *Catostomus insignis*	SGCN	Aquatic	✓	✓
Amphibians				
Lowland leopard frog *Lithobates yavapaiensis*	SGCN	Aquatic	✓	
Birds				
American peregrine falcon *Falco peregrinus anatum*	SGCN	Terrestrial	✓	

Table 11. Documented occurrence of other special status species within 3 miles of the study area, by segment.

Name	Status	Habitat	Recorded in Study Area or Vicinity Above Ashurst–Hayden Diversion Dam	Recorded in Study Area or Vicinity Below Ashurst–Hayden Diversion Dam
Bald eagle *Haliaeetus leucocephalus*	WSC, SGCN	Riparian	✓	
Golden eagle *Aquila chrysaetos*	SGCN	Terrestrial	✓	
Western burrowing owl *Athene cunicularia hypugaea*	SGCN	Terrestrial		✓
Mammals				
California leaf-nosed bat *Macrotus californicus*	WSC, SGCN	Terrestrial	✓	
Pale Townsend's big-eared bat *Corynorhinus townsendii pallescens*	SGCN	Terrestrial	✓	
Reptiles				
Desert box turtle *Terrapene ornata luteola*	SGCN	Terrestrial	✓	
Tucson shovel-nosed snake *Chionactis occipitalis klauberi*	SGCN	Terrestrial		✓
Sonoran Desert tortoise *Gopherus morafkai*	CCA, SGCN	Terrestrial	✓	✓

CCA = Candidate Conservation Agreement, SGCN = AGFD Species of Greater Conservation Need, WSC = Wildlife of Special Concern in Arizona

The bald eagle and golden eagle are also protected under the Bald and Golden Eagle Protection Act (BGPA). With the exception of a few species, all birds that occur or potentially occur in the study area are protected under the Migratory Bird Treaty Act (MBTA). The Lower San Pedro Important Bird Area occurs along the San Pedro River and extends from Cochise County into the study area at the confluence with the Gila River.

A number of species protected under the Arizona Native Plant Law occur in the study area. These consist predominantly of desert trees and cacti. One highly safeguarded protected native plant, the Acuña cactus, has been recorded within 3 miles of the study area. This species is also listed as endangered and is addressed in Table 10.

Invasive Species

Based on EO 13112, Invasive Species, signed by President Clinton on February 3, 1999, all projects will, "subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to, and control, populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably…[and] (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded."

An invasive plant species survey was completed in 2010 in the area extending from Ashurst–Hayden Diversion Dam approximately 2 miles downstream. Table 12 lists invasive plant species observed. These and other invasive plant species are expected to occur throughout the study area, to varying degrees. The portion of the study area below Ashurst–Hayden Diversion Dam to the project terminus near Picacho Reservoir is expected to support the highest number and the highest abundance of invasive plant species due to the greater extent of habitat disturbance from roads, canals, farm fields, and rural/municipal development. The upper portion of the study area (Coolidge Dam to Ashurst–Hayden Diversion Dam) is less disturbed and likely supports fewer invasive plant species. Those species that occur, however, may be present at relatively high densities along the riparian corridor (e.g., tamarisk, cocklebur).

Table 12. Invasive plant species observed in 2010 in the vicinity of Ashurst–Hayden Diversion Dam.

Common Name	Scientific Name
Asian mustard	*Brassica tournefortii*
Athel tamarisk	*Tamarix aphylla*
Bermudagrass	*Cynodon dactylon*
Cheeseweed mallow	*Malva parviflora*
Common cocklebur	*Xanthium strumarium*
London rocket	*Sisymbrium irio*
Mediterranean grass	*Schismus* sp.
Nettleleaf goosefoot	*Chenopodium murale*
Prickly lettuce	*Lactuca serriola*
Prickly Russian thistle	*Salsola tragus*
Redstem stork's bill	*Erodium cicutarium*
Tamarisk	*Tamarix* sp.
Spiny sowthistle	*Sonchus asper*
Tree tobacco	*Nicotiana glauca*

A number of other nonindigenous species are known to occur in the study area, primarily aquatic (fish) and semiaquatic (amphibian) species that have been recorded in the Gila River, the FCG Canal, and Picacho Reservoir (Kesner and Marsh 2010; Jakle and Baucom 1983). Table 13 lists nonindigenous aquatic and semiaquatic species recorded in these water bodies. One of these species, the bullfrog *(Rana catesbeiana)* is identified as a Priority 3 Aquatic Invasive Species in Arizona (AGFD 2011).

Table 13. Documented occurrence of nonindigenous aquatic and semiaquatic species in the study area.

Common Name	Scientific Name	Recorded Occurrence		
		Gila River	FCG Canal	Picacho Reservoir
Black bullhead	*Ameiurus melas*		✓	✓
Black crappie	*Pomoxis nigromaculatus*	✓		
Bluegill	*Lepomis macrochirus*	✓		
Bullfrog	*Rana catesbeiana*	✓		✓
Channel catfish	*Ictalurus punctatus*	✓	✓	✓
Common carp	*Cyprinus carpio*	✓	✓	✓
Flathead catfish	*Pylodictis olivaris*	✓	✓	
Green sunfish	*Lepomis cyanellus*	✓	✓	
Largemouth bass	*Micropterus salmoides*	✓		✓
Mosquitofish	*Gambusia affinis*	✓	✓	✓
Redear	*Lepomis microlophus*	✓		
Red shiner	*Cyprinella lutrensis*		✓	
Spiny softshell	*Apalone spinifera*	✓		
Threadfin shad	*Dorosoma petenense*	✓	✓	
Tilapia	*Tilapia* sp.			✓
Yellow bullhead	*Ameiurus natalis*	✓	✓	

The April 20, 1994, USFWS Biological Opinion (USFWS 1994) mandated that an electric barrier be placed on the Florence–Casa Grande Canal just south of China Wash. The placement of the barrier was intended to protect against introduction of nonnative fishes from the CAP into the Gila River and its tributaries by prohibiting their movement upstream beyond the diversion at Ashurst–Hayden Dam. Since the barrier has been constructed, it has been met with challenges that have limited its effectiveness. It relies solely on an electrical current to impede the movement of fish in an area where power is unreliable. In addition, siltation on the barrier's electrical components has, at times, made it less effective, but it undergoes regular maintenance and cleaning to ensure it is operational.

3.11.2 Environmental Consequences

No Action

Vegetation

Under the No Action alternative, construction would be limited to the rehabilitation or replacement of China Wash Flume. This would result in limited disturbance to Arizona Upland Sonoran Desertscrub vegetation in the direct vicinity of the flume. These impacts on vegetation would be direct, site-specific, long-term, minor, and adverse.

None of the canal rehabilitation proposed under the action alternatives would occur under the No Action alternative, and there would be no associated permanent or temporary impacts to vegetation. The annual 5-week maintenance dry-up of the system would continue to result in a 5-week dry-up of the Gila River. Associated temporary reductions in flow in the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam would occur near the end of the growing season and would have little effect on vegetation. Effects on riparian and wetlands vegetation are discussed in Section 3.12.2.

Wildlife

Under the No Action alternative, there would be no project-related removal or disturbance of wildlife habitat. Canals in the system would remain unlined and would continue to be subject to access by wildlife for drinking water and occasional incidental drowning.

Threatened and Endangered Species

The No Action alternative would have no effect on endangered, threatened, proposed, or candidate species and would not result in adverse modification of any proposed or designated critical habitat. There would be no construction-related changes in flow in the reach of the Gila River from Coolidge Dam to Ashurst–Hayden Diversion Dam, no removal or disturbance of habitat, and no construction-related disturbance. In Reach 1, there would be no removal of saguaros, which represent potential foraging resources for the endangered lesser long-nosed bat and no construction-related disturbance of this species. There would be no project-related change in potential habitat at Picacho Reservoir for the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, or the endangered Yuma Ridgway's rail.

Other Special Status Species

Under the No Action alternative, there would be no effect on other special status species or their habitats.

Water quality conditions for other special status fish species in the canal system would remain unchanged. Under the No Action alternative, there would be no construction-related disturbance of other special status bird species such as the American peregrine falcon, the golden eagle, or the Western burrowing owl. The No Action alternative would not affect nesting habitat for species protected under the (MBTA or the BGPA.

Invasive Species

The No Action alternative would have little or no effect on the distribution or spread of invasive species. Other than the rehabilitation or replacement of China Wash Flume, there would be no construction-related spread or change in distribution of invasive plant species. Water quality conditions in the canal system would remain unchanged, and there would be no change in habitat conditions for invasive aquatic species. Under this alternative, the electric fish barrier at China Wash would remain. The effectiveness of this feature in preventing upstream movement of nonnative fish species would continue to be limited by unreliable power supply and siltation of electrical components.

Effects Common to Both Action Alternatives

Vegetation

Rehabilitation of the canal system under the action alternatives would result in permanent and temporary impacts on vegetation. Construction of parallel canal segments, the Pima Lateral interconnect, the link canal, and a regulating reservoir would result in the removal or disturbance of about 98 acres of vegetation mapped as Arizona Upland Sonoran Desertscrub (Paloverde–Cacti–Mixed Scrub Series) in Reach 1 and about 170 acres of vegetation mapped as Lower Colorado River Valley Subdivision Sonoran Desertscrub (Creosote Bush–Bursage Series and Saltbush Series) in Reaches 2 and 3. Based on the current condition of other previously disturbed sites in the study area, the areas affected would be unlikely to substantially revert to natural,

preexisting conditions and plant communities, though some vegetation would likely become reestablished. These effects would, therefore, be largely permanent in nature.

Under both action alternatives, the proposed mid-system regulating reservoir and improvements downstream of that reservoir would reduce the diversion of water into system laterals that exceed the quantity required by farm gates drawing water from the laterals. This would reduce spillage or excess diversion of irrigation water into system laterals and ultimately into farm drains. Because farm drains are open ditches and spillage occurs infrequently and in low volumes, there is little associated vegetation. Therefore, elimination of spillage under the action alternatives would not have a substantial effect on vegetation in the study area.

Wildlife

Permanent impacts to wildlife under the action alternatives include the removal of habitat as a result of system rehabilitation and associated construction activities. This permanent removal of habitat would have the most pronounced effects in Reach 1 (generally upstream of where the CAP canal crosses the FCG Canal), where the project is contiguous to the Gila River floodplain and areas of relatively undisturbed Arizona Upland Sonoran Desertscrub habitat on both sides. The remaining reaches of the project (Reaches 2 and 3) are primarily in agricultural and rural developed areas and have less wildlife use. Patches of Lower Colorado River Sonoran Desertscrub remain along these reaches, but a portion of these are substantially fragmented or isolated from other areas of natural habitat by the CAP and/or the FCG Canal, existing roads, agricultural and rural development, and, to some extent, include or consist of nonnative vegetation that has become established along the canals.

Lining the existing and new canal segments with concrete under both action alternatives would make it more difficult for wildlife that fall into a canal to escape. Under the action alternatives, deer and tortoise fencing would be installed, where terrain permits, along both sides of the new concrete-lined main canal in Reach 1 above the CAP canal crossing to minimize the potential for wildlife drowning. In areas where fencing is not feasible due to terrain, wildlife escape ramps would be constructed to Reclamation specifications, and buoys would be installed across the canal to guide wildlife to the ramps. The effectiveness of wildlife fencing would be addressed through an adaptive management approach. If the use of buoys and escape ramps does not minimize wildlife drowning, alternative or additional measures would be evaluated by Reclamation and SCIDD, in coordination with the AGFD. In addition to wildlife fencing, a new 6-foot-wide wildlife bridge would be constructed at the lower end of Reach 1.

Concrete lining and fencing of canals would also eliminate a source of drinking water for some wildlife. SCIDD would install one new drinker and would maintain access to all existing laterals and farmlands that provide access to water. The action alternatives would result in temporary impacts on wildlife from management of flows, noise disturbance, and removal or disturbance of vegetation during construction.

Because irrigation demands and plant growth/productivity are typically limited during fall–winter, implementation of the 5-3-5 dry-ups at this time of the year during construction would not substantially affect the availability of surface water, cover, and foraging resources for wildlife in the reach of the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam. The fish fauna in this reach is predominantly nonnative. The fish population has persisted over the long-

term despite historic fluctuation in flows and therefore is unlikely to be substantially affected by a continued implementation of the traditional 5-week maintenance dry-up or the 5-3-5 dry-up sequence.

Under the action alternatives, construction activities would result in some displacement or avoidance by wildlife of adjacent natural areas due to noise and/or human presence. Construction-related disturbance would affect foraging patterns and effectiveness and increase stress for some species. Construction activities could also result in entrapment of wildlife in trenches or existing burrows and injury or mortality of wildlife through crushing or strikes by construction equipment and/or vehicles. These effects would also be temporary and limited to the period of construction. Removal of vegetation present in places within the canal right-of-way due to rehabilitation of existing canal segments would eliminate habitat for some wildlife species, including substrate for nesting or breeding; foraging resources; and thermal, movement, and hiding cover. As discussed under the effects on vegetation, elimination of spillage under the action alternatives would not have a substantial effect on wildlife habitat in the study area.

Threatened and Endangered Species

The action alternatives would result in the removal of some saguaros that may serve as foraging resources and potentially day roosts for the endangered lesser long-nosed bat. The number of saguaros that would be removed would be small (estimated at roughly 20), and all salvageable saguaros that cannot be reasonably avoided would be transplanted to an adjacent area. The removal of this limited number of saguaros would not substantially affect the availability or local distribution of foraging resources for the lesser long-nosed bat and is unlikely to affect potential roosts.

In Reach 1, any lesser long-nosed bats using saguaros as day roosts in the vicinity of construction areas could be disturbed by noise and displaced to find other roost sites. The action alternatives may affect potential habitat for the endangered Southwestern willow flycatcher and the threatened yellow-billed cuckoo due to potential changes in the amount of riparian habitat within Picacho Reservoir. There is no suitable habitat for these species in the reach of the Gila River immediately below Ashurst–Hayden Diversion Dam or along the FCG Canal or other canals.

No breeding Southwestern willow flycatchers have been recorded at Picacho Reservoir during previous surveys, though one individual was recorded during the breeding season in 2008. The reservoir has suitable vegetation and vegetation structure, and the lack of surface water is thought to be the primary factor inhibiting potential Southwestern willow flycatcher breeding. Yellow-billed cuckoos have been recorded at Picacho Reservoir during the breeding season, though there are no confirmed nesting records. Potential habitat at Picacho Reservoir has been affected by reduced inflows, and no yellow-billed cuckoos have been documented in recent years.

Though no confirmed nesting records exist, Picacho Reservoir has the potential to support suitable nesting habitat for Southwestern willow flycatcher and yellow-billed cuckoo. Based on design and engineering evaluations completed to date, it is anticipated that storm flows into Picacho Reservoir would be reduced. However, the planned rehabilitation of the inlet structure would facilitate the capture of storm flows that reach the reservoir, and this water would not be

withdrawn for irrigation purposes. The net effect on riparian vegetation and potential habitat for the Southwestern willow flycatcher and yellow-billed cuckoo is difficult to quantify, but it appears unlikely that riparian vegetation representing potential habitat for these species would increase, and it may decrease or the potential for it to develop in the future may decrease. Currently, the suitability of habitat at Picacho Reservoir for these species is reduced due to limited surface water in the reservoir in recent years from drought, accumulation of sediment and vegetation, and impaired inlet function.

The action alternatives would not affect habitat for the Southwestern willow flycatcher or the yellow-billed cuckoo between Ashurst–Hayden Diversion Dam and Coolidge Dam. Under the action alternatives, managed flows in this reach of the Gila River would consist of continuing to implement the 5-3-5 dry-up sequence during construction years, essentially two 5-week canal dry-up periods separated by three weeks from the end of October through January.

During construction of Reach 1 under the action alternatives, cessation of releases from Coolidge Dam may be required for the first and second 5-week periods for up to two consecutive years. Curtailed releases from Coolidge Dam during construction of Reach 1 in the first two years would occur in winter, generally outside the growing season for riparian vegetation, and outside the period when Southwestern willow flycatchers or yellow-billed cuckoos are present.

As construction moves progressively downstream along Reaches 2 and 3, dam releases would incrementally increase in the second 5-week dry-up period because irrigation water deliveries can resume in upstream portions of the service area. After completion of construction, the normal 5-3-5 dry-up schedule would resume, except for years when only maintenance work is planned and dry-up is limited to one 5-week maintenance dry-up. These managed/limited releases from Coolidge Dam in fall and winter, which would occur outside the nesting and migration period for the Southwestern willow flycatcher and yellow-billed cuckoo, would not directly affect the amount or extent of surface water in areas of suitable nesting habitat between Coolidge Dam and Ashurst–Hayden Diversion Dam during the breeding/migration period.

The 5-3-5 dry-ups would occur during the latter part of the growing season for riparian vegetation (end of October –November) and outside the growing season (December–January) and, therefore, would not affect primary constituent elements of designated critical habitat for the Southwestern willow flycatcher (i.e., riparian habitat and insect prey populations), or primary constituent elements of proposed critical habitat for the yellow-billed cuckoo (i.e., riparian woodlands, adequate prey base, and dynamic riverine processes).

The action alternatives may affect habitat for the Yuma Ridgway's rail as a result of changes to Picacho Reservoir inflows. Due to variable flow conditions, the reach of the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam is unlikely to support extensive and dense marsh habitat required by Yuma Ridgway's rails, and no suitable habitat for this species occurs along the FCG Canal, the Pima Lateral, or other SCIP facilities to be rehabilitated.

At Picacho Reservoir, Yuma Ridgway's rails were detected in previous surveys conducted between 1975 and 2011, though they were not detected in years when the reservoir was dry during the breeding season. Though the action alternatives would result in reduced storm flows into Picacho Reservoir, those flows that reach the reservoir would be more effectively captured

by rehabilitation and maintenance of the inlet structure and would be retained in the reservoir. The net effect on marsh/wetland vegetation and potential habitat for the Yuma Ridgway's rail is difficult to quantify. It appears unlikely that marsh/wetland vegetation representing potential habitat for this species would increase, and it may decrease or the potential for it to develop in the future may decrease. Currently, suitability of habitat at Picacho Reservoir for the Yuma Ridgway's rail is reduced due to limited surface water in the reservoir in recent years.

Under the action alternatives, continued management of flows (5-3-5 dry-ups) in the Gila River mainstem between Coolidge Dam and Ashurst–Hayden Diversion Dam during construction years would reduce aquatic habitat and escape cover, and could result in higher rates of predation or competition by nonnative fishes on any endangered spikedace or loach minnows that may have been transported from Aravaipa Creek during periods of high flows. This would affect a relatively small number of individuals of these species and would not affect population or habitat on Aravaipa Creek.

Other Special Status Species

The action alternatives, to varying degrees, may affect other special status species through removal/disturbance of habitat and disturbance of individuals from construction-related noise and human presence. The action alternatives would result in potential disturbance or displacement of Western burrowing owls that may be nesting along the existing canal banks in Reaches 2 and 3 of the study area. This would affect only a small portion of the potential habitat for this species that exists in the agricultural areas surrounding the study area. Both action alternatives would also result in some removal of potential nesting habitat for migratory birds.

Because construction in Reach 1 would take place within the existing canal easement and in relatively disturbed areas in or near the Gila River floodplain, the action alternatives would not impact habitat likely to support shelter or den sites for Sonoran Desert tortoises but could result in some construction traffic–related mortality of tortoises moving between areas of suitable habitat.

Effects of managed flows during construction on other special status species recorded between Coolidge Dam and Ashurst–Hayden Diversion Dam would be similar to what is occurring under the existing condition. Periodic dry-ups of the Gila River would temporarily reduce or eliminate habitat for aquatic and semiaquatic species (i.e., desert sucker, Gila longfin dace, Sonora sucker, lowland leopard frog, desert box turtle) and may reduce foraging habitat and resources for the bald eagle.

The action alternatives would not affect habitat or individuals of other species status species recorded along this reach (American peregrine falcon, golden eagle, California leaf-nosed bat, pale Townsend's big-eared bat). Managed flows during construction may affect special status fish species that have been recorded in the FCG Canal and other canals and laterals (i.e., desert sucker, Gila longfin dace, Sonora sucker) through potential mortality of individuals of these species as a result of periodic dry-ups. These effects would be similar to those occurring under the existing condition and would not affect population viability of these species. The action alternatives would result in the removal or disturbance of Lower Colorado River Subdivision Sonoran Desertscrub that represents potential habitat for the Tucson shovel-nosed snake.

Invasive Species

To varying degrees, construction activities associated with rehabilitation of the canal system under the action alternatives may result in the introduction or spread of invasive plant species into newly disturbed areas through incidental transport via equipment and vehicles and by colonization from adjacent agricultural areas.

Florence Canal Alternative (Proposed Action)

Vegetation

In addition to the 98 acres of Arizona Upland Sonoran Desertscrub vegetation removed or disturbed, as described in the effects common to both action alternatives, this alternative would remove or disturb an estimated 170 acres of vegetation mapped as Lower Colorado River Valley Subdivision Sonoran Desertscrub (Creosote Bush–Bursage Series and Saltbush Series) in Reaches 2 and 3. Most of this represents vegetation in or immediately adjacent to existing canal easements and access roads and may include, in places, nonnative species such as Athel tamarisk *(Tamarix aphylla).*

Impacts on vegetation with the Proposed Action would be direct, site-specific and localized, long-term, moderate, and adverse.

Wildlife

The Proposed Action would result in permanent impacts to wildlife through mortality of individuals by construction vehicles and equipment and removal of habitat, including nesting/breeding substrates or sites; foraging resources; and thermal, hiding, or movement cover. Construction of wildlife exclusion fencing, escape ramps, and wildlife crossing structures along Reach 1 under the Proposed Action would reduce the potential for wildlife mortality from drowning. These conservation measures would be supported by monitoring and funding for additional fencing, escape ramps, and/or crossings. Construction of a wildlife drinker would address reduced access to water resulting from exclusion fencing installed along Reach 1 under the Proposed Action.

The Arizona Upland Sonoran Desertscrub habitat and some of the Lower Colorado River Valley Subdivision Sonoran Desertscrub habitat affected by the Proposed Action is contiguous or adjacent to other areas of desertscrub habitat, providing higher value wildlife habitat. In these areas, impacts on wildlife with the Proposed Action would be direct and indirect, site-specific and localized, long-term, moderate, and adverse. Other habitat is substantially fragmented in nature (isolated from larger tracts of remaining desertscrub) due to existing canal alignments, agriculture, and other development. These substantially fragmented areas provide lower value wildlife habitat. In these areas, impacts on wildlife with the Proposed Action would be direct and indirect, site-specific and localized, long-term, negligible, and adverse.

Temporary impacts to wildlife from noise and human presence during construction would occur over a five-year period under the Proposed Action. These impacts on wildlife with the Proposed Action would be direct and indirect, site-specific and localized, short-term, minor, and adverse.

Threatened and Endangered Species

Under the Proposed Action, the net effect of reduced storms flows into Picacho Reservoir, coupled with enhanced capture of any flows through inlet rehabilitation and maintenance and the lack of withdrawals from the reservoir for irrigation, is difficult to quantify. The Proposed Action would be unlikely to increase riparian and marsh (wetland) vegetation representing potential habitat for the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, and the endangered Yuma Ridgway's rail and may decrease it or decrease the potential for its development in the future.

Currently, the suitability of habitat at Picacho Reservoir for these species is reduced due to limited surface water in the reservoir in recent years from drought, accumulation of sediment and vegetation, and impaired inlet function. Impacts on potential foraging resources and day roosts for the lesser long-nosed bat would be reduced through transplantation and subsequent monitoring of all single-stem saguaros from disturbance areas.

A Biological Evaluation (BE) has been prepared for the Proposed Action and submitted to the USFWS for consultation under Section 7 of the Endangered Species Act. The BE concludes that the Proposed Action may affect the lesser long-nosed bat, the Southwestern willow flycatcher, the yellow-billed cuckoo, and the Yuma Ridgway's rail but would not adversely affect these species and would not adversely affect or modify proposed or designated critical habitat. The USFWS concurred with these conclusions in a letter dated August 9, 2017 (Appendix I).

Impacts on threatened and endangered species with the Proposed Action would be direct and indirect, site-specific and localized, long-term, and moderate.

Other Special Status Species

The Proposed Action may affect other special status species through removal or disturbance of habitat. The Proposed Action would result in potential impacts to nesting bird species protected under the MBTA, including the Western burrowing owl, through the removal or disturbance of up to 268 acres of desertscrub vegetation. Preconstruction surveys for burrowing owls and other migratory birds under the Proposed Action would mitigate impacts to these species by eliminating direct mortality of nesting individuals. Effects of the Proposed Action on the remaining other special status species recorded in the analysis area are described in the previous Effects Common to Both Action Alternatives section. A conservation measure for handling and relocation of Sonoran Desert tortoises would reduce direct mortality of this species during construction.

Impacts on other special status species with the Proposed Action would be direct and indirect, site-specific and localized, long-term and short-term, minor to moderate, and adverse.

Invasive Species

Construction activities associated with rehabilitation of the canal system may result in the introduction or spread of invasive plant species into 268 acres of newly disturbed areas through incidental transport via equipment and vehicles and by colonization from adjacent agricultural areas. This potential effect would be minimized by implementation of a conservation measure requiring washing and inspection of all construction equipment.

This alternative would improve the irrigation district's effectiveness of impeding upstream movement of nonnative fish through the placement of a new bifurcation structure. The structure would replace the existing electric fish barrier at the transition between Reaches 1 and 2. While the bifurcation structure would serve a dual purpose, its physical and operational characteristics would make it a more reliable and effective barrier. The structure would be composed of overshot gates that would give it an effective barrier height that ranges from 5 to 7.25 feet above surface elevation. The velocity over the top of the gates would also help with its barrier effect.

Impacts on invasive species with the Proposed Action would be direct and indirect, site-specific and localized, long-term, moderate, and beneficial and adverse.

FCG Canal Alternative

Vegetation

Because more miles of new canal would be constructed and more acres impacted, the FCG Canal Alternative would result in greater impacts to vegetation compared with the Proposed Action.

Impacts on vegetation with the FCG Canal Alternative would be direct, site-specific and localized, long-term, moderate, and adverse.

Wildlife

Because more miles of new canal would be constructed and more acres impacted, the FCG Canal Alternative would result in removal or disturbance of a greater number of acres of wildlife habitat consisting of Lower Colorado River Sonoran Desertscrub compared with the Proposed Action. Similar to the Proposed Action, the impacts on wildlife with the FCG Canal Alternative would be direct and indirect, site-specific and localized, long-term, negligible to moderate depending on the habitat type and quality affected, and adverse.

Temporary impacts to wildlife from noise and human presence during construction would extend over a seven-year period, compared with a five-year period under the Proposed Action. These impacts on wildlife with the FCG Canal Alternative would be direct and indirect, site-specific and localized, short-term, minor, and adverse.

Threatened and Endangered Species

Effects of the FCG Canal Alternative on threatened and endangered species would be similar to the Proposed Action, except that the inflows to Picacho Reservoir would be further reduced and would further decrease potential habitat (or its potential to develop in the future) for the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, and the endangered Yuma Ridgway's rail.

Impacts on threatened and endangered species with the FCG Canal Alternative would be direct and indirect, site-specific and localized, long-term, and moderate.

Other Special Status Species

Effects of the FCG Canal Alternative on other special status species would be the same as those described under the Proposed Action, except that the FCG Canal Alternative would result in

construction of more miles of new canal in Reaches 2 and 3 and, therefore, would affect more potential habitat for the Tucson shovel-nosed snake.

Impacts on other special status species with the FCG Canal Alternative would be direct and indirect, site-specific and localized, short-term and long-term, minor to moderate, and adverse.

Invasive Species

The FCG Canal Alternative would have a greater potential to introduce and spread invasive plant species compared with the Proposed Action due to more miles of new canal construction.

Effects of the FCG Canal Alternative with regard to nonnative fish movement would be the same as under the No Action alternative. The electric fish barrier at China Wash would remain and the effectiveness of this structure in impeding upstream movement of nonnative fish would continue to be limited by an unreliable power source and siltation of electrical components.

Impacts on invasive species with the FCG Canal Alternative would be direct and indirect, site-specific and localized, long-term, moderate, and beneficial and adverse.

Cumulative Impacts

Construction and maintenance of SCIP and associated agricultural development in the Casa Grande Valley has eliminated habitat for many native species but has improved habitat for some species, such as the Western burrowing owl.

Implementation of Phase 1 of this project (rehabilitation of Ashurst–Hayden Diversion Dam and associated headworks and construction of a sediment removal and storage facility) disturbed an estimated 260 acres that consisted primarily of fallow agricultural lands but could have served as habitat for the Western burrowing owl and/or other wildlife species. Phase 1 activities have increased the extent of disturbance and the amount of habitat for invasive plant species.

Annual maintenance dry-ups of the SCIP system over the month of November (near the end of the growing season) would continue, resulting in an associated dry-up of the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam. The annual maintenance dry-up would be used for the first 5-week dry-up for each year of construction. A second 5-week dry-up would occur during construction but would be outside the growing season.

Within the past ten years, urban expansion and rural development, irrigation system improvements (including the implementation of Phase 1 of this project), construction of power generating and transmission facilities, development of utility infrastructure, and the construction of new roadways have contributed to cumulative impacts on biological resources in the Casa Grande Valley. Present or ongoing actions, including agricultural operations and operations and maintenance of canal systems, further contribute to these impacts.

Reasonably foreseeable future actions in the Casa Grande Valley would also contribute to cumulative impacts on biological resources. Future actions include continued improvements to canals and laterals and the future development of power generating and transmission projects, new roadway projects, including the North–South Corridor, and urban expansion. Future actions would primarily affect areas of Lower Colorado River Sonoran Desertscrub that are substantially

fragmented due to extensive agricultural and rural development and would affect biological resources wildlife habitat and vegetation and habitat for other special status species such as migratory birds, the Western burrowing owl, and the Tucson shovel-nosed snake.

Because the action alternatives would primarily rehabilitate the existing canal system, these actions would have a limited effect on biological resources. Past, present, and reasonably foreseeable future actions, in combination with the site-specific and localized, short-term and long-term, minor to moderate, and adverse effects of the action alternatives, would result in a moderate cumulative effect on biological resources.

3.12 RIPARIAN ZONES AND WETLANDS

3.12.1 Affected Environment

Riparian vegetation along the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam varies from monotypic tamarisk (*Tamarix* spp.) to mixed exotic/native vegetation, primarily tamarisk, Goodding's willow *(Salix gooddingii),* and Fremont cottonwood *(Populus fremontii)* (Graber and Koronkiewicz 2011). The ephemeral reach of the Gila River below Ashurst–Hayden Diversion Dam is composed of a braided floodplain dominated by clumps of tamarisk and singlewhorl burrobrush *(Hymenoclea monogyra).* The FCG Canal and other canals in the lower extent of the study area generally do not support riparian vegetation, though they may be bordered in places by sporadic stands of mesquite, introduced Athel tamarisk *(Tamarix aphylla),* or other species. Picacho Reservoir supports wetland vegetation composed primarily of California bulrush *(Schoenoplectus californicus)* and cattail (*Typha* spp.), surrounded by tamarisk, willows (*Salix* spp.), and mesquite (*Prosopis* spp.). Riparian and wetland habitat at Picacho Reservoir has been affected in recent years by drought, accumulation of sediment and vegetation, and impaired inlet function. Fringe wetlands are anticipated to occur sporadically along the perennial reach of the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam. Due to steep banks and currents, the canals in the remainder of the study area (Ashurst–Hayden Diversion Dam to Picacho Reservoir) generally do not support wetlands, except for small, isolated patches of wetland vegetation that occur at some locations where there is seepage of irrigation water from existing canal release gates.

3.12.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no associated effects on riparian zones or wetlands. Periodic annual maintenance dry-ups of the canal system, or 5-3-5 dry-ups for years of construction, would continue, but associated temporary reductions in flow in the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam would occur near the end of the growing season and would have little effect on riparian zones or fringe wetlands. There would be no project-induced change in the amount or frequency of water entering Picacho Reservoir and no associated change in riparian vegetation or wetlands present. Mesquites and other xeroriparian tree species that occur in places along the existing canal right-of-way would be unaffected. Small, isolated patches of wetland vegetation from canal seepage would be unaffected and would be likely to persist.

The No Action alternative would have no impact on riparian zones or wetlands.

Effects Common to Both Action Alternatives

For the past six years, system 5-3-5 dry-ups have occurred from the end of October through January, with cessation of releases from Coolidge Dam in the first 5-week period, followed by a 3-week wet-up period and sporadic releases during the second 5-week dry-up. Continued implementation of the 5-3-5 dry-up schedule for the action alternatives is unlikely to affect riparian or wetlands habitat. Other than the cessation of releases from Coolidge Dam during the second 5-week period during the first two years of construction (Reach 1), the dry-up schedule would not represent a change from existing conditions. This is in the period toward the end and outside the growing season for plants; therefore, the action alternatives would be unlikely to have a substantial long-term effect on riparian or wetland vegetation along this reach of the Gila River.

Rehabilitation of existing canal segments under the action alternatives would result in the removal of xeroriparian vegetation that has become established in places within the canal right-of-way. Some of this vegetation may reestablish over the long-term, though this would be limited due to the reduction of canal seepage under all of the action alternatives.

Improvement of the canal system would likely remove small, isolated areas of wetland vegetation that have resulted from canal seepage.

Florence Canal Alternative (Proposed Action)

Based on design and engineering evaluations completed to date, it is anticipated that storm flows into Picacho Reservoir would be reduced. However, the planned rehabilitation of the inlet structure would facilitate the capture of storm flows that reach the reservoir, and this water would not be withdrawn for irrigation purposes. The net effect on surface water availability, riparian habitat, and wetlands at Picacho Reservoir is difficult to quantify; however, it appears unlikely to result in an increase in riparian and wetland vegetation and may result in a decrease in this vegetation.

Impacts on riparian areas and wetlands with the Proposed Action would be direct, site-specific, long-term, minor, and adverse from construction activities and canal lining, and indirect, localized, long-term, moderate, and adverse from potentially reduced inflows to Picacho Reservoir.

FCG Canal Alternative

Compared with the Proposed Action, the FCG Canal Alternative would have a more limited capacity to convey storm water to Picacho Reservoir because it would commingle storm water with irrigation water in Reach 2. If irrigation orders were filled at the same time that storm water is available in the Gila River, irrigation water would tie up some of the canal capacity, limiting the capacity available to convey excess storm water. In addition, the cross drainage that is currently intercepted along Reach 2 is conveyed to Picacho Reservoir. Under the FCG Canal Alternative, this intercepted cross drainage would be discharged instead to the Gila River. This alternative would result in a greater potential decrease in riparian and wetland vegetation at Picacho Reservoir compared with the Proposed Action.

Impacts on riparian areas and wetlands with the FCG Canal Alternative would be direct, site-specific, long-term, minor, and adverse from construction activities and canal lining, and indirect, localized, long-term, moderate, and adverse from reduced inflows to Picacho Reservoir.

Cumulative Impacts

The original construction of Ashurst–Hayden Diversion Dam, continuing diversion of Gila River water at this location, and development of the SCIP canal system resulted in elimination of perennial flows in downstream reaches of the Gila River and contributed to the loss of riparian vegetation and wetlands along this reach of the river.

Construction and maintenance of SCIP and associated agricultural development in the Casa Grande Valley has likely eliminated some localized riparian areas and wetlands, though their extent was likely very limited. Implementation of Phase 1 of this project was estimated to result in the removal or disturbance of about 7 acres of riparian vegetation dominated by exotic tamarisk from armoring of the river bank and long-term sediment storage.

Annual, 5-week maintenance dry-ups of the SCIP system (near the end of the growing season) would continue, resulting in an associated dry-up of the Gila River between Coolidge Dam and Ashurst–Hayden Diversion Dam. The annual maintenance dry-up would be used for the first 5-week dry-up for each year of construction. A second 5-week dry-up would occur during construction but would be outside the growing season. Because these dry-ups occur outside the growing season, they would not result in a cumulative effect on riparian areas and vegetation.

Within the past ten years, urban expansion and rural development, irrigation system improvements (including the implementation of Phase 1 of this project), construction of power generating and transmission facilities, development of utility infrastructure, and the construction of new roadways have contributed to limited cumulative impacts on riparian areas and wetlands in the Casa Grande Valley. Present or ongoing actions, including agricultural operations and operations and maintenance of canal systems, are not anticipated to contribute further to these impacts. Reasonably foreseeable future actions in the Casa Grande Valley, such as continued improvements to canals and laterals and the future development of power generating and transmission projects; new roadway projects, including the North–South Corridor; and urban expansion would not contribute to cumulative effects on riparian areas or wetlands. Past, present, and reasonably foreseeable future actions, in combination with the site-specific and localized, long-term, minor, and beneficial and adverse effects of the action alternatives, would result in a minor to moderate cumulative effect on riparian and wetlands areas.

3.13 NOISE

3.13.1 Affected Environment

Sound is created when an object vibrates and radiates part of its energy as acoustic pressure or waves through a medium, such as air, water, or a solid object. Sound levels are expressed in units of decibels. Noise is generally defined as the undesired component of sound. Because the human ear does not respond equally to all frequencies, measured noise levels are adjusted or weighted to correspond to the frequency response of human hearing capabilities and the human perception of

loudness. The weighted noise level corresponding to the human ear is designated as the A-weighted noise in decibels (dBA).

People generally perceive a 10 dBA increase as a doubling of loudness. For example, an 80 dBA sound will be perceived by the average person as twice as loud as a 70 dBA sound (FHWA 2011b). In general, when distance is the only factor considered, sound levels decrease by about 6 dBA for every doubling of distance from the noise source. Topographic features, vegetation, and structures between the noise source and the receptor can also affect the perceived loudness of sound. Noise levels approaching 70 dBA are typically considered intrusive in most settings where residential development is the predominant land use.[7]

Most of the construction area for Phase 2 Reaches 1–3 is adjacent to agricultural or undeveloped land. The most sensitive noise receptors consist of adjacent individual residences that occur sporadically on agricultural land and higher-density clusters of residences that are associated with the Florence urban center and one unnamed rural site on the west side of the Florence Canal between Randolph Road and Kleck Road. The houses in the unnamed rural site are more than 500 feet west of the Florence Canal. The high-density residential development in Florence is contiguous with a 0.3-mile segment of the existing FCG Canal and the proposed construction areas for the action alternatives. Other sensitive noise receptors, including schools, churches, and cemeteries, are in the greater study area.[8]

The area of concern for this project is the residential development in Florence (Table 14). The residential development in Florence is on the north side of the FCG Canal between SR 287 and SR 79.

Table 14. Number of residential units close to the construction area in Florence.

Community	Number of Family Units	Distance from Construction Area (Feet)
Florence	0 family units	25–50
	2 multiple-family units	≤200
	14 single-family units	
	4 multiple-family units	≤400
	32 single-family units	

Ambient noise levels throughout most of the study area are relatively low. Higher noise levels are associated with vehicular traffic on I-10 and other highways, and the passage of trains on two rail lines that intersect the study area. Sporadic noise is also generated from farm equipment and machinery in agricultural operations. In Florence, urban activities, including motor vehicle travel, contribute to ambient noise levels.

Two jurisdictions that overlap the construction area have noise ordinances or regulations that apply to a variety of activities. These ordinances consist of the *Town of Florence Code of*

[7] A similar threshold is used by the FHWA when evaluating the need for noise abatement on highway projects. FHWA guidelines define constant noise levels exceeding 67 dBA near homes, schools, hospitals, and other sensitive receptors as having the potential to disrupt conversation and interfere with other tasks.

[8] None of these receptors would be affected by peak construction noise in excess of 60 dBA.

Ordinances (2006); and the Pinal County Noise Ordinance (2006). Of these, only the Pinal County Noise Ordinance addresses construction noise and is applicable to this project.

In Pinal County, the noise level criteria metric is based on the equivalent sound level (L_{eq}), which is the constant level that, over a given period, transmits to the receptor the same amount of acoustic energy as the actual time elapsed. For residential areas, the L_{eq} limits for daytime are 60 dBA from 7 a.m. to 8 p.m. and for nighttime are 55 dBA from 8 p.m. to 7 a.m. Per the Pinal County Noise Ordinance, the hours of construction activities are limited, as noted in Table 15. Construction and repair work may be conducted at different times and at higher noise levels than otherwise allowed, if upon written application, a permit is obtained from the Pinal County Planning Services and Development Department.

Table 15. Pinal County Noise Ordinance restrictions for construction activities.

Activity	Location	Date	Time Frame Allowed
Concrete pouring	Residential and nonresidential	April 15–October 15	5 a.m.–7 p.m.
		October 16–April 14	6 a.m.–7 p.m.
Other types of construction	Within 500 feet of a residence	April 15–October 15	6 a.m.–7 p.m.
		October 16–April 14	7 a.m.–7 p.m.
Other types of construction	More than 500 feet from a residence	Throughout the year	5 a.m.–7 p.m.
Other types of construction	Residential and nonresidential	Weekends and holidays	7 a.m.–7 p.m.
Concrete pouring	Residential and nonresidential	Weekends and holidays	6 a.m.–7 p.m.

3.13.2 Environmental Consequences

No Action

Under the No Action alternative, the only construction-related noise would result from the rehabilitation or replacement of China Wash Flume; however, construction equipment would continue to be used periodically for operations and maintenance activities. Impacts on noise levels from construction would be expected to be negligible due to the lack of sensitive receptors in the construction area. Impacts on noise levels with the No Action alternative would generally be direct, site-specific, short-term, negligible, and adverse.

Effects Common to Both Action Alternatives

Similar to the No Action alternative, periodic use of construction equipment would continue to be used for operations and maintenance activities. In addition, temporary noise impacts would occur during construction of the action alternatives.

The action alternatives would require the use of various types of construction equipment. Table 16 shows the noise level of equipment at various distances. The FHWA Road Construction Noise Model Version 1.1 (FHWA 2006) was used to estimate total noise levels at sensitive receptors, based on distance and equipment used. Direct and indirect effects would include noise and vibration from construction equipment and increased traffic on local roads. Referenced noise level estimates are for exterior spaces; noise levels inside residential structures would be lower. Typically, standard constructed homes provide at least a 20 dBA noise level reduction, so that if

the exterior noise level is 65 dBA or less, the interior noise level will be 45 dBA or less, provided that the windows and doors are closed.

Table 16. Construction equipment typical equivalent noise level.

Equipment Description	Typical Equivalent Noise Level, dBA				
	25 feet	50 feet	100 feet	200 feet	400 feet
Paver	91	85	79	73	67
Scraper	91	85	79	73	67
Compactor	86	80	74	68	62
Bulldozer	91	85	79	73	67
Excavator	91	85	79	73	67
Motor grader	91	85	79	73	67
Truck–concrete mixer	91	85	79	73	67
Truck–bottom or end dump	90	84	78	72	67
Loader–front end	86	80	74	68	62
Truck–concrete pump	88	82	76	70	63
Air compressor	86	80	74	68	62
Crane	91	85	79	73	67
Pickup truck	61	55	49	43	37
Truck–flatbed	90	84	78	72	66
Backhoe	86	80	74	68	62
Generator	88	82	76	70	64

Source: FHWA 2006

In general, construction noise is temporary and varies widely, both spatially and temporally. Construction noise would vary with the type of operation, the location and function of the equipment, and the equipment usage cycle. Potentially disruptive noise levels approaching or exceeding 70 dBA would affect receptors that are within 400 feet of construction. However, noise levels at receptor locations would be transient, and extended disruption of normal activity would not be likely to occur. To reduce noise disturbance, the hours of operation of construction would be limited to the hours specified in the Pinal County Noise Ordinance (refer to Table 14).

Florence Canal Alternative (Proposed Action)

Noise impacts would be greatest among those receptors that are closest to the construction zone. The other sensitive noise receptors (including schools, churches, and cemeteries) in the greater study area would not be affected by peak construction noise in excess of 60 dBA.

In Florence, the distance from the edge of the construction area to the closest residential development is approximately 175 feet. Those residents may experience typical yet intermittent exterior noise levels of 77 dBA during construction. Within 400 feet of construction, there are four multiple-family units and 32 single-family units that could be exposed to exterior noise levels ranging from 70 to 77 dBA, depending on distance from the noise source (Appendix J).

With restrictions in the construction hours in the areas of sensitive receptors, impacts on noise levels with the Proposed Action would be direct, site-specific, short-term, moderate, and adverse.

FCG Canal Alternative

Noise impacts would be greatest among those receptors that are closest to the construction zone. The other sensitive noise receptors (including schools, churches, and cemeteries) in the greater study area would not be affected by peak construction noise in excess of 60 dBA.

The distance from the edge of the construction area to the noise-sensitive receptors in Florence would be approximately 200 feet for the FCG Canal Alternative. For those residents in Florence in closest proximity to the construction zone, the typical exterior noise levels would be 76 dBA during construction. Within 400 feet of construction, residents at four multiple-family units and 32 single-family units could be exposed to maximum exterior noise levels ranging from 70 to 76 dBA. However, 12 of the single-family units are slightly more than 400 feet from the construction area, and residents may experience exterior noise levels less than 70 dBA. The other sensitive noise receptors in the greater study area (including schools, churches, and cemeteries) would not be affected by peak construction noise in excess of 60 dBA.

With restrictions in the construction hours in the areas of sensitive receptors, impacts on noise levels with the Proposed Action would be direct, site-specific, short-term, moderate, and adverse.

Cumulative Impacts

Noise from the operation of construction equipment would incrementally contribute to ongoing ambient noise, including vehicular traffic on roads and the operation of farm equipment. These existing noise sources, in combination with the site-specific, short-term, moderate, and adverse effects of construction under the action alternatives, would have a site-specific, short-term, moderate cumulative effect on noise levels in the immediate area of construction.

3.14 AIR QUALITY AND CLIMATE

3.14.1 Affected Environment

Ambient Air Quality

The air quality index (AQI) is a general expression of ambient air quality at a given location. The U.S. Environmental Protection Agency (EPA) calculates the AQI for the following five air pollutants based on daily results from air quality monitoring stations: ozone, particulate matter, carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). As the AQI increases, an increasing percentage of the population is likely to experience adverse health effects. Air quality with AQI values in the good to moderate range is generally considered to have little impact on public health. AQI values above the moderate range are indicative of poor air quality, with potential health implications for sensitive receptors first, and then the general public as the values increase.

Representative ambient air quality information for the proposed construction area was based on air quality data from the EPA for the City of Coolidge for a ten-year period beginning in 1999. Mean annual AQI values during the period were almost entirely in the good to moderate range, with the preponderance of values in the good range. AQI values in the moderate range occurred most often from May to August each year. With the exception of particulate matter, ambient air quality is not considered problematic for public health.

Criteria Air Pollutants and Applicable Thresholds

The Clean Air Act (CAA) of 1990 provides the principal framework for national, state, and local efforts to protect air quality. Under the CAA, the EPA is responsible for setting National Ambient Air Quality Standards (NAAQS) for pollutants that are considered harmful to human health and the environment. The EPA has promulgated NAAQS for six criteria pollutants: ozone, CO, NO_2, SO_2, lead, and particulate matter. Particulate matter includes $PM_{10,}$ inhalable coarse particles less than 10 but more than 2.5 microns in diameter, and $PM_{2.5,}$ fine particles equal to or less than 2.5 microns in diameter. States are required to adopt standards that are at least as stringent as the NAAQS. In Pinal County, the Air Quality Control District is responsible for protecting air quality and issuing dust permits for construction activities.

Localities with air quality that do not meet the standards for one or more pollutants are designated as "nonattainment areas" for that pollutant. For nonattainment areas, states are required to formulate and submit State Implementation Plans (SIPs) to the EPA that outline those measures the state will use to attain and maintain compliance with the NAAQS (40 CFR § 51) within a designated time period.

On May 31, 2012, the EPA published a Final Rule in the Federal Register—Designation of Areas for Air Quality Planning Purposes; State of Arizona; Pinal County; PM_{10} (77 FR 105:32024–32033) The Final Rule, effective July 2, 2012, redesignated a portion of western Pinal County from unclassifiable (attainment) to moderate nonattainment for the 24-hour PM_{10} (EPA 2010a). The redesignation follows the Proposed Rule published on October 1, 2010 (75 FR 190: 60680–60689). The boundary of the West Pinal PM_{10} nonattainment area, which encompasses approximately the west half of Pinal County, is based on numerous recorded violations of the PM_{10} standard. The West Pinal PM_{10} nonattainment area includes the SCIDD service area and the construction area for Phase 2 Reaches 1–3.

Primary (health) and secondary (welfare) PM_{10} standards are met when the expected number of exceedances per year at each monitoring station, averaged over a three-year period, is less than or equal to one. There are two PM_{10} monitoring stations within 10 miles of the construction area: Coolidge and Pinal County Housing (in Eleven Mile Corner). Based on sampling data from 2014–2016 provided by the Pinal County Air Quality Manager (J. DeZeeuw, Pinal County Air Quality, emails and personal communication, June 5 and 7, 2017), these monitoring stations would be expected to yield three-year average rates of exceedance greater than one, which represents a violation of the 24-hour PM_{10} standard (Table 17).

Table 17. Violations of 24-hour PM_{10} standard for monitoring stations within 10 miles of the proposed construction area, 2014–2016.

Monitoring Station Name	2014 Expected Exceedance	2015 Expected Exceedance	2016 Expected Exceedance	Three-Year Average Expected Rate of Exceedance
Coolidge	0	0	6.1	2.0
Pinal County Housing	6.0	3.0	4.3	4.4

In western Pinal County, the primary sources of particulate material that contribute to elevated PM_{10} levels include vehicular traffic on paved and unpaved roads, which is the single largest source category, followed in importance by concentrated animal feeding operations, construction, agriculture (tilling and harvesting), and permitted point sources. Unpaved road emissions during low winds and the total high wind emissions account for approximately 92 percent of the total annual emissions inventory. Construction accounts for approximately 3.5 percent of the total low wind PM_{10} emissions. Areas of relatively higher emission densities occur in and around population centers such as Coolidge and Florence (75 Federal Register 60683).

Designation of the West Pinal PM_{10} nonattainment area placed a requirement on the State of Arizona to revise the SIP[9] and impose certain planning requirements to reduce PM_{10} concentrations in the area to protect human health. Major concerns for human health from increased exposure to PM_{10} particles include effects on breathing and the respiratory system, damage to lung tissue, and death. For individuals with a preexisting lung disease, inhalation of PM_{10} may induce inflammation and exacerbate respiratory and cardiovascular effects through the induction of oxidative stress and inflammation (Brown et al. 2004). With the exception of PM_{10}, the area encompassing Phase 2 Reaches 1–3 is in attainment for all other NAAQS.

Two other nonattainment areas for particulate matter are in the region. Approximately 10 miles east of the construction area is the Hayden Planning Area, which is classified as nonattainment (moderate) for PM_{10}. The Hayden Planning Area incorporates approximately 5 miles of the Gila River south of the town of Hayden (ADEQ 2015) and overlaps the study area upstream of Ashurst–Hayden Diversion Dam. A second area is the West Central Pinal County $PM_{2.5}$ nonattainment area, which is situated approximately 20 miles west of the construction area.

Under the General Conformity Rule, established in accordance with Section 176(c)(4) of the CAA, the actions of Federal agencies in nonattainment or maintenance areas must conform to the initiatives established in the applicable SIP. In such areas, conformity requirements only apply to the pollutants for which the areas were designated. A conformity determination is required for each criteria pollutant or precursor when the total direct and indirect[10] emissions of the criteria pollutant or precursor caused or initiated by a Federal action in a nonattainment or maintenance area exceed or equal specified annual emission levels (referred to as *de minimis* thresholds). The *de minimis* threshold for PM_{10} in nonattainment areas classified as moderate is 100 tons/year. Annual PM_{10} emissions from actions that fall below this level do not require a conformity determination.

Since the proposed construction area is designated unclassifiable (attainment) for the criteria pollutants other than PM_{10}, the conformity *de minimis* thresholds for ozone, CO, NO_2, SO_2, and lead are not relevant to this analysis. The General Conformity Rule would apply only to PM_{10} emission from Phase 2 construction. The criteria pollutant $PM_{2.5}$ was considered in this analysis

[9] ADEQ submitted the Arizona SIP revision for the West Pinal County PM_{10} Nonattainment Area to EPA on December 30, 2013.

[10] Indirect emissions refers to those criteria pollutants in a nonattainment or maintenance area that are caused or initiated by the Federal action and originate in the same nonattainment or maintenance area but occur at a different time or place as the action, are reasonably foreseeable, can be practically controlled by the agency, and for which the agency has continuing program responsibility.

due to the relative proximity of the West Central Pinal County $PM_{2.5}$ nonattainment area to the study area.

Diesel Particulate Matter and Hazardous Air Pollutants

The particulate phase of diesel exhaust includes fine respirable particles (mostly $PM_{2.5}$) composed mainly of carbon with absorbed compounds, including sulfate, nitrate, metals, and other trace elements. The gas phase is composed of certain hazardous air pollutants, which are defined as mobile source air toxics (MSATs). The MSATs typically associated with diesel exhaust are acetaldehyde, acrolein, 1,3-butadiene, polycyclic aromatic hydrocarbons, and volatile organic compounds such as benzene and formaldehyde. Other components of diesel exhaust include $PM_{10,}$ carbon dioxide (CO_2), CO, nitrogen oxide, and SO_2. In the study area, existing sources of diesel exhaust emissions include agricultural operations, transportation, and construction associated with residential, industrial, and commercial development in the urban centers.

Acute exposure to diesel exhaust can cause irritation to the eyes, nose, throat, and lungs, and neurological effects such as lightheadedness. High levels of exposure over the short term can cause coughing or nausea. Based on human epidemiological studies, there is evidence that diesel exhaust is also a likely carcinogen.

Specially Designated Areas

The CAA provides special protection for visibility and other air quality–related values in specially designated Class 1 areas where the cleanest and most stringent protection from air quality degradation is considered important. These areas include National Parks and Wilderness Areas that have been designated Class 1 under Section 162(a) of the CAA. Class 1 designation allows almost no degradation in air quality. No specially designated areas are in the study area or vicinity.

Global Climate Change

Climate change refers to significant change in measures of climate (particularly temperature and precipitation) that occur over long periods of time. Gases that trap heat in the atmosphere are GHGs. The CEQ defines GHGs as CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The common unit of measurement of GHGs is metric tons of CO_2 equivalent (CO_2-e). In considering when to disclose projected quantitative GHG emissions, CEQ has provided a reference point of 25,000 metric tons of CO_2-e emissions per annum below which a quantitative analysis is not warranted (CEQ 2014).

Globally, sources of human-induced emissions of GHGs include mainly burning of fossil fuels for power generation and transportation, with significant contributions of GHGs that are released as a result of destruction of GHG sinks, such as forests and coastal wetlands. In the study area, principal local sources of GHGs include combustion emissions from industry and heavy equipment and light vehicles used in farming, construction, and personal and commercial transportation. Large regional sources of GHGs include three natural gas–fired power plants and one coal-fired power plant.

Emission of GHGs is believed by many scientists to affect changes in climate. Climate trends in the Sonoran Desert from 1960 to 2000 show widespread winter and spring warming, a decrease in the frequency of days with freezing temperatures, a lengthening of the frost-free season, and increased minimum temperatures (National Park Service 2010). An analysis of multiple climate models provides strong evidence for an imminent transition to a warmer and more arid climate in the southwestern United States (Reclamation 2011; National Park Service 2010). As a result of warming, precipitation and flooding events are projected to become more extreme, even as drought conditions intensify (National Park Service 2010). Increasing levels of soil dryness may also make the region more susceptible to wildfires and wind erosion, resulting in increased emissions of particulate matter. Potential changes in climate in the Desert Southwest are particularly problematic because of projected increases in population and commensurate increases in demand for limited water supplies.

Sensitive Receptors

The potential for adverse air quality impacts on sensitive receptors is correlated to the intensity and duration of exposure. Air quality impacts typically associated with construction activities are transient; therefore, an adverse impact is most likely to occur when a sensitive receptor is acutely exposed to emissions. Acute exposure may result from a single high emission source or the additive emissions of multiple sources. Receptors that are particularly sensitive to poor air quality include children, the elderly, and people with illnesses or chronic diseases. Sensitive receptor locations include hospitals, schools, convalescent facilities, and residential areas.

3.14.2 Environmental Consequences

No Action

Under the No Action alternative, construction-related impacts to air quality would be limited to the rehabilitation or replacement of China Wash Flume; however, service vehicles and construction equipment would continue to be used periodically for operations and maintenance activities similar to the action alternatives.

As with the action alternatives, the use of service vehicles (a mix of gasoline- and diesel-powered pickup trucks) to operate and maintain the canal system would generate minor amounts of fugitive dust and engine exhaust, including criteria pollutants (except lead) and GHGs. PM_{10} emissions would remain well below the 100 tons per year *de minimis* threshold and, therefore, would not affect regional attainment status. GHG emissions from operation and maintenance would not substantially contribute to climate change. Only negligible levels of diesel exhaust emissions would be anticipated. In the long-term, the No Action alternative would generate greater levels of engine combustion byproducts and fugitive dust than would the action alternatives because of the greater number of miles of main canals that would require maintenance. Furthermore, with rehabilitation limited to China Wash Flume and with no concrete lining the canal system, the No Action alternative would be expected to require more frequent maintenance and repairs.

Impacts on air quality with the No Action alternative would be direct, localized, short-term, minor, and adverse during construction, and direct, localized, long-term, negligible, and adverse following construction.

Effects Common to Both Action Alternatives

Air quality impacts during construction would include particulate matter (fugitive dust and combustion) emissions from construction equipment and support vehicles. Fugitive dust emissions, including PM_{10} and $PM_{2.5}$, would vary depending on the type, intensity, and duration of construction activity, site conditions, and other factors, and would result from the following components of project construction:

- General construction (canal excavation, material hauling, redeposition of excavated material, shaping, compacting, concrete lining, and repair/replacement/installation of structures)
- Operation of a portable concrete batch plant on-site (loading and transfer of sand, aggregate, cement, and cement supplement, weigh hopper and truck mix loading, and raw materials storage piles)
- Vehicle travel on unpaved roads (additional to that included under general construction, such as contractor vehicle travel to and from the work site and materials hauling/equipment transport to and from off-site locations)
- Track-out of materials onto paved roads by haul trucks and other vehicles, and subsequent fugitive dust generation by passing traffic.

Fugitive dust emissions are described and estimated for the action alternatives using emission factors developed by the EPA in its guidance document AP-42—*Compilation of Air Pollutant Emission Factors* (EPA 1995) and subsequent modifications/refinements (EPA 2001, 2006; Midwest Research Institute 1999).

Emissions from engine exhaust (combustion emissions) would depend on the number and type of vehicles used during construction but would be minor and short-term (e.g., approximately five years under the Proposed Action and approximately seven years under the FCG Canal Alternative). Engine combustion associated with construction activities would generate, as byproducts, all of the criteria pollutants, except lead. Regional impacts from the action alternatives are unlikely to exceed NAAQS for any criteria pollutant because of the short-term and relatively small, localized sources of emissions during construction. Combustion emissions of PM_{10} from construction activities for the action alternatives are estimated based on information on the proposed fleet of construction equipment (e.g., equipment types and horsepower ratings), year-by-year activity data for each piece of equipment (e.g., hours of operation and fuel consumption), and emission factors from the EPA's NONROAD model (EPA 2005). Combustion emissions of $PM_{2.5}$ from construction activities under the Proposed Action are calculated as a factor of the estimated PM_{10} emissions from this source. The EPA's NONROAD model, which served as the basis for estimating exhaust emissions from construction equipment, converts PM_{10} emissions from diesel engines to $PM_{2.5}$ emissions using an adjustment factor of 0.97 (EPA 2010b).

The action alternatives result in controlled PM_{10} emissions below the 100 tons per year *de minimis* threshold for conformity and, therefore, would not affect the future status of the West Pinal PM_{10} nonattainment area or outlying PM_{10} nonattainment areas (e.g., Hayden Planning Area). Appendix K includes emission factors, calculations, assumptions, and models used to estimate, for the action alternatives, PM_{10} and $PM_{2.5}$ emissions from general construction

activities, operation of a portable concrete batch plant, travel on unpaved roads, mud and dirt track-out, and combustion emissions from construction equipment. Table 18 summarizes estimated emissions for the action alternatives by source.

Table 18. Estimated particulate matter emissions from project-related construction.

Source	Proposed Action		FCG Canal Alternative	
	Estimated PM_{10} emissions (tons/year)	Estimated $PM_{2.5}$ emissions (tons/year)	Estimated PM_{10} emissions (tons/year)	Estimated $PM_{2.5}$ emissions (tons/year)
General construction	18.54	1.85	20.38	2.04
Concrete batch plant	0.99	0.10	0.94	0.09
Unpaved haul/access road emissions	20.43	2.04	14.48	1.45
Mud and dirt track-out	5.00	0.50	5.00	0.50
Combustion emissions	1.53	1.48	1.64	1.60
Total	**46.49**	**5.97**	**42.44**	**5.68**

Other than residential units in some locations, no sensitive receptors to short-term and dispersed emissions of diesel particulate matter and MSATs have been identified along the path of construction. Engine exhaust emissions would be highly localized and generally transient, affecting mostly sparsely populated agricultural land and desert. The project would skirt only one location with higher population densities—Florence. This community would be affected by construction for approximately five months. The greatest potential for acute or chronic exposure to diesel exhaust exists among construction workers who are close to operating diesel equipment; however, the equipment would be operating in highly ventilated open spaces, which significantly reduces the potential for excessive occupational exposures. Exposure of residential areas to construction dust would be minimized through the application of environmental controls (refer to Table 1). There are no schools, day care centers, hospitals, or other facilities that house concentrated populations that are especially sensitive to the effects of air pollutants in, or adjacent to, the construction area.

Emissions of GHGs associated with engine combustion products from construction equipment and vehicles would be temporary and well below the CEQ threshold of 25,000 metric tons of CO_2-e emissions per annum. Consequently, a quantitative analysis of the alternatives is not warranted. Increased emissions would cease after construction.

Following construction, the rehabilitation and concrete lining of the canals would reduce overall maintenance needs compared with the No Action alternative. PM_{10} emissions during the operational phase would be well below the 100 tons per year *de minimis* threshold.

Florence Canal Alternative (Proposed Action)

For the Proposed Action, construction activities would take place over a five-year period. Construction activities would result in estimated emissions of 46.49 tons per year of PM_{10} and

5.97 tons per year of $PM_{2.5}$. Once constructed, the Proposed Action would require maintenance of fewer miles of canals (26.0 miles of irrigation conveyance canals, including interim earthen canal) compared with the No Action alternative (42.1 miles) and the FCG Canal Alternative (43.7 miles irrigation conveyance canals, including interim earthen canal). Over the long-term, the Proposed Action would therefore result in lower emissions of these air pollutants compared with the No Action alternative and the FCG Canal Alternative, and would result in slightly lower emissions of PM_{10} and GHGs compared with the FCG Canal Alternative.

Impacts on air quality with the Proposed Action would be direct, localized, short-term, minor, and adverse during construction, and direct, localized long-term, negligible, and adverse following construction.

FCG Canal Alternative

Under the FCG Canal Alternative, construction activities would be expected to take place over a seven-year period. Construction activities would result in estimated emissions of 42.44 tons per year of PM_{10} and 5.68 tons per year of $PM_{2.5}$. The FCG Canal Alternative would require maintenance of roughly the same number of miles of canal (43.7 miles) as the existing condition (42.1) and roughly 17.7 more miles than the Proposed Action. The need to maintain 17.7 more miles of canal system under the FCG Canal Alternative would result in somewhat higher emissions of PM_{10} and GHGs compared with the Proposed Action.

Impacts on air quality with the FCG Canal Alternative would be direct, localized, short-term, minor, and adverse during construction, and direct, localized long-term, negligible, and adverse following construction.

Cumulative Impacts

Present and ongoing operations would contribute to the generation of pollutants emitted into the atmosphere. These would include the operation of existing nearby power generating facilities, Phase 1 sediment storage and disposal, agricultural production, operation and maintenance of existing irrigation conveyance systems including the SCIP and the CAP, and the operation of motor vehicles on paved and unpaved roadways. Future actions would include construction of new residential, commercial, and industrial development, the construction and operation of the in-situ copper extraction operation, the construction of new electric transmission lines, the construction and operation of new solar and natural gas power generating facilities, development of new roadway corridors (North-South Corridor), and the operation of motor vehicles on paved and unpaved roadways.

With the Proposed Action, the generation of air pollutants as a result of operations and maintenance would be less than under the No Action alternative or FCG Canal Alternative due to a substantial reduction in miles of canal to be maintained and a resultant substantial reduction in miles traveled by service vehicles to operate and maintain the system. Under the Proposed Action, the canal system mileage would be 17.7 miles shorter than the FCG Canal Alternative.

Past, present, and reasonably foreseeable future actions, in combination with the localized, short-term and long-term, negligible to minor, and adverse effects on air quality with the action alternatives would result in a short-term, minor, cumulative effect on localized air quality during

construction, and a long-term, negligible, cumulative effect on localized air quality during operations and maintenance activities.

3.15 HAZARDOUS MATERIALS

3.15.1 Affected Environment

The evaluation of potential hazardous materials concerns included a review of USGS topographic maps, aerial photography, and agency databases. The USGS topographic maps identified mining or mineral-related prospect pits, excavations, or mine shafts at several locations in the study area upstream of Ashurst–Hayden Diversion Dam—the most notable near the communities of Hayden and Winkelman.

The ADWR (2013) well database identified several hundred existing wells owned by state or local entities or private parties in the study area upstream and downstream of Ashurst–Hayden Diversion Dam, including wells in, or directly adjacent to, the construction area. These wells vary in depth and purpose and include exempt and non-exempt wells.

Downstream of Ashurst–Hayden Diversion Dam, active or formerly active agricultural farmland is present in, or adjacent to, a majority of the construction area. It is possible that past agricultural practices may pose a minor environmental concern due to the potential presence of residual pesticides and herbicides in the soils. Concentrations of pesticides and/or herbicides may be present in the soil surfaces or the shallow subsurface. These former agricultural area soils could pose an environmental concern if (1) the extent of their surface area disturbances is significant and (2) the potential presence of residual pesticides and herbicides in the soils exceeds regulatory thresholds for worker health and safety or soil waste management issues.

ADEQ (2011) and EPA (2011) databases were reviewed for the study area. These databases were not checked for the study area upstream of Ashurst–Hayden Diversion Dam because no ground disturbance would occur in this area.

Four leaking underground storage tank (LUST) sites are identified in the ADEQ (2011) database as within, or adjacent to, the construction area downstream of Ashurst–Hayden Diversion Dam. All four LUST cases have been closed for more than 10 years. One hazardous materials incident was reported in the study area but outside the construction area at 5122 E. Storey Road, Coolidge, Arizona. The incident occurred in April 2000 and consisted of a release of an unknown quantity of an unknown chemical. A material recovery facility and an active municipal landfill (Adamsville/Ironwood) are in the study area but outside the construction area, in Florence, Arizona. An inactive municipal landfill is in the city of Coolidge in the study area. No other areas of hazardous materials concerns were identified in or near the proposed construction area.

3.15.2 Environmental Consequences

No Action

Under the No Action alternative, construction-related impacts would be limited to the rehabilitation or replacement of China Wash Flume. The use of fuels, lubricants, and other fluids would be necessary to operate construction equipment and other support vehicles and could have

the potential to contaminate soil, water, and vegetation. Ongoing maintenance and repair activities would not be expected to generate hazardous materials or alter or disperse any existing hazardous materials.

Potential impacts related to hazardous materials with the No Action alternative would be direct, site-specific, short-term, negligible, and adverse with construction, and direct, site-specific to localized, long-term, negligible, and adverse following construction.

Effects Common to Both Action Alternatives

The use, storage, and disposal of hazardous materials and solid waste associated with construction have the potential to contaminate soil, water, and vegetation, and could indirectly affect wildlife and humans. Phase 2 construction would require the short-term use of fuels, lubricants, and other fluids that would be necessary to operate construction equipment and other support vehicles. Any impacts from these activities would be localized and would not be anticipated to extend beyond the construction area. No impacts associated with hazardous materials would occur in the area between Coolidge Dam and Ashurst–Hayden Diversion Dam because no construction is proposed for that area.

If the project stores an aggregate of more than 1,320 gallons of oil or other petroleum products on-site, it would be subject to the Spill Prevention, Control, and Countermeasure (SPCC) Regulation (40 CFR § 112), and a SPCC plan would be required. With the implementation of appropriate hazardous materials management and solid waste disposal, impacts on the environment related to these materials would be minimized. Spills of hazardous materials would require immediate corrective action and cleanup to minimize any potential adverse effect on sensitive resources.

A hazardous substances site assessment would be conducted prior to acquisition of any new right-of-way required for project development in accordance with the U.S. Department of the Interior Environmental Compliance Manual *ECM-10-2, Pre-Acquisition Environmental Assessment Guidelines for Federal Land Transactions* (U.S. Department of the Interior 2010). Sites that are shown to be contaminated would be remediated.

Proposed Action

The Proposed Action is not expected to require the removal or relocation of any wells; however, the relocation and lining of the main canal would require the replacement and/or relocation of discharge pipes to reconnect wells to the new concrete-lined canal. Discharge pipes have the potential to be painted with lead-based paint. Any painted discharge pipes to be removed or relocated would be tested for lead prior to construction and disposed of in accordance with Federal and state regulations.

Residual concentrations of pesticides, herbicides, or both may be present in soils in agricultural lands in the construction area. Approximately 92 acres of soil disturbance across agricultural lands would occur under the Proposed Action. These residual concentrations of pesticides and herbicides could be dispersed due to construction but are not expected to pose an environmental concern.

The Proposed Action would not be anticipated to impact the hazardous materials sites and incidents identified in the database search. The LUST site cases were closed more than 10 years ago, and all other hazardous materials incidents and facilities identified were outside the construction area.

Potential impacts related to hazardous materials with the Proposed Action would be direct, site-specific, short-term, negligible, and adverse with construction, and direct, site-specific to localized, long-term, negligible, and adverse following construction.

FCG Canal Alternative

Impacts to hazardous materials with the FCG Canal Alternative would be similar to those described for the Proposed Action, except that less acreage of agricultural land would be disturbed by construction. Potential impacts related to hazardous materials with the Proposed Action would be direct, site-specific, short-term, negligible, and adverse with construction, and direct, site-specific to localized, long-term, negligible, and adverse following construction.

Cumulative Impacts

The project would require the short-term use of fuels, lubricants, and other fluids, which have the potential to result in impacts if released into the environment. With the implementation of controls and best management practices related to management, storage, and remedial actions, potential impacts are expected to be minimal and localized within the construction area. Therefore, there would be no potential for cumulative impacts associated with use of hazardous materials.

3.16 PUBLIC HEALTH AND SAFETY

3.16.1 Affected Environment

This section describes the potential public health and safety effects that could occur during construction, maintenance, and operation of project facilities. The topic of public health involves potential threats and other conditions that could interfere with human health. The topic of public safety involves those events or conditions that could endanger the safety of the general public from injury/harm or damage.

Open canals present a drowning hazard to the public. The hazard is more pronounced for canals with steeper sides, concrete lining, and higher flow velocities. Proximity to residential development would increase risk exposure for humans. Segments of the existing main system that are open canals and are proximal to residential development total approximately 0.3 mile along the FCG Canal in Florence (Reach 2B). A segment of the existing Florence Canal is piped and does not represent a drowning hazard.

3.16.2 Environmental Consequences

No Action

With the No Action alternative, there would be no changes in canal alignments and no concrete lining of canal facilities or change in flow velocities; therefore, no changes to public health and safety would be anticipated. Public safety hazards associated with the existing canals would

persist. In addition, until China Wash Flume is rehabilitated or replaced, the existing potential risk of failure of the flume would constitute a public safety hazard.

Potential impacts related to public safety with the No Action alternative would be direct, localized, long-term, negligible, and adverse.

Effects Common to Both Action Alternatives

Lining of the main canal would allow its operation at higher flow velocities. With the action alternatives, the canal operating velocities would range from 3 feet per second to 5.6 feet per second, with velocities varying according to the volume of water diverted into the canal system. These higher velocities, along with the new canal's steeper sides and concrete lining, would make it more difficult for a person to swim to the side of the canal and climb out, increasing the potential for human injuries and drowning.

These hazards could be more pronounced in urbanized areas where more people would be exposed. The majority of the canal alignment falls in rural areas, removed from local populations. Residential development is proximal to the construction area only in one location, along the perimeter of the town of Florence (in Reach 2B). For the action alternatives, only approximately 0.3 mile (roughly 1 percent of the new concrete-lined main) would be proximal to residential development. In many cases, a strip of land of varying width separates the canal from the housing development. Many of the houses in these developments have exterior property fences or walls that further separate them from canal right-of-way. The land separation and property fences/walls may reduce the potential that younger children would accidentally fall into the canal. Cables and escape ladders would be incorporated into the design at regular intervals to help people reach the side of the canal and safely climb out.

To a much lesser extent, the new regulating reservoir could introduce another potential drowning hazard. That concern, however, is somewhat obviated by siting and design characteristics of the reservoir, such as the proposed remote location, the absence of flow velocity, and the relatively shallow slope (3:1) of the banks, which would make egress relatively easy.

Construction activities can present a temporary and localized hazard to the public. Ground excavation and the storage or stockpiling of equipment, chemicals, and construction materials at construction sites can present hazards to the public. Exclusionary fencing would be used to minimize the potential for public access onto a construction site during the workday or after hours. Signage would be used to warn the public of the dangers present.

The potential drowning hazard would be essentially the same between the action alternatives except that there would be 17.7 more miles of concrete-lined canal under the FCG Canal Alternative.

The replacement of China Wash Flume under either Subalternative A or Subalternative B would reduce the risk of its failure, which would notably reduce an existing public safety hazard.

Potential impacts related to public safety with the action alternative would be direct, localized, long-term, minor, and adverse.

Cumulative Impacts

The proposed lining of the main canal and its potential to increase the risk of human drowning would have a cumulative effect with other existing drowning hazards (e.g., other canals, laterals, Picacho Reservoir) in the study area. Potential future improvements to the SCIDD service area, such as concrete lining of additional canals and laterals under Phase 3, could result in an increased impact on human safety in the study area. Piping of existing laterals near urban centers would result in a localized reduction of the safety risk. These cumulative impacts are not expected to change the overall risk to human safety in the study area.

4.0 CONSULTATION AND COORDINATION

4.1 LIST OF AGENCIES AND ENTITIES CONTACTED

Reclamation submitted information on the project proposal to the following entities during the development of the Draft NEPA document. The names of the individuals are retained in the administrative record.

4.1.1 Cooperating Agencies

- SCIDD
- BIA/SCIP
- Gila River Indian Community/P-MIP

4.1.2 Indian Communities

- Ak-Chin Indian Community
- Hopi Tribe
- Pascua Yaqui Tribe
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- Tohono O'odham Nation
- White Mountain Apache Tribe
- Pueblo of Zuni

4.1.3 Congressional Delegation

- Senator John McCain
- Senator Jon Kyl (former)

4.1.4 Local Government Agencies

- Pinal County Board of Supervisors
- Pinal County Air Quality Control District
- Pinal County Flood Control District
- City of Casa Grande
- Mayor Bob Jackson, City of Casa Grande
- City of Coolidge
- Mayor Thomas Shope, City of Coolidge
- Town of Florence

- Mayor Vicki Kilvinger, Town of Florence
- City of Mesa

4.1.5 State Agencies

- ADEQ
- Arizona Department of Corrections
- Arizona Department of Transportation
- AGFD
- ADWR
- Arizona State Land Department
- Governor's Office
- SHPO

4.1.6 Federal Agencies

- USACE
- EPA
- NRCS
- USFWS
- USGS

4.1.7 Conservation, Environmental, and Recreation Organizations

- Center for Biological Diversity
- Sierra Club

4.1.8 Grazing Organization

- Arizona Cattle Growers Association

4.1.9 Other Organizations

- Copper Basin Railway, Inc.
- Union Pacific Railroad
- Gila River Farms
- Gila Water Commissioner
- Hohokam Irrigation and Drainage District

5.0 LIST OF PREPARERS

The EA has been prepared by Reclamation with the assistance of EcoPlan Associates, Inc. The following individuals participated in the development of this document:

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6.0 COMPLIANCE WITH RELATED ENVIRONMENTAL LAWS AND DIRECTIVES

The CEQ regulations encourage agencies to "integrate the requirements of NEPA with other planning and environmental review procedures required by law." Coordinating NEPA procedures with those of other Federal environmental statutes and EOs facilitates NEPA objectives by promoting efficiencies in environmental planning and development of relevant information on which to base agency decisions. This integrative approach to NEPA ensures planning, review, and compliance processes run concurrently rather than consecutively with procedures required by other environmental laws.

The following is a list of Federal laws, EOs, and other directives that apply to the action alternatives discussed in the EA.

The National Environmental Policy Act of 1969, as amended, requires Federal agencies to evaluate the potential environmental consequences of major Federal actions. An action becomes "federalized" when it is implemented, wholly or partially funded, or requires authorization by a Federal agency. The intent of NEPA is to promote consideration of environmental impacts in the planning and decision-making process prior to project implementation. NEPA also encourages full public disclosure of the proposed action, accompanying alternatives, potential environmental effects, and mitigation.

An NOI to prepare an EIS and a public meeting announcement were published in the Federal Register on August 31, 2010. Scoping information was posted on Reclamation's Phoenix Area Office website and distributed to more than 97 individuals, organizations, and agencies on August 23, 2010. News releases regarding the proposal were submitted to 12 news media outlets, including *The Arizona Republic* and the *Florence Reminder and Blade-Tribune* newspapers. A scoping meeting and an open house were held on September 18, 2010, and May 17, 2012, respectively, to discuss the project with the public. Public scoping comments received helped guide the development of the proposed project and mitigation. Subsequent to the public outreach process, Reclamation determined that an EA was the appropriate level of environmental analysis for the project due to a substantial reduction in the project scope and construction area and the limited response to solicitation of comments. A Notice of Cancellation to Prepare a Draft EIS for the San Carlos Irrigation Project, Arizona, was published in the Federal Register on September 14, 2016 (81 FR 178:63204).

The Draft EA was mailed to 44 agencies and entities, and 92 adjacent landowners. The Draft EA is available on Reclamation's Phoenix Area Office website.

The Draft EA was made available for public review during a formal public comment period from May 18 through June 2, 2017. A Notice of Availability of the Draft EA and public meeting was mailed on May 15, 2017, to 44 agencies and entities, and 92 adjacent landowners. A public notice was published in local newspapers on May 17 and May 18, 2017, and the Draft EA was posted on Reclamation's Phoenix Area Office website. Paper copies of the Draft EA were available for public review and inspection, and paper copies and CDs of the Draft EA were

available upon request. The public meeting was held on Wednesday, May 24, 2017. No guests attended the meeting.

Written responses on the Draft EA were received from one landowner and two agencies. A summary of these comments and Reclamation's responses are included in Appendix C of the Final EA.

The Fish and Wildlife Coordination Act of 1958, as amended, provides a procedural framework for the consideration of fish and wildlife conservation measures in Federal water resource development projects. Coordination with the USFWS and state wildlife management agencies is required on all Federal water development projects. Scoping information was provided to the USFWS and the AGFD for comment on mitigating losses to wildlife that may result from the project. A Biology Working Group that included representatives from Reclamation, the USFWS, the AGFD, SCIDD, BIA/SCIP, and private consultants was formed and met on several occasions: November 5, 2010; December 2, 2010; and January 13, 2011, when a field review was conducted. Though USFWS representatives were not present at the latter two meetings, they were provided copies of the meeting minutes. The Draft EA was provided to the USFWS for review and comment.

The Endangered Species Act of 1973, as amended, provides protection for plants and animals that are currently in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened). Section 7 of this law requires Federal agencies to ensure that their activities do not jeopardize the continued existence of endangered or threatened species or adversely modify designated critical habitat. Reclamation has concluded that the proposed project "may affect, but is not likely to adversely affect" the endangered lesser long-nosed bat, the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, the endangered Yuma Ridgway's rail, the endangered spikedace, and the endangered loach minnow. No other federally listed species would be affected, and there would be no adverse modification of proposed or designated critical habitat.

A USFWS IPaC Trust Resource Report generated for the project was reviewed by a qualified biologist to determine which listed species may occur in the project vicinity. Table 10 examines the potential for occurrence of endangered, threatened, and other species status species in the study area. Due to potential effects on the endangered lesser long-nosed bat, the endangered Southwestern willow flycatcher, the threatened yellow-billed cuckoo, the endangered Yuma Ridgway's rail, the endangered spikedace, and the endangered loach minnow. Reclamation has prepared a BE for submittal to the USFWS for consultation under Section 7(a)(2). The BE concludes that the Proposed Action may affect the lesser long-nosed bat, the Southwestern willow flycatcher, the yellow-billed cuckoo, the Yuma Ridgway's rail, the spikedace, and the loach minnow but would not adversely affect these species or their habitats and would not adversely modify proposed or designated critical habitat.

The Migratory Bird Treaty Act of 1918, as amended, implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. The MBTA prohibits the take, possession, import, export, transport, selling, or purchase of any migratory bird, their eggs, parts, or nests.

The Proposed Action would result in potential impacts to nesting bird species protected under the MBTA, including as the Western burrowing owl. Mitigation measures have been included to avoid such take.

The Clean Air Act of 1963, as amended, requires any Federal entity engaged in an activity that may result in the discharge of air pollutants to comply with all applicable air pollution control laws and regulations (Federal, state, or local). It also directs the attainment and maintenance of NAAQS for six criteria pollutants: carbon monoxide, ozone, particulate matter, sulfur oxides, oxides of nitrogen, and lead. Air quality in the study area is in attainment of NAAQS.

Construction activities associated with the project, which would be limited to Pinal County, would generate emissions, including PM_{10} and $PM_{2.5}$. On May 31, 2012, the EPA published a Final Rule in the Federal Register—Designation of Areas for Air Quality Planning Purposes; State of Arizona; Pinal County; PM_{10} (77 FR 105:32024–32033) to redesignate a portion of western Pinal County from unclassifiable (attainment) to nonattainment for PM_{10}. Designation of the West Pinal PM_{10} nonattainment area places a requirement on the State of Arizona to revise the SIP and impose certain planning requirements to reduce PM_{10} concentrations in the area. The EA concludes that the annual emissions that would be generated from project construction would not exceed the 100 tons/year threshold for PM_{10}; therefore, the project would not require a conformity determination. No Class I airshed is located in or near the study area.

The Clean Water Act of 1977, as amended, strives to restore and maintain the chemical, physical, and biological integrity of the Nation's waters by controlling the discharge of pollutants. The basic means to achieve the goals of the CWA is through a system of water quality standards, discharge limitations, and permits. Section 404 of the CWA identifies conditions under which a permit is required for actions that result in placement of fill or dredged material into jurisdictional WUS. In addition, a Section 401 water quality certification and a Section 402 NPDES permit are required for activities that discharge pollutants to WUS. The EPA has delegated the responsibility to administer water quality certification and NPDES programs in Arizona to the ADEQ.

Coordination with the USACE was initiated by email on June 21, 2012, and resent on December 17, 2012. The applicability of a CWA exemption for construction and maintenance of irrigation ditches (40 CFR § 232.3(c)(3)—Exempt Activities Not Requiring 404 Permits) was discussed with USACE regulatory personnel (W. Miller, USACE, personal communication, December 20, 2012). Due to the nature of the project activities, Reclamation subsequently determined that this exemption applies to the project and that no further consultation with the USACE or Section 404 permitting is required.

An AZPDES NOI would be filed with the ADEQ, and a SWPPP would be implemented during project construction.

The National Historic Preservation Act of 1966, as amended, mandates that all federally funded undertakings that have the potential to affect historic properties are subject to Section 106 of the NHPA. Federal agencies are responsible for the identification, management, and nomination to the NRHP of cultural resources that could be affected by Federal actions. Consultation with the

Advisory Council on Historic Preservation and SHPO is required when a Federal action may affect cultural resources in, or eligible for inclusion in, the NRHP.

The following actions would fulfill Reclamation's compliance requirements under Section 106 (now Section 306108) of the NHPA: (1) completing Class III pedestrian surveys of the Proposed Action's construction area, (2) consulting with Native American groups that may have interests or concerns to determine if there are Traditional Cultural Properties or sacred sites within the APE, (3) preparing eligibility assessments, as needed, for all cultural resources in the study area and consulting in that regard with SHPO and other interested parties, (4) making a determination of effect for the proposed undertaking and consulting with SHPO accordingly, (5) developing a Memorandum of Agreement or Programmatic Agreement, as appropriate, and (6) developing/administering a mitigation plan.

Consultation with SHPO and Native American Tribes has been initiated and is ongoing. SHPO, the Ak-Chin Indian Community, the Hopi Tribe, the Tohono O'odham Nation, and the White Mountain Apache Tribe responded to the initial consultation letter. Based on these responses, no Traditional Cultural Properties, including sacred sites, have been identified.

Archaeological Consulting Services, Ltd., completed a Class III pedestrian survey of the Proposed Action APE, from the edge of the settling basin to the south edge of Picacho Reservoir.

Class I and Class III survey has identified 43 cultural resources within the APE of the Proposed Action for Phase 2. Of this total, 20 are previously recorded archaeological sites, two are cultural resources listed in the ARHP that do not have assigned Arizona State Museum (ASM) site numbers, and 21 are newly recorded archaeological sites. Seventeen historic properties have been determined eligible for inclusion in the NRHP, 11 archaeological sites have been determined ineligible, and 15 sites lack sufficient data to adequately evaluate them for NRHP eligibility. Six of the 15 sites listed as unevaluated were not relocated during archaeological investigations—four archaeological sites and two ARHP-listed properties.

The Resource Conservation and Recovery Act, as amended, establishes thresholds and protocols for managing and disposing of solid waste. Solid waste that exhibits the characteristics of hazardous waste or is listed by regulation as hazardous waste is subject to strict accumulation, treatment, storage, and disposal controls.

The proposed project is unlikely to generate hazardous waste as defined and regulated under the Resource Conservation and Recovery Act.

Executive Order 11988 (Floodplain Management) requires Federal agencies to avoid, where practicable alternatives exist, the short- and long-term adverse impacts associated with floodplain development. Federal agencies are required to reduce the risk of flood loss; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibility.

With the Proposed Action, construction would occur within the 100-year floodplain. In most areas, canal alignments cross the floodplain; however, the new parallel canal in Reach 1 would overlap the 100-year floodplain of the Gila River for approximately 2 miles. Based on the nature

of the project, it would not be expected to decrease floodplain capacity or raise the 100-year flood elevation.

Executive Order 11990 (Wetlands) requires Federal agencies, in carrying out their land management responsibilities, to take action that would minimize the destruction, loss, or degradation of wetlands and take action to preserve and enhance the natural and beneficial values of wetlands.

The Proposed Action would not result in the destruction, loss, or degradation of any wetlands except for small, isolated areas of wetland vegetation resulting from canal seepage. It might increase the extent of wetlands at Picacho Reservoir through the potential diversion and delivery of more storm water, though this would depend on the magnitude and frequency of storm events and irrigation water demands.

Executive Order 12898 (Environmental Justice) requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations.

Protected populations were identified in proximity to the proposed construction area. Short-term construction-related impacts (e.g., generation of air pollutants, increase in noise, and public safety risk) would be expected when construction is ongoing in the vicinity of residential populations. Residential development is in the proximity of the proposed construction area only in one location—the town of Florence. This area is considered to be a protected population. The segment of the project in proximity to this protected population is approximately 0.9 mile long, or 3.7 percent of the 24.2-mile new main canal under the Proposed Action. Because these effects would occur in the entire construction area, not just the area adjacent to a protected population, populations protected under EO 12898 would not be disproportionately affected.

Executive Order 13514 directs Federal agencies to promote pollution prevention and reduce emissions of GHGs from actions under their control. In accordance with EO 13514, the CEQ defines GHGs as carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Emissions of GHGs associated with engine combustion products from construction equipment and vehicles would be temporary and well below levels generally considered to be potentially significant contributors to climate change. Increased emissions would cease after construction.

Secretarial Order 3175 (incorporated into 512 DM 2) requires that if any U.S. Department of the Interior agency actions impact ITAs, the agency must explicitly address those impacts in planning and decision-making, and the agency must consult with the tribal government whose trust resources are potentially affected by the Federal action.

In 1935, the U.S. District Court for the District of Arizona issued the Globe Equity No. 59 Decree (Gila River Decree), which recognized the right of the United States to demand and divert Gila River water for irrigation of 50,546 acres of Indian farmland on the Gila River Indian Community. Water rights described in the Globe Equity Decree and the Settlement Agreement are held in trust by the United States on behalf of the Gila River Indian Community

and are considered an ITA. Gila River water associated with these water rights is conveyed through the SCIP Joint and Indian Works facilities to the Gila River Indian Community.

The Proposed Action would improve operational efficiencies of the SCIP main conveyance system, increase the reliability of water deliveries, reduce operation and maintenance costs, and reduce water losses from the system (i.e., conserve water). The conserved water would enable the Gila River Indian Community to develop additional on-Reservation land and put more of its SCIP water to beneficial use.

The Farmland Protection Policy Act and 7 CFR § 658 are intended to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural purposes. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, and oilseed crops and is available for these uses. In general, prime farmland has acceptable soil conditions with few rocks, a favorable temperature and growing season, and an adequate and dependable water supply from precipitation or irrigation. Unique farmland is land other than prime farmland that is used for production of specific high-value foods and fiber crops.

The NRCS has general responsibility nationwide for implementing the FPPA and to review projects that may affect prime, unique, or statewide-important farmland and/or wetlands associated with agriculture. Of the land to be acquired and converted to project use under the Proposed Action, an estimated 92 acres involve active or fallow agriculture. Because this acreage would be used in support of agriculture and no prime or unique farmland would be developed or converted to nonagricultural use, this conversion would be exempt from the FPPA, which was developed to mitigate actions that would convert farmland to nonagricultural uses.

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