3.10 Topography, Geology, and Soils

This section provides an overview of the study area's geologic setting and preliminary information concerning geotechnical and geologic conditions in the action corridor alternatives.

3.10.1 Regulatory Context

NEPA directs federal agencies to assess impacts, adverse and otherwise, on the environment. Because the proposed action would avoid major landforms and unique geologic features, the analysis focused on geological conditions that may pose challenges to constructing the proposed action. See Section 3.6, *Prime and Unique Farmland*, for information regarding soils that support high-value farmland.

3.10.2 Methodology

The evaluation presented in this section is based on available information on regional and local geology, seismicity, subsidence, and earth fissuring. It relied on existing data sources and previous reports and did not include field reconnaissance or subsurface investigation.

The existing information included a previous geotechnical assessment memorandum for the Corridor (NCS Consultants, LLC 2011, provided in Appendix H, *Geotechnical Information*). Data were also obtained from governmental agencies in the Corridor, including the U.S. Bureau of Reclamation, ADOT, Pinal County, Pinal County Flood Control District, and the Flood Control District of Maricopa County. Online databases from USGS, Arizona Geological Survey (AZGS), Arizona Department of Water Resources (ADWR), and NRCS were accessed, as were published geologic maps, current and historical topographic maps, NRCS soil survey maps, and groundwater well databases. The research encompassed the study area, with a focus on the proposed action corridor alternatives.

3.10.3 Affected Environment

3.10.3.1 Geologic Conditions

The proposed action traverses the Basin and Range physiographic province of the southwestern United States. The Basin and Range physiographic province topography is the result of tectonic extension in the middle and late Cenozoic era (approximately 15 million to 17 million years before present), and is characterized by a northwest-to-southeast trending system of rugged mountains with intervening, broad, and extensive alluvial valleys. The valley portions dropped down and mountains were up-thrown, followed by subsequent erosion that degraded the mountain ranges and partially filled the basins with sediment, creating the present landforms (AZGS 2000).

The topography in the study area is relatively flat. Surface elevation at the northern end of the study area ranges from approximately 1,640 to 1,680 feet. Ground elevation decreases toward the south to a low point at the Gila River crossing, at approximately 1,480 feet. Surface elevation then increases toward the southern end of the study area to approximately 1,600 feet.

Geologic units in the study area consist predominantly of Quaternary-age (up to 2 million years before present) soil deposits without significant geologic variation of the surficial soils. The surficial soil deposits of the Gila River and to the north of the study area were generally deposited within the last 10,000 years, with some older deposits within the last 750,000 years. South of the Gila River, the surficial soil deposits were deposited in the last 10,000 years, with some as old as 2 million years.

Surface soils alternate in the study area between primarily granular sandy soils and fine-grained clay soils. Coarse-grained soils, such as granular sandy soils, provide better subgrade support than fine-grained soils, but can be susceptible to hydro-collapse and settlement if the soils are loose in place. Fine-

grained soils, such as clay soils, provide poor subgrade support and are more susceptible to volume change from both expansion (swell) and hydro-collapse and settlement. Near-surface soils for over half of the study area consist of fine-grained, primarily sandy, clay soils with a lesser fraction of sand and gravelly soils. Conditions are not appreciably different among the action corridor alternatives.

In general, bedrock in the study area is located at a great depth below existing ground, and ranges from less than 400 feet to more than 9,000 feet below the ground surface. The depth to bedrock is less than 400 feet at the northern end of Segment 1. Moving to the south, depth to bedrock increases and reaches a depth of more than 3,000 feet at the middle portion of Segment 1. Depth to bedrock then decreases to approximately 400 to 800 feet in the northern end of Segment 3, where the E3a and E3c Alternatives may intersect surface bedrock exposures for a short distance. From the northern portion of Segment 3 and moving south, the depth to bedrock increases to a maximum depth of approximately 9,600 feet at the southern end of Segment 4.

3.10.3.2 Groundwater

Depth-to-groundwater information was obtained from ADWR. The average depth to groundwater in all segments is greater than 90 feet, and estimated depth to groundwater is the greatest at the northern and southern ends of the study area, with shallower groundwater in the middle segments where the action corridor alternatives pass through irrigated agricultural lands. With the exception of the southern portion of Segment 1, where CAP Canal surface water deliveries have replaced groundwater supplies and groundwater levels are rising, the remainder of the study area is experiencing either stable or declining groundwater levels.

Two areas, or groupings, of groundwater wells in the study area may have shallow groundwater. The first group is in the northern portion of Segment 3 near the Gila River, and the second group is in the southern portion of Segment 3. It should be acknowledged that ADWR depth-to-groundwater data have not been field verified, and there is a possibility that areas of high groundwater may be data anomalies. It is likely that groundwater depths near Queen Creek, the Gila River, and flood control structures fluctuate substantially in response to flows in the drainages, and shallow groundwater could be encountered in these areas after significant flow events.

3.10.3.3 Land Subsidence and Earth Fissuring

Land subsidence in the southwestern and western United States has resulted from long-term groundwater withdrawals. Declining groundwater levels increase effective stress in the subsurface soils by removing the effect of buoyancy within the previously saturated soil. This results in an increased vertical stress on lower soil layers without adding any surface loads. The increase in vertical stress triggers land subsidence. Associated with land subsidence, earth fissures and potential earth fissure features have appeared in Arizona since the late 1980s. Earth fissures are tension cracks that form in deep alluvium-filled basins in response to land subsidence. There is a strong correlation between groundwater decline, land subsidence, earth fissures, and bedrock contours.

Most of the mapped earth fissures in the study area are defined as “reported, unconfirmed earth fissure.” It is possible that some of these features are not correctly identified as fissures; additionally, it is possible that unidentified earth fissures exist in the area and will continue to form and progress if land subsidence continues.

Land subsidence data published by ADWR indicate two subsidence zones in the study area: Hawk Rock in Segment 1 and Picacho-Eloy in Segments 3 and 4 (AZGS 2016a). Both subsidence areas correspond strongly to areas of deep groundwater caused by historical overdraft by overpumping.

Groundwater levels at the Hawk Rock subsidence zone are approximately 435 feet deep and have stabilized over time as CAP Canal surface water has replaced groundwater pumping for supply.

Subsidence in the Hawk Rock subsidence zone is approximately 0.25 inch per year. Data obtained from ADWR show areas of confirmed and unconfirmed earth fissures within the Hawk Rock subsidence zone along the W1a Alternative.

The Picacho-Eloy subsidence zone is much larger than the Hawk Rock subsidence zone and extends from south of I-10 north to Florence. Subsidence is more severe in this zone, especially in the overpumped groundwater areas along I-10 near SR 87, where depth to groundwater is as much as 500 feet in some locations. In this area, the subsidence rate is approximately 1 inch per year. Subsidence of approximately 1 inch per year has been recorded along the E4 Alternative between I-10 and Arica Road in Eloy. Data obtained from ADWR indicate areas of earth fissures within the Picacho-Eloy subsidence zone along all of the action corridor alternatives in Segments 3 and 4.

3.10.3.4 Mining

Sand and gravel mines are located throughout the study area. These facilities have largely developed to support the growth occurring in the area. The Florence Copper project, an in-situ recovery copper mine, is located on the northern side of the Gila River in Florence (this mine is discussed in greater detail in Section 3.2, *Land Use*). Additional BLM mining claims and subsurface estate held by BLM may be present on BLM lands in the study area.

Sand and gravel mining, or aggregate mining, is an important part of the region's economy. Regional sand and gravel deposits support local road building and construction. Most aggregates in the study area are unconsolidated alluvial deposits found in and along the Gila River and Queen Creek.

Gila River deposits cover a broad swath from east of Florence to the confluence of the Gila and Salt Rivers (located west of the study area in the Phoenix area). In response to state legislation, the Town of Florence amended its *General Plan* to include sources of currently identified aggregates in the Town's MPA to preserve these aggregates for future development and to avoid incompatible land uses. Most of these Aggregate Resources Overlays are near the Gila River.

Queen Creek deposits form a large, elongate fan complex in the southeastern Phoenix metropolitan area between Queen Valley, east of the study area, and the town of Queen Creek, at the study area's western edge. The Queen Creek alluvial fan complex widens to a maximum of approximately 5 miles just upslope from the CAP Canal. The extent of the Queen Creek deposits downslope from the CAP Canal is poorly defined because this area has been substantially altered by agricultural activity and urban development (AZGS 2016b).

3.10.3.5 Regional Seismicity and Local Faulting

Seismic hazard information for the study area was obtained from USGS (2015). The study area's surface topography is characterized by low, pedimented, deeply embayed mountain fronts that are indicative of long-term tectonic stability.

No Quaternary-age active faults are within the study area. Quaternary faults outside the study area occur in the Carefree, Sugarloaf, Whitlock Wash, Little Rincon Mountains, and Santa Rita Fault Zones (USGS 2015).

USGS data were used to determine peak ground acceleration at the northern, midpoint, and southern ends of the study area (peak ground acceleration is a measure of the maximum force experienced by the ground surface during an earthquake). Peak ground acceleration at the northern end was 0.062 percent of gravity, 0.067 percent of gravity at the approximate midpoint, and 0.063 percent of gravity at the southern end.

Seismic event-induced liquefaction primarily occurs in loose sands with low clay and silt content where groundwater is relatively shallow or near the ground surface. In the study area, groundwater depths are

generally more than 90 feet below the ground surface. Shallow groundwater may be expected seasonally at Queen Creek and the Gila River and in response to flow events. The subsurface soil profile close to these drainages consists of sands and gravels that are resistant to liquefaction.

3.10.4 Environmental Consequences

3.10.4.1 No-Action Alternative

Under the No-Action Alternative, only ongoing development and construction activities would affect the geologic and geotechnical conditions in the study area.

3.10.4.2 Action Corridor Alternatives

Land subsidence and earth fissures are identified as geotechnical issues for the proposed action. Both of these geological processes pose a potential risk to the proposed action and associated structures and improvements. Hazards associated with earth fissures include damage to homes and buildings, roads, dams and embankments, canals and channels, and sewer, water, and other utility lines.

Known areas of subsidence that would affect action corridor alternatives include the Hawk Rock and Picacho-Eloy subsidence zones. The Hawk Rock subsidence zone would primarily affect the W1a and W1b Alternatives. The Picacho-Eloy subsidence zone would primarily affect I-10 connection points for both the E4 and W4 Alternatives. As subsidence continues in these areas, environmental consequences caused by subsidence, groundwater decline, or earth fissures could affect action corridor alternatives.

The absence of detectable earth fissures at the ground surface in a subsiding area provides no assurance that fissures are not present in the shallow subsurface or will not form in the future. As long as overdraft groundwater extraction continues, land subsidence and earth fissures will present long-term hazards to infrastructure.

Depth to groundwater can affect surface construction projects and geotechnical design of foundations and roadway subgrade. Shallow groundwater may require dewatering during construction and may affect geotechnical design of foundations and roadway subgrade. Deeper groundwater has a less tangible effect on design and construction, but deep groundwater levels coupled with ongoing overdraft and decline of the groundwater table may indicate ongoing land subsidence. Average depth to groundwater in all segments is greater than 90 feet, which generally suggests that shallow groundwater is not likely to pose construction or design challenges except from the standpoint of ongoing and future land subsidence and earth fissuring.

In Segment 1, the Eastern Alternatives would cross Queen Creek upstream of the CAP Canal, with no noticeable distinction between the E1a and E1b Alternatives when considering the anticipated ground conditions that would be encountered. In Segment 3, all of the action corridor alternatives would cross the Gila River.

The W3 Alternative would cross through an active, privately owned sand and gravel mine, although the area through which the corridor passes is not actively mined. The E3b and E3d Alternatives would pass through an active, privately owned sand and gravel mine. The E3a and E3b Alternatives would pass through a privately owned sand and gravel mine, although the area through which the corridors would pass is not actively mined.

The subsurface soil profile close to drainages consists of sands and gravels that are resistant to liquefaction. Given the relatively great depth to groundwater and the relatively low peak ground acceleration, liquefaction is considered to be a low risk with no significant difference between the Eastern and Western Alternatives. Faults are not considered to represent a seismic hazard to the study area.

3.10.5 Potential Avoidance, Minimization, and Mitigation Strategies

The combined efforts of the geoscience and engineering communities have led to extensive study and development of successful mitigation practices for many geologic hazards (swelling and collapsing soils, faults, and earthquakes). Engineers, designers, and builders have studied the associated hazards and engineered solutions that, for the most part, successfully mitigate their impacts.

Unfortunately, geologists and engineers lack adequate field tools or analytical methods to determine where a narrow earth fissure crack will present itself, or when that fissure will erode and enlarge, perhaps overnight, into a dangerous gully or chasm. It is difficult to mitigate and engineer a solution to a problem when the problem itself is not well-understood.

The state of the practice for fissure mitigation is restricted to a handful of designs by local engineers and geologists using experience and judgment to design and construct informal solutions. Generally accepted mitigation methods are lacking, and studies of mitigation failures are wholly lacking, hindering efforts to develop better and surer mitigation methods.

In Arizona, AZGS has adopted guidelines for investigating land subsidence and earth fissures. Under these guidelines, potential land subsidence and earth-fissure hazards should be investigated for proposed projects in areas of known or suspected land subsidence. Research should include reviewing existing data and reports, analyzing remote sensing data, conducting surface and subsurface investigations, conducting a geophysical investigation, and completing other more intensive investigative methods as appropriate when special conditions exist. Siting of critical structures or facilities—where long-term monitoring is crucial—warrants more intensive investigative methods. These more intensive methods include, but are not limited to, conducting aerial reconnaissance overflights, installing and monitoring piezometers, taking high-precision survey or geodetic measurements (including comparison surveys and a program of repeat surveys), measuring strain (displacement) at the surface and in borings as part of a long-term monitoring program, and age dating (AZGS 2011).

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts.

3.10.6 Subsequent Tier 2 Analysis

No geological or geotechnical issues have been identified that would preclude constructing any of the action corridor alternatives. However, geological and geotechnical conditions would require consideration in the Tier 2 phase and in final design, should an action corridor alternative become the preferred alternative.

Subsequent analysis related to topography, geology, and soils for the Tier 2 environmental evaluation should involve preparing a geotechnical report that provides updated information about geologic conditions, groundwater levels, land subsidence, earth fissuring, mining, and regional seismicity. During Tier 2 studies, additional coordination would occur with BLM regarding potential mining claims and subsurface estate held by BLM.

3.10.6.1 Conclusion

The predominant geotechnical and geological issues for the study area are land subsidence caused by compaction of deep subsurface alluvial soil strata in response to declining groundwater levels and the resulting development of earth fissures. Both of these geological processes pose a potential risk to the proposed freeway and associated structures. The selection of the preferred alternative should consider the proximity and potential effect of earth fissures. From the existing information, the W1a and W1b Alternatives may be affected more by earth fissures when compared with the E1a and E1b Alternatives; however, unmapped fissures may cross all action corridor alternatives through the

Hawk Rock subsidence zone. There is likely no substantial difference between the Eastern and Western Alternatives in Segments 3 and 4; however, the Eastern Alternatives are closer to known fissures and shallower bedrock and may have a higher potential for fissures. Additional investigation of the subsidence zones and earth fissures is recommended for future studies and design.

No visual site or invasive subsurface investigation was performed, and no new engineering analyses or evaluations were completed for this high-level characterization. Actual site conditions, both surface and subsurface, may vary from the conditions described in this report because geotechnical conditions can be determined only by performing a geotechnical field investigation.

3.11 Biological Resources

This section describes the existing environment for biological resources and the proposed action's potential impacts on wildlife, vegetation, and protected species or their habitats.

3.11.1 Regulatory Context

Roadway construction and operations activities that have a potential to affect wildlife, vegetation, and protected species or their habitats are required to consider biological resources regulated by various federal and state agencies. Table 3.11-1 summarizes relevant laws, regulations, and guidance that relate to biological resources and apply to the proposed action. These regulations and guidance provide the framework for regulatory agencies to offer direction that may influence the design, construction, and operations to ensure regulations and protected biological resources are addressed.

Table 3.11-1. Applicable federal and state laws, regulations, and guidance

Agency	Authority	Description
Federal		
U.S. Fish and Wildlife Service	Endangered Species Act	Provides for the protection of species designated as threatened, endangered, candidate, or proposed. When applicable, under Section 7 of the Act, lead federal agencies are required to consult with the U.S. Fish and Wildlife Service to ensure that their actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction of any designated critical habitat upon which the species depend.
	Bald and Golden Eagle Protection Act	Prohibits any form of possession or take of bald or golden eagles, including any body part, nest, or egg, unless allowed by permit. The Act defines "take" as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."
	Migratory Bird Treaty Act	Provides protection for birds that migrate between the United States and Canada, Mexico, Japan, or Russia.
Federal Highway Administration	Executive Order 13112, Invasive Species	Addresses preventing the introduction and spread of invasive species and provides for their control to minimize the economic, ecological, and human health impacts that invasive species cause.
State		
Arizona Game and Fish Department	Species of Greatest Conservation Need	Based on the Arizona Game and Fish Department State Wildlife Action Plan, which outlines a vision for addressing all wildlife and habitats through partnerships and coordination with stakeholders, focusing on identifying and managing wildlife and habitats that are in greatest need of conservation.
Arizona Department of Agriculture	Arizona Native Plant Law	Provides protection for special status plants that are considered unusual or rare, have high value for landscaping, or are long-lived and not easily replaced. These include plants that are assigned to the following categories: highly safeguarded, salvage restricted, export restricted, salvage assessed, and harvest restricted.

3.11.2 Methodology

This evaluation used existing natural resource data, web-based environmental review tools from AGFD and the U.S. Fish and Wildlife Service (USFWS), a preliminary site-specific evaluation conducted by AGFD, and general field investigations (see Appendix A, *Agency Coordination*, for AGFD's *Preliminary Evaluation for the Arizona Department of Transportation's North-South Corridor Study Analysis*).

3.11.3 Affected Environment

The landscape encompassing the action corridor alternatives consists of agricultural fields, development, native desertscrub, natural and engineered hydrologic networks, and roadway networks (Figure 3.11-1). The region is characterized by climatic extremes such as low rainfall, high temperatures, very high evaporation rates, and strong winds. The action corridor alternatives fall within the Gila/Salt Intermediate Basin and Middle Gila/Salt River Floodplains ecoregions. The Gila/Salt Intermediate Basin ecoregion contains most of the state's human population and has permanently altered ecological features and processes. The region is the urban and agricultural core of south-central Arizona, dominated by urban, suburban, and cropland land cover types and highly engineered hydrologic networks (Griffith et al. 2014). The Middle Gila/Salt River Floodplains ecoregion includes the middle reaches of these rivers, consisting of basin-floor deposits with clay, silt, or gravel soils and river terraces. Parts of this ecoregion are in agriculture with crops of barley, hay and alfalfa, and cotton. Riparian and wetland habitats have been extensively altered. Invasive plants such as tamarisk now cover riverbanks that were once covered by cottonwoods, willows, and mesquite. Agricultural return flows and municipal sewage discharges now feed many of the rivers (Griffith et al. 2014).

3.11.3.1 Vegetation and Wildlife Resources

The following 14 vegetation types, as mapped for the Arizona Gap Analysis Program (USGS 2004), are present in the action corridor alternatives:

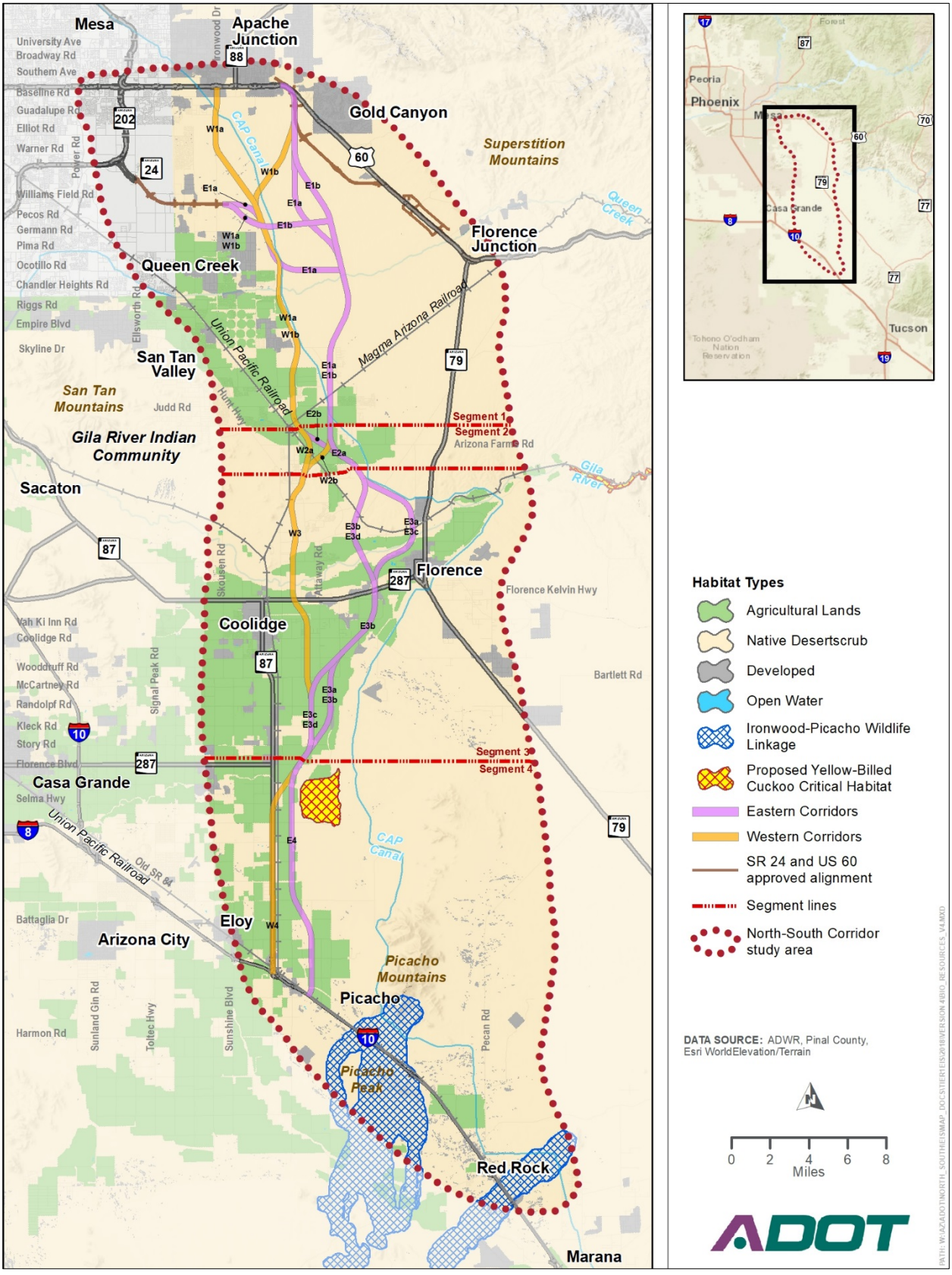
- creosote bush-white bursage desertscrub
- paloverde-mixed cacti desertscrub
- mixed salt desertscrub
- mesquite upland scrub
- invasive southwest riparian woodland and shrubland
- warm desert riparian woodland and shrubland
- warm desert riparian mesquite bosque
- warm desert wash
- mid-elevation desertscrub
- agriculture
- developed, medium – high intensity
- developed, open space – low intensity
- barren lands, non-specific
- open water

The three predominant landscape-level habitats represented in the action corridor alternatives are Sonoran desertscrub, agricultural lands, and developed areas (Figure 3.11-1).

Sonoran Desertscrub Habitat

Native desertscrub habitat covers approximately 60 percent of the area defined by the action corridor alternatives and is primarily represented in the northern half. Common plant species include creosote bush (*Larrea tridentata*), foothill paloverde (*Parkinsonia microphylla*), mesquite (*Prosopis* sp.), ironwood (*Olneya tesota*), saltbush (*Atriplex* spp.), brittlebush (*Encelia farinosa*), prickly pear cactus (*Opuntia* spp.), and barrel cacti (*Ferocactus* spp.). Desertscrub habitat is common across the region and—depending on factors such as landform position, plant composition and density, water availability, and proximity to human disturbance—can vary widely in its capacity to support wildlife. A 2013 report by AGFD documented wildlife linkages—areas used by wildlife for movement within and/or between portions of unfragmented habitat—within the study area (based on stakeholder input), and identified a portion of the study area as a Landscape Movement Area (modeled) (AGFD 2013).

Figure 3.11-1. Biological resources



Many species of wildlife occupy variations of this native habitat, particularly in xeroriparian habitats along desert washes. Xeroriparian habitats, which feature vegetation associated with desert washes, have high value for wildlife not only because of the vegetation density and composition but also as movement corridors. Numerous washes cross the action corridor alternatives; however, many have been truncated by agricultural activities and canals and many terminate at retention basins. AGFD identified Queen Creek as a known Riparian Movement Area, based on stakeholder input received at a workshop in 2010 (AGFD 2013).

Stock tanks, created by excavation and damming along washes, occur in many scattered locations across native desertscrub habitats in and near the action corridor alternatives. These sources of semipermanent water in otherwise waterless areas and their adjoining scrub vegetation are important habitats for amphibians, migratory and resident birds, mammals, and reptiles. Additional information regarding the influence of ephemeral and intermittent streams on ecological and hydrological processes may be found in Section 3.12.3.1, *Surface Water*.

Mammalian species found in desertscrub habitat include the black-tailed (*Lepus californicus*) and antelope (*Lepus alleni*) jackrabbit, cottontail rabbit (*Sylvilagus audubonii*), ground squirrel (*Spermophilus* sp.), ringtail cat (*Bassariscus astutus*), coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), raccoon (*Procyon lotor*), skunk (*Mephitis* spp.), javelina (*Dicotyles tajacu*), mule deer (*Odocoileus hemionus*), and various species of bats and small rodents.

Common birds include the Gila woodpecker (*Melanerpes uropygialis*), Gambel's quail (*Callipepla gambelii*), curve-billed thrasher (*Toxostoma curvirostre*), Abert's towhee (*Pipilo aberti*), black-throated sparrow (*Amphispiza bilineata*), phainopepla (*Phainopepla nitens*), blue-gray gnatcatcher (*Polioptila caerulea*), cactus wren (*Campylorhynchus brunneicapillus*), gnatcatcher (*Polioptila* spp.), lesser nighthawk (*Chordeiles acutipennis*), mourning (*Zenaida macroura*) and white-winged (*Zenaida asiatica*) doves, greater roadrunner (*Geococcyx californianus*), turkey vulture (*Cathartes aura*), and western burrowing owl (*Athene cunicularia hypugaea*), and other species of raptors including owls, falcons, and hawks.

Reptiles include many snake species, Gila monsters (*Heloderma suspectum*), lizards (*Phrynosoma* spp.), whiptails (*Aspidoscelis spp.*), desert iguanas (*Dipsosaurus dorsalis*), and Sonoran desert tortoises (*Gopherus morafkai*). Amphibians may include the Sonoran Desert toad (*Bufo alvarius*) and Couch's spadefoot toad (*Scaphiopus couchii*).

Agricultural Lands

Agricultural land includes rangeland and irrigated cropland. The Sonoran desertscrub habitat located primarily in the northern half of the action corridor alternatives and described previously is also used as rangeland. Years of drought and cattle grazing have thinned the desertscrub vegetation. Where water is found at stock tanks and depressions along the CAP Canal, cattle congregating and frequenting these areas has created areas devoid of most vegetation other than mesquite trees.

Irrigated agricultural land, mostly found in the southern half of the action corridor alternatives, attracts a wide variety of wildlife. Major crops include cotton, small grain, grain sorghum, and alfalfa hay. Other important crops are sugar beets, broccoli, lettuce, melons, citrus fruit, and pecans (NRCS 1991). These fields are more likely used for foraging, particularly when water is present. Mammalian species using agricultural land include coyotes, gray foxes, bobcats, raccoons, skunks, javelinas, mule deer, bats, and small rodents.

Agricultural croplands provide habitat for western burrowing owls, which are frequently found nesting and hunting on the perimeter of the fields and irrigation dikes. Other bird species likely to be found foraging and possibly nesting include Gambel's quail, black-necked stilt (*Himantopus mexicanus*), killdeer (*Charadrius vociferus*), white-winged dove, mourning dove, Inca dove (*Columbina inca*), great-tailed grackle (*Quiscalus mexicanus*), red-winged (*Agelaius phoeniceus*) and yellow-headed (*Xanthocephalus xanthocephalus*) blackbirds, cowbirds (*Molothrus* spp.), greater roadrunner, cattle egret (*Bubulcus ibis*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), lesser nighthawk, black phoebe (*Sayornis nigricans*), Say's phoebe (*Sayornis saya*), Lucy's warbler (*Oreothlypis luciae*), yellow warbler (*Dendroica petechia*), vireos (*Vireo* spp.), turkey vulture, Harris's hawk (*Parabuteo unicinctus*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), and other species of foraging raptors.

Agricultural areas include various features that may be used as habitat including stock ponds, canals, irrigation ditches, and associated embankments, dikes, and levees. Many of these features are part of the San Carlos Irrigation Project and allow for a controlled application of water to farmed fields. The smaller, human-made aquatic habitats are often used by wildlife. Habitat surrounding the open water is generally degraded and associated with rural roads and nonnative vegetation.

Developed Areas

Developed areas feature impervious surfaces covered by roadways, single-family homes, apartment complexes, and commercial and industrial developments. Low-intensity developments include lawns, large-lot single-family homes, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes (NatureServe 2015). To a lesser extent, developed areas support a variety of wildlife including small rodents, lizards, and birds such as curve-billed thrasher, northern mockingbird (*Mimus polyglottos*), Gambel's quail, white-winged dove, mourning dove, Inca dove, great-tailed grackle, cowbirds, and various other species that are tolerant of human activity and disturbance.

Wildlife Connectivity

In 2006, the CAP Canal was identified in *Arizona's Wildlife Linkages Assessment* (Arizona Wildlife Linkages Workgroup 2006) as a potential wildlife linkage corridor. Canals are known to have both positive and negative impacts on desert wildlife. Some species may use canals as a water source, but the steep banks make it impossible or dangerous for most animals to do so (Beier et al. 2006). Large mammals, such as desert mule deer, are known to drown in canals (Rautenstrauch and Krausman 1989). Canals often pose major barriers to species by preventing movement to viable habitat on the other side of the canal, by drowning, and by rerouting natural movement patterns. In the study area, the CAP Canal is approximately 40 to 50 feet wide and is typically fenced on both sides to keep animals out; it is a barrier to wildlife movement though the area. While the CAP Canal is a barrier to mammal movement, the washes that are truncated by the canal (and FRSs constructed adjacent to the canal) collect water on the upstream side in constructed basins and channels that develop dense habitat consisting mainly of mesquite trees. Many of these basins are intended to provide mesquite bosque habitat as habitat improvement to address impacts from flood control projects in the study area (personal communication, Flood Control District of Maricopa County with HDR, on March 17, 2016). Although such features occur along the CAP Canal in the action corridor alternatives and can provide a movement corridor for many mammals, the barriers and land use such as roads, development, and agriculture prevent directed movement along the greater extents of the canal system. The exception is for bats and birds that may use the CAP as a corridor along its entire extent.

The Ironwood-Picacho wildlife linkage corridor constitutes the only mapped AGFD wildlife corridor in the study area. The Ironwood-Picacho Linkage consists of two strands that together provide habitat for movement and dispersal of wildlife between the Ironwood, Picacho, and the Durham-Coronado Plain (Beier et al. 2006). The linkage boundary is approximately 2 miles southeast of the E4 Alternative's southern terminus at I-10 and would not be crossed by the action corridor alternatives (Figure 3.11-1).

3.11.3.2 Protected Species

Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973, as amended, provides for the listing and protection of species designated as threatened, endangered, candidate, or proposed. Under Section 7 of the ESA, lead federal agencies are required to consult with USFWS to ensure that their actions do not jeopardize the continued existence of threatened or endangered species or result in the adverse modification of any designated critical habitat upon which they depend. As defined under Section 9 of the ESA, it is unlawful for any person to "take" a threatened or endangered species without a special permit. A "take" is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

An Official Species List of federally protected species and habitats that should be considered in an effects analysis for the proposed action was obtained from USFWS on November 15, 2017 (Appendix I, *Biological Resources Information*). That list included seven species and/or their habitat (USFWS 2017); however, one of those species, the lesser long-nosed bat, was delisted in April 2018 and therefore is excluded from further evaluation. The remaining six federally protected species are presented in Table 3.11-2. Of these species, two listed as endangered were evaluated as having the potential to occur in or adjacent to the action corridor alternatives and are described below. Designated or proposed critical habitat does not occur in the Corridor; however, proposed critical habitat for the yellow-billed cuckoo (*Coccyzus americanus*) does occur approximately 0.25 mile from the E4 Alternative (Figure 3.11-1). One additional species, the southwestern willow flycatcher (*Empidonax trailii extimus*), is known to occur in or near the Corridor study area and, therefore, is also included in Table 3.11-2.

Four federally protected species identified on the USFWS Official Species List, including California least tern (*Sterna antillarun browni*), Sonoran pronghorn (*Antilocarpa americana sonoriensis*), Northern Mexican gartersnake (*Thamnophis eques megalops*), and roundtail chub (*Gila robusta*), were excluded from further evaluation because no suitable habitats for these species were identified within 1 mile of the action corridor alternatives.

Table 3.11-2. Federally protected species evaluated for potential occurrence in the North-South Corridor

Common name	Scientific name	Habitat	Status
Southwestern willow flycatcher	*Empidonax traillii extimus*	Dense riparian habitats dominated by native cottonwoods and willows or by nonnative tamarisk	Endangered; present along the Gila River in suitable habitat
Yellow-billed cuckoo (Western distinct population segment)	*Coccyzus americanus*	Large blocks of riparian woodlands (cottonwood, willow, or tamarisk galleries)	Threatened; documented within 3 miles of project vicinity near Picacho Reservoir; proposed critical habitat at Picacho Reservoir (AGFD)
Yuma Ridgway's rail (formerly Yuma clapper rail)	*Rallus obsoletus yumanensis*	Fresh and brackish marsh habitat with dense vegetation next to the water's edge	Endangered; documented within 3 miles of project vicinity near Picacho Reservoir (AGFD)
California least tern	*Sterna antillarun browni*	Sandy beaches, sand bars, gravel pits or exposed flats along large lakes, recharge basin and wetlands	Endangered; no suitable sandy habitat near large water features in or adjacent to the action corridor alternatives
Sonoran pronghorn	*Antilocarpa americana sonoriensis*	Alluvial valleys with creosote bush-bursage and paloverde-mixed cacti/ creosote bush-bursage associations	Endangered; suitable habitat exists in the action corridor alternatives; species does not occur in the project vicinity
Northern Mexican gartersnake	*Thamnophis eques megalops*	Dense vegetation along wetlands, cienegas, stock tanks, and streamside riparian woodlands	Threatened; no suitable aquatic habitat with dense ground vegetation or streamside riparian habitat occurs in or adjacent to the action corridor alternatives
Roundtail chub	*Gila robusta*	Cool to warm waters of rivers and streams; often occupy deepest pools and eddies of large streams	Proposed threatened; no suitable aquatic habitat occurs in or adjacent to the action corridor alternatives

Source: U.S. Fish and Wildlife Service, November 15, 2017, IPaC Official Species List, Consultation Code: 02EAAZ00-2016-SLI-0401
Note: AGFD = Arizona Game and Fish Department

SOUTHWESTERN WILLOW FLYCATCHER

The southwestern willow flycatcher was federally listed as an endangered species in 1995 (60 *Federal Register* 10694). Critical habitat was initially designated for the southwestern willow flycatcher in 1997 and was later modified in 2005 (70 *Federal Register* 60886) and 2014 (78 *Federal Register* 344). Critical habitat is not designated within or near the Corridor. Southwestern willow flycatchers are neotropical migrants that breed during the late spring through summer throughout the southwestern United States. Breeding habitat for the species presently includes southern California, southern Nevada, southern Utah, Arizona, New Mexico, and southwestern Colorado; historically, western Texas and extreme northwestern Mexico were also included. Southwestern willow flycatchers migrate south by the end of September to winter in Mexico, Central America, and northern South America (Lower Colorado River Multi-Species Conservation Program 2008). An estimated 1,300 pairs remain; few populations include more than 50 pairs (USFWS 2002).

Dense riparian habitats dominated by native cottonwoods and willows or by nonnative tamarisk, with microclimatic conditions dictated by the local surroundings, are required for nesting. Other plant species closely associated with suitable nesting habitat include seepwillow (also known as mulefat; *Baccharis* spp.), boxelder (*Acer negundo*), stinging nettle (*Urtica* spp.), blackberry (*Rubus* spp.), cottonwood (*Populus* spp.), arrowweed (*Tessaria sericea*), and Russian olive (*Eleagnus angustifolia*) (USFWS 2002). Conditions such as saturated soils, standing water, or nearby streams, pools, or cienegas influence the microclimate and vegetation density component and, therefore, are important components of suitable nesting habitat (McClure et al. 2016; USFWS 2002). Height of vegetation within the patch is most often

between 2 and 30 meters; however, an understory of dense vegetation that occurs between 2 and 4 meters appears to be especially important for nesting (USFWS 2002). Habitat not suitable for nesting may be used for migration and foraging. The dense riparian vegetation required for breeding historically was rare and sparsely distributed, and is even rarer today (68 *Federal Register* 10485).

Threats to the southwestern willow flycatcher include habitat loss, degradation, fragmentation, and alteration; predation; brood parasitism by brown-headed cowbirds (*Molothrus ater*); disease; and environmental toxins. Historically, water developments that altered flows in the rivers and streams used by the species were the primary threat. However, with riparian areas presently limited, and with regrowth difficult due to changes in flows, fire has become a significant risk to remaining habitats. In addition, human disturbances at nesting sites may result in nest abandonment (USFWS 2002).

YELLOW-BILLED CUCKOO

The yellow-billed cuckoo's western distinct population segment was listed as a threatened species effective November 3, 2014, and critical habitat for the yellow-billed cuckoo was proposed on August 15, 2014 (USFWS 2014). In Arizona, the yellow-billed cuckoo was historically widespread and described as locally common (Corman and Magill 2000). Studies along the lower Colorado River system indicated rapid declines in populations between 1975 and 1983 (AGFD 2011). Major declines are likely attributable to loss and fragmentation of riparian habitat from inundation by reservoirs and flood control activities, conversion of suitable habitat to agricultural land and urban development, and the continued degradation and loss of breeding habitat (Laymon and Halterman 1987).

Breeding habitat in Arizona includes large blocks of riparian communities consisting of dense cottonwood-willow groves and mesquite bosques. The yellow-billed cuckoo prefers habitat patches greater than 42 acres in size, with a minimum of 7.4 acres of closed canopy broad-leaf vegetation (Ehrlich et al. 1988).

In Arizona, nesting activities for this migrant begin in mid- to late May, with breeding usually beginning in mid-June and ending in August (Hughes 1999). Yellow-billed cuckoos are known to occur at Picacho Reservoir, near the southeastern edge of the E4 Alternative, and where critical habitat is proposed for this species. The reservoir is surrounded by a tall, steep earthen dam. No additional suitable yellow-billed cuckoo habitat was identified in or near the action corridor alternatives.

YUMA RIDGWAY'S RAIL (FORMERLY YUMA CLAPPER RAIL)

The Yuma Ridgway's rail (*Rallus obsoletus yumanensis*), a marsh bird, was listed as endangered in March 1967, and in 2010 a *Draft Recovery Plan* was released. Typically, the Yuma Ridgway's rail is a migratory species that appears in Arizona from February to mid-September (USFWS 2009), with its current range in Arizona encompassing several major river drainages in central and southwestern Arizona, including the lower Salt and Gila Rivers. The Yuma Ridgway's rail inhabits freshwater or brackish marshes and streams. Shallow waters near uplands consisting of dense stands of cattails, sedges, bulrushes, and other wetland vegetation are preferred habitats (Haynes and Schuetze 1997; USFWS 2009). Habitat requirements include wet substructures such as mudflats, sandbars, or slough bottoms. Threats to the species include destruction and modification of marsh and wetland habitat through river channelization, dredging, and flooding and drying of marshes; diversion of water sources; wildfires; toxic levels of heavy metals, primarily selenium (AGFD 2006); and predation.

Yuma Ridgway's rails have been known to occur at Picacho Reservoir during periods with higher water levels. Currently, the volume of water directed into the reservoir does not create the habitat to support the Yuma Ridgway's rail. Suitable habitat for the Yuma Ridgway's rail habitat may occur if waters are redirected into the reservoir. No additional suitable habitat for the Yuma Ridgway's rail was identified in or near the action corridor alternatives.

Bald and Golden Eagle Protection Act

Habitat suitable for foraging bald (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) occurs across the region; however, suitable breeding habitat does not occur for either species in or adjacent to the action corridor alternatives.

Bald eagles typically build nests and occupy large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey; however, the bald eagle will forage across native desertscrub habitats and agricultural areas. The absence of trees for perching near water sources that would provide forage species generally makes the habitat in or near the action corridor alternatives a low-quality habitat for bald eagle foraging.

In Arizona, golden eagles are typically found in mountainous regions between 4,000 and 10,000 feet above mean sea level (AGFD 2002). Golden eagles build nests in steep, rugged terrain, often on sites with overhanging ledges, cliffs, or trees as cover. The golden eagle is a wide-ranging predator and, in desert habitats, the eagle usually leaves the area after the nesting season when there is no need to return to tend eggs or feed fledglings in the nest.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, was implemented for the protection of migratory birds and is administered by USFWS. Specific provisions of the statute include establishment of a federal prohibition, unless permitted by regulations, to

> pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention … for the protection of migratory birds … or any part, nest, or egg of any such bird (16 USC § 703).

Habitat destruction and alteration do not qualify as a “take” as long as these activities involve no loss of birds, eggs, or nests (FHWA 2001). Birds protected under the MBTA include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves, swifts, martins, swallows, and others, including their body parts (feathers, plumes, etc.), nests, and eggs (50 CFR § 10.13).

Many bird species protected under the MBTA occur in the Corridor. Federal-aid highway projects with the potential to result in take of birds protected under the MBTA would require avoidance or the issuance of special permits from the local USFWS jurisdiction.

Special Status Species

The AGFD On-Line Environmental Review Tool was accessed to identify known Special Status Species in AGFD’s Heritage Data Management System that have been documented within 3 miles of the project vicinity (Appendix I, *Biological Resources Information*). The AGFD information also identified predicted State of Arizona Species of Greatest Conservation Need (SGCN) and Species of Economic and Recreation Importance (SERI) that could occur in the action corridor alternatives. Special Status Species documented in the project vicinity include USFWS species of concern (SC), federally listed threatened (LT) and endangered species (LE), USFWS candidate conservation agreement species (CCA), and Arizona Native Plant Law salvage-restricted plants.

These designations include birds, mammals, fish, reptiles, amphibians, and plants. The list was reviewed to determine the potential for these species and/or suitable habitat to occur in the action corridor alternatives. Special Status Species, SGCN, and SERI, and their potential to occur in the action corridor alternatives, are listed in Table 3.11-3.

Table 3.11-3. Special Status Species, Arizona Species of Greatest Conservation Need, and Arizona Species of Economic and Recreation Importance known or predicted to occur in the action corridor alternatives

Scientific name	Common name	Habitat	Status	Occurrence: known or potential
		Birds		
Aix sponsa	Wood duck	Open water in wooded areas	SGCN	Not likely
Ammodramus savannarum perpallidus	Western grasshopper sparrow	Open fields and grasslands	SGCN	Not likely
Anthus spragueii	Sprague's pipit	Native grasslands with vegetation of intermediate height and lacking woody shrubs	SC, SGCN	Not likely
Aquila chrysaetos	Golden eagle	Open country; nest on rock ledges, cliffs, or in large trees	SGCN	Likely
Athene cunicularia hypugaea	Western burrowing owl	Variable in open, well-drained grasslands, steppes, deserts, prairies, and agricultural lands, often associated with burrowing mammals	SC, SGCN	Known
Botaurus lentiginosus	American bittern	Marshlands and very wet meadows	SGCN	Not likely
Buteo regalis	Ferruginous hawk	Open scrublands and woodlands, grasslands, semidesert grassland; during winter they will use agricultural areas	SC, SGCN	Likely
Callipepla gambelii	Gambel's quail	Dry, semidesert with tall shrubs; adjacent agricultural areas; residential areas with tall shrubs adjacent to water	SERI	Known
Charadrius montanus	Mountain plover	Flat dry terrain with short grass or bare ground, plowed fields, sandy deserts; breeds in high plains or shortgrass prairie	SC, SGCN	Not likely
Coccyzus americanus	Yellow-billed cuckoo (Western distinct population segment)	Large blocks of riparian woodlands (cottonwood, willow, or tamarisk galleries)	LT, SGCN	Known (past records)
Colaptes chrysoides	Gilded flicker	Riparian woods and saguaro deserts	SGCN	Known
Cynanthus latirostris	Broad-billed hummingbird	Riparian woods, low-elevation wooded canyons	SGCN	Likely
Empidonax traillii extimus	Southwestern willow flycatcher	Dense cottonwood/willow and tamarisk vegetation along rivers, streams, and wetlands	LE, SGCN	Known
Falco peregrinus anatum	American peregrine falcon	Near cliffs that support sufficient abundance of prey	SC, SGCN	Not likely
Glaucidium brasilianum cactorum	Cactus ferruginous pygmy-owl	Mature cottonwood and willow galleries, mesquite bosques, and Sonoran desertscrub	SC, SGCN	Not likely
Haliaeetus leucocephalus	Bald eagle	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey	SC, SGCN	Likely

Table 3.11-3. Special Status Species, Arizona Species of Greatest Conservation Need, and Arizona Species of Economic and Recreation Importance known or predicted to occur in the action corridor alternatives

Scientific name	Common name	Habitat	Status	Occurrence: known or potential
Melanerpes uropygialis	Gila woodpecker	Low-elevation deserts with woody plants large enough to provide nest sites, including areas with saguaro cactus and cottonwoods	SGCN	Known
Melospiza lincolnii	Lincoln's sparrow	Nests in damp, dense brushy areas in sunny clearings; winters in grassy patches around brush/trees, often near water	SGCN	Likely
Melozone aberti	Abert's towhee	Dense riparian brush	SGCN	Known
Passerculus sandwichensis	Savannah sparrow	Open grassy or weedy habitats	SGCN	Likely
Peucaea carpalis	Rufus-winged sparrow	Desert grasslands and sandy washes with thorn scrub	SGCN	Not likely
Progne subis Hesperia	Desert purple martin	Nests in tree cavities and saguaro cactus during spring and summer months	SGCN	Likely
Rallus obsoletus yumanensis	Yuma Ridgway's rail	Inhabits freshwater or brackish marshes with dense stands of cattails, sedges, bulrushes, and other wetland vegetation	LE, SGCN	Known (past records)
Setophaga petechia	Yellow warbler	Wet, brushy areas such as willow thickets, field edges	SGCN	Likely
Toxostoma lecontei	Le Conte's thrasher	Extremely arid and sparsely vegetated plains with saltbush, creosote bush, and lots of bare sandy ground	SGCN	Likely
Troglodytes pacificus	Pacific wren	Damp, shaded areas	SGCN	Not likely
Vireo bellii arizonae	Arizona Bell's vireo	Lowland riparian areas with dense, low, shrubby vegetation	SGCN	Likely
Zenaida asiatica	White-winged dove	Brushlands and suburban areas with trees	SERI	Known
Zenaida macroura	Mourning dove	Urban areas, agriculture fields, and open desertscrub habitats	SERI	Known
Mammals				
Ammospermophilus harrisii	Harris' antelope squirrel	Rocky desert with cactus and shrubs	SGCN	Likely
Corynorhinus townsendii pallescens	Pale Townsend's big-eared bat	Day roosts found in mines and caves from desertscrub up to woodland and coniferous forests; night roosts may be in abandoned buildings; hibernate in cold caves, lava tubes, and mines mostly in uplands and mountains	SC, SGCN	Likely
Dipodomys spectabilis	Banner-tailed kangaroo rat	Desert grasslands with scattered shrubs	SGCN	Likely
Euderma maculatum	Spotted bat	Varied; most captured in dry, rough desertscrub; few captured/heard in Ponderosa pine forest	SC, SGCN	Likely

Table 3.11-3. Special Status Species, Arizona Species of Greatest Conservation Need, and Arizona Species of Economic and Recreation Importance known or predicted to occur in the action corridor alternatives

Scientific name	Common name	Habitat	Status	Occurrence: known or potential
Eumops perotis californicus	Greater Western bonneted bat	Lower/upper Sonoran desertscrub near cliffs; prefers rugged/rocky canyons with abundant crevices	SC, SGCN	Likely
Lasiurus blossevillii	Western red bat	Riparian and wooded areas	SGCN	Not likely
Lasiurus xanthinus	Western yellow bat	Not clearly understood: may be associated with Washington fan palm trees, other palms, or other leafy vegetation such as sycamores, hackberries, and cottonwoods	SGCN	Likely
Leopardus pardalis	Ocelot	Variable, including thorn scrub, semiarid woodland, tropical deciduous and semideciduous forest, subtropical forest, lowland rainforest, palm savanna, and seasonally flooded savanna woodland	LE, SGCN	Not likely
Leptonycteris curasoae yerbabuenae	Lesser long-nosed bat	Desertscrub habitat with agave and columnar cacti present as food plants	SGCN	Likely
Lepus alleni	Antelope jackrabbit	Grassy slopes at moderate elevations; most common where grass grows well under desert shrubs	SGCN	Likely
Macrotus californicus	California leaf-nosed bat	Sonoran desertscrub; primarily roosts in mines, caves, and rock shelters	SC, SGCN	Likely
Myotis occultus	Arizona myotis	Summer: near water in ponderosa pine and oak-pine woodland; along permanent water in riparian areas in some desert areas	SC, SGCN	Not likely
Myotis velifer	Cave myotis	Desertscrub of creosote, brittlebush, paloverde, and cacti; roosts in caves, tunnels, mineshafts, under bridges, and sometimes in buildings within a few miles of water	SC, SGCN	Likely
Myotis yumanensis	Yuma myotis	Varied upland and lowland habitats, including riparian, desertscrub, moist woodlands, and forests; prefer cliffs/rocky walls near water	SC, SGCN	Not likely
Nyctinomops femorosaccus	Pocketed free-tailed bat	Desertscrub and arid lowland; roosts in high crevices in rugged canyons; may roost in buildings or under roof tiles	SGCN	Likely
Odocoileus hemionus	Mule deer	Wide-ranging: grasslands, semideserts, scrublands, forests	SERI	Known
Odocoileus virginianus	White-tailed deer	Woodlands of chaparral, oak, and pine with interspersed clearings	SGCN	Not likely
Ovis canadensis mexicana	Mexican desert bighorn sheep	Desert mountain ledges and grassy basins	SGCN, SERI	Not likely
Panthera onca	Jaguar	Found in Sonoran desertscrub up through subalpine conifer forest	LE, SGCN	Not likely
Pecari tajacu	Javelina	Desert, chaparral, oak, grasslands	SERI	Known

Table 3.11-3. Special Status Species, Arizona Species of Greatest Conservation Need, and Arizona Species of Economic and Recreation Importance known or predicted to occur in the action corridor alternatives

Scientific name	Common name	Habitat	Status	Occurrence: known or potential
Perognathus amplus	Arizona pocket mouse	Flat areas with varying desertscrub vegetation or bunch grasses	SGCN	Likely
Perognathus longimembris	Little pocket mouse	Desert and open grasslands	SGCN	Likely
Puma concolor	Mountain lion	Desert mountains with broken terrain and steep slopes, along with dense vegetation, caves, rocky crevices that provide shelter	SERI	Likely
Tadarida brasiliensis	Brazilian free-tailed bat	Desertscrub, coniferous forest, and coniferous woodlands	SGCN	Likely
Vulpes macrotis	Kit fox	Desertscrub, chaparral, and grasslands	SGCN	Known
Fish				
Agosia chrysogaster	Gila longfin dace	Wide-ranging from intermittent, hot, low-desert streams to clear, cool brooks at higher elevations	SC, SGCN	Known
Catostomus clarkii	Desert sucker	Rapids/flowing pools of streams/ rivers primarily over bottoms of gravel-rubble with sandy-silt in the interstices	SC, SGCN	Known
Catostomus insignis	Sonora sucker	Varied: warm-water rivers to trout streams	SC, SGCN	Known
Cyprinodon macularius	Desert pupfish	Shallow waters of springs, small streams, and marshes	LE, SGCN	Not likely
Reptiles				
Chilomeniscus stramineus	Variable sandsnake	Upland desertscrub; washes or drainages with fine to coarse sand and leaf litter; can be above or below upland elevation	SGCN	Likely
Chionactis occipitalis klauberi	Tucson shovel-nosed snake	Creosote bush-mesquite floodplain habitats with soft, sandy loams, sparse gravel; scattered sand hammocks crowned with mesquite or other desert shrubs	SC, SGCN	Known
Coluber bilineatus	Sonoran whipsnake	Upland desertscrub foothills and mountains, semidesert grassland, interior chaparral, Madrean evergreen woodland, Great Basin conifer woodland	SGCN	Likely
Crotalus tigris	Tiger rattlesnake	Upland desertscrub foothills/mountains, interior chaparral, Madrean evergreen woodland	SGCN	Not likely
Crotaphytus nebrius	Sonoran collared lizard	Sonoran desertscrub on hillsides, canyons, mountain slopes, and rocky bajadas	SGCN	Not likely
Gopherus morafkai	Sonoran desert tortoise	Primarily rocky (often steep) hillsides and bajadas of Sonoran desertscrub but may encroach into desert grassland, juniper woodland, interior chaparral habitats, and even pine communities; washes and valley bottoms may be used in dispersal	CCA, SGCN	Known

Table 3.11-3. Special Status Species, Arizona Species of Greatest Conservation Need, and Arizona Species of Economic and Recreation Importance known or predicted to occur in the action corridor alternatives

Scientific name	Common name	Habitat	Status	Occurrence: known or potential
Heloderma suspectum	Gila monster	Sonoran desert; undulating rocky foothills, bajadas, canyons	SGCN	Known
Kinosternon sonoriense sonoriense	Desert mud turtle	Springs, creeks, ponds, waterholes of intermittent streams	SGCN	Likely
Micruroides euryxanthus	Sonoran coralsnake	Above flats in or near rocky or gravelly drainages, mesquite-lined washes, and canyons; upland desert/bajadas with diverse soil types	SGCN	Likely
Phrynosoma goodei	Goode's horned lizard	Sonoran desertscrub in the Lower Colorado River Valley; flat, open areas with sandy or loamy soils	SGCN	Likely
Phrynosoma solare	Regal horned lizard	Valleys and on rocky bajadas within Arizona upland desertscrub, Chihuahuan desertscrub, and semidesert grassland	SGCN	Likely
Phyllorhynchus browni	Saddled leaf-nosed snake	Upland desertscrub in association with alluvial soils and bajadas, sometimes Lower Colorado River desertscrub flats	SGCN	Not likely
Xantusia bezyi	Bezy's night lizard	Crevice dweller of large rock outcroppings, cliff faces, and boulder fields, Arizona upland desertscrub, interior chaparral, and woodland communities	SGCN	Not likely
Amphibians				
Anaxyrus retiformis	Sonoran green toad	Washes and near water in mesquite-grassland, creosotebush desert, and upland saguaro-paloverde desertscrub	SGCN	Not likely
Incilius alvarius	Sonoran desert toad	Sonoran/Chihuahuan Desertscrub, Semidesert Grassland, Madrean Evergreen Woodland; breeds in temporary pools formed by monsoon rains	SGCN	Likely
Lithobates yavapaiensis	Lowland leopard frog	Sonoran Desertscrub, Great Basin Conifer Woodland, Madrean Evergreen Woodland; permanent/semipermanent water; riparian areas, ponds, cienegas, springs, cattle tanks, wetlands, and ditches	SC, SGCN	Likely
Plants				
Abutilon parishii	Pima Indian mallow	Rocky hillsides, cliff bases, canyon bottoms, lower side slopes, ledges of canyons among rocks and boulders; mesic habitat with full sun in higher Sonoran desertscrub	SC, salvage-restricted	Known
Ferocactus cylindraceus	Desert barrel cactus	Gravelly or rocky hillsides, canyon walls, alluvial fans, wash margins on igneous and limestone substrates	Salvage-restricted	Known

Source: Arizona Game and Fish Department, November 16, 2017, On-Line Environmental Review Tool, Project ID: HGIS-02473

Notes: CCA = U.S. Fish and Wildlife Service candidate conservation agreement species, LE = federally listed endangered species, LT = federally listed threatened species, SC = species of concern, SERI = State of Arizona Species of Economic and Recreation Importance, SGCN = State of Arizona Species of Greatest Conservation Need

Arizona Native Plant Act

Many plants that occur in the action corridor alternatives fall into one of five groups that are protected by the Arizona Native Plant Act (A.R.S. §§ 3-901 et seq.). Plants protected by the Act are often unusual or rare, have high value for landscaping, or are long-lived and not easily replaced. They are, therefore, susceptible to theft, vandalism, or unnecessary destruction resulting from development (Arizona Department of Agriculture 2009). The greatest density and variety of protected plant species that occur in the action corridor alternatives are in previously undeveloped areas; however, protected native plants are located throughout the area. Commonly recognized protected native plants in the action corridor alternatives include, but are not limited to, saguaro, cholla (*Cylindropuntia* spp.), bundle hedgehog cactus (*Echinocereus fasiculatus* var. *fasiculatus*), barrel cactus (*Ferocactus* sp.), ocotillo (*Fouquieria splendens*), ironwood (*Olneya tesota*), paloverde (*Parkinsonia* sp.), and mesquite.

Invasive Species

Invasive species surveys have not been conducted in the study area; however, invasive species including Tamarisk (*Tamarix ramosissima*), Russian-thistle (*Salsola kali*), Sahara mustard (*Brassica tournefortii*), foxtail brome (*Bromus rubens*), Bermuda grass (*Cynodon dactylon*), and buffelgrass (*Pennisetum ciliare*) were observed in the study area. Based on Executive Order 13112, Invasive Species, dated 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."

3.11.4 Environmental Consequences

This section evaluates the potential impacts on vegetation and wildlife resources by the action corridor alternatives, as well as the No-Action Alternative.

3.11.4.1 No-Action Alternative

No direct impacts on biological resources would occur in the Corridor under the No-Action Alternative. Disturbance and displacement of habitats adjacent to existing roadways and vehicle collisions with wildlife could increase as future traffic volumes rise and as development continues.

3.11.4.2 Action Corridor Alternatives

Impacts Common to All Action Corridor Alternatives

All action corridor alternatives would result in the permanent loss of mixed native desertscrub habitat, agricultural lands, and developed areas, resulting in increased habitat fragmentation across the length of the Corridor. The overall effect of increased fragmentation would be lessened because existing agricultural fields, urban and rural development, roadways, railroads, and engineered hydrologic networks already bisect and cover widespread portions of the Corridor and vicinity (Figure 3.11-1). The westernmost action corridor alternatives would result in fewer impacts on wildlife, habitat, and wildlife resources than the action corridor alternatives to the east as a result of the extent of development associated with the westernmost action corridor alternatives. The CAP Canal is an existing constraint to east-to-west wildlife movement, and action corridor alternatives west of the CAP Canal would result in fewer impacts on terrestrial wildlife movement through the area and less overall habitat fragmentation as a result of the already isolated habitat on the western side of the canal. Existing drainage structures and roads cross the CAP Canal and, although not constructed for use by wildlife, may be used to a limited extent by some species. Depending on development and the ability for terrestrial species to access

habitat, wildlife-friendly crossings along the action corridor alternatives may be considered at locations that match suitable crossings occurring along the CAP Canal.

All action corridor alternatives would result in impacts on mammals and reptiles, including permanent loss of habitat from within the new freeway footprint, habitat fragmentation, and displacement of animals from habitat adjacent to the new roadway. These impacts could result in lower population sizes, reduced resources and increased competition, impediments to movement, and direct mortality resulting from vehicle collisions. For many of these species, the CAP Canal, existing roads, and irrigation channels represent existing barriers to wildlife movement. Larger mammals could move across the CAP Canal at discrete locations where road bridges and uncovered drainage structures occur and along the Gila River, but their movement is severely altered by the canal. For smaller mammals and reptiles, the CAP Canal, existing road infrastructure, and irrigation network represent a reflective boundary. Various segments of each action corridor alternative built on a new alignment would add another semipermeable barrier. This may cause different and marginally greater impacts on wildlife movement and mortality.

Impacts on birds would include a permanent loss of habitat, disturbance from human activity along the roadway, and direct mortality from collisions with vehicles. Vegetation clearing and road construction would result in a loss of bird habitat used for some or all of the following activities: foraging, resting, breeding, perching, and nesting for resident birds and resting and foraging for migrating birds. This could result in decreased reproduction, behavior modification, increased mortality, and displacement to other habitat, increasing competition. Habitat quality adjacent to the new roadway may also be reduced because of increased disturbance from human activity and invasive species. Construction of the proposed action is not anticipated to affect either bald or golden eagles.

Temporary construction impacts would occur during and after construction because disturbed areas would have reduced habitat quantity and quality. During construction, artificial lighting and noise and dust generated by equipment and human activity could temporarily displace birds from foraging, resting, and nesting habitat. Disturbance-related displacement from favored breeding habitats could result in birds competing with other birds for suitable replacement habitats. This could result in nesting in less-favored areas where nests may be damaged or accessed more easily by predators, which could limit survival of offspring or adults. Other animal species also could be affected by temporary construction impacts such as reduced air quality attributable to dust, reduced water quality as a result of incidental discharge, and noise.

Once construction is complete, disturbed native desertscrub habitats immediately adjacent to the new road embankment would be addressed according to a revegetation plan. Following construction, habitat quality adjacent to the roadway may be reduced because of increased disturbance from human activity, noise, and reduced air quality attributable to vehicular emissions. Operation of the roadway would cause a long-term increase in human activity and noise levels that can create avoidance zones that extend well beyond the road for certain bird species (Reijnen and Foppen 2006). Use of the roadway would vary by time of day, and species active during daylight may be affected more than species active at night when traffic volumes and noise levels would be less.

Impacts by Segment

SEGMENT 1

All Segment 1 action corridor alternatives would remove large, homogenous areas of creosote desertscrub habitat (Figure 3.11-1). The E1a and E1b Alternatives would remove similar amounts of desertscrub habitat. Likewise, the W1a and W1b Alternatives would remove similar amounts of desertscrub habitat; however, the E1a and E1b Alternatives would remove a larger amount compared with the W1a and W1b Alternatives. The E1a and E1b Alternatives would remove the same amount of agricultural land and the W1a and W1b Alternatives would remove the same amount of agricultural land;

however, the W1a and W1b Alternatives would remove a larger amount compared with the E1a and E1b Alternatives.

The E1b and W1b Alternatives would cross the CAP Canal and flood control structures, resulting in potential impacts on mesquite/shrub habitat along these structures. The mesquite habitat is east of the CAP Canal and was planted along the flood control structures as replacement habitat for habitat losses resulting from flood control projects in that area. The E1a Alternative would also cross the CAP Canal, but in a location that avoids flood control structures and planted habitat. The E1a and E1b Alternatives would generally have a greater impact on biological resources compared with the W1a and W1b Alternatives because they would cross less-disturbed desertscrub habitat with numerous ephemeral washes and stock ponds that provide better-quality habitat for species.

Although all habitat in the area is currently fragmented to some degree by transportation and other facilities—such as US 60, SR 24, arterial streets, UPRR, Magma Arizona Railroad, and the CAP Canal—the E1a and E1b Alternatives would increase habitat fragmentation compared with the W1a and W1b Alternatives because the W1a Alternative and most of the W1b Alternative are located between more intensely developed lands and the CAP Canal and, therefore, would be built in a more highly fragmented habitat. The E1a and E1b Alternatives would be similar in their impact on east-to-west wildlife connectivity and, likewise, the W1a and W1b Alternatives would be similar. However, the E1a and E1b Alternatives would have a greater impact on east-to-west wildlife connectivity than the W1a and W1b Alternatives because of their location in larger homogenous and contiguous areas of creosote desertscrub east of the CAP Canal. The E1a and E1b Alternatives would be similar in their impact on north-to-south wildlife connectivity and would have a greater impact than the W1a and W1b Alternatives because of their much longer east-to-west SR 24 connections. The W1b Alternative would have a greater impact on north-to-south wildlife connectivity than the W1a Alternative because a segment of that alternative is located on the eastern side of the CAP Canal and would cross to the western side.

SEGMENT 2

All Segment 2 action corridor alternatives would remove greater amounts of agricultural land than creosote desertscrub habitat (Figure 3.11-1). The E2a and E2b Alternatives would remove the same amount of desertscrub habitat and the W2a and W2b Alternatives would remove similar amounts of desertscrub habitat; however, the W2a and W2b Alternatives would remove a larger amount compared with the E2a and E2b Alternatives. All Segment 2 action corridor alternatives would affect mesquite habitat associated with a minor drainage feature within the desertscrub habitat. The E2a and E2b Alternatives would affect a greater amount of the mesquite habitat than the W2a and W2b Alternatives, although the differences are minor. Generally, all Segment 2 action corridor alternatives would be similar in their impacts on biological resources.

All habitat in Segment 2 is currently fragmented by transportation facilities, canals, and development of various types. All Segment 2 action corridor alternatives would have a similar, low impact on habitat fragmentation. All Segment 2 action corridor alternatives would be similar in their impact on wildlife connectivity because of the lack of defined movement corridors in this area.

SEGMENT 3

All Segment 3 action corridor alternatives would remove greater amounts of agricultural land than desertscrub habitat (Figure 3.11-1), and all Segment 3 action corridor alternatives would remove a similar acreage of desertscrub habitat. The E3a and E3c Alternatives would remove a similar amount of agricultural land but more than the E3b and E3d Alternatives. The W3 Alternative would remove the least agricultural land. The desertscrub in Segment 3 represents the least degraded, intact, large areas of habitat associated with the Corridor. From the north, each action corridor alternative would cross creosote desertscrub that transitions into Mixed Paloverde-Cacti Desertscrub before crossing Hunt Highway. South

of Hunt Highway, each action corridor alternative would cross agricultural land that abuts the Gila River and then cross the Gila River before reentering agricultural land. The action corridor alternatives then continue across agricultural land interspersed with developed land and remnant parcels of desertscrub habitat.

Suitable Sonoran desert tortoise habitat would be removed by all Segment 3 action corridor alternatives in the Mixed Paloverde-Cacti Desertscrub habitat. Construction of any of the action corridor alternatives would not affect Sonoran desert tortoise populations or viability because the area where suitable habitat occurs is highly fragmented and isolated.

Segment 3 action corridor alternatives would increase habitat fragmentation in the most unaltered but isolated Mixed Paloverde-Cacti Desertscrub habitat identified in the Corridor, an area bounded by the CAP Canal, Hunt Highway, UPRR, agricultural land, and development. All Segment 3 action corridor alternatives would potentially add to the existing negative effects on east-to-west wildlife connectivity along the Gila River that currently result from gravel mining and development; however, any action corridor alternative crossing the Gila River would be bridged and would not present a barrier to wildlife. All action corridor alternatives would also add to the impacts on east-to-west wildlife connectivity that currently result from the existing CAP and Florence-Casa Grande Canals that are barriers east of the action corridor alternatives.

SEGMENT 4

All action corridor alternatives in Segment 4 would remove degraded desertscrub, agricultural land, and developed areas. The W4 Alternative would remove less desertscrub habitat and remove more agricultural land than the E4 Alternative. Although Segment 4 action corridor alternatives would remove degraded desertscrub habitat, there would be minimal impacts on habitat fragmentation because this habitat is located within or along the periphery of agricultural land that is currently highly fragmented. The Segment 4 action corridor alternatives would add to the existing impacts on east-to-west wildlife connectivity that currently result from the CAP and Florence-Casa Grande Canals, which are existing barriers east of the Segment 4 action corridor alternatives.

The Segment 4 action corridor alternatives are not likely to affect the yellow-billed cuckoo or Yuma Ridgway's rail because an 1,800-foot separation exists between the nearest potential suitable habitat for these species at Picacho Reservoir and the E4 Alternative, the closest Segment 4 action corridor alternative. The Segment 4 action corridor alternatives would not affect proposed yellow-billed cuckoo critical habitat identified at Picacho Reservoir.

3.11.5 Potential Avoidance, Minimization, and Mitigation Strategies

Mitigation strategies for all action corridor alternatives include avoidance, minimization, and mitigation. The following mitigation measures are examples of measures that could be implemented to avoid, minimize, and mitigate impacts on protected species; to comply with state and federal regulations; and to reduce habitat fragmentation, wildlife displacement, impediments to movements, and collisions.

- During the design phase, ADOT would coordinate with federal and state wildlife agencies, as required, to determine whether any species-specific mitigation measures would be required.
- Invasive species in the project footprint would be treated according to an invasive species management plan prior to construction. ADOT would continue standard practices for addressing noxious and invasive species during operation and maintenance of the facility.
- To comply with the Arizona Native Plant Act, ADOT would salvage plants on site and/or notify the Arizona Department of Agriculture so that it could determine the disposition of those plants.

- ADOT would conduct preconstruction surveys for species such as burrowing owls prior to construction in all suitable habitats that would be disturbed. If the species are located during construction, the contractor would stop work at that location and the species would be relocated from the project area, as appropriate.
- ADOT would have a permitted avian biologist, approved by USFWS and AGFD, conduct protocol surveys for southwestern willow flycatchers, yellow-billed cuckoos, and Yuma Ridgway's rails in suitable habitats within the study area and 500 feet of disturbance areas to determine their presence or absence prior to initiation of the Tier 2 process. The surveys would be of adequate duration to verify potential nest sites.
- If any Sonoran Desert tortoises are encountered during construction, the contractor would adhere to AGFD's *Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects*, revised September 22, 2014.
- To avoid the introduction of noxious and invasive species seeds, and to avoid noxious and invasive species seeds from entering/leaving the sites, all construction equipment should be washed and free of all attached plant/vegetation and soil/mud debris prior to entering/leaving the construction sites.
- ADOT would coordinate with AGFD and other stakeholders to determine wildlife connectivity data needs and study design. ADOT would facilitate implementation of identified studies prior to the initiation of the Tier 2 process, given the timeline required (likely 2 to 4 years) to collect and analyze sufficient data before draft design plans begin to limit the possible mitigations. ADOT and the stakeholders would identify potential crossing structures, design features, and supporting mitigation or conservation necessary to facilitate the movement of wildlife through the roadway barrier, and would incorporate the solutions into subsequent Tier 2 studies.
- Active nest surveys may be conducted if clearing, grubbing, or tree/limb removal would take place during the bird breeding season (February 1 to August 31). Such surveys would be conducted prior to removal of the trees/limbs.
- ADOT would continue to honor its commitments within the Candidate Conservation Agreement for the Sonoran desert tortoise in Arizona (USFWS 2015).
- Any future North-South Freeway segments selected for construction that are located within Sonoran desert tortoise habitat would follow ADOT's existing mitigation strategies. ADOT has developed comprehensive Sonoran desert tortoise mitigation that includes, but is not limited to, education of contractors and ADOT staff regarding tortoise awareness, preconstruction surveys, relocation of tortoises, on-site monitoring of construction activities, and best management practices designed to reduce potential tortoise mortalities during construction.

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts. Chapter 4, *Indirect and Cumulative Impacts*, contains further discussion of potential impacts on biological resources and strategies to address such impacts.

3.11.6 Subsequent Tier 2 Analysis

Once funding has been initiated, the subsequent analysis of biological resources during the Tier 2 study would involve the preparation of a biological evaluation that would address potential impacts on the southwestern willow flycatcher, yellow-billed cuckoo and its proposed critical habitat, and the Yuma Ridgway's rail. ADOT would have a permitted avian biologist conduct protocol surveys for southwestern willow flycatchers, yellow-billed cuckoos, and Yuma Ridgway's rails to determine occupancy of suitable habitat prior to initiation of the Tier 2 process. Accordingly, Section 7 consultation would be initiated with USFWS prior to approval of the Tier 2 NEPA decision document, should it be determined that the

proposed action may affect the southwestern willow flycatcher, yellow-billed cuckoo, Yuma Ridgway's rail, or proposed critical habitat for the yellow-billed cuckoo. Prior to and during the Tier 2 analysis, ADOT would coordinate with AGFD to develop mitigation strategies. Mitigation strategies may include design features and applicant proposed measures, best management practices, mitigation measures required by USFWS in response to potential environmental impacts identified during the Tier 2 study, and avoidance of occupied habitat and/or compensation for impacts on habitat deemed suitable for habitation by southwestern willow flycatchers, yellow-billed cuckoos, and Yuma Ridgway's rails. In addition, if it is determined project-related activities would occur in suitable habitat during the breeding season, ADOT would have a qualified avian biologist, permitted by USFWS and AGFD, conduct protocol surveys for southwestern willow flycatchers, yellow-billed cuckoos, and Yuma Ridgway's rails in suitable habitat within the project area and within 500 feet of disturbance areas. The surveys would be of adequate duration to verify potential nest sites. In addition, future coordination with AGFD and USFWS regarding wildlife connectivity would be conducted early in the Tier 2 studies.

3.11.6.1 Conclusion

All action corridor alternatives would result in permanent loss of habitat in the new freeway footprint, habitat fragmentation, displacement of wildlife from habitat adjacent to the new freeway, and direct mortality from collisions with vehicles. These impacts could result in decreased reproduction, behavior modification, increased mortality, and increased competition. The CAP Canal, existing roads, and irrigation channels represent existing barriers to wildlife movement. Various segments of each action corridor alternative built on a new alignment would add another semipermeable barrier. This may cause different and marginally greater impacts on wildlife movement and mortality.

Development of the proposed action is not expected to greatly affect or imperil the populations of any species. Actual impacts of the action corridor alternatives on wildlife species would be reduced by avoidance and minimization measures for design and construction. Specific mitigation or commitments would be developed during preparation of the biological evaluation and in coordination with AGFD.

3.12 Hydrology, Floodplains, and Water Resources

This section describes the hydrology, floodplains, and water resources in the study area and potential impacts on those resources as a result of the proposed action. Several topics related to water resources are included: surface water hydrology, water quality, groundwater, and floodplains. Additional information about issues related to water resources is in Section 3.13, *Waters of the United States*.

3.12.1 Regulatory Context

Executive Order 11988 (dated May 24, 1977) and Federal Emergency Management Agency (FEMA) regulations require that floodplain encroachments avoid adverse impacts and minimize development of floodplains where there is a practicable alternative.

Section 404 of the Clean Water Act (CWA) requires that a permit be obtained from the U.S. Army Corps of Engineers (USACE) for the discharge of fill material into waters of the United States (Waters). Section 401 of the CWA requires that a water quality certificate be obtained from ADEQ. See Section 3.13, *Waters of the United States*, for further information regarding CWA requirements.

The existing FRSs in the study area are considered dams under A.R.S. § 45-1201, and all but one are subject to regulation by ADWR. Improvements that affect the structures would require ADWR approval.

Arizona's Groundwater Management Code was enacted in 1980. It provides a comprehensive management framework for groundwater that is administered by ADWR. Six key provisions of this code are: (1) groundwater rights, (2) prohibition of irrigating new agricultural land within a designated Active Management Area (AMA), (3) management plans and conservation targets for the AMAs, (4) 100-year assured water supply for new developments, (5) metering at all large wells, and (6) annual water withdrawal and use reporting.

Under Section 1424(e) of the Safe Drinking Water Act, EPA designated the Upper Santa Cruz and Avra Valley Basin, which underlies the southern portion of the study area, as a sole source aquifer. The aquifer is the sole or principal drinking water source for the area and, if contaminated, would create a hazard to public health. As a result of this designation, proposed projects receiving federal financial assistance with the potential to contaminate the designated sole source aquifer are subject to EPA review.

3.12.2 Methodology

The watersheds contributing runoff to the Corridor were delineated on USGS topographic maps to identify flow patterns, estimate the magnitude of runoff on the action corridor alternatives, and identify major watercourses and features that may be affected by the action corridor alternatives. Existing data and reports were reviewed to further identify drainage patterns and features that may be affected by the action corridor alternatives. FEMA Flood Insurance Rate Maps were reviewed to identify the locations and extent of floodplains in the study area to determine the relationship of the proposed action to 100-year floodplain boundaries.

The groundwater evaluation presented in this section was based on available information on local groundwater resources, including data from ADWR. The evaluation relied on existing data sources and did not include field investigation.

3.12.3 Affected Environment

3.12.3.1 Surface Water

Surface flow crosses the study area flowing west along the length of the proposed action. The study area's surface waters are shown on Figures 3.12-1 and 3.12-2.

Figure 3.12-1. Surface waters, Segments 1 and 2

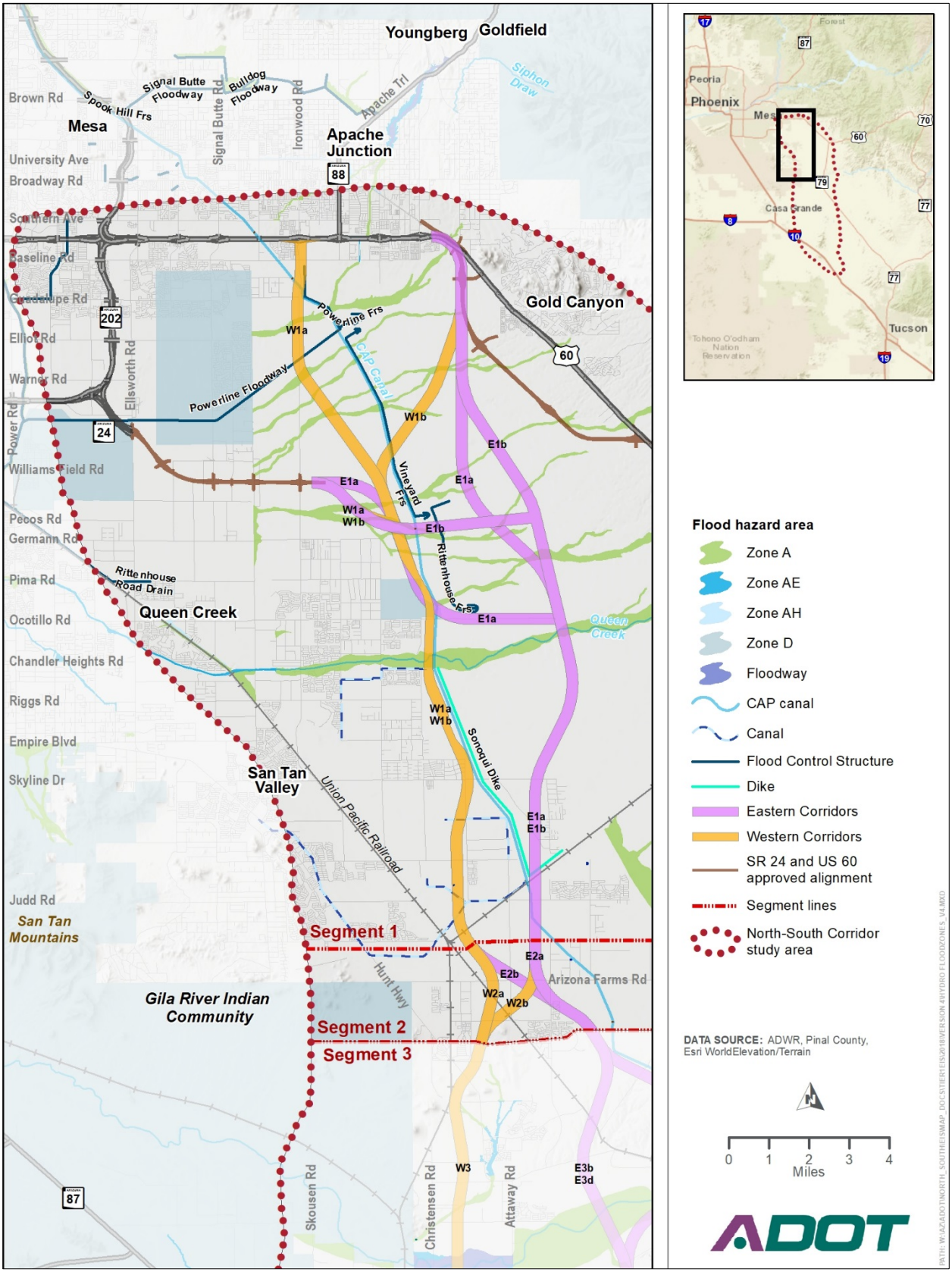
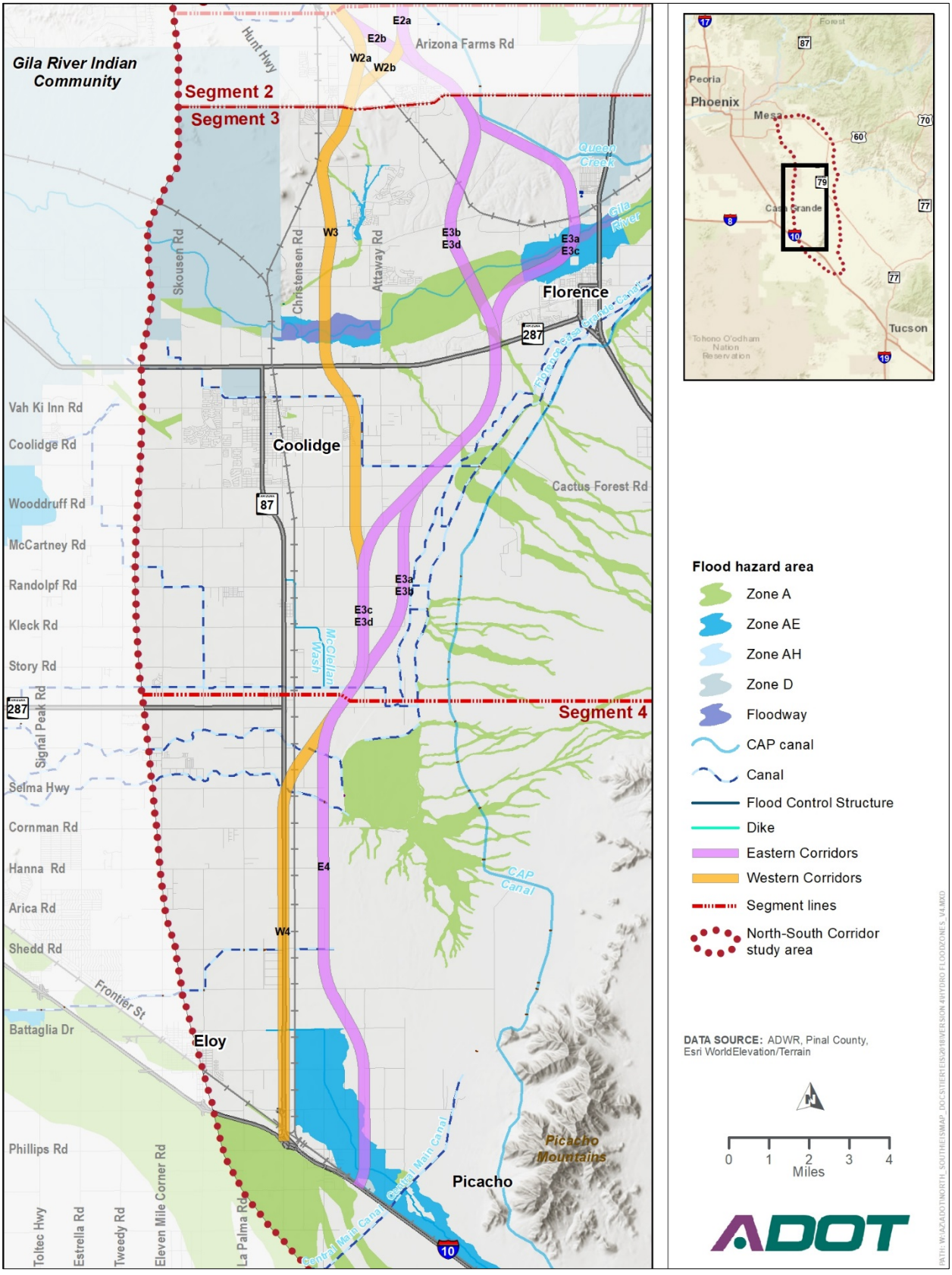


Figure 3.12-2. Surface waters, Segments 3 and 4



All of the washes are *ephemeral*—normally dry but flowing in response to precipitation. The most notable single water source is the Gila River, which crosses through Florence in the middle of the study area.

Significance of Ephemeral and Intermittent Streams

Because ephemeral and intermittent stream channels support higher moisture content and an increased abundance of vegetation, microenvironments supporting both unique microclimates and microhabitats are created in and around these areas and provide important refuge sites for wildlife that could not otherwise escape from the harsh desert climate. The Sonoran Desert is characterized by low, highly variable levels of annual precipitation. Riparian ecosystems occupy just a small portion of the overall landscape. Those riparian ecosystems support significant biological diversity and influence numerous processes including hydrology, geomorphology, and other ecological processes. In addition, riparian habitats are important for many species and are essential for their survival. Previous studies indicate that for more than 80 percent of terrestrial vertebrates and over 50 percent of all nesting birds in the arid Southwest, riparian habitat is critical (Johnson et al. 1977; Krueper 1993; Levick et al. 2008).

Ongoing development of watersheds in the arid Southwest indicates that widespread effects on downstream water quality and ecosystem health may be a direct result of impacts on ephemeral and intermittent stream channels (headwaters). Sediment transport, which includes a wide range of particle types and sizes, is a major function of arid ephemeral stream networks. Removal or fill of headwaters or small upstream channels of a drainage network ultimately increases downstream sedimentation and thus negatively affects aquatic species, channel stability, and overall stream productivity (Levick et al. 2008). Conversely, small upstream channels or headwaters replaced with paved or lined floodways could decrease sediment production and increase downstream erosion. Streamflows of ephemeral and intermittent desert streams that are affected by development have been shown to diminish the vibrancy of riparian biological communities and transform floodplains into dry terraces. Although difficult to precisely measure because of a number of variables, groundwater recharge in the arid Southwest may also be affected by ephemeral streams.

In arid environments such as the Sonoran Desert in Arizona, cryptobiotic soil crusts consisting of mosses, algae, microfungi, lichen, and cyanobacteria on and below the soil help stabilize the soil, hold moisture, stimulate plant growth, and fix carbon and nitrogen (Levick et al. 2008). Vegetation occurring in ephemeral stream channels assists with resource retention and ecological processes.

Major Washes and Streams in the Study Area

Washes and streams in the study area generally flow to the southwest and originate from the mountains east and northeast of the study area. Major named washes and streams in the study area include:

- Siphon Draw – Approximately 9 linear miles of Siphon Draw are within the study area. Siphon Draw originates in the Superstition Mountains east of the study area and flows southwest to Roosevelt Canal outside the study area, eventually joining the Gila River. Siphon Draw is approximately 10 to 90 feet wide in the study area.
- Weekes Wash – Approximately 3 linear miles of Weekes Wash are within the study area. Weekes Wash originates in the Goldfield Mountains north of the study area and flows south into Siphon Draw just east of the CAP Canal. Weekes Wash is approximately 15 to 20 feet wide in the study area.
- Queen Creek – Approximately 18 linear miles of Queen Creek are within the study area. Queen Creek originates in the Superstition Mountains east of the study area. Queen Creek flows southwest across the northern portion of the study area, crosses the CAP Canal in the central portion of the study area, and flows into the Gila River approximately 20 miles west of the study area. Sand and gravel mines operate in portions of the Queen Creek streambed. Queen Creek is approximately 50 to 3,300 feet wide in the study area.

- McClellan Wash – Approximately 26 linear miles of McClellan Wash are within the study area. McClellan Wash originates east of the Picacho Mountains, crosses the southern portion of the study area, and flows south toward I-10. It is then diverted northwest along I-10 where the wash spreads into many smaller channels and sheet flow as it meanders through the flat lands of the Eloy area. Constructed diversions direct flows around agricultural fields, but the wash generally flows to the northwest along I-10 to the Santa Rosa Canal. McClellan Wash is approximately 10 to 60 feet wide in the study area.
- Gila River – The Gila River is a 650-mile-long tributary of the Colorado River, to which the other drainage crossings are tributary. Flow in the Gila River is seasonal and intermittent, influenced by upstream diversions for irrigation. Approximately 19 linear miles of the Gila River channel are within the study area.

  The Gila River is the largest linear drainage feature in the study area. The major tributaries include Queen Creek and Siphon Draw, which cross the northern portion of the study area, and McClellan Wash, which crosses the southern portion. Queen Creek and Siphon Draw originate in the Superstition Mountains east of the Phoenix metropolitan area, flow west through the study area, and eventually join the Gila River approximately 20 miles west of the study area. Flow in McClellan Wash originates in the mountains east of the Picacho Mountains, flows along the northern side of I-10, and joins the Gila River just downstream of the study area, although the confluence is not well-defined because of flow dispersion through agricultural areas around Coolidge and Eloy.

  Many sand and gravel mines operate in the Gila River corridor. The locations and extents of potential future mines are unknown at this time. The Gila River flows west across the central portion of the study area and eventually flows into the Colorado River. The Gila River is approximately 300 to 3,500 feet wide in the study area.

The study area is affected by dispersed flows from local subbasins originating in the mountains east of the Phoenix metropolitan area, a number of large FRSs, and impoundment behind embankments at irrigation canals and railroad tracks.

A number of federally mapped floodplains cross the study area: Siphon Draw, four unnamed watercourses north of Queen Creek, Queen Creek, the Gila River, an unnamed watercourse in Florence, Bogart Wash, and McClellan Wash. Impoundments behind the FRSs and irrigation canals are generally mapped by FEMA; however, the embankments are not certified levees or dams and most of the structures have safety or stability issues.

Watershed Descriptions and Flow Characteristics

The proposed action lies in the central portion of the Gila River watershed. The watershed is in the Basin and Range Province, which is characterized by broad, gently sloping alluvial valleys between north-to-south trending mountain ranges. The Gila River is the primary drainage for southern Arizona and the largest tributary to the lower Colorado River. It drains a 57,900-square-mile watershed that extends across Arizona and into New Mexico. Geographic features range from low-elevation desert range land on the west to mountain ranges with peaks over 9,000 feet on the east.

The proposed action crosses the Gila River near Florence, approximately 70 miles downstream of the Coolidge Dam near Globe. Florence is at approximately the center of the middle reach of the Gila River, which extends from the Coolidge Dam to the Salt River confluence west of Phoenix, a 150-mile alluvial reach. Flow from the Upper Gila River into this reach is regulated by the Coolidge Dam, which reduces the effects of frequent floods but does not eliminate the effects of larger floods. The study area is subject to localized flooding and runoff from storms centered over the watershed downstream of Coolidge Dam.

Runoff from the mountains along the eastern side of the Phoenix metropolitan area flows west, crossing the study area all along its length, generally as dispersed or sheet flow. The terrain is typical of an alluvial valley with little relief along the contours and poorly defined drainage ways. A number of large FRSs, irrigation canals, and railroad embankments impede direct runoff. The FRSs include the Powerline FRS, Vineyard FRS, Rittenhouse FRS, Sonoqui Dike, Magma Dam, Florence Dam, and Picacho Reservoir. The canals include the CAP Canal (a 336-mile-long system of aqueducts, pumping plants, and pipes) and various smaller local canals.

The study area is largely downstream of and roughly parallel to the CAP Canal. The canal collects runoff and provides drainage structures for surface flow crossing the canal. The railroad embankments and irrigation canals generally impede the movement of floodwaters from the east, resulting in ponding and shallow flooding along the embankments. The canals are typically oriented nearly parallel to ground contours across portions of the action corridor alternatives. Local canals include the Florence-Casa Grande, Florence, Santa Rosa, and Central Main Canals.

3.12.3.2 Floodplains

A base flood, commonly referred to as a 100-year flood, is caused by a flood with a 1 percent chance of occurring in any given year. The area where it occurs is referred to as the 100-year floodplain.

An encroachment is an action within the limits of the 100-year floodplain. The regulatory floodway is the portion of the floodplain area reserved by federal, state, and/or local requirements in an unconfined and unobstructed manner to provide for discharge of a base flood so that the overall increase in water surface elevation is no more than 1 foot (not a significant increase), as established by FEMA. Development in the floodway is allowed if it can be demonstrated that no rise in the base flood elevation would occur (44 CFR Chapter 1 Part 9.11 [10-1-02 Edition]).

The FEMA Flood Insurance Rate Maps include Special Flood Hazard Areas, which are the 100-year floodplains. These are areas where the National Flood Insurance Program floodplain management regulations must be enforced and where the mandatory purchase of flood insurance applies. Special Flood Hazard Areas applicable to the proposed action are:

- Zone A – Areas inundated by 100-year flood, generally determined using approximate methodologies. Detailed hydraulic analyses have not been performed; therefore, no base flood elevations or depths are shown.
- Zone AE – Areas inundated by 100-year flood that are determined by detailed methodologies. Base flood elevations are shown.

Moderate and minimal flood hazard areas are shown on the Flood Insurance Rate Maps as Zone X shaded and unshaded. Zone X shaded areas are between the limits of the base flood and the 500-year (0.2 percent chance) floodplain. Zone X unshaded areas are outside the Special Flood Hazard Area, higher than the elevation of the 500-year floodplain. Areas in which flood hazards are undetermined, but possible, are shown as Zone D.

The study area crosses ten FEMA 100-year floodplains, including the Gila River and its tributaries. The watercourses include: Siphon Draw, four unnamed watercourses north of Queen Creek, Queen Creek, the Gila River, an unnamed watercourse in Florence, Bogart Wash, and McClellan Wash. All are mapped as Zone A, except McClellan Wash and a 1.5-mile section of the Gila River that are designated as Zone AE with some Zone X shaded areas. FEMA floodways are designated only on the Gila River at the Zone AE mapped area, which extends through the existing SR 79 bridge in Florence.

The areas between the Zone A areas are all Zone X unshaded, except scattered Zone D areas at military property and some Zone X shaded areas near McClellan Wash south of Coolidge. The Zone D areas

include the Rittenhouse Air Force Auxiliary Field near Queen Creek and the Florence Military Reservation near the Gila River.

Watercourse Descriptions

GILA RIVER

The Gila River is the largest tributary to the lower Colorado River, with the confluence near Yuma, Arizona. It is approximately 650 miles long. The headwaters are in southwestern New Mexico. The study area is in the central portion of the Gila River watershed, just upstream (east) of the Phoenix metropolitan area. Flow in the Gila River is affected by upstream dams and reservoirs that impound and divert flow for agricultural uses. The main flood control structure is Coolidge Dam, completed in 1928. It is approximately 65 miles east of Florence. The dam impounds flow in the Gila River, forming the San Carlos Reservoir near Globe. The other major structure on the Gila River is the Ashurst-Hayden Diversion structure, 12 miles east of Florence. The structure, completed in 1922, diverts most of the flow from the Gila River to the San Carlos Irrigation and Drainage District canal system that distributes water to users throughout the Phoenix Valley.

The other structure that affects flow in the Gila River through the study area is the SR 79 bridge that crosses the Gila River in Florence. The 1,500-foot-long bridge, just upstream of the proposed action, constricts flow and creates a backwater condition upstream of the bridge. The 100-year discharge in the Gila River at Florence is 66,300 cubic feet per second, according to the Flood Insurance Study. The floodplain width is approximately 1 mile.

POWERLINE FLOODWAY

The Powerline Floodway is the outfall channel for runoff collected by a series of three FRSs in northwestern Pinal County. The Powerline, Vineyard, and Rittenhouse FRSs are earthen dams constructed by the Soil Conservation Service (now NRCS) in the 1960s to protect downstream areas from flooding. The structures, just upstream of the CAP Canal, significantly reduce downstream discharges by impounding runoff. They collect runoff from a 145-square-mile area that originates in the Superstition Mountains. The drainageways include Weekes Wash, Siphon Draw, and several unnamed drainages. Upstream of the study area, the wash alignments are controlled by drainage structures that cross US 60. Downstream of US 60, the drainages spread out on the natural alluvial slopes to where they are collected behind the FRSs approximately 5 miles downstream.

Although located in Pinal County, the three FRSs are owned and operated by the Flood Control District of Maricopa County. The principal outlets from the FRSs discharge to the Powerline Floodway, where they are conveyed to the East Maricopa Floodway and then to the Gila River. The emergency spillways for the FRSs typically discharge to different locations than the primary outlets. The structures are known to have structural and functional deficiencies; the Flood Control District of Maricopa County is proposing improvements to alleviate the hazard posed by the structures.

QUEEN CREEK

Queen Creek is a major drainageway that crosses the study area just south of the Rittenhouse FRS in northwestern Pinal County. Flow in Queen Creek collects behind the Sonoqui Detention Dike just upstream of the CAP Canal. The dike was constructed in 1983 by the Bureau of Reclamation as a part of the CAP Canal to protect the canal from flows in Queen Creek. The dike is owned and operated by CAP.

MCCLELLAN WASH

McClellan Wash is at the southern end of the study area in southwestern Pinal County. It has a watershed area of approximately 420 square miles. This ephemeral wash originates on the eastern side

of the Picacho Mountains where it flows south toward I-10. It is then diverted northwest along I-10. West of the Picacho Mountains, McClellan Wash spreads out across flat agricultural fields and is diverted north by the UPRR tracks. A 100-year discharge of 12,960 cubic feet per second is identified in the Flood Insurance Study for McClellan Wash at the CAP Canal. The floodplain width through the study area is approximately 1.5 miles.

Summary of Flooding Risk and Flooding History

Flooding risk is based on the potential for damage during a 100-year or lesser flood. Several factors unrelated to the proposed action may affect flooding risk. These include operation of upstream dams and diversion structures on the Gila River, existing FRSs and embankments along the study area length, and sand and gravel mining activities.

Major flooding may occur along the Gila River when water is released from Coolidge Dam. These releases occur when runoff from the watershed is expected to exceed the capacity of the reservoirs. Flooding may occur as a result of storms in the watershed downstream of the dam.

The *Pinal County Flood Insurance Study* indicates that “the principal flood hazard results from overflow of major rivers during large flood events. This overflow results in inundation of generally wide, flat floodplains, encompassing any residential, commercial, or agricultural development located within them. In addition, the region is subject to intense, short-duration rainfall, resulting in ‘flash floods,’ which rise quickly and cause high-velocity flood flows carrying large amounts of debris and sediment. Erosion of natural and newly created earthen drainage channels adds to the potential hazard from flooding.”

Risk of flooding caused by the potential failure of existing FRSs, dams, and embankments occurs throughout the study area. All of the structures are old, constructed prior to current levee and dam requirements. None of the structures are certified levees or dams and all have features that put them at risk for failure. Some of the structures have had relatively recent evaluations and breach analyses. Some have plans or recommendations to enhance safety and/or function. The major structures are:

- Powerline, Vineyard, and Rittenhouse FRSs, owned and operated by the Flood Control District of Maricopa County
- Sonoqui Diversion Dike and impoundment behind the CAP Canal at various locations, owned and operated by CAP
- Magma Dam, owned and operated by the Magma Flood Control District
- Florence FRS, owned and operated by the Florence Area Watershed Flood Control District
- Picacho Reservoir, owned and operated by the Bureau of Indian Affairs, managed by the San Carlos Irrigation and Drainage District

Canals in the study area typically impound runoff but are not constructed to current levee standards. They may be susceptible to failure that may cause downstream flooding and erosion. The CAP and Santa Rosa Canals were designed as embankments to prevent runoff and sediment from entering the canals. The CAP Canal was designed to collect, impound, and convey flow over the structure. The Santa Rosa Canal is similar, but lacks drainage crossings. Changes in the watershed, including those attributable to subsidence fissures, erosion, and sedimentation, make the canal systems susceptible to failure, which may cause flooding.

3.12.3.3 Groundwater

Groundwater remains a significant component of the overall water supply portfolio throughout Arizona—approximately 43 percent of the total supply. Agriculture accounts for the largest water use throughout the state, or approximately 70 percent of total water use.

Rapid population growth has resulted in the retirement of agricultural land and the conversion of agricultural groundwater supplies to urban supply. Issues created by groundwater overdraft include decreased water levels in aquifers and increased well drilling and pumping costs and, in some areas of severe groundwater depletion, land subsidence. Areas in Maricopa and Pinal Counties have subsided more than 18 feet since the early 1990s. Land subsidence can result in cracks and fissures that can damage roads, building foundations, and underground infrastructure.

To more sustainably manage groundwater in urban areas, ADWR created AMAs to regulate groundwater pumping, including regulating drilling, installation, and abandonment of groundwater wells. ADWR administers groundwater use through implementation of five successive management plan periods that will result in a safe yield by 2025. The AMAs are in their Fourth Management Period (2010 to 2020).

Groundwater Setting and Development

The study area is primarily in two AMAs. The northern half of the study area is in the Phoenix AMA; the southern half is in the Pinal AMA (see Figure 3.12-3 for the boundaries). The far southeastern portion of the study area is in the Tucson AMA, but the proposed action would not cross this AMA.

PHOENIX ACTIVE MANAGEMENT AREA

The study area is within the East Salt River Valley subbasin of the Phoenix AMA. Since 1990, recharge volumes have exceeded withdrawals, primarily because of the cessation of farming (and associated reductions in pumping) and direct use and recharge of CAP Canal water (ADWR 2014a, 2016). Groundwater level trends vary widely across the East Salt River Valley, but portions have seen an excess of a 60-foot rise in groundwater levels, some near the study area.

PINAL ACTIVE MANAGEMENT AREA

The study area is in the Eloy subbasin of the Pinal AMA. Similar to the East Salt River Valley subbasin in the Phoenix AMA, declining agricultural water demands in conjunction with higher use of CAP Canal water have resulted in rising groundwater levels in the central and western portions of the Eloy subbasin (ADWR 2014a, 2014b). However, in the eastern and northern portions of the basin, along the study area, groundwater levels are declining.

Irrigation Districts

Irrigation districts in the study area use groundwater wells and have both surface (canals) and subsurface conveyance (pipes) infrastructure associated with their operations. Irrigation districts directly affect groundwater levels and quality. In districts where groundwater is the primary source of irrigation water, groundwater levels typically drop over time as total withdrawals exceed the net recharge rates. In districts where surface water is imported and used as the primary source of irrigation water, groundwater levels typically rise. Groundwater in agricultural areas is prone to nitrate contamination and salt buildup. The irrigation district boundaries are shown in Figure 3.12-3.

Irrigation districts in the study area are:

- Queen Creek Irrigation and Drainage District has approximately 16,000 acres under irrigation, fed primarily with groundwater and supplemented with CAP Canal supply. The district is in Segment 1 of the study area.

- New Magma Irrigation and Drainage District has approximately 27,000 acres under irrigation, fed primarily with CAP Canal supply and supplemented with groundwater wells. The district is in Segments 1 and 2 of the study area.
- San Carlos Irrigation and Drainage District has approximately 50,000 acres under irrigation, fed primarily with CAP Canal supply and supplemented with groundwater wells. The district is in Segments 3 and 4 of the study area.
- Hohokam Irrigation and Drainage District includes approximately 28,000 acres under irrigation, fed primarily with CAP Canal supply and supplemented with groundwater wells. The district is in Segments 3 and 4 of the study area.
- Central Arizona Irrigation and Drainage District is the largest district in the study area, with approximately 87,600 acres under irrigation, fed primarily with CAP Canal supply and supplemented with groundwater wells. The district is in Segment 4 of the study area.

Groundwater Well Locations

ADWR maintains a database containing annually updated well information. This information was used to identify 831 active groundwater wells in the study area. Figure 3.12-3 shows wells within 0.5 mile of the action corridor alternatives.

Groundwater Recharge Facilities

Groundwater recharge facilities allow providers to store water, typically surface water or wastewater effluent, in the aquifer where it may be recovered for later use. Two primary types of groundwater recharge facilities exist:

1. Underground storage facility (USF) – allows the service provider to directly recharge water, either through percolation basins or injection wells, into the aquifer where it can be banked.
2. Groundwater savings facility (GSF) – allows the service provider to deliver renewable water supply (that is, surface water or wastewater effluent) to a recipient who agrees to stop pumping the corresponding volume of groundwater. This allows service providers to allow groundwater levels to recover while providing previous groundwater customers with renewable supplies.

USFs and GSFs affect groundwater levels and quality differently. USFs tend to create localized groundwater mounds that, over time, take on the water quality characteristics of the water being recharged. In other words, the groundwater would begin to resemble the surface water or effluent. GSFs tend to result in smaller but more widespread increases in water surface elevation that typically retain the water quality signature of the in-situ groundwater. Several USFs and GSFs exist in the study area (Figure 3.12-4).

The influence of the GSF locations on the action corridor alternatives is primarily a surface infrastructure dilemma, that is, irrigation canals that have been installed to replace wells. From a groundwater perspective, it is anticipated that groundwater levels would rise within the GSF areas over time as surface water is imported for irrigation.

Figure 3.12-3. Wells, Active Management Areas, and irrigation districts

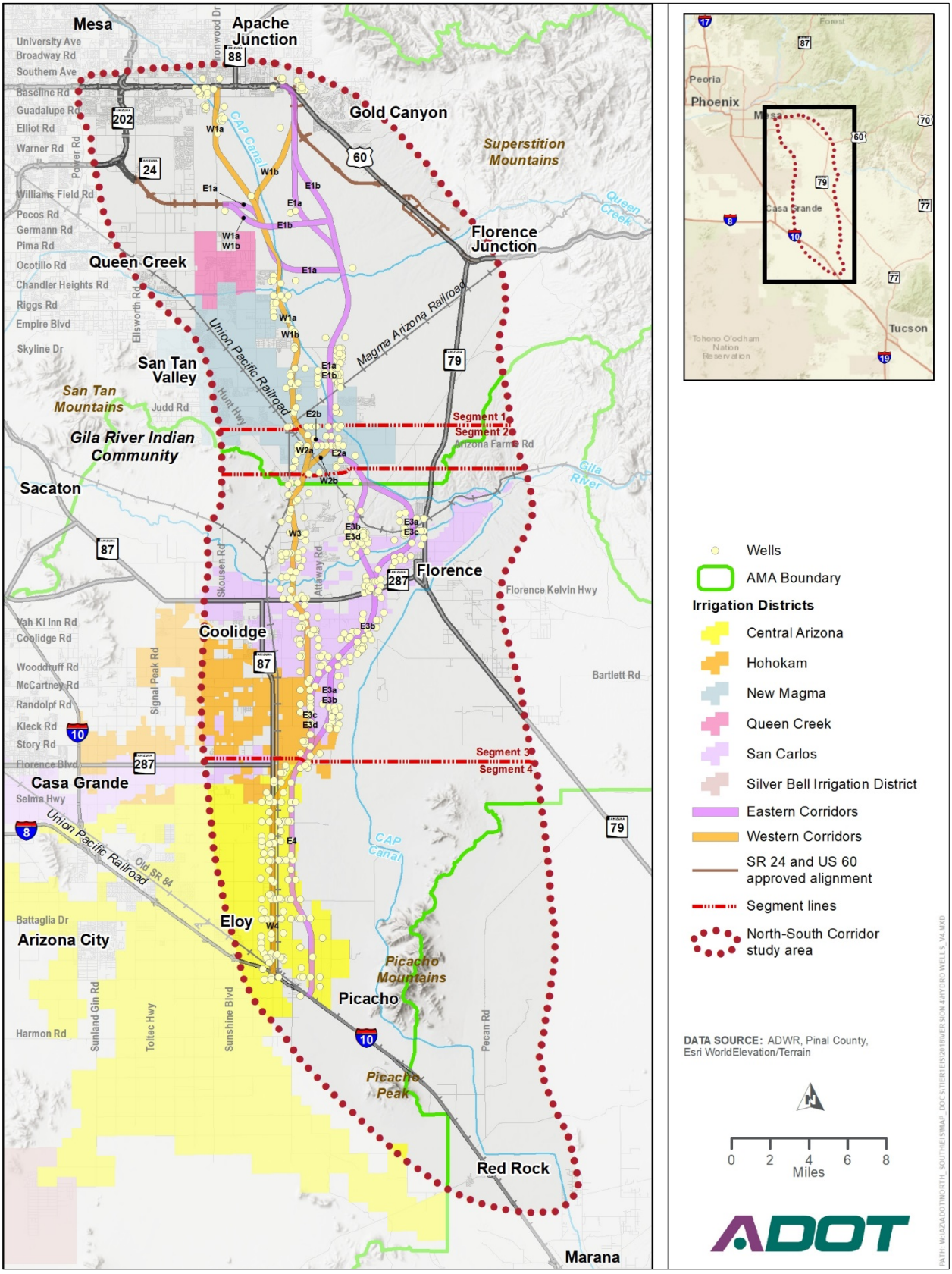
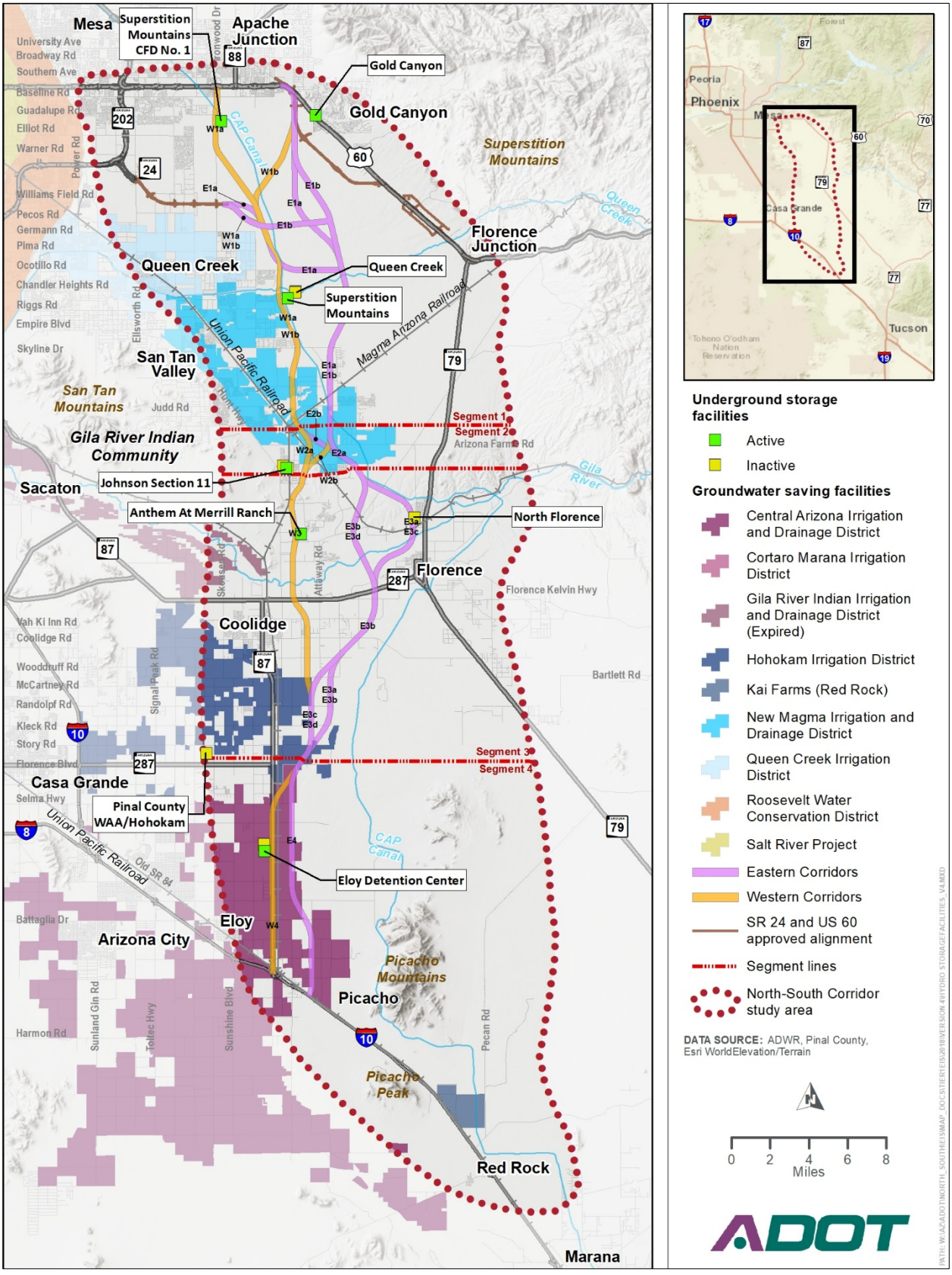


Figure 3.12-4. Underground storage facilities and groundwater saving facilities



Groundwater Quality

The following describes the general groundwater quality in the Phoenix and Pinal AMAs:

- Phoenix AMA – ADWR published water quality data for the Phoenix AMA in April 2010. The water quality data include five sample locations in the study area where ADWR found drinking water standard, or health-based, primary maximum contaminant level exceedances for mercury, lead, cadmium, beryllium, arsenic, and nitrate.
- Pinal AMA – Similar to the Phoenix AMA, ADWR published groundwater quality data for the Pinal AMA. The water quality data included 12 sample locations in the study area where ADWR found health-based primary maximum contaminant level exceedances—mostly for nitrate, but other contaminants included lead, cadmium, arsenic, and fluoride.
- A groundwater quality study for the Pinal AMA was conducted by ADEQ in 2005 to 2006, sampling water from 86 wells (ADEQ 2008). The groundwater quality study revealed that health-based primary maximum contaminant levels were exceeded at 60 of 86 sites, with the most common contaminants being arsenic, fluoride, and nitrate. Aesthetics-based secondary maximum contaminant levels were exceeded at 59 of 86 sites, with the most common contaminants being chloride, sulfate, and total dissolved solids.

Groundwater Levels

Depth to groundwater can affect surface construction projects. Shallow groundwater may require dewatering during construction and may affect the geotechnical design for foundations and the roadway subgrade. Deep groundwater has a less tangible effect on design and construction, but deep groundwater levels coupled with continued declines may indicate ongoing subsidence issues.

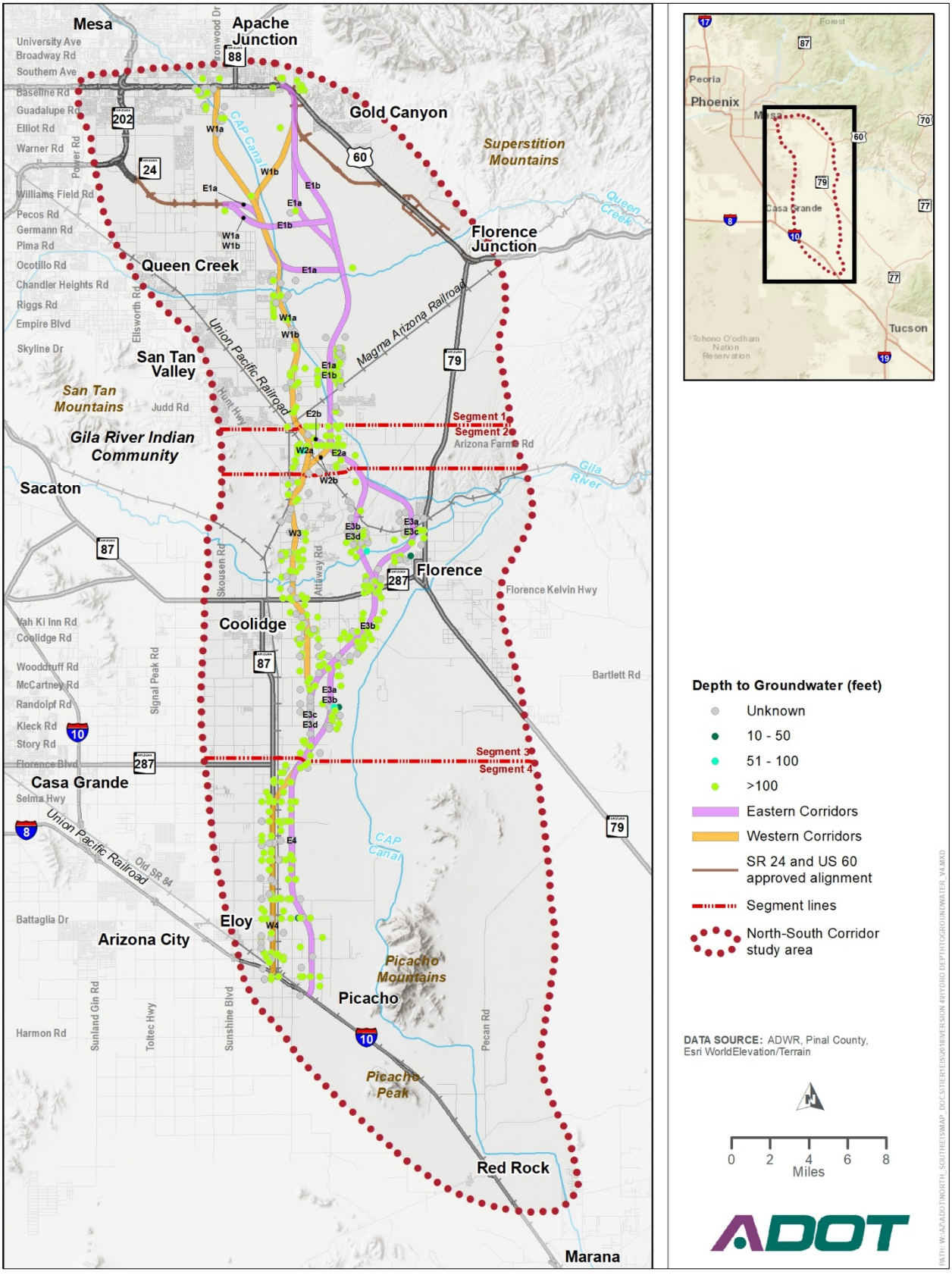
Depth to groundwater data were obtained from the *Arizona Water Atlas Volume 8, Active Management Area Planning Area*, produced by ADWR in April 2010. Depth to groundwater data from active wells in the study area are shown in Figure 3.12-5, and Table 3.12-1 summarizes the depth to groundwater levels for each segment. Additionally, groundwater elevation trends in each of the subbasins were estimated based on information in the *Arizona Water Atlas* (see Volume 8, Figures 8.1-6A and 8.2-6B).

Depth to groundwater is the greatest at the northern and southern ends of the study area, with shallower groundwater in the middle segments where the action corridor alternatives pass through irrigated lands. With the exception of Segment 1, where CAP Canal surface water deliveries have replaced groundwater supplies and groundwater levels are rising, the remainder of the study area is either experiencing stable or declining groundwater levels. Average depth to groundwater in all segments is greater than 200 feet, generally suggesting that shallow groundwater is not likely to pose construction or design challenges.

Table 3.12-1. Summary of depth to groundwater

Segment	Range (feet)	Average (feet)	Average annual change in groundwater elevation in feet per year
1	160–670	435	–3 to +6 (minor decrease northern end of Segment 1, rest of segment experiencing increasing groundwater levels)
2	410–480	440	–3 (declining)
3	90–350	200	–3 to +3 (varies, generally declining in most of segment)
4	160–500	320	–3 to 0 (declining)

Figure 3.12-5. Depth to groundwater



High Groundwater Risks

As shown in Figure 3.12-5, shallow groundwater may be present in two small areas, or groupings of wells, in the study area—both are located in Segment 3, with the first group located near the center of the segment and the second group located farther to the south.

- In the first group near the center of Segment 3, two wells have depth to groundwater of less than 30 feet, and three wells have groundwater levels between 85 and 90 feet deep. The two shallowest wells suggest that groundwater levels in this area may require dewatering and/or enhanced foundation or roadway subgrade design.
- In the second group at the southern end of Segment 3, one well has a depth to groundwater of 50 feet, and two wells have groundwater levels 80 and 85 feet deep. Groundwater levels in this area are generally declining and, while these wells indicate localized high groundwater conditions, no notable impact on the proposed action is likely.

It should be acknowledged that the ADWR depth to groundwater data have not been field verified, and it is possible that the areas of high groundwater may be data anomalies. This is a real possibility because the adjacent wells have depths to groundwater greater than 100 feet. It is recommended that depth to groundwater in these high groundwater risk areas be field verified.

Declining Groundwater Levels and Subsidence Risks

Land subsidence data published by ADWR indicate two subsidence zones are in the study area: Hawk Rock (in Segment 1) and Picacho-Eloy (in Segments 3 and 4). Both areas of subsidence correspond strongly to areas of deep groundwater caused by historical over-pumping. Further discussion is provided in Section 3.10, *Topography, Geology, and Soils*.

Sole Source Aquifer

The southern portion of the study area overlaps the northwestern portion of the Upper Santa Cruz and Avra Basin Sole Source Aquifer designated area (EPA 2018c). The aquifer's northwestern boundary is generally defined by the eastern side of the Picacho Mountains.

3.12.4 Environmental Consequences

This section describes water resource-related impacts that could result from the proposed action, including increases in sediment loading into receiving watercourses, release of pollutants generated by traffic, and erosion of unprotected banks. It also discusses impacts on floodplains: flooding risks, impacts on natural and beneficial floodplain values, probable incompatible floodplain development, mitigation measures, and alternatives to encroachment.

3.12.4.1 No-Action Alternative

Proposed action-related water quality impacts would not result from the No-Action Alternative. There would be no construction that could create erosion or sediment deposits in existing watercourses or that could alter the existing groundwater. As urban growth continues, traffic volumes would, however, likely increase on existing roadways. As a result, pollutants would continue to be generated by increased traffic on the surrounding road system and be dispersed over a larger area. Storms may cause erosion of exposed soil surfaces and subsequent runoff of sediment-laden water.

The No-Action Alternative would have no impact on floodplains or groundwater in the study area.

3.12.4.2 Action Corridor Alternatives

Potential impacts of the action corridor alternatives are discussed below, with impacts common to all action corridor alternatives discussed first, followed by impacts specific to only certain alternatives.

Surface Water

ACTION CORRIDOR ALTERNATIVES, EASTERN AND WESTERN ALTERNATIVES

The action corridor alternatives are similar with regard to drainage considerations because they would have a similar effect on local runoff and because they would cross the same floodplains, although the locations and configurations differ.

Regardless of the action corridor alternative, pavement for the new freeway would increase the amount of impervious surface area, thereby increasing runoff quantities and peak flows during storms. Because the surface would be impermeable, precipitation on the freeway would run off the pavement to roadside ditches or nearby natural channels. The increased runoff from the new impervious surfaces would increase the transport of pollutants generated by vehicles using the roadway. The pollutants would be transported from the road surface by the initial runoff generated during a storm. The most common impact would be an increase in pollutant loading into receiving waters. The action corridor alternatives would concentrate vehicular traffic and the associated accumulation of pollutants throughout the freeway.

Regardless of the action corridor alternative, the proposed action would cross the Gila River and tributaries, encroaching into several federally mapped floodplains. Runoff would be directed to drainage facilities that ultimately discharge to the Gila River. This runoff could temporarily increase contaminant concentrations in the river or its tributaries during periods of seasonal runoff. The effect of pollutant discharges on water quality would be directly proportional to traffic volumes on the proposed action.

Impacts on surface water (that is, the Gila River or tributaries) would depend on time of year and associated flows. The ephemeral drainageways are dry most of the year. Several FRSs, irrigation district conveyance canals, ditches, and pipelines would be crossed by the action corridor alternatives.

Construction activities such as clearing, grading, trenching, and excavating would disturb soils and sediment. If not managed properly, disturbed soils and sediments can easily be washed into nearby water bodies during storms, where water quality is then reduced.

ACTION CORRIDOR ALTERNATIVES, EASTERN ALTERNATIVES

In addition to the impacts identified as common to all action corridor alternatives, the E1a and E1b Alternatives could affect water quality impounded behind the regional FRSs downstream of the Eastern Alternative. Discharge of pollutants to the ephemeral washes tributary to the structures could result from storms.

The E1a and E1b Alternatives would cross the CAP Canal. The E1b Alternative would cross a regional FRS and encroach on the structure’s storage area.

ACTION CORRIDOR ALTERNATIVES, WESTERN ALTERNATIVES

In addition to the impacts identified as common to all action corridor alternatives, the W1a and W1b Alternatives would cross the CAP Canal and several drainage outfall channels.

Floodplains

ACTION CORRIDOR ALTERNATIVES, EASTERN AND WESTERN ALTERNATIVES

All action corridor alternatives would affect floodplains. Fourteen mapped 100-year floodplains would be affected by the Eastern Alternatives and 11 would be affected by the Western Alternatives. FHWA

policies and procedures for locating and designing hydraulic encroachments on floodplains are set forth in 23 CFR Part 650. This section summarizes the evaluation of the action corridor alternatives relative to applicable provisions of those regulations, including flooding risks, impacts on natural and beneficial floodplain values, probable incompatible floodplain development, measures to minimize floodplain impacts, alternatives to encroachment, and the potential for significant encroachment.

All action corridor alternatives would laterally cross the floodplains, except at these locations:

- SR 24 connections for the E1b, W1a, and W1b Alternatives
- Gila River crossings for the E3a and E3c Alternatives
- an unnamed wash crossing on the southern side of the Gila River for the E3a, E3b, E3c, and E3d Alternatives

The above-listed locations would have action corridor alternatives crossing floodplains in a nearly parallel manner, rather than perpendicularly. Otherwise, encroachments are minimized and there would be no longitudinal encroachments. The Gila River has an associated federally mapped floodplain and regulatory floodway through the existing SR 79 bridge. The other floodplains are federally mapped, but, unlike the Gila River, are not associated with a regulatory floodway. There is no alternative to crossing the Gila River or the other floodplains because they form continuous east-to-west features across the study area. All action corridor alternatives would encroach on the floodplains and result in limited flooding risk.

Table 3.12-2 lists estimates of encroachment on FEMA-mapped floodplains for the action corridor alternatives. The estimates assume encroachment on the full width of the 1,500-foot-wide corridor. The encroachment includes all of the mapped floodplain within each action corridor alternative; thus, substantially more area than what the Tier 2 alignment would require (that area occupied by freeway structures and fill needed to create or stabilize these structures) is included. The acreage estimates provide a relative extent of encroachment for each of the action corridor alternatives. The extent of encroachment would be less than that shown in Table 3.12-2, further reducing flooding risk in the study area.

The Gila River floodplain crossings would be on bridges designed for the base flood to minimize impacts. The other encroachments would be either bridges or culverts designed for the base flood. Design modifications that could further mitigate floodplain impacts, if warranted, are typically considered during the design process.

North of the Gila River, the E1a Alternative would have the least overall floodplain encroachment potential, and the W1a Alternative would have the greatest. The difference is largely attributable to the connections with SR 24, which would cross floodplains associated with unnamed washes north of Germann Road. The connection for the E1a Alternative is oriented to cross the floodplains at a perpendicular angle, thereby minimizing the encroachment. The connection for the E1b Alternative would cross parallel to a floodplain, causing a large impact at a single crossing. The floodplain width is, however, considerably narrower than the corridor. The freeway would be located within the corridor outside of the floodplain, with bridge or culvert crossings to minimize encroachments.

None of the action corridor alternatives for Segment 2 would have an appreciable impact on mapped floodplains. South of the Gila River, the Western Alternatives (the W3 and W4 Alternatives) would have the least overall floodplain encroachment potential. The E3b and E3d Alternatives and W3 Alternative have the same overall floodplain encroachment potential associated with the Gila River, although the total floodplain encroachment for the E3b and E3d Alternatives would be greater than the W3 Alternative. The E3a and E3c Alternatives would not cross the Gila River at a perpendicular angle, but rather are oriented parallel with the river in the floodplain and thus would have a major encroachment on the Gila River.

Table 3.12-2. Comparative acreage of floodplain encroachments, action corridor alternatives

Action corridor alternative	Gila River encroachment (acres)	Tributary encroachments (each)	Tributary encroachments (acres)	Total floodplain encroachment (acres)
North-South Corridor at Gila River				
E3a	409	2	58	467
E3b	202	2	62	264
E3c	409	2	58	467
E3d	202	2	62	264
W3	202	2	13	215
North-South Corridor at tributaries				
E1a	—	15	240	240
E1b	—	11	295	295
E2a	—	—	—	—
E2b	—	—	—	—
E4	—	1	257	257
W1a	—	11	301	301
W1b	—	11	248	248
W2a	—	—	—	—
W2b	—	—	—	—
W4	—	—	—	—

RISKS ASSOCIATED WITH ACTION CORRIDOR ALTERNATIVES

Risks are the consequences associated with the probability of flooding attributable to encroachment. This includes potential property loss or hazard to life. The floodplain risks would be minimized for all the action corridor alternatives by minimizing or mitigating the floodplain impacts. The floodplain impacts would be minimized by the freeway alignment that is essentially perpendicular to flow for all crossings except for the following:

- SR 24 connections for the E1b, W1a, and W1b Alternatives
- Gila River crossings for the E3a and E3c Alternatives
- unnamed wash crossing on the southern side of the Gila River for the E3a, E3b, E3c, and E3d Alternatives

The necessary floodplain encroachments would be mitigated by providing drainage structures designed to accommodate the flow. The measures further discussed in Section 3.12.5, *Potential Avoidance, Minimization, and Mitigation Strategies*, would minimize the risks.

IMPACTS ON NATURAL AND BENEFICIAL FLOODPLAIN VALUES

Natural and beneficial floodplain values associated with floodplains include:

- open space
- wildlife habitat and connectivity
- scientific research opportunities
- outdoor recreation
- agriculture
- natural flood control
- mining and industry (building material source)
- water quality maintenance
- groundwater recharge
- natural flood control

The action corridor alternatives would minimize impacts on natural and beneficial floodplain values by minimizing impacts on floodplains. The floodplain impacts would be minimized by the freeway alignment that is essentially perpendicular to flow for all crossings except for the following:

- SR 24 connections for the E1b, W1a, and W1b Alternatives
- Gila River crossings for the E3a and E3c Alternatives
- unnamed wash crossing on the southern side of the Gila River for the E3a, E3b, E3c, and E3d Alternatives

The necessary floodplain encroachments would be mitigated by providing drainage structures designed to accommodate the flow, generally spanning a large portion of the floodplain. The mapped floodplains typically have the largest discharges and would, therefore, have the largest drainage structures, likely bridges or large culverts. The drainage structures would allow wildlife to move freely within the drainages and maximize open space and the other beneficial aspects of floodplains.

SUPPORT OF INCOMPATIBLE FLOODPLAIN DEVELOPMENT

Agriculture, mining, and undeveloped open space dominate the 100-year floodplains. All of the action corridor alternatives would be controlled-access facilities and would cross the 100-year floodplain with structures above the 100-year water surface elevation. The Pinal County Flood Control District enforces floodplain management regulations, with statutory authority as prescribed under A.R.S. §§ 48-3603 and 48-3609. The proposed action would provide improved access to future development, which would be consistent with floodplain regulations. The action corridor alternatives would not contribute to incompatible floodplain development.

MEASURES TO MINIMIZE FLOODPLAIN IMPACTS

The measures described in Section 3.12.5, *Potential Avoidance, Minimization, and Mitigation Strategies*, would be effective in minimizing impacts associated with encroachments into 100-year floodplains.

ALTERNATIVES TO ENCROACHMENT

Potential encroachments into 100-year floodplains are quantified in Table 3.12-2. Encroachment in the floodplains by any of the action corridor alternatives was determined to be unavoidable. Both the Eastern and Western Alternatives would cross the affected floodplains, essentially perpendicular to the floodplains, thereby minimizing encroachments. The exceptions are:

- SR 24 connections for the E1b, W1a, and W1b Alternatives
- Gila River crossings for the E3a and E3c Alternatives

- unnamed wash crossing on the southern side of the Gila River for the E3a, E3b, E3c, and E3d Alternatives

POTENTIAL FOR SIGNIFICANT ENCROACHMENT

Significant encroachment, as defined in 23 CFR 650.105(q), Subpart A, would occur when freeway encroachment and any base floodplain development would involve one or more of the following construction or flood-related impacts:

- interruption or termination of a transportation facility needed for emergency vehicles or one that provides a community's only evacuation route
- significant risk
- significant adverse effect on natural and beneficial floodplain values

Regardless of action corridor alternative, the proposed action would not have the potential to interrupt or terminate transportation facilities needed for emergency vehicles or emergency evacuation routes. The proposed action would neither create a substantial risk nor adversely affect natural or beneficial floodplain values. Therefore, the proposed action would not have a significant encroachment on floodplains.

ACTION CORRIDOR ALTERNATIVES, EASTERN ALTERNATIVES

In addition to the impacts identified as common to all action corridor alternatives, the E1a Alternative would have the least overall floodplain encroachment potential for the segment north of the Gila River. No mapped floodplains cross the study area in Segment 2; therefore, none of the action corridor alternatives in Segment 2 would affect mapped floodplains. South of the Gila River, the E3b and E3d Alternatives would have the greatest overall floodplain encroachment potential; however, they would have the least potential for encroachment on the floodplain associated with the Gila River. For SR 24, the E1a Alternative would have the least overall floodplain encroachment potential.

ACTION CORRIDOR ALTERNATIVES, WESTERN ALTERNATIVES

In addition to the impacts identified as common to all action corridor alternatives, the W1a and W1b Alternatives would have greater overall floodplain encroachment potential than the E1a Alternative, but less than the E1b Alternative for the segment north of the Gila River. However, it should be noted that these FEMA-mapped floodplains may not reflect the actual area potentially subject to flooding. The mapping does not appear to consider the existing FRSs or outfall structures nor consider proposed improvements to the structures. The impacts for these segments may change in the future if structure improvements planned by the Flood Control District of Maricopa County are made and the floodplains are remapped.

No mapped floodplains cross the study area in Segment 2; therefore, none of the action corridor alternatives in Segment 2 would affect mapped floodplains.

The W3 Alternative would encroach on the floodplain associated with the Gila River, slightly more so than the least impactful E3b and E3d Alternatives. South of the Gila River, the W3 and W4 Alternatives would have the least potential floodplain encroachment. However, the encroachment in the W4 Alternative may be underestimated because the McClellan Wash FEMA mapping ends short of the W4 Alternative and is, therefore, not included in Table 3.12-2. The McClellan Wash flow does cross the E4 Alternative in a poorly defined fashion, and McClellan Wash flow would be affected by the E4 Alternative.

Groundwater

ACTION CORRIDOR ALTERNATIVES, EASTERN AND WESTERN ALTERNATIVES

A substantial portion of the action corridor alternatives is in active agricultural areas where groundwater wells are prevalent. This study has identified 147 wells along the entire length of the Eastern and Western Alternatives that are directly within the 1,500-foot action corridor alternatives. Figure 3.12-6 shows the potentially affected wells, and Table 3.12-3 summarizes affected wells for each action corridor alternative.

Any groundwater well falling within the footprint of the proposed freeway would likely require abandonment of the existing well and drilling/equipping/piping of a new replacement well. It is possible that some groundwater wells within the footprint may be purchased outright without replacement. Well-documented groundwater quality issues in both the Phoenix and Pinal AMAs are primarily related to past agricultural and industrial activities. Given these water quality impacts, prior to drilling replacement wells, it is recommended that historical groundwater quality in those specific areas be reviewed to increase the chances of locating groundwater that meets the water quality standards for which it is intended.

Table 3.12-3. Potentially affected wells

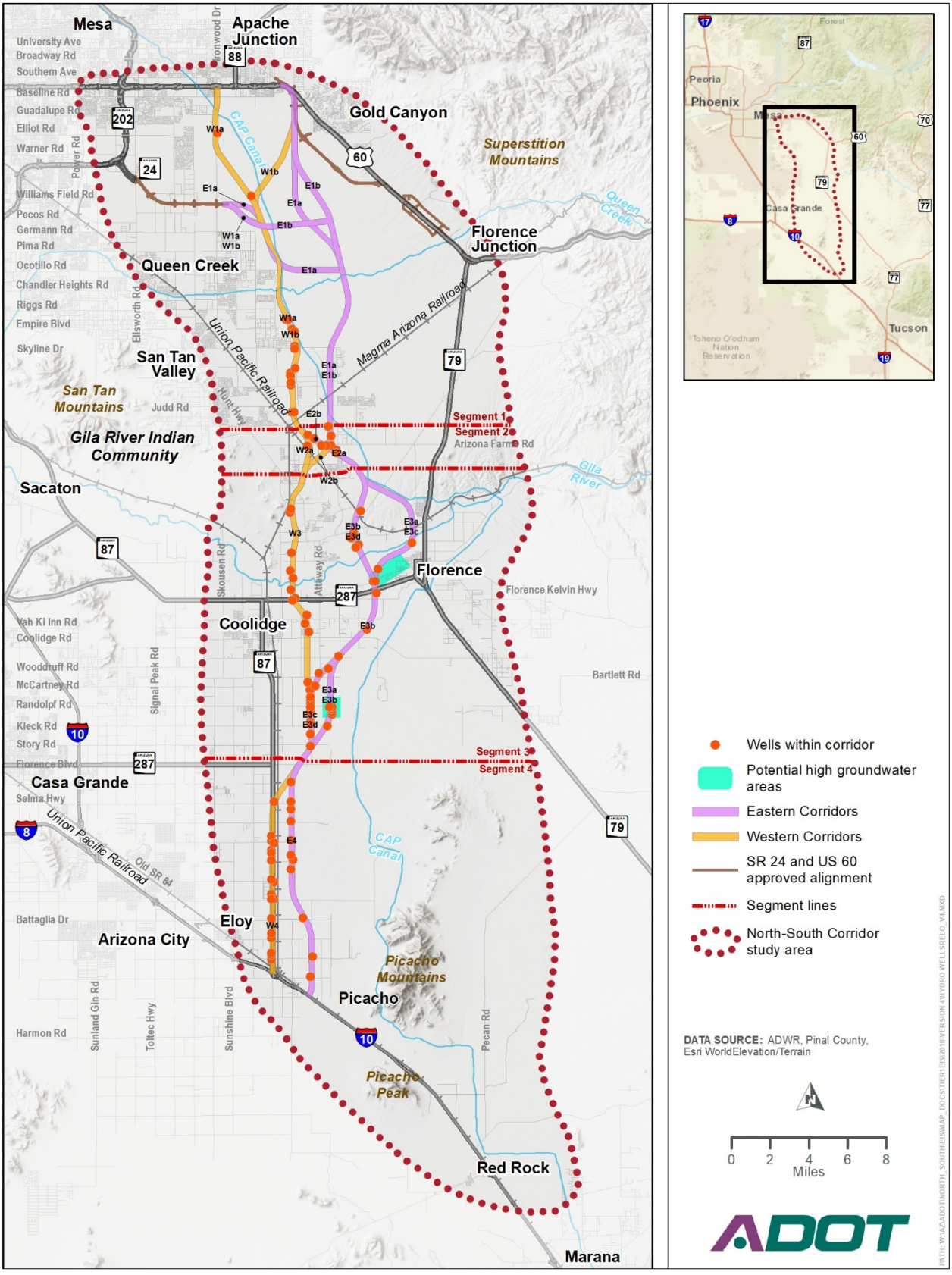
Action corridor alternative	Affected wells	Action corridor alternative	Affected wells
Segment 1		***Segment 3***	
E1a	0	E3a	14
E1b	0	E3b	18
W1a	15	E3c	19
W1b	13	E3d	24
Segment 2		W3	22
E2a	5	***Segment 3***	
E2b	6	E4	11
W2a	2	W4	18
W2b	4		

Other than the direct impact on groundwater wells and widespread agricultural contamination at many locations, no groundwater issues would affect the action corridor alternatives. Groundwater throughout the study area is typically deeper than 200 feet and poses little impact on surface construction. Isolated areas of potential impact are shown in Figure 3.12-6, and those impacts are discussed for each action corridor alternative.

As shown in Figure 3.12-4, Segments 2 and 4 are the most affected by GSFs, both of which have been over-pumped historically and where the average depth to groundwater is now greater than 300 feet. Given the depth of groundwater in these areas, gradual increases in groundwater levels attributable to GSF activities are not anticipated to directly affect any of the action corridor alternatives.

Six active USF sites are in the study area (Figure 3.12-4). Five of the sites—Superstition Mountains Community Facilities District No. 1, Superstition Mountains, Johnson Section 11, Anthem at Merrill Ranch, and the Eloy Detention Center—are near the action corridor alternatives. These facilities are sufficiently far enough away from any action corridor alternative that they fall outside the ROW limits and would not be directly affected.

Figure 3.12-6. Wells with the potential to be relocated and potential high groundwater areas



Regarding the Upper Santa Cruz and Avra Valley Basin sole source aquifer, the action corridor alternatives would not affect the aquifer because the nearest alternatives are approximately 4 miles (E4) and 7 miles (W4) west of the aquifer's northwestern boundary. All action corridor alternatives are located west of the Picacho Mountains, outside of the drainage basin that contributes to the Upper Santa Cruz and Avra Valley Basin sole source aquifer.

ACTION CORRIDOR ALTERNATIVES, EASTERN ALTERNATIVES

Areas of impact along the Eastern Alternatives include:

- Sixty-eight wells fall within the Eastern Alternatives.
- Potential areas of shallow groundwater are along the E3a and E3c Alternatives near Florence and the E3a and E3c Alternatives southeast of Coolidge. It is possible that the groundwater elevation data at these locations are incorrect, and it is recommended that the groundwater depth be field verified during Tier 2 studies.
- In the Picacho-Eloy subsidence zone, the subsidence rate is approximately 1 inch per year, affecting the I-10 connection for the E4 Alternative. There is recorded subsidence of approximately 1 inch per year along the E4 Alternative between I-10 and Arica Road. ADWR data showed areas of fissures in the Picacho-Eloy subsidence zone along the E4 Alternative. Refer to Section 3.10, *Topography, Geology, and Soils*.

ACTION CORRIDOR ALTERNATIVES, WESTERN ALTERNATIVES

Areas of impact along the Western Alternatives include:

- Thirty-five wells fall within the Western Alternatives, mostly along the W3 and W4 Alternatives.
- Subsidence in the Hawk Rock subsidence zone is approximately 0.25 inch per year and primarily affects the W1a and W1b Alternatives. ADWR data showed areas of fissures in the subsidence zone along the W1a Alternative.
- In the Picacho-Eloy subsidence zone, the subsidence rate is approximately 1 inch per year, affecting the I-10 connection for the W4 Alternative. ADWR data showed areas of fissures in the Picacho-Eloy subsidence zone along W3 and W4 Alternatives. Refer to Section 3.10, *Topography, Geology, and Soils*.

3.12.5 Potential Avoidance, Minimization, and Mitigation Strategies

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts. Such strategies for potential impacts on surface water, floodplains, and groundwater are provided in the following sections.

3.12.5.1 Surface Water

None of the action corridor alternatives would completely avoid impacts on water resources because any roadway east of the Phoenix metropolitan area that connects US 60 with I-10 would cross the Gila River and ephemeral washes.

Mitigation strategies for all alternatives include avoidance, minimization, and mitigation. Avoidance can be accomplished by shifting the future construction footprint away from sensitive resources to the extent possible. Impact minimization could be accomplished through temporary best management practices during construction, permanent best management practices after construction, and adherence to federal and state water quality requirements.

Mitigation would be identified to:

- Reduce the quantity of pollutants reaching the Gila and Salt Rivers, if necessary after further investigations during Tier 2 studies.
- Minimize erosion from cut and fill slopes.
- Prevent erosion along conveyance features.
- Provide settling basins to reduce the potential impact of contaminants.
- Obtain an Arizona Pollutant Discharge Elimination System (AZPDES) Construction General Permit.
- In compliance with the Construction General Permit, develop a Stormwater Pollution Prevention Plan that includes best management practices for erosion and sediment control.
- Obtain CWA Section 401 certification by ADEQ.
- Coordinate with governmental agencies, including flood control districts, and the community regarding the design of drainage features.
- Relocate irrigation district canals as necessary to allow conveyance of irrigation water from one side of the freeway to the other.
- Obtain CWA Section 402 permit authorization.
- Comply with State of Arizona Surface Water Quality Standard Rules (18 Arizona Administrative Code 11).
- Coordinate with municipal separate storm sewer system agencies.
- Improve surface water quality when the freeway would be open to operation by properly maintaining retention, detention, and stormwater runoff facilities, if necessary after further investigations during Tier 2 studies.

3.12.5.2 Floodplains

The proposed action would affect floodplains. The Gila River and tributary floodplains extend across the entire width of the study area. None of the action corridor alternatives would completely avoid causing adverse effects because any freeway east of the Phoenix metropolitan area connecting US 60 with I-10 would necessarily encroach into floodplains.

Mitigating 100-year floodplain encroachments would be accomplished by constructing bridge and culvert structures, where appropriate, to accommodate 100-year floodwaters.

Mitigation measures would minimize the potential for property loss or hazard to life. The following measures would minimize impacts on floodplains as a result of the proposed action:

- Design bridges to cross floodplains so that their support piers and abutments do not contribute to a rise in floodwater elevation by more than 1 foot.
- Minimize floodplain impacts by implementing transverse crossings of the floodplains and avoiding longitudinal encroachments.
- Conduct comprehensive analyses of hydrology, hydraulics, sediment transport, and erosion to minimize the impacts of encroachment.
- Provide the Pinal County Floodplain Manager with an opportunity to review and comment on the design plans.
- Base design criteria for on- and off-site drainage on current ADOT guidance.

- Complete comprehensive hydrologic, hydraulic, sediment transport, and erosion-related assessments regarding potential 100-year flood effects associated with ephemeral washes.

3.12.5.3 Groundwater

The proposed action would affect groundwater resources. The following measures would minimize impacts on groundwater as a result of the proposed action:

- Field-verify depth to groundwater in high groundwater risk areas.
- Abandon or replace existing groundwater wells within the proposed ROW, as necessary.
- Prior to drilling replacement wells (for those wells that fall directly in the freeway ROW), review historical groundwater quality data in those specific areas to increase the chances of locating groundwater that meets the water quality standards for which it is intended.

3.12.6 Subsequent Tier 2 Analysis

Surface water, floodplain, and groundwater conditions would be analyzed in the Tier 2 phase. These subsequent analyses would involve investigating the more refined alternatives identified within the boundaries of the action corridor alternatives discussed in this Tier 1 DEIS.

3.12.6.1 Conclusion

Runoff from any implemented action corridor alternative would temporarily increase pollutant loading in surface water drainage during seasonal runoff. The differences in pollutant loading among action corridor alternatives would be minor, and the impacts from pollutant loading would be typical of such impacts experienced throughout the Phoenix metropolitan region's freeway system. Impacts would be effectively mitigated through the AZPDES Construction General Permit, which requires the implementation of a Stormwater Pollution Prevention Plan.

All of the action corridor alternatives cross the Gila River and tributary floodplains, with the W1a (301 acres), E3a/E3c (467 acres), and E4 (257 acres) Alternatives having substantially greater effect on floodplain acreage than would the E1a (240 acres), W3 (215 acres), and W4 (0 acres) Alternatives. Floodplain impacts would be mitigated through elevated crossings of the floodplain, using appropriate bridge and culvert design. Under the No-Action Alternative, continued urbanization in the foreseeable future would likely lead to further encroachment into federally mapped floodplains.

Other than physically relocating wells directly in the proposed freeway's ROW, or purchasing and abandoning such wells, the anticipated impacts on groundwater are minimal. The Western Alternatives pass through a longer section of irrigation districts, which increases the number of groundwater wells (79) affected as compared with the Eastern Alternatives (68). Groundwater throughout the study area is sufficiently deep so as not be affected by surface development of any action corridor alternative. Conversely, with the exception of two potentially high groundwater areas along the Eastern Alternatives, groundwater is not likely to have a direct impact on any action corridor alternatives. It is recommended the depth to groundwater in these two areas be field-verified. The most substantial groundwater-related impacts would be subsidence and fissures that could directly affect the W1a Alternative at the northern end of the study area and the E4 and W4 Alternatives at the southern end. From strictly a groundwater perspective, the Eastern Alternatives are preferred because they would pass through less irrigation district land, would require fewer well replacements, and would experience fewer impacts from subsidence and fissures.

All action corridor alternatives are located several miles west of the Picacho Mountains, outside of the drainage basin that contributes to the Upper Santa Cruz and Avra Valley Basin sole source aquifer. No impacts on the sole source aquifer would occur.

3.13 Waters of the United States

This section describes the existing environment for Waters and potential impacts on those resources as a result of the proposed action. USACE administers Section 404 of the CWA, which regulates the discharge of dredged or fill material into Waters, including wetlands. USACE regulates impacts on Waters primarily through permitting, using nationwide and individual permits. Types of Waters that are regulated include ephemeral washes, intermittent and perennial streams, springs, riverbeds, wetlands, and other special aquatic sites. The physical attributes of a water body are a key component of the Waters determination. The types of activities and impacts on affected Waters are fundamental to the associated permitting requirements and level of appropriate mitigation measures.

Waters are defined in 33 CFR § 328.3; this section defines the term “waters of the United States” as it applies to the jurisdictional limits of the authority of USACE under the CWA. It prescribes the policy, practice, and procedures to be used in determining the extent of USACE’s jurisdiction concerning “waters of the United States.”

The 2015 Clean Water Rule modified the definition, but it is not being implemented in 26 states because of litigation. In Arizona, USACE and EPA are following the Rapanos Guidance that was issued in 2008 (EPA 2019). It is worth noting that the definition is currently under revision by EPA and USACE, and may change in the future.

Ephemeral washes are drainage features that typically convey stormwater during or after storms. The jurisdictional status of an ephemeral wash is determined on a case-by-case basis through a significant nexus determination made in an approved jurisdictional determination.

3.13.1 Regulatory Context

The CWA is the primary federal statute governing discharge of pollutants into Waters, which, in Arizona, include perennial, intermittent, and ephemeral watercourses, their tributaries, and adjacent wetlands. The CWA’s principal goal is to establish water quality standards to restore and maintain the chemical, physical, and biological integrity of Waters by preventing point (concentrated output) and nonpoint (widely scattered output) pollution sources.

Section 404 of the CWA regulates the discharge of earthen fill, concrete, and other construction materials into waterways, and authorizes USACE to issue permits regulating the discharge of dredge or fill material into Waters. The limits of Waters are defined through a preliminary jurisdictional determination or an approved jurisdictional determination accepted by USACE. A preliminary jurisdictional determination assumes all drainages identified in a given area that have the appropriate physical characteristics are subject to USACE’s jurisdiction. An approved jurisdictional determination requires that all drainages display a significant nexus to a downstream traditional navigable water.

Common types of Section 404 permits for transportation projects in Arizona are (1) Nationwide Permit 14 (Linear Transportation Projects), and (2) individual permits, which are required for projects that affect more than a certain defined area of Waters or involve impacts on wetlands. Mitigation may be required to minimize or offset the impacts on Waters with no net loss of functions and values of the water resource Note that mitigation is guided by regulations set forth at 33 CFR Part 332. In Arizona, mitigation usually occurs through the purchase of credits by the permittee from an in-lieu fee program that serves the project’s watershed or ecoregion.

According to CFR 40 Part 230(a), “no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.” This regulation mandates that the least environmentally damaging practicable alternative (LEDPA) is identified as part of the alternatives analysis if an individual permit is required. In a Tier 1

study, it is important that the potential LEDPA is not eliminated with the selection of the preferred alternative.

Section 404 permits require water quality certification as set forth in Section 401 of the CWA prior to discharging fill material into Waters. Section 401 of the CWA requires any applicant requesting a federal permit or license for activities that may result in discharge into Waters to first obtain a Section 401 certification from the state in which the discharge originates. The Section 401 certification verifies that prospective permits comply with the State's applicable effluent limitations and water quality standards. Federal permits or licenses are not issued until the Section 401 certification is obtained. Since the project would be located on non-tribal land, ADEQ would be responsible for the Section 401 certification, which is either conditional or individual. If a project meets criteria for conditional Section 401 certification, notification to ADEQ is typically not required. However, if a project does not meet criteria for conditional certification, such as projects occurring within 0.25 mile of unique or impaired waters, an individual Section 401 certification application to ADEQ is required. The CWA Section 303(d) list identifies those waters that are impaired and indicates the pollutant(s) causing impairment (ADEQ 2007, 2014). Notification to ADEQ also occurs whenever a preconstruction notification to USACE is submitted for a Nationwide Permit.

3.13.1.1 Identification of 303(d) Impaired Waters

Arizona's Integrated 305(b) Water Quality Assessment and 303(d) Listing Report (published biennially) describes the status of surface and groundwater resources in Arizona in relation to State water quality standards. The report is so named because it fulfills requirements of Section 305(b) of the CWA and is based on the requirement to identify waterbodies that do not meet water quality standards. These *water quality limited waters* are waterbodies assessed by ADEQ as having impaired quality that would require more than existing technology and permit controls to achieve or maintain water quality standards for intended uses in accordance with CWA Section 303(d) (ADEQ 2007, 2014).

Section 402 of the CWA presents the National Pollutant Discharge Elimination System (NPDES), which regulates pollutant discharges, including stormwater, into Waters. The NPDES permit sets specific discharge limits for pollutants into Waters and outlines special conditions and requirements for a particular project to reduce impacts on water quality. In 2002, EPA authorized ADEQ to administer the NPDES program at the State level, which is called the AZPDES. AZPDES permits are required for construction activities exceeding 1 acre of ground disturbance and require preparing and implementing a stormwater pollution prevention plan and implementing erosion control best management practices for the protection of Waters.

3.13.2 Methodology

The following activities and guidance documents were used to identify Waters in the study area:

- review of USGS 7.5-minute topographic quadrangles
- desktop review of aerial photography from Google Earth
- *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (USACE 2008a)
- 33 CFR Part 328 and 33 CFR Part 329, Definition of Waters of the United States and Navigable Waters
- *Wetlands Delineation Manual* (USACE 1987)
- USACE regulatory guidance letter (No. 08-02) for jurisdictional delineations, dated June 26, 2008 (USACE 2008b)

- *Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States* (EPA and USACE 2008), memorandum and guidance

3.13.3 Affected Environment

Potential Waters in the study area include ephemeral washes and intermittent streams (characteristic of the region's semiarid climate and landscape). The nearest traditionally navigable water is the Gila River, approximately 75 miles downstream of the study area. As mentioned earlier, ephemeral washes must have a significant nexus to a traditionally navigable water in order to be jurisdictional. When reviewing the discussion of ephemeral washes, note that some may be found to be non-jurisdictional during the Tier 2 phase.

Numerous named and unnamed ephemeral washes exist in the study area. Washes north of the Gila River originate near the Superstition or Goldfield Mountains east and north of the study area. Many of the ephemeral washes north of the Gila River are blocked by the CAP Canal, and water collects behind the canal in retention basins. Larger washes such as the Brady, Bogart, Durham, and Paisano Washes are south of the Gila River and upstream of the CAP Canal; they generally originate near the Tortilla Mountains and flow west into McClellan Wash or across the CAP Canal into the Picacho Reservoir or the Gila River. Some ephemeral channels in the study area lack connections to a downstream water.

The CAP Canal, including a segment called the Salt-Gila Aqueduct, generally runs to the southeast through most of the study area. It turns east in the central portion of the study area across SR 79, passes under the Gila River and then continues to the south, outside the study area. The CAP Canal is a 336-mile-long system of aqueducts, tunnels, pumping plants, and pipelines constructed by the Bureau of Reclamation. In the study area, it passes through undeveloped desert and agricultural fields and creates an east-to-west barrier for many of the small ephemeral washes. The CAP Canal is not a Water.

Other named canals in the study area, some of which could be potential Waters depending on their functional status and connection with Waters, include the North Side, Central Main, Florence, Pima Lateral, Hohokam Lateral, and Casa Grande Canals. These canals would be evaluated for their status as Waters through a jurisdictional delineation for the Tier 2 study.

The USFWS National Wetland Inventory database identifies freshwater emergent and freshwater forested/shrub wetlands in the study area along the Gila River. The database also identifies freshwater ponds throughout the study area. These ponds are generally livestock tanks, and many provide a connection to potential Waters (primarily ephemeral washes). These ponds and wetlands may also be considered Waters and would be evaluated during the jurisdictional delineation for the Tier 2 study. Based on the field review, however, no wetland vegetation was present.

3.13.4 Environmental Consequences

This section describes impacts on potential Waters, including ephemeral and intermittent streams, that could result from the No-Action Alternative and the action corridor alternatives. Potential Waters in the study area are based on drainages identified on USGS topographic maps and review of aerial photographs that indicate the presence of a well-defined channel.

3.13.4.1 No-Action Alternative

The No-Action Alternative would not result in direct impacts on Waters.

3.13.4.2 Action Alternatives

All action corridor alternatives would cross the Gila River, Queen Creek, and unnamed ephemeral washes. Impacts associated with all action corridor alternatives would likely include placement of fill into potential Waters. Effects on potential Waters within the action corridor alternatives may include channel

realignment, placement of culverts, placement of facility structures such as piers, or runoff from the freeway, as addressed in Section 3.12, *Hydrology, Floodplains, and Water Resources*. The roadway drainage system would channel minor washes to major washes. Transverse crossings over major washes would be constructed using culverts to convey stormwater beneath the roadway or under bridges. Temporary construction zones may result in additional impacts on Waters.

The action corridor alternatives are 1,500 feet wide, and the freeway ROW would typically be narrower—located somewhere within the larger action corridor alternative. Impacts on potential Waters were evaluated based on the average widths of the potential Waters within each action corridor alternative, the width of the action corridor alternatives, and the amount of fill that is anticipated for road and bridge crossings. Figure 3.13-1 shows potential Waters, and Table 3.13-1 lists estimates of the number of jurisdictional features that each action corridor alternative would cross, by segment.

Segment 1

Segment 1 includes the CAP Canal, Weekes Wash, Siphon Draw, Queen Creek, Cottonwood Creek, their unnamed ephemeral tributaries, livestock tanks, freshwater ponds, and an unnamed canal along the Magma Arizona Railroad. All of the Segment 1 action corridor alternatives would cross Queen Creek and other potential Waters. Weekes Wash and Cottonwood Creek would not be affected by the Segment 1 action corridor alternatives. The Eastern Alternatives would cross more potential Waters than the Western Alternatives.

With regard to the SR 24 connection, the E1a Alternative would likely have less impact on Waters than the E1b, W1a, and W1b Alternatives because it would cross ephemeral washes in that area in a more perpendicular manner.

Segment 2

Segment 2 includes the CAP Canal, Magma Dam, unnamed canals, livestock tanks, freshwater ponds, and unnamed ephemeral tributaries. All of the Segment 2 action corridor alternatives would cross potential Waters. The Eastern Alternatives would cross approximately the same number of potential Waters as the Western Alternatives. The CAP Canal would not be affected by the Segment 2 action corridor alternatives.

Segment 3

Segment 3 includes the CAP Canal, North Side Canal, Pima Lateral Canal, Florence Casa Grande Canal, Hohokam Lateral, unnamed canals, livestock tanks, freshwater ponds, the Gila River, National Wetland Inventory-identified freshwater ponds along the Gila River, Little Gila River, Bogart Wash, Paisano Wash, McClellan Wash, and unnamed ephemeral washes. Any of the Segment 3 action corridor alternatives would cross the Gila River and other potential Waters, including livestock ponds. The CAP Canal and Paisano Wash would not be affected by the Segment 3 action corridor alternatives. The Eastern Alternatives would cross more potential Waters than the Western Alternatives.

With regard to the Gila River crossing, the E3b and E3d Alternatives would have the least potential impact, although the W3 Alternative's potential impact would be only minimally greater. The E3a and E3c Alternatives would cross the Gila River in a nearly parallel manner, rather than perpendicularly, and thus would potentially have greater impacts on that Water. South of the Gila River, the E3a, E3b, E3c, and E3d Alternatives would also cross an unnamed wash in a nearly parallel manner, resulting in potentially greater impacts than the W3 Alternative.

Figure 3.13-1. Potential waters of the United States

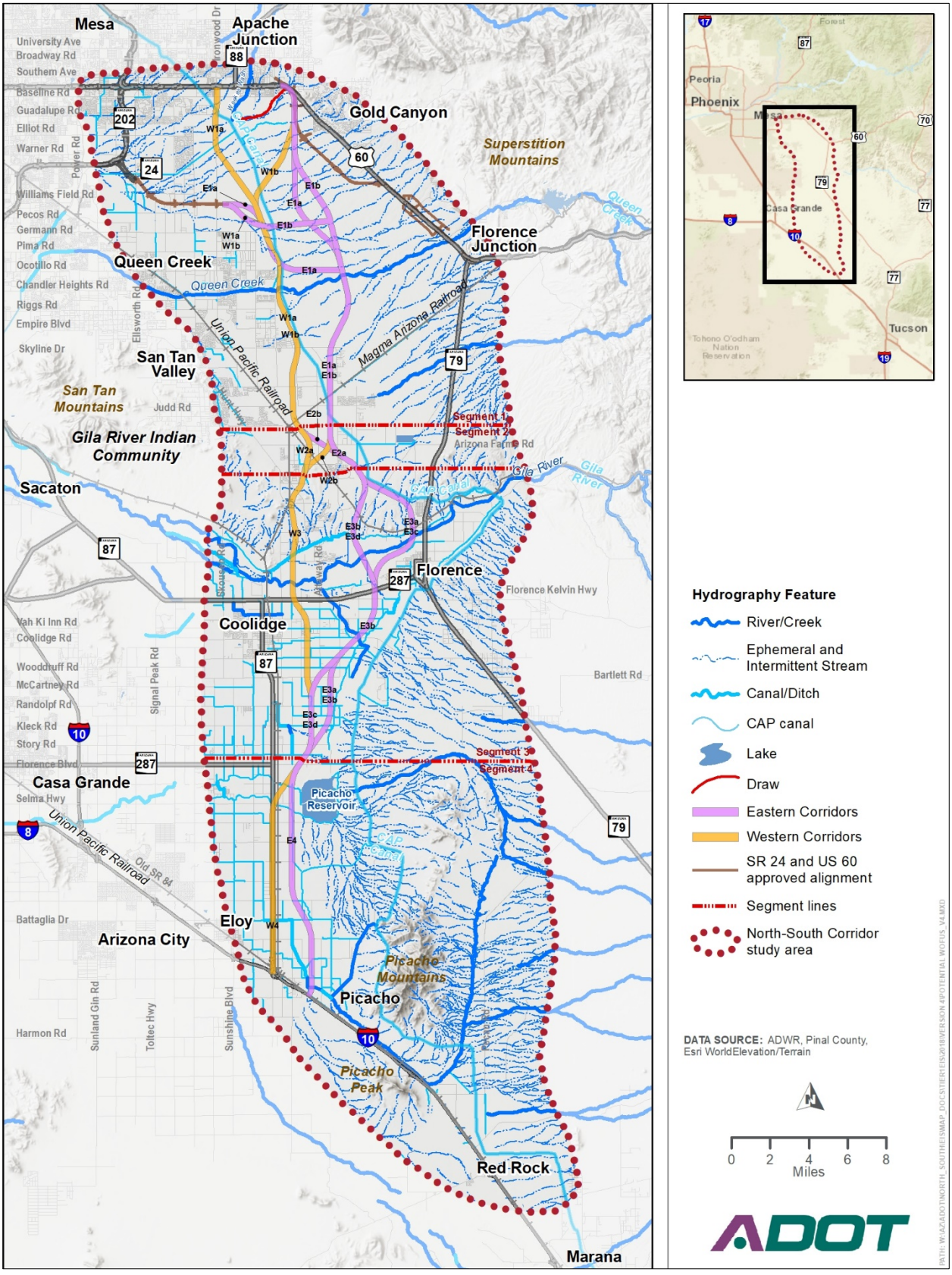


Table 3.13-1. Potential waters of the United States within the action corridor alternatives

Action corridor alternative	Potential waters of the United States (including livestock tanks)	Total drainage crossings
Segment 1		
E1a	27–29 ephemeral wash crossings, including Siphon Draw; Queen Creek; 4–6 freshwater (livestock) ponds; Central Arizona Project Canal	33–37
E1b	22–24 ephemeral wash crossings, including Siphon Draw; Queen Creek; 3–5 freshwater (livestock) ponds; Central Arizona Project Canal	27–31
W1a	16–18 ephemeral wash crossings, including Siphon Draw; Queen Creek; 4–6 freshwater (livestock) ponds; 3–4 unnamed canals; Central Arizona Project Canal	25–30
W1b	17–19 ephemeral wash crossings; Queen Creek; 3–5 freshwater (livestock) ponds; 3–4 unnamed canals; Central Arizona Project Canal	25–30
Segment 2		
E2a	1–3 ephemeral wash crossings	1–3
E2b	1–3 ephemeral wash crossings	1–3
W2a	1–3 ephemeral wash crossings	1–3
W2b	1–3 ephemeral wash crossings	1–3
Segment 3		
E3a	10–12 ephemeral wash crossings, including Bogart Wash; Gila River; 1–2 freshwater and/or livestock ponds; 18–20 unnamed canals	30–35
E3b	5–7 ephemeral wash crossings, including Bogart Wash; Gila River and 1–2 associated National Wetland Inventory ponds; North Side Canal; 17–19 unnamed canals	25–30
E3c	13–15 ephemeral wash crossings, including Bogart Wash; Gila River; 1–2 freshwater (livestock) ponds; North Side Canal; 15–17 unnamed canals	31–36
E3d	13–15 ephemeral wash crossings, including Bogart Wash; Gila River and 1–2 associated National Wetland Inventory ponds; North Side Canal; 15–17 unnamed canals	31–36
W3	9–11 ephemeral wash crossings; Gila River and 1–2 associated National Wetland Inventory ponds; North Side Canal; 11–13 unnamed canals	23–28
Segment 4		
E4	1–3 ephemeral wash crossings; McClellan Wash; 2–3 freshwater (livestock) ponds; 10–12 unnamed canals	14–19
W4	1–3 ephemeral wash crossings; McClellan Wash; 5–7 unnamed canals	7–11

Segment 4

Segment 4 includes the CAP Canal; Picacho Reservoir; Casa Grande Canal; Florence Casa Grande Canal extension; the McClellan, Brady, Tom Mix, Bogard, Durham, and Suizo Washes; freshwater ponds; and other unnamed ephemeral washes. Any of the Segment 4 action corridor alternatives would cross McClellan Wash and other potential Waters. The CAP Canal and the Brady, Bogard, Tom Mix, and Durham Washes would not be affected by the Segment 4 action corridor alternatives. The Eastern Alternative would cross approximately the same number of potential Waters as the Western Alternative.

Regarding the McClellan Wash crossing, the E4 Alternative would cross the wash at a point where it is more constrained.

3.13.5 Potential Avoidance, Minimization, and Mitigation Strategies

It is anticipated that none of the action corridor alternatives would completely avoid potential Waters because any freeway corridor would cross the Gila River, Queen Creek, and numerous ephemeral washes. Crossing potential Waters was evaluated during the alternatives analysis for the proposed action (see Chapter 2, *Alternatives*, and Chapter 6, *Evaluation of Alternatives*).

There is a risk of impacts on Waters with both the Eastern and Western Alternatives; therefore, either a Section 404 CWA Nationwide Permit 14 (Linear Transportation Projects) with preconstruction notification or an individual permit from USACE and the respective Section 401 certification from ADEQ would be required. ADOT would comply with all terms and conditions of the CWA permitting as established by USACE.

If an individual permit under Section 404 of the CWA would be required, ADOT would follow Section 404(b)(1) guidelines. Under Section 404(b)(1), ADOT is required to select the LEDPA, considering cost, existing technology, and logistics to identify practicable alternatives, as well as the environmental impacts of alternatives that would avoid the Waters, in light of overall project purposes (40 CFR Part 230). According to Section 404(b)(1), when avoidance of Waters would not be practicable, minimization of impacts would be achieved and unavoidable impacts would be mitigated to the extent reasonable and practicable.

The avoidance, minimization, and mitigation strategies identified in Section 3.12, *Hydrology, Floodplains, and Water Resources*, present the actions ADOT would take with regard to mitigating and reducing the impact of the proposed action on surface water and floodplains. In addition to these strategies, the following steps would be taken by ADOT should a Section 404 individual permit be required:

- minimize impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts
- rectify impacts by repairing, rehabilitating, or restoring the affected environment
- reduce impacts over time by preservation and maintenance operations during the life of the action
- compensate for impacts by replacing, enhancing, or providing substitute resources or environments

The general and special conditions of any Section 404 permit would be followed during construction.

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts.

3.13.6 Subsequent Tier 2 Analysis

During the Tier 2 analysis, a preferred alternative would be identified with a specific alignment for the freeway that avoids Waters as much as possible and minimizes impacts where avoidance is not feasible. During this analysis, a jurisdictional delineation would be conducted and submitted to USACE to determine the extent of Waters within the preferred alternative. The jurisdictional delineation would include a desktop review followed by a site visit to document Waters within the preferred alternative alignment. In locations where the Tier 2 alignment may cross Waters perpendicularly, design options to span the crossing would be considered and prioritized to avoid the need for dredged or fill materials in the Water. If it is anticipated that there would be more than 0.5 acre of Waters affected with the preferred alignment and an individual permit is required, an alternatives analysis would be conducted to show that

the preferred alternative is, in fact, the LEDPA, since an individual permit can be issued only for the LEDPA. The alternatives analysis would follow Section 404(b)(1) guidelines and would include:

- need and purpose of the action
- description of alternatives
- description and analysis of alternatives for practicability
- identification of the LEDPA
- determination of the LEDPA

During the Tier 2 study, the Selected Alternative would be evaluated for impacts on Waters and the appropriate Section 404 permit application would be prepared for the Selected Alternative. The application would be submitted to USACE for approval, and mitigation to offset impacts on Waters would be identified.

3.13.6.1 Conclusion

Under the No-Action Alternative, no impacts on Waters related to the proposed action would occur; however, continuing urban development associated with projected growth in the region and study area would continue to affect Waters.

The Western Alternatives would affect the fewest potential Waters; however, during the Tier 2 study, potential impacts on Waters would be evaluated and the LEDPA, after considering cost, existing technology, and logistics, in light of overall project purposes, would be identified within the selected corridor, should an individual permit be required. For the proposed action, permits would be required under Sections 404 and 401 of the CWA. CWA permitting would be completed during the freeway design phase. ADEQ would issue Section 401 certification for compliance with water quality prior to Section 404 permit issuance. The general and special conditions of the Section 404 permits would minimize impacts on Waters to the extent practicable.

3.14 Cultural Resources

This section describes potential impacts on cultural resources that could result from the proposed action.

A cultural resource is a definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources include prehistoric and historic sites; historic buildings, structures, objects, districts, and landscapes; and properties that are associated with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. This evaluation is based on inventories of archaeological and historical resources and places of traditional cultural importance. See Section 3.19, *Section 4(f) and Section 6(f) Resources*, for a discussion of potential impacts on historic sites afforded protection under Section 4(f).

3.14.1 Regulatory Context

3.14.1.1 National Environmental Policy Act

Section 101(b)(4) of NEPA (42 USC § 4321 et seq.) stipulates that federal agencies work to preserve not only the natural environment but also historic and cultural aspects of our nation's heritage. The cultural environment includes those aspects of the physical environment that relate to human culture and society, along with the institutions that form and maintain communities and link them to their surroundings (King and Rafuse 1994). Agency and public scoping for the NSCS identified three components of the cultural environment that are of concern: (1) archaeological sites; (2) historic districts, buildings, and structures; and (3) traditional cultural resources and life ways.

3.14.1.2 National Historic Preservation Act

Section 106 of the NHPA, as amended (54 USC § 300101 et seq.), requires federal agencies to take the effects of their undertakings on historic properties into account and to afford the State Historic Preservation Office (SHPO) or Tribal Historic Preservation Officer and other consulting parties an opportunity to comment on such undertakings. Regulations for Protection of Historic Properties (36 CFR § 800) implement Section 106 of the NHPA. These regulations define a process for responsible federal agencies to consult with the SHPO or Tribal Historic Preservation Officer, Native American groups, other interested parties, and, when necessary, the Advisory Council on Historic Preservation to ensure that historic properties are duly considered as federal projects are planned and implemented. Historic properties are cultural resources that are included in or eligible for inclusion in the NRHP. ADOT is the lead agency responsible for Section 106 compliance for the NSCS.

To be determined eligible for inclusion in the NRHP, a cultural resource must meet three main standards: age, integrity, and significance. To meet the age criterion, the resource generally must be at least 50 years old, although younger properties may be considered for inclusion if they are of exceptional importance. Integrity is the ability of a cultural resource to convey its significance. To meet the integrity criterion, the resource must possess the applicable aspects of integrity, which may include location, design, setting, materials, workmanship, feeling, and association. Finally, the resource must be significant according to one or more of the following criteria:

Criterion A: be associated with events that have made a significant contribution to the broad patterns of our history

Criterion B: be associated with the lives of persons significant in our past

Criterion C: embody the distinctive characteristics of a type, period, or method of construction; or represent the work of a master; or possess high artistic values; or represent a significant distinguishable entity whose components may lack individual distinction

Criterion D: have yielded, or may be likely to yield, information important in prehistory or history.

Section 106 Consultation

Table 3.14-1 summarizes the Section 106 consultation efforts for the NSCS. Letters were sent to agencies and/or Native American tribes on the dates listed in the table, which also lists the topic of the letters. For additional details and the consultation letters, refer to Appendix J, *Section 106 Consultation*.

Table 3.14-1. Section 106 consultation

Date	Topic
2/17/2011	Initiation of Section 106 consultation
6/28/2011	Class I cultural resources overview report
9/9/2011	Class I cultural resources overview report (additional letter to Center for Desert Archaeology)
11/16/2011	Traditional cultural property inquiry
2/3/2014	Approach for addressing traditional cultural properties
4/7/2014	Follow-up correspondence (by email) regarding approach for addressing traditional cultural properties
9/3/2015	Traditional cultural property overview report and technical summary report
4/18/2016	Traditional cultural property technical summary report
6/22/2016	Revised versions of traditional cultural property overview and technical summary reports
3/15/2017	Supplemental Class I cultural resources overview and built environmental reports
3/23/2017	Class III cultural resources survey report
4/17/2017	Response to letter from Gila River Indian Community Tribal Historic Preservation Office regarding consulting parties
9/13/2017	Revised version of Class III cultural resources survey report
9/28/2017	Built environment inventory report
10/24/2017	Memorandum regarding AZ U:14:73(ASM) (Site 73)
11/2/2017	Traditional cultural property evaluation
2/26/2018	Invitation to additional agencies to participate in Section 106 consultation

Traditional Cultural Properties

Amendments to NHPA in 1980 resulted in NRHP Bulletin 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (TCPs). TCPs are properties that have heritage value for contemporary communities and are eligible for the NRHP because of their association with historic cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the community's continuing cultural identity. This category of resources can encompass archaeological resources, structures, neighborhoods, prominent topographic features, habitat, plants, animals, and minerals that people consider essential for the preservation of a traditional culture. A TCP is ascribed an intangible cultural element or value that is linked to a specific geographic location.

3.14.1.3 State Preservation Laws

In addition to other federal laws (for example, Archaeological Resources Protection Act of 1979, Native American Graves Protection and Repatriation Act of 1990), a project may also need to comply with state preservation laws including the State Historic Preservation Act of 1982 (A.R.S. §§ 41-861 and 41-864) and the Arizona Antiquities Act (A.R.S. §§ 41-841 to 41-847). The State Historic Preservation Act stipulates that state agencies work to identify and preserve historic properties and states that the chief administrator of each state agency is responsible for the preservation of historic properties that are owned or controlled by the agency. It also states that each state agency shall establish a program to locate, inventory, and nominate to the Arizona Register of Historic Places all properties that are under the agency's ownership or control and that appear to meet the criteria for inclusion on the register, and shall provide the Arizona SHPO an opportunity to comment on any agency plans that affect properties listed or that may qualify for inclusion on the Arizona Register of Historic Places. The Arizona Antiquities Act prohibits excavation of historic or prehistoric sites on lands owned or controlled by the State of Arizona, any agency or institution of the state, or any county or municipal corporations in the state without obtaining the written permission of the director of the Arizona State Museum (ASM), and directs those in charge of activities on such lands to notify the ASM director of the discovery of any archaeological sites, historical resources, and human remains in coordination with the SHPO.

3.14.2 Methodology

This evaluation used cultural resource data compiled through inventories of archaeological resources (Stewart and Brodbeck 2017), built environment resources (historic buildings and structures) (Brodbeck 2018), and TCPs (Darling 2016, 2017) prepared for the action corridor alternatives. Because specific freeway alignments have not been selected within the action corridor alternatives, an area of potential effects was not defined—nor were specific effect findings made—during this Tier 1 analysis. This Tier 1 evaluation identifies the known historical properties and cultural and historical resources in the action corridor alternatives and assesses potential impacts on those resources.

3.14.3 Affected Environment

This Tier 1 DEIS is evaluating 1,500-foot-wide action corridor alternatives. The locations of the actual alignments within the action corridor alternatives are not known and would be identified during subsequent Tier 2 evaluations. ADOT would develop project-specific areas of potential effects during the Tier 2 evaluation in consultation with the consulting parties as the projects are proposed and developed.

3.14.3.1 Archaeological Resources

The Class I inventory of archaeological resources within the action corridor alternatives identified 157 previous archaeological surveys and 86 previously recorded archaeological sites (Stewart and Brodbeck 2017). The archaeological sites are distributed across the action corridor alternatives, with noticeable concentrations of sites near the Gila River, Queen Creek, and Picacho Reservoir. A wide variety of site types was identified in the inventory, representing a range of settlement, subsistence, economic, and traditional cultural uses of the landscape. Prehistoric archaeological site types documented in the action corridor alternatives include artifact scatters, artifact scatters with features, artifact scatters with rock piles, lithic scatters, habitations, canals, and rock features. Historical archaeological site types documented in the action corridor alternatives include artifact scatters/trash dumps, artifact scatters with features, irrigation canals and ditches, and abandoned roads. Multicomponent sites have overlapping combinations of prehistoric and historical archaeological site types.

No archaeological sites in the action corridor alternatives are listed on the NRHP. Thirty-eight are determined eligible with SHPO concurrence, or recommended eligible by the recorders, for listing on the

NRHP. Eighteen sites are determined ineligible or recommended ineligible for listing on the NRHP. Thirty archaeological sites need further testing or are unevaluated.

Approximately 32 percent of the action corridor alternatives was previously surveyed. The distribution of sites in the action corridor alternatives depends, in large part, on the prior survey coverage. Large swaths of many of the action corridor alternatives have yet to be surveyed for archaeological resources. Thus, the absence of cultural resources does not necessarily mean that no cultural resources would be found through future surveys.

An important factor to consider when comparing impacts on archaeological sites among the action corridor alternatives is that the number of NRHP-eligible sites present does not always equate to the level of significance. For example, one large habitation site with human burials could, and mostly likely would, have higher cultural sensitivity than multiple small, sparse artifact scatters representing limited activity areas. Furthermore, the numbers of sites and types of sites present must be balanced with the percentage of the action corridor alternatives surveyed. As an example, the W1a and W1b Alternatives have 60 percent survey coverage, whereas the other action corridor alternative segments all have less than 50 percent coverage. Thus, the full range of impacts on archaeological sites is not known at the Tier 1 level. Class III full-coverage surveys of proposed freeway alignments would be performed at the Tier 2 level. Table 3.14-2 summarizes the known archaeological sites, by action corridor alternative.

Table 3.14-2. Archaeological sites, by action corridor alternative

Action corridor alternative	Acres[a]	Survey coverage[b] (%)	# of sites	Site types[c]	NRHP eligibility[d]
Segment 1					
E1a	4,883	20	15	8 prehistoric artifact scatters 4 prehistoric artifact scatters with features 1 prehistoric habitation 2 multicomponent sites	3 NRHP-eligible 4 NRHP-ineligible 8 not evaluated
E1b	4,451	22	11	7 prehistoric artifact scatters 2 prehistoric artifact scatters with features 1 prehistoric habitation 1 multicomponent site	3 NRHP-eligible 2 NRHP-ineligible 6 not evaluated
W1a	3,614	60	12	5 prehistoric artifact scatters 2 prehistoric artifact scatters with features 1 prehistoric habitation 1 prehistoric canal 1 historic canal 2 multicomponent habitation sites	7 NRHP-eligible 2 NRHP-ineligible 3 not evaluated
W1b	3,664	60	21	10 prehistoric artifact scatters 4 prehistoric artifact scatters with features 2 habitation sites 1 prehistoric canal 1 historic ditch 3 multicomponent sites	14 NRHP-eligible 4 NRHP-ineligible 3 not evaluated
Segment 2					
E2a	514	25	0	No sites	No sites
E2b	669	20	0	No sites	No sites
W2a	479	5	0	No sites	No sites
W2b	561	5	0	No sites	No sites

Table 3.14-2. Archaeological sites, by action corridor alternative

Action corridor alternative	Acres[a]	Survey coverage[b] (%)	# of sites	Site types[c]	NRHP eligibility[d]
Segment 3					
E3a	3,369	37	23	4 prehistoric artifact scatters 1 prehistoric lithic scatter 11 prehistoric artifact scatters with rock piles 2 prehistoric habitations 2 historic artifact scatters 1 historic artifact scatter with features 2 multicomponent sites	14 NRHP-eligible 3 NRHP-ineligible 6 not evaluated
E3b	3,018	46	18	10 prehistoric artifact scatters 2 prehistoric artifact scatters with rock piles 1 prehistoric habitation 1 historic canal 1 historic artifact scatter with features 3 multicomponent sites	10 NRHP-eligible 5 NRHP-ineligible 3 not evaluated
E3c	3,389	36	23	9 prehistoric artifact scatters with rock piles 5 prehistoric artifact scatters 1 prehistoric lithic scatter 1 rock feature 2 prehistoric habitations 2 historic artifact scatters 1 historic artifact scatter with features 2 multicomponent sites	12 NRHP-eligible 5 NRHP-ineligible 6 not evaluated
E3d	3,038	46	18	10 prehistoric artifact scatters 2 prehistoric artifact scatters with rock piles 1 prehistoric habitation 1 historic artifact scatter 1 historic canal 3 multicomponent sites	10 NRHP-eligible 5 NRHP-ineligible 3 not evaluated
W3	2,760	35	8	4 prehistoric artifact scatters 1 prehistoric artifact scatter with features 1 prehistoric habitation 2 unnamed historic dirt roads	3 NRHP-eligible 2 NRHP-ineligible 3 not evaluated
Segment 4					
E4	2,280	27	5	2 prehistoric artifact scatters 1 prehistoric lithic scatter 1 Archaic-period campsite 1 multicomponent site	5 not evaluated
W4	2,088	40	7	5 prehistoric artifact scatters 1 prehistoric habitation 1 multicomponent site	5 NRHP-eligible 2 not evaluated

Note: NRHP = National Register of Historic Places
[a] total acres in action corridor alternative [b] approximate [c] Multicomponent sites have both prehistoric and historical period components.
[d] NRHP eligibility determined by the Federal Highway Administration in consultation with the State Historic Preservation Office.

3.14.3.2 Historic Built Environment Resources

The historic built environment inventory for the action corridor alternatives addressed historic buildings, structures, and districts (Brodbeck 2018). Buildings and structures constructed prior to 1975 were included in the inventory, which accounts for a 50-year window, from 1975 to 2025 (in anticipation of

future Tier 2 projects). Property parcels that extend into the action corridor alternatives that contain historic built environment resources outside the corridor were included in the analysis so that indirect effects from potential ROW acquisitions could be considered. Table 3.14-3 lists the built environment properties, by action corridor alternative.

Table 3.14-3. Built environment resources, by action corridor alternative

Action corridor alternative	Property type	NRHP eligibility
Segment 1		
E1a	1 highway 1 railroad	2 NRHP eligible
E1b	1 highway 1 railroad	2 NRHP eligible
W1a	1 highway 1 railroad 1 residence	2 NRHP eligible 1 NRHP ineligible
W1b	1 highway 1 railroad 1 residence	2 NRHP eligible 1 NRHP ineligible
Segment 2		
E2a	2 residences	2 not evaluated
E2b	2 residences	2 not evaluated
W2a	1 railroad	1 NRHP eligible
W2b	1 railroad	1 NRHP eligible
Segment 3		
E3a	8 residences 5 residential farmsteads 4 utility buildings 2 canals 1 highway 1 railroad 1 residential farmstead/dairy	4 NRHP eligible 10 NRHP ineligible 8 not evaluated
E3b	6 residences 5 residential farmsteads 4 utility buildings 2 canals 1 highway 1 railroad 1 residential farmstead/dairy	4 NRHP eligible 8 NRHP ineligible 8 not evaluated
E3c	4 residential farmsteads 2 canals 2 residences 2 utility buildings 1 highway 1 railroad 1 residential farmstead/dairy	4 NRHP eligible 5 NRHP ineligible 4 not evaluated

Table 3.14-3. Built environment resources, by action corridor alternative

Action corridor alternative	Property type	NRHP eligibility
E3d	4 residential farmsteads 2 canals 2 utility buildings 1 highway 1 railroad 1 residential farmstead/dairy	4 NRHP eligible 3 NRHP ineligible 4 not evaluated
W3	2 residential farmsteads 1 airfield 1 school 1 utility building 1 highway 1 railroad 1 canal	4 NRHP eligible 4 not evaluated
Segment 4		
E4	1 barn 1 residence 2 canals 1 railroad 1 pipeline	4 NRHP eligible 2 not evaluated
W4	1 barn 1 farmstead 6 residences 1 residential farmstead 2 warehouse facilities 1 service garage 1 highway 2 railroads 2 canals 1 pipeline	6 NRHP eligible 5 NRHP ineligible 7 not evaluated

Note: NRHP = National Register of Historic Places

Thirty-eight historic-era building properties and 12 historic-era linear structures were identified within the action corridor alternatives. These properties include 18 residences, 9 residential farmsteads, 4 railroads, 4 irrigation canals, 3 state highways, 2 cotton warehouse facilities, 1 elementary school, 4 utility buildings, 1 farmstead, 1 barn, 1 service garage, 1 airfield (with auxiliary buildings), and 1 pipeline. Of these, 13 properties have been determined eligible for listing on the NRHP with SHPO concurrence, 16 properties have been determined ineligible for NRHP listing with SHPO concurrence, and 21 properties are unevaluated.

3.14.3.3 Traditional Cultural Properties

An inventory of TCPs was carried out for the entire EIS study area (Darling 2016, 2017). The TCP inventory identified and evaluated TCPs within the EIS study area, which was expansive and encompassed the action corridor alternatives. The action corridor alternatives would avoid all NRHP-eligible TCPs. Potential indirect effects on TCPs would be evaluated at the Tier 2 stage once potential freeway alignments are proposed.

During field visits in April 2016 conducted by the study team archaeologist with representatives of the Four Southern Tribes, the Four Southern Tribes raised concerns regarding the potential impacts of the alternatives on TCPs.

To address the Four Southern Tribes' concerns, a meeting was held in Casa Grande in August 2016. The meeting, coordinated by ADOT and FHWA, was attended by ADOT management, the FHWA Arizona Division Administrator, and Four Southern Tribes' representatives. At this meeting, the lead agencies committed to adjusting the alternatives to avoid sensitive sites (near the Gila River and Queen Creek). The study team agreed to prepare avoidance alternatives and to review them with the Four Southern Tribes.

On March 28, 2017, the study team presented the avoidance alternatives to the Four Southern Tribes at a workshop in Casa Grande. The alternatives were discussed at two subsequent meetings with the Four Southern Tribes on May 17 and May 31, 2017. While the tribes' general position was that they would prefer improvements to the area's existing roadway infrastructure, they did identify a preferred corridor. This information—along with the preferences of jurisdictions affected by the proposed action, the cooperating and participating agencies, and the public—is presented in the *Corridor Selection Report* evaluation criteria (see Appendix C, *Alternatives Screening*).

AZ U:14:73(ASM) is a prehistoric site within the W1a and W1b Alternatives that was identified as a TCP not eligible for NRHP listing because of integrity issues (Darling 2017). After the TCP evaluation was completed, additional information about the site was obtained through continuing consultation with the Four Southern Tribes (Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and Tohono O'odham Nation). In a memorandum to the Four Southern Tribes dated October 24, 2017, FHWA and ADOT acknowledged that the site may be eligible as a TCP, stated that sufficient information had been obtained for the Tier 1 EIS process, and proposed to reevaluate the site's eligibility in the Tier 2 study if an action corridor alternative that partially encompasses the site is chosen as the selected corridor in the Tier 1 ROD.

3.14.4 Environmental Consequences

This section evaluates the potential effects on cultural resources from the action corridor alternatives and No-Action Alternative. An adverse effect would occur when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative. Impacts on cultural resources would vary depending on the future location of a freeway alignment within the selected action corridor alternative. Avoidance is the preferred way to address cultural resources, and decisions regarding avoidance methods would be reached through Section 106 consultation during the Tier 2 process when more details regarding the freeway location, design, and operation would be available.

Physical impacts on cultural resources may include direct damage to or destruction of cultural resources within the footprint of the freeway alignment, including any needed nearby staging areas.

Operational impacts on cultural resources could include permanent access restrictions, visual impacts, and noise and vibration impacts on properties close to a future freeway alignment. In addition, direct damage to or destruction of cultural resources (for example, looting) attributable to increased accessibility to previously isolated areas is possible. Permanent loss or temporary changes in the viewshed of potential TCPs and permanent loss or temporary changes to potential TCP access and use could result.

Construction impacts on cultural resources may include direct damage to or destruction of cultural resources and noise and vibration impacts on properties that are close to a future freeway alignment (including staging areas) but would not be permanently incorporated into the freeway facility. Indirect damage may be caused through vibrations from geotechnical testing, use of heavy equipment, or earth-

moving activities. Construction impacts may also include unanticipated discovery of previously unknown cultural resources (including human burials), permanent loss or temporary changes in the viewshed of potential TCPs, permanent loss or temporary changes in potential TCP access and use, and increased noise and dust.

3.14.4.1 No-Action Alternative

Under the No-Action Alternative, the proposed action would not affect cultural resources.

3.14.4.2 Action Corridor Alternatives

Segment 1

The Eastern and Western Alternatives within Segment 1 contain NRHP-eligible archaeological sites and, because the corridors have not been surveyed in full, the complete distribution of sites in the corridors is not known. Impacts on archaeological sites would depend on the potential freeway alignment developed for Tier 2 projects. The Eastern Alternatives have no historic-era building properties, 1 historic-era highway, and 1 historic-era railroad. The Western Alternatives have 1 NRHP-ineligible historic-era building property, 1 NRHP-eligible historic-era highway, and 1 NRHP-eligible historic-era railroad. NRHP eligibility evaluations would be required for Tier 2 projects for any unevaluated built environment resources. Furthermore, an assessment of effects on historic-era buildings and structures would be performed for Tier 2 projects once freeway alignments have been developed. No NRHP-eligible TCPs are within the Eastern and Western Alternatives in Segment 1; however, AZ U:14:73(ASM) is located in the W1a and W1b Alternatives and would require reevaluation during the Tier 2 process as a potential TCP. Evaluation of potential indirect effects on TCPs would be performed for Tier 2 projects.

Segment 2

No NRHP-eligible archaeological sites have been identified in the Eastern and Western Alternatives within Segment 2; however, because the corridors have not been surveyed in full, the distribution of sites within the corridors is not known. Impacts on archaeological sites would depend on the potential freeway alignment developed for Tier 2 projects. The Eastern Alternatives have 2 historic-era building properties that have not been evaluated for NRHP eligibility. The Western Alternatives have 1 historic-era railroad and no historic-era building properties. NRHP eligibility evaluations would be required for Tier 2 projects for any unevaluated built environment resources. Furthermore, an assessment of effects on historic-era buildings and structures would be performed for Tier 2 projects once freeway alignments have been developed. No NRHP-eligible TCPs are found within the Eastern and Western Alternatives in Segment 2. Evaluation of potential indirect effects on TCPs would be performed for Tier 2 projects.

Segment 3

The Eastern and Western Alternatives in Segment 3 contain NRHP-eligible archaeological sites. Because the corridors have not been surveyed in full, the complete distribution of sites in the corridors is not known. Impacts on archaeological sites would depend on potential freeway alignments developed for Tier 2 projects. The Eastern Alternatives have 11 NRHP-ineligible historic-era building properties, 7 historic-era building properties unevaluated for NRHP eligibility, 1 historic-era highway, 1 historic-era railroad, and 1 historic-era canal. The Western Alternative has 1 NRHP-eligible property, 4 historic-era building properties unevaluated for NRHP eligibility, 1 historic-era highway, 1 historic-era railroad, and 1 historic-era canal. NRHP eligibility evaluations would be required for Tier 2 projects for any unevaluated built environment resources. Furthermore, an assessment of effects on historic-era buildings and structures would be performed for Tier 2 projects. No NRHP-eligible TCPs are found within the Eastern and Western Alternatives in Segment 3. Evaluation of potential indirect effects on TCPs would be performed for Tier 2 projects.

Segment 4

The Eastern and Western Alternatives in Segment 4 contain NRHP-eligible archaeological sites. Because the corridors have not been surveyed in full, the complete distribution of sites in the corridors is not known. Impacts on archaeological sites would depend on potential freeway alignments developed for Tier 2 projects. The Eastern Alternative has 2 historic-era building properties unevaluated for NRHP eligibility, 1 historic-era railroad, 2 historic-era canals, and 1 historic-era pipeline. The Western Alternative has 5 NRHP-ineligible historic-era building properties, 7 historic-era building properties unevaluated for NRHP eligibility, 1 historic-era highway, 2 historic-era railroads, 2 historic-era canals, and 1 historic-era pipeline. NRHP eligibility evaluations would be required for Tier 2 projects for any unevaluated built environment resources. Furthermore, an assessment of effects on historic-era buildings and structures would be performed for Tier 2 projects once freeway alignments have been developed. No NRHP-eligible TCPs are found within the Eastern and Western Alternatives in Segment 4. Evaluation of potential indirect effects on TCPs would be performed for Tier 2 projects.

3.14.5 Potential Avoidance, Minimization, and Mitigation Strategies

The proposed action has the potential to adversely affect historic properties between US 60 and I-10. Therefore, ADOT will develop a programmatic agreement, pursuant to Section 106 of the NHPA, to define procedures for continuing to consider effects on historic properties during the proposed phased planning and construction of Tier 2 projects. The programmatic agreement will commit to the identification and evaluation of historic properties, determination of effects, and resolution of any adverse effects on historic properties during the NEPA process and construction of the individual Tier 2 undertakings; commit to consultation with the tribes that may ascribe traditional religious and cultural significance to historic properties that may be affected by the undertaking; commit to compliance with all applicable federal and state laws and regulations in effect at the time of each undertaking; and commit to assess and evaluate site AZ U:14:73(ASM) as a potential TCP if a Western Alternative is selected.

Potential mitigation measures could include—but are not limited to—archaeological testing and data recovery, flagging of sites for avoidance, monitoring of sites during construction, a Historic American Buildings Survey, or a Historic American Engineering Record. These types of mitigation would be guided by plans that are required by the agreement document and consulted on through the Section 106 process.

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts.

3.14.6 Subsequent Tier 2 Analysis

During Tier 2 evaluations, as more detailed information is gathered for review of the preferred corridor and specific freeway alignments are identified, SHPO, Native American tribes, and other consulting parties would be formally consulted throughout the study. The Section 106 process would be followed: establish the undertaking, identify consulting parties, identify the scope of work and area of potential effects, identify historic properties, make a finding of project effect, and assess and resolve adverse effects, as necessary. If any adverse effects are identified during the Tier 2 process, they would be addressed through consultation and would be in compliance with 36 CFR § 800.5 (Assessment of adverse effects) and 36 CFR § 800.6 (Resolution of adverse effects).

Specific mitigation measures, to the extent required, would be identified and discussed during the Tier 2 analysis after design details are known. Tier 2 analyses would include data gathered from other agencies including ADOT, SHPO, and ASM/AZSITE, as well as any information gathered from tribes and land-managing agencies (for example, counties, municipalities), and all previously unsurveyed areas within the footprint of the undertaking would be surveyed for cultural resources.

Mitigation measures may be developed in accordance with the terms of the programmatic agreement, pursuant to 36 CFR § 800.14, between ADOT and consulting parties, including the Advisory Council on Historic Preservation, SHPO, and other consulting parties.

3.14.6.1 Conclusion

Based on the results of the archaeological, built environment, and TCP inventories prepared for this analysis, and the provisions in place to mitigate any potential adverse effects on historic properties resulting from Tier 2 projects, the action corridor alternatives have a low risk of adverse impacts on identified cultural resources. However, it should be noted that the action corridor alternatives have not been surveyed in full for archaeological resources; therefore, the complete distribution of sites is not known. Impacts on archaeological sites would not be known until freeway alignments are developed and surveys performed for Tier 2 projects.

Given the abundance of archaeological resources identified in the portions of the action corridor alternatives previously surveyed, and the potential to identify additional resources in Tier 2 studies, it is possible that Tier 2 projects may not be able to completely avoid all sites, thereby resulting in a low to medium risk of adverse impacts on cultural resources. Any adverse impacts on NRHP-eligible archaeological resources would require mitigation. NRHP-eligibility evaluations would be required for Tier 2 projects for previously unevaluated built environment resources. An assessment of effects on historic-era buildings and structures would be performed for Tier 2 projects once freeway alignments have been developed. No NRHP-eligible TCPs are within the Eastern and Western Alternatives; however, AZ U:14:73(ASM) is located in the W1a and W1b Alternatives and would require reevaluation during the Tier 2 process as a potential TCP. Evaluation of potential indirect effects on TCPs would be performed for Tier 2 projects.

3.15 Hazardous Materials

This section provides an overview of the potential for hazardous materials in the action corridor alternatives.

3.15.1 Regulatory Context

Federal regulations governing hazardous materials and waste sites include the following:

- Toxic Substances Control Act (15 USC §§ 2601–2692)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 USC § 9601 et seq.)
- Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.)
- Superfund Amendments and Reauthorization Act (42 USC § 9601 et seq.)

EPA is the federal agency responsible for overseeing hazardous waste management. Under RCRA and Arizona state statutes and codes, ADEQ has the authority to monitor and direct industries that may generate, transport, or dispose of hazardous waste.

State programs and regulations governing hazardous materials and waste sites include:

- Arizona Administrative Code, Title 18, Environmental Quality, Chapter 8, Department of Environmental Quality – Hazardous Waste Management
- A.R.S., Title 49, The Environment, Chapter 5, Hazardous Waste Disposal
- Arizona Aboveground Storage Tank Database
- Arizona Aquifer List
- ADEQ's Dry Well Database
- ADEQ's Emergency Response for Spills
- Arizona Environmental Monitoring and Assessment Program
- Arizona Leaking Underground Storage Tank Incident Reports
- Arizona Solid Waste Facilities and Landfill Sites Inventory
- Arizona Solid Waste Tire Facilities
- Arizona Underground Storage Tank Database
- Arizona Wastewater Treatment Facility Database

3.15.2 Methodology

The evaluation presented in this section is based on preliminary research conducted for the proposed action through the preparation of an Initial Site Assessment (ISA) in 2016 (Appendix K, *Hazardous Materials Information*). The evaluation established existing conditions in the study area as an information baseline for potential site acquisition and due diligence, and identified possible locations of hazardous materials that may have been released to the surface or subsurface. The 2016 ISA included review of a regulatory database search, review of historical information regarding land use, and site reconnaissance. It should be noted that the action corridor alternatives have since been refined and currently represent different alignments than were analyzed during preliminary research. However, the research activities described above included a large buffer area surrounding the alignments, thus capturing a larger

preliminary analysis area. Further, because substantial land use changes have not occurred in the study area since 2016, the 2016 ISA completed for the proposed action represents an accurate overview of existing conditions in the study area. The 2016 ISA would be refined and expanded to accurately reflect the action corridor alternatives during subsequent analysis, as described in Section 3.15.6, *Subsequent Tier 2 Analysis*.

3.15.3 Affected Environment

The study area has potential contamination issues from point-source locations and nonpoint-source areas. Point-source locations include specific, listed sites, such as gas stations and landfills, with an identifiable source of contamination. Nonpoint-source areas include agricultural properties, urban areas, and areas where wildcat dumping may include hazardous wastes.

3.15.3.1 Regulatory Database Search

A regulatory database search was performed by Environmental Data Resources Inc. (EDR) on May 28, 2015, as documented in the 2016 ISA. Regulatory databases and resources that were researched to document hazardous materials in the study area included federal, state, local, and tribal environmental records and EDR's proprietary databases.

Based on a review of the regulatory database search conducted in 2015, 84 records were identified by EDR in the search area; however, only 37 listings were linked to sites of potential concern. These 37 listings represented 12 potential sites of concern, with some sites listed in multiple databases. Table 3.15-1 shows the number of listings and listings of concern from the regulatory database search. Table 3.15-1 includes only those databases that returned results.

Table 3.15-1. Listings of concern from the regulatory database search

Database	Description	Number of listings	Listings of concern
RCRA-TSDF	Resource Conservation and Recovery Act (RCRA) Transporters are individuals or entities that move hazardous waste from the generator off site to a facility that can recycle, treat, store, or dispose of the waste. Treatment, Storage, and Disposal Facilities (TSDF) treat, store, or dispose of the waste.	1	1
RCRA NonGen	RCRA Non-Generators do not presently generate hazardous waste.	3	2
FINDS	The Facility Index System (FINDS) contains both facility information and "pointers" to other sources of information that contain more detail.	17	5
US AIRS	The Air Facility System, a subsystem of Aerometric Information Retrieval System (AIRS), contains compliance data on air pollution point sources regulated by EPA and/or state and local air regulatory agencies.	1	1
FUDS	The listing includes locations of Formerly Used Defense Sites (FUDS) properties where the U.S. Army Corps of Engineers is actively working or will take necessary cleanup actions.	1	0
ICIS	The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program and the unique needs of the National Pollutant Discharge Elimination System program.	1	0
AZ SWF/LF	The Solid Waste Facilities/Landfill (SWF/LF) Sites records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. The data come from ADEQ's Municipal Solid Waste Landfills/Closed Solid Waste Landfills database.	2	2

Table 3.15-1. Listings of concern from the regulatory database search

Database	Description	Number of listings	Listings of concern
AZ LUST	The Leaking Underground Storage Tank (LUST) Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from ADEQ's LUST file listing by ZIP Code.	3	3
AZ UST	The Underground Storage Tank (UST) database contains registered USTs. USTs are regulated under Subtitle I of RCRA. The data come from ADEQ's UST-DMS facility and tank data listing by city database.	16	10
AZ AST	The Aboveground Storage Tank (AST) database contains registered ASTs. The data come from ADEQ's UST-DMS facility and tank data listing by city database.	2	0
AZ SWTIRE	A waste tire "facility" means a solid waste tire (SWTIRE) facility where tires are stored outdoors on any day.	1	1
AZ Spills	The ADEQ Emergency Response Unit documents chemical spills and incidents that are referred to the Unit.	2	2
AZ Dry Well	A dry well is a bored, drilled, or driven shaft or hole whose depth is greater than its width and is designed and constructed specifically for the disposal of stormwater. The source is ADEQ.	1	0
CA HAZNET	The data are extracted from copies of hazardous waste manifests received each year by the California Department of Toxic Substances Control.	1	1
AZ WWFAC	Statewide list of wastewater treatment facilities (WWFAC).	7	1
AZ Aquifer List	The aquifer protection permitted facilities database comes from ADEQ.	3	0
AZ EMAP	An online interactive map (EMAP) listing places of interest to ADEQ, including air, waste, and water sites.	20	7
Indian ODI	Location of open dumps on Indian land (ODI).	1	1
US Hist Cleaners	EDR has searched selected national collections of business directories and has created lists of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments.	1	0
	Total	**84**	**37**

Source: Environmental Data Resources Inc., May 28, 2015

Notes: ADEQ = Arizona Department of Environmental Quality, AZ = Arizona, CA = California, EDR = Environmental Data Resources Inc., EPA = U.S. Environmental Protection Agency, US = United States

3.15.3.2 Historical Resources

A review of historical resources, including historical aerial photographs, provided a history of previous land uses in the study area and facilitated assessing these uses for potential hazardous materials that may affect the proposed action. Data from fire insurance maps and city directories were not available for the study area because these resources are produced for urbanized areas, and the study area is primarily rural. The study team reviewed historical aerial photographs for 1937 to 2013. The photographs were provided by:

- Maricopa County, Office of Enterprise
- Historical Aerials by Nationwide Environmental Title Research, LLC (NETROnline) (www.historicaerials.com)

Based on the review of the photographs, historical conditions in each segment of the study area have mainly consisted of undeveloped desert, farmland and cattle farms, and dwellings. Other major developments noted in the historical aerial photograph review include, for Segment 1, the alignment of US 60 as early as 1937, the CAP Canal by 1992, and high-voltage power transmission lines, a wastewater facility, and a golf course by 2000. For Segment 3, major developments noted include a landfill by 1992. Segments 2 and 4 did not show any major developments.

3.15.3.3 Site Reconnaissance

Site reconnaissance for the proposed action was performed, including ground reconnaissance on several days between June and August 2015 and a helicopter overflight conducted on June 10, 2015. Land use in the study area primarily consisted of undeveloped desert, agricultural land, and urbanized property.

Undeveloped Desert

In general, undeveloped desert land has the lowest potential for hazardous materials and hazardous waste releases. The main exception is “wildcat dumping,” or the illegal dumping of trash or waste in remote areas. Numerous wildcat dumps were present in the northern portions of the study area, primarily near roads, or near roads along washes. Most wildcat dumps contained fairly benign materials such as household trash, building materials, landscaping waste, and appliances. A small number of dumps contained drums or barrels. It is not possible to ascertain whether these drums contained anything (especially hazardous wastes) without individual assessment and sampling. ADOT should be aware that these wildcat dumps exist, and this issue should be addressed should a preferred alternative be selected.

Agricultural Land

Agricultural chemicals (pesticides and herbicides) can result in an aggregate effect of residual chemicals in soil, particularly in tailwater ditches (which drain excess surface water from fields under cultivation) or drainageways. Of particular concern are areas where Pima cotton has been farmed in the past. Highly toxic agricultural chemicals were used on Pima cotton crops from the 1950s to 1970s, and some of these chemicals are long-lived in the environment. It is impossible to determine whether farmers used agricultural chemicals appropriately. Even the chemicals with less toxicity could create a long-term issue in soils if they were misapplied.

Another issue on agricultural property is the location of batch plants, or places on a farm where agricultural chemicals were stored, mixed, or loaded onto distribution equipment (spreaders, sprayers, etc.). These facilities were and are operated by local farmers or a cooperative of farmers, and spill prevention techniques can be lacking, particularly in operations that have been in use for decades. The aggregation and/or concentrations of chemicals in the soil can be an issue at such batch plants. The study team noted many batch plants and fertilizer storage tanks on agricultural properties in the study area. Some were located near barns or sheds that apparently store the farm’s distribution equipment. Others were aboveground storage tanks near irrigation ditches—these were most likely used for storing liquid fertilizer that can be released into the irrigation ditches for passive distribution.

Urbanized Property

Urbanized property has the highest potential for containing actionable hazardous waste and/or hazardous materials in the subsurface. Hazardous materials and hazardous wastes associated with urbanized property include releases from gas stations, dry cleaners, and other business operations, and from storm runoff that transports lawn chemicals, automotive residue from roads, and other chemicals. Several facilities in this category were noted during the site reconnaissance. Although the action corridor alternatives are generally located outside of urban development in the study area, the termini of the proposed freeway (northern and southern ends), as well as the Eastern Alternatives (near Florence),

could cross locations where urban site types could adversely affect the subsurface. Notably, one of the transition sections near Florence crosses a landfill. Landfills may or may not contain hazardous wastes, but this possibility should be considered when planning a freeway through or over a landfill.

3.15.4 Environmental Consequences

3.15.4.1 No-Action Alternative

Environmental consequences caused by the No-Action Alternative would include continued wildcat dumping in undeveloped desert until enforcement is enacted, the continued presence of hazardous materials and hazardous waste from agricultural practices in the study area, and the continued presence and increase in hazardous materials and hazardous waste associated with urbanized property, especially as population growth occurs in communities in the study area.

Numerous leaking underground storage tanks, underground storage tanks, landfills, open dump sites, a wastewater treatment facility, and other sites that are listed as sites of concern in the regulatory database search would continue to be present in the study area with the No-Action Alternative.

3.15.4.2 Action Corridor Alternatives

Based on results of the regulatory database search, 12 sites of concern were identified in or near the action corridor alternatives (Table 3.15-2). Some sites of concern may be applicable to more than one alternative.

Table 3.15-2. Sites of concern, by action corridor alternative

Action corridor alternative	Sites of concern	Action corridor alternative	Sites of concern
Segment 1		***Segment 3***	
E1a	0	E3a	6
E1b	0	E3b	6
W1a	2	E3c	6
W1b	1	E3d	6
Segment 2		W3	0
E2a	0	***Segment 4***	
E2b	2	E4	1
W2a	0	W4	1
W2b	0		

Environmental consequences caused by the action corridor alternatives would include increased hazardous materials and hazardous waste occurrence related to automobile and truck use near the new freeway. Wildcat dumping would likely continue to occur, as long as enforcement does not increase, and may also increase because of enhanced access to undeveloped desert from the new freeway. As population growth occurs in the study area, hazardous materials and hazardous waste occurrence related to urbanized property use would increase. Hazardous materials and hazardous waste related to agricultural practices may decrease if agricultural land is developed for commercial or residential

purposes or is abandoned in the study area. However, residual agricultural chemicals may be present from earlier use of these lands.

3.15.5 Potential Avoidance, Minimization, and Mitigation Strategies

When possible, avoidance or minimization is the primary mitigation for identified hazardous materials sites. The following list describes potential mitigation measures to avoid, reduce, or otherwise mitigate environmental impacts associated with the proposed action. However, a detailed analysis of avoidance, minimization, and mitigation strategies applicable to the action corridor alternatives, including specific responsibilities of the construction contractor, would be developed during subsequent Tier 2 analysis, described in Section 3.15.6, *Subsequent Tier 2 Analysis*.

- No activity would occur in an area that potentially has lead-based substances until a Lead-Based Paint Removal and Abatement Plan is approved and implemented.
- The engineer, in association with the contractor, would complete the National Emission Standards for Hazardous Air Pollutants documentation and submit it to the ADOT Environmental Planning hazardous materials coordinator for review 5 working days prior to it being submitted to the regulatory agency or agencies.
- No activity would occur in an area that potentially has asbestos until an Asbestos Removal and Disposal Plan is approved by the ADOT Environmental Planning hazardous materials coordinator.
- Staging for construction activities near wells or dry wells would be located in areas where accidental releases of potential contaminants would be minimized and any accompanying threat to groundwater resources minimized.
- In cooperation with the contractor, ADOT's Construction District would develop and coordinate emergency response plans with local fire authorities, local hospitals, and certified emergency responders for hazardous materials releases or chemical spills.
- Asbestos- and lead-paint-containing materials identified in structures to be demolished would be properly removed and disposed of prior to demolition.
- Existing aboveground storage tanks or underground storage tanks would be removed or relocated.
- The contractor would develop an on-site health and safety plan for construction activities.
- A hazardous waste management plan would be prepared for handling hazardous materials during construction.
- If suspected hazardous materials are encountered during construction, work would cease at that location and the engineer would be notified. The engineer would contact the ADOT Environmental Planning hazardous materials coordinator immediately and make arrangements for assessment, treatment, and disposal of the materials.

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts.

3.15.6 Subsequent Tier 2 Analysis

No hazardous materials issues have been identified that would preclude construction of the proposed action in any of the action corridor alternatives. However, hazardous materials conditions would require consideration in the Tier 2 study and in final design.

Subsequent analysis related to hazardous materials for the Tier 2 environmental evaluation should involve further investigation in the form of a targeted Corridor ISA (once a preferred alternative is

selected), which would clear many sites without issues and would limit the number of parcels where a parcel-specific Phase I investigation would be required. The targeted Corridor ISA should include an updated regulatory database search, a detailed review of historical resources, additional site reconnaissance activities, and interviews with specific site property owners or business operators. Parcel-specific Phase I investigations should be performed at properties slated for acquisition (in accordance with ADOT Right-of-Way policies and procedures). The goal of a Phase I investigation is to provide adequate information for ADOT to move forward with property acquisition and to develop management strategies for sites with identified hazardous materials issues.

Additional studies could include Phase II drilling and sampling projects (also known as preliminary site investigations) to verify or refute the actual concentrations and locations of subsurface impacts prior to construction. A Phase II analysis involves collecting soil and possibly groundwater samples for inclusion in a targeted analytical program; it is highly customized for the issues discovered during the Phase I investigation, with the goal of supporting future construction management. If contaminated areas are identified in Phase I/ISA efforts, and preliminary site investigation work verifies that contamination is present in actionable concentrations, a process known as environmental construction monitoring may be implemented during construction as a proper method of removing and disposing of hazardous waste material and protecting construction workers.

3.15.6.1 Conclusion

The study area has potential contamination issues from point-source locations and nonpoint-source areas. Point-source locations include specific, listed sites, such as gas stations and landfills, with an identifiable source of contamination. Nonpoint-source areas include agricultural properties, urban areas, and areas where wildcat dumping may include hazardous wastes. All action corridor alternatives have the potential for contamination issues from point-source locations and nonpoint-source areas. The action corridor alternatives that include sites of concern are:

- Segment 1 – W1a and W1b Alternatives
- Segment 2 – E2b Alternative
- Segment 3 – E3a, E3b, E3c, and E3d Alternatives
- Segment 4 – E4 and W4 Alternatives

The difference between the action corridor alternatives is not substantial regarding the potential for encountering hazardous materials, and the types of materials expected are typical of highway construction projects. ADOT is well-qualified to manage such sites during construction.

3.16 Energy

This section discusses the energy that would be used in the region for the No-Action Alternative and action corridor alternatives. Primary energy use would be fossil fuel consumption (gasoline and diesel fuel) by vehicles traveling in and around the study area. Other energy use would be associated with construction, maintenance, and development activities. Fuel would be consumed during the planned construction of new arterial streets and freeways identified in the applicable regional transportation plan and regional transportation programs. Also, fuel would be consumed during construction of commercial developments, industrial buildings, and homes throughout the study area and surrounding region.

3.16.1 Regulatory Context

Regulations for implementing the procedural provisions of NEPA require that the energy requirements and conservation potential of various alternatives and mitigation measures be evaluated as part of the environmental consequences of the proposed action [40 CFR § 1502.16(e)].

3.16.2 Methodology

Operational energy use was calculated using VMT and VHT projections, which were developed using travel demand modeling to forecast 2040 conditions. This included developing a base highway network for use by the AZTDM2 model, along with population and employment projections from the State Office of Employment and Population Statistics, MPOs, councils of governments, and other local agencies. The stakeholders—MAG, SCMPO, and CAG—also provided input from their transportation networks and long-range transportation plans.

3.16.3 Affected Environment

The average fuel economy of the nation's vehicles, measured in miles per gallon (mpg), has consistently improved over the past 40 years, and this trend is expected to continue during the next 20 years. However, the improved fuel economy is not likely to be dramatic. Barring a technological breakthrough in the engines providing power to the vehicles of 2040, a substantial change in fuel economy is difficult to predict, and, therefore, not assumed in the analysis. Even with such a breakthrough, penetration of a new technology across the country's vehicle fleet can take decades. The average fuel economy of a passenger car operated in the United States in 1990 was 20.2 mpg and, 20 years later in 2010,[2] it was 23.5 mpg (Energy Information Administration 2012).

Automobiles are most efficient when operating at steady speeds between 35 and 45 mph with no stops (Oak Ridge National Laboratory 2002; USDOT 1983). Fuel consumption increases by approximately 17 percent as speeds increase from 55 to 70 mph.

Total fuel consumption in the United States has consistently risen from year to year. From 2010 to 2015, motor vehicle fuel consumption increased from 170 to 173 billion gallons per year in the United States, and the state of Arizona consumed 3.4 billion gallons per year, or 2 percent of the 2010 total (USDOT Bureau of Transportation Statistics 2013). Increased congestion on freeways and arterial streets has become a major contributor to increased fuel consumption. The 2011 *Annual Urban Mobility Report* (Texas Transportation Institute 2011) reported that vehicles in the Phoenix urban area consumed approximately 47 million gallons of fuel in 2010 because of congestion.

[2] As of December 8, 2017, 2010 remains the most recent year for which fuel economy is published (Energy Information Administration 2012).

3.16.4 Environmental Consequences

3.16.4.1 No-Action Alternative

While the No-Action Alternative would not need fuel for construction, other road projects and improvements would need to be developed in the study area to accommodate the region's growth. The No-Action Alternative would not entail energy consumption associated with use of the proposed action because the proposed action would not be built.

Although the No-Action Alternative shows the smallest VMT of all the alternatives, more fuel use is projected compared with Alternatives 4, 5, 7, and 8 because of the higher VHT. Compared with all of the action corridor alternatives, the No-Action Alternative would result in overall lower speeds and, therefore, lower fuel economy.

3.16.4.2 Action Corridor Alternatives

Construction activities for any of the action corridor alternatives would have comparable fuel commitments. Construction energy use is, however, not addressed in further detail because the total fuel needed for construction of the action corridor alternatives is assumed to be essentially the same as the total fuel needed for construction of other road projects under the No-Action Alternative.

Operational energy use for the action corridor alternatives was calculated by dividing the yearly VMT projections for each alternative (and for the No-Action Alternative, as a point of comparison) by the fuel economy of the different classes of vehicles. The analysis included light-duty cars, light-duty trucks, and heavy-duty trucks and buses, which have average fuel economies of 23.5 mpg, 17.2 mpg, and 6.4 mpg, respectively. Fuel economies were adjusted for each alternative based on the projected average speed (mph), and were calculated by dividing the VMT by the VHT.

Operational energy use was considered for the entire region, and was evaluated for the continuous action corridor alternatives (see Chapter 2, *Alternatives*). Table 3.16-1 shows that among eight of the possible combinations of alternatives that produce continuous full-length action corridor alternatives, operational energy use for the action corridor alternatives may be greater or less than the No-Action Alternative. Alternative 5 would result in the greatest energy savings, with minimum annual energy savings of 8 percent, followed by Alternative 7, which would result in a minimum annual energy savings of 2 percent. Alternatives 4 and 8 would have no net difference in minimum annual energy savings, while Alternative 6 would have the greatest minimum annual energy increase of 5 percent, followed by Alternatives 2 and 3 (4 percent) and Alternative 1 (1 percent).

Table 3.16-1. Annual regional energy consumption, 2040

Travel and energy use	2015 existing	2040 No-Action Alternative	Continuous full-length action corridor alternative							
			1	2	3	4	5	6	7	8
Vehicle miles traveled per year[a] (millions)	1,561	3,939	4,257–4,271	4,189–4,205	4,171–4,194	4,254–4,268	4,194–4,235	4,188–4,253	4,183–4,189	4,185–4,273
Average speed (miles per hour)	45.9	33.9	40.2–40.1	39.7–39.5	39.6–39.4	40.1	38.7–38.9	38.8–39.0	38.8–38.6	39.7–40.0
Operational energy use[b] (millions of gallons of fuel per year)	51.0	135.8	142.6–143.0	140.3–140.8	139.7–140.5	142.5–142.9	140.5–141.8	140.3–142.4	140.1–140.3	140.2–143.1

[a] Vehicle miles traveled (VMT) per year were calculated from daily VMT estimates provided by the travel demand model. Daily estimates were converted to annual estimates by assuming 6 days per week (the equivalent of 1 day of traffic for Saturday and Sunday combined) and 52 weeks per year.

[b] Gallons per year data were determined by dividing the VMT for each category by an assumed fuel economy factor for all motor vehicles, adjusted by miles per gallon according to speed (VMT/vehicle hours traveled). Base factors were obtained by running the U.S. Environmental Protection Agency's Motor Vehicle Emission Simulator (MOVES) model at the Pinal County level.

[c] Vehicle mix data were derived from Maricopa County vehicle registrations as reported by the Arizona Department of Transportation 2017 Vehicle Registrations for Maricopa County. Gasoline and diesel vehicles for all classes were combined. Buses were added to the heavy-duty trucks category. Motorcycles and alternative fuel and electric vehicles were assumed to have an insignificant contribution.

3.16.5 Potential Avoidance, Minimization, and Mitigation Strategies

No mitigation is proposed for energy use associated with the proposed action.

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts (for other resources).

3.16.6 Subsequent Tier 2 Analysis

If an action corridor alternative is advanced, the energy use of individual projects would be examined as necessary during the Tier 2 studies.

3.16.6.1 Conclusion

The No-Action Alternative would involve more energy consumption then several of the action corridor alternatives. Alternative 5 would result in the greatest reduction in energy consumption, with a savings of 14 to 16 million gallons of fuel per year, followed by Alternative 7, which would result in a savings of 4 million gallons per year. Alternative 6 would potentially result in fuel savings of 4 million gallons per year, or an increase of 9 million gallons per year, depending on the segment options selected.

3.17 Environmental Justice and Title VI

This section describes the study's compliance with applicable federal regulations for environmental justice (EJ) and Title VI of the Civil Rights Act of 1964 (Title VI, 42 USC § 2000d). This section includes a review of the regulatory context and methodology, identification of minority and/or low-income populations, and an assessment of potential impacts and benefits that would affect these populations.

3.17.1 Regulatory Context

ADOT is a recipient of federal financial assistance and, therefore, is required to comply with regulations related to Title VI, EJ, and limited English proficiency (LEP). The analyses presented in this section were prepared in compliance with:

- Title VI
- Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 11, 1994)
- Presidential Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency (August 11, 2000)
- USDOT Order to Address Environmental Justice in Minority Populations and Low-Income Populations [USDOT Order 5610.2(a), May 2, 2012]
- FHWA's Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (FHWA Order 6640.23A, June 14, 2012)
- FHWA *Environmental Justice Reference Guide* (April 1, 2015)

Title VI is the federal law that protects individuals and groups from discrimination on the basis of their race, color, and national origin. Under Title VI and USDOT regulations, recipients of federal financial assistance are prohibited from, among other things, using "criteria or methods of administering its program which have the effect of subjecting individuals to discrimination based on their race, color, or national origin." Protection of LEP populations falls under the "national origin" basis of Title VI.

As outlined in the FHWA *Environmental Justice Reference Guide*, USDOT and FHWA are required to make EJ part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of programs, policies, and activities on minority populations and/or low-income populations to achieve an equitable distribution of benefits and burdens. FHWA incorporates EJ and nondiscrimination principles into all phases of project development including planning, environmental review, design, ROW acquisition, construction, and maintenance and operations.

Furthermore, USDOT Order 5610.2(a) sets forth the USDOT policy to consider EJ principles in all its programs, policies, and activities. It describes how EJ objectives are integrated into planning and programming, rulemaking, and policy formulation. This chapter addresses only effects on minority and low-income populations that would be caused by the action corridor alternatives, because the No-Action Alternative would not directly or indirectly change existing conditions of the surrounding environment.

3.17.2 Methodology

The EJ evaluation framework is based on the FHWA *Environmental Justice Reference Guide*. The reference guide outlines a methodology that addresses Executive Order 12898 and includes a public participation process and an analytical process. The analytical process includes three basic steps:

1. Determine whether the proposed action would potentially affect minority and low-income populations.

2. If minority and low-income populations are present, consider the potential effects of the proposed action on those populations, including any disproportionately high and adverse effects.
3. Determine whether adverse effects can be avoided, minimized, or mitigated.

This section presents this three-step analysis, modified as necessary for a Tier 1 study since many direct impacts cannot be determined at this time.

3.17.2.1 Study Area and Data Sources

A GIS platform was used to identify a 0.5-mile buffer around the action corridor alternatives. This buffer was consistent with corridor demographic measurements used throughout this Tier 1 DEIS. U.S. Census Bureau American Community Survey 2011 to 2015 data were used to map and quantify minority and low-income populations at the block group level. For the analyses, each block group that intersected or was completely in the 0.5-mile buffer was included in the study area. Block groups that spanned multiple segments were assigned to one segment only to avoid duplicative totals.

3.17.2.2 Identifying Minority, Low-income, and Limited English Proficiency Populations

As defined in USDOT Order 5610.2(a) and FHWA Order 6640.23A, persons of minority status include those who are:

- Black – a person having origins in any of the black racial groups of Africa;
- Hispanic or Latino – a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race;
- Asian American – a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent;
- American Indian and Alaskan Native – a person having origins in any of the original people of North America, South America (including Central America), and who maintains cultural identification through tribal affiliation or community recognition; or
- Native Hawaiian and Other Pacific Islander – a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

As defined in USDOT Order 5610.2(a) and FHWA Order 6640.23A, a low-income person is one whose household income is at or below the U.S. Department of Health and Human Services' poverty guidelines (U.S. Department of Health and Human Services 2014). Poverty levels are defined at the national level and vary by the number of persons in a family and the age of the family members.

Households identified as having LEP are those for which the residents either do not speak English at all or speak English less than well. Households that speak languages other than English were also identified.

For the analysis presented in this section, locations with appreciably greater percentages of minority, low-income, and LEP populations than in a region of comparison were identified. The region of comparison for this analysis consisted of Pinal County and portions of Queen Creek and Mesa in Maricopa County. This defined region presents a close representation of the study area for the proposed action.

3.17.2.3 Determining Effects on Minority and Low-income Populations

An EJ evaluation determines whether a proposed action would result in disproportionately high and adverse effects on minority and low-income populations. Based on the FHWA *Environmental Justice Reference Guide*, the analysis for this study considered the following questions:

- Would the action corridor alternatives' adverse effects be predominantly borne by minority and low-income populations?
- Would adverse effects on minority and low-income populations be appreciably more severe or greater in magnitude than those suffered by non-minority and non-low-income populations?
- What would be the effect of the action corridor alternatives' offsetting benefits?
- What would be the effect of mitigation measures that would be incorporated into the action corridor alternatives, and any other enhancements or betterments that would be provided in lieu of mitigation?

Determining the potential disparate effects on populations protected by Title VI was based on a methodology similar to that used for minority and low-income populations. Potential adverse effects on and benefits to the protected populations were identified.

3.17.3 Affected Environment

This section describes the minority, low-income, and LEP populations identified in the study area.

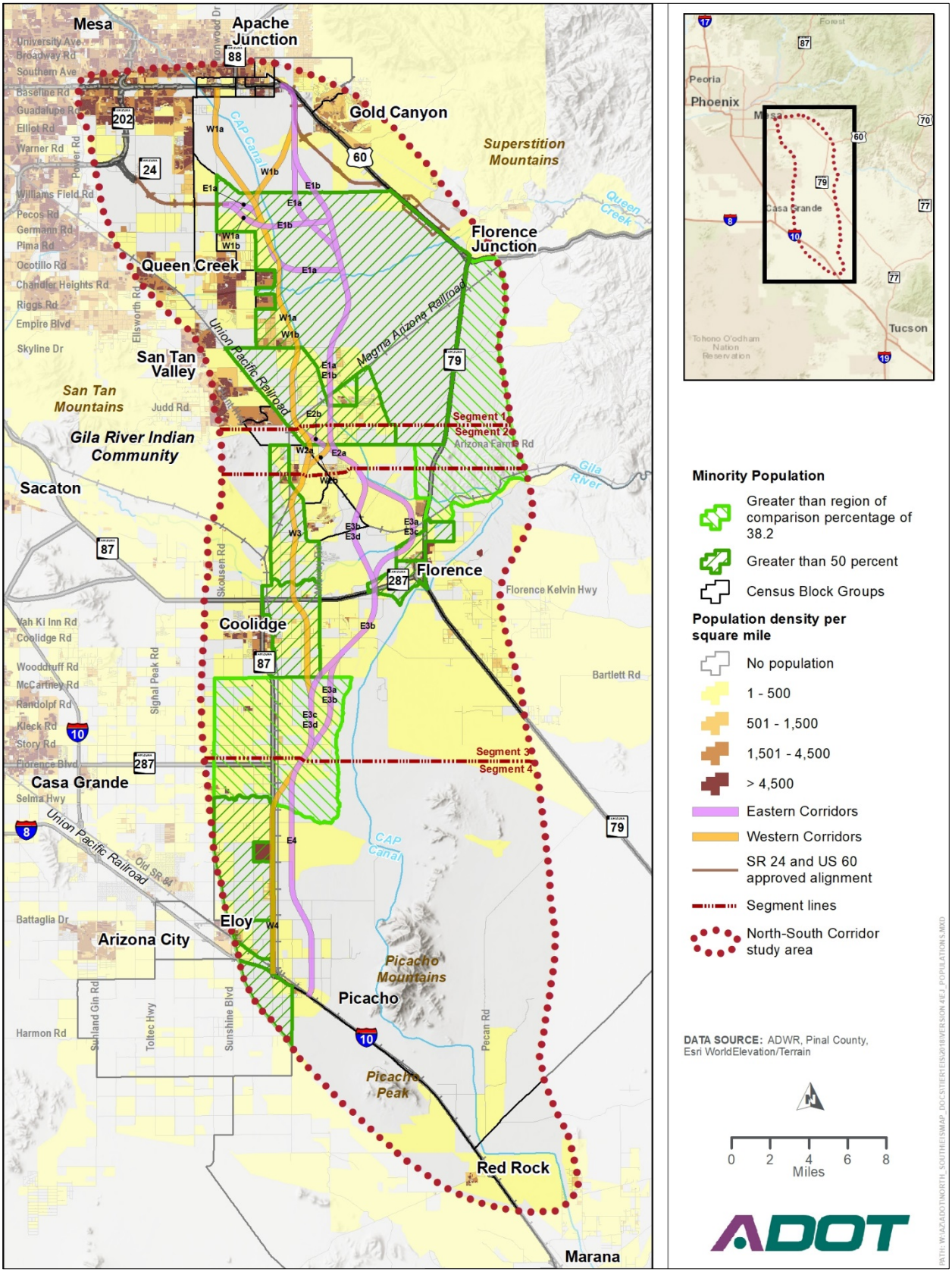
3.17.3.1 Minority Populations

Table 3.3-2 shows the racial composition of Arizona, Pinal County, Maricopa County, and various jurisdictions in the study area (see Section 3.3, *Social Conditions*). Minorities consist of populations that identify as Hispanic or Latino, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, some other race, or two or more races. While minorities account for 43.5 percent of the state population, there are slightly lower percentages in Maricopa and Pinal Counties (42.7 percent and 42 percent, respectively) and an even lower percentage in Mesa (36 percent), Queen Creek (24 percent), and Apache Junction (20.3 percent). However, in Florence, Coolidge, and Eloy, there are greater percentages of minorities than statewide, with 49.2 percent, 54.8 percent, and 77.2 percent, respectively. Appendix E, *Social Conditions Information*, lists the detailed racial composition of each block group in the study area.

The same block groups within 0.5 mile of the action corridor alternatives were used to describe the racial composition at the block-group level to identify the locations of populations with appreciably greater percentages of minority populations. Table E-1 in Appendix E provides the data by block group.

Figure 3.17-1 shows the block groups with minority populations that exceed the threshold of 38.2 percent (the percentage in the defined region of comparison) and 50 percent (a typical threshold used in EJ analyses). Block groups with a higher percentage of minority populations than the region of comparison are considered high-minority block groups.

Figure 3.17-1. Minority populations in the study area



Block groups with minority percentages that exceed 50 percent are located in each segment of the study area. In the north, these block groups are concentrated in the south-central portion of Segment 1, and all four Segment 1 action corridor alternatives cross these block groups; however, the W1a and W1b Alternatives are closer to the populated areas from which the demographic data are drawn. In Segment 3, the E3a, E3c, and W3 Alternatives cross block groups with minority percentages that exceed 50 percent. In the southern part of Segment 3 and northern part of Segment 4, all action corridor alternatives go through block groups with minority percentages that exceed that of the region of comparison. In Segment 4 south of Selma Highway, the W4 Alternative is adjacent to block groups with minority percentages greater than 50 percent, while the E4 Alternative goes through block groups with lower minority percentages. Appendix E, *Social Conditions Information*, includes maps showing the percentages of specific minority groups by block group: Hispanic or Latino, Black or African American, American Indian or Alaska Native, Asian, and other (which includes Native Hawaiian or other Pacific Islander, some other race, and two or more races).

3.17.3.2 Low-income Households

Table 3.3-8 in Section 3.3, *Social Conditions*, shows the percentages of low-income individuals (that is, those with household income below the federally established poverty level based on household size) in Arizona, Pinal County, Maricopa County, and the various jurisdictions in the study area (see Section 3.3, *Social Conditions*). The table indicates that both Maricopa and Pinal Counties have about 17 percent of their populations living below the federally established poverty level. The cities and towns in the study area have poverty percentages that range between 8.6 percent in Queen Creek and 36.2 percent in Eloy.

Figure 3.17-2 shows the concentrations of low-income residents in the study area by census tract block group. Similar to determining categories for minorities, categories of low-income status are based on the low-income percentage of the region of comparison (that is, Pinal County, Mesa, and Queen Creek) which is 16.6 percent. Appendix E provides the detailed low-income composition of each block group in the study area. Block groups with a lower percentage of low-income populations than the region of comparison are considered non-low-income block groups and the ones with a higher percentage of low-income populations are considered low-income block groups.

As the figure shows, low-income populations are located throughout the study area. Large concentrations of block groups with high percentages of low-income populations are located in central and southern Segment 1 (all alternatives), along the W3 Alternative, in Florence near the E3a and E3c Alternatives, in the southern portion of Segment 3 (all alternatives), and west of the W4 Alternative.

3.17.3.3 Limited English Proficiency Households

Table 3.17-1 and Figure 3.17-3 show the percentages of LEP households in Arizona, Maricopa County, Pinal County, and the various jurisdictions in the study area. As the table indicates, several of the study area's jurisdictions have low percentages of LEP households, with the exception of Mesa (4.6 percent) and Coolidge (4.8 percent), with percentages of LEP households more closely in line with those of Arizona in general.

An October 2017 memorandum identified the languages primarily spoken by LEP populations in the study area, in accordance with the ADOT Civil Rights Office's *Title VI Nondiscrimination Program: 2016 Limited English Proficiency Plan* and "Safe Harbor" stipulation to comply with its obligations to provide written translations in languages other than English (see Appendix E, *Social Conditions Information*).

Table 3.17-1. Limited English proficiency households in the region

Geographic area	Total households	Language other than English spoken in household		Limited English proficiency household	
		Total	Percentage (%)	Total	Percentage (%)
Maricopa County	1,442,518	373,600	25.9	67,554	4.7
Pinal County	127,599	28,356	22.2	3,109	2.4
Apache Junction	15,933	1,974	12.4	354	2.2
Mesa	168,914	36,567	21.6	7,766	4.6
Queen Creek	8,758	1,173	13.4	54	0.6
Florence	6,832	1,172	17.2	157	2.3
Coolidge	3,806	1,355	35.6	183	4.8
Eloy	3,241	1,812	55.9	444	13.7

Source: U.S. Census Bureau, American Community Survey 2011 to 2015 5-year estimates, Table B16002

The memorandum indicates that 5.43 percent of the total population in the study area speaks English less than “very well,” according to the U.S. Census Bureau’s 2015 American Community Survey, and approximately 87 percent of those individuals speak Spanish or Spanish Creole (4.71 percent of the total population). In 20 of the 61 census tracts in the study area, more than 5 percent of the population speaks English less than “very well”—the threshold for providing written translations in languages other than English. In 14 of these 20 census tracts, more than 5 percent of the population speak Spanish or Spanish Creole. Within the study area, the next most prevalent spoken languages are Laotian (0.10 percent), Chinese (0.09 percent), and Tagalog (0.09 percent). Given these findings, it is recommended that NSCS informational materials be translated to Spanish to comply with Title VI, Executive Order 13166, and the ADOT *Title VI Nondiscrimination Program: 2016 Limited English Proficiency Plan*.

Figure 3.17-3 shows the locations of block groups with percentages of households that speak a language other than English that is greater than the region of comparison (21.7 percent) and those with percentages of LEP households greater than the region of comparison (3.6 percent). Appendix E lists the detailed LEP household data for each block group in the study area. The figure illustrates that high LEP household block groups occur throughout the study area in areas that also have higher percentages of minority and/or low-income populations. All action corridor alternatives cross block groups with larger percentages of LEP households than the region of comparison, with the E3a, E3c, and E4 Alternatives having the shortest stretches in these areas.

Figure 3.17-2. Low-income households in the study area

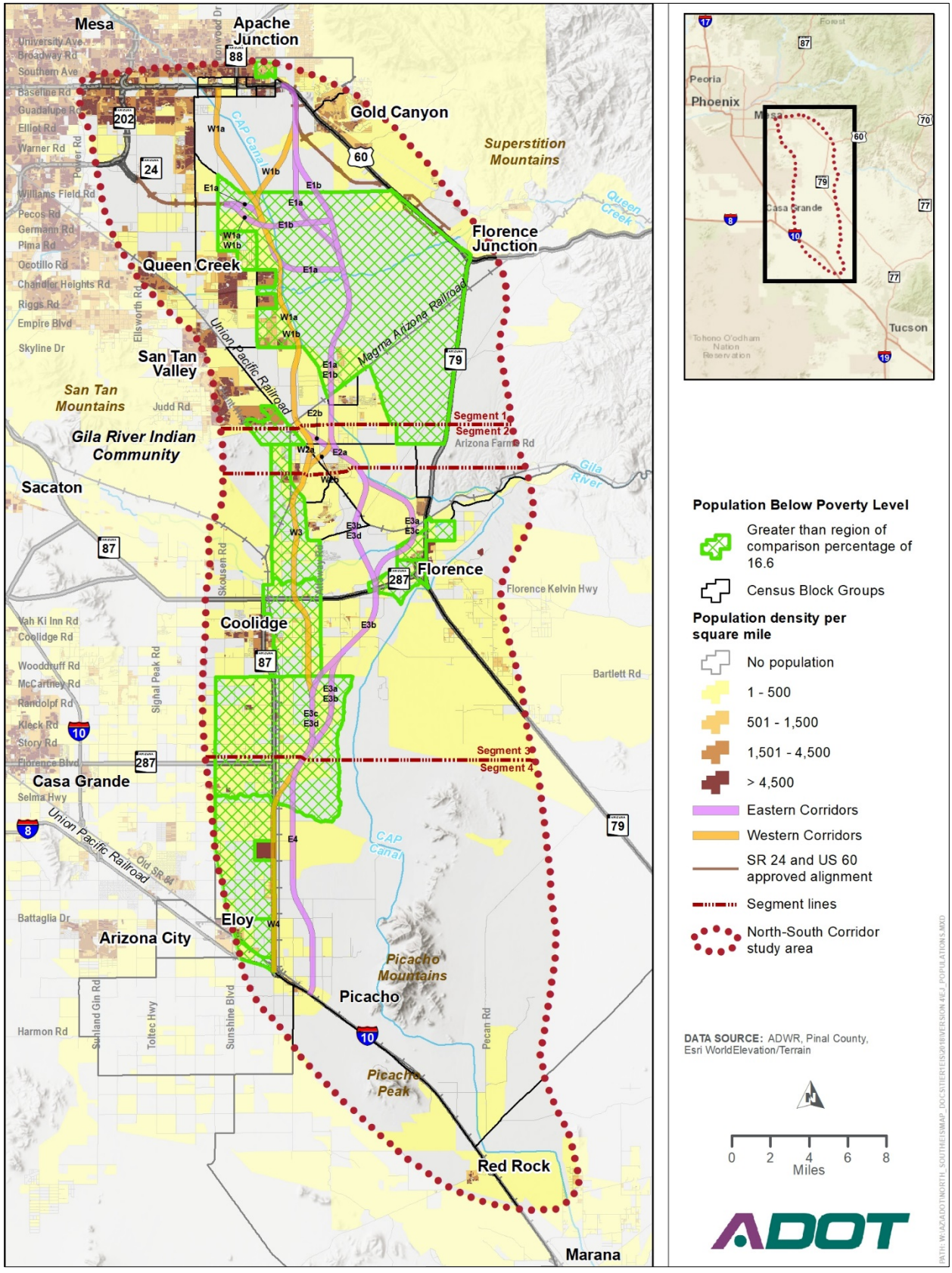
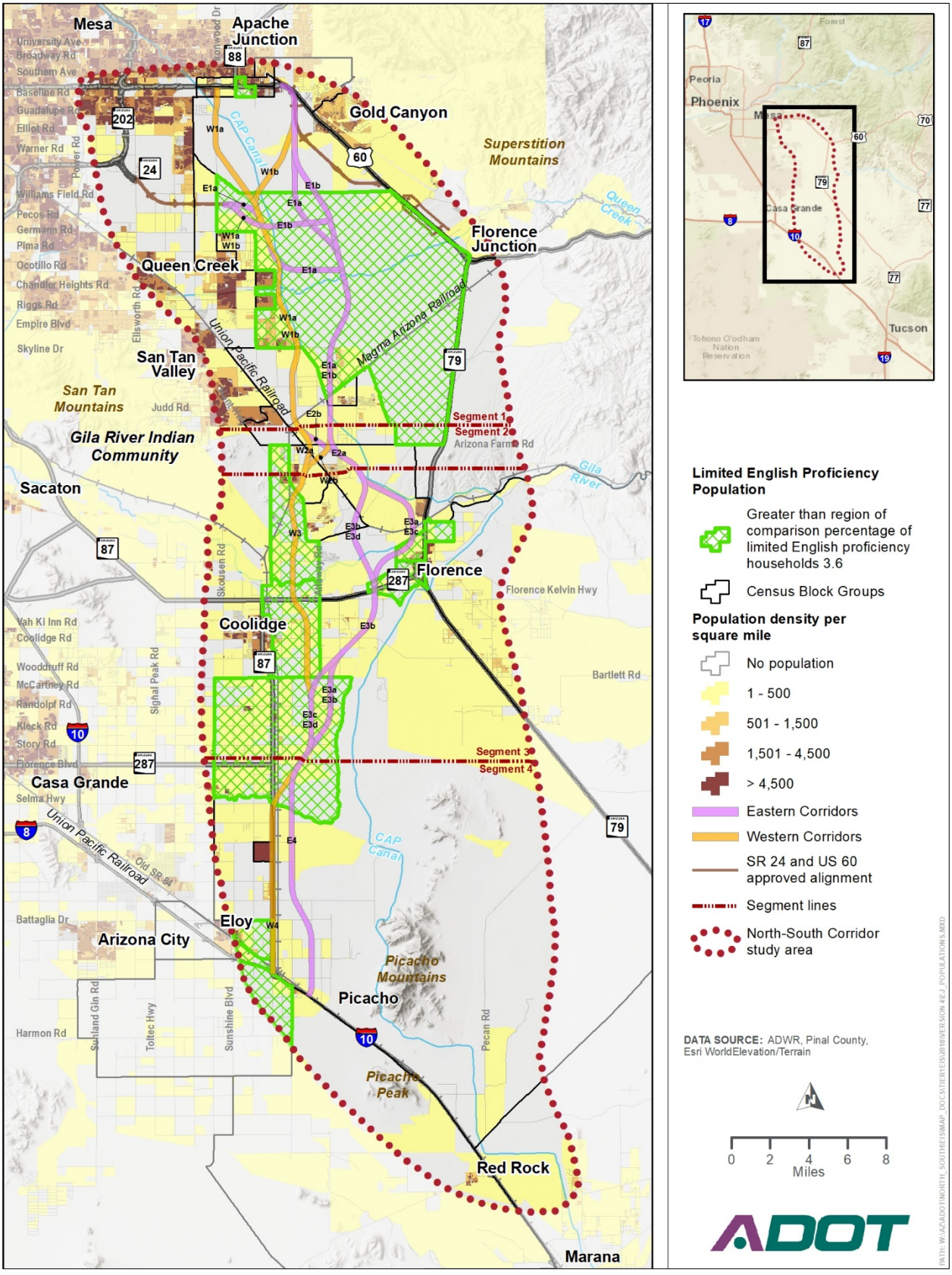


Figure 3.17-3. Limited English proficiency households in the study area



3.17.3.4 Environmental Justice and Title VI Populations by Action Corridor Alternative

Based on the EJ definitions previously discussed and on the locations of these populations as shown in previous figures, Table 3.17-2 summarizes the EJ status for each action corridor alternative by segment using the demographic data from Section 3.3, *Social Conditions*. An entry of "no" in the table indicates that the percentage of minorities, low-income, and/or LEP populations for the action corridor alternative is comparatively lower than the region of comparison. Inversely, an entry of "yes" indicates that the percentage of minorities, low-income, and/or LEP populations for the action corridor alternative is comparatively higher than the region of comparison. Locations in the action corridor alternatives for which the demographic data are higher than the region of comparison are identified as EJ areas and are evaluated in the following sections for potential disproportionately high and adverse effects.

Table 3.17-2. Summary of study area locations with minority, low-income, and limited English proficiency populations

Action corridor alternative	Comparison of minority percentage with that of region of comparison	Comparison of low-income percentage with that of region of comparison	Comparison of LEP household percentage with that of region of comparison
Segment 1			
E1a	Yes – south of Pecos Road	Yes – between Pecos and Judd Roads	Yes – between Pecos and Judd Roads
E1b	Yes – south of Pecos Road	Yes – between Pecos and Judd Roads	Yes – between Pecos and Judd Roads
W1a	Yes – south of Pecos Road	Yes – between Pecos Road and Skyline Drive	Yes – between Pecos Road and Skyline Drive
W1b	Yes – south of Pecos Road	Yes – between Pecos Road and Skyline Drive	Yes – between Pecos Road and Skyline Drive
Segment 2[a]			
E2a	Yes – north of Arizona Farms Road	No	No
E2b	Yes – north of Arizona Farms Road	No	No
W2a	Yes – north of Arizona Farms Road	No	No
W2b	Yes – north of Arizona Farms Road	No	No
Segment 3			
E3a, E3c	Yes – between Hunt Highway and Butte Avenue; south of Bartlett Road	Yes – between Hunt Highway and Butte Avenue; south of Bartlett Road	Yes – between Hunt Highway and Butte Avenue; south of Bartlett Road
E3b, E3d	Yes – south of Bartlett Road	Yes – south of Bartlett Road	Yes – south of Bartlett Road
W3	Yes – all[b]	Yes – all[b]	Yes – all[b]

Table 3.17-2. Summary of study area locations with minority, low-income, and limited English proficiency populations

Action corridor alternative	Comparison of minority percentage with that of region of comparison	Comparison of low-income percentage with that of region of comparison	Comparison of LEP household percentage with that of region of comparison
Segment 4			
E4	Yes – north of Selma Highway	Yes – north of Selma Highway	Yes – north of Selma Highway
W4	Yes – all	Yes – all[b]	Yes – north of Selma Highway; south of Battaglia Drive

Note: LEP = limited English proficiency

[a] Segment 2 contains block groups that overlap other segments, and demographics are accounted for in Segments 1 and 3; however, the assessment of locations of high concentrations of minority and low-income populations is considered for Segment 2.

[b] In these areas, only a small portion of the block groups is not considered high-minority or low-income.

3.17.4 Environmental Consequences

3.17.4.1 Environmental Justice Evaluation Overview

Both USDOT Order 5610.2(a) and FHWA Order 6640.23A define a disproportionately high and adverse effect on human health or the environment to include an adverse effect that:

1. Is predominantly borne by a minority population and/or a low-income population.
2. Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.

Projects cause positive and negative effects, or benefits and burdens, which may occur in the short, medium, or long term. If an effect is disproportionately high and adverse on minority and low-income populations, mitigation measures and offsetting benefits to the affected minority and low-income populations are considered.

All environmental resource areas described in this chapter were reviewed to identify those that may be adversely affected by the action corridor alternatives. The environmental resource areas with no adverse effects or with adverse effects that would be effectively mitigated during the construction and operation phases were not considered for additional analysis because they involved no potential for disproportionately high and adverse effects on minority and low-income populations. Environmental resource areas where adverse effects would likely occur were examined to determine whether the adverse effects have the potential to be disproportionately high and predominantly borne by minority and low-income populations. Project benefits to these resources were also considered. Table 3.17-3 lists the resource areas and identifies those that required additional EJ analysis as part of this Tier 1 DEIS (see discussion in Section 3.17.4.2, *Adverse Effects on Minority and Low-income Populations*). The rationale for the selection of these categories is also provided.

The following sections describe the EJ analyses for the environmental resource areas that may affect minority and low-income populations, as previously described. The EJ analyses assessed whether the anticipated effects would likely result in disproportionately high and adverse effects on the minority and low-income populations, consider mitigation measures and offsetting benefits, and determine whether the benefits of the proposed action would be equitably distributed to the minority and low-income populations.

Table 3.17-3. Environmental resource areas considered in environmental justice analysis

Environmental resource area	Environmental justice analysis required?	Rationale
Traffic and transportation	Yes	Effects on local access and benefits in terms of travel time savings, improved access, and congestion reductions may disproportionately affect minority and low-income populations.
Land use	Yes	Potential property acquisitions and displacements may disproportionately affect minority and low-income populations.
Social conditions	Yes	Potential effects on community cohesion and public services and utilities may disproportionately affect minority and low-income populations.
Economics	No	Tax revenue effects on local jurisdictions may affect the social services provided to local residents; however, these effects would be distributed widely in the study area.
Parklands and recreational facilities	Yes	Effects on accessibility to parklands and recreational facilities may disproportionately affect minority and low-income populations.
Prime and unique farmland	Yes	Direct and indirect effects on prime and unique farmland may disproportionately affect minority and low-income populations.
Air quality	No	No adverse effects.
Noise	Yes	Noise impacts are anticipated in residential development areas, which may disproportionately affect minority and low-income populations.
Visual resources	No	No adverse effects with mitigation.
Topography, geology, and soils	No	No adverse effects with mitigation.
Biological resources	No	No adverse effects.
Hydrology, floodplains, and water resources	No	No adverse effects with mitigation.
Wetlands and waters of the United States	No	No adverse effects with mitigation.
Cultural resources	No	To the extent feasible, all potential impacts on cultural resources would be avoided with the alternatives under consideration.
Hazardous materials	No	No adverse effects with mitigation.
Energy	No	No adverse effects.

3.17.4.2 Adverse Effects on Minority and Low-income Populations

Traffic and Transportation

The Eastern or Western Alternatives would improve regional mobility by providing a continuous north-to-south access-controlled route, connecting US 60 with I-10. The benefits to minority and low-income populations are discussed in Section 3.17.4.3, *Benefits to Minority and Low-income Populations*.

All the action corridor alternatives would change local circulation and affect local access by blocking cross streets that would not have direct traffic interchange access with the action corridor alternatives. In EJ areas in Segments 1, 3, and 4, the action corridor alternatives have potential interchange access at the

same crossing streets, which means there would not be notable differences in the effects on local access in these segments regardless of which action corridor alternatives are selected.

ADOT would coordinate with municipalities, affected communities, local schools, large employers, medical facilities, and all appropriate emergency services to address and resolve effects on local road networks during the design and construction phases.

Land Use and Property Acquisitions

With the conversion of land uses to transportation use, full and partial property acquisitions would result from implementing any of the action corridor alternatives. In most cases, these property acquisitions would not displace residents or businesses. In Segment 1, potential property acquisitions resulting in unavoidable displacements may occur along the W1a and W1b Alternatives in an area characterized as an EJ area. Property acquisitions may also occur with all action corridor alternatives in the northern portion of Segment 1, particularly with the W1a Alternative, in areas characterized as non-minority and/or non-low-income areas. Therefore, in Segment 1, there is the potential that the W1a and W1b Alternatives would result in disproportionately high and adverse impacts on minority and low-income populations with respect to land use and property acquisitions.

In Segment 2, none of the action corridor alternatives would displace residents or businesses. In Segment 3, the W3 Alternative would possibly result in the property acquisition and displacement of one or more isolated properties. The E3a and E3c Alternatives may affect one home outside of downtown Florence, and the E3a and E3b Alternatives may result in the acquisition and displacement of one or more isolated properties. The E3d Alternative may result in no displacements; however, it is mostly in non-minority and/or non-low-income areas. Since the W3 Alternative and the potentially affected parts of the E3a, E3b, and E3c Alternatives are all in EJ areas, all action corridor alternatives except the E3d Alternative in Segment 3 may potentially result in disproportionately high and adverse effects on minority and low-income populations.

The locations of potential property acquisitions and displacements in Segment 4 are along SR 87; therefore, the W4 Alternative may result in property impacts while the E4 Alternative would not. Since the W4 Alternative is characterized as an EJ area, and most of the E4 Alternative is considered non-minority and/or non-low-income, the W4 Alternative may potentially result in disproportionately high and adverse effects on minority and low-income populations.

ADOT has a well-developed relocation program to assist residents and business owners who may be displaced by the proposed action. All displaced persons, regardless of their EJ status, would be given assistance on an individual basis in accordance with ADOT policy, Arizona statutes, and the Uniform Act. Section 3.2, *Land Use*, has information on the Uniform Act and the mitigation measures to be implemented with the proposed action.

Social Conditions

Because the study area is mostly undeveloped, effects on social conditions in the study area are limited to specific locations where existing communities or facilities are located and would be affected either directly or indirectly (such as, effects on access) by one of the action corridor alternatives.

In Segment 1, in the EJ areas south of Pecos Road, the W1a, W1b, and E1a Alternatives would potentially reduce access to an existing airfield. No other adverse effects on community facilities are anticipated in EJ areas. In non-minority and/or non-low-income areas in the northern portion of Segment 1, the W1a Alternative may affect access to an existing school. The airfield impact may be avoided or minimized; however, the school impact may not be avoided. Therefore, in Segment 1, none of the alternatives would result in disproportionately high and adverse effects on minority and low-income populations.

In Segment 3, there are several community facilities in downtown Florence that would not be adversely affected with the Eastern Alternatives. On the other hand, the W3 Alternative would possibly reduce access to an existing church located within the 1,500-foot-wide corridor. During Tier 2 studies, direct impacts on the church may be avoided; however, if it is determined that access to and from the church by minority and low-income populations would be reduced, additional mitigation measures would be identified. Therefore, the W3 Alternative may potentially result in disproportionately high and adverse effects on minority and low-income populations.

In Segment 4, a post office and a Southern Baptist Church are located in the potential footprint of a system traffic interchange at I-10 with both the W4 and E4 Alternatives. The I-10 system interchange would be designed during Tier 2 studies, at which time exact impacts would be identified and avoided to the extent possible; however, the access to church, which may have minority and low-income populations in its congregation, may be affected. If impacts are identified, appropriate mitigation measures would be incorporated during Tier 2 studies to maintain access to and from this community resource. Therefore, since the potential of this impact would result with both alternatives, neither alternative in Segment 4 would have a higher likelihood of resulting in disproportionately high and adverse effects on minority and low-income populations.

In general, residents in all segments would benefit from the implementation of the action corridor alternatives because each would improve regional connectivity, reduce travel times, and provide enhanced access to jobs, community resources, and other destinations. More detailed EJ analysis regarding the potential social benefits is discussed in Section 3.17.4.3, *Benefits to Minority and Low-income Populations*.

Parklands and Recreational Facilities

All the action corridor alternatives have the potential to affect existing and/or planned parks and recreational facilities in some way because each action corridor alternative has one or more facilities located within 0.5 mile. Direct impacts would occur if all or part of the facility is converted to a nonrecreational use. Indirect impacts would occur if access or use of the facility is affected or if construction activities affect the facility. In Segment 1, there would be potential direct impacts on parks and trails in areas with and without minority and non-low-income populations with all alternatives. At US 60, the W1a Alternative would likely affect a private golf course and recreational areas associated with a high school, while the E1a, E1b, and W1b Alternatives would likely affect planned areas of Silly Mountain Park and Trails; however, the actual impacts of a Tier 2 alignment may avoid impacts on the park since planning documents for the park identify a future transportation facility through the park (see Section 3.5, *Parkland and Recreational Facilities*). Farther south in Segment 1, all action corridor alternatives would affect both existing and planned trails. These impacts would be avoided or minimized during Tier 2 studies with the design of the facility. Therefore, in Segment 1, any impacts on parks and recreational facilities would not be borne disproportionately by minority and low-income populations since both direct and indirect impacts would be avoided or minimized to the extent practicable, regardless of location.

In Segment 3, the Eastern Alternatives have the potential to directly affect the Gila River Trail; however, the portion of the trail crossed by the E3a and E3c Alternatives is in a minority and low-income area while the portion of the trail crossed by the E3b and E3d Alternatives is in a non-minority and/or non-low-income area. In addition, the E3b and E3d Alternatives may directly affect two other planned trails in non-minority and/or non-low-income areas. The W3 Alternative may directly affect Coolidge parks in minority and low-income areas. As with Segment 1, both direct and indirect impacts would be avoided or minimized to the extent practicable, regardless of location. However, implementing the W3 Alternative may potentially result in disproportionately high and adverse effects on minority and low-income populations regarding parks and recreational facilities.

One resource in Segment 4, the planned Butterfield Overland trail, may be directly affected by the Eastern and Western Alternatives. This impact, as well as the potential indirect impact on the Picacho Reservoir with the E4 Alternative, would be avoided or minimized to the extent practicable. Therefore, neither alternative in Segment 4 would result in disproportionately high and adverse effects on minority and low-income populations regarding parks and recreational facilities.

Prime and Unique Farmland

The action corridor alternatives would result in effects on prime and unique farmland, as described in Section 3.6, *Prime and Unique Farmland*. Effects on farmland of all types would adversely affect minority and low-income populations if the farmland is owned and operated by minority and/or low-income persons that could lose their livelihood if the land is converted.

In Segment 1, more prime farmland and farmland of unique importance exists along the W1a and W1b Alternatives (in EJ areas) than along the Eastern Alternatives. While more EJ areas may experience greater farmlands impacts with the Western Alternatives, since both the Eastern and Western Alternatives in Segment 1 have minority and low-income populations, these impacts would not be disproportionately high and adverse. Nearly all of the Segment 2, 3, and 4 alternatives are located completely in areas identified as prime farmland or farmland of unique importance; therefore, the farmland impacts in Segments 2, 3, and 4 with any of the action corridor alternatives would not be disproportionately high and adverse. With all action corridor alternatives, direct effects on the use of farmlands would be avoided or minimized, and access to adjacent farmland properties would be maintained to the extent practicable.

Noise

With the action corridor alternatives, modeled noise levels are slightly lower for the Eastern Alternatives than for the Western Alternatives because of slightly lower traffic volumes with the Eastern Alternatives. The small difference in noise levels between the two alternatives would not be perceptible to the human ear. In Segment 1, the W1a Alternative may potentially cause noise impacts along Ironwood Drive, a non-minority and/or non-low-income area. In the southern EJ areas of Segment 1, adverse noise levels may be greater with the W1a and W1b Alternatives than with the E1a and E1b Alternatives. Therefore, in Segment 1, it is possible that the Western Alternatives would result in disproportionately high and adverse noise effects on EJ populations.

In Segments 3 and 4, in some locations where a 1,500-foot-wide action corridor alternative overlays homes, there is a risk that the Tier 2 alignment may cause adverse noise impacts. This risk is higher for EJ areas with the E3a, E3b, and W4 Alternatives; therefore, these alternatives have the potential to result in disproportionately high and advserse noise impacts on minority and low-income populations.

Noise barriers would likely be warranted to mitigate potential noise impacts on the affected residential development areas.

3.17.4.3 Benefits to Minority and Low-income Populations

Travel Time Savings

The action corridor alternatives would provide substantial benefits to the local and regional transportation network. The proposed action would remove pass through traffic from key study area roadways, resulting in reduced congestion and decreased travel times because the proposed action corridor alternatives would provide a more direct route between I-10 and US 60 in Pinal County and an alternative travel route that provides increased capacity and network redundancy to improve system efficiency.

Traffic is projected to increase throughout the study area, with the greatest increases expected in the area south of Arizona Farms Road, where most of the EJ areas are located. In 2015, a peak period trip

between San Tan Valley and downtown Florence would have taken less than a half hour; by 2040, with the No-Action Alternative, that same trip is anticipated to take twice the time. With any of the action corridor alternatives, it is anticipated that the same trip in 2040 would take 34 minutes, a substantial improvement over the No-Action Alternative.

The reduction in travel time is a benefit for all populations, particularly for minority and low-income populations who may have more hourly paid jobs than non-minority and non-low-income populations, and who may be more sensitive to fuel costs for longer commutes. The time savings may increase productivity, enable families to spend more time together, or have other quality-of-life or health benefits.

Regional Access and Connectivity

Both the Eastern and Western Alternatives would provide a direct route between US 60 in Apache Junction and I-10 near Eloy, particularly in 2040 when local roads would be more congested and direct north-to-south access would otherwise be limited. Study area residents and residents of the greater Sun Corridor would benefit from this continuous, nonfragmented, north-to-south connection to access regional employment, education, and recreation opportunities.

By 2040, the Phoenix metropolitan region workforce is projected to be distributed among downtown Phoenix, Tempe, Chandler, Mesa, Apache Junction, Queen Creek, Florence, Coolidge, Eloy, Tucson, and a number of other employment centers (Figure 3.17-4).

The greatest density of employment opportunities (that is, areas with greater than 1.5 jobs per 2 acres, as shown in the figure) is located in the Phoenix metropolitan area northwest of the study area; however, these dense employment centers are also located within the study area. Regardless of the selected action corridor alternative, the proposed action would improve the connectivity for residents in the Corridor, including the large number of minority and/or low-income populations commuting to the locations with the greatest employment opportunities.

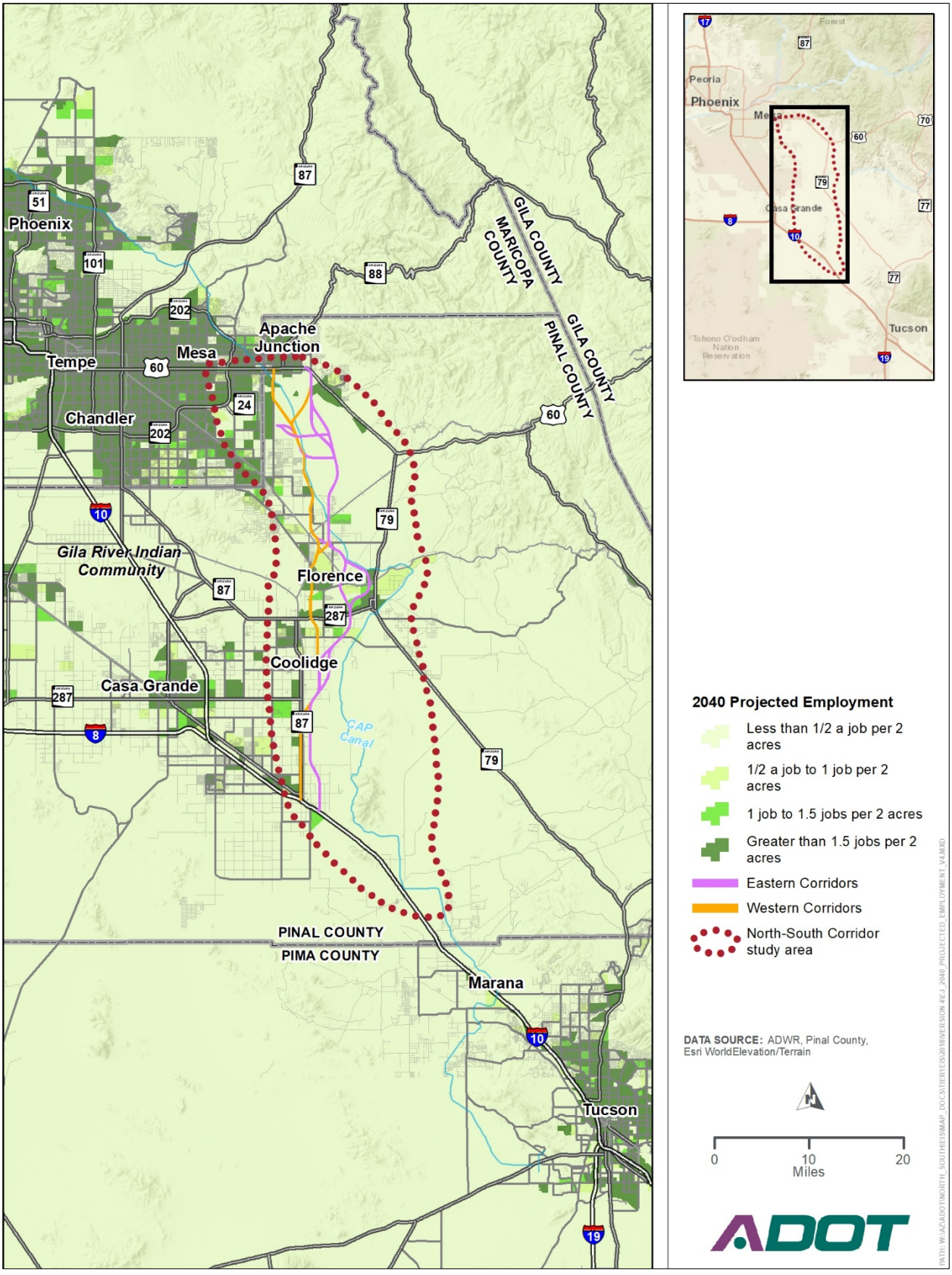
The action corridor alternatives would provide the local residents with improved connectivity and access to other key destinations in the region, such as recreation centers, universities and colleges, shopping centers, medical centers, and other public and community facilities.

Because study area residents and residents of the greater Sun Corridor would all have access to the proposed action, the benefit in terms of improved regional access and connectivity would be equitably distributed to all populations in the study area.

Economic Benefits

The action corridor alternatives would result in local and regional economic benefits. As a result of travel time reductions, there is potential cost savings on gas and vehicle maintenance for people who regularly commute through the area. As the region continues to grow, it is expected that new development, together with the improved regional access and connectivity, may actually increase overall property tax and sales tax revenues in the region as compared with today’s tax revenues. In addition, the construction of a new freeway would increase job opportunities in the local market, benefitting local residents as a whole.

Figure 3.17-4. 2040 projected regional employment, by traffic analysis zone



3.17.4.4 Environmental Justice and Title VI Conclusions

Environmental Justice Conclusion

While potential adverse effects would be related to the action corridor alternatives, all populations in the study area would likely receive the benefits listed below from the proposed action. It is anticipated that during Tier 2 studies, as the actual alignments are developed, impacts on minority and low-income populations would be evaluated and feasible measures to avoid, minimize, or mitigate adverse effects would be put in place. However, as the analyses also show, some segment alternatives have the potential to result in disproportionately high and adverse effects on minority and low-income populations. Generally, the Western Alternatives would more likely cause disproportionately high and adverse effects on minority and low-income populations than the Eastern Alternatives. While these effects would be further evaluated in Tier 2 studies, for the purposes of this high-level Tier 1 analysis, these potential disproportionately high and adverse effects are listed in Table 3.17-4.

Table 3.17-4. Potential environmental justice impacts

Resource	Potential disproportionately high and adverse effects
Land use	Segment 1 – W1a, W1b Segment 3 – E3a, E3b, E3c, W3 Segment 4 – W4
Social conditions	Segment 3 – W3
Parks and recreation	Segment 3 – W3
Noise	Segment 1 – W1a, W1b Segment 3 – E3a, E3b Segment 4 – W4

While potential adverse effects would be related to the action corridor alternatives, all populations in the study area would receive the following benefits from the proposed action:

- a continuous, nonfragmented, north-to-south connection between US 60 in Apache Junction and I-10 near Eloy
- reduced congestion on the existing transportation network
- faster travel times along the proposed Corridor
- improved access to employment, educational, recreational, shopping, and cultural opportunities
- reduced gas and vehicle maintenance costs attributable to reduced congestion and faster travel times
- increased local job opportunities owing to constructing a new freeway
- improved air quality

An equity evaluation would be included in the Tier 2 phase to identify the extent to which minority and low-income populations, as well as populations as a whole, in different locations would receive these benefits, to provide a comprehensive EJ analysis once the actual alignments are developed.

Title VI Conclusion

Individuals protected by Title VI include minority and LEP populations. As shown in Figures 3.17-1 and 3.17-3, minority and LEP populations, respectively, reside throughout the study area and would be

affected by any of the action corridor alternatives. The discussion in Section 3.17.4.2 regarding potential adverse effects on minority and low-income populations applies to the Title VI evaluation. In addition, the potential benefits listed in Section 3.17.4.3, such as improved travel time, reduced congestion, and improved regional access and connectivity, are among the benefits that can be anticipated by all study area residents. During Tier 2 analysis, impacts would be analyzed and mitigated.

3.17.5 Potential Avoidance, Minimization, and Mitigation Strategies

For each resource area considered, specific avoidance, minimization, and mitigation measures may be implemented to reduce the adverse effects of the proposed action and to not result in disproportionately high and adverse effects on minority and low-income populations. These specific measures would be developed during Tier 2 studies once actual alignments are developed and their impacts are evaluated in greater detail. Targeted community outreach would be conducted during Tier 2 studies to identify minimization and mitigation measures. Possible strategies could include:

- specifying commitments in terms of time frame or performance standards so that expectations are clear
- providing ongoing commitment and monitoring reports to minority and low-income populations
- conducting additional outreach to minority and low-income populations
- assigning a dedicated point-of-contact to be available for EJ-related concerns and issues during the Tier 2 process
- including monitoring requirements, and sharing the results, to alleviate concerns
- providing appropriate compensation through replacement or substitute resources
- rectifying an impact through repair, rehabilitation, or restoration

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts.

3.17.6 Subsequent Tier 2 Analysis

During Tier 2 studies, detailed analyses for all alignments under consideration shall identify:

- adverse impacts (specific burdens) that would be borne by minority and low-income populations versus those borne by non-minority and non-low-income populations to determine:
    - whether any adverse impacts would be predominantly borne by minority and low-income populations, and
    - whether any adverse impacts suffered by minority and low-income populations would be appreciably more severe or greater in magnitude than those suffered by non-minority and non-low-income populations
- benefits received by minority and low-income populations to ensure there is no denial of, reduction in, or significant delay in benefits received from the proposed action
- all public outreach efforts to engage minority and low-income populations in the transportation planning process

Once specific project impacts are determined during Tier 2 studies, the effects on pockets of minority and low-income populations not necessarily identified through census data would be included to fully assess the potential for disproportionately high and adverse effects on minority and low-income populations.

3.18 Temporary Construction Impacts

Implementing the proposed action would cause temporary construction-related impacts on a number of resources evaluated in this Tier 1 DEIS, should an action corridor alternative proceed to the Tier 2 study and be identified as a preferred alternative for construction. Those resource areas for which no construction-related impacts are anticipated are not included in the following discussion. Moreover, for some resource areas, such as cultural resources and acquisitions and displacements, impacts are expected to be permanent.

Because the action corridor alternatives discussed in this Tier 1 DEIS are relatively wide corridors, potential construction impacts are described in a general way. As the transportation decision-making process advances into the Tier 2 study, design would be further refined and detailed construction activities, traffic control, and public involvement plans would be prepared to avoid and minimize adverse effects to the extent practicable and to inform the public of ongoing activities. Specific temporary construction impacts and mitigation measures would be developed during the Tier 2 study.

With the No-Action Alternative, a new freeway would not be constructed; therefore, no temporary construction-related impacts would result.

3.18.1 Short-term Environmental Consequences

Short-term impacts associated with construction would affect the following resource areas:

- social conditions
- parkland and recreational facilities
- traffic and transportation
- air quality
- noise
- visual resources
- biological resources
- waters of the United States
- hydrology, floodplains, and water resources
- minority and low-income populations
- utilities

Table 3.18-1 discusses these impacts and potential mitigation measures to address such impacts.

Table 3.18-1. Short-term construction impacts, by resource

Resource	Impacts	Potential mitigation
Social conditions	• Detours, lane closures, and the movement of construction-related vehicles would temporarily affect access to residential areas and businesses. Construction-related activities have the potential to affect access to community facilities and services, and the delivery of emergency services. • Construction of the proposed action would generate employment opportunities throughout the construction period.	• ADOT's traffic control management procedures would be implemented to avoid, minimize, or mitigate potentially adverse construction-related access impacts on affected neighborhoods, businesses, and community facilities and services. • Construction action and traffic control plans would identify temporary transportation impacts and the locations of potential temporary detours. The plans would help ensure that local access to homes and businesses, and access for emergency services providers, is maintained. Plans would specify time frames for temporary detours and identify the process for notifying affected parties of the construction period and changes in access. • ADOT would work with local contractors to employ workers who reside in Pinal County and/or across the larger region.

Table 3.18-1. Short-term construction impacts, by resource

Resource	Impacts	Potential mitigation
Parkland and recreational facilities	• Construction impacts on parks or recreational facilities would occur if resources are located near or in the construction area. Temporary impacts might include increased dust from ground disturbance, noise from construction equipment, views of construction activities, access restrictions, and the presence of construction staging areas.	• To minimize potential construction-related impacts, mitigation measures may include strategically locating construction equipment to suitable locations near existing parkland and recreational facilities and establishing screening for noise disturbances.
Traffic and transportation	• Construction activities would temporarily affect vehicular movements, on-street parking, and access to adjacent properties along existing streets. The number of lanes along existing arterial streets adjacent to construction activities may be reduced periodically during construction, and detours may be necessary at some locations. • The movement of construction vehicles would create temporary traffic impacts in areas close to the construction zone, the extent of which would depend on which alternative is selected as the preferred alternative, and on the amount of new development at the time of construction. In addition, the magnitude of these impacts would depend on the location of sources of fill material and of disposition sites for surplus material, land uses adjacent to the Corridor and along haul routes, duration of hauling operations, staging locations, and construction phasing.	• Traffic would be managed by detailed traffic control plans and by procedures and guidelines specified in Part VI of FHWA's *Manual on Uniform Traffic Control Devices* (FHWA 2009) and by the *Arizona Supplement to Part VI of the Manual on Uniform Traffic Control Devices* (ADOT 2012b). In planning traffic control measures, the contractor would coordinate with potentially affected public services. Access would be maintained during construction, and construction activities that may substantially disrupt traffic would not occur during peak travel times. • ADOT would coordinate with local jurisdictions regarding traffic control and construction activities during special events. Requirements for using construction notices and bulletins would be identified. The effectiveness of traffic control measures would be monitored during construction and necessary adjustments would be made. • To identify acceptable routes and times of operation for hauling operations, ADOT would prepare an agreement with local agencies regarding hauling of construction materials on public streets.
Air quality	• Air quality impacts associated with construction would be limited to short-term increased fugitive dust and mobile source emissions. Fugitive dust would be generated by haul trucks, concrete trucks, delivery trucks, and other earthmoving vehicles. Increased dust levels would be attributable primarily to particulate matter resuspended by vehicle movement over paved and unpaved roads and other surfaces, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks. Most fugitive dust is made up of relatively large particles (that is, greater than 100 microns in diameter) that are responsible for the reduced visibility often associated with this type of construction. Given their relatively large size, these particles tend to settle within 20 to 30 feet of their source.	• To reduce the amount of construction dust generated, particulate control measures related to construction activities would be followed. Measures to avoid, minimize, or mitigate adverse effects would be implemented in accordance with the most recent version of ADOT's *Standard Specifications for Road and Bridge Construction* (ADOT 2008b). The measures would address three phases of construction: site preparation, construction, and postconstruction.

Table 3.18-1. Short-term construction impacts, by resource

Resource	Impacts	Potential mitigation
Noise	• Roadway construction generates a substantial amount of temporary noise in localized areas. As a result, noise generated by construction activities has the potential to be a nuisance to nearby residents and businesses. • The most common noise source in construction areas would be from engine-powered machinery such as earth-moving equipment (bulldozers), material-handling equipment (cranes), and stationary equipment (generators). Mobile equipment (such as trucks and excavators) operates in a sporadic manner while stationary equipment (generators and compressors) generates noise at fairly constant levels. • Typical noise levels from construction equipment range from 69 to 106 dBA at 50 feet from the source; however, most typical construction activities fall within the 75 to 85 dBA range at 50 feet.	• ADOT's *Standard Specifications for Highway and Bridge Construction* (2008b) stipulate that all exhaust systems on equipment should be in good working order, and properly designed engine enclosures and intake silencers should be used where appropriate. • Stationary equipment would be located as far from sensitive receptors as possible. • On-site generators would be shielded from sensitive noise receptors by using temporary noise enclosures. • Construction alerts would be distributed to inform the public of ongoing construction activities near noise-sensitive locations.
Visual resources	• Temporary visual impacts would result from construction activities, such as temporary vegetation removal, disturbed soil, construction equipment, and construction equipment operation. Such impacts would occur where the proposed freeway is adjacent to existing homes and where the proposed traffic interchanges would be built. These temporary disruptions and activities would be typical of any major roadway project and are not considered adverse.	• No mitigation would be needed for temporary construction impacts on visual resources.
Biological resources	• Temporary construction impacts would occur during and for a period after construction because of reduced habitat quantity and quality in disturbed areas. • During construction, artificial lighting and noise and dust in the air generated by equipment and human activity could temporarily displace birds from foraging, resting, and nesting habitat. Disturbance-related displacement from favored breeding habitats could result in birds competing with other birds for suitable replacement habitats. This could result in nesting in less-favored areas where nests may be damaged or accessed more easily by predators, which could limit survival of offspring or adults.	• Once construction activities are complete, disturbed native desertscrub habitats adjacent to the new roadway embankment would be addressed according to a revegetation plan. • Measures to avoid, minimize, and mitigate impacts on protected species, comply with state and federal regulations, and reduce habitat fragmentation, wildlife displacement, impediments to movements, collisions, and spread of invasive species would be developed for a preferred alternative during the Tier 2 study.
Waters of the United States	• Temporary construction zones may result in additional impacts on waters of the United States beyond the permanent impacts associated with road and bridge crossings for the proposed action.	• During the Tier 2 study, the preferred alternative would be evaluated for specific impacts on waters of the United States, the appropriate level of Section 404 permitting would be identified, and mitigation measures would be developed.

Table 3.18-1. Short-term construction impacts, by resource

Resource	Impacts	Potential mitigation
Hydrology, floodplains, and water resources	• Construction activities such as clearing, grading, trenching, and excavating would disturb soils and sediment. If not managed properly, disturbed soils and sediment could be washed into nearby water bodies during storms, thereby reducing water quality. • Potential areas of shallow groundwater were identified in the study area. If groundwater is determined to be shallow at locations near the proposed action, it may affect the facility's foundation and subgrade design, and could require dewatering during construction activities.	• Measures to avoid, minimize, or mitigate impacts on hydrology, floodplains, and other water resources would be implemented to address temporary construction impacts. • Ground-disturbing activities exceeding 1 acre would require an AZPDES permit from the Arizona Department of Environmental Quality. The permit must be consistent with discharge limitations and water quality standards established for the receiving water. • Construction-related activities regulated under the AZPDES permit are required to have a Stormwater Pollution Prevention Plan, which would be prepared by the contractor. • Implementing best management practices would reduce water quality impacts on the receiving waters of the Gila River and its tributaries. Both construction and operational impacts may be mitigated by using best management practices. • During design, the depth to groundwater in areas with potentially shallow groundwater would be field-verified.
Minority and low-income populations	• Construction-related impacts may disproportionately affect minority and low-income populations in the study area. These construction-related impacts include adverse effects on social conditions, parkland and recreational facilities, traffic and transportation, air quality, noise, visual resources, and utility service. These construction-related impacts would be short-term and temporary because they would occur during construction or until ground-disturbing activities are completed.	• Mitigation measures presented in this table would address construction-related impacts for both minority and low-income populations and the general population.
Utilities	• Construction may temporarily disrupt the delivery of utility services to customers near the proposed action. Table 3.18-2 identifies the number the existing public utilities that may be in conflict with the proposed action. • Potential permanent impacts, such as required utility relocations resulting from conflicts with the proposed action, may also result and would be evaluated during the Tier 2 study once a preferred alternative is selected and the specific conflicts are identified.	• Disruptions to utility services would be restricted to being short-term and localized. Advanced planning would be accomplished during the design phase so that interruption of the delivery of utility services would not occur or would be minimized. • ADOT and its contractors would coordinate with utility service providers during the design phase and throughout construction to identify potential problems and/or conflicts and to provide opportunities for their resolution before construction begins. • Utility interruptions would be scheduled and prior notification would be provided to affected parties. • Emergency response procedures would be outlined by ADOT in consultation with utility providers to ensure quick and effective repair of any inadvertent or accidental disruptions in service.

Notes: ADOT = Arizona Department of Transportation, AZPDES = Arizona Pollutant Discharge Elimination System, Corridor = North-South Corridor, dBA = A-weighted decibel, FHWA = Federal Highway Administration

The proposed action would affect utilities belonging to the following entities:

- Canals: Central Arizona Irrigation and Drainage District, CAP, Hohokam Irrigation and Drainage District, New Magma Irrigation and Drainage District, and San Carlos Irrigation Project
- Communication lines: AT&T, COX, Level 3, Media Com, MCI (Verizon), and Sprint Nextel Corp.
- Electrical transmission lines: Arizona Public Service, Electrical District No. 2, Electrical District No. 4, Salt River Project, San Carlos Irrigation Project, Tucson Electric Power, and Western Area Power Administration
- Natural gas and petroleum pipelines: City of Mesa, El Paso Natural Gas, Kinder-Morgan, and Southwest Gas
- Railroads: Copper Basin Railway, Magma Arizona Railroad, and UPRR
- Sewer lines: City of Coolidge, Superstition Mountain Community Facilities District No. 1, and Town of Florence
- Water lines: Arizona Water Company, Diversified Water Utility, Queen Creek Irrigation District, and Town of Gilbert

Table 3.18-2 lists the number of existing public utilities that may be in conflict with the proposed action. Additional details regarding the potential conflicts are in Appendix L, *Utility Information*. Subsequent analysis as part of the Tier 2 study would identify the location and extent of specific conflicts. Relocations of utilities such as pipelines and communication lines would be permanent impacts, but such relocations would be accomplished with minimal service disruptions to utility customers and would maintain previous levels of service.

Table 3.18-2. Potential utility impacts

	Segment 1				Segment 2				Segment 3					Segment 4	
Utility type	E1a	E1b	W1a	W1b	E2a	E2b	W2a	W2b	E3a	E3b	E3c	E3d	W3	E4	W4
Canals	2	2	2	2	1	1	0	0	2	2	2	2	3	3	2
Communication lines	3	3	3	4	4	4	2	3	5	5	5	5	5	2	5
Electrical transmission lines	3	3	5	5	1	1	3	3	21	18	19	16	14	11	10
Natural gas and petroleum pipelines	0	0	2	2	1	1	1	1	5	5	5	5	4	3	4
Railroads	1	1	1	1	0	0	1	1	1	1	1	1	0	0	1
Sewer main	0	0	1	0	0	0	0	0	2	1	3	2	3	0	0
Water main	1	1	4	4	0	0	0	0	0	0	0	0	1	1	1
Total	**10**	**10**	**18**	**18**	**7**	**7**	**7**	**8**	**36**	**32**	**35**	**31**	**30**	**20**	**23**

Source: research by Kimley-Horn and Associates, Inc., 2018

In Segment 1, fewer impacts would be associated with the E1a and E1b Alternatives, which would each involve 10 potential utility conflicts, versus 18 potential conflicts with the W1a and W1b Alternatives.

In Segment 2, all action corridor alternatives would have similar impacts. The E2a, E2b, and W2a Alternatives would each have 7 potential utility conflicts, and the W2b Alternative would have 8 potential utility conflicts.

In Segment 3, the E3a Alternative would have the most impacts, with 36 potential utility conflicts, followed by the E3c Alternative, with 35 potential conflicts. The E3b Alternative would have 32 potential conflicts, the E3d Alternative would have 31 potential conflicts, and the W3 Alternative would have 30 potential conflicts.

In Segment 4, the action corridor alternatives would have similar utility impacts, with the E4 Alternative potentially affecting 20 utilities and the W4 Alternative potentially affecting 23 utilities.

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts.

3.18.2 Subsequent Tier 2 Analysis

As the transportation decision-making process advances into the Tier 2 study, design would be further refined and detailed construction activities, traffic control, and public involvement plans would be prepared to avoid and minimize adverse effects to the extent practicable and to inform the public of ongoing activities. Specific temporary construction-phase impacts and mitigation measures would be further refined during the Tier 2 study.

3.18.2.1 Conclusion

Short-term construction impacts on most of the resource areas discussed in this section would be similar regardless of whether an Eastern or Western Alternative were chosen to advance into the Tier 2 study. Such temporary construction impacts would be typical of a major roadway project, and mitigation measures would be implemented to minimize such impacts.

In terms of utility impacts, the Western Alternatives in Segment 1 would have almost twice as many utility conflicts as the Eastern Alternatives. In Segments 2, 3, and 4, the potential utility conflicts associated with the Eastern and Western Alternatives are generally similar in magnitude. The potential utility conflicts associated with each action corridor alternative are routine in nature, and ADOT is well-qualified to manage such issues during construction.

3.19 Section 4(f) and Section 6(f) Resources

This section provides an overview of the Section 4(f) and Section 6(f) resources that may be affected by the action corridor alternatives.

3.19.1 Regulatory Context

The following sections describe the regulatory context for Section 4(f) and Section 6(f) resources.

3.19.1.1 Section 4(f) of the Department of Transportation Act

Section 4(f) of the Department of Transportation Act of 1966, codified at 49 USC § 303, declares that "it is the policy of the U.S. Government that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites."

Section 4(f) specifies that the Secretary of Transportation may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of a historic site of national, state, or local significance (as determined by the federal, state, or local officials having jurisdiction over the park, area, refuge, or site) only if a determination is made that:

- There is no feasible and prudent alternative to the use of the land from the property;
- The action includes all possible planning to minimize harm to the property resulting from such use; or,
- The use of the Section 4(f) property will have a *de minimis* impact on the property.

A property protected by Section 4(f) is "used" when land is permanently incorporated into a transportation facility, when the property is temporarily occupied during construction, or when the proximity impacts of the project are so severe that they substantially impair the activities, features, or attributes that qualify the property for Section 4(f) protection. Coordination with and concurrence on the use of the property from the official with jurisdiction over the Section 4(f) property—for example, a city parks department for recreational resources or the SHPO or Tribal Historic Preservation Officer for historic resources, is required.

For parks and recreational facilities, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities qualifying the property for protection under Section 4(f). Public review and subsequent concurrence from the official with jurisdiction on a *de minimis* finding is required. A determination of *de minimis* impact on a historic property may be made when a finding of "no adverse effect" or "no historic properties affected" is made by the SHPO and/or Tribal Historic Preservation Officer through the Section 106 consultation process. In this case, the SHPO/Tribal Historic Preservation Officer must be informed of the intent to use the Section 106 finding as the basis of the *de minimis* finding.

For tiered environmental documents, the Tier 1 DEIS includes a broad assessment of potential Section 4(f) properties and impacts, followed by a more site-specific evaluation and formal determination in subsequent Tier 2 studies. According to FHWA's 2012 *Section 4(f) Policy Paper*, "if sufficient information is available, a preliminary Section 4(f) approval may be made at the first-tier stage as to whether the impacts resulting from the use of a Section 4(f) property are *de minimis* or whether there are feasible and prudent avoidance alternatives." Alternatively, "if sufficient information is unavailable during the first-tier stage, then the EIS may be completed without any preliminary Section 4(f) approvals." In this scenario, the documentation should include the following:

- statement of reason or reasons no preliminary approval is possible during the first-tier stage
- explanation of the process that would be followed to complete Section 4(f) evaluations during subsequent tiers

- discussion of any effects of the subsequent tier Section 4(f) approval (preliminary or final) on any decision made during the first-tier stage

3.19.1.2 Section 6(f) of the Land and Water Conservation Fund Act

Section 6(f) resources are parklands subject to the conditions of the Land and Water Conservation Fund (LWCF) Program, established by the LWCF Act of 1965 and administered by the National Park Service. Section 6(f) resources are acquired with LWCF grants for a public recreational use. 36 CFR Part 59, Section 6(f)(3), of the LWCF Act is the basis of federal compliance efforts to ensure LWCF investments are maintained in public outdoor recreation use. Once an area has been funded with LWCF assistance:

> No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location. [36 CFR Part 59, Section 6(f)(3)]

Projects that result in private and/or nonrecreation activities on Section 6(f) property, or that affect its public recreation use, would trigger a “conversion.” If a conversion of parkland developed with LWCF assistance occurs, the project sponsor is required to provide replacement recreational property.

3.19.2 Methodology

This section presents an overview of the resources that presently exist or are planned or programmed within the action corridor alternatives that may be considered Section 4(f) properties and may be affected by the action alternatives. Section 4(f) properties include the following:

- parks and recreational areas of national, state, or local significance that are both publicly owned and open to the public
- publicly owned wildlife and waterfowl refuges of national, state, or local significance that are open to the public to the extent that public access does not interfere with the primary purpose of the refuge
- historic sites of national, state, or local significance and listed in or determined eligible for listing in the NRHP, as determined by the Section 106 process regardless of whether they are open to the public [23 USC § 138(a) and 49 USC § 303(a)]

As described in Section 3.19.1, the Section 4(f) regulations allow for a preliminary Section 4(f) approval to be made at the time of a Tier 1 EIS [23 CFR § 774.7(e)(1)]; however, the project detail at the corridor level in this Section 4(f) overview is not sufficient to address the specific criteria for determining a Section 4(f) use. In particular, it cannot be determined if or how future design elements (for example, roadway features) would have an effect on parks or on historic properties under 36 CFR Part 800, or if and how those elements would affect the features, attributes, or activities that qualify a park, recreation area, or wildlife and waterfowl refuge for protection under Section 4(f). Moreover, there are several identified unevaluated potential historic properties that would be evaluated in subsequent Tier 2 studies; therefore, it is unknown at this time whether they would be considered Section 4(f) properties and to what extent, if at all, they would be affected by the Tier 2 alignments. For these reasons, although the regulations allow that a Tier 1 EIS may include a preliminary Section 4(f) approval, such an approval will not be made in this case for the NSCS Tier 1 EIS.

3.19.2.1 Parks and Recreational Areas

The identification of public parks and recreational resources was based on available information regarding existing and planned parks, recreational facilities (including schools with public recreation facilities), and trails in the study area. Data sources used to inventory resources included federal, state, and local websites and associated GIS data, where available. Resources within 0.5 mile of the action corridor alternatives were inventoried and assessed for potential Section 4(f) impacts.

Recreational facilities encumbered by Section 6(f) of the LWCF Act were researched, and it was determined that no such facilities are within 0.5 mile of the action corridor alternatives. Therefore, this Tier 1 DEIS does not include an assessment of risks to Section 6(f) resources.

3.19.2.2 Wildlife and Waterfowl Refuges

This overview used existing natural resource data, web-based environmental review tools from AGFD and USFWS, a preliminary site-specific evaluation conducted by AGFD, and general field investigations. This research concluded that no waterfowl or wildlife refuges are located in the study area.

3.19.2.3 Historic Sites

This overview used cultural resource data compiled through inventories of archaeological resources (Stewart and Brodbeck 2017), built environment resources (historic buildings and structures) (Brodbeck 2018), and TCPs (Darling 2016, 2017) prepared for the action corridor alternatives.

3.19.3 Affected Environment

This section describes Section 4(f) resources identified in the study area, including parks and recreational areas and historic sites.

3.19.3.1 Parks and Recreational Areas

Table 3.19-1 lists existing and planned parks, recreational facilities, and trails with the potential to be affected by the action corridor alternatives and that are considered Section 4(f) properties (that is, they are public recreational facilities). Any of these resources may be considered Section 4(f) resources for evaluation in subsequent Tier 2 studies. Refer to Table 3.5-2 in Section 3.5, *Parkland and Recreational Facilities*, for a full list of parks and recreational facilities in the study area that are within 0.5 mile of the action corridor alternatives.

Table 3.19-1. Potentially affected Section 4(f) resources: parks and recreational facilities

Potentially affected resource	Action corridor alternative
Existing facilities	
Silly Mountain Park and Trails	E1a, E1b, W1b
Sheep Drive Multiuse Trail	E1a, E1b, W1b
Pinal County Existing Municipal Trails (multiple segments)	E1a, E1b, W1a, W1b, E3a, E3b, E3c, E3d, E4, W4
Pinal County Existing Multiuse Trail Corridor	E3a, E3b, E3c, E3d, W3
Poston Butte Trail and Open Space	E3a, E3c
Proposed parks	
Florence Community Park #8	W1a, W1b
Proposed trails	
Central Arizona Project Trail	E1a, E1b, W1a, W1b
Pinal County Proposed Multiuse Trail Corridor (multiple sections): Magma Arizona Railroad Trail (segment 1), Copper Basin Railroad Trail (segments 2, 3), other unnamed trails	E1a, E1b, W1a, W1b, W2a, W2b, E3a, E3b, E3c, E3d, W3, E4, W4
Pinal County Proposed Drainage Trail (multiple segments)	E1a, E1b, W1a, W1b
Pinal County Proposed Off-highway Vehicle Trail	E1a, E1b, W1b
Pinal County Adopted Trail Corridor – Florence/Casa Grande Canal Corridors	E1a, E1b, W1a, W1b
Pinal County Florence Planned Power Line Corridor Trail	E3b, E3d
National Park Service Butterfield Overland Trail	E4, W4
Eloy Planned Municipal Trail	E4, W4

3.19.3.2 Wildlife and Waterfowl Refuges

No wildlife and/or waterfowl refuges are located within any of the action corridor alternatives.

3.19.3.3 Historic Sites

Table 3.19-2 lists historic properties with the potential to be affected by the action corridor alternatives and that are considered Section 4(f) properties.

Table 3.19-2. Potentially affected Section 4(f) resources: historic sites

Potentially affected resource	Action corridor alternative
Kenilworth Elementary School	W3
Southern Pacific Railroad Main Line – Sunset Route	E4, W4
Southern Pacific Railroad – Wellton-Phoenix-Eloy Line	W3, W4
Southern Pacific Railroad – Mesa-Winkelman Line	E3a, E3b, E3c, E3d, W2a, W2b
Magma Arizona Railroad	E1a, E1b, W1a, W1b
North Side Canal	E3a, E3b, E3c, E3d
Pima Lateral Canal	E3a, E3b, E3c, E3d, W3
Casa Grande Canal	E4, W4
Florence-Casa Grande Canal Extension	E4, W4
El Paso Natural Gas Pipeline No. 1007	E4, W4
AZ U:14:73(ASM)[a]	W1a, W1b

[a] AZ U:14:73(ASM) was previously determined not eligible for listing in the National Register of Historic Places but requires reevaluation as a traditional cultural property, potentially eligible under Criterion A.

Twenty-one properties within the action corridor alternatives with historic-age buildings, as shown in Table 3.19-3, have not been evaluated for NRHP eligibility at this Tier 1 level. NRHP evaluations of these properties would be carried out in Tier 2 studies if they are located within the preferred corridor. If determined eligible for NRHP listing, the properties would be considered Section 4(f) historic properties.

Table 3.19-3. National Register of Historic Places unevaluated historic sites

#	Parcel	Address	Use	Date	Action corridor alternative
1	200-70-001D	4125 W. Arizona Farms Rd., Florence, AZ 85132	Residence	1954	E2a, E2b
2	202-24-006M	12464 E. Vah Ki Inn Rd., Coolidge, AZ 85128	Residential farmstead/dairy	1950s	E3a, E3b, E3c, E3d
3	202-36-002A	8405 N. Clemans Rd., Coolidge, AZ 85128	Residential farmstead	1955	E3a, E3b, E3c, E3d
4	209-11-0050	6704 E. Highway 287, Coolidge, AZ 85128	Residential farmstead	1939	W3
5	209-16-0020	1101 E. Highway 287, Coolidge, AZ 85128	Residential farmstead	1939	W3
6	209-36-0050	7534 N. Attaway Rd., Coolidge, AZ 85128	Farmstead	Pre-1961	W4
7	210-46-002A	9865 N. Attaway Rd., Florence, AZ 85132	Residence	1969	E2a, E2b
8	400-36-014B	4163 N. Wheeler Rd., Coolidge, AZ 85128	Residence	1950s	E3a, E3b
9	400-37-001A	3951 N. Wheeler Rd., Coolidge, AZ 85128	Residence	1948	E3a, E3b
10	400-37-003A	3817 N. Wheeler Rd., Coolidge, AZ 85128	Utility buildings	1960s/ 1970s	E3a, E3b

Table 3.19-3. National Register of Historic Places unevaluated historic sites

#	Parcel	Address	Use	Date	Action corridor alternative
11	401-21-0040	2680 E. Randolph Rd., Coolidge, AZ 85128	Residential farmstead	1947	E3a, E3b, E3c, E3d
12	401-21-006A	3360 S. Fast Track Rd., Coolidge, AZ 85128	Landing strip	1950	W3
13	401-34-0030	2797 E. Kleck Rd., Coolidge, AZ 85128	Utility building	1950s	E3a, E3b
14	401-34-0060	2162 E. Storey Rd., Coolidge, AZ 85128	Utility building	1960s/ 1970s	E3a, E3b, E3c, E3d, W3
15	401-40-001C	1577 S. Christensen Rd., Coolidge, AZ 85128	Barn	1950s	E4, W4
16	401-48-0010	300 W. Grogan Ave., Coolidge, AZ 85194	Residential farmstead	1950s	W4
17	401-55-003F	12727 S. Edgedale Rd., Eloy, AZ 85131	Residence	Pre-1961	E4
18	401-62-0310	4826 E. Stallion Drive, Eloy, AZ 85131	Residence	1974	W4
19	401-62-0320	4780 E. Stallion Drive, Eloy, AZ 85131	Residence	1974	W4
20	401-62-0330	4730 E. Stallion Drive, Eloy, AZ 85131	Residence	1974	W4
21	411-03-0010	15790 S. Highway 87, Eloy, AZ 85131	Service garage	1952	W4

3.19.4 Environmental Consequences

A transportation project may have three general types of impacts on Section 4(f) resources:

- Permanent incorporation – Land is considered permanently incorporated into a transportation project when it has been purchased as ROW or sufficient property interests have otherwise been acquired for the purpose of project implementation.
- Temporary occupancy – Examples of temporary occupancy of Section 4(f) land include right-of-entry, project construction, a temporary easement, or other short-term arrangement involving a Section 4(f) property.
- Constructive use – Constructive use occurs when the proximity impacts of a project on an adjacent or nearby Section 4(f) property, after incorporation of impact mitigation, are so severe that the activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired.

The risk of use based on the location of known Section 4(f) properties is identified in this this Tier 1-level evaluation. Preliminary Section 4(f) determinations are not made since permanent incorporation, temporary occupancy, or constructive uses cannot be identified at this time without the specific location of the project footprint. Moreover, several unevaluated potential historic properties may be affected with the action corridor alternatives. The full evaluation of cultural resources, for compliance with the Section 106 process, would be completed with Tier 2 studies, at which time it would be determined whether the properties are eligible for listing in the NRHP and whether they would be affected by the Tier 2 projects.

This section does identify known Section 4(f) properties that are located within the action corridor alternatives and, therefore, may be affected by either a permanent acquisition or permanent easement. The risk of use of these properties by Tier 2 projects is assessed in the following sections based on the

location within the action corridor alternatives and the potential for avoidance through design in Tier 2 studies.

3.19.4.1 Parks and Recreational Areas

The following discussion provides an overview of the risks of use of Section 4(f) parks and recreational properties with the action corridor alternatives.

Silly Mountain Park and Trails: Silly Mountain Park and Trails, at 5203 East 36th Avenue in Apache Junction, is a 200-acre park that includes an existing network of over 3.5 miles of easy to difficult trails located just east of Silly Mountain Road and US 60. The park is under the jurisdiction of Apache Junction, and the City plans to expand the park. The E1a, E1b, and W1b Alternatives would all overlap the City's planned expansion area. The City of Apache Junction has indicated that it would be open to coordinating joint planning of the park expansion and highway project. Therefore, there is a low risk of impacts on the planned Silly Mountain Park and Trails Section 4(f) property with the E1a, E1b, and W1b Alternatives.

Sheep Drive Multiuse Trail: The 1,628-acre Sheep Drive Multiuse Trail surrounds the city of Apache Junction to the north and east of Lost Dutchman Boulevard and Goldfield Road with a meandering system of trails for equestrian and hiking use and natural areas for animals and animal observers. The southernmost portion of the trail is just within the outer boundary of the 1,500-foot-wide E1a, E1b, and W1b Alternatives. However, the proposed freeway in this area would be co-located with the existing US 60, and Sheep Drive Trail is located northeast of US 60 to tie into the existing Silly Mountain Park. Therefore, there is a very low risk of impacts on the Sheep Drive Multiuse Trail Section 4(f) property with the E1a, E1b, and W1b Alternatives.

Pinal County Municipal Trails: The Pinal County *Open Space and Trails Master Plan* (2007) identifies a number of existing and planned municipal trails, many of which cross the action corridor alternatives in Segment 1 (all alternatives), Segment 3 (Eastern Alternatives), and Segment 4 (both alternatives). The study team would endeavor to avoid use of these facilities by providing grade separations and/or realignment of the affected trails; however, these design details would be determined during Tier 2 studies. In a worst-case scenario for these existing trails, some ROW may be required, but the recreational features would be retained. Therefore, there is a medium risk of impacts on the Pinal County Existing Municipal Trails Section 4(f) properties with the W1a, W1b, E1a, E1b, E3a, E3b, E3c, E3d, W4, and E4 Alternatives.

Pinal County Existing Multiuse Trail Corridor: The Pinal County *Open Space and Trails Master Plan* (2007) identifies a number of existing and planned multiuse trail corridors, one of which crosses all of the action corridor alternatives in Segment 3. This trail is partially existing and partially planned, and its alignment adjacent to the existing Pima Lateral Canal crosses the W3 Alternative perpendicularly just north of Vah Ki Inn Road, follows a north-to-south alignment within a portion of the W3 Alternative between Vah Ki Inn Road and Starview Avenue, continues in an east-to-west direction across the E3a, E3b, E3c, and E3d Alternatives, and then continues east. The study team would endeavor to avoid use of this trail by providing grade separations and/or realignment of the affected trail; however, these design details would be determined during Tier 2 studies. In a worst-case scenario, some ROW may be required, but the recreational features would be retained. Therefore, there is a medium risk of impacts to the Pinal County Existing Multiuse Trail Corridor Section 4(f) property with the W3, E3a, E3b, E3c, and E3d Alternatives.

Poston Butte Trail and Open Space: The Town of Florence's Poston Butte Trail and Open Space is a 160-acre site north of Hunt Highway and west of Herseth Road, with both existing and planned components. The existing portion of the site contains Poston Butte, where Charles Poston is buried at its summit. Planned expansions east and west would include additional open space areas, paved and unpaved trails, and trailheads for connectivity to the park. Based on the location of the eastern expansion

as noted in the 2008 Town of Florence *Parks, Trails, and Open Space Master Plan*, the E3a and E3c Alternatives would overlap a portion of the planned area. However, through coordination with the Town, the boundary of the planned portions of the Poston Butte Trail and Open Space was adjusted to avoid encroachment by the proposed action. Therefore, there is a very low risk of impacts on the Poston Butte Trail and Open Space Section 4(f) property with the E3a and E3c Alternatives.

Proposed Florence Community Park #8: The Town of Florence's proposed 124-acre Community Park #8 would be located amidst a medium-density residential community west of the CAP Canal and north of Skyline Drive. The proposed park would include athletic fields, a swimming pool, playground areas, a skate park, a community center, and other amenities to serve a growing neighborhood. The W1a and W1b Alternatives would be east of the proposed park, potentially affecting some existing homes at the eastern end of the community. Because these residential impacts would be avoided or minimized to the extent possible during Tier 2 studies by shifting the alignment closer to the CAP Canal, there is less risk of impacts on the park farther west. Therefore, there is a very low risk of impacts to the proposed Community Park #8 Section 4(f) property with the W1a and W1b Alternatives.

Proposed Trails: Pinal County and local jurisdictions have proposed a comprehensive trail network in the study area. As Table 3.19-1 indicates, every action corridor alternative could potentially affect one or more proposed trails, with the exception of the E2a and E2b Alternatives. The study team would endeavor to avoid use of property designated for future trails through coordination with the officials with jurisdiction over the proposed facilities and by considering grade separations and/or realignment of the affected trails through joint planning during Tier 2 studies. Therefore, there is a low risk of impacts on the planned trails throughout the study area with all action corridor alternatives except E2a and E2b.

3.19.4.2 Wildlife and Waterfowl Refuges

Because no wildlife and/or waterfowl refuges are located within any of the action corridor alternatives, there is no risk of use of these resources by the proposed action.

3.19.4.3 Historic Sites

The following discussion provides an overview of the risks of use of Section 4(f) historic properties with the action alternative corridors.

Kenilworth Elementary School: Kenilworth Elementary School, at 2060 East Coolidge Avenue, is approximately 1 mile east of Coolidge. The school property is completely in the W3 Alternative. The school was built in the 1920s to serve the rural community east of Coolidge. Today, the property is no longer used as a public school, although it is still owned by Pinal County School District 21. The school was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], October 13, 2017), for listing on the NRHP under Criteria A and C for its historical associations with the early development of the Coolidge area and the rural education system in the middle Gila Valley and for its architectural design. The school could potentially be avoided in Tier 2 studies; therefore, there is a medium risk of impacts on the Kenilworth Elementary School Section 4(f) property with the W3 Alternative.

Southern Pacific Railroad Main Line – Sunset Route: Southern Pacific Railroad's original transcontinental main line, known as the Sunset Route, intersects the E4 and W4 Alternatives at the southern end of the study area as it runs parallel to I-10. The railroad was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criteria A and D in Arizona at the state and national levels for its many important historical associations with the construction of America's first transcontinental railroads, the development of Arizona's railroad network, and as a driver of settlement and economic growth in Arizona. Because the railroad can be clear spanned, there is a low risk of impacts on the Southern Pacific Railroad Main Line – Sunset Route Section 4(f) property with the E4 and W4 Alternatives.

Southern Pacific Railroad – Wellton-Phoenix-Eloy Line: Segments of Southern Pacific Railroad's Wellton-Phoenix-Eloy railroad line intersect with the W3 and W4 Alternatives. The railroad was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criterion A for its important historical associations with the development of Arizona's railroad network. Because the railroad can be clear spanned, there is a low risk of impacts on the Southern Pacific Railroad – Wellton-Phoenix-Eloy Line Section 4(f) property with the W3 and W4 Alternatives.

Southern Pacific Railroad – Mesa-Winkelman Line: The Mesa-Winkelman Line of the Southern Pacific Railroad crosses the W2a, W2b, E3a, E3b, E3c, and E3d Alternatives. The railroad was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criterion A for its associations with the development of Arizona's railroad network and mining economy. Because the railroad can be clear spanned, there is a low risk of impacts to the Southern Pacific Railroad – Mesa-Winkelman Line Section 4(f) property with the W2a, W2b, E3a, E3b, E3c, and E3d Alternatives.

Magma Arizona Railroad: The Magma Arizona Railroad crosses the E1a, E1b, W1a, and W1b Alternatives. The railroad line extends for 30 miles from Magma Junction, where it connects with the Wellton-Phoenix-Eloy and Mesa-Winkelman lines, to Superior. The railroad was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criteria A and D for its associations with the development of Arizona's railroad network and mining economy. Because the railroad can be clear spanned, there is a low risk of impacts on the Magma Arizona Railroad Section 4(f) property with the E1a, E1b, W1a, and W1b Alternatives.

North Side Canal: The North Side Canal intersects with the E3a, E3b, E3c, and E3d Alternatives. The canal was constructed in 1930 as part of the San Carlos Irrigation Project. It extends for approximately 19 miles, delivering water to land north of the Gila River. The North Side Canal was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criteria A and C for its associations with the San Carlos Irrigation Project and the development of irrigation systems in the middle Gila River Valley. Because the canal can be clear spanned, there is a low risk of impacts on the North Side Canal Section 4(f) property with the E3a, E3b, E3c, and E3d Alternatives.

Pima Lateral Canal: The Pima Lateral Canal intersects with the E3a, E3b, E3c, E3d, and W3 Alternatives. The 23-mile-long canal was constructed in 1928 as a component of the San Carlos Irrigation Project. The Pima Lateral Canal was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criteria A and C as an integral component of the San Carlos Irrigation Project. Because the canal can be clear spanned, there is a low risk of impacts on the Pima Lateral Canal Section 4(f) property with the E3a, E3b, E3c, E3d, and W3 Alternatives.

Casa Grande Canal: The Casa Grande Canal intersects the E4 and W4 Alternatives. The Florence Canal Company constructed the canal between 1886 and 1889 to irrigate land south of the Gila River. The property was acquired by the federal government in 1920 and subsequently was integrated into the San Carlos Irrigation Project. The Casa Grande Canal was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criteria A and D for its associations with the San Carlos Irrigation Project. Because the canal can be clear spanned, there is a low risk of impacts on the Casa Grande Canal Section 4(f) property with the E4 and W4 Alternatives.

Florence-Casa Grande Canal Extension: The Florence-Casa Grande Canal intersects the E4 and W4 Alternatives. The canal was built between 1923 and 1928 as an extension of the Florence-Casa Grande Canal and as part of the San Carlos Irrigation Project. The Florence-Casa Grande Canal Extension was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2,

2018), for listing on the NRHP under Criterion A for its associations with the San Carlos Irrigation Project. Because the canal can be clear spanned, there is a low risk of impacts on the Florence-Casa Grande Canal Extension Section 4(f) property with the E4 and W4 Alternatives.

El Paso Natural Gas Pipeline No. 1007: The El Paso Natural Gas Pipeline No. 1007 intersects with the E4 and W4 Alternatives. The property is an underground pipeline constructed in the early 1930s to extend natural gas service from copper mines in Douglas to Tucson and Phoenix. The El Paso Natural Gas Pipeline No. 1007 was determined eligible, with SHPO concurrence (Jacobs [SHPO] to Petty [FHWA], April 2, 2018), for listing on the NRHP under Criteria C and D primarily for its associations with the development of Arizona's pipeline infrastructure. Because the pipeline is buried and can be crossed over, there is a very low risk of impacts on the El Paso Natural Gas Pipeline No. 1007 Section 4(f) property with the E4 and W4 Alternatives.

3.19.5 Potential Avoidance, Minimization, and Mitigation Strategies

During Tier 2 studies, ADOT would coordinate with owners with jurisdiction over the Section 4(f) properties to identify further avoidance or minimization measures to reduce impacts on affected parks and recreational facilities (that is, city or regional parks departments, or other specific agencies) and historic properties (that is, SHPO). Efforts would be made to maintain access to the resources potentially affected to the extent feasible. ADOT would also coordinate with local agencies on planned park and recreational resources and the potential for joint development. Where access cannot be maintained or where implementation of the proposed action would require full or partial acquisition of existing parks or recreational facilities, potential mitigation measures would be developed in consultation with the local agencies. Specific mitigation measures may include minimizing the acreage of acquisition of these areas during the design phase, selecting alternatives that avoid parks and recreational facilities, strategically locating construction equipment to suitable locations within existing parks and recreational facilities, and designing landscaping to offset vegetation removal or to establish screening for noise and visual disturbances.

If the North-South Corridor advances into Tier 2 design and NEPA analysis, ADOT would examine ways to avoid or minimize impacts on Section 6(f) properties. Potential strategies ADOT could consider include, but are not limited to, defining alignments that do not use park properties and incorporating refinement details—such as using retaining walls to minimize the proposed freeway's footprint.

As part of that effort, ADOT would continue coordinating with the agencies having jurisdiction over the potentially affected properties. If land from one or more properties cannot be avoided, Section 6(f) requires replacement of park land that is converted to a transportation use. The land must be equal to or greater in value than the affected land in terms of its ability to serve as park land. To achieve this requirement, if park land cannot be avoided, ADOT would assist in identifying replacement land.

During the Tier 2 studies, if a preferred alignment would adversely affect a property or properties that are listed on or eligible for listing on the NRHP or are unevaluated (requiring more research or archaeological testing to determine their NRHP eligibility), a document such as a memorandum of agreement or a programmatic agreement would be developed through the Section 106 process. This agreement document would detail the measures ADOT would take to mitigate any adverse effects on these properties. Potential mitigation measures could include—but are not limited to—archaeological testing and data recovery, a Historic American Buildings Survey, or a Historic American Engineering Record. These types of mitigation would be guided by plans that are required by the agreement document and consulted on through the Section 106 process.

Appendix D, *Summary of Avoidance, Minimization, and Mitigation Strategies*, contains a consolidated list of strategies to address environmental impacts.

3.19.6 Subsequent Tier 2 Analysis

During Tier 2 studies, at the time that specific alignments are identified and evaluated, a comprehensive Section 4(f) evaluation would be required. Tier 1 analysis has identified resources subject to the provisions of Section 4(f) that have a risk of use by an action corridor alternative. This Tier 1 analysis does not include a preliminary determination of Section 4(f) use; therefore, a full analysis would be required for NEPA clearance in subsequent tiers.

With the development of action corridor alternatives studied in this Tier 1 DEIS, efforts to avoid or minimize encroachment by the corridors into Section 4(f) properties were made as described in Section 2.2.4.1, *Modifications to Avoid Environmentally Sensitive Resources*. Considering these avoidance actions and the potential for avoidance or minimization of impacts in Tier studies, the risks of use of Section 4(f) properties are identified in Section 3.19.4. During Tier 2 studies, with the development of specific alignments, additional efforts may allow for further avoidance or minimization of impacts.

Subsequent Tier 2 studies will include the following analyses of Section 4(f) properties as part of the Section 4(f) Evaluation required for Tier 2 NEPA clearance:

- Identification of Section 4(f) properties:
    - identification of all potential Section 4(f) properties within an established radius from the selected corridor to evaluate potential direct permanent uses, temporary construction uses, and indirect constructive uses of each property by the proposed project
    - consideration of existing properties identified in this Tier 1 DEIS and any additional properties not yet identified
    - identification performed in coordination with officials with jurisdiction over the Section 4(f) properties to confirm the primary purpose and significance of the property and to identify planned and programmed projects that may be subject to Section 4(f)
- Evaluation of uses of Section 4(f) properties:
    - assessment of uses of Section 4(f) properties by project elements, including property acquisition, permanent easements, temporary construction easements, and indirect effects on activities, attributes, or features that qualify each Section 4(f) property for protection
    - consideration of design modifications to avoid or minimize impacts and preliminary mitigation measures, as appropriate
    - preparation of preliminary determinations of use of each property
    - evaluation of uses performed in coordination with officials with jurisdiction over the Section 4(f) properties to discuss and gain concurrence on the degree of impact, avoidance and minimization measures, potential mitigation strategies, and preliminary use determinations

If permanent use of Section 4(f) properties occurs, and the impact does not qualify as a *de minimis* use, a thorough evaluation of all possible feasible and prudent alternatives to completely avoid the use of the Section 4(f) property and all possible planning to minimize harm to the Section 4(f) property is required. If it is determined that there is no feasible and prudent avoidance alternative and there are two or more alternatives that use Section 4(f) property, a least overall harm analysis would be necessary pursuant to 23 CFR 774.3(c). The least overall harm analysis would include the following elements: an assessment of the feasibility and prudence of avoidance alternatives; incorporation of appropriate mitigation measures into the project; evaluation of relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection; and the consideration of views of the officials with jurisdiction over the Section 4(f) properties used by the project.

For any uses of Section 4(f) properties that are determined to be *de minimis* impacts, all avoidance, minimization, mitigation, or enhancement measures are included as part of the determination. The *de minimis* finding does not require an analysis of feasible and prudent avoidance alternatives. The official or officials with jurisdiction must be informed of the intent to make a *de minimis* finding and must concur in writing.

Tier 2 analyses should also include a current assessment of impacts on park properties encumbered by Section 6(f) of the LWCF Act. Depending on the timing of the Tier 2 studies and specific alignments studied, there is the potential that Section 6(f) resources may be located in the Tier 2 study area if new LWCF Act-funded parks are developed in the preferred corridor. If it is determined that property would be acquired from a Section 6(f) resource and a conversion from parkland to a transportation use would occur, ADOT would be required to follow the conversion provisions of Section 6(f)(3) of the LWCF Act, according to the LWCF Act Federal Financial Assistance Manual.

3.19.7 Conclusion

The following sections summarize the preliminary overview of Section 4(f) properties and the risk of use of these resources by each action corridor alternative.

3.19.7.1 Segment 1

In Segment 1, all action corridor alternatives have Section 4(f) properties with very low to medium risk of impact by the proposed action. It is anticipated that there would be opportunities during Tier 2 studies to avoid or minimize any potential impacts. In Segment 1, there are no identified unevaluated historic properties; therefore, the likelihood of identifying additional Section 4(f) properties in the Tier 2 phase would be low.

3.19.7.2 Segment 2

In Segment 2, the Western Alternatives each have one Section 4(f) property with a low risk of impact and the Eastern Alternatives each have two unevaluated historic sites within their corridors.

3.19.7.3 Segment 3

In Segment 3, all action corridor alternatives have Section 4(f) properties with a very low to medium risk of impact by the proposed action; however, it is anticipated that there would be opportunities during Tier 2 studies to avoid or minimize any potential impacts. There is a medium risk of the W3 Alternative affecting the Kenilworth School located within the corridor. In Segment 1, there are four identified unevaluated historic properties within each of the corridors of the W3, E3c, and E3d Alternatives, and eight within each of the corridors of the E3a and E3b Alternatives; therefore, there is a potential of identifying additional Section 4(f) properties with any of the Segment 3 alternatives.

3.19.7.4 Segment 4

In Segment 4, both action corridor alternatives have Section 4(f) properties with a low to medium risk of impact by the proposed action. It is anticipated that there would be opportunities during Tier 2 studies to avoid or minimize any potential impacts. In Segment 4, there are two and seven identified unevaluated historic properties within the E4 and W4 Alternatives, respectively; therefore, there is a greater potential of identifying additional Section 4(f) properties in the Tier 2 phase with the W4 Alternative.

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