Final Tier 1 Environmental Impact Statement and Preliminary Section 4(f) Evaluation

Appendix E13, Water Resources Technical Memorandum

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Acronyms

ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
CAP	Central Arizona Project
CAVSARP	Central Avra Valley Storage and Recovery Project
CFR	Code of Federal Regulations
CWA	Clean Water Act
DOT	Department of Transportation
EIS	Environmental Impact Statement
EO	Executive Order
FEMA	Federal Emergency Management Agency
I	Interstate
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NWI	National Wetland Inventory
SAVSARP	Southern Avra Valley Storage and Recovery Project
SR	State Route
Study Area	I-11 Corridor Study Area
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

E13 Water Resources Technical Memorandum

E13.1 Purpose

This technical memorandum describes water resources that could be affected by the proposed Interstate 11 (I-11) from Nogales to Wickenburg, Arizona. This technical memorandum supports the Final Tier 1 Environmental Impact Statement (EIS) and Preliminary Section 4(f) Evaluation that evaluates the social, economic, and environmental impacts potentially resulting from the alternatives under evaluation, including the No Build Alternative.

Federal, state, and local governments have developed programs and regulations to protect and manage water resources. Water resources within the I-11 Corridor Study Area (Study Area) may be used for drinking water, agriculture, industrial processes, transportation, the environment, and recreation. This document identifies water resources within each of the 2,000-foot-wide corridor options, which are situated within the larger Study Area. This analysis addresses the following categories of water resources: active management areas, sole source aquifers, groundwater wells, Outstanding Arizona Waters, impaired waters, waters of the US including wetlands, and floodplains.

E13.2 Methodology

Water resources addressed in this analysis include those that are regulated under federal, state, or local law, as well as resources that were otherwise identified as being of special concern. The affected environment is presented by geographic region of the Study Area: South Section, Central Section, and North Section. The best available information was used to identify and assess project effects to each resource. For most resources, each corridor option was overlaid on geospatial data to quantify the resource and to identify its location(s) within the corridor. The 2,000-foot-wide corridors are collectively referred to as the Project Area. Modified approaches were used to identify and describe impaired waters and wetlands; these methodologies are described in detail below.

The following categories of groundwater and surface water resources were assessed.

Active Management Areas

Active management areas managed under Arizona's Groundwater Management Act. These resources were identified using the Arizona Department of Water Resources (ADWR) Water Atlas (ADWR 2010) and geospatial data acquired from ADWR (2020). Effects to groundwater recharge facilities authorized under the Underground Water Storage and Recovery Program and Underground Water Storage, Savings, and Replenishment Act are included in this assessment.

Sole Source Aquifers

Sole source aquifers regulated under the Safe Drinking Water Act. These resources were identified using geospatial data acquired from the United States Environmental Protection Agency (USEPA) (2017a).

Groundwater Wells

An inventory of wells was used to assess potential impacts on access to groundwater resources (ADWR 2017). Such wells are used for water quality monitoring, production, geotechnical observation, domestic uses, testing purposes, and irrigation, among others. Groundwater quality information was obtained from sources including water quality assessments prepared by Arizona Department of Environmental Quality (ADEQ) and ADWR's Water Atlas (ADWR 2010). Groundwater quality standards are set under Arizona's Aquifer Water Quality Standards.

Outstanding Arizona Waters

Waters defined as Outstanding Arizona Waters were identified using geospatial data acquired from ADEQ (2020).

Impaired Waters

Waters assessed as impaired by ADEQ pursuant to Section 303(d) of the Clean Water Act (CWA). Both impaired waters placed on the CWA Section 303(d) list and impaired waters designated as Not Attaining are included in this analysis. Impaired waters were identified using geospatial data acquired from ADEQ (2018a).

ADEQ considers proposed projects affecting waters within 1.0 mile upstream or 0.5 mile downstream of an impaired water to have the potential to contribute to the impairment; ADEQ reviews such proposed projects to assess compliance with Section 401 of the CWA (ADEQ 2017a). Therefore, this analysis considers impaired waters located within 0.5 mile upstream and 1.0 mile downstream of each corridor option. The term "Analysis Area" is used to indicate this buffered corridor for the impaired waters analysis only.

Waters of the US

Waters regulated under the CWA. The boundaries of non-wetland waters of the US are delineated by their ordinary high water mark, which is defined as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, or the presence of litter and debris (33 Code of Federal Regulations [CFR] 328.3). Surface waters with ephemeral, intermittent, and perennial flows may all possess such characteristics.

The National Hydrography Dataset (NHD) (US Geological Survey [USGS] 2019) was used to calculate the miles of named and unnamed surface waters with the potential to possess the physical characteristics of waters of the US. Although the US Army Corps of Engineers (USACE) regulates impacts on waters of the US in terms of area as opposed to length, this analysis utilizes mileage because geospatial data depicting acreage are not available. Waterbodies identified by the NHD were reviewed qualitatively. NHD data were created at a desktop level and may over- or under-represent surface waters present on the ground. Further, not all surface waters are regulatory waters of the US. It should also be noted that surface flow regimes described herein are based on the best available data and do not necessarily reflect actual conditions. Site-specific jurisdictional delineations would be required to accurately identify regulated waters and delineate their surface area; jurisdictional delineations would be

conducted during the Tier 2 National Environmental Policy Act (NEPA) process. For this reason, mapped surface waters are referred to as "potential waters of the US."

Wetlands

Wetlands are regulated under the CWA and subject to Executive Order (EO) 11990. The National Wetland Inventory (NWI) (United States Fish and Wildlife Service [USFWS] 2019) was used to calculate the acreage of potential wetlands within the Build Corridor Alternatives. The NWI maps use the Cowardin System, which classifies the types of ecosystems related to water resources (Cowardin et al. 1979). Typical wetland classifications in the arid west include:

- **Freshwater Emergent Wetland**: wetlands dominated by a 30 percent or greater areal coverage of emergent (extending out of the water) vegetation.
- **Freshwater Forested/Shrub Wetland**: wetlands dominated by a 30 percent or greater areal coverage of trees or shrubs.
- **Freshwater Pond**: wetlands less than 20 acres in a topographic depression or dammed river channel that lack trees, shrubs, or persistent emergent vegetation.
- **Lake**: wetlands greater than 20 acres in a topographic depression or dammed river channel that lack trees, shrubs, or persistent emergent vegetation.
- **Riverine**: wetlands contained within a channel, except for those dominated by trees, shrubs, or persistent emergent vegetation.

The NWI data were created from remote data sources and may not be representative of ground conditions. Formal wetland delineations using the three-part United States Army Corps of Engineers (USACE) methodology of identifying hydric soils, wetland hydrology, and hydrophytic vegetation would be required to accurately identify wetlands (USACE 2008a). Formal wetland delineations will be conducted during Tier 2 NEPA analysis. For this reason, this analysis refers to the mapped NWI wetlands as "potential wetlands." Additionally, the NWI identifies most surface waters within Arizona as "riverine" wetlands; however, this classification is known to be highly inaccurate as most surface waters in the state are not wetlands. As a result, areas identified as "riverine" wetlands are excluded from this analysis.

To further refine the wetlands analysis, site-specific reviews were conducted at key areas (e.g., at major river crossings) that had potential to affect the outcome of the analysis. Predominant vegetation observed during site visits was used to identify potential wetlands. Sites dominated by plant species classified as wetland indicator species were considered to contain potential wetlands. Wetland indicators are those species classified as facultative, facultative wetland, or obligate in the Arid West (USDA 2020). These species range from being equally likely to occur in wetlands or uplands to almost always occurring in wetlands (Lichvar et al. 2012). In formal wetland delineations, vegetation is considered to be hydric (i.e., wetland vegetation) if it is dominated by species in these three categories (USACE 2008a). Locations where site-specific reviews identified potential wetlands are hereafter referred to as key potential wetlands.

Several key areas could not be assessed in the field due to accessibility issues and one area did not warrant a site assessment based on desktop review of remote data. For these locations, Google StreetView (2020) and/or the USGS (2004) National Gap Analysis Program Provisional

Digital Land Cover Map for the Southwestern US was used to identify plant species likely to be present. The following vegetation categories as defined by the National Gap Analysis Program are discussed in the analysis:

- **North American Warm Desert Riparian Woodland and Shrubland**: This category represents low-elevation riparian corridors along medium to large perennial streams. Dominant trees include box elder (*Acer negundo*), velvet ash (*Fraxinus velutina*), Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), netleaf hackberry (*Celtis laevigata var. reticulata*), and Arizona walnut (*Juglans major*). Shrub dominants include Geyer willow (*Salix geyeriana*), silver buffaloberry (*Shepherdia argentea*), and coyote willow (*Salix exigua*). Because many of these plant species are wetland indicators (see below), areas containing this vegetation category are considered to be potential wetlands for the purposes of this assessment.

- **Warm Desert Riparian Mesquite Bosque**: This category represents low-elevation riparian corridors along intermittent streams. Dominant trees include honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*Prosopis velutina*). Shrub dominants include seep willow (*Baccharis salicifolia*), arrowweed (*Pluchea sericea*), and coyote willow. Although the dominant tree species are not wetland indicators, the dominant shrub species are. Therefore, potential wetlands may occur within this vegetation category; areas containing this vegetation category are considered to be potential wetlands for the purposes of this assessment.

- **Sonora-Mojave Creosotebush-White Bursage Desert Scrub**: This category occurs in broad valleys, lower bajadas, plains and low hills in the Mojave and lower Sonoran deserts. Plants are adapted to dry conditions. Dominant species typically consist of creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Because these plant species are not wetland indicators, areas containing this vegetation category are not considered to be potential wetlands for the purposes of this assessment.

- **Sonoran Paloverde-Mixed Cacti Desert Scrub**: This category occurs on dry hillsides, mesas, and upper bajadas. Dominant species include saguaro (*Carnegiea gigantea*), littleleaf paloverde (*Parkinsonia microphylla*), and creosote bush. Mesquite species, ironwood (*Olneya tesota*), and ocotillo (*Fouquieria splendens*) are less prominent. Because these plant species are not wetland indicators, areas containing this vegetation category are not considered to be potential wetlands for the purposes of this assessment.

Jurisdictional status for all wetlands and waters of the US in the Project Area has not been assigned at this Tier 1 level for following reasons:

- For many of the waters of the US and wetlands in the Project Area, it is not possible to determine jurisdictional status without formal field delineations. Field delineations would be included as part of the Tier 2 NEPA review process.

- The evolving nature of how jurisdiction under the CWA is interpreted by the courts means that, over the expected build-out period for Tier 2 projects, this status could change for many of the identified streams and wetlands.

Specific impacts on jurisdictional waters of the US and wetlands cannot be quantified until more detailed alignments are developed as part of the Tier 2 NEPA process.

Floodplains

For the purposes of this analysis, floodplains are defined as Special Flood Hazards Areas regulated by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Rate Program. Such areas are also subject to DOT Order 5650.2 (USDOT 1979), EO 11988, and Floodplain Use Permits. The data collection and analysis for this technical report are consistent with EO 13690.

Flood Insurance Rate Maps provided by FEMA (2017) were used to calculate the acreage of 100-year floodplains within the Build Corridor Alternatives. FEMA defines the geographic area of floodplains according to varying levels of flood risk by designating Special Flood Hazards Areas on a Flood Insurance Rate Map. Special Flood Hazards Areas are those areas that are susceptible to being inundated by a flood event having a 1 percent chance (base flood or 100-year flood) of being equaled or exceeded each year, and are regulated by FEMA (FEMA 2007). A regulatory floodway is defined by FEMA as "…the channel of a watercourse and the adjacent land that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height." Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area (FEMA 2007). The following list provides a description of flood zones in the Study Area.

- **A**: Special Flood Hazards Areas inundated by the 100-year flood; base flood elevations are not determined.
- **AE**: Special Flood Hazards Areas inundated by the 100-year flood; base flood elevations are determined.
- **AH**: Special Flood Hazards Areas inundated by the 100-year flood; flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations are determined.
- **AO**: Special Flood Hazards Areas inundated by the 100-year flood; flood depths of 1 to 3 feet (usually sheet flow on the sloping terrain); average depths are determined. For areas of alluvial fan flooding, velocities also are determined.
- **C**: Area determined to be outside the 500-year floodplain.
- **D**: Area in which flood hazards are undetermined.
- **X**: Area of 500-year flood; area subject to the 100-year flood with average depths of less than 1 foot or with contributing drainage area less than 1 square mile; and areas protected by levees from the base flood (FEMA 2019).

Areas protected by levees as identified on the Flood Rate Insurance Maps (FEMA 2017) are assessed qualitatively. FEMA has not mapped all floodplains or areas protected by levees. Further assessment of unmapped floodplains and levees including coordination with flood control districts and jurisdictions would occur during Tier 2 NEPA analyses.

E13.3 Affected Environment

The Study Area falls within the extensive Basin and Range Physiographic Province of southern and western Arizona. This province is characterized by elongated, northwest to southeast trending mountain ranges separated by broad alluvial valleys (Nations and Stump 1996). Average annual precipitation within the Study Area ranges from 8.3 inches at Phoenix Sky Harbor Airport to 18.7 inches in Nogales. Precipitation peaks seasonally, as a result of jet-stream guided winter storm systems and summer monsoons (ADWR 2010).

Groundwater is a major source of potable and irrigation water in the Study Area. Numerous private, municipal, utility, and corporate-owned groundwater wells are located within the Study Area. Groundwater is underground water found in pore spaces between grains of soil or rock or within fractured rock formations. Groundwater can originate from precipitation that infiltrates through soil and underlying unsaturated geologic materials until reaching the water table. The primary sources of groundwater within the Study Area are infiltration of surface flows from mountain ranges along the valley margins, streamflow infiltration, and underflow from adjacent basins (ADWR 2010). Groundwater quality with the Study Area is generally suitable for most uses. Reported exceedances of drinking water standards are most commonly due to nitrate, fluoride, arsenic, and organic compounds (ADWR 2010). One sole source aquifer, the Upper Santa Cruz and Avra Valley Sole Source Aquifer, is included in the Study Area.

The Study Area encompasses portions of four active management areas that cover approximately 14,700 square miles and stretch continuously from the international border with Mexico at Nogales through central Arizona to the northern boundary of Maricopa County. The Phoenix, Pinal, and Tucson Active Management Areas contain deep alluvial aquifers and significant volumes of water in storage. However, aquifer recharge rates are low and the pumping is high. As a result, the aquifers have historically been in an overdraft condition. In the Santa Cruz Active Management Area, aquifers occur in basin-fill sediments along the Santa Cruz River. Water levels in the stream alluvium along the Santa Cruz River are closely interrelated with precipitation and drought events. The Santa Cruz Active Management Area is considered to be in a safe-yield condition, which is accomplished when no more groundwater is being withdrawn than is being replaced annually (ADWR 2010).

Surface water resources within the Study Area are associated with three major watersheds: the Santa Cruz River, the Middle Gila River, and the Agua Fria River-Lower Gila River watersheds (ADWR 2010). Major watercourses within these watersheds generally contain perennial or intermittent flows, while streamflow in other surface drainages is primarily ephemeral. Within the Study Area, numerous ephemeral desert washes carry stormwater flows and can create intricate, braided drainage systems across the valleys between mountain ranges. In addition to stormwater inputs, groundwater, effluent, and irrigation return waters contribute to surface flows in the intermittent and perennial drainages.

Surface water is also a source of potable and irrigation water within the Study Area. Surface waters are diverted from waterways and impoundments, then transported to intake facilities or agricultural fields via a vast network of canals. No major surface water impoundments or surface waters with a domestic water source designated use occur within the Project Area.

A total of five impaired waters, which consist of portions of the Santa Cruz River, Potrero Creek, Nogales Wash, the Hassayampa River, and the Gila River, are located within 0.5 mile upstream

or 1.0 mile downstream of corridor options. No Outstanding Arizona Waters are located within the Study Area (ADEQ 2020); therefore, this resource is not carried forward for further analysis.

Numerous potential waters of the US and associated floodplains occur throughout the Study Area. Wetlands are relatively uncommon in Arizona, occupying less than 1 percent of the land surface (Dahl 1990). Substantial losses of wetlands have occurred in Arizona; it is estimated that 36 percent of the wetland acreage present in the late 1700s was lost by 1990 (Dahl 1990). Within the Study Area, wetlands are uncommon and are generally associated with rivers, streams, and manmade catchments such as cattle tanks.

The following sections discuss more specifically the existing conditions relating to water resources within the three sections of the Project Area (South, Central, and North).

E13.3.1 South Section

Key features relevant to water resources are shown on **Figure E13-1**, **Figure E13-2**, and **Figure E13-3** and include:

- Santa Cruz and Tucson Active Management Areas
- Upper Santa Cruz and Avra Basin Sole Source Aquifer
- Two major groundwater recharge facilities, the Central Avra Valley Storage and Recovery Project (CAVSARP) and the Southern Avra Valley Storage and Recovery Project (SAVSARP)
- Numerous groundwater wells
- Two wastewater treatment plants, the Nogales International Wastewater Treatment Plant and the Tres Rios Water Reclamation Facility
- Impaired waters stretches of the Santa Cruz River, Potrero Creek, and Nogales Wash
- Santa Cruz River, its major tributaries, and associated floodplains
- Potential wetlands along Potrero Creek, the Rillito River, and the Santa Cruz River

Active Management Areas

The South Section Project Area includes the Santa Cruz, Tucson, and Pinal Active Management Areas (**Figure E13-1**). All corridor options within the South Section are completely contained within active management areas. The miles of each South Section corridor option within active management areas are shown in **Table E13-1**.

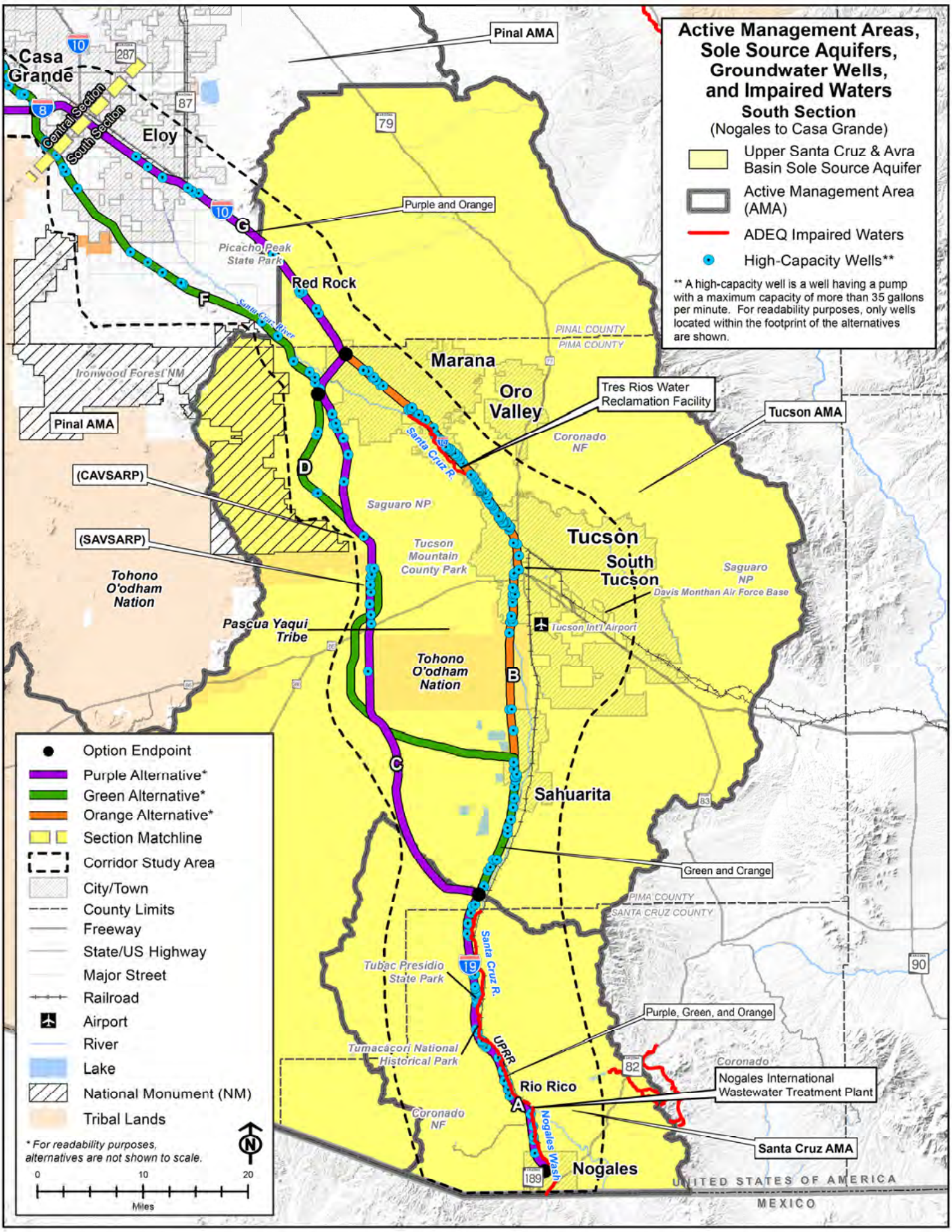

Figure E13-1. Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters – South Section

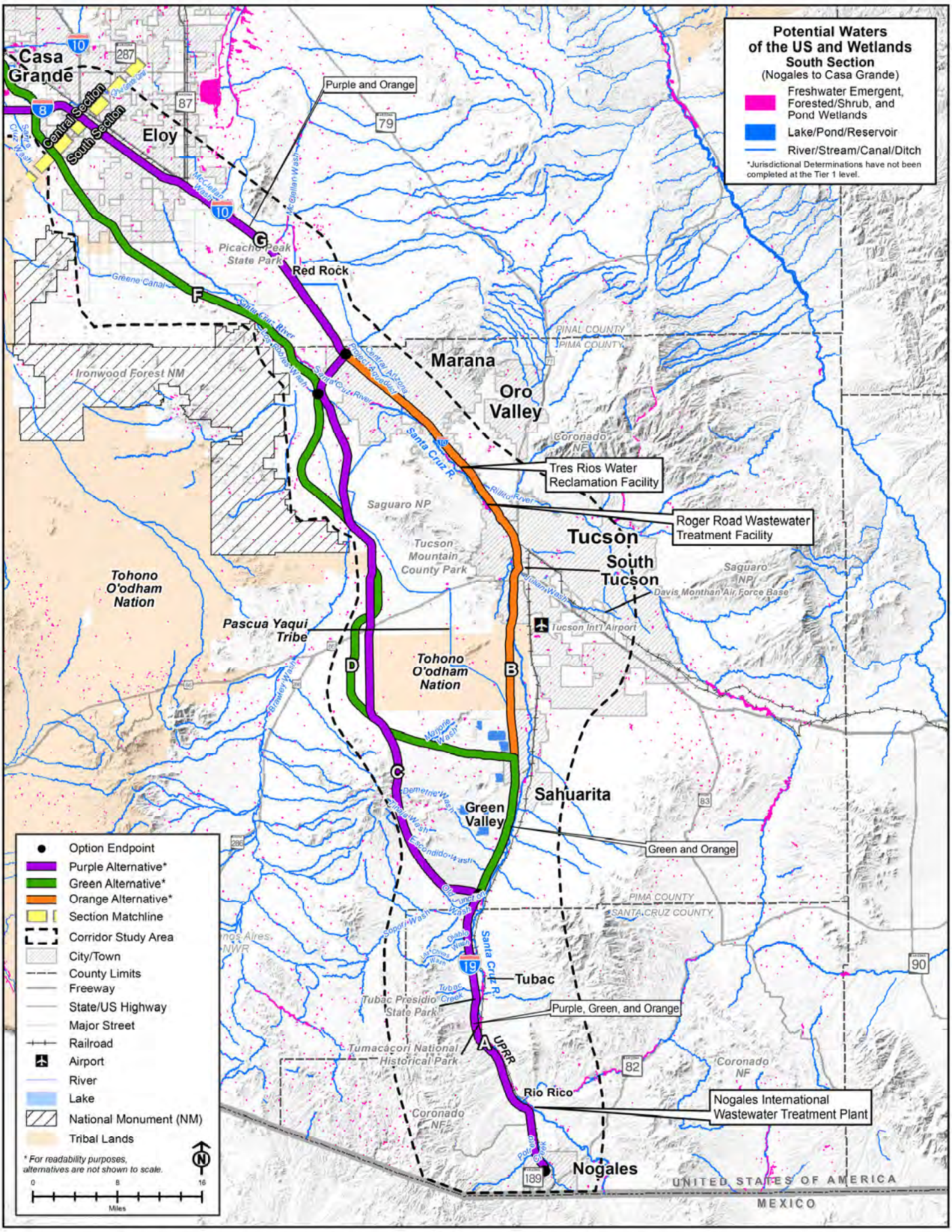

Figure E13-2. Potential Waters of the US and Wetlands – South Section

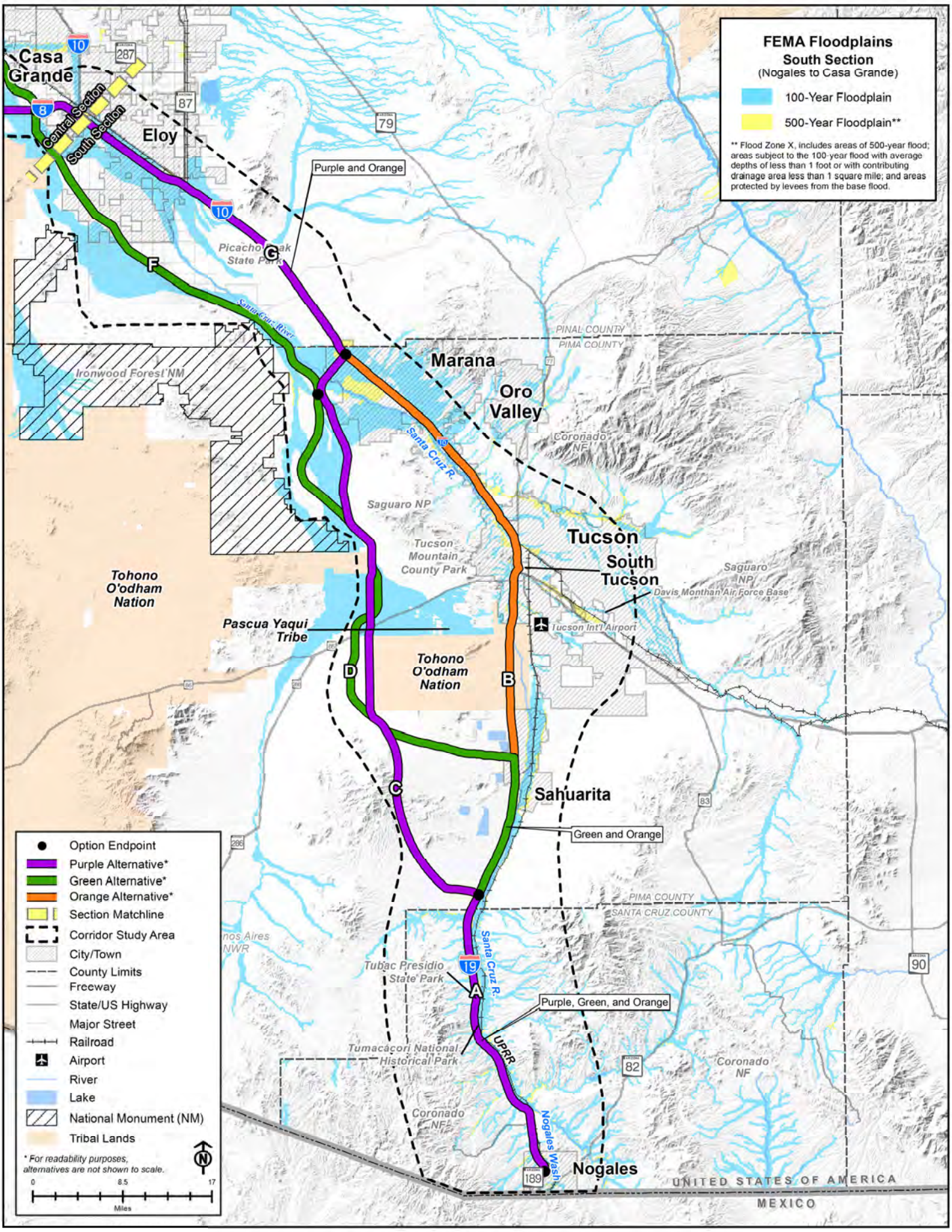

Figure E13-3. FEMA Floodplains – South Section

Table E13-1. Miles of Corridor Options within South Section Active Management Areas

Active Management Area	Miles within Active Management Areas by Corridor Option[a]					
	A	B	C	D	F	G
Santa Cruz	28.7	0.2	8.4	0.2	0	0
Tucson	0	58.4	49.9	64.1	6.8	13.9
Pinal	0	0	0	0	44.1	31.3
Total	28.7	58.6	58.3	64.3	50.9	45.2

SOURCE: ADWR 2020.
[a]Rounded to the nearest 0.1 mile.

The Santa Cruz Active Management Area includes approximately 716 square miles and its major drainage, the Santa Cruz River, flows from Mexico into the basin (ADWR 2010). The management goal for the Santa Cruz Active Management Area is to maintain a safe-yield condition in the active management area and to prevent local water tables from experiencing long-term declines. Safe-yield is accomplished when no more groundwater is being withdrawn than is being annually replaced.

The Tucson Active Management Area includes approximately 3,866 square miles; the Santa Cruz River is also the major drainage in this active management area (ADWR 2010). The management goal for the Tucson Active Management Area is to establish a safe-yield by 2025. Recharge of aquifers in the Tucson Active Management Area is supported by the CAVSARP and SAVSARP. Colorado River water is delivered to Tucson via the Central Arizona Project (CAP) canal, and that water is allowed to sink into the ground and recharge the aquifer at CAVSARP and SAVSARP (City of Tucson 2017). The surface ponds for these recharge facilities are west of Tucson in Avra Valley (**Figure E13-1**). Recharge basins associated with the CAVSARP are located approximately 1,000 feet west of Options C and D. One of the SAVSARP's nine recharge basins, Basin 1, is located within Option C; the remaining basins are located immediately adjacent to Option C on the west side of Sandario Road. Several wells owned by the City of Tucson adjacent to the CAVSARP and SAVSARP properties are located within Options C and D. Such wells include piezometers, which are used to measure groundwater depth or pressure.

The Pinal Active Management Area includes approximately 4,100 square miles; major drainages consist of the Gila River and Santa Cruz River (ADWR 2010). The management goal of the Pinal Active Management Area is to allow development of non-irrigation uses and to preserve existing agricultural economies in the active management area for as long as feasible, consistent with the necessity to preserve future water supplies for non-irrigation uses.

Sole Source Aquifers

The Upper Santa Cruz and Avra Valley Sole Source Aquifer underlies approximately 4,591 square miles in southern Arizona and is the only USEPA-designated sole source aquifer within the Study Area (**Figure E13-1**) (USEPA 2017a). The full lengths of Options A through D and portions of Options F and G are located within this sole source aquifer. The mileage of each corridor option within sole source aquifers is shown in **Table E13-2**.

Table E13-2. Miles of Corridor Options within Sole Source Aquifers

Miles within Sole Source Aquifers by Corridor Option[a]					
A	B	C	D	F	G
28.7	58.5	58.3	64.2	6.8	13.8

SOURCE: USEPA 2017a.
[a]Rounded to the nearest 0.1 mile.

Groundwater Wells

The primary uses of groundwater within the South Section are drinking water and irrigation. Groundwater in the South Section Project Area is of acceptable quality for most uses. Most of the groundwater resources meet federal and state drinking water standards, although contaminant levels exceed primary safe drinking water standards in a few areas (ADEQ 2002; Cordy et al. 2000). A review of water quality data from Pima County drinking water providers for the 1998 to 2000 sampling years indicates the most common regulated constituents detected were nitrate, fluoride, arsenic, and chromium. Although these constituents were detected in the drinking water supplies, none exceeded the established drinking water maximum contaminant levels (Pima Association of Governments 2002).

Figure E13-1 shows the location of high-capacity public and private water supply and monitoring wells within the Project Area. A high-capacity well is a well having a pump with a maximum capacity of more than 35 gallons per minute (ADWR 2017). The number of wells within each South Section corridor option is shown in **Table E13-3**.

Table E13-3. Groundwater Wells within South Section Corridor Options

	Number of Wells by Corridor Option					
	A	B	C	D	F	G
Number of Wells	256	661	106	111	78	89

SOURCE: ADWR 2017.

Impaired Waters

As regulated and monitored by ADEQ, impaired surface water segments within the South Section Project Area include portions of the Santa Cruz River, Potrero Creek, and Nogales Wash (ADEQ 2018b) (**Figure E13-1**). Impairments within the Upper Santa Cruz River watershed, which contains these drainages, are primarily related to livestock and grazing, failing septic systems, recreational users, wildlife, stormwater, and inputs from Mexico (ADEQ 2020). As summarized in **Table E13-4**, only Options A and B have impaired waters located within 0.5 mile upstream or 1.0 mile downstream.

Table E13-4. Impaired Waters within the South Section Analysis Area by Corridor Option

Impaired Water		Miles of Impaired Waters by Corridor Option [a,b]					
Name	Impairment	A	B	C	D	F	G
Santa Cruz River	Ammonia, and E. coli	22.8	8.6	0	0	0	0
Potrero Creek	Chlorine, low dissolved oxygen, and E. coli	3.9	0	0	0	0	0
Nogales Wash	Ammonia and dissolved copper, E. coli and total residual chlorine	3.1	0	0	0	0	0
Total		**29.8**	**8.6**	**0**	**0**	**0**	**0**

SOURCE: ADEQ 2018b.
[a]Rounded to the nearest 0.1 mile.
[b]Miles of impaired waters located within 0.5 mile upstream or 1.0 mile downstream.

Waters of the US

Potential waters of the US within the South Section Project Area include 19 named streams and canals and numerous unnamed ephemeral washes. Most of these watercourses, including Rillito River, Cañada del Oro, and Julian Wash, are tributaries to the Santa Cruz River.

The Santa Cruz River flows north from the border with Mexico and disperses in the vicinity of Eloy. The Santa Cruz River flows south to north through the Study Area while the ephemeral tributary washes flow predominantly east to west. Only two reaches of the river experience year-round streamflow due to effluent discharges from wastewater treatment plants in Nogales and Marana (ADEQ 2016; Nakolan, Meixner, and Thompson 2015). Other portions of the Santa Cruz River flow intermittently (ADWR 2008). USACE has determined that two reaches of the Santa Cruz River, from the Tubac gage to the Continental gage near Green Valley, and from the Roger Road Wastewater Treatment Plant to the Pima County/Pinal County border, located within or adjacent to the Project Area are Traditional Navigable Waters (USACE 2008b). The USGS report *Water Quality in the Central Arizona Basins* concludes that surface water in the area consists of effluent-dependent urban streams that are valuable water resources (Cordy et al. 2000).

A portion of the Nogales International Wastewater Treatment Plant is located within Option A north of Nogales and a portion of the Tres Rios Water Reclamation Facility is located within Option B in Marana. Both facilities discharge treated effluent to the Santa Cruz River, which is located 0.3 mile and 0.5 mile from Options A and B in the vicinity of these facilities, respectively. Several major canals, including the CAP canal, are within the South Section Project Area. Additionally, the South Section Project Area includes ponds used for livestock water, groundwater recharge, aesthetics, and other purposes. These water features that range in size from 0.25 acre to over 1,000 acres are shown on **Figure E13-2**.

Named watercourses are shown on **Figure E13-2** and the linear feet of potential waters of the US within the South Section corridor options are quantified in **Table E13-5**.

Table E13-5. Potential Waters of the US within South Section Corridor Options

Name	Miles of Potential Waters of the US by Corridor Option [a]					
	A	B	C	D	F	G
Brawley Wash	0	0	2.1	2.4	0	0
Casa Grande Canal	0	0	0	0	1.7	0.7
CAP Canal	0	0.7	0.6	0	0	0
Demetrie Wash	0	0.5	0	0.5	0	0
Diablo Wash	0.4	0	0	0	0	0
Escondido Wash	0	0.4	1.2	0.4	0	0
Greene Canal	0	0	0	0	1.5	0
Julian Wash	0	0.4	0	0	0	0
Las Chivas Wash	0.5	0	0	0	0	0
Los Robles Wash	0	0	0.8	0.4	2.1	0
Marjorie Wash	0	0	0	<0.1	0	0
McClellan Wash	0	0	0	0	0	2.8
Old Junction Wash	0.5	0	0	0	0	0
Potrero Creek	1.0	0	0	0	0	0
Rillito River	0	0.7	0	0	0	0
Santa Cruz River	1.3	4.6	0.4	0	1.3	0
Santa Cruz Wash	0	0	0	0	0.8	0.6
Sopori Wash	0.5	0	0	0	0	0
Tinaja Wash	0	0	0.7	0	0	0
Tubac Creek	0.4	0	0	0	0	0
Unnamed (Total)	36.6	83.1	83.5	89.3	23.8	26.8
Total	**41.2**	**90.4**	**89.3**	**93.1**	**31.2**	**30.9**

SOURCE: USGS 2019.
[a]Rounded to the nearest 0.1 mile.

Wetlands

Wetland resources that are present in the South Section Project Area are associated with channels and floodplains of the Santa Cruz River, and ponding areas in or adjacent to ephemeral washes. Cowardin et al. (1979) wetland types within the Project Area include Freshwater Emergent Wetlands, Freshwater Forested/Shrub Wetlands, Freshwater Ponds, and one Lake. Notable wetlands within the South Section include Freshwater Emergent and Freshwater Forested/Shrub Wetland along Potrero Creek in Option A, patches of Freshwater Forested/Shrub Wetland and Freshwater Pond wetlands along approximately 2 miles of the Santa Cruz River near Rio Rico within Option A, and approximately 3 miles of Freshwater Forested/Shrub Wetland along the Santa Cruz River near Red Rock within Option F. Additionally, 230 square feet of mapped wetlands at the northeastern corner of the City of Tucson's Sweetwater Wetlands Park occur within Option B. **Table E13-6** shows the NWI-mapped non-riverine wetland acreage by corridor option in the South Section. **Figure E13-2** shows the location of NWI-mapped non-riverine wetlands.

Table E13-6. Wetlands within South Section Corridor Options

Wetland Type[b]	Wetland Acreage by Corridor Option[a]					
	A	B	C	D	F	G
Freshwater Emergent Wetland	6	3	0	0	0	0
Freshwater Forested/Shrub Wetland	43	0	4	0	33	0
Freshwater Pond	19	30	10	30	8	33
Lake	0	5	0	0	0	0
Total	**68**	**38**	**14**	**30**	**41**	**33**

SOURCE: USFWS 2019.
[a]Rounded to the nearest acre.
[b]See **Section E13.3** for a description of wetland types.

The project team conducted site visits or reviewed geospatial data at the following locations to determine whether potential wetlands were present:

- **Santa Cruz River south of Tucson, Option B**. Approximately 0.4 mile of the river was assessed at this location. The channel of the Santa Cruz River was generally dry during the site visit with small pockets of standing water. Seep willow (*Baccharis salicifolia*) and paloverde (*Parkinsonia* sp.) were present along the banks. Seep willow is a wetland indicator species; therefore, this location may contain potential wetlands.

- **Santa Cruz River in Tucson, Option B**. Approximately 2.2 miles of the river and two adjoining unnamed drainages were assessed at this location. The channel of the Santa Cruz River and both drainages were dry during the site visit. Observed vegetation consisted of mesquite (*Prosopis* sp.), paloverde, and seep willow. Seep willow is a wetland indicator species; therefore, this location may contain potential wetlands.

- **Rillito River in Tucson and Marana, Option B**. Approximately 0.8 mile of the river was assessed at this location. The channel of the Rillito River was dry during the site visit. Observed vegetation consisted of Johnsongrass (*Sorghum halepense*), orchardgrass (*Dactylis glomerata*), paloverde, mesquite, and salt cedar (*Tamarix* sp.). Salt cedar is a wetland indicator species; therefore, this location may contain potential wetlands.

- **Santa Cruz River in western Marana, Option C**. Approximately 0.4 mile of the river was assessed at this location. The channel of the Santa Cruz River was dry during the site visit. Riparian vegetation dominated by Goodding's willow (*Salix gooddingii*), mesquite, salt cedar, and rabbitsfoot grass (*Polypogon* sp.) was present. Fremont cottonwoods (*Populus fremontii*) were noted downstream. Goodding's willow, salt cedar, and rabbitsfoot grass are wetland indicator species; therefore, this location may contain potential wetlands.

- **Braided channels associated with the Santa Cruz River, Los Robles Wash, the Greene Canal, and unnamed drainages between the Pima-Pinal County Line and Eloy, Option F**. Several disjunct stretches of interconnected drainages totaling approximately 12 miles in length were assessed at this location. The portions of the drainages that could be accessed during the site visit include the Santa Cruz River near the Pima-Pinal County Line, Los

Robles Wash 4.5 miles northwest of the Pima-Pinal County Line, and an unnamed wash 7.5 miles northwest of the Pima-Pinal County Line; accessible areas all occurred within the southeastern two-thirds of this location. Accessed drainages were dry at the time of the site visit with adjacent mesquite, willow, tamarisk, and/or seep willow. Approximately 2 miles of inaccessible drainages within the southeastern portion of this location occur within areas identified as North American Warm Desert Riparian Woodland and Shrubland or Warm Desert Riparian Mesquite Bosque. Because willow, tamarisk, seep willow, and the dominant plant species associated with the geospatial data categories are wetland indicators, the southeastern two-thirds of this location are considered to be potential wetlands for the purposes of this assessment.

Inaccessible areas within the northwestern portion of this location are identified as Sonora-Mojave Creosotebush-White Bursage Desert Scrub and Sonoran Paloverde-Mixed Cacti Desert Scrub (USGS 2004). Because the dominant plant species associated with the geospatial data categories are not wetland indicator species, none of the aforementioned areas are potential wetlands for the purposes of this assessment.

Floodplains

Table E13-7 quantifies the acreage of mapped 100-year floodplain within each corridor option in the South Section. Floodplains in the Project Area are associated with the Santa Cruz River and its tributaries as well as other ephemeral streams such as Arivaca Wash, Brawley Wash, Greene Wash, and Los Robles Wash. Within the town of Marana, approximately 2,750 acres of Flood Zone X are protected by a levee located along the Santa Cruz River (FEMA 2017). Approximately 0.3 mile of the southeastern end of this levee is located within Option B. Another 86 acres of Flood Zone X are protected by a levee along the Santa Cruz River in Tucson (FEMA 2017). Approximately 1 mile of this levee is located within Option B. There also are regulatory floodways found along the Santa Cruz River and its major tributaries. **Figure E13-3** illustrates the mapped floodplains in the South Section.

Table E13-7. Floodplains within South Section Corridor Options

Flood Zone[b]	Floodplain Acreage by Corridor Option[a]					
	A	B	C	D	F	G
A	1,218	446	860	1,165	4,059	2,142
AE	900	508	1,010	444	1,567	693
AH	0	894	0	0	0	3
AO	116	785	3,735	2,318	0	18
Total	2,234	2,633	5,605	3,927	5,626	2,856

SOURCE: FEMA 2017.
[a]Rounded to the nearest acre.
[b]Refer to **Section E13.3** for flood zone definitions.

E13.3.2 Central Section

Key features relevant to water resources in the Central Section Project Area are shown on **Figure E13-4**, **Figure E13-5**, and **Figure E13-6** and include:

- Pinal and Phoenix Active Management Areas
- Groundwater wells
- Impaired stretches of the Hassayampa River and Gila River
- Gila River and Hassayampa River, their major tributaries, and associated floodplains
- Potential wetlands along Vekol Wash, the Gila River, and the Hassayampa River

Active Management Areas

The Central Section Project Area includes the Pinal and Phoenix Active Management Areas (**Figure E13-4**). Portions of two corridors within the Central Section, Options K and Option Q1, occur outside active management areas. All other corridor options within the Central Section are completely contained within active management areas. The mileage of each Central Section corridor option within active management areas is shown in **Table E13-8**.

Table E13-8. Miles of Corridor Options within Central Section Active Management Areas

Active Management Area	Miles within Active Management Areas by Corridor Option[a]										
	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R
Pinal	18.1	7.3	18.6	9.6	0.4	0	0	0	0	0	0
Phoenix	0	0	0	0	14.7	15.9	25.6	1.8	4.5	17.3	17.5
Total	**18.1**	**7.3**	**18.6**	**9.6**	**15.1**	**15.9**	**25.6**	**1.8**	**4.5**	**17.3**	**17.5**

SOURCE: ADWR 2020.
[a]Rounded to the nearest 0.1 mile.

The Pinal Active Management Area is 4,100 square miles, and its major drainage is the Gila River in the northern part of the active management area. In the Pinal Active Management Area, where the economy is primarily agricultural, the management goal is to preserve that economy for as long as feasible, while considering the need to preserve groundwater for future non-irrigation uses.

The Phoenix Active Management Area is 5,646 square miles, and the Gila and Salt Rivers are the major drainages in the active management area (ADWR 2010). In the Phoenix Active Management Area, the primary management goal is safe-yield by the year 2025. Safe-yield is accomplished when no more groundwater is being withdrawn than is being replaced annually.

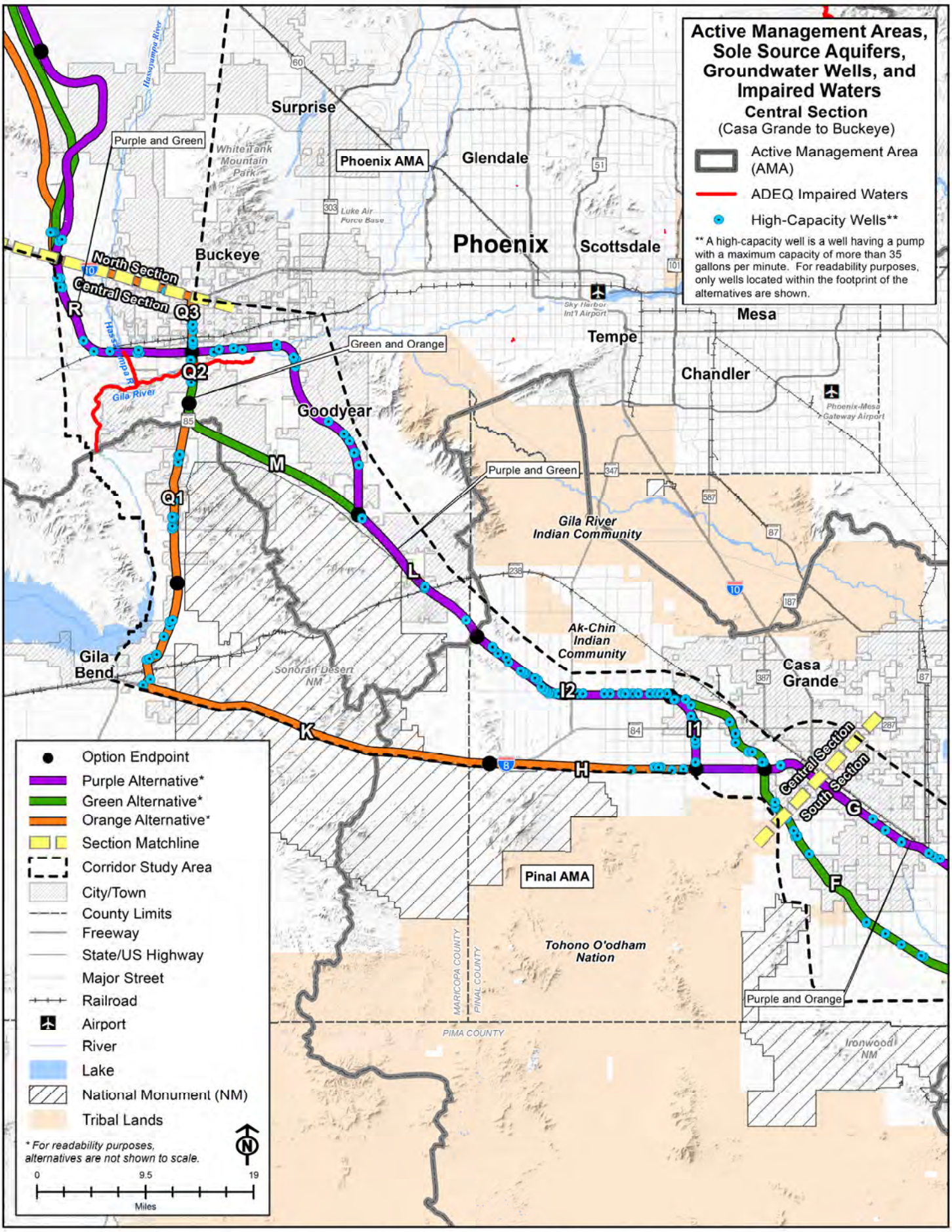

Figure E13-4. Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters – Central Section

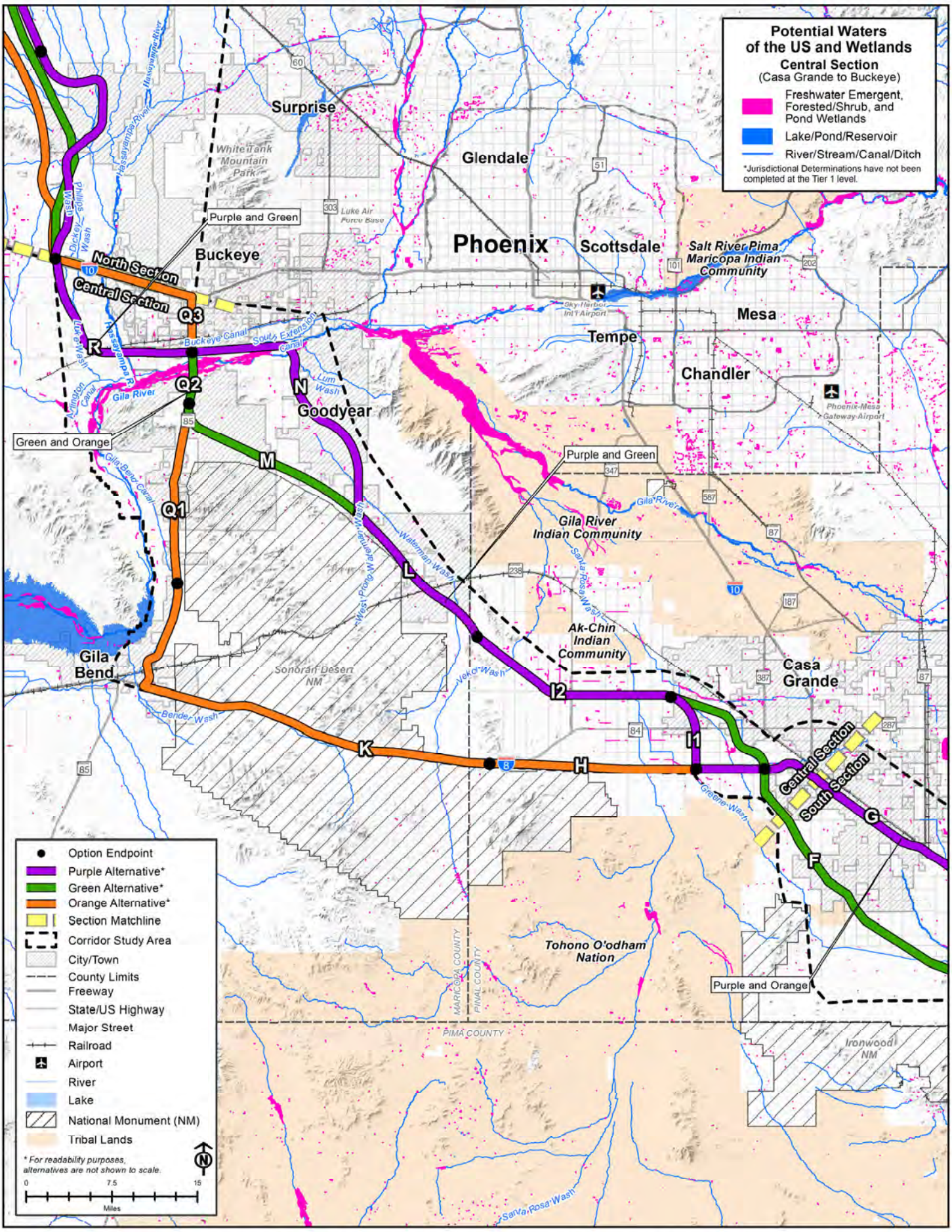

Figure E13-5. Potential Waters of the US and Wetlands – Central Section

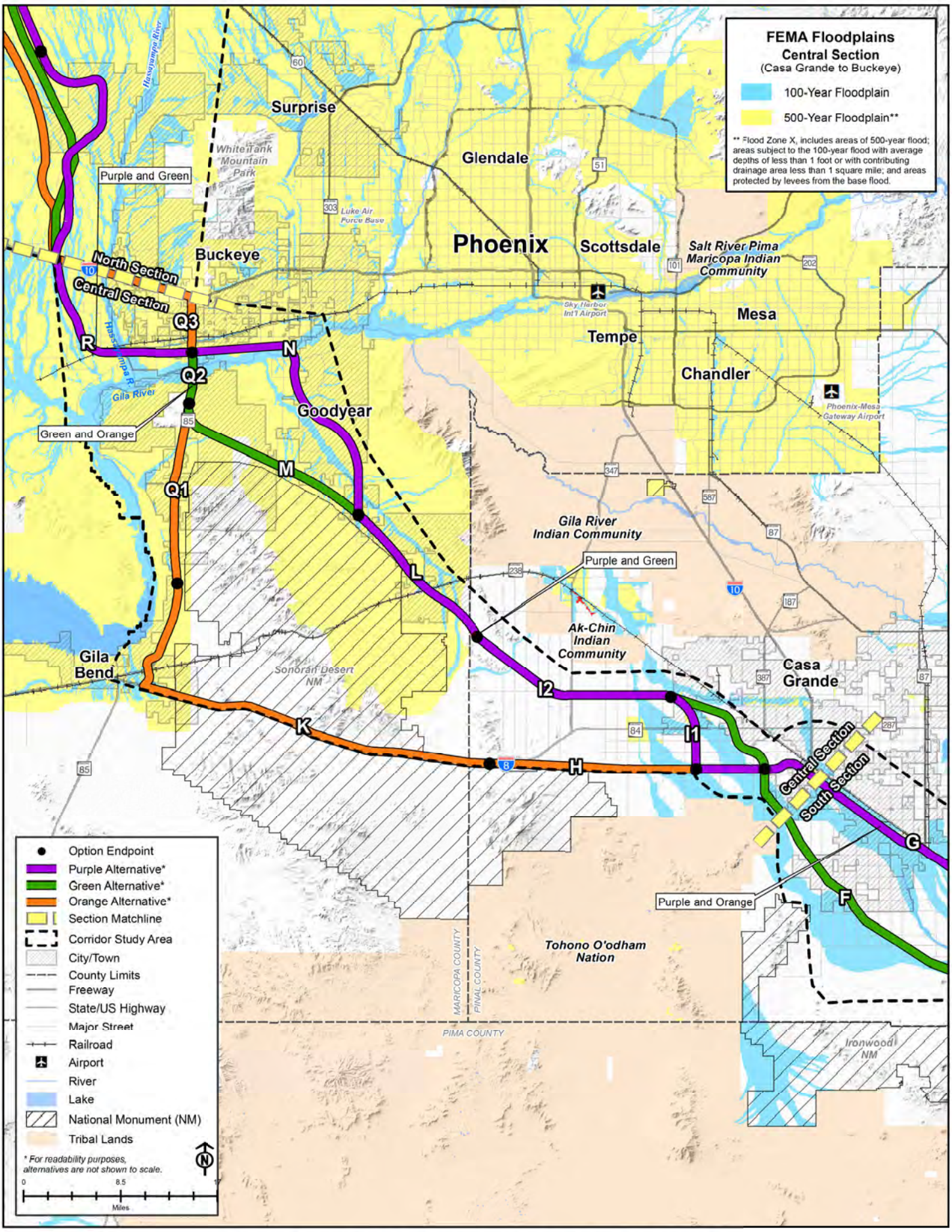

Figure E13-6. FEMA Floodplains – Central Section

Sole Source Aquifers

No sole source aquifers occur in the Central Section.

Groundwater Wells

Although groundwater quality in the Phoenix Active Management Area is generally suitable for most uses, 68 groundwater contamination sites have been identified. Volatile organic compounds are the most common contaminant at these sites. Approximately 1,500 assessed sites have been found to exceed drinking water standards, most commonly due to nitrate, fluoride, arsenic, manganese, and organics (ADWR 2010).

Groundwater in the Pinal Active Management Area as measured by ADEQ is slightly alkaline, fresh, and hard-to-very hard as indicated by pH values and total dissolved solids. Of the 86 sites sampled for the Pinal Active Management Area study, 13 percent met all Safe Drinking Water Act primary and secondary water quality standards. In addition, ADWR aquifer water quality standards were exceeded at 70 percent of the 86 sites sampled. Sites sampled within the Pinal Active Management Area exceeded the Safe Drinking Water Act standards for the level of arsenic, fluoride, gross alpha, nitrate, and uranium (ADEQ 2008).

Figure E13-4 shows the location of high-capacity public and private water supply and monitoring wells within the Project Area. A high-capacity well is a well having a pump with a maximum capacity of more than 35 gallons per minute. **Table E13-9** quantifies the wells by corridor option in the Central Section.

Table E13-9. Groundwater Wells within Central Section Corridor Options

	Number of Wells by Corridor Option										
	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R
Number of Wells	15	24	70	22	21	2	200	25	13	40	116

SOURCE: ADWR 2017.

Impaired Waters

As regulated and monitored by ADEQ, impaired surface water segments within the Central Section Project Area include portions of the Hassayampa and Gila Rivers. Impairments within the Central Section are primarily related to mining, agricultural runoff, grazing, contributions from urban areas including inputs from fertilizers and leaking septic systems, and municipal and industrial discharges (ADEQ 2018b). Locations of impaired waters are shown on **Figure E13-4** and are quantified in **Table E13-10**.

Table E13-10. Impaired Waters within the Central Section Analysis Area by Corridor Option

Impaired Water		Miles of Impaired Waters by Corridor Option [a,b]							
Name	Impairment	H	I	K	L	M	N	Q2	R
Hassayampa River	E. coli and selenium	0	0	0	0	0	0	0	1.4
Gila River	Selenium and boron	0	0	0	0	0	3.6	2.3	0
Total		0	0	0	0	0	3.6	2.3	1.4

SOURCE: ADEQ 2018b.
[a]Rounded to the nearest 0.1 mile.
[b]Miles of impaired waters located within 0.5 mile upstream or 1.0 mile downstream.

Waters of the US

Major drainages in the Central Section include the Gila River and its tributary, the Hassayampa River. The Gila River flows from east to west, while its tributaries flow predominantly north or south. Within the Study Area, the Gila River contains perennial flows largely due to effluent discharges from wastewater treatment plants and irrigation return (ADWR 2010). A 6.9-mile reach of the Gila River, from Powers Butte to Gillespie Dam, is designated as a Traditional Navigable Water (USACE 2008b). This reach begins approximately 3 miles south of Option R, but does not cross the Project Area. The Hassayampa River is primarily ephemeral within the Central Section and flows from north to south into the Gila River approximately 5 miles west of State Route (SR) 85 (ADWR 2010).

In addition to the Gila and Hassayampa Rivers, there are 14 named ephemeral streams and canals, and numerous other unnamed ephemeral washes within the Project Area. Additionally, the Central Section Project Area includes numerous ponds used for livestock water, sewage treatment, among other uses, or that appear to have formed as a result of alterations to the terrain such as construction of roadways. Ponds range in size from less than 1 acre to approximately 30 acres.

Named watercourses are shown on **Figure E13-5** and the linear feet of potential waters of the US within the Central Section corridor options are quantified in **Table E13-11**.

Table E13-11. Potential Waters of the US within Central Section Corridor Options

Name	Miles of Potential Waters of the US by Corridor Option[a]										
	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R
Arlington Canal	0	0	0	0	0	0	0	0	0.4	0	0
Bender Wash	0	0	0	3.6	0	0	0	0	0	0	0
Buckeye Canal	0	0	0	0	0	0	0	0	0	0.4	0
Dickey Wash	0	0	0	0	0	0	0	0	0	0.5	0
Gila Bend Canal	0	0	0	1.0	0	0	0	0	0	0	0
Gila River	0	0	0	0	0	0	0.5	0	0.7	0	0
Greene Wash	0.6	0	0	0	0	0	0	0	0	0	0

Name	Miles of Potential Waters of the US by Corridor Option[a]										
	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R
Hassayampa River	0	0	0	0	0	0	0	0	0	0.4	0.4
Luke Wash	0	0	0	0	0	0	0	0	0	0	1.5
Lum Wash	0	0	0	0	0	0	1.3	0	0	0	0
Phillips Wash	0	0	0	0	0	0	0	0	0	0.4	0
Santa Rosa Wash	0.4	0	0.4	0	0	0	0	0	0	0	0
South Extension Canal	0	0	0	0	0	0	2.1	0	0	0	0
Vekol Wash	0	0	0.5	0.4	0	0	0	0	0	0	0
Waterman Wash	0	0	0	0	0.4	0	0.7	0	0	0	0
West Prong Waterman Wash	0	0	0	0	0.1	0.4	1.3	0	0	0	0
Unnamed (Total)	16.5	0	10.5	138.6	17.5	55.2	14.4	57.0	3.6	17.9	25.2
Total	17.5	0	11.4	143.6	18.0	55.6	20.3	57.0	4.7	19.6	27.1

SOURCE: USGS 2019.
[a]Rounded to the nearest 0.1 mile.

Wetlands

Wetland resources that are present in the Central Section Project Area are associated with channels and floodplains of the Gila River, and ponding areas in or adjacent to ephemeral washes. Cowardin et al. (1979) wetland types within the Central Section Project Area include Freshwater Ponds and Freshwater Forested/Shrub Wetlands. Notable wetlands within the Central Section include Freshwater Forested/Shrub Wetland within the channel of the Gila River near Buckeye within Option Q2. **Table E13-12** summarizes the acres of potential wetlands within each Central Section corridor option. **Figure E13-5** shows the location of NWI-mapped non-riverine wetlands.

Table E13-12. Wetlands within Central Section Corridor Options

Wetland Type[b]	Wetland Acreage by Corridor Option[a]										
	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R
Freshwater Forested/Shrub Wetland	0	0	0	0	0	0	0	0	141	0	3
Freshwater Pond	6	1	23	12	0	0	5	1	0	0	0
Total	6	1	23	12	0	0	5	1	141	0	3

SOURCE: USFWS 2019.
[a]Rounded to the nearest acre.
[b]See **Section E13.3** for a description of wetland type.

The project team conducted site visits or reviewed geospatial data at the following locations to determine whether potential wetlands were present:

- **Vekol Wash, an unnamed drainage, and an unnamed canal southeast of Goodyear, Option I2**. Approximately 0.4 mile of Vekol Wash was assessed at this location. Vekol Wash was dry during the site visit and surrounding vegetation consisted of desert willow (*Chilopsis linearis*) and paloverde. Desert willow is a wetland indicator species; therefore, this stretch of Vekol Wash may contain potential wetlands.

- **Vekol Wash at I-8 near the Maricopa-Pinal County Line, Option K**. Approximately 0.4 mile of Vekol Wash was assessed at this location. Vekol Wash was dry during the site visit. Vegetation at this location was dominated by mesquite, paloverde, and creosote bush. Because the dominant species observed during the site visit are not wetland indicator species, this stretch of Vekol Wash is not considered to be potential wetlands for the purposes of this assessment.

- **Gila River in Goodyear, Option N**. Approximately 0.4 mile of the Gila River was assessed at this location. Salt cedar, a wetland indicator species, was observed along the Gila River during the site visit. Therefore, this stretch of the Gila River may contain potential wetlands.

- **Gila River, Arlington Canal, and an unnamed Canal at SR 85 in Buckeye, Option Q2**. Approximately 0.4 mile of the Gila River, 0.2 mile of the Arlington Canal, and 0.2 mile of an unnamed canal were assessed at this location. Surface water was observed within the main channel of the Gila River and the two canals. The Gila River floodplain, which contains the Arlington Canal, is dominated by salt cedar, a wetland indicator species. Additionally, two areas totaling just under 0.5 acre along the main channel of the Gila River have been formally delineated as wetlands. Rabbitsfoot grass and cattails (*Typha* sp.), both wetland indicator species, were observed within the unnamed canal. Due to the presence of surface water, wetland indicator species, and known wetlands, this stretch of the Gila River, Arlington Canal, and unnamed canal may contain potential wetlands.

- **Hassayampa River and an unnamed canal near Buckeye, Option R**. Approximately 0.4 mile of the Hassayampa River and 0.3 mile of an unnamed canal were assessed at this location. The Hassayampa River was dry during the site visit, but ponding was present south of the Project Area. Surface water was also present in the unnamed canal. The vegetation along the Hassayampa River was dominated by salt cedar, a wetland indicator. Woody vegetation along the unnamed canal consisted of mesquite and paloverde, which are not wetland indicators. However, toothed dock (*Rumex dentatus*), a wetland indicator, was present along the canal floor. Due to the presence of surface water and wetland indicator species this stretch of the Hassayampa River and the unnamed canal are considered to contain potential wetlands.

- **Hassayampa River near Buckeye, Option Q3**. Approximately 0.4 mile of the Hassayampa River at this location was assessed via a desktop-only review. Woody vegetation visible on Google StreetView (2020) is dominated by mesquite, paloverde, and creosote bush. Geospatial data identifies the vegetation at this location as Sonora-Mojave Creosotebush-White Bursage Desert Scrub and Sonoran Paloverde-Mixed Cacti Desert Scrub (USGS 2004). Because neither the dominant plant species associated with these geospatial data categories or the woody species visible on Google StreetView are wetland indicator species,

this location is not considered to contain potential wetlands for the purposes of this assessment.

Floodplains

Table E13-13 summarizes the acres of 100-year floodplain within each Central Section corridor option. Floodplains in the Project Area are associated with the Gila River, Hassayampa River and their major tributaries including Greene Wash, Santa Rosa Wash, Vekol Wash, Bender Wash, and Waterman Wash. Regulatory floodways occur along the channels of Santa Cruz Wash, Waterman Wash, the Gila River, and the Hassayampa River, among others. In addition to the floodways and floodplains adjacent to these areas, some areas are subject to sheet flooding. **Figure E13-6** illustrates the 100- and 500-year floodplains in the Central Section.

Table E13-13. Floodplains within Central Section Corridor Options

Flood Zone[b]	Floodplain Acreage by Corridor Option[a]										
	H	I1	I2	K	L	M	N	Q1	Q2	Q3	R
A	883	90	252	1	413	340	361	91	0	707	597
AE	0	438	0	100	0	20	1,005	155	479	99	274
AH	0	0	0	5	0	0	0	0	0	26	30
AO	0	228	0	60	0	0	0	3	0	0	0
Total	883	756	252	166	413	360	1,366	249	479	832	901

SOURCE: FEMA 2017.
[a]Rounded to the nearest acre.
[b]Refer to **Section E13.3** for flood zone definitions.

E13.3.3 North Section

Key features relevant to surface and groundwater in the North Section are shown on **Figure E13-7**, **Figure E13-8**, and **Figure E13-9** and include:

- Phoenix Active Management Area
- Hassayampa River and its major tributaries, tributaries to the Gila River and associated floodplains

Active Management Areas

The North Section Project Area includes the Phoenix Active Management Area (**Figure E13-7**). The northern boundary of the Phoenix Active Management Area is located approximately 3 miles south of US 60; the southern portions of all three North Section corridor options are located within this active management area. **Table E13-14** shows the miles of each North Section corridor option within active management areas.

The Phoenix Active Management Area covers 5,646 square miles; the Gila and Salt Rivers are the major drainages in the active management area (ADWR 2010). The primary management goal in the Phoenix Active Management Area is safe-yield by the year 2025.

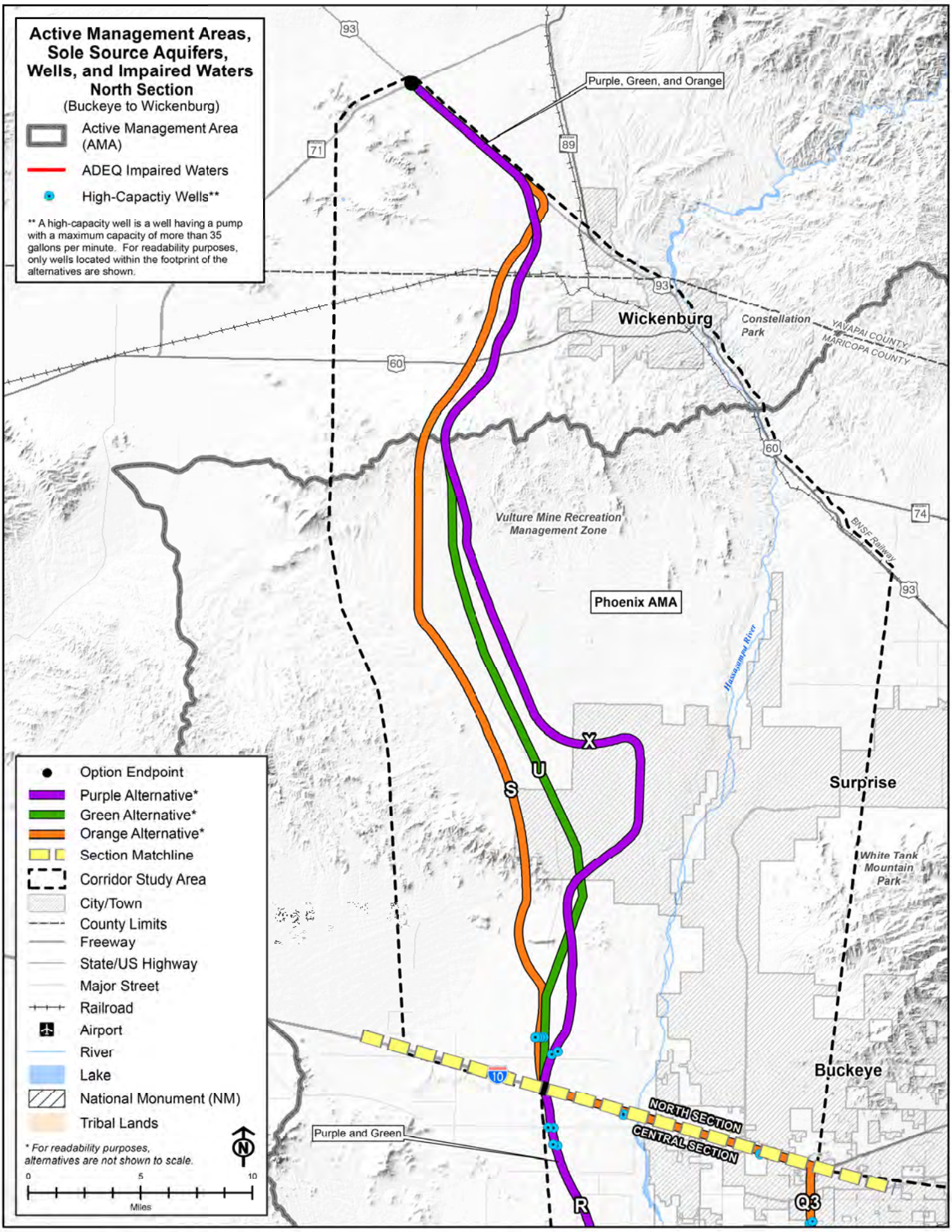

Figure E13-7. Active Management Areas, Sole Source Aquifers, Wells, and Impaired Waters – North Section

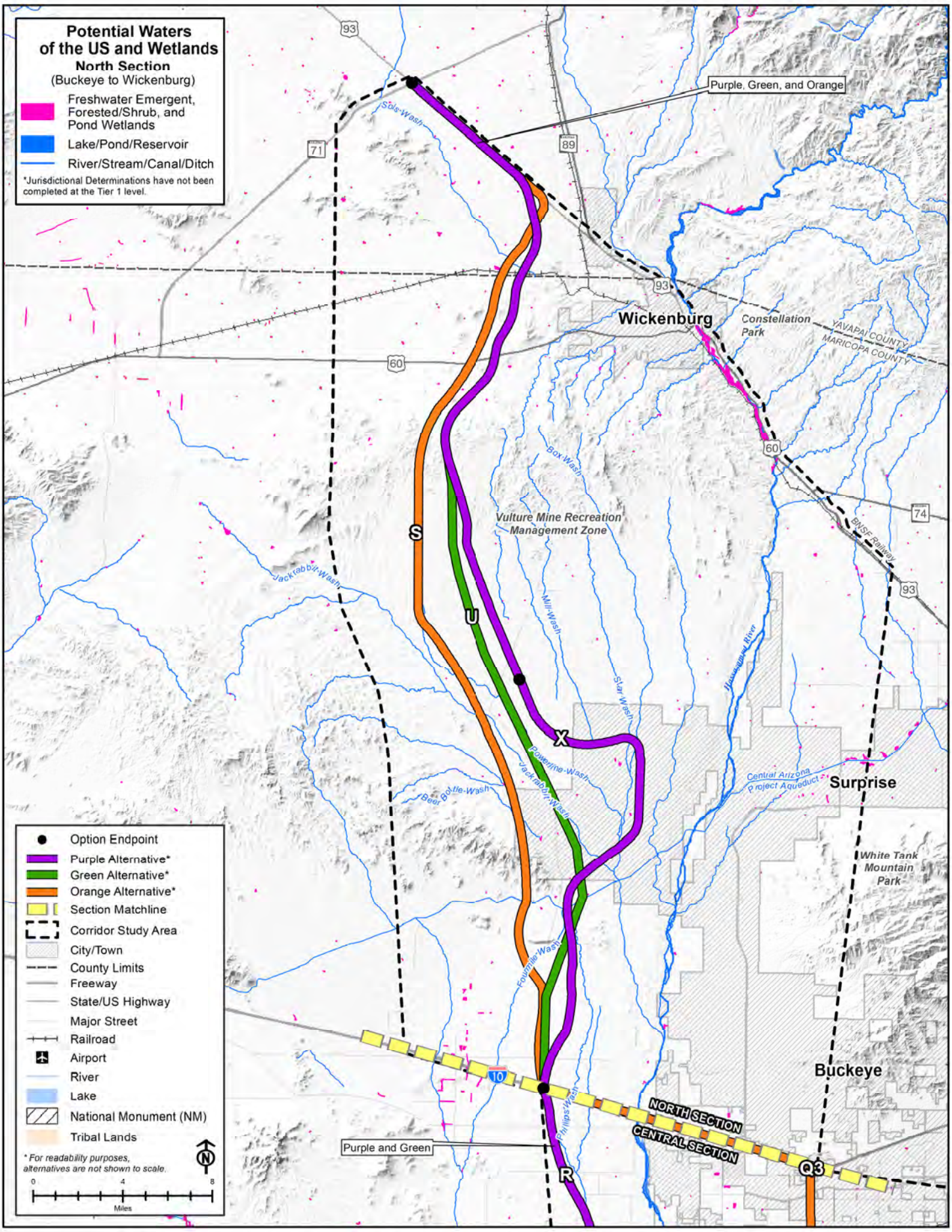

Figure E13-8. Potential Waters of the US and Wetlands – North Section

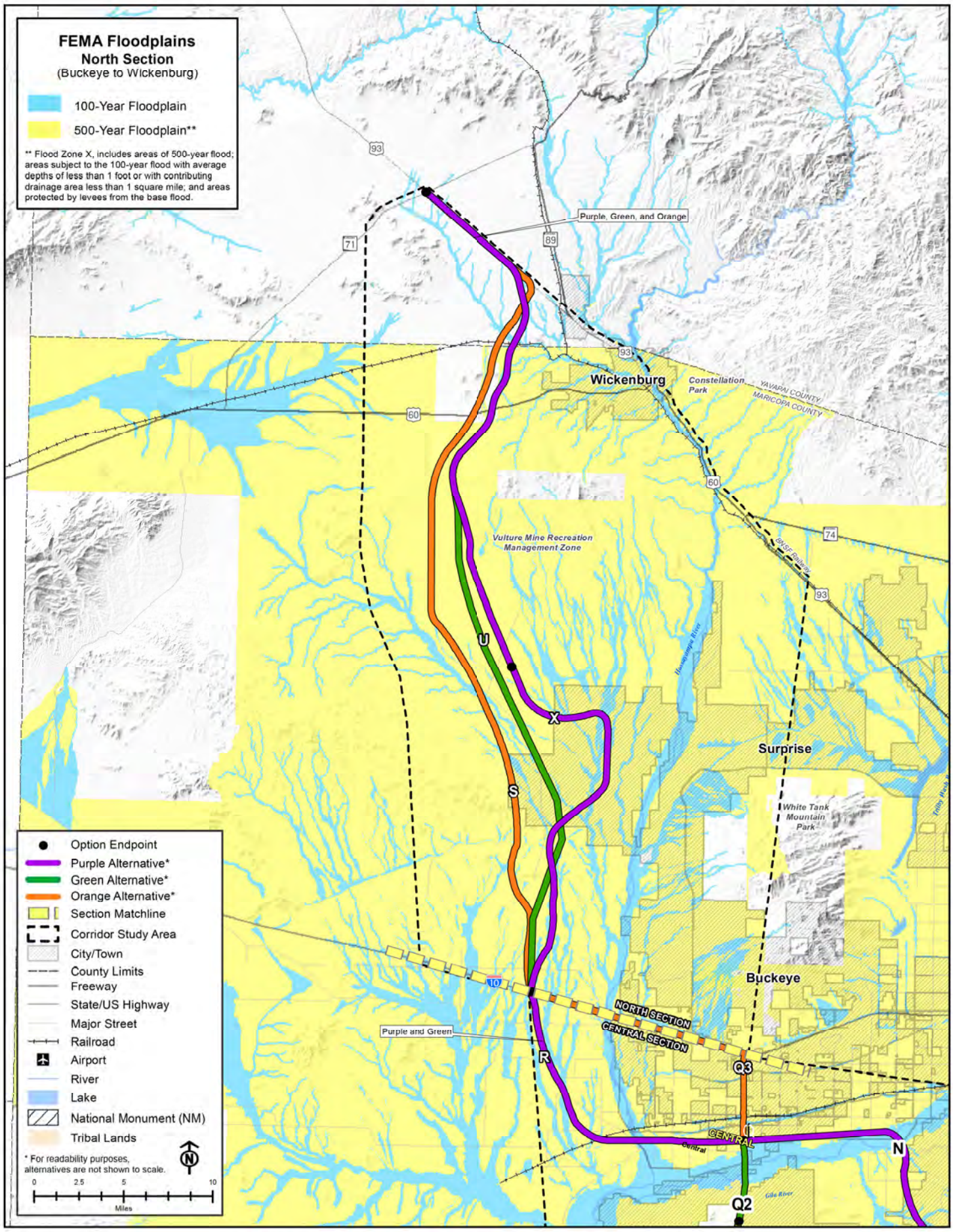

Figure E13-9. FEMA Floodplains – North Section

Table E13-14. Miles of North Section Corridor Options within North Section Active Management Areas

Active Management Area	Miles within Active Management Areas by Corridor Option[a]		
	X	U	S
Phoenix	35.4	30.4	30.3

Source: ADWR 2020.
[a]Rounded to the nearest 0.1 mile.

Sole Source Aquifers

There are no sole source aquifers in the North Section.

Groundwater Wells

Groundwater in the Phoenix Active Management Area is generally suitable for drinking water uses. Although groundwater quality in the Phoenix Active Management Area is generally suitable for most uses, 68 groundwater contamination sites have been identified. Volatile organic compounds are the most common contaminant at these sites. Approximately 1,500 assessed sites have been found to exceed drinking water standards, most commonly due to nitrate, fluoride, arsenic, manganese, and organics (ADWR 2010).

Portions of the North Section outside the Phoenix Active Management Area occur within the Upper Hassayampa River Basin. Groundwater in this basin is generally suitable for drinking water uses. Of 34 sites sampled, 9 sites within the Upper Hassayampa River Basin have exceeded the primary maximum contaminant levels for arsenic, gross alpha, and nitrate (ADEQ 2013a). Groundwater in the basin typically has calcium or mixed-bicarbonate chemistry and is slightly alkaline, fresh, and hard-to very-hard, based on pH levels, concentrations of total dissolved solids, and hardness concentrations (ADEQ 2013a).

Table E13-15 presents the number of groundwater wells by corridor option. **Figure E13-7** shows the location of high-capacity public and private water supply and monitoring wells within the Project Area. A high-capacity well is a well having a pump with a maximum capacity of more than 35 gallons per minute.

Table E13-15. Groundwater Wells within North Section Corridor Options

	Number of Wells by Corridor Option		
	X	U	S
Number of Wells	18	23	16

SOURCE: ADWR 2017.

Impaired Waters

There are no impaired waters in the North Section.

Waters of the US

Water resources in the North Section Project Area include an extensive network of ephemeral watercourses that flow into the lower Gila and Hassayampa Rivers. The Hassayampa River is mostly intermittent, but is perennial in its upper reaches and south of Wickenburg (ADWR 2009). This river flows south to its confluence with the Gila River in the Central Section. None of the corridor options cross the Hassayampa River itself, but several of its tributaries including Jackrabbit Wash, Powerline Wash, and Sols Wash occur within the Project Area. Although the Gila River is not located within the North Section, the North Section Project Area includes several of its tributaries such as Phillips Wash and Fourmile Wash. No Traditional Navigable Waters occur within the North Section.

In total, 10 named streams and canals occur within the North Section. Notable among these is the CAP canal, which flows west to east across the North Section. Numerous other unnamed ephemeral washes are found throughout the North Section. The Project Area contains three ponds that range in size from 0.25 acre to approximately 2.0 acres and appear to be used for livestock water.

Named watercourses are shown on **Figure E13-8** and the linear feet of potential waters of the US within the North Section corridor options are quantified in **Table E13-16**.

Table E13-16. Potential Waters of the US within North Section Corridor Options

Name	Miles of Potential Waters of the US by Corridor Option[a]		
	S	U	X
Beer Bottle Wash	0.6	0	0
Box Wash	0	0	0.6
CAP Canal	0.4	0.6	0.4
Fourmile Wash	0.4	0	0.1
Jackrabbit Wash	0.4	1.5	0.4
Mill Wash	0	0	0.3
Phillips Wash	0	1.0	<0.1
Powerline Wash	2.1	2.9	0
Sols Wash	0.4	0.4	0.4
Star Wash	0	0	0.9
Unnamed (Total)	48.8	39.9	45.1
Total	53.1	46.3	48.2

SOURCE: USGS 2019.
[a]Rounded to the nearest 0.1 mile.

Wetlands

Wetland resources that are present in the North Section Project Area are associated with channels and floodplains of ephemeral washes. Cowardin et al. (1979) wetland types within the North Section Project Area consist of freshwater ponds. No notable wetlands occur within the North Section Project Area. **Table E13-17** summarizes the acres of potential wetlands within

each North Section corridor option. **Figure E13-8** shows the location of NWI-mapped non-riverine wetlands.

No major river crossings are present within the North Section; therefore, no site-specific reviews or site visits were conducted to determine whether potential wetlands were present.

Table E13-17. Wetlands within North Section Corridor Options

Wetland Type[b]	Wetland Acreage by Corridor Option[a]		
	X	U	S
Freshwater Pond	8	8	14
Total	8	8	14

SOURCE: USFWS 2019.
[a]Rounded to nearest acre.
[b]See **Section E13.3** for a description of wetland types.

Floodplains

Floodplains in the Project Area are predominantly associated with tributaries to the Hassayampa River, such as Powerline, Sols, and Jackrabbit washes, and tributaries to the Gila River including Fourmile and Phillips Washes. Floodways include the channels of Jackrabbit Wash and Star Wash, among others. The estimated acreage of 100-year floodplain by corridor option in the North Section is shown in **Table E13-18**. **Figure E13-9** illustrates the 100- and 500-year floodplains in the North Section.

Table E13-18. Floodplains within North Section Corridor Options

Flood Zone[b]	Floodplain Acreage by Corridor Option[a]		
	X	U	S
A	740	367	868
AE	364	331	58
AH	47	36	5
Total	**1,151**	**734**	**931**

SOURCE: FEMA 2017.
[a]Rounded to the nearest acre.
[b]Refer to **Section E13.3** for flood zone definitions.

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