3.13 Water Resources

This section addresses the potential effects of the I-11 No Build and Build Corridor Alternatives on water resources. Assessed categories of water resources include active management areas, sole source aquifers, groundwater wells, Outstanding Arizona Waters, impaired waters, waters of the US including wetlands, and floodplains. Quantities of the resources within each 2,000-foot-wide Build Corridor Alternative are identified and impacts are evaluated using a combination of quantitative and qualitative assessments. Mitigation measures and analyses that would be conducted during Tier 2 NEPA reviews are described.

This section does not follow the condensed format used for the other sections in **Chapter 3** (Affected Environment and Environmental Consequences). This section is a republication of information presented in the Draft Tier 1 EIS plus an evaluation of the Recommended and Preferred Alternatives. Some subsections have been reorganized to improve document clarity. Additionally, certain analyses and discussions have been updated to include additional information. Major changes from the Draft Tier 1 EIS include:

- Separation of active management areas, sole source aquifers, and Outstanding Arizona Waters into separate subsections. These resources were addressed under "Sensitive Water Resources" in the Draft Tier 1 EIS.
- Revision of the groundwater wells analysis to include all wells. The Draft Tier 1 EIS analysis was limited to high-capacity wells. The title of the "Groundwater Resources" subsection has been changed to "Groundwater Wells" (**Section 3.13.3.3**).
- Update of the impaired waters analysis to include impaired waters within 0.5 mile upstream and 1.0 mile downstream of each Build Corridor Alternative. The Draft Tier 1 EIS analysis included impaired waters within 0.5 mile of the Build Corridor Alternatives.
- Revision of the waters of the US analysis to include unnamed watercourses.
- Update of the wetlands analysis to exclude riverine wetlands and to add a new analysis of key potential wetlands where site-specific reviews were conducted.

Refer to **Section 3.13.2** for additional information regarding the analysis of these water resources.

3.13.1 Regulatory Setting

This section contains a brief explanation of the federal, state, and local regulations pertinent to activities that may impact water resources within the I-11 Study Area.

3.13.1.1 Federal

<u>Clean Water Act (CWA) of 1972</u>

The goal of the CWA (33 U.S.C. Section 1251 et seq.) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Waters of the US regulated under the

CWA include traditional navigable waters, their tributaries, and adjacent wetlands (33 CFR 328.3).

On April 21, 2020, USACE and USEPA published a rule revising the definition of waters of the US (40 Federal Register 22250-22342). Under the April 2020 rule, waters of the US subject to regulation under the CWA include the territorial seas and traditional navigable waters, perennial and intermittent tributaries that contribute surface water flow to the territorial seas and traditional navigable waters in a typical year, and wetlands adjacent to other waters of the US. Ephemeral tributaries and their adjacent wetlands are not subject to regulation under the CWA per the April 2020 rule. As defined in 40 Federal Register 22338-22339, ephemeral surface water flows or pools only in direct response to precipitation such as rain or snowfall. Intermittent surface water flows continuously during certain times of the year and more than in direct response to precipitation. Perennial surface water flows continuously year-round.

The CWA establishes the basic structure for regulating discharges of pollutants into waters of the US and regulating quality standards for surface waters through Sections 404, 401, 402, and 303(d) of the Act.

Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into waters of the US. A permit is required for such discharges, unless the activity is exempt from regulation (33 U.S.C. Section 1344). No discharge of dredged or fill material may be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem so long as the alternative does not have other significant adverse environmental impacts (40 CFR 230.10). In other words, the selected alternative must be the least environmentally damaging practicable alternative. Impacts on the aquatic ecosystem considered by USACE are outlined in the CWA Section 404(b)(1) guidelines and include effects to substrate, suspended particulates/turbidity, water, current patterns and water circulation, normal water fluctuations, salinity gradients, threatened and endangered species, aquatic organisms, and other wildlife (40 CFR 230).

Jurisdictional wetlands are regulated as special aquatic sites and are given special consideration in the Section 404 permitting process (40 CFR 230.41 and 230.3). Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. All practicable alternatives that do not involve discharges into wetlands are generally considered to have less adverse impact on the aquatic ecosystem. As such, projects with proposed impacts on wetlands must demonstrate that no practicable alternative exists that would not impact wetlands.

In most states including Arizona, the CWA Section 404 program is administered by USACE. USEPA is responsible for program policy, scope, and oversight. For activities subject to CWA Section 404 permitting, USACE requires compensatory mitigation for the purpose of offsetting unavoidable loss of aquatic resources. Specific mitigation requirements can include aquatic resource restoration, establishment, enhancement, or preservation, which may be conducted directly by the project proponent or achieved through use of in-lieu fee programs and mitigation banks.

Under **Section 401** of the CWA, a federal agency may not issue a permit to conduct any activity that may result in a discharge to waters of the US unless a state or authorized tribe where the discharge would occur issues a water quality certification or waives the certification requirement

(33 U.S.C. Section 1341). Certification decisions are based on whether the activity would comply with state or tribal water quality standards, effluent limitations, and other applicable water quality requirements. In Arizona, Section 401 certification is administered by ADEQ if the action is entirely on non-tribal lands. If any portion of the action occurs within or affects waters of the US on tribal lands, the Section 401 certification would be obtained from either USEPA or the respective tribe.

Section 402 of the CWA formed the National Pollutant Discharge Elimination System (NPDES), which regulates pollutant discharges, including stormwater, into waters of the US. NPDES permits set specific discharge limits for point source pollutants and outline special conditions and requirements for projects to reduce water quality impacts (33 U.S.C. Section 1342). Permits require that projects be designed to protect waters of the US. Construction projects that will disturb more than 1 acre of land must comply with the requirements of the NPDES Construction General Permit, which, among other provisions, requires preparation and implementation of a Stormwater Pollution Prevention Plan (ADEQ 2013b). NPDES permits on non-tribal lands in Arizona are administered by the state under the Arizona Pollutant Discharge Elimination System (AZPDES). Pollutant discharges on tribal lands must be permitted through USEPA Region 9.

Section 402(p) of the CWA also falls under NPDES and requires implementation of controls for discharges from industrial activities and municipal separate stormwater sewer systems (MS4s). Two types, or “phases,” of MS4s are defined under NPDES and are permitted depending on the size and type of the MS4. Phase I regulations (64 Federal Register 68722) require discharges from large construction sites, certain industrial activities, and operators of “medium” or “large” MS4s (those that serve a population of 100,000 or greater), to obtain a permit and implement a stormwater management program. The Phase II regulations (64 Federal Register 68722) require smaller operators to obtain a permit for their stormwater discharges. Phase II MS4s can be any MS4 that does not meet the definition of a medium or large MS4 and can include state departments of transportation and military bases, among other entities. Both types of permits require controls to reduce the discharge of pollutants to the maximum extent practicable. ADEQ was delegated authority to implement AZPDES permitting for MS4 operators in 2002.

Section 303(d) of the CWA requires states, territories, and authorized tribes to develop a list of water quality-impaired segments of waterways (33 U.S.C. Section 1313(d)). The Section 303(d) list includes waterbodies that do not meet water quality standards for the specified beneficial uses of that waterway and ranks the waterbodies by priority. Section 303(d) requires jurisdictions to develop total maximum daily loads for all the waters identified on their impaired waters list in order of priority. The objective of a total maximum daily load is to determine the loading capacity of the waterbody and to allocate that load among different pollutant sources so that the appropriate control actions can be taken and water quality standards achieved. Certain waters assessed as impaired are not placed on the Section 303(d) list because a total maximum daily load has already been implemented for the water, an action is occurring that is expected to bring the water to attainment before the next Section 303(d) list submission, or the impairment of the water is due to a pollutant for which a total maximum daily load allocation cannot be developed; such waters are classified as not attaining (Arizona Administrative Code [AAC] 18-11). Impacts on impaired waters are considered in ADEQ’s CWA Section 401 water quality certification decision process.

Rivers and Harbors Act of 1899

USACE, in partnership with various stakeholders, has constructed many civil works projects across the nation. Given the widespread locations of these projects, many embedded within communities, over time there may be a need for others outside of USACE to alter or occupy these projects and their associated lands. To ensure that these projects continue to provide their intended benefits to the public, Section 14 of the Rivers and Harbors Act (33 U.S.C. Section 408) requires that any use or alternation of a USACE civil works project by another party is subject to USACE approval. USACE may grant permission for another party to alter a civil works project upon a determination that the alteration proposed will not be injurious to the public interest and will not impair the usefulness of the project.

Federal Regulation of Land Development in Flood Control Basins

Under Policy Guidance Letter No. 32, Use of Corps Reservoir Flowage Easement Lands, no structure may be constructed or maintained and no excavation or landfill may be placed on flowage easement lands without USACE approval (USACE 1993). Flowage easement land is privately owned land on which USACE has acquired certain perpetual rights, such as the right to flood the land in connection with the operation of a reservoir.

USACE is responsible for water control management at the reservoir projects it owns and operates as well as at certain non-USACE projects. Water control management is conducted pursuant to Engineer Regulation 1110-2-240, Water Control Management (USACE 2016).

National Flood Insurance Program

The Federal Emergency Management Agency (FEMA) issues flood zone maps on a countywide level. Among other provisions, the National Flood Insurance Program regulations state that if an area of construction is located within a regulatory floodway, as delineated on the Flood Insurance Rate Map, it must not increase base flood elevation levels (44 CFR Section 59-65).

Department of Transportation (DOT) Order 5650.2, Floodplain Management and Protection

The purpose of DOT Order 5650.2 is to ensure that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts by DOT actions, planning programs, and budget requests (US Department of Transportation [USDOT] 1979). Among other requirements, DOT Order 5650.2 requires review of the risk to, or resulting from, the transportation action; impacts on natural and beneficial floodplain values; and the degree to which the action provides direct or indirect support for development in the base floodplain. The review must include methods proposed to minimize harm and, where practicable, to restore and preserve floodplain values. Where DOT proposes to conduct, support, or allow an action involving a significant encroachment, the review document must consider alternatives to avoid the encroachment. A significant encroachment cannot be approved unless the proposed action is found to be the only practicable alternative. FHWA procedures regarding floodplain management are codified at 23 CFR 650 Subpart A.

Executive Order (EO) 11988, Floodplain Management

EO 11988 requires federal agencies "to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (42 Federal Register 26951). This EO requires agencies to evaluate the potential effects of any actions it may take in a floodplain. When a proposed action will impact a floodplain, the agency must consider alternatives to avoid adverse impacts. If the agency finds that the only practicable alternative would result in floodplain impacts, the agency must design or modify the action to minimize harm to the floodplain and provide an explanation of why the action must occur within a floodplain. FHWA procedures regarding floodplain management are codified at 23 CFR 650 Subpart A.

EO 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input

EO 13690 amended EO 11988 to improve the Nation's resilience to current and future flood risk and established the Federal Flood Risk Management Standard (80 Federal Register 6425). EO 13690 guides agencies to use a higher flood elevation and expanded flood hazard area than the base flood to ensure that future changes are adequately accounted for in agency decisions. Another requirement is that federal agencies should use, where possible, natural systems, ecosystem processes, and nature-based approaches in federal actions and alternatives.

EO 11990, Protection of Wetlands

EO 11990 requires that "Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities" and, per NEPA, "shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may consider economic, environmental and other pertinent factors" (42 Federal Register 26961).

Safe Drinking Water Act of 1974

The Safe Drinking Water Act authorizes USEPA to set national health-based standards for drinking water to protect against both naturally occurring and manmade contaminants that may be found in drinking water (42 U.S.C. Section 300f et seq.). National Primary Drinking Water Standards are described in 40 CFR Part 141. In Arizona, the Safe Drinking Water Act standards are administered by ADEQ if the action is entirely on non-tribal lands.

The Safe Drinking Water Act provides special protections for drinking water supplies in areas where there are few or no alternative sources to the groundwater resource and where, if contamination occurred, using an alternative source would be extremely expensive (USEPA 2016). Such areas may be designated as a sole source aquifer, which USEPA defines as an area where (1) the aquifer supplies at least 50 percent of the drinking water for its service area and (2) there are no reasonably available alternative drinking water sources should the aquifer become contaminated. USEPA is authorized by Section 1424(e) of the Safe Drinking Water Act of 1974 (76 Federal Register 19261) to review federally funded proposed projects within sole source aquifers. The purpose of the review is to determine whether the project has the potential to contaminate the sole source aquifer.

Fish and Wildlife Coordination Act of 1934

The Fish and Wildlife Coordination Act requires federal agencies to consult with the US Fish and Wildlife Service (USFWS) before undertaking or approving water projects that would control or modify surface water (16 U.S.C. Section 662).

3.13.1.2 State

Groundwater Management Act of 1980

The 1980 Groundwater Management Act recognized the need to aggressively manage the state's groundwater resources to support the economy and general welfare of the state and its citizens (Arizona Revised Statutes 45-401 et seq.). The three primary goals of the act are to (1) control severe overdraft occurring in many parts of the state, (2) provide a means to allocate the state's limited groundwater resources to most effectively meet the changing needs to the state, and (3) augment Arizona's groundwater through water supply development.

Areas with heavy reliance on mined groundwater were identified and designated as active management areas. Five active management areas have been established to date: Phoenix, Tucson, Prescott, Pinal, and Santa Cruz. Each active management area carries out a groundwater management program consistent with the overall goals of the Groundwater Management Act while considering and incorporating the unique character of each active management area and its water users. Goals of each active management area include achieving or maintaining safe-yield, which is accomplished when no more groundwater is being withdrawn than is being replaced annually.

Underground Water Storage and Recovery Program of 1986 and Underground Water Storage, Savings, and Replenishment Act of 1994

The Underground Water Storage and Recovery Program and the Underground Water Storage, Savings, and Replenishment Act together define the groundwater recharge program for Arizona (Arizona Revised Statutes 45-801 et seq.; AAC R12-12-151). The purpose of the recharge program is to (1) encourage the use of renewable water supplies, particularly Colorado River water, instead of groundwater by establishing a regulatory program for the underground storage, savings, and replenishment of water; and (2) allow for the efficient and cost-effective management of water supplies by using underground storage facilities for filtration and distribution of surface water instead of constructing surface water treatment plants and pipeline distribution systems.

Outstanding Arizona Waters

AAC R18-11-112 defines Outstanding Arizona Waters. These are waters that meet the following conditions: A surface water that is perennial or intermittent, free-flowing, has water quality that meets or is better than applicable water quality standards, and meets one or both of the following: (1) The surface water is of exceptional recreational or ecological significance or (2) threatened or endangered species are known to be associated with the waterbody and maintenance and protection of existing water quality is essential to the maintenance of the threatened or endangered species, or the surface water provides critical habitat (AAC R18-11-112[D]; ADEQ 2017b).

Site-specific standards may be developed by the state to maintain and protect existing water quality within designated Outstanding Arizona Waters. Impacts on Outstanding Arizona Waters are considered in ADEQ's CWA Section 401 water quality certification decision process.

Water Quality Standards

Arizona has adopted water quality standards for surface waters and aquifers (AAC 18-11 Articles 1 and 4). Water quality standards have been set for various designated uses of surface waters (AAC 18-11-104). These designated uses have been assigned to specific surface waters and are used in ADEQ's compliance with Section 303(d) of the CWA. Arizona has incorporated specific safe drinking water regulations with the goals of protecting the public health and welfare as well as maintaining the state's enforcement responsibility of the Safe Drinking Water Act (AAC 18-4-101 et seq.).

3.13.1.3 Local

County flood control districts and incorporated municipalities require a Floodplain Use Permit in cases where a project encroaches into a floodplain. Specific permitting requirements vary by jurisdiction. Approval of a Floodplain Use Permit typically requires development of a hydraulic computer model to demonstrate that structures, berms, or other facility components located within the floodplain will not result in increased potential for flooding or erosion. This level of detail is not available at this stage of the planning process and will be addressed, as appropriate, during Tier 2 NEPA studies. The following county flood control districts and municipalities would evaluate the need for and review any Floodplain Use Permits during a Tier 2 project assessment. Additional jurisdictions would also be identified during Tier 2 assessment.

- City of Tucson
- Flood Control District of Maricopa County
- Pima County Regional Flood Control District
- Pinal County Flood Control District
- Santa Cruz County Flood Control District
- Town of Marana
- Town of Oro Valley
- Town of Sahuarita
- Yavapai County Flood Control District

ADEQ requires Phase I MS4 permits for operators that serve populations greater than 100,000 (ADEQ 2017c). Operators holding MS4 permits within the Study Area include ADOT, Pima County, City of Phoenix, and City of Tucson. Each permittee implements its own MS4 program under its AZPDES permit. MS4 permittees must develop individual programs to manage and treat stormwater discharges to the maximum extent practicable. For example, ADEQ issued the ADOT MS4 Permit on July 17, 2015, with an effective date of August 16, 2015. ADOT's Stormwater Management Plan identifies the program and procedures implemented by ADOT to minimize, to the extent practicable, the release of pollutants to, and the discharge of pollutants from, the ADOT MS4 (ADOT 2017b). Pima County developed a Stormwater Management Program to ensure the quality of stormwater discharges were managed to the maximum extent practicable (Pima County 2015b), and the City of Tucson passed Stormwater Management Ordinance Number 10209 in 2005 (City of Tucson 2005).

The Pima County Department of Environmental Quality and the Maricopa County Environmental Services Department have been delegated authority from ADEQ to administer provisions of the federal Safe Drinking Water Act and Arizona's safe drinking water regulations (AAC 18-4 and 18-5) applicable to public water systems with their jurisdictions (ADEQ 2019). These counties implement permitting, inspection, and enforcement programs for the construction, operation, and closure of public water systems with oversight from ADEQ.

3.13.2 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. Assessed categories of water resources include active management areas, sole source aquifers, groundwater wells, Outstanding Arizona Waters, impaired waters, waters of the US including wetlands, and floodplains. Further details regarding the analysis methodology are provided in **Appendix E13** (Water Resources Technical Memorandum).

For most resources, each 2,000-foot-wide Build Corridor Alternative 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. Data sources and approach for each category of water resources are described below.

Active management areas were identified using the Arizona Department of Water Resources' (ADWR) Water Atlas (ADWR 2010) and geospatial data acquired from ADWR (2020).

Sole source aquifers were identified using geospatial data acquired from USEPA (2017a).

Groundwater wells were identified using an inventory of wells compiled by ADWR (2017).

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

Impaired waters were identified using geospatial data acquired from ADEQ (2018a). Both impaired waters placed on the CWA Section 303(d) list and impaired waters designated as Not Attaining were analyzed. 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 2017d). Therefore, this analysis considers impaired waters located within 0.5 mile upstream and 1.0 mile downstream of each Build Corridor Alternative.

Waters of the US were identified using surface waters included in the National Hydrography Dataset (US Geological Survey [USGS] 2019) as a proxy. The National Hydrography Dataset geospatial 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. Although 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. 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 would be conducted during the Tier 2 NEPA process. For this reason, mapped surface waters are referred to as "potential waters of the US."

Wetlands were identified using wetlands identified by the National Wetlands Inventory (NWI) (USFWS 2019) as a proxy. NWI geospatial data were created from remote data sources and may not be representative of ground conditions. Formal wetland delineations using the three-part 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, if needed. 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. Several key areas could not be assessed in the field due to accessibility issues. For these locations, the USGS (2004) National Gap Analysis Program report Provisional Digital Land Cover Map for the Southwestern US was used to identify plant species likely to be present. Sites dominated by plant species classified as wetland indicator species were considered to contain potential wetlands (US Department of Agriculture [USDA] 2020). In formal wetland delineations, vegetation is considered to be hydric (i.e., wetland vegetation) if it is dominated by wetland indicator species (USACE 2008a). Locations where site-specific reviews identified potential wetlands are hereinafter referred to as key potential wetlands.

Floodplains were identified using Flood Insurance Rate Maps provided by FEMA (2017). For the purposes of this analysis, floodplains are defined as Special Flood Hazard Areas regulated by FEMA under the National Flood Insurance Rate Program. Special Flood Hazard 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 (FEMA 2007). Areas protected by levees as identified on the Flood Insurance Rate Maps (FEMA 2017) are assessed qualitatively. Regulatory floodways are also identified. Regulatory floodways are defined 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 (between 0 and 1 foot) (FEMA 2007). Refer to **Appendix E13** (Water Resources Technical Memorandum) for additional information regarding flood zone definitions. The data collection and analysis for this technical report are consistent with EO 13690. 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.

The environmental consequences of the No Build and Build Corridor Alternatives were assessed. Because the location and design of the highway have not yet been identified within the larger 2,000-foot-wide corridor and limitations of geospatial data described above, this assessment considers both quantitative and qualitative factors. Quantitative factors consist of measurable quantities of water resources within the 2,000-foot-wide corridors; in most cases the full quantity of resources reported herein would not be directly impacted during project construction. Qualitative factors address considerations that cannot be easily measured. Key factors include:

- Mapped quantity of water resources within each Build Corridor Alternative (e.g., number of groundwater wells, miles of streams, acreage of wetlands and floodplains, and miles of impaired waterbodies).
- Configuration of water resources within each Build Corridor Alternative, which may indicate the feasibility of avoiding or minimizing impacts.
- Proportion of the Build Corridor Alternative that is co-located in an existing transportation right-of-way. Co-located portions of the Build Corridor Alternatives are anticipated to require fewer new lane miles than new corridors.

Effects to waters of the US were assessed in the framework of the Section 404(b)(1) guidelines. Characteristics addressed include effects to substrate, suspended particulates/turbidity, water, current patterns and water circulation, normal water fluctuations, and salinity gradients. A discussion of effects to threatened and endangered species, aquatic organisms, and other wildlife is included in **Section 3.14** (Biological Resources). The waters of the US analysis gives special consideration to major watercourses such as the Santa Cruz, Gila, and Hassayampa Rivers. Special consideration is warranted because portions of these features contain wetlands, riparian vegetation, and perennial or intermittent flows, features that are relatively uncommon within the Study Area. Further, because major watercourses are more likely to contain perennial or intermittent flows than small, unnamed watercourses, they are more likely to be subject to regulation under the CWA.

After assessing the above quantitative and qualitative factors, the level of impact on each category of water resource was ranked relative to the other alternatives. Potential strategies to avoid, minimize, and mitigate impacts are then presented, followed by a discussion of analyses, assessments, and coordination that would be conducted during Tier 2 NEPA analyses.

3.13.3 Affected Environment

The following sections summarize the water resources within the Study Area. Where applicable, information is presented by geographic region: South Section, Central Section, and North Section. Detailed descriptions and quantifications of water resources within each option, which comprise the Build Corridor Alternatives, are presented in **Appendix E13** (Water Resources Technical Memorandum).

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 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 is a major source of potable and irrigation water in the Study Area.

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.

3.13.3.1 Active Management Areas

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. Active management areas are shown on **Figure 3.13-1, Figure 3.13-2,** and **Figure 3.13-3**. All corridor options except Options K, Q1, X, U, and S occur entirely within active management areas.

The Phoenix, Pinal, and Tucson Active Management Areas contain deep alluvial aquifers and substantial volumes of water in storage. However, aquifer recharge rates are low and 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).

Each active management area has a management goal to guide the use of groundwater within its boundaries. The management goals for the active management areas in the Study Area are as follows:

- **Santa Cruz Active Management Area**. Maintain a safe-yield condition and prevent long-term declines of local water tables.
- **Tucson Active Management Area**. Establish a safe-yield condition by 2025.

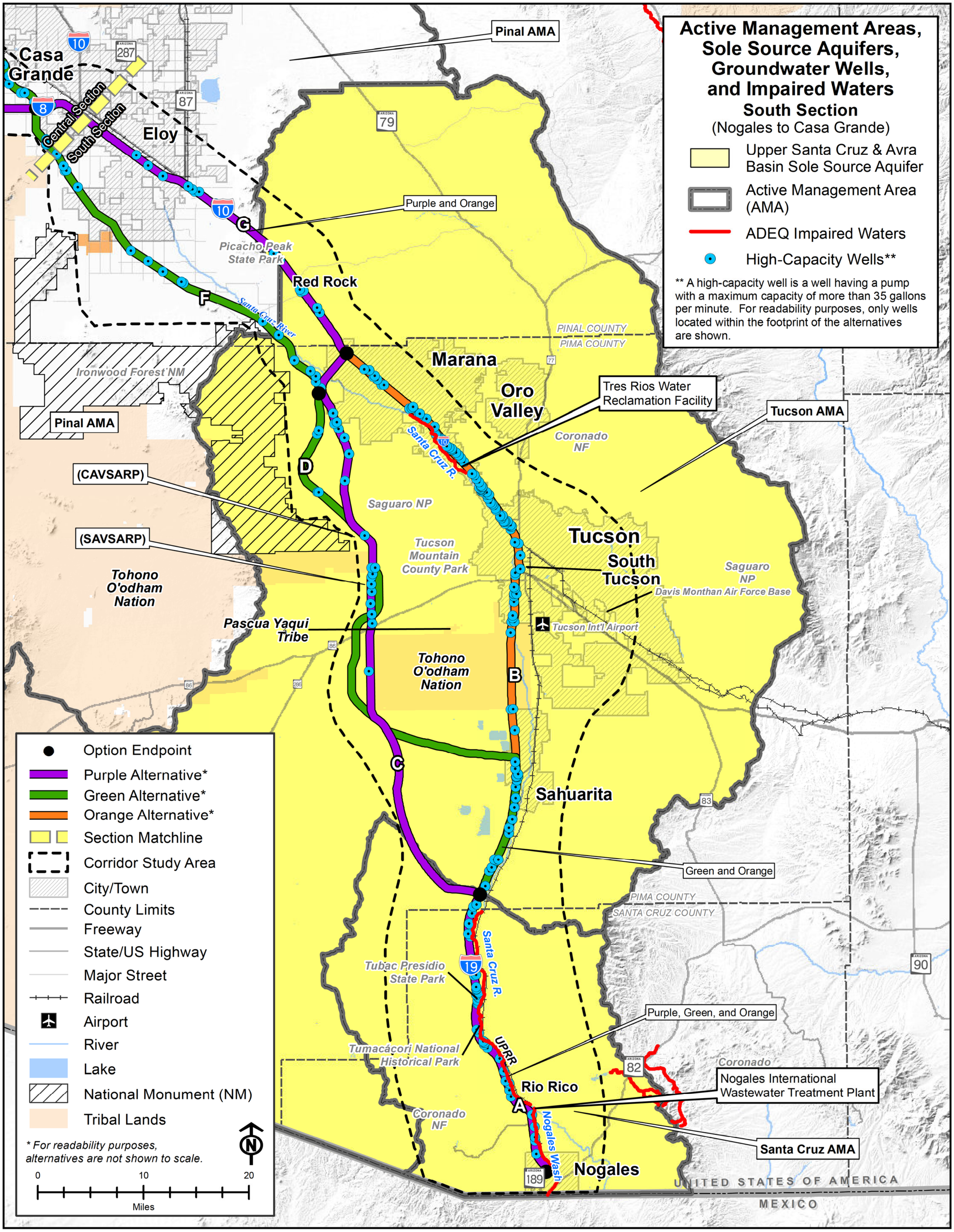

Figure 3.13-1. South Section Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters

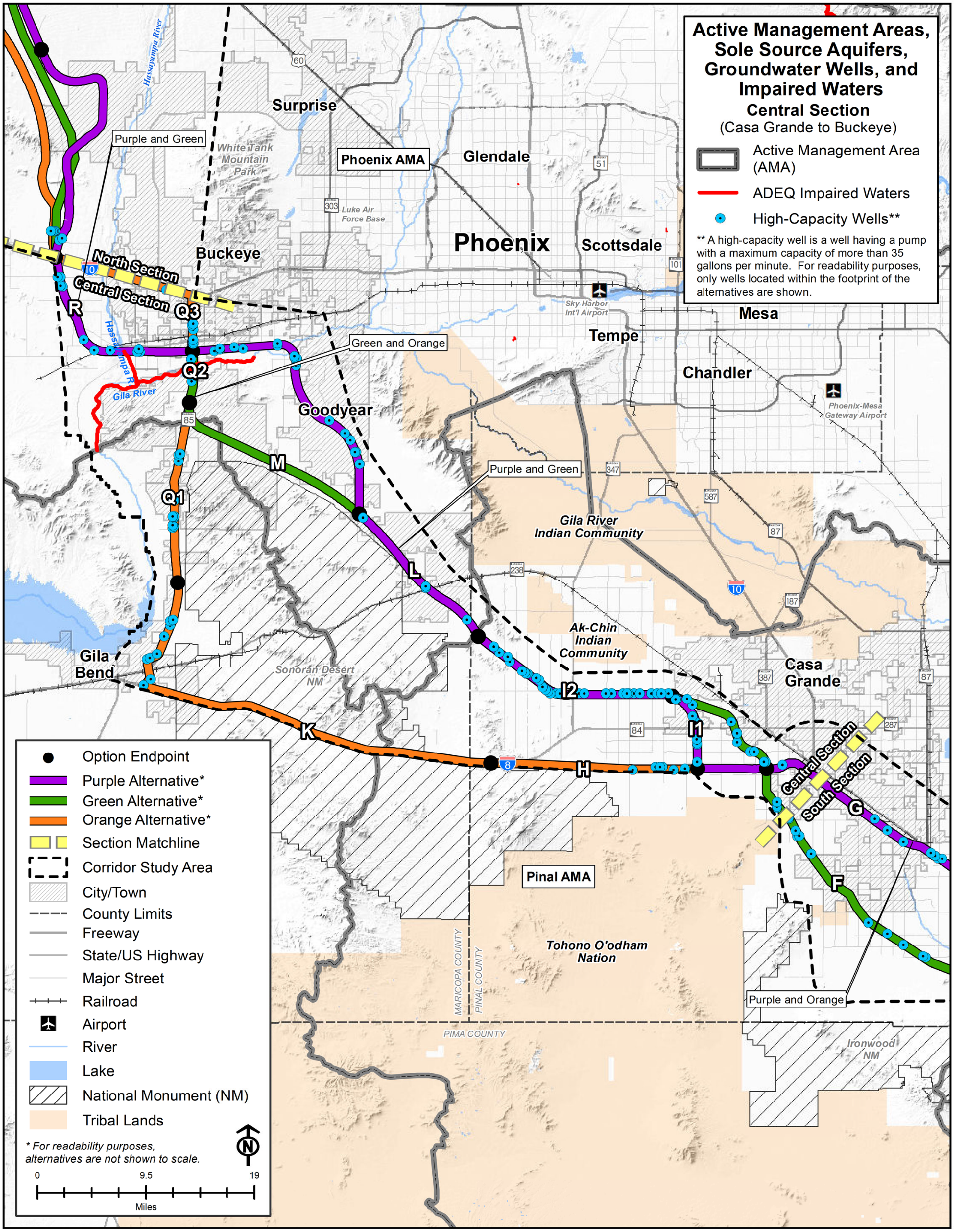

Figure 3.13-2. Central Section Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters

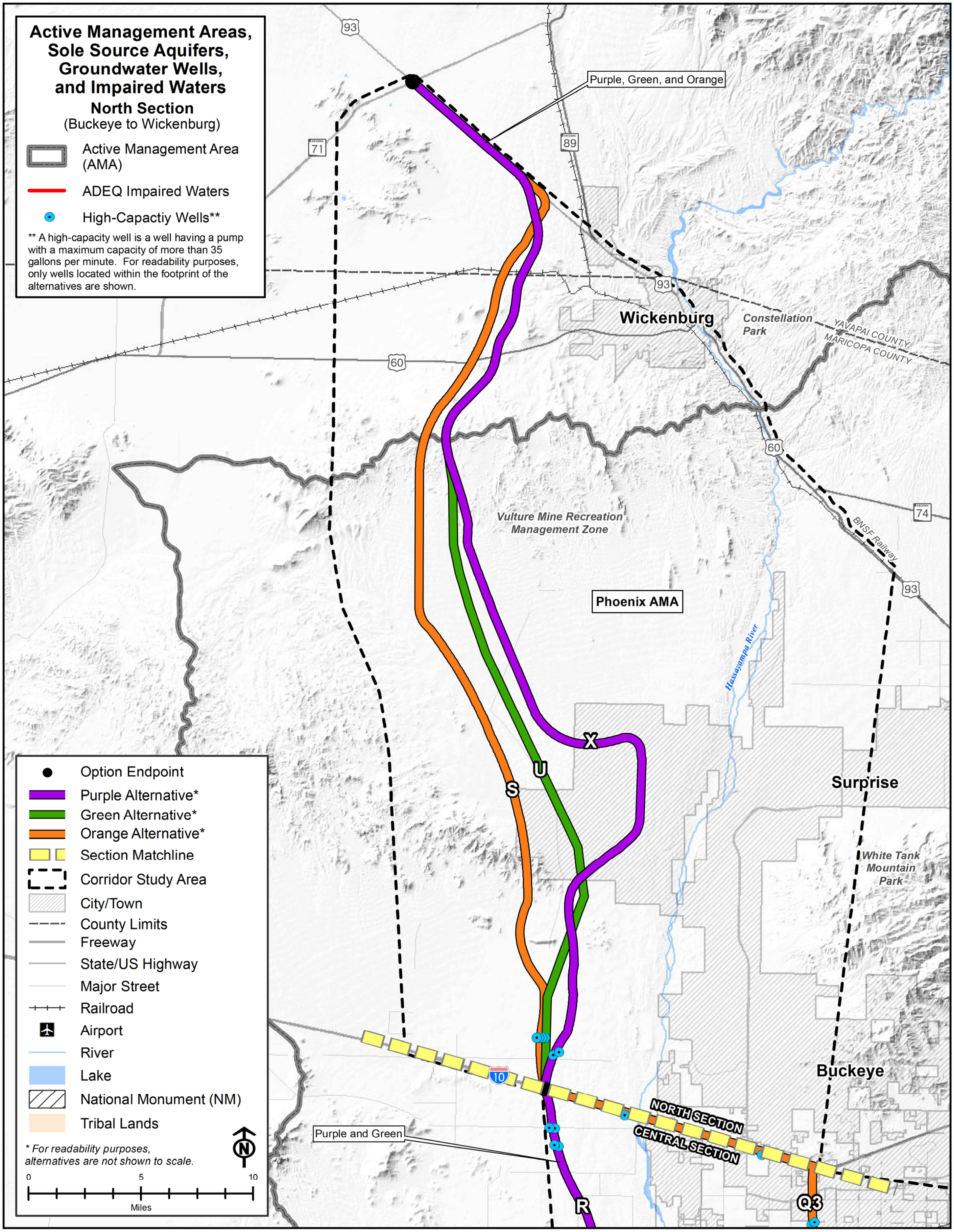

Figure 3.13-3 North Section Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters

- **Pinal Active Management Area**. Allow development of non-irrigation uses and preserve existing agricultural economies for as long as feasible, consistent with the necessity to preserve future water supplies for non-irrigation uses.
- **Phoenix Active Management Area**. Achieve a safe-yield condition by year 2025 through increased use of renewable water supplies and decreased groundwater withdrawals in conjunction with efficient water use.

Recharge of aquifers in the Tucson Active Management Area is supported by the CAVSARP and the SAVSARP. Colorado River water is delivered to Tucson via the 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 E13-2**). 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.

3.13.3.2 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 (USEPA 2017a). The full lengths of Options A-D and portions of Options F and G are located within this sole source aquifer. The Upper Santa Cruz and Avra Valley sole source aquifer is shown on **Figure 3.13-1**.

3.13.3.3 Groundwater Wells

Water quality data from Pima County drinking water providers for the sampling years from 1998 to 2000 indicate that the most common regulated constituents detected were nitrate, fluoride, arsenic, and chromium; none exceeded established drinking water maximum contaminant levels (PAG 2002).

Groundwater in the Pinal Active Management Area is slightly alkaline, fresh, and hard to very hard, as indicated by pH values and total dissolved solids. Of 86 sites sampled within the Pinal Active Management Area in 2005-2006, 13 percent met all Safe Drinking Water Act primary and secondary water quality standards. Primary Safe Drinking Water Act and ADWR aquifer water quality standards were exceeded at 70 percent of the 86 sites sampled. Sites sampled within the Pinal Active Management Area exceeded Safe Drinking Water Act primary standards for the level of arsenic, fluoride, gross alpha, nitrate, and uranium (ADEQ 2008).

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 Study Area north of 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).

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. High-capacity public and private water supply and monitoring wells within the Build Corridor Alternatives are shown on **Figure 3.13-1, Figure 3.13-2,** and **Figure 3.13-3**. A high-capacity well is a well having a pump with a maximum capacity of more than 35 gallons per minute (ADWR 2017).

3.13.3.4 Outstanding Arizona Waters

No Outstanding Arizona Waters are located within the Study Area (ADEQ 2020); therefore, this resource is not carried forward for further analysis.

3.13.3.5 Impaired Waters

Locations of impaired waters are shown on **Figure 3.13-1**, **Figure 3.13-2**, and **Figure 3.13-3**. Impaired surface water segments within 0.5 mile upstream or 1.0 mile downstream of Build Corridor Alternatives include the following:

- Santa Cruz River, Options A and B, Impairment: ammonia and Escherichia coli [E. coli]
- Potrero Creek, Option A, Impairment: chlorine, E. coli, and dissolved oxygen
- Nogales Wash, Option A, Impairment: ammonia, dissolved copper, E. coli, and total residual chlorine
- Hassayampa River, Option R, Impairment: E. coli and selenium
- Gila River, Options N and Q2, Impairment: selenium and boron

3.13.3.6 Waters of the US

Major drainages in the Study Area, which are all potential waters of the US, include the Santa Cruz River, Gila River, and Hassayampa River. These and other named watercourses are shown on **Figure 3.13-4**, **Figure 3.13-5**, and **Figure 3.13-6**.

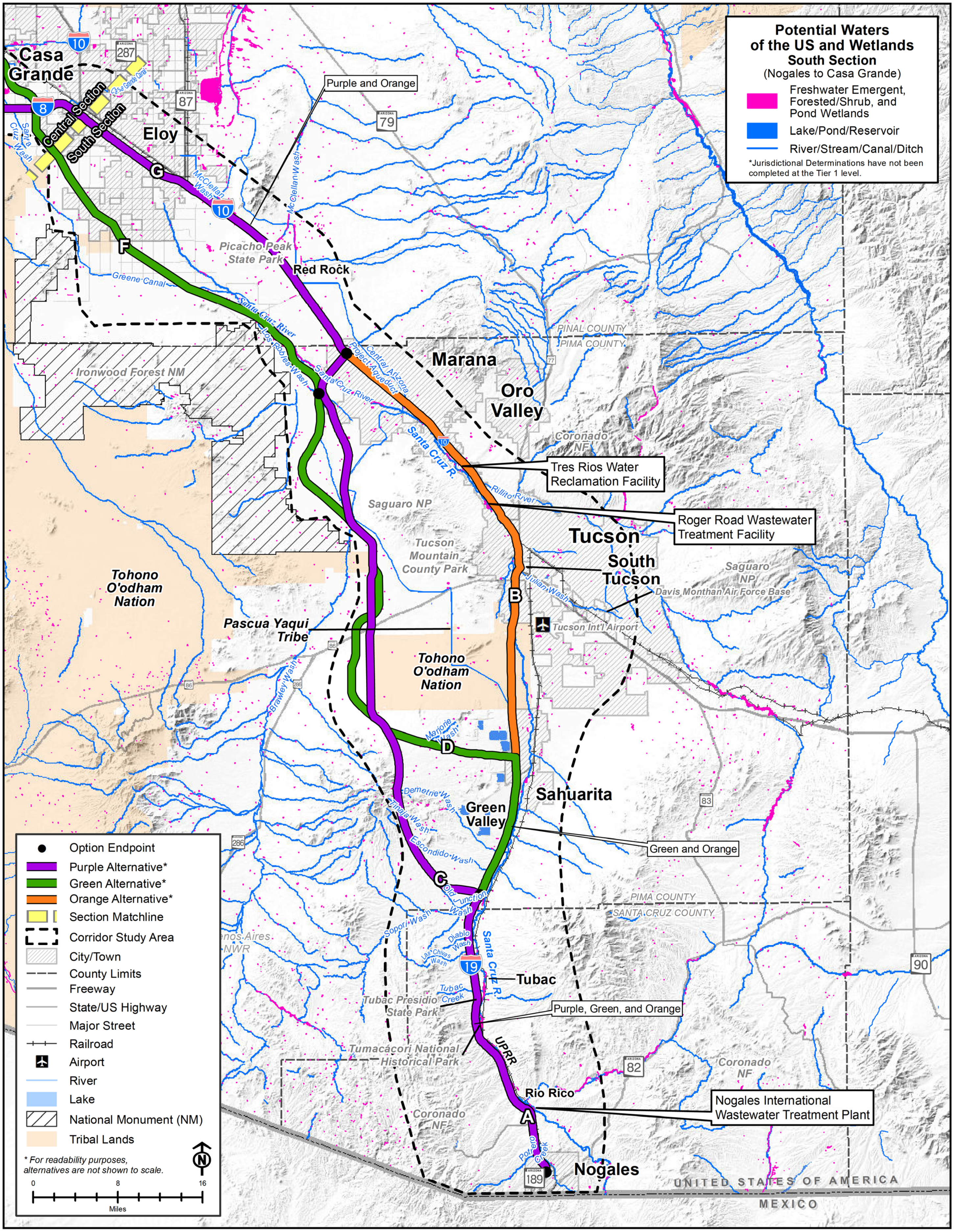

Figure 3.13-4. South Section Potential Waters of the US and Wetlands

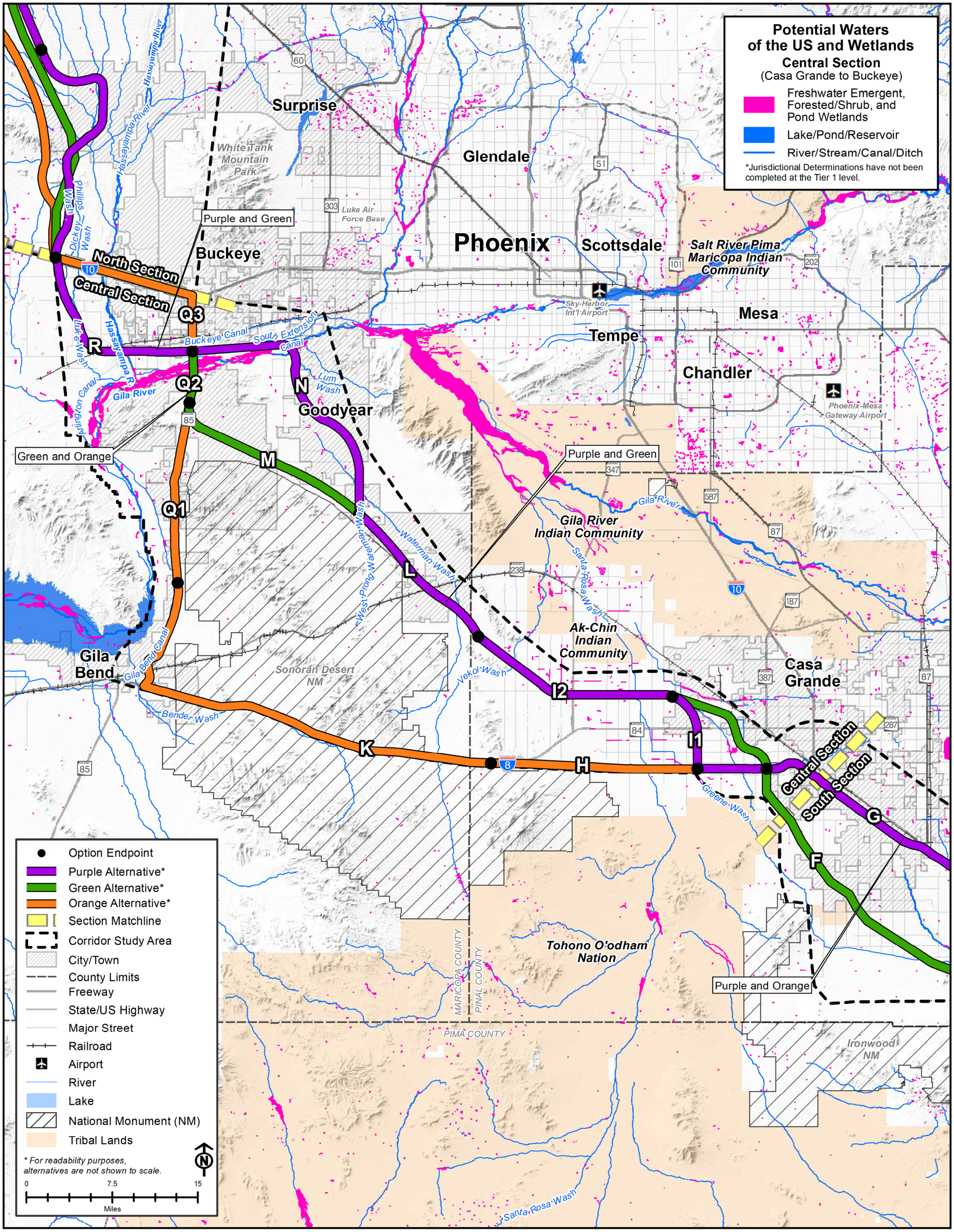

Figure 3.13-5. Central Section Potential Waters of the US and Wetlands

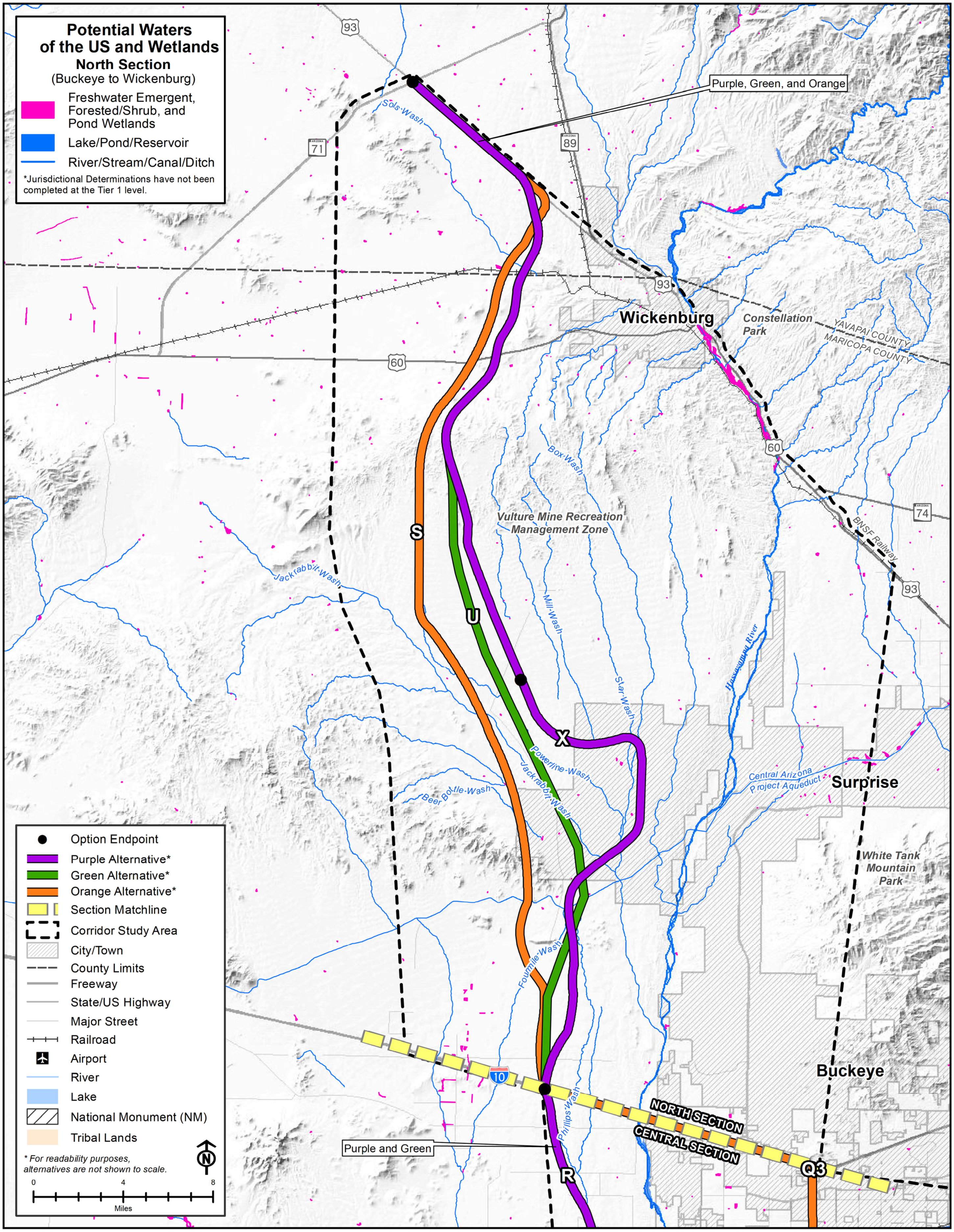

Figure 3.13-6. North Section Potential Waters of the US and Wetlands

The Santa Cruz River flows north from the border with Mexico and disperses in the vicinity of Eloy. Only two reaches of the river experience year-round streamflow due to treated wastewater effluent discharged downstream of Nogales and Tucson (ADEQ 2016; Nakolan, Meixner, and Thompson 2015). Other portions of the Santa Cruz River flow intermittently (ADWR 2008) as groundwater pumping has eliminated most natural perennial flow (ADEQ 2016). 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). 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.

Within the Study Area, the Gila River flows east to west and contains perennial flows largely due to effluent 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 ephemeral within the Project Area but is intermittent throughout much of the Study Area (ADWR 2009). Perennial flows occur within the Study Area south of Wickenburg and beyond the Study Area in the river's upper reaches (ADWR 2009). The Hassayampa River flows south through the North Section of the Study Area to its confluence with the Gila River in the Central Section.

Several major canals and other named watercourses, including the CAP canal, Brawley Wash, Potrero Creek, and Vekol Wash, are located within the Project Area. Additionally, the Project Area includes ponds used for livestock water, groundwater recharge, aesthetics, and other purposes.

3.13.3.7 Wetlands

Potential wetland resources present in the Study Area are associated with channels and floodplains of the major drainages, canals, and ponding areas in or adjacent to ephemeral washes. Notable potential wetlands within the Project Area, as identified using geospatial data (USFWS 2019), are located along Potrero Creek in Option A, approximately 2 miles of the Santa Cruz River near Rio Rico within Option A, approximately 3 miles of the Santa Cruz River near Red Rock within Option F, and the Gila River near Buckeye within Option Q2.

Potential wetlands identified during site-specific reviews consist of the following:

- Santa Cruz River south of Tucson, Option B
- Santa Cruz River in Tucson, Option B
- Rillito River in Tucson and Marana, Option B
- Santa Cruz River in western Marana, Option C

- Braided channels associated with the Santa Cruz River, Los Robles Wash, and unnamed drainages near the Pima-Pinal County Line, Option F
- Vekol Wash, an unnamed drainage, and unnamed canal southeast of Goodyear, Option I2
- Gila River in Goodyear, Option N
- Gila River, Arlington Canal, and an unnamed canal at SR 85 in Buckeye, Option Q2
- Hassayampa River and an unnamed canal near Buckeye, Option R

NWI-mapped freshwater emergent, forested/shrub, and pond wetlands are shown on **Figure 3.13-4**, **Figure 3.13-5**, and **Figure 3.13-6**.

3.13.3.8 Floodplains

Areas mapped by FEMA as floodplains are shown on **Figure 3.13-7**, **Figure 3.13-8**, and **Figure 3.13-9.** Floodplains are associated with the Santa Cruz River, Gila River, Hassayampa River, and their tributaries. Within the town of Marana, approximately 2,750 acres 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 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. Regulatory floodways are found along the Santa Cruz River, Gila River, Hassayampa River, and their major tributaries.

3.13.4 Environmental Consequences

This section includes an analysis and comparison of the No Build and Build Corridor Alternatives. Both quantitative and qualitative factors are considered as described in **Section 3.13.2**. The No Build Alternative is presented, followed by a discussion of impacts common to all the Build Corridor Alternatives. Purple, Green, and Orange Alternatives are then compared. The Recommended Alternative is then discussed and compared with the Purple, Green, and Orange Alternatives. This is followed by a discussion of the Preferred Alternative, which is compared to the Recommended Alternative. The two Preferred Alternative options (west option in Pima County and east option in Pima County) are also compared to one another.

3.13.4.1 No Build Alternative

The No Build Alternative represents the existing transportation system, along with committed improvement projects that would be completed in the future. Under the No Build Alternative, traffic would continue to use the existing transportation system and a new I-11 corridor would not be constructed. As such, the No Build Alternative represents the baseline for comparison to the Build Corridor Alternatives and would generally result in the fewest negative effects to water resources. However, future capacity improvement projects completed under the No Build Alternative may still result in substantive impacts on water resources. The general nature of impacts from future capacity improvement projects is described in **Section 3.13.4.2**.
Construction of Build Corridor Alternatives that utilize existing roadways may present an opportunity to address known drainage issues; this opportunity may not be available under the No Build Alternative.

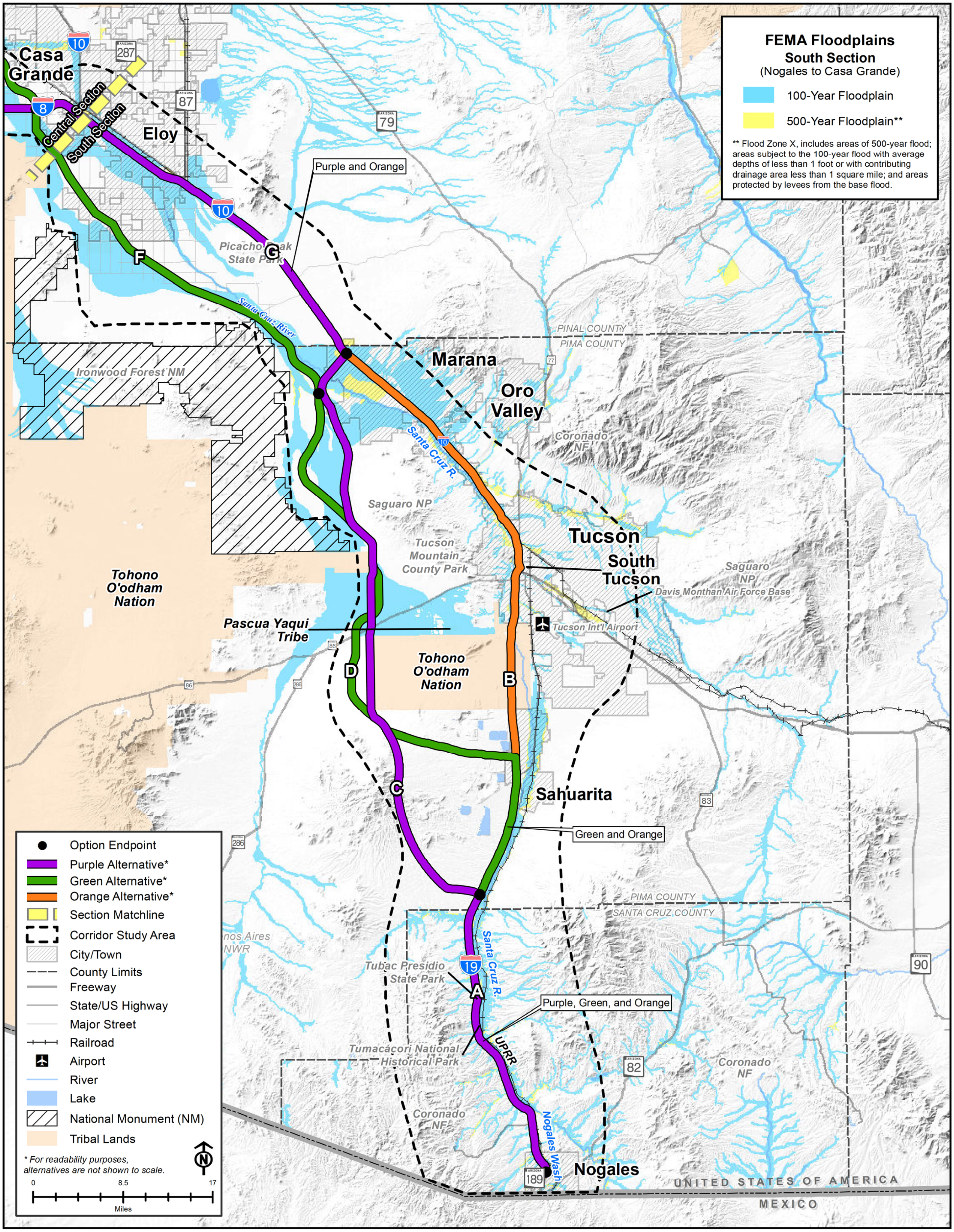

Figure 3.13-7. South Section FEMA Floodplains

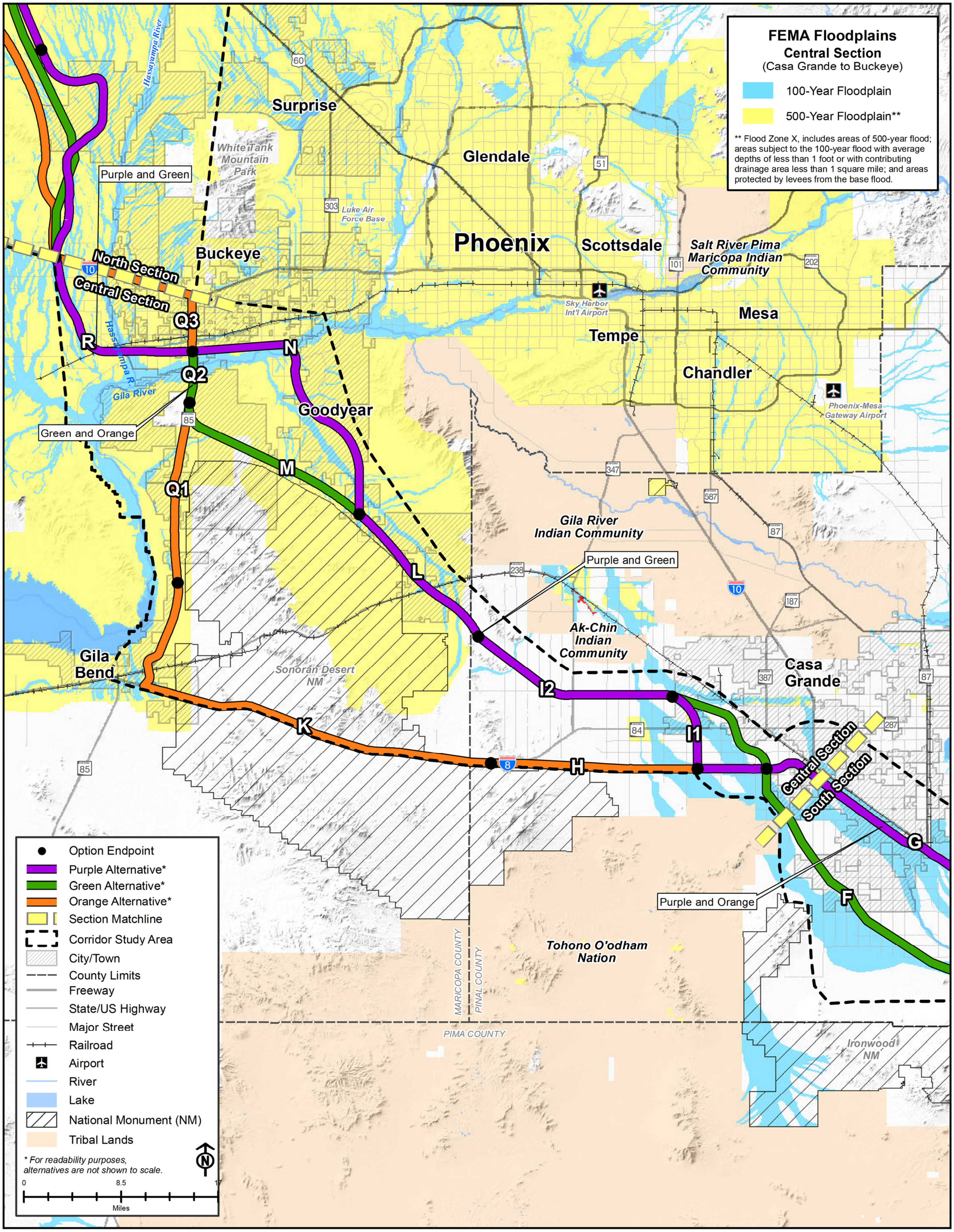

Figure 3.13-8. Central Section FEMA Floodplains

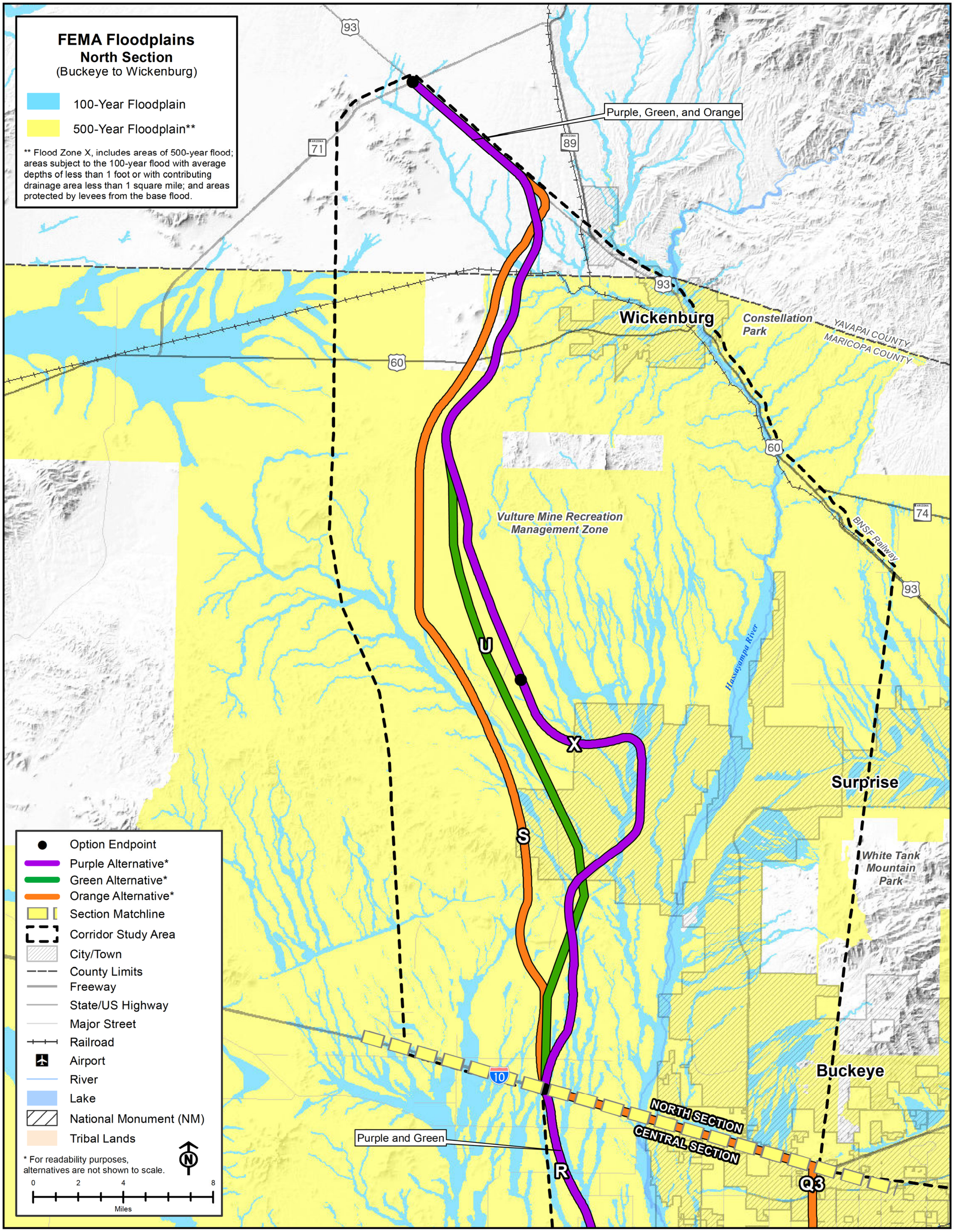

Figure 3.13-9. North Section FEMA Floodplains

3.13.4.2 Impacts Common to All Build Corridor Alternatives

Impacts common to all Build Corridor Alternatives are described below. The degree to which such impacts would occur varies by alternative and is described in **Section 3.13.4.3**. Many of the described impacts are interrelated. For example, construction-related reductions in the length of potential waters of the US may reduce infiltration of surface water, which may reduce groundwater quantity. Reductions in groundwater quantity could in turn reduce the length of perennial reaches of surface waters, some of which are groundwater dependent. Construction of any Build Corridor Alternative would impact water resources by reducing the quantity and quality of groundwater and surface water as described below.

Groundwater quantity: As described in **Section 3.13.3**, groundwater within the Study Area can originate from infiltration of precipitation and surface flows, among others. As a result, activities that affect surface water infiltration may also affect groundwater.

Surface water infiltration could be impacted by activities that reduce the surface area or timeframe available for infiltration to occur. All Build Corridor Alternatives would increase the amount of impervious surface within the Study Area, thereby directly reducing the area available for infiltration. Increases of impervious surface would also increase stormwater runoff, which may result in greater downstream flow velocities. Increased flow velocity would provide surface waters less opportunity for infiltration as flows would exit a given area more rapidly. Construction activities that increase erosion, that constrict flows, or that reduce the total length of drainages may also increase downstream flow velocities. Such activities include vegetation removal, soil excavation, and construction or extensions of bridges and culverts as well as those that require diversions or filling of surface waters. In some cases, increased erosion could result in sedimentation of downstream waters, which could reduce downstream flow velocities, thereby increasing infiltration.

Groundwater quality: Construction of I-11 may impact groundwater quality through infiltration of pollutants into aquifers. Surface waters carrying increased pollutant loads as described below may introduce pollutants to groundwater in this way. Hazardous materials could also infiltrate directly into groundwater as a result of accidental releases.

Surface water quantity: Surface water quantity would be affected by activities that fill existing surface waters such as washes, rivers, or stock tanks. New drainage systems, including retention basins, may be constructed along new roadway corridors or may be altered along existing corridors. As described in **Section 3.13.3**, groundwater contributes to surface flows in intermittent and perennial drainages within the Study Area. Thus, surface water quantity may be altered by activities that reduce or increase groundwater quantity.

Increases of impervious surface would also increase stormwater runoff, which may result in greater downstream flow velocities within surface waters. Increased flow velocity would reduce the timeframe surface waters are present as flows would exit a given area more rapidly. Construction activities that increase erosion, that constrict flows, or that reduce the total length of drainages may also increase downstream flow velocities. Such activities include vegetation removal, soil excavation, and construction or extensions of bridges and culverts as well as those that require diversions or filling of surface waters. In some cases, increased erosion could result in sedimentation of downstream waters, which could reduce downstream flow velocities and increase surface water presence.

Surface water quality: Constructing I-11 would result in an increase in the overall area of impervious surface area within the associated watershed, which would result in increases in localized runoff compared to existing conditions. Generally, runoff contains sediment or pollutants in quantities that could reduce water quality. For example, runoff from paved surfaces would carry particulate matter from tire wear, oils, and greases from vehicles, and would be expected to include urban litter such as paper and plastic materials. Any alternative that increases traffic volumes would increase the contribution of this automotive-based nonpoint source contamination. Hazardous materials may also enter surface waters as a result of accidental releases. These materials could be directly released into watercourses at drainage crossings or could be conveyed into surface waters via stormwater runoff.

Active Management Areas and Sole Source Aquifers

All Build Corridors Alternatives are at least partially located within active management areas and the Upper Santa Cruz and Avra Valley Sole Source Aquifer. As a result, all Build Corridor Alternatives could affect these groundwater resources. Potential effects to active management areas are primarily related to groundwater quantity, as described above, as the primary goal of all active management areas within the Study Area is to maintain or attain a safe-yield condition. Effects to sole source aquifers are related to groundwater quality, as described above.

Groundwater Wells

Effects to groundwater wells could result from any Build Corridor Alternative due to the potential impacts on groundwater quantity and quality described above. Reductions in groundwater quantity may reduce a well's capacity. The potential for an alternative to affect or contaminate groundwater supply wells depends on well construction, proximity to pollution sources, and geological conditions. Effects on wells may also include physical damage to the well casing or wellhead, restriction in access to the wellhead, restricted use of the well, and/or administrative barriers to the well or use of the well, and safety issues associated with access to or use of the well.

Impaired Waters

All Build Corridor Alternatives would parallel or cross the same impaired segments of the Santa Cruz River, Potrero Creek, and Nogales Wash within Option A. All Build Corridor Alternatives would cross or parallel additional impaired waters in other portions of their corridor as described in **Appendix E13** (Water Resources Technical Memorandum), **Section E13.5.3**.

Impairments for surface waters in proximity to Build Corridor Alternatives include chlorine, copper, boron, selenium, ammonia, low dissolved oxygen, and E. coli. Impairments within the Study Area are primarily related to mining, agricultural runoff, grazing, contributions from urban areas including inputs from fertilizers and leaking septic systems, recreational users, wildlife, stormwater, municipal and industrial discharges, and inputs from Mexico, with transportation a minor contributor (ADEQ 2016).

Temporary increases in stormwater runoff during construction, or permanent increases resulting from new or widened corridors, could affect impaired waters. For example, if soils are high in selenium, erosion of soils during or after construction could increase selenium loading in the adjacent streams. Nutrients in soils (nitrogen or phosphorous) or use of ammonia-based fertilizers may affect waters listed for ammonia or low dissolved oxygen. At rest stations, E. coli from poorly maintained septic systems, or more commonly from dog waste, can be high. New rest stations or increased use of existing rest stations may exacerbate nearby impairments.

Waters of the US and Wetlands

Potential waters of the US and wetlands would be affected by all Build Corridor Alternatives due to effects to surface water quantity, as described above. Permanent impacts could occur as a result of construction of cut and fill slopes, structural fills including bridge piers and culverts, diversions, or other transportation facilities. Short-term, temporary impacts could occur during construction activities such as clearing ground for staging areas, access routes, and diversions of surface flow. Placement of fill material and structures within streams could permanently alter stream contours and result in the loss of wetlands.

The Santa Cruz River is a notable potential waters of the US that could be impacted by all the Build Corridor Alternatives. The Nogales International Wastewater Treatment Plant releases effluent into the Santa Cruz River; therefore, impacts on this facility would also affect waters of the US. Both the Santa Cruz River and the Nogales International Wastewater Treatment Plant are located within a section of corridor co-located with I-19 within Option A. Should the corridor be widened to accommodate I-11, the final corridor would most likely be sited to avoid impacting the Nogales International Wastewater Treatment Plant. If widening were to occur on the western side of I-19, many direct impacts on the Santa Cruz River could also be avoided.

All the Build Corridor Alternatives may also impact wetlands along Potrero Creek and the Santa Cruz River within Option A. Although this option is co-located with I-19, the potential wetlands are situated such that they may be difficult to avoid should the corridor be widened to accommodate I-11 traffic.

Characteristics of waters of the US identified in the CWA Section 404(b)(1) guidelines that may be impacted under any Build Corridor Alternative include substrate, suspended particulates/turbidity, water, current patterns and water circulation, normal water fluctuations, and salinity gradient and are described in detail below.

Substrate: Construction of any of the Build Corridor Alternatives may alter substrate through the placement of erosion control materials such as riprap or concrete within waters of the US. Substrate may also be altered by over-excavation of native materials, which may not be replaced in-kind, or by placement of structures such as concrete culverts within waters. Sedimentation or scour may alter substrate within and downstream of construction areas.

Suspended particulates/turbidity and salinity gradients: These characteristics may be affected by activities that increase or decrease stormwater runoff, erosion, or downstream flow velocities. Such activities include vegetation removal, soil excavation, and construction or extensions of bridges and culverts as well as those that require diversions or filling of surface waters.

Water: Water quantity would be affected by activities that fill existing surface waters such as washes, rivers, or stock tanks. Drainage systems including retention basins may be constructed along new roadway corridors or may be altered along existing corridors. As described in **Section 3.13.3**, groundwater contributes to surface flows in intermittent and perennial drainages. Thus, water quantity may also be impacted by activities that reduce or increase groundwater quantity as described above.

Current patterns and water circulation: Construction of roadway features within waters of the US may alter water currents and circulation. Such features could include bridge piers and erosion control such as riprap or concrete flooring. Diverting or channelizing existing surface waters may also alter current patterns and circulation.

Normal water fluctuations: This characteristic may be impacted by activities that alter flow velocities and water quantity.

Floodplains

Floodplains occur within all the Build Corridor Alternatives and could be affected by activities that affect surface water quantity and flow patterns, as described above. Such activities include those that result in an increase in impervious surface, constriction or blockage of surface water flow, and the placement of fill or structure within a waterway or floodplain. Placement of fill or structures within a floodplain could increase base flood elevation or cause new backwaters to form upstream. Downstream impacts could include increased velocities and erosion.

3.13.4.3 Comparison of Purple, Green, and Orange Alternatives

The discussion of relative impacts on water resources in this section is based on quantity of the resource within each alternative, the potential for each alternative to avoid resources during the Tier 2 NEPA design process, and the amount of new versus co-located corridor within each alternative. The Build Corridor Alternative's ability to avoid resources was determined by assessing the density, size, and position of each resource within the corridor. New corridors are generally expected to have greater overall impacts on resources than co-located corridors because they would result in the greatest amount of new disturbance.

Active Management Areas

Table 3.13-1 shows the miles of each alternative within active management areas. The Purple and Green Alternatives have comparable lengths within active management areas, while the Orange Alternative has the shortest length within active management areas.

Table 3.13-1. Active Management Areas in the 2,000-foot-wide Build Corridor Alternatives

Active Management Area	Purple Alternative[a]	Green Alternative	Orange Alternative	Recommended Alternative	Preferred Alternative with West Option	Preferred Alternative with East Option
Santa Cruz	37.1	28.9	28.9	28.9	28.9	28.9
Tucson	63.8	70.9	72.3	77.4	90.0	69.0
Pinal	57.6	63.1	58.9	63.2	67.9	65.4
Phoenix	93.2	83.0	54.0	88.5	83.2	83.2
Total	**251.7**	**245.9**	**214.1**	**258.0**	**270.0**	**246.5**

SOURCE: ADWR 2020.
[a] All numbers in table rounded to the nearest 0.1 mile.

Both the Purple Alternative and the Green Alternative are in close proximity to the CAVSARP and SAVSARP and may impact ancillary facilities such as monitoring wells. The Purple Alternative is situated such that impacts on Basin 1 of the SAVSARP would be nearly unavoidable, given the basin's 1,000 foot width. Loss of SAVSARP Basin 1 would negatively impact the aquifer recharge program and may interfere with the Tucson Active Management Area's ability to meet or maintain its goal of safe-yield.

Overall, impacts on active management areas are expected to be the lowest for the Orange Alternative and highest for the Purple Alternative. The Purple Alternative would have the greatest impact due to its potential to impact the SAVSARP. Otherwise, the Green Alternative would be expected to have the greatest effect to active management areas because it has the greatest length of new corridor. The Orange Alternative would have the most co-located corridor options and would, therefore, have the lowest amount of new impervious surface. This would result in the lowest anticipated amount of new runoff and lowest reduction in groundwater infiltration compared with the other two alternatives. Additionally, portions of two corridors utilized only by the Orange Alternative, Option K and Option Q1, occur outside active management areas.

Sole Source Aquifers

The miles of each Build Corridor Alternative within sole source aquifers are shown in **Table 3.13-2**. The Purple, Green, and Orange Alternatives have comparable lengths within the Upper Santa Cruz and Avra Valley Sole Source Aquifer. However, the Orange Alternative is expected to have fewer impacts on sole source aquifers because it contains the greatest length of co-located corridor and would, therefore, have the lowest amount of new impervious surface and other disturbance.

Table 3.13-2. Sole Source Aquifers in the 2,000-foot-wide Build Corridor Alternatives

Sole Source Aquifer	Purple Alternative[a]	Green Alternative	Orange Alternative	Recommended Alternative	Preferred Alternative with West Option	Preferred Alternative with East Option
Upper Santa Cruz and Avra Valley	100.9	99.7	101.1	106.2	118.7	97.8

SOURCE: USEPA 2017a.
[a] All numbers in table rounded to the nearest 0.1 mile.

Groundwater Wells

The number of groundwater wells within each Build Corridor Alternative is shown in **Table 3.13-3**. Overall, impacts on groundwater wells are expected to be lowest for the Orange Alternative and highest for the Green Alternative. Although the Orange Alternative would have the highest number of wells within its 2,000-foot-wide corridor, this alternative would have the most corridor options located within existing transportation right-of-way and is therefore anticipated to result in the least disturbance to wells. The Orange Alternative would also result in the lowest amount of new impervious surface and resulting runoff that could contaminate wells compared with the other alternatives.

Table 3.13-3. Groundwater Wells in the 2,000-foot-wide Build Corridor Alternatives

	Purple Alternative	Green Alternative	Orange Alternative	Recommended Alternative	Preferred Alternative with West Option	Preferred Alternative with East Option
Number of Wells	900	689	1137	887	636	1183

SOURCE: ADWR 2017.

Impaired Waters

Table 3.13-4 shows the miles of each impaired water within 0.5 mile upstream or 1.0 mile downstream of each Build Corridor Alternative. The Orange Alternative is located near an impaired stretch of the Santa Cruz River north of Tucson that is not located in proximity to the Purple and Green Alternatives. The Purple Alternative parallels an impaired stretch of the Gila River not in proximity to the other alternatives but avoids an impaired stretch of the Gila River crossed by the Green and Orange Alternatives. The Purple and Green Alternatives would both cross an impaired stretch of the Hassayampa River not crossed by the Orange Alternative.

Table 3.13-4. Miles of Impaired Waters in Proximity to the 2,000-foot-wide Build Corridor Alternatives

Impaired Water	Purple Alternative[a,b]	Green Alternative	Orange Alternative	Recommended Alternative	Preferred Alternative with West Option	Preferred Alternative with East Option
Santa Cruz River	22.8	22.8	31.4	22.8	22.8	31.4
Potrero Creek	3.9	3.9	3.9	3.9	3.9	3.9
Nogales Wash	3.1	3.1	3.1	3.1	3.1	3.1
Gila River	3.6	2.3	2.3	3.6	2.3	2.3
Hassayampa River	1.4	1.4	0.0	1.4	0.0	0.0
Total	**34.8**	**33.5**	**40.7**	**34.8**	**32.1**	**40.7**

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

Overall, the Purple Alternative is anticipated to have the greatest impacts on impaired waters, while the Orange Alternative is anticipated to have the lowest impacts. Although the Green and Purple Alternatives would avoid an impaired segment of the Santa Cruz River north of Tucson that is paralleled by the Orange Alternative, this segment of the Orange Alternative is co-located with the existing I-10. The Green and Purple Alternatives would construct a new crossing over an impaired segment of the Hassayampa River, which is likely to be more impactful. Similarly, although the Purple Alternative would avoid crossing an impaired reach of the Gila River that is crossed by the Green and Orange Alternatives, the crossing is co-located with the existing SR 85. The portion of the Purple Alternative that parallels an impaired stretch of the Gila River would be a new corridor. However, the Purple Alternative is situated such that if the final

400-foot-wide highway corridor were to run along the northern edge of the Purple Alternative's 2,000-foot-wide corridor, much of the highway would be located greater than 1 mile from the Gila River and would likely avoid impacting impaired waters.

Waters of the US

Table 3.13-5 shows the miles of potential waters of the US within each Build Corridor Alternative. The greatest length of potential waters of the US occurs within the Orange Alternative, while the least length occurs within the Purple Alternative. However, the Orange Alternative is anticipated to have the lowest impact on potential waters of the US because it mostly consists of co-located corridors. The Tres Rios Water Reclamation Facility releases effluent into the Santa Cruz River; therefore, impacts on this feature would also affect waters of the US. Although the Tres Rios Water Reclamation Facility is located within the corridor of the Orange Alternative, the final corridor would likely be sited to avoid impacting the facility. Similarly, the Orange Alternative parallels the Santa Cruz River for a substantial distance in the vicinity of Tucson. If this section of co-located corridor must be widened to accommodate I-11 traffic, many direct impacts on the river could be avoided by widening the east side of the existing highway.

Table 3.13-5. Miles of Potential Waters of the US in the 2,000-foot-wide Build Corridor Alternatives

Potential Waters of the US	Purple Alternative[a]	Green Alternative	Orange Alternative	Recommended Alternative	Preferred Alternative with West Option	Preferred Alternative with East Option
Santa Cruz River	1.7	2.6	6.0	3.1	2.5	6.7
Gila River	0.5	0.7	0.7	0.5	0.7	0.7
Hassayampa River	0.4	0.4	0.4	0.4	0.4	0.4
Other Named	24.2	23.2	22.3	26.3	16.0	15.1
Unnamed	259.6	301.6	429.1	276.1	303.0	289.0
Total	**286.4**	**328.5**	**458.5**	**306.4**	**322.6**	**311.9**

SOURCE: USGS 2019.
[a] All numbers in table rounded to the nearest 0.1 mile.

The Green Alternative would have the highest impacts on potential waters of the US because it primarily consists of new corridors and has the potential to impact a greater length of waters than the Purple Alternative. The Green Alternative also contains a 12-mile-long stretch of braided channels associated with the Santa Cruz River, Los Robles Wash, the Greene Canal, and other unnamed drainages in the vicinity of the Pima-Pinal County Line that would not be affected under the other alternatives. The Purple Alternative would also have high impacts on potential waters of the US, primarily because it would include new crossings of the Santa Cruz and Gila Rivers that are avoided by the other alternatives. Although all three alternatives cross the Hassayampa River; the Green and Purple Alternatives would include a new crossing while the Orange Alternative is co-located with I-10.

Wetlands

Table 3.13-6 shows the acres of potential wetlands and key potential wetlands within each Build Corridor Alternative.

Table 3.13-6. Acres of National Wetlands Inventory Wetlands and Key Potential Wetlands in the 2,000-foot-wide Build Corridor Alternatives

Potential Wetlands[a]	Purple Alternative	Green Alternative	Orange Alternative	Recommended Alternative	Preferred Alternative with West Option	Preferred Alternative with East Option
NWI-mapped (acres)[b]	156	314	313	187	282	286
Santa Cruz River (B)	No	No	Yes	No	No	Yes
Rillito River (B)	No	No	Yes	No	No	Yes
Santa Cruz River (C)	Yes	No	No	Yes	No	No
Braided Channels (F)	No	Yes	No	Yes	Yes [c]	Yes [c]
Vekol Wash (I2)	Yes	Yes	No	Yes	Yes	Yes
Gila River (N)	Yes	No	No	Yes	No	No
Gila River (Q2)	No	Yes	Yes	No	Yes	Yes
Hassayampa River (R)	Yes	Yes	No	Yes	No	No

SOURCE: USFWS 2019.
[a] The corridor option associated with each crossing is indicated in parentheses.
[b] All numbers in table rounded to the nearest acre.
[c] Impacts reduced compared to the Purple, Green, Orange, and Recommended Alternative. See **Section 3.13.4.5**.

The Green and Orange Alternatives each have twice the acreage of potential wetlands within their corridors than the Purple Alternative. However, the Orange Alternative is anticipated to have the lowest impact on potential wetlands because it mostly consists of co-located corridors. While the Purple Alternative has a lower acreage of potential wetlands within its corridor and generally has a longer length of co-located options than the Green Alternative, the Purple Alternative would include a new crossing of the Gila River that could impact potential wetlands. The Green and Orange Alternatives would cross the Gila River via a segment co-located with SR 85. Although potential wetlands are also present at this crossing, they would experience fewer new impacts due to the presence of the existing highway. However, the Green Alternative would include construction of a new corridor through a stretch of potential wetlands within Option F that would not be impacted by the Purple or Orange Alternatives. Both the Purple and Green Alternatives would include a new crossing of the Hassayampa River that could impact potential wetlands. The Orange Alternative would cross the Hassayampa River via a corridor co-located with I-10. As identified by geospatial data (USGS 2004), potential wetlands are not likely to occur at this location because the dominant plant species are not wetland indicators (USDA 2020). Therefore, both the Purple and Green Alternatives are considered to have a high potential to impact wetlands.

Floodplains

Table 3.13-7 shows the acres of floodplains within each Build Corridor Alternative. Overall, the Green Alternative would have the highest impacts on floodplains, followed by the Purple Alternative and the Orange Alternative. As a mostly new corridor, the Green Alternative would result in the greatest amount of new structural fill being placed within mapped floodplains, which would change flood elevations, constrict waterways, and potentially exacerbate downstream flooding. The Orange Alternative would result in the least amount of new fill within mapped floodplains, both because it is mostly co-located and due to the configuration of floodplains in relation to the corridor. However, the Orange Alternative may impact known levees in Tucson and Marana. Although the Purple Alternative has the largest acreage of mapped floodplains within its corridor, its impacts would be intermediate between the Orange and Green Alternatives because it has fewer co-located segments than the Orange Alternative and more co-located segments than the Green Alternative.

Table 3.13-7. Acres of FEMA Floodplains in the 2,000-foot-wide Build Corridor Alternatives

	Purple Alternative[a,b]	Green Alternative	Orange Alternative	Recommended Alternative	Preferred Alter-native with West Option	Preferred Alter-native with East Option
Floodplains	15,534	14,926	11,263	15,817	13,261	10,809

SOURCE: FEMA 2017.
[a] All numbers in table rounded to the nearest acre.
[b] Refer to **Appendix E13** (Water Resources Technical Memorandum) for flood zone definitions.

3.13.4.4 Recommended Alternative

Active Management Areas

Active management areas within the Recommended and Preferred Alternatives are shown on **Figure 3.13-10, Figure 3.13-11,** and **Figure 3.13-12**. **Table 3.13-1** shows the miles of each alternative within active management areas. The Recommended Alternative has more length within active management areas than the Purple, Green, or Orange Alternatives.

Potential effects to the CAVSARP and SAVSARP are substantially decreased under the Recommended Alternative compared to the Purple and Green Alternatives. Due to an eastward shift in the corridor alignment, the Recommended Alternative would completely avoid impacting Basin 1 of the SAVSARP. As a result, this alternative is not anticipated to interfere with the Tucson Active Management Area's ability to meet or maintain its goal of safe-yield. The eastward corridor shift also places a greater distance between the Recommended Alternative and the CAVSARP and SAVSARP, thus reducing the potential for accidental hazardous materials releases to impact these facilities.

Overall, impacts on active management areas under the Recommended Alternative are expected to be lower than the Purple and Green Alternatives due its position in relation to the CAVSARP and SAVSARP. Impacts on active management areas under the Recommended

Alternative are expected to be higher than the Orange Alternative because the Orange Alternative uses more co-located corridor.

Sole Source Aquifers

The miles of each alternative within sole source aquifers are shown in **Table 3.13-2**. The Recommended Alternative has a comparable length within sole source aquifers compared to the Purple, Green, and Orange Alternatives. However, it is expected to have greater impacts on sole source aquifers than the Orange Alternative because it utilizes less co-located corridor; use of co-located corridor is comparable for the Purple, Green, and Recommended Alternatives within sole source aquifers.

Groundwater Wells

Groundwater wells within the Recommended and Preferred Alternatives are shown on **Figure 3.13-10**, **Figure 3.13-11**, and **Figure 3.13-12.** The number of groundwater wells within each alternative is shown in **Table 3.13-3**. Fewer wells occur within the corridor of the Recommended Alternative than occur within that of the Purple and Orange Alternatives and more wells are present than under the Green Alternative. However, the Recommended Alternative is expected to have the greatest potential to impact wells because it utilizes less co-located corridor than the Purple, Green, and Orange Alternatives and has more wells within its corridor than the Green Alternative.

Impaired Waters

Locations of impaired waters within the Recommended and Preferred Alternatives are shown on **Figure 3.13-10**, **Figure 3.13-11**, and **Figure 3.13-12. Table 3.13-4** shows the miles of each impaired water within 0.5 mile upstream or 1.0 mile downstream of each alternative. The Recommended Alternative and Purple Alternative would have equivalent impacts because both alternatives utilize the same corridor options near impaired waters. Overall, these two alternatives are anticipated to have the greatest impacts on impaired waters.

Waters of the US

Figure 3.13-13, **Figure 3.13-14**, and **Figure 3.13-15** show potential waters of the US within the Recommended and Preferred Alternatives. **Table 3.13-5** shows the miles of potential waters of the US within each alternative. The Recommended Alternative contains more potential waters of the US than the Purple Alternative and fewer potential waters of the US than the Orange and Green Alternatives. However, the Recommended Alternative would have higher impacts on potential waters of the US than the Purple, Green, and Orange Alternatives in part because it contains less co-located corridor. Further, the Recommended Alternative includes new crossings of the Santa Cruz and Gila Rivers avoided by the Green and Orange Alternatives as well as a new crossing of the Hassayampa River avoided by the Orange Alternative. The Recommended Alternative also contains a 12-mile-long stretch of braided channels associated with the Santa Cruz River, Los Robles Wash, Greene Canal, and other unnamed drainages that would be avoided by the Purple and Orange Alternatives.

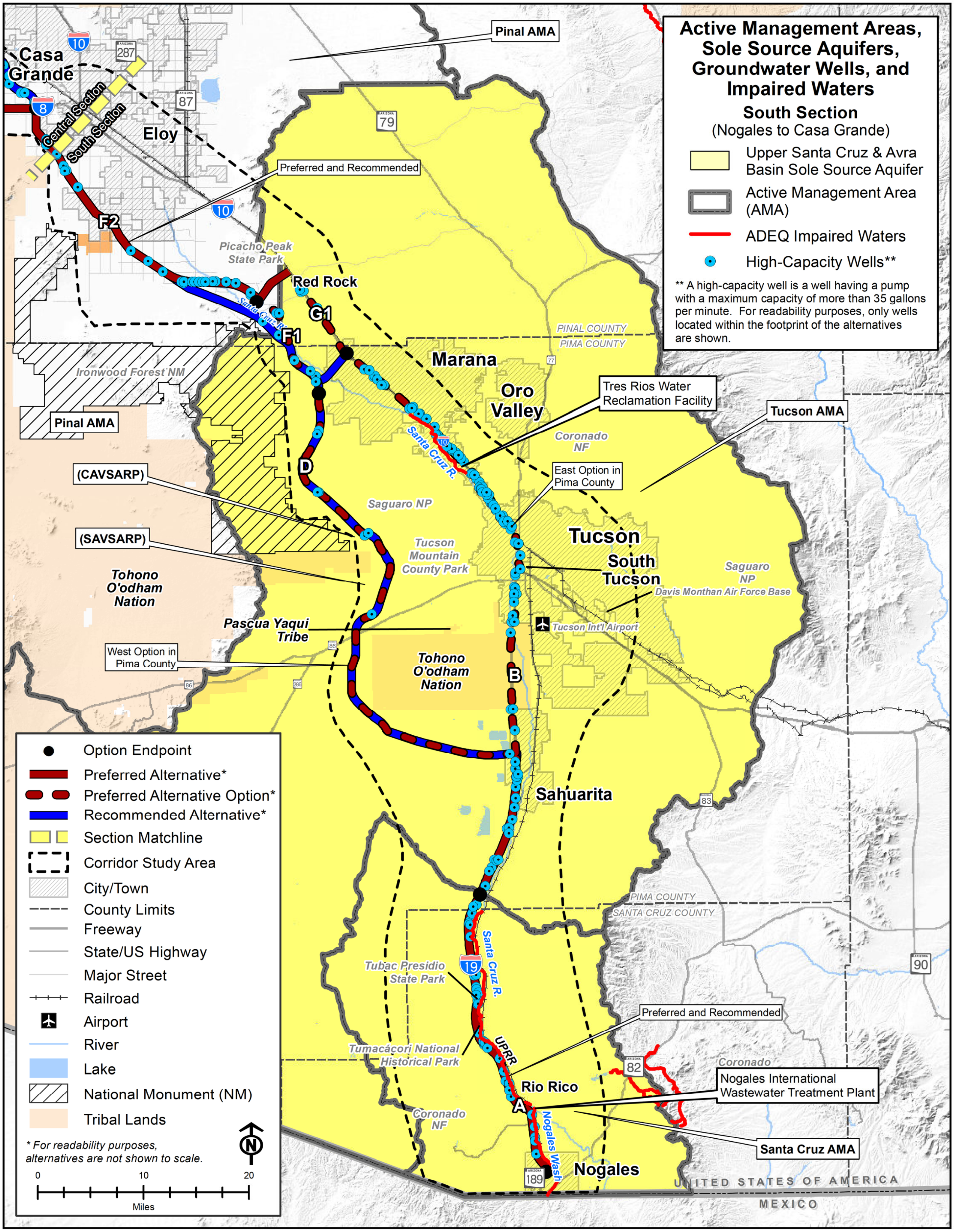

Figure 3.13-10. South Section Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters - Recommended and Preferred Alternatives

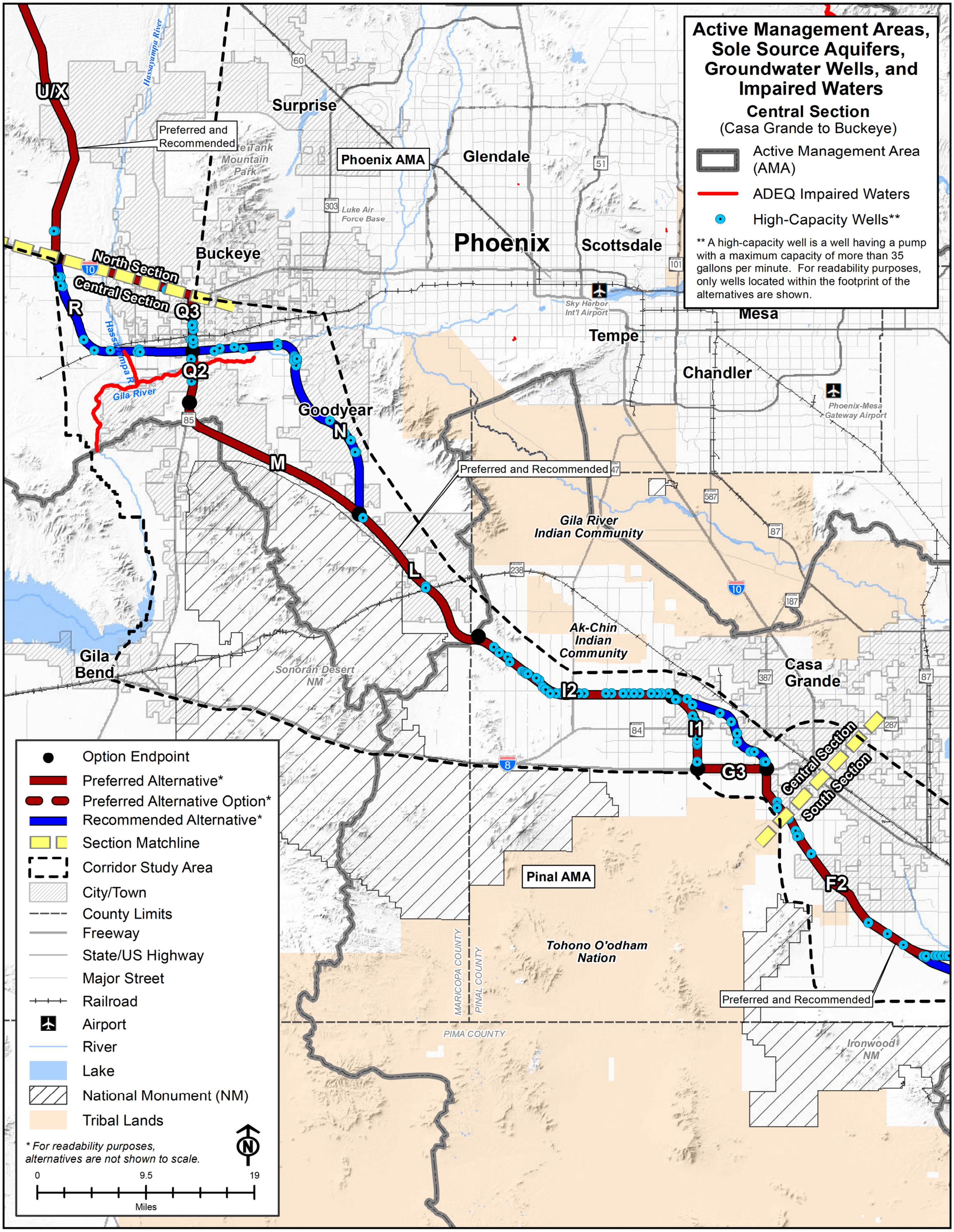

Figure 3.13-11. Central Section Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters – Recommended and Preferred Alternatives

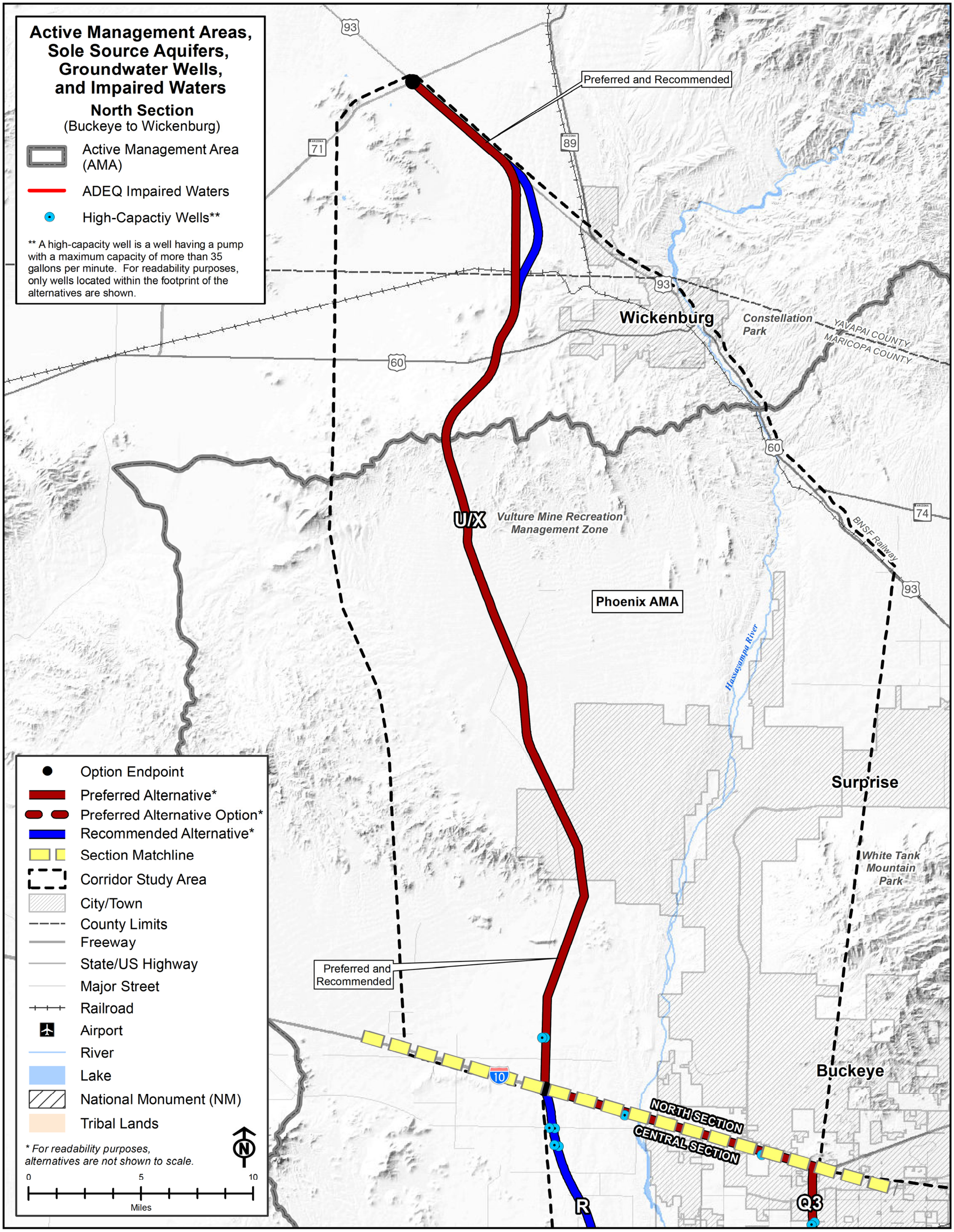

Figure 3.13-12. North Section Active Management Areas, Sole Source Aquifers, Groundwater Wells, and Impaired Waters - Recommended and Preferred Alternatives

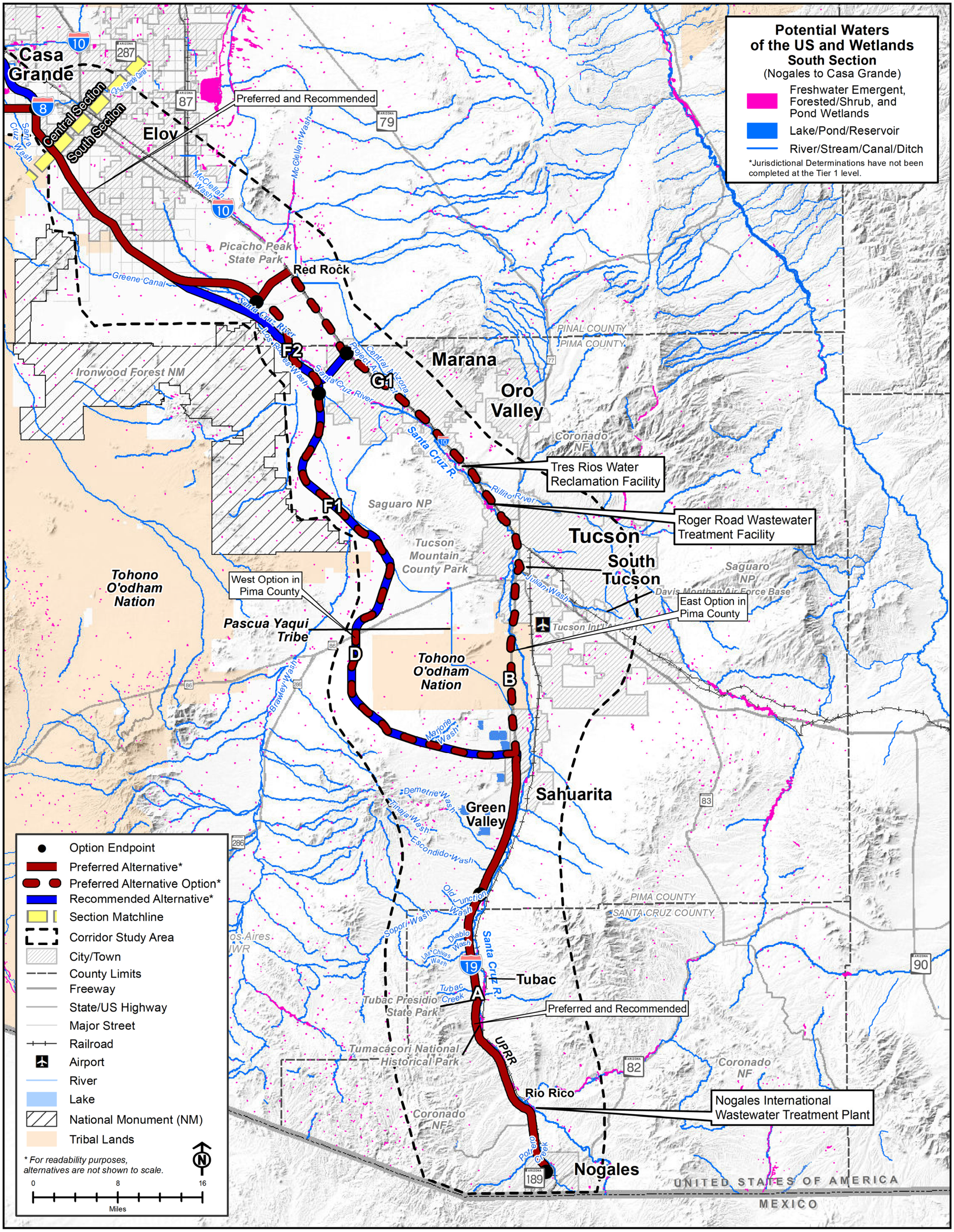

Figure 3.13-13. South Section Potential Waters of the US and Wetlands - Recommended and Preferred Alternatives

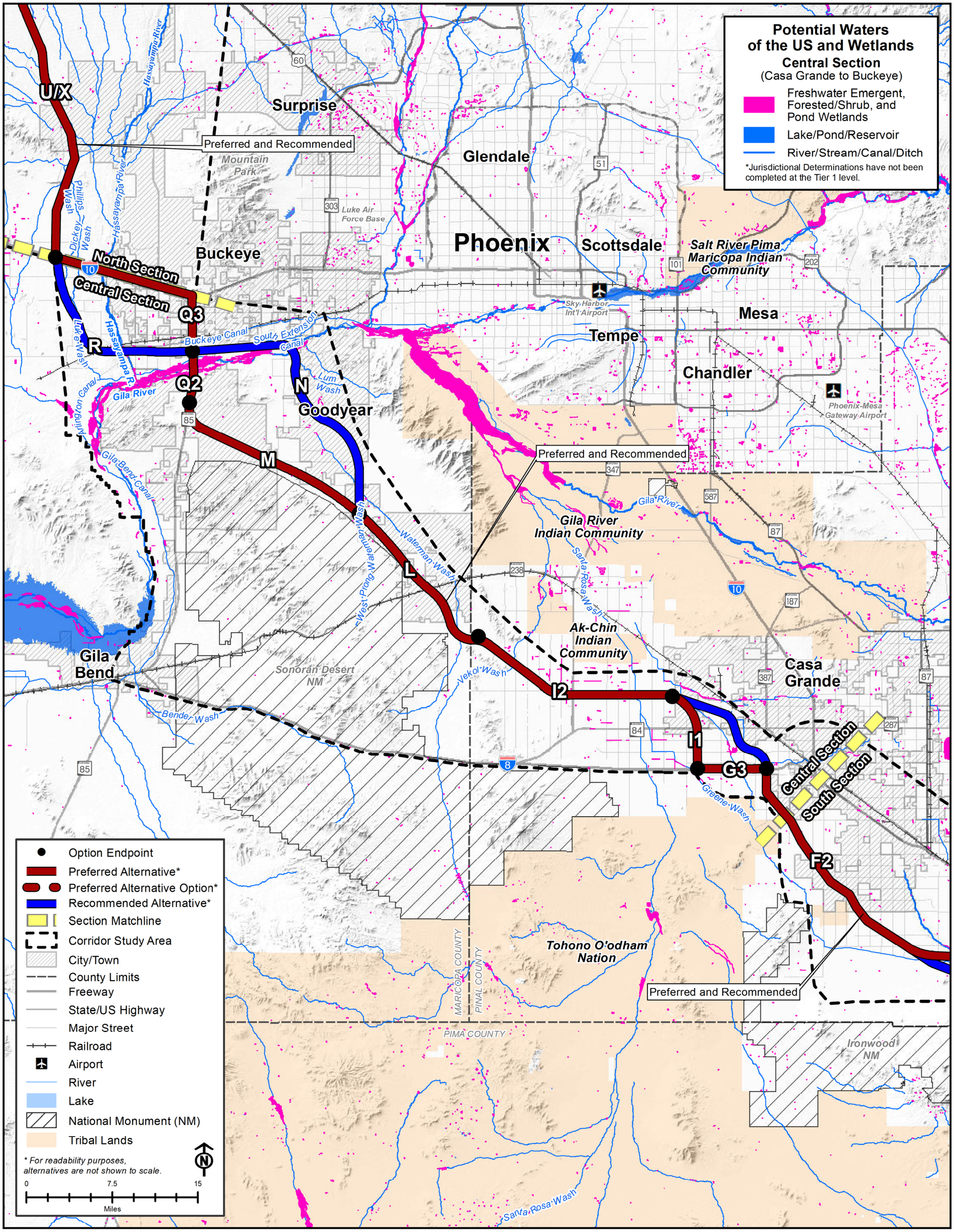

Figure 3.13-14. Central Section Potential Waters of the US and Wetlands - Recommended and Preferred Alternatives

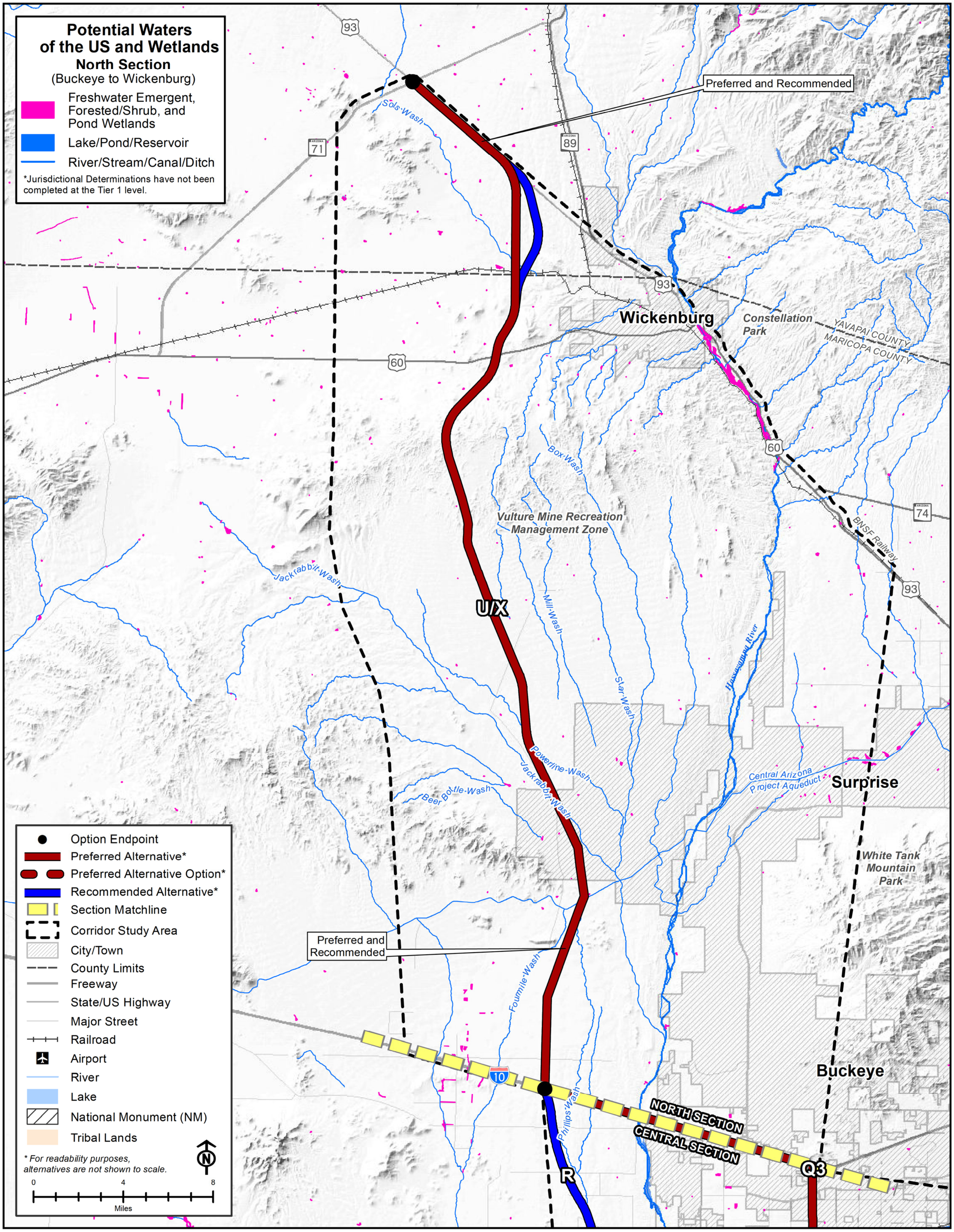

Figure 3.13-15. North Section Potential Waters of the US and Wetlands – Recommended and Preferred Alternatives

Wetlands

NWI-mapped freshwater emergent, forested/shrub, and pond wetlands are shown on **Figure 3.13-13**, **Figure 3.13-14**, and **Figure 3.13-15**. **Table 3.13-6** shows the key potential wetlands and acres of potential wetlands within each alternative. The Recommended Alternative contains more potential wetlands than the Purple Alternative and fewer potential wetlands than the Orange and Green Alternatives. However, the Recommended Alternative would have higher impacts on potential wetlands than the Purple, Green, and Orange Alternatives in part because it contains less co-located corridor. For example, a large proportion of the potential wetland acreage associated with the Green and Orange Alternatives is located along the Gila River within a corridor co-located with SR 85. While the Recommended Alternative avoids wetlands at this location, it would include a new crossing of the Gila River that could result in new impacts on potential wetlands at key locations as identified during site-specific reviews. Further, the Recommended Alternative includes new crossings of the Santa Cruz and Gila Rivers avoided by the Green and Orange Alternatives as well as a new crossing of the Hassayampa River avoided by the Orange Alternative. Potential wetlands were identified during site-specific reviews at all three of these key locations. The Recommended Alternative also contains a stretch of braided channels associated with the Santa Cruz River, Los Robles Wash, Greene Canal, and other unnamed drainages containing potential wetlands that would be avoided by the Purple and Orange Alternatives.

Floodplains

Figure 3.13-16, Figure 3.13-17, and **Figure 3.3-18** show areas mapped by FEMA as floodplains within the Recommended and Preferred Alternatives. **Table 3.13-7** shows the acres of floodplains within each alternative. The Recommended Alternative contains more floodplain acreage than the Purple, Green, and Orange Alternatives. Additionally, the Recommended Alternative is expected to have greater impacts on floodplains because it contains less co-located corridor than the other alternatives.

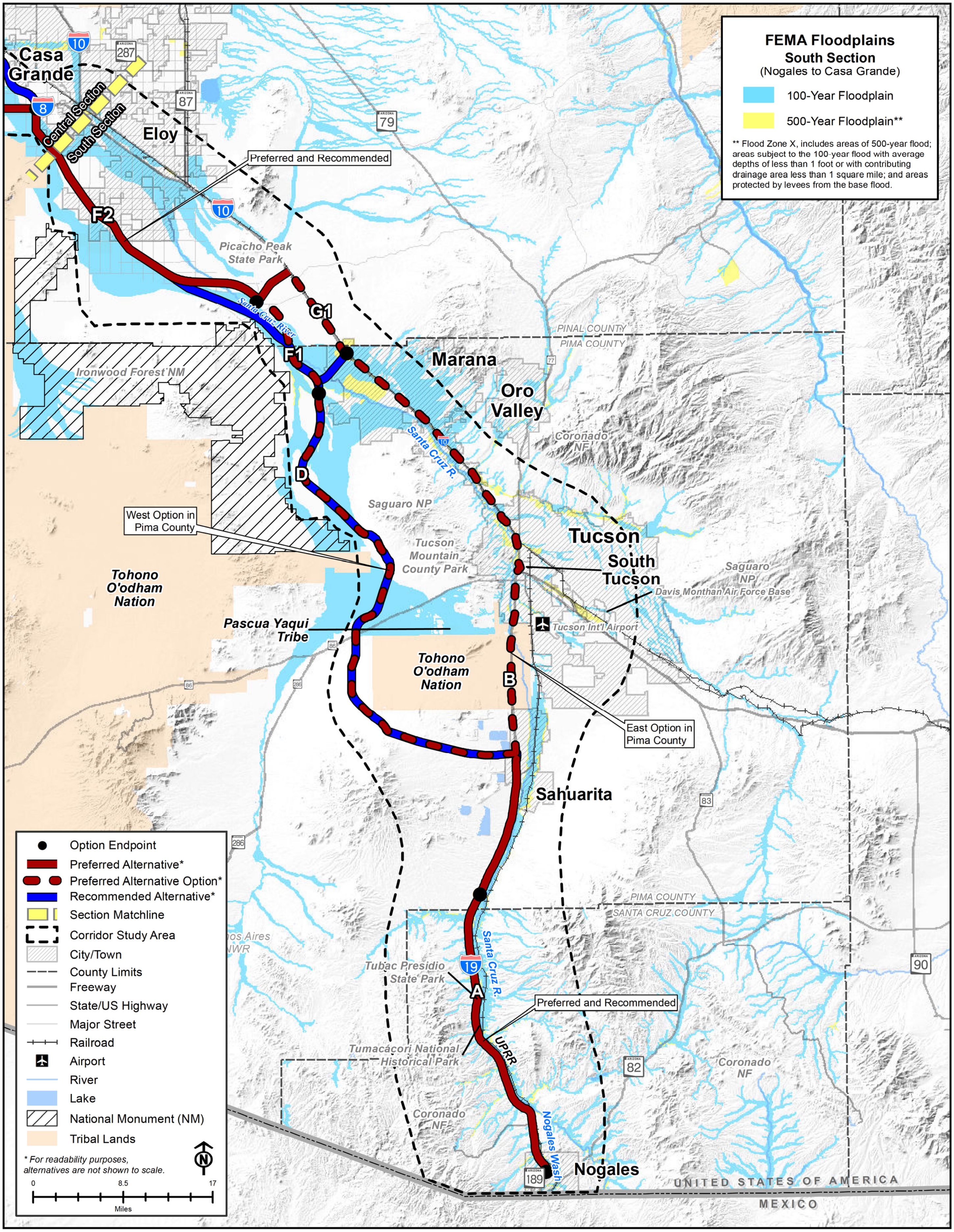

Figure 3.13-16. South Section FEMA Floodplains – Recommended and Preferred Alternatives

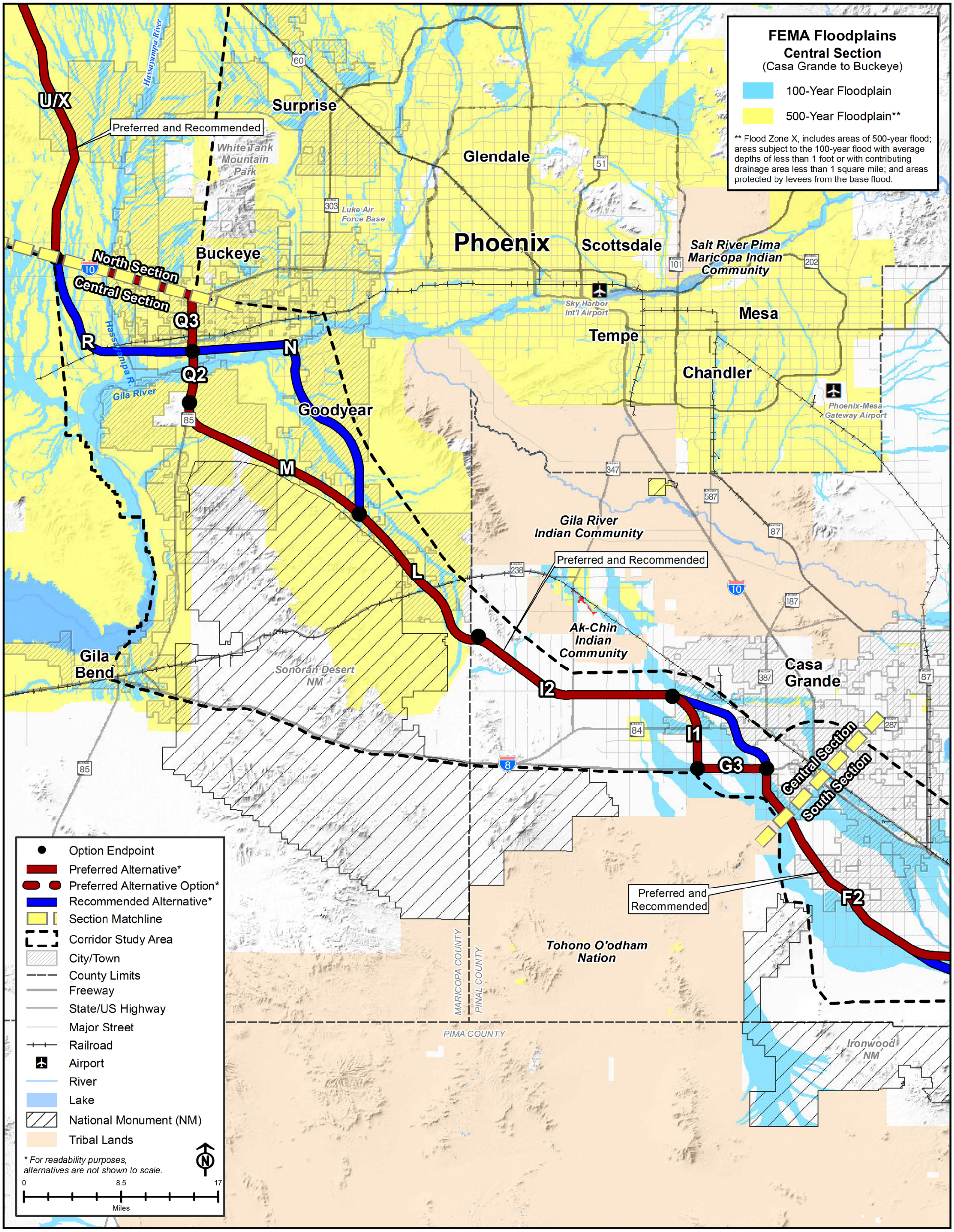

Figure 3.13-17. Central Section FEMA Floodplains – Recommended and Preferred Alternatives

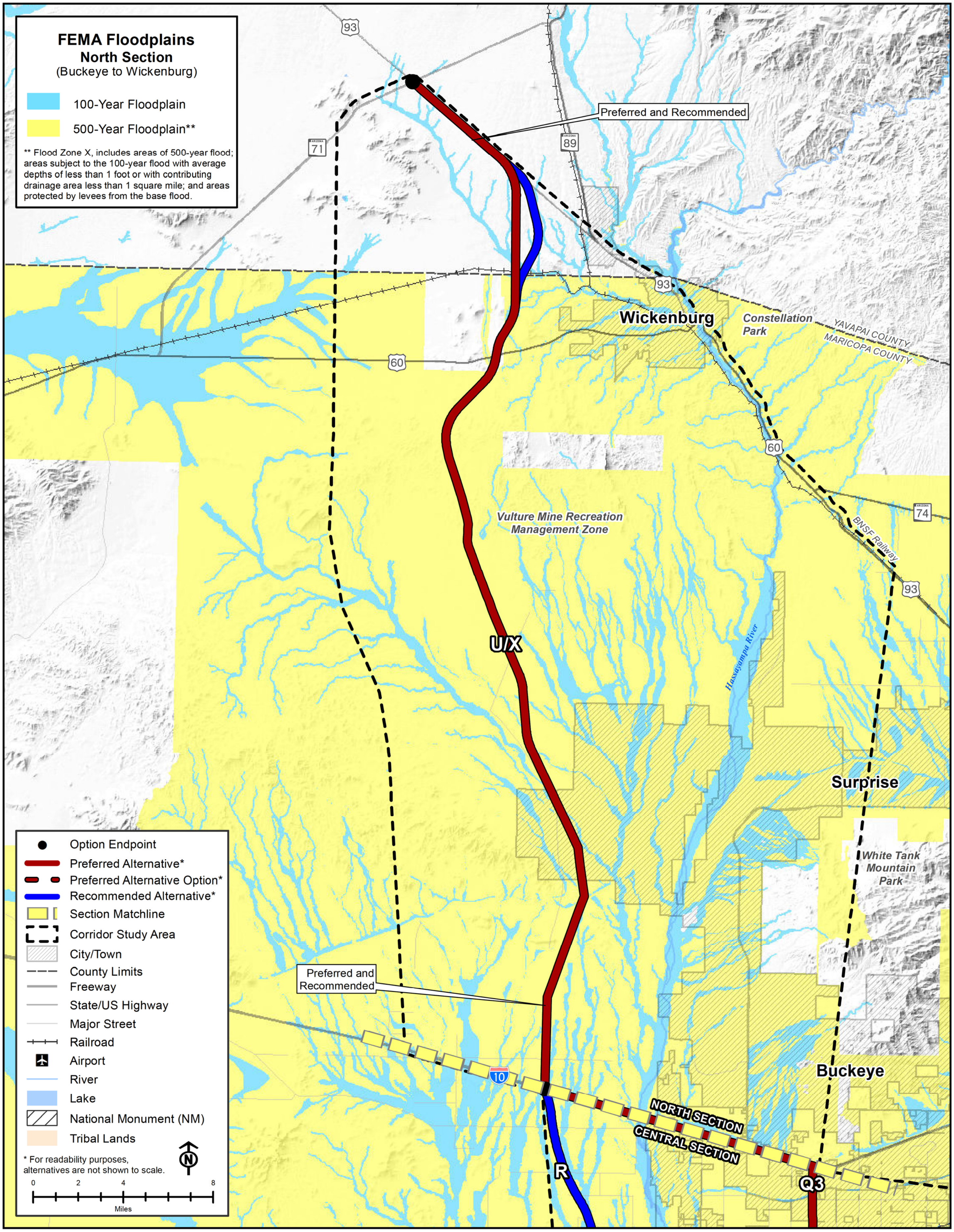

Figure 3.13-18. North Section FEMA Floodplains – Recommended and Preferred Alternatives

Preferred Alternative

Active Management Areas

Table 3.13-1 shows the miles of each alternative within active management areas. The Preferred Alternative west option has a greater length within active management areas than the Recommended Alternative, while the Preferred Alternative east option has less length. For this reason, and because the east option would include more co-located corridor than the west option, the east option is anticipated to result in the fewest impacts on active management areas. Because the Preferred Alternative west option would use more co-located corridor, it is anticipated to result in fewer impacts on active management areas than the Recommended Alternative.

Sole Source Aquifers

The miles of each alternative within sole source aquifers are shown in **Table 3.13-2**. The Preferred Alternative west option has a greater length within sole source aquifers than the Recommended Alternative, while the Preferred Alternative east option has less length. For this reason, and because the east option would include more co-located corridor than the west option, the east option is anticipated to result in the fewest impacts on sole source aquifers. Because the Preferred Alternative west option has a greater length within sole source aquifers than the Recommended Alternative and has a comparable length of co-located corridor, it is anticipated to result in more impacts on sole source aquifers than the Recommended Alternative.

Groundwater Wells

The number of groundwater wells within each alternative is shown in **Table 3.13-3**. Fewer wells occur within the corridor of the Preferred Alternative west option than occur within the corridor of the Recommended Alternative, which in turn has fewer wells than the Preferred Alternative east option. However, the Preferred Alternative east option is anticipated to impact the fewest wells because it utilizes the most co-located corridor. In addition to having fewer wells within its corridor, the Preferred Alternative west option has more co-located corridor than the Recommended Alternative and is therefore expected to have fewer impacts on wells.

Impaired Waters

Table 3.13-4 shows the miles of each impaired water within 0.5 mile upstream or 1.0 mile downstream of each alternative. The Preferred Alternative would have fewer impacts on impaired segments of the Gila and Hassayampa Rivers than the Recommended Alternative because it does not parallel or include new crossings of these impaired waters. Instead, the Preferred Alternative crosses the impaired segment of the Gila River within a corridor co-located with SR 85 and crosses a segment of the Hassayampa River that is not impaired via a corridor co-located with I-10. Of the two Preferred Alternative options, the east option would have the most impacts on impaired waters because it is located along an impaired segment of the Santa Cruz River that would not be impacted by the west option.

Waters of the US

Table 3.13-5 shows the miles of potential waters of the US within each alternative. Both options under the Preferred Alternative have a greater length of potential waters of the US within their corridors than the Recommended Alternative. However, the Preferred Alternative options would avoid the following new crossings of major watercourses included in the Recommended Alternative.

- The Preferred Alternative west option generally follows the alignment of the Recommended Alternative through southern Pinal County. However, the segment of the Recommended Alternative containing a 12-mile-long stretch of braided channels associated with the Santa Cruz River, Los Robles Wash, Greene Canal, and other unnamed drainages was shifted eastwards under the Preferred Alternative west option and away from these features. The Preferred Alternative west option would still require a new crossing of the Santa Cruz River near the Pima-Pinal County Line in the southern portion of this stretch, but this crossing would be perpendicular and no longer follow the river's course. The shifted alignment under both options would require a new crossing of the Santa Cruz River near Eloy in the northern portion of this stretch.
- The Preferred Alternative would avoid a new crossing of the Santa Cruz River at Marana Road that connected the Recommended Alternative to I-10. The Preferred Alternative options would use an I-10 connection farther north that does not cross the river.
- The Preferred Alternative does not include new crossings of the Gila and Hassayampa Rivers. Instead, the Preferred Alternative would cross these rivers via a corridor co-located with SR 85 and I-10.

The two Preferred Alternative options differ in their impacts on the Santa Cruz River and associated watercourses. The Preferred Alternative east option would parallel the Santa Cruz River for a substantial distance in the vicinity of Tucson; however, this segment is co-located with I-10. Meanwhile, the east option would avoid a new crossing of the Santa Cruz River near the Pima-Pinal County Line that would be constructed under the west option. Therefore, the west option is expected to have greater impacts on waters of the US than the east option.

Wetlands

Table 3.13-6 shows the acres of potential wetlands and key potential wetlands within each alternative. Both options under the Preferred Alternative have a greater acreage of potential wetlands within their corridors than the Recommended Alternative. However, the Preferred Alternative options avoid potential wetlands identified during site-specific reviews at the following key locations that would be affected under the Recommended Alternative.

- The Preferred Alternative west option generally follows the alignment of the Recommended Alternative through southern Pinal County. However, the segment of the Recommended Alternative containing potential wetlands along a stretch of braided channels associated with the Santa Cruz River, Los Robles Wash, Greene Canal, and other unnamed drainages was shifted eastwards under the Preferred Alternative west option and away from these features. The Preferred Alternative west option would still require a new crossing of potential wetlands along the Santa Cruz River near the Pima-Pinal County Line in the southern portion of this stretch, but this crossing would be perpendicular and no longer follow the river's course. The shifted alignment under both options would require a new crossing of the Santa Cruz River near Eloy in the northern portion of this stretch. As identified by geospatial data (USGS 2004), vegetation at this location is not dominated by wetland indicator species; therefore, wetlands are not considered likely to be present.

- The Preferred Alternative avoids potential wetlands at a new crossing of the Santa Cruz River in western Marana that connected the Recommended Alternative to I-10. The Preferred Alternative options use an I-10 connection farther north that does not cross the river.

- The Preferred Alternative does not include new crossings of the Gila and Hassayampa Rivers. Instead, the Preferred Alternative crosses these rivers via a corridor co-located with SR 85 and I-10. Much of the acreage of potential wetlands identified by the NWI (USFWS 2019) occurs at the co-located crossing of the Gila River.

The two Preferred Alternative options differ in their impacts on potential wetlands along the Santa Cruz River and associated watercourses. The Preferred Alternative east option would avoid a new crossing of the Santa Cruz River near the Pima-Pinal County Line that would be constructed under the west option. Therefore, the west option is expected to have greater impacts on potential wetlands than the east option.

<u>Floodplains</u>

Table 3.13-7 shows the acres of floodplains within each alternative. Both Preferred Alternative options have less acreage of floodplain within their corridors than the Recommended Alternative. The Preferred Alternative east option would have fewer impacts on floodplains than the west option because it contains less acreage within its corridor and because it contains more co-located corridor.

3.13.4.5 Summary

This section ranks impacts of the various Build Corridor Alternatives to water resources as a whole relative to one another. Rankings reflect both the quantitative and qualitative assessments presented in the preceding sections. As a result, the rankings are themselves qualitative. **Table 3.13-8** ranks the relative impacts on water resources for the Purple, Green, and Orange Alternatives as well as the No Build Alternative. **Table 3.13-9** ranks the impacts on water resources of the Recommended Alternative relative to the Purple, Green, and Orange Alternatives. **Table 3.13-10** ranks the relative impacts on water resources of the two Preferred Alternative options relative to the Recommended Alternative and to one another. **Table 3.13-11,** located at the end of this section, summarizes the impact differences among the Build Corridor Alternatives.

Of the Purple, Green, and Orange Alternatives, the Green Alternative would be the most impactful to water resources as a whole and the Orange Alternative would be the least impactful. In general, this is because the Orange Alternative shares more corridor options with existing transportation facilities, meaning that there would be fewer new water resources impacted.

Table 3.13-8. Comparison of the Potential Impacts on Water Resources in the 2,000-foot-wide Corridors of the Purple, Green, and Orange Alternatives

Resource	Purple Alternative	Green Alternative	Orange Alternative
Active Management Areas	Highest	Intermediate	Lowest
Sole Source Aquifers	Comparable	Comparable	Lowest
Groundwater Wells	Intermediate	Highest	Lowest
Impaired Waters	Highest	Intermediate	Lowest
Potential Waters of the US	Intermediate	Highest	Lowest
Potential Wetlands	Highest[a]	Highest[a]	Lowest
Floodplains	Intermediate	Highest	Lowest

[a] The Purple and Green Alternatives both have high potential impacts on potential wetlands compared to the Orange Alternative. These impacts are not comparable because they affect different wetlands.

Table 3.13-9. Comparison of the Potential Impacts on Water Resources in the 2,000-foot-wide Corridors of the Recommended Alternative to the Purple, Green, and Orange Alternatives

Resource	Purple Alternative[a]	Green Alternative[a]	Orange Alternative[a]
Active Management Areas	Lower	Lower	Higher
Sole Source Aquifers	Comparable	Comparable	Higher
Groundwater Wells	Higher	Higher	Higher
Impaired Waters	Equivalent	Higher	Higher
Potential Waters of the US	Higher	Higher	Higher
Potential Wetlands	Higher	Higher	Higher
Floodplains	Higher	Higher	Higher

[a] Lower indicates that the Recommended Alternative would have fewer impacts than the Purple, Green, or Orange Alternatives, while Higher indicates the Recommended Alternative would have more impacts.

Table 3.13-10. Comparison of the Potential Impacts on Water Resources in the 2,000-foot-wide Corridors of the Recommended and Preferred Alternatives

Resource	Recommended Alternative	Preferred Alternative with West Option	Preferred Alternative with East Option
Active Management Areas	Highest	Intermediate	Lowest
Sole Source Aquifers	Intermediate	Highest	Lowest
Groundwater Wells	Highest	Intermediate	Lowest
Impaired Waters	Highest	Lowest	Intermediate
Potential Waters of the US	Highest	Intermediate	Lowest
Potential Wetlands	Highest	Intermediate	Lowest
Floodplains	Highest	Intermediate	Lowest

Overall, the Recommended Alternative would have higher impacts on water resources than the Purple, Green, or Orange Alternatives primarily because it utilizes the least co-located corridors.

Overall, the Preferred Alternative would have fewer impacts on water resources than the Recommended Alternative primarily because it utilizes the more co-located corridor. Similarly, the Preferred Alternative east option would have fewer impacts on water resources than the west option mainly because it uses more co-located corridors. Although the Preferred Alternative does not result in the least amount of overall impacts to potential waters of the US, it does result in a reduction of impacts to sensitive wetlands by avoiding these areas on the Santa Cruz River in southern Pinal County and eliminating a new crossing of the Gila River near Buckeye and a new crossing of the Hassayampa River west of SR 85 in the Palo Verde area. Therefore, any Tier 2 alternatives developed within the Preferred Alternative corridor are more likely to comply with the Section 404(b)(1) guidelines and contain the Least Environmentally Damaging Practicable Alternative (40 CFR 230.10(a)1-3).

3.13.5 Mitigation and Tier 2 Analysis

3.13.5.1 Tier 2 Analysis Commitments

FHWA and ADOT completed an initial level of analysis in this Final Tier 1 EIS to identify a 2,000-foot-wide corridor for the Preferred Alternative. Additional analysis in Tier 2 will inform (1) the selection of a specific alignment within the selected 2,000-foot-wide corridor and (2) the selection of the west or east option in Pima County. Tier 2 analysis will also identify measures to avoid, minimize, or mitigate impacts on water resources. Specifically, ADOT commits to carrying out the following analysis during the Tier 2 process:

- **T2-Water Resources-1**: Coordinate with USEPA regarding proposed construction within sole source aquifers.

- **T2-Water Resources-2**: Conduct field delineations of potential waters of the US and wetlands within the final project footprint, determine which potential waters of the US and wetlands are jurisdictional under the USACE definition, and identify specific CWA permitting requirements and mitigation. Tier 2 analyses will consider the requirement that no discharge of dredged or fill materials may be permitted if there is a practicable alternative that would have less adverse impact on the aquatic ecosystem.

- **T2-Water Resources-3**: Provide clear documentation of the Tier 1 alternatives analyses and selection process to inform the CWA Section 404 permitting process. Conduct an alternative analysis and selection process for Tier 2 alternatives in support of CWA Section 404 Individual Permit applications and per the requirements of EO 11990.

- **T2-Water Resources-4**: Assess which MS4 applies in which area, and whether any small operators (Phase II MS4s) are located within the Tier 2 study area.

- **T2-Water Resources-5**: Identify USACE civil works projects that may be altered by project construction and obtain USACE approval prior to alteration of such projects as required by Section 14 of the Rivers and Harbors Act.

- **T2-Water Resources-6**: Identify and assess project effects to unmapped floodplains, levees, and flood control basins that may be altered by project construction. Provide flood control districts and jurisdictions the opportunity to provide information regarding unmapped floodplains, levees, and flood control basins.

- **T2-Water Resources-7**: Conduct hydraulic computer modeling or other assessments of impacts on floodplains. Coordinate with local floodplain administrators to discuss the need for Floodplain Use Permits and mitigation. Assess impacts on high-hazard flood areas versus low-hazard (500-year-flood zone) areas and assess floodplain areas that have not been categorized in more detail; additional information sources such as Pima County's mapped regulatory riparian resources may be used to inform this analysis. Assess existing floodplain issues and potential solutions. An avoidance alternative outside of the 2,000-foot corridor may be considered.

3.13.5.2 Mitigation Commitments

As required by NEPA, FHWA and ADOT considered measures to avoid, minimize, and mitigate impacts on water resources from the Project (generally referred to as mitigation measures) during this Tier 1 process. Such strategies are required by many of the federal and state regulations described in **Section 3.13.1**.

The movement and use of hazardous materials present exposure risk from accidental releases and spills. The potential for such releases to impact water resources would be minimized in accordance with local, state, and federal design standards; freight transportation regulations; and management requirements for specific hazardous substances. Further discussion of mitigation strategies and best management practices regarding hazardous materials is included in **Section 3.11** (Hazardous Materials).

Specific mitigation that ADOT is committing to implement if a Build Alternative is selected includes:

- **MM-Water Resources-1**: Develop location-specific avoidance, minimization, and mitigation measures for water resources. Avoid and minimize impacts on waters of the US, including wetlands, to the maximum extent practicable.

- **MM-Water Resources-2**: Incorporate best management practices designed to reduce erosion, minimize sedimentation, and eliminate non-stormwater pollutants into the project design. Standard best management practices are identified in ADOT's *Erosion and Pollution Control Manual for Highway Design and Construction* (2012) and ADOT's *Standard Specifications for Road and Bridge Construction* (2008). The most recent versions of these design standards will apply during Tier 2 analysis. Among others, restrictions and requirements that will be incorporated during construction include the following:
  - Wastewater will be contained and disposed of at an approved off-site location.
  - No equipment refueling will occur within drainages.
  - The contractor will keep a regulated work area free of litter and trash.

- The contractor will remove all construction material and debris from the construction site upon completion of the project.

- **MM-Water Resources-3**: Site the final corridor footprint to avoid sensitive water resources to the maximum extent practicable. Examples of resources that could be avoided through strategic footprint siting include the Tres Rios Water Reclamation Facility, Sweetwater Wetlands Park, certain segments of the Santa Cruz River, and the Nogales International Wastewater Treatment Plant, among others.

- **MM-Water Resources-4**: Comply with federal, state, and local regulations pertaining to water resources and acquire the necessary permits and approvals prior to project construction.

- **MM-Water Resources-5**: Coordinate with federal, state, and location jurisdictions as appropriate to identify water resources of concern and to develop strategies to avoid and minimize impacts.

3.13.5.3 Additional Mitigation to be Evaluated in Tier 2

During the Tier 2 process, ADOT will evaluate mitigation measures to include design features, best management practices, permit requirements, and/or other mitigation strategies suggested by agencies or the public. Such measures may be structural or non-structural in nature. Structural measures are intended to permanently slow stormwater runoff, retain pollutants, and reduce disturbance within drainages. Non-structural measures include temporary or ongoing procedures and policies to reduce impacts on water resources implemented during facility construction and post-construction maintenance.

Examples of permanent measures that ADOT may evaluate in Tier 2 include:

- Incorporate check dams into the project design to slow water before it enters waterways or wetlands.

- Design bridges to span drainages or reduce the number of piers within waters.

- Use self-cleaning culverts.

- Use retention ponds to hold water long enough to allow sediments and other pollutants to settle out.

- Locate rest stops away from drainages.

Examples of temporary or ongoing measures that ADOT may evaluate in Tier 2 include:

- Use wattles around the work area to capture sediment during the construction phase.

- Use tracking pads so that equipment does not carry sediment onto roadway surfaces during the construction phase.

- Sweep adjacent roadways daily to pick up sediment that the tracking pads do not catch.

- Limit the work area to avoid sensitive areas such as wetlands. Place protective material over wetlands before any temporary fill or equipment crossings occur and remove all materials after work is completed.
- Stabilize disturbed areas as soon as possible after work is completed.
- Limit the use of fertilizers along highways or at rest stops.
- Provide bags and regulations for picking up dog waste at rest stops.
- Design features to capture stormwater runoff for supplemental irrigation of landscaping.