# 2 Alternatives Considered

This chapter summarizes the routing alternatives considered for the APRCS. The Alternatives Analysis (AA) Report, available in the *Alternatives Analysis Appendix*, documents the assessment of opportunities in the study corridor that led to the selection of the corridor alternatives evaluated in the Tier 1 EIS. Included as an appendix to this Tier 1 EIS, the AA provides supporting documentation to the information presented in this chapter.

## 2.1 Rail Alternatives

As discussed and/or illustrated in the *Alternatives Analysis Report and AA Appendix*, each rail alternative is assumed to have similar characteristics, including:

- 150 mph maximum design speed
- 125 mph maximum operating speed with segments of lower speed where required because of design constraints (mostly in urbanized area)
- Blend of intercity and commuter operations
    - Intercity trains provide express service by stopping only at regional stations, such as airports
    - Commuter trains provide local service by stopping at all stations
- Single track system and a 60-foot cross section with dual track at stations and where directional conflicts are identified by operations modeling
- Coordination and collaboration with the freight rail operators within the study area
- Adherence to UP's "*Commuter Rail Principles,*" where applicable
- As identified as part of the FRA *Southwest Multi-State Rail Planning Study,* a future connection to a larger western network that is envisioned to include a high speed rail connection between Phoenix, Las Vegas, and Los Angeles

## 2.2 Prior Studies

The Sun Corridor megaregion has been evaluated for rail passenger service on a number of occasions in the past several decades. ADOT studied rail options throughout the state in 1993, and a passenger rail feasibility study was conducted in 1994. Those efforts led to an evaluation of high-speed rail in the Tucson-Phoenix Corridor in 1998. MAG completed a Commuter Rail Study in 2010 for the Phoenix metropolitan area, which provides a basis for some of the analysis in the AA related to commuter services. While information from past studies provided a foundation for alternatives criteria and a comparison for study results, the alternative corridors developed for this analysis are based largely on new original work, new data collection, and additional public involvement.

## 2.3 Alternatives Screening and Selection Process

The AA began with a broad range of possible alternatives designed to identify all reasonable connections between Tucson and Phoenix meeting the Project's purpose and need. All available modes were initially considered, including automobile, air, rail, and bus rapid transit (BRT). Automobile travel has been thoroughly analyzed in the study corridor; a comprehensive implementation plan is in place for expanding capacity, but the projected capacity will not fully satisfy future transportation demand. Therefore, infrastructure to support automobile travel will not meet the purpose and need and was not considered further in this analysis. Air travel was not competitive in terms of time or cost and fails to satisfy the purpose and need because it will not effectively serve destinations between the Tucson and Phoenix hubs. Expanding existing bus service was also found not to be competitive with rail or BRT (operating in a dedicated guideway) alternatives in terms of travel time and would be subject to the same reliability limitations as present roadway operations (e.g., congestion, crashes). This left rail and BRT as the primary modal choices to be evaluated further.

The remaining passenger rail and BRT alternatives were refined through progressive levels of analysis, which are listed below and explained in more detail throughout this section.

- Level 1 Initial Screening: Range of Alternatives
- Level 2 Evaluation: Conceptual Alternatives
- Level 3 Evaluation: Final Alternatives

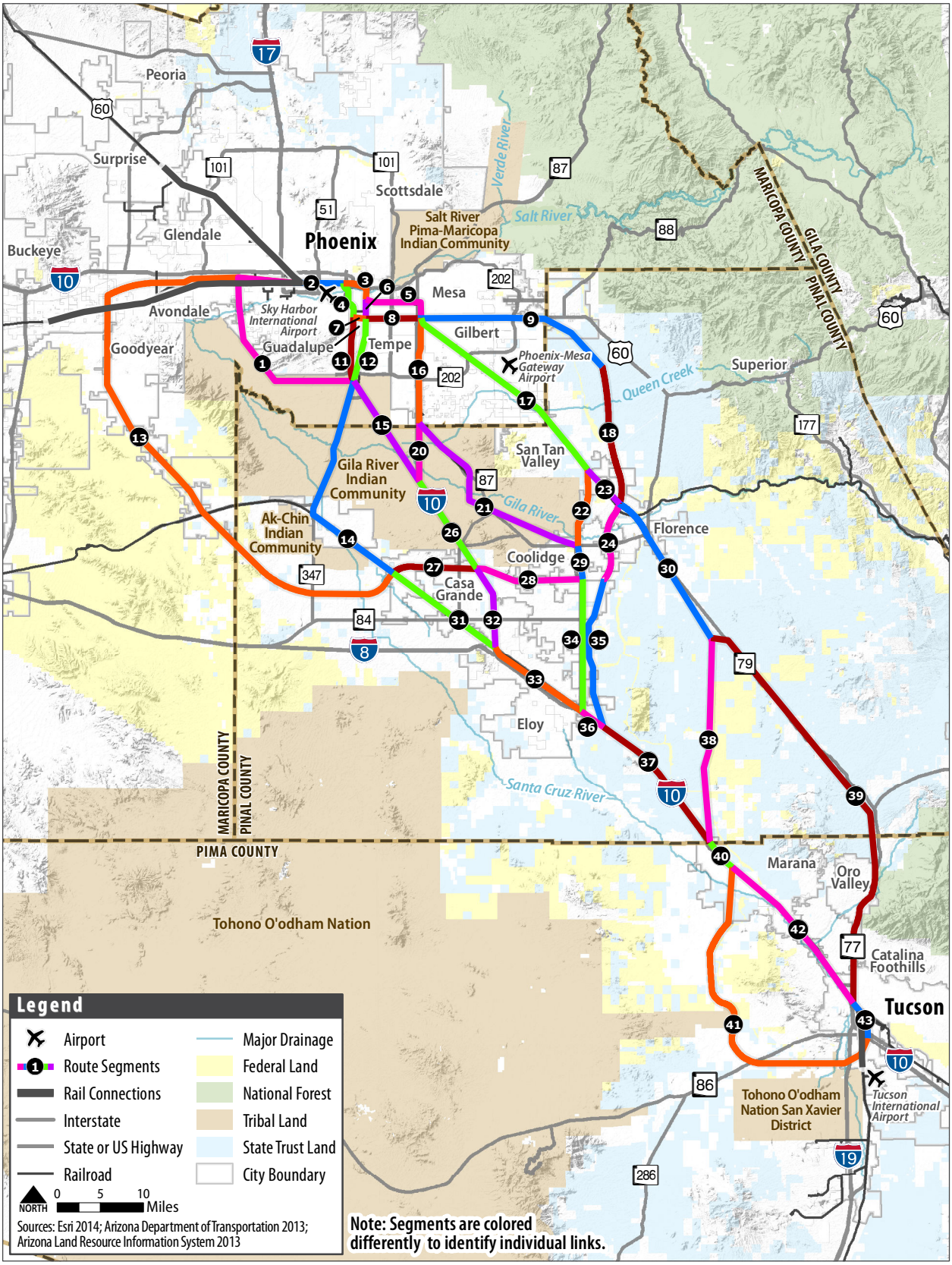
### 2.3.1 Level 1 Initial Screening

#### *Range of Alternatives*

The initial screening evaluated BRT as well as a range of rail alternatives made up of 43 corridor segments linking 38 potential station locations, which produced more than 150 unique corridor alternatives between Tucson and Phoenix. The range of alternatives process introduced all reasonable routes and station locations to be evaluated in the Level 1 initial screening, including those based on public and agency comments. The information from the range of alternatives process was used in the initial screening of corridors and provided a fatal flaw and/or risk assessment to help select routes that best meet the project purpose and need. **Figure 2-1** shows the route segments that were evaluated as part of the initial screening process.

The details of the initial screening process are documented in the Range of Alternatives Report (ADOT Multimodal Planning Division 2012) and Initial Screening Report (ADOT Multimodal Planning Division 2013a), both included in the *Alternatives Analysis Appendix*. The possible route

**Figure 2-1. Route Segments That Define the Range of Alternatives**



segments and locations served were screened based on broad assessments of land use compatibility, environmental impacts, travel markets, and cost. Throughout the initial screening process, the evaluation methodology established an appropriate level of analysis to identify a set of complete alternatives. The screening criteria relied as much as possible upon qualitative measures, with minimal use of quantitative assessments. Qualitative assessments were made to establish a tiered ranking of the measurements and included the input of the public, agencies, and professionals with pertinent expertise.

A complete alternative, defined for purposes of the initial screening, comprised three elements that were assessed independently: alignment, locations served (including hub stations, regional stations, and local stations), and service type (mode and connections). These details, which are discussed later in this chapter, were developed only for purposes of the analysis in the AA because locations served and service type were necessary components in determining effective and viable routes.

FRA determined that the route of a future passenger rail system must first be considered in its regional context, as it would influence roadway networks, future planning processes, and environmental issues spanning portions of three counties, numerous jurisdictions, and multiple independent planning processes. Given the existing and projected

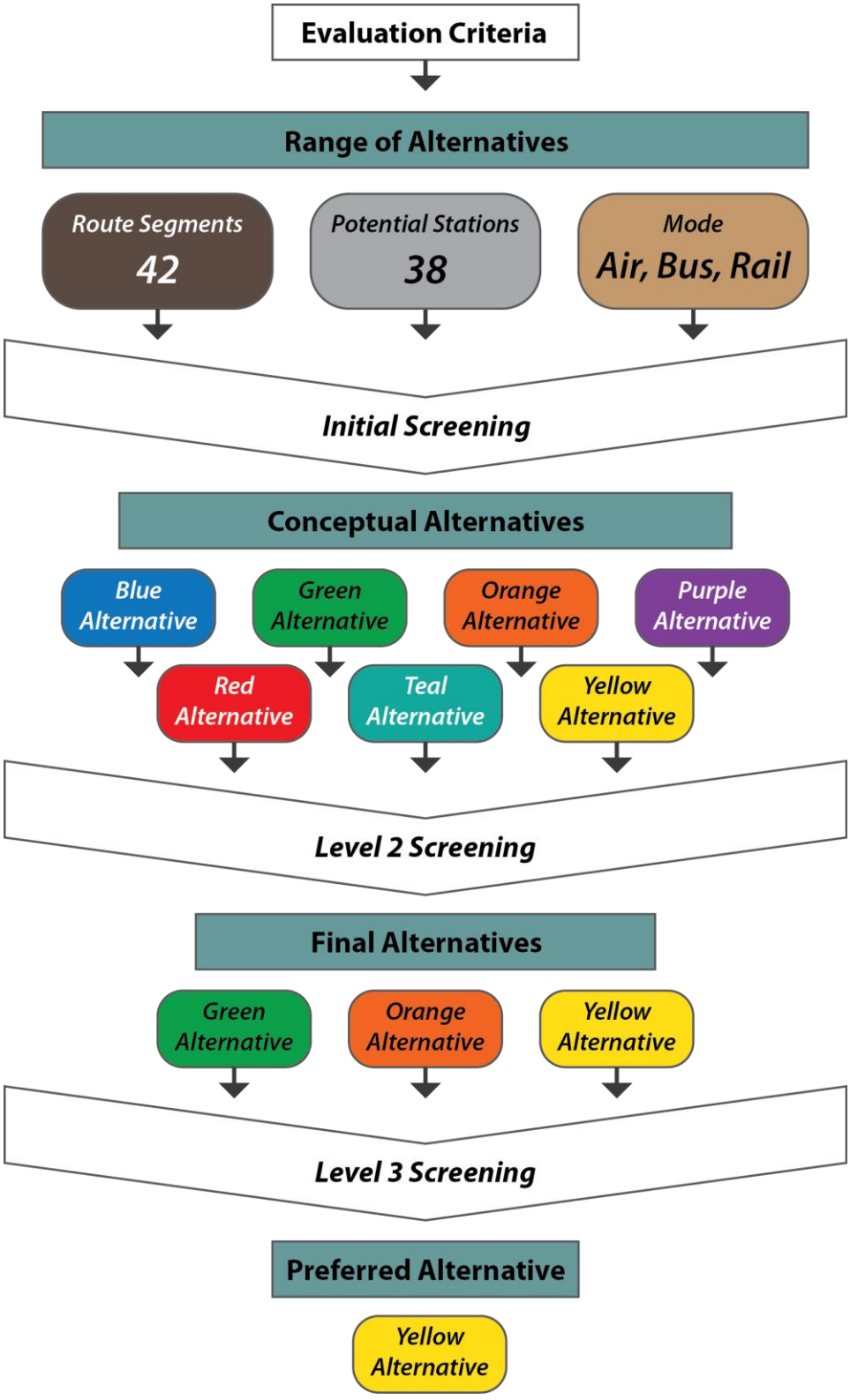
rapid growth in and around the study area, it is vital to identify a preferred corridor alternative as early as feasible, so that planning decisions can consider a future passenger rail system, and before new development reduces alignment options or increases ROW acquisition costs. This Tier 1 EIS evaluates only the corridor alternatives that were identified through the AA's levels of screening and evaluation (**Figure 2-2**). General locations for rail stations were identified in the AA but were used primarily for travel forecasting purposes. Details such as alignment and specific alternative station locations, and the environmental impacts associated with them, would be evaluated in subsequent Tier 2 analyses.

Among the initial list of alternatives that could link the Tucson and Phoenix hub locations, alternatives deemed viable by the initial analysis were those that served population centers between Tucson and Phoenix with a relatively direct route (i.e., minimal or no reverse direction travel). As noted, more than 150 possible 1-mile-wide corridor options were identified that addressed those requirements.

### *Conceptual Alternatives*

After completing the initial screening analysis, the range of reasonable alternatives was refined from the 150 possible alternatives to seven conceptual alternatives and associated station locations. The initial screening found that these seven alternatives would provide the most

**Figure 2-2. Screening Process Developed for the Alternatives Analysis**



effective movement in terms of service, travel time, generalized cost (based on distance), accessibility, and potential environmental effects.

Public and agency input indicated that impacts to undeveloped land should be minimized by considering routes parallel to other, existing linear transportation corridors. Therefore, all seven conceptual alternatives focused on the use of existing transportation corridors such as I-10, Union Pacific Railroad (UP) freight lines, proposed new freeway alignments, or other existing transportation facilities. **Figure 2-3** shows existing railroads within the study corridor. In general, all seven conceptual alternatives attempted to minimize greenfield (previously undisturbed land) impacts, although one alternative relies on a proposed multimodal corridor in a largely agricultural portion of the three-county Study Area. These seven conceptual alternatives selected for further analysis are described below and shown in **Figure 2-4**. The geographical descriptions in this Tier 1 EIS move from south to north, originating in Tucson and ending in Phoenix. These conceptual alternatives include high-level operating assumptions as described in section 3.2 of *Alternatives Analysis Appendix*.

- **Blue Alternative** – A BRT alternative along I-10 between Tucson and Phoenix in dedicated lanes)
- **Green Alternative** — A rail alternative connecting Tucson and Phoenix along I-10 and the UP Tempe Branch
- **Orange Alternative** — A rail alternative along 1) I-10, 2) the planned North-South Corridor, 3) an exclusive transit corridor planned in the proposed Superstition Vistas development on ASLD lands, and 4) the US 60 Superstition Freeway
- **Teal Alternative** — A rail alternative along 1) I-10, 2) the planned North-South Corridor, 3) the Southeast Branch of the UP Phoenix Subdivision, and 4) Rittenhouse Road. The Teal Alternative represents a combination of the Orange and Yellow Alternatives
- **Yellow Alternative** — A rail alternative along the existing UP corridor, including the Southeast Branch of the UP Phoenix Subdivision and the UP Sunset Route (although the UP Sunset Route was later removed, as discussed in **Section** ? on the evaluation of conceptual alternatives).
- **Purple Alternative** — A rail alternative along I-10 from Tucson, turning north through the Gila River Indian Community (GRIC) north of Casa Grande to join the UP Chandler Branch into Phoenix.

**Figure 2-3. Existing Railroads within the Study Corridor**

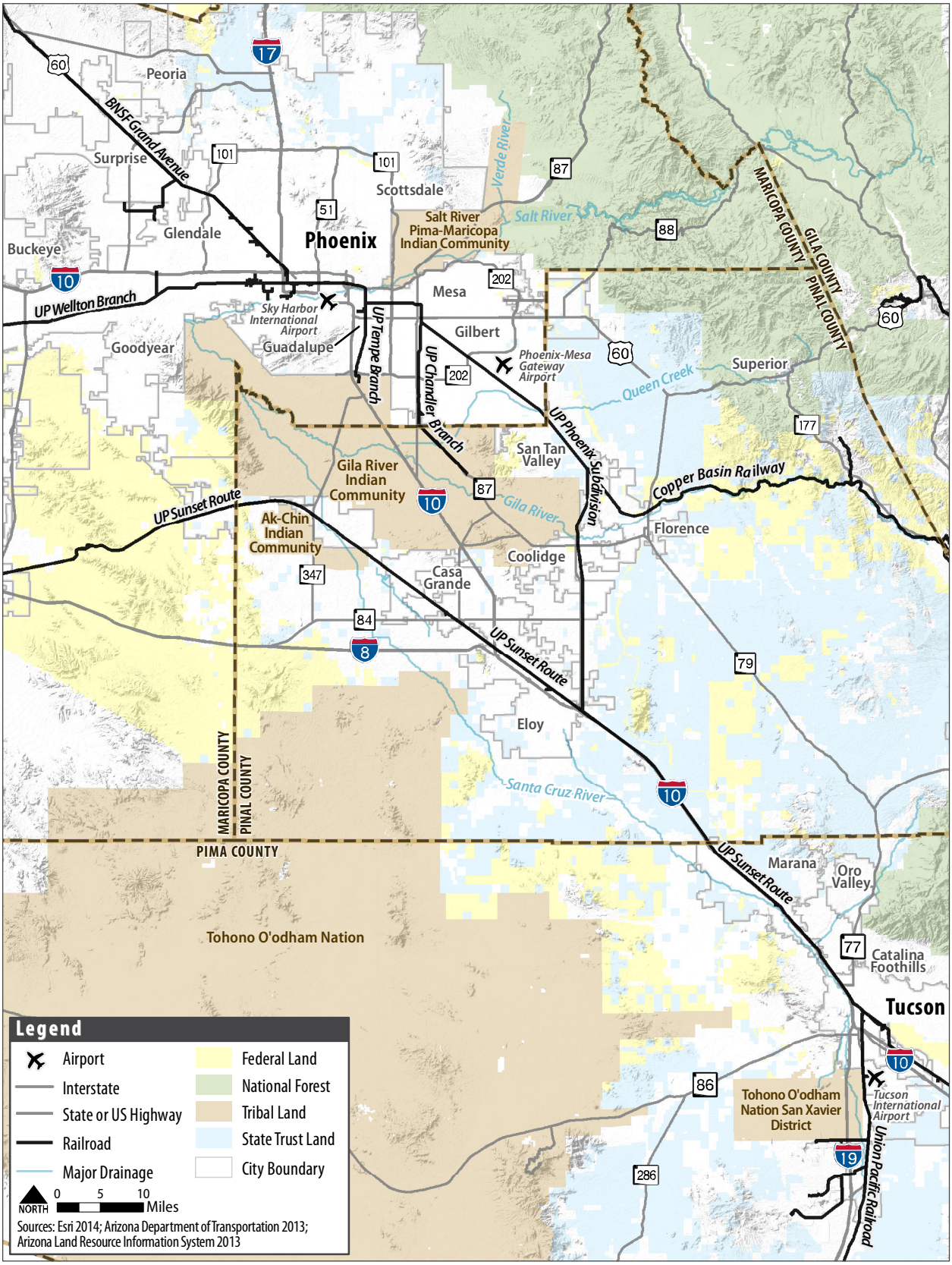
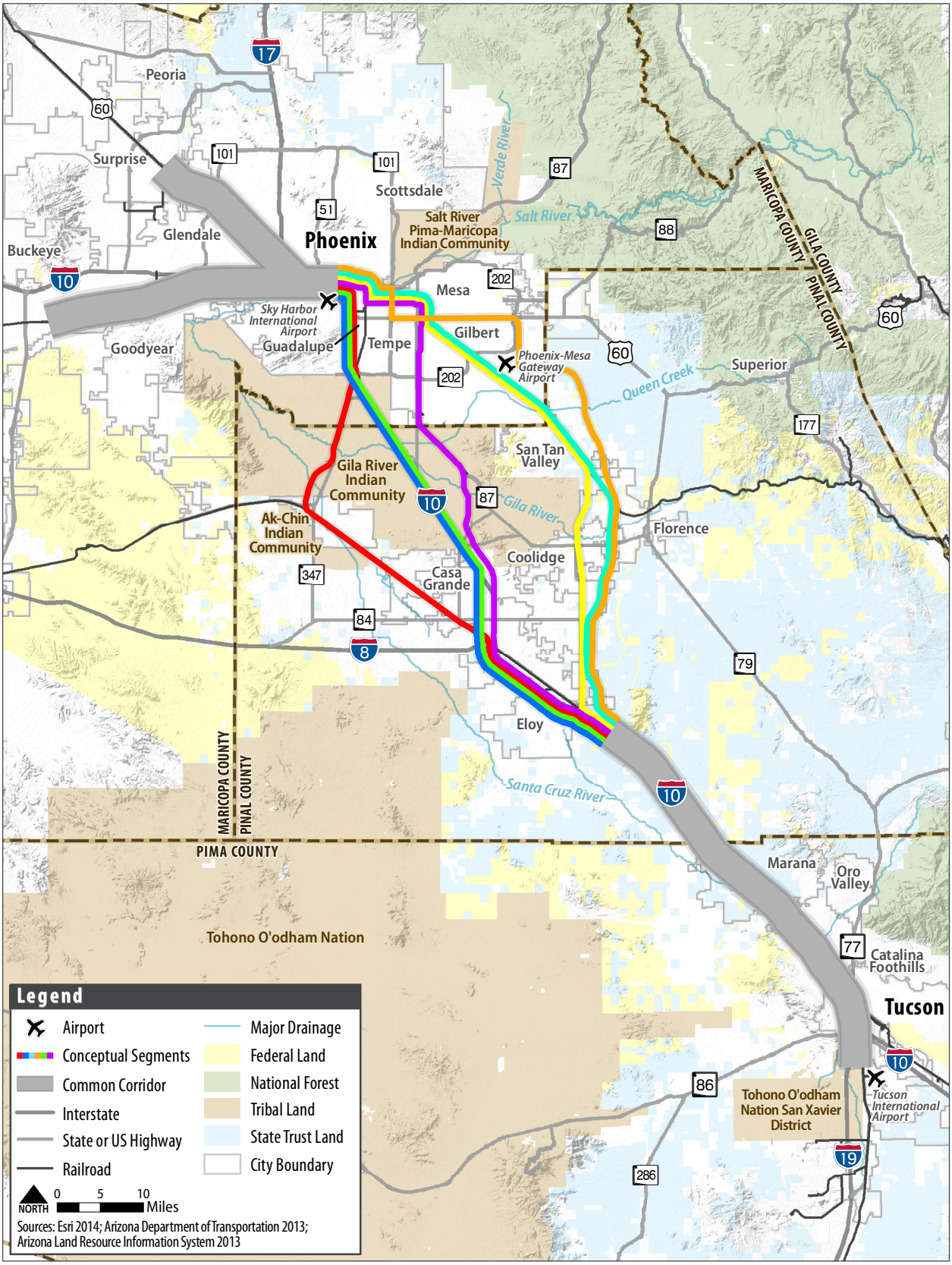


**Figure 2-4. Conceptual Alternatives (Level 2)**



- **Red Alternative** — A rail alternative running along I-10 from Tucson, continuing along the Maricopa-Casa Grande Highway into the City of Maricopa, then following SR 347 to join the UP Tempe Branch into Phoenix

### 2.3.2 Level 2 Screening

#### *Evaluation of Conceptual Alternatives*

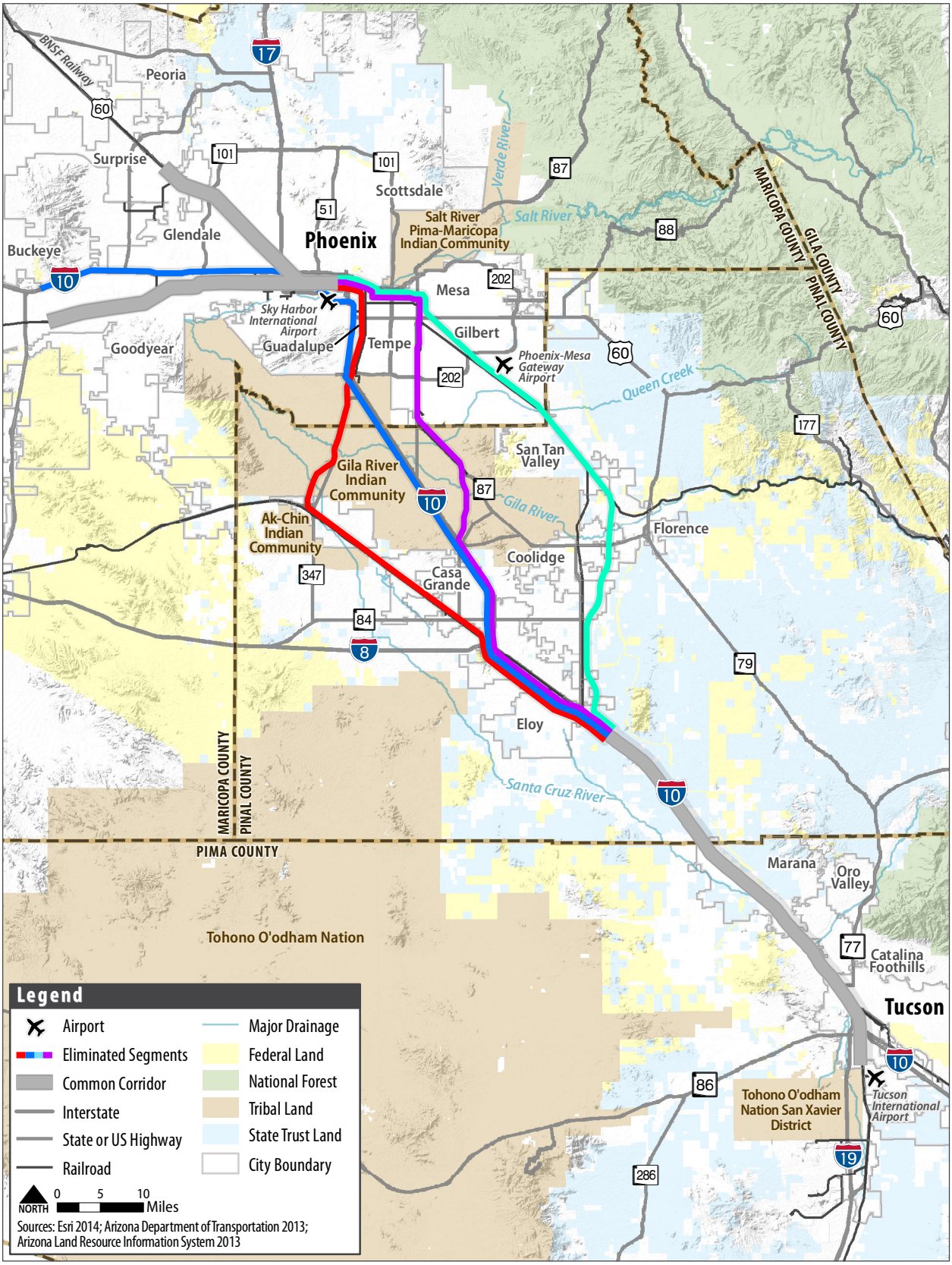
The Level 2 evaluation consisted of a more detailed evaluation of the seven conceptual alternatives identified in the Level 1 initial screening assessment. In Level 2, each alternative was evaluated based on specific information about conditions, including environmental impacts, potential travel performance (predictability and dependability, potential travel market, and travel time), preliminary operating and capital costs, practicality of the proposed project within local government plans, and public input.

The Level 2 screening indicated that the Orange Alternative scored the highest, given a multitude of mobility, environmental, agency/public input, and financial considerations documented in the Level 2 Screening Report (ADOT Multimodal Planning Division 2013b). The Blue (BRT), Green, Purple, and Teal alternatives were determined to have a medium level of feasibility. The Red Alternative was considered one of the least feasible due to a lower performance in the evaluation criteria. Similarly, the Yellow Alternative, based on the goal of sharing the UP Sunset Route in southern Arizona from Tucson to Eloy, was also considered one of the least feasible alternatives. However, subsequent coordination with UP and a reconfiguration of the Yellow Alternative in southern Arizona improved the feasibility.

UP expressed major concerns about shared passenger service on the UP Sunset Route as it is one of UP's busiest and most vital freight routes with plans for over 100 trains per day. This would likely prevent effective shared use as a joint passenger and freight corridor. The southern section of the Yellow Alternative was eliminated due to this conflict, as other viable routes like I-10 exist within the same corridor. The northern portion of the alternative following the UP Phoenix Subdivision remained a viable connection between Eloy and Phoenix and rated favorably in the alternatives screening process.

A separate analysis of major conflicts in the AA determined that three of the seven conceptual alternatives were either fatally flawed or had other characteristics that rendered them noncompetitive, and they were eliminated from further study or development. The eliminated alternatives and a summary of the reasons for the findings are listed below and are shown in **Figure 2-5**.

**Figure 2-5. Alternatives Eliminated from Detailed Study in the Tier 1 EIS**



### *Eliminated Conceptual Alternatives*

The following conceptual alternatives were eliminated from further consideration during the Level 2 evaluation.

- **Blue Alternative** – The Blue (BRT) Alternative would not meet the project purpose and need, as the alternative would be subject to unpredictable highway conditions on I-10 including increased congestion, traffic accidents, and inclement weather events that would make bus operation, even in a dedicated lane, unsafe or unreliable. In addition, the Blue Alternative was least popular among the public, based on submitted comments and survey results. High-level operating cost estimates also indicated that that long-term operation and maintenance costs for bus service would be much greater than a rail alternative and would have substantially lower passenger capacity.
- **Purple Alternative** – This rail corridor would use I-10 from Tucson north and would establish a new corridor through the GRIC population center at Sacaton, continuing north along the UP Chandler Branch into Phoenix. Coordination with GRIC cultural resources staff and Natural Resources Committee indicated that the portion of the corridor through the GRIC would adversely affect Tribal cultural and historic resources and community cohesion and would have a significant effect on property in allocated lands.

  **Red Alternative** – The proposed corridor is longer in distance than other alternatives, would attract a relatively low ridership, and would affect the GRIC in a manner similar to the Purple alternative. These limitations were reflected during the second public outreach phase, when the public ranked the alternative the least favorable overall.

After considering the results of the Level 2 screening and the presence of fatal flaws, the Green, Orange, Teal, and Yellow alternatives emerged as potential final alternatives. These alternatives advanced to Level 3 screening, which provided additional analysis and rationale for further refinements to the alternatives and the resulting elimination of additional alternatives from detailed consideration in the Tier 1 EIS.

### 2.3.3 Level 3 Screening

Analyses of the Teal Alternative were covered under the evaluation of the Yellow and Orange corridor alternatives. As a result, the Teal Alternative was assumed to be part of the Yellow and Orange corridor alternatives, leaving the three final alternatives: Green, Yellow, and Orange. The only area of the Teal Alternative not common to either the Orange or the Yellow alternatives is a 5-mile section along the Copper Basin Railroad corridor.

The Level 3 evaluation analyzed the three remaining final alternatives in greater detail regarding community acceptance and accessibility, environmental impacts, financial feasibility, ease of implementation, operating characteristics, mobility, and safety. Additional screening and ongoing stakeholder coordination resulted in the elimination of the Green Alternative from detailed consideration.

- **Green Alternative** — The shortest alternative between the two hub stations, the Green Alternative received comments of support from many participants in the public outreach process and from some agencies; however, the Green Alternative did not attract ridership comparable to other alternatives, did not effectively serve as many key population centers within the study corridor, and presented a high degree of potential cultural resource impacts.

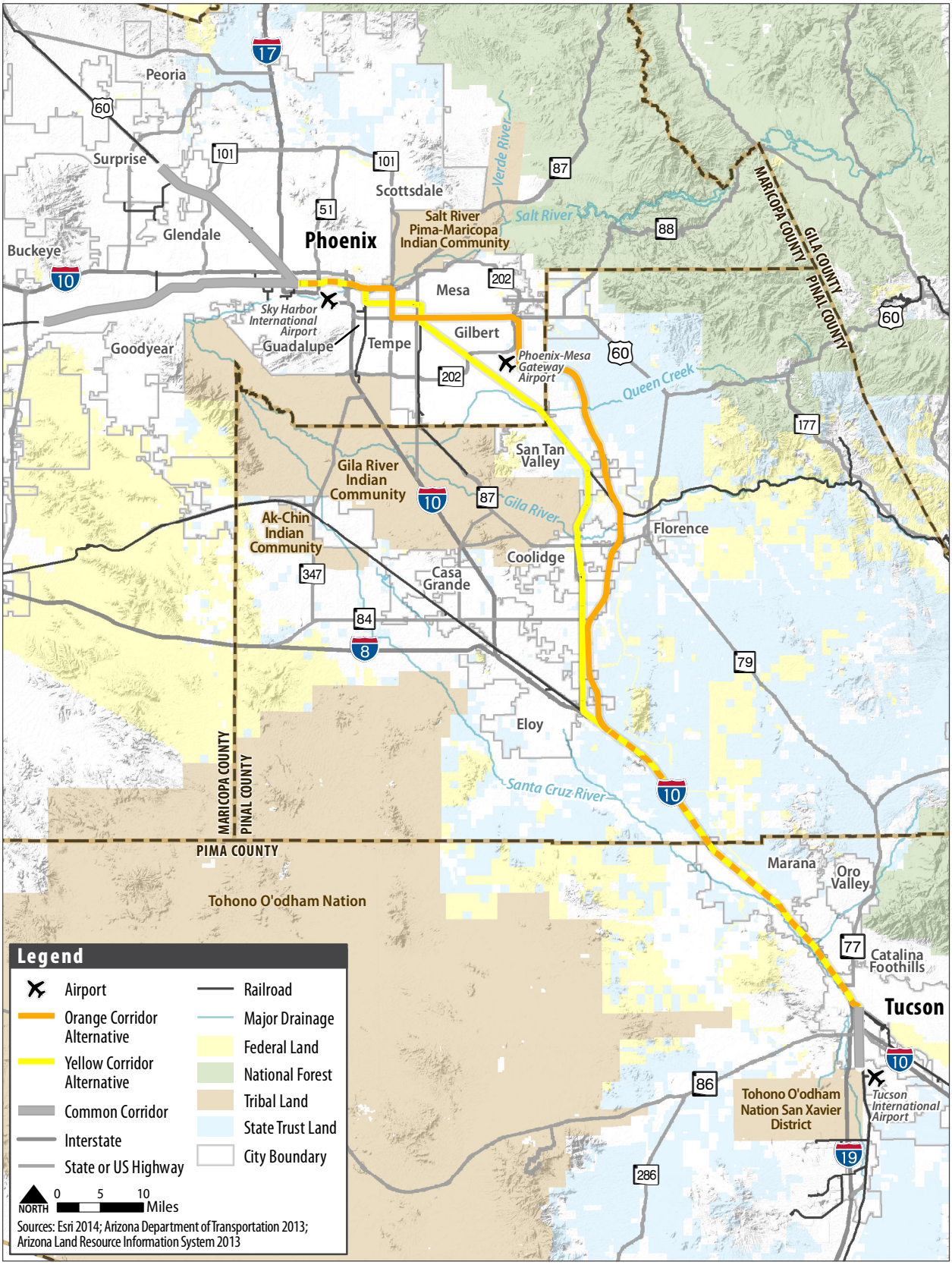
  The GRIC Tribal Historic Preservation Officer, Transportation Technical Team, Natural Resources Standing Committee, and Tribal Council voiced concerns about potential impacts to cultural and community resources. A passenger rail system paralleling I-10 would require additional easement beyond that of the existing highway. The additional land required from the Community would necessitate the acquisition of a large number of allotted parcels, requiring extensive and lengthy ROW and landowner coordination. Due to cultural resource impacts, ROW challenges, and no advantage in ridership, the Green Alternative was no longer advanced for further study. This was presented to the GRIC Tribal Council, and the Council accepted the removal of the Green Alternative from the study with the understanding that complementary transit connections to the GRIC would be included.

Based on the three levels of alternatives screening, the Orange and Yellow corridor alternatives were carried forward for analysis at a corridor level with the intent of providing a basis for identifying corridor-level impacts and understanding system performance.

## 2.4 Alternatives Evaluated in the Tier 1 EIS

Based on the findings in the AA and an assessment of fatal flaws or duplication of study segments, two corridor alternatives were carried forward for detailed analysis along with the No Build Alternative in the Tier 1 EIS. These corridor alternatives were evaluated for potential environmental impacts in the Tier 1 EIS extend between downtown Tucson and downtown Phoenix. Connections to TUS and into the Phoenix metropolitan area's West Valley, as shown in **Figure 2-6**, illustrate the potential for a more comprehensive future rail system. In response to public and agency input, ADOT and FRA commit to include TUS in required future (Tier 2) studies as the southern terminus of a passenger rail system from Tucson to Phoenix.

**Figure 2-6. Corridor Alternatives Carried Forward for Detailed Study**



FTA requires that the AA be used to inform local officials and community members on the benefits, costs, and impacts of transportation options so that the community can identify a preference. This phase is complete when local and regional decision makers select a locally preferred alternative, and it is adopted by the MPO into the region's long-range transportation plan. A locally preferred alternative, typically the final result of an AA, was identified in the Draft Tier 1 EIS and identified by FRA as the preferred alternative in the Record of Decision and this Final Tier 1 EIS.

### 2.4.1 Yellow Corridor Alternative

This corridor alternative is a modification of the original Level 2 Yellow Alternative proposed within the existing UP corridor. The Yellow Corridor Alternative is a 1-mile-wide corridor that would follow the I-10 ROW between Tucson and Eloy and then follow the UP corridor between the City of Eloy and downtown Phoenix. It is anticipated that the Yellow Corridor Alternative would adhere to UP guidelines for coordination of services along active UP freight lines. The Yellow Corridor Alternative and its characteristics, as evaluated in the Tier 1 EIS, are shown in **Figure 2-6**. With selection of this corridor alternative, a future alignment could be designed anywhere within the corridor. ADOT would obtain permission from GRIC to study any alignments encroaching on GRIC land.

### 2.4.2 Orange Corridor Alternative

The Orange Corridor Alternative connects Tucson and Phoenix following existing and planned freeway alignments. The Orange Corridor Alternative extends 0.5 mile on each side of I-10 between Tucson and Eloy, in common with the Yellow Corridor Alternative. From their common point near Eloy to the Phoenix metropolitan area, the Orange Corridor Alternative would follow whichever potential north-south route is ultimately selected for the planned North-South Corridor, which is currently under study as a possible expressway with a high-capacity mode such as rail. From the vicinity of Phoenix-Mesa Gateway Airport into Tempe, the Orange Corridor Alternative follows the existing US 60 (Superstition Freeway), SR Loop 101 (Price Freeway), and SR Loop 202 (Red Mountain Freeway). From Tempe into Phoenix, this corridor alternative follows the UP corridor in the vicinity of Sky Harbor Airport. Should this corridor alternative be selected, a future alignment could be designed anywhere within the 1-mile-wide corridor. ADOT would obtain permission from the Salt River Pima-Maricopa Indian Community (SRP-MIC) to study any alignments encroaching on SRP-MIC land. The Orange Corridor Alternative is shown in **Figure 2-6**.

### 2.4.3 No Build Alternative

Under the No Build Alternative, no passenger rail system would be developed between Tucson and Phoenix. The No Build Alternative assumes that existing and committed projects within the study corridor would occur. This includes all transportation facilities and services programmed for implementation within the three-county Study Area, including transit, roadway, and highway Improvements identified in the Transportation Improvement Programs (TIPs) of MAG, Central Arizona Association of Governments (CAG), the Sun Corridor Metropolitan Planning Organization (SCMPO) and PAG, including major and minor roadway and transit improvements as well as other significant projects in the planning, design, or construction phases.

Transportation projects programmed or under construction include the following:

- Planned Extensions of Valley Metro Light Rail System:
  - Gilbert Road Extension: 1.9 miles in design from Main Street to Gilbert Road in Mesa
  - Phoenix West Extension: Addition from State Capitol, following I-10 to 79th Avenue
  - Northwest Phase II Extension: 2.0 miles to be added from Dunlap and 19th Avenues to Metrocenter Mall
- Tempe Streetcar Addition
  - Network loop serving downtown Tempe along Rio Salado Parkway, Mill Avenue, Ash Avenue, and University Drive
- North-South Corridor
  - New, approximately 50-mile-long expressway in Pinal County connecting Apache Junction to I-10 south of Eloy
- State Route 202L – South Mountain Freeway
  - Extension of State Route 202L connecting Chandler and West Phoenix, via new route south of the Phoenix South Mountain Park/Preserve
- Interstate 10
  - Construction of local express lanes between 32nd Street and Loop 202
  - Roadway widening from four to six general purpose lanes and the addition of a high occupancy vehicle (HOV) lane from Loop 202 to Riggs Road
  - Roadway widening and lane additions between Florence Boulevard and State Route 87
  - Roadway widening from six to eight lanes between Ina Road and Prince Road

  - Widening from four to six general purpose lanes and two HOV lanes across the GRIC between Riggs Road and McCartney Road

- Interstate 19
  - Roadway widening from four to eight lanes between San Xavier Road and Interstate 10
- State Route 77
  - Roadway widening from four to six lanes between Tangerine Road and the Pima County line
- Maricopa-Casa Grande Highway
  - Roadway widening from two to four lanes between State Route 84 and State Route 347

The Tucson Streetcar, Sun Link, began passenger operations on July 25, 2014, and is also a transportation element of the No Build Alternative. This new streetcar system, which connects the Mercado neighborhood, downtown Tucson, and the University of Arizona along Congress Street, 4th Avenue, University Boulevard, and 2nd Street, boarded its millionth rider on May 21, 2015, six weeks ahead of the projected milestone.

The projects listed above are not analyzed in this Tier 1 EIS except as part of the cumulative impact analysis. With any of the alternatives being considered, the programmed projects may be developed regardless of the decision of whether to establish passenger rail service between Tucson and Phoenix. The No Build Alternative provides a baseline analysis so that the anticipated effects from construction and operating a passenger rail system in either the Yellow or Orange corridor alternative may be compared to the effects of not constructing and operating a passenger rail system. In the case of some environmental resource categories, these effects were estimated based on travel demand and ridership estimates provided in **Chapter 4, Transportation Impacts**.

## 2.5 Conclusion

The Corridor Alternatives evaluated in detail as part of this Tier 1 EIS were selected as a result of analyses carried out as part of the AA and previous studies. The AA includes the development of the original Range of Alternatives, the Initial Screening (Level 1) of unique corridor possibilities, the bundling of alternatives and station locations into Conceptual Alternatives, the Level 2 screening of Conceptual Alternatives and identification of fatal flaws, the selection of Final Corridor Alternatives, and the elimination of the Green Alternative due to lower ridership, right-of-way challenges, and a high degree of potential cultural resource impacts in addition to

further coordination with the Gila River Native American Community during the Level 3 screening. The Yellow and Orange corridor alternatives and the No Build Alternative form the basis of this Tier 1 EIS and are evaluated and compared in the following chapters.