7 Comparison of Alternatives

7.1 Introduction

In order to accomplish a multidisciplinary evaluation of alternatives, FRA, FTA, and ADOT, in collaboration with FHWA, undertook an Alternatives Analysis (AA) as part of the APRCS that involved conceptual engineering of possible alternative alignments at a level appropriate for cost estimating, scheduling, operational analyses, and community involvement. Summary information taken from the AA forms the basis of **Chapter 3, Public Agency Coordination**; **Chapter 4, Transportation Impacts**; **Chapter 5, Existing Conditions and Environmental Consequences**; and **Chapter 7, Cost Analysis** of this Tier 1 EIS. This chapter combines the corridor-level analysis contained in **Chapter 6, Cost Analysis** with the AA findings reported in the other chapters to compare the potential performance and environmental impacts of a passenger rail system within each corridor alternative and the No Build Alternative. Community and other environmental impacts, financial feasibility, ease of implementation and operating characteristics, and mobility and safety are compared in the tables in this chapter. Detailed descriptions of the two corridor alternatives are included in **Chapter 3, Public Agency Coordination** and illustrated on **Figure 3-4**. Based on that comparison, this chapter also identifies the agencies' Preferred Alternative.

7.2 Impact and Performance Comparison

Combined, the Tier 1 EIS and AA for the APRCS cover a broad range of topics intended to inform program-level decisions as well as future decision-making on potential major infrastructure investments. Capital, operating, and maintenance cost estimates and travel times were developed in the AA based on conceptual alignments within each corridor alternative; and conceptual station locations along these alignments were used to model potential ridership and estimate potential changes in VMT, air pollutant emissions, injuries, and fatalities. All of these numbers are representational; a future passenger rail system and associated stations could be located anywhere within a given corridor, requiring further data gathering, impact analysis, and more specific mitigation tailored to a specific design and alignment. The tables on the following pages provide qualitative and high-level quantitative data on a number of criteria to allow comparison between the No Build Alternative and the two corridor alternatives.

7.2.1 Community and Other Environmental Criteria

Table 7-1 compares community and other environmental factors potentially affected by a passenger rail system within the Yellow and Orange corridor alternatives and the No Build Alternative. The resources listed on this table are a combination of data gathered for the AA and elements analyzed in **Chapter 5 – Existing Conditions and Environmental Consequences**

Table 7-1. Comparison of Community and Environmental Criteria

Criterion	Yellow Corridor	Orange Corridor	No Build
Potential need for conversion of non-transportation land uses	Moderate	Moderate to High	N/A
Compatibility with local plans	Compatible	Moderately Incompatible	Compatible
Compatibility with underlying property ownership	Moderately Incompatible	Compatible	Compatible
Compatibility of station areas[a]	Compatible	Moderately Incompatible	N/A
Existing population within station area district[b]	851,713	717,329	N/A
Existing employment within station area district[b]	796,426	726,212	N/A
Future population within station area district[b]	1,188,103	1,027,518	N/A
Future employment within station area district[b]	1,036,490	939,520	N/A
Existing minority population within station area district[b]	481,916	404,114	N/A
Existing low-income population within station area district[b]	296,018	265,145	N/A
Parks (200-foot ROW corridor)	151 (21)	146 (20)	N/A
Daily reduction in NO_X emissions (STOPS)[c] (kg.)	516	519	[d]
Daily reduction in CO emissions (STOPS) (kg.)	9,507	9,563	[d]
Daily reduction in VOC emissions (STOPS) (kg.)	340	342	[d]
Daily reduction in PM_{10} emissions (STOPS) (kg.)	6	6	[d]
Daily reduction in CO_2 emissions (STOPS) (kg.)	242,072	243,504	
Daily reduction in SO_2 emissions (STOPS) (kg.)	2.39	2.40	
Potential noise receptors (within 1,800-foot sensitivity distance)	51,260 (39,450)	50,094 (34,155)	N/A
Potential vibration impacts	4,925	2,325	N/A
Hazardous materials sites	1,511	1,142	[e]
Rivers, washes, or arroyos (linear feet)	1,480,187	1,910,872	[e]
Potential wetlands (acres)	1,032	1,476	[e]
100-year Floodplain (acres)	9,330	9,876	[e]
Wildlife corridors	20	26	[e]
Wildlife linkage zones crossed (miles)	20.3	32.93	[e]
Annual reduction in gasoline usage (gallons)	3,037,000	3,058,000	[d]

Table 7-1. Comparison of Community and Environmental Criteria

Criterion	Yellow Corridor	Orange Corridor	No Build
Visual, aesthetic, and scenic resource impacts	Minimal to Moderate	Moderate to High	Minimal
Known archaeological resources	372	418	[e]
Historic resources listed on the National Register of Historic Places	158	126	[e]

[a] Conceptual station areas at major intersections or activity centers; not specific sites
[b] A 3-mile radius surrounding each conceptual station area
[c] Simplified Trips-on-Project Software (STOPS) is a ridership modeling program utilized by FTA
[d] Likely increases in pollutant emissions and gasoline usage from increased vehicular congestion not calculated for this Tier 1 analysis
[e] Potential impacts from other reasonably foreseeable projects are not calculated for this Tier 1 analysis

using available GIS data for the 1-mile-wide corridor alternatives. Because the physical footprint and exact location of a passenger rail system have not been determined, this Tier 1 EIS reported on the total resources within a 1-mile-wide corridor to form a basis for comparing, in relative terms, the potential intensity of impacts and benefits between alternatives. Quantities of potentially affected parks and potential noise receptors were estimated for narrower corridors, in addition to their mile-wide corridor totals; the narrower-effect numbers appear in parentheses directly beneath the quantities for the mile-wide corridors.

In summary, a passenger rail system within the Yellow Corridor Alternative would be more compatible with existing local plans and property ownership; serve a larger population; and potentially affect slightly fewer natural resources, sensitive noise receptors, viewers, and known archaeological resources than a passenger rail system within the Orange Corridor Alternative. The potential to affect historic resources, hazardous materials, and parks would be slightly greater within the Yellow Corridor Alternative compared to a passenger rail system within the Orange Corridor Alternative. Although serving a smaller population, a passenger rail system within the Orange Corridor Alternative has a greater potential to reduce gasoline consumption and criteria pollutant emissions than a passenger rail system within the Yellow Corridor Alternative. The potential to affect water resources, wildlife corridors, and potential species habitat would be greater within the Orange Corridor Alternative. Compared to the No Build Alternative, a passenger rail system within either corridor alternative offers increased access to transit for protected populations and economic generators as well as improved air quality and energy consumption.

Prior to the Tier 2 NEPA analysis, special status species and wildlife movement studies/surveys would be conducted so that the data are available to inform the NEPA process and the establishment of alignment alternatives.

7.2.2 Financial Feasibility, Implementation, and Operating Characteristics

Table 7-2 compares financial feasibility, ease of implementation, and operating characteristics between a passenger rail system within the Yellow and Orange corridor alternatives and the No Build Alternative. See **Chapter 7, Cost Analysis** for a detailed explanation of the line items in the table.

Table 7-2. Comparison of Financial Feasibility, Ease of Implementation, and Operating Characteristics

Criterion	Yellow Corridor	Orange Corridor	No Build
Annual operating cost for commuter rail plus intercity rail service (2013 dollars)	$67 Million	$86.0 Million	$0
Capital cost (2013 dollars)	$4.5 Billion	$7.6 Billion	$0
Annual operating cost per commuter rail passenger (2013 dollars)	$10.37	$15.99	$0
Annual operating cost per intercity rail passenger (2013 dollars)	$14.73	$15.38	$0
Right-of-Way cost (2013 dollars)	$144.9 Million	$62.1 Million	$0
Ease of Implementation	Moderate	Low	N/A
Predictability and Dependability	Moderate	High	Low

A passenger rail system within the Orange Corridor Alternative would have a substantially greater capital cost as one within the Yellow Corridor Alternative and would be more difficult to implement. The operating and maintenance costs would be higher as well. While the ROW cost for a passenger rail system within the Yellow Corridor Alternative is potentially higher than one within the Orange Corridor Alternative, the lower estimated annual operating cost would recover the difference in estimated ROW cost within the first six years of operation. While the No Build Alternative would not incur any of these costs, it would not meet the identified purpose and need for an alternate transportation mode between Tucson and Phoenix.

7.2.3 Mobility and Safety

Table 7-3 compares mobility and safety characteristics of a passenger rail system within the Yellow Corridor Alternative to those of a passenger rail system within the Orange Corridor Alternative.

Table 7-3. Comparison of Mobility and Safety Characteristics

Criterion	Yellow Corridor	Orange Corridor	No Build
Urban stations (conceptual)	14	12	0
Rural stations (conceptual)	1	3	0
Daily commuter ridership	16,700	13,940	0
Daily intercity ridership	3,360	4,140	0
Reduction in automobile VMT (STOPS)	566,914	570,268	0
Transit and pedestrian connectivity[a]	D	C	F
Tucson to Phoenix commuter rail travel time (hours:minutes)	1:35	1:45	N/A
Tucson to Phoenix intercity rail travel time (hours:minutes)	1:23	1:30	2:22[b]
Estimated at-grade crossings[c]	112	55	0[d]
2035 reduction in fatalities per million VMT (STOPS)	2.2	2.2	0[e]
2035 reduction in injuries per million VMT (STOPS)	33.2	33.4	0[e]

Notes:
[a] Graded on an A-F scale with "A" offering the greatest number of transit and pedestrian connections, and "F" the lowest number of connections
[b] Year 2035 Baseline
[c] At-grade crossings inferred based on ADOT rail crossing database and aerial photography review
[d] Via I-10
[e] Zero reduction in fatalities and injuries; potential increases from traffic congestion not calculated for this Tier 1 analysis

In summary, a passenger rail system within the Yellow Corridor Alternative would provide shorter trip times to a larger total number of riders, with reductions in injuries and fatalities over the No Build Alternative similar to those for a passenger rail system within the Orange Corridor Alternative.

7.3 Comparison Summary and Recommended Preferred Alternative

The No Build Alternative does not meet the purpose and need for a transportation solution. It does not divert highway trips within the Tucson-to-Phoenix study corridor, reduce congestion, increase access to employment and activity centers, or provide reliable travel times and a level of safety comparable to that offered by passenger rail travel. The No Build Alternative would not connect the suburban and rural areas between Tucson and Phoenix with a high-capacity travel option, facilitate continued development of a multimodal transportation network, or provide mobility choices for existing and future needs.

In summary, considering the overall estimated costs, projected ridership, agency and public input, and potential environmental impacts associated with implementing passenger rail within in the corridor alternatives, a passenger rail system within the Yellow Corridor Alternative is considered to be more cost efficient and better performing than a passenger rail system within the Orange Corridor Alternative, with similar potential impacts to the environment. ADOT recommended the Yellow Corridor Alternative as the preferred alternative in the Tier 1 EIS. Based on that recommendation and the analysis in this EIS, FRA has identified the Yellow Corridor Alternative as the preferred alternative for purposes of NEPA.

7.3.1 Route Options

Within the preferred alternative, optional routings would be considered in Tier 2 studies as potential solutions for addressing concerns. While the preferred corridor alternative follows existing transportation system alignments (such as the UP Railroad), challenges within portions of this corridor may arise during further analysis. The options presented are based on a high-level viability assessment in response to stakeholder input. Existing conditions and environmental consequences for both options are covered under the analyses of the two corridor alternatives in the Tier 1 EIS. **Figure 7-1** shows the entire Yellow Corridor Alternative, including the route options, which together constitute the preferred alternative.

Tempe Options

As a variant of the corridor alternatives studied, a segment of what was the Orange Corridor Alternative could be used in the corridor between Tucson and Phoenix through Tempe. This routing option through Tempe could be used to avoid or minimize the potential use of Section 4(f) resources and/or potential adverse effects to historic properties (**Figure 7-2**).

Pinal County Option

Figure 7-3 shows an optional routing for the Yellow Corridor Alternative in Pinal County. Should an alignment along existing UP ROW or elsewhere within the 1-mile-wide corridor alternative through Pinal County not be feasible, this option would utilize a portion of the Orange Corridor

Alternative along the planned North-South Corridor from I-10 to its intersection with the Copper Basin Railroad, as described earlier in the discussion of the Teal Alternative under **Section 2.3.3**, **Level 3 Screening**.

Figure 7-1. Yellow Corridor Alternative with Route Options

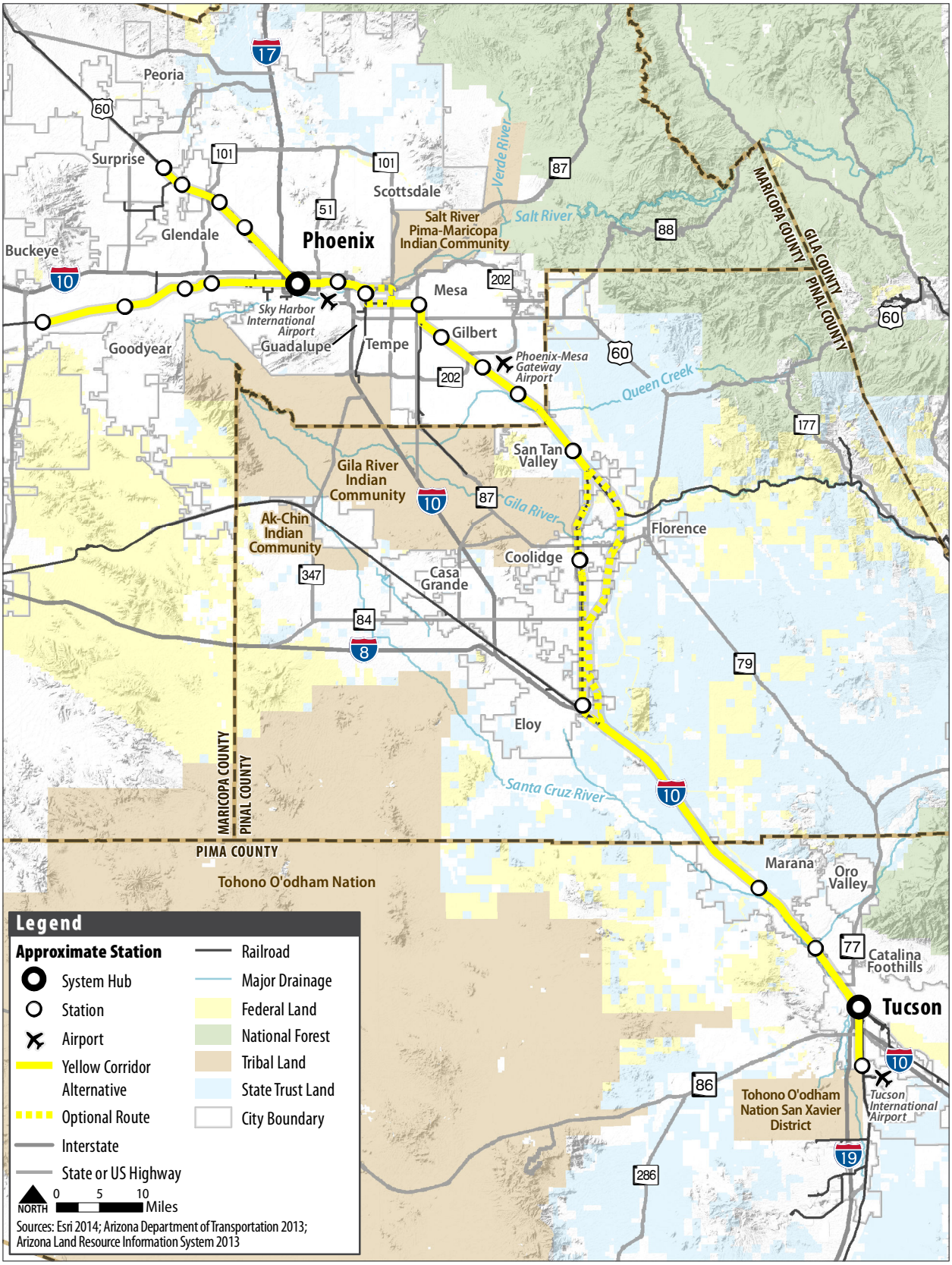

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Figure 7-2. Tempe Route Option

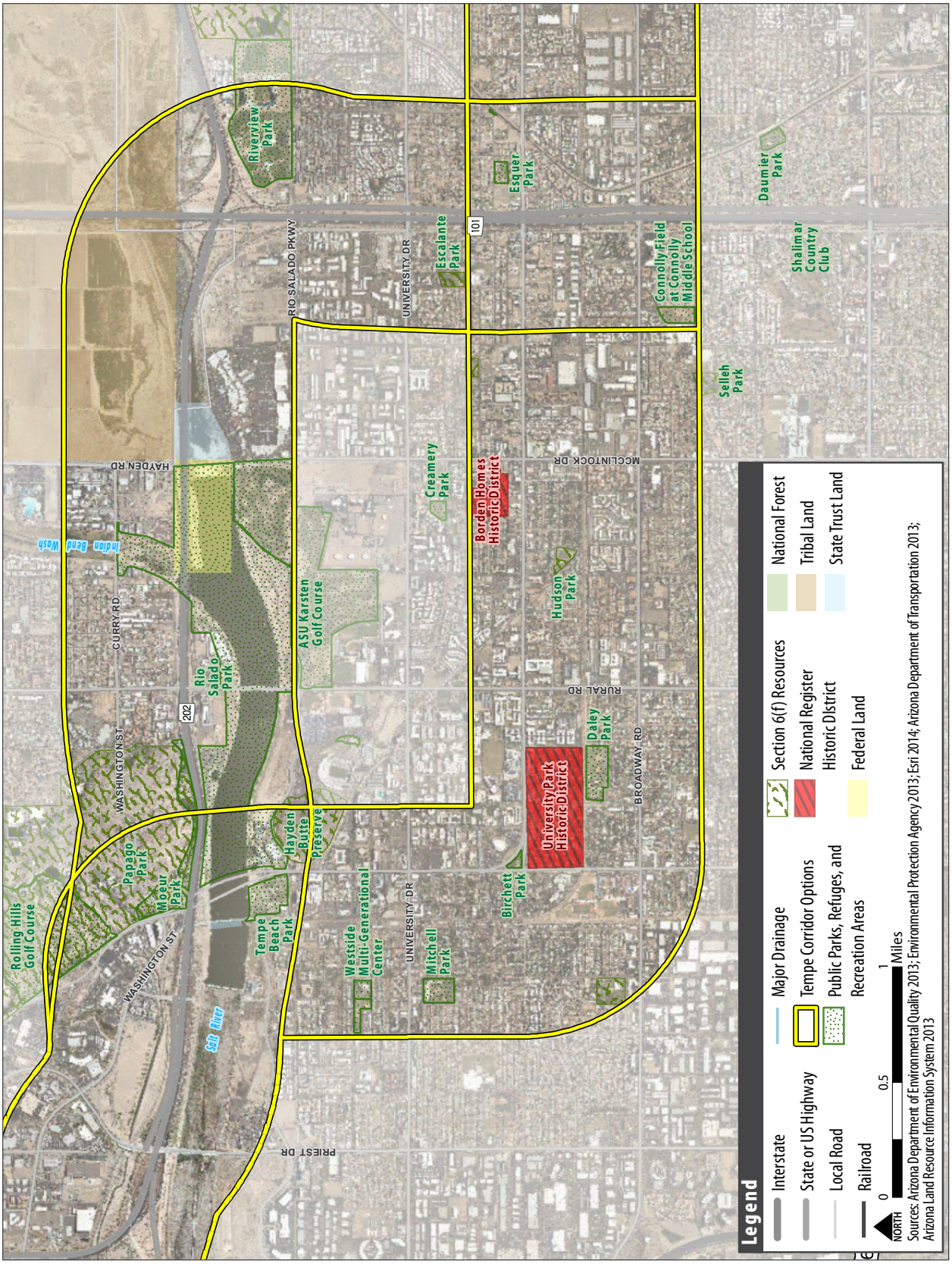

Figure 7-3. Pinal Route Option