CHAPTER 3
Alternatives

BACKGROUND AND ALTERNATIVES DEVELOPMENT AND SCREENING

PURPOSE OF THE CHAPTER

Information in the chapter is presented to provide the reader an understanding of steps taken to identify those alternatives ultimately studied in detail in the Draft Environmental Impact Statement (DEIS). Table 3-1 provides a summary of topics, content, and intended benefits to the reader.

CONTEXT OF ALTERNATIVES IN THE EIS PROCESS

After a purpose and need has been established for the proposed action (see Chapter 1, *Purpose and Need*), a key step in the environmental impact statement (EIS) process is to identify a range of reasonable alternatives to be studied in detail in the DEIS (see sidebar, on this page, regarding the definition of a range of reasonable alternatives). This step is commonly referred to as an alternatives development and screening process. Its purpose is to identify reasonable alternatives to the proposed action to allow for meaningful subsequent comparison of how these alternatives may affect the human and natural environment (described in Chapter 4, *Affected Environment, Environmental Consequences, and Mitigation*).

ALTERNATIVES DEVELOPMENT AND SCREENING

Alternatives for a major transportation facility in the Study Area have been proposed and studied since the mid-1980s. Those proposals were not discarded, but rather were incorporated into the consideration, development, and study of alternatives for the EIS process, which began in 2002 following the clear determination of a purpose and need for the proposed action. Figure 3-1 illustrates the relationship of the Study Area for the proposed action to other transportation facilities and some of the communities in the region it would serve. Beginning with the initial agency and public scoping efforts, numerous alternatives were considered to determine the most appropriate transportation investment strategy. Alternatives considered included past freeway proposals as well as transportation system management (TSM)/transportation demand management (TDM), transit (e.g., commuter rail, light rail, expanded bus services), arterial street network improvements, land use controls, new freeways, and a No-Action Alternative.

Alternatives Development and Screening Process

The following text describes the process used to identify, develop, and screen action alternatives, concluding with identification of the action alternatives to be studied in detail in the DEIS. The screening process is summarized to facilitate readers' understanding of the process and of the logic for actions taken by the project team (see sidebar on this page for a description of project team). More detail can be found in the *Alternatives Screening Report* (2003) (see sidebar on page 3-2).

Reconfirm the Purpose and Need for the Proposed Action

The first step in the alternatives development and screening process was to reconfirm the purpose and need for the proposed action, as presented in Chapter 1. The analysis described in Chapter 1, *Purpose and Need*, concluded a major transportation facility is needed in the Study Area to address increases in population, housing, and employment projected in the Maricopa Association of Governments (MAG) region over the next 25 years. These socioeconomic factors are expected to almost double between 2005 and 2035, and VMT are expected to grow from 101 million to 185 million over the same period. Much of this growth will occur in areas that would be served by a major transportation facility in the Study Area. A major transportation facility is also needed to address projected increases in regional transportation demand and deficiencies in transportation system capacity. Although capacity deficiencies exist today, they are expected to worsen and cause even greater increases in travel times (delays) by 2035.

The purpose of the proposed action—a major transportation facility—is to address the transportation needs described above. Constructing and operating such a facility may serve other purposes as well, including:

- providing regional transportation system linkage as planned in the *Regional Transportation Plan* (RTP)
- serving regional mobility needs (moving trips from lower-capacity to higher-capacity facilities)

What is meant by a range of reasonable alternatives?

Federal regulations stipulate that an EIS shall "rigorously explore and objectively evaluate all reasonable alternatives" (40 Code of Federal Regulations [C.F.R.] § 1502.14).

In 1983, the Council on Environmental Quality (CEQ) issued guidance stating "reasonable alternatives include those that are practical or feasible from a technical and economic standpoint" and "us[e] common sense." When a large number of alternatives may exist, "only a reasonable number . . . covering the full spectrum of alternatives, must be analyzed and compared in the EIS" (*Federal Register* 46:18026 [1981]).

Who is the project team?

The project team is a group of individuals who represent a comprehensive set of diverse viewpoints and have expertise relevant to environmental concerns, design requirements, traffic optimization goals, project costs, and concerns of local importance. The team includes local jurisdictions and federal, State, and regional agencies. (See Chapter 6, *Comments and Coordination*, for a list of project team members.)

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Review of technical reports, predecisional reports, and memorandums

Technical reports, predecisional reports, and memorandums can be made available for review by appointment—with the exception of the cultural resources technical reports (because of the sensitive information they contain)—at Arizona Department of Transportation (ADOT) Environmental Planning Group, 1611 W. Jackson St., Phoenix, AZ 85007 [(602) 712-7767]. Special requests for portions of the cultural resources reports will be considered by ADOT on a case-by-case basis. These reports examine existing conditions and assess potential impacts on existing conditions.

Table 3-1 Alternatives Content Summary, Chapter 3

Topic	Page	Highlights	Reader Benefit
Purpose of the Chapter	3-1	• Context of alternatives in the EIS[a] process	• An understanding of the definition of a full range of reasonable alternatives and how they are assessed in the DEIS[b]
Alternatives Development and Screening	3-1	• Alternative development and screening process overview • Development of screening criteria • Modal screening • Modes eliminated from further study • Corridor screening • Corridors eliminated from further study • Alignment alternatives screening (First Tier) • Alignments eliminated from further study • Creation of Western and Eastern Sections in the proposed action's Study Area • Technical alternatives screening (Second Tier) • Technical alternatives eliminated from further study • Design options and refinements (Third Tier) • Design options eliminated from further study • Design adjustments (Fourth Tier) • Design alternatives and footprint and alignment options eliminated from further study • Alignment screening and further design adjustments (Fifth Tier) • Alignment on Community[c] land and alignment option eliminated from further study • Responsiveness of proposed freeway to purpose and need criteria • Additional benefits of the proposed freeway • Summary of screening process	• Orientation to the geography of the Study Area • Orientation to how alternatives and their environmental effects are presented in the DEIS • An understanding of how alternatives for the proposed action were developed, who (including the public) contributed to the development of alternatives, and what alternatives were considered • An understanding of the logical, sequential steps taken—and by whom—to determine which alternatives should be studied in detail in the DEIS • An understanding of why multiple disciplines, or factors, are considered when comparing alternatives • An understanding of why—individually—transit, rail, and other nonfreeway alternatives are not studied in detail in the DEIS • An understanding of logical termini and independent utility, regardless of alternative considered • An understanding of why some freeway alternatives were eliminated from detailed study in the DEIS • An understanding of adjustments made to alternatives to further reduce impacts before detailed study was undertaken • An understanding of beneficial outcomes related to the screening of alternatives • Identification of the action alternatives to be studied in detail in the DEIS • Introduction to the degree of regulatory interaction required for the proposed action • An understanding of why a freeway alternative would meet the purpose and need criteria of the project
Alternatives Studied in Detail	3-40	• No-Action Alternative • Descriptions of the action alternatives • Traffic operations of the alternatives	• A description of the No-Action Alternative and why it is studied • An understanding of design features of each action alternative, including alignment, profile, number of lanes, and ancillary design features • An understanding of conceptual costs and construction sequencing for each action alternative • An understanding of enhancement opportunities associated with the action alternatives • An understanding of how traffic would operate on each alternative in the future
Identification of a Preferred Alternative	3-65	• Process and reasons for the identification of the Preferred Alternatives in the Western and Eastern Sections	• Awareness of the Preferred Alternatives in the Western and Eastern Sections • An understanding that the identification of a Preferred Alternative is not final until the EIS process is complete • An understanding of ongoing coordination with the Community
Conclusions	3-70	• Summary of alternatives in the EIS process	• A summary of the process to screen alternatives, identify a range of reasonable alternatives, study alternatives in detail, and identify a Preferred Alternative

[a] environmental impact statement [b] Draft Environmental Impact Statement [c] Gila River Indian Community

- meeting objectives adopted in regional and local long-range plans

These additional purposes of the proposed action are discussed in this chapter and in the *Land Use* section of Chapter 4, beginning on page 4-3.

Alternatives Development and Screening Process Described

A process was undertaken to develop a range of alternatives, screen those alternatives using a multidisciplinary set of criteria (see sidebar on page 3-4), and identify the alternatives to be studied in detail in the DEIS. Figure 3-2 schematically illustrates the process undertaken.

To define the process, a memorandum (*Alternatives Development and Screening Process Memorandum* [2002]) was first created. The project team concurred with the approach outlined in the memorandum, specifically:

- The approach outlined would satisfy National Environmental Policy Act (NEPA) intent, Federal Highway Administration (FHWA) guidelines that implement NEPA, ADOT environmental policy, and related environmental policies and regulations.
- The criteria and related performance measurements were appropriate for the screening process and represented an objective multidisciplinary set of criteria.

The memorandum presented step-by-step guidance for development of alternatives and their subsequent screening. Steps were necessarily added or modified throughout the screening process at the request of the project team as new information became available, as additional investigation warranted, and/or as new discoveries about alignment or modal alternatives were made. The following summarizes the steps taken to identify action alternatives to be studied in detail in the DEIS.

Confirmation of Screening Criteria and Performance Measures

The multidisciplinary approach presented in the 2002 memorandum was reviewed by the project team. Team members conducting the review represented expertise associated with environmental, engineering, land acquisition, construction, and government standards and processes. Using a diverse group ensured screening would be consistent with NEPA intent to use a systematic, interdisciplinary approach when decisions may have an effect on the human and natural environment. The following general categories reflect the criteria established for the screening process (*Alternatives Screening Report* [2003]):

- ability to satisfy purpose and need
- ability to minimize impacts on the human and natural environments
- ability to improve operational characteristics of the region's transportation system
- degree of public and political acceptability
- consideration of overall conceptual cost estimates

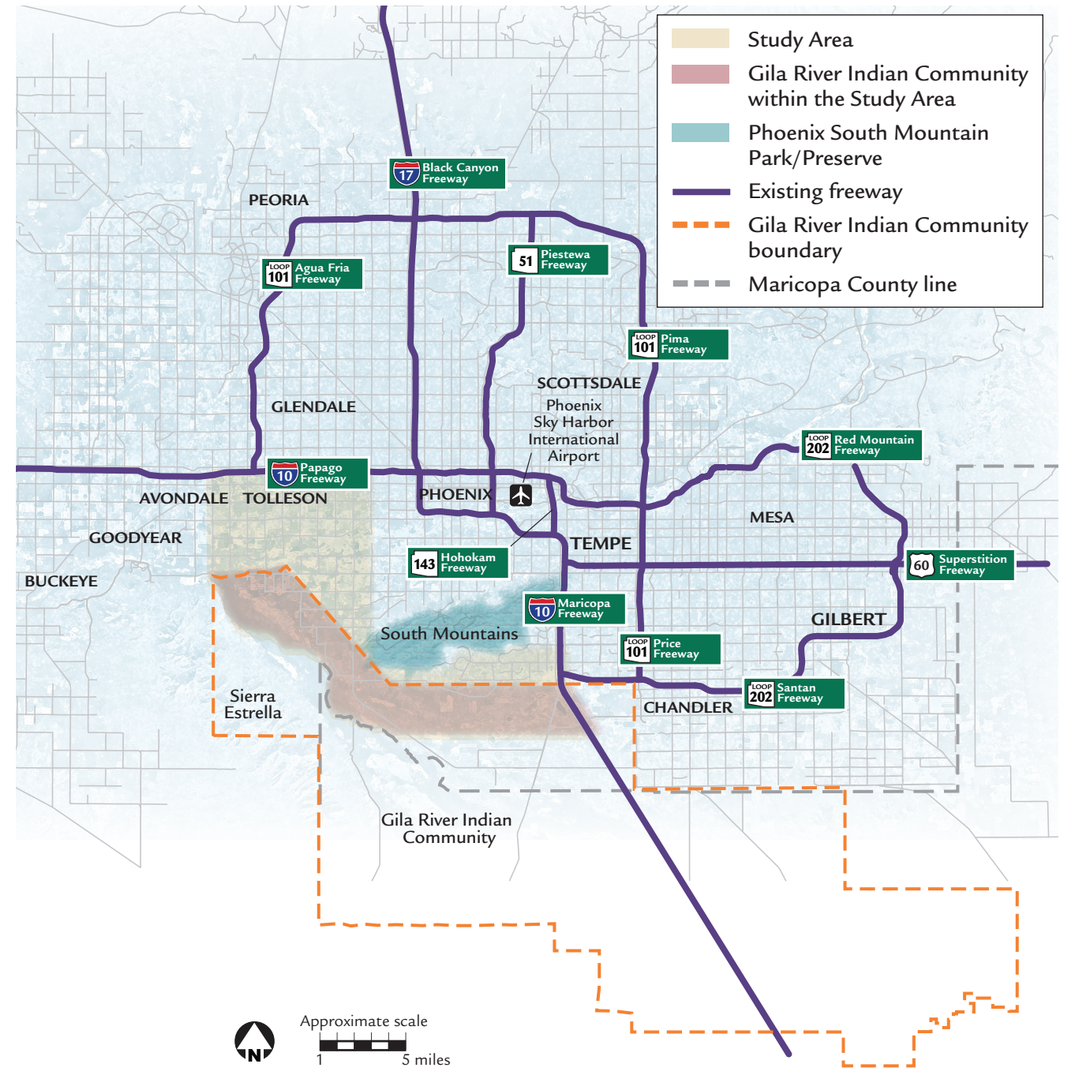
Modal Screening

Modal screening is performed to analyze the potential of various transportation modes (either individually or in combination) to meet the purpose and need of a proposed action. To minimize environmental impacts, the modal screening strategy involves looking first at those modes that would create the least impact while meeting purpose and need criteria. If these criteria cannot be satisfied with the low-impact modes, others with greater impact but more capability of meeting the proposed action's purpose and need are examined. The process continues in this way until only those modes able to meet purpose and need criteria remain (or do so in concert with earlier-considered modes), thus satisfying these criteria while reducing impacts.

The project team considered a wide range of modal alternatives to improve transportation conditions in the Study Area (see also Table 3-2):

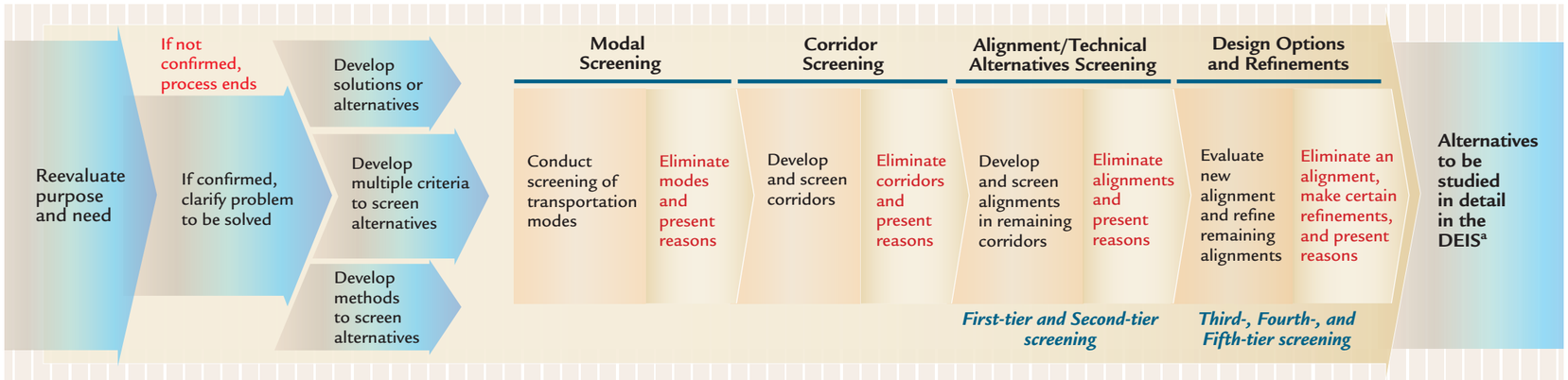
- **TSM** – maximizing the efficiency of existing transportation facilities
- **TDM** – reducing demand on existing transportation facilities
- **Transit** – increasing capacity of the existing transit network
- **Arterial street expansion** – increasing capacity of the existing arterial street network
- **Existing freeway expansion** – increasing capacity of the existing freeway network
- **Land use** – reducing demand from existing and planned land uses
- **New freeway** – provide new freeway segments

Figure 3-1 Regional Context, Proposed Action



The Study Area for the proposed action is in the southwestern portion of Maricopa County and is strategically positioned where a gap exists in the regional transportation system's loop freeway network. The study of viable alternatives was limited by the topographical constraints of the South Mountains and by the inability to study alternatives in detail on Gila River Indian Community land.

Figure 3-2 Alternatives Development and Screening Process



[a] Draft Environmental Impact Statement

Identification of alternatives for detailed analysis followed logical steps, beginning with determination of the proposed action's purpose and need and progressing to consideration of transportation modes and then corridors and alignments. Specific multidisciplinary criteria were established prior to the screening process to guide determinations.

What is a multidisciplinary process?

When passing NEPA, Congress wanted agencies to use a process that integrated a multitude of factors when making decisions about public programs and projects. Specifically, all federal agencies should apply "a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making which may have an impact on man's environment" [42 United States Code (U.S.C.) § 4332 Sec. 102(A)]. The "multidisciplinary" process as applied in the analysis of the proposed action and presented in this chapter is a reflection of this Congressional intent.

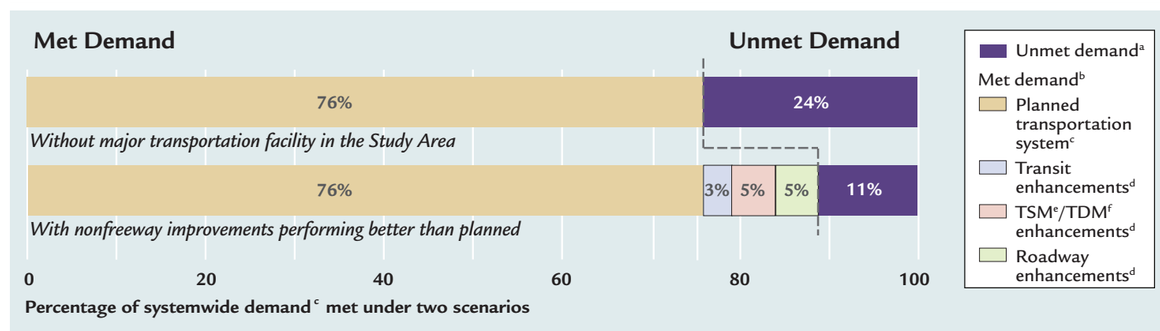
Modal Screening Results

Freeway and nonfreeway alternatives were evaluated both as individual alternatives and in combination. Nonfreeway alternatives would provide transportation system improvements in the Study Area in lieu of a new freeway facility. Nonfreeway alternatives were ultimately eliminated from further study because they did not meet the purpose and need criteria for the project; chiefly, they did not support criteria related to transportation demand and capacity deficiencies. If better-than-planned scenarios for such modal alternatives as nonfreeway planned improvements (e.g., increases in funding, increases in the number of express bus routes, increases in ridership for transit modes) were to occur, 13 percentage points of the 24 percent capacity deficiency would be accommodated (Figure 3-3); the network would still maintain an 11 percent capacity deficiency.

A brief description of these alternatives and reasons for eliminating each from detailed study are provided in Table 3-2. Notable observations include:

- Funding for TSM/TDM strategies is included in the RTP and these strategies will continue to be implemented throughout Maricopa County. Examples of how elements of the TSM/TDM Alternative would be implemented include the use of ramp metering; overhead, automated, advanced warning signs; freeway cameras for monitoring traffic flow/and other intelligent transportation system technology to enhance operational characteristics; ride share programs; Maricopa County Trip Reduction Program; and van pool programs. Alone, this alternative was eliminated from further study because:
  - Even better-than-planned performance of TSM/TDM would not be sufficient to adequately address the projected 2035 capacity deficiency.
  - TSM/TDM strategies would have limited effectiveness in reducing congestion along freeways and arterial streets in the Study Area.
- Funding for the expansion of transit modes in the MAG region is included in the RTP. Modes being considered in the Study Area include light rail, commuter rail, bus routes, and van pools. By themselves, these modes were eliminated from further study because:
  - Even better-than-planned performance of transit would not be sufficient to adequately address the projected 2035 capacity deficiency.
  - Two high-capacity transit corridors are being considered near the western and eastern extents of the Study Area: 1) Interstate 10 (I-10, Papago Freeway) extension from downtown Phoenix west to 79th Avenue and potentially north to the

Figure 3-3 Met and Unmet Demand with and without Modal Improvements, 2035



Source: Maricopa Association of Governments, 2010b; extrapolated analysis

[a] Unmet demand means delays and congestion for travelers on the Maricopa Association of Governments (MAG) transportation network.
[b] Data are extrapolated from the 41st Street cut-line analysis (see Figure 1-11) to characterize performance for the entire MAG transportation system.
[c] The analysis assumes that the MAG *Regional Transportation Plan* is fully implemented.
[d] improvements that could occur in the better-than-planned scenario
[e] transportation system management
[f] transportation demand management

Even when incorporating the most optimistic scenario for adoption and performance of nonfreeway improvements, 24 percent capacity deficiency would be reduced by 13 percentage points, leaving an 11 percent systemwide capacity deficiency in 2035.

Table 3-2 Nonfreeway Alternatives Considered and Reasons for their Elimination from Further Study

Alternative	Element	Description	Reason for Elimination
TSM[a]/TDM[b]	TSM	TSM attempts to maximize the safety and efficiency of the existing transportation network using auxiliary lanes, turning lanes, and Freeway Management System elements (electronic message signs, signals to meter traffic flow at on-ramps, closed-circuit television cameras, and vehicle detectors).	These alternatives alone would have limited effectiveness in reducing overall traffic congestion in the Study Area and, therefore, would not meet the purpose and need criteria; specifically, they would not adequately address projected capacity and mobility needs of the MAG[c] region (see Table 1-2, *Regional Transportation Plan Highlights*, on page 1-10, and Figure 3-3, which describe the contributions of these improvements to meeting regional transportation needs). Elimination does not preclude the use of these elements in combination with the freeway mode, nor does it preclude them from being implemented in the future.
	TDM	TDM encourages reductions in travel demand in the existing transportation network by promoting alternative modes of travel, including riding a bus, carpooling, van pooling, walking, bicycling, using alternative work schedules and compressed work schedules to reduce trips, and telecommuting.	
Transit	Light rail	The first segment of the Central Phoenix/East Valley Light Rail Transit project has been completed through central Phoenix, northern Tempe, and northwestern Mesa. While expansion routes are being studied, none would link the western and eastern termini of the Study Area.	
	Commuter rail	Commuter rail is designed to primarily meet the needs of regional commuters with service between suburbs and urban centers for the purpose of reaching activity centers, such as employment, special events, and intermodal connections. Commuter rail service would be provided only during peak times and in the peak direction. The MAG region is not currently served by commuter rail. All active heavy rail tracks in the region are used for freight.	
	Bus routes/Van pools	Express bus routes generally provide service to and from "hubs" (e.g., park-and-ride lots, downtown city centers, major employment centers). Travel could be by freeway or arterial street. Park-and-ride lots permit commuters to park vehicles to take express buses. Van pools allow groups of commuters to use community vans to commute to and from work; these function similarly to express bus routes, but with fewer individuals participating.	
Arterial Street Network Expansion	• Add more lanes to existing arterial streets • Improve intersections • Create new arterial street routes	Improvements to the arterial street network beyond those improvements as planned in the RTP[d] and municipal general plans would occur under this alternative.	Based on projected regional travel demand and the extent of mobility needs of the MAG region and in the Study Area, arterial street network improvements alone would not meet the needs of the MAG region (see Table 1-2, *Regional Transportation Plan Highlights*, on page 1-10, and Figure 3-3, which describe the contributions of these improvements to meeting regional transportation needs).
Land Use	• Increase residential densities • Redistribute employment centers	The alternative proposes to alter planned land uses to reduce the region's dependence on the use of single-occupancy vehicles and to reduce demand on and increase efficiency of the MAG region's transportation network. In support, local governments could institute services to improve performance of transit-related components of the system.	Planned land uses and associated densities in the Study Area have remained relatively unchanged since the mid-1980s. A major transportation facility in the form of the South Mountain Freeway is generally consistent with the City of Phoenix *General Plan*, and planned land uses and transportation improvements are reflected in the plan. Although the City of Phoenix has a program to discourage longer trips in the region through the village planning concept and process, accommodation of regional travel is an integral element of the plan. The Land Use Alternative is not a viable alternative because no plans exist to alter planned land uses in the region, and components to support increased efficiency in the transportation network (e.g., transit, local arterial street network improvements) are already planned in the RTP.

[a] transportation system management [b] transportation demand management [c] Maricopa Association of Governments [d] *Regional Transportation Plan*

Glendale sports complexes and 2) Tempe South extension from State Route (SR) 202L (Red Mountain Freeway) to SR 202L (Santan Freeway). Both extensions are currently under study (see the Web site, <www.valleymetro.org/metrolightrail>, for more information). By themselves, such extensions would not adequately address the projected 2035 capacity deficiency.

- MAG completed a series of studies in 2010 to evaluate the feasibility of commuter rail in the region. One corridor, Yuma West, includes the Union Pacific Railroad (UPRR), which passes through the Study Area. The study results support the conclusion that, by itself, commuter rail would not meet projected regional capacity and mobility needs.

- Funding for expansion of the arterial street system in the MAG region is included in the RTP. Arterial street improvements were eliminated from further study because, by themselves:
  - Even better-than-planned performance of arterial street improvements would not be sufficient to adequately address the projected 2035 regional capacity deficiency.

- The only Study Area arterial street connection of southeastern Phoenix to southwestern Phoenix around the South Mountains is the combination of Riggs Road, Beltline Road, and 51st Avenue through the Gila River Indian Community (Community). As an alternative, this route would have limited effectiveness in addressing regional capacity and mobility needs. Expansion of 51st Avenue, Beltline Road, and Riggs Road within Community boundaries would require approval of the Community.
- The City of Phoenix has indicated it will not extend an arterial street through Phoenix South Mountain Park/Preserve (SMPP) to improve connectivity between southeastern and southwestern Phoenix. The alternative was eliminated based on the City's position and because it would not provide the capacity needed to meet the proposed action's purpose and need criteria, but would result in impacts similar to those of the proposed action.

- Alteration of land use and land use controls could be used to reduce regional travel needs. The adopted City of Phoenix *General Plan* identifies goals and objectives to continue to promote development of primary and secondary cores, or villages, to centralize commercial and mixed use developments. First presented in the City's *General Plan* in the mid-1980s, an integrated focus of the city's 15 villages is to create hubs to promote the use of other modes of transportation such as transit, bicycle, and pedestrian travel. This alternative was eliminated from further study because:
  - Although the City's plan encourages local travel through its villages—in contrast to regional travel—accommodation of regional travel is an integral element of the plan.
  - No plans exist to alter planned land uses in the region, and components to support increased efficiency in the transportation network (e.g., transit, arterial street network improvements) are already planned in the RTP.
- A freeway/light rail combination alternative would integrate a freeway and light rail system into a single transportation corridor. As considered, the light rail segment would be located within the freeway right-of-way (R/W), either within the freeway median or along the outside of the freeway main line. Integration of a freeway and a light rail system into a single transportation corridor is planned in the RTP at two locations: along I-10 (Papago Freeway) and along SR 51 (Piestewa Freeway). These two segments would connect to the light rail system currently in operation.
- With these two freeway/light rail segments already in planning stages in the RTP, members of the public identified what would appear to be a similar opportunity along the route of the proposed freeway. Most freeway/light rail combinations, however, radiate from a central demand generator (e.g., a central business district or major airport). No such systems are known to follow a circumferential route, as the proposed action would. While light rail segments are planned in the RTP near the western and eastern termini of the Study Area, no funds are available or anticipated to support a combined system through the Study Area. The additional R/W (light rail generally needs a 50-foot-wide corridor) for the alternative would generate substantial community impact (e.g., displaced residences and businesses, community character and cohesion, and parkland impacts). Therefore, the alternative was eliminated from further study. Such a system could be evaluated at a later time as a future transportation option.

The freeway mode for the proposed action was determined to be an appropriate response to the purpose and need criteria for the project in that it met the criteria while minimizing impacts (see the section, *Responsiveness of the Proposed Freeway to Purpose and Need Criteria*, beginning on page 3-27). The freeway mode resulted in additional benefits, including those related to system linkage, regional mobility, and consistency with regional and local long-range plans (see the section, *Additional Benefits of the Proposed Freeway*, on page 3-35).

Combinations of nonfreeway and freeway alternatives were considered. Where appropriate, the freeway mode of the proposed action would incorporate aspects of nonfreeway alternatives to optimize traffic operational characteristics in the Study Area and to minimize impacts. For example, high-occupancy vehicle (HOV) and auxiliary lanes would be incorporated into the freeway mode design to optimize efficient traffic flow. Electronic messaging would alert motorists to important changes in travel and traffic conditions. Existing and potential park-and-ride lots would be strategically integrated into freeway-mode alignments and mass transit routing.

Corridor Screening

The first step after determining a freeway to be the suitable transportation mode was identification of broad corridors where distinct alignment alternatives could be developed, environmental screening criteria applied, and alignments' operational performance could be compared. Each corridor was established as a large land area to:

- develop alignment alternatives based on past studies and input from agencies and the public
- identify design controls and avoid identified undesirable conflicts with environmental conditions
- compare the operational performance of alignment alternatives in the corridors in the context of purpose and need criteria and regional operation of the MAG transportation network

Figure 3-4 illustrates the location of the corridors within the Study Area. Notable observations are:

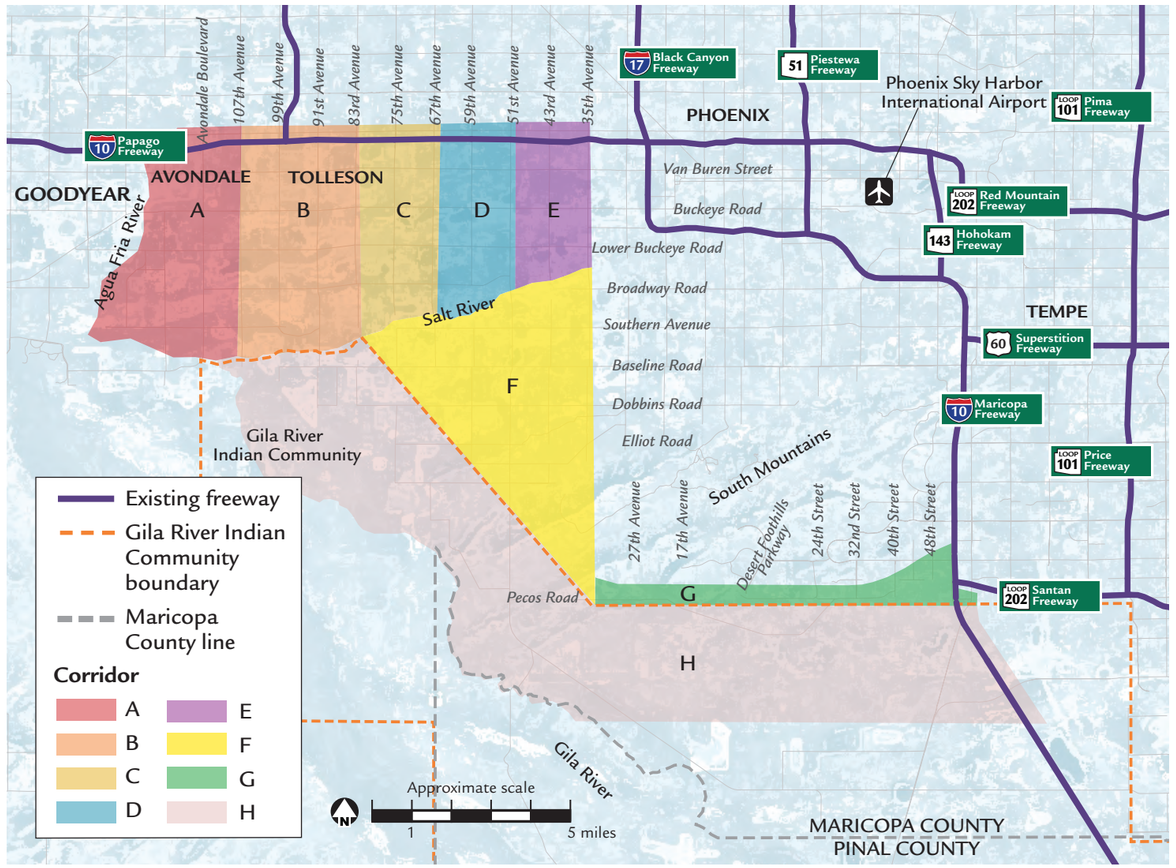
- Corridor H was located within Community land. A corridor along Pecos Road (Corridor G) followed an alignment consistent with previously published and adopted alignments since the mid-1980s. The other eastern corridor (Corridor F) included alignments that would connect to I-10 north of the South Mountains.
- Five corridors (Corridors A–E) were established north of the Salt River, between the Agua Fria River to the west and 35th Avenue to the east. These were created because of possible differences in effects on the operational characteristics of I-10 (Papago Freeway).

Corridor Screening Results

Using the following criteria, a comparative analysis was conducted to determine whether any of the corridors could be eliminated from further study, because alignments in a given corridor would:

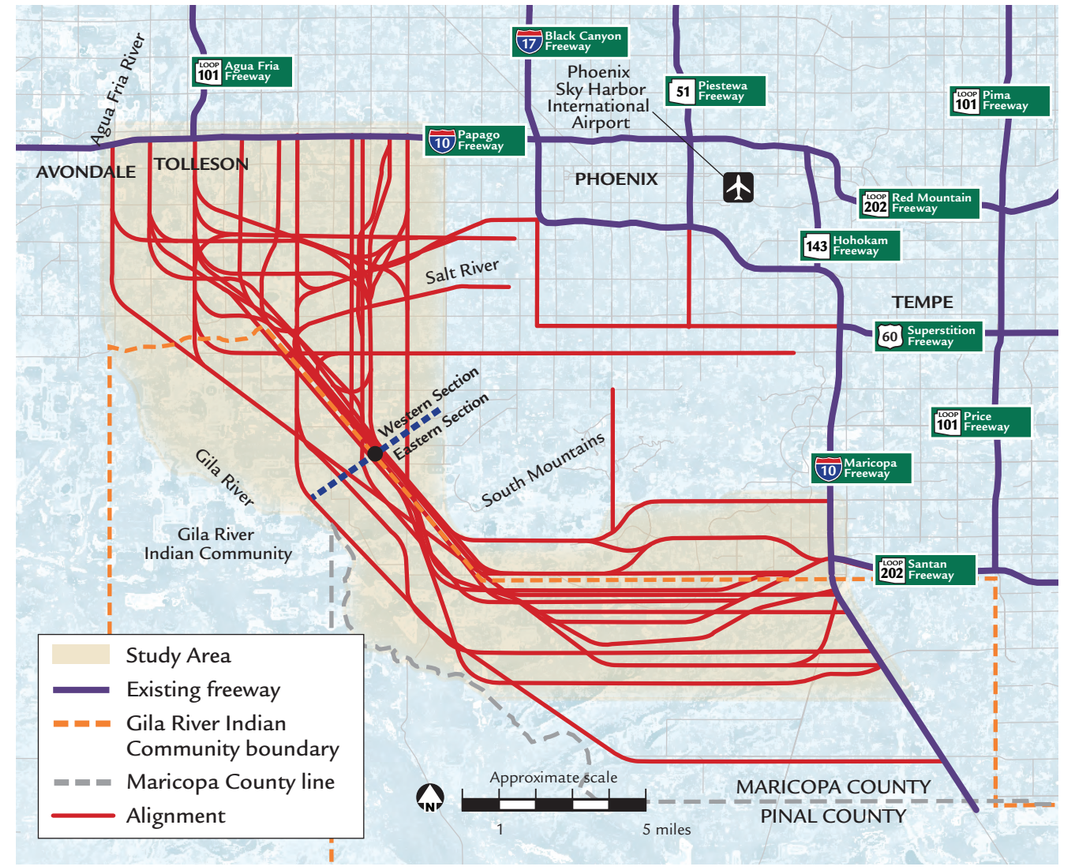
- not satisfy the purpose and need criteria

Figure 3-4 Corridor Locations, Alternatives Development and Screening Process



The first step after determining a freeway to be the suitable transportation mode was identification of broad corridors where distinct alignment alternatives could be developed, environmental screening criteria applied, and comparison of alignments' operational performance facilitated. Corridors A–E, north of the Salt River, could be linked through additional corridors, F–H, to Interstate 10 (Maricopa Freeway).

Figure 3-5 Early Alignment Siting Efforts, Alternatives Development and Screening Process



Through public input and review of past studies, the project team started with a myriad of freeway alignments through the Study Area.

- result in substantially greater impacts on the environment when compared with other alignment alternatives in other corridors
- clearly not be publicly or politically acceptable
- clearly be cost-prohibitive

Based on a screening guided by the above criteria and traffic analyses, no alternatives were developed in Corridor A. Traffic analyses revealed a projected drop in traffic volumes on a proposed action connection to I-10 (Papago Freeway) west of SR 101L (Agua Fria Freeway) when compared with volumes in corridors east of Corridor A. Therefore, Corridor A was eliminated from further study.

Alignment Alternatives Screening (First Tier)

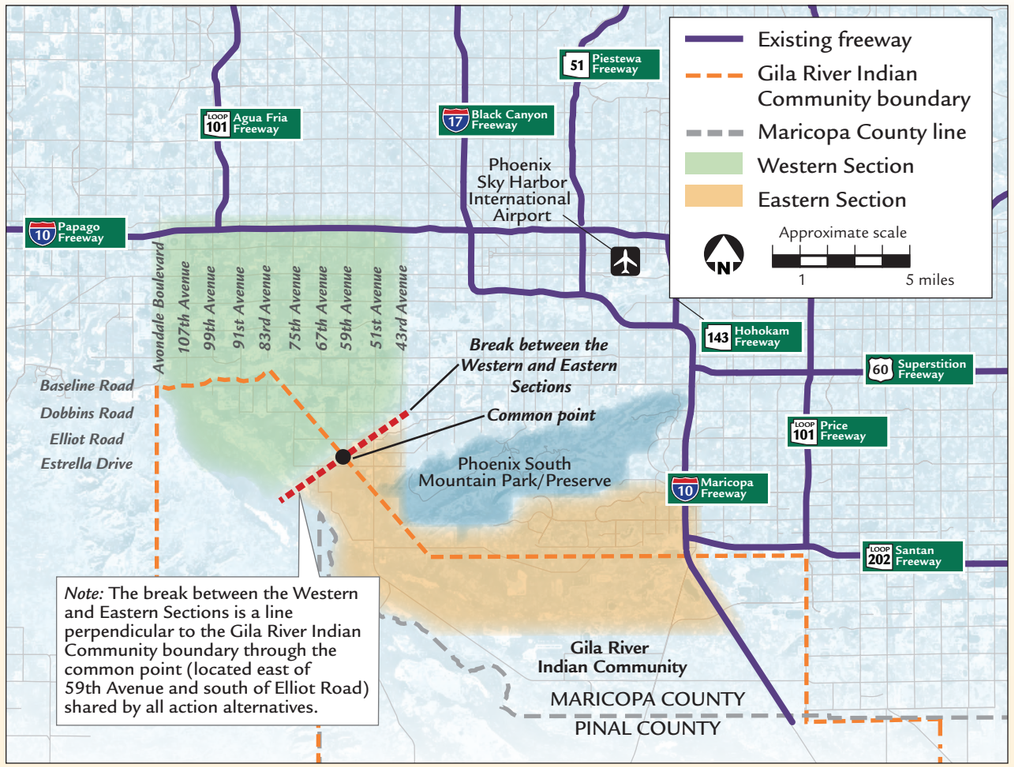
Alignments were generated from previous studies, project team input, and routes provided from public input. Numerous alignments were identified (Figure 3-5) in an initial effort requesting public preferences for freeway alignments that would contribute to creating a comprehensive set of alternatives (see Chapter 6, *Comments and Coordination*, and the sidebar on page 6-23 for more information on how the public has influenced the project). Although public preference included alignments in Corridor A, none were carried forward in the screening process because of the corridor screening results. Alternatives screened were from the Western and Eastern Sections (see text box on page 3-8) and from outside the Study Area.

3

Creation of Western and Eastern Sections for the DEIS

As shown in the map below, a common point is shared among the Study Area alignments of all action alternatives: east of 59th Avenue and south of Elliot Road. To evaluate and compare action alternatives, the Study Area is presented in two geographic sections: a Western Section and an Eastern Section. The Western Section covers the area north and west of the common point, generally from south of Elliot Road to I-10 (Papago Freeway) and from 43rd Avenue to Avondale Boulevard. The Eastern Section covers the area south and east of the common point, generally from south of Elliot Road onto Community land and between 59th Avenue and I-10 (Maricopa Freeway).

The common point between the Western and Eastern Sections permits combining action alternatives in the Western Section with action alternatives in the Eastern Section to best satisfy the purpose and need of the proposed action. Dividing the Study Area into two sections also allows for more specific comparative impact analyses among the alternatives.



Geographic and jurisdictional constraints narrowed consideration of action alternatives in the Eastern Section of the Study Area. In the Western Section, geography and jurisdictions did not constrain the number of alternatives considered. This distinction led to identification and use of separate Western and Eastern Sections, each with its own alternative(s), to facilitate the overall alternatives development and screening process.

Several major drivers and constraints affected alignment definition and viability and guided the comparative analysis:

- **Historical Context of the Proposed Freeway** – The South Mountain Freeway was originally included in the 232-mile Regional Freeway and Highway System proposed in 1985 (see the section, *Historical Context of the Proposed Action*, beginning on page 1-5, for further discussion of project-related history). At that time, the facility, designated as a portion of SR 202L, was designed as a high-speed, access-controlled freeway with a rolling profile (see sidebar on page 3-41), grade separations, and traffic interchanges.
- The South Mountain Freeway has remained in updates to MAG transportation planning documents since the mid-1980s, including the RTP. The RTP notes that the location of the South Mountain Freeway would be determined through the design concept report (DCR)/EIS study process, which is considering multiple options.
- **Status of Gila River Indian Community Alternatives at the DEIS Stage** – A key issue from the start of the EIS process has been whether ADOT and FHWA would be able to study alternatives in detail on Community land. While Chapter 2, *Gila River Indian Community Coordination*, discusses in detail the nature and extent of communication and coordination undertaken regarding the matter, this section summarizes the DEIS status of Community alternatives.
- Although Figure 3-5 illustrates that the public presented numerous alternatives on Community land (within Corridor H, shown on Figure 3-4), none could be carried forward for further study.
- No action alternatives under detailed study are on Community land. The Community has not granted permission to ADOT and FHWA to study alternatives in detail within its boundaries. See the discussion in *Alignment Screening and Further Design Adjustments (Fifth Tier)*, beginning on page 3-24, of the project team's preliminary analyses of an alignment—but not an action alternative—on Community land. As a sovereign nation, the Community must grant permission to the State and rescind Resolution GR-126-00 before any alternatives that would cross Community land can be developed. If permission were granted and (after being studied) an action alternative on Community land were subsequently identified as the Selected Alternative, the Community would have to grant additional permission to ADOT and FHWA to construct the alternative.
- Despite the efforts to formally study an alternative in detail on Community land, ADOT and FHWA have determined that an alternative alignment on Community land is not feasible. The EIS process of evaluating the proposed action in locations other than on Community land will continue and, in so doing, the process maintains consideration of a range of reasonable alternatives.
- **Treatment of the South Mountains as Resources Afforded Protection under Section 4(f) at the DEIS Stage** – The geographic and regulatory relationship of the proposed action to resources of the South Mountains afforded protection under Section 4(f) of the Department of Transportation Act influences both the alternatives under study and Community coordination. Details can be found in Chapter 5, *Section 4(f) Evaluation*.

First-tier Screening Results

From the many alignments assessed with respect to termini, location, system operational performance, impact avoidance or reduction, and local access, the project team created alignment alternatives that:

- best fit the intent of the numerous alignment alternatives suggested
- conformed to design standards
- avoided major conflicts with known environmental constraints

The following are examples of how alignment alternatives were adjusted:

- Some alignment alternatives provided by the public would have the proposed action located in place of major arterial streets. A design goal for the proposed action is to add capacity to the network, not replace

it. Therefore, where possible, alignments were moved off arterial streets to locations between arterial streets to optimize operation of the alignment alternatives and the arterial street network.

- Some alignment alternatives were placed down the main channel of the Salt River to avoid major conflicts with residential, commercial, and industrial uses. Such alignments would have substantial water-related impacts and be subject to regulation under Section 404 of the Clean Water Act (CWA) (see the section, *Waters of the United States*, beginning on page 4-106). Therefore, alignments were adjusted to avoid these potential effects.
- Certain alignment alternatives would have affected SMPP. Because SMPP is a resource afforded protection under Section 4(f), alignments were adjusted to reduce impacts on the resource [see Chapter 5, *Section 4(f) Evaluation*, for additional detail].

Western Section

Figure 3-1 illustrates the location of the mountains relative to the Community boundary. The previous bullets described why alternatives could not be studied in detail on Community land. As such, any alignment alternative located within Corridor G (south of the mountains and north of the Community) would have to pass through the mountains to connect to Corridor F. Having an alignment through the mountains, though, would be consistent with what has been planned since the mid-1980s. In published regional and local planning documents and in updates to those documents since the mid-1980s, a freeway similar to the proposed freeway is clearly shown passing through the mountains.

Figure 3-6 illustrates the locations of the resulting nine alignment alternatives in the Western Section. As part of this step, a report (*Alternatives Screening Report* [2003]) was developed to detail anticipated impacts for each of the nine technical alternatives using criteria relating to traffic performance, design, environmental considerations, and planning-level cost estimates. In the report, the alignment alternatives were referred to as Technical Alternatives T01 through T09 (see Figure 3-6). The project team, including key stakeholders, determined which alternatives best satisfied the screening criteria, and these alternatives were then carried forward for subsequent analysis and possible inclusion in the DEIS.

Eastern Section

Figure 3-6 illustrates the locations of the eight alignment alternatives in the Eastern Section carried forward into the next step of the screening process.

Other Alternatives Eliminated from Further Study

In this screening step, in addition to refining alignments in the corridors in the Western and Eastern Sections, alternatives identified outside the Study Area were subjected to a screening analysis. The Riggs Road Alternative and SR 85/Interstate 8 (I-8) Alternative were assessed using criteria presented for the corridor and Western Section First-tier screening processes. A description of each alternative and reasons for its elimination are provided below.

Riggs Road Alternative

The Riggs Road Alternative would replace 51st Avenue south of its connection to I-10 (Papago Freeway) for approximately 21 miles. It would then replace approximately 4 miles of Beltline Road in an easterly direction. At the Riggs Road/SR 347 intersection, the alternative would replace approximately 3 miles of Riggs Road before connecting to I-10 (Maricopa Freeway) at the existing I-10/Riggs Road service traffic interchange.

Nearly two-thirds of the alternative would be on Community land. While the Riggs Road Alternative would serve regional mobility needs, particularly of those living in the Maricopa area, meeting this travel demand would not address any specifically identified planning goals for an integrated regional transportation network. The RTP identifies the proposed action as a critical link in the Regional Freeway and Highway System, both in completing it and in optimizing overall system performance as well as that of specific existing links such as SR 202L (Santan Freeway). The Riggs Road Alternative would not complete the loop system as part of SR 202L, thereby causing substantial out-of-direction travel for motorists. Therefore, the alternative would not meet the proposed action's purpose and need criteria and was eliminated from further study.

SR 85/I-8 Alternative

The SR 85/I-8 Alternative would begin at I-10 approximately 32 miles west of downtown Phoenix and would either replace or widen SR 85 for approximately 33 miles south before connecting to I-8 in Gila Bend. It would then replace or widen I-8 for approximately 63 miles east before reconnecting with I-10 at Casa Grande, approximately 56 miles south of downtown Phoenix. SR 85 is currently being reconstructed as a four-lane, divided highway with limited-access control, and I-8 is a four-lane, divided Interstate freeway with full access control. Existing signs at each terminus designate the route as a truck bypass of downtown Phoenix. This route would continue to be available for interstate and inter-regional travel, but it does not meet the proposed action purpose and need as part of a regional transportation network and, therefore, it was eliminated from further consideration.

Technical Alternatives Screening (Second Tier)

Western Section

The operational characteristics of the nine technical alternatives in the Western Section were compared to determine whether any of the technical alternatives could be eliminated from further study. Traffic modeling results were used to assess how simulated traffic would travel on the technical alternatives and how the traffic from the alternatives would interact with traffic on I-10 (Papago Freeway) (*Alternatives Screening Report* [2003]).

The technical alternatives were based on an assessment of operational performance combined with consideration of other criteria (e.g., displacements and relocations, traffic performance, compliance with design standards, preliminary R/W requirements, and planning-level cost estimates).

Eastern Section

The eight Eastern Section alternatives were screened primarily on the severity of community-related impacts (e.g., displacements and relocations, community character and cohesion impacts). Other factors were also considered (e.g., operational characteristics, compliance with design standards, preliminary R/W requirements, planning-level cost estimates).

3

History of naming action alternatives

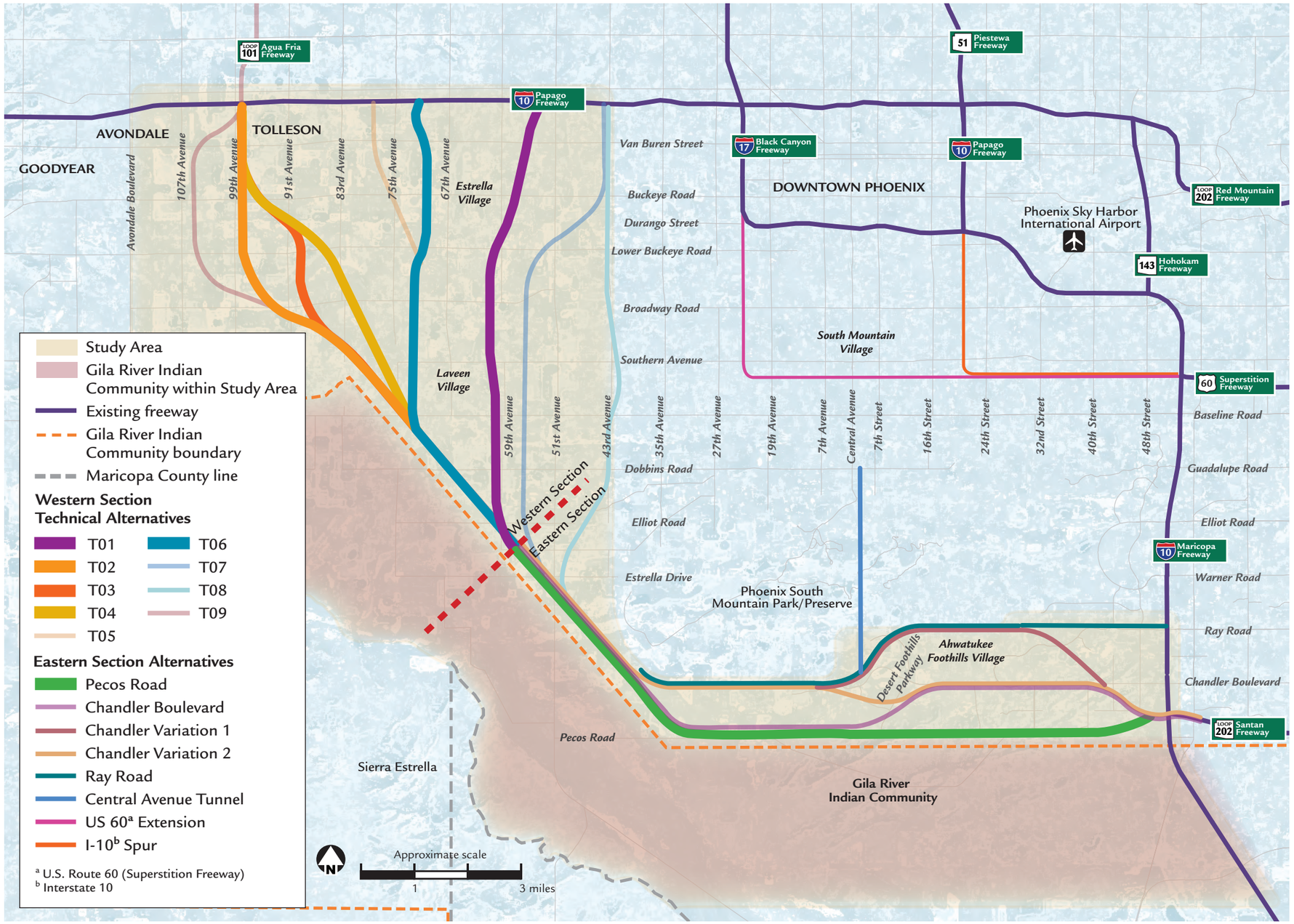
The names of the action alternatives studied in detail in the DEIS resulted from comments received from the public and participating agencies. The names serve as geographical references based on each alternative's location in the Study Area and its relationship to the Interstate, regional freeway, and arterial street networks.

All action alternatives were assigned a letter, using "W" for Western Section alternatives and "E" for Eastern Section alternatives.

Action alternatives in the Western Section were then assigned numbers based on the alternatives' western termini in relation to their connections to I-10 (Papago Freeway) (e.g., "71" for the I-10 connection at 71st Avenue and "101" for the I-10 connection at the I-10/SR 101L interchange). Because only one action alternative is being studied in detail in the Eastern Section, it was assigned the number "1."

Each alignment option of the W101 Alternative was named based on its relative geographical location among Western, Central, and Eastern alignments (*Renaming of Alternatives for the Draft EIS Memorandum* [2006]).

Figure 3-6 Western and Eastern Section Alternatives, First-tier Screening, Alternatives Development and Screening Process



As a result of the First-tier screening, nine alternatives in the Western Section and eight alternatives in the Eastern Section were carried forward for further study.

Table 3-3 Western Section Alternatives Eliminated from Further Study, Second-tier Screening, Alternatives Development and Screening Process

Location of Alternatives Eliminated	Alternative	Reason for Elimination
	T05	• Operational failure experienced on I-10[a] (Papago Freeway) between 83rd Avenue and SR 101L[b] because of two system traffic interchanges within 3 miles of each other • Substantial cost and right-of-way associated with system traffic interchange ramps and connector roads
	T07	• Operational failure experienced on I-10 (Papago Freeway) between 43rd Avenue and I-17[c] because of two system traffic interchanges within 3 miles of each other • Substantial impacts to existing and planned residential and commercial developments • Substantial cost for construction and right-of-way acquisition associated with displacements and system traffic interchange ramps and connector roads
	T08	• Operational failure experienced on I-10 (Papago Freeway) between 43rd Avenue and I-17 because of two system traffic interchanges within 3 miles of each other • Substantial impacts to existing and planned residential and commercial developments • Substantial cost for construction and right-of-way acquisition associated with displacements and system traffic interchange ramps and connector roads
	T09	• Connection to SR 101L would require sharp curves that would limit the speeds allowed on the freeway to a maximum of 45 miles per hour • Substantial impacts to existing and planned residential and commercial developments in Tolleson and Avondale • Substantial cost of right-of-way acquisition associated with displacements

[a] Interstate 10 [b] State Route 101L (Loop 101) [c] Interstate 17

Table 3-4 Renaming of Action Alternatives,[a] Western Section

Technical Alternative Carried Forward from the Second-tier Screening Process	Alternative Name as Presented in the DEIS[b]
Technical Alternative T01	W55 Alternative or W59 Alternative[c]
Technical Alternative T02	W101 Alternative Western Option[d]
Technical Alternative T03	W101 Alternative Central Option[d]
Technical Alternative T04	W101 Alternative Eastern Option[d]
Technical Alternative T06	W71 Alternative

[a] See sidebar on previous page.
[b] Draft Environmental Impact Statement
[c] The W55 Alternative later became the W59 Alternative.
[d] The three options of the W101 Alternative (W101 Alternative Western Option, W101 Alternative Central Option, W101 Alternative Eastern Option) represent horizontal alignment options to the action alternative that would connect to Interstate 10 (Papago Freeway) at its interchange with State Route 101L (Agua Fria Freeway).

3

Second-tier Screening Results

Western Section

Four of the nine technical alternatives were eliminated from further study based on the criteria above. Reasons for elimination of Technical Alternatives T05, T07, T08, and T09 are presented in Table 3-3. While none of the alternatives were completely unacceptable (sometimes referred to as "fatally flawed"), the four eliminated were determined to generate greater operational, environmental, and/or economic impacts than the remaining five alignment alternatives.

The remaining Technical Alternatives T01, T02, T03, T04, and T06 in the Western Section were renamed (see Table 3-4). A key observation from the table pertains to Technical Alternatives T02, T03, and T04: each represents an option associated with a single action alternative in the Western Section that would connect to I-10 at its interchange with SR 101L (Agua Fria Freeway).

Eastern Section

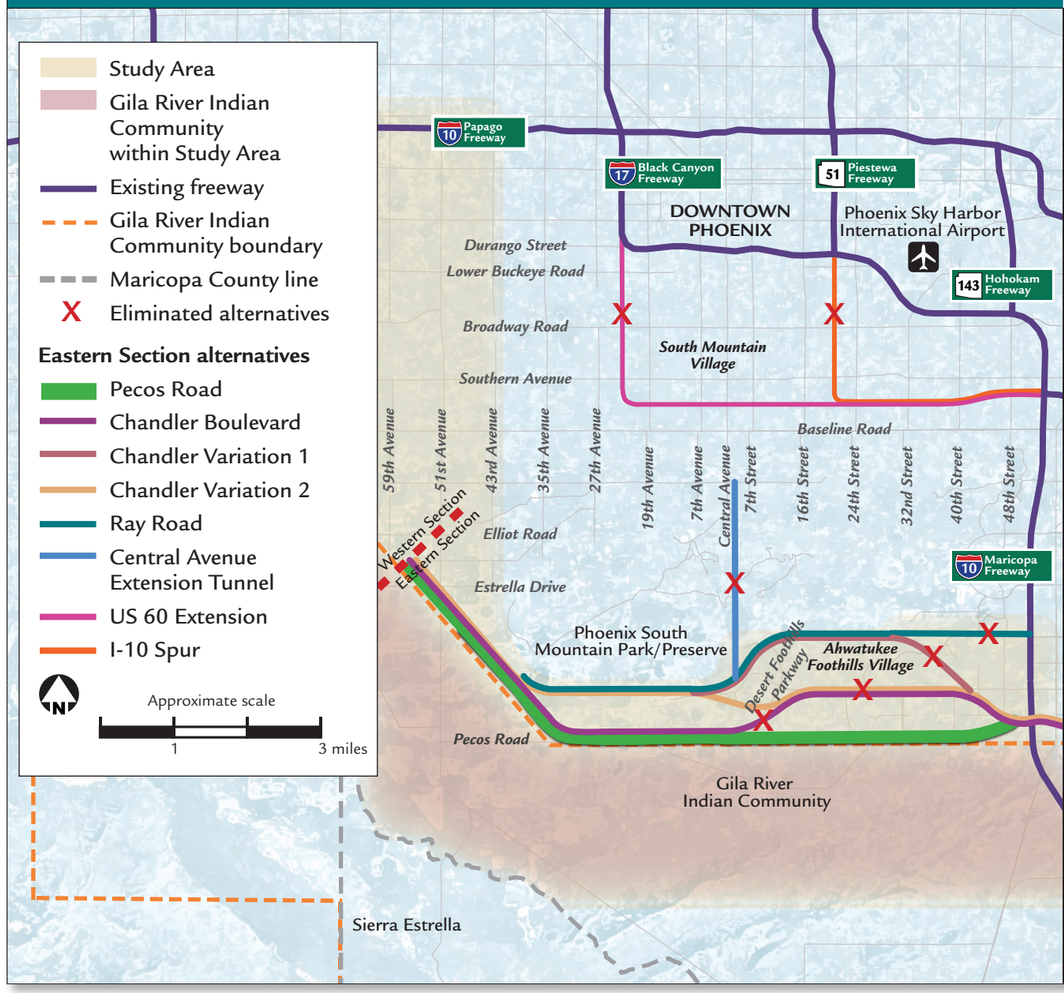
All but one of the alignment alternatives in the Eastern Section were eliminated from further study. Reasons for elimination of the alternatives are presented in Table 3-5.

The remaining alternative, the Pecos Road Alignment (later referred as the E1 Alternative), would do the most to avoid, reduce, or otherwise mitigate impacts on neighborhoods immediately north of Pecos Road. It would closely follow the published alignment first adopted in the 1980s.

Project Termini and Independent Utility

The Second-tier screening concluded that the three alignment alternatives in the Western Section and one alignment alternative in the Eastern Section, if combined, would connect major traffic generators and

Table 3-5 Eastern Section Alternatives Eliminated from Further Study, Second-tier Screening, Alternatives Development and Screening Process

Location of Alternative	Alternative	Reason for Elimination
	Ray Road	• Substantial impacts on traffic performance on I-10[a] (Maricopa Freeway) based on three system traffic interchanges within a 6-mile segment of I-10 (including I-10/SR 202L[b]/Pecos Road, I-10/Ray Road Alternative, and I-10/US 60[c]) • Substantial impacts on existing residences, including hundreds of residential displacements • Substantial disruption to community character and cohesion, splitting Ahwatukee Foothills Village • Loss of road network capacity by loss of a portion of Ray Road • Impacts on commercial frontage along Ray Road and developments • Added costs to construct a new system traffic interchange and add capacity improvements along I-10 (in addition to what is already planned)
	Chandler Boulevard[d]	• Substantial impacts on existing residences, including hundreds of residential displacements • Substantial disruption to community character and cohesion, splitting Ahwatukee Foothills Village • Impacts on commercial frontage along Chandler Boulevard and developments • Loss of road network capacity by unplanned loss of portions of Chandler Boulevard and Ray Road
	US 60 Extension	• Would not address needs based on regional travel demand and existing and projected transportation system capacity deficiencies • Would cause substantial traffic performance impacts on I-10 (Maricopa Freeway) between SR 202L (Santan Freeway) and US 60 (Superstition Freeway) • Increased undesirable congestion on US 60 (Superstition Freeway) and SR 101L[e] (Price Freeway) • Unintended underuse of SR 202L (Santan Freeway) • Substantial impacts on existing residences, including thousands of residential displacements • Would not be consistent with local or regional planning, which includes a freeway alternative that completes the loop system as part of SR 202L
	I-10 Spur	• Similar reasons cited for elimination of the US 60 Extension Alternative • Substantial disruption to community character and cohesion, splitting South Mountain Village
	Central Avenue Extension Tunnel	• Minimal improvement to traffic performance along I-10 (Maricopa Freeway) and regional mobility • Alternative would be an unplanned extension of Central Avenue and would not adequately address capacity deficiencies in the region • A tunnel under SMPP[f]: up to 2.5 miles long and cost-prohibitive, undesirable for safety and emergency response, would result in direct use of a resource afforded protection under Section 4(f), and result in disproportionately high construction costs considering the percentage of vehicular trips served

[a] Interstate 10 [b] State Route 202L (Loop 202) [c] U.S. Route 60 (Superstition Freeway)
[d] Two variations of the Chandler Boulevard Alternative were considered, both of which would tie into the Ray Road Alternative. The first variation would begin at the I-10/SR 202L/Pecos Road system traffic interchange and continue northwest past Chandler Boulevard and connect with the Ray Road Alternative near 32nd Street. The second variation would follow the Chandler Boulevard Alternative alignment, but instead of joining with the existing Pecos Road alignment near Desert Foothills Parkway, the second variation would dip slightly and then follow the Ray Road Alternative along the southern SMPP boundary, where no roadway currently exists.
[e] State Route 101L (Loop 101) [f] Phoenix South Mountain Park/Preserve

provide access to the surrounding communities in the western and eastern portions of the MAG region. The potential termini of these alignments (see the text box on page 3-13) are consistent with the logical termini identified in the section, *Project Location, Description, and Current Status*, beginning on page 1-4.

Also, the combined alignments would have independent utility (see sidebar regarding independent utility on page 1-4) in that they would:

- ➤ not depend on other projects to serve the proposed freeway's purpose
- ➤ be usable even if no other transportation-related improvements were made in the Study Area

Design Options and Refinements (Third Tier)

At this stage of the alternatives development and screening process, the level of design was limited to alignment locations for the proposed freeway. For project designers, however, other features associated with freeway design must be considered, such as:

Potential Termini for the Proposed Freeway

(a) I-10 at 55th and 59th avenues, looking east

(b) I-10 at 71st Avenue, looking east

(c) I-10 at SR 101L, looking east

(d) SR 202L at I-10, looking west

Source: Arizona Department of Transportation 2005a

Photos a, b, and c illustrate possible western termini on I-10 (Papago Freeway) near 59th Avenue, 71st Avenue, and SR 101L (Agua Fria Freeway), respectively. Photo d shows the possible eastern terminus, near the SR 202L (Santan Freeway) and I-10 (Maricopa Freeway) system traffic interchange, which was constructed between 2000 and 2002 to accommodate the western leg of SR 202L.

- What should the vertical profile of the freeway look like? Should it be aboveground or belowground? Or should it be a combination of both?
- Where should traffic interchanges (see sidebar on page 3-14) with the local arterial streets be located? And how many should there be?
- What should the interchanges look like? And what do drivers expect them to look like?
- Should the arterial streets go over or under the freeway?
- How will drainage for the freeway be treated?

Answers to these types of questions drive project designers to consider different options, weigh the benefits and disadvantages of each, and determine the appropriate option for each design-related issue. This section addresses those key design options and presents those options considered but eliminated from detailed study in the DEIS.

Third-tier Screening Results

Adjustments were made to the Western and Eastern Section alignment alternatives to avoid conflict with sensitive environmental resources (see sidebar on this page) and to optimize traffic performance through improvements in freeway-to-freeway interchange geometry and through local access to and from the alignment alternatives. Examples of adjustments made to the Western and Eastern Section alignment alternatives are shown in Figures 3-7 (see page 3-14) and 3-8 (see page 3-15), respectively. Design details of the action alternatives are presented in the section, *Alternatives Studied in Detail*, beginning on page 3-40.

The design options that were considered and eliminated from detailed study in the DEIS are presented in the following text.

South Mountains Avoidance Options

As proposed, the Pecos Road Alignment would pass through the southwestern edge of the South Mountains. This alignment, similar to that planned since the late 1980s, would follow existing terrain except where cuts to the hillsides would be needed to pass through the ridgelines (Figures 5-9 and 5-10 on pages 5-16 and 5-17, respectively, illustrate features of the proposed ridgeline cuts).

Local residents and representatives from the City of Phoenix, Ahwatukee Foothills Village, the Community, and the South Mountain Citizens Advisory Team (SMCAT) expressed concerns that these cuts would substantially and adversely affect the South Mountains' valued resources. In response, design options were developed in an effort to avoid and/or reduce impacts on the mountains. Design options considered fell into these categories:

- Build a bridge over the South Mountains.
- Build a tunnel under the South Mountains.

Assessment of these design options concluded:

- Options to build a bridge over the South Mountains were eliminated from further study because of incident management and homeland security concerns, constructibility and maintenance issues, future expansion limitations, substantially higher estimated construction costs, and undesirable intrusion-related impacts. (Additional information is provided in the section, *Bridge Alternatives*, beginning on page 5-20.)

Can impacts on the environment be avoided entirely?

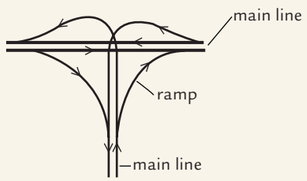
All alignment alternatives would generate impacts on the natural and human environment. Impacts would be unavoidable because of the size of the proposed action. Because other alignment alternatives were eliminated from further study owing to undesirable impacts on the natural and human environment, the action alternatives carried forward for detailed study in the DEIS represent actions undertaken to avoid, reduce, or otherwise mitigate impacts on the environment. By this measure, the impacts on overall resources reported later in Chapter 4, *Affected Environment, Environmental Consequences, and Mitigation*, have been reduced through the screening process.

3

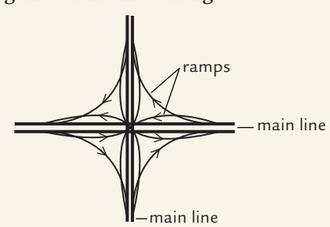
Traffic interchange configurations for the action alternatives

Traffic would gain access to the proposed freeway using system and service traffic interchanges. System traffic interchanges are interchanges connecting a freeway with another freeway, such as the I-10/I-17 Stack in downtown Phoenix. Service traffic interchanges provide freeway access to and from the local arterial street network, such as I-10 at 7th Avenue in downtown Phoenix. The action alternatives would use two types of system traffic interchanges:

Three-leg directional interchange

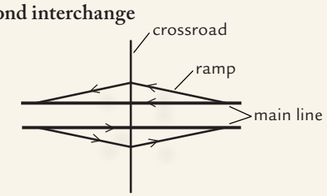


Four-leg directional interchange



The region's freeway system most often uses two types of service traffic interchanges:

Diamond interchange



Single-point urban interchange

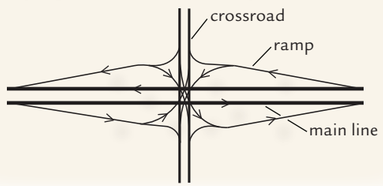
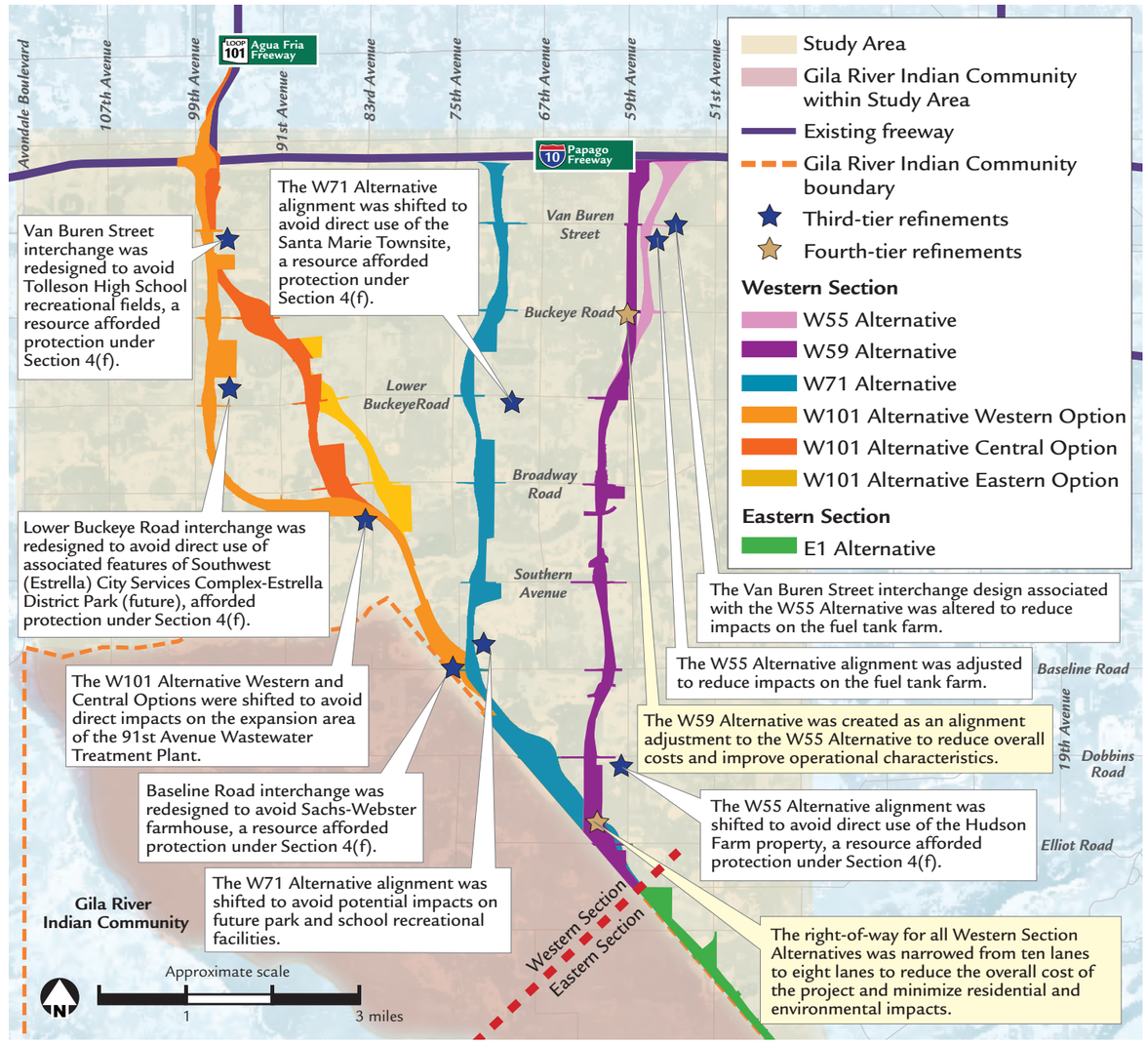


Figure 3-7 Alignment Adjustments, Third- and Fourth-tier Screening, Western Section, Alternatives Development and Screening Process



For action alternatives in the Western Section, adjustments were made early in the study process to avoid or reduce impacts on unique facilities and resources protected under Section 4(f). (The bulges and other irregular shapes depicted for the alternatives' otherwise-linear footprints reflect projected right-of-way needed for drainage basins and channels, construction staging areas, interchanges, etc.)

- Building a tunnel under the South Mountains as a design option was also assessed and, based on safety and constructibility, undesirable intrusion-related impacts, maintenance, and construction cost, it was eliminated from further study (see text box regarding tunneling options on page 3-16 for further discussion).

System Traffic Interchange Connection Options

The major challenge in designing system traffic interchanges is ensuring efficient and safe conveyance of traffic in various directions. Design options considered for the system traffic interchanges were vertical profiles, horizontal alignments, and existing service traffic interchange ramp configurations.

The action alternatives in the Western Section (except for the W101 Alternative—see the next paragraph) would connect to I-10 (Papago Freeway) at proposed new system traffic interchanges, and existing service traffic interchanges would be reconfigured to minimize disruption of traffic operational performance on I-10. Several ramp configurations for each connection were evaluated for traffic operational characteristics. The results of this evaluation were used as the basis for eliminating ramp configurations from detailed study (*Traffic Report* [2007]). Additional information is presented in the section, *System Traffic Interchanges*, on page 3-48, and *Alteration of Existing Service Traffic Interchanges*, on page 3-52.

The W101 Alternative would connect to I-10 (Papago Freeway) at the existing system traffic interchange with SR 101L (Agua Fria Freeway). Design configurations varied in the following ways:

- removal of the existing system interchange to construct a new system traffic interchange to the west or partial reconstruction of the existing system traffic interchange
- retention of an at-grade profile or use of bridges to reduce community impacts
- replacement of a section of 99th Avenue or use of a location shifted ¼ mile east of 99th Avenue

Through an iterative process using multiple criteria (with a focus on impacts on Tolleson and Avondale), options were eliminated from detailed study (*SR 202L/SR 101L Direct Connection Alternatives Screening Report* [2003] and *SR 202L/SR 101L Direct Connection Alternatives along 99th Avenue and ¼ Mile East Memorandum* [2004]). A description of the options carried forward for further study is presented in the section, *System Traffic Interchanges*, on page 3-48, and *Alteration of Existing Service Traffic Interchanges*, on page 3-52.

W101 Alternative – Alignment Options

Table 3-4 on page 3-11 notes the W101 Alternative has three alignment options (Western, Central, and Eastern) approaching its connection to I-10 (Papago Freeway). Alignment options were considered for the W101 Alternative Western Option near Tolleson. In this area, the alternative would have passed through the city, generally following the alignment of 97th Avenue (if it existed) or by replacing 99th Avenue. For each, various designs were considered in attempts to reduce impacts on land uses in the immediate vicinity. The design options that would have replaced 99th Avenue were eliminated from further study because of greater business impacts, undesirable traffic and access operational considerations, and greater comparative costs (*W101 Options Screening Memorandum* [2006]).

E1 Alternative – Pecos Road Variations

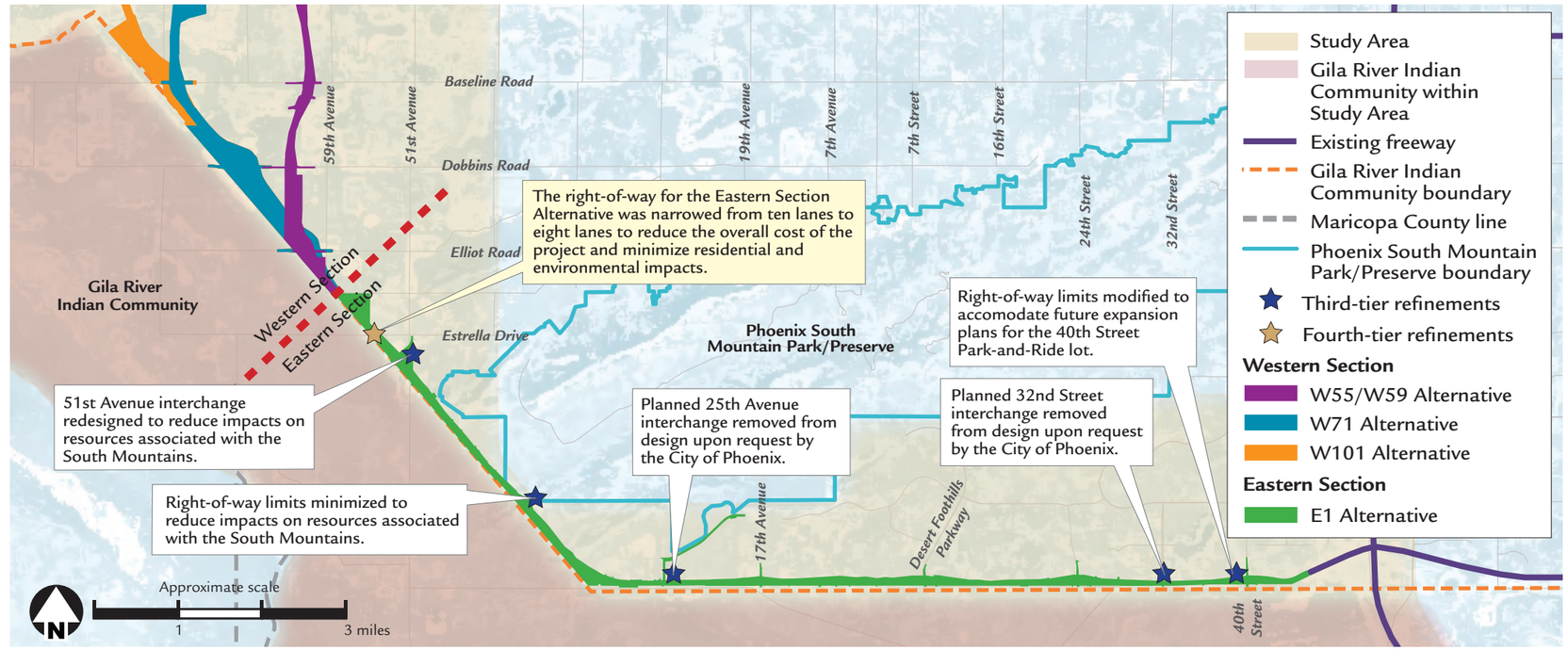
As highlighted in Chapter 6, *Comments and Coordination*, local residents and representatives from the City of Phoenix, Ahwatukee Foothills Village, and the SMCAT expressed concerns that the Pecos Road Alignment of the E1 Alternative would degrade air quality and would introduce substantial visual and noise intrusions into Ahwatukee Foothills Village and its surroundings, adversely affecting the social characteristics of the community (see Table 4-9, *Impacts on Community Character and Cohesion, Action Alternatives*, beginning on page 4-24, regarding impacts on Ahwatukee Foothills Village). Ongoing requests to depress the freeway through the area led ADOT and FHWA to examine two design options for this segment of the proposed freeway. The first was to develop and examine depressed freeway options. The second was to place the freeway on the utility easement located immediately south of the Pecos Road R/W (*E1 Alternative – Profile Variations along Pecos Road Memorandum* [2009]).

Depressed Freeway Options

As proposed, the E1 Alternative would have a rolling profile [see the section, *E1 Alternative (Preferred Alternative)*, on page 3-48, for more information]. With the exception of the proposed freeway segments passing through ridgelines of the South Mountains, the freeway would be at or near existing ground level but would be elevated to pass over existing arterial streets. As a basis of understanding, a profile for a freeway—and its resulting dimensions (e.g., R/W width)—is generally controlled by considerations such as:

- **Drainage** – For driver safety, freeways are designed to allow stormwater runoff to cross. This can be accomplished in a number of ways. Examples are to provide:
  - culverts to allow the runoff to cross under the freeway where it would cross naturally
  - channels to intercept runoff and direct it to another location to cross the freeway
  - retention/detention basins to collect the runoff to either meter the flow of water or to redirect it to another location
  - a combination of the above
- The size of these facilities is a function of "storm events." Storm events are based on historic data used to predict worst-case storms during a given period. Based on historic data, a 50-year storm, for instance, is one that has a likelihood of occurring only once in 50 years. ADOT uses a minimum 50-year storm to gauge the size of drainage facilities needed for a project.
- **Subsurface conditions** – For example, a high groundwater table would need special drainage design requirements for a depressed freeway that otherwise could be avoided by using an at-grade design. Also, underground utility lines can influence the profile design; relocation of major utility lines can be extremely costly and must be considered in the context of ADOT's fiscal responsibility.

Figure 3-8 Design Adjustments, Third- and Fourth-tier Screening, Eastern Section, Alternatives Development and Screening Process



For the action alternative in the Eastern Section, adjustments were made early in the study process to avoid or reduce impacts on residential areas and to avoid resources protected by Section 4(f).

3

Tunneling under the South Mountains

The South Mountains are a highly valued resource to Arizona communities (see text beginning on page 5-14 to learn more about the importance of the South Mountains). As designed, the proposed action would alter some of the mountain range's natural landscape by converting it to a transportation use and by causing visual scars from the freeway cutting through mountain ridgelines (see the photo simulation on the left, next page). In addition, concerns have been expressed that the proposed action would introduce an intensive human-made use into an otherwise passive, natural, and—for some—sacred setting; would reduce access to the mountain range; and would diminish wildlife habitat in the area. In response to these concerns, design options to tunnel through the South Mountains were examined.

Tunnel Engineering – As background information, the way a freeway tunnel system looks is generally controlled by technical considerations, such as:

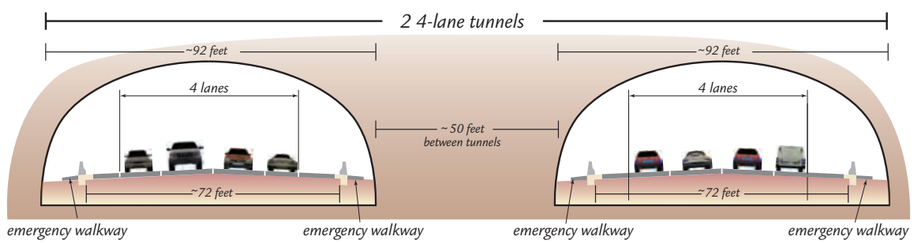
1. A tunnel's dimensions and its distance below ground are dictated by existing geological conditions and available construction technology. When coupled with appropriate safety considerations, these factors basically determine a single tunnel's size or tunnel conditions.
2. Once geologic and construction capabilities are determined, operational needs are considered, including the number of lanes, safe sight distances and other safety features, maintenance features, and security issues. These considerations are used to determine whether the operational needs can be met with the tunnel conditions outlined or whether more than one tunnel (located adjacent to each other) would be needed.
3. Finally it is necessary to determine whether the tunnel(s) would be sufficiently deep and long to avoid or reduce impacts on the surrounding environment.

When considered together, these factors helped determine the minimum acceptable tunnel dimensions (height and width), distance below ground, number of adjacent tunnels to accommodate all of the freeway lanes, tunnel length and location, and possible construction techniques. In determining what type of tunnel could be built, ADOT and FHWA balanced traffic performance against existing technological capabilities. Tunneling options were also assessed to determine the feasibility of their construction and maintenance, to determine their effectiveness in avoiding or reducing impacts to the South Mountains, and to assess whether tunneling through the mountain range would generate other desirable or undesirable outcomes.

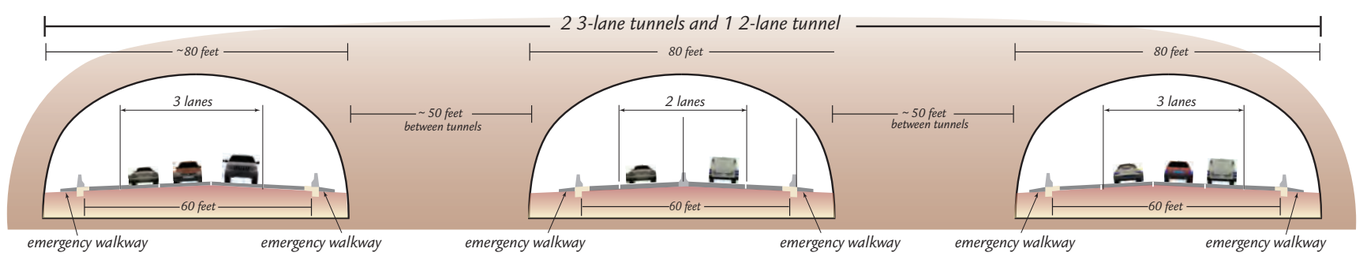
Three tunnel configurations were considered. All the configurations were located along the same alignment as the proposed freeway. The three graphics to the left illustrate the issues involved with each of these configurations. Based on the assessment, summarized below, tunneling options were eliminated from further detailed study. (*Phoenix South Mountain Park/Preserve and Traditional Cultural Property Avoidance, Ridge Bridge – Tunnel Analysis Memorandum* [2009])

Safety and Constructibility – Tunnel options would create undesirable safety issues. Emergencies would result in complex response planning for traffic control, fire detection, ventilation and exhaust, and fire safety systems. There are security concerns with tunnels on urban freeways being considered potential terrorist targets (American Association of State and Highway Transportation Officials [AASHTO] 2003). It is possible that the entire segment of the proposed action would have signs installed warning that transportation of hazardous cargo is prohibited. (For more information on the transport of hazardous materials, see page 4-154.)

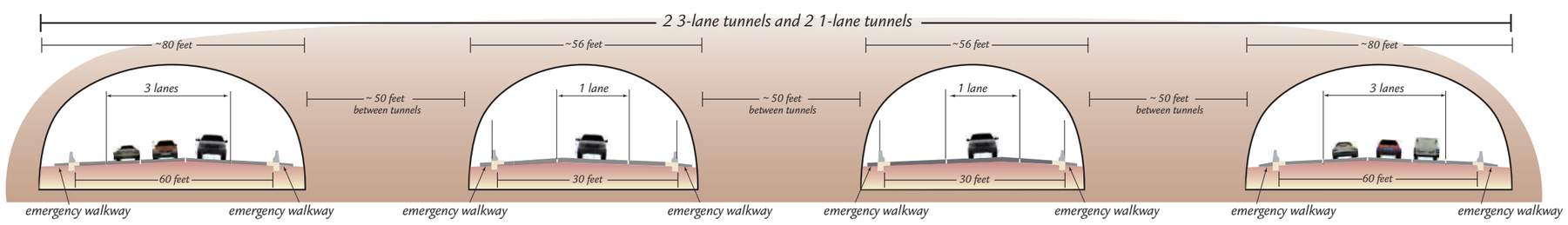
Ideal Cross Section *(total width is approximately 234 feet)*



Constructible Cross Section A *(total width is approximately 340 feet)*



Constructible Cross Section B *(total width is approximately 422 feet)*



Note: graphics are not to scale

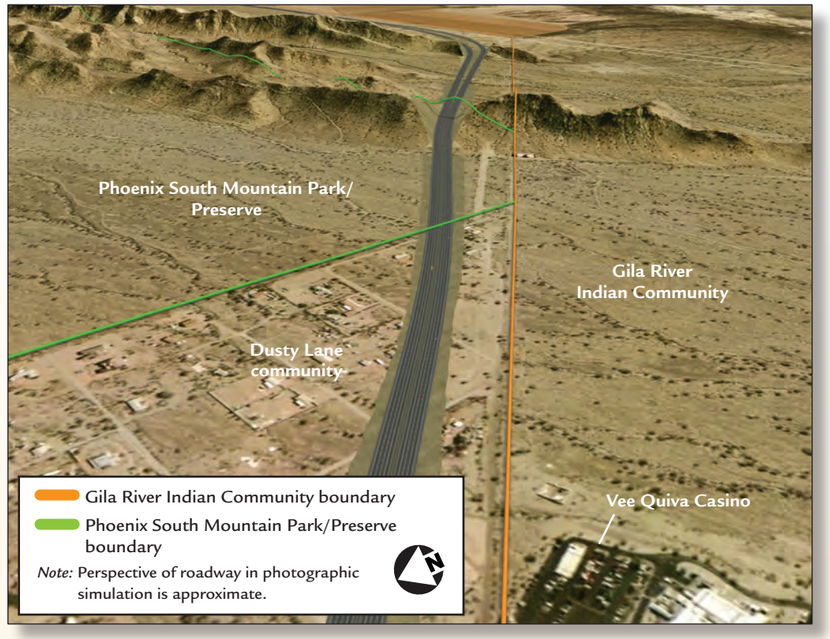
Tunneling under the South Mountains (continued)

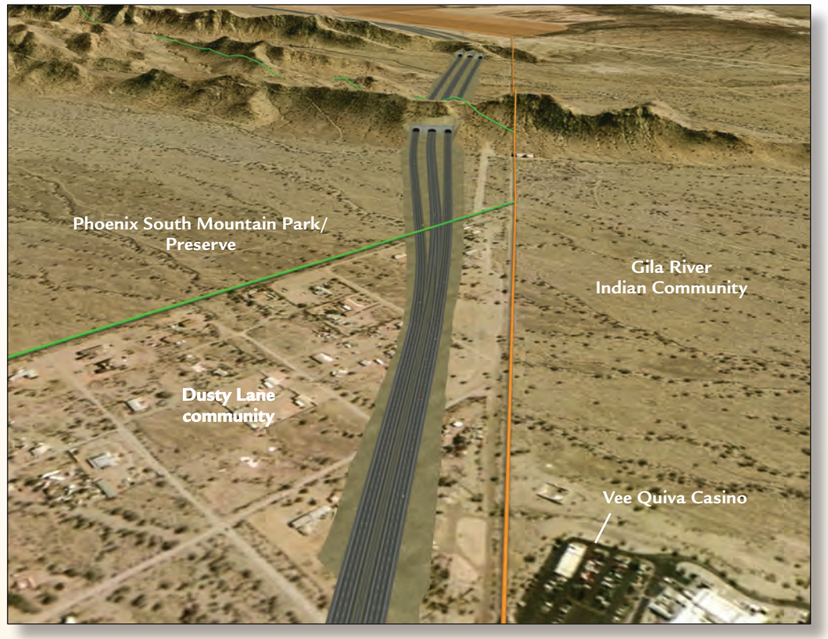
The proposed freeway is being constructed with eight lanes. In an ideal situation, all lanes of traffic moving in one direction would be in one tunnel (see "ideal," in the top graphic). For the proposed freeway's eight lanes, this would result in two tunnels, each approximately 92 feet wide. The four-lane tunnels would not be possible with current construction technology. A review of tunnels constructed in the United States and around the world indicates that 80 feet is the maximum practicable limit for tunnel excavation under ideal conditions, about 12 feet narrower than would be necessary for the ideal option.

The only option that appears constructible using current technology would use three or four tunnels, splitting HOV traffic into a single tunnel or individual tunnels (see "constructible" options A and B in the graphic to the left). The three-lane tunnels would require an 80-foot width, at the limit of constructibility for any known existing tunnels in the United States. Because of the variable nature of site-specific geology (including dangers that could arise from encountering fractured rock), it is not possible at this time to determine specific dimensions of a maximum feasible tunnel width.

Both ADOT and FHWA believe that an 80-foot tunnel option would result in unacceptable safety concerns, with diverging traffic and increased constructibility challenges.

(As a side note, readers may have observed that the I-10 tunnel through downtown Phoenix accommodates more than five lanes in each direction. However, it is not actually a tunnel. Instead, it is an open cut, capped with a "deck" [a city park] supported by load-bearing concrete walls. This is why the structure is called the "Deck Park Tunnel.")





The illustration on the left depicts changes to the ridgelines resulting from the proposed action. The illustration on the right depicts potential changes to the ridgelines from tunneling.

Impacts – The desired effects from tunnel options—avoidance of the conversion of parkland to a transportation use, intrusion of an intensive use into a passive setting, reduced access, reduced impact on a traditional cultural property, and loss of habitat—would not be fully achieved. The tunnel options would have less visual, noise level, and habitat acreage impacts than would the open cut design of the proposed action; total avoidance of such impacts, however, would not be possible. Each tunnel option would require entrances, or portals, that would necessitate ridgeline excavation and subsequent scarring as high as 75 feet. (See the photo simulation on the right, above.)

ADOT would evaluate treatment of any newly exposed rock faces for suitability for application of standard treatments. These might include recessing the face of the tunnel portals to minimize their apparent breadth; incorporating rock crags characteristic of the adjacent natural rock features; rounding and blending newly cut faces to minimize existing contours and highlight natural formations; adjusting or warping slopes to flow into each other or transition with the natural ground surface with minimally noticeable breaks; shaping, sloping, and fracturing exposed rock formations to the extent practicable and feasible, depending on geotechnical and constructibility reviews; using shotcrete that matches the colors and textures of adjacent rocks; or staining cut faces to match the surrounding rock colors.

Additionally, necessary bridge structures, embankments for approaches, rockfall protection systems above the portals, ventilation equipment locations, maintenance facilities, and access roads would further alter the natural setting in the parkland. Therefore, avoidance of the impacts outlined would not be fully achieved using the tunnel options.

Maintenance – Tunnel options would result in higher long-term operational and maintenance costs than a typical freeway. Costs would include full-time personnel for operation and maintenance of ventilation equipment and drainage structures, rockfall protection maintenance at the portals, and tunnel rehabilitation. Annually, these costs are estimated to range from $1.5 million to $2 million. Further, regular maintenance would require tunnel closures lasting a weekend and would require undesirable traffic detour planning and routing.

Construction Cost – Preliminary construction costs for the tunnel options range from approximately $215 million to $1.9 billion, depending on length and excavation (see section, *Tunnel Alternatives*, on page 5-18). The estimate for the same segment of the proposed action (open cut) is approximately $41 million. Considering that current technology does not allow for construction of tunnels that would meet the ideal characteristics and that tunnel options would not fully achieve the desired outcomes, ADOT and FHWA have determined the additional costs presented by tunnel options would not be warranted and, therefore, not justified. ADOT and FHWA would implement mitigation measures as outlined beginning on page 5-23 to reduce impacts from the proposed action on the South Mountains.

For the reasons stated, the tunnel options were eliminated from further study. The study of tunnel options through the South Mountains is not new. In the late 1980s, similar concerns regarding impacts on the South Mountains were expressed by the public, and tunnel options were studied as part of the design process undertaken in 1988 (ADOT 1988b). Reasons to eliminate the tunnel options from further study at that time are consistent with the conclusions reached in this study and presented in this document.

The assessment and its conclusions also have direct applicability to other federal regulations guiding the analysis of alternatives in the NEPA process, specifically to the evaluation of alternatives as outlined under procedures established to protect resources afforded protection under Section 4(f) of the Department of Transportation Act. [See Chapter 5, *Section 4(f) Evaluation*, for further discussion regarding the evaluation.]

3

Drainage design options

Drainage design for the depressed profile option included a number of concepts that have been implemented along freeways in the Phoenix area. The photos below provide examples.

Narrow parallel retention basin

Channel over freeway

Off-site retention basins

Underground storage cells

- **Surrounding environment** – For example, public comments suggest a depressed freeway would be more effective than an at-grade rolling profile in reducing impacts on adjacent land uses that may be sensitive to the freeway's effects. It cannot be assumed, however, that a depressed freeway would reduce all noise and visual impacts. Noise walls, which could affect visual quality, would still be necessary on a depressed freeway.

Drainage served as the primary design constraint for the Pecos Road segment of the E1 Alternative. Runoff from the South Mountains follows mostly natural drainage patterns as it flows to the southwest through Ahwatukee Foothills Village, across Pecos Road, and onto Community land. The Community has documented concerns relating to the quantity, quality, and location of drainage released onto its land. These concerns have controlled drainage design on other Regional Freeway and Highway System segments such as SR 202L (Santan Freeway).

ADOT and FHWA employed these factors in considering a depressed profile option for the proposed freeway. Assessments were performed to determine constructibility and effectiveness in avoiding or reducing impacts and to evaluate whether a depressed profile would generate other desired or undesired outcomes. Based on the results of these assessments, further design options were developed and refined in attempts to reduce impacts on the adjacent community. The modifications incorporated alternative drainage designs, use of retaining walls, and other features to reduce R/W requirements.

Four drainage concepts were developed for a depressed profile through Ahwatukee Foothills Village and its surroundings: the use of linear channels, underground storage, off-site detention basins, and channels (see sidebar on this page).

To summarize the results presented in the ADOT Technical Memorandum, *E1 Alternative – Profile Variations along Pecos Road* (2009), the depressed freeway options would create:

- **Drainage design complexities** – The existing drainage facilities adjacent to and passing under Pecos Road are designed to accommodate a 10-year storm. According to ADOT guidelines, the drainage facilities for on-site flow (water falling on the proposed freeway) must accommodate a 10-year storm and facilities for off-site flow (water passing under the proposed freeway from upstream areas) must accommodate, minimally, a 50-year storm. It is assumed that outflow onto Community land would be maintained at the current flow and location. Using a rolling profile for the roadway, maintenance of the existing flow would need extension of the existing drainage structures and construction of small drainage basins at regular intervals.
- With a depressed freeway section, drainage facilities for both the on- and off-site flows would, at a minimum, have to accommodate a 50-year storm for driver safety. The depressed freeway section would sever the existing drainageways, resulting in the need to develop new and potentially larger facilities, including four to six pump stations. Because any drainage design option associated with a depressed freeway option would not be allowed to exceed existing outflows, more water would need to be stored upstream, resulting in the need to develop large drainage basins and, therefore, acquire more R/W. Also, redistributing the water to its original drainage pattern would be more difficult once it has been collected into a basin.
- **Greater R/W needs than the at-grade rolling profile under study** – Approximately 150 additional acres would be needed when compared with the at-grade rolling profile under study.
- **More residential displacements** – As a result of the increased R/W needed, between 152 and 326 more residences would be displaced, depending on the drainage design option considered when compared with the at-grade rolling profile.
- **Increased costs** – The total construction costs for the depressed freeway options would be nearly 50 percent higher when compared with the at-grade, rolling profile under study for this area of the proposed action. Costs would increase from $761 million for the at-grade, rolling profile option to $1.23 billion to $1.26 billion for the depressed freeway options. The majority of the additional $469 million to $499 million is for R/W, approximately 90 percent, while the remaining 10 percent is for construction.
- **Impacts on Ahwatukee Foothills Village** – The public generally perceives that a depressed freeway would reduce and/or eliminate impacts on visual resources and freeway-related noise. Visual and noise-level impacts from operation of the proposed E1 Alternative would, however, still occur and would require mitigation, as would be the case for the at-grade rolling profile.

For these reasons, the depressed freeway options were not carried forward for further study. Instead, the rolling profile was carried forward. Maintaining the existing flows onto Community land with a rolling profile would require extension of the existing drainage structures and the construction of small drainage basins at regular intervals.

Utility Easement Options

Another option suggested to reduce impacts on Ahwatukee Foothills Village would be to locate the Pecos Road Alignment on the utility easement immediately south of Pecos Road. The concept would be to construct the freeway on the existing utility easement, as close to the Community boundary as possible, thereby providing additional separation from the neighborhoods north of Pecos Road in Ahwatukee Foothills Village. To achieve this design, the power lines would be relocated from the southern side of the proposed freeway to the northern side of the proposed freeway in the western portion of Ahwatukee Foothills Village, beginning west of 25th Avenue. The power lines would remain north of the freeway until approximately 32nd Street, where they would cross back to the southern side.

An assessment of the option revealed:

- Relocation of the power lines would require acquisition of additional R/W for a utility easement to replace the existing easement. This would result in essentially the same amount of R/W acquisition as would be required with the at-grade, rolling profile under study.
- This concept would locate overhead power lines immediately adjacent to residential neighborhoods,

an action that could be perceived as a negative impact.

- Relocation of the 500 kilovolt (kV) power lines would cost approximately $2 million per mile, or $15 million for the length considered for relocation, not including R/W costs and prior rights issues (see sidebar on this page).
- Indications from the utility companies are that the lines could not be relocated underground because of the ancillary equipment required (e.g., cooling facilities) and associated costs.

For these reasons, the utility easement option was not carried forward for further study.

Design Adjustments (Fourth Tier)

The action alternatives advanced from the Third-tier screening process were subjected to intensive engineering, cost, environmental, economic, and social analyses, and these action alternatives (along with the No-Action Alternative) were presented to the public for comment at numerous meetings and open houses between 2005 and 2009 (see Chapter 6, *Comments and Coordination*). During this period, an economic downturn gripped the nation, including Arizona. According to the draft *Annual Report on the Status of the Implementation of Proposition 400* (MAG 2009d), the half-cent sales tax approved through Proposition 400 has been the major funding source for the RTP and provided over half its revenues. Because sales tax receipts have declined (and are projected to continue declining), fiscal year 2008 (the MAG fiscal year begins July 1 and ends June 30) receipts from the half-cent sales tax were 3.2 percent lower than in fiscal year 2007 (MAG 2009d). This period marked the first decline in the history of the half-cent sales tax since its inception in 1985. The decline continued with fiscal year 2009 receipts, 13.6 percent lower than fiscal year 2008 receipts. Adding to transportation budget shortfalls, other revenues provided for the RTP have declined and are expected to continue to decline.

In response, MAG began evaluating methods of cutting project costs while still delivering the major RTP elements. The effort included methods to address public concerns (acquisitions of homes, etc.) and reduce costs, R/W needs, and other impacts for this project. The effort, a Fourth-tier screening process, resulted in considering other alternatives to a freeway, reducing or "constraining" the freeway and its R/W, and making alignment adjustments. Each of these cost-cutting measures is further discussed below.

Alternatives to a Freeway

To reduce costs and impacts of the proposed freeway, the project team considered use of what is termed the Arizona Parkway as an alternative to an access-controlled freeway (see sidebar on this page). The parkway is a nonfreeway, restricted-access facility having greater capacity than major urban arterial streets. The parkway alternative, by design, would provide additional travel capacity without needing full grade separations at intersections with arterial cross streets. In the best-case scenario, average daily traffic (ADT) on the parkway would be approximately 105,000 vehicles per day (vpd), well below the ADT on the proposed freeway, which would range from 120,000 to 175,000 vpd. As a result, the Arizona Parkway would lack sufficient capacity to meet projected travel demand. The Arizona Parkway would not adequately address the projected transportation system capacity deficiency and would not remove a sufficient amount of traffic from the arterial street network and, therefore, would not meet the proposed project's stated purpose and need. For these reasons, the Arizona Parkway was eliminated from further consideration.

This analysis reinforced that a freeway corridor was the appropriate infrastructure facility; means to reduce the R/W acquisition needs and other costs associated with a freeway facility were reviewed by MAG.

Constrained R/W Eight-lane Freeway

To continue in its efforts to undertake cost-cutting measures, MAG, in association with ADOT, examined design refinements that would reduce the R/W width proposed for the freeway without jeopardizing the ability to meet the purpose and need established for the proposed project. The action alternatives advanced from the Third-tier screening process were designed with a freeway cross section that provided three general purpose lanes in each direction and sufficient R/W to add an HOV lane and a general purpose lane in each direction in the median in the future when warranted by travel demand. In addition, the proposed freeway was designed to have side slopes based on ADOT design guidelines, thereby avoiding the need for retaining walls. The Fourth-tier evaluation included an alternative design with a reduced number of lanes (three general purpose lanes and one HOV lane in each direction) and a constrained R/W (see text box on page 3-20 regarding constrained and unconstrained R/W).

The analysis assumed that while the freeway with a constrained R/W section would not preclude future expansion of the freeway, it would make any future widening much more expensive and considerably more disruptive to freeway operations when compared with the unconstrained cross section. Examples of these issues include:

- Widening the freeway through the South Mountains' ridges would be highly challenging because the additional lanes could encroach on the rockfall containment ditches and could need additional excavation of the mountain ridges.
- Reconstructing on- and off-ramps while widening the freeway to the outside would be disruptive to motorists because the ramps would need to be closed for an extended period of time.
- Removing and reconstructing noise barriers and retaining walls to accommodate additional freeway lanes would be very costly.

The MAG regional travel demand model was used to compare the operational performance of the unconstrained R/W section (four general purpose lanes and one HOV lane in each direction [ten-lane freeway]) and constrained R/W section (three general purpose lanes and one HOV lane in each direction [eight-lane freeway]).

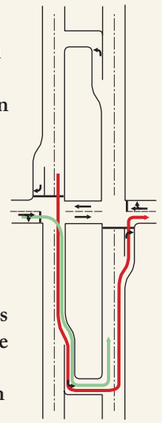
The analysis was conducted to determine whether the reduced number of lanes in the constrained R/W freeway would still meet the need of the proposed freeway.

Utilities and prior rights

The term *prior rights*, as used in this DEIS, refers to a situation involving a utility company that has facilities located on private easements later encompassed by the State's R/W. In this situation, the utility is given a choice of relocating its facilities onto a public R/W or of acquiring a new private easement and relocating onto it. Either would be at ADOT's expense.

"Arizona Parkway" concept

The Arizona Parkway adds capacity by eliminating left-turn movements at intersections and accommodating such turns elsewhere—a design approach commonly referred to as the Michigan left turn, or indirect left turn. In a Michigan left-turn intersection, a U-turn break in the median on the departure side of the intersection accommodates left-turn movements. Traffic signals can be used at high-volume intersections to control congestion at these U-turn breaks. Key advantages of this parkway configuration over a typical urban arterial street come from eliminating left turns traditionally located at intersections, thereby providing greater capacity, less delay and idling, and less potential for collisions at intersections. For more information, see <www.bqaz.org>.



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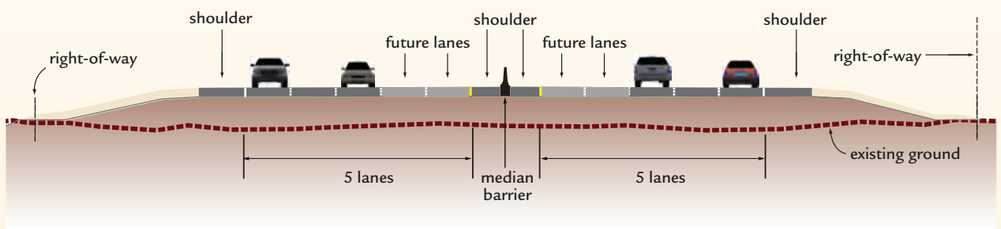
Constrained and Unconstrained Rights-of-way

Many of the recently completed segments of the Regional Freeway and Highway System have been constructed with sufficient R/W for three general purpose lanes in each direction and with the flexibility to accommodate an additional HOV lane in the median without having to acquire more R/W. Any additional general purpose lanes would require widening to the outside, which could trigger acquisition of more R/W and reconstruction of traffic interchanges along the freeway alignment.

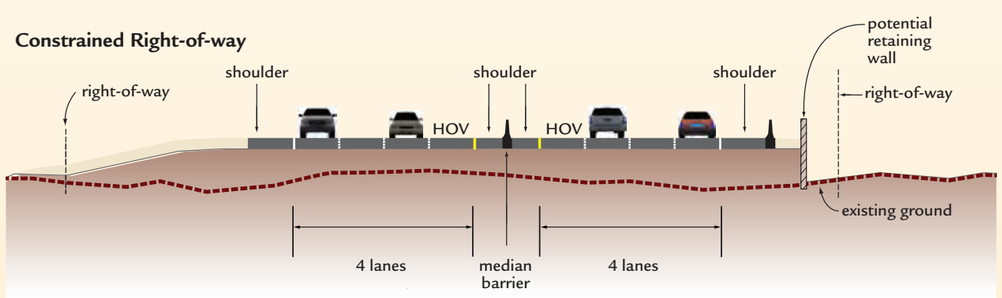
Learning from the benefits and challenges of this design, the South Mountain Freeway typical section (number of lanes and R/W) initially considered in the DEIS would have allowed for widening to accommodate one general purpose lane and one HOV lane in the median, thus reducing future costs and community impacts associated with additional lanes. This typical section (a ten-lane freeway) would also have used desirable side slopes according to ADOT design guidelines in lieu of retaining walls.

In 2009, to reduce initial project costs and community impacts, the South Mountain Freeway typical section was reconfigured to three general purpose lanes and one HOV lane in each direction (an eight-lane freeway). In addition, the needed R/W for this section was further reduced by using retaining walls instead of side slopes where additional R/W cost savings would be realized.

Unconstrained Right-of-way



Constrained Right-of-way

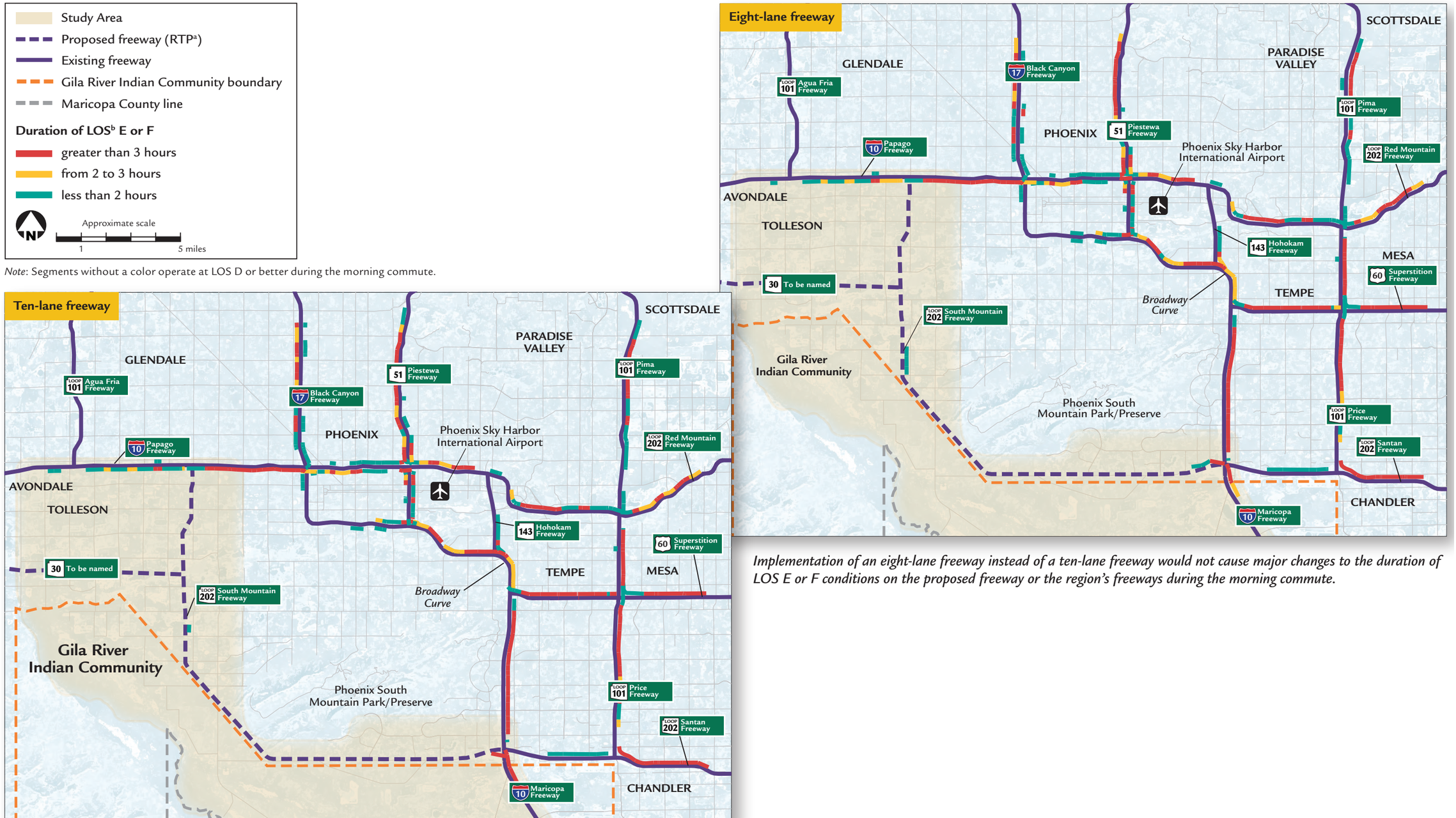


The methods used for this analysis were identical to those presented in *Responsiveness of the Proposed Freeway to Purpose and Need Criteria*, beginning on page 3-27. It is important to note that with the reduction in number of lanes, the relative capacity of the freeway would be reduced by 20 percent. This loss in capacity would have its greatest effect during the peak commuting periods of the day, when the freeway would be operating at capacity. During off-peak times, the severity of the impact would be less because the demand would be less than the capacity of an eight-lane freeway. Although the analysis showed that there would be traffic-related consequences of reducing the number of lanes of the proposed freeway, the eight-lane freeway would still meet the purpose and need criteria, just not as well as the ten-lane freeway. The summarized results follow:

- The distribution of traffic between arterial streets and freeways (as shown in the cut-line analysis) would be about the same between the eight- and ten-lane freeways. This shows that there would be no reduction in the number of trips, just a redistribution of trips to fill the capacity of the freeway and arterial street network.
- In 2035, the daily traffic volume on the proposed action would decrease by 2,000 to 13,000 vpd with the eight-lane freeway when compared with a ten-lane freeway. This traffic would be spread across the region's arterial street and freeway networks.
- Daily traffic volumes on other freeways in the region would vary by less than 3 percent (plus or minus) between the eight- and ten-lane freeways. This minimal change is explained by the fact that these other freeways would be operating at capacity; therefore, with the eight-lane freeway, motorists would likely shift to driving on arterial streets to avoid congestion on the region's freeways.
- Daily traffic volumes on arterial streets in the region would increase by up to 10 percent more (depending on location) with the eight-lane than with the ten-lane freeway.
- According to the cut-line analysis, the ten-lane freeway would accommodate 85 percent of the unmet demand, while the eight-lane freeway would accommodate 82 percent. Therefore, the ten-lane freeway would meet 3 percentage points more of the unmet demand than would the eight-lane freeway. To match the capacity of the ten-lane freeway, two additional freeway lanes or six additional arterial street lanes would need to be constructed along with the eight-lane freeway.
- The differences in the duration of level of service (LOS) E or F on the region's freeways (not including the proposed action) are depicted in Figures 3-9 and 3-10 for the morning and evening commute, respectively. Although some declines in operations would occur, no substantial changes in the operations of the region's freeways would be caused by the reduction in the number of lanes on the proposed freeway. Similar to the observation regarding traffic volumes on the region's freeways, with the eight-lane freeway, motorists would likely shift to driving on arterial streets to avoid congestion on the region's freeways, which would be operating at capacity.
- At eight lanes, the proposed freeway would have areas of evening LOS E or F for 2 to 3 hours and greater, as well as areas with higher LOS (see Figure 3-10); these areas would have less than 2 hours of congestion with the ten-lane freeway. This additional congestion would result from reducing the number of lanes on the proposed freeway.
- The constrained R/W eight-lane freeway (see the section, *Alignment Adjustments*, beginning on page 3-23) would cost about $200 million less than the ten-lane freeway ($50 million less for construction and $150 million less for R/W). Most of the cost savings associated with the eight-lane freeway would be realized by building retaining walls (rather than slopes that take up a larger area) in areas where land is more expensive, allowing ADOT to avoid higher R/W acquisition costs. Reducing the number of lanes from ten to eight would narrow the freeway footprint by 24 feet.

From this analysis, it was concluded that the constrained R/W freeway (eight-lane freeway) would address the purpose and need criteria as described in Chapter 1, although the unconstrained R/W freeway (ten-lane freeway) would have better performance (less congestion) and would be easier and less expensive to expand in the future, if warranted by traffic demand. The eight-lane freeway, however, would sufficiently address capacity deficiency, would shift an appropriate amount of traffic from the arterial street network to the freeway network, would increase network capacity, and would do so with less R/W acquisition. For example, a

Figure 3-9 Duration of Level of Service E or F on Eight-lane and Ten-lane Freeways, Morning Commute, 2035



Note: Segments without a color operate at LOS D or better during the morning commute.

Implementation of an eight-lane freeway instead of a ten-lane freeway would not cause major changes to the duration of LOS E or F conditions on the proposed freeway or the region's freeways during the morning commute.

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

[a] *Regional Transportation Plan* [b] level of service

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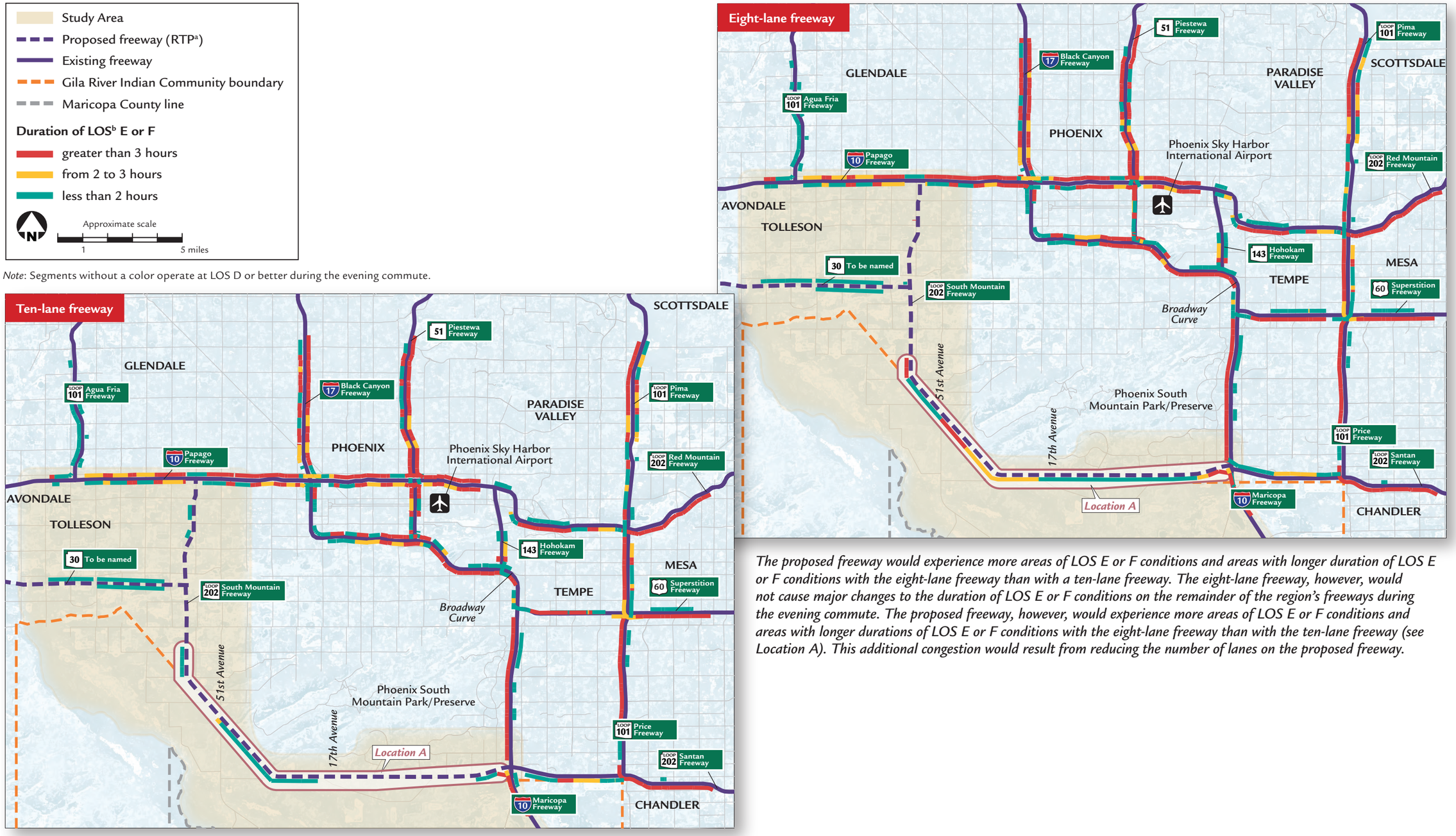
Figure 3-10 Duration of Level of Service E or F on Eight-lane and Ten-lane Freeways, Evening Commute, 2035



Note: Segments without a color operate at LOS D or better during the evening commute.

The proposed freeway would experience more areas of LOS E or F conditions and areas with longer duration of LOS E or F conditions with the eight-lane freeway than with a ten-lane freeway. The eight-lane freeway, however, would not cause major changes to the duration of LOS E or F conditions on the remainder of the region's freeways during the evening commute. The proposed freeway, however, would experience more areas of LOS E or F conditions and areas with longer durations of LOS E or F conditions with the eight-lane freeway than with the ten-lane freeway (see Location A). This additional congestion would result from reducing the number of lanes on the proposed freeway.

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

[a] *Regional Transportation Plan* [b] level of service

ten-lane E1 Alternative would displace 317 residences, but an eight-lane E1 Alternative would displace 138 residences—a 56 percent reduction. Because the eight-lane freeway would meet the proposed project's purpose and need and would do so with lower costs, less R/W acquisition, and fewer impacts than the ten-lane freeway, it was carried forward for further consideration. Accordingly, the ten-lane freeway was eliminated from further consideration.

Alignment Adjustments

In 2009, MAG suggested that a portion of the W55 Alternative (advanced from the Third-tier screening) could be shifted west onto 59th Avenue to take advantage of R/W owned by the City of Phoenix and to reduce cost and business displacements. Further analysis was conducted related to alignment, traffic operations, construction impacts, and environmental considerations (*W59 Alternative Environmental and Engineering Overview* [2010]). As shown in Figure 3-7, this shifted alignment (called the W59 Alternative) would connect to I-10 (Papago Freeway) at 59th Avenue and offer the following advantages and disadvantages:

- would enable better I-10 traffic performance than would be achievable with the W55 Alternative
- would offer certain design advantages over the W55 Alternative
- would be preferred from a security perspective because it would be farther from the petroleum storage facilities at 51st Avenue and Van Buren Street
- would not reconstruct the 51st Avenue Bridge at I-10
- would require the relocation of fewer businesses
- would require the relocation of utilities along 59th Avenue
- would cause increased disruption of traffic during construction along 59th Avenue
- would eliminate direct access from I-10 to 59th Avenue and vice versa (indirect access would be provided by a system of access roads connecting to 51st and 67th avenues)
- would require the relocation of more single-family residences and two apartment complexes

In developing the W59 Alternative, two location options and two drainage channel configuration options were considered between Van Buren Street and Lower Buckeye Road. The two location options considered a W59 Alternative to the west of 59th Avenue and to the east of 59th Avenue. The two drainage channel configuration options both needed the drainage channel to be located on the eastern side of the W59 Alternative to capture the surface water generally flowing from the east. However, the channel could be located either between the freeway and frontage road or east of the frontage road. Ultimately, through analysis of projected impacts, ADOT, MAG, and the City of Phoenix determined that the best location of a drainage channel for the W59 Alternative is west of 59th Avenue between Van Buren Street and Lower Buckeye Road and that the drainage channel would be located between the freeway and the frontage road. The other options were eliminated from further study.

Alignment Description

The W59 Alternative would follow the W55 Alternative alignment south of Lower Buckeye Road. North of Lower Buckeye Road, the W59 Alternative would remain parallel and adjacent to 59th Avenue on its western side. The W59 Alternative would use a portion of the existing 59th Avenue R/W owned by the City of Phoenix. In this area, approximately between Van Buren Street and the Roosevelt Irrigation District (RID) canal, existing 59th Avenue traffic would be carried on either side of the proposed freeway on frontage roads (see sidebar on this page). Southbound 59th Avenue traffic would be placed on a frontage road on the western side of the proposed freeway, and northbound 59th Avenue traffic would be located on a frontage road on the eastern side of the freeway. Access would be provided to and from 59th Avenue for the properties adjacent to the frontage roads. The frontage roads and the freeway would be separated by walls, with on- and off-ramps providing movement between the facilities, at approximately every mile. The frontage roads would be two lanes wide on each side of the W59 Alternative. The W59 Alternative would connect to I-10 (Papago Freeway) with a system traffic interchange. Connecting the proposed freeway to I-10 (Papago Freeway) would result in modifications to the existing service traffic interchanges (see Figure 3-29).

Operational Comparison of W55 and W59 Alternatives

The W55 Alternative included service traffic interchanges that would have been close to the existing intersections of 59th Avenue with Buckeye Road and with Van Buren Street—leading to an undesirable situation along Buckeye Road and Van Buren Street where three major signalized intersections would have been located within a ¼-mile distance. With the W59 Alternative, 59th Avenue would be incorporated into the freeway as a frontage road system. Therefore, there would be only two signals at each arterial street, and they would be coordinated to handle 59th Avenue and I-10 (Papago Freeway) ramp traffic.

According to a traffic sensitivity analysis using 2035 traffic projections, the intersections associated with the W55 Alternative would reach LOS F with lower traffic volumes than would the intersections associated with the W59 Alternative. This observation is consistent for both the morning and evening commutes as well as at both the Buckeye Road and Van Buren Street intersections. In summary, the W59 Alternative frontage road system would handle higher traffic volumes better than would the W55 Alternative with closely-spaced intersections.

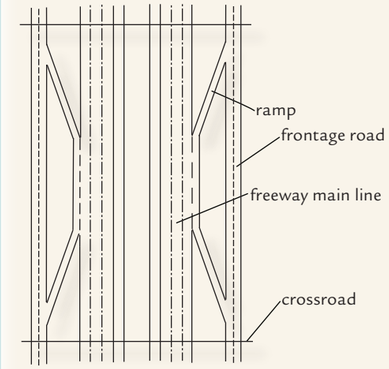
A microsimulation model was used to evaluate traffic conditions on I-10 at the connections with the W55 and W59 Alternatives. This model provides numerous measures of effectiveness for evaluating freeway-to-freeway connections. No single metric tells the entire story of the operational characteristics of the model. In this case, delay per vehicle and average travel time were chosen as measures of effectiveness for the analysis of the W55 and W59 Alternatives because they were distinguishing characteristics between the two alternatives.

The model showed that I-10 would function better with the W59 Alternative. This is because the W59 Alternative would have a more compressed system traffic interchange with I-10 that would provide better spacing between adjacent on- and off-ramps for the 67th Avenue and 51st Avenue traffic interchanges. Conversely, the W55 Alternative would have additional on- and off-ramps that would cause more issues with traffic weaving as drivers would try to get on and off I-10. Under

W59 Alternative frontage road section

The proposed W59 Alternative would use a portion of the 59th Avenue R/W and convert 59th Avenue into one-way frontage roads on each side of the freeway (see graphic below). At no cost to the project, the 59th Avenue R/W (similar to any local or county street R/W) can be taken into ADOT's R/W system through a resolution by the State Transportation Board (STB).

The frontage roads along 59th Avenue would allow direct access from adjacent properties. Examples of similar frontage road systems in the region include SR 101L (Price Freeway) between U.S. Route 60 (US 60) and SR 202L (Santan Freeway), and I-17 between McDowell Road and Glendale Avenue (shown in the photo below).



Source: Arizona Department of Transportation, 2010a

the W59 Alternative, drivers would experience fewer delays and shorter average travel times. Additionally, the construction area along I-10 would be shorter with implementation of the W59 Alternative than with the W55 Alternative: 4 miles versus 5 miles (*W59 Alternative Environmental and Engineering Overview* [2010]).

Construction Impacts

The W55 Alternative would have required a complex, skewed bridge where the freeway would have spanned both 59th Avenue and the RID canal. Although design concepts were developed that would have accommodated these constraints, construction would have been more expensive than with a traditional bridge overpass and would have caused extensive disruption to local traffic along 59th Avenue. These complex design and construction methods would not be needed with the W59 Alternative.

The W59 Alternative would not reconstruct the 51st Avenue Bridge at I-10. The W59 Alternative would cross the UPRR tracks on a grade-separated structure. 59th Avenue traffic on the frontage roads would cross using two grade-separated structures: one for the northbound frontage road and one for the southbound frontage road. Coordination with UPRR would be required to determine the necessary design considerations and concerns.

Environmental Considerations

Environmental information was reviewed to determine whether the W59 Alternative or W55 Alternative offered any important advantages or constraints over each other. The major differentiators between the alternatives related to displacements and security. Table 3-6 summarizes the anticipated displacement effects of the W59 and W55 Alternatives.

During 2006, ADOT held numerous meetings with business owners, the City of Phoenix, and the Arizona Department of Homeland Security regarding the petroleum storage facilities at 51st Avenue and Van Buren Street. This tank farm provides the majority of fuel for Phoenix Sky Harbor International Airport and is considered by the City of Phoenix and the State of Arizona as a potential terrorist target. As a result of the stakeholder meetings, the W55 Alternative was considered viable if specific security measures were incorporated during construction. The measures included security barriers on the eastern side of the freeway and ramps. The barriers would reduce the potential of vehicles deliberately driving off the freeway and would reduce the tank farm's visibility from the freeway. Additionally, security cameras would be installed to monitor the security barrier and property line. These precautions would not be necessary with the W59 Alternative.

Fourth-tier Screening Results

Fourth-tier screening analyses led to the following conclusions:

- A freeway is still needed, and a lower-capacity facility (Arizona Parkway) would not meet the purpose and need for the proposed project.
- Reducing the number of through lanes by two (to result in an eight-lane freeway) and reducing the R/W needed for the proposed freeway would still meet the purpose and need established for the project at a lower cost and with fewer impacts.
- Although the constrained R/W for the eight-lane freeway would not preclude future expansion of the freeway, it would make any future widening considerably more disruptive to traffic and to nearby residents and businesses and would be much more expensive.
- Because the W59 Alternative would connect to I-10 at an existing service traffic interchange, I-10 (Papago Freeway) traffic would be less affected and have fewer ramp closures, which would be preferable to the greater I-10 operational impacts under the W55 Alternative.
- Although the W59 Alternative would cost approximately 3 percent more than the W55 Alternative, the project team determined the operational benefits to I-10 to be worth the additional expense.

Because of the factors discussed above, the W59 Alternative was carried forward and the W55 Alternative was eliminated from further consideration.

Table 3-6 Comparison of Displacements, W55 and W59 Alternatives

Effect	Action Alternative	
	W55	W59
Business displacements	64	40
Single-family residential displacements	19	45
Multifamily residential displacements[a]	0	680

Sources: Review of aerial photography (2010); field observations in September 2003, January and October 2005, April 2006, March 2008, and February 2010

[a] numbers represent total number of residential units, not number of structures, and all units may not be occupied

Alignment Screening and Further Design Adjustments (Fifth Tier)

Community Alignment

In January 2010, the ADOT Director received a letter from the Community Governor, who indicated that the Community was willing to assist in conducting a study of the proposed South Mountain Freeway on Community land. The Governor requested that the following concerns be addressed in developing a proposed alignment on Community land:

- mitigation of negative impacts of the freeway (noise, trash, etc.)
- avoidance of cultural sites and culturally important properties
- preservation of traditional routes and wildlife corridors between the Sierra Estrella and the South Mountains
- reduction of truck and commuter traffic on 51st Avenue and Beltline Highway

In response, the project team conducted preliminary analyses of projected engineering issues, cultural resources impacts, natural resources, multiuse crossings, air quality impacts, noise level impacts, socioeconomic impacts, and Section 4(f) issues. The project team created preliminary designs for major features of the

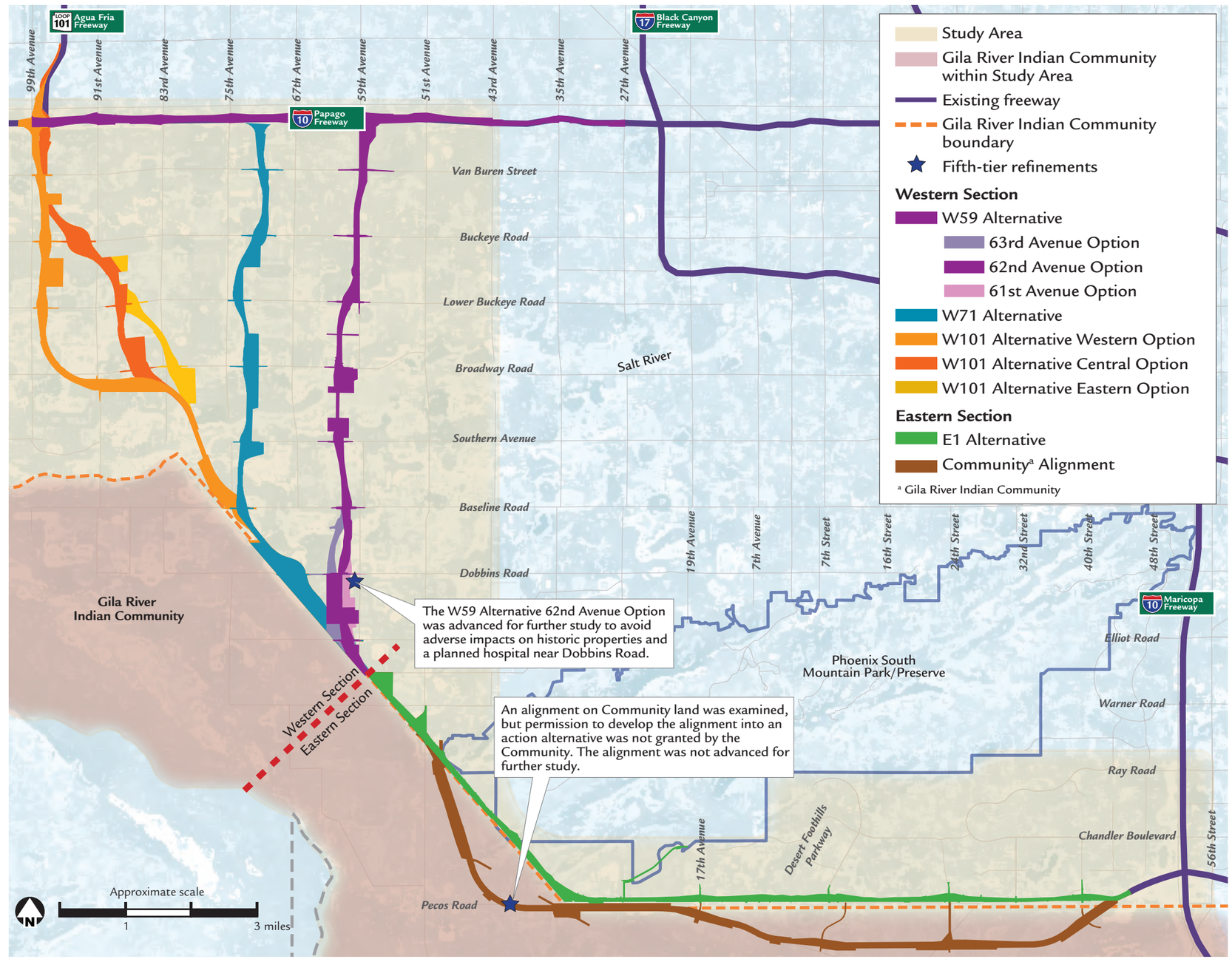
potential freeway alignment (termed the Community Alignment, Figure 3-11), including proposed freeway cross sections, horizontal and vertical alignments, service traffic interchanges, modifications to local streets and intersections, drainage facilities, bridge structures, major utilities, maintenance needs, landscaping, and aesthetic components. The project team also developed traffic projections for the Community Alignment. The project team compiled a description of current conditions along the Community Alignment and briefly assessed the types of impacts the Community could expect from construction and operation of a freeway along the Community Alignment.

ADOT discussed the results of the preliminary analyses with the Community's Transportation Technical Team (TTT) in the summer and fall of 2010 and delivered its report on these preliminary analyses in November 2010. Between December 2010 and March 2011, the Community conducted extensive outreach to its members regarding the proposed Community Alignment. After considering the project team's preliminary findings and the comments and concerns of its members, the Community Council approved Resolution GR-164-11 authorizing a referendum of Community members to favor or oppose the construction of the proposed South Mountain Freeway on Community land or to support a no-build option. The referendum occurred in February 2012, and Community members voted in favor of the no build option. Therefore, the Community Alignment was not carried forward for further study and the E1 Alternative was carried forward as the only action alternative in the Eastern Section.

W59 Alternative Options through Laveen Village

In a letter dated July 18, 2010, the City of Phoenix requested that ADOT and FHWA reexamine the alignment of the W59 Alternative near Dobbins Road in Laveen Village (see Figure 3-11). The alignment presented to the public in 2005 generally followed 63rd Avenue between Dobbins and Elliot roads. This alignment (termed the 63rd Avenue Option) would avoid two historic properties in the area, the Hudson Farm and the Barnes Dairy Barn.

Figure 3-11 Alignment and Design Adjustments, Fifth-tier Screening, Alternatives Development and Screening Process



The Fifth-tier screening process resulted in an alignment shift along the W59 Alternative near Dobbins Road. An alignment was examined on Gila River Indian Community land, but it was not advanced for further study.

The 63rd Avenue Option would adversely affect the planned Laveen Village core and would conflict with City-approved zoning activities in Laveen Village that occurred in the latter part of the past decade.

The 63rd Avenue Option would not be consistent nor compatible with City of Phoenix long-range plans for the Laveen Village core. To support the creation of the Laveen Village core (as planned since the mid-1980s), the City of Phoenix plans to widen Dobbins Road from two lanes to four lanes (with a center turn lane) and has changed the area's zoning to accommodate high-intensity commercial and residential land uses. The Laveen Village core is essentially "downtown" Laveen Village (City of Phoenix 2004b).

In the July 18, 2010, letter, the City of Phoenix supported shifting the alignment east approximately ¼ mile to be more consistent with the Laveen Village core plans. This alignment (termed the 61st Avenue Option), however, would affect a historic property in the area, the Hudson Farm.

A public meeting was held in Laveen in February 2011 to present the 61st Avenue Option and 63rd Avenue Option of the W59 Alternative and to gather input regarding local support for protecting the Hudson Farm.

On June 10, 2011, ADOT submitted a formal request to FHWA to consider an alignment on 61st Avenue (through the Hudson Farm property). FHWA, after serious consideration, concluded the agency could not support the 61st Avenue Option because of its impacts on the historic property.

As a result, examination of other potential avoidance alternatives (besides just the 63rd Avenue Option) was undertaken for the W59 Alternative. At the same time, the study team reevaluated the historic properties in the area. This reevaluation confirmed the importance and eligibility for protection from Section 4(f) of the Hudson Farm and Barnes Dairy Barn, but also determined that the Dobbins Road Streetscape was no longer eligible. This finding allowed for greater flexibility in locating freeway alignments in the area. With this new information, the project team evaluated alignments that would be located east of, west of, and between the 63rd Avenue Option and the 61st Avenue Option.

After extensive discussions with the City of Phoenix and MAG, FHWA and ADOT determined that the 62nd Avenue Option (located between the 63rd Avenue Option and the 61st Avenue Option) would avoid historic properties in the area and would not conflict with City-approved zoning activities in Laveen Village; therefore, the 62nd Avenue Option of the W59 Alternative was advanced for further study and the other options were eliminated from further consideration.

Fifth-tier Screening Results

Fifth-tier screening analyses led to the following conclusions:

- In January 2010, at the Community's request, the project team developed an alignment on Community land. However, the Community rejected this freeway alignment. The Community Alignment, therefore, was not carried forward for further study.
- After discussions with the City of Phoenix and considering input from the public, the project team adjusted the alignment of the W59 Alternative in the Dobbins Road vicinity from 63rd Avenue eastward to 62nd Avenue. This design adjustment avoided historic properties in the area and better conformed to recent local zoning decisions and with the City of Phoenix's *General Plan* with respect to Laveen Village.

Alternatives Development and Screening Process Conclusions

By conducting a multidisciplinary process to screen action alternatives, ADOT, FHWA, and stakeholders participated in an approach in which federal, State, and local agencies (and different departments within those agencies) reviewed and concurred with the alternatives development and screening process. Approaches to each step and findings of each step were reviewed. This led to certain beneficial outcomes in the consideration of the proposed action. Such effects included:

- a comprehensive set of alternatives including all modes was considered at the start of the EIS process
- a comprehensive set of diverse viewpoints and expertise relevant to pertinent determinations associated with environmental concerns, design requirements, traffic operation optimization goals, planning-level cost estimates, and concerns of local importance was represented
- a balanced comparison of the above criteria
- assurance that the screening process was an open process, with results of each step being shared with project team members, local jurisdictions, and the public in a timely manner (see Chapter 6, *Comments and Coordination*, for additional information regarding public disclosure)

The following conclusions were reached through the screening process:

- The purpose and need for the proposed action, as identified in Chapter 1, *Purpose and Need*, was confirmed.
- Nonfreeway alternatives (e.g., TSM/TDM, transit, local arterial street network improvements, Arizona Parkway) alone would not fully satisfy the purpose and need criteria of the proposed action.
- A common point in the Study Area located east of 59th Avenue and south of Elliot Road, as illustrated in the text box on page 3-8, allowed for the evaluation and comparison of action alternatives in two geographic areas: a Western Section and an Eastern Section.
- The South Mountains share a common boundary with—and actually extend onto—Community land for a distance west of the common point. Alternatives located south of the Community or north of the mountains would not be prudent and feasible (see section, *Eastern Section*, on page 3-9 and Table 3-5 on page 3-12). Therefore, any action alternative considered must use either a portion of the mountains, be located on Community land, or both. Because the Community has not allowed the detailed study of alternatives on Community land, there is no prudent and feasible alternative to avoid use of the resources of the South Mountains afforded protection under Section 4(f), including traditional cultural properties and SMPP as a public park and as a historic resource [supported in text presented in Chapter 5, *Section 4(f) Evaluation*]. Therefore, using a portion of the mountains is an unavoidable consequence of the E1 Alternative.

- From EIS process inception for the proposed action, both ADOT and FHWA have worked to engage the Community to develop alternatives on Community land. No alternatives on Community land are studied in detail in the DEIS. To date, the Community has not permitted ADOT to study alternatives in detail on Community land. Despite the efforts to formally study an alternative in detail on Community land, ADOT and FHWA determined that an alternative alignment on Community land is not feasible. The EIS process of evaluating the proposed action in locations other than on Community land will continue.
- A logical, sequential, step-by-step process using data and expertise from multiple disciplines (e.g., environment, design, traffic performance) was used to conclude which of many alignment alternatives represented a full range of reasonable alternatives and which should be eliminated from further consideration.
- The action alternatives carried forward for detailed study in the DEIS represented a range of reasonable alternatives.

Compliance with Section 404(b)(1) Guidelines

Provisions set forth in Section 404(b)(1) of the CWA were the criteria used to evaluate alternatives that would involve discharge of dredged or fill material [see the section, *Waters of the United States*, beginning on page 4-108, for details regarding Section 404(b)(1)]. These guidelines require U.S. Army Corps of Engineers (USACE) to permit only the least environmentally damaging, practicable alternative. An alternative is considered practicable if it is available or capable of being constructed, taking into account cost, logistics, and existing technology in light of the overall project purpose.

Alternatives described in the previous sections were developed in consideration of the provisions of Section 404(b)(1). Site-specific design criteria for any of the action alternatives would be incorporated to minimize impacts on jurisdictional waters, and compensatory mitigation would be provided for unavoidable impacts. Drainage flows would be maintained in the numerous wash crossings using corrugated metal pipe, concrete box culverts, or bridge structures, depending on engineering feasibility, environmental constraints, field reconnaissance data, and conceptual cost estimates. The section, *Biological Resources*, beginning on page 4-117, outlines measures such as multiuse wildlife crossings that would be implemented in association with natural drainages to mitigate project-related impacts.

Responsiveness of the Proposed Freeway to Purpose and Need Criteria

Previous text in this chapter described the process used to develop and screen various alternatives to 1) determine the types, or modes, of transportation improvements that could meet the established purpose and need criteria for the proposed action and 2) determine the best possible locations for these improvements. One tool used to support the screening process was a modeling analysis that forecast regional traffic conditions as reasonably foreseeable for 2035. Assessment of traffic volumes, traffic conditions, travel distribution, capacity deficiencies, and travel time provided the project team a basis to evaluate all alternatives considered in terms of responsiveness to purpose and need criteria. Determinations to eliminate nonfreeway alternatives from further study were based on analysis findings. The results guided the project team in its assessment of operational characteristics of the future road network, with and without the proposed freeway in place, further confirming the determination that a freeway is the appropriate transportation mode for the Study Area.

Traffic Modeling Background Information

To conduct the analysis, the project team used the tools described in Table 3-7 and, in so doing, applied reasonable assumptions about future traffic characteristics.

Methodology

The traffic assessment for the Study Area employed the MAG travel demand model (TransCAD software platform), as certified by FHWA and reviewed by the U.S. Environmental Protection Agency (EPA) for air quality conformity. The model projects demand for multiple modes of travel, including automobile, bus, and light rail. Key model inputs used to forecast travel demand included:

- socioeconomic data based on the adopted general plans of MAG members, along with population and economic forecasts and the existing and planned transportation infrastructure as identified by MAG members
- the anticipated average number of vehicle trips within the region (including those to and from the region's households) on a daily basis (this number is monitored regularly by MAG)
- the distribution of transportation modes used by travelers in the MAG region (also monitored regularly by MAG)
- the capacity of the transportation infrastructure to accommodate regional travel
- the future transportation infrastructure established using RTP-planned projects and improvements and from known arterial street network improvements assumed to be made by the County, Cities, and private developers

Table 3-7 Traffic Analysis Tools Used to Assess a Freeway's Effect on Identified Needs

Analysis Tool[a]	Tool Purpose
Future Traffic Volume Projections (Travel Demand Analysis) (TransCAD[b])	Establish overall demand for and distribution of use of the future network[c] and traffic volume on proposed action
Trip Redistribution (Cut-line Analysis)	Evaluate proposed action's traffic redistribution effect on the network
Level of Service Analysis (TransCAD)	Determine quality of service of network resulting from proposed action and determine capacity needs of proposed action to operate at an acceptable level of service
Existing and Projected Travel Time and Congestion Analysis (TransCAD)	Determine proposed action's effect on network delay and congestion reduction
Trip Distribution (Select Link Analysis)	Establish trip origins and destinations using the proposed freeway

[a] Analytical tools are further described in the section, *Key Traffic Modeling Definitions*, on this page.
[b] TransCAD is the travel demand modeling software platform used by the Maricopa Association of Governments.
[c] future planned transportation network analyzed with and without the proposed action

Key Traffic Modeling Definitions

- **Level of Service Identifies the Operational Efficiency of the Regional Transportation Network** – Existing and projected traffic volumes can be determined

3

Key assumptions used in analysis of system capacity deficiency

The traffic model examined existing conditions and forecast travel demand for 2035 (updated for this project from the 2026 forecasts used for the RTP) with and without the proposed action. Important analytical assumptions were:

- Nonconstruction enhancements: System enhancements were made in the model to improve the operational characteristics of the existing road network without the proposed action in place. These were enhanced TSM measures.
- Mass transit enhancements: Additional capacity beyond what is planned in the RTP was assigned to bus service, light rail, and HOV lanes to reduce dependency on single-occupancy vehicles for travel in the MAG region.
- Existing network enhancements: Increased improvements beyond what is planned for the major arterial street network as identified in the RTP were considered in the model.

Together, the analysis assumptions result in lower regional travel demand for single-occupancy vehicles than would generally be forecast.

Why were these assumptions employed? The resulting "reduced" single-occupancy vehicle demand implies a lesser need for a major transportation facility, such as the proposed action, in the Study Area. In a way, the assumptions confirm that the investment for the proposed action would be warranted. The analysis assumptions —and its results— are, by design, conservative: the results imply that the facility is truly needed.

for the morning commute, evening commute, and throughout the day (see sidebar on page 1-13). From these numbers, transportation analysts are able to determine at which level of efficiency roads and intersections are operating, as measured by LOS. (See text box regarding LOS, on page 1-14.)

- **Cut-line Analysis Identifies Distribution of Traffic in the Region** – *Cut line* refers to a tool used by traffic analysts to assess the traffic distribution throughout a road network. It is an imaginary line placed in the road network that crosses a number of road segments. A cut-line analysis allows planners to evaluate changes in the distribution of traffic volumes over time.
- **Select Link Analysis Identifies the Type of Travel Occurring in the Region** – Select link analysis is a tool used to evaluate the volume of traffic using a specific section of road, based on the forecast regional volumes. By identifying where trips through a section of road begin or end, the tool allows analysts to determine the lengths of trips that would occur with or without the proposed action in place. The tool lets analysts determine the percentage of trips that might be local trips (e.g., to and from the grocery store), regional trips (e.g., regional commute), or interstate trips (e.g., "pass-through").

Assessment of 2035 Traffic Conditions

In Chapter 1, *Purpose and Need*, 2035 traffic conditions were examined assuming planned RTP improvements are implemented, but without the construction and operation of a major transportation facility in the Study Area. It was determined that without implementation of such a facility, congestion and resultant delays for motorists would only increase. In this section, operational characteristics of 2035 traffic are also evaluated, this time assuming all planned RTP improvements are implemented, including construction and operation of the proposed freeway.

Forecast Traffic Volumes – Freeways and Arterial Streets

In considering operational characteristics of traffic on the proposed freeway, anticipated ADT volumes on the freeway, if implemented, are critical. Also important is the forecast ADT on other Regional Freeway and Highway System segments and on arterial streets. Because the RTP is an integrated system, future operational characteristics of traffic on any one component will affect and will be affected by traffic on other components. The following text addresses these issues.

Effects of the Proposed Freeway on Other Regional Freeway Segments

Fourteen freeway locations were identified for use in determining the effects of the proposed freeway, as incorporated in the RTP, on freeway traffic volumes in the MAG region (the effects of operation of the proposed freeway on arterial street volumes are discussed later in this chapter). Figure 3-12 presents the forecast ADT volumes with and without the proposed action. Notable observations include:

- The proposed freeway, when in operation in 2035, would function as planned in the RTP. As a link in the Regional Freeway and Highway System, the proposed action would redistribute traffic on the region's freeways; in most cases, the proposed freeway would remove traffic from segments of freeways, while other segments would experience increases in ADT volumes. The proposed freeway would increase the capacity of the region's freeways to respond in part to the projected travel demand; in so doing, some of the traffic volume would be redistributed onto the proposed freeway, as described below.
- I-10 between 48th Street and Broadway Road (the Broadway Curve) would carry approximately 24,000 fewer vpd in 2035. This location currently experiences some of the highest daily traffic volumes and worst congestion in the region.
- SR 202L (Santan Freeway) between Priest Drive and Kyrene Road would carry approximately 43,000 additional vpd in 2035. Similarly, the proposed SR 30 freeway between 83rd Avenue and 75th Avenue would carry approximately 35,000 additional vpd in 2035. Although these increases could result in additional congestion, without the proposed action, SR 202L (Santan Freeway) and SR 30 would be underused relative to their planned performance in the context of the Regional Freeway and Highway System.

Effects of the Proposed Freeway on Arterial Street Traffic Volumes

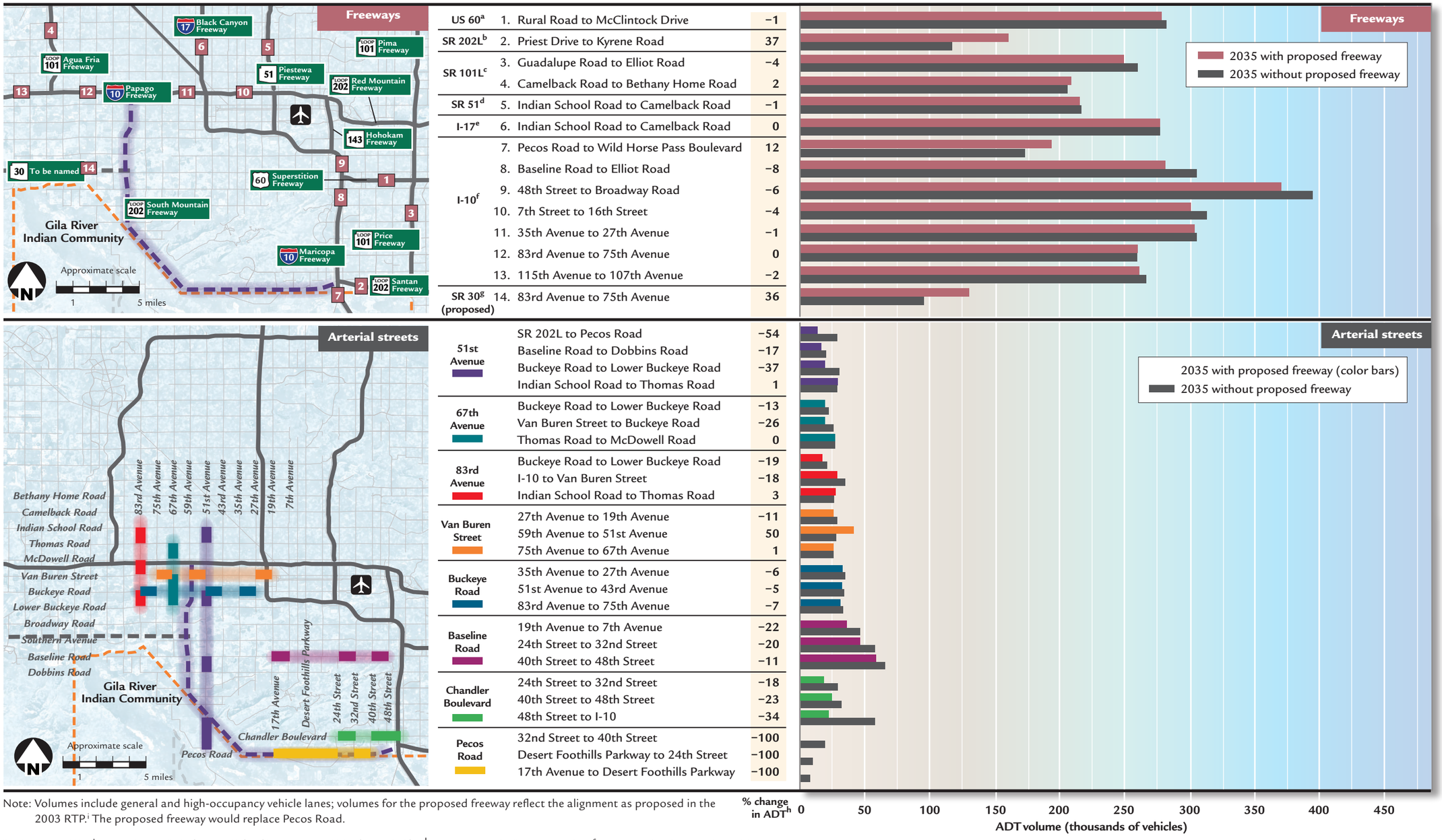
Six cut lines were identified for use in assessing the possible effect of the proposed freeway on traffic volumes, using the arterial street network. Figure 3-12 presents the forecast ADT volumes on the arterial streets and on the freeways through the cut lines (shown in Figure 3-13), with and without the proposed freeway (volumes for the proposed freeway reflect the alignment as proposed in the RTP).

The analysis illustrates a shift in traffic volumes from the arterial street network to freeways if the proposed freeway were in operation in 2035. The traffic reduction on arterial streets is projected to be as high as 82,000 vpd across a single cut line and 277,000 vpd across all six cut lines. As explained in the previous section, this shift in ADT volumes from arterial streets to freeways would not adversely affect the performance of the Regional Freeway and Highway System. Meanwhile, the shift would greatly reduce the pressure on the arterial street network. Such shifts are the intent of the Regional Freeway and Highway System.

Effects of the Proposed Freeway on Capacity Deficiency

Data from the cut-line analysis were used to calculate the capacity deficiency of the road network, assuming the network were to operate at LOS D on average throughout a given day. The analysis considered the capacity deficiency of the road network in the Study Area with and without the proposed freeway in operation in 2035 (see sidebar on this page). Capacity deficiency was calculated by comparing the total capacity and the total demand (projected 2035 volumes) of all of the roads that would cross the 41st Street cut line (see Figure 3-13). According to the assessment, without the proposed freeway in place the existing roads and RTP-planned roadway improvements would accommodate about 76 percent of the demand projected for 2035, leaving 24 percent of the anticipated demand unmet (capacity deficiency—congestion and delays). If better-than-planned scenarios for such modal alternatives as nonfreeway planned improvements (e.g., increases in funding, increases in the number of express bus routes, increases in ridership for transit modes) were to occur,

Figure 3-12 Projected Average Daily Traffic Volumes on Freeways and Arterial Streets with and without the Proposed Freeway, 2035



US 60[a]	1. Rural Road to McClintock Drive	−1
SR 202L[b]	2. Priest Drive to Kyrene Road	37
SR 101L[c]	3. Guadalupe Road to Elliot Road	−4
	4. Camelback Road to Bethany Home Road	2
SR 51[d]	5. Indian School Road to Camelback Road	−1
I-17[e]	6. Indian School Road to Camelback Road	0
I-10[f]	7. Pecos Road to Wild Horse Pass Boulevard	12
	8. Baseline Road to Elliot Road	−8
	9. 48th Street to Broadway Road	−6
	10. 7th Street to 16th Street	−4
	11. 35th Avenue to 27th Avenue	−1
	12. 83rd Avenue to 75th Avenue	0
	13. 115th Avenue to 107th Avenue	−2
SR 30[g] (proposed)	14. 83rd Avenue to 75th Avenue	36
51st Avenue	SR 202L to Pecos Road	−54
	Baseline Road to Dobbins Road	−17
	Buckeye Road to Lower Buckeye Road	−37
	Indian School Road to Thomas Road	1
67th Avenue	Buckeye Road to Lower Buckeye Road	−13
	Van Buren Street to Buckeye Road	−26
	Thomas Road to McDowell Road	0
83rd Avenue	Buckeye Road to Lower Buckeye Road	−19
	I-10 to Van Buren Street	−18
	Indian School Road to Thomas Road	3
Van Buren Street	27th Avenue to 19th Avenue	−11
	59th Avenue to 51st Avenue	50
	75th Avenue to 67th Avenue	1
Buckeye Road	35th Avenue to 27th Avenue	−6
	51st Avenue to 43rd Avenue	−5
	83rd Avenue to 75th Avenue	−7
Baseline Road	19th Avenue to 7th Avenue	−22
	24th Street to 32nd Street	−20
	40th Street to 48th Street	−11
Chandler Boulevard	24th Street to 32nd Street	−18
	40th Street to 48th Street	−23
	48th Street to I-10	−34
Pecos Road	32nd Street to 40th Street	−100
	Desert Foothills Parkway to 24th Street	−100
	17th Avenue to Desert Foothills Parkway	−100

Note: Volumes include general and high-occupancy vehicle lanes; volumes for the proposed freeway reflect the alignment as proposed in the 2003 RTP.[i] The proposed freeway would replace Pecos Road.

[a] U.S. Route 60 [b] State Route 202L (Loop 202) [c] State Route 101L (Loop 101) [d] State Route 51 [e] Interstate 17 [f] Interstate 10 [g] State Route 30
[h] average daily traffic [i] *Regional Transportation Plan*

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

With the proposed freeway in operation, additional planned capacity would be added to the region's freeway system. With the added capacity, freeway volumes would be redistributed, with most freeway segments experiencing reduced average daily traffic volumes. Demand on the arterial street grid would also shift; almost all sampled arterial street segments would experience reduced daily traffic volumes.

3

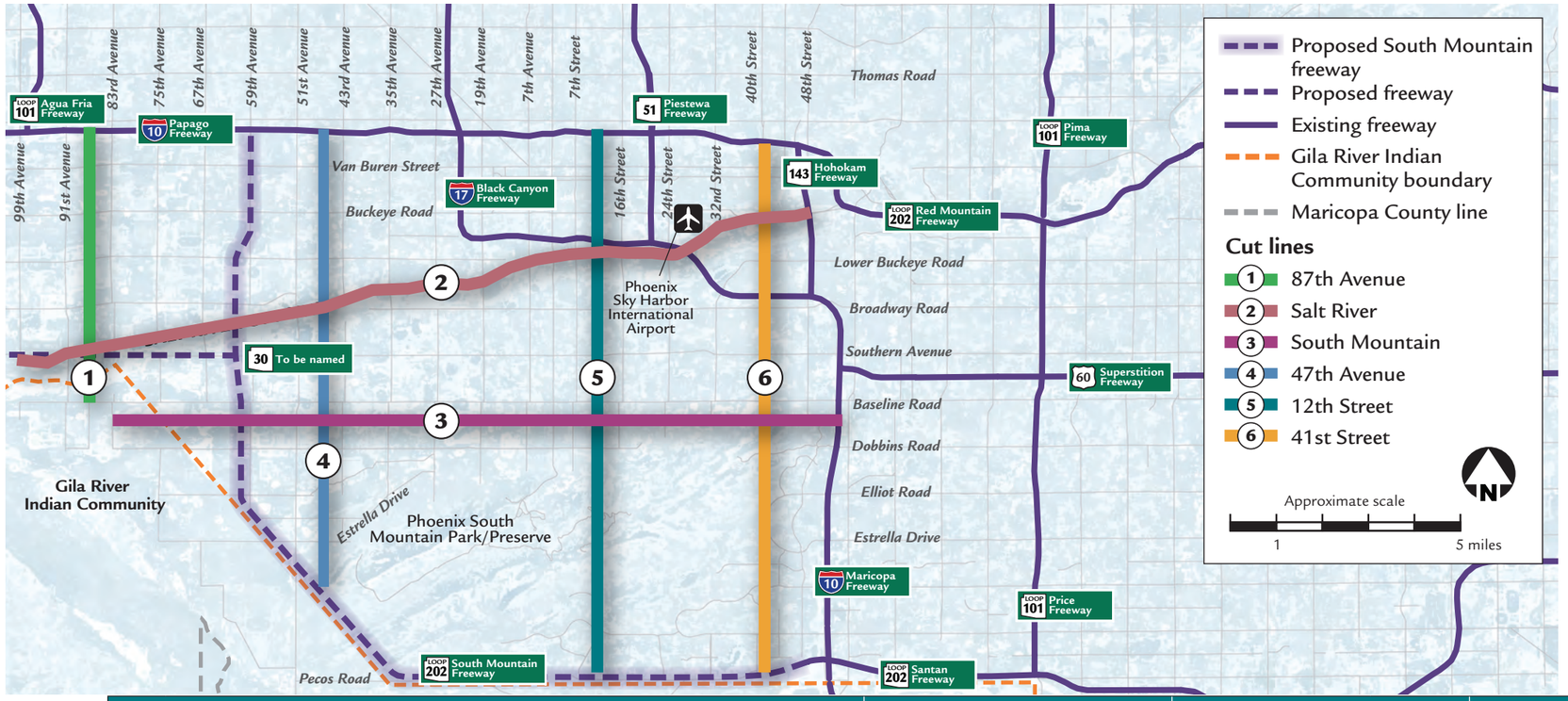
What would traffic be like on the proposed freeway if it were fully constructed and operating in 2035?

Projected volumes would range from 120,000 to 175,000 vehicles per day.[a] Similar volumes were being experienced on other freeway segments in the region (MAG 2010b):

- I-10 (Maricopa Freeway), between Ray and Warner roads, had three general purpose lanes and one HOV lane in each direction and an ADT volume of 151,000 vehicles.
- SR 101L (Agua Fria Freeway), between Camelback and Bethany Home roads, had three general purpose lanes in each direction and an ADT volume of 128,000 vehicles.

[a] rounded from projections presented later in this chapter for the W59 Alternative

Figure 3-13 Cut-line Analysis with and without the Proposed Freeway, 2035



Cut line		Alternative	Volume (000s)			Split (%)	
			Total	Freeways	Arterials	Freeway	Arterial
1	87th Avenue: I-10[a] (Papago Freeway) to Baseline Road	With proposed freeway	512	425	87	83	17
		Without proposed freeway	464	366	98	79	21
2	Salt River: 99th Avenue to SR 143[b] (Hohokam Expressway)	With proposed freeway	1,123	858	265	76	24
		With proposed freeway	1,001	654	347	65	35
3	South Mountain: 83rd Avenue to I-10 (Maricopa Freeway)	With proposed freeway	565	456	109	81	19
		Without proposed freeway	458	307	151	67	33
4	47th Avenue: I-10 (Papago Freeway) to Estrella Drive	With proposed freeway	491	295	196	60	40
		Without proposed freeway	530	287	243	54	46
5	12th Street: I-10 (Papago Freeway) to Pecos Road	With proposed freeway	974	731	243	75	25
		Without proposed freeway	898	612	286	68	32
6	41st Street: SR 202L[c] (Red Mountain Freeway) to Pecos Road	With proposed freeway	1,066	746	320	70	30
		Without proposed freeway	1,001	629	372	63	37
	All six cut lines	With proposed freeway	4,731	3,511	1,220	74	26
		Without proposed freeway	4,352	2,855	1,497	66	34

[a] Interstate 10 [b] State Route 143 [c] State Route 202L (Loop 202)

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

The total volume removed from the arterial street network for all six cut lines with the proposed freeway in place in the Study Area in 2035 would be 277,000 vehicles per day. Based on the arterial lane capacity from the Maricopa Association of Governments travel demand model, this equates to 33 arterial street-lanes of traffic being removed from the six cut-line locations. The cut-line analyses validate a purpose of the proposed action: to redistribute traffic appropriately based on travel needs.

13 percentage points of the 24 percent deficiency would be accommodated (Figure 3-14); the network would still maintain an 11 percent capacity deficiency.

The same analysis with the proposed freeway in operation in 2035 concluded that the met demand would increase to 82 percent; better-than-planned scenarios noted above, if achieved, would reduce network deficiency to 5 percent. The proposed action would capture about half of the capacity deficiency not captured by these other modes.

Forecast Traffic Volumes on the Proposed Freeway

In 2035, forecast ADT on the proposed freeway would vary depending on location. Projected ADT would range from 120,000 to 175,000 vehicles. These projected volumes are similar to volumes being experienced on other freeways in the MAG region (see sidebar on facing page). The projected volumes demonstrate:

- Motorists would place a high demand on the proposed freeway in this area of the MAG region.
- The proposed freeway, when in operation in 2035, would function as an integral part of the RTP.

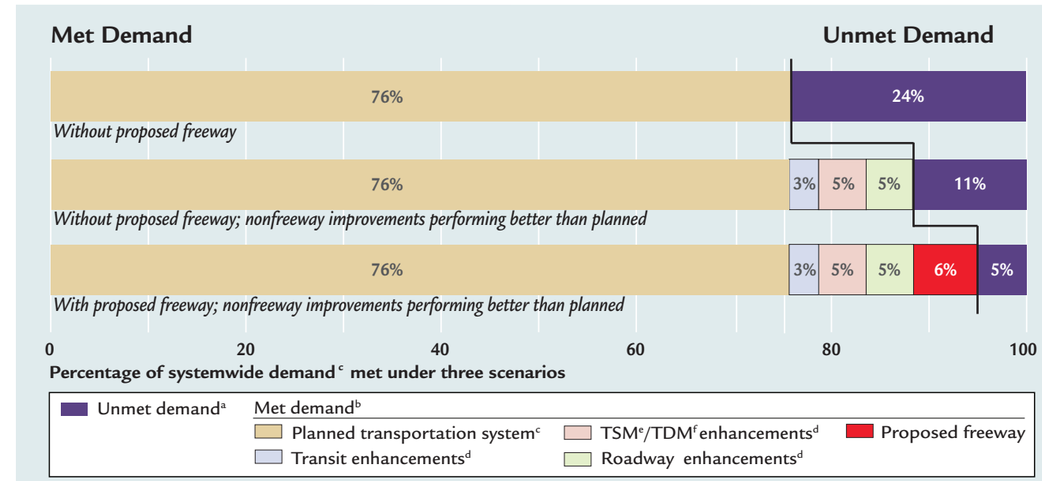
Level of Service

The previous sections described how the proposed freeway, by adding capacity to the freeway system in the MAG region, would reduce traffic on some freeway segments and reduce traffic on the arterial street network. This section presents the results of the analysis to assess how these changes in traffic volumes would translate to system efficiency in terms of LOS.

Future travel and socioeconomic conditions were modeled in TransCAD (see Table 3-7, on page 3-27) to determine the duration of LOS E or F in 2035 with and without the proposed freeway during the morning and evening commute periods. Results of the analysis are illustrated in Figures 3-15 and 3-16. Notable observations from the analysis are:

- For an urban area, such as the Phoenix metropolitan area, it is expected that freeways would operate at LOS E or F during some portion of the peak commuting periods. Demand to use the proposed freeway would be high (an intended outcome).
- When the heavy congestion duration would last longer than 1 to 2 hours, the utility of the freeway would be reduced and regional mobility hampered.
- The number of freeway segments operating at LOS E or F would be higher during the evening commuting period than in the morning commuting period.
- During the morning commute, the freeways inbound to downtown Phoenix including eastbound I-10 (Papago Freeway), westbound I-10 (Maricopa Freeway) along the Broadway Curve, and westbound SR 202L (Red Mountain Freeway) would experience shorter durations of LOS E or F with the proposed freeway than without. Additionally, the inner loop freeways, I-10 and I-17, that encircle downtown Phoenix would experience shorter durations of LOS E or F with the proposed freeway than without.
- During the evening commute, portions of planned SR 30 and SR 202L (Santan Freeway) would experience a longer duration of LOS E or F with the proposed freeway than without the proposed freeway. This demonstrates that the freeways would be in high demand and would work as intended as a part of the loop freeway system.
- During the evening commute, almost all of the region's freeways would experience long periods of LOS E or F, including the proposed freeway. Because most of the freeways providing service outbound from downtown Phoenix would experience over 3 hours of LOS E or F, it is difficult to identify substantial differences between the evening conditions with and without the proposed freeway. However, when comparing other measures of effectiveness, such as capacity deficiency and travel time, conditions with the freeway would still be better than conditions without the freeway during the evening commute.

Figure 3-14 Met and Unmet Demand with and without the Proposed Freeway, 2035



Source: Maricopa Association of Governments, 2010b; extrapolated analysis

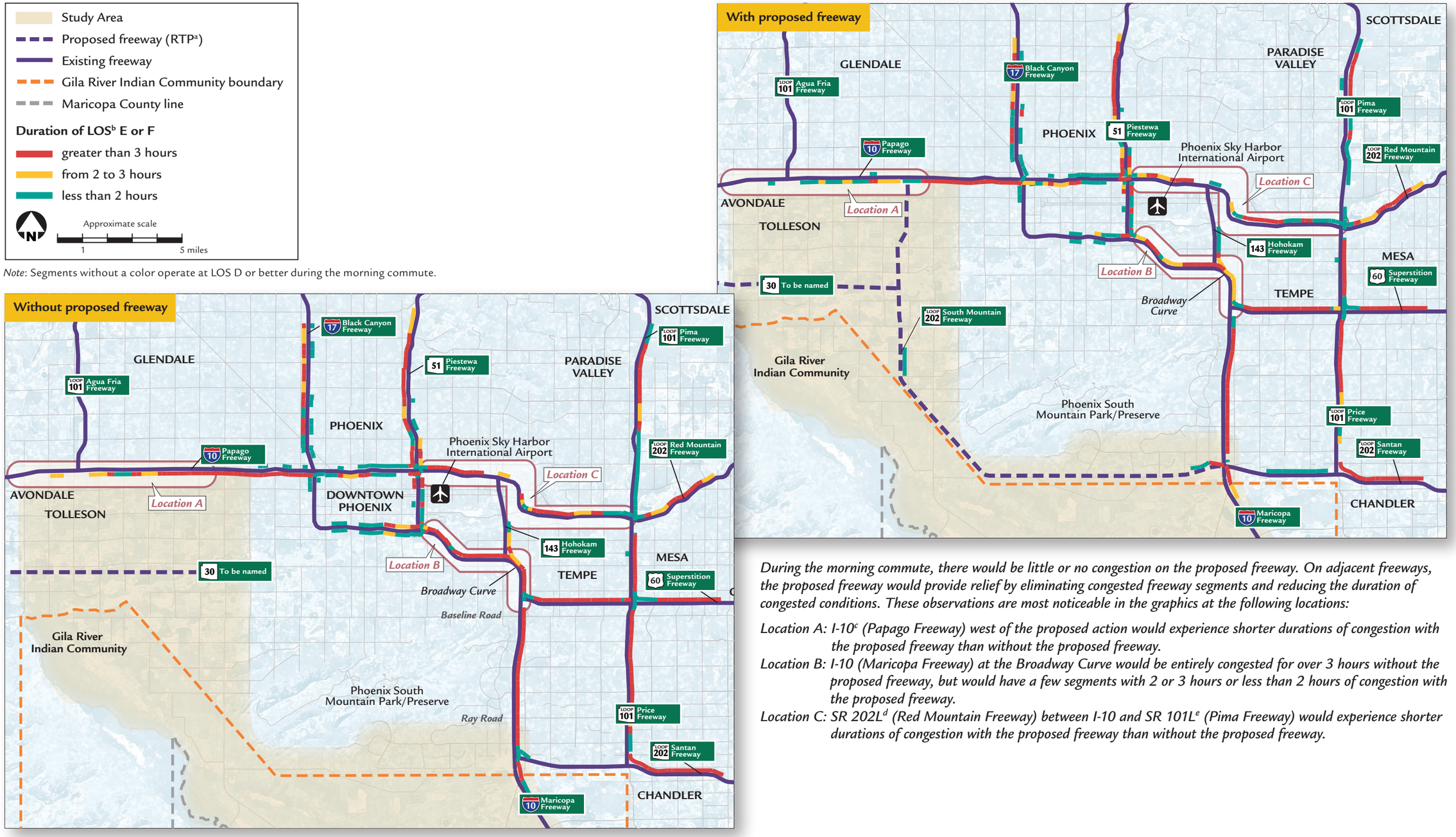
[a] Unmet demand means delays and congestion for travelers on the Maricopa Association of Governments (MAG) transportation network.
[b] Data are extrapolated from the 41st Street cut-line analysis (see text and Figure 3-13) to characterize performance for the entire MAG transportation system.
[c] The analysis assumes that the MAG *Regional Transportation Plan* is fully implemented.
[d] improvements that could occur in the better-than-planned scenario (see sidebar on page 3-28)
[e] transportation system management
[f] transportation demand management

Implementation of the freeway would not completely solve the regional systemwide capacity deficiency in 2035. The proposed freeway's additional operating capacity would alleviate about 55 percent (see red bar) of the projected 11 percent regional system capacity shortfall when incorporating the most optimistic scenario for adoption and performance of nonfreeway improvements.

Projected Travel Time

Within the Study Area, existing traffic congestion has decreased travel speeds during much of any given day on the region's freeways or on its arterial street network. The amount of time a motorist spends driving each day to and from the same origin and destination continues to increase. Travel time is important to most drivers; further, increases in travel time translate to further congestion and congestion-related impacts (as certainly would be the case under the No-Action Alternative). It is important, therefore, to examine representative travel times in different locations and project to 2035 what travel times would be with and without the proposed action.

Figure 3-15 Duration of Level of Service E or F with and without the Proposed Freeway, Morning Commute on Freeways, 2035



Note: Segments without a color operate at LOS D or better during the morning commute.

During the morning commute, there would be little or no congestion on the proposed freeway. On adjacent freeways, the proposed freeway would provide relief by eliminating congested freeway segments and reducing the duration of congested conditions. These observations are most noticeable in the graphics at the following locations:

Location A: I-10[c] (Papago Freeway) west of the proposed action would experience shorter durations of congestion with the proposed freeway than without the proposed freeway.

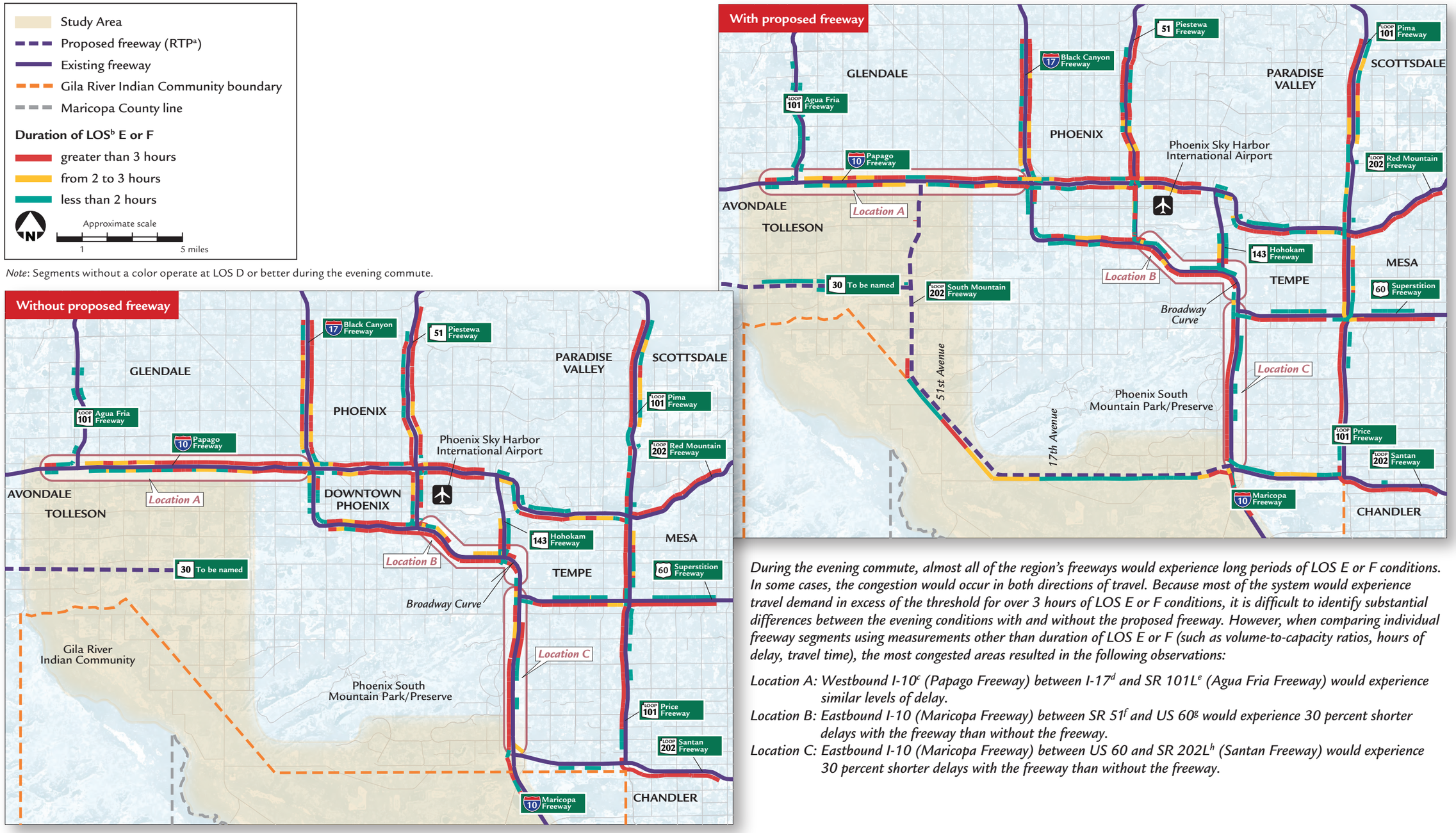
Location B: I-10 (Maricopa Freeway) at the Broadway Curve would be entirely congested for over 3 hours without the proposed freeway, but would have a few segments with 2 or 3 hours or less than 2 hours of congestion with the proposed freeway.

Location C: SR 202L[d] (Red Mountain Freeway) between I-10 and SR 101L[e] (Pima Freeway) would experience shorter durations of congestion with the proposed freeway than without the proposed freeway.

[a] *Regional Transportation Plan* [b] level of service [c] Interstate 10 [d] State Route 202L (Loop 202) [e] State Route 101L (Loop 101)

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

Figure 3-16 Duration Level of Service E or F with and without the Proposed Freeway, Evening Commute on Freeways, 2035



Note: Segments without a color operate at LOS D or better during the evening commute.

During the evening commute, almost all of the region's freeways would experience long periods of LOS E or F conditions. In some cases, the congestion would occur in both directions of travel. Because most of the system would experience travel demand in excess of the threshold for over 3 hours of LOS E or F conditions, it is difficult to identify substantial differences between the evening conditions with and without the proposed freeway. However, when comparing individual freeway segments using measurements other than duration of LOS E or F (such as volume-to-capacity ratios, hours of delay, travel time), the most congested areas resulted in the following observations:

Location A: Westbound I-10[c] (Papago Freeway) between I-17[d] and SR 101L[e] (Agua Fria Freeway) would experience similar levels of delay.

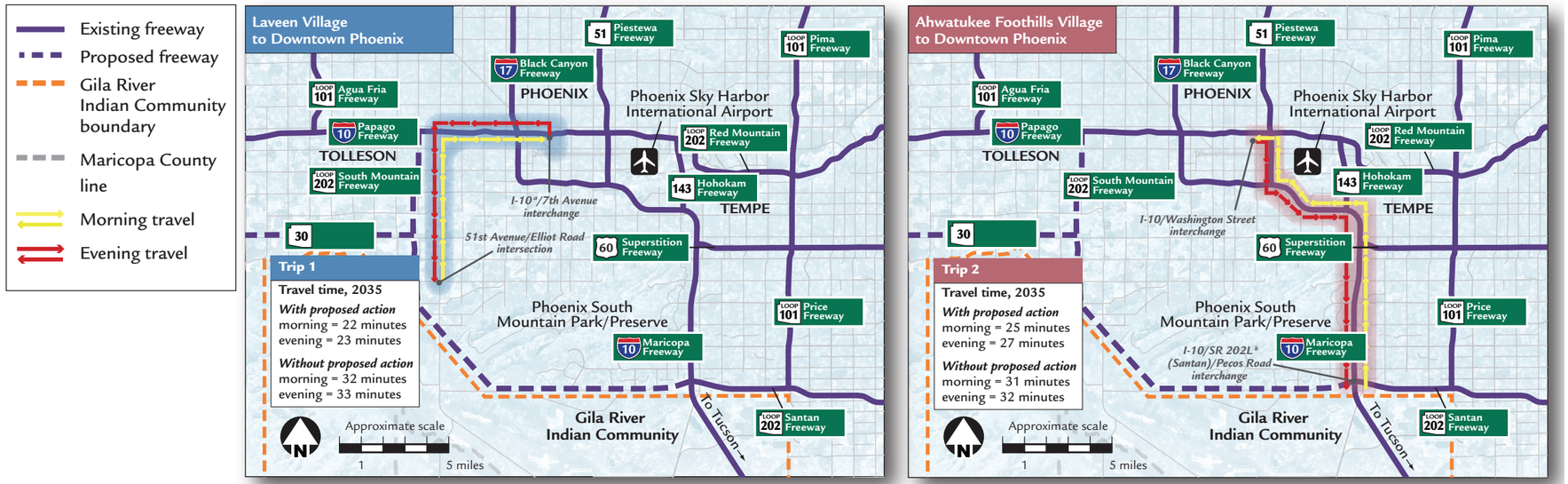
Location B: Eastbound I-10 (Maricopa Freeway) between SR 51[f] and US 60[g] would experience 30 percent shorter delays with the freeway than without the freeway.

Location C: Eastbound I-10 (Maricopa Freeway) between US 60 and SR 202L[h] (Santan Freeway) would experience 30 percent shorter delays with the freeway than without the freeway.

[a] *Regional Transportation Plan* [b] level of service [c] Interstate 10 [d] Interstate 17 [e] State Route 101L (Loop 101) [f] State Route 51 [g] U.S. Route 60 [h] State Route 202L (Loop 202)

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

Figure 3-17 Representative Travel Times with and without the Proposed Freeway, 2035



[a] Interstate 10 [b] State Route 202L (Loop 202)

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

Time savings would be experienced during peak travel times of the day. Taken individually, savings may not appear to be substantial, but when considered in the context of the hundreds of thousands of drivers, each day, over the course of numerous years, the cumulative time savings would be substantial.

Table 3-8 Regional Travel Times, 2035

Freeway Segment			Travel Time[a] (minutes)		
Begin	End	Direction	Without Proposed Freeway	With Proposed Freeway	Difference
Avondale	Downtown Mesa	Westbound Eastbound	46 51	45 49	–1 –2
Avondale	Downtown Scottsdale	Westbound Eastbound	36 40	35 39	–1 –1
Avondale	Arizona State University (Tempe Campus)	Westbound Eastbound	33 35	31 34	–2 –1
I-10[b] (Maricopa Freeway)/SR 202L[c] (Santan Freeway) System Traffic Interchange	I-10 (Papago Freeway)/SR 101L[d] (Agua Fria Freeway) System Traffic Interchange	Westbound (via I-10)	42	43	+1
		Eastbound (via I-10)	50	44	–6
		Westbound (via I-10 or SR 202L)	42	26	–16
		Eastbound (via I-10 or SR 202L)	50	27	–23
Ahwatukee Foothills Village	Phoenix Sky Harbor International Airport	Northbound Southbound	46 47	41 41	–5 –6
Ahwatukee Foothills Village	Downtown Scottsdale	Northbound Southbound	37 41	34 37	–3 –4
Ahwatukee Foothills Village	Downtown Phoenix	Northbound Southbound	33 37	29 31	–2 –6

[a] Travel times reflect the most congested conditions of the peak periods. [b] Interstate 10 [c] State Route 202L (Loop 202)
[d] State Route 101L (Loop 101)

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

Travel times were calculated using the TransCAD model results based on the road type and projected LOS. The two trips presented in Figure 1-13, on page 1-20, were incorporated into the 2035 forecast conditions. The results for the two trips for conditions with and without the proposed freeway are presented in Figure 3-17.

Additional trips were identified to represent a regional perspective. As depicted in Table 3-8, motorists undertaking regional trips would also experience shorter travel times with the proposed action.

Travel time savings indicated in Figure 3-17 and Table 3-8 are based on an individual vehicle for a specific trip. When travel time savings are considered cumulatively for all vehicles traveling in the region with the proposed freeway in operation, the reader can begin to see the aggregate time savings realized. Further, a monetary savings can be assigned to the time savings: the region would realize a savings of approximately $200 million annually once the freeway were to become

operational (see the section, *Economic Impacts*, beginning on page 4-46, regarding travel savings).

Major Points Regarding 2035 Traffic Conditions

Based on the assessment of projected 2035 traffic volumes, LOS, capacity deficiency, and travel time, the following conclusions are reached:

- Nonfreeway alternatives, separately or in combination, would capture only a small percentage of the capacity deficiency of the region's transportation network.
- The proposed freeway would serve as a planned link in the Regional Freeway and Highway System, causing traffic on the region's freeways to be redistributed. In most cases, the proposed freeway would remove traffic from some segments of freeways, while other segments would experience RTP-intended increases in daily volumes. The proposed freeway would increase the capacity of the region's freeways in response, in part, to projected regional travel demand.
- The proposed freeway would appropriately shift a substantial portion of travel demand from the arterial street network to the freeway network in 2035. Within the Study Area, travel demand would remain relatively the same with or without the proposed freeway, demonstrating that the proposed freeway would absorb the majority of volume projected in the Study Area.
- The proposed freeway would increase projected 2035 network capacity by capturing almost one-half of the projected 2035 deficiency (see Figure 3-14).
- Travel times during the morning and evening commuting periods at representative locations of the regional transportation network would be shorter with the proposed freeway in operation in 2035 than without the proposed freeway.
- Motorists would place a high demand for the proposed freeway in the Study Area.

The freeway alternative is the appropriate solution to the regional transportation need identified in the Study Area. The freeway alternative would serve as a planned link in the loop system in the Regional Freeway and Highway System, optimize overall Regional Freeway and Highway System performance, and redistribute traffic as intended between the arterial street and freeway networks.

Additional Benefits of the Proposed Freeway

Identification of the freeway mode as the preferred mode for the proposed action would result in additional benefits related to the purposes for a major transportation facility in the Study Area and would also provide system linkage, improve regional mobility, and be consistent with local and regional planning. (See Chapter 1, *Purpose and Need*, regarding FHWA guidance for determining a proposed project's purpose and need.)

System Linkage

The Regional Freeway and Highway System, a major component of the RTP, addresses the region's transportation needs. The Regional Freeway and Highway System was designed to function as part of an integrated surface transportation network comprising an arterial street network, a system of loop freeways, and major freeways connecting to cities outside the region. System continuity is critical in optimizing:

- the effectiveness of individual network segments
- the use of transit
- freeway management strategies

The RTP-planned improvements for the Regional Freeway and Highway System assumed that a freeway would be located in the Study Area in the foreseeable future. If a freeway were not built to provide this capacity, future traffic distributions and volumes would vary from those used to plan and design other major facilities. Because of these discrepancies, recent improvements could be oversized (e.g., too many lanes), undersized (e.g., too few lanes), and/or could operate in a manner that would not satisfy the intended uses.

As an example, the freeway was planned as a portion of SR 202L, in part to accommodate longer trips in the MAG region and to reduce demand on other parts of the regional freeway, Interstate, and arterial street networks. Without the connecting link created by the proposed freeway, SR 202L (Santan Freeway) would be underused in 2035. Because I-10 (Maricopa Freeway) would not have the capacity to accept the full traffic volume the Santan Freeway could deliver to it, motorists who might have used the Santan Freeway may choose other available but already congested routes.

The proposed freeway would also serve as an important link to planned transportation facilities in the region. Two transportation projects in initial planning stages and adjacent to the Western Section Preferred Alternative would be affected if the No-Action Alternative were to be the Selected Alternative: SR 30 and Avenida Rio Salado (ARS)/Broadway Road. Both projects have been planned to address important east–west travel demand and to provide motorists with alternatives to using the heavily congested I-10 (Papago Freeway).

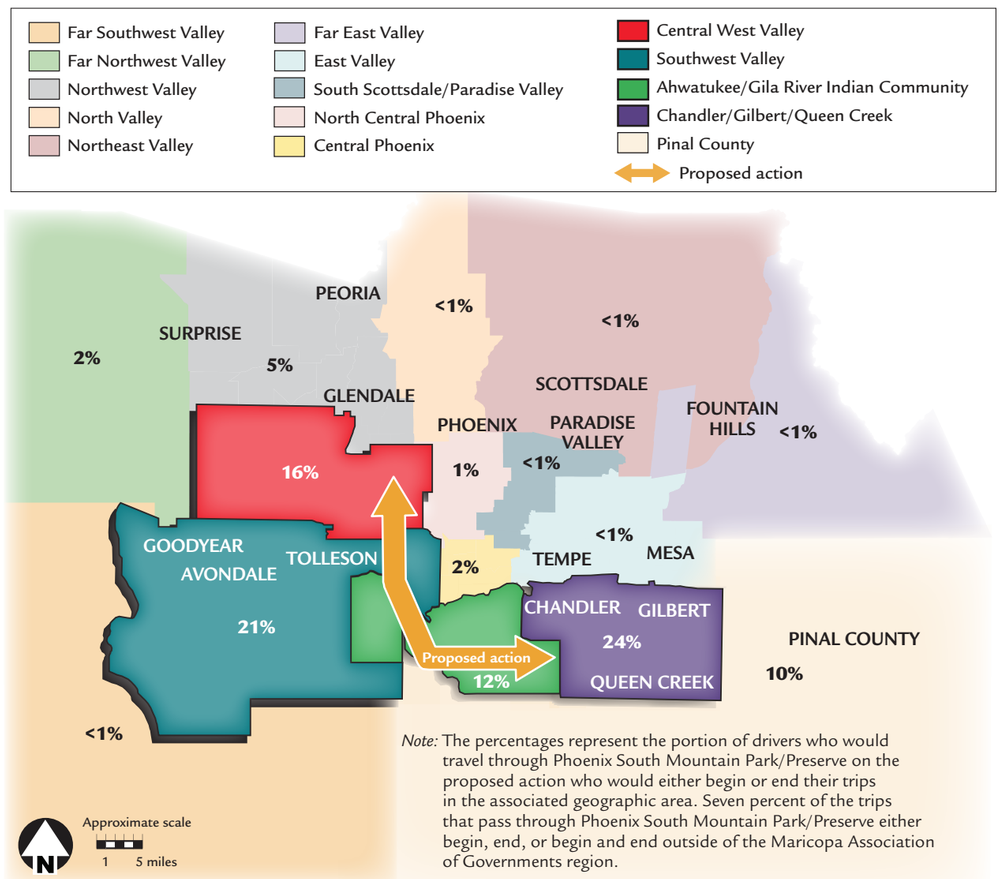
The proposed SR 30, part of the Regional Freeway and Highway System and RTP, would construct a new freeway between SR 303L and the proposed action (connecting south of Broadway Road), in the interim, with future plans to ultimately extend SR 30 farther west to SR 85. The proposed ARS project, being planned by the City of Phoenix as a part of the RTP Arterial Streets Program, would involve developing new east–west arterial street capacity south of the Salt River to provide better access to and from downtown Phoenix and to connect to the Regional Freeway and Highway System. The proposed ARS project would widen, improve, and extend Broadway Road from 7th Street to, in the interim, 51st Avenue, with future plans to ultimately connect to the proposed action and to SR 30. More information about SR 30 is available at <www.azdot.gov/Highways/Valley_Freeways> and about the ARS project is available at <www.avenidariosalado.com/about.php>.

If the No-Action Alternative were the Selected Alternative, both SR 30 and ARS would need to be reassessed in terms of purpose and need, logical termini, and traffic performance. If a system traffic interchange were not provided at the eastern terminus of SR 30 with the proposed freeway, eastbound freeway-volume traffic would enter a local road network designed for—at most—arterial-street traffic loads: an unworkable configuration. The length and alignment of SR 30 would likely have to be altered. Therefore, the proposed freeway mode plays an important role in relation to operation of the region's existing and planned freeway systems.

Regional Mobility

As presented in Chapter 1, *Purpose and Need*, the Study Area for the proposed action is located such that it would serve an area that would experience almost 50 percent of the projected increases in population, housing, and employment between 2005 and 2035 for the entire MAG region.

Figure 3-18 Select Link Analysis, Origins and Destinations within and outside the Region, 2035



Note: The percentages represent the portion of drivers who would travel through Phoenix South Mountain Park/Preserve on the proposed action who would either begin or end their trips in the associated geographic area. Seven percent of the trips that pass through Phoenix South Mountain Park/Preserve either begin, end, or begin and end outside of the Maricopa Association of Governments region.

Source: Maricopa Association of Governments, 2010b; extrapolated analysis

By estimating where travelers in a given location are coming from and where they are going, the project team was able to project 1) the types of trips future users of the proposed freeway might undertake and 2) the distribution of these trips. Seventy-three percent of travelers anticipated to use the proposed action would be involved in trips beginning or ending in the Study Area itself or in the areas immediately surrounding it.

As an important component of the loop route function of the Regional Freeway and Highway System, the proposed freeway would help to address east–west regional mobility needs. Figure 3-18 illustrates the results of a select link analysis. In this analysis, the origins and destinations of all vehicles forecast to be on the proposed action through SMPP were plotted. A projected 73 percent of the travelers who might use the proposed action would have origins and/or destinations near the proposed action. The proposed action would be used heavily by traffic from the eastern and western areas of the MAG region. This conclusion is supported by findings recounted in the section, *Need Based on Socioeconomic Factors*, beginning on page 1-11.

Legislation – Regional and Local Planning

Regional Planning Context

When county voters passed Proposition 300 in 1985, public and local planning agencies expected the Regional Freeway and Highway System would be implemented as planned. STB approval of the South Mountain Freeway alignment in 1988 reinforced that expectation. What essentially is now the proposed freeway has been included in MAG transportation planning documents since 1985 and is included in the RTP. Therefore, a freeway in the Study Area is consistent with voter mandate, regional planning objectives, and public expectations.

Local Planning Context

The proposed action is directly or indirectly referenced in municipalities' long-range planning efforts.

Avondale

The proposed action is not mentioned specifically in the adopted *Avondale General Plan 2030* (2012). The circulation (transportation) element of the plan, however, identifies "promote Avondale in regional transportation issues" as a goal. In addition, one of the policies in the plan's land use element is to "coordinate with Goodyear, Phoenix, Litchfield Park, Tolleson, and Maricopa County regarding land use and transportation along Avondale's borders." The proposed action is not inconsistent with the *Avondale General Plan 2030*.

Chandler

Only a small portion of Chandler is located in the Study Area. This portion is designated for employment uses. The City of Chandler *General Plan* (2008) does not specifically discuss the proposed action, but does show the South Mountain Freeway as a proposed freeway on the Regional Context Map.

Phoenix

The proposed action is included in the City of Phoenix *General Plan*, Circulation Element (City of Phoenix 2001). As stated in the voter-approved and formally adopted 2002 update, "the Circulation Element discusses how to reduce the rate of increased traffic congestion, which is increasing faster than population growth."

Goal 1 of the Circulation Element states:

> An effective multi-modal transportation system should be developed that will allow the movement of goods and all people safely and efficiently throughout the city, especially into, and between, the urban village cores.

Several policies are outlined to implement this goal, one of which is Policy 7:

> Encourage timely construction of the freeways and expressways in the adopted Maricopa Association of Governments Plan. One of the freeways identified in the plan is the South Mountain Parkway.

Another policy of the Circulation Element is to "plan and design the city's transportation system to help implement the Land Use Element's goals while assuring that new transportation facilities are available concurrently with changes in land use." The proposed action is an integral component in two area land use plans for Phoenix neighborhoods traversed by the 1988 alignment. The two plans are the *Southwest Growth Study/Laveen: A Guide for Development* (City of Phoenix 1998) and the *Estrella Village Plan* (City of Phoenix 1999). In both plans, urban village planning areas show village cores developed around a "South Mountain Freeway." Based on these plans, development, zoning, and residential and commercial location decisions in the past several years

have been made assuming a "South Mountain Freeway" generally near the 1988 alignment.

Tolleson

The *2005 Tolleson General Plan* established a goal to maintain and enhance streets to retain Tolleson's community character. A strategy to attain this goal was to "maintain assertive leadership to prevent freeways and major highways (such as Highways 101 and 202 Extensions) from bisecting Tolleson." The plan states that "a 99th Avenue corridor alignment would pose extreme hardship on the City of Tolleson due to vast amounts of right-of-way that would be needed." A 99th Avenue Growth Area is denoted in the plan, in which a preference for commercial land uses is stated. In addition, the plan states that both Phoenix and Tolleson support and prefer an alignment for the proposed freeway near "55th Avenue" (most similar to the W59 Alternative).

Conclusions Regarding Appropriateness of the Proposed Freeway as the Modal Alternative

In the 1980s, a phased transportation network (the Regional Freeway and Highway System) was proposed and adopted to serve the region's transportation demands (see the section, *Historical Context of the Proposed Action*, beginning on page 1-5) resulting from growth in employment, housing, and population. The South Mountain Freeway was determined to be a key link in the Regional Freeway and Highway System. At the onset of the EIS process, the transportation network was reexamined to determine whether a major transportation facility was still needed and, if so, what mode would be an appropriate method of meeting the identified need. The need to serve the transportation demands of a growing region was still applicable. It was further determined that the freeway mode was an appropriate response to this need.

The proposed freeway was also determined necessary to serve future transportation demand from continuing job, housing, and population growth in the area that would be served by the proposed freeway. The proposed freeway was refined to provide system linkage and regional mobility and to address regional and local transportation planning efforts. Based on these efforts, it was determined the proposed freeway was needed even more now than in the past and that the proposed freeway would address the identified need. Some of the results of the analyses described in the previous sections are presented in Table 3-9, along with a summary of the proposed freeway's ability to meet the purpose and need criteria.

The proposed freeway clearly meets the purpose and need criteria of the project. When considering the historical context of the proposed freeway, its context in regional transportation planning, and analyses of existing and projected regional transportation demand and capacity, the proposed freeway is a needed element of the integrated transportation infrastructure network in the MAG region because:

- The rationale for identifying the Study Area as the location for a major new transportation facility is supported by:
  - The proposed action has a historical identification as an important part of the planned integrated regional transportation infrastructure and loop freeway systems to support citizens of the MAG region.
  - Almost 50 percent of the projected increases in population, housing, and employment between 2005 and 2035 for the entire MAG region is expected to occur in the southwestern and southeastern portions of the Phoenix metropolitan area.
- The analytical results presented in Chapter 1, *Purpose and Need*, and in this chapter identify a need for a major transportation facility and present reasons that the proposed freeway is the facility to meet that need:
  - The quality of current operating conditions during peak operating periods on the regional transportation facilities in the Study Area and its surroundings is poor, with much of the network congested.
  - Travel within the MAG region is projected to nearly double between 2010 and 2035.
  - Performance of the majority of region's freeways and arterial streets is projected to be poor—at LOS E or worse without the proposed action in operation in 2035.
  - Operation of the proposed freeway would appropriately redistribute projected traffic onto the remaining Regional Freeway and Highway System, Interstate freeways, and arterial street network when compared with the projected traffic volumes without the proposed freeway in operation.
  - Without the proposed freeway, the RTP's planned facility improvements would accommodate about 76 percent of the total 2035 projected demand (operating at LOS D), leaving 24 percent of the anticipated demand unmet.
  - Better-than-planned performance of nonfreeway modal transportation improvements, including transit, TDM/TSM, and other expanded arterial street network improvements, alone or cumulatively, would not be sufficient to adequately address the projected 2035 capacity deficiency.
  - Travel time during peak periods would increase between 2010 and 2035, with or without the proposed freeway; such travel times would, however, not increase as much with the proposed freeway in operation.
- The proposed freeway is a major component in the Regional Freeway and Highway System, which is intended to function as an integrated freeway network. The system linkage provided by the proposed freeway would further optimize system continuity and the effectiveness of individual network segments, which are important to overall Regional Freeway and Highway System operation.
- The proposed freeway is an important component of past, current, and known future planning efforts. Maricopa County, Phoenix's villages (Laveen, Estrella, and Ahwatukee Foothills), Tolleson, and Avondale have all made transportation, land use, and economic planning decisions in a context of the proposed freeway operating in the Study Area.
- The proposed freeway would function as planned and intended in the RTP.

Table 3-9 Implementation of the Proposed Freeway as the Appropriate Modal Alternative to Satisfy Purpose and Need Criteria, 2035

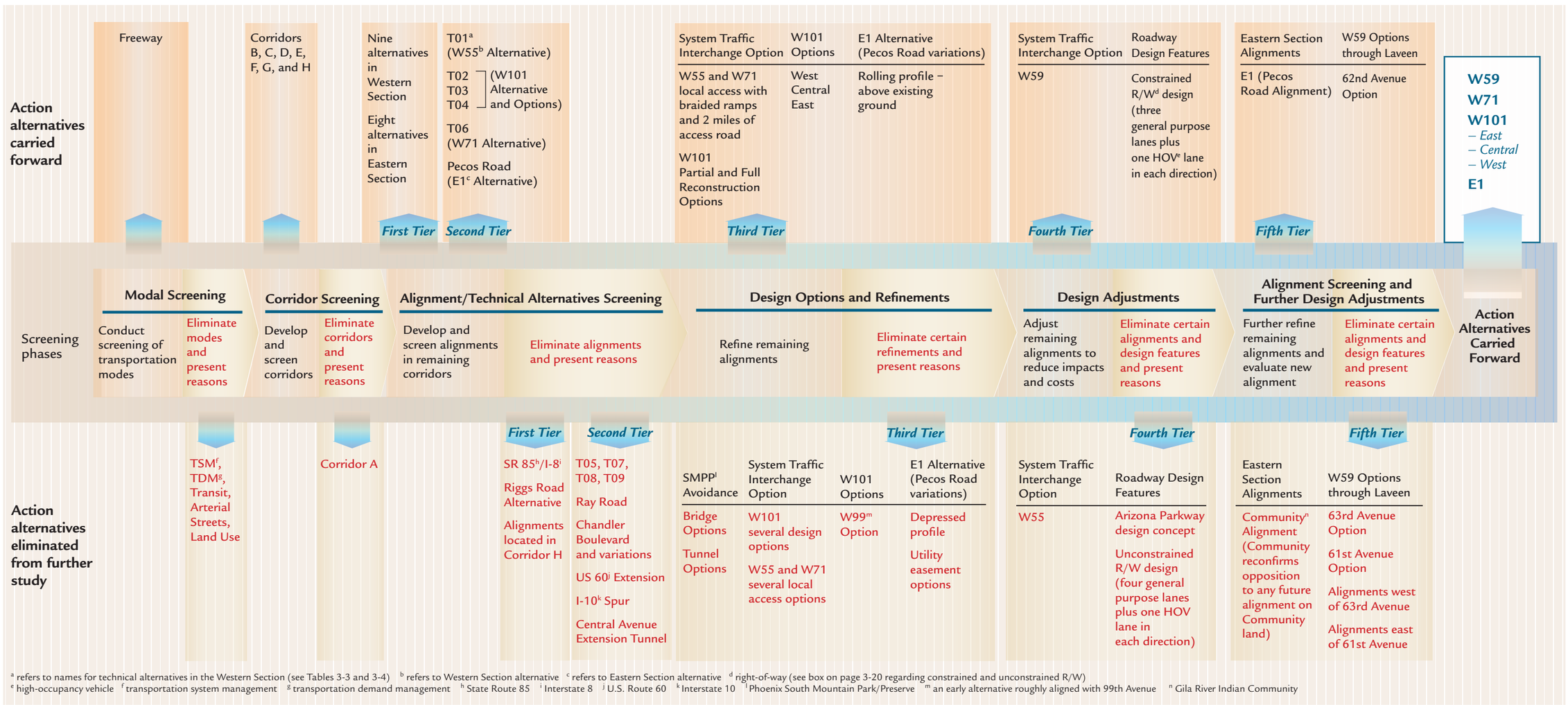
Decisional Criterion	With the Proposed Freeway	Without the Proposed Freeway
Who would use the proposed freeway?	• 73 percent of drivers using the proposed freeway would be coming from or traveling to the area surrounding the proposed freeway; this area is projected to experience almost 50 percent of the growth in Maricopa County by 2035	• Travelers would continue to use existing routes such as I-10[a] and Baseline Road, which would become more and more congested • Increased congestion and travel time would occur because no other high-capacity facilities (e.g., freeways) are planned in the area
How would the proposed freeway affect the average traveler?	• By reducing congestion, travel times would improve within the region, resulting in an estimated $200 million annual savings in travel time	• Trip times and traffic congestion would worsen without the proposed freeway
What effects would the proposed freeway have on the regional freeway system?	• Would improve the regional transportation network as planned for during the past 25 years, increasing the efficiency of other existing and planned freeways • Would remove traffic from congested freeways and arterial streets • Would optimize use of adjacent freeways such as SR 202L[b] (Santan Freeway) and the proposed SR 30[c]	• Freeways would not experience congestion relief provided by proposed freeway • If the connections were not provided, the need for other planned freeways would have to be reassessed and reanalyzed in terms of traffic performance • Segments of the regional freeway system, such as SR 202L (Santan Freeway) and SR 30, would be underused
What effects would the proposed freeway have on the area's arterial street network?	• Proposed freeway would reduce traffic on arterial streets by 277,000 vpd[d], which equates to 33 arterial street-lanes of traffic being removed from the system	• Street widening and intersection improvements would be needed to address increased congestion, but these improvements are not planned or funded and obtaining the right-of-way for these improvements would be difficult
What effects would the proposed freeway have on areawide continuity and connectivity?	• Would complete the freeway loop system (as part of SR 202L) • Would increase mobility and access by connecting freeways such as SR 202L (Santan Freeway) in the east to SR 30, SR 101L[e], and SR 303L[f] in the west	• Freeway loop system would be incomplete; SR 202L would be incomplete and underused • An alternative connection between the eastern and western portions of the Phoenix metropolitan area would not be provided • Motorists on the local arterial street network would have to drive longer distances on these congested streets before being able to gain access to Interstate and regional freeways
What effects would the proposed freeway have on the area's overall transportation capacity deficiency?	• 18 percent of the travel demand in 2035 would remain unmet (see Figure 3-14, on page 3-31); 6 percent less than without the proposed freeway, which would make a substantial difference for the areas's overall transportation network	• 24 percent of the travel demand in 2035 would remain unmet (see Figure 3-14, on page 3-31)
Would the proposed freeway affect traffic in the Broadway Curve[g] area of I-10?	• Proposed freeway would reduce daily traffic volumes by 24,000 vpd on this portion of I-10 and to the south on I-10 between Baseline and Elliot roads, more than any other segments of the region's freeways • During the morning commute, the Broadway Curve would experience shorter duration of LOS E[h] or F conditions	• Would carry approximately 6 percent more traffic without the proposed freeway and would experience a greater degradation of traffic performance • During the morning commute, the Broadway Curve would experience longer duration of LOS E and F conditions
What effects would the proposed freeway have on SR 202L (Santan Freeway)?	• Would increase use on the segment near the proposed freeway by 43,000 vpd • Would optimize operation of the remainder of the SR 202L system	• SR 202L near the proposed freeway would remain underused
Would the proposed freeway affect traffic using 51st Avenue through Community[i] land?	• Would limit traffic growth from 7,000 vpd in 2009 to 13,000 vpd in 2035, preventing a larger increase in unwanted traffic cutting through the Community	• Traffic volumes would increase to 29,000 vpd in 2035 • 51st Avenue would continue to be used by unwanted traffic cutting through the Community
What other general transportation effects would the proposed freeway have?	• Would reduce projected traffic volumes on the remaining regional freeway system, Interstate freeways, and local road network • Would provide opportunities for freeway-dependent transit services • Would provide additional opportunities for transportation system management and transportation demand management	• No improvement in performance of the region's freeways, Interstate freeways, and arterial streets would occur • Additional opportunities for regional freeway-dependent transit services, transportation system management, and transportation demand management would not occur
What effects would the proposed freeway have on the area's transportation planning efforts?	• Would fulfill the planning efforts of numerous governmental entities • Would be an integral element and enhance operation of other planned improvements in the *Regional Transportation Plan* • Would fulfill a need first formally acknowledged in 1985	• Lack of the proposed freeway would be inconsistent with the planning efforts of numerous governmental entities • Would not complete the planned improvements in the *Regional Transportation Plan*

[a] Interstate 10 [b] State Route 202L (Loop 202) [c] State Route 30 [d] vehicles per day [e] State Route 101L (Loop 101) [f] State Route 303L (Loop 303) [g] The Broadway Curve is the area of Interstate 10 between 48th Street and Broadway Road; it is the most congested stretch of freeway in the Phoenix metropolitan area. [h] level of service [i] Gila River Indian Community

Summary of Screening Process Results – Alternatives Eliminated and Alternatives Carried Forward

Based on the content in Figure 3-2, Figure 3-19 presents the specific outcomes of the screening process, highlighting those action alternatives carried forward and those eliminated from further study. As a result of this systematic, multidisciplinary process, three action alternatives (including design options) in the Western Section and one action alternative in the Eastern Section were carried forward for detailed study in the EIS. The combinations of action alternatives from the Western and Eastern Sections represent a range of reasonable alternatives for detailed consideration. The No-Action Alternative was also carried forward.

Figure 3-19 Summary of Action Alternatives Considered and Eliminated



[a] refers to names for technical alternatives in the Western Section (see Tables 3-3 and 3-4) [b] refers to Western Section alternative [c] refers to Eastern Section alternative [d] right-of-way (see box on page 3-20 regarding constrained and unconstrained R/W)
[e] high-occupancy vehicle [f] transportation system management [g] transportation demand management [h] State Route 85 [i] Interstate 8 [j] U.S. Route 60 [k] Interstate 10 [l] Phoenix South Mountain Park/Preserve [m] an early alternative roughly aligned with 99th Avenue [n] Gila River Indian Community

In accordance with the National Environmental Policy Act, a range of reasonable action alternatives to carry forward for further analysis was determined through application of multidisciplinary criteria in a logical, step-wise progression. At the end of each step, modes, corridors, alignments, or options were either eliminated or advanced to the next step.