Technical Memorandum

Date:	Wednesday, September 17, 2014
Project:	South Mountain Transportation Corridor
To:	Project Team
From:	HDR
Subject:	Validation of the Alternatives Screening Process at the FEIS Stage

Purpose

The purpose of this memorandum is to document the evaluation of the alternatives development and screening process presented in the Final Environmental Impact Statement (FEIS) for the South Mountain Freeway. The screening process for the project, which was originally outlined in the *Alternatives Development and Screening Process* (October 2002), included many stages and was updated and validated over a 13-year period. Over that time, change has occurred in the Study Area and region, which includes all of the Phoenix metropolitan area. Additionally, after the Draft Environmental Impact Statement (DEIS) release, the Maricopa Association of Governments (MAG) approved new socioeconomic and traffic projections for the region.

This memorandum is structured such that the modes, corridors, and alignment alternatives eliminated follow the screening process shown in Figure 3-19 on page 3-39 of the FEIS, but alternatives are collectively discussed if the alternatives were addressed within the same report or memorandum. Within each step of the process the **consensus** points are identified along with reference to the original **documentation** or study that supports the screening process. For each consensus point, a **validation** of the analysis presented in the original documentation is presented. Alternatives that are also considered "avoidance alternatives" in the Section 4(f) Evaluation are highlighted in yellow and noted in the respective sections of the memorandum.

Alternatives Development and Screening Process

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. In June 2013, the Maricopa Association of Governments (MAG) approved new socioeconomic projections

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for Maricopa County. The purpose and need analysis was updated and reevaluated using these new population, employment, and housing projections and corresponding projections related to regional traffic. The conclusions reached in the DEIS are reconfirmed in the FEIS.

The traffic operational assessments performed during the alternatives development and screening process used the latest traffic projections from the MAG travel demand model, as certified by FHWA and reviewed by the U.S. Environmental Protection Agency 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 tracked regularly by MAG)
- the distribution of transportation modes used by travelers in the MAG region (also tracked 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

The new MAG socioeconomic and traffic projections for Maricopa County were used to update the analysis in the FEIS. The traffic volumes, traffic conditions, travel distribution, capacity deficiencies, and travel time were reanalyzed to evaluate the alternatives considered in terms of responsiveness to purpose and need criteria. The new socioeconomic and traffic projections [see *Traffic Overview* (2014)], while lower than what was previously predicted, still support the purpose and need, evaluation of lane and alignment changes, responsiveness of the proposed freeway to purpose and need, and traffic conditions with the action and No-Action alternatives.

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.

CONSENSUS: ELIMINATION OF TRANSPORTATION SYSTEM MANAGEMENT (TSM), TRANSPORTATION DEMAND MANAGEMENT (TDM), TRANSIT, ARTERIAL STREETS, AND LAND USE

Documentation:

Purpose and Need Memorandum (July 2003)

An early step in preparing the EIS was to determine if there is a purpose and need for the proposed action. The *Purpose and Need Memorandum* evaluates that need based on socioeconomic factors and based on regional transportation demand and existing and projected transportation system capacity deficiency. As part of the evaluation, the memorandum considered nonfreeway modes of travel and whether they could address the identified needs.

The *Purpose and Need Memorandum* found that population, economic growth, and related transportation infrastructure needs are projected to increase in the study area and its vicinity. This growth is expected to increase faster than the planned transportation facility and services improvements can accommodate the transportation infrastructure needs. The traffic analysis showed that best-case modal transportation improvements, including transit, TDM/TSM, roadway improvements (not including a major regional roadway in the Study Area), alone and cumulatively, are not enough to adequately address the projected 2021 capacity deficiencies (see page 34 of the *Purpose and Need Memorandum*).

Draft Environmental Impact Statement (April 2013)

The DEIS presented updated traffic analysis related to the modal alternatives (see Figure 3-3 on page 3-4 of the DEIS) as well as detailed descriptions of each option. Detailed descriptions of each modal option are provided beginning on page 3-4 of the DEIS. Reasons for the elimination of specific nonfreeway alternatives include:

- TSM/TDM:
    - 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 region (see Figure 3-3 on page 3-4 of the DEIS).
    - 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.
- Transit:
    - 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 region (see Figure 3-3 on page 3-4 of the DEIS).
    - 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.

- Arterial street network expansion:
    - 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 Figure 3-3 on page 3-4 of the DEIS).
- Land use:
    - 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 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 Regional Transportation Plan (RTP).

Validation:

The purpose and need for the project was reassessed with the updated MAG socioeconomic and traffic projections and there were not substantial changes to the findings (see text beginning on page 2-17 of the 2014 *Traffic Overview*). As discussed on page 2 of this memo, the MAG travel demand model (used in the assessment of purpose and need and the evaluation of alternatives) is updated regularly to incorporate the latest information related to population, housing, employment, land use plans, multimodal transportation plans, trip distributions by mode, and more. Therefore, the effectiveness or the effects of nonfreeway modes such as TSM, TDM, transit, arterials, and land use are reflected in the traffic projections used in the analysis.

Any changes identified in the MAG *2035 Regional Transportation Plan* (2014) for implementation of the nonfreeway alternatives have been incorporated into the FEIS (see text beginning on page 3-4). TSM and TDM strategies have evolved and become more effective, but not to the level that would make them effective in addressing the project's purpose and need (MAG *2035 Regional Transportation Plan*, 2014; see Figure 3-3 on page 3-4 of the FEIS). Transit routes and operations have not expanded beyond those planned in the RTP. The arterial street network has not changed substantially and operations and effectiveness have not improved substantially. The land use plans have not changed substantially with respect to densities and distributions (as derived from a comparison of general plan maps from the cities of Phoenix, Avondale, and Tolleson in 2010 and 2014). The ability of the nonfreeway modes to meet the identified needs with respect to regional capacity deficiency or mobility has not changed. Therefore, the elimination of the nonfreeway alternatives is still valid (see Figure 3-3 on page 3-4 of the FEIS).

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, physical environmental screening criteria applied, and alignments' operational performance could be compared (see map on the next page, Figure 3-4 of the FEIS). 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 physical 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

CONSENSUS: ELIMINATION OF CORRIDOR A

Documentation:
Corridor Screening_ADT Maps (April 2002)

Based on the screening criteria and traffic analyses, Corridor A was eliminated from further study. Corridor A covers the area north of Baseline Road, west of 107th Avenue, east of the Agua Fria River, and south of McDowell Road. The average daily traffic (ADT) maps from the MAG regional travel demand model were used to evaluate alignments within each of the corridors. Based on the review of the ADT maps, alignments within Corridor A (as represented by Alternative A in the ADT maps) would have lower traffic volumes on the proposed freeway near I-10 (Papago Freeway) than any other corridor (see table on this page page) and would, therefore, not meet the purpose and need for the project as well as alignments within the other corridors. For this reason, Corridor A was eliminated from further consideration.

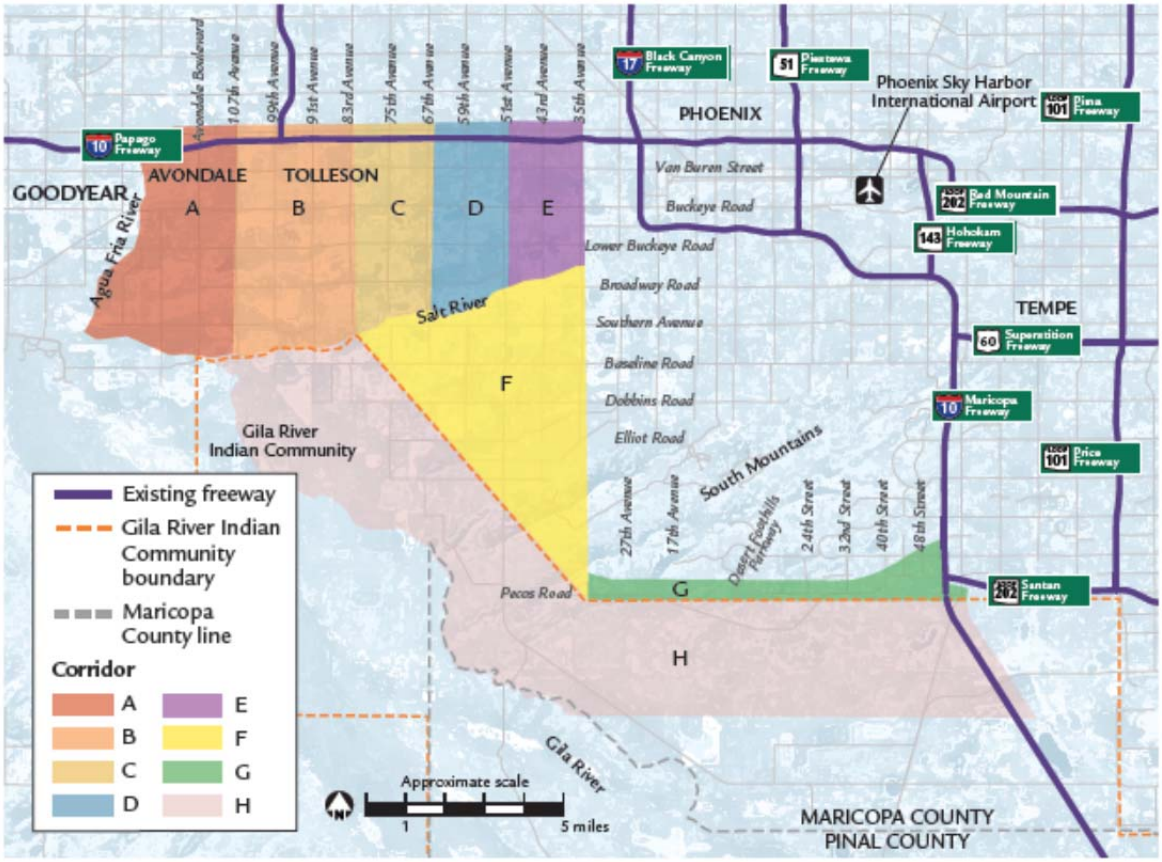
Daily traffic volume on proposed freeway just south of I-10 (Papago Freeway) by corridor

Corridor	A	B	C	D	E
Average daily traffic	**96,000**	**128,000**	**127,000**	**123,000**	**124,000**

Validation for FEIS:
The elimination of Corridor A was based on traffic analysis. The design year of the traffic projections used for the corridor screening analysis was 2025. The current design year for the traffic analysis in the FEIS is 2035. Both sets of traffic projections were obtained from the MAG regional travel demand model which uses the local jurisdictions land use plans as a basis for the traffic projections. The land use and trip distribution assumptions used to model each design year has not changed substantially (as derived from a comparison of general plan maps from the cities of Phoenix, Avondale, and Tolleson in 2010 and 2014 and from the comparison between the 2007 *Traffic Report* and 2014 *Traffic Overview*). Therefore, the 2035 traffic projections for Corridor A near I-10 (Papago Freeway) would be

lower than any other corridor and Corridor A would still not meet the purpose and need for the project as well as alternatives within the other corridors. Based on this, the elimination of Corridor A is still valid.

Figure 3-4 of the FEIS

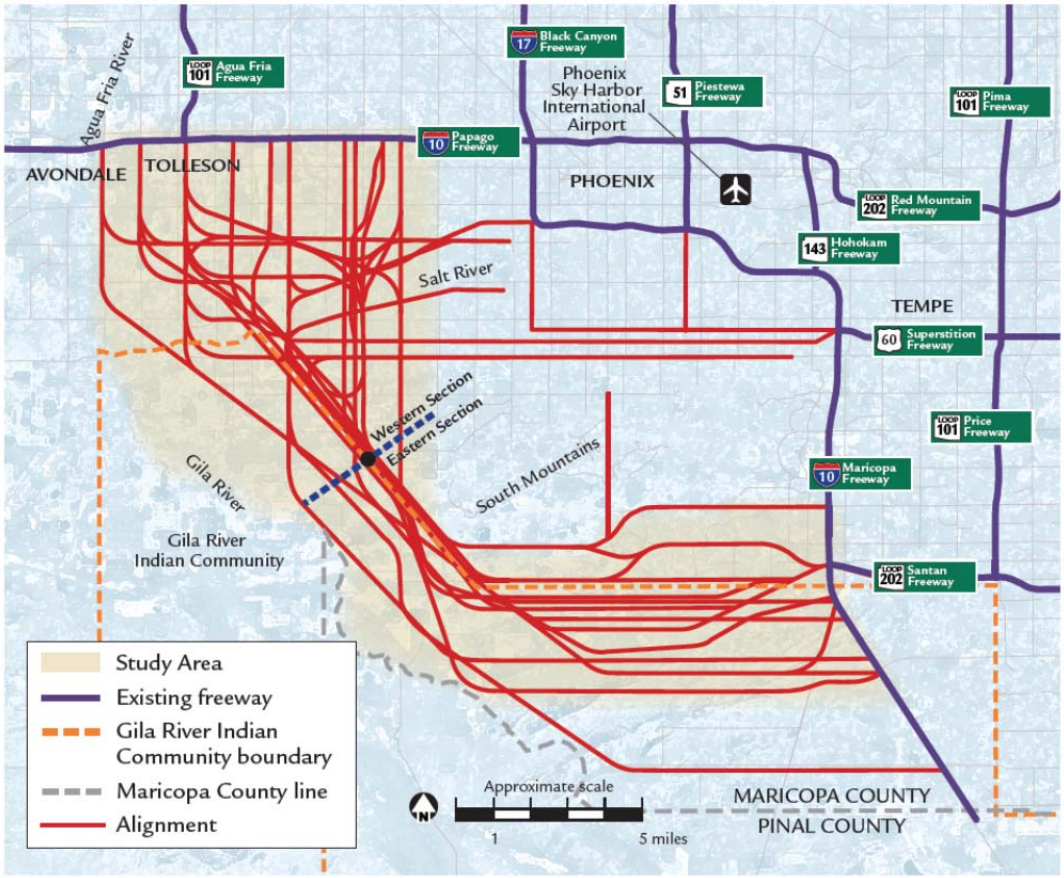


Alignment/Technical Alternatives Screening

First Tier

Alignments were generated from previous studies, project team input, and routes provided from public input. Numerous alignments were identified (see map on the next page, Figure 3-5 of the FEIS) in an initial effort requesting public preferences for freeway alignments that would contribute to creating a comprehensive set of alternatives. 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 and from outside the Study Area.

Figure 3-5 of the FEIS



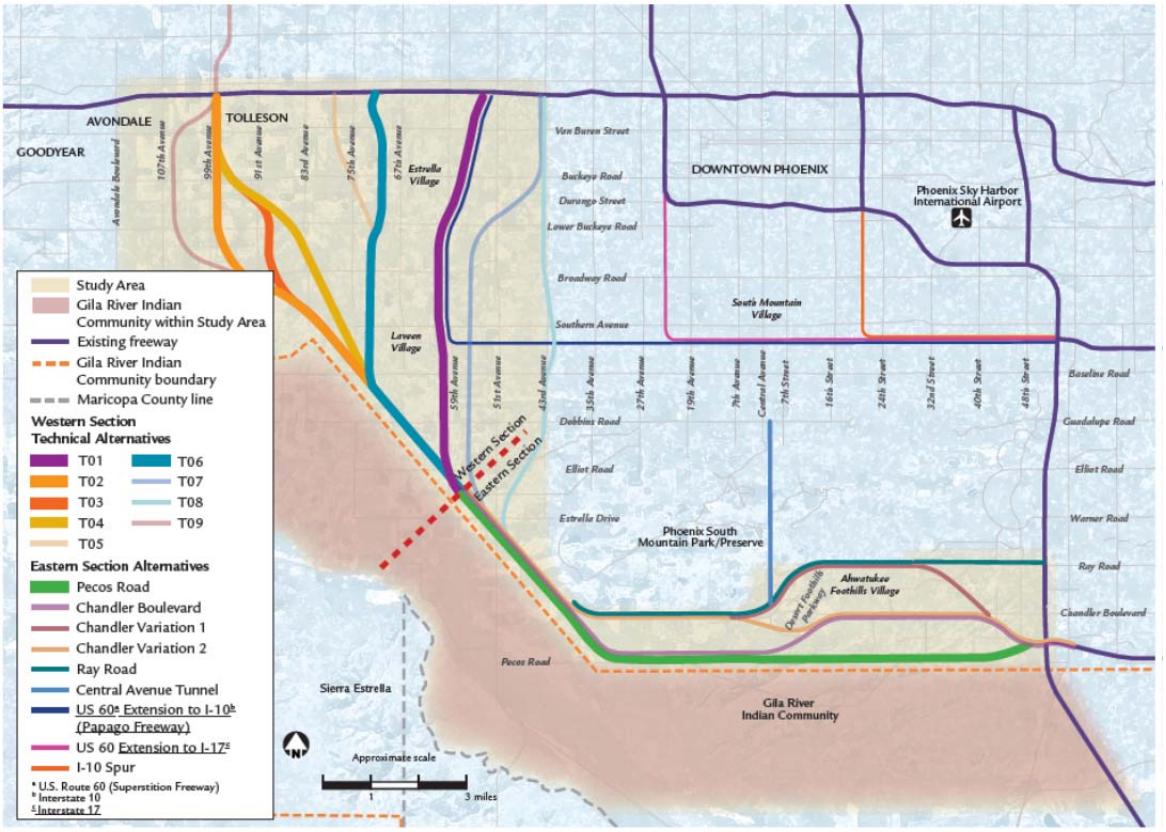
CONSENSUS: IDENTIFICATION OF ALTERNATIVES IN WESTERN AND EASTERN SECTION

Documentation:
Development of Technical Alternatives Memorandum (January 2003)

The *Development of Technical Alternatives Memorandum* documented the process by which the early alignments were refined into nine Western Section Alternatives and one Eastern Section alternative (seven more Eastern Section alternatives were later added to the screening process in the DEIS and an eighth was added prior to release of the FEIS) (see map on the next page, Figure 3-6 of the FEIS). The conclusions reached in this stage of the process were based on physical environmental constraints, design criteria, and engineering feasibility.

Validation for FEIS:
Since this process was completed, population and housing growth has occurred in the Study Area. However, there have not been substantial changes to the physical environmental constraints, design criteria, or engineering feasibility that were used to consolidate the Western Section alignments into potential action alternatives. Therefore, the basis for refining the alignments is still valid.

Figure 3-6 of the FEIS



CONSENSUS: ELIMINATION OF CORRIDOR H

Documentation:
Draft Environmental Impact Statement (April 2013)

Corridor H includes all of the land within the Study Area that is located on the Gila River Indian Community (Community) (see map on page 5, Figure 3-4 of the FEIS). It extends from I-10 (Maricopa Freeway) west and then northwest to the Community boundary near the Salt River. The documentation and reasoning for its elimination is presented in the DEIS (see page 3-8). Tribal sovereignty is based on the inherent authority of Native American tribes to govern themselves. States have very limited authority over activities within tribal land. ADOT and FHWA do not have the authority to survey tribal land, make transportation determinations directly affecting tribal land, or condemn tribal land through an eminent domain process. Corridor H was eliminated because the Community has not granted permission to study alternatives on Community land; therefore, this corridor is not prudent and feasible.

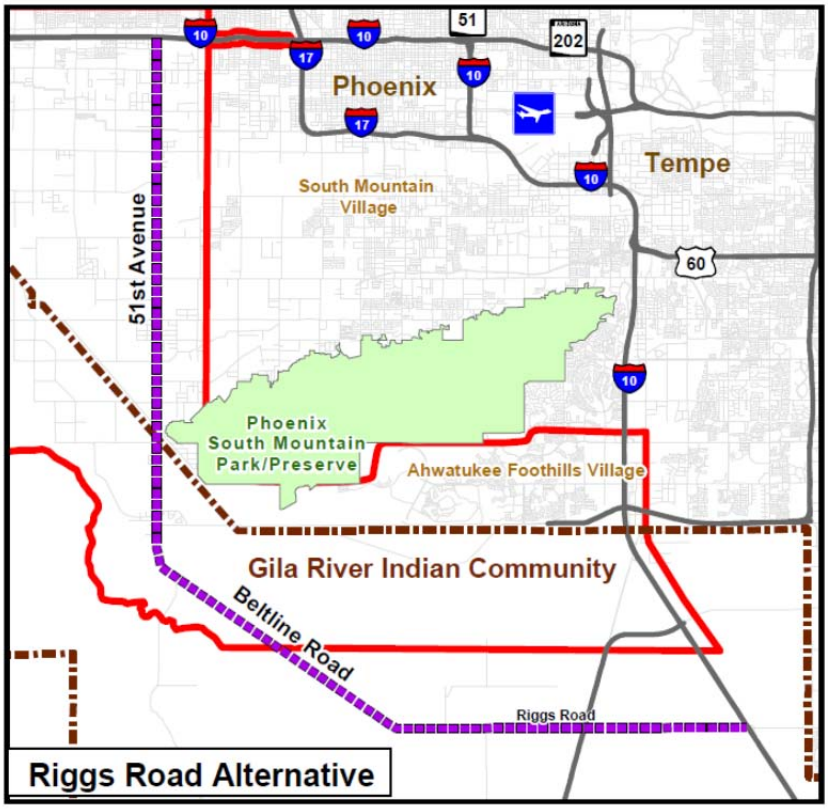
Validation for FEIS:
Since the release of the DEIS, there has been no change in the Community's opposition to constructing the freeway on their land. Therefore, the elimination of this corridor for potential action alternatives is still valid and the finding that this corridor would not be prudent and feasible is still valid.

CONSENSUS: ELIMINATION OF THE RIGGS ROAD ALTERNATIVE

Documentation:
Draft Environmental Impact Statement (April 2013)
Section 4(f) and Section 6(f) Report (December 2012)

The Riggs Road Alternative would replace 51st Avenue with a freeway 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 (see map on this page, Figure 50 of the *Section 4(f) and Section 6(f) Report*). 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.

Inset of Figure 50 of the *Section 4(f) and Section 6(f) Report*



The Riggs Road Alternative was presented as a potential action alternative in Chapter 3 of the DEIS and as an avoidance alternative for the South Mountains in Chapter 5 of the DEIS. The documentation and basis for the elimination of this alternative is presented in the DEIS (see page 3-9 and 5-18) and the Section 4(f) technical report. The Riggs Road Alternative would not complete the loop system as part of SR 202L, thereby causing substantial out-of-direction travel for motorists. Additionally, nearly two-thirds of the alternative would be on Community land and permission to study alternatives on Community land has not been granted. Tribal sovereignty is based on the inherent

authority of Native American tribes to govern themselves. States have very limited authority over activities within tribal land. ADOT and FHWA do not have the authority to survey tribal land, make transportation determinations directly affecting tribal land, or condemn tribal land through an eminent domain process. Therefore, the alternative would not meet the proposed action's purpose and need criteria and was eliminated from further study. For these same reasons, the alternative would not be prudent and feasible.

Validation for FEIS:
The purpose and need for the project was validated through the update and development of Chapter 1 in the FEIS using the updated socioeconomic and traffic projections for the region (information is also presented in the 2014 *Traffic Overview*). The new socioeconomic and traffic projections, while lower than what was previously predicted, still support the purpose and need. The Riggs Road Alternative does not address the regional needs identified for the project. The Riggs Road Alternative would not complete the loop system and would require substantial out-of-direction travel for accessing the alignment from the eastern end of the Study Area. In addition, there has been no change in the Community's opposition to freeway alignments on their land, including along 51st Avenue and Beltline Road which is where the Riggs Road Alternative would be located. Based on this, the elimination of the Riggs Road Alternative as a potential action alternative is still valid and the finding that this alternative would not be prudent and feasible is still valid.

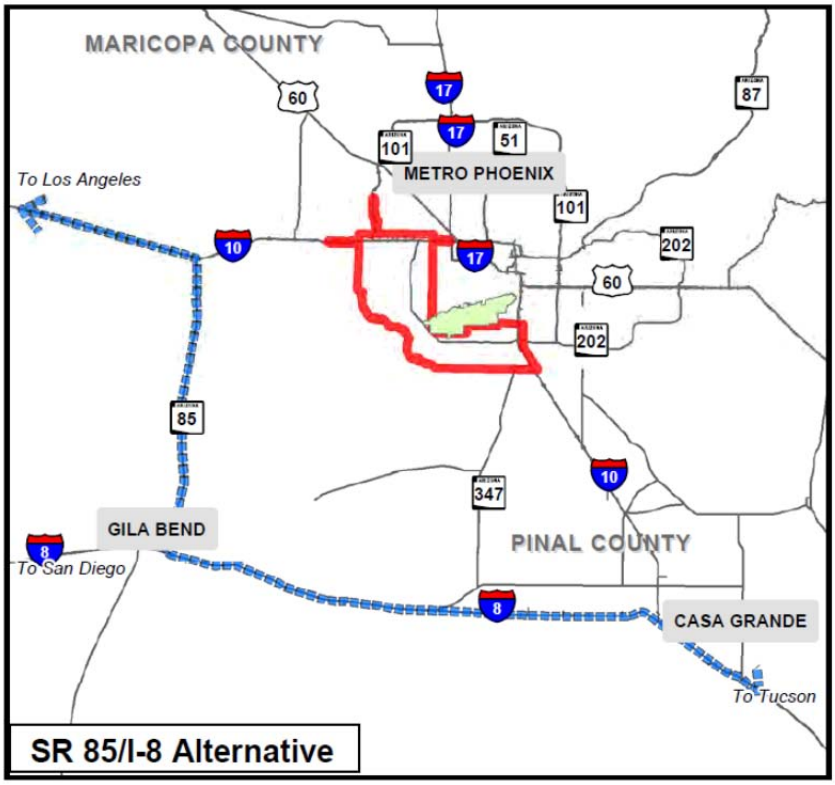
CONSENSUS: ELIMINATION OF THE SR85/I-8 ALTERNATIVE

Documentation:
Draft Environmental Impact Statement (April 2013)
Section 4(f) and Section 6(f) Report (December 2012)

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 (see map on the next page, Figure 50 of the *Section 4(f) and Section 6(f) Report*). 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.

The SR 85/I-8 Alternative was presented as a potential action alternative in Chapter 3 of the DEIS and as an avoidance alternative for the South Mountains in Chapter 5 of the DEIS. The documentation and basis for the elimination of this alternative is presented in the DEIS (see page 3-9 and 5-18) and Section 4(f) technical report. The SR 85/I-8 Alternative would continue to be available for interstate and inter-regional travel, but it does not meet the proposed action purpose and need based on regional transportation demand and existing and projected transportation system capacity deficiencies and, therefore, it was eliminated from further consideration. For these same reasons, the alternative would not be prudent and feasible.

Inset of Figure 50 of the *Section 4(f) and Section 6(f) Report*



Validation for FEIS:

The purpose and need for the project was validated through the update and development of Chapter 1 in the FEIS using the updated socioeconomic and traffic projections for the region (information is also presented in the 2014 *Traffic Overview*). The new socioeconomic and traffic projections, while lower than what was previously predicted, still support the purpose and need. The SR 85/I-8 Alternative does not address the regional needs identified for the project. The SR 85/I-8 Alternative does not serve regional travel demand or mobility. Based on this, the elimination of the SR 85/I-8 Alternative as a potential action alternative is still valid and the finding that this alternative would not be prudent and feasible is still valid.

Second Tier

In the Second Tier screening, the operational characteristics of the alternatives carried forward from the First Tier screening (see map on page 7) were compared to determine whether any of the alternatives could be eliminated from further study. The alternatives were screened based on an assessment of criteria such as displacements and relocations, traffic performance, compliance with design standards, preliminary right-of-way (R/W) requirements, and planning-level cost estimates.

CONSENSUS: CARRYING FORWARD T01 (W55 ALTERNATIVE), T02, T03, T04 (W101 ALTERNATIVE AND OPTIONS), AND T06 (W71 ALTERNATIVE) AND ELIMINATION OF T05, T07, T08, AND T09

Documentation:
Alternatives Screening Report (March 2003)

The Western Section technical alternatives discussed in the *Alternatives Screening Report* are presented in Table 3-3 of the FEIS (see map on this page). They all begin at the common point with the Eastern Section (at approximately 59th Avenue and Elliot Road) and then extend north to I-10 (Papago Freeway) on varying alignments. The alignments connect to I-10 (Papago Freeway) between 43rd Avenue and 99th Avenue.

The traffic operational characteristics (speed, delay, congestion, etc.) 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).

The technical alternatives were eliminated based on an assessment of traffic 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). Reasons for the elimination of specific alignments include:

- T05:
  - Traffic operational failure experienced on I-10 (Papago Freeway) between 83rd Avenue and SR 101L because of two system traffic interchanges within 3 miles of each other
  - Greater cost and R/W associated with system traffic interchange ramps and connector roads

- T07:

  - Traffic 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
  - Greater impacts to existing and planned residential and commercial developments
  - Greater cost for construction and R/W acquisition associated with displacements and system traffic interchange ramps and connector roads

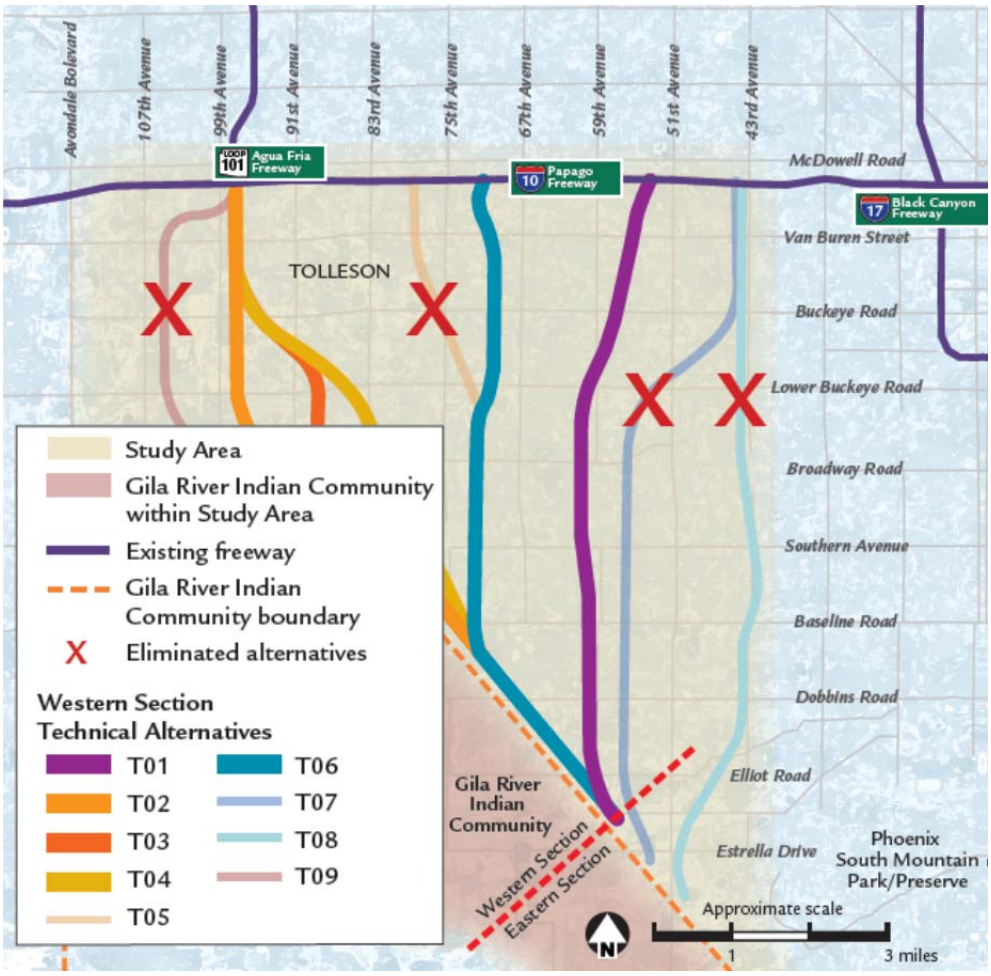
- T08:

  - Traffic 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
  - Greater impacts to existing and planned residential and commercial developments

- Greater cost for construction and R/W 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, reducing capacity and adversely affecting traffic operations
  - Greater impacts to existing and planned residential and commercial developments in Tolleson and Avondale
  - Greater cost of R/W acquisition associated with displacements

Table 3-3 of the FEIS



Validation for FEIS:

The primary basis for the elimination of Western Section technical alternatives was due to the location of the proposed freeway's system traffic interchange with I-10 (Papago Freeway) and its proximity to I-17 or State Route (SR) 101L (Agua Fria Freeway). The traffic analysis concluded that the proposed freeway's connection to I-10 needed to be at least 3 miles away from the next major freeway-to-freeway connection to not adversely

affect the traffic operational performance of I-10 (Papago Freeway). Although the design year traffic projections used have changed since this initial traffic analysis, there have not been substantial changes to the traffic projected on the I-10 main line lanes, ramps, or SR 101L and I-17 connections (as derived from a comparison between the 2007 *Traffic Report* and 2014 *Traffic Overview*). Therefore, the system traffic interchanges would still be too closely spaced and the elimination of the Western Section technical alternatives (T05, T07, T08, and T09; see Table 3-3 in the FEIS) is still valid.

CONSENSUS: ELIMINATION OF RAY ROAD ALTERNATIVE AND CHANDLER BOULEVARD ALTERNATIVE AND VARIATIONS

Documentation:
Ray Road Alternative and Chandler Boulevard Alternative Elimination from Further Consideration (November 2003)

The Ray Road Alternative would begin at Ray Road and I-10 (Maricopa Freeway) and extend west along Ray Road and Chandler Boulevard Road until turning northwest where it would pass through the South Mountains on a common alignment with the Pecos Road Alternative. The Chandler Boulevard Alternative and variations would begin at the existing I-10 (Maricopa Freeway) and Pecos Road system traffic interchange and extend west along Chandler Boulevard until turning northwest where they would pass through the South Mountains on a common alignment with the Pecos Road Alternative. All of these alternatives and variations are presented in Table 3-4 of the FEIS (see map on next page).

This memorandum was developed to supplement the *Alternatives Screening Report* by including additional Eastern Section Alternatives for consideration. It included an evaluation of the Pecos Road Alternative (the E1 Alternative in the FEIS), Ray Road Alternative, and Chandler Boulevard Alternative with options. The evaluation considered similar criteria (such as displacements and relocations, air quality and noise impacts, and traffic operational impacts) as were used in the *Alternatives Screening Report*.

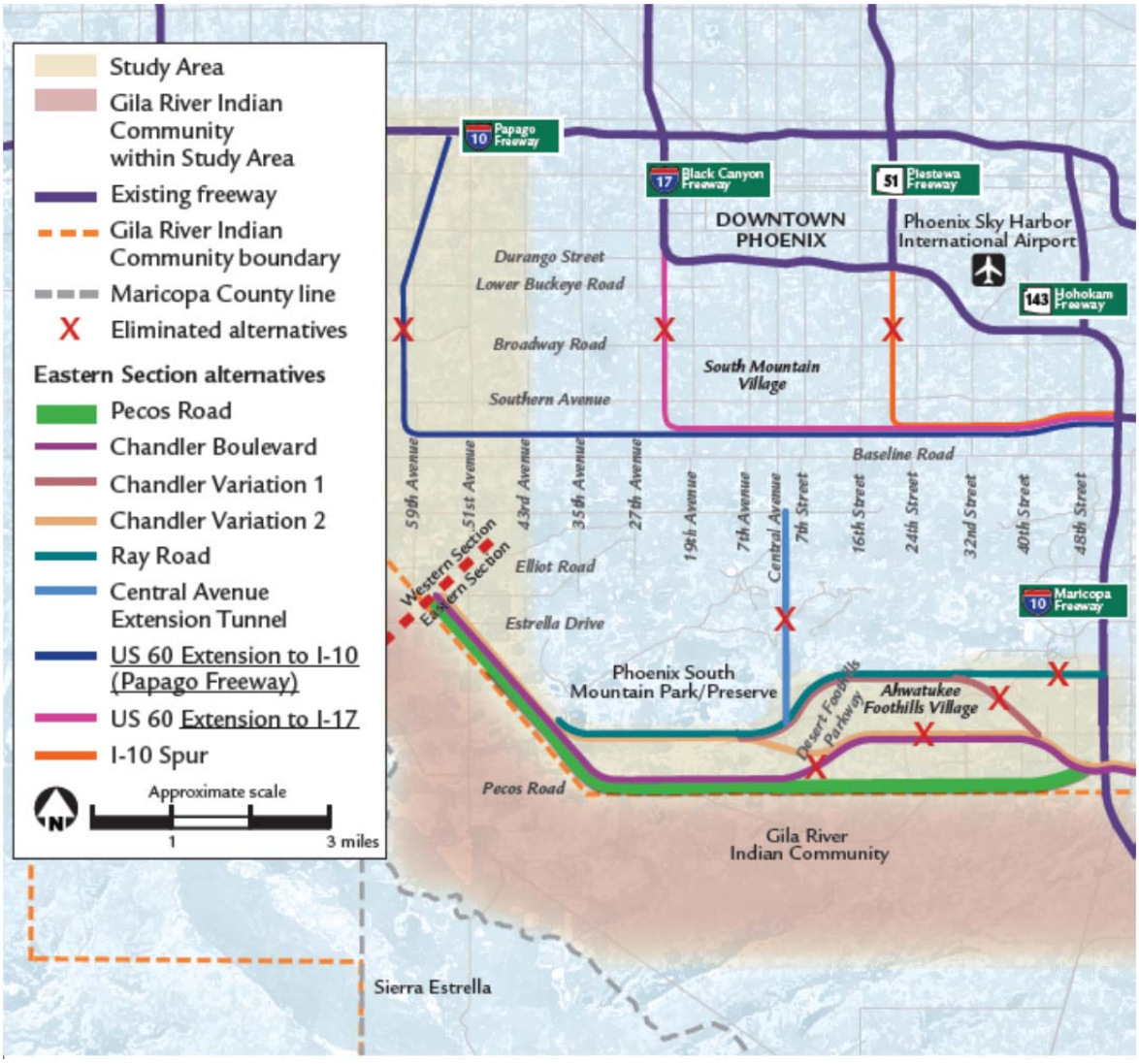
The Ray Road Alternative was eliminated based on:

- Greater impacts on traffic performance on I-10 (Maricopa Freeway) based on three system traffic interchanges within a 6-mile segment of I-10 (including I-10/SR 202L/Pecos Road, I-10/Ray Road Alternative, and I-10/US 60)
- Greater impacts on existing residences, including hundreds of residential displacements
- Greater 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)

The Chandler Boulevard Alternative and its variations were eliminated based on:

- Greater impacts on existing residences, including hundreds of residential displacements
- Greater 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

Table 3-4 of the FEIS



Validation for FEIS:

The primary basis for the elimination of the Ray Road and Chandler Boulevard alternatives was because of the community impacts related to residential and commercial displacements and splitting the Ahwatukee Foothills Village. Also, the Ray Road Alternative would include a freeway-to-freeway connection at Ray Road which is highly

undesirable from a traffic operational standpoint because of its proximity to the freeway-to-freeway connection at Pecos Road, just 2 miles away. There have not been substantial changes in the land use (as derived from a comparison between the City of Phoenix *General Plan Map* from 2010 and 2014) or conditions in Ahwatukee Foothills, therefore, the conclusions previously reached are still valid and the elimination of the Ray Road and Chandler Boulevard alternatives is still valid.

CONSENSUS: ELIMINATION OF THE US 60 EXTENSION TO I-10, US 60 EXTENSION TO I-17, AND I-10 SPUR ALTERNATIVES

Documentation:
Traffic Sensitivity Alignment G – US 60 (January 2003)

The *Traffic Sensitivity Alignment G – US 60* memorandum focused on the traffic analysis of Alignment G. Alignment G is presented in the *Corridor Screening_ADT Maps* (2002) (see page 4) and is referred to as the US 60 Extension to I-17 in the FEIS. The alignment begins at the US Route 60 (US 60) and I-10 (Maricopa Freeway) system traffic interchange and extends west between Baseline Road and Southern Avenue until it turns north at approximately 23rd Avenue and connects to I-17. While including different western connection points, the US 60 Extension to I-10, US 60 Extension to I-17, and I-10 Spur would begin at the same location and would serve similar travel demand (trips). Therefore, the traffic analysis of Alignment G is representative of each alternative.

For reference, the US 60 Extension to I-17 and I-10 Spur alternatives were included in the DEIS. Based on comments received on the DEIS, an additional alternative, the US 60 Extension to I-10 (Papago Freeway) was added to the FEIS. Based on its proximity and similarity to the other alternatives, it is evaluated in this section. All of these alternatives are presented in Table 3-4 of the FEIS (see map on page 13).

The traffic analysis of Alignment G found that rather than reduce the congestion (as determined by average daily traffic) on the region's freeway system, Alignment G actually places a greater amount of traffic on the system, even those routes not directly connected with Alignment G. From the analysis presented in the traffic sensitivity memo, the following observations were noted as it relates to the effectiveness of the alignments to meet the purpose and need for the project:

- Would cause greater traffic operational 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$_f$ (Price Freeway)
- Unintended underuse of SR 202L (Santan Freeway)
- Would not address needs based on regional travel demand and existing and projected transportation system capacity deficiencies (would not adequately improve regional mobility by shifting traffic from arterial streets to freeways, would not adequately improve travel times)

Draft Environmental Impact Statement (April 2013)

In addition to the traffic analysis, the DEIS presents documentation for the social and environmental impacts associated with the US 60 Extension alternatives and the I-10 Spur alternative (see page 3-12 of the DEIS). These include:

- Greater impacts on existing residences and businesses, including thousands of residential displacements and over 100 business displacements
- Greater disruption to community character and cohesion, splitting South Mountain Village and constructing a barrier between schools, parks, and residences
- Would not be consistent with local or regional planning, which includes a freeway alternative that completes the loop system as part of SR 202L

For the reasons presented above, these alternatives were eliminated from further study and found to not be prudent and feasible.

Validation for FEIS:
The purpose and need for the project was validated through the update and development of Chapter 1 in the FEIS using the updated socioeconomic and traffic projections for the region (information is also presented in the 2014 *Traffic Overview*). The new socioeconomic and traffic projections, while lower than what was previously predicted, still support the purpose and need. The alternatives north of the South Mountains that connect to I-10 and US 60 do not address that need. They do not address regional transportation demand and existing and projected transportation system capacity deficiencies. In addition, the alternatives north of the South Mountains would result in extraordinary social impacts related to residential and commercial displacements and bisecting of neighborhoods. There have not been substantial changes in land uses in the area the alternatives pass through (as derived from a comparison of general plan maps from the cities of Phoenix, Avondale, and Tolleson in 2010 and 2014). The alternatives would still adversely affect the US 60 and I-10 interchange, one of the highest travelled areas in the region (see Table 3-4 of the FEIS). Therefore, the elimination of the US 60 Extension to I-10 (Papago Freeway), US 60 Extension to I-17, and I-10 Spur alternatives is still valid and the finding that these alternatives would not be prudent and feasible is still valid.

CONSENSUS: ELIMINATION OF THE CENTRAL AVENUE EXTENSION TUNNEL

Documentation:
Draft Environmental Impact Statement (April 2013)

The evaluation of the Central Avenue Extension Tunnel Alternative (see map on page 13) is presented in the DEIS (see page 3-12). This alternative would include an approximate 2.5-mile-long tunnel under the South Mountains connecting Dobbins Road to Ray Road along the Central Avenue alignment. The evaluation resulted in the following observations:

- 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 the South Mountains up to 2.5 miles long would be cost-prohibitive, undesirable for safety and emergency response, would result in direct use of a resource afforded protection under Section 4(f), and would result in disproportionately high construction costs considering the percentage of vehicular trips served

This alternative would not meet the purpose and need for the project based on regional transportation demand and existing and projected transportation system capacity deficiencies and, therefore, it was eliminated from further study.

Validation for FEIS:
The purpose and need for the project was validated through the update and development of Chapter 1 in the FEIS using the updated socioeconomic and traffic projections for the region (information is also presented in the 2014 *Traffic Overview*). The new socioeconomic and traffic projections, while lower than what was previously predicted, still support the purpose and need. The Central Avenue Extension Tunnel Alternative does not address the regional needs identified for the project. It would not address regional transportation demand and existing and projected transportation system capacity deficiencies. In addition, it would impact the South Mountains (a Section 4(f) resource). There have not been substantial changes in the land use (as derived from a comparison between the City of Phoenix *General Plan Map* from 2010 and 2014)., travel patterns (as derived from a comparison between the 2007 *Traffic Report* and *2014 Traffic Overview*), or status of the South Mountains, therefore, the elimination of the Central Avenue Extension Tunnel Alternative is still valid.

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:

- 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 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?

The Third-tier screening addressed these types of questions and presented the options considered but eliminated from detailed study.

CONSENSUS: ELIMINATION OF BRIDGE AND TUNNEL OPTIONS

Documentation:
Ridge Bridge - Tunnel Analysis Memo (December 2006)
Ridge Bridge - Tunnel Analysis Memo_addendum (December 2009)

Local residents and stakeholders expressed concerns that the cuts associated with the E1 Alternative 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.

This technical memorandum presents potential options for crossing through the South Mountains, a Section 4(f) resource and traditional cultural property. The preferred alternative would cut through Main Ridge North and Main Ridge South. This memo analyzed bridge and tunnel options with the focus on minimizing impacts on the mountain ridges. Included in the discussion are the adverse and beneficial impacts of each option.

Options to build a bridge over the South Mountains were eliminated from further study because of incident management, constructability, and maintenance issues; future expansion limitations; substantially higher estimated construction costs; undesirable intrusion-related impacts; and the alternative would still use the Section 4(f) resource.

Building a tunnel under the South Mountains as a design option was also assessed and, based on safety and constructability, undesirable intrusion-related impacts, maintenance and construction cost, and the fact that the alternative would still use the Section 4(f) resource, it was eliminated from further study.

For these reasons, neither option would be prudent and feasible.

An addendum to the original memorandum was completed after the proposed freeway was changed from an ultimate ten-lane facility to an ultimate eight-lane facility. Through the reevaluation based on the number of lanes, the original findings did not change.

Validation for FEIS:
The primary basis for the elimination of the Bridge and Tunnel options has not changed since the evaluation that was completed in 2009. Tunnel construction methods have not substantially improved since the initial evaluation. The cost difference between each option and the Preferred Alternative would be the same because the cost of material has not changed substantially since the evaluation that was completed in 2009. In addition, both options would still use the Section 4(f) resource. Based on this, the elimination of the Bridge and Tunnel options is still valid and the finding that these options would not be prudent and feasible is still valid.

CONSENSUS: SYSTEM TRAFFIC INTERCHANGE OPTIONS CARRIED FORWARD AND ELIMINATED

Documentation:
SR 202L SR 101L Direct Connection Screening Report (October 2003)
SR 202L SR 101L Direct Connection Alternatives along 99th Avenue and ¼ Mile East (March 2004)
Traffic Report (January 2007)

The direct connection evaluations were performed early in the study process to determine the feasibility of connecting the W101 Alternative and Options to the existing SR 101L (Agua Fria Freeway) and I-10 (Papago Alternative) system traffic interchange. In the initial report and subsequent memorandum, a number of design options were considered with some being eliminated and some being carried forward for further study. The primary determination was related to ramp and main line geometry, operational performance, R/W impacts, and cost.

The 2007 version of the *Traffic Report* included a detailed analysis of multiple system traffic interchange scenarios for the W55, W71, and W101 Alternative and Options. For the W55 and W71 alternatives, the options differed based on the on- and off-ramp configurations along I-10. The W101 Alternative options included concepts that would partially or fully reconstruct the existing system traffic interchange and then within each concept there were multiple options for on- and off-ramps along I-10 and SR 101L. Detailed microsimulation models of each alternative were developed to analyze the traffic operational performance of each option.

Ultimately, a single configuration for the W55 and W71 Alternatives was carried forward. For the W101 Alternative, a single configuration for each of the partial and full reconstruction option was carried forward. The determinations were primarily based on the traffic operational results.

Validation for FEIS:
Since 2007, MAG has updated the regional travel demand model numerous times, including the latest update in June 2013 with new socioeconomic projections based on the 2010 Census. Although the traffic volumes have changed since the original evaluation in 2007 (and earlier), there have not been substantial changes in the region's planned road network [as derived from the comparison between the *Regional Transportation Plan* (2003) and the *2035 Regional Transportation Plan* (2014)] and land uses (as derived from a comparison of general plan maps from the cities of Phoenix, Avondale, and Tolleson in 2010 and 2014). As a result, the distribution of trips for each alternative is the same as in the original evaluation and the options previously carried forward would continue to perform the best. Therefore, the options carried forward and eliminated are still valid.

CONSENSUS: ELIMINATION OF W99 OPTION TO W101 ALTERNATIVE

Documentation:
W101 Options Screening Memo (January 2006)

The W99 Option to the W101 Alternative would maintain the W101W Alternative alignment south of Lower Buckeye Road. North of Lower Buckeye Road, the W99 Option would travel along 99th Avenue (splitting 99th Avenue into a pair of one-way frontage roads between Lower Buckeye Road and Van Buren Street).

The purpose of this memorandum was to evaluate the W101 Alternative options. Between Baseline Road and Van Buren Street, four alignment options were proposed for the W101 Alternative of the proposed South Mountain Freeway project. The options are the W99 Option (W101W99), the W Option (W101W), the C Option (W101C), and the E Option (W101E). The W99 Option was eliminated from further study based on:

- Undesirable horizontal curvature in close proximity to the South Mountain Freeway connection to I-10 would complicate driver decisions on the freeway (undesirable condition relative to driver expectancy).
- While the W99 Option would displace about the same number of residences as the W Option (which would be expected) and up to 300 less residences than the C and E Options, it would displace a noticeably higher number of businesses (some with local and regional importance and high levels of capital investment) than the other options. Further the business displacements would affect a noticeably higher number of employees than the other options.
- The W99 Option would have the greatest impact resulting from reductions in property and sales tax revenues (a substantial impact on the City of Tolleson).
- The W99 Option would be an estimated 18 percent higher in construction costs than the other highest cost option (E Option).

Validation for FEIS:
The basis for the elimination of the W99 Option of the W101 Alternative has not changed. The undesirable horizontal geometry and higher relative cost are still factors. Since the elimination of the W99 Option, continuing commercial development of the 99th Avenue corridor results in even greater property and sales tax revenue impacts than initially identified. Based on this, the elimination of the W99 Option is still valid.

CONSENSUS: ELIMINATION OF DEPRESSED PROFILE OPTION TO E1 ALTERNATIVE

Documentation:
E1 Profile Variations along Pecos Road (November 2006)
E1 Profile Variations along Pecos Road _Amendment (March 2008)

The proposed profile for the E1 Alternative assumes an at-grade freeway facility that would become elevated to cross over major arterial streets such as 51st Avenue and 24th Street. At the request of the City of Phoenix and members of the public, a profile option to depress the E1 Alternative belowground along Pecos Road was investigated. The

potential impacts of this profile option were identified and compared with the current (at-grade) profile for the E1 Alternative along Pecos Road.

For the following reasons, the depressed profile option was eliminated from further consideration:

- 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.
- Approximately 150 additional acres would be needed when compared with the at-grade rolling profile under study for drainage basins.
- 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.
- The total construction costs for the depressed profile 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.

Validation for FEIS:
The basis for the elimination of the depressed profile option to the E1 Alternative has not changed. The design criteria and legal requirements for protecting the freeway from stormwater have not changed and the availability and cost of adjacent land for the needed drainage basins have not changed. Therefore, the elimination of the depressed profile option is still valid.

CONSENSUS: ELIMINATION OF UTILITY EASEMENT OPTION TO E1 ALTERNATIVE

Documentation:
E1 Profile Variations along Pecos Road (November 2006)
E1 Profile Variations along Pecos Road _Amendment (March 2008)

During the evaluation of profile variations along Pecos Road, it was suggested that it may be possible to reduce impacts on Ahwatukee Foothills Village by locating 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 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.
- 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 eliminated from further study.

Validation for FEIS:
The basis for the elimination of the utility easement option to the E1 Alternative has not changed. The R/W requirements, cost of relocation, and costs of relocating the power lines underground have not changed. Therefore, the elimination of the utility easement option is still valid.

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. During this period, an economic downturn gripped the nation, including Arizona. 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.

CONSENSUS: ELIMINATION OF ARIZONA PARKWAY CONCEPT

Documentation:
Draft Environmental Impact Statement (April 2013)

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. The DEIS provides documentation for the elimination of the Arizona Parkway concept (see

page 3-19 of the DEIS). The parkway is a nonfreeway, restricted-access facility having greater capacity than major urban arterial streets. Ultimately, the Arizona Parkway concept was eliminated because it would lack sufficient capacity to meet projected travel demand for the transportation corridor. In the best-case scenario, 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 (according to projections presented on page 3-19 of the DEIS).

Validation for FEIS:

The documentation presented in the DEIS has been updated in the FEIS with the updated traffic projections from MAG. Those updates resulted in changes to the range of vehicles per day that are projected to use the proposed freeway. The new projections range from 117,000 to 190,000 vpd. The Arizona Parkway would still have a capacity of only 105,000 vpd. Based on this, the elimination of the Arizona Parkway concept is still valid.

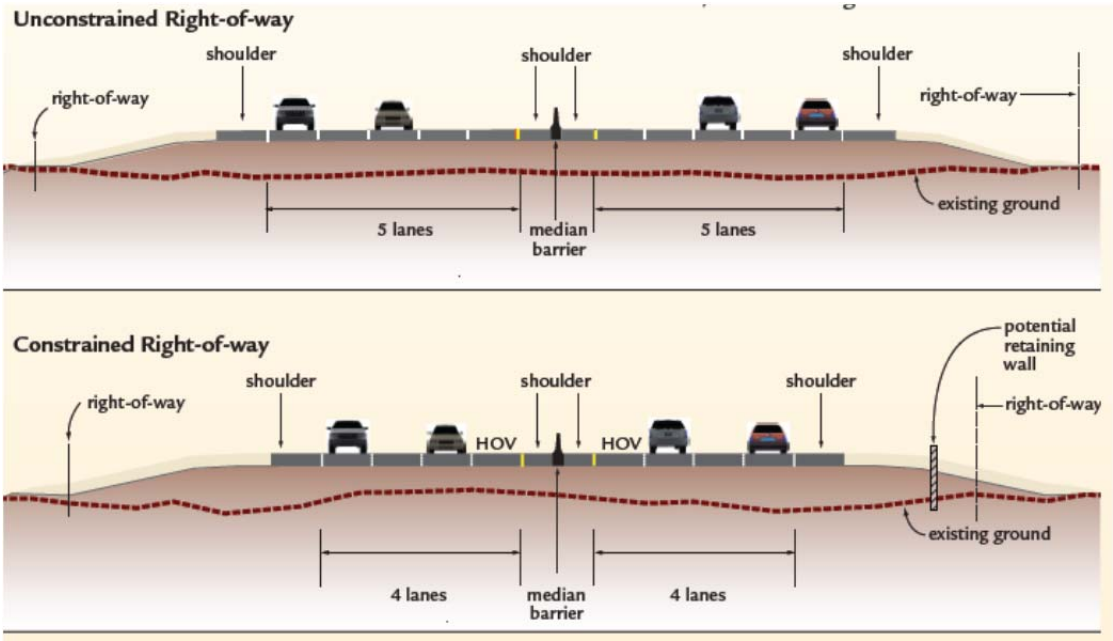
CONSENSUS: EVALUATION OF CONSTRAINED R/W DESIGN (CARRYING FORWARD THE EIGHT-LANE FREEWAY AND ELIMINATING THE TEN-LANE FREEWAY)

Documentation:

Traffic Overview (November 2012)

To continue in its efforts to undertake cost-cutting measures, the project team 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 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 the graphics on the next page, Text box on page 3-20 of the FEIS).

Text box on page 3-20 of the FEIS



Section 3, *Evaluation of Lane and Alignment Changes*, in the *Traffic Overview* document prepared in support of the DEIS includes a detailed comparison of traffic operational analysis for the eight-lane and ten-lane proposed freeway. In weighing the pros and cons of the two options, the project team determined that because the eight-lane freeway would still meet the purpose and need criteria for the project and would require less R/W and cost less, it would be carried forward for further consideration. Subsequently, the ten-lane freeway was eliminated from further study.

Validation for FEIS:
A new *Traffic Overview* (May 2014) was produced using the new socioeconomic and traffic projections in preparation for the FEIS. The analysis related to the comparison between the eight-lane and ten-lane proposed freeway was updated. The results of the updated analysis are also presented in the FEIS (see text beginning on page 3-1 of the 2014 *Traffic Overview*). There were no substantial changes to the analysis results. Therefore, eliminating of the ten-lane freeway and carrying forward the eight-lane freeway is still valid.

CONSENSUS: CARRYING FORWARD THE W59 ALTERNATIVE AND ELIMINATION OF THE W55 ALTERNATIVE

Documentation:
W59 Alternative Environmental and Engineering Overview (May 2010)
Traffic Overview (November 2012)

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.

The W59 Alternative Environmental and Engineering Overview memo was prepared in response to agency requests to provide an environmental and engineering overview of an alternative to connect the South Mountain Freeway to I-10 (Papago Freeway) at 59th Avenue (W59 Alternative). This memo provides an evaluation of a connection at 59th Avenue and whether it provides benefits over the proposed connection at 55th Avenue (W55 Alternative), without resulting in an unreasonable change in impacts or cost.

The W59 Alternative would maintain 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. Two options were considered for the W59 Alternative, one west of 59th Avenue called the W59 Alternative (West) and one east of 59th Avenue called the W59 Alternative (East), between Lower Buckeye Road and Van Buren Street.

The engineering evaluation included items such as constructability, railroad coordination, traffic operations, and cost. The traffic analysis included the affected interchanges along the proposed freeway as well as along I-10 (Papago Freeway). Detailed microsimulation models were developed to analyze the I-10 operations. The traffic analysis portion of the

report is also presented in the *Traffic Overview* (November 2012). The environmental evaluation included items such as cultural resources, hazardous materials sites, acquisitions and relocations, and environmental justice issues.

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. The environmental analysis did not differentiate between the two alternatives. Because of the factors discussed above, the W59 Alternative was carried forward and the W55 Alternative was eliminated from further consideration. Within the options for the W59 Alternative, the “West” option was carried forward and the “East” option was eliminated.

Validation for FEIS:
The primary basis for the eliminating the W55 Alternative and carrying forward the W59 Alternative has not changed. The traffic operational comparison between the W55 and W59 Alternatives was not updated in the *Traffic Overview* (2014) using the 2013 MAG traffic projections because it was determined that the revised traffic projections would affect each alternative the same and there would be no change in the overall findings. Therefore, eliminating the W55 Alternative and carrying forward the W59 Alternative is still valid.

Alignment Screening and Further Design Adjustments

Fifth Tier

In 2010, ADOT and FHWA were approached by major stakeholders for the study, the Community and City of Phoenix, and asked to consider adjustments to the alternatives that progressed from the Fourth-tier screening. The effort, a Fifth-tier screening process, resulted in considering an alignment on Community land and alternative alignments for the W59 Alternative in the Laveen Village area.

CONSENSUS: ELIMINATION OF THE COMMUNITY ALIGNMENT

Documentation:
Draft Environmental Impact Statement (April 2013)

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

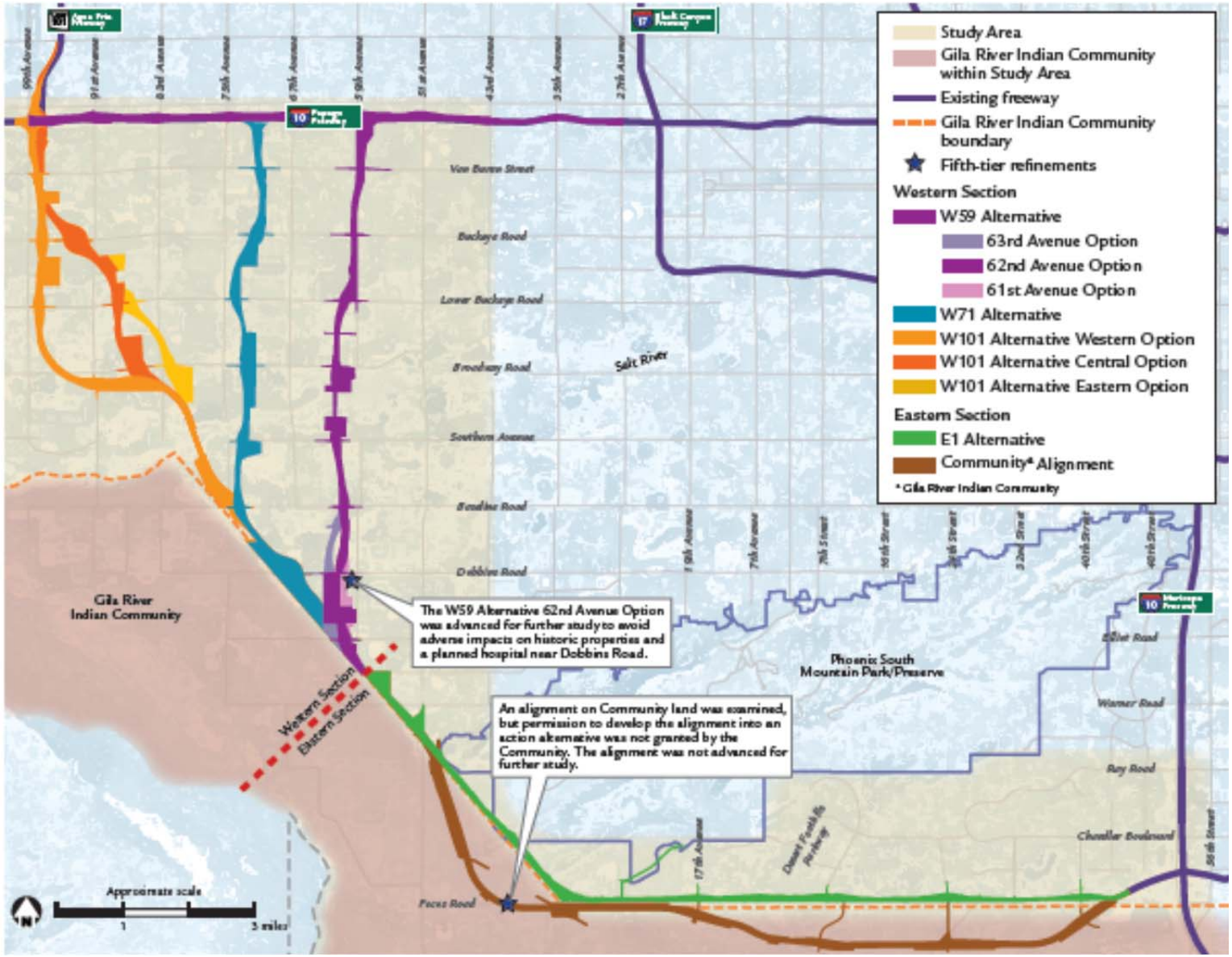
- reduction of truck and commuter traffic on 51st Avenue and Beltline Road

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 evaluation of the Community Alignment (see map on the next page, Figure 3-11 of the FEIS) is documented in a series of engineering and environmental technical reports. However, because the information from the Community is sensitive, these documents are not available to the public. The public documentation for the elimination of the Community Alignment is in the DEIS (discussed in both Chapter 2, page 2-8, and Chapter 3, page 3-24). The reason the alignment was eliminated was because in the Community-coordinated referendum that occurred in February 2012 the no-build option received the highest number of votes. Similar reasons are presented in Chapter 5 for why the alternative would not be prudent and feasible. Tribal sovereignty is based on the inherent authority of Native American tribes to govern themselves. States have very limited authority over activities within tribal land. ADOT and FHWA do not have the authority to survey tribal land, make transportation determinations directly affecting tribal land, or condemn tribal land through an eminent domain process.

Validation for FEIS:
Since the release of the DEIS, there has been no change in the Community's opposition to constructing the freeway on their land. Therefore, the previous conclusion that the alternative is not prudent and feasible is still valid.

Figure 3-11 of the FEIS



CONSENSUS: EVALUATION OF ALIGNMENTS THROUGH LAVEEN

Documentation:
61st Avenue Alignment Section 4(f) Summary (June 2012)

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. The alignment presented to the public in 2005 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. 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.

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 project team reevaluated the historic properties in the area. This reevaluation confirmed the importance and eligibility for protection under Section 4(f) of the Hudson Farm and Barnes Dairy Barn, but also determined that the Dobbins Road Streetscape was no longer eligible for the National Register of Historic Properties. This finding allowed for greater flexibility in designing 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 (see map on page 26 for location of alignments considered).

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.

Validation for FEIS:
The conditions that led to the reevaluation of the W59 Alternative alignment in Laveen Village have not changed. The City's plan for development of the community core and the historic eligibility of nearby structures and properties has not changed. Therefore, carrying forward the 62nd Avenue Option and eliminating the other options is still valid.

Conclusion

The alternatives development and screening process was reviewed considering changes in existing and forecast population, housing, employment, and traffic. The alternatives development and screening process was validated.

Attachments:

1. Alternatives Development and Screening Report
2. Purpose and Need Memorandum
3. Corridor Screening ADT Maps
4. Development of Technical Alternative Memo
5. Alternatives Screening Report
6. Ray Road Alternative and Chandler Boulevard Alternative Memo
7. Traffic Sensitivity Alignment G – US 60 Memo
8. Ridge Bridge – Tunnel Analysis Memo
9. SR 202L/SR 101L Direct Connection Screening Report
10. SR 202L/SR 101L Direct Connection Alternatives along 99th Avenue and ¼-mile East
11. Traffic Report (2007)
12. W101 Options Screening Memo
13. E1 Alternative Profile Variations along Pecos Road
14. W59 Alternative Environmental and Engineering Overview
15. 61st Avenue Alignment Section 4(f) Summary

Alternatives Development and Screening Process

in support of the
Technical Studies to the
Environmental Impact Statement

South Mountain Transportation Corridor in Maricopa County, Arizona

Arizona Department of Transportation
Federal Highway Administration
in cooperation with
United States Army Corps of Engineers
United States Bureau of Indian Affairs

Version 3.0 / October 2002
ADOT TRACS No. 202L MA 054 H5764 01L
FHWA Federal Aid Project No. NH-202-D( )

Abstract: This document addresses the Alternatives Development and Screening Process that will be used to determine the alternatives to be studied in detail in the Draft Environmental Impact Statement.

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METHODOLOGY REVIEW AND VERIFICATION

This discussion paper outlines the approach that will be used to determine the alternatives to be studied in detail in the Environmental Impact Statement (EIS) for the South Mountain Transportation Corridor (SMTC) project. The approach has been developed to satisfy the intent of the National Environmental Policy Act of 1969 (NEPA), Federal Highway Administration (FHWA) guidelines that implement NEPA, and related environmental policies and regulations.

On April 15, 2002, two meetings were held to review and comment on the initial draft of this discussion paper. The meetings included an internal consultant team and an interagency project team. Meeting attendees reviewed and commented on the approach, assumptions, and methodologies related to the defensibility and objectivity of the process. The following sections incorporate the review comments that were received.

SCREENING PROCESS PARTICIPANTS

At each stage of the screening process, two teams composed of study participants will be employed. First, the Consultant Team will conduct a quality control review and test of the methodologies and assumptions for each step. Then the Project Team will verify and apply the methodologies and assumptions and agree on the results of that step before proceeding to the next one.

The multidisciplinary Consultant Team is composed of the following traffic analysts, engineers, and environmental staff:

Project Manager: Dave Anderson
Environmental: Jack Allen, Mark Wollschlager, Andrea Helmstetter
Engineering: Amy Edwards
Traffic: Pat Ramos, Mike Connors
Quality Control: Dave Bender, Arvid Thomsen
Legal: Jeremy Lite
Drainage: Tim Morrison
Structures: Paul Tremel
Facilitator: Theresa Gunn/John Godec

The Project Team listed below will perform each screening step. The team is appropriate for this task because it represents the federal lead agency, the state project proponent, cooperating agencies, and the jurisdictions where the corridor is located. The team also includes experts from the various disciplines required for the project. The Project Team members are:

ADOT:	TRIBAL & MUNICIPAL GOVERNMENT:	TECHNICAL:
Mary Viparina	Sandra Shade (GRIC DOT)	Dave Anderson
Dan Lance	Lloyd Page (City of Chandler)	Jack Allen
Oliver Antony	Don Herp (City of Phoenix)	Mark Wollschlager
Thor Anderson	Ralph Valez (City of Tolleson)	Amy Edwards
Annette Riley	Scott Schrader (City of Avondale)	Pat Ramos
Shafi Hasan	Bob Woodring (MCDOT)	John Godec
Dennis Crandall	Eric Anderson (MAG)	Theresa Gunn
John Hauskins		Mike Connors
Perry Powell	**COOPERATING AGENCIES:**	**FHWA:**
Bill Hayden	Dana Owsiany (COE)	Bill Vachon
Steve Jimenez	Peter Overton (BIA)	Ken Davis
		Rebecca Rivera

The composition of the team may change as the process progresses. Changes must be approved by the Project Team.

PURPOSE STATEMENT

Identifying the alternatives that will be studied in detail is an important step in preparing an EIS. Specifically, 40 CFR 1502.14 requires project proponents to:

- Rigorously explore and objectively evaluate all reasonable alternatives;
- For alternatives eliminated from detailed study, briefly discuss the reasons why they were eliminated;
- Thoroughly discuss each alternative considered in detail, including the proposed action, so that reviewers can make an informed comparison of the alternatives;
- Include reasonable alternatives outside the jurisdiction of the lead agency;
- Include the alternative of no action;
- Identify the agency's preferred alternative or alternatives (if one or more exists) in the draft EIS, and identify such alternative(s) in the final EIS unless another law prohibits identifying a preference; and
- Include appropriate mitigation measures that are not already included in the proposed action or alternatives.

The goal of the screening process is to identify the reasonable alternatives that will be studied in detail in the EIS. During the screening process, it is important to document all decisions made

while developing, evaluating, and eliminating alternatives. The screening process should document the process that was used, the reasons why the range of alternatives was developed, and the public and agency comments that affected the outcome. The screening process should also document why alternatives were eliminated from consideration, the point in the process at which they were eliminated, the criteria used to assess alternatives and measures of effectiveness, and the parties who approved those criteria.

The No-Build Alternative will be included in the range of alternatives. This alternative may include short-term activities such as upgrades to existing systems and maintenance activities. This alternative serves as a baseline against which other alternatives can be compared. In the case of the SMTC Study, the No-Build Alternative will probably be the Maricopa Association of Governments' (MAG) Long-Range Transportation Plan (MAG, 2001) without a South Mountain Freeway link.

GENERAL SCREENING GUIDELINES

The alternative screening process is composed of a number of steps or tiers. This deliberative, multidisciplinary process narrows the range of alternatives by evaluating each alternative against an approved set of criteria.

The following questions often guide the development of screening criteria:

- How well would the alternative satisfy the project's purpose and need?
- How well would the alternative satisfy the proponent's initial goals and objectives?
- Would it be feasible to construct the alternative?
- How well would the alternative reduce or minimize impacts on the surrounding environment?
- Would the alternative avoid known environmental constraints while satisfying environmental regulations?
- How compatible would the alternative be with the plans of the cities and counties affected by the project?
- Would the alternative satisfy agency guidelines?
- Is the alternative likely to produce major political, social, economic, or environmental justice issues?
- Would the alternative satisfy specific criteria associated with the project, including design objectives?
- Is the total cost of the alternative likely to be within budget constraints?

Several iterations may be needed to arrive at the final alternatives to be carried forward for detailed study in the EIS. In general, the screening criteria for each stage move from the broader to the more refined as necessary to focus the range of alternatives. The criteria should be specific

to the proposed project and should produce specific measurements, either quantitative or qualitative, for each alternative. Finally, the screening criteria should identify the important differences among the alternatives being considered.

SMTC SCREENING OUTLINE

The SMTC screening process will generally follow this proven, established, and recognized step-by-step process to identify the alternatives that will be studied in detail in the EIS. The process will satisfy the intent of NEPA (42 U.S.C. 4321 et seq.) as well as the procedural requirements of Section 4(f) of the Department of Transportation Act of 1966 (23 U.S.C. 138 and 49 U.S.C. 303), Section 404(b)(1) of the Clean Water Act of 1977 (33 U.S.C. 1251 et seq.), the FHWA Policy Paper addressing secondary and cumulative impacts (FHWA, 1992), and Executive Order 12898 pertaining to environmental justice.

In summary, the following step-by-step approach is proposed:

Step 1 – Establish Purpose and Need

- Establish the purpose and need for the project based on traffic analyses.
- Establish the appropriate study area to best satisfy the project's purpose and need.
- Identify the appropriate mode(s) of transportation in the study area.

Step 2 – Identify Wide Corridors

- If the Project Team agrees that a freeway is the appropriate solution, identify potential wide corridors in the study area, based on public and agency input and technical evaluation, through which multiple alignment alternatives may pass.

Step 3 – Confirm Screening Process

- Develop and agree on a screening methodology.
- Develop and agree on screening criteria.

Step 4 – First Screen (Wide Corridors)

- Screen the identified wide corridors against the project's purpose and need and against regulatory requirements.

Step 5 – Second Screen (Alignments in Wide Corridors)

- Identify potential freeway alignment alternatives within accepted wide corridors.
- Screen the identified freeway alignment alternatives against a multidisciplinary set of criteria to determine the freeway alignment alternatives to be studied in detail in the EIS.

Step 6 – Subsequent Alignment Alternatives Screen

- Further screen alternatives based on more-refined criteria, if needed.

Step 7 – Crossing Jurisdictional Waters of the U.S.

- Discuss design methods to cross jurisdictional waters of the U.S. and conduct second screening according to Section 404(b)(1) of the Clean Water Act.
- Get approval from the Project Team to prepare technical studies in support of the EIS, and refine the design of the freeway alignment alternatives to be studied in detail.

STEP 1 – ESTABLISH PURPOSE AND NEED

The purpose and need for a major transportation improvement in the region was evaluated during the previous phase of the SMTC study. The *Draft Purpose and Need Technical Memorandum, South Mountain Transportation Corridor Study* and the appended *Traffic Analysis Technical Report* analyzed future travel demand in the SMTC study corridor. The SMTC study predicts an unsatisfied travel demand of over 20,000 vehicles per day at peak hour, even if MAG's current plans for public transit and travel demand management systems are enhanced. This excess demand can be met only by adding multiple freeway lanes and/or expanding arterial routes beyond the current plans of the affected cities. Adding a freeway link in the SMTC study corridor could satisfy part of the excess regional demand.

STEP 2 – IDENTIFY WIDE CORRIDORS

Once the Project Team agrees that a freeway is part of the build solution, the study area is divided into a series of wide corridors, representative of many potential freeway alternative alignments.

STEP 3 – CONFIRM SCREENING PROCESS

Step 3, developing the screening process and screening criteria, was conducted in study team meetings on April 15, 2002.

Purposes

The purposes of this step are to:

- Review and refine the screening methodology to be used.
- Develop and refine the screening criteria to be used at each subsequent stage in the screening process.

Methodology

This section presents the proposed screening methodology.

PRELIMINARY SCREENING CRITERIA

In a monthly progress team meeting on February 20, 2002, the study team developed the potential screening criteria listed below. At the April 15 meetings, the objectives were to 1) determine which of the potential criteria to carry forward, 2) confirm that these criteria would be appropriate and defensible, 3) decide which criteria would be appropriate for which stage of the screening process, and 4) develop definitions of the criteria to foster a common understanding among screening process participants.

Ability To Serve Excess Demand (From Screenline Analysis)

- Number of vehicles served
- Percent of demand served
- Use peak hour and daily
- Must consider modal alternatives and run a light-rail-in-corridor analysis

Projected Traffic Volumes on New Facility

- Number of vehicles per day
- Goal = 1800 vehicles per lane = LOS D
- Will develop a way to look at length of LOS F in peak hour

Effects on Regional Roadway Network

- Daily volume reductions
- Peak-hour volume reductions: goal = LOS D = 1800 vehicles per lane
- Level of service improvements by category
- Level of service improvements by peak-hour category/duration

Connectivity of the Regional Freeway System

- Measures = vehicle miles traveled (VMT) on system
- Impacts on I-10

Environmental Considerations

- Section 404(b)(1) jurisdictional waters
- Section 4(f) properties
- Cultural resources
- Environmental justice concerns
- Threatened and endangered species
- Other environmental considerations

Compatibility with Land Use Planning

- Location

- Intent of local and regional planning
- Development opportunities

Cost (Order of Magnitude)

- Construction
- Operational
- User cost = vehicle hours traveled

This criteria was further defined by the stages of the process it would be used in. This refined criteria is shown in Table 1 for the Corridor and Alignments within Corridors and in Table 2 for the EIS Alternatives.

STEP 4 – FIRST SCREEN (WIDE CORRIDORS)

Purposes

The purposes of this step are to:

- Review the modal analysis and traffic sensitivity analysis conducted in Step 1.
- Confirm the need for freeway alternatives as concluded in Step 1.
- Apply the screening criteria related to purpose and need as developed in Step 3.
- Apply the screening criteria related to environmental regulatory requirements as developed in Step 3.
- Document and summarize which corridors were eliminated and why.
- Confirm the corridors that will be carried forward in the screening process.

Methodology

The Consultant Team will conduct the initial screening exercise for this step. When this exercise is complete, the Consultant Team will present its findings and recommendations to the Project Team. At this presentation, the Project Team will review the findings and recommendations and assess the validity of this step. Before moving to the next screening step, the Project Team will confirm the presented findings and recommendations from Step 4.

The technical team will provide data from the traffic sensitivity analyses to indicate how each wide corridor performs relative to the evaluation criteria. This comparison will be in matrix form.

Once the Project Team agrees that the traffic analyses were adequate and a freeway alternative is needed, the team will evaluate and screen the wide corridors based on how well they meet the project's purpose and need and how well they satisfy environmental regulatory requirements.

Table 1 – Screening Criteria Matrix – Wide Corridor and Alignments in Wide Corridors

Wide Corridor	Alignments in Wide Corridors
Purpose and Need	**Environmental Constraints**
Excess Demand	4(f) and 6(f)
Level of Service I-10	Cultural Sites
West	404 Jurisdictional Waters
Broadway Curve	Environmental Justice
East	Threatened and Endangered Species
Level of Service Arterials	Potentially Hazardous Waste Sites
Connectivity	General Plan Intent Compatability
I-10	Prime and Unique Farmlands
Loop System	Noise Quality
MAG Freeway Principles	Displacements
Historical Context	Business
Environmental Constraints	Residence
4(f) and 6(f)	Floodplain
Cultural Sites	Utilities
404 Jurisdictional Waters	Sensitive Community Services
Environmental Justice	Cumulative
Threatened and Endangered Species	**Design**
	ADOT Preferences and Policy
	Traffic Operations
	Cost
	Right-of-Way
	Construction
	Acceptability
	Public
	Political
WHY?	**WHY?**
These criteria are used to determine if the corridors meet the basics of purpose and need. If the corridors do, then they will be evaluated to determine if an alternative or alternatives can be designed within the corridor to limit the impact to the key environmental elements.	These criteria are used to determine if the alignment alternatives are minimizing impacts to specific distinguishing elements.
OUTCOME	**OUTCOME**
The desired outcome of this process is development of alignment alternatives meeting purpose and need and limiting impact to key environmental constraints. These alignments to be evaluated in the next phase.	The desired outcome of this process is the determination of alignment alternatives minimizing impacts to environmental constraints. These alignments to be evaluated in the EIS.

Table 2 – Screening Criteria Matrix – EIS Analysis

EIS Alternatives	
Environmental Constraints	**Environmental Constraints**
Existing Land Use	Mining
Plans and Policies for Future Land Use	Vegetative Communities
Plans and Policies for Future Land Use	Wildlife
Land Use Compatibility	Threatened and Endangered Species
Land Use Plan Consistency	Native Plants
Community Character and Cohesion	Invasive Plants
Demographic Characteristics	Cultural Resources
Community Facilities and Services	Hazardous Materials
Title VI and Environmental Justice	Visual Resource
Displacements and Relocations	Prime and Unique Farmlands
Projected Growth and Economic Activity	4(f) and 6(f)
Overall Economic Activity	**Traffic Operations**
Tax Revenues	Skewed Intersections/Interchanges
Property Values	Weave Distance
Air Quality	Driver Expectancy
Noise	**Design**
Surface Water	Design Exceptions
Ground Water	**Cost**
Floodplains	Construction
Jurisdictional Waters of the United States	Right-of-Way
Water Quality	Mitigation
Topography, Geology and Soils	**Acceptability**
Land Subsidence	Public
Earth Fissures	Political
Seismic Activity	
Secondary and Cumulative	
WHY?	
The environmental analysis of the alternatives for detailed study to satisfy NEPA and related regulatory requirements.	
OUTCOME	
The desired outcome is the impact analyses and identified mitigation in order to compare the environmental impacts of each alternative at an equal level to aid in the ultimate identification of the selected alternative.	

STEP 5 – SECOND SCREEN (ALIGNMENT ALTERNATIVES)

Purposes

The second screening of alternatives will be based on the interdisciplinary criteria developed in Step 3. The purposes of this step are to:

- Identify potential freeway alignments within accepted wide corridors.
- Apply the screening criteria related to environmental considerations, design, traffic operations, cost, and acceptability as developed in Step 3.
- Document and summarize which alternatives were eliminated and why.
- Decide whether further screening steps are needed, and decide on the screening criteria and additional data needed to conduct further screening.
- Confirm the alternatives to be carried forward for detailed study in the EIS (or carried forward to the next screening step, if one is required).

Methodology

IDENTIFY ALTERNATIVES

Identification of alternatives for the SMTC study has been an open process accessible to all potential stakeholders. Alternatives identification began during the project scoping phase. Agencies and public participants in scoping suggested several system, or modal, alternatives such as extending US 60 and enhancing transit options as well as suggesting conceptual alignment alternatives. The scoping process is documented in the *SMTC Project Scoping Report*.

Over the past several months, additional alternatives have been suggested through review of previous studies and through the public involvement process. The process has been aimed at capturing all possible alternatives that might be suggested through the course of preparing the EIS. Identifying and considering a wide range of suggested routes early in the process will minimize the number of new alternatives that might be suggested later.

To document alternatives, workshops were conducted with civic organizations from January 2002 through March 2002; with citizen volunteers from the Phoenix, Ahwatukee, Estrella, Laveen, and South Mountain Village Planning Committees; with the Southwest Mayors and Managers group; and with the SMTC Citizens' Advisory Team. Participants were invited to draw alternative alignments on study area maps and aerial photos and to indicate locations of sensitive resources or constraints. Through this public process, more than 30 system/modal and alignment alternatives were identified.

The Gila River Indian Community (GRIC) may also provide alignment alternatives on GRIC land to be evaluated in the EIS.

Along with the public suggested alternatives and any GRIC suggested alternatives, the Consultant Team identified a series of alternative alignments within the accepted wide corridors.

The intent of each public suggested alternative will be evaluated and determined to be represented either by one of the alternatives within the accepted wide corridors or by one of the corridors not passing the initial screening. This evaluation will be documented.

All alignment alternatives within the accepted wide corridors, including crossroads currently under the jurisdiction of Maricopa County or the City of Phoenix, will be developed according to the SMTC Roadway Design Criteria documented as presented in Appendix A. Developed alternatives will be reviewed by the relevant jurisdictions for concurrence on traffic interchange locations and configurations.

These alternatives represent the full range of alternatives that will be available for the screening process.

SCREENING ALTERNATIVES

The technical team will provide data from the traffic sensitivity analyses, Geographic Information System (GIS)-based environmental mapping and related information, and order-of-magnitude costs to indicate how each alternative would perform relative to the evaluation criteria. All criteria data will be provided in a matrix form for screening. A consensus-based screening process using the Co-Nexus decision support tool will be used in this screening step.

Co-Nexus is a decision-making aid that uses a keypad voting system to record individual participants' preferences. The individual preferences are then aggregated into a group profile that forms the basis for discussion. The participants can determine the degree of consensus on any criterion or alternative by analyzing the level of agreement or disagreement among participants. Successive rounds of voting can be conducted to allow people to change their minds based on group discussion.

Co-Nexus will be used in the Project Team workshop session to 1) evaluate and rate the relative importance of the various criteria and 2) apply the weighted criteria to the alternatives based on participants' judgments about the data provided and 3) document the discussion regarding the analysis of alternatives.

At the April 15, 2002 meetings, a test of the Co-Nexus process by the Project Team concluded that Co-Nexus is a useful tool for this screening exercise.

The Project Team assumes that the project will be able to meet design standards and that the team can accurately assess impacts from the horizontal and vertical profile for this concept and level of design.

STEP 6 – SUBSEQUENT ALIGNMENT ALTERNATIVES SCREEN

After the first screening of alignment alternatives (Step 5), there will probably be fewer alignment alternatives remaining. However, if the results of Step 5 do not result in a range of reasonable alternatives to be studied in detail in the EIS, an additional screening will be required.

Purposes

The purposes of this step are to:

- Apply the criteria developed in Step 3 to further screen the alternatives.
- Document and summarize why alternatives were eliminated from further study.
- Identify the alignment alternatives to be studied in detail in the EIS.

Methodology

The methodology used in the second interdisciplinary screening is the same as in Step 5, namely using Co-Nexus in a group workshop setting. Step 6 (and possibly subsequent screening exercises) would follow the methods of Steps 4 and 5 using additional and more-refined criteria.

STEP 7 – CROSSING JURISDICTIONAL WATERS OF THE U.S.

Purposes

The screening of design options to cross jurisdictional waters of the U.S. will occur after alignment alternatives have been screened and after the Project Team (including the U.S. Army Corps of Engineers) approves the recommendation of alternatives for further study. The purposes of this step are to:

- At a conceptual level, compare various design options for crossing jurisdictional waters of the U.S. This comparison will help the Corps select the least environmentally damaging, most practical alternative.
- Document and summarize which design options types were eliminated and why.
- Confirm with the Project Team that the design options to be included in the alignment alternatives to be studied in detail in the EIS are appropriate and confirm how further comparison would occur during concept and final design.

Methodology

Once alignment alternatives have been screened, the technical team will prepare a discussion paper addressing design requirements for crossing jurisdictional waters of the U.S. and will present design options to be considered during the concept and final design phases. If

applicable, the paper will include recommendations not to carry forward certain design options and the reasons why. The recommendations will initially be made to ADOT and FHWA, and the technical team will then will follow up with the Corps for their approval. The recommendations will then be brought to the Project Team for consensus.

At the conclusion of the final screening step, the Project Team will be asked to reach consensus that the set of remaining alternatives represents the alternatives to be studied in detail in the EIS. The results of the entire screening process will document this decision.

ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADOT	Arizona Department of Transportation
BIA	Bureau of Indian Affairs
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
EIS	Environmental Impact Statement
et seq.	and subsequent sections
FHWA	Federal Highway Administration
GIS	Geographic Information System
GRIC	Gila River Indian Community
L/DCR	Location/Design Concept Report
LOS	level of service
MAG	Maricopa Association of Governments
MCDOT	Maricopa County Department of Transportation
RDG	Roadway Design Guidelines
SMTC	South Mountain Transportation Corridor
T&E	threatened and endangered
U.S.C.	United States Code
VMT	vehicle miles traveled

REFERENCES

23 United States Code (U.S.C.) 138 and 49 U.S.C. 303, Section 4(f) of the Department of Transportation Act of 1966.

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Purpose and Need Memorandum

in support of the
Technical Studies to the
Environmental Impact Statement

South Mountain Transportation Corridor in Maricopa County, Arizona

Arizona Department of Transportation
Federal Highway Administration
in cooperation with
United States Army Corps of Engineers
United States Bureau of Indian Affairs

Version 4.0 /July 2003
ADOT TRACS No. 202L MA 054 H5764 01L
FHWA Federal Aid Project No. NH-202-D( )

Abstract: This document assesses the purpose and need to construct the last link in the Phoenix area Regional Freeway System adopted by voters in 1985. It describes the historical context of the proposed plan, examines regional population economic growth, and summarizes the traffic analyses conducted in support of the evaluation. This document will be the basis of Chapter 1 in the South Mountain Transportation Corridor Environmental Impact Statement.

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LIST OF ACRONYMS

101L	State Route 101 or Loop 101
202L	State Route 202 or Loop 202
303L	State Route 303 or Loop 303
ADOT	Arizona Department of Transportation
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
GRIC	Gila River Indian Community
HOV	high-occupancy vehicle
I-10	Interstate 10
I-17	Interstate 17
LOS	Level of Service
LRT	light rail transit
LRTP	Long-Range Transportation Plan
MAG	Maricopa Association of Governments
MPO	Metropolitan Planning Organization
NEPA	National Environmental Policy Act of 1969
RFS	Regional Freeway System
SMTC	South Mountain Transportation Corridor
SR	State Route
SRPMIC	Salt River Pima-Maricopa Indian Community
STB	State Transportation Board
TDM	Transportation Demand Management
TSM	Transportation System Management
US 60	U.S. Route 60
USC	U.S. Code
USDOT	U.S. Department of Transportation

GLOSSARY

ADOT	Arizona Department of Transportation. The State agency responsible for state roads and highways.
capacity	The maximum number of vehicles that a given section of roadway or traffic lane can accommodate in one direction in one hour.
CFR	Code of Federal Regulations. A comprehensive collection of U.S. government regulations and rules.
design standards	Engineering principles that determine the principal features of the highway.
EIS	Environmental Impact Statement. A federally mandated report that analyzes potential environmental effects of federally funded projects or projects involving lands with federal jurisdiction.
et seq.	and subsequent sections
FHWA	Federal Highway Administration. The federal agency responsible for interstate and other federal aid roads and highways.
form	The shape or structure of something as opposed to the material of which it is composed.
HOV	High-occupancy vehicle. Refers to vehicles that carry two or more people, such as transit buses, carpools, and vanpools.
impact	A direct or indirect consequence of the construction or operation of a proposed alternative on the environment in the study area.
Level of Service (LOS)	The operating level of an intersection or roadway segment can be described using the term Level of Service. Level of Service is a qualitative description of operation based on delay and maneuverability.
LRTP	Maricopa Association of Governments Long-Range Transportation Plan that addresses transportation needs and planned improvements in the MAG region through the year 2021.
RFS	Regional Freeway System. The proposed 232-mile Regional Freeway System approved by Maricopa County, Arizona voters in a 1985 referendum.

1. South Mountain Transportation Corridor Project Status

HISTORICAL CONTEXT

The South Mountain Freeway was included in the proposed 232-mile Regional Freeway System (RFS) approved by Maricopa County, Arizona voters in a 1985 referendum. The referendum approved local sales tax funding to build the freeway segments identified in the RFS plan. Figure 1 depicts the current status of the RFS. Subsequent location/design and state-level environmental studies were conducted by the Arizona Department of Transportation (ADOT) for RFS route segments. The state-level Environmental Assessment and a Design Concept Report (ADOT, 1988a and 1988b) prepared for the South Mountain Freeway, which is now designated as part of State Route 202 (202L), was approved by the State Transportation Board (STB) in 1988.

After voters approved the 1985 referendum, the RFS was adopted by the Maricopa Association of Governments (MAG), the designated Metropolitan Planning Organization (MPO) responsible for a variety of planning functions (including transportation planning) in Maricopa County. The South Mountain Freeway has been included in MAG transportation planning documents since 1985, and is currently included in the MAG Long-Range Transportation Plan (LRTP), 2001 Update (MAG, 2001a). The MAG LRTP, developed for 2020 and reaffirmed for 2021, addresses transportation needs and planned improvements in the MAG region through 2021.

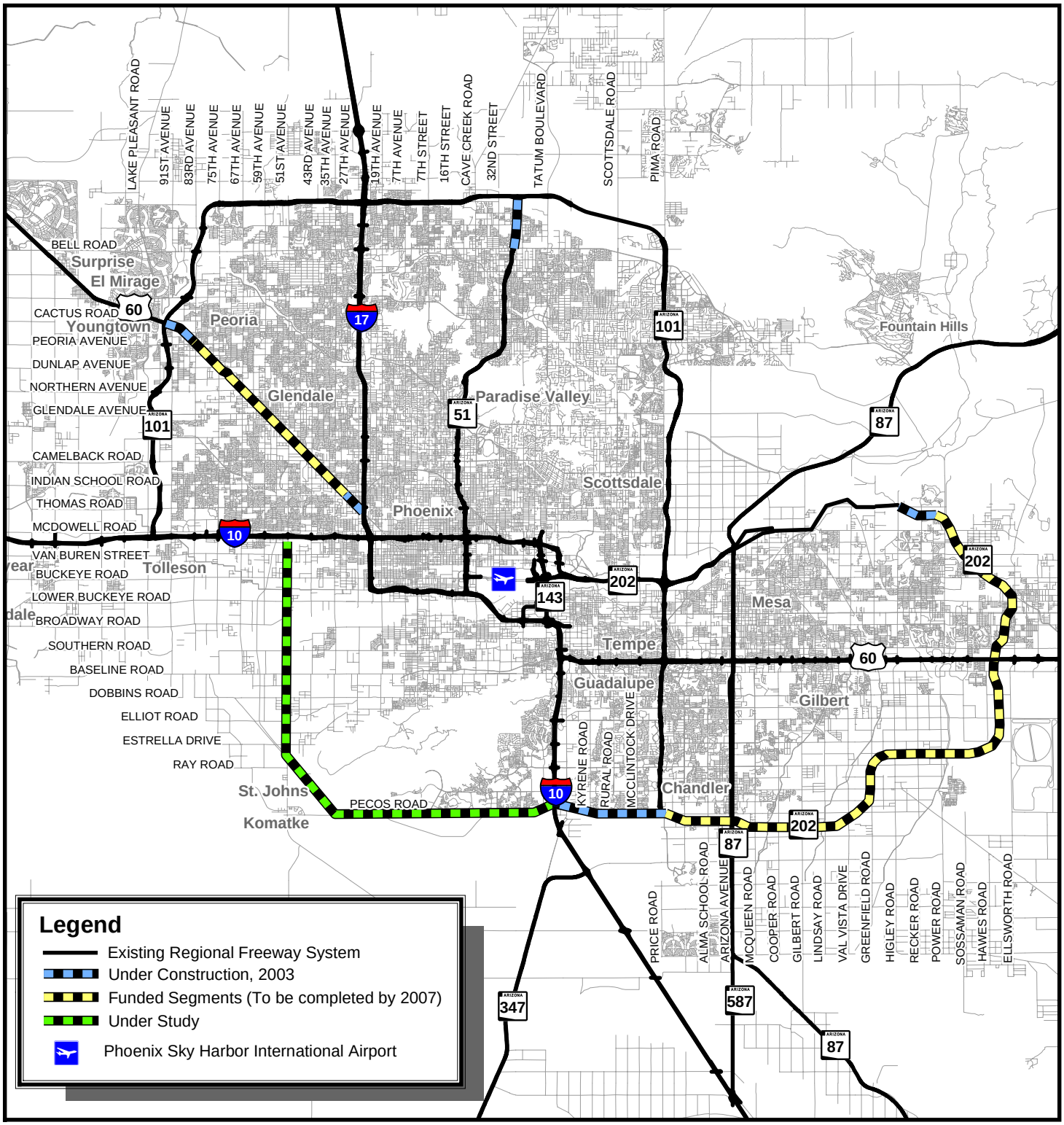
Note: The text in the MAG LRTP refers to the facility in the South Mountain corridor as the "South Mountain Parkway"; the Freeway Expressway Plan map in the LRTP indicates a "Planned Parkway/Expressway" in the South Mountain corridor; and the Regional Freeway System Certification map includes a facility in the South Mountain corridor, thus implying a "freeway". Text in the LRTP also refers to the Pima "Freeway" and the Price "Parkway", both of which have been constructed as freeways.

It is therefore concluded that the MAG LRTP definitely includes a major roadway in the South Mountain corridor, but leaves the determination of the type of the facility – freeway, expressway, or parkway – to this environmental study process. For the purpose of establishing the purpose and need for a transportation facility in the South Mountain corridor, the term "South Mountain Roadway" will be used. (When reference is directly to a MAG document, the MAG term will be used.) The exact type of facility will be determined as part of the alternatives evaluation phase of this study.

The RFS plan was originally intended to serve regional traffic and reduce congestion on the local roadway network in the MAG area. The RFS plan, as amended, remains a key component of MAG's intermodal LRTP to address the transportation needs resulting from continued growth in the MAG region. While the RFS alone will not solve all mobility issues, it provides a basic infrastructure framework for the integrated transportation system (MAG, 2001a). When complete, the RFS would provide:

- an integrated network of freeways and expressways strategically located to accommodate local and regional land use planning;
- improved regional mobility in the MAG area;
- enhanced local mobility by moving regional traffic off the local roadway network; and
- infrastructure to support the regional bus transit system component of the LRTP.

Much of the RFS has been completed, and most of the uncompleted segments are, or will soon be, under design and construction (Figure 1). The entire system, with the exception of the South Mountain Freeway, is scheduled for completion by 2007 (ADOT 2002).



Regional Freeway System

N

0 2.5 5 10 Miles

DRAFT 10/31/02

F:Projects/ADOT/SouthMtn/Purpose&Need/Figs_09_02/PN1.mxd

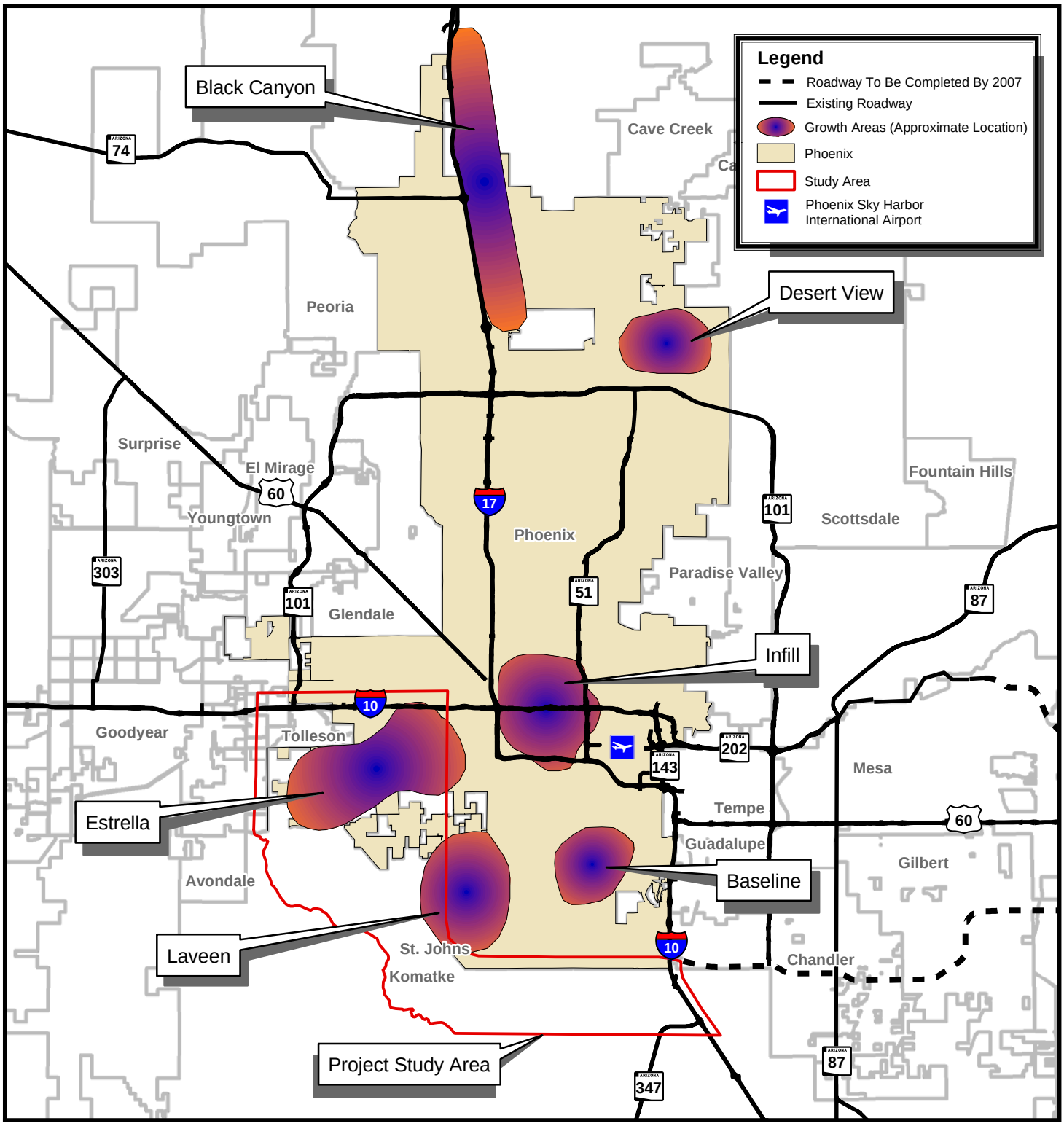
South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: ADOT Regional Freeway System, July 2002 Certification

Figure 1
Page 3

Since 1985, ADOT has constructed the RFS to meet the most pressing transportation needs in the MAG area as funds have become available. Consequently, construction has followed the patterns of development and population growth. High-growth areas historically have been the northeast, northwest, and southeast quadrants of the MAG area. Available funds have been used to build segments of the RFS in those areas, and completing the RFS in the southwest quadrant has been a lower priority. Growth in the valley is projected to continue, including future growth in the west and southwest. For example, the *General Plan of Phoenix* (City of Phoenix, 2001a) identifies three of its six future growth areas in the area of the proposed South Mountain Freeway (Figure 2).

Within this context, ADOT has begun finalizing the planning for the final segment in the RFS, the South Mountain Freeway. The transportation planning horizon for the South Mountain Freeway is 2025, which is consistent with municipal general planning efforts, including the MAG LRTP. As currently proposed, the proposed action is located in the southwest part of the Phoenix metropolitan area in Maricopa County, Arizona (Figures 3 and 4). A major transportation facility in this corridor would connect Interstate 10 (I-10) in western Phoenix to I-10 south of Phoenix.

In 1988, the STB adopted the South Mountain Freeway as the major transportation investment to make this connection. The South Mountain Freeway remains designated as part of the National Highway System and would be an integral part of 202L (part of the RFS), which has been planned to traverse the east, southeast, and southwest regions of the Phoenix metropolitan area. The east and southeast segments of 202L have been constructed, are under construction, or are funded for construction (Figure 1). The southwest segment of 202L (the South Mountain Freeway) would be the last segment constructed as currently planned. The freeway alignment adopted by the STB in 1988 would connect to I-10 near 59th Avenue, extend south around South Mountain, and turn east along the Pecos Road alignment to connect with I-10 at its junction with 202L, a distance of about 23 miles (Figure 4).



Future Growth Areas City of Phoenix

N

0 2.5 5 10 Miles

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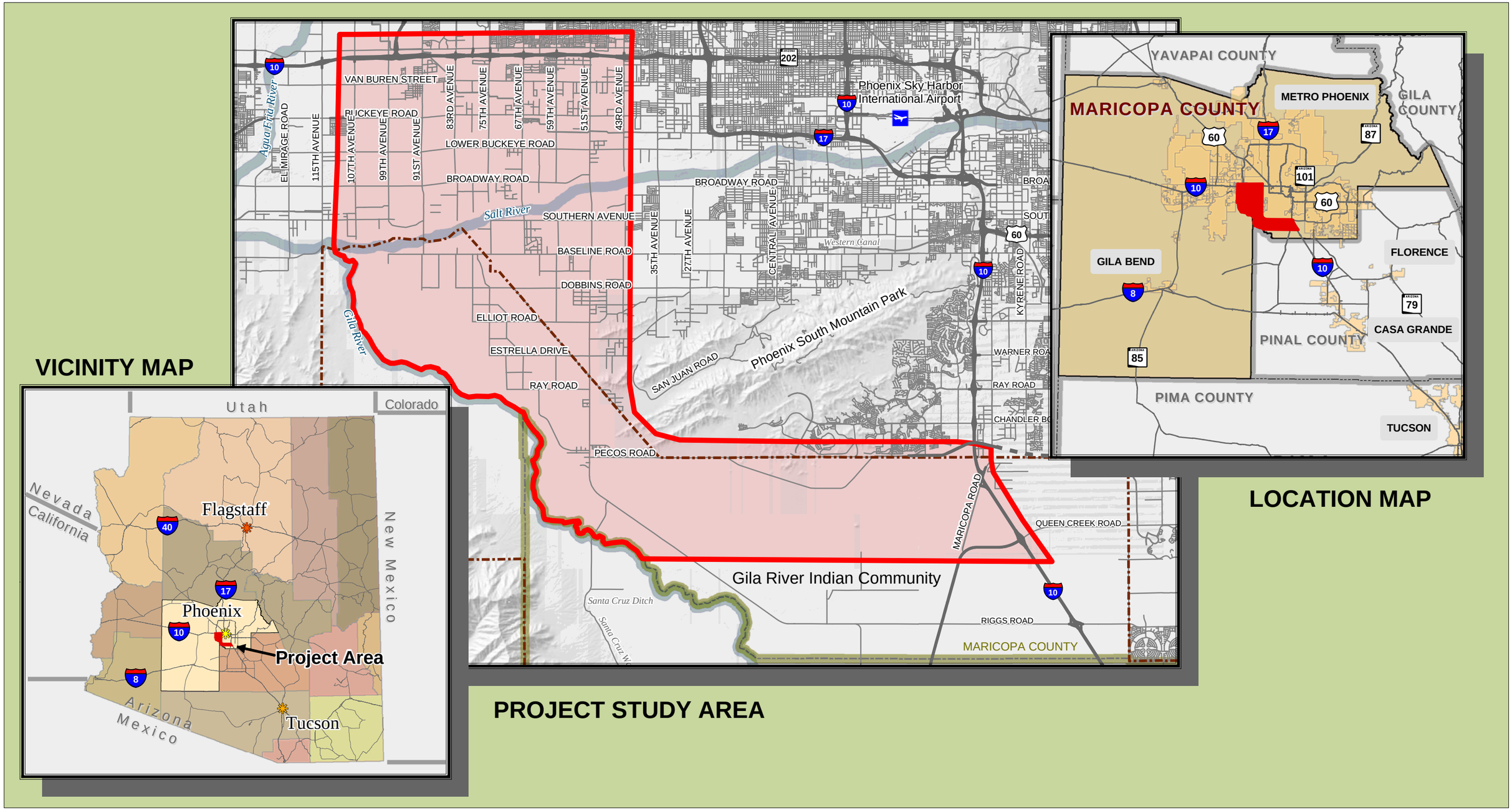
South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: City of Phoenix, 2001

Figure 2
Page 5



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )

N

0 1.25 2.5 5 Miles

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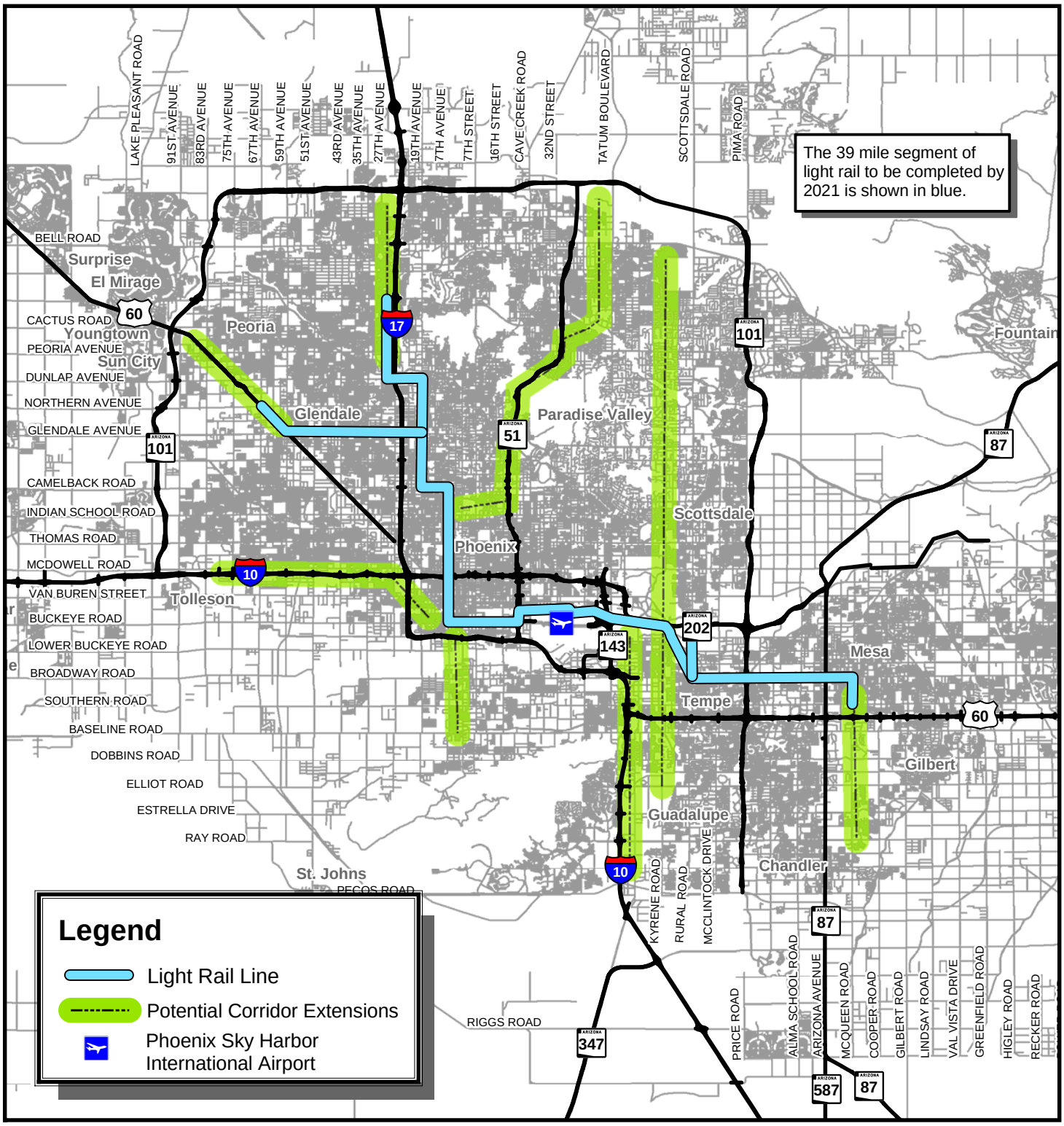
Vicinity Map and Location Map

Figure 3
Page 6



Light Rail Transit 2021 Planned Improvements

N

0 2.5 5 10 Miles

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South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG, Long Range Transportation Plan, July 2002

Figure 7

Page 14

Since the state-level Environmental Assessment for the adopted South Mountain Freeway alignment was completed in 1988, changes have occurred in regional growth patterns and traffic movements, local land uses, state and federal environmental regulations, roadway design standards, and funding sources. These changes call for further study of the proposed action. Therefore, ADOT (the project sponsor) has decided to begin preparing an Environmental Impact Statement (EIS) in accordance with the provisions of the National Environmental Policy Act (NEPA) of 1969 [42 U.S.C. 4332(2)(c)], the NEPA compliance procedures of the U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA) (23 CFR 771), Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 U.S.C. 303), Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1251), and the environmental review requirements of ADOT.

Development of this *Purpose and Need Technical Memorandum, South Mountain Transportation Corridor*, is based on FHWA Technical Advisory T 6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (USDOT-FHWA October 30, 1987) Section V, D., "Purpose of and Need for the Action." Because ADOT has decided to seek federal funds for the project, the FHWA will be the lead federal agency.

TECHNICAL MEMORANDUM PURPOSE IN THE CONTEXT OF THE EIS PROCESS

An early step in preparing the EIS is to determine if there is a purpose and need for the proposed action. If it is concluded through analysis that there is no purpose and need for the proposed action, no EIS would be prepared. However, if the analysis concludes that there is purpose and need for the proposed action, the EIS process would continue with the evaluation of a range of reasonable alternatives for a transportation facility in the study area. The study area for this proposed action has loosely been defined as the southwest part of the Phoenix metropolitan area of the MAG region (Figure 4).

According to the FHWA Technical Advisory T 6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (USDOT-FHWA October 30, 1987) Section V, D., "Purpose of and Need for the Action," a purpose and need memorandum should:

> Identify and describe the proposed action and the transportation problem(s) or other needs which it is intended to address (40 CFR 1502.13). This section should clearly demonstrate that a "need" exists and should define the "need" in terms understandable to the general public. This discussion should clearly describe the problems the proposed action is to correct. It will form the basis for the "no action" discussion in the "Alternatives" section, and assist with the identification of reasonable alternatives and the selection of the preferred alternative. Charts, tables, maps, and other illustrations (e.g., typical cross-section, photographs, etc.) are encouraged as useful presentation techniques.

The following is a list of items which may assist in the explanation of the need for the proposed action. It is by no means all-inclusive or applicable in every situation and is intended only as a guide.

1. Project Status - Briefly describe the project history including actions taken to date, other agencies and governmental units involved, action spending, schedules, etc.
2. System Linkage - Is the proposed project a "connecting link?" How does it fit in the transportation system?
3. Capacity - Is the capacity of the present facility inadequate for the present traffic? Projected traffic? What capacity is needed? What is the level(s) of service (LOS) for existing and proposed facilities?
4. Transportation Demand - Include relationships to any statewide plan or adopted urban transportation plan together with an explanation of the project's traffic forecasts that are substantially different from those estimates from the 23 U.S.C. 134 (Section 134) planning process.
5. Legislation - Is there a federal, state, or local governmental mandate for the action?
6. Social Demands or Economic Development - New employment, schools, land use plans, recreation, etc. What projected economic development/land use changes indicate the need to improve or add to the highway capacity?
7. Modal Interrelationships - How will the proposed facility interface with and serve to complement airports, rail and port facilities, mass transit services, etc.?
8. Safety - Is the proposed project necessary to correct an existing or potential safety hazard? Is the existing accident rate excessively high? Why? How will the proposed project improve it?
9. Roadway Deficiencies - Is the proposed project necessary to correct existing roadway deficiencies (e.g., substandard geometrics, load limits on structures, inadequate cross-section, or high maintenance costs)? How will the proposed project improve it?

This memorandum addresses the FHWA guidance. A conclusion section is presented at the end of this memorandum that summarizes the memorandum findings.

ADOT MISSION STATEMENT

ADOT's published mission statement is to provide a safe and efficient transportation system, together with the means of revenue collection and licensing for Arizona. Its stated goals relating to the proposed action are:

- To improve the movement of people and products throughout Arizona.
- To increase the quality, timeliness, and cost-effectiveness of its products and services.
- To optimize the use of all resources.
- To improve public and political support necessary to meet Arizona's transportation needs.

ADOT's mission and stated goals are important within the context of determining the purpose and need for the proposed action. As the project sponsor, ADOT is obligated to continue to study the proposed action if analysis concludes that there is a purpose and need for the action.

REGIONAL TRANSPORTATION PLANNING

MAG serves as the regional agency for the greater Phoenix metropolitan area. Member agencies include ADOT, Apache Junction, Avondale, Buckeye, Carefree, Cave Creek, the Citizens Transportation Oversight Committee, El Mirage, Fountain Hills, Gila River Indian Community (GRIC), Gilbert, Glendale, Goodyear, Guadalupe, Litchfield Park, Maricopa County, Mesa, Paradise Valley, Peoria, Queen Creek, the Salt River Pima-Maricopa Indian Community (SRPMIC), Scottsdale, Surprise, Tempe, Tolleson, Wickenburg, and Youngtown.

MAG is also the designated MPO for regional planning in the Maricopa County region. MAG provides regional planning and policy decisions in areas of transportation, air quality, environment analysis, regional development, and social services. With respect to transportation, MAG prepares and annually updates the LRTP. The LRTP identifies specific transportation facilities and services to be constructed or provided in the next 20 years and is the culmination of proposed facilities and services provided from all member agencies. The plan is fiscally constrained and includes only projects for which funding is currently available or is reasonably expected. The LRTP considers a variety of transportation modal plans including freeways, streets, transit, and bicycles. The LRTP also addresses demand management, system management (including Intelligent Transportation Systems), special transportation needs, and safety (MAG, 2001a).

In response to projected population growth in Maricopa County, the 2001 LRTP includes expanding services and facilities through 2021. Notable expansions include:

- a 66-percent increase in freeway/expressway lane-miles;
- a 300-percent increase in express and commuter bus service;
- completion of a 39-mile light rail transit system; and
- an approximately 45-percent increase in street lane miles.

Relevant sections of the 2001 LRTP are summarized below.

Freeways

As of 2001, 112 miles of the MAG RFS have not been completed. With the exception of the South Mountain Freeway, the expected completion for these freeways is 2007 (Figure 1). Notable improvements under the 2001 LRTP include completing 202L in the eastern part of the MAG area; widening Interstate 17 (I-17) and U.S. Route 60 (US 60) (east of Loop 101); completing high-occupancy vehicle (HOV) lanes on I-17, US 60, and State Route 51; and

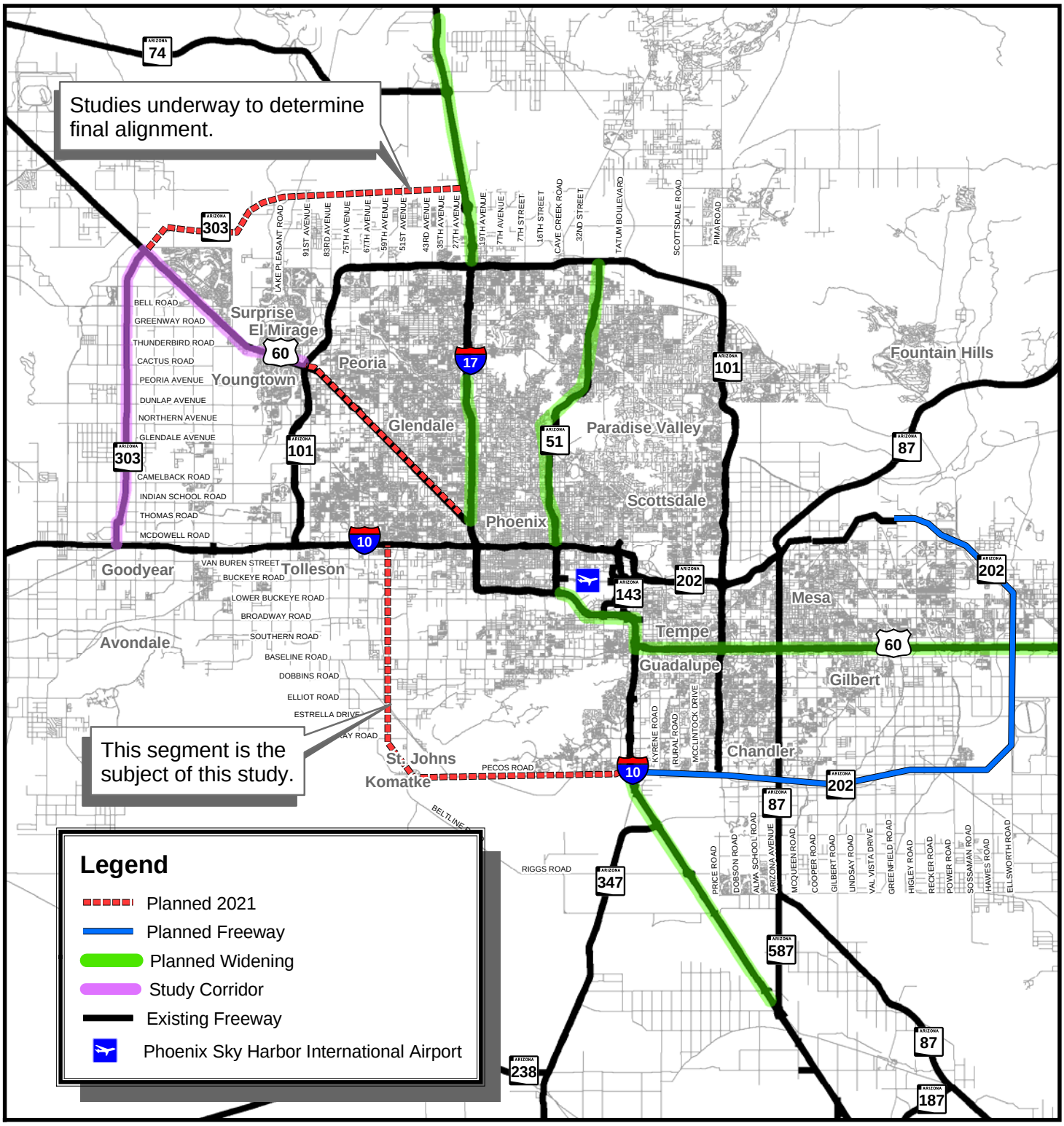
completing State Route 303 (303L) to connect to I-17 (Figure 5). Projects to improve access from outside the MAG area into the MAG area are also in the 2001 LRTP, including widening US 60 to four lanes to the northwest and to the east and widening I-10, I-17, and State Route 85 (Figure 6).

Transit

Major planned improvements in regional transit include tripling local bus service, tripling dial-a-ride service, quadrupling express bus service, and completing a 39-mile light rail transit (LRT) system by the 2021 planning horizon (Figure 7).

Fixed bus route service generally follows the Phoenix metropolitan mile grid street pattern. The plan calls for tripling of service, including improved frequencies in areas of existing service, service to new areas, and extended hours of service. The LRTP projects a 400-percent increase in the miles of express bus service focused primarily on peak period demand.

The 39-mile LRT system would include park-and-ride lots and signal prioritization to enhance service.



2021 Long Range Transportation Plan
Freeway/Expressway Plan

ADOT

South Mountain corridor team

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG, Long Range Transportation Plan, July 2002

N

0 2.5 5 10 Miles

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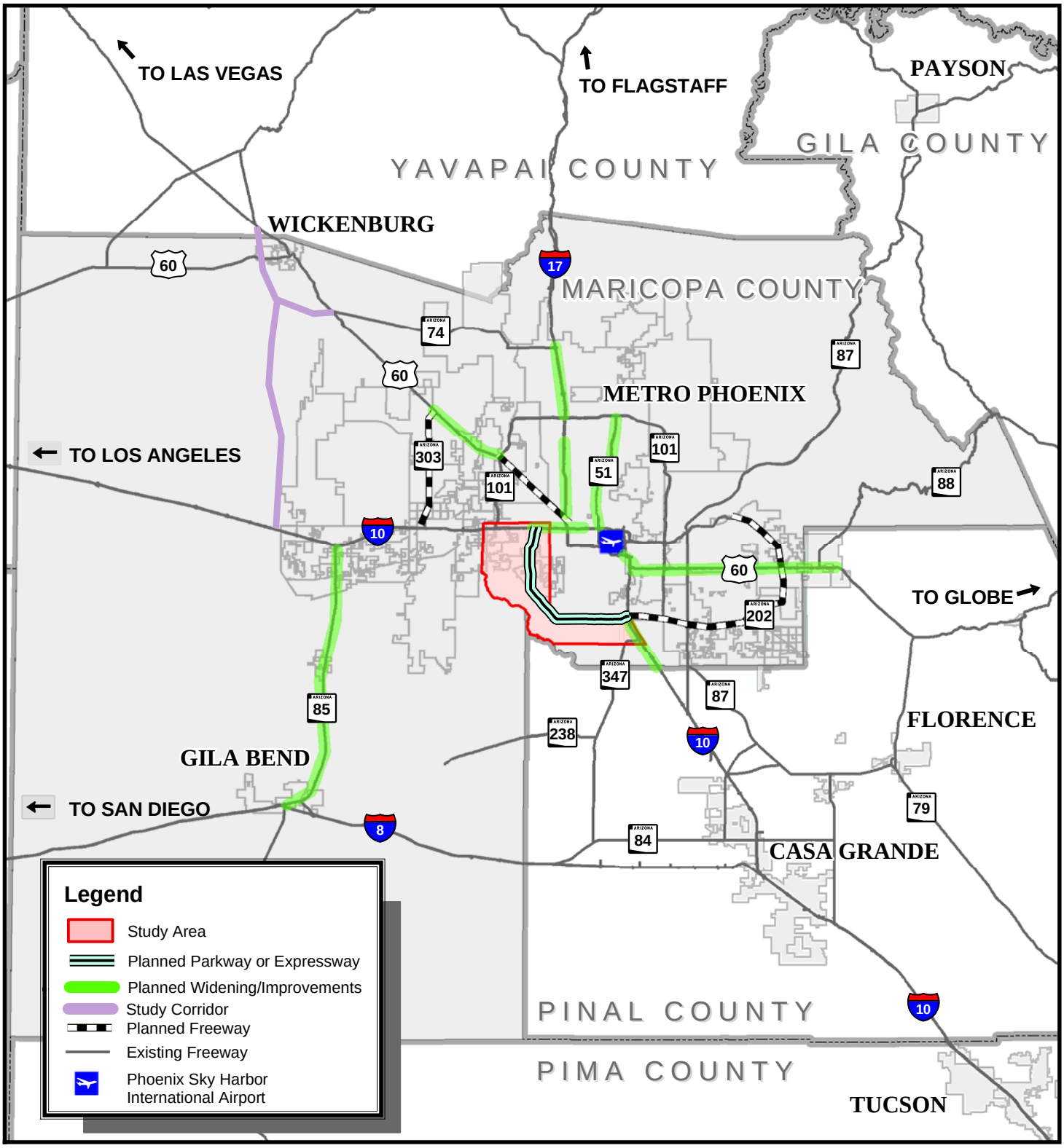
Figure 5

Page 12



2021 Long Range Transportation Plan Regional Highway System

N

0 5 10 20 Miles

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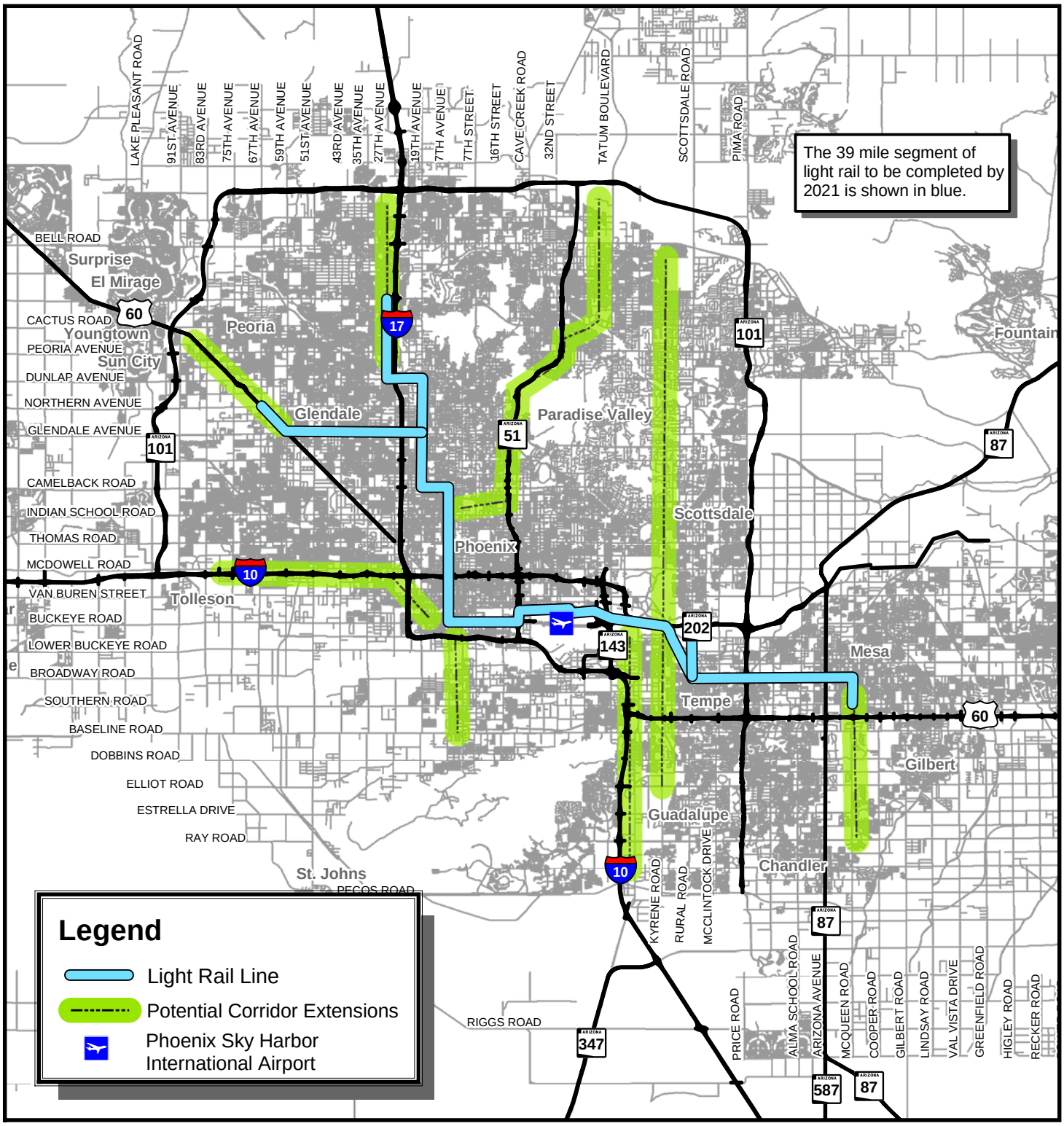
South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG, Long Range Transportation Plan, 2001 Update

Figure 6

Page 13



Light Rail Transit 2021 Planned Improvements

N

0 2.5 5 10 Miles

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South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG, Long Range Transportation Plan, July 2002

Figure 7

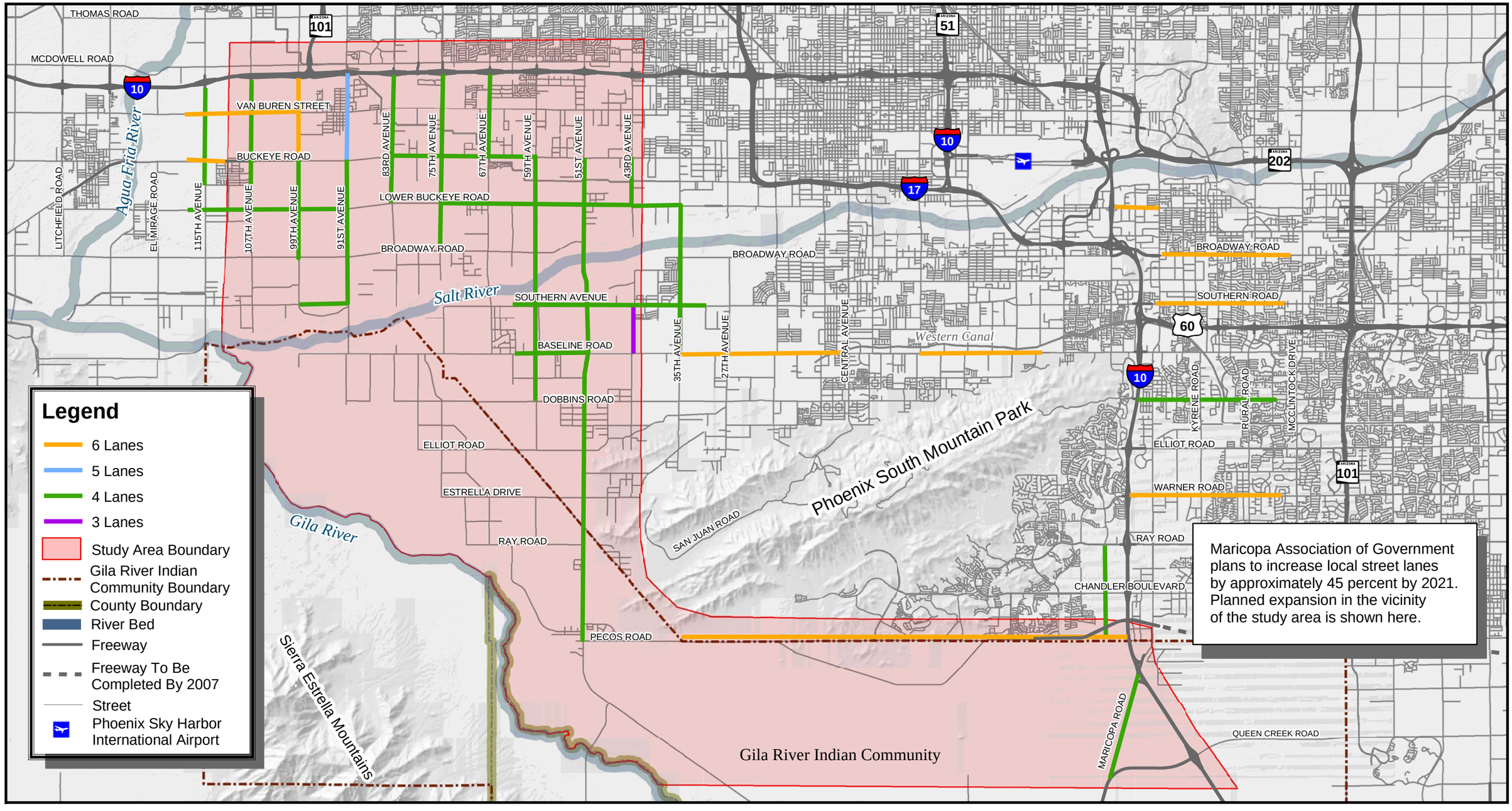
Page 14

Streets

Major arterial streets in the MAG area currently carry the majority of traffic in the MAG region (MAG, 2001a). Generally, these streets are located on a mile grid pattern. At present, the major arterial streets range in size from one lane in each direction to three lanes in each direction. By 2021, an approximately 45-percent increase in major arterial street miles is planned. While most new lanes would be located on the edges of the metropolitan area, streets would be widened to five or six lanes in built-up areas (MAG, 2001a). Figure 8 illustrates proposed major arterial street widening in the study area.

Transportation Demand Management and Transportation System Management

Continued commitment to the Transportation Demand Management (TDM) and Transportation System Management (TSM) programs and strategies are included in the 2001 LRTP. Generally, TSM programs and strategies implement measures that result in better operation of the existing roadway network and TDM programs and strategies implement measures that result in reduced demand. Specifically, the 2001 LRTP identifies continued TDM efforts to promote ridesharing, vanpool programs, telecommuting, and TSM projects such as real-time traffic management and the enhanced use of intelligent transportation systems to improve operations. See the 2001 LRTP for more information about these efforts.



ADOT

South Mountain corridor team

2021 Planned Major Arterial Street Improvements

N

0 1.25 2.5 5 Miles

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South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG, Long Range Transportation Plan, 2001

Figure 8

2. Need for the Proposed Action

SOCIAL DEMANDS AND ECONOMIC DEVELOPMENT

Historical Population Growth, Population Projections, and Housing Projections

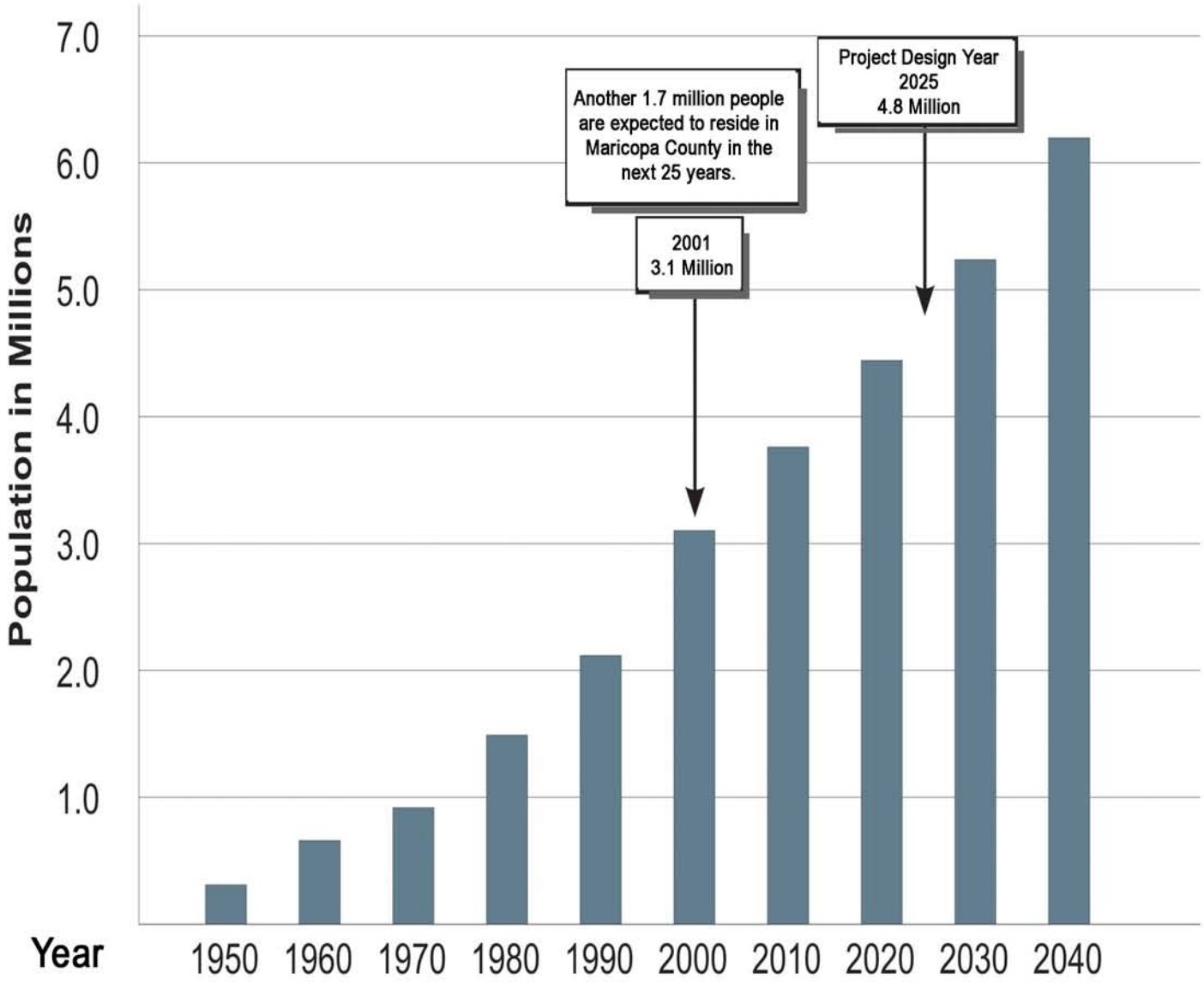
Between 1950 and 1994, the metropolitan area grew by 564 percent compared to 72 percent for the United States as a whole (MAG, 2001b). This rapid growth continued through 2000 and is projected to continue through 2040 (Figure 9). Between 1990 and 2000, population in the MAG region increased 45 percent from 2.1 to about 3.1 million (MAG, 2001b). MAG population projections indicate that Maricopa County's population will more than double between 2000 and 2040, with an increase of about 50 percent expected by 2020.

Figure 10 illustrates population distribution in Maricopa County beginning in 1964 and projected to 2025 (MAG, 2001b). The RFS routes are shown in Figure 10 for reference. As shown in the figure, the historical trend in the distribution of population growth is projected to continue in the Phoenix metropolitan area, with the southwestern area of the region (where the study area is located) experiencing a portion of this growth. The Growth Element of the *General Plan of Phoenix* (City of Phoenix, 2001b) identifies three of the City's six future growth areas close to or within the study area (Figure 2).

Currently, there are over 1.1 million housing units in Maricopa County including homes and apartments; an additional 900,000 units would be needed for the projected population of 2025 (MAG, 20001b). There is enough vacant and planned land to adequately meet the demand for housing between 2001 and 2025 without putting abnormal pressure on market prices. The amount of acreage planned for all residential uses is expected to extend Maricopa County's housing growth (MAG, 2001b).

Economic Development

Historical employment rates are tracked using County Business Patterns data (MAG, 2001b). The data are categorized in nine major industry groups: agriculture; mining; construction; manufacturing; transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and services. Using these data, employment in the MAG area increased in all nine groups between 1984 and 1994 from 643,342 jobs to 959,158 jobs. This increase of 316,000 jobs was a 49 percent gain, which exceeds the 24 percent national gain during the same period (MAG, 2001b). Employment in the United States declined in two



Historical and Projected Population Growth for Maricopa County

Figure 9
Page18

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: Maricopa Association of Government, View of the Valley in 2040.

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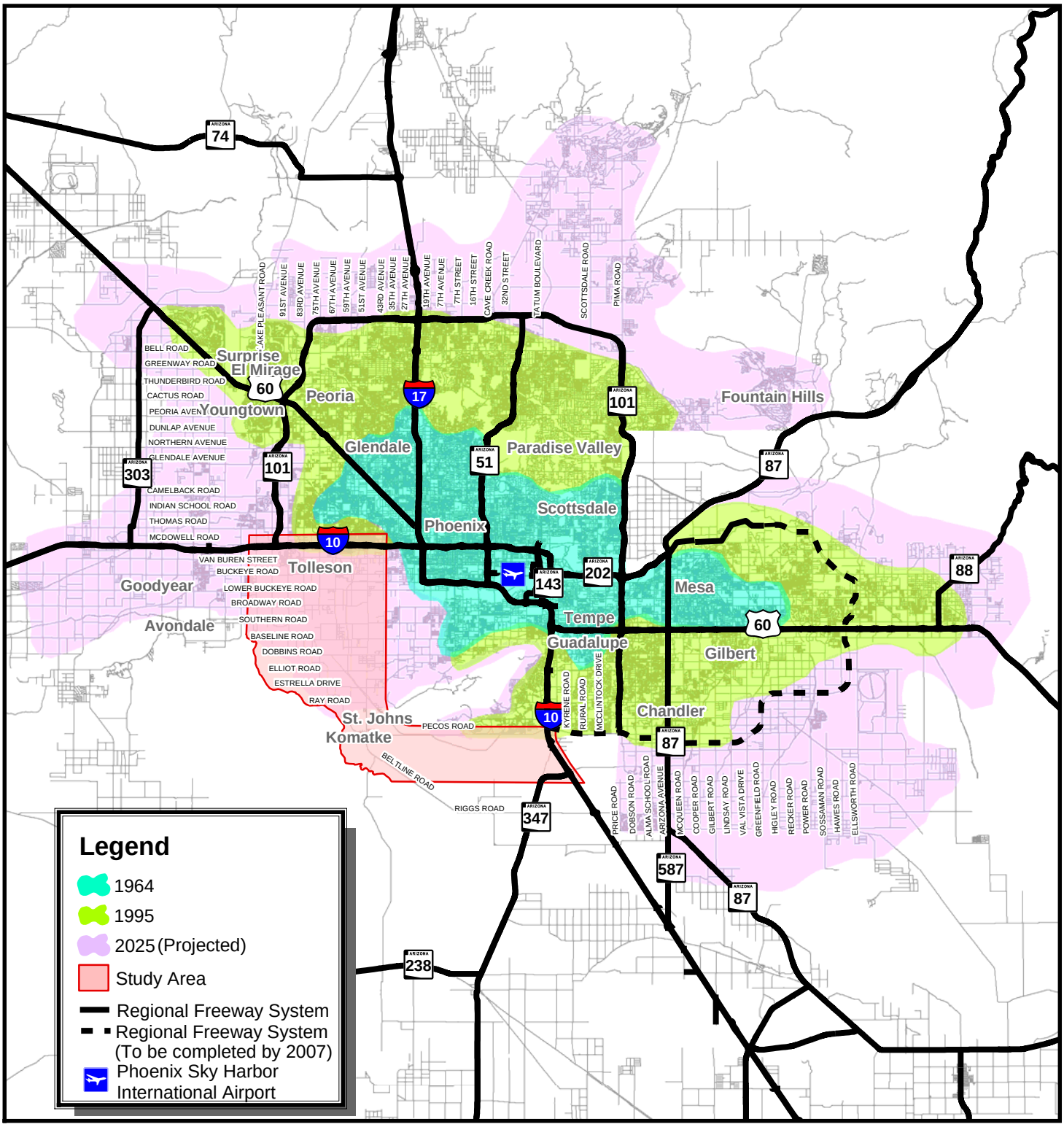

Historical and Projected Population Growth Distribution, Maricopa County

N

0 2.5 5 10 Miles

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South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG, Valley Vision 2025

Figure 10

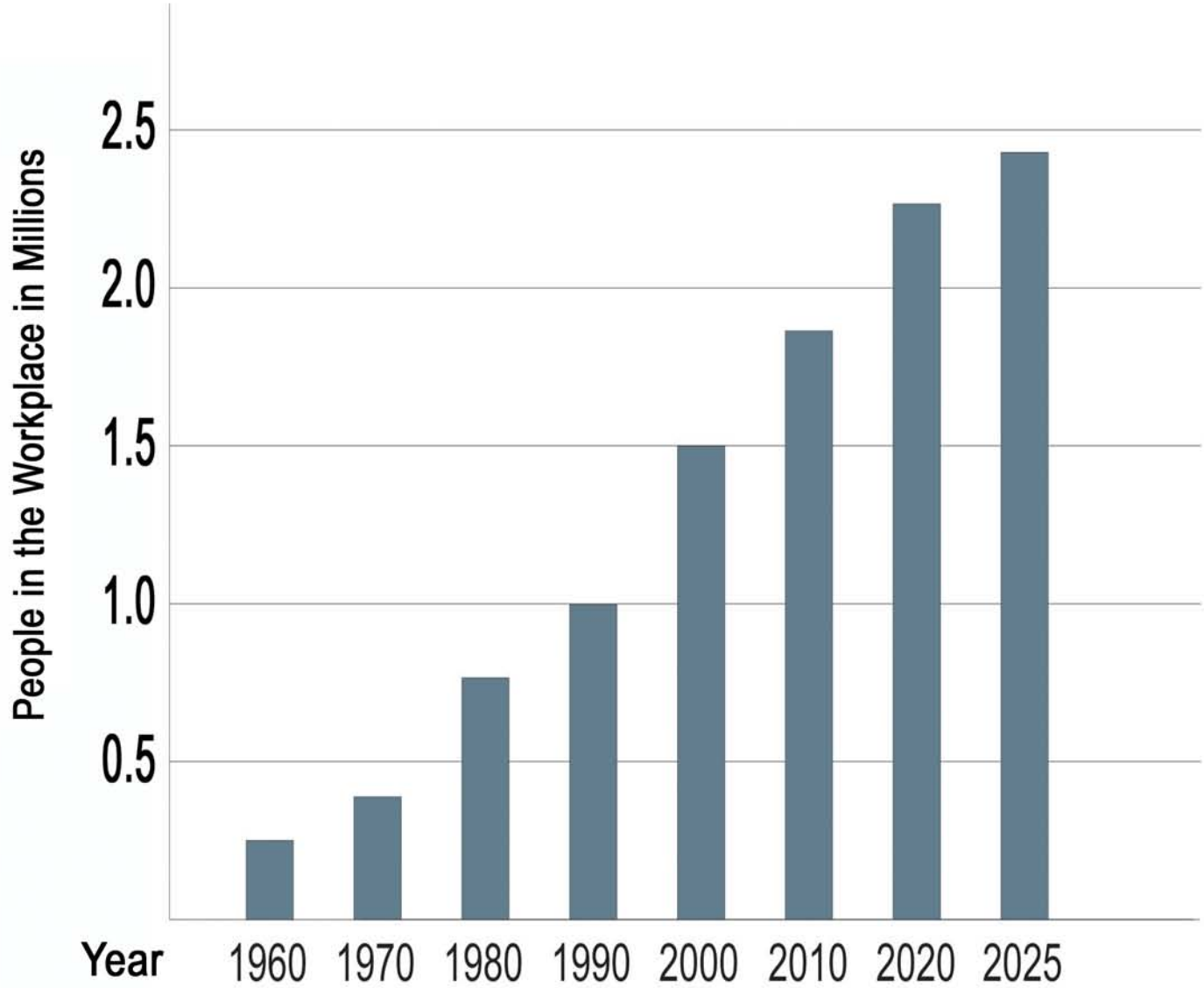
of the industry groups, mining and manufacturing. This decline did not occur in the MAG region (City of Phoenix, 1999a).

The region's economy has been growing faster than the United States' economy (City of Phoenix, 1999a). For example, between 1992 and 1996, the number of jobs in the country increased at an annual rate of 2.3 percent, or a total increase of 9.5 percent, while the region's employment grew more than 6 percent per year for a total increase of 26 percent. Currently, the acreage in use for employment opportunities is still less than 2 percent of all the planned land in the region.

The employment growth rates from 1970 through the mid-1980s were about equal to the growth rates after 1985. The number of people in the labor force almost doubled from 1980 to the mid-1990's (Figure 11). It is estimated that the number of jobs will reach about 2.4 million in 2025 (MAG, 2001b).

Conclusion

The 2025 socioeconomic forecast for the MAG region is a population of about 5 million, almost 2 million dwelling units, and an employment level of 2.4 million (MAG, 2001b). The planned multi-model regional transportation improvements in the 2001 LRTP are a fiscally constrained response to the projected rapid growth and projected travel demand in the MAG region. The identified study area is appropriate for a major new transportation facility within the context of past and current regional transportation planning described in the "South Mountain Transportation Corridor Project Status" section of this memorandum and within the context of the projected population distribution trends in the southwestern MAG region.



Historical and Projected Employment Growth for Maricopa County

Figure 11
Page 21

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )

DRAFT 10/31/02

Source: Maricopa Association of Governments, Valley Vision 2025 F:Projects/ADOT/South Mtn/Purp_need/Figs_09_02?Adittlfigs/fig11.psd

TRANSPORTATION DEMAND AND CAPACITY

Traffic analyses were conducted based on the MAG population and LRTP projections using MAG's regional traffic model. This section describes the methodology used in the analyses and the conclusions based on 2000 regional mobility conditions and projected 2025 travel demand. The methodology includes optimization of transit, major arterial streets, and TDM and TSM strategies (with and without the South Mountain Freeway in place in 2025). Refer to Appendix A for a more detailed discussion.

The Growth in Population model shows that, in 2025, specific transportation needs will be to:

- provide additional capacity to accommodate the forecast travel demand from projected population growth and planned economic development; and
- prevent future congestion and maintain existing travel times on the MAG region's transportation system.

The rationale for selecting the study area as the location for a major new transportation facility is supported by the context of past and current regional planning described in the "South Mountain Transportation Corridor Project Status" section of this memorandum.

Methodology

TRAFFIC MODELING

The analysis employed the MAG travel demand model (EMME/2) approved by the U.S. Environmental Protection Agency. The model is a mode-choice model, meaning it predicts the amount of travel that occurs for all modes of traffic including bus, rail, and automobiles. Two major inputs enable the model to calculate travel demand. These inputs are socioeconomic data (how many people live and work in the region now and predicted in the future) and the capacity of the transportation infrastructure to accommodate the people (now and planned for in the future). The socioeconomic data are based on the adopted general plans of agency members along with population and economic forecasts and the existing and planned future transportation infrastructure as identified by agency members.

MAJOR ASSUMPTIONS

The model was used to examine 2001 conditions and to forecast travel demand for 2025 with and without a South Mountain corridor. In conducting traffic modeling for future conditions, certain assumptions were made regarding demographics, travel modes, and the roadway network.

The assumptions used for this analysis (see Appendix A) are considered to be conservative for the following reasons:

- The 1995 Special Census data were used to re-validate the model. A review of the 2000 census results suggests that future demographic forecasts could be as much as 20 percent higher than those based upon the 1995 census (which would increase the travel demand presented in this memorandum);
- Additional capacity beyond what is planned for in the LRTP was assigned to non-regional freeway transportation modes such as bus service, light rail, and HOV lanes to reduce dependency on single-occupancy vehicles for travel in the MAG region; and
- Assumptions were made to improve the operations of the existing roadway network without a major transportation facility in the study area. These assumptions are enhancing TSM measures and increasing improvements beyond what is planned for the major arterial street network identified in the 2001 LRTP update.

Together, these model assumptions result in a lower regional travel demand for single-occupancy vehicles than what is currently projected for in the LRTP 2021 projections. This reduced demand would imply a lesser need for a major transportation facility, such as a freeway, in the study area.

KEY TRAFFIC MODELING DEFINITIONS

Screenline Analysis

A screenline is an imaginary line, usually vertical or horizontal, that cuts through model network roadway segments. For this study, the traffic volumes occurring on roads intersecting the screenlines were used to evaluate the effects of facility alignment locations on traffic volumes on the overall roadway network.

Select Link Analysis

Select Link Analysis is a tool used by traffic engineers to evaluate the trips using an individual section of roadway based on the forecasted volumes. The main purpose of this analysis is to identify the general area where trips traveling through a section of roadway begin or end.

Level of Service

Once existing and projected traffic volumes are determined using the traffic model, traffic volumes can then be determined for the morning commute (AM peak) and evening commute (PM peak) and throughout the day (daily traffic volumes). From these numbers, transportation engineers can determine how the roadways would operate as measured in Level of Service (LOS). The LOS concept uses qualitative measures to characterize operational conditions of traffic flow. These measures characterize traffic conditions using factors such as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. There are six LOS categories defined for each type of facility for which the analysis procedures are available. These categories are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst (Figure 12). Typically, when planning new

improvements on the state highway system in urban areas, LOS D is considered an acceptable design level.

Existing Conditions

TRAFFIC VOLUMES AND LEVEL OF SERVICE

Current operating conditions in the study area and its vicinity are shown on Figures 13, 14 and 15 (Figure 13 shows current daily traffic volumes; Figure 14 shows current morning peak hour LOS on I-10 by direction. Figure 15 shows current evening peak hour LOS on I-10 by direction). Current volumes on I-10 are about 250,000 daily trips (as measured on I-10 at the Broadway curve). Long segments of I-10 between 91st Avenue and Ray Road operate at LOS F during both the morning and afternoon peak hours.

TRAVEL TIME

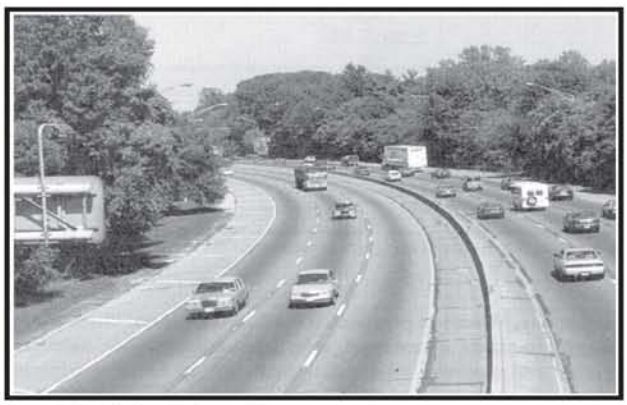
Figure 16 shows model-estimated current travel times during the morning peak period for:

- I-10 from the I-10 /Pecos Road interchange to the I-10/Washington Street interchange;
- 51st Avenue and I-10 from Elliot Road to the I-10/I-17 interchange.

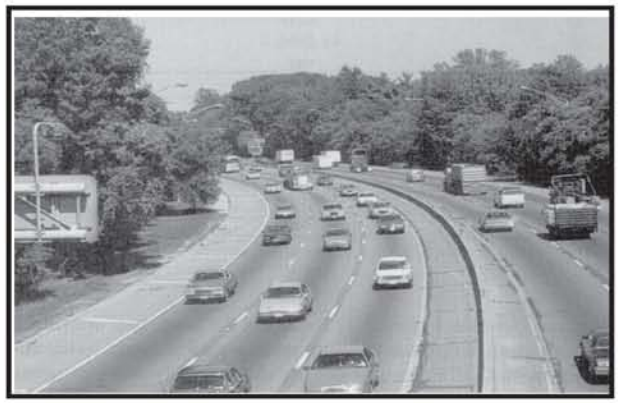
Travel time for both routes is about a half-hour.

Level of Service A

Level of Service D



Level of Service B



Level of Service E

Level of Service C

Level of Service F

Illustrations of Levels of Service

Figure 12
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South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: Maricopa Association of Governments, View of the Valley in 2040

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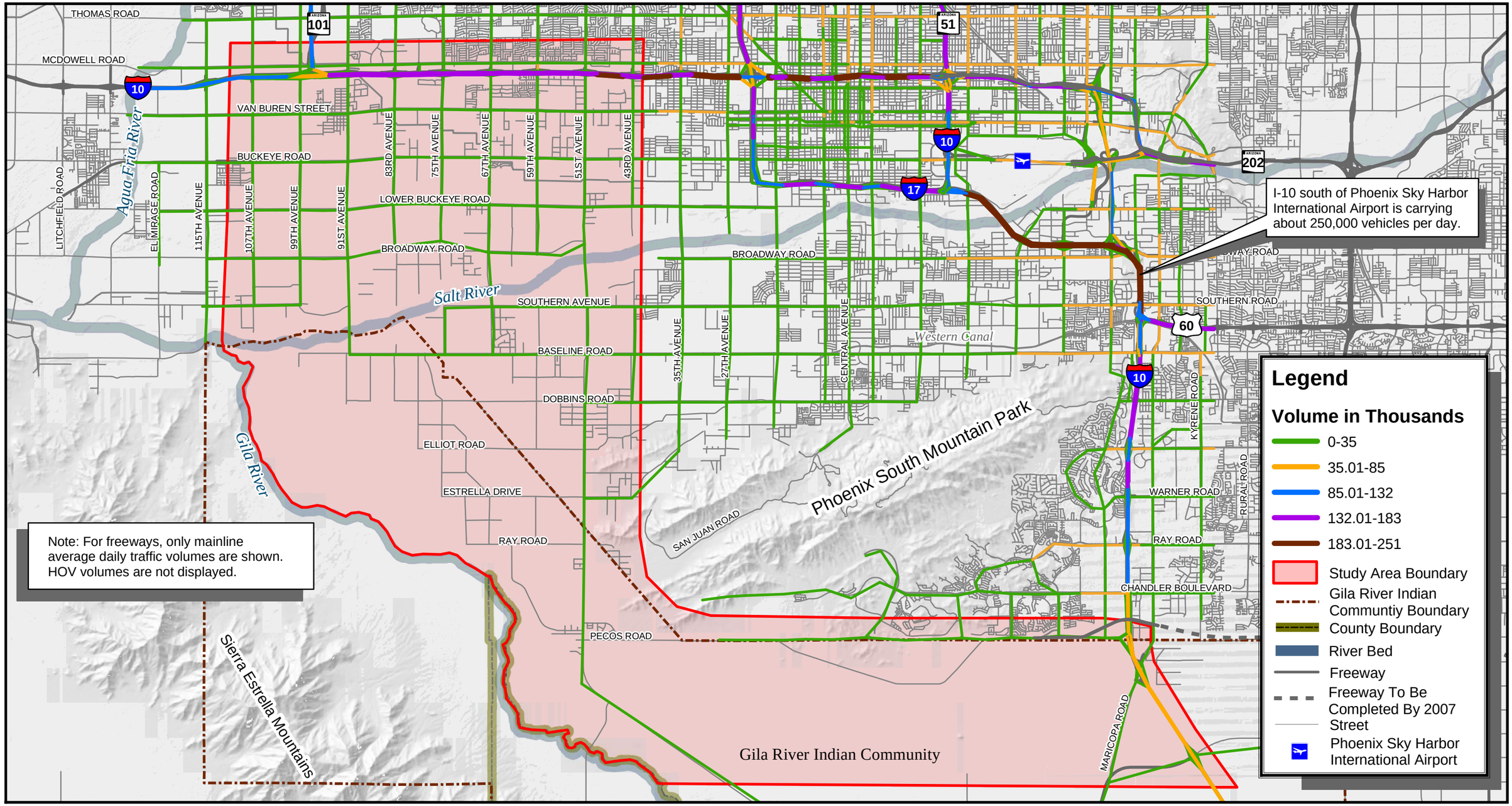

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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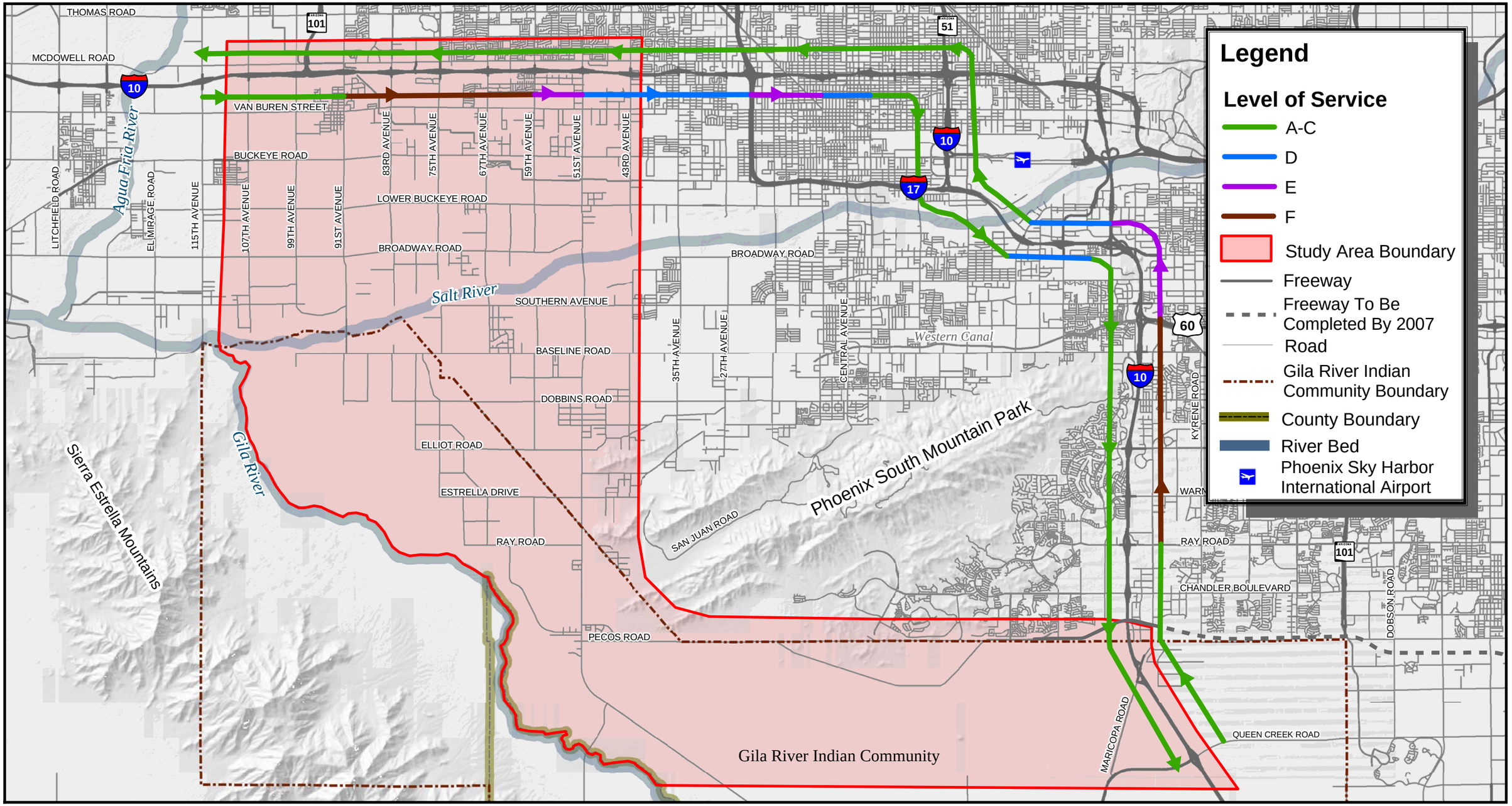
2001 Daily Traffic Volumes

Figure 13
Page 26



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source:MAG Model, 2001

N

0 1.25 2.5 5 Miles

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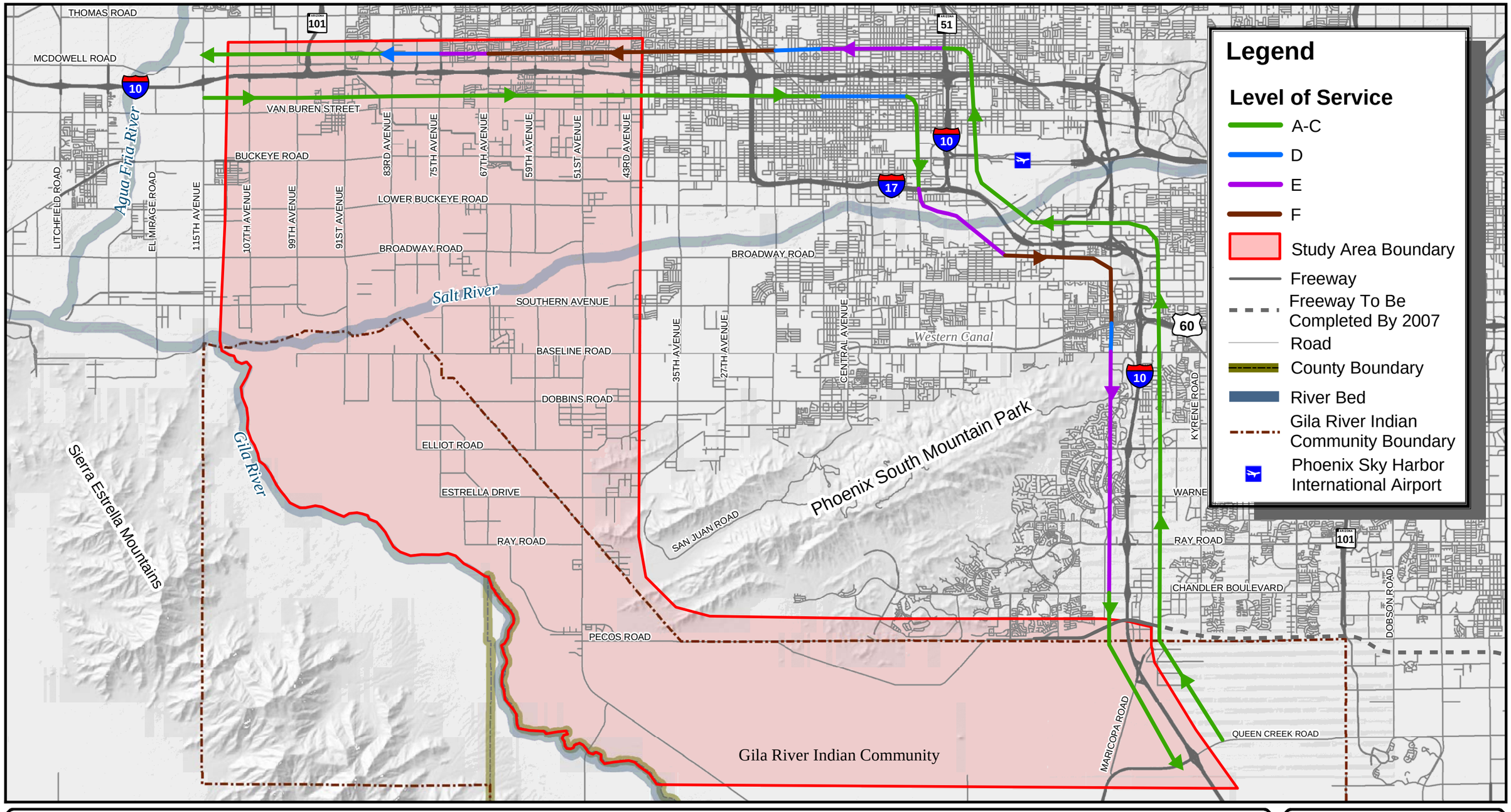
2001 Level of Service on I-10
Morning Peak Hour

Figure 14
Page 27



South Mountain corridor team

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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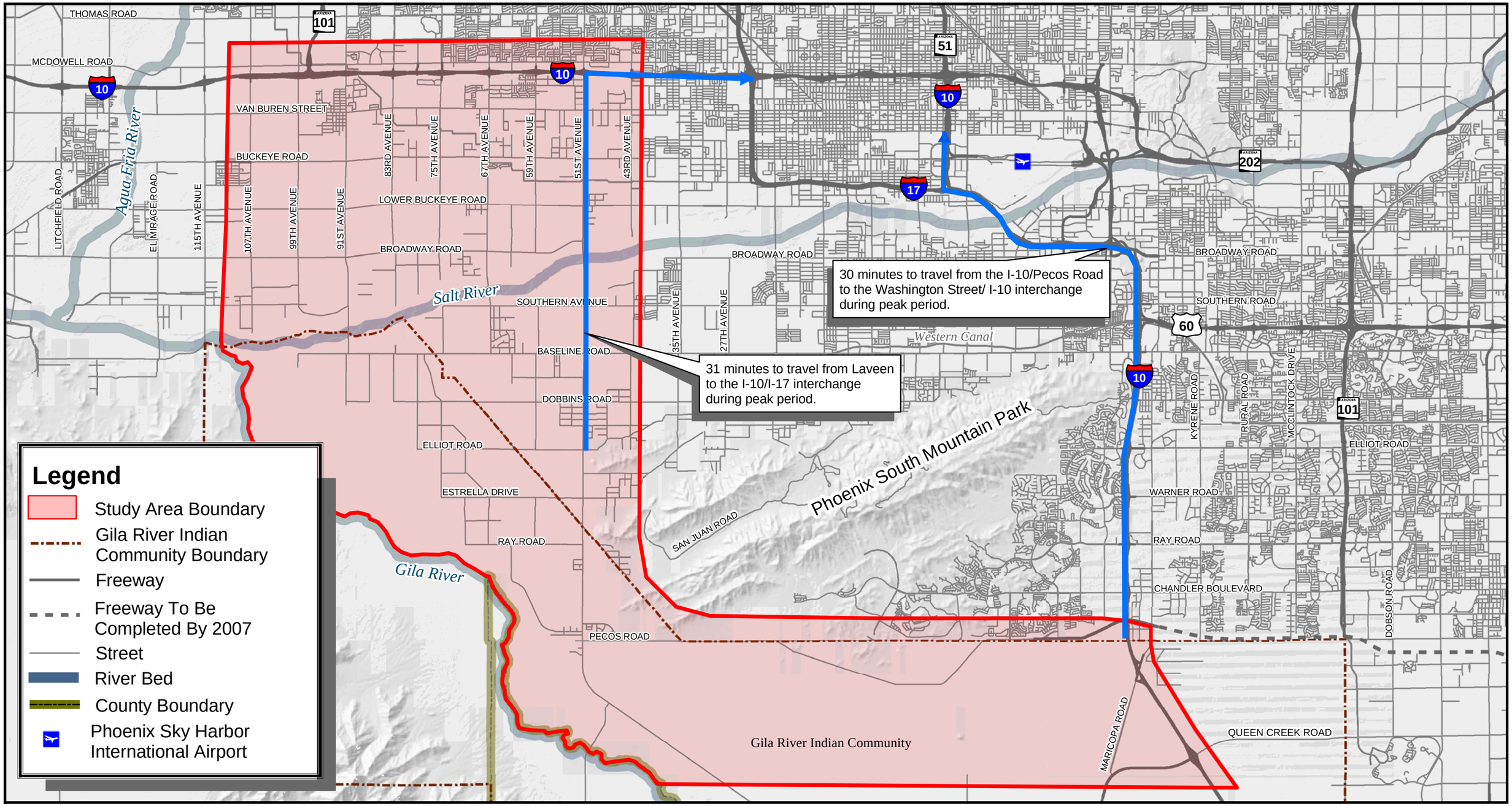
I-10 2001 Level of Service Evening Peak Hour

Figure 15



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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2001 Travel Times

Figure 16
Page 29

2025 Conditions without South Mountain Freeway

TRAFFIC VOLUMES AND LEVEL OF SERVICE

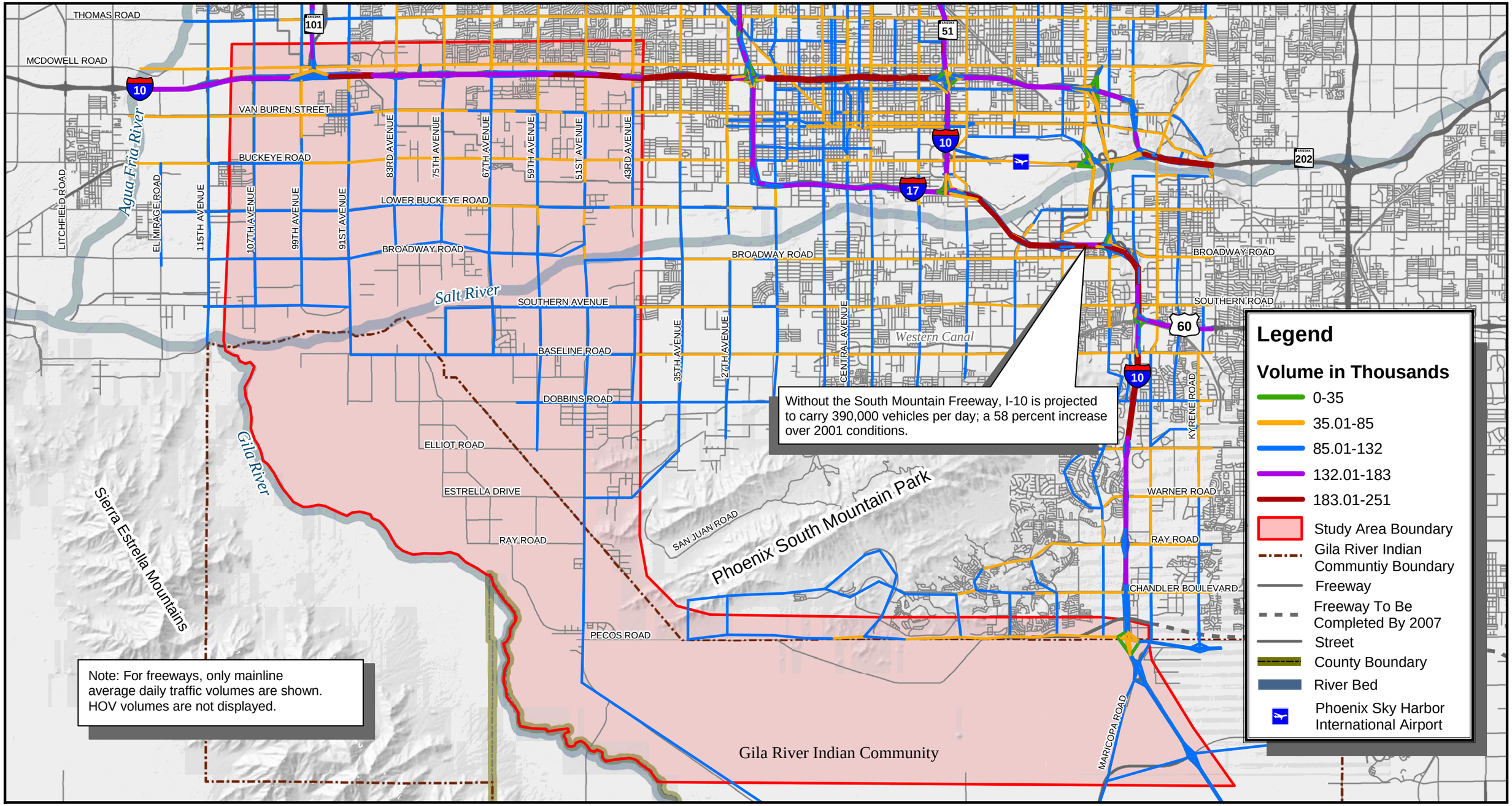
Travel in the MAG region is projected to increase about 58 percent over the next 20 years (MAG 2001b). Within the study area and its vicinity, substantial increases in traffic volumes are projected. I-10, at the Broadway curve, is projected to carry about 390,000 vehicles daily, which is about 140,000 more vehicles than current daily traffic volumes (Figure 17). Greater distances (than those distances currently) along I-10 and its adjacent arterials would operate at LOS F (Figure 18).

The key findings of the traffic analysis conducted for this study for 2025 are as follows:

- most metropolitan-area freeways and arterials are projected to operate at LOS E or worse if a major regional roadway in the South Mountain Transportation Corridor (SMTC) is not built;
- several roadways will operate at LOS E or worse during peak periods of travel, including I-10 from 115th Avenue to Chandler Boulevard and many of the major arterial streets north of South Mountain Park and south of Thomas Road (including Thomas Road).

TRAVEL TIME

Figure 19 shows the estimated travel times for the I-10 and 51st Avenue/I-10 corridors without the South Mountain Freeway. On I-10 from the I-10/Pecos Road interchange to the I-10/Washington Street interchange, travel time is estimated to increase from the current 30 minutes to 37 minutes, an increase of over 23 percent. Thus, even the widening and collector-distributor roads being planned for I-10 will not accommodate the forecasted demand at the current LOS. Travel time in the 51st Avenue/I-10 corridor is estimated to double, from the current 31 minutes to 63 minutes, without the South Mountain Freeway.



ADOT South Mountain corridor team

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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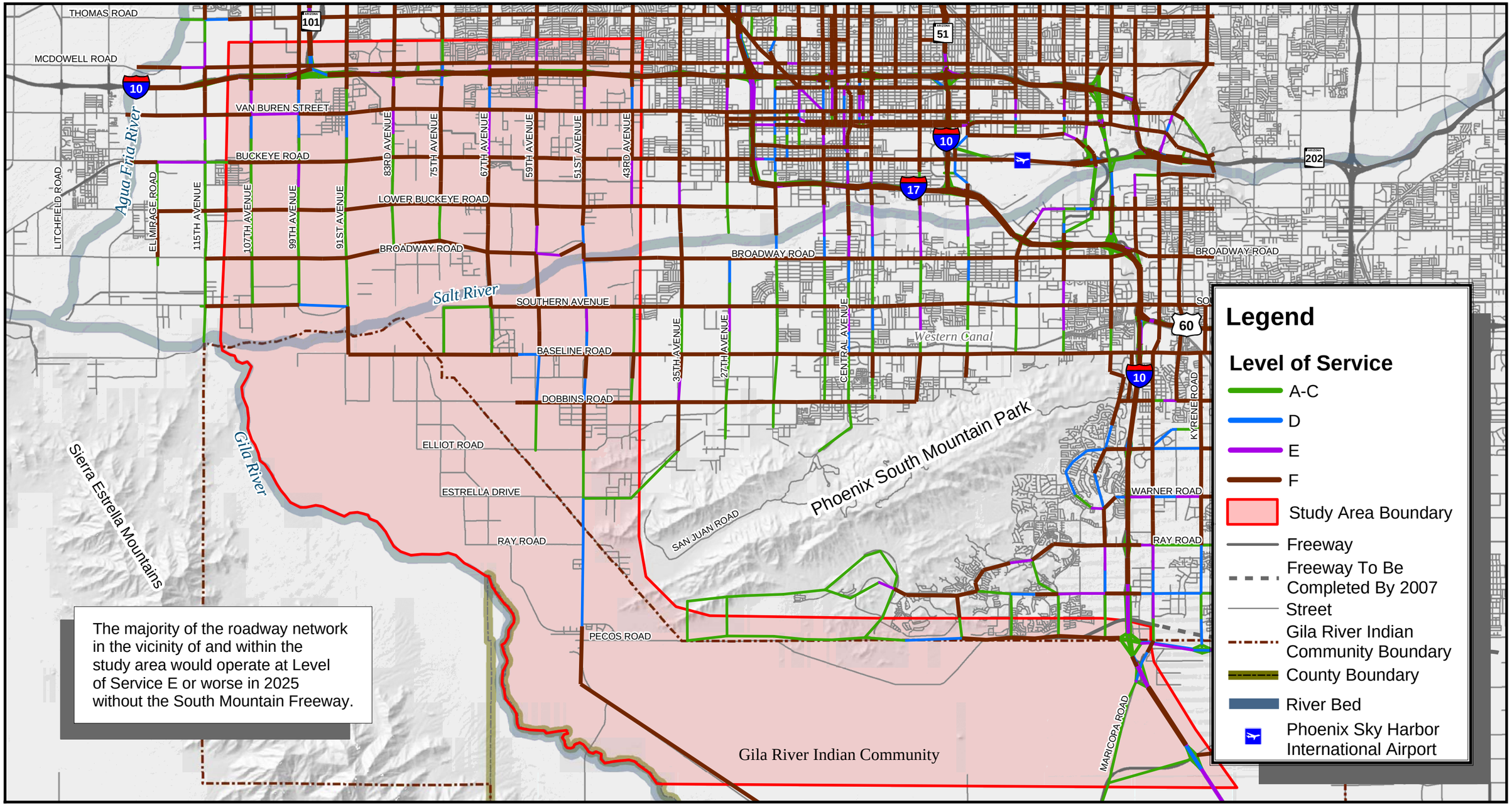
2025 Forecasted Daily Traffic Volumes

Figure 17
Page 31



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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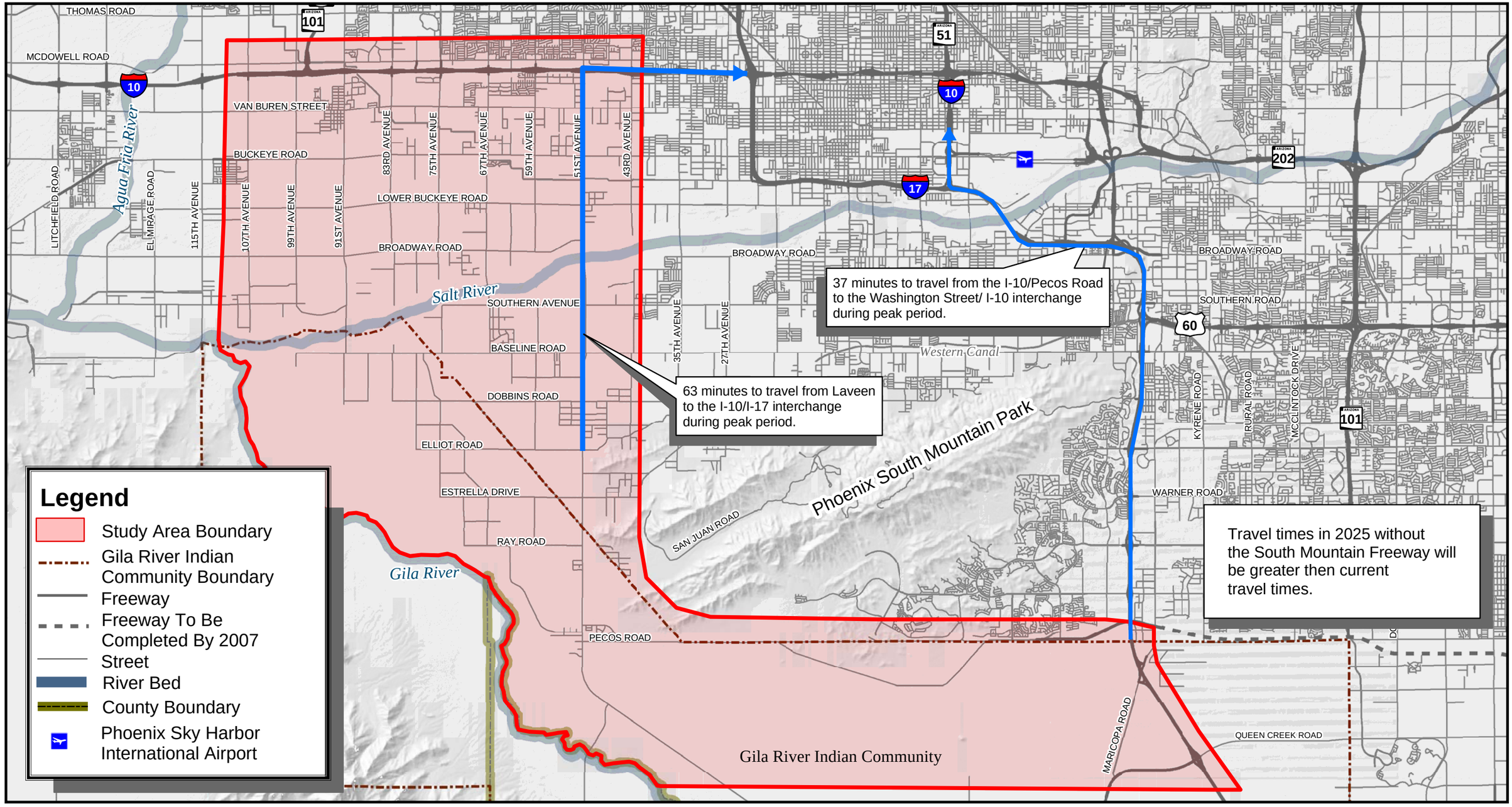
2025 Projected Daily Level of Service without South Mountain Freeway

Figure 18
Page 32



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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2025 Travel Times without the South Mountain Freeway

Figure 19
Page 33

CAPACITY DEFICIENCIES

Without a major regional roadway in the SMTC, the 2001 LRTP planned facility and services improvements would accommodate about 65 percent of the demand (operating at an acceptable LOS D) as projected in 2021. The best-case scenarios noted above for transit, light rail, enhanced TSM/TDM measures, and maximizing major arterial street improvements would accommodate about 13 percent of the 35 percent deficiency in projected 2021 capacity demand (Table 1).

Table 1 – Capacity Deficiency

	Projected Capacity Captured (%)	Remaining Capacity Deficiency (%)
2021 Projected Capacity Deficiency	—	**35**
Transit	3	32
Transportation Demand Management/Transportation System Management	5	27
Roadway Improvements	5	22
Remaining capacity deficiency (without a major regional roadway in the South Mountain Transportation Corridor)	—	22

CONCLUSION

Population, economic growth, and related transportation infrastructure needs are projected to increase in the study area and its vicinity. This growth is expected to increase faster than the planned LRTP 2021 facility and services improvements can accommodate the transportation infrastructure needs. The above analysis shows that best-case modal transportation improvements, including transit, TDM/TSM, roadway improvements (not including a major regional roadway in the SMTC), alone and cumulatively, are not enough to adequately address the projected 2021 capacity deficiencies.

2025 Conditions with South Mountain Freeway

To determine the need for a major regional roadway in the SMTC, a freeway was applied to the forecasted travel demand. A freeway is appropriate for this purpose because it has the most capacity in response to projected corridor demand of all major regional roadway types (including expressways and parkways).

TRAFFIC VOLUMES AND LEVEL OF SERVICE

In 2025, a South Mountain Freeway in the study area would carry about 155,000 vehicles per day (about 25,800 vehicles per lane per day). In comparison, I-10 along the Broadway curve currently carries 250,000 vehicles per day (about 25,000 vehicles per lane per day). A freeway in the study area would contribute to enhanced operations on I-10, US 60, and portions of the RFS (Table 2).

Table 2 - Current versus Projected Traffic Volumes on Selected RFS Segments

		Vehicles Per Day, 2025	
Segment	**2001***	**Without South Mountain Freeway**	**With South Mountain Freeway**
I-10, Baseline Road to Elliott Road	158,000	226,000	205,000
I-10, 32nd Street to 24th Street	217,500	390,000	359,800
US 60, Rural Road to Kyrene Road	170,000	197,500	195,000
US 60, SR 101 to Dobson Road	108,800	158,000	160,800
202L, SR 101 to Dobson Road	91,900	146,700	140,700
202L, Mesa Drive to State Route 87	73,700	129,400	126,000

Notes

* Based on average of daily traffic counts taken in 2001 by MAG

TRAVEL TIME

A screenline analysis was conducted to help determine the impact of a South Mountain Freeway on the arterial street network. Three screenlines (shown on Figure 20) were defined:

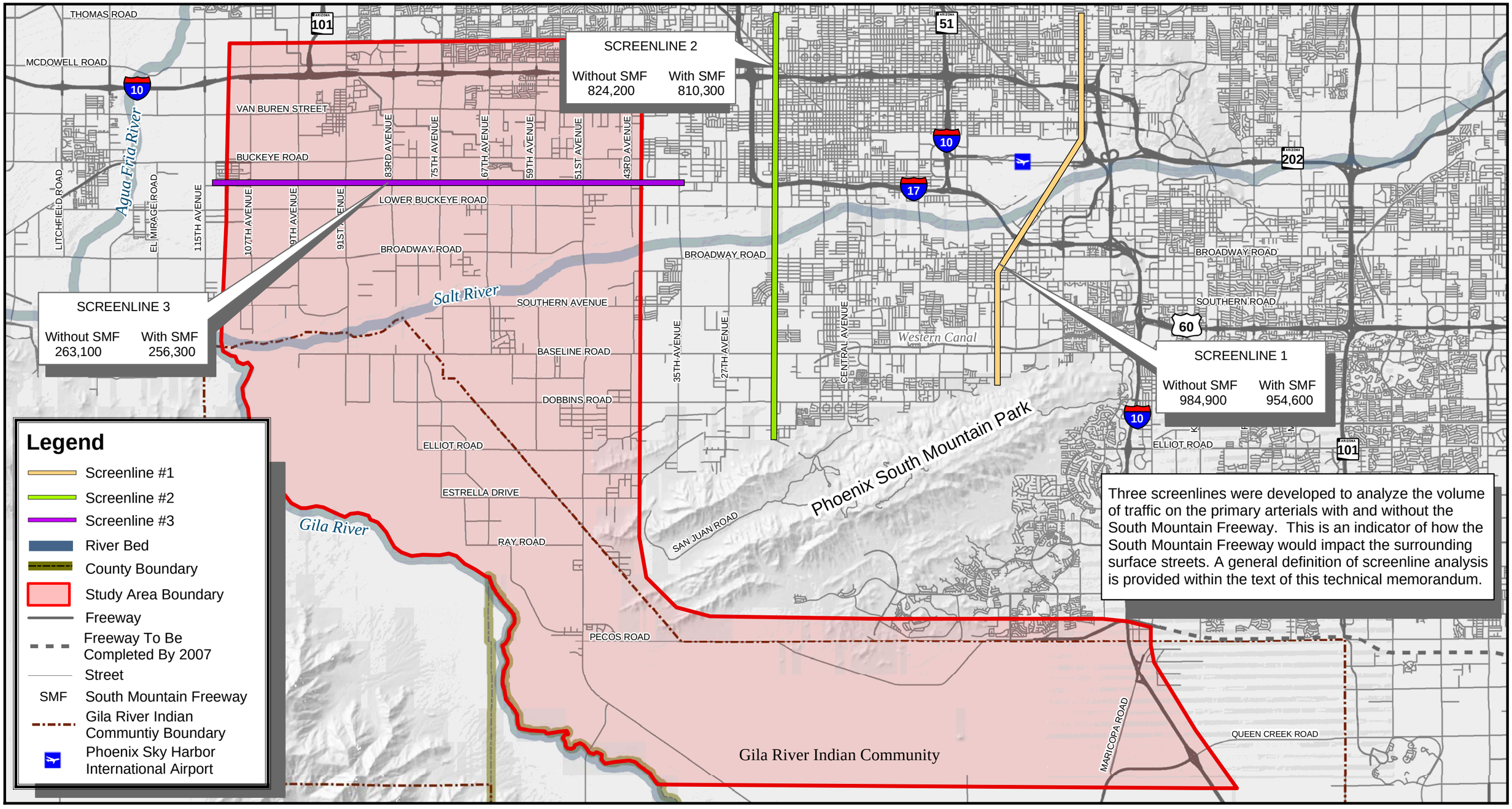
- Screenline 1: Between 24th Street and 40th Street from Baseline Road to Thomas Road.
- Screenline 2: Between 19th Avenue and 27th Avenue from Dobbins Road to Thomas Road.
- Screenline 3: Between Buckeye Road and Lower Buckeye Road from 107th Avenue to 35th Avenue.

As indicated on Figure 20, traffic volumes crossing each screenline were less with the South Mountain Freeway than without the freeway: 30,300 (three percent) on screenline 1; 13,900 (two percent) on screenline 2; and 6,800 (three percent) on screenline 3. This indicates that the South Mountain Freeway will alleviate some of the traffic on arterial streets.

With the South Mountain Freeway, travel time in the I-10 corridor from Pecos Road to Washington Street in 2025 is estimated to be 28 minutes, about the same as today. Travel time in the 51st Avenue/I-10 corridor will decrease from 63 minutes without the South Mountain Freeway to 48 minutes with the freeway, which is a 24 percent decrease (Figure 21).

FREEWAY USERS

To determine who would use the South Mountain Freeway, a Select Link analysis was performed. In this analysis the origins and destinations of all vehicles forecasted to be on the South Mountain Freeway at the turning point near 51st Avenue and Pecos Road were plotted. The distribution is shown in Figure 22.



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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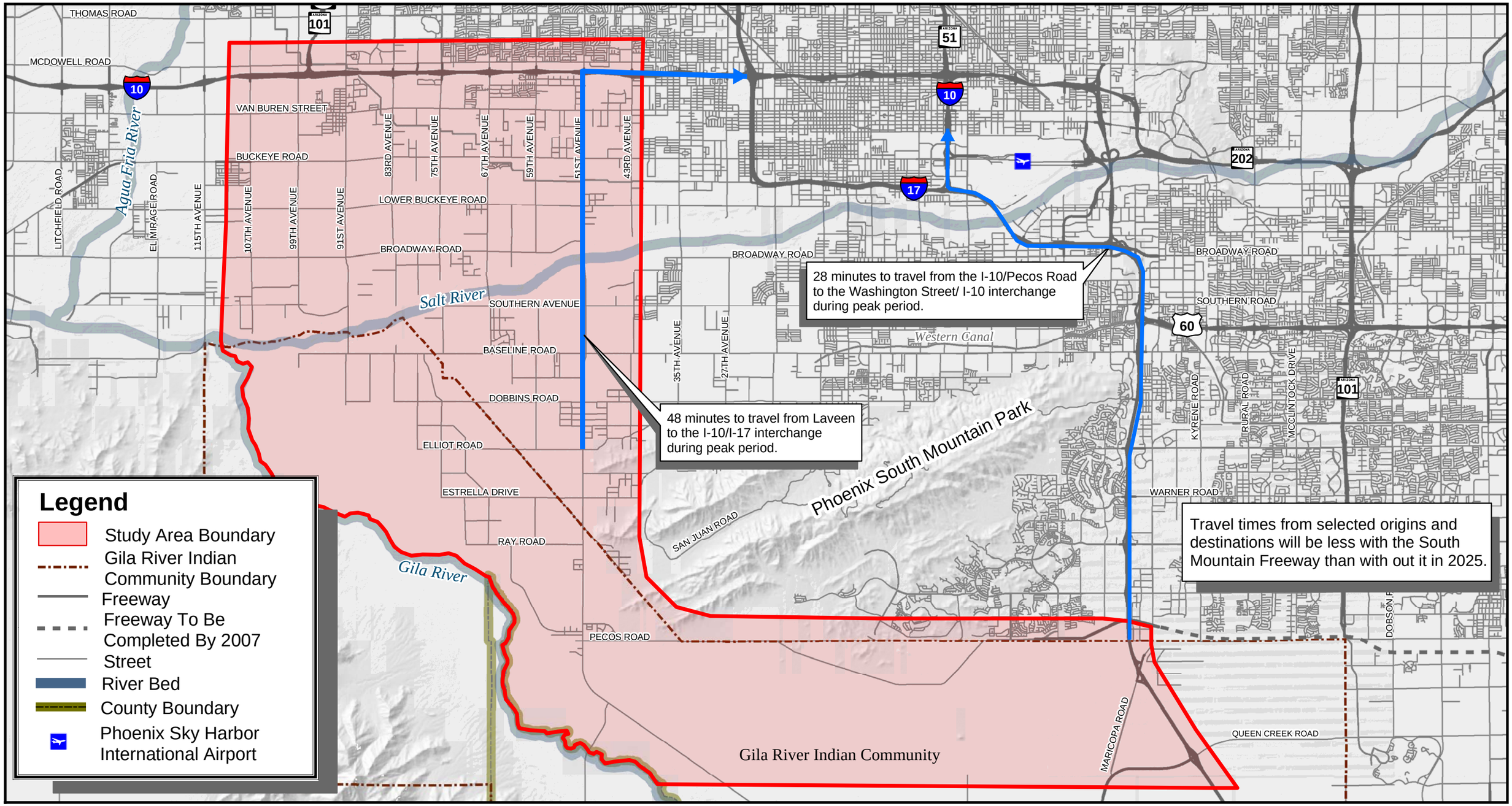
Screenline Analysis

Figure 20
Page 37



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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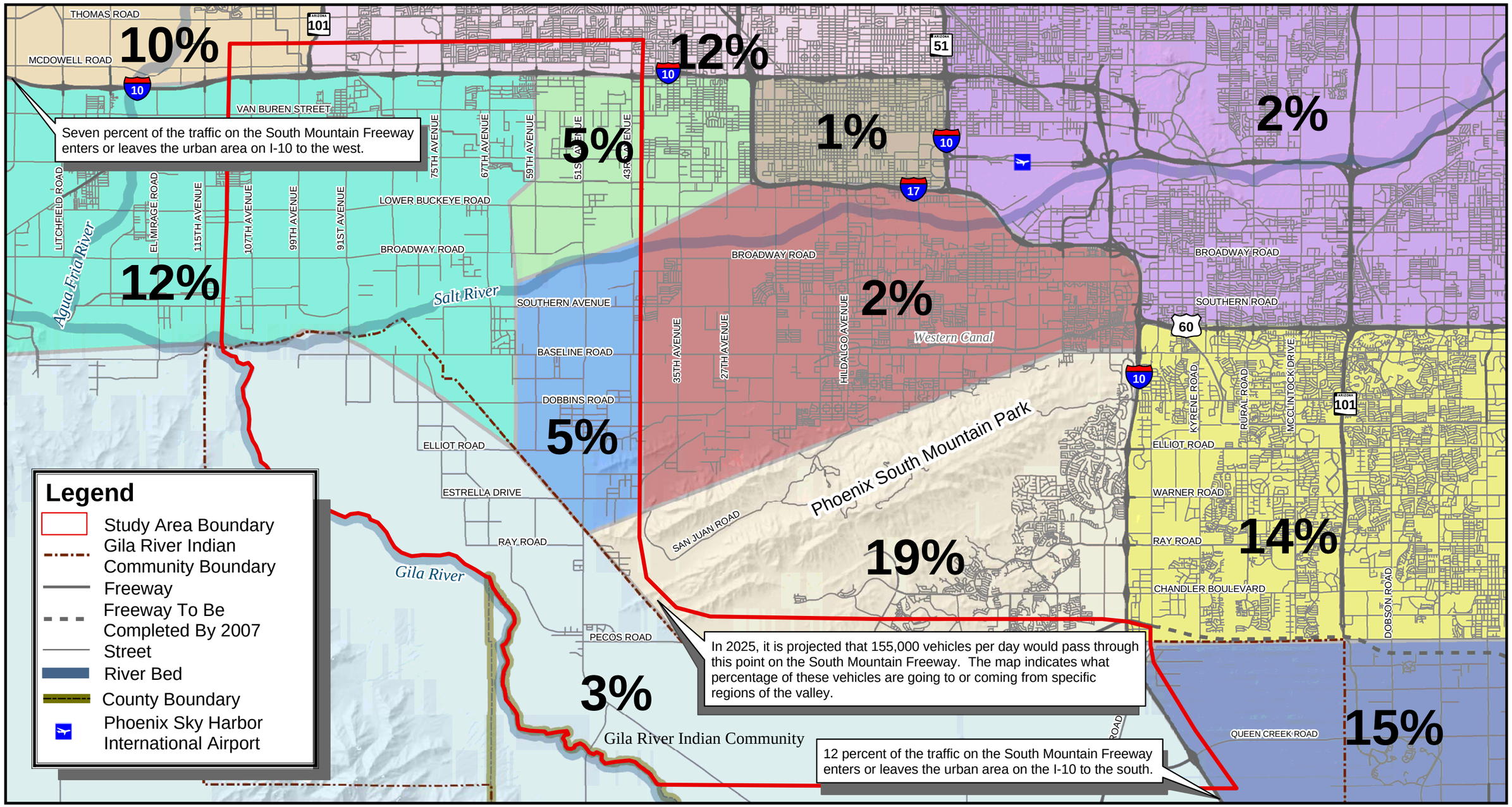
2025 Travel Times with the South Mountain Freeway

Figure 21
Page 38



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )
Source: MAG Model, 2001

N

0 1.25 2.5 5 Miles

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Trip Distribution on South Mountain Freeway in 2025

Figure 22
Page 39

CAPACITY DEFICIENCIES

Without a major regional roadway in the SMTC, the LRTP planned facility and services improvements would accommodate about 65 percent of the demand (operating at an acceptable LOS D) that is projected in 2021. Further best-case application of non-major regional roadway transportation modal improvements would capture about 13 percent of the remaining 35 percent excess demand, leaving a 22 percent capacity deficiency in the MAG region transportation network of facilities and services. A freeway in the SMTC is projected to capture seven percent, or 155,000, average daily trips.

CONCLUSIONS

As the results of the traffic analyses show, there is a need for a major regional roadway in the SMTC for the following reasons:

- Current operating conditions during peak periods on regional transportation facilities in the study area and its vicinity are congested, with much of the network operating at unacceptable LOS.
- Travel within the MAG region is projected to increase about 58 percent over the next 20 years. The majority of metropolitan-area freeways and arterials are projected to operate at LOS E or worse without a major regional roadway in the SMTC.
- The length of travel time during peak periods will increase substantially between 2002 and 2025.
- Without a major regional roadway in the SMTC, the 2001 LRTP planned facility and services improvements would accommodate about 65 percent of the total demand (operating at an acceptable LOS D) that is projected in 2021.
- Best-case non-freeway modal transportation improvements, including transit, TDM/TSM, roadway improvements (not including a major regional roadway in the SMTC), alone or cumulatively, are not enough to adequately address the projected 2021 capacity deficiencies.
- A freeway in the SMTC would reduce projected volumes on the remaining RFS and the local roadway network compared to the RFS and network without a freeway in the SMTC.

3. Purposes for the Proposed Action

The purposes of constructing and operating a major roadway facility in the SMTC are:

- to provide a regional system linkage with the remainder of the RFS, which was approved by Maricopa County voters in 1985;
- to meet the objectives of adopted local land use plans, which have been developed around the concept of a major transportation facility in the southwest part of the region; and
- to serve part of regional mobility needs resulting from rapid population growth and associated travel demand, much of which will occur in the southwest part of the region.

SYSTEM LINKAGE

The MAG RFS is a major component of the LRTP to address the region's transportation needs, and it was designed to function as an integrated freeway network. System continuity is important for optimizing the effectiveness of individual network segments. With transportation networks, the whole is greater than the sum of the parts.

Recently funded improvements to 202L, I-10, and US 60, as well as the recent completion of the Price Freeway (State Route 101), assumed that there would be a South Mountain Freeway in the study area in the future. If a major transportation facility were not built to provide this capacity, future traffic distributions and volumes would vary from those used to design other major facilities. Due to these discrepancies, various features of recent improvements could be oversized, undersized, and/or could operate in a manner that does not satisfy the intended uses.

The South Mountain Freeway was proposed as a segment of the 202L in part to accommodate longer trips in the MAG region and to reduce demand on other parts of the RFS, metropolitan highways, and local roads. Without a connecting South Mountain link, the Santan Freeway would be underutilized in 2025 because I-10 does not have the capacity to accept the full traffic volume the Santan could deliver. Trips that might have used the Santan Freeway would be forced to distribute among other available but congested routes.

LEGISLATION – REGIONAL AND LOCAL PLANNING

Regional Planning Context

See the "South Mountain Transportation Corridor Project Status" section of this memorandum regarding the purpose of the South Mountain Freeway within the regional planning context. In summary, when county voters passed Proposition 300 in October 1985, the public and local planning agencies expected that the RFS facility would be implemented as planned. The STB's approval of the South Mountain Freeway alignment in 1988 reinforced that expectation. The RFS facility has remained a component of the MAG LRTP since its inception. Therefore, a

major transportation facility in the study area is consistent with regional and local planning objectives and public expectations.

Local Planning Context

The South Mountain Freeway is included in the City of Phoenix *General Plan Circulation Element* (City of Phoenix, 2001c). 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.

A number of 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. These include:
>
> - Completion of 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." A South Mountain Freeway is currently an integral component in two area land use plans for City of 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, 1999b). 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 13 years have been made assuming a South Mountain Freeway generally in the vicinity of the 1988 alignment.

4. Conclusions

There is a clear and defensible need to continue preparing the EIS for the proposed action. Specifically, based on the conclusions outlined below, there is a clear purpose and need for a major regional roadway in the SMTC.

- In 2025, the MAG area is projected to have a population of about 5 million, almost 2 million dwelling units, and an employment level of 2.4 million. These projections would result in increased travel demand that would further burden the existing and planned regional transportation system.
- The rationale for selecting the study area as the location for a major new transportation facility is supported by:
  - the context of past and current regional planning described in the "South Mountain Transportation Corridor Project Status" section of this memorandum;
  - the context of the projected population distribution trends in the southwestern MAG region; and
  - the existence of physical (South Mountain), and jurisdictional (GRIC) constraints in the southwestern MAG region that are not conducive to regional mobility needs and that limit the locations of regional transportation facilities. Specifically:
    - GRIC has few roads with regional mobility value (existing roads function primarily as local circulation roads);
    - South Mountain is a large municipal park and a physical impediment to constructing a regional transportation facility.
- The result of the traffic analyses is a need for a major regional roadway in the SMTC for the following reasons:
  - Current operating conditions on the regional network in the study area and its vicinity are congested, with much of the network operating at unacceptable LOS.
  - Travel within the MAG region is projected to increase about 58 percent over the next 20 years. The majority of metropolitan-area freeways and arterials are projected to operate at LOS E or worse without a major regional roadway in the SMTC.
  - The length of travel time during peak periods of travel in the same areas will increase substantially.
  - Without a major regional roadway in the SMTC, the LRTP planned facility and services improvements would accommodate about 65 percent of the total demand (operating at an acceptable LOS D) that is projected in 2021.
  - Best-case non-freeway modal transportation improvements, including transit, TDM/TSM, roadway improvements (not including a major regional roadway in the SMTC), alone and cumulatively, are not enough to adequately address the projected 2021 capacity deficiencies. Further, such best-case scenarios are not planned for or funded.
  - A freeway in the SMTC would reduce projected volumes on the remaining RFS and the local roadway network compared to the RFS and network without a freeway in the SMTC.
  - A freeway in the SMTC in 2021 would enhance travel times and reduce congested areas compared to the SMTC without a freeway.

- A major regional roadway in the SMTC is a major component in the MAG RFS, which is intended to function as an integrated freeway network. The system linkage provided by such a facility optimizes the system continuity, which is important for overall RFS operation.
- A major regional roadway in the SMTC is an important component of past and current planning efforts. Maricopa County, Phoenix, Laveen, Estrella, Tolleson, and Avondale have all made transportation, land use, and economic planning decisions within the context of having a major regional roadway in the study area.

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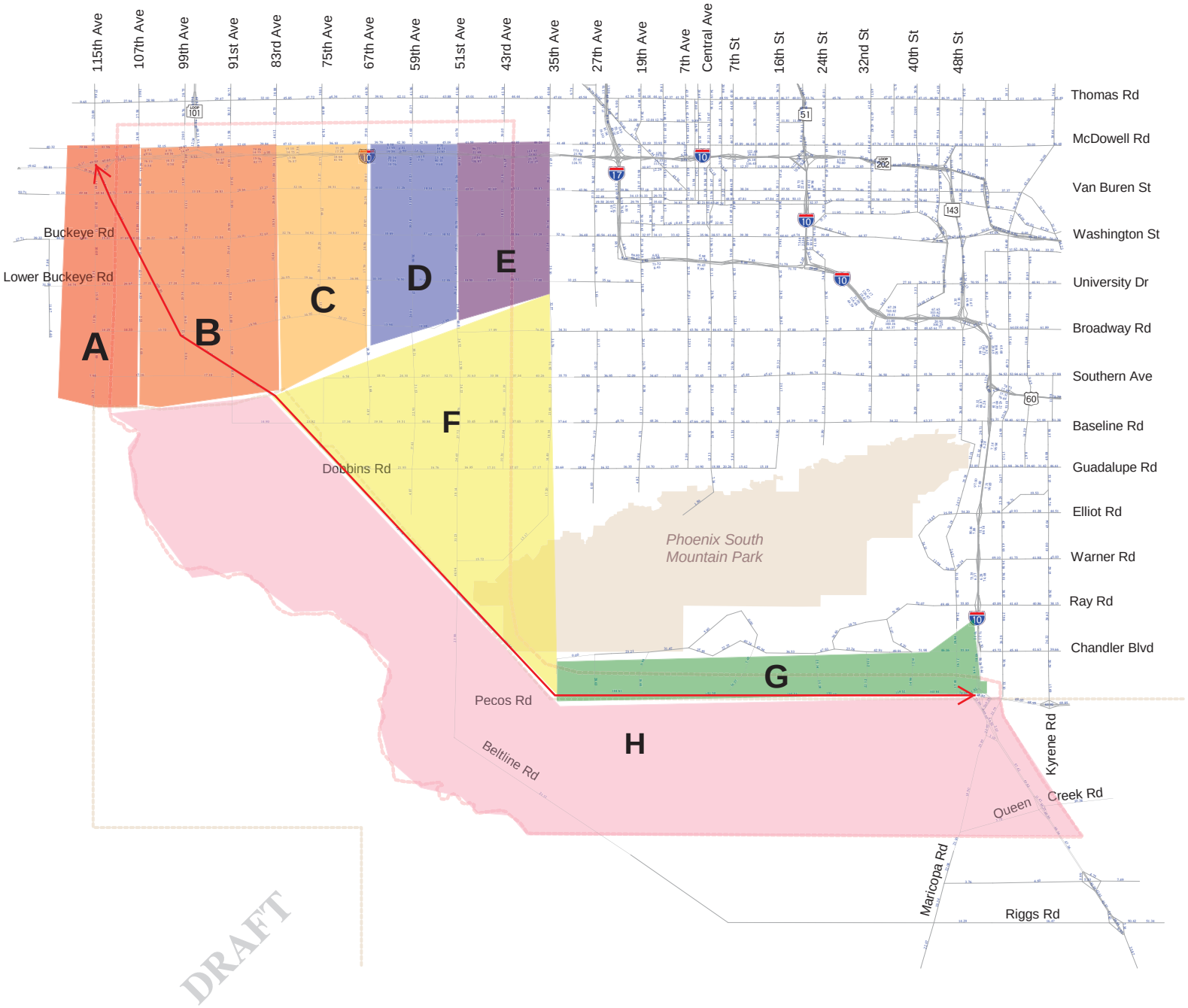
6. Appendix A – Purpose and Need Technical Memorandum Traffic Analysis

N

SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE A



Note: Shaded areas represent the distinct corridors within the Study Area used during the alternatives development and screening process.

0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

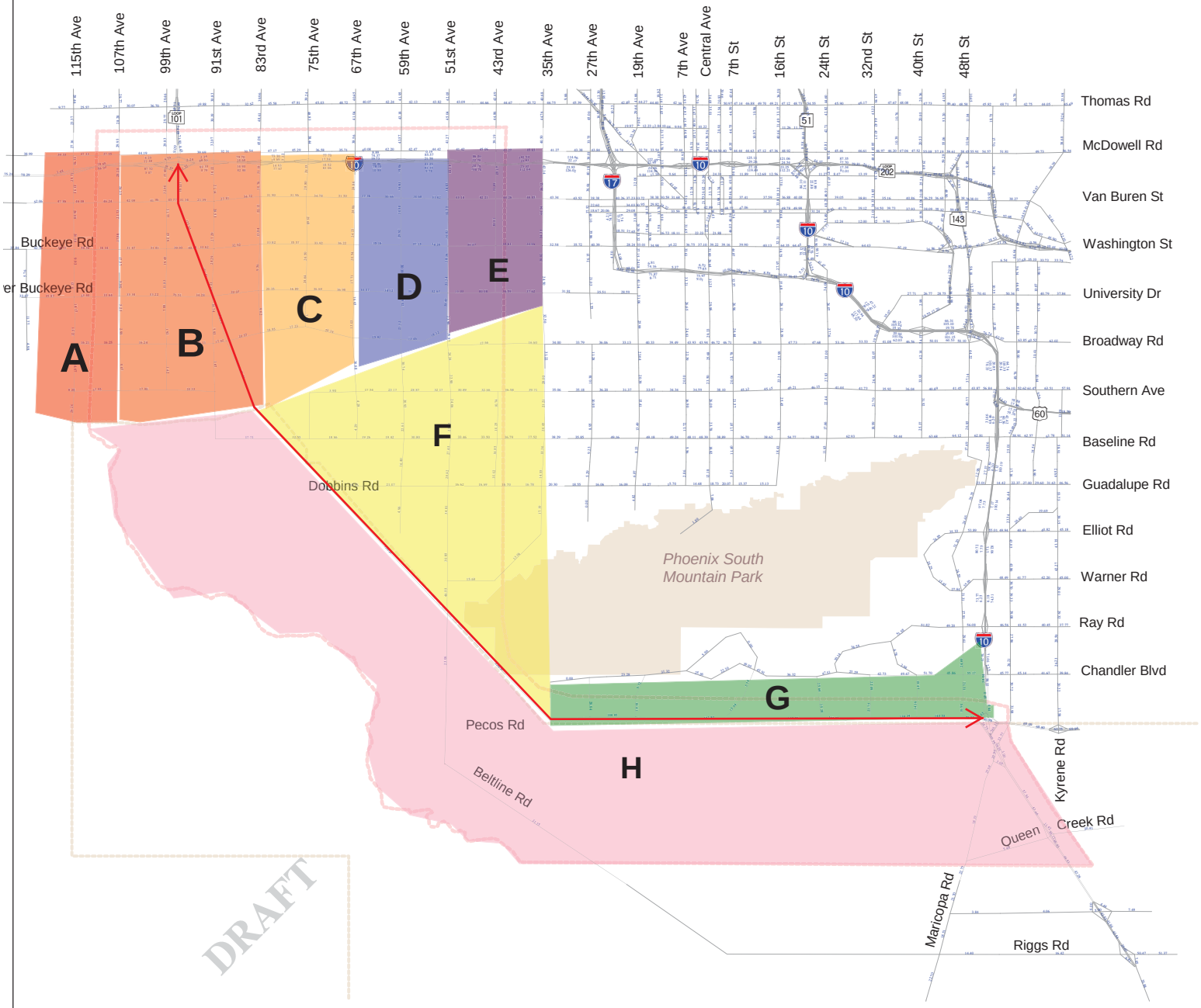
0 1 2 3 4 5 Miles

Draft: 4/12/02

N

SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE B



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0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

0 1 2 3 4 5 Miles

Draft: 4/12/02

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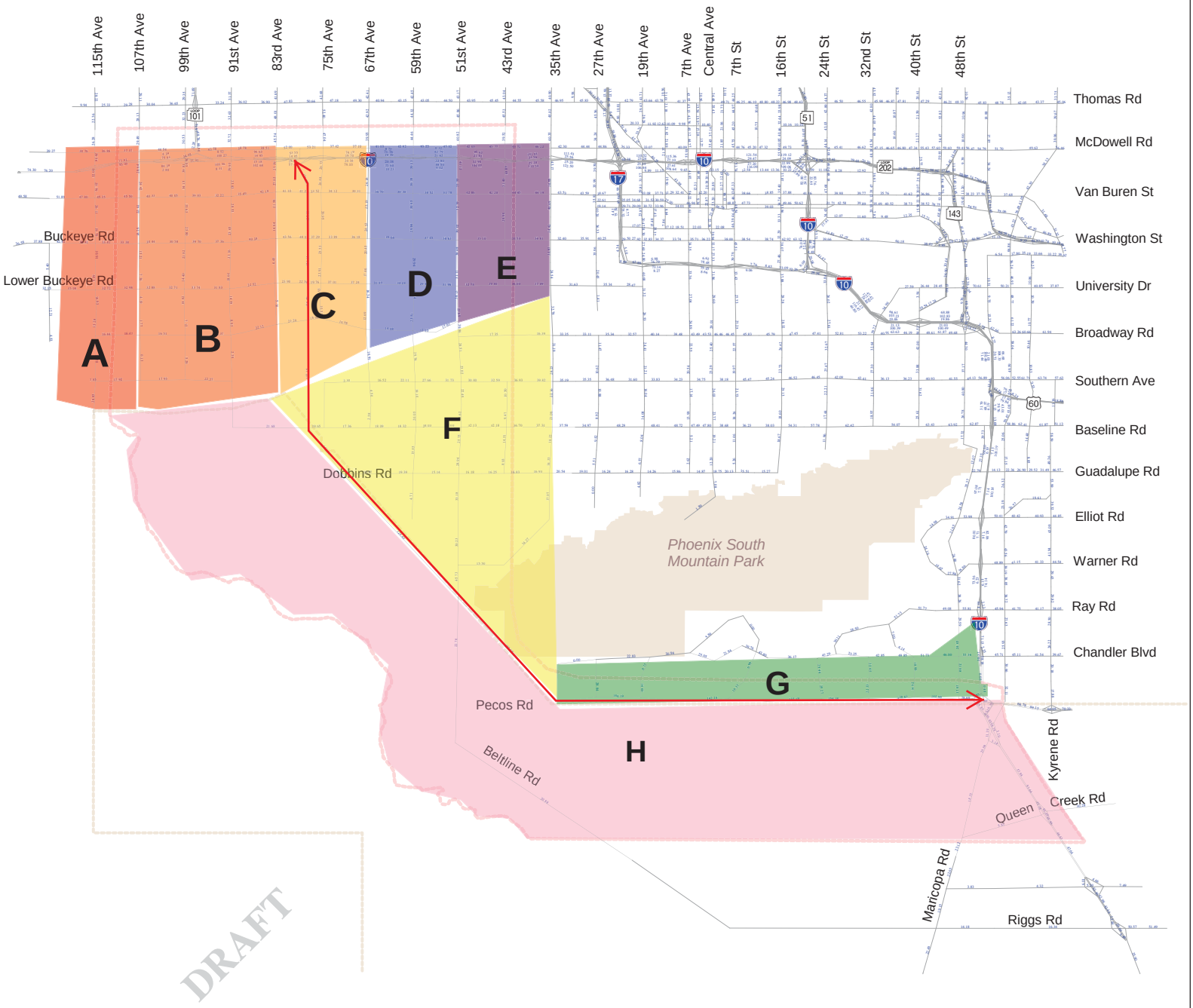
SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE C



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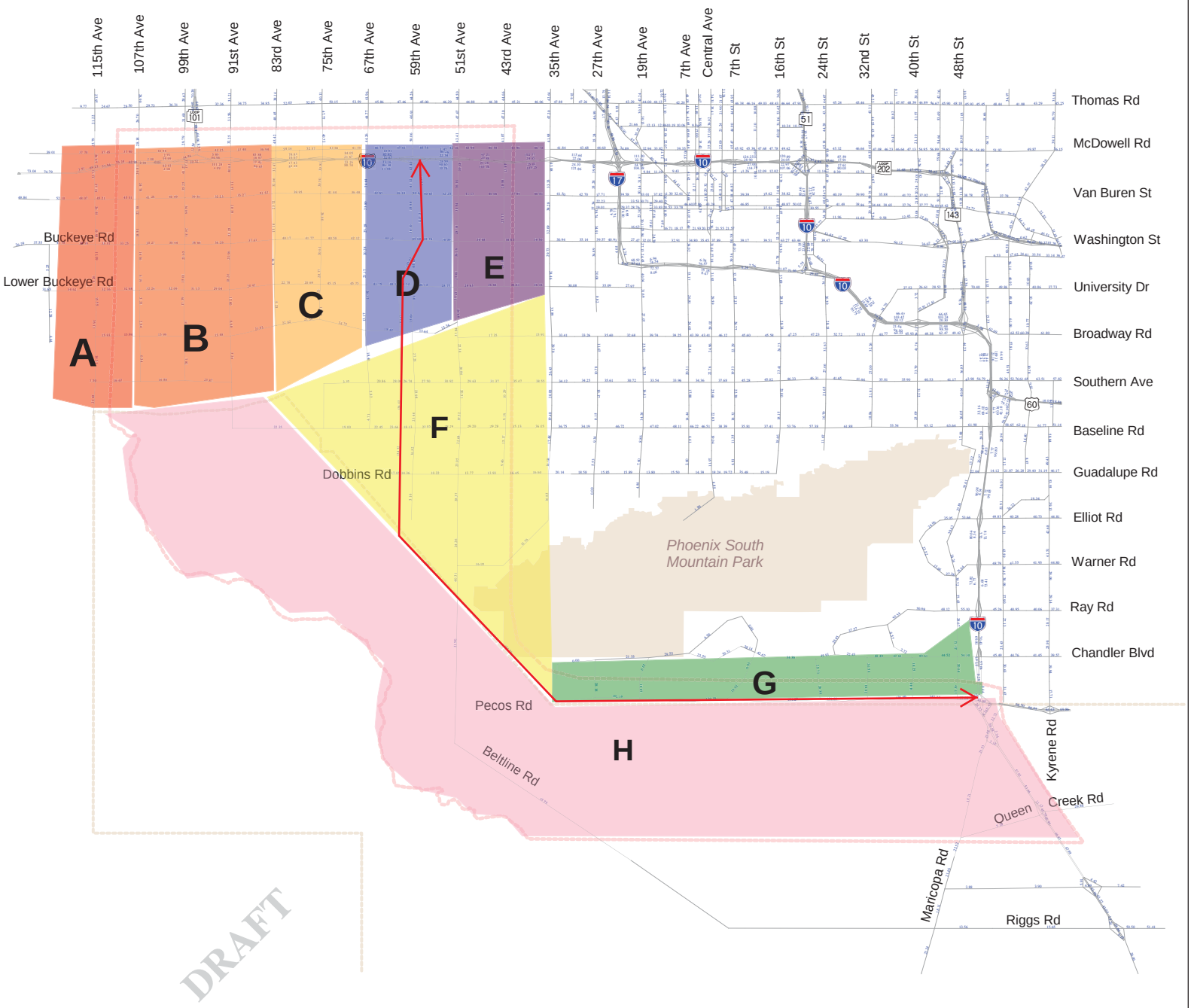
0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

0 1 2 3 4 5 Miles

Draft: 4/12/02

SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE D



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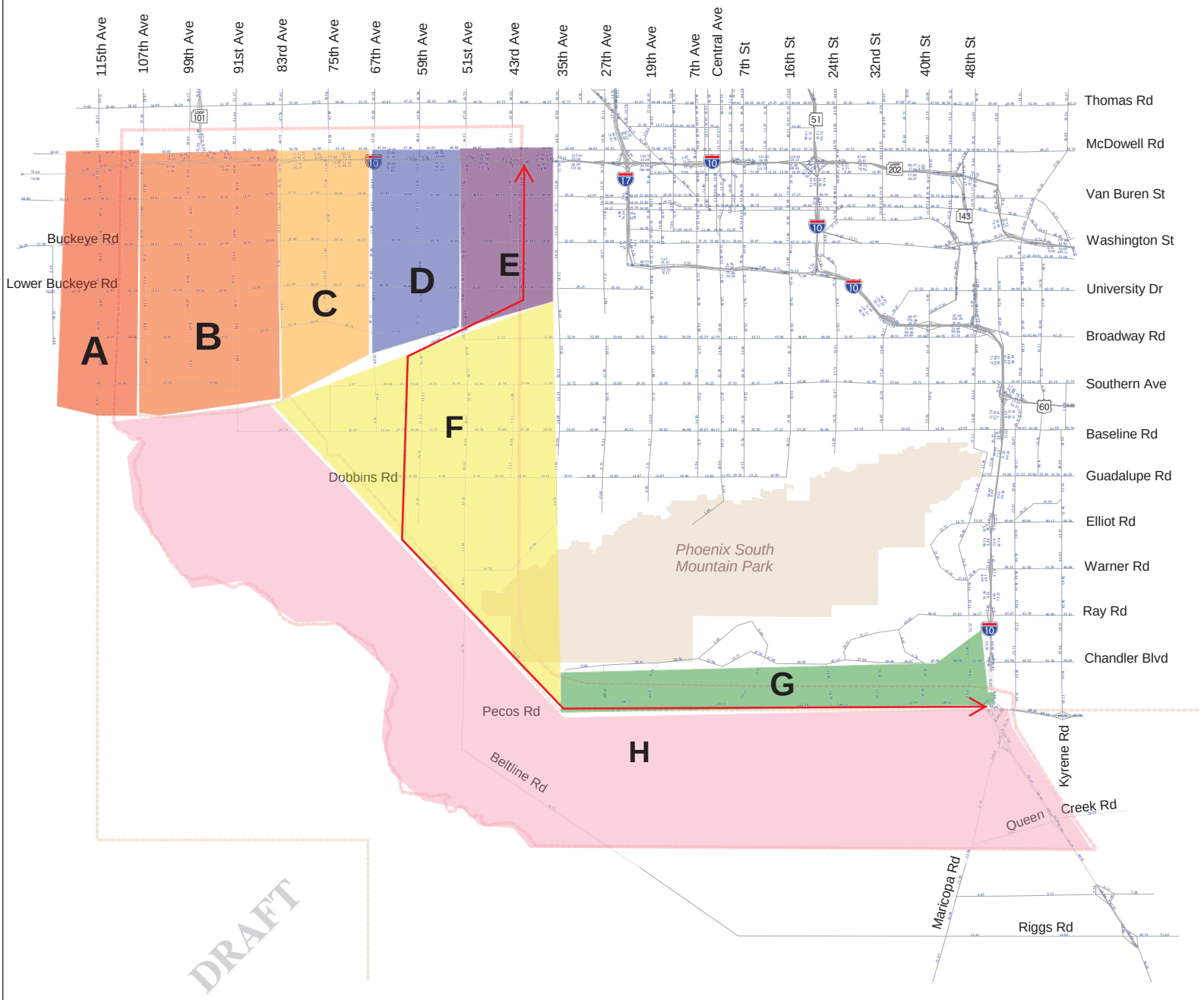
0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

0 1 2 3 4 5 Miles

Draft: 4/12/02

SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE E



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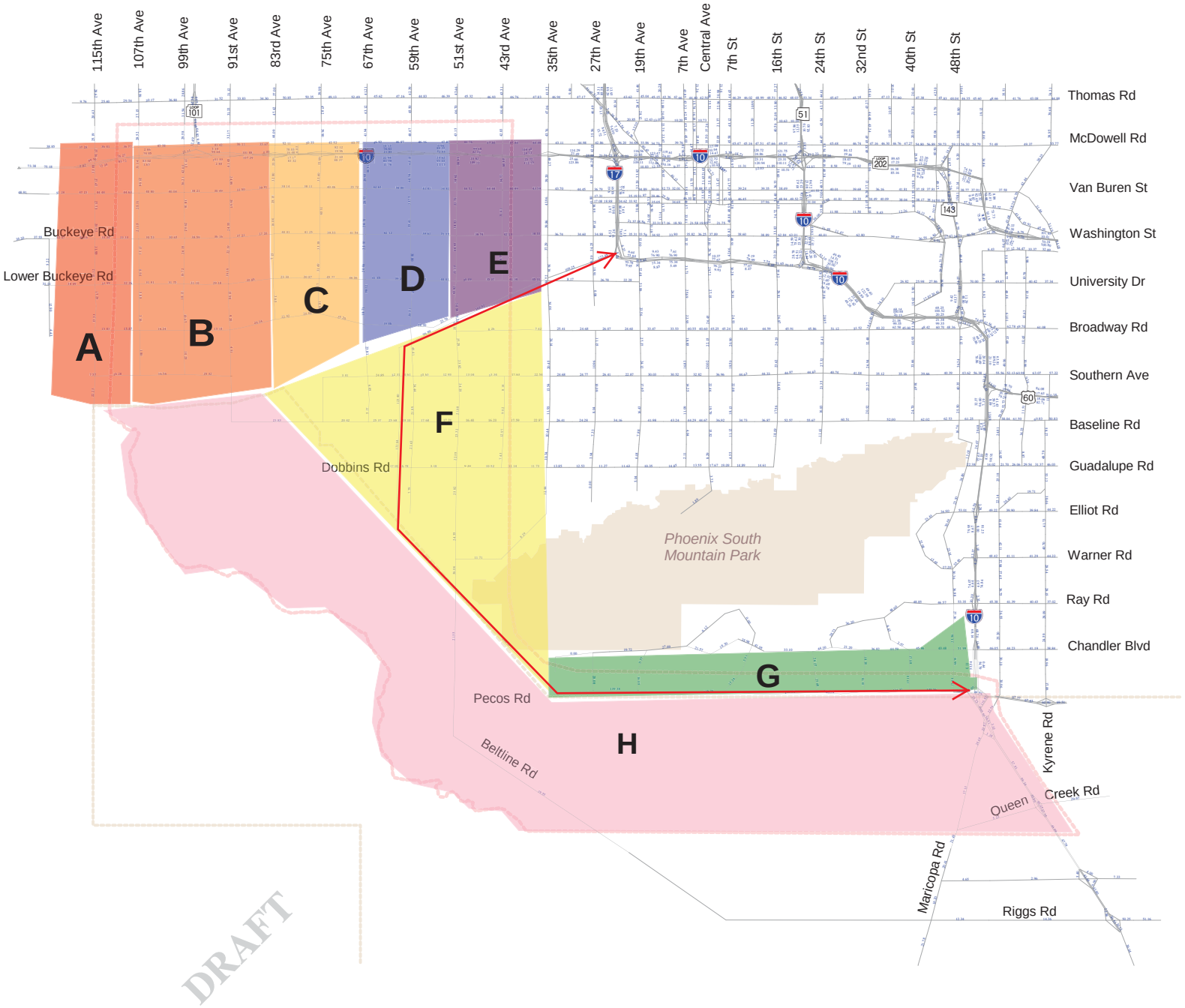
0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

0 1 2 3 4 5 Miles

Draft: 4/12/02

SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE F



Note: Shaded areas represent the distinct corridors within the Study Area used during the alternatives development and screening process.

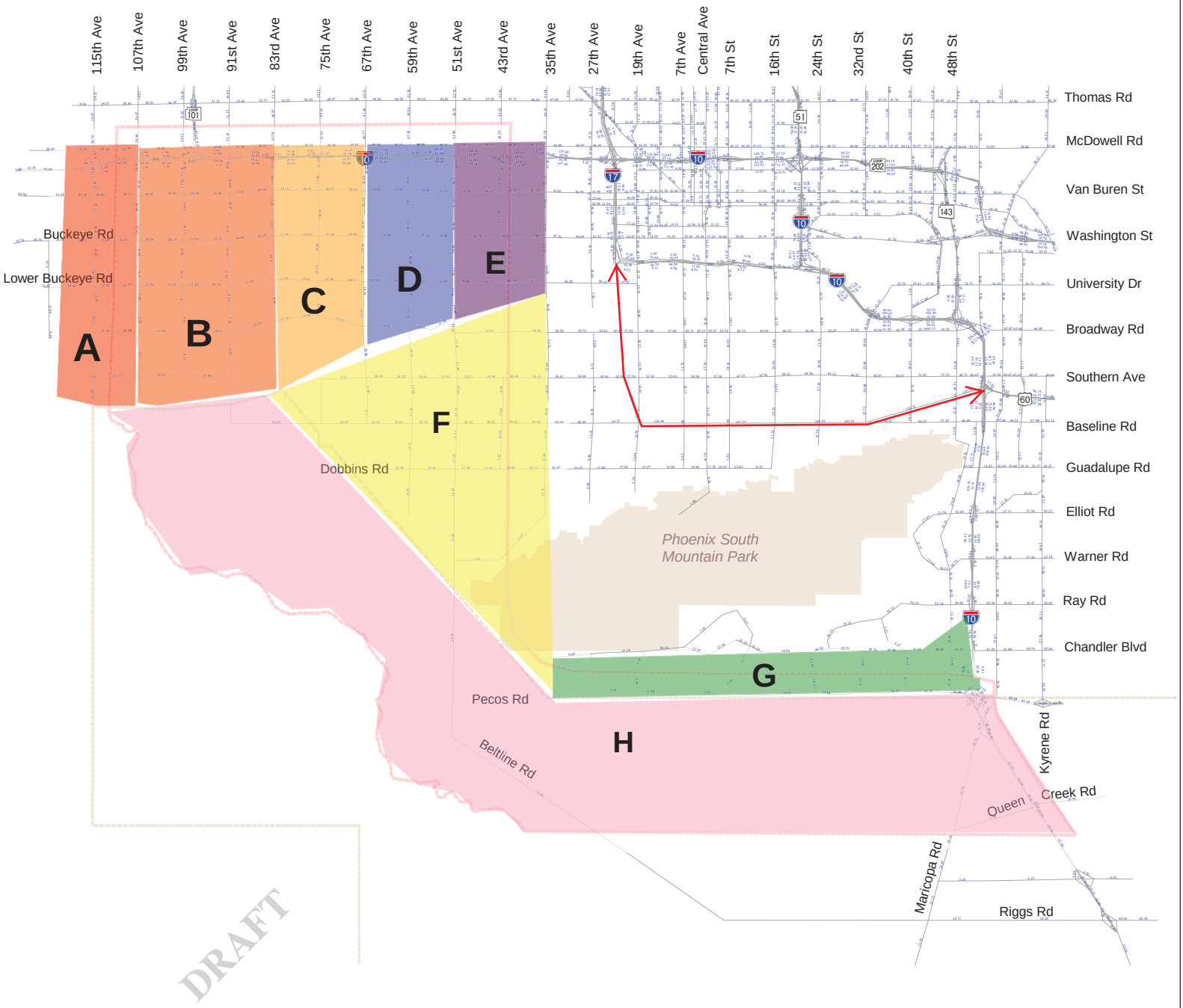
0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

0 1 2 3 4 5 Miles

Draft: 6/12/02

SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE G



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0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

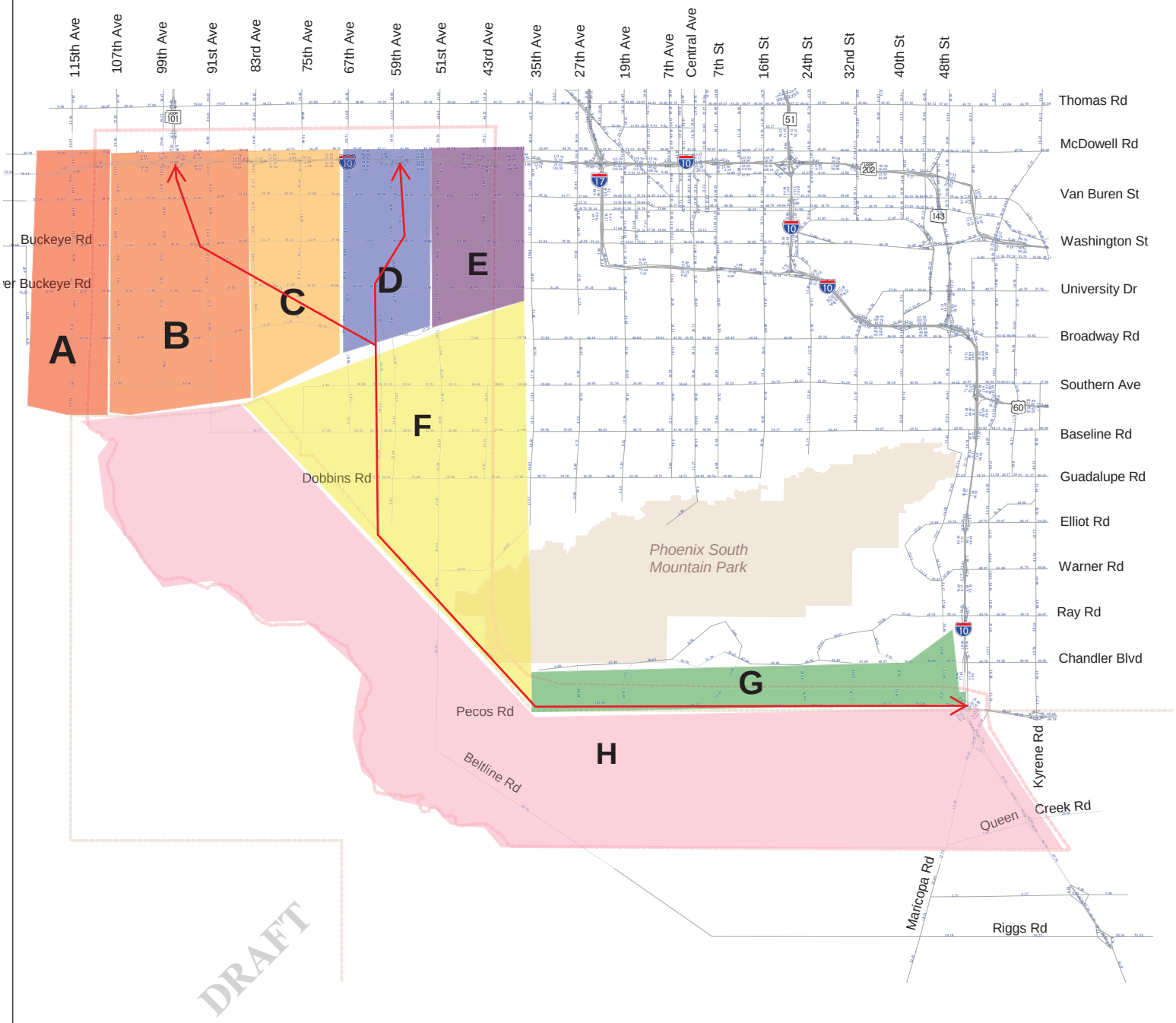
0 1 2 3 4 5 Miles

Draft: 6/12/02

N

SOUTH MOUNTAIN CORRIDOR STUDY

AVERAGE DAILY TRAFFIC VOLUMES
ALTERNATIVE H



Note: Shaded areas represent the distinct corridors within the Study Area used during the alternatives development and screening process.

0.00 Volume in Thousands
Study Area Network
Study Area
Gila River Indian Community Boundary
Phoenix South Mountain Park

0 1 2 3 4 5 Miles

Draft: 6/12/02

To	Project File
From	Christopher Clary-Lemon and Rob Ripmaster
Date	January 8, 2003
Subject	ADOT South Mountain EIS & L/DCR

M e m o r a n d u m

RE: South Mountain EIS & L/DCR – Development of Technical Alternatives

Introduction

One of the primary goals of the South Mountain Environmental Impact Statement (EIS) and the Location and Design Concept Report (L/DCR) is the development of alignment alternatives for which impacts, both positive and negative, can be ascertained. Over the previous six months, alignment alternatives have been sought from both public as well as governmental entities. The intent of this process was to determine where various groups believed the alignment would best serve their needs, both now and in the future.

This memorandum presents the process that was undertaken to solicit public and governmental comments, refine alignment alternatives collected and determine which alignment alternatives will be carried forward to the second round of screening.

Process

The development of the initial technical alternatives for consideration is broken down into three main areas. The first area, public input, focused mainly on soliciting alignment alternatives from various groups of citizens. Once these alignment alternatives were collected, HDR analyzed each to determine its intent and used basic engineering standards to establish technical alternatives that would meet the projects design criteria. Presentation of these technical alternatives to the local municipalities within the project area constituted the third area. At these presentations, comments and suggestions were also solicited, in one case leading to an additional alternative for consideration.

Following completion of these three main areas, the technical alternatives will be subjected to a second screening through the use of Geographic Information System (GIS) data to determine the impacts associated with each technical alternative and ultimately lead to the selection of which technical alternatives will be carried forward for study in greater detail within the EIS and L/DCR.

Analysis of Publicly Provided Alternatives

To best determine how to meet the travel needs of the residents within the project area, the Project Team (Arizona Department of Transportation (ADOT) and HDR) decided to bring to question to the public. The Project Team met with several groups including the Maricopa County Farm Bureau, the Village Planners, and the Citizen Action Team (CAT), to name a few. The purpose of these meetings was to bring together the Project Team with various interested

groups to explain the scope of the project, what its desired outcome would be, and to solicit input related to alignment alternatives. A total of ## meetings were held over the course of several months.

Through these meetings, a total of 30 public alignment alternatives were developed, as shown in **Figure 1**. The alignment alternatives collected reflect a wide range of alignments with various connections to the regional freeway system. Northern connections ranged from as far east as US Route 60 to as far west as 115th Avenue. The southern portion of the alignments ranged from Pecos Road to five miles deep into the Gila River Indian Community (GRIC).

The 30 alignment alternatives were then entered into CADD to simplify the analysis. As mentioned above, many of the alignment alternatives collected ran outside the study area for this project, and thus were not considered in their entirety. Additionally, at the time the technical alternatives were being developed, ADOT did not have the consent of the GRIC to study alternatives of their land, and thus, any alternative that ran within the GRIC was not considered. Rather than simply eliminate these alignment alternatives from consideration, the intent of these alignments was studied to determine if the intent could be met with an alternative that was off the GRIC lands and within the project area.

Ultimately, the 30 alignment alternatives generated through public comment lead to the creation of eight (8) technical alternatives. All 30 alternatives were investigated when determining the technical alternatives. It should be noted that most of the public alternatives were drawn free hand with no knowledge of environmental restrictions and geometric criteria that might pertain. The 30 alignment alternatives were developed into the eight technical alternatives described below and shown in **Figure 2**. As stated above, ADOT does not currently have permission to study alignments that run onto the GRIC, and thus, all technical alternatives will follow the Pecos Road alignment between 51st Avenue and I-10 (Maricopa).

[Note: Within the discussion below, alternatives labeled "T##" refer to technical alternatives created by the Project Team while alternatives labeled "P##" refer to alignment alternatives created by the public.]

Alternative T01

Alternative T01 represents the 1988 alignment designed by ADOT as part of the Maricopa Association of Governments (MAG) regional freeway plan. Beginning at the eastern terminus, the southern portion runs along the Pecos Road alignment then travels in the northwest direction along the GRIC boundary. The alignment then turns north, running just west of 59th Avenue and tying in to I-10 (Papago) near 55th Avenue.

Alternative T01 takes into consideration four public alignment alternatives; P01, P16, P26 and P27.

- The differences between Alternatives T01 and P01 are minimal; both for the most part running between 51st and 59th Avenues until the GRIC border just south of Elliot Road.

- Alternative T01 differs from P16 in that the north - south portion of Alternative P16 runs between 59th and 67th Avenues. Otherwise they follow the same alignment.
- Alternatives P26 and P27 also follow the same basic alignment in the north – south portion until they run into the GRIC border. They are not followed from that point on.

Alternative T02
Alternative T02 follows a north - south alignment between 91st and 99th Avenues. The alternative begins to take a diagonal alignment approximately at Broadway Road. It continues to follow along the GRIC border to Pecos Road and then on until the I-10 (Maricopa) interchange.

Alternative T02 takes into consideration six public alignment alternatives; P02, P06, P08, P12, P19, and P30.

- Alternative P02 also follows a north – south alignment between 91st and 99th Avenues. The alignment continues south into the GRIC between Southern Avenue and Baseline Road and therefore not studied while inside the border. The alignment however exits the border at Pecos Road and continues to follow the border to I-10, as does T02.
- Alternatives P08 and P19 each enter the GRIC between Southern Avenue and Baseline Road as well. The alignments never exit the GRIC, therefore are not studied from this point on.
- Alternative P30 has a north – south alignment that runs further east between 83rd and 91st Avenues. This alignment crosses the GRIC border near Dobbins Road and is not studied from there on.
- Alternative P06 is the most closely resembling alternative to T02 differing only in that its north - south alignment runs further south. P06 begins its eastward direction just south of Southern Avenue.

Alternative T03
Alternative T03 is basically a hybrid of Alternatives T02 and T04. The alignment effectively halves the two alternatives' north - south alignments then joining the two at the diagonal portion along the GRIC border.

Alternative T03 takes into consideration eight public alignment alternatives; P02, P03, P06, P07, P08, P12, P19, and P30. For descriptions of how these public alignment alternatives are reflected in Alternative T03, refer to their discussion under Alternatives T02 and T04.

Alternative T04
Alternative T04 is similar to Alternative T02 differing in that it starts its diagonal alignment more north near Buckeye Road.

Alternative T04 takes into consideration two public alignment alternatives; P03 and P07.

- Alternative P03 takes a more north - south, east - west approach than Alternative T04. Alternative P03 takes a north – south alignment until Broadway Road. The alignment then runs east along Broadway until 67th Avenue where it begins to turn south again

running down near 59th Avenue. Once it reaches the GRIC border south of Elliot Road the Alternative runs along it until Pecos Road and on until the I-10 (Maricopa) interchange.

- Alternative P07 takes a north – south alignment until Buckeye Road. The alignment then runs diagonal southeast until just north of 51st and Southern Avenues. The Alternative runs north – south into the GRIC for a short time before it reaches Pecos Road to join up with Alternatives T04 and P03.

Alternative T05

Beginning at the eastern terminus, the southern portion of Alternative T05 runs along the Pecos Road alignment then travels in the northwest direction along the GRIC boundary. The alignment then turns north, running between 67th and 75th Avenues until Broadway Road, where it shifts to a northwest direction joining into I-10 (Papago) near 79th Avenue.

Alternative T05 takes into consideration one public alignment alternative; P29.

- Alternative T05 resembles P29 in that they both start their north - south alignments between 75th and 83rd Avenues. Alternative T05 goes on to merge with Alternative T06 running south until the GRIC border before beginning its diagonal run. P29 veers west to run down 83rd Avenue where T05 veers east to run down between 67th and 75th Avenues. Otherwise they are very similar.

Alternative T06

Alternative T06 follows a north - south alignment between 67th and 75th Avenues. The alignment reaches the GRIC border between Baseline Road and Dobbins Road, follows the border to Pecos Road, and on to the I-10 (Maricopa) interchange.

Alternative T06 takes into consideration three public alignment alternatives; P12, P20, and P22.

- Alternative P12 follows the north – south alignment of T06 closely except that it ia slightly west down 75th Avenue. The alignment crosses the GRIC border between Baseline Road and Dobbins Road; therefore it is not studied from then on.
- Alternative P20 follows the north – south alignment of P12 exactly; that is down 75th Avenue. The alignment crosses the GRIC border between Baseline Road and Dobbins Road; therefore it is not studied from then on.
- Alternative P22 is also similar to P12 except that it heads southeast to follow along the GRIC border for a short time south of Baseline Road. The alternative crosses the GRIC border at Estrella Drive and is not studied from then on.

Alternative T07

Alternative T07 begins its north - south alignment between 43rd and 51st Avenues crossing west between Buckeye Road and Lower Buckeye Road to run down between 51st and 59th Avenues. T07 runs to the GRIC border south of Estrella Drive, from there following along the border to the I-10 (Maricopa) interchange.

Alternative T07 takes into consideration one public alignment alternative; P26.

- Alternative P26 is similar although it begins its north - south alignment between 51st and 59th Avenues crossing west between Buckeye Road and Lower Buckeye Road to run down 59th Avenue. P26 crosses into the GRIC south of Estrella Drive and is not studied from there on.

Alternative T08
Beginning at the eastern terminus, Alternative T08 runs along the Pecos Road alignment then shifts to a northwest alignment along the GRIC border. The alignment then turns north at 51st Avenue and continues northward between 43rd and 51st Avenues until tying in to I-10 (Papago) near 47th Avenue.

Alternative T08 takes into consideration one public alignment alternative; P21.

- Alternative T08 takes the basic premise of P21 and shifts the major portion of the north - south alignment east to run down between 43rd and 51st Avenues. Alternative T08 joins back up with P21 near the GRIC border before angling east along the border to Pecos Road. P21 continues to run into the GRIC south of Estrella Drive and therefore is not followed from that point on.

As shown above, the initial analysis of the 30 public alignment alternatives yielded eight technical alternatives. These alternatives were then discussed with the entire Project Team, which determined it was best to bring these to the local municipalities to get their feedback on the progress made to date.

Presentation of Technical Alternative to Municipalities and Governmental Organizations
The next step in the development of concept alternatives for the EIS and L/DCR was to bring the eight technical alternatives which were generated from the 30 public alignment alternatives to the local governments to get their feedback on how the alternatives would impact their communities, both positively and negatively. Municipalities included the likes of the cities of Tolleson and Phoenix, among others, as well as the GRIC and MAG.

These groups (municipalities and governmental organizations) provided feedback as to alignment conflicts with features such as parks, schools, water treatment plants, etc. Copies of exhibits were marked up with areas where major conflicts may be present, as well as additional alignment alternatives that may be worth considering.

At the conclusion of these meetings, several technical alternatives needed minor changes in alignment. During this process another technical alternative, T09, was developed based on comments received. In addition to meeting the need expressed during these meetings, Alternative T09 also reflects many of the public alignment alternatives received several months prior.

Alternative T09
The north - south portion of Alternative T09 runs along 107th Avenue veering slightly east to run south between 99th and 107th Avenues. The alignment begins its diagonal run along the GRIC border just north of Broadway Road. Alternative T09 continues along the border on Pecos Road and on to the I-10 (Maricopa) interchange.

Alternative T09 takes into consideration five public alignment alternatives; P04, P05, P23, P24, and P28.

- Alternative P04 also has its north - south portion running down 107th Avenue. The Alternative shifts to head east between Buckeye Road and Lower Buckeye Road. It resumes its north - south alignment between Lower Buckeye Road and Southern Avenue at 59th Avenue. P04 then follows the GRIC border on to the I-10 (Maricopa) interchange.
- Alternative P05 is very similar to P04 except in the fact that its initial north – south alignment begins just west of the study area. Besides that it is the same alignment.
- Alternative P23, like T09, begins it north – south alignment running along 107th Avenue. Alternative P23 continues to follow 107th Avenue beginning its diagonal run just south of Lower Buckeye Road. The alignment follows the GRIC border until 51st Avenue where it enters the GRIC and is not followed from then on.
- Alternative P24 is very similar to P23. The alternative enters the GRIC though more north near 83rd Avenue and is not followed from there on.
- Alternative P28 also begins its north – south portion along 107th Avenue. The Alternative heads east along Broadway Road, then running just north and parallel to the GRIC border. P28 shifts south and enters the GRIC between 51st and 59th Avenues where it is not followed from then on.

Results of Public Alignment Alternatives Analysis and Presentation of Technical Alternatives
As can be seen from above analysis, while the intent of the 30 public alignment alternatives were investigated, not all were included in the development of the nine technical alternatives (**See Table 1**). Those alternatives that were outside the study area were not taken into consideration. Hence, alignment alternatives P09, P11, P13, P14, P15, P17, P18 are not listed above.

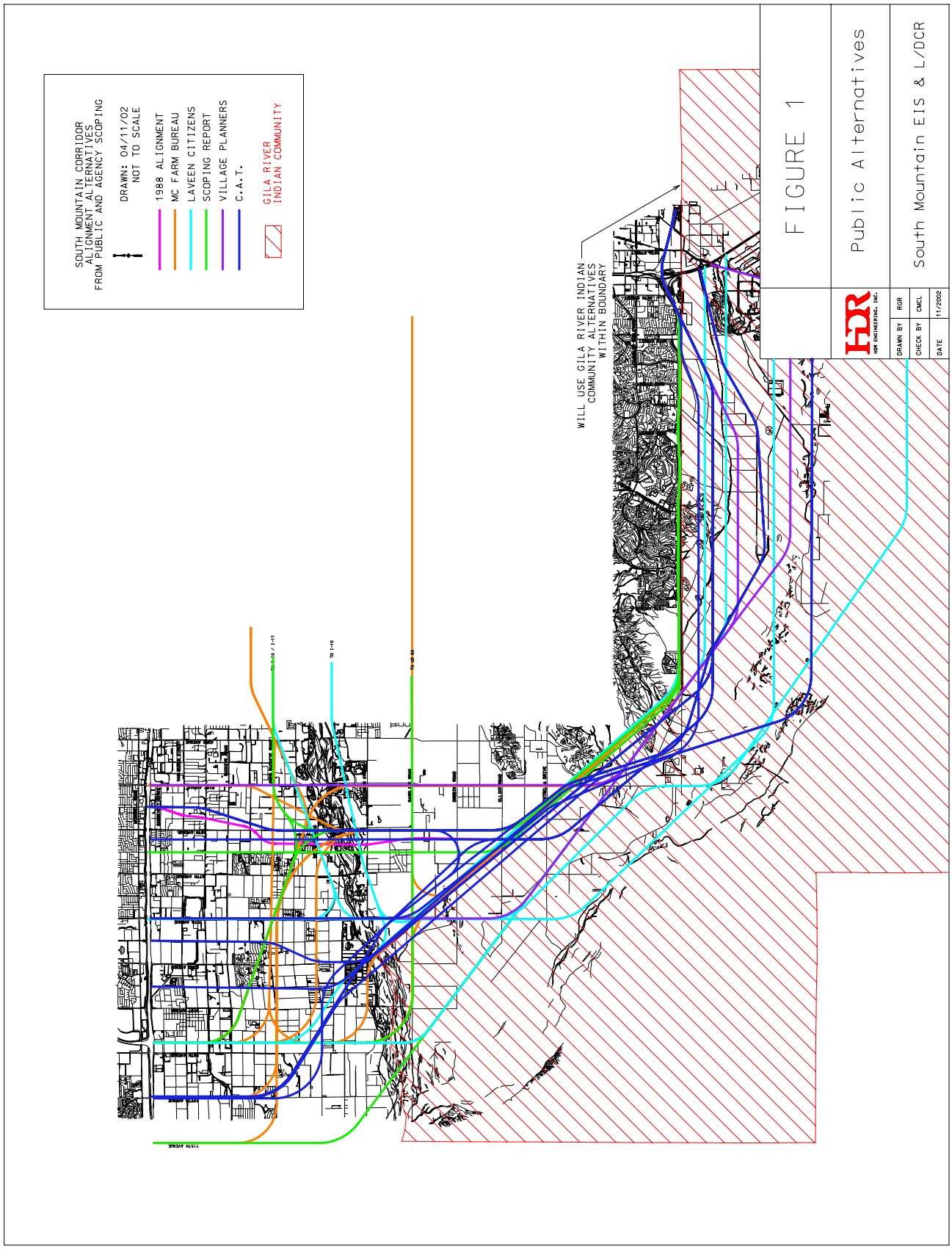
The two other alternatives not considered are alignment alternatives P10 and P25. Both of these had a split in the north - south portion of their alignments. This allowed for two routes that led to I-10, one of which would lead into the SR101L. These alternatives were not considered to be cost effective.

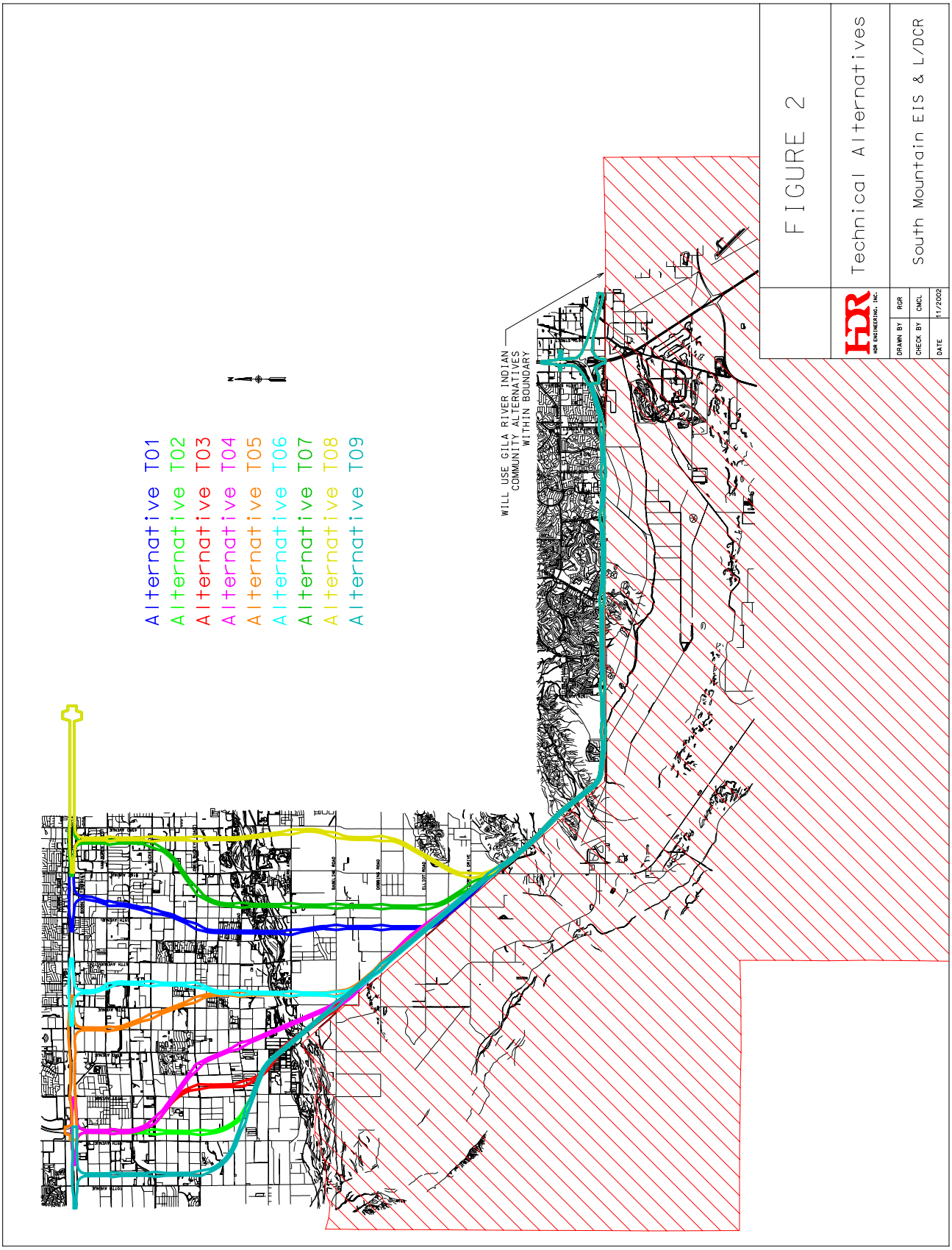
Table 1 South Mountain EIS and L/DCR Development of Technical Alternatives	
Alternative	**Public Alternatives Considered**
T01	P01, P16, P26, P27
T02	P02, P06, P08, P19, P30
T03	P02, P03, P06, P07, P08, P12, P19, P30
T04	P03, P07
T05	P29
T06	P12, P20, P22
T07	P26
T08	P21
T09	P04, P05, P15, P23, P24, P28
Not Included	P09, P10, P11, P13, P14, P15, P17, P18, P25

These nine Technical Alternatives will now be subjected to the second screening process in this study which will investigate each Alternative for impacts related to such areas as floodplains, threatened and endangered species, cultural resources and Section 4(f) properties, to name a few. Once the second screening is complete, the number of Technical Alternatives will be reduced and the remaining alternatives will be analyzed in greater detail for inclusion in the EIS.

Conclusion

It is concluded that the nine technical alternatives presented above reflect accurately the concerns of the public while factoring in environmental constraints and geometric criteria. They also present the most cost effective alignments that can be run through the study area at this point in the analysis and without inclusion of GRIC alternatives.


SOUTH MOUNTAIN CORRIDOR
ALIGNMENT ALTERNATIVES
FROM PUBLIC AND AGENCY SCOPING
DRAWN: 04/11/02
NOT TO SCALE
1988 ALIGNMENT
MC FARM BUREAU
LAVEEN CITIZENS
SCOPING REPORT
VILLAGE PLANNERS
C.A.T.
GILA RIVER
INDIAN COMMUNITY
WILL USE GILA RIVER INDIAN
COMMUNITY ALTERNATIVES
WITHIN BOUNDARY
FIGURE 1
Public Alternatives
South Mountain EIS & L/DCR
HDR
HDR ENGINEERING, INC.
DRAWN BY RGR
CHECK BY CMCL
DATE 11/2002


Alternative T01
Alternative T02
Alternative T03
Alternative T04
Alternative T05
Alternative T06
Alternative T07
Alternative T08
Alternative T09
WILL USE GILA RIVER INDIAN COMMUNITY ALTERNATIVES WITHIN BOUNDARY
FIGURE 2
Technical Alternatives
South Mountain EIS & L/DCR
HDR ENGINEERING, INC.
DRAWN BY RGR
CHECK BY CMCL
DATE 11/2002

Alternatives Screening Report

In support of the **Technical Studies**
to the **Environmental Impact Statement**

South Mountain Transportation Corridor in Maricopa County, Arizona

Arizona Department of Transportation
Federal Highway Administration
in cooperation with
United States Army Corps of Engineers
United States Bureau of Indian Affairs

Version 2.0 / March 2003
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FHWA Federal Aid Project No. NH-202-D( )

Abstract: This document addresses the screening impacts to be considered for all nine technical alternatives developed as part of the EIS and L/DCR process.

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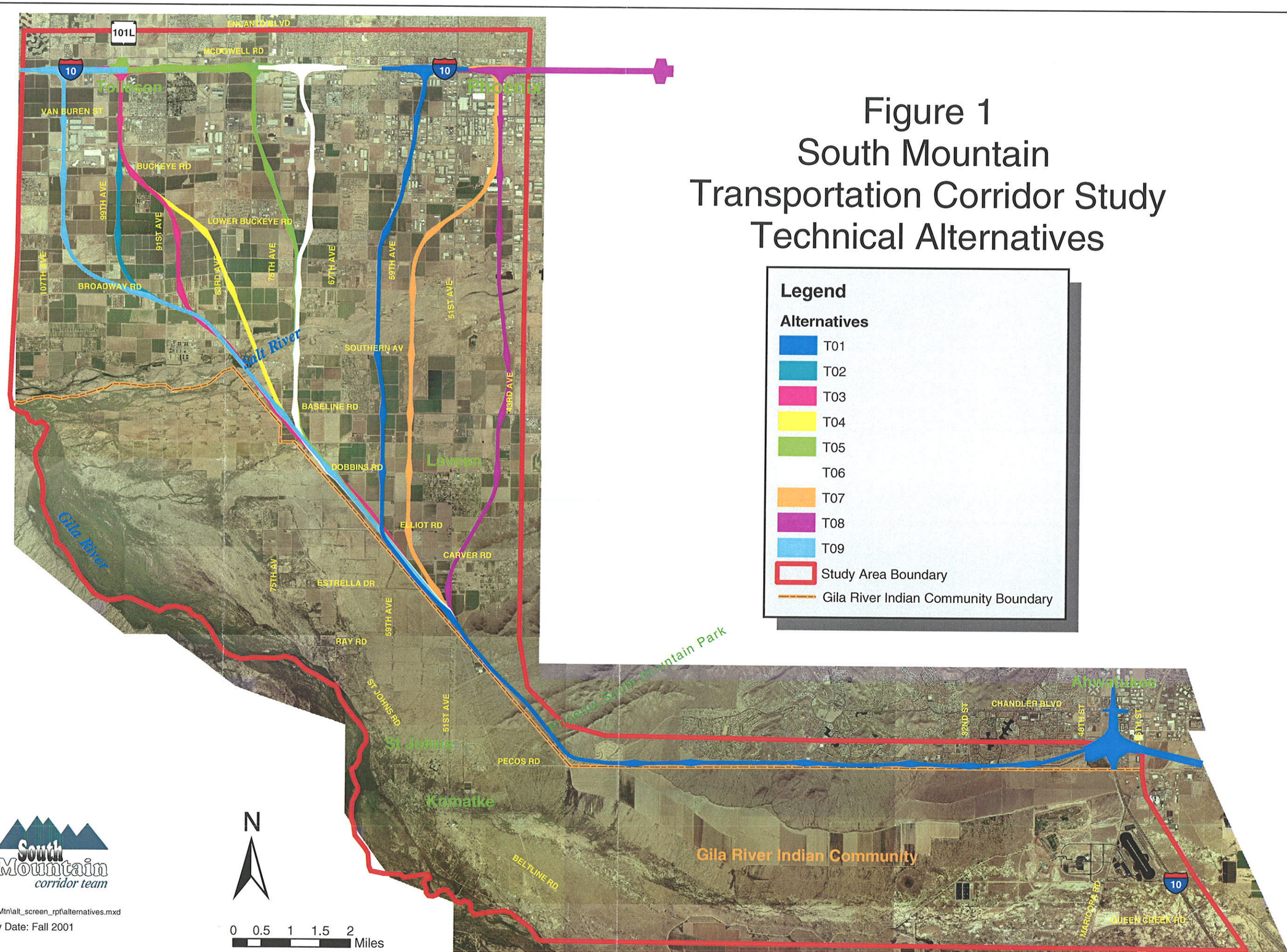
Figure 1
South Mountain Transportation Corridor Study
Technical Alternatives



South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 1

Summary Data of Nine Technical Alternatives Compared with Criteria

Criteria	Description	Alternatives								
		T01	T02	T03	T04	T05	T06	T07	T08	T09
Section 4(f)	Resources Directly Used (number)	4	5	5	5	4	4	4	4	4
	Parks and Recreation (acreage)	96.2	94.7	94.5	91.8	91.8	92.3	94.9	88.7	89.9
	Arizona State Museum (acreage)	2.4	0.4	0.5	0.5	7.0	2.3	2.5	0.4	0.4
Cultural Sites	Sites Directly Used (number)	16	13	13	15	17	16	21	16	12
	Total (acreage)	81.7	20.4	20.3	22.9	94.7	41.6	87.6	41.6	19.4
Jurisdictional Waters	Total (acreage)	22.0	20.2	20.0	16.5	12.8	12.8	18.7	19.3	20.2
Environmental Justice		Refer to Environmental Justice section for discussion and figures.								
Sensitive Species		With the exception of one Candidate Species, there are no federally protected species or critical habitat within the study area. The exact location of the Candidate Species is not known.								
Potentially Hazardous Sites		Refer to Potentially Hazardous Sites section for figure of all nine technical alternatives.								
	High-Priority Sites (number)	1	0	0	0	1	0	1	0	0
	Mid-Priority Sites (number)	6	0	0	0	2	0	3	0	0
	Low-Priority Sites (number)	1	1	0	0	1	0	10	1	0
General Plan Compatibility	Includes a S. Mtn. Fwy.[1] Component – Tolleson	No	No	No	No	No	No	No	No	No
	Includes a S. Mtn. Fwy. Component – Avondale	No	No	No	No	No	No	No	No	No
	Includes a S. Mtn. Fwy. Component – Phoenix	Yes	No	No	No	No	No	No	No	No
Prime and Unique Farmland		No prime or unique farmlands are known to exist within the study area.								
Air Quality and Noise	Residential Noise Sensitive Receptors (units)	927	711	707	702	736	868	1211	1224	710
	Non-Residential Noise Sensitive Receptors (units)	40	14	11	14	19	13	43	51	18
Displacements and Relocations	Existing Residential (units)	175	182	181	183	185	205	295	314	188
	Existing Non-Residential (units)	36	8	9	9	10	13	41	42	8
	Planned Residential (acreage)	237.6	391.3	389.4	362.3	353.8	314.2	266.3	340.1	425.6
	Planned Non-Residential (acreage)	283.5	199.0	190.1	176.6	194.0	174.2	209.1	157.5	188.7

Summary Data of Nine Technical Alternatives Compared with Criteria (Continued)

Criteria	Description	Alternatives								
		T01	T02	T03	T04	T05	T06	T07	T08	T09
Utilities		Impacts are anticipated to be similar across all nine technical alternatives.								
Public Service Impacts	Total (number)	2	2	2	2	3	2	2	2	2
Cumulative Impacts		Refer to Cumulative Impacts section for discussion.								
Public and Political Acceptability	Tolleson	No Comment	Oppose	Oppose	Oppose	No Comment	No Comment	No Comment	No Comment	No Comment
	Avondale	Of Interest	Of Interest	Of Interest	Of Interest	Of Interest	No Comment	No Comment	No Comment	Oppose
	Goodyear	Of Interest/Split	Split	Split	Split	Split	No Comment	No Comment	No Comment	Split
	Chandler	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
	Phoenix	Prefer	Oppose	Oppose	Oppose	Oppose	Oppose	Oppose	Oppose	Oppose
	Maricopa Association of Governments (MAG)	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment
	Maricopa County	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment
	Gila River Indian Community (GRIC)	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment	No Comment
Compliance with Design Standards		All nine technical alternatives are in compliance with state and federal design standards.								
Traffic Operations/CORSIM		A detailed presentation will be made prior to screening.								
Cost[2]	Total Preliminary Right-of-Way Acreage (acres)	1,350	1,420	1,410	1,400	1,530	1,380	1,570	1,530	1,470
	Construction Cost	$470,000,000	$480,000,000	$480,000,000	$470,000,000	$740,000,000	$470,000,000	$760,000,000	$730,000,000	$490,000,000
	Land Acquisition Costs	$590,000,000	$810,000,000	$800,000,000	$750,000,000	$740,000,000	$680,000,000	$650,000,000	$780,000,000	$860,000,000
	Total Cost	$1,060,000,000	$1,290,000,000	$1,280,000,000	$1,220,000,000	$1,480,000,000	$1,150,000,000	$1,410,000,000	$1,510,000,000	$1,350,000,000

[1]S. Mtn. Fwy stands for South Mountain Freeway.

[2] Costs presented are preliminary and do not reflect final costs. These costs are not to be interpreted as actual construction costs or land acquisition costs.

INTRODUCTION

At this point in the alternatives development process, it has been established that while transit and roadway improvements are part of the solution to the excess transportation demand in the Phoenix Valley, a new freeway in the South Mountain Transportation Corridor (SMTC) is also warranted. The process described in the following deals with development and screening of freeway alternatives.

Identification of alternatives for the SMTC Project has been an open process accessible to all potential stakeholders. Alternatives identification began during the project scoping phase. Agencies and public participants in scoping suggested several system, or modal, alternatives such as the extension of US 60 and enhanced transit options as well as conceptual alignment alternatives. The scoping process is documented in the SMTC Project Scoping Report.

Over the past several months, additional alternatives have been suggested through review of previous studies and through the public involvement program. This process has attempted to aim at capturing the possible alternatives that might be suggested through the course of the Environmental Impact Statement (EIS) studies. To document alternatives, workshops were conducted with civic organizations; citizen volunteers from City of Phoenix Ahwatukee, Estrella, Laveen, and South Mountain Village Planning Committees; with the Southwest Mayors and Managers group; and the SMTC Citizens Advisory Team. Participants were invited to draw alternative alignments on study area maps and aerial photos and to indicate locations of sensitive resources or constraints. Through this process, more than 30 system/modal and alignment alternatives have been identified.

The technical team analyzed each of the 30 alignment alternatives provided to determine their perceived intent. New alignments were then created that met the intent of the alignment alternatives, generated by the public, while at the same time conforming to current design standards and eliminating any major conflicts with environmental constraints. The resulting alignments were presented to the potentially affected jurisdictions, including Tolleson, Avondale, Goodyear, Chandler, Phoenix, Maricopa County, Maricopa Association of Governments (MAG) and the Gila River Indian Community (GRIC). The screening process outlined in this report details the nine technical alternatives created by the technical team.

The GRIC is in the process of developing alternatives that they would like to have evaluated in the EIS. (The nine technical alternatives presented in this report lie entirely outside the GRIC.) When these are completed, the full range of alternatives will be available for the screening process.

The data provided in the Alternatives Screening Report details impacts and criteria determined by the technical team to be important at this stage of analysis. Included in the analysis are

measurable criteria such as potentially hazardous sites, residential and business displacements and impacts to public services. The alternatives deemed to best satisfy the criteria by the project team, including key stakeholders, would then be carried forward for full analysis in the EIS.

SUMMARY

As noted above, through the input of municipal, state and federal agencies, as well as that of public organizations, nine technical alternatives were developed that span the entire study area, with the exception of the GRIC. Should the GRIC wish to submit for consideration alternatives that enter their land, those alternatives would be subjected to the same type of screening process that is detailed within this report.

Since all nine technical alternatives lie outside the GRIC, Pecos Road was used as the eastern portion for all nine alignments. From Interstate 10 (I-10, Maricopa Freeway) on the east side of the study area to approximately 51st Avenue, all nine technical alternatives have the same alignment. Specifically, all nine alternatives begin at the I-10 (Maricopa Freeway) / Loop 202 (SR 202L) system interchange and proceed in a westerly direction along Pecos Road until it meets the GRIC border. At the GRIC border, the alignments turn northwest and run along the northern edge of the GRIC until 51st Avenue. At this point, the nine technical alternatives separate. Some of the data presented in the tables, within this report, are thus broken down into two sections; Pecos Road Section and West Section. The Pecos Road Section covers the eastern portion of the alignments that run from I-10 (Maricopa Freeway) to the Phoenix South Mountain Park boundary approximately ½ mile east of 43rd Avenue. The West Section covers the remainder of the alignments to the west.

Each of the nine technical alternatives are described in detail below. Figure 1, in the Executive Summary, illustrates the locations of the nine technical alternatives within the study area.

TECHNICAL ALTERNATIVE 01

Technical Alternative 01 would follow the GRIC border in a northwest direction until halfway between 59th Avenue and 63rd Avenue. At this location the alignment would turn north and remain between these two arterials until just south of Lower Buckeye Road, where it would turn slightly to the northeast, cross 59th Avenue and connect with I-10 (Papago Freeway) near 55th Avenue, approximately 5.25 miles east of the I-10 / Loop 101 (SR 101L) system interchange. This alternative reflects the original 1988 alignment. The total acreage of direct impacts is approximately 1,350 acres.

TECHNICAL ALTERNATIVE 02

Technical Alternative 02 would follow the GRIC border in a northwest direction, over the Salt River and then would turn in a more westerly direction just west of 83rd Avenue, between Southern Avenue and Broadway Road. The alignment would then turn north between 95th Avenue and 99th Avenue and connect with I-10 (Papago Freeway) at the existing I-10 / SR 101L system interchange. The total acreage of direct impacts is approximately 1,420 acres.

TECHNICAL ALTERNATIVE 03

Technical Alternative 03 would follow the GRIC border in a northwest direction, over the Salt River and would then turn north between 87th Avenue and 91st Avenue, just south of Broadway Road. The alignment would travel north until Lower Buckeye Road where it would again turn in a northwest direction and cross 91st Avenue. At Buckeye Road, the alignment would turn to the north between 95th Avenue and 99th Avenue and connect with I-10 (Papago Freeway) at the existing I-10 / SR 101L system interchange. The total acreage of direct impacts is approximately 1,410 acres.

TECHNICAL ALTERNATIVE 04

Technical Alternative 04 would follow the GRIC border in a northwest direction until 75th Avenue, where it would turn in a more north-northwest direction, over the Salt River, to just south of Lower Buckeye Road, between 83rd Avenue and 87th Avenue. At this location, the alignment would turn to a northwest direction until Buckeye Road, between 95th Avenue and 99th Avenue, where it would turn north and connect with I-10 (Papago Freeway) at the existing I-10 / SR 101L system interchange. The total acreage of direct impacts is approximately 1,400 acres.

TECHNICAL ALTERNATIVE 05

Technical Alternative 05 would follow the GRIC border in a northwest direction until midway between 71st Avenue and 75th Avenue, where it would turn to the north. The alignment would continue north until just south of Lower Buckeye Road where it would turn to the north-northwest. Between Buckeye Road and Van Buren Street, the alignment would shift to the north running along 79th Avenue where it would connect with I-10 (Papago Freeway) approximately 2.25 miles east of the I-10 / SR 101L system interchange. Collector-distributor (C-D) roads would be provided along I-10 to provide direct connections between Technical Alternative 05 and SR 101L. The total acreage of direct impacts is approximately 1,530 acres.

TECHNICAL ALTERNATIVE 06

Technical Alternative 06 would follow the GRIC border in a northwest direction until midway between 71st Avenue and 75th Avenue, where it would turn to the north. The alignment would continue north until just south of Lower Buckeye Road where it would turn to the north-northeast, until it would parallel 69th Avenue. At this location, the alignment would travel north until Van Buren Street, where it would make a slight shift to the west to connect into I-10 (Papago Freeway) just west of 69th Avenue, approximately 3 miles east of the I-10 / SR 101L system interchange. The total acreage of direct impacts is approximately 1,380 acres.

TECHNICAL ALTERNATIVE 07

Technical Alternative 07 would follow the GRIC border in a northwest direction until midway between 55th Avenue and 59th Avenue, where it would turn to the north. The alignment would continue north until just north of the Salt River (between Broadway Road and Lower Buckeye

Road) where it would shift to the northeast. Just south of Buckeye Road, between 43rd Avenue and 47th Avenue, the alignment would shift to the north, connecting into I-10 (Papago Freeway) between 43rd Avenue and 47th Avenue, approximately 6.5 miles east of the I-10 / SR 101L system interchange. C-D roads would be provided along I-10 to provide direct connections between Technical Alternative 07 and Interstate 17 (I-17). A portion of the C-D roads extends beyond the study area. The total acreage of direct impacts is approximately 1,570 acres.

TECHNICAL ALTERNATIVE 08

Technical Alternative 08 would follow the GRIC border in a northwest direction until 51st Avenue, where it would turn to the northeast at Estrella Drive. The alignment would continue in the northeast direction until midway between Elliot Road and Dobbins Road, west of 43rd Avenue, where it would shift to the north. The alignment would have several slight direction shifts, and would travel between 43rd Avenue and 47th Avenue until connecting into I-10 (Papago Freeway) midway between the two, approximately 6.5 miles east of the I-10 / SR 101L system interchange. C-D roads would be provided along I-10 to provide direct connections between Technical Alternative 08 and I-17. A portion of the C-D roads extends beyond the study area. The total acreage of direct impacts is approximately 1,530 acres.

TECHNICAL ALTERNATIVE 09

Technical Alternative 09 would follow the GRIC border in a northwest direction, over the Salt River and would then shift to a more westerly direction just west of 83rd Avenue, between Southern Avenue and Broadway Road. The alignment would continue in its west-northwest direction, cross Broadway Road and would turn to the north, south of Lower Buckeye Road between 103rd Avenue and 107th Avenue. The alignment would continue north and tie into I-10 (Papago Freeway) midway between 103rd Avenue and 107th Avenue, approximately 1 mile west of the I-10 / SR 101L system interchange. C-D roads would be provided along I-10 to provide direct connections between Technical Alternative 09 and SR 101L. The total acreage of direct impacts is approximately 1,470 acres.

The nine technical alternatives presented above were run through Geographic Information Systems (GIS) and Computer Aided Drafting and Design (CADD) analyses to determine the impacts associated with each of the criteria presented below:

- Section 4(f)
- Cultural Sites
- Jurisdictional Waters
- Environmental Justice
- Threatened, Endangered and Sensitive Species
- Potentially Hazardous Sites
- General Plan Compatibility
- Prime and Unique Farmland

- Air Quality and Noise
- Displacements and Zoning
- Utilities
- Public Service Impacts
- Cumulative Impacts
- Public and Political Acceptability
- Compliance with Design Standards
- Traffic Operations / CORSIM
- Cost

Table 1, in the Executive Summary, provides the summary data of nine technical alternatives compared with criteria detailed in this report.

SECTION 4(f)

The purpose of this screening exercise is to determine if there are feasible and prudent alternatives (non-Gila River Indian Community alternatives) which avoid or have minimal impact on Section 4(f) resources (USDOT 1987). It is assumed that impacts on Section 4(f) resources would occur from those alternatives carried forward into the EIS for detailed study. A 'use' of a Section 4(f) resource occurs: (1) when land is permanently incorporated into a transportation facility, (2) when there is a temporary occupancy of land that is adverse in terms of the statute's preservationist purposes, or (3) when there is a constructive use of land. A constructive use of a Section 4(f) resource occurs when the transportation project does not incorporate land from the Section 4(f) resource, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired (23 CFR 771.135 (p)).

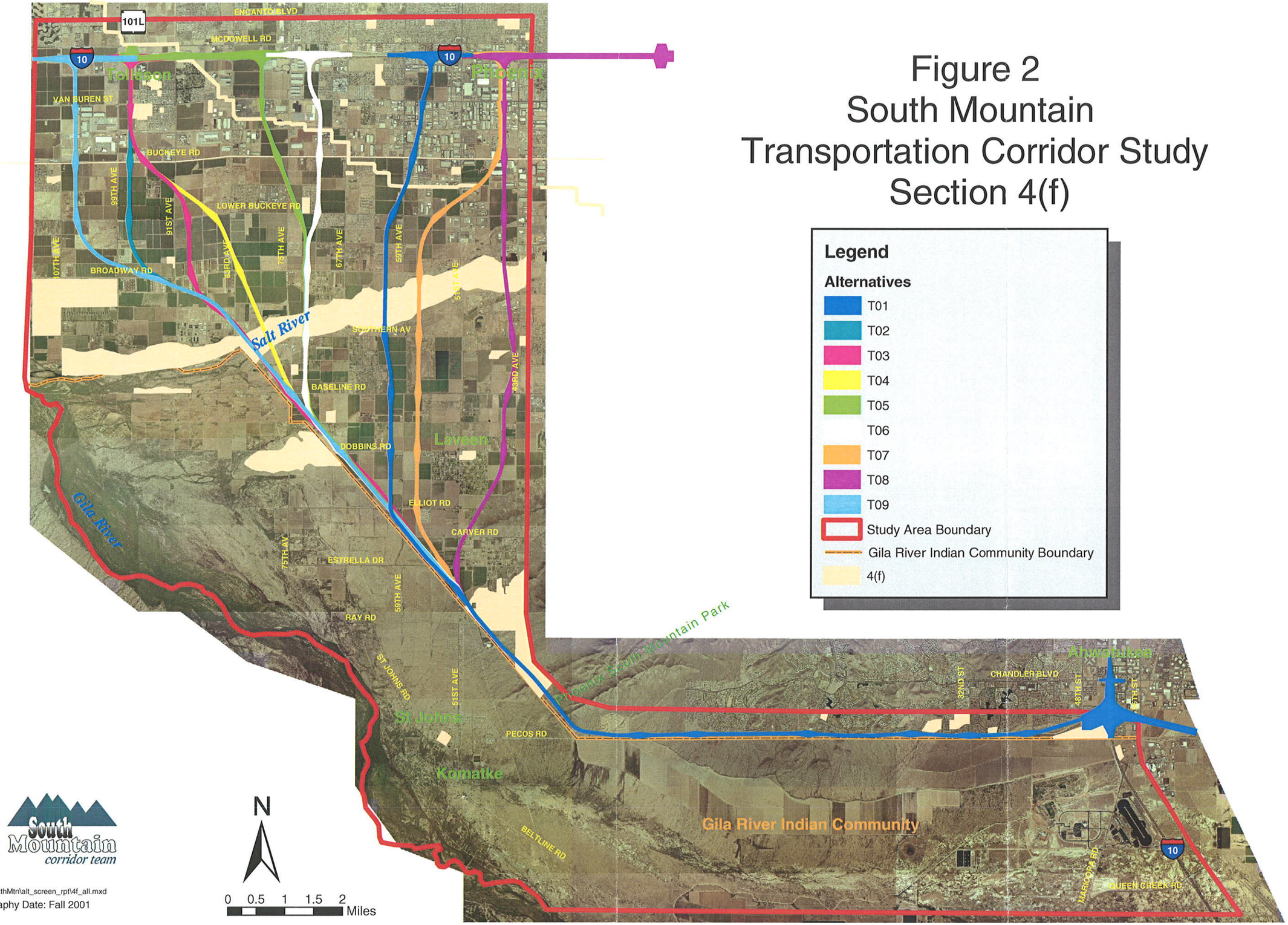
For alternatives that extend beyond the study area, no Section 4(f) impacts were developed for the area outside the study area.

For purposes of this screening, land use plans, aerial photography, field verification and available mapping were all sources used in identification of Section 4(f) resources.

Figure 2 illustrates the locations of all known existing and planned resources within the study area afforded protection under Section 4(f). Figure 3 provides the location and Site ID number for those resources that come in direct contact with any of the nine technical alternatives but does not show Traditional Cultural Properties.

Tables 2, 3 and 4 present the data that supports Figure 3. There are no known ASM Sites, qualified for protection under Section 4(f), on the Pecos Road Section and thus no table is provided for this segment.

Figure 2
South Mountain Transportation Corridor Study
Section 4(f)



ADOT

South Mountain corridor team

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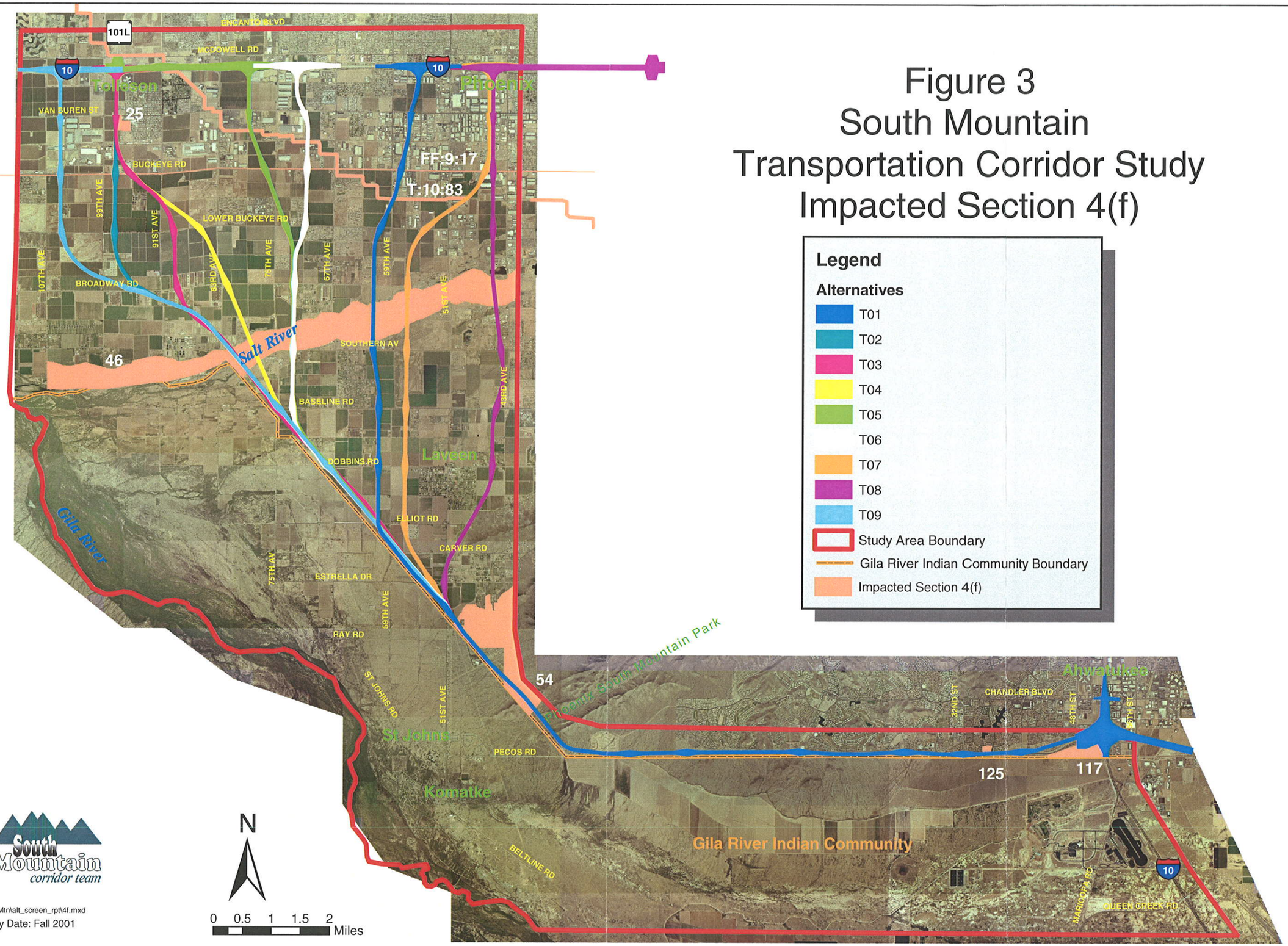
Aerial Photography Date: Fall 2001

DRAFT 2/03

Figure 3
South Mountain Transportation Corridor Study
Impacted Section 4(f)



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Aerial Photography Date: Fall 2001
DRAFT 2/03

Fig. 3

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 2

Section 4(f) Site Locations Based on Parks and Recreation Designations – Pecos Road Section

Alternative	Site ID	Frequency	Description	Comment	Status	Acreage
All	117	1	Parks / Open Space – Publicly Owned	Ahwatukee District Park	Planned	23.6
	125	1	Educational		Existing	< 0.1
					Total Pecos Road Section Acreage =	**23.7**

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 3

Section 4(f) Site Locations Based on Parks and Recreation Designations – West Section

Alternative	Site ID	Frequency	Description	Comment	Status	Acreage
T01	46	1	Parks / Open Space – Publicly Owned	Salt River	Existing	24.4
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**72.5**
T02	25	1	Educational		Existing	4.8
	46	1	Parks / Open Space – Publicly Owned	Salt River	Existing	18.1
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**71.0**
T03	25	1	Educational		Existing	4.8
	46	1	Parks / Open Space – Publicly Owned	Salt River	Existing	17.9
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**70.8**

Section 4(f) Site Locations Based on Parks and Recreation Designations – West Section (Continued)

Alternative	Site ID	Frequency	Description	Comment	Status	Acreage
T04	25	1	Educational		Existing	4.8
	46	1	Parks / Open Space - Publicly Owned	Salt River	Existing	15.2
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**68.1**
T05	46	1	Parks / Open Space - Publicly Owned	Salt River	Existing	20.0
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**68.1**
T06	46	1	Parks / Open Space - Publicly Owned	Salt River	Existing	20.5
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**68.6**
T07	46	1	Parks / Open Space - Publicly Owned	Salt River	Existing	23.1
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**71.2**
T08	46	1	Parks / Open Space - Publicly Owned	Salt River	Existing	16.9
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**65.0**
T09	46	1	Parks / Open Space - Publicly Owned	Salt River	Existing	18.1
	54	2	Active Open Space	South Mountain Park	Existing	48.1
					Total West Section Acreage =	**66.2**

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 4

Section 4(f) Site Locations Based on Arizona State Museum (ASM) Designations - West Section			
Alternative	**ASM Site ID**	**Frequency**	**Acreage**
T01	FF:9:17	1	0.4
	T:10:83	1	2.0
		Total West Section Acreage =	**2.4**
T02	FF:9:17	1	0.4
		Total West Section Acreage =	**0.4**
T03	FF:9:17	1	0.5
		Total West Section Acreage =	**0.5**
T04	FF:9:17	1	0.5
		Total West Section Acreage =	**0.5**
T05	FF:9:17	1	0.4
	T:10:83	3	6.6
		Total West Section Acreage =	**7.0**
T06	FF:9:17	1	0.4
	T:10:83	1	1.9
		Total West Section Acreage =	**2.3**
T07	FF:9:17	1	0.4
	T:10:83	1	2.1
		Total West Section Acreage =	**2.5**
T08	FF:9:17	1	0.4
		Total West Section Acreage =	**0.4**
T09	FF:9:17	1	0.4
		Total West Section Acreage =	**0.4**

CULTURAL SITES

The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on archaeological sites, which includes historic and prehistoric sites. Locations of sites and previous archaeological project areas are not plotted in exhibit format to protect the sensitive nature of the sites. This does not include historic properties. It is assumed that impacts on cultural resources will occur from those alternatives carried forward into the EIS for detailed study and mitigation would be necessary. Traditional Cultural Properties are not included at the request of the Gila River Indian Community because of the sensitive nature of the data. All data were gathered from the Arizona State Museum, State Historic Preservation Office, and the Gila River Indian Community Cultural Management Program.

For alternatives that extend beyond the study area, no Cultural Site impacts were developed for the area outside the study area.

No figure is provided for this section.

Table 5 presents the data generated for impacts to cultural sites for the entire length of each alignment.

Data acquired from database sources at Arizona State Museum, Arizona State University and Gila River Indian Community literature searches.

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 5

Cultural Sites - Total Alignment

Alternative	Source	Site	Site ID	Frequency	Acreage
T01	ASM	FF:9:17	5	1	0.4
		T:10:83	1	1	2.0
		T:12:91	29	1	17.4
	ASU	T:12:18(ASU)	8	1	20.0
		T:12:39(ASU)	22	1	4.6
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.2
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
		T:12:54(ASU)	9	1	23.1
	Other	T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**81.7**
T02	ASM	FF:9:17	4	1	0.4
		T:11:26	2	1	1.0
	ASU	T:12:39(ASU)	22	1	4.8
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.2
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
	Other	T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**20.4**

Cultural Sites – Total Alignment (Continued)

Alternative	Source	Site	Site ID	Frequency	Acreage
T03	ASM	FF:9:17	4	1	0.5
		T:11:26	2	1	1.1
	ASU	T:12:39(ASU)	22	1	4.6
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.3
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.1
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
	Other	T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**20.3**
T04	ASM	FF:9:17	4	1	0.5
		T:11:26	2	1	1.3
		T:12:127	26	1	2.7
	ASU	T:12:1(ASU)	12	1	< 0.1
		T:12:39(ASU)	22	1	4.2
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.1
		T:12:48(ASU)	30	1	1.0
		T:12:49(ASU)	26	1	0.2
	Other	T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**22.9**

Cultural Sites – Total Alignment (Continued)

Alternative	Source	Site	Site ID	Frequency	Acreage
T05	ASM	FF:9:17	4	1	0.4
		T:10:83	1	3	6.6
		T:11:26	2	1	0.6
		T:12:127	26	1	0.2
	ASU	T:12:39(ASU)	22	1	4.5
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.1
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
	Other	ElTermino	7	1	7.5
		T:12:3(MNA)	5	1	60.7
		T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**94.7**
T06	ASM	FF:9:17	4	1	0.4
		T:10:83	1	1	1.9
		T:12:127	26	1	0.3
	ASU	T:12:39(ASU)	22	1	4.2
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.1
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
	Other	Fowler Ruin	6	1	8.2
		T:12:3(MNA)	5	1	12.5
		T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**41.6**

Cultural Sites – Total Alignment (Continued)					
Alternative	**Source**	**Site**	**Site ID**	**Frequency**	**Acreage**
T07	ASM	FF:9:17	5	1	0.4
		T:10:83	1	1	2.1
		T:12:116	6	1	7.9
		T:12:92	27	1	0.3
	ASU	Ruins(ASU?)	3	1	2.4
		T:12:18(ASU)	8	1	21.2
		T:12:39(ASU)	22	1	3.1
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.2
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
		T:12:55(ASU)	14	1	24.1
		no#ASU	4	1	3.3
	Other	AreaA(MNA)	11	1	5.8
		Shpo no#	15	1	2.8
		T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**87.6**

Cultural Sites – Total Alignment (Continued)					
Alternative	**Source**	**Site**	**Site ID**	**Frequency**	**Acreage**
T08	ASM	FF:9:17	5	1	0.4
		T:12:116	6	1	7.9
		T:12:116	9	1	11.1
	ASU	Ruins(ASU?)	3	1	0.5
		T:12:39(ASU)	22	1	3.1
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.2
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
		no#ASU	4	1	4.5
	Other	T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**41.6**
T09	ASM	FF:9:17	4	1	0.4
	ASU	T:12:39(ASU)	22	1	4.8
		T:12:40(ASU)	27	1	2.1
		T:12:41(ASU)	28	1	2.5
		T:12:44(ASU)	33	1	4.3
		T:12:45(ASU)	29	1	0.2
		T:12:46(ASU)	34	1	1.3
		T:12:47(ASU)	31	1	2.2
		T:12:48(ASU)	30	1	0.9
		T:12:49(ASU)	26	1	0.2
	Other	T:12:No#(PG)	18	1	0.3
		T:12:No#(PG)	19	1	0.2
				Total Acreage =	**19.4**

JURISDICTIONAL WATERS

The purpose of this screening exercise is to determine which alternatives avoid or have minimal impacts on floodplains and jurisdictional waters of the U.S., as required by Section 404 of the Clean Water Act. It is anticipated that impacts on floodplains and waters of the U.S. would occur from those alternatives carried forward into the EIS for detailed study because of the water features in the study area. Floodplains were delineated from floodplain maps and for the purpose of this exercise the footprint of the floodplain is assumed to be jurisdictional. Other drainages appearing more than two feet in width on the aerial photography (dated October 2001) are shown on Figure 3 and are used for calculation purposes. At this time, they have not been field verified but would be during detailed study. It is assumed that the study area has an abundance of drainages, as is the case throughout Arizona, however they may not be evident on available aerial photography and they would be field evaluated when alternatives are identified for detailed study in the EIS. It is assumed that these smaller drainages would not alter decisions being made at this point of the screening process.

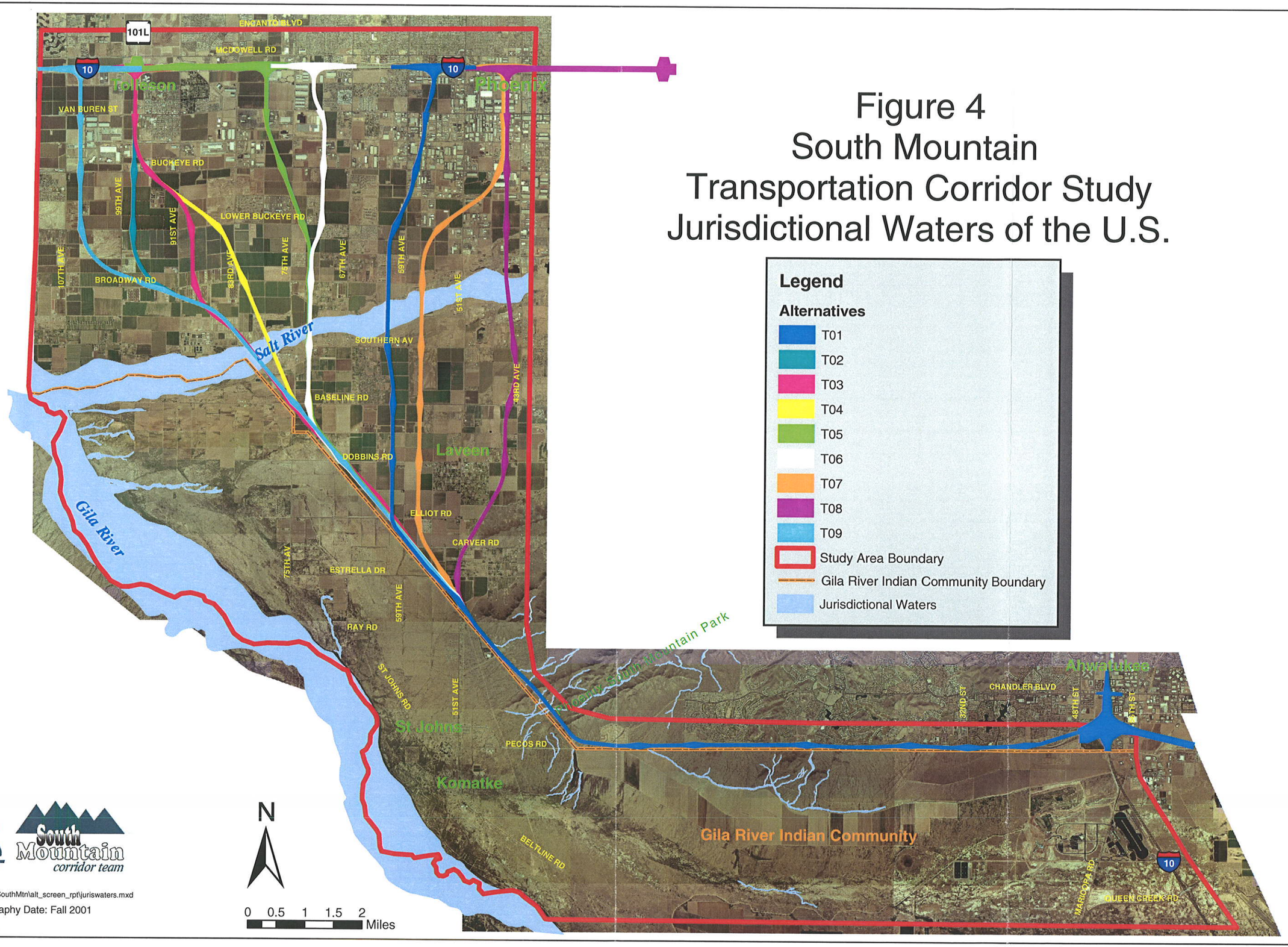
It should be noted that the U.S. Army Corps of Engineers would make the final determination of delineation for all waters of the U.S.

For alternatives that extend beyond the study area, no jurisdictional waters impacts were examined for the area outside the study area.

Figure 4 illustrates the locations of jurisdictional waters within the study area.

Table 6 details the area of impact on jurisdictional waters by each alternative.

Figure 4
South Mountain Transportation Corridor Study
Jurisdictional Waters of the U.S.



South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 6

Jurisdictional Waters		
Alternative	**Location**	**Area of Impact (acres)**
T01	Salt River	19.2
	All Other	2.8
	Total	**22.0**
T02	Salt River	17.4
	All Other	2.8
	Total	**20.2**
T03	Salt River	17.2
	All Other	2.8
	Total	**20.0**
T04	Salt River	13.7
	All Other	2.8
	Total	**16.5**
T05	Salt River	10.0
	All Other	2.8
	Total	**12.8**
T06	Salt River	10.0
	All Other	2.8
	Total	**12.8**
T07	Salt River	15.9
	All Other	2.8
	Total	**18.7**
T08	Salt River	16.5
	All Other	2.8
	Total	**19.3**
T09	Salt River	17.4
	All Other	2.8
	Total	**20.2**

ENVIRONMENTAL JUSTICE

The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on people based on their color, national origin, age, sex, or disability. The goals of the screening are to identify areas where minority and low-income populations are located and determine if any minority or low-income populations could bear disproportionately high and adverse portions of the overall project impacts. These data include tract information for head of household passing specific criteria for age, income, sex, disability or ethnicity. The data was compiled from the Census 2000 block group data that is based on the county average.

This is based on "Title VI of the Civil Rights Act of 1964" and related statutes which assure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, national origin, age, sex, and disability. *Executive Order 12898* on Environmental Justice directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations.

For alternatives that extend beyond the study area, no environmental justice impacts were developed for the area outside the study area.

Figures 5, 6, 7, 8 and 9 illustrate environmental justices areas including minority groups, age, poverty level and disabilities and Title VI female head of household.

No table is included in this section.

Figure 5
South Mountain Transportation Corridor Study
Environmental Justice - Minority Groups

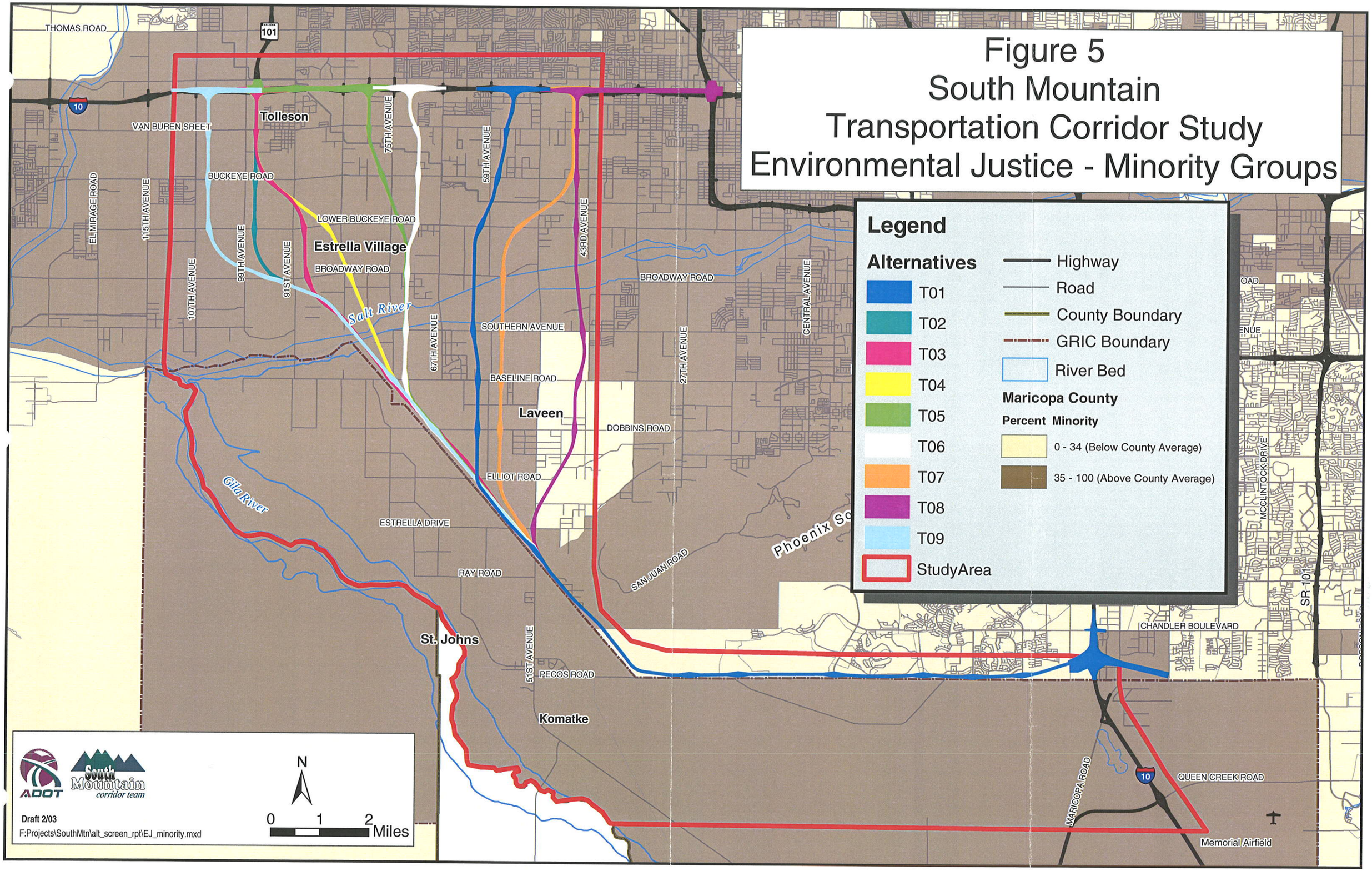


Fig. 5

Figure 6
South Mountain Transportation Corridor Study
Environmental Justice - 65 and Over

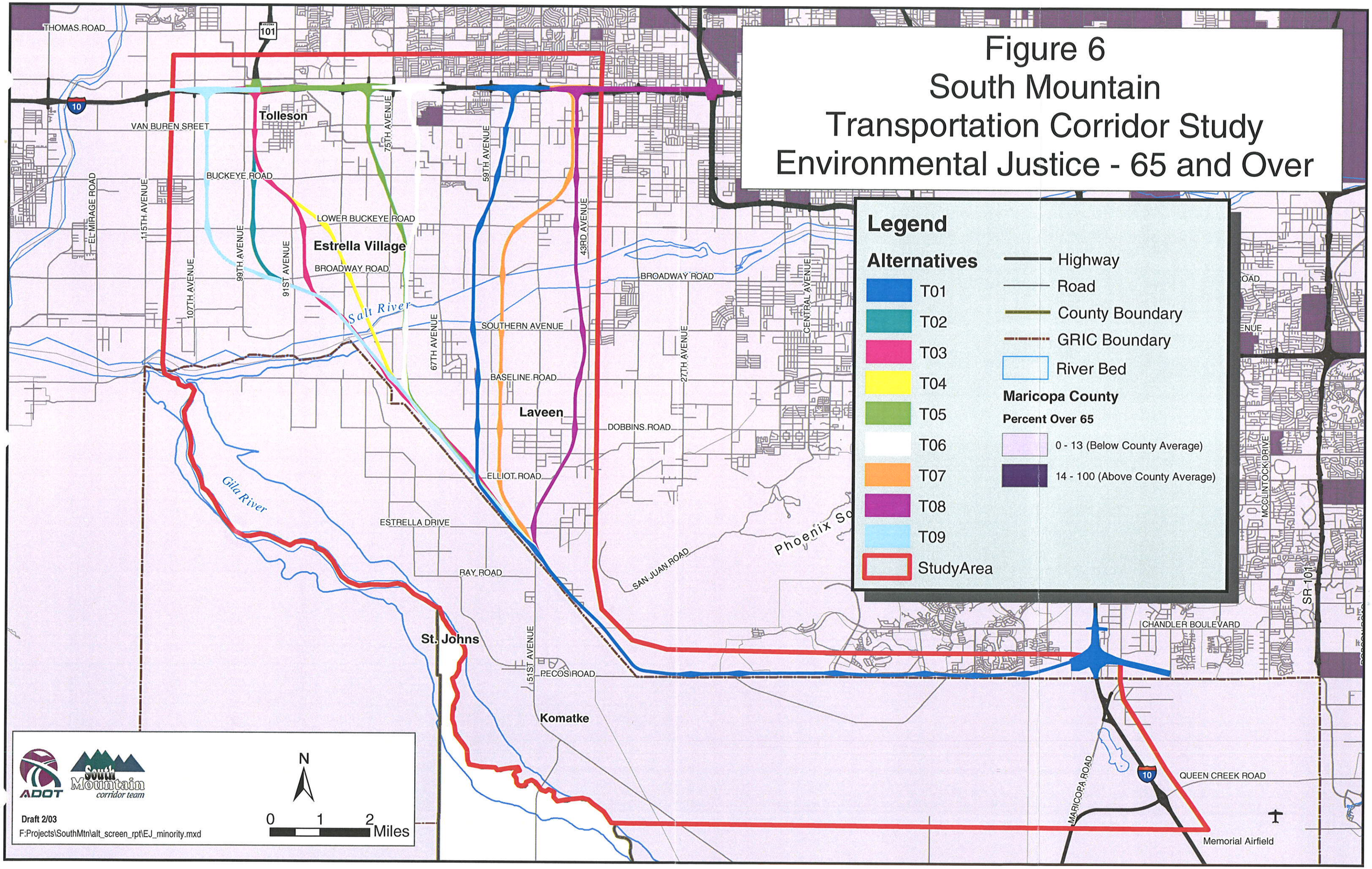


Fig. 6

Figure 7
South Mountain Transportation Corridor Study
Environmental Justice - At and Below Poverty

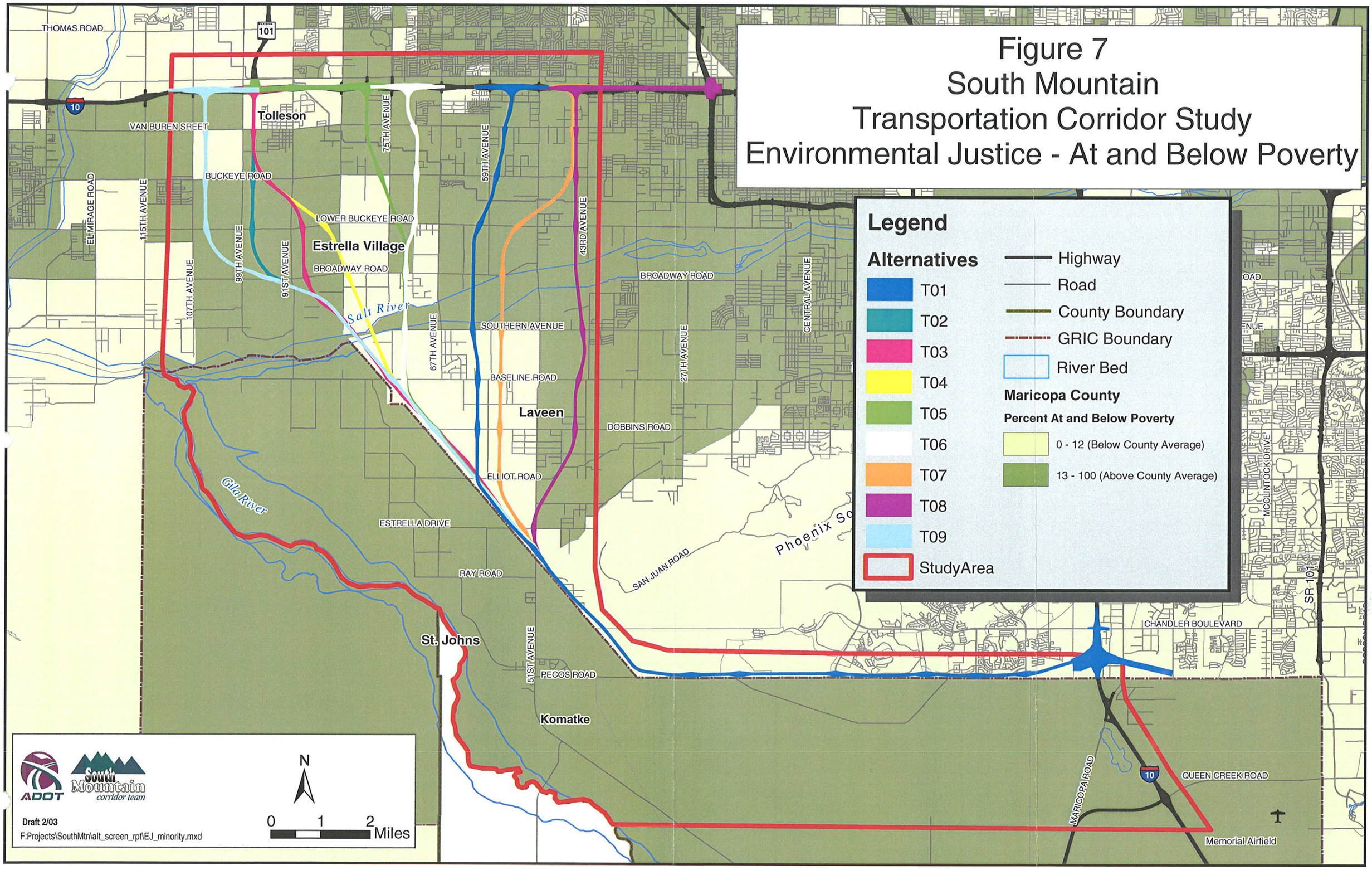


Figure 8
South Mountain Transportation Corridor Study
Environmental Justice - Disabled

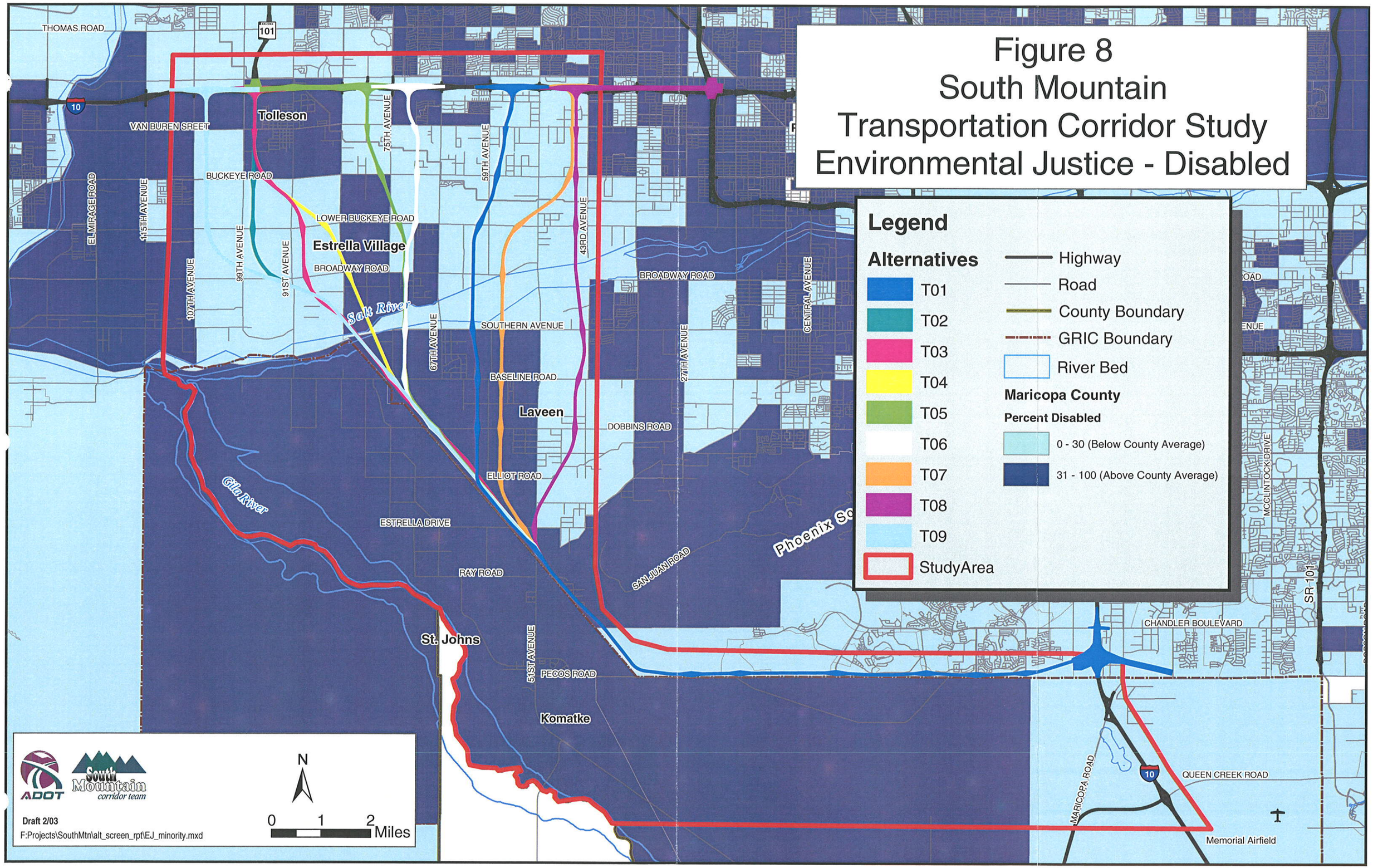


Figure 9
South Mountain Transportation Corridor Study
Title VI - Female Head of Household

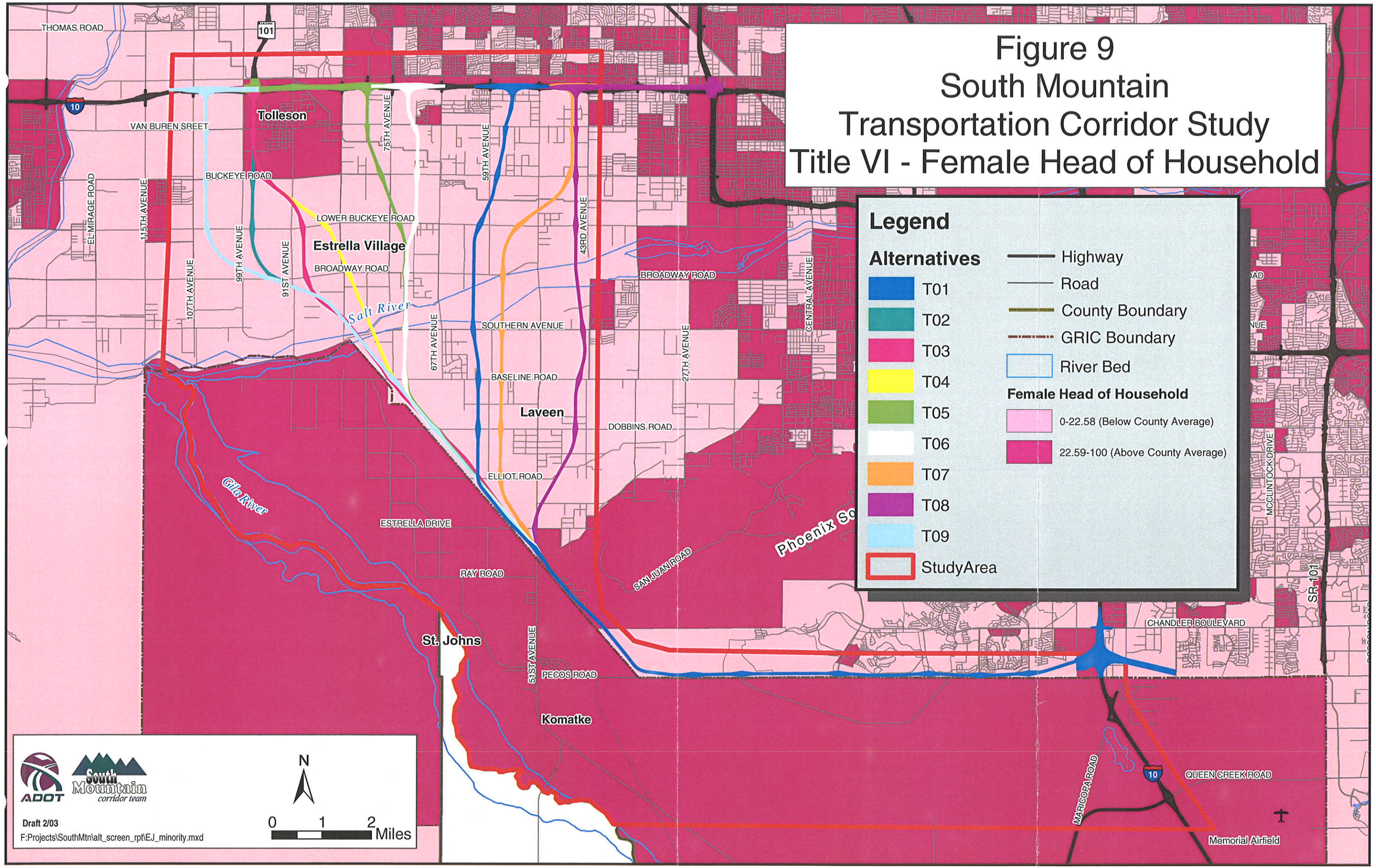


Fig. 9

THREATENED, ENDANGERED AND SENSITIVE SPECIES; CRITICAL HABITIAT

The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on Threatened, Endangered and Sensitive plant and animal species. The U.S. Fish and Wildlife Service's list of Listed, Proposed and Candidate Species for Maricopa County was used to determine what species have the potential to occur within the study area (U.S. Fish and Wildlife Service 2002). In addition, the Arizona Game and Fish Department's Heritage Data Management System was accessed (May 6, 2002) and three bird species, the Western burrowing owl (Species of Concern), the Yellowed-billed cuckoo (Candidate Species), the black-bellied Whistling-duck (State-listed as Wildlife of Concern) and the Sonoran desert tortoise (Species of Concern and State-listed as Wildlife of Concern) have been documented in the study area. With the exception of the Candidate Species, none of the other designations are afforded protection under the Endangered Species Act (U.S. Fish and Wildlife Service 1973).

No critical habitat for listed species is found within the area of the alternatives. However, suitable habitat for these species may be affected by the alternatives. Most species that have the potential to occur in Maricopa County are not present within the study area because of unsuitable habitat, nesting, or foraging resources.

For alternatives that extend beyond the study area, no threatened, endangered and sensitive species impacts or critical habitat impacts were developed for the area outside the study area.

No figure is provided for this section in order to protect the locations of the sensitive species.

No table is provided for this section.

POTENTIALLY HAZARDOUS SITES

Potentially hazardous sites have been classified in this level of analysis as high-priority, mid-priority and low-priority. The evaluation is based on the guidance from the Federal Highway Administration (FHWA 1988; 1995; 1997). Following is a definition of each of these classifications. The table following shows the various sites being impacted by each alternative.

HIGH-PRIORITY CLASSIFICATION DEFINITION & DATABASES

The high-priority sites are classified as such because they could entail high remediation costs and can involve coordination with multiple regulatory agencies at both state and federal levels. These sites may involve soil and/or groundwater contamination requiring an extensive or long-term remediation effort to meet regulatory cleanup goals. The high-priority sites include these databases:

- CERCLIS Database - The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) database lists federal Superfund sites and is maintained by EPA. The federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) legislation (Superfund) was authorized to finance the cleanup of abandoned disposal sites throughout the United States.

- SCL Database - The State Contaminant List (SCL) includes two computer databases maintained by the Arizona Department of Environmental Quality (ADEQ). The Arizona CERCLA Information and Data System (ACIDS) contains locations subject to investigations concerning possible contamination of soil, surface water or groundwater under federal CERCLA and the state Water Quality Assurance Revolving Fund (WQARF) programs. The inclusion of a particular facility on this database does not necessarily indicate the site is contaminated, is causing contamination, or is in violation of state or federal statutes and regulations. The listing implies that, due to the nature of activities conducted at these locations, a potential for the previously mentioned conditions exists.

  The SCL database also includes the WQARF Priority List, which is a historical database maintained by ADEQ. Following changes to the WQARF program in mid to late 1990s, the former Priority List was replaced by the ACIDS list. The WQARF program addresses sites that are scored and placed on ACIDS, utilizing an approved eligibility and evaluation (EE) model for evaluating risk and other environmental factors. ADEQ no longer updates this database.

- LUST Database - The ADEQ maintains an inventory of known or reported incidents involving Leaking Underground Storage Tanks (LUSTs).

- Landfill/Solid Waste Site Lists - The “Active/Inactive Landfills List”, is a statewide list maintained by ADEQ of active and inactive (closed) municipal landfills, and USGS Solid Waste Landfills List.

- CORRACTS Database - EPA maintains the Resource Conservation and Recovery Act (RCRA) Corrective Action Sites (CORRACTS) list that identifies facilities that are undergoing "corrective action" under RCRA. A "corrective action order" is issued pursuant to RCRA Section 3008(h) when there has been a release of hazardous waste or constituents into the environment from a RCRA-regulated facility.

- RCRA Violations Database - EPA maintains a RCRA Violations list that identifies facilities that have been charged with non-compliance with the regulations laid out in RCRA.

MID-PRIORITY CLASSIFICATION DEFINITION & DATABASES

The mid-priority sites are classified as such because due to the nature of operations, they have potential to impact soil and groundwater beneath the site. However, these sites are not currently listed as hazardous material release sites. The mid-priority sites include the following databases:

- ERNS Database - The Emergency Response Notification System (ERNS) is a national database that compiles information on reported releases of petroleum and hazardous substances. The database contains information from spill reports made to federal authorities including EPA, the U.S. Coast Guard, the National Response Center and the Department of Transportation.

- HMIRS Database - The Hazardous Material Incident Reporting System (HMIRS) is a national database that contains information on all hazardous materials spills that have been reported to the U.S. Department of Transportation. Double counting of incidents can occur with the federal ERNS database.

- Spills Database - The Spills database is a state database that tracks hazardous materials spills. Double counting of incidents can occur with the federal ERNS database.

- UST Database - Under Subtitle I of the 1984 RCRA Amendments, owners of Underground Storage Tanks (USTs) that contained regulated substances were required to notify (register) the designated state agency of the existence of the tank(s) by May 1986.

LOW-PRIORITY CLASSIFICATION DEFINITION & DATABASES

The low-priority sites are classified as such because they have either been remediated, have been investigated and not found to need remediation, or are anticipated not to require large-scale remediation. The low-priority sites include these databases:

- CICIS Database - The Chemicals in Commerce Information System (CICIS) is a national database, which tracks hazardous chemicals that are listed in the Toxic Substances Control Act (TSCA).

- Mines Database - The Mines database that is maintained by EPA tracks known mining claims derived from the Mineral Availability System (MAS)/Mineral Industry Location System (MILS) CD-ROM provided by EPA Office of Water.

- NFRAP Database - The No Further Remedial Action Planned (NFRAP) sites are those that have been removed from CERCLIS. After initial investigation, either no contamination was found, contamination was removed quickly, or the contamination was not serious enough to require Federal Superfund action or National Priority List consideration.

- PADS Database -The PCB Activity Database System (PADS) is a national database, which contains information pertaining to facilities that which generate, store, transport, or dispose of polychlorinated biphenyls (PCBs).

- RCRA Generators – Large Quantity Generators Database - This RCRA database maintained by EPA, lists facilities that generate hazardous wastes. Large quantity generators are those that generate 1,000 kilograms (kg) or more of hazardous waste in a month.

- RCRA Generators – Small Quantity Generators Database – This RCRA database maintained by EPA, lists facilities that generate hazardous wastes. Small quantity generators are those that generate 100 to 1,000 kg of hazardous waste in a month.

- RCRA Transporters Database - The RCRA Transporter database is maintained by EPA and lists facilities that transport hazardous materials.

- RCRIS Database - The Resource Conservation and Recovery Information System (RCRIS) database is a national database, maintained by EPA that provides selective information on facilities that generate, transport, store, treat, or dispose of hazardous materials.

- TRIS Database - The Toxic Release Inventory System (TRIS) is a national database that tracks all facilities that manufacture, process, or import toxic chemicals in quantities

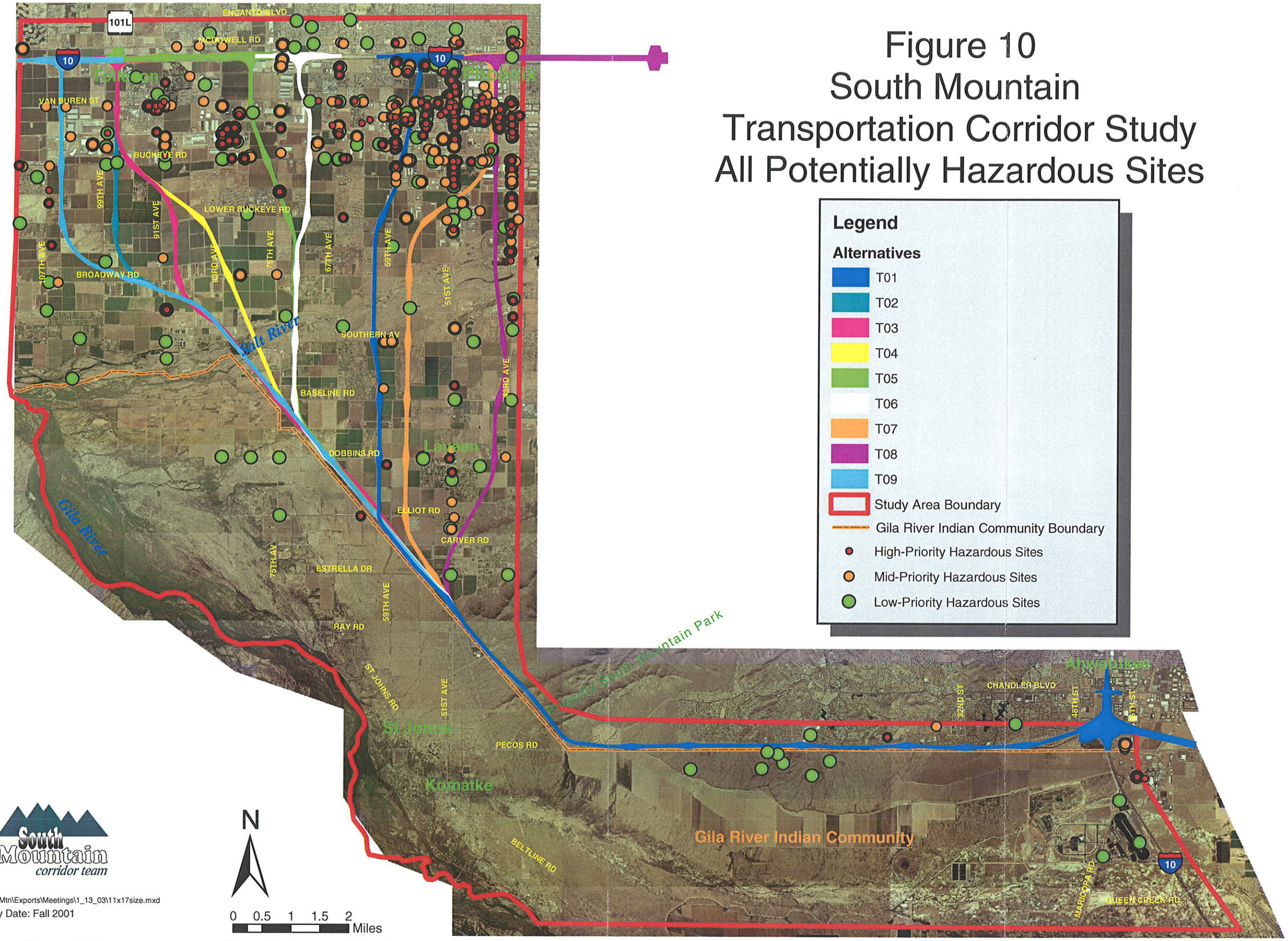
exceeding 25,000 pounds annually, as required by the Superfund Amendments and Reauthorization Act (SARA) Title III, Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA).

For alternatives that extend beyond the study area, no potentially hazardous site impacts were developed for the area outside the study area.

Figure 10 illustrates the locations of all potentially hazardous sites within the study area. Figures 11, 12 and 13 illustrate the locations of all potentially hazardous sites (based on priority) that come in contact with any of the nine technical alternatives.

Table 7 presents the data that supports Figures 11, 12 and 13. There are no potentially hazardous sites on the Pecos Road Section, and thus no table is provided. (Landfills are not included in these tables.)

Figure 10
South Mountain Transportation Corridor Study
All Potentially Hazardous Sites



ADOT

South Mountain corridor team

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Aerial Photography Date: Fall 2001

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Figure 11
South Mountain Transportation Corridor Study
Potentially High-Priority Hazardous Sites

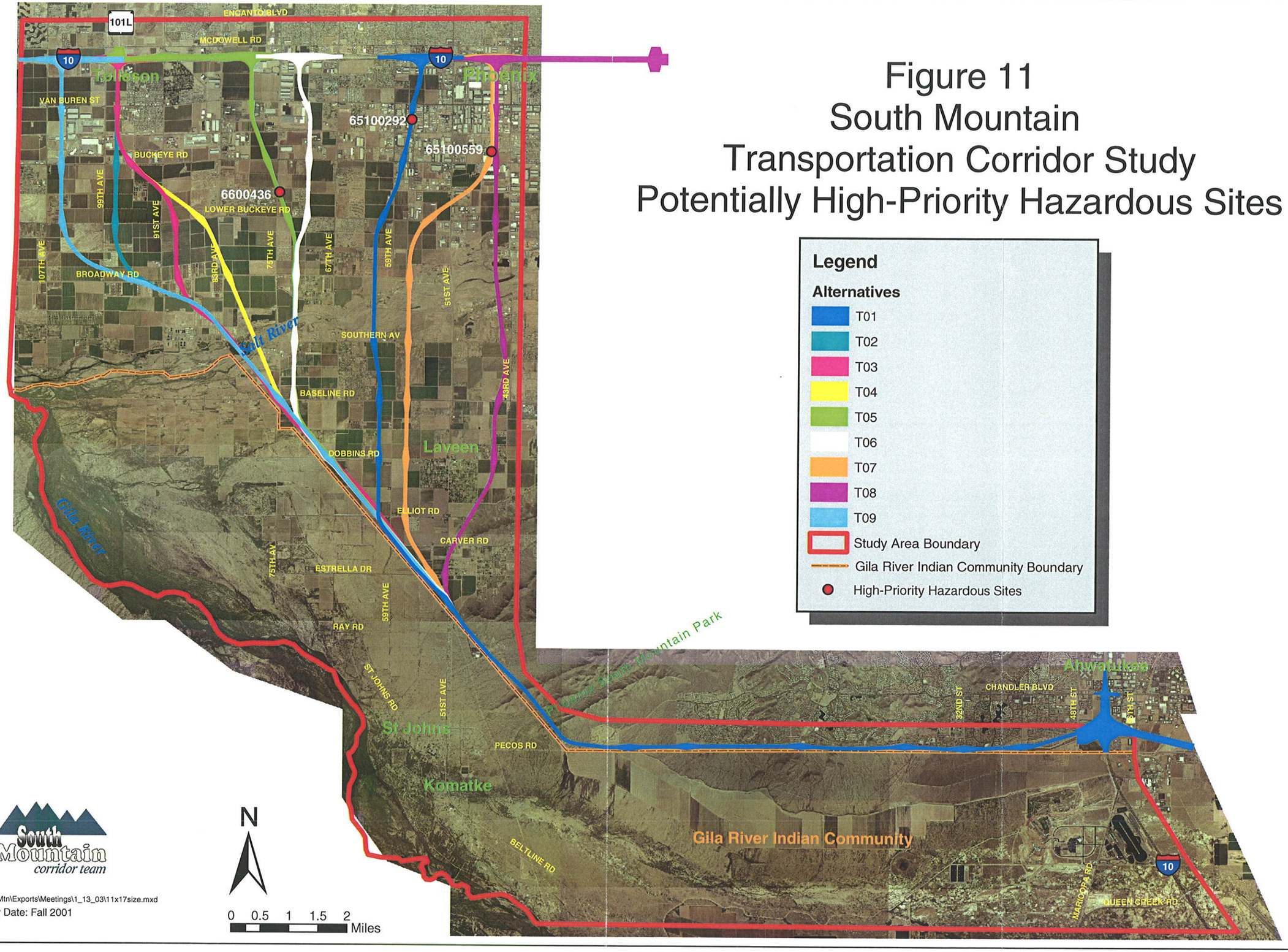
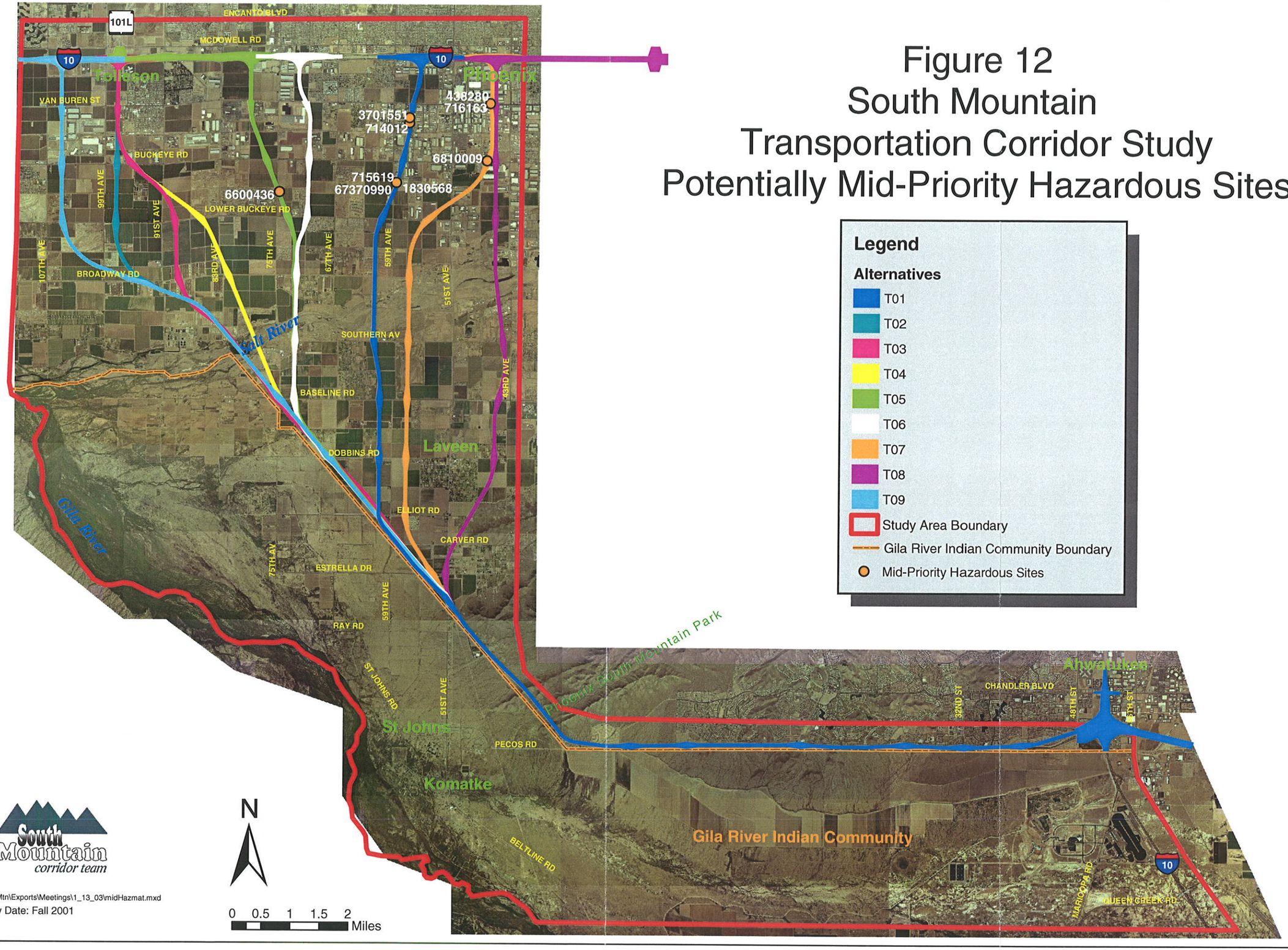


Figure 12
South Mountain Transportation Corridor Study
Potentially Mid-Priority Hazardous Sites



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Aerial Photography Date: Fall 2001

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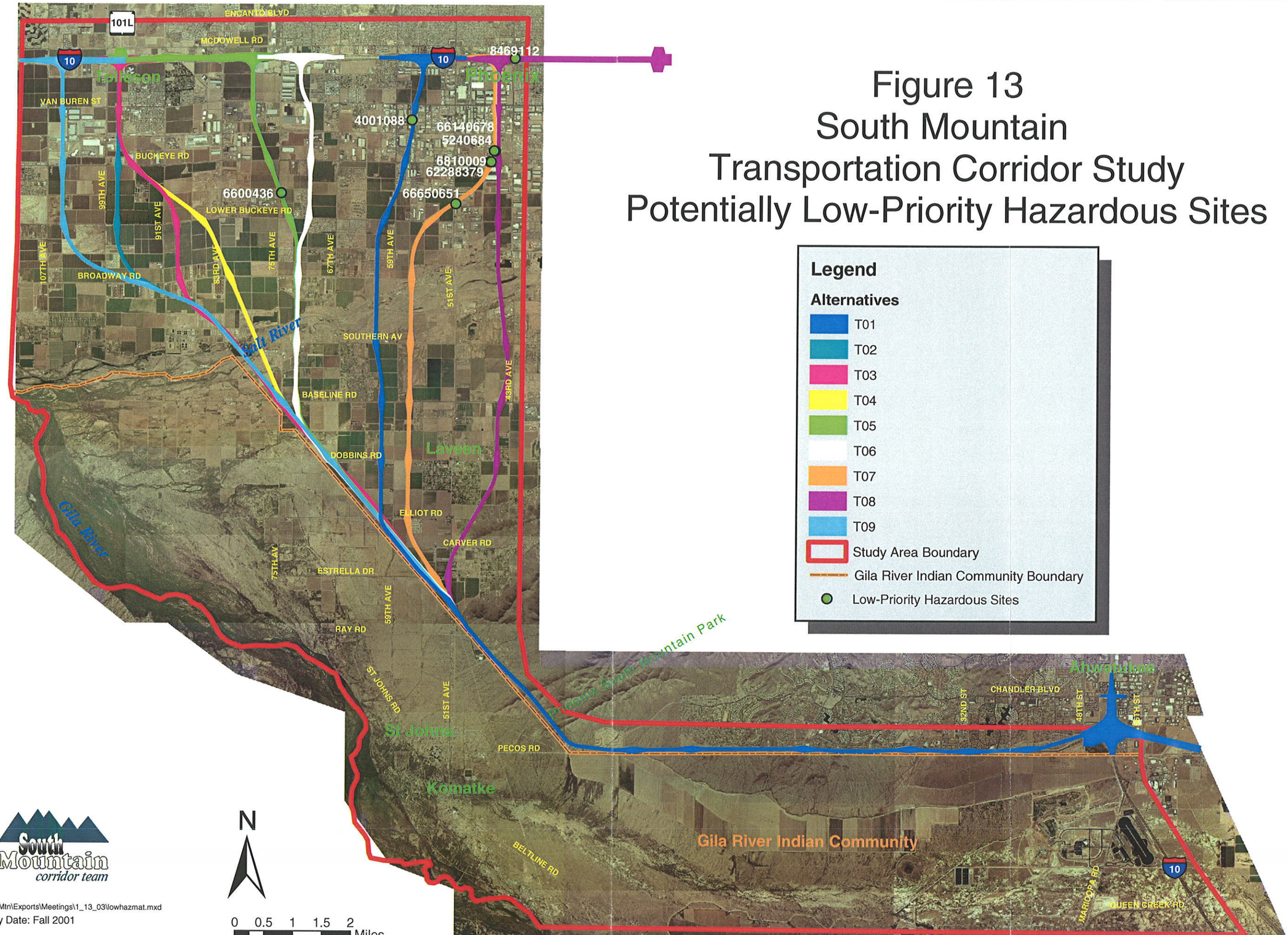
Figure 13
South Mountain Transportation Corridor Study
Potentially Low-Priority Hazardous Sites



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Aerial Photography Date: Fall 2001

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South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 7

Potentially Hazardous Sites - West Section

Alternative	Priority	ID	Type	Name	Address	Total
T01	High	65100292	State Cleanup Listing	San Joaquin Refining Co	131 S 57th Ave	1
	Medium	3701551	RCRA Transporter	Silver Systems Inc	3 S 57th Dr	6
		3701551	RCRIS	Silver Systems Inc	3 S 57th Dr	
		714012	UST	Hinckley & Schmitt Inc	315 S 57th Dr	
		67370990	RCRIS	Ritchie Brothers Auctioneers	1833 S 59th Ave	
		715619	UST	Northern Contracting Co	1833 S 59th Ave	
		1830568	UST	Ritchie Brothers Auctioneers	1835 S 59th Ave	
	Low	4001088	NFRAP	San Joaquin Refining Co	131 S 57th Ave	1
T02	Low	0	MINES	Building Products Co		1
T03	No locations identified.					
T04	No locations identified.					
T05	High	6600436	RCRA Violators	Swift Transportation	2200 S 75th Ave	1
	Medium	6600436	RCRA Transporter	Swift Transportation	2200 S 75th Ave	2
		6600436	RCRIS	Swift Transportation	2200 S 75th Ave	
	Low	6600436	RCRA SM Generator	Swift Transportation	2200 S 75th Ave	1
T06	No locations identified.					

Potentially Hazardous Sites - West Section (Continued)

Alternative	Priority	ID	Type	Name	Address	Total
T07	High	65100559	State Cleanup Listing	APS West Power Plant	4606 West Hadley	1
	Medium	438280	RCRIS	Uniserve Technologies Inc	4615 W Van Buren St	3
		716163	UST	Stan-An Development	4615 W Van Buren	
		6810009	UST	Alliant Foodservice Inc	4650 W Buckeye Rd	
	Low	8469112	ERNS	DNS Trucking	Interstate 10 at 43rd Ave	10
		66140678	SPILLS	Arizona Public Service	4606 W Hadley St	
		5240684	ERNS	AZ Public Service Co	4606 West Hadley	
		5240684	SPRILLS	APS	4606 W Hadley	
		5240684	ERNS	AZ Public Service Co	4606 West Hadley	
		6810009	ERNS	Alliant Foodservice Inc	47th Ave and Buckeye Rd	
		6810009	ERNS	Alliant Foodservice Inc	47th Ave and Buckeye Rd	
		62288379	HMIRS		4650 W Buckeye	
		66650651	HMIRS		2410 S 51 Ave	
		0	MINES	Gravel Pit		
T08	Low	8469112	ERNS	DNS Trucking	Interstate 10 at 43rd Ave	1
T09	No locations identified.					

GENERAL PLAN INTENT COMPATABILITY

The purpose of this screening exercise is to discuss the General Plan compatibility of the alignments. Specifically, the General Plans of the City of Phoenix (adopted December 5, 2001), City of Tolleson (November 1996) and City of Avondale (June 17, 2002) will be reviewed. It is assumed that project impacts that would not be compatible with general plans would occur from those alternatives carried forward into the EIS for detailed study. The compatibility of the alternatives with transportation and open space goals of the general plans is presented.

TOLLESON

The General Plan calls for 91st Avenue to become an enhanced principal access for residential and tourist traffic, not a primary truck route. They prefer principal truck and industrial traffic on 99th Avenue, which is already a fully improved major arterial. The goal of the City is to create an enhanced principal gateway for residents and visitors, while providing other improved routing for industrial traffic. They want to retain, enhance and expand transit and rail services in Tolleson and have enhanced pedestrian and bicycling routes; their goal being to continue improvements, enhancements and maintenance of streets for motorists, bicyclists and pedestrians. There is no discussion about a freeway in the General Plan (City of Tolleson 1996).

AVONDALE

Avondale plans to develop long range transportation plans, develop linkages to light rail, expand bus service, and encourage land development patterns that would promote efficient use of existing and planned transportation facilities. They would also provide facilities appropriate to varying traffic volumes and provide transportation corridors to existing and future developments and also offer non-vehicular options so residents do not have to rely on automobiles. The General Plan does not discuss a freeway.

PHOENIX

Phoenix is planning to expand capacity on streets and freeways and expand mass transit. The City of Phoenix General Plan states that the City encourages the timely construction of the freeways and expressways in the adopted MAG Plan. This includes completion of the South Mountain Parkway.

Existing plans do not include construction of C-D roads from the new system interchange along I-10 (Papago Freeway) to either SR 101L or I-17 (City of Phoenix 2002).

Figures 14, 15 and 16 illustrate all nine technical alternatives on top of the General Plans of the study area.

No table is provided for this section.

Figure 14
South Mountain Transportation Corridor Study
Tolleson General Plan

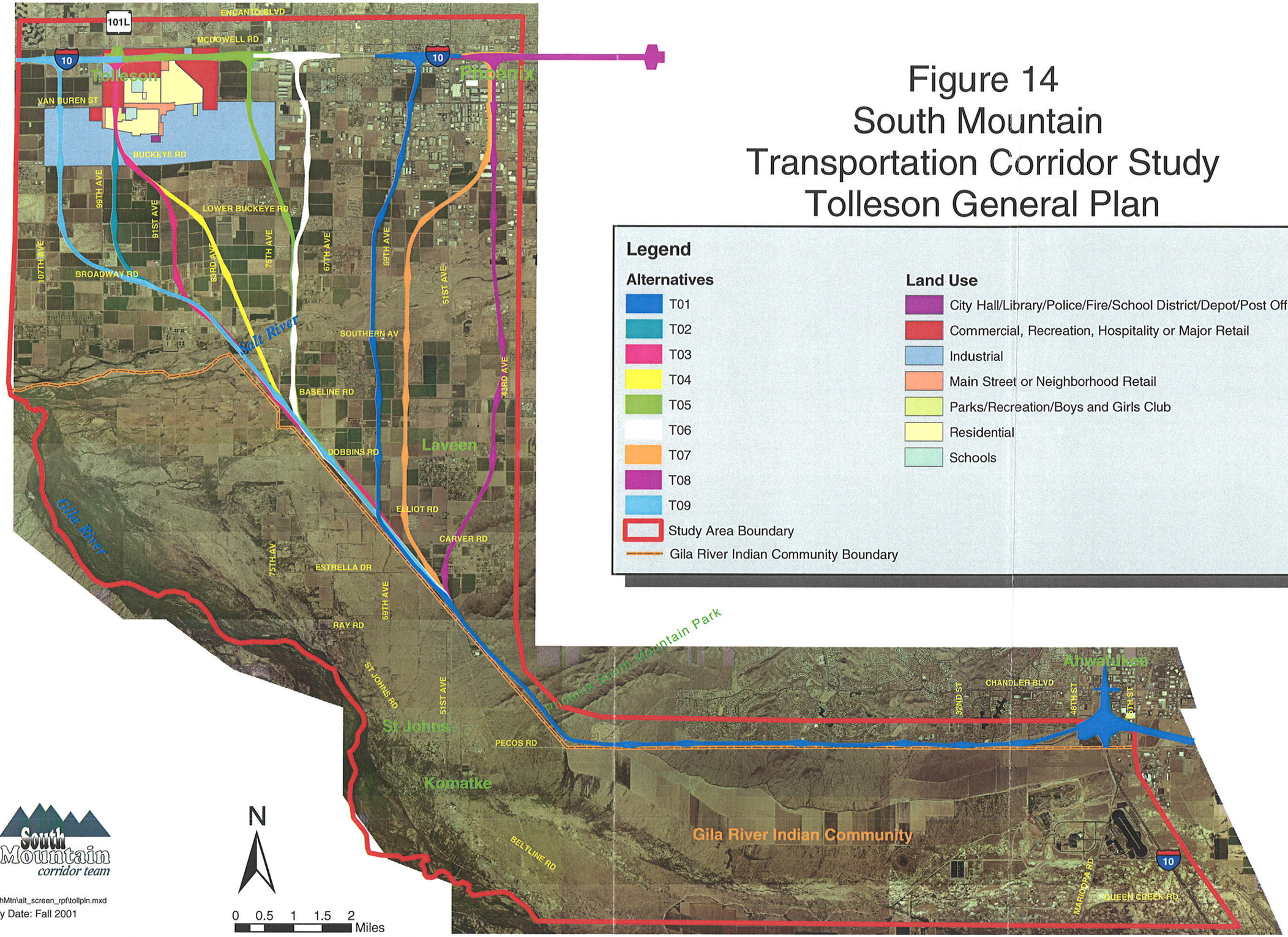


Figure 15
South Mountain Transportation Corridor Study
Avondale General Plan

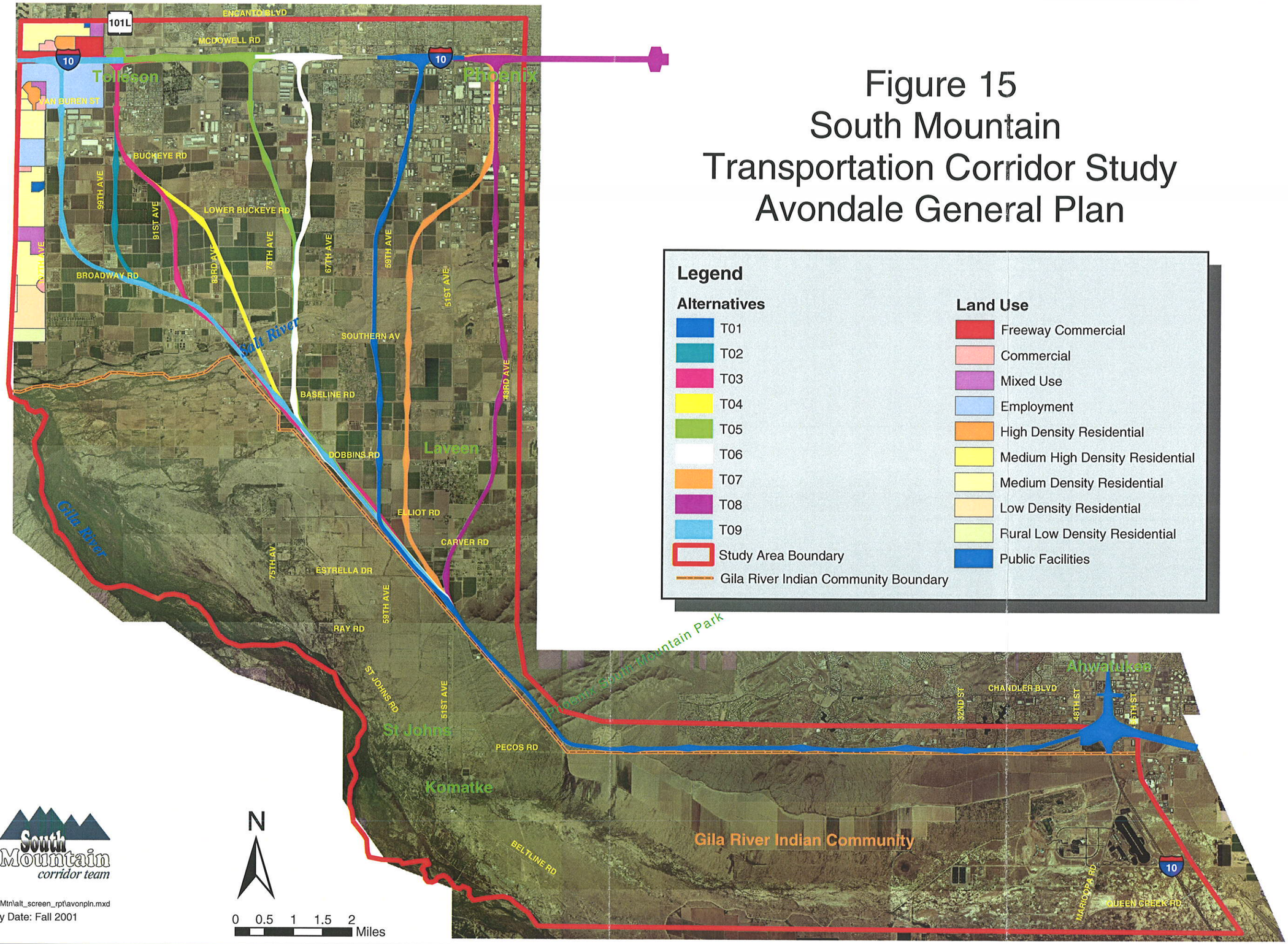


Figure 16
South Mountain Transportation Corridor Study
Phoenix General Plan

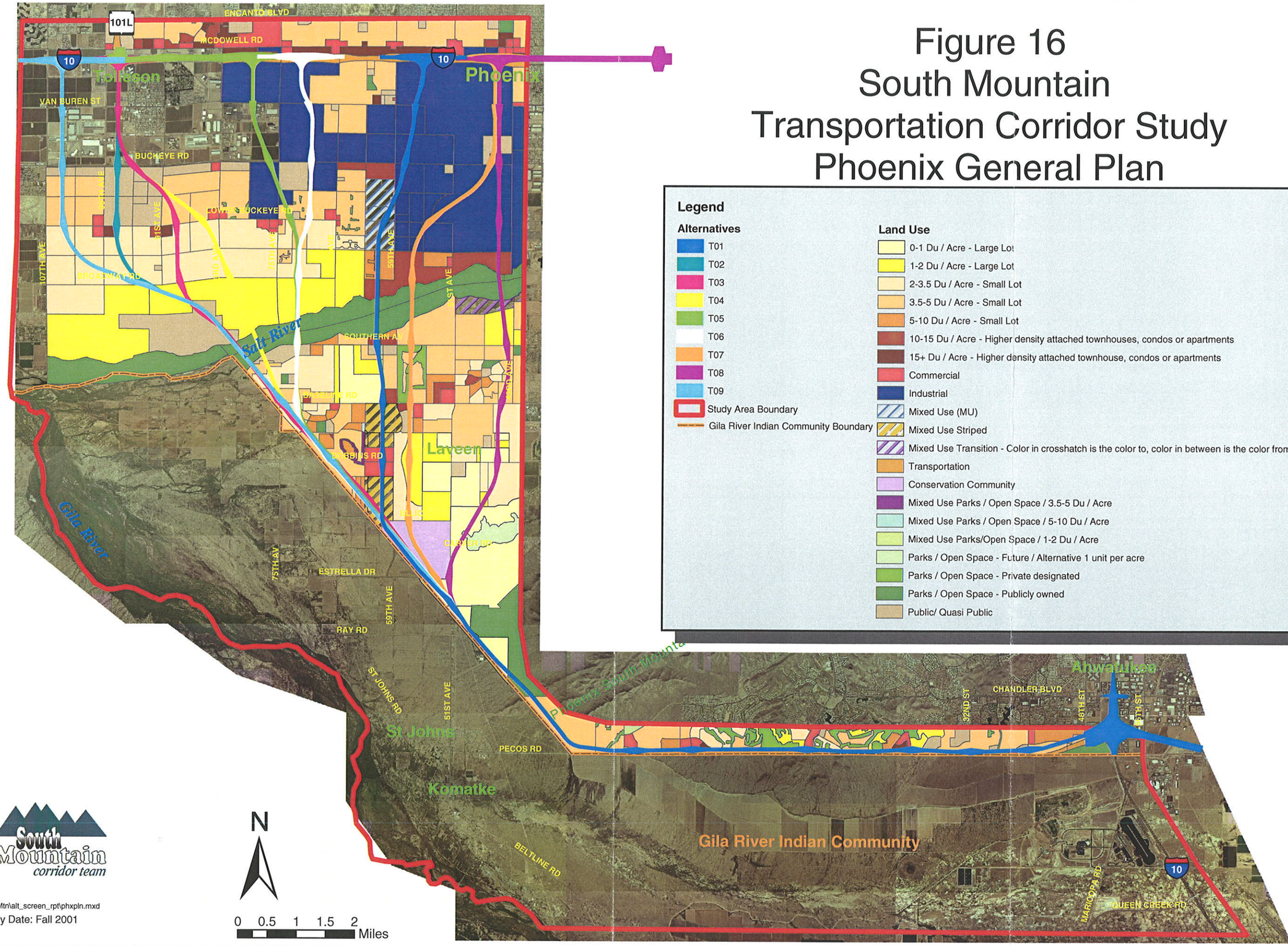


Fig. 16

PRIME AND UNIQUE FARMLAND

The purpose of this screening exercise is to determine which alternatives would impact prime and unique farmlands under the Farmland Protection Policy Act. It is assumed that impacts on prime and unique farmlands would occur from those alternatives carried forward into the EIS for detailed study.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, and other agricultural crops. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. Designation of prime or unique farmland is made by the Natural Resources Conservation Service, under the U.S. Department of Agriculture.

No prime and unique farmland are known to exist within the study area. This is also assumed for the portions of alternatives that extend beyond the study area.

No figure is provided for this section.

No table is provided for this section.

AIR QUALITY AND NOISE QUALITY

The purpose of this screening exercise is to determine which alternatives have minimal impact on air quality and noise quality within and near the study area.

AIR QUALITY

Air quality impacts are difficult to analyze at this stage of the study. All alternatives fall within Maricopa County and within non-attainment areas for carbon monoxide (CO), suspended particulate matter (PM_{10}), and ozone (O_3) (ADEQ 2002). Review of the alignments indicates that in general, air impacts would be fairly consistent. However, sensitive air receptors are determined in the same manner as sensitive noise receptors. See the following section for sensitive receptor location approximation.

NOISE QUALITY

The number of sensitive noise receptors that are located within 500 feet of the middle of the outside lane of travel were documented. Analysis is based on the guidance of FHWA Document, FHWA-HI-00-046, June 1995 Highway Traffic Noise Analysis and Abatement Policy and Guidance. This states that "Traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 feet to 200 feet meters from lightly traveled roads".

At this level of analysis, FHWA guidelines are being used. During detailed analysis, all alternatives carried forward will be analyzed using ADOT's Noise Policy.

Existing conditions are identified from field visits, aerial mapping, zoning and land use plans, topographic maps, and preliminary roadway alignment plans prepared for the project. Sensitive land uses in the study area are identified in accordance with FHWA's Noise Abatement Criteria. The existing and planned land uses within the study area fall within established NAC categories established by the FHWA Federal Aid Program Guide (FAPG) H-772 in accordance with 23 CFR Part 772. These criteria and activity categories are summarized in the table below.

Noise Abatement Criteria (NAC) ***Hourly A-Weighted Sound Level - Decibels (dBA)***		
Activity Category	***LAeq1h***	***Description of Activity Category***
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	-	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.
The decibel (dB) is a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level. *It has been found that the A-scale on a sound-level meter best approximates the frequency response of the human ear. (dBA)* *The hourly equivalent sound level, LAeq1h, represents the A-weighted sound level which contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over one hour.*		

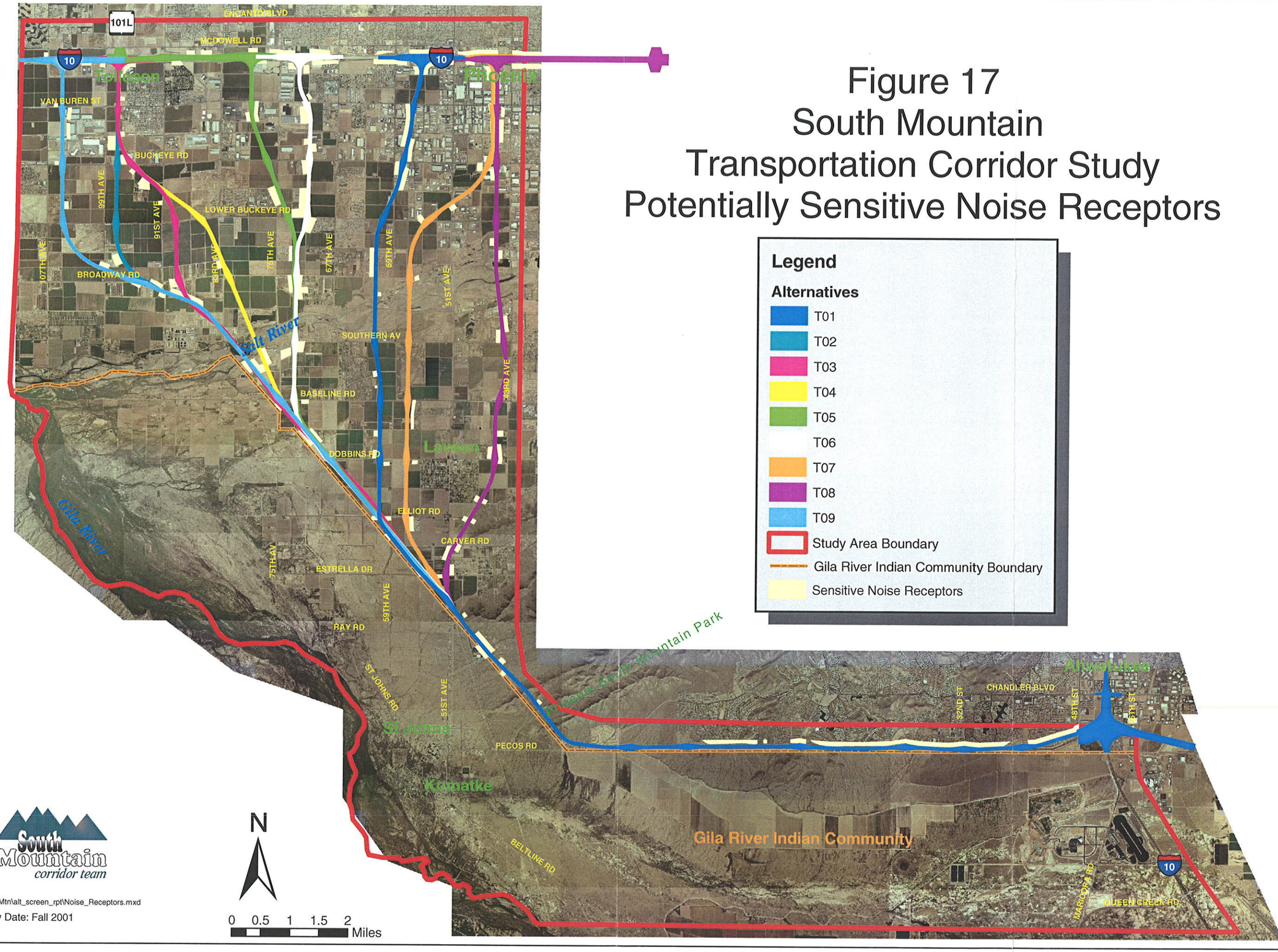
Source: U.S. Department of Transportation, Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement, Policy and Guidance*, June 1995, 23 CFR 772.

Noise impacts were development for alternatives that extend beyond the study area.

Figure 17 illustrates the location where sensitive noise receptors were considered along each alignment. While the entire length of each alignment was reviewed, the sensitive receptors quantified only occurred within developed segments of each alignment.

Tables 8 and 9 present the data that supports Figure 17. Only existing residential and non-residential units were documented. Impacts based on planned developments and zoning were not considered.

Figure 17
South Mountain Transportation Corridor Study
Potentially Sensitive Noise Receptors



South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 8

Potentially Sensitive Noise Receptors - Pecos Road Section			
Alternative	**Residential Units**	**Non-Residential Units**	**Additional Impacts**
ALL	676	2	2 Schools, Apartment Complex

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 9

Potentially Sensitive Noise Receptors - West Section			
Alternative	**Residential Units**	**Non-Residential Units**	**Additional Impacts**
T01	251	38	Casino, Apartment Complex
T02	35	12	Casino, School Fields, Apartment Complex
T03	31	9	Casino, School Fields, Apartment Complex
T04	26	12	Casino, School Fields, Apartment Complex
T05	60	17	Casino
T06	192	11	Casino, Apartment Complex
T07	535	41	Casino, Golf Course
T08	548	49	Casino
T09	34	16	Casino

DISPLACEMENTS AND RELOCATIONS

The purpose of this screening exercise is to determine which alternatives would cause displacements and relocations in the study area. The number of existing residences and businesses that would be impacted by each alternative and acreage of specific zoning for future residences and businesses was evaluated. The number of displacements recorded were within the right-of-way, which is 150 feet on each side of the centerline and widens to 300 feet at the interchanges. To determine future displacements, the zoning sections of the land use plans were used. Dwellings per acre were determined as they were described in the plans.

For alternatives that extend beyond the study area, existing residences and businesses that would need to be relocated, and are in the portion of the alternative outside the study area, have been included in the impacts table. For those alternatives that incorporated C-D roads along I-10, the right-of-way width was widened to 250 feet on each side. No future zoning impacts were considered for the portions outside the study area.

Refer to Figure 1, in the Executive Summary, for the location of all nine technical alternatives within the study area.

Tables 10, 11, 12 and 13 present the data for displacements and relocations for the Pecos Road Section (all alignments identical) and the West Section for each alignment. In Tables 12 and 13, residential is abbreviated as Res., commercial is abbreviated as Comm. and industrial is abbreviated as Ind.

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 10

Existing Units Displaced within Right-of-Way - Pecos Road Section			
Alternative	**Residential Units**	**Non-Residential Units**	**Additional Impacts**
ALL	168	4	Church

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 11

Existing Units Displaced within Right-of-Way - West Section			
Alternative	**Residential Units**	**Non-Residential Units**	**Additional Impacts**
T01	7	32	Church
T02	14	4	School Fields
T03	13	5	School Fields
T04	15	5	School Fields
T05	17	6	
T06	37	9	
T07	127	37	
T08	146	38	
T09	20	4	

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 12

Future Zoning / Land Use Impact Analysis - Pecos Road Section								
Alternative	**Res. Acreage**	**Dwelling Units**	**Comm. Acreage**	**Ind. Acreage**	**Mixed Use - Comm/Ind Acreage**	**Commerce/ Business Park Acreage**	**Conservation Community Acreage**	**Public/ Quasi-Public Acreage**
ALL	80.0	376	14.0	0.0	0.0	0.0	0.0	0.0

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 13

Future Zoning / Land Use Impact Analysis - West Section								
Alternative	**Res. Acreage**	**Dwelling Units**	**Comm. Acreage**	**Ind. Acreage**	**Mixed Use - Comm/Ind Acreage**	**Commerce/ Business Park Acreage**	**Conservation Community Acreage**	**Public/ Quasi-Public Acreage**
T01	157.6	629	60.4	105.1	58.6	0.0	45.4	0.0
T02	311.3	947	18.4	63.8	11.0	0.0	60.0	31.8
T03	309.4	907	18.5	65.4	15.3	0.0	46.1	30.8
T04	282.3	682	18.6	69.2	0.0	0.0	74.8	0.0
T05	273.8	724	0.0	115.8	11.4	0.0	46.9	5.9
T06	234.2	736	0.0	94.8	10.9	1.7	46.8	6.0
T07	186.3	550	0.0	115.0	0.0	0.0	51.5	28.6
T08	260.1	561	0.0	122.6	0.0	0.0	10.2	10.7
T09	345.6	945	0.0	52.2	11.0	33.5	46.2	31.8

UTILITIES

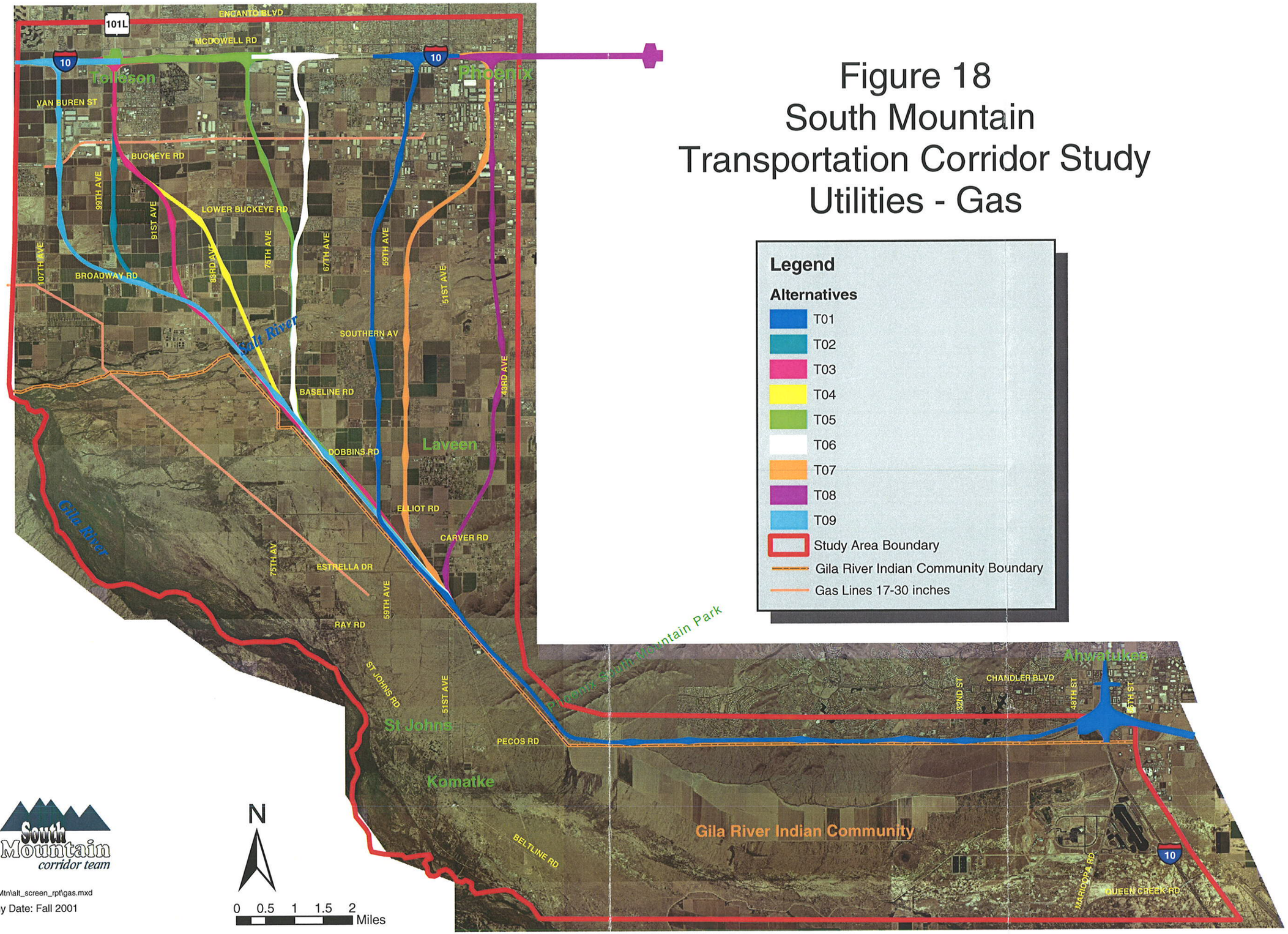
The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on existing utilities, which includes gas, irrigation, phone/fiber optic, power, railroad and sewer. It is assumed that impacts on utilities would occur from those alternatives carried forward into the EIS for detailed study and mitigation would be necessary.

For alternatives that extend beyond the study area, no utility impacts were developed for the area outside the study area.

Figures 18, 19, 20, 21, 22 and 23 illustrate the location of major utilities within the study area and their vicinity to the nine technical alternatives.

Tables 14, 15, 16 and 17 present the data that supports Figures 18, 19, 20, 22, 22 and 23. Tables 14 and 15 present the major utilities impacted by each technical alternative while Tables 16 and 17 present the impacts to all utilities by alternative.

Figure 18
South Mountain Transportation Corridor Study
Utilities - Gas



F:\Projects\ADOT\SouthMtn\alt_screen_rpt\gas.mxd

Aerial Photography Date: Fall 2001

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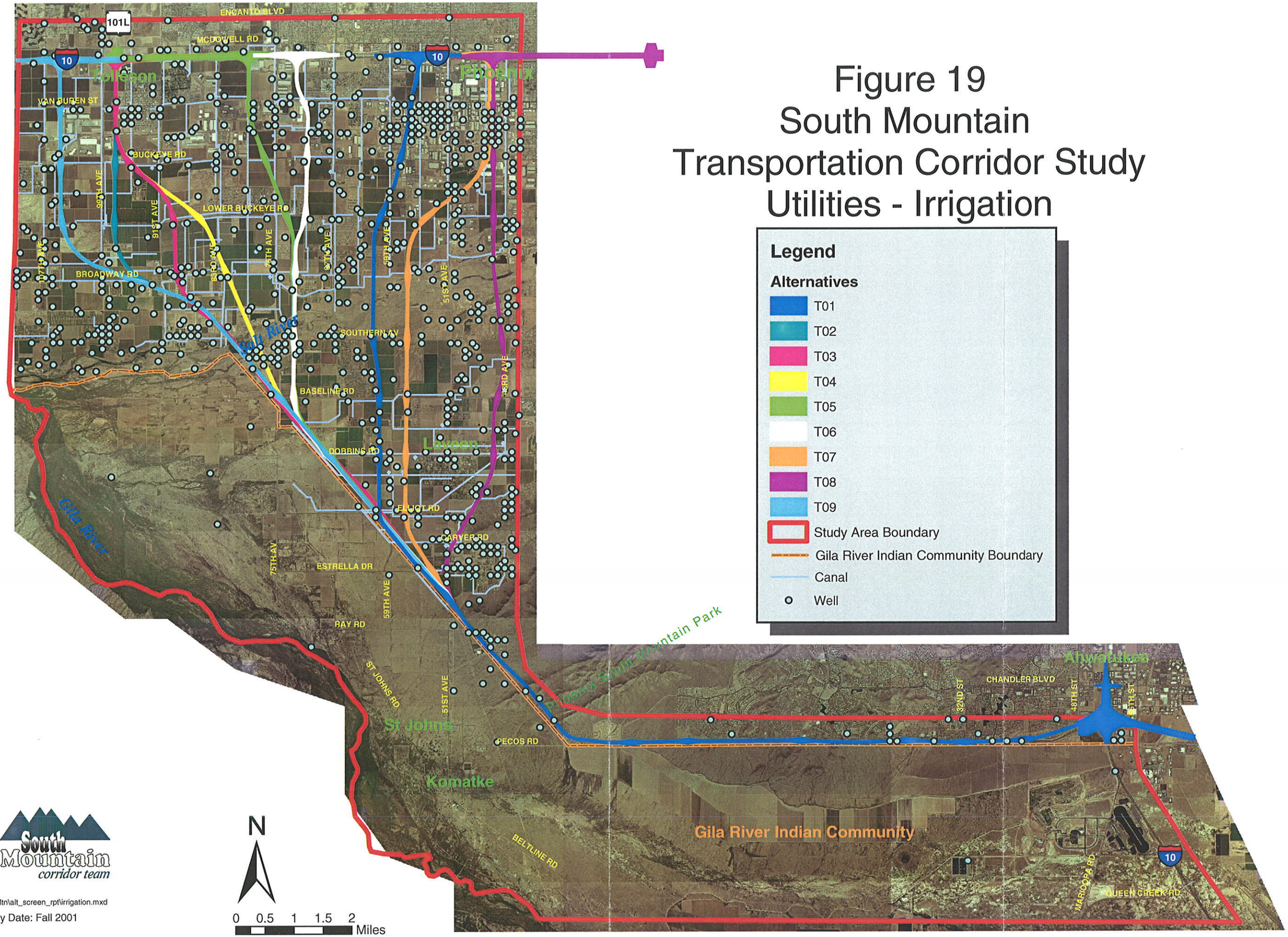
Figure 19
South Mountain Transportation Corridor Study
Utilities - Irrigation



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Aerial Photography Date: Fall 2001
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Figure 20
South Mountain Transportation Corridor Study
Utilities - Underground Fiber Optic

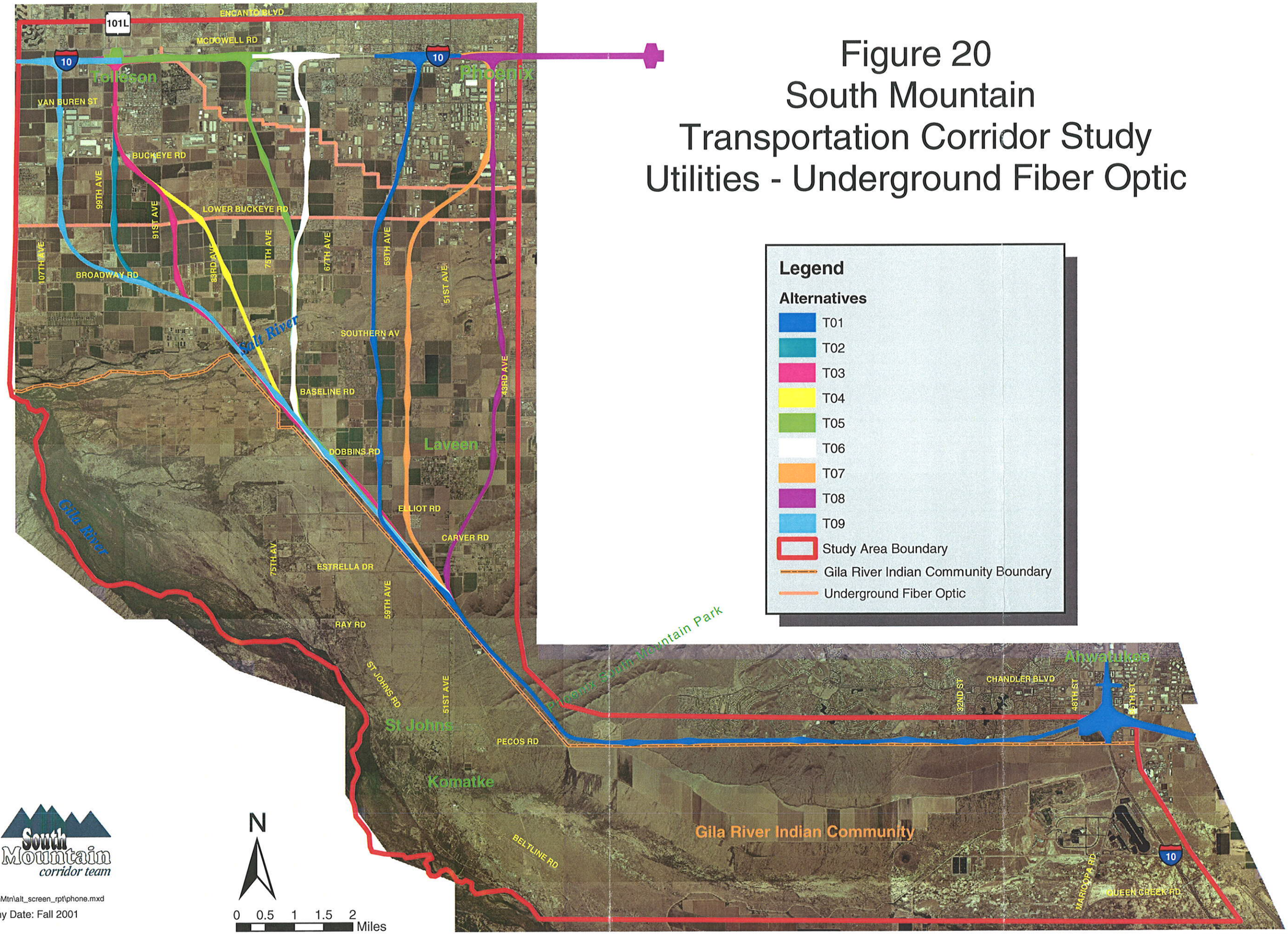
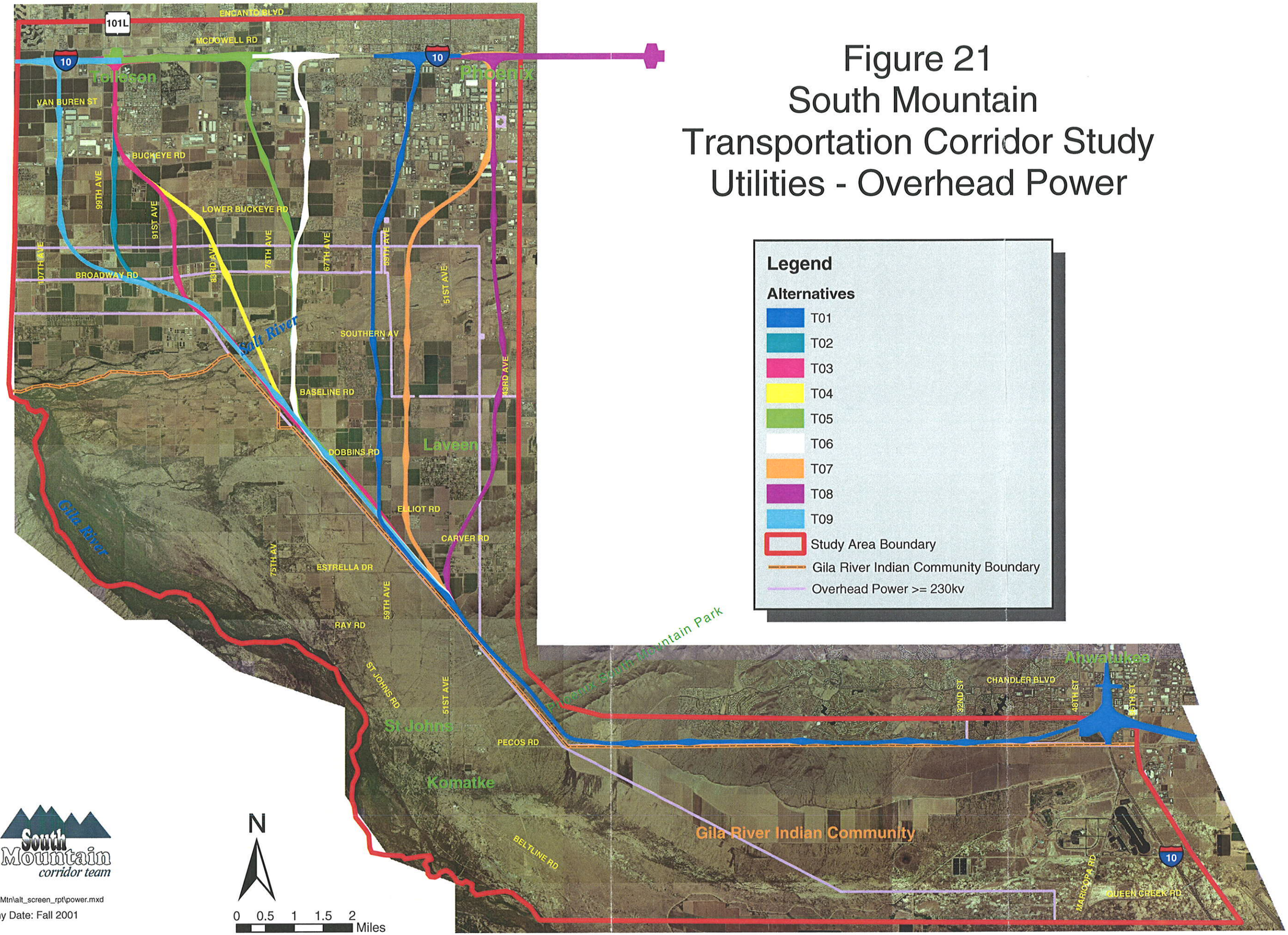


Figure 21
South Mountain Transportation Corridor Study
Utilities - Overhead Power



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Aerial Photography Date: Fall 2001

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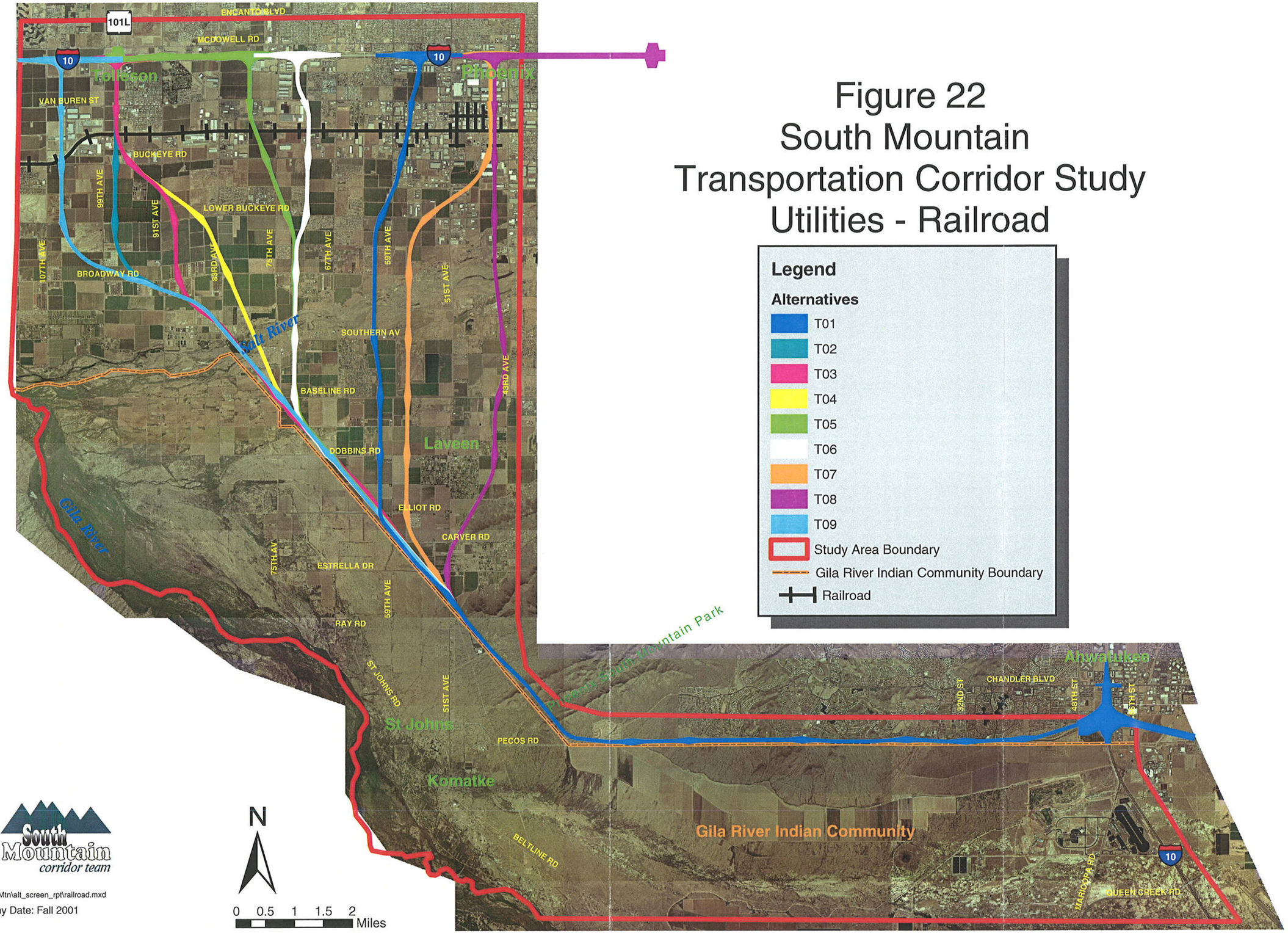
Figure 22
South Mountain Transportation Corridor Study
Utilities - Railroad



ADOT

South Mountain corridor team

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Aerial Photography Date: Fall 2001

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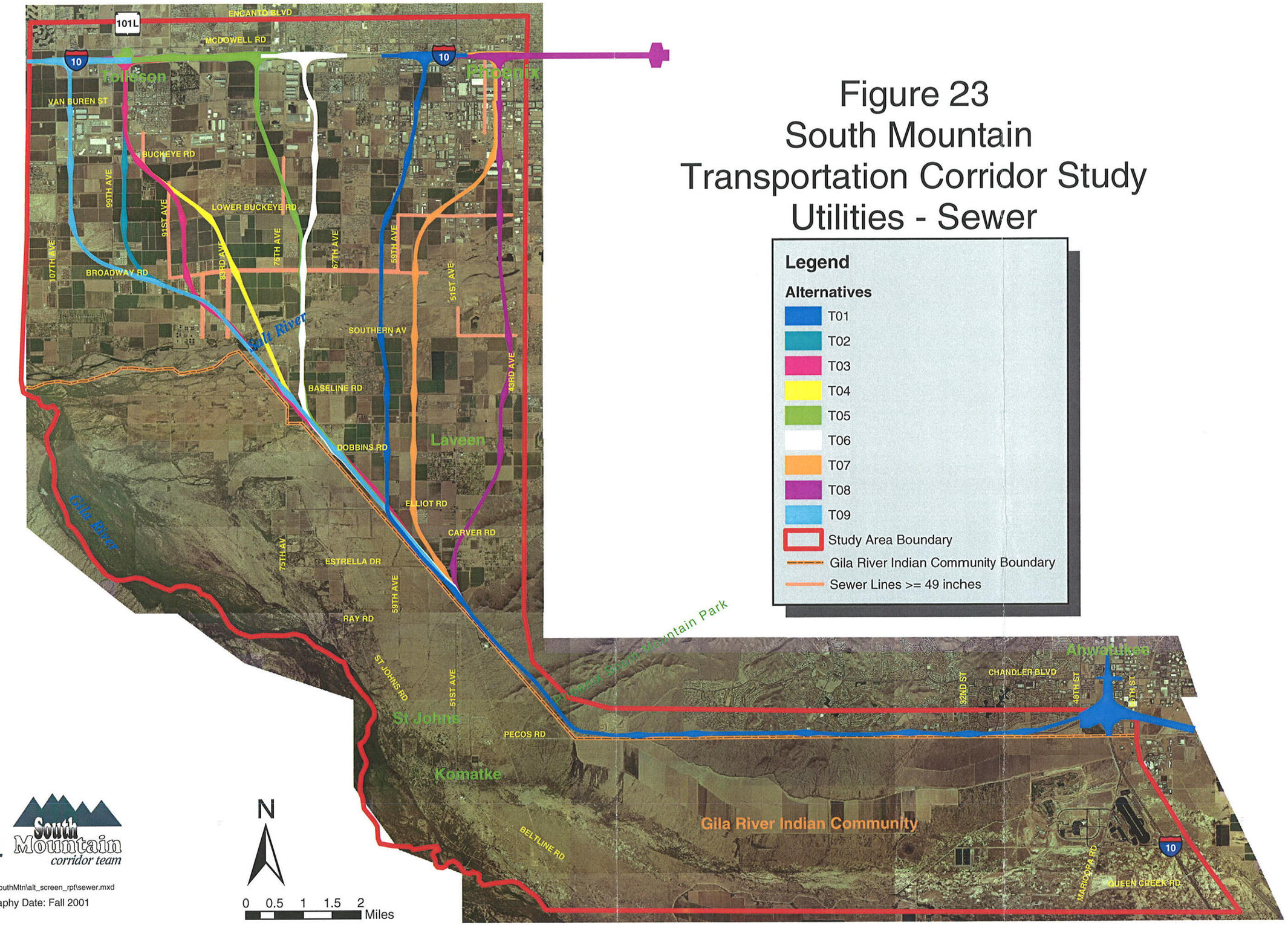
Figure 23
South Mountain Transportation Corridor Study
Utilities - Sewer



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Aerial Photography Date: Fall 2001

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South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 14

Major Utility Locations - Pecos Road Section

Alternative	Utility	Type	Location
ALL	Power	230KV	32nd St.
		500KV	32nd St.

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 15

Major Utility Locations - West Section

Alternative	Utility	Type	Location
T01	Gas	17"-30"	Between Van Buren St & Buckeye Rd
	Irrigation	Canal Crossing	Van Buren St
		Canal Crossing	Between Buckeye Rd & Lower Buckeye Rd
		Irrigation Well	Lower Buckeye Rd
		Irrigation Well	Van Buren St
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
		Fiber Optic	Along RID Canal (AT&T)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
	Railroad		Between Van Buren St & Buckeye Rd (3 sets of tracks)
	Sewer	>49"	Between Buckeye Rd & Lower Buckeye Rd
		>49"	Broadway Rd (2 lines)

Major Utility Locations - West Section (Continued)

Alternative	Utility	Type	Location
T02	Gas	17"-30"	Between Van Buren St & Buckeye Rd
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
	Railroad		Between Van Buren St & Buckeye Rd
	Sewer	>49"	Between Van Buren St & Buckeye Rd
		>49"	Between Broadway Rd & Southern Ave (4 lines)
T03	Gas	17"-30"	Between Van Buren St & Buckeye Rd
	Irrigation	Irrigation Well	Broadway Rd
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
	Railroad		Between Van Buren St & Buckeye Rd
	Sewer	>49"	Between Van Buren St & Buckeye Rd
		>49"	Buckeye Rd (2 lines)
		>49"	Broadway Rd
		>49"	Between Broadway Rd & Southern Ave (4 lines)
T04	Gas	17"-30"	Between Van Buren St & Buckeye Rd
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
	Railroad		Between Van Buren St & Buckeye Rd
	Sewer	>49"	Between Van Buren St & Buckeye Rd
		>49"	Buckeye Rd (2 lines)
		>49"	Broadway Rd (2 lines)

Major Utility Locations - West Section (Continued)

Alternative	Utility	Type	Location
T05	Gas	17"-30"	Between Van Buren St & Buckeye Rd
	Irrigation	Canal Crossing	Van Buren St
		Canal Crossing	Between Van Buren St & Buckeye Rd
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
		Fiber Optic	Along RID Canal (AT&T)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
		Substation	Van Buren St
	Railroad		Between Van Buren St & Buckeye Rd
	Sewer	>49"	Between Buckeye Rd & Lower Buckeye Rd
		>49"	Broadway Rd (2 lines)
T06	Gas	17"-30"	Between Van Buren St & Buckeye Rd
	Irrigation	Canal Crossing	Van Buren St
		Canal Crossing	Between Van Buren St & Buckeye Rd
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
		Fiber Optic	Along RID Canal (AT&T)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
	Railroad		Between Van Buren St & Buckeye Rd
	Sewer	>49"	Broadway Rd (2 lines)

Major Utility Locations - West Section (Continued)			
Alternative	**Utility**	**Type**	**Location**
T07	Irrigation	Canal Crossing	Van Buren St
		Canal Crossing	Between Buckeye Rd & Lower Buckeye Rd
		Irrigation Well	Van Buren St
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
		Fiber Optic	Along RID Canal (AT&T)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
	Railroad		Between Van Buren St & Buckeye Rd
	Sewer	>49"	Between Buckeye Rd & Lower Buckeye Rd
		>49"	Lower Buckeye Rd
		>49"	Broadway Rd
T08	Irrigation	Canal Crossing	Van Buren St
		Canal Crossing	Between Buckeye Rd & Lower Buckeye Rd
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
		Fiber Optic	Along RID Canal (AT&T)
	Power	230KV	Elliot Rd
		230KV	Ray Rd
	Railroad		Between Van Buren St & Buckeye Rd (2 sets of tracks)
	Sewer	>49"	Lower Buckeye Rd
		>49"	Southern Ave
T09	Gas	17"-30"	Buckeye Rd
	Phone	Fiber Optic	Lower Buckeye Rd (Sprint)
	Power	230KV	Between Lower Buckeye Rd & Broadway Rd
		230KV	Broadway Rd
		230KV	Ray Rd
		Substation	Buckeye Rd
	Railroad		Buckeye Rd

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 16

All Utility Conflicts - Pecos Road Section

Alternative	Utility	UID	TID	Type	Conflict (feet)
ALL	Gas	GAS	4"-6"	4"-6"	2,190
	Power	PWR	OH-12KV	Overhead - 12KV	2,757
		PWR	OH-500KV	Overhead - 500KV	1,694
		PWR	UG-PR	Underground primary	5,931
	Sewer	SWR	7"-10"	7"-10"	479
		SWR	11"-16"	11"-16"	2,476
		SWR	31"-48"	31"-48"	1,902
	Telephone	TEL	UG-AL	Underground analog	6,522
	Water	WTR	11"-16"	11"-16"	5,609
		WTR	W-L	Proposed waterline	483

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 17

All Utility Conflicts - West Section

Alternative	Utility	UID	TID	Type	Conflict (feet)
T01	Cable	CBL	OH-FO	Overhead Fiber-Optic	1,145
	Gas	GAS	4"-6"	4"-6"	1,379
		GAS	7"-10"	7"-10"	1,386
		GAS	11"-16"	11"-16"	433
		GAS	17"-30"	17"-30"	308
	Irrigation	IRR	IRR-WELL	Irrigation Well (each)	2
		IRR	OD-PD	Open drain or pump ditch	1,815
		IRR	PIP-LAT	Piper lateral	5,310
		IRR	PD-PD	Piped drain or pump ditch	267
		IRR	X-ING	Canal crossing (each)	1
	Power	PWR	OH-12KV	Overhead - 12KV	6,550
		PWR	OH-69KV	Overhead - 69KV	2,580
		PWR	OH-230KV	Overhead - 230KV	935
		PWR	UG-PR	Underground primary	896
	Railroad	RR	RR-XING	Railroad crossing (each)	3
	Sewer	SWR	7"-10"	7"-10"	576
		SWR	11"-16"	11"-16"	576
		SWR	17"-30"	17"-30"	740
		SWR	49"-PL	>49"	600
	Telephone	TEL	UG-AL	Underground analog	4,023
		TEL	UG-FO	Underground fiber-optic	2,605
	Water	WTR	4"-6"	4"-6"	1,129
		WTR	7"-10"	7"-10"	947
		WTR	11"-16"	11"-16"	2,931
		WTR	W-L	Proposed waterline	2,270

All Utility Conflicts - West Section (Continued)

Alternative	Utility	UID	TID	Type	Conflict (feet)
T02	Cable	CBL	OH-FO	Overhead fiber-optic	564
		CBL	UG-FO	Underground fiber-optic	567
	Gas	GAS	4"-6"	4"-6"	1,517
		GAS	7"-10"	7"-10"	1,516
		GAS	11"-16"	11"-16"	996
		GAS	17"-30"	17"-30"	300
	Irrigation	IRR	OD-PD	Open drain or pump ditch	2,377
		IRR	PIP-LAT	Piped lateral	5,231
		IRR	PD-PD	Piped drain or pump ditch	960
	Power	PWR	OH-12KV	Overhead - 12KV	1,995
		PWR	OH-69KV	Overhead - 69KV	1,773
		PWR	OH-230KV	Overhead - 230KV	1,615
	Railroad	RR	RR-XING	Railroad crossing (each)	1
	Sewer	SWR	11"-16"	11"-16"	563
		SWR	31"-48"	31"-48"	1,063
		SWR	49"-PL	>49"	1,900
	Telephone	TEL	UG-AL	Underground analog	3,489
		TEL	UG-FO	Underground fiber-optic	1,831
	Water	WTR	7"-10"	7"-10"	343
		WTR	11"-16"	11"-16"	3,124
		WTR	49"-PL	>49"	300
		WTR	W-L	Proposed waterline	2,298

All Utility Conflicts - West Section (Continued)

Alternative	Utility	UID	TID	Type	Conflict (feet)
T03	Cable	CBL	OH-FO	Overhead fiber-optic	564
		CBL	UG-FO	Underground fiber-optic	563
	Gas	GAS	4"-6"	4"-6"	1,437
		GAS	7"-10"	7"-10"	1,595
		GAS	11"-16"	11"-16"	1,155
		GAS	17"-30"	17"-30"	314
	Irrigation	IRR	IRR-WELL	Irrigation well (each)	1
		IRR	OD-PD	Open drain or pump ditch	3,113
		IRR	PIP-LAT	Piped lateral	5,950
		IRR	PD-PD	Piped drain or pump ditch	377
	Power	PWR	OH-12KV	Overhead - 12KV	2,622
		PWR	OH-69KV	Overhead - 69KV	1,902
		PWR	OH-230KV	Overhead - 230KV	1,212
	Railroad	RR	RR-XING	Railroad crossing (each)	1
	Sewer	SWR	7"-10"	7"-10"	466
		SWR	11"-16"	11"-16"	722
		SWR	17"-30"	17"-30"	1,432
		SWR	31"-48"	31"-48"	3,159
		SWR	49"-PL	>49"	3,984
	Telephone	TEL	UG-AL	Underground analog	3,169
		TEL	UG-FO	Underground fiber-optic	1,833
	Water	WTR	7"-10"	7"-10"	118
		WTR	11"-16"	11"-16"	3,582
		WTR	49"-PL	>49"	941
		WTR	W-L	Proposed waterline	2,736

All Utility Conflicts - West Section (Continued)

Alternative	Utility	UID	TID	Type	Conflict (feet)
T04	Cable	CBL	OH-FO	Overhead fiber-optic	565
		CBL	UG-FO	Underground fiber-optic	675
	Gas	GAS	4"-6"	4"-6"	1,471
		GAS	7"-10"	7"-10"	1,636
		GAS	11"-16"	11"-16"	1,163
		GAS	17"-30"	17"-30"	314
	Irrigation	IRR	OD-PD	Open drain or pump ditch	2,440
		IRR	PIP-LAT	Piped lateral	6,953
		IRR	PD-PD	Piped drain or pump ditch	377
	Power	PWR	OH-12KV	Overhead - 12KV	2,954
		PWR	OH-69KV	Overhead - 69KV	2,067
		PWR	OH-230KV	Overhead - 230KV	1,266
	Railroad	RR	RR-XING	Railroad crossing (each)	1
	Sewer	SWR	7"-10"	7"-10"	483
		SWR	11"-16"	11"-16"	730
		SWR	17"-30"	17"-30"	2,299
		SWR	31"-48"	31"-48"	2,767
		SWR	49"-PL	>49"	2,963
	Telephone	TEL	UG-AL	Underground analog	2,697
		TEL	UG-FO	Underground fiber-optic	1,919
	Water	WTR	11"-16"	11"-16"	3,748
		WTR	49"-PL	>49"	960
		WTR	W-L	Proposed waterline	2,788

All Utility Conflicts - West Section (Continued)

Alternative	Utility	UID	TID	Type	Conflict (feet)
T05	Cable	CBL	UG-FO	Underground fiber-optic	602
	Gas	GAS	4"-6"	4"-6"	2,077
		GAS	7"-10"	7"-10"	1,506
		GAS	11"-16"	11"-16"	1,028
		GAS	17"-30"	17"-30"	321
	Irrigation	IRR	OD-PD	Open drain or pump ditch	1,457
		IRR	PIP-LAT	Piped lateral	7,382
		IRR	PD-PD	Piped drain or pump ditch	396
		IRR	X-ING	Canal crossing (each)	1
	Power	PWR	OH-12KV	Overhead - 12KV	2,844
		PWR	OH-69KV	Overhead - 69KV	3,482
		PWR	OH-230KV	Overhead - 230KV	1,195
		PWR	SUB-00KV	Substation (each)	1
	Railroad	RR	RR-XING	Railroad crossing (each)	1
	Sewer	SWR	7"-10"	7"-10"	913
		SWR	49"-PL	>49"	1,941
	Telephone	TEL	UG-AL	Underground analog	3,506
		TEL	UG-FO	Underground fiber-optic	2,182
	Water	WTR	7"-10"	7"-10"	813
		WTR	11"-16"	11"-16"	3,706
		WTR	W-L	Proposed waterline	2,753

All Utility Conflicts - West Section (Continued)

Alternative	Utility	UID	TID	Type	Conflict (feet)
T06	Cable	CBL	OH-FO	Overhead fiber-optic	216
		CBL	UG-AL	Underground analog	621
		CBL	UG-FO	Underground fiber-optic	565
	Gas	GAS	4"-6"	4"-6"	2,937
		GAS	7"-10"	7"-10"	1,460
		GAS	11"-16"	11"-16"	433
		GAS	17"-30"	17"-30"	300
	Irrigation	IRR	OD-PD	Open drain or pump ditch	2,219
		IRR	PIP-LAT	Piped lateral	10,148
		IRR	PD-PD	Piped drain or pump ditch	1,375
		IRR	X-ING	Canal crossing (each)	1
	Power	PWR	OH-12KV	Overhead - 12KV	2,887
		PWR	OH-69KV	Overhead - 69KV	2,967
		PWR	OH-230KV	Overhead - 230KV	1,195
		PWR	UG-PR	Underground primary	556
	Railroad	RR	RR-XING	Railroad crossing (each)	1
	Sewer	SWR	7"-10"	7"-10"	556
		SWR	11"-16"	11"-16"	392
		SWR	49"-PL	>49"	558
	Telephone	TEL	UG-AL	Underground analog	3,264
		TEL	UG-FO	Underground fiber-optic	2,170
	Water	WTR	7"-10"	7"-10"	752
		WTR	11"-16"	11"-16"	2,300
		WTR	W-L	Proposed waterline	2,843

All Utility Conflicts - West Section (Continued)

Alternative	Utility	UID	TID	Type	Conflict (feet)
T07	Gas	GAS	4"-6"	4"-6"	1,491
		GAS	7"-10"	7"-10"	1,158
		GAS	11"-16"	11"-16"	1,170
	Irrigation	IRR	IRR-WELL	Irrigation wells (each)	1
		IRR	OD-PD	Open drain or pump ditch	1,803
		IRR	PIP-LAT	Piped lateral	6,175
		IRR	PD-PD	Piped drain or pump ditch	565
		IRR	X-ING	Canal crossing (each)	1
	Power	PWR	OH-12KV	Overhead - 12KV	4,385
		PWR	OH-69KV	Overhead - 69KV	1,262
		PWR	OH-230KV	Overhead - 230KV	1,213
		PWR	UG-PR	Underground primary	792
	Railroad	RR	RR-XING	Railroad crossing (each)	1
	Sewer	SWR	7"-10"	7"-10"	391
		SWR	17"-30"	17"-30"	365
		SWR	31"-48"	31"-48"	600
		SWR	49"-PL	>49"	1,964
	Telephone	TEL	UG-AL	Underground analog	2,761
		TEL	UG-FO	Underground fiber-optic	2,890
	Water	WTR	4"-6"	4"-6"	1,133
		WTR	11"-16"	11"-16"	3,396
		WTR	W-L	Proposed waterline	1,980

All Utility Conflicts - West Section (Continued)

Alternative	Utility	UID	TID	Type	Conflict (feet)
T08	Gas	GAS	4"-6"	4"-6"	5,502
		GAS	7"-10"	7"-10"	4,014
		GAS	11"-16"	11"-16"	3,291
	Irrigation	IRR	OD-PD	Open drain or pump ditch	1,192
		IRR	PIP-LAT	Piped lateral	5,838
		IRR	PD-PD	Piped drain or pump ditch	628
		IRR	X-ING	Canal crossing (each)	1
	Power	PWR	OH-12KV	Overhead - 12KV	4,572
		PWR	OH-69KV	Overhead - 69KV	1,581
		PWR	OH-230KV	Overhead - 230KV	1,510
		PWR	UG-PR	Underground primary	4,044
	Railroad	RR	RR-XING	Railroad crossing (each)	2
	Sewer	SWR	7"-10"	7"-10"	726
		SWR	17"-30"	17"-30"	302
		SWR	49"-PL	>49"	1,140
	Telephone	TEL	UG-AL	Underground analog	3,017
		TEL	UG-FO	Underground fiber-optic	4,321
	Water	WTR	11"-16"	11"-16"	6,585
		WTR	W-L	Proposed waterline	3,198

All Utility Conflicts - West Section (Continued)					
Alternative	**Utility**	**UID**	**TID**	**Type**	**Conflict (feet)**
T09	Cable	CBL	OH-FO	Overhead fiber-optic	566
		CBL	UG-FO	Underground fiber-optic	1,410
	Gas	GAS	4"-6"	4"-6"	1,433
		GAS	7"-10"	7"-10"	1,434
		GAS	11"-16"	11"-16"	1,000
		GAS	17"-30"	17"-30"	627
	Irrigation	IRR	OD-PD	Open drain or pump ditch	2,415
		IRR	PIP-LAT	Piped lateral	5,651
		IRR	PD-PD	Piped drain or pump ditch	1,818
	Power	PWR	OH-12KV	Overhead - 12KV	2,795
		PWR	OH-69KV	Overhead - 69KV	1,742
		PWR	OH-230KV	Overhead - 230KV	2,044
		PWR	SUB-00KV	Substation (each)	1
	Railroad	RR	RR-XING	Railroad crossing (each)	1
	Sewer	SWR	11"-16"	11"-16"	866
		SWR	31"-48"	31"-48"	462
		SWR	49"-PL	>49"	1,602
	Telephone	TEL	UG-AL	Underground analog	4,728
		TEL	UG-FO	Underground fiber-optic	1,854
	Water	WTR	7"-10"	7"-10"	343
		WTR	11"-16"	11"-16"	682
		WTR	W-L	Proposed waterline	2,679

PUBLIC SERVICE IMPACTS

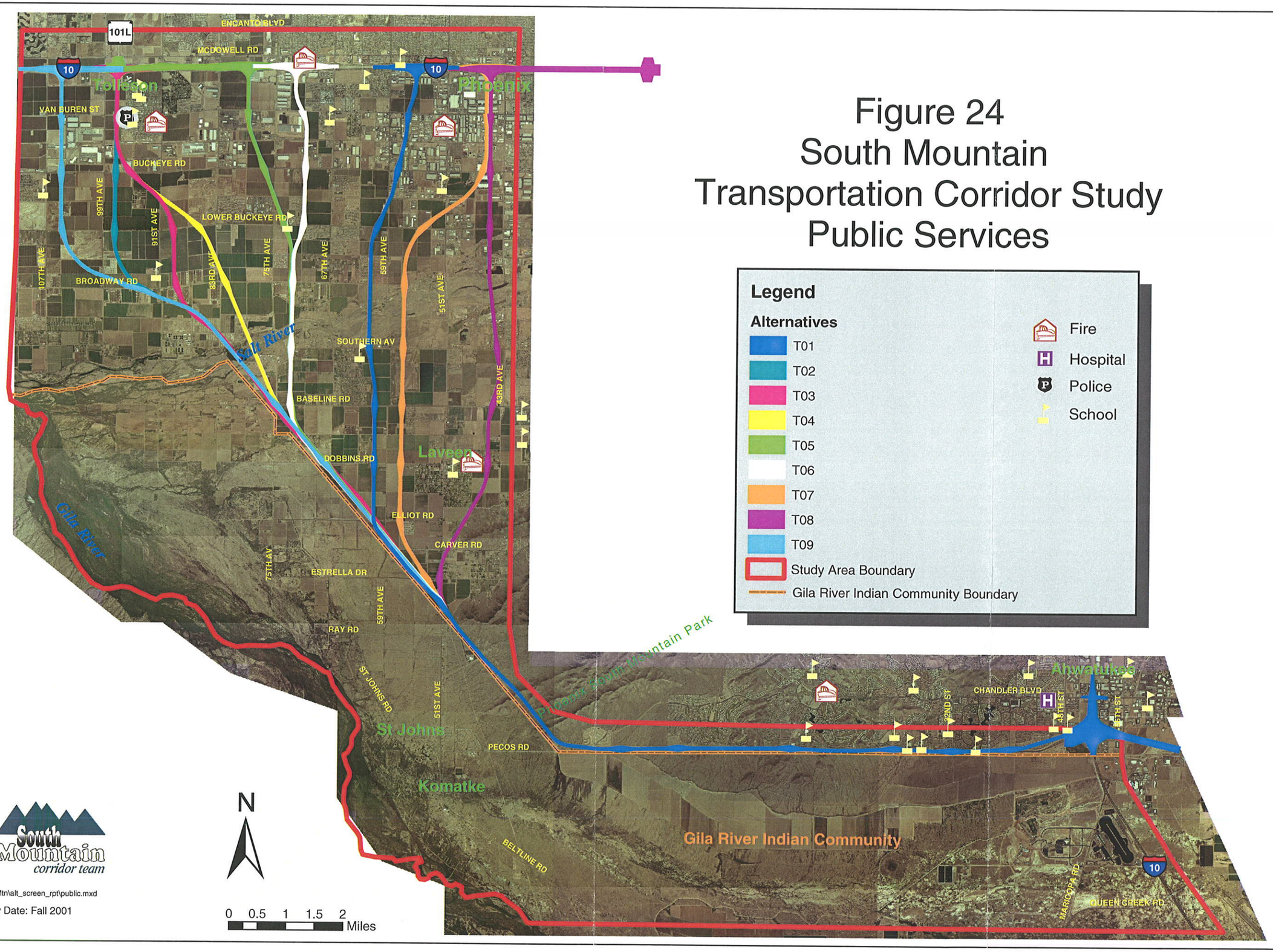
The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on public services, which include police and fire services, schools and hospitals. Mapping of the study area was reviewed to determine the location of existing facilities. Existing public service facilities were considered to be impacted if they fell within the same 500-foot area as the sensitive receptors discussed in Air Quality and Noise Quality (500 feet from the center of the outermost traveled lane). Planned and proposed facilities are not included. It is assumed that impacts on public services would occur from those alternatives carried forward into the EIS for detailed study and mitigation would be necessary.

For alternatives that extend beyond the study area, no public service impacts were developed for the area outside the study area.

Figure 24 illustrates the location of public services within the study area that may be impacted by the nine technical alternatives.

Table 18 presents the data that supports Figure 24.

Figure 24
South Mountain Transportation Corridor Study
Public Services



ADOT

South Mountain corridor team

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Aerial Photography Date: Fall 2001

DRAFT 2/03

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 18

Public Service Impacts – Total Alignment					
Alternative	**Police**	**Fire**	**Schools**	**Hospitals**	**Total**
T01	0	0	2	0	2
T02	0	0	2	0	2
T03	0	0	2	0	2
T04	0	0	2	0	2
T05	0	0	3	0	3
T06	0	0	2	0	2
T07	0	0	2	0	2
T08	0	0	2	0	2
T09	0	0	2	0	2

CUMULATIVE IMPACTS

The purpose of this screening exercise is to determine which alternatives avoid or have minimal cumulative impacts within the study area. The Council on Environmental Quality (CEQ) regulations define cumulative impacts as:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7).

The National Environmental Policy Act requires that cumulative impacts of a federally funded project be identified, evaluated and mitigated as appropriate. If a project does not *directly* impact a particular environmental resource, the project would not contribute to a *cumulative* impact on that resource.

This evaluation would be conducted in accordance with FHWA and CEQ regulations and guidance documents, including the January 1997 CEQ handbook titled *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997), and the April 1992 FHWA position paper titled *Secondary and Cumulative Impact Assessment in the Highway Project Development Process* (USDOT 1992).

PUBLIC AND POLITICAL ACCEPTABILITY

During October and November of 2002, the project team met with the potentially affected jurisdictions as well as the Citizens Advisory Team regarding the proposed alternatives. The jurisdictions consulted were:

- Tolleson
- Avondale
- Goodyear
- Chandler
- Phoenix
- Maricopa Association of Governments
- Maricopa County
- Gila River Indian Community

The intent of these meetings was to apprise the groups of the progress to date, including gathering public suggested routes, evaluation of these routes, and development of technical team routes. It was explained that the process would continue with impacts analysis on these alternatives with the intent being to determine which alternatives were appropriate for further study in the EIS. Following is a summary of the feedback provided by these jurisdictions:

TOLLESON

Staff from Tolleson expressed concern with the potential of relocating a $400 million planned and existing development along 99th Avenue due to the South Mountain Project. They are a small community (5-6 square miles) and removing land from development has a large affect on their tax base.

AVONDALE

Staff, mayor and city council from Avondale expressed concern regarding any alternative along 107th Avenue due to impacts on the existing and planned land use in this area. An interest in having a connection further west than 59th Avenue was expressed. Although, it was acknowledged that the potential existed for redevelopment opportunities if the 59th Avenue alternative were maintained.

GOODYEAR

Staff from Goodyear suggested a split alignment that would come around South Mountain from the east and allow users the opportunity to continue north along an alignment near 59th Avenue or continue further west with a connection as far west as possible.

CHANDLER

Staff from Chandler expressed their concern in maintaining the connection at the existing interchange at Pecos Road. In addition, they encourage alternatives that reduce congestion on I-10 towards downtown Phoenix.

PHOENIX

Staff from Phoenix encourages the original connection to I-10 on the west side (proposed in 1988). They indicate there would be protests and chaos if this connection is not used. Also, they have committed to the residents of Ahwatukee that Pecos Road would never be a freeway.

MARICOPA ASSOCIATION OF GOVERNMENTS (MAG)

MAG indicated that there are a number of projects being proposed as part of the half-cent sales tax. These projects include the I-10 Reliever and the Rio Salado Parkway. Decisions regarding the feasibility and funding of these projects would be made prior to the completion of the South Mountain EIS & L/DCR. As such, they would need to be considered at the time.

MAG has concerns about the ability of I-10 to handle a new system interchange on the west side of Phoenix.

Ultimately, MAG would back its member agencies.

MARICOPA COUNTY

The County was interested in whether a consideration had been made to not connect to I-10 on the west side, but rather to connect to the Rio Salado or I-10 Reliever. They also indicated a need to make an early decision as this is one of the fastest developing areas in the county.

GILA RIVER INDIAN COMMUNITY (GRIC)

For any alternative off Community lands, GRIC is concerned about access to the facility.

CITIZENS ADVISORY TEAM

Concerns expressed by the CAT included:

- Minimize impacts to existing residential.
- Place facility where it would capture the majority of truck traffic without trucks needing to travel long distances on the surface streets to access the new facility.
- Consider connections with Rio Salado and/or I-10 Reliever.
- Consider constructing the facility over the existing and planned industry in Tolleson.
- Minimizing cost.

COMPLIANCE WITH DESIGN STANDARDS

All nine technical alternatives included in this Alternatives Screening Report are in compliance with the state and federal guidelines and policies as presented in the South Mountain *Roadway Design Criteria*.

TRAFFIC OPERATIONS / CORSIM

The purpose of this screening exercise is to determine the system-wide as well as local traffic impacts associated with each of the nine technical alternatives. CORSIM simulation was used for this exercise, and is described in detail below. For the purpose of simplifying the analysis, five separate conditions were investigated, three of which represent build scenarios.

INTRODUCTION

This exercise is intended to provide some preliminary traffic analysis results of the proposed South Mountain (SR 202L) interchange along I-10 (Papago Freeway). CORSIM simulation models were developed for each concept to assess the traffic operations within the study area. The following bullet points describe the limits of the study area;

- I-10 (Papago Freeway) between (and inclusive of) 115th Avenue and I-17
- SR 101L (Agua Fria Freeway) between (and inclusive of) Indian School Road and I-10 (Papago Freeway)

A CORSIM model was developed for both the AM and PM peak hours for each of the concepts listed below. The simulations included preliminary geometric concepts along I-10 (Papago Freeway), as well as along SR 101L (Agua Fria Freeway) and SR 202L (South Mountain). The preliminary geometrics were based on ADOT standards and practices.

- Existing Conditions
- No-Build Conditions
- 43rd Avenue Alternative for SR 202L (South Mountain)
- 55th Avenue Alternative for SR 202L (South Mountain)
- 79th Avenue Alternative for SR 202L (South Mountain)

Existing travel time runs were conducted during both the AM and PM peak hours to assist in calibrating the existing conditions models. Existing AM and PM peak hour volumes were developed using existing turning movement counts (conducted as part of this study) and various peak hour counts along mainline I-10 (Papago Freeway), SR 101L (Agua Fria Freeway) and the on/off ramps. Future peak hour volumes (2025) were developed for the No-Build and each of the SR 202L (South Mountain) Alternatives for use in the CORSIM simulation models. The table below includes the average daily traffic (ADT) and AM peak hour volumes at various locations within the study area. The ADT values were obtained from the approved MAG Transportation Model. More discussion related to the traffic volumes will follow in the sections below. The volumes in Table 19 are to be considered preliminary.

GENERAL OVERVIEW

There are several locations along I-10 (Papago Freeway) that currently are operating at level of service (LOS) F. The following planned improvements were included between 59th Avenue and SR 101L in the future models; (1) a fourth travel lane and (2) various auxiliary lanes in both the eastbound and westbound directions along I-10 (Papago Freeway). Due to the rather large increases in traffic volumes in the future, the following additional assumptions were also made;

- The eastbound on-ramp to I-10 (Papago Freeway) from SR 101L (Agua Fria Freeway) and the westbound off-ramp from I-10 (Papago Freeway) to SR 101L (Agua Fria Freeway) were both modeled as having three lanes. The forecasted AM peak hour

volume along southbound SR 101L (Agua Fria Freeway) is between 7,400 and 8,500 for the three alternatives.

- SR 202L (South Mountain) was modeled as a six-lane freeway.
- An additional lane was included at various on/off ramps to accommodate the increased traffic volumes.

These assumptions were made to allow the No-Build model to operate and provide a basis of comparison of alternatives. Without these improvements, the model fails in the No-Build condition and does not allow for comparison of alternatives. Additionally, the I-10 (Papago Freeway) / I-17 interchange causes congestion along I-10 (Papago Freeway) that results in back ups in all of the simulations.

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 19

Traffic Operations Results from CORSIM Analysis										
Location	Existing		No-Build		43rd Avenue Alternative		55th Avenue Alternative		79th Avenue Alternative	
	ADT	Peak Hour	ADT	Peak Hour	ADT	Peak Hour	ADT	Peak Hour	ADT	Peak Hour
I-10: 115h Ave to SR 101L	112,200	7,300	155,000	9,600	157,000	9,700	158,000	9,700	160,000	9,900
I-10: 83rd Ave to 75th Ave	160,000	10,800	159,000	13,300	160,000	13,300	162,000	12,700	165,000	12,800
I-10: 59th Ave to 51st Ave	185,000	13,600	185,000	16,800	188,000	17,100	177,000	16,600	173,000	16,400
I-10: 35th Ave to 27th Ave	230,000	16,900	235,000	19,700	236,000	19,700	236,000	19,700	234,000	19,600
SR 101L: Indian School Rd to Thomas Td	85,000	7,600	123,000	11,300	131,000	12,300	122,000	11,200	131,000	12,400
SR 202L: South of I-10	N/A	N/A	N/A	N/A	159,000	11,600	124,000	9,100	138,000	10,100

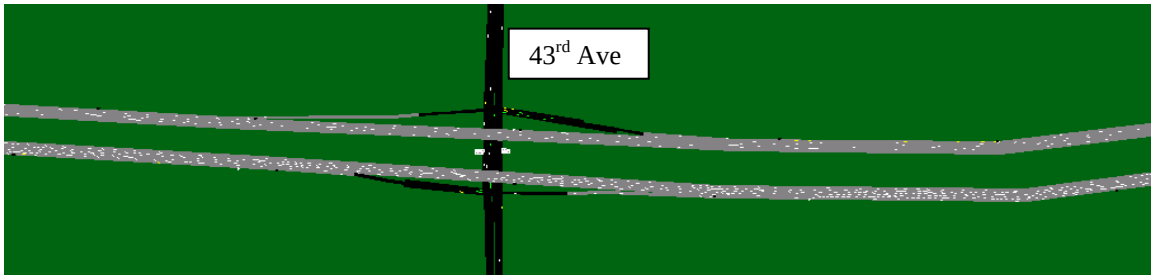
EXISTING CORSIM MODELS

In general, the CORSIM models replicated the existing (November 2002) conditions in both the AM and PM peak hours. Bottlenecks occurred at 59th Avenue in the AM peak hour, and at 35th Avenue in the PM peak hour. Since the study area did not include I-10 (Papago Freeway) to the east of I-17, the model was adjusted to account for the eastbound backup that currently exists. In general, the CORSIM models were within 10 percent of the peak hour volumes that were input into CORSIM.

NO-BUILD CORSIM MODELS

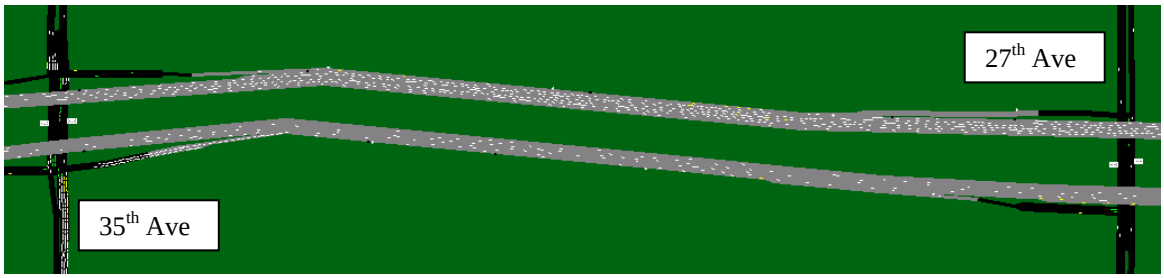
Congestion along eastbound I-10 (Papago Freeway) east of the I-10 / I-17 interchange continued during the No-Build AM peak hour. Some of the congestion can be attributed to the on/off ramps at I-17 as well as congestion most likely caused by the tunnel. In general, the CORSIM

models replicated the No-Build peak hour volumes within about 10-20 percent. The figure below depicts congestion at 43rd Avenue.



The simulation capture above shows the No-Build Model and its associated congestion along I-10 (Papago Freeway) in the eastbound direction during the AM Peak at 43rd Avenue.

During the PM peak hour, congestion begins to occur at 35th Avenue. There are approximately 10,300 vehicles traveling in the westbound direction at 35th Avenue. The figure below depicts the congestion.



The simulation capture above shows the No-Build Model and its associated congestion along I-10 (Papago Freeway) in the westbound direction during the PM Peak between 27th Avenue and 35th Avenue.

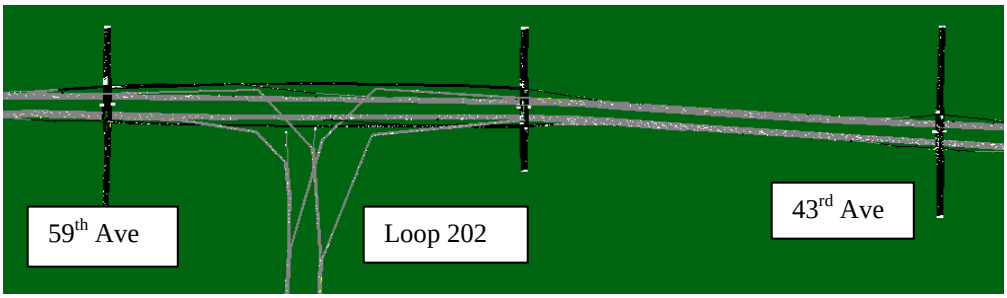
SR 202L – 43RD AVENUE ALTERNATIVE

This alternative had the highest ADT along SR 202L of the three alternatives analyzed. Since the ADT was the highest, the peak hour volumes were also the highest among the alternatives. The figure below depicts the congestion along I-10 (Papago Freeway) in the vicinity of the proposed I-10 (Papago Freeway) / SR 202L (South Mountain) interchange. In general, the high peak hour volumes and close spacing of the existing interchanges cause traffic along I-10 (Papago Freeway) to become congested. If more travel lanes along I-10 (Papago Freeway) were constructed, possibly to I-17, this alternative may be comparable to the other alternatives. This analysis is on-going.

The simulation capture above shows 43rd Avenue Alternative and its associated congestion along I-10 (Papago Freeway) in the westbound direction during the PM Peak at 43rd Avenue.

SR 202L – 55TH AVENUE ALTERNATIVE

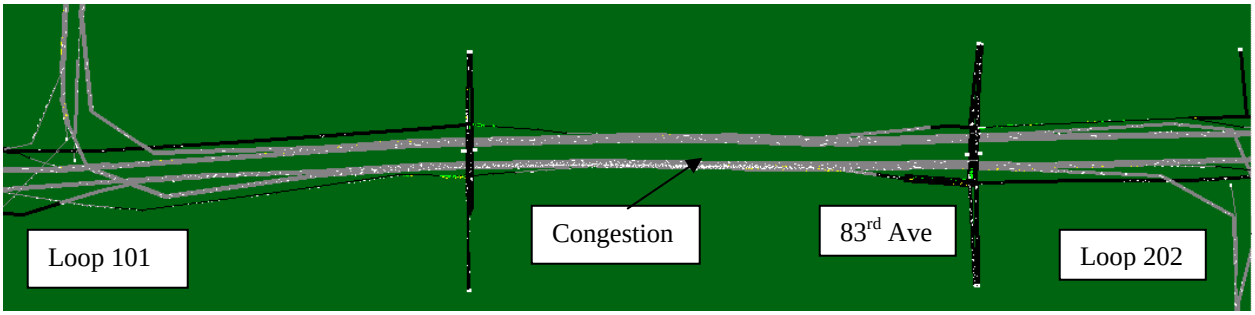
This alternative had the lowest ADT along SR 202L (South Mountain) of the three alternatives. Consequently, this alternative had the lowest peak hour volumes entering/existing I-10 (Papago Freeway). In general, this alternative (compared to the others) seemed to reduce traffic congestion along eastbound I-10 (Papago Freeway), as shown below, during the AM peak hour due to lower peak hour volumes. No other major traffic operational issues were observed at this time.



The simulation capture above shows the 55th Avenue Alternative.

SR 202L – 79TH AVENUE ALTERNATIVE

This alternative had similar ADT and peak hour volumes as the 43rd Avenue Alternative. The advantage to this alternative is that it is located further to the west than the other two alternatives. This could be considered an advantage because the traffic volumes in the vicinity of the proposed interchange were generally lower during both peak hours than the other alternatives, one might expect decreasing congestion levels at some locations. It should be noted, however, that due to the close spacing of the 83rd Avenue interchange and the high AM peak hour volumes, drivers begin to experience excessive delay in the eastbound direction at the 83rd Avenue interchange. This can be attributed to some drivers weaving to exit at 83rd, while others are weaving to exit onto the proposed Loop 202. In addition, since the improvements related to this alternative are not extended beyond 67th Avenue, the traffic operations east of 67th Avenue are similar to those of the No-Build.



The simulation capture above shows the 79th Avenue Alternative.

PRELIMINARY SUMMARY

In general, the 43rd Avenue and 55th Avenue Alternatives provide similar traffic operations along I-10 (Papago Freeway) west of 67th Avenue. However, due to the close spacing of the existing interchanges and the high traffic volumes, the 43rd Avenue Alternative is expected to have excessive delay along I-10 (Papago Freeway) east of the proposed Loop 202. The 79th Avenue alternative is expected to have excessive delay at the 83rd Avenue interchange and also along I-10 (Papago Freeway) east of 67th Avenue. Due to this, the 43rd Avenue and 79th Avenue

Alternatives would be the least desirable of the three alternatives based on the analysis completed. It should be noted that several enhancements to existing on/off ramps would most likely be needed to accommodate the future traffic volumes within the I-10 (Papago Freeway) study area. Analysis of necessary improvements is on-going.

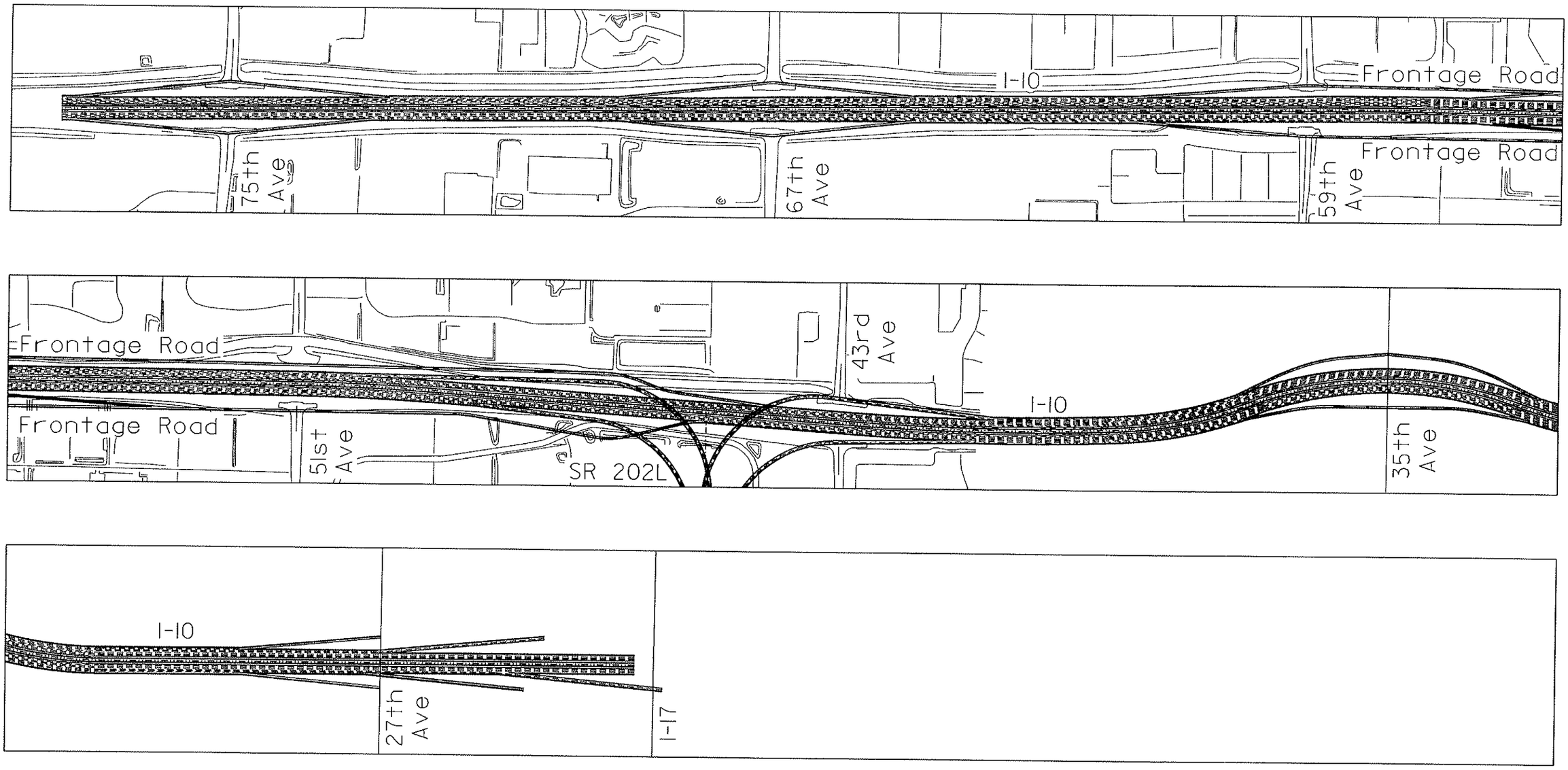
Figures 25, 26 and 27 illustrate the preliminary geometric assumptions used to create the Build CORSIM Models.

As each alternative was modeled, specific modifications were made from the geometric layouts. Following is a description of these changes.

- 43rd Avenue Alternative
  - At 35th Avenue, the eastbound ramp meter was removed due to ramp backups.
  - At 51st Avenue, the eastbound on-ramp was changed to 2 lane due to backups on the ramp and frontage road. Also, the westbound off-ramp was changed to 2 lanes due to backups on the ramp.
  - At 67th Avenue, the eastbound ramp meter was removed due to ramp backups.
  - At 83rd Avenue, the eastbound off-ramp was changed to 2 lanes.
- 55th Avenue Alternative
  - At 35th Avenue, the eastbound ramp meter was removed due to ramp backups.
  - At 51st Avenue, the eastbound ramp meter was removed and the ramp changed to 2 lanes due to ramp backups and into the intersection.
  - At 67th Avenue, the eastbound ramp meter was removed due to ramp backups.
  - At 83rd Avenue, the eastbound off-ramp was changed to 2 lanes.

- 79th Avenue Alternative
  - At 51st Avenue, the eastbound on-ramp was changed to 2 lanes due to ramp backups.
  - At 67th Avenue, the eastbound ramp meter was removed due to ramp backups.
  - At 75th Avenue, the eastbound ramp was changed to 2 lanes and the ramp meter removed due to backups on the frontage road and 75th Avenue.
  - At 83rd Avenue, the eastbound off-ramp was changed to 2 lanes due to ramp backups. Also, the westbound on-ramp was changed to 2 lanes due to ramp backups.

Figure 25
South Mountain Transportation Corridor Study
CORSIM - 45th Avenue Alternative



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South Mountain corridor team

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Fig. 25

Figure 26
South Mountain Transportation Corridor Study
CORSIM - 55th Avenue Alternative

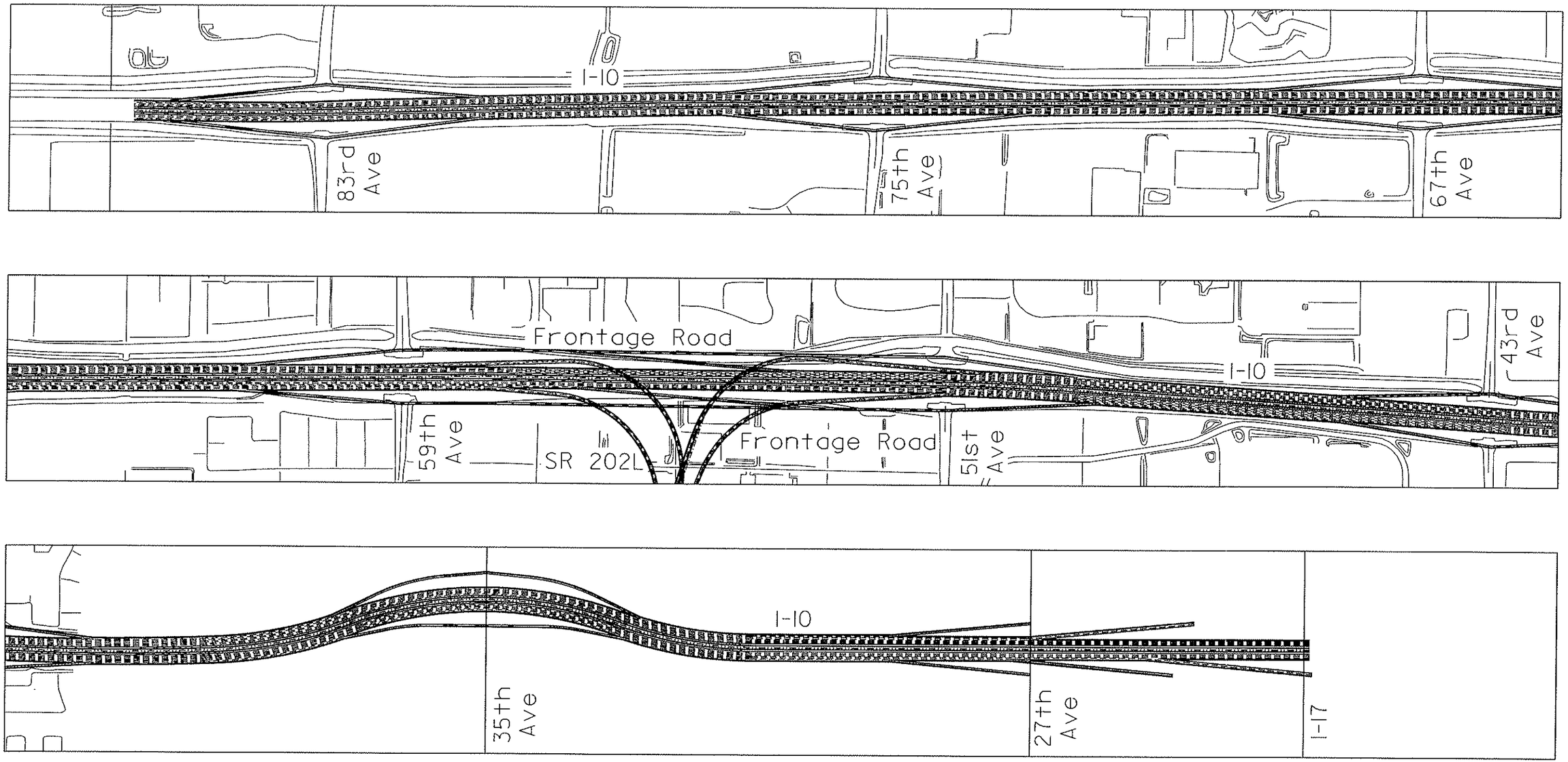

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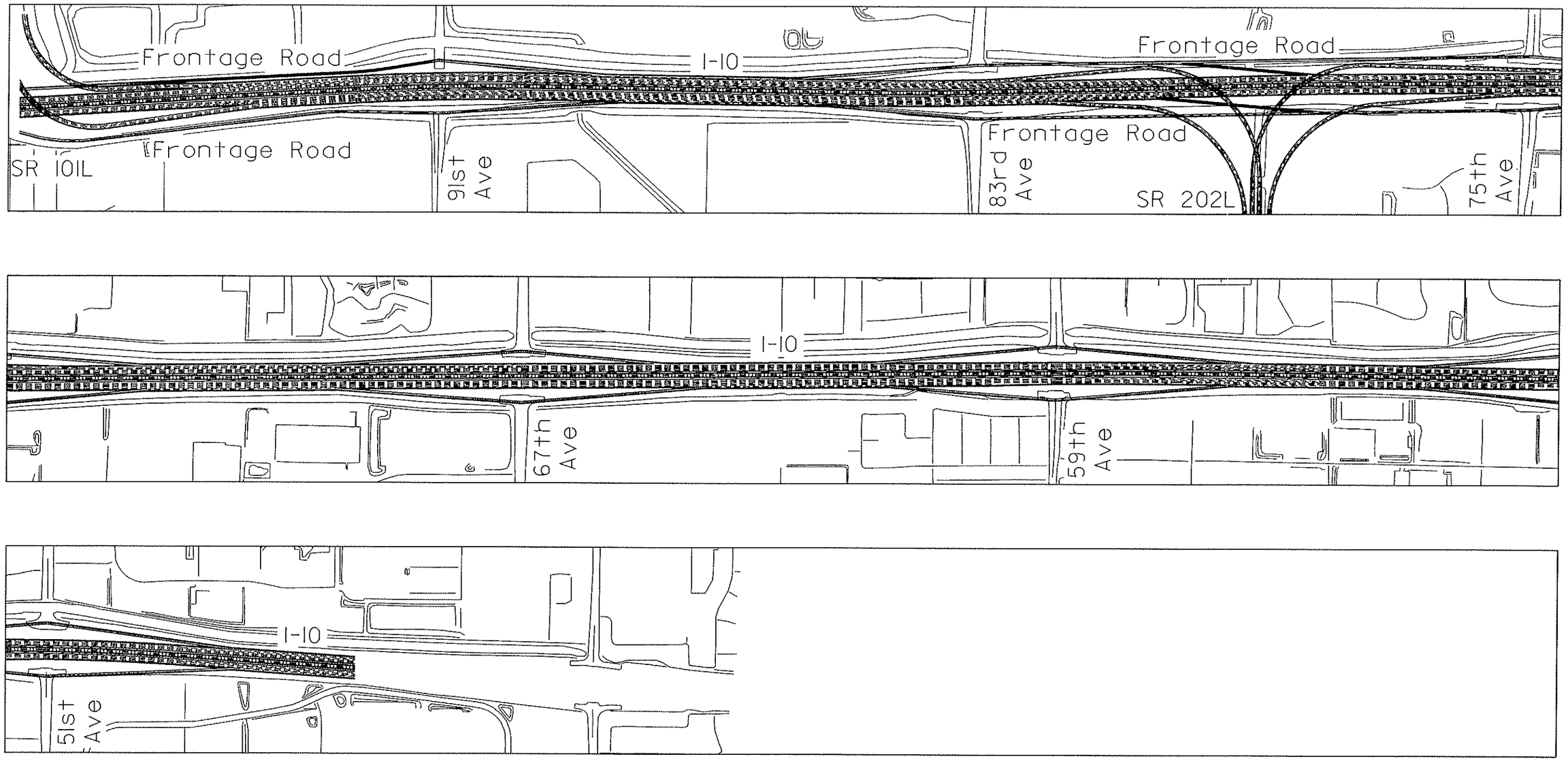
Fig. 26

Figure 27
South Mountain Transportation Corridor Study
CORSIM - 79th Avenue Alternative



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South Mountain corridor team

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Fig. 27

COST

The purpose of this screening exercise is to determine the approximate cost, defined as construction and land acquisition, for each of the nine technical alternatives.

The construction costs were determined by calculating costs for a typical 1-mile section, average service interchange, the various types of system interchanges and structure spans. These typical values were then multiplied by the number of occurrences each technical alternative exhibited (e.g. number of service interchanges times average service interchange cost).

The land acquisition costs were determined in two primary areas, existing development and future zoned/planned development. For the purposes of this preliminary estimate of cost, it was assumed the entire study area was fully developed according to local land use plans and densities. Preliminary land acquisition costs were developed using ADOT supplied data from the original 1988 alignment property costs, which are updated every six months.

For alternatives that extend beyond the study area, construction cost and land acquisition costs were included for the portions outside the study area.

Refer to Figure 1, in the Executive Summary, for the location of all nine technical alternatives within the study area.

Table 20 presents costs for both construction and land acquisition broken down into the Pecos Road Section and West Section for each of the nine technical alternatives.

South Mountain Transportation Corridor Study
Technical Alternatives Screening Data
Table 20

Project Costs									
Alternative	Construction Cost			Land Acquisition Costs					Total Cost
	Pecos Road	West	Total	Pecos Road		West		Total	
				Displacement	Zoning	Displacement	Zoning		
T01	$180,000,000	$290,000,000	$470,000,000	$50,000,000	$150,000,000	$40,000,000	$350,000,000	$590,000,000	**$1,060,000,000**
T02	$180,000,000	$300,000,000	$480,000,000	$50,000,000	$150,000,000	$10,000,000	$600,000,000	$810,000,000	**$1,290,000,000**
T03	$180,000,000	$300,000,000	$480,000,000	$50,000,000	$150,000,000	$10,000,000	$590,000,000	$800,000,000	**$1,280,000,000**
T04	$180,000,000	$290,000,000	$470,000,000	$50,000,000	$150,000,000	$10,000,000	$540,000,000	$750,000,000	**$1,220,000,000**
T05	$180,000,000	$560,000,000	$740,000,000	$50,000,000	$150,000,000	$10,000,000	$530,000,000	$740,000,000	**$1,480,000,000**
T06	$180,000,000	$290,000,000	$470,000,000	$50,000,000	$150,000,000	$20,000,000	$460,000,000	$680,000,000	**$1,150,000,000**
T07	$180,000,000	$580,000,000	$760,000,000	$50,000,000	$150,000,000	$80,000,000	$370,000,000	$650,000,000	**$1,410,000,000**
T08	$180,000,000	$550,000,000	$730,000,000	$50,000,000	$150,000,000	$80,000,000	$500,000,000	$780,000,000	**$1,510,000,000**
T09	$180,000,000	$310,000,000	$490,000,000	$50,000,000	$150,000,000	$10,000,000	$650,000,000	$860,000,000	**$1,350,000,000**

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Listed, Proposed, and Candidate Species for Arizona. March 21, 2002.

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APPENDIX A – PROJECT OWNERS TEAM MEETING (02/26/2003)

This document is being submitted as Appendix A to the Alternatives Screening Report (ADOT, 2003). Its primary intent is to establish the basis for preliminary justification for the elimination of Alternatives T04, T05, T07 and T08 from further detailed study in the EIS.

Introduction

As part of the development and screening of freeway alternatives for the South Mountain Transportation Corridor (SMTC) Environmental Impact Statement (EIS), this Alternatives Screening Report (ADOT, 2003) was prepared, as agreed to by the Project Owners Team (Arizona Department of Transportation (ADOT), Federal Highway Administration (FHWA), and U.S. Army Corps of Engineers (COE)). The report details the criteria used and impacts assessed in the initial screening of alternatives. The criteria developed by the progress meeting attendees (ADOT, FHWA, COE, stakeholder jurisdictions and consulting team) and agreed upon by the group, was determined to be important at this stage of the analysis for the nine freeway alternatives.

The nine alternatives developed reside outside the Gila River Indian Community (GRIC). While the western portion of each of the nine alternatives are different, the eastern portion, between I-10 (Maricopa Freeway) and 51st Avenue, of each alternative ties into an alignment parallel to Pecos Road. The alignment parallel to Pecos Road closely follows the alignment approved by the State Transportation Board (STB) in 1988 and presented in the state-level Environmental Assessment (EA) and Design Concept Report (DCR) (ADOT, 1988a and 1988 b).

The purpose of this memorandum is to describe the process that was undertaken by the Project Owners Team during a review of the Alternatives Screening Report (ADOT, 2003) and to establish the basis for preliminary justification for the elimination of certain alternatives from further detailed study in the EIS.

Meeting Summary

On February 26, 2003, the Project Owners Team gathered for a roundtable discussion of the Alternatives Screening Report (ADOT, 2003), including presentation of CORSIM analysis and review of environmental impacts. The primary intent of this meeting was to determine if any of the nine alternatives included in this document had any unreasonable characteristics that precluded them from further study. ADOT, FHWA and the COE were represented at the meeting. The following individuals, who reflect project owners as well as all disciplines reflected in the Alternatives Screening Report (ADOT, 2003), including design considerations, environmental considerations (including 404(b)(1)), and financial considerations, were in attendance:

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ADOT	FHWA	COE	Consulting Team
Dan Lance	Bill Vachon	Dana Owsiany	Dave Anderson
Steve Jimenez	Ken Davis		Jack Allen
Floyd Roehrich			Amy Edwards
Thor Anderson			Andrea Helmstetter
Perry Powell			Michael Trueblood
John Eckhardt			Chris Clary-Lemon
Chuck Eaton			Dave Bender
Dee Bowling			

The meeting began with a presentation of the CORSIM models developed for three Build alternatives with tie-ins to I-10 (Papago Freeway) at 45th Avenue, 55th Avenue and 79th Avenue, all year 2025. The No-build model for year 2025 was also presented to allow for better comparison between the Build alternatives and the No-build alternative.

Following the CORSIM presentation, the group began to evaluate the impacts associated with each alternative for the 17 criteria, as presented in Table 1 of the Alternatives Screening Report (ADOT, 2003). A summary of the major impacts is presented below.

Alternative T01, which ties into I-10 (Papago Freeway) at 55th Avenue, was found to have a high impact on cultural site acreage as well as jurisdictional waters of the U.S. acreage. Alternative T01 was also found to have impacts on a total of eight potentially hazardous sites, of which one is considered “high-priority”. Conversely, Alternative T01 was the only alternative to fit into an existing general plan and was the only alternative not opposed by any of the local municipalities. In addition, the CORSIM model showed that a connection at 55th Avenue would provide the best traffic operations along I-10 (Papago Freeway) as compared to the other Build alternative models. Alternative T01 was also found to have the lowest cost of all nine alternatives.

With respect to Alternatives T02, T03 and T04, which tie directly into I-10 (Papago Freeway) at the existing Loop 101 (SR 101L) system interchange, the group was in agreement that these three alternatives functioned more as three options of one alternative, rather than three separate alternatives. This decision was made since their logical termini are the same, their alignments are identical over 80% of their lengths, and all three provide the same general access. With this in mind, these three “options” were compared to one another, with the intent of being able to determine if any had unreasonable characteristics.

A review of Alternatives T02, T03 and T04 found that Alternative T04 had the highest impact on cultural site acreage of the three, but the lowest impact on jurisdictional waters of the U.S. Of the three alternatives, Alternative T02 was the only one to have potentially hazardous sites, and it had one which was a “low-priority”. No CORSIM model was created to reflect the traffic operations along I-10 (Papago Freeway) with a South Mountain Freeway connection into SR 101L. The group, however, was in agreement that this connection was the most logical in terms of system continuity and

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would likely produce traffic operations along I-10 (Papago Freeway) that were more favorable than those presented for tie-ins at 45th Avenue and 79th Avenue. Of these three alternatives, Alternative T04 was found to have the lowest cost.

Similar to Alternatives T02, T03 and T04 above, the group was also in agreement that Alternatives T05 and T06 were two "options" of the same alternative, as their only major difference is the location with which they tie-in to I-10 (Papago Freeway). These alternatives were thus compared against one another, with the intent of being able to determine if any had unreasonable characteristics.

Alternative T05 was found to impact over twice as much cultural site acreage as Alternative T06. Alternative T05 was also found to impact four potentially hazardous sites, one of which was "high-priority", while Alternative T06 impacted none. Alternative T06, however, was found to impact a greater number of residential noise sensitive receptors than Alternative T05, but Alternative T05 impacted one additional school and cost approximately 28% more than Alternative T06. A CORSIM model was created for Alternative T05, which ties into I-10 (Papago Freeway) at 79th Avenue. The model showed failure along portions of I-10 (Papago Freeway) due to the close proximity of the two system interchanges (SR 101L and South Mountain Freeway) along I-10 (Papago Freeway). In addition, Alternative T05 would likely result in a substantial loss of local access along I-10 (Papago Freeway) between the two system interchanges, ultimately resulting in greater congestion along I-10 (Papago Freeway) towards Phoenix where the local traffic would ultimately be allowed access to I-10 (Papago Freeway). For Alternative T06, which ties into I-10 (Papago Freeway) at 71st Avenue, no CORSIM model was run. Since Alternative T05 is outside the three-mile sphere of influence of SR 101L, and local access would be provided along I-10 (Papago Freeway) it was believed that traffic operations along I-10 (Papago Freeway) would operate better for Alternative T06 than Alternative T05.

Alternative T07, which ties into I-10 (Papago Freeway) at 45th Avenue, was found to have high impacts on both cultural site acreage and potentially hazardous sites, of which one was a "high-priority". In addition, Alternative T07 was also found to have the second highest impact on both residential and non-residential noise sensitive receptors as well as existing residential and non-residential displacements. A review of the 45th Avenue CORSIM model showed that the proximity of Alternative T07s system interchange at I-10 (Papago Freeway) to the I-10 (Papago Freeway) / I-17 system interchange resulted in excess congestion along I-10 (Papago Freeway) and a failure in traffic operations. Alternative T07 was also found to have a high cost, by comparison.

Alternative T08, which also ties into I-10 (Papago Freeway) at 45th Avenue, was found to have the lowest Section 4(f) impacts of all alternatives. Conversely, Alternative T08 was found to have the highest impact on both residential and non-residential noise sensitive receptors as well as existing residential and non-residential displacements. Similar to Alternative T07, the CORSIM model presented for the tie-in at 45th Avenue resulted in a failure of traffic operations along I-10 (Papago Freeway).

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Alternative T09, which ties into I-10 (Papago Freeway) at 105th Avenue, but provides direct ramp access to SR 101L, was found to have the lowest impacts on cultural site acreage. However, Alternative T09 was found to have the highest planned residential and non-residential impacts. Similar to Alternatives T02, T03 and T04, no CORSIM model was created to reflect the operations along I-10 (Papago Freeway) as a result of this connection. The group was in agreement that this connection would function much the same as Alternatives T02, T03 and T04, and would not adversely impact traffic operations along I-10 (Papago Freeway) to the point of failure.

Conclusion

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Alternatives Screening Report, South Mountain Transportation Corridor. March 2003.

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Memo

To:	South Mountain Project Team		
From:	Christopher Clary-Lemon	Project:	South Mountain EIS & L/DCR
CC:	Project File		
Date:	November 19, 2003	Job No:	

RE: South Mountain Environmental Impact Statement and Location / Design Concept Report
Ray Road Alternative and Chandler Boulevard Alternative
Elimination from Further Consideration

INTRODUCTION

As part of the South Mountain Environmental Impact Statement (EIS) and Location/Design Concept Report (L/DCR), the Project Team (ADOT, FHWA, COE, and Consultant Team) is investigating non-Gila River Indian Community alternatives in both the Western and Eastern Sections of the Study Area. A common segment, in the vicinity of 51st Avenue, connects the Western and Eastern Sections and could be used to connect any Western Section alternative with any Eastern Section alternative.

The purpose of this technical memorandum is the present the Chandler Boulevard Alternative and Ray Road Alternative, two of three non-Gila River Indian Community alternatives in the Eastern Section of the Study Area. In addition to the Chandler Boulevard Alternative and Ray Road Alternative descriptions, this memorandum will also present the beneficial and adverse impacts associated with these alternatives and recommendations regarding their continued consideration in this study.

ALTERNATIVE DESCRIPTIONS

In early 2003, nine (9) non-Gila River Indian Community alternatives were presented, along with their potential impacts, in an *Alternatives Screening Report* (ADOT, 2003). The nine alternatives considered in that document all utilized the same horizontal alignment between 51st Avenue (to the west) and I-10 (to the east). This alignment followed the Gila River Indian Community boundary through Phoenix South Mountain Park / Preserve and the existing alignment of Pecos Road, connecting to the I-10 (Maricopa Freeway) / Loop 202 (Santan Freeway) / Pecos Road system traffic interchange.

Following the Project Team's review of the *Alternatives Screening Report*, and determination of which alternatives would be carried forward for additional study, the Study Team began to investigate other potential alignments within the Eastern Section of the Study Area. As the Gila River Indian Community has not yet granted permission for the State to study alternatives within their Community, all possible options would have to exist north of Pecos Road. For the purposes of this analysis, including the development of alternatives and the evaluation of impacts, an area bound by the Gila River Indian Community to the south and Phoenix South Mountain Park / Preserve to the north was considered. **Figure 1** presents the area under investigation as well as the public services and parks within the revised study area.

The investigation of alternatives to the Pecos Road alignment began one mile north of Pecos Road with the Chandler Boulevard Alternative. The second alternative investigated was two miles north of Pecos Road (one mile north of Chandler Boulevard) and has been identified as the Ray Road Alternative. Descriptions of all three Eastern Section alternatives are presented below.

Pecos Road Alternative
A freeway alignment along Pecos Road, an east-west arterial street located directly north of the Gila River Indian Community, would provide a connection from the existing I-10 / Loop 202 / Pecos Road system traffic interchange to the Western Section of the Study Area. **Figure 2** illustrates the freeway alignment alternative corridor considered along Pecos Road.

The Pecos Road Alternative would begin at the existing system traffic interchange (I-10 / Loop 202 / Pecos Road) and travel west along the existing Pecos Road alignment. The Pecos Road Alternative would then turn northwest and travel through Phoenix South Mountain Park / Preserve connecting to the Western Section of the Study Area.

Chandler Boulevard Alternative
A freeway alignment along Chandler Boulevard, an east-west arterial street located approximately one mile north of the Gila River Indian Community, would provide a connection from the existing I-10 / Loop 202 / Pecos Road system traffic interchange to the Western Section of the Study Area. **Figure 2** illustrates the freeway alignment alternative corridors considered along Chandler Boulevard.

The Chandler Boulevard Alternative would begin at the existing system traffic interchange (I-10 / Loop 202 / Pecos Road) and travel northwest, joining the existing Chandler Boulevard arterial street alignment near 40th Street. The alignment would continue along the existing Chandler Boulevard alignment until just east of Desert Foothills Parkway where it would turn southwest and join with the existing Pecos Road alignment. The Chandler Boulevard Alignment would follow the existing Pecos Road alignment and travel through Phoenix South Mountain Park / Preserve connecting to the Western Section of the Study Area.

In addition to the Chandler Boulevard Alternative described above, two options to this alternative were considered, both of which tie into the Ray Road Alternative. The first option, Chandler Boulevard Alternative Option 1, would begin at the existing system traffic interchange (I-10 / Loop 202 / Pecos Road) and travel northwest, past Chandler Boulevard and connect with the Ray Road Alternative in the vicinity of 32nd Street. The second option, Chandler Boulevard Alternative Option 2, would follow the Chandler Boulevard Alternative, but instead of joining with the existing Pecos Road alignment near Desert Foothills Parkway, Option 2 would dip slightly and then follow the Ray Road Alternative along the southern boundary of Phoenix South Mountain Park / Preserve, where no roadway currently exists.

Ray Road Alternative
A freeway alignment along Ray Road, an east-west arterial street located approximately two miles north of the Gila River Indian Community, would provide a new freeway-to-freeway system traffic interchange along I-10. **Figure 2** illustrates the freeway alignment alternative corridor considered along Ray Road.

The Ray Road Alternative would begin at a new system traffic interchange and travel west along the existing Ray Road alignment and continue traveling west on a new alignment instead of following Ray Road through its southward loop. The Ray Road Alternative would travel along the southern edge of Phoenix South Mountain Park/Preserve until Desert Foothills Parkway, where it would turn southwest for approximately one-mile and then west again, paralleling the southern border of the Park/Preserve. The Ray Road Alternative would then turn northwest and travel through Phoenix South Mountain Park / Preserve connecting to the Western Section of the Study Area.

ALTERNATIVE IMPACTS

The same methodology that was utilized in the development of the *Alternatives Screening Report* was used to investigate the alternatives presented above. In total, 17 criteria were included in the *Alternatives Screening Report*. Nine of these criteria were anticipated to have similar impacts for all alternatives considered, and thus are not included in the impacts analysis below. These criteria include:

- Cultural Sites
- Jurisdictional Waters
- Environmental Justice
- Sensitive Species
- Potentially Hazardous Sites
- Prime and Unique Farmlands
- Utilities
- Cumulative Impacts
- Compliance with Design Standards

The remaining eight criteria that were anticipated to have different impacts for all alternatives considered are described below and summarized in **Table 1**.

Section 4(f) Impacts

The purpose of this criterion is to determine the impacts each alternative would have on Section 4(f) resources within the revised study area. For the purposes of this analysis, aerial photography and available mapping were used in identifying the location of all known existing resources. Both parks and play fields associated with schools were included in this analysis. Planned resources were not included in this analysis.

The Pecos Road Alternative had no direct impacts to Section 4(f) resources. Two resources are in close proximity to the Pecos Road Alternative, including Pecos Park and Kyrene de los Lagos Elementary School (playing fields), possibly resulting in indirect impacts to these resources.

The Chandler Boulevard Alternative and its Options had no direct impacts to Section 4(f) resources. Two resources are in close proximity to the Chandler Boulevard Alternative and its Options, including Desert Foothills Park and Phoenix South Mountain Park / Preserve (for Options 1 and 2), possibly resulting in indirect impacts to these resources.

The only alternative considered that had direct impacts to Section 4(f) resources was the Ray Road Alternative. In total, 6.3 acres would be required from two resources (Sunray Park and Centennial Middle School), both along Ray Road. In addition to these direct impacts, the Ray Road Alternative is in close proximity to Mountain Vista Park and Phoenix South Mountain Park / Preserve, possibly resulting in indirect impacts to these resources.

General Plan Compatibility

The purpose of this criterion is to determine the compatibility each alternative would have with the City of Phoenix General Plan (2001). The General Plan does include a South Mountain Freeway as a “future transportation” facility. The alignment illustrated in the General Plan follows the Pecos Road Alternative. It is assumed both the Chandler Boulevard Alternative (and its Options) and the Ray Road Alternative would not be compatible with the General Plan and future land uses within the Ahwatukee Foothills Village.

In addition to General Plan compatibility, community cohesion was also investigated for each alternative. Whereas the Pecos Road Alternative resides on the edge of the Ahwatukee Foothills Village, portions of the other two alternatives considered would bisect the Village and thereby reduce community cohesion by possibly splitting school districts, neighborhoods, and homeowners associations.

Air Quality and Noise Impacts
The purpose of this criterion is to determine the number of sensitive receptors each alternative would impact. Residential and non-residential sensitive receptors were documented within an area 500 feet outside the center of the outside lane of travel. Planned development was not included in this analysis.

Each alternative considered had impacts to both residential and non-residential sensitive receptors. Largely a residential community with limited commercial / industrial uses, the number of residential sensitive receptors in the Ahwatukee Foothills Village greatly exceeds the number of non-residential sensitive receptors.

The Pecos Road Alternative had the fewest residential sensitive receptors (834 units), followed closely by the Ray Road Alternative (878 units). The Chandler Boulevard Alternative and its Options had the most residential sensitive receptors, ranging from 1,150 to 1,715 units.

The Pecos Road Alternative also had the fewest non-residential sensitive receptors (10 units). The Chandler Boulevard Alternative had the most non-residential sensitive noise receptors (52 units). The Chandler Boulevard Alternative Options had 28 and 48 non-residential sensitive receptors while the Ray Road Alternative had 44 non-residential sensitive receptors.

Displacements and Relocations
The purpose of this criterion is to determine the number of residential and non-residential displacements each alternative would require. For residential displacements, units were included if the alternative's right-of-way shape fell within the residential property limits. For non-residential displacements, units were included if the alternative's right-of-way shape rendered the property unusable by either limiting access or directly impacting the structure.

The Pecos Road Alternative had the fewest residential (175 units) and non-residential (1 unit) displacements. The Ray Road Alternative had the second fewest residential displacements (561 units), but the most non-residential displacements (37 units). The Chandler Boulevard Alternative had the third fewest residential displacements (639 units), but the second most non-residential displacements (36 units). The Chandler Boulevard Alternative Options had the most residential displacements (741 and 944 units), but fewer non-residential displacements (14 and 31 units) than all alternatives considered with the exception of the Pecos Road Alternative.

Public Service Impacts
The purpose of this criterion is to determine the impacts each alternative would have to public services, including police, fire, hospitals, and schools. For this analysis, public services were considered to be impacted if they fell within the same 500-foot buffer utilized in the Air Quality and Noise Impacts section above. Direct impacts were documented where the structure of a particular service was within the 500-foot zone, while indirect impacts were documented where the structure was outside the 500-foot zone but a portion of the property was within it. Every alternative considered impacted public services.

The Pecos Road Alternative had the fewest direct impacts (0) but the most indirect impacts (5). Four of the indirect impacts were schools located along Pecos Road including Kyrene de los Lagos Elementary School, Desert Vista High School, Kyrene Akimel A-al Middle School, and Kyrene de la Estrella Elementary School. The fifth indirect impact associated with the Pecos Road Alternative involved the post office located along Desert Foothills Parkway.

The Chandler Boulevard Alternative and its Options would each have two public service impacts, one direct and one indirect. For all three alignments, the Kyrene del Milenio Elementary School would be directly impacted and require relocation. All three alignments would also indirectly impact the South Mountain Community College branch.

The Ray Road Alternative would have two public service impacts, one direct and one indirect. The direct impact associated with the Ray Road Alternative includes the Centennial Middle School, which would require relocation. The indirect impact would occur to Kyrene de la Colina Elementary School located just north of Centennial Middle School.

Public and Political Acceptability
The purpose of this criterion is to determine the acceptability of the alternatives considered in this analysis.

At the time of this analysis, neither the municipal government nor the residents of Phoenix have been made aware of these alternatives, and thus their acceptability is unknown.

Traffic Operations Impacts
The purpose of this criterion is to determine the impacts each alternative would have on the traffic operations along I-10 (Maricopa Freeway) and the local arterial roadway network with the Ahwatukee Foothills Vilalge.

For all alternatives considered, I-10 would function best with a direct connection to the existing I-10 / Loop 202 / Pecos Road system traffic interchange. This occurs with all alternatives except the Ray Road Alternative, which would provide a new system traffic interchange at I-10 / Ray Road. The challenges associated with this new connection involve the spacing of system traffic interchanges along I-10. With the Ray Road Alternative, the two system traffic interchanges would be less than two miles apart, with a little over one mile between the two for merging and weaving maneuvers. Collector-distributor roadways or direct connection freeway ramps may be needed between the Ray Road Alternative, I-10, Loop 202 (Santan Freeway) and Pecos Road to allow the alternative to function adequately in terms of freeway traffic operations.

For all alternatives considered, the local arterial street network within the Ahwatukee Foothills Village would function best if the freeway is not placed on an arterial street that provides direct access to residential and commercial development. The Pecos Road Alternative and Chandler Boulevard Alternative Option 1 would function better than the other alternatives considered. The Chandler Boulevard Alternative Option 1 does not require the removal of any arterial streets from the local roadway network. While the Pecos Road Alternative would eliminate an arterial street from the local roadway network, all existing access to major arterial streets could be accommodated. The other alternatives considered, Chandler Boulevard Alternative, Chandler Boulevard Alternative Option 2, and Ray Road Alternative would all require the removal of one to three miles of arterial street from the local roadway network. This removal would impact both east-west as well as north-south travel through the Village. It would not be possible to provide access to all existing arterial streets due to arterial street geometry and service traffic interchange spacing requirements.

The following service traffic interchanges were included for the alternatives considered:

- Pecos Road (6 interchanges) : 40th Street, 32nd Street, 24th Street, Desert Foothills Parkway, 17th Avenue, and 25th Avenue
- Chandler Boulevard Alternative (3 interchanges): 32nd Street, 17th Avenue, and 25th Avenue
- Chandler Boulevard Alternative Option 1 (2 interchanges): Desert Foothills Parkway and 17th Avenue
- Chandler Boulevard Alternative Option 2 (2 interchanges): 32nd Street and 17th Avenue
- Ray Road Alternative (3 interchanges): East Ranch Cirlce / 36th Street, Desert Foothills Parkway, and 17th Avenue

Estimated Construction Costs

The purpose of this criterion is to develop estimated costs for use in comparing the alternatives to one another. For this analysis, the same estimated costs for freeway miles, service traffic interchanges, and system traffic interchanges used in the *Alternatives Screening Report* were used to determine an estimated construction cost for each alternative. Right-of-way costs were not included in this estimate.

The following values were used as typical costs:

Typical Freeway Mile Cost	=	$9.3M
Typical Service Traffic Interchange Cost	=	$14.5M
Typical System Traffic Interchange Cost	=	$82.5M (three-leg)

The estimated construction costs, based on the three unit costs presented above, range from a low of $130,000,000 to a high of $230,000,000. The Chandler Boulevard Alternative Options would have the lowest construction costs, primarily due to the reduced local access they accommodate. The Ray Road Alternative would have the highest construction cost, primarily due to the need for a new system traffic interchange along I-10.

Table 1 Summary Data of Eastern Section Alternatives Compared with Criteria						
Criteria	**Description**	**Eastern Section Alternatives**				
		Pecos Road	**Chandler Boulevard**			**Ray Road**
			Original	**Option 1**	**Option 2**	
Section 4(f)	Area of Direct Impact (acres)[1]	0.0	0.0	0.0	0.0	6.3
General Plan Compatibility	Inclusion in City of Phoenix General Plan	Included	Not Included	Not Included	Not Included	Not Included
	Community Cohesion	Edge of Community	Splits Community	Splits Community	Splits Community	Splits Community
Air Quality and Noise	Residential Noise Sensitive Receptors (units)[2]	834	1,715	1,150	1,645	878
	Non-Residential Noise Sensitive Receptors (units)[2]	10	52	28	48	44
Displacements and Relocations	Existing Residential (units)	175	639	741	944	561
	Existing Non-Residential (units)	1	36	14	31	37
Public Service Impacts	Total (number)[3]	5 (0-Direct) (5-Indirect)	2 (1-Direct) (1-Indirect)	2 (1-Direct) (1-Indirect)	2 (1-Direct) (1-Indirect)	2 (1-Direct) (1-Indirect)
Public and Political Acceptability	COP Municipal Government and Residents	Unknown				
Traffic Operations	**F**reeway and **A**rterial Street Operations	F – Good A – Good	F – Good A – Poor	F – Good A – Good	F – Good A – Poor	F – Poor A – Poor
Cost	Construction Cost[4]	$180M	$150M	$130M	$130M	$230M

[1]Does not include impacts through Phoenix South Mountain Park / Preserve.
[2]Existing units within 500 feet of the center of the outside lane of travel.
[3]Services within 500 feet of the center of the outside lane of travel on the proposed facility. Direct impacts are those where the structure is within the 500-foot limit. Indirect impacts are those where the structure is outside the 500-foot limit but a portion of the property is within the limit.
[4]Construction cost is based on average costs per freeway mile and the number of traffic interchanges accommodated. Right-of-way costs are not included. All costs are rounded up to the nearest $10M.

ALTERNATIVE ANALYSIS

Based on the impacts analysis conducted:

The Pecos Road Alternative would have fewer adverse impacts than other alternatives being considered, including:

- No direct impacts to Section 4(f) resources south of Phoenix South Mountain Park / Preserve.
- Compatible with the City of Phoenix General Plan and future land uses.
- Does not diminish community cohesion.
- Fewest residential and non-residential sensitive receptors.
- Fewest residential and non-residential displacements.
- Least direct impacts to public services.
- Most indirect impacts to public services.
- Good traffic operations on both the freeway and arterial streets.
- Moderate construction costs.

The Chandler Boulevard Alternative and its Options would have greater adverse impacts and provide no additional benefit than other alternatives being considered, including:

- Most direct impacts to Section 4(f) resources south of Phoenix South Mountain Park / Preserve, including a school.
- Not included in the City of Phoenix General Plan and future land uses.
- Greater disruption to community cohesion (divides the Ahwatukee Foothills Village in two).
- Largest number of residential sensitive receptors as well as more non-residential sensitive receptors than other alternatives.
- Most residential displacements.
- Large number of non-residential displacements.
- Direct impacts to one school, requiring its relocation.
- Good traffic operations on the freeway.
- Poor traffic operations on the arterial street network.
- Lowest construction costs.

The Ray Road Alternative would have greater adverse impacts and provide no additional benefits than other alternatives being considered, including:

- Most direct impacts to Section 4(f) resources south of Phoenix South Mountain Park / Preserve, including a school.
- Not included in the City of Phoenix General Plan and future land uses.
- Greater disruption to community cohesion (divides the Ahwatukee Foothills Village in two).
- Second lowest number of residential sensitive receptors, but second most non-residential sensitive receptors.
- More impacts to existing residential developments, including a greater number of residential displacements.
- Most impacts to existing commercial developments, including the loss of Ray Road as an arterial street.
- Direct impact to one school, requiring its relocation.
- Most impacts to traffic operations on I-10 based on three system traffic interchanges within a six-mile segment of I-10 (including I-10 / Loop 202 / Pecos Road, I-10 / Ray Road Alternative, and I-10 / US 60).
- Highest construction costs associated with construction of a new system traffic interchange and capacity improvements needed along I-10 in addition to what is already planned.

RECOMMENDATIONS

Based on the impacts identified above, the Project Team recommends the Chandler Boulevard Alternative, Chandler Boulevard Alternative Option 1, Chandler Boulevard Alternative Option 2, and Ray Road Alternative in the Eastern Section of the Study Area be eliminated from further consideration in this study.

The Pecos Road Alternative is recommended for continued consideration in this study.

To	Project File
From	Christopher Clary-Lemon
Date	January 22, 2003 (**Revised January 3, 2006**)
Subject	South Mountain Freeway, SR 202L EIS and L/DCR ADOT Project No. RAM-202-C200 Traffic Sensitivity Alignment G – US 60

HDR

M e m o r a n d u m

This technical memorandum was revised on January 3, 2006.
All additions to the original text are shown in bold.

* *

As part of the initial screening process for alternative alignment development in the South Mountain Environmental Impact Statement (EIS) and Location and Design Concept Report (L/DCR), a total of eight (8) corridor alignments were investigated surrounding the Phoenix South Mountain Park from a traffic capacity perspective. This analysis will focus primarily on Alignment G, US Route 60 (US 60) to Interstate Route 17 (I-17) connection, and its impact on the Regional Freeway System (RFS).

INTRODUCTION

As stated in the Purpose and Need Memorandum (November 2002) for the South Mountain Transportation Corridor (SMTC), the primary purpose of the SMTC is to provide a regional system linkage with the remainder of the RFS that meets the objectives of adopted local land use plans while also meeting the regional mobility needs resulting from rapid population growth and its associated travel demand.

To determine the future travel demand associated with the projected population growth, potential alignments were inserted in the Maricopa Association of Governments (MAG) regional traffic model. The Model was then run to determine the anticipated traffic the proposed facility would accommodate as well as the impact it would have on the system as a whole. The results generated from the traffic modeling were also to be used to support the boundaries of the Study Area.

To determine the level of design detail necessary for the MAG Model to accurately reflect the intent of the alignment alternatives, the 1988 Arizona Department of Transportation (ADOT) alignment was input into the MAG Model in two forms. First, the 1988 alignment was inserted with full gemeotric details included at the system interchanges with Interstate Route 10 (I-10), both the Papago and Maricopa Freeways. Next, the 1988 alignment was inserted into the MAG

Model using only lines, assuming that system interchanges would be treated as free-flow intersections. The traffic volume results from these two runs showed that the data was statistically identical; meaning that less detail work was needed for the development of the alignment alternatives at this stage in the screening process.

The two initial runs of the 1988 ADOT alignment led to the development of eight Traffic Sensitivity Alignments surrounding the Phoenix South Mountain Park, with 115th Avenue (Alignment A) representing the farthest western alignment and US 60 (Alignment G) representing the farthest eastern alignment. The alignments are not intended to represent a freeway in that exact location, but rather to give an idea of the traffic impacts associated with a freeway alignment running through that corridor. As noted above, these alignments were input with interchanges represented as free flow intersections to simplify the model analysis.

Traffic Sensitivity Alignment G, which connects US 60 at I-10 (Maricopa Freeway) with Interstate Route 17 (I-17), is the focus of this analysis.

ANALYSIS

The Traffic Sensitivity Alignments generated for the MAG Model are presented in the table below. There are five alignments that tie into I-10 (Papago Freeway), two alignments that tie into I-17, and one alignment that creates a split alignment with two junctions into I-10 (Papago Freeway).

Table 1
SMTC Traffic Sensitivity Alignments for MAG Model Traffic Volumes

Traffic Sensitivity Alignment	Begin Location	Route	End Location
A	GRIC Boundary	NW along boundary, north along 115th Avenue	I-10 (Papago) / 115th Avenue
B	GRIC Boundary	NW along boundary, north ¼-mile east of 99th Avenue	I-10 (Papago) / SR 101L
C	GRIC Boundary	NW along boundary, north along 75th Avenue	I-10 (Papago) / 75th Avenue
D	GRIC Boundary	NW along boundary, north along 59th/55th Avenues	I-10 (Papago) / 55th Avenue (1988 Alignment)
E	Alignment D	NE north of Salt River, north along 43rd Avenue	I-10 (Papago) / 43rd Avenue
F	Alignment E	NE north of Salt River to I-17	I-17 Durango Curve
G	I-10 (Maricopa) / US Route 60	East between Baseline Road and Southern Avenue, north along 23rd Avenue	I-17 Durango Curve
H	GRIC Boundary	NW along boundary, split alignments following B and D.	1) I-10 (Papago) / SR 101L 2) I-10 (Papago) / 55th Avenue (1988 Alignment)

The Traffic Sensitivity Alignments above present a wide range of corridor options that span the entire western portion of the Study Area, without encroaching on the GRIC, as well as alignments northeast of the Study Area. Three alignments proceed outside the Study Area,

namely A, F and G, and were included to determine if the Study Area was appropriately delineated to meet the purpose and need of the proposed action.

Once the Traffic Sensitivity Alignments were finalized, they were run through the MAG Model to determine the system-wide impact each alignment would have on the RFS. Eight locations were chosen to be compared between the eight Traffic Sensitivity Alignments, along with a total calculation. The MAG Model was run for each Traffic Sensitivity Alignment to generate Year 2025 traffic volumes, presented in the table below.

Table 2
Year 2025 Network MAG Model Average Daily Traffic (ADT)

Location	Traffic Volumes per Traffic Sensitivity Alignments							
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Loop 101 North of I-10	138.33	145.97	140.73	135.07	136.28	136.52	135.95	144.79
I-17 North of I-10	205.16	203.82	206.75	209.05	212.16	210.28	210.68	206.25
I-17 North of Washington St	162.68	158.63	162.30	160.46	161.22	172.57	187.81	158.04
I-10 Between 7th St and 7th Ave	171.30	168.64	172.79	170.83	171.68	170.72	168.49	170.92
I-10 Between 24th St and 32nd St	380.12	380.86	381.78	379.12	379.54	377.80	377.42	379.45
I-10 Between Baseline and Guadalupe	212.04	212.10	212.11	212.89	212.36	211.82	237.53	211.48
US 60 Between Price and Dobson	181.03	180.58	181.45	179.52	179.98	178.88	185.35	180.02
Loop 202 East of I-10	138.02	137.89	137.91	136.95	136.36	135.60	113.02	137.16
Total	**1,588.68**	**1,588.49**	**1,595.82**	**1,583.89**	**1,589.58**	**1,594.19**	**1,616.25**	**1,588.11**

As stated above, this analysis will focus on Traffic Sensitivity Alignment G, which extends US 60 westward and ties into I-17 in south Phoenix.

From inspection of the data presented in **Table 2**, the affects of Alignment G on the RFS can be readily seen. As one would expect, incorporation of Alignment G into the MAG Model results in a reduction in ADT along portions of I-10 between US 60 to the east and the I-17 stack interchange to the west, as compared with the other alignments. This is primarily due to the fact that Alignment G acts like a downtown Phoenix bypass, which is pulling traffic off this portion of I-10 and onto Alignment G.

Also as expected, **Table 2** indicates an increase in traffic volumes along I-10 south of US 60 as well as I-17 north of Alignment G and the stack interchange. This is primarily due to the bottleneck that is created at both locations. The existing I-10 / US 60 system interchange experiences congestion during both the AM and PM peak hours. Inclusion of a western extension of US 60, while providing additional capacity for through traffic, does not provide additional capacity along I-10 south of US 60, hence, creation of the bottleneck.

Where Alignment G ties in to I-17 near the Durango Curve, a similar situation is encountered. I-17 near the Durango Curve does not currently experience the types of delays seen near the previous example. But north of I-10, I-17 does experience considerable congestion during AM and PM peak hours. Inclusion of Alignment G into the MAG Model shows that congestion

along I-17 will increase, both north of the Durango Curve as well as north of I-10, over existing levels. I-17, being constrained by existing right-of-way and bordering development, would experience a decline in the level of service.

One final observation made, which was not as expected, was the reduction in traffic volumes along State Route 202 (SR 202L). From inspection of the data in **Table 2**, it appears as though a portion of the traffic that would typically be on SR 202L has shifted to both I-10 and US 60, both of which experience greater volumes under Alignment G. Shifting traffic off SR 202L will result in an underutilized freeway (SR 202L) while placing more traffic on US 60 and I-10, which are currently very congested during AM and PM peak hours.

To supplement the locations presented in **Table 2** above, Year 2025 average daily traffic (ADT) volumes were also calculated for the southern portion of the Phoenix metropolitan area, within which the SMTC Study Area lies. Comparisons were made between the Year 2025 No Build Alternative and the Year 2025 Alignment G Alternative.

Table 3 below presents freeway ADT information for both the No Build and the Alignment G alternatives in Year 2025.

Table 3
Comparison of Year 2025 Average Daily Traffic (ADT) for No Build and Alignment G

Route	Location	ADT (in 1,000s)		% Difference over No Build
		No Build	Alignment G	
I-10	Pecos – Chandler	126	128	1.59
	Warner – Elliot	173	199	15.03
	Baseline – US 60	211	254	20.38
	Southern – Broadway	353	373	5.67
	48th St – 40th St	341	369	8.21
	32nd St – 24th St	345	377	9.28
	Washington – Van Buren	158	199	25.95
	16th St – 7th St	245	295	20.41
	7th Ave – 19th Ave	228	282	23.68
	27th Ave – 35th Ave	234	294	25.64
I-17	I-10 – 16th St	154	158	2.60
	Central – 7th Ave	157	165	5.10
	7th Ave – 19th Ave	153	155	1.31
	Washington – Van Buren	153	188	22.88
	North of I-10	127	160	25.98
SR 202L	Mill – Priest	191	217	13.61
	40th St – 32nd St	173	210	21.39
	32nd St – 24th St	173	203	17.34
US 60	Priest – I-10	161	206	27.95

A review of the data above shows that rather than reduce the demand for the RFS within this area, Alignment G actually places more traffic on the system. This of course would be expected along the portion of I-10 south of Alignment G, the portion of I-17 north of Alignment G and on US 60, as these three facilities provide the inflow and outlet of traffic from Alignment G. But Alignment G's affect on the RFS does not end there.

The entire stretch of I-10 between Pecos Road and 35th Avenue experiences increased volumes. While some locations experience only minimal increases (2,000 ADT), other locations experience increases in excess of 30,000 ADT over the No Build Alternative. Similarly, the stretch of I-17 that parallels Alignment G also experiences increases in volumes over the No Build Alternative, ranging from 2,000 to 8,000 ADT.

To the northeast of the Study Area, SR 202L is also impacted by the inclusion of Alignment G. The analysis found that over 30,000 additional vehicles would use SR 202L daily as compared with the No Build Alternative. This could be for several reasons, one of which is the additional traffic now on US 60 as a result of Alignment G. The analysis in Table 2 found that with Alignment G in place, traffic that would normally have used SR 101L was now using I-10 and US 60. With the additional 45,000 vehicles using US 60 per day, it is reasonable to assume that much of the traffic that would have used I-10, US 60 and SR 101L are now using SR 202L to avoid the reconfigured interchange at I-10 / US 60.

CONCLUSIONS

The traffic analysis of Traffic Sensitivity Alignment G found that rather than reduce the congestion (ADT) on the RFS within the Phoenix metropolitan area, Alignment G actually places a greater amount of traffic on the system, even those routes not directly connected with Alignment G.

[Table 2 found that Alignment G actually pulled traffic off SR 202L east of I-10, whereas Table 3 found that Alignment G added an additional 30,000 vehicles per day in the same location. Table 2 was provided to us, Table 3 was created using ADT maps provided by Lima.]

While Alignment G does carry between 105,000 and 127,000 ADT, it also accounts for increases in ADT as high as 28% along other regional freeway as compared with the No Build Alternative. Furthermore, Alignment G does little to meet the purpose and need for the proposed action.

While Alignment G does provide a regional system linkage, the linkage it provides mimics an existing route, namely I-10 to I-17, which is at most 3.5 miles away. Therefore, the connection is more a parallel route than a system linkage.

It is also highly doubtful that Alignment G would meet the needs of existing local planning goals, as the route would primarily serve the City of Phoenix, as opposed to the Valley as a whole. A ½ mile portion of the alignment would fall within the City of Tempe, but the communities to the east of Phoenix South Mountain Park would only be minimally served by this extension. The communities to the west would not be served at all.

Additionally, the regional mobility needs the Phoenix metropolitan area is experiencing are not centered around the area north of Phoenix South Mountain Park, where Alignment G would have the greatest impact. Historically, the greatest challenge in terms of regional mobility has been the movement of traffic between Phoenix South Mountain Park and Papago Park (and further east with the Salt River Pima – Maricopa Indian Community), a distance of roughly 5 miles.

Evidence of this regional bottleneck is apparent in the number of existing freeways that run through this corridor (I-10, US 60, SR 202L, SR 143, SR 153). Regardless of the capacity that Alignment G would offer, there still remains only two logical inflow and outflow freeways to feed it at its eastern terminus, I-10 and US 60, both of which currently experience heavy delays in the AM and PM peak hours. The same situation occurs at the northern terminus of Alignment G, where only I-17 has the ability to serve as a freeway feeder into it. As noted above, I-17 is tightly constrained within its existing right-of-way. Widening of I-17 is considered cost prohibitive.

RECOMMENDATION

The conclusions above are based on the data presented in **Tables 2 and 3**, along with Year 2025 ADT maps for the No Build and Traffic Sensitivity Alignment G. There are several issues that were uncovered during this analysis of Alignment G that must be addressed prior to any formal recommendations being submitted.

1. The information presented in **Table 2** does not correlate to the information presented on the Year 2025 ADT for Alignment G. Specifically, **Table 2** states "I-17 North of I-10" at 210.68 (in thousands) ADT whereas the plot shows 160 (in thousands) ADT. **Table 2** states "Loop 202 East of I-10" as 113.02 (in thousands) ADT whereas the plot shows 203 (in thousands). The remaining numbers that appear in **Table 2** match the plot.
2. Conclusions above were made without knowing the existing ADT along these routes. Therefore, it is possible that all alignments make the existing system more congested, and not just Alignment G.
3. Several quirks were noticed in the Year 2025 Alignment G ADT plot that corresponds to Model input. For example, Alignment G between Broadway and Lower Buckeye (near I-17 junction) has an ADT of 127.42 (in thousands), while the connecting ramps only show a volume of 51.13 (in thousands). This means that within a one-mile spacing in excess of 75,000 vehicles have exited Alignment G onto Lower Buckeye Road, which as shown, only has an ADT of 37.07/38.10 (in thousands).

Recommendations for Traffic Sensitivity Alignment G should not be made until the Project Manager is comfortable that the above issues have been formally addressed. It is believed, however, that should the data presented in the Year 2025 ADT plot for Alignment G be correct, there would be little benefit in carrying forward Alignment G, as it appears to do more harm to the RFS than good.

Following several iterations and updates to the Transportation Demand Model, the Project Team believes the information presented in Table 3 to be more representative of the RFS with and without the inclusion of Alignment G. Table 3 clearly shows that Alignment G:

- **does not provide relief to the RFS,**
- **results in greater than 20% increases in volumes on already congested freeways, and**
- **provides no new regional connectivity.**

As such, the Project Team recommends Traffic Sensitivity Alignment G (US 60 Extension) be removed from further consideration in this study.

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Memo

To: South Mountain Project Team	
From: Ben Spargo Amy Edwards	Project: South Mountain EIS & L/DCR
CC: Project File	
Date: May 12, 2006 **Updated: December 1, 2006**	Job No:

RE: Phoenix South Mountain Park/Preserve and Traditional Cultural Property Avoidance (Ridge Bridge – Tunnel) Analysis

INTRODUCTION

The E1 Alternative would connect I-10 (Maricopa Freeway) and SR-202L (Santan Freeway) to any of the alternatives being considered in the Western Section of the Study Area. To make this connection, a portion of the E1 Alternative travels through Phoenix South Mountain Park/Preserve (SMPP) as well as a Traditional Cultural Property (TCP), both resources afforded protection under Section 4(f) of the U.S. Department of Transportation Act. An aerial location map of the E1 Alternative and SMPP is presented in Figure 1. Due to the sensitive nature of the TCP, its boundary is not shown; however it does expand beyond the limits of the SMPP. The E1 Alternative is within the SMPP boundary from approximately station 2550+00 to 2580+00 and station 2635+00 to 2645+00 for a total distance of 4000 feet. The three mountain ridges that the E1 Alternative crosses are Main Ridge South, from station 2495+00 to 2515+00, Main Ridge North, from Station 2545+00 to 2560+00, and Alta Ridge from station 2630+00 to 2648+00. For the analysis, it is assumed these ridges are afforded protection under Section 4(f).

At this point in the study process, there are no feasible and prudent alternatives to avoiding direct impacts to SMPP or the TCP. Consequently, the Study Team has looked at ways to minimize harm to the resource.

This technical memorandum presents the potential options for crossing Main Ridge North and Main Ridge South while minimizing impacts on the Section 4(f) resources of SMPP and TCP. Included in the discussion are the adverse and beneficial impacts of each option.

DESIGN CRITERIA

The overall design criteria used in the development of the options for passing through the ridges is the ADOT Roadway Design Guidelines. Portions of the guidelines are repeated here as they pertain to the specifics of the designs. Additionally, the tunnel design criteria were based on comparable tunnels and coordination with Hatch Mott McDonald, a leading tunnel design and construction firm.

Open Cut

The width of the open cut option has been minimized to reduce right-of-way required and ultimately impacts. This option includes a rock fall containment ditch and cut slopes of ¾:1. Flatter cut slopes and benching could be considered, but would increase the amount of right-of-way necessary and ultimately impacts. The ultimate slopes would depend on the geotechnical constraints encountered during construction.

Tunnel

In evaluating tunnel options, two methods were considered: the boring method and Sequential Excavation Method (SEM)/New Austrian Tunneling Method (NATM).

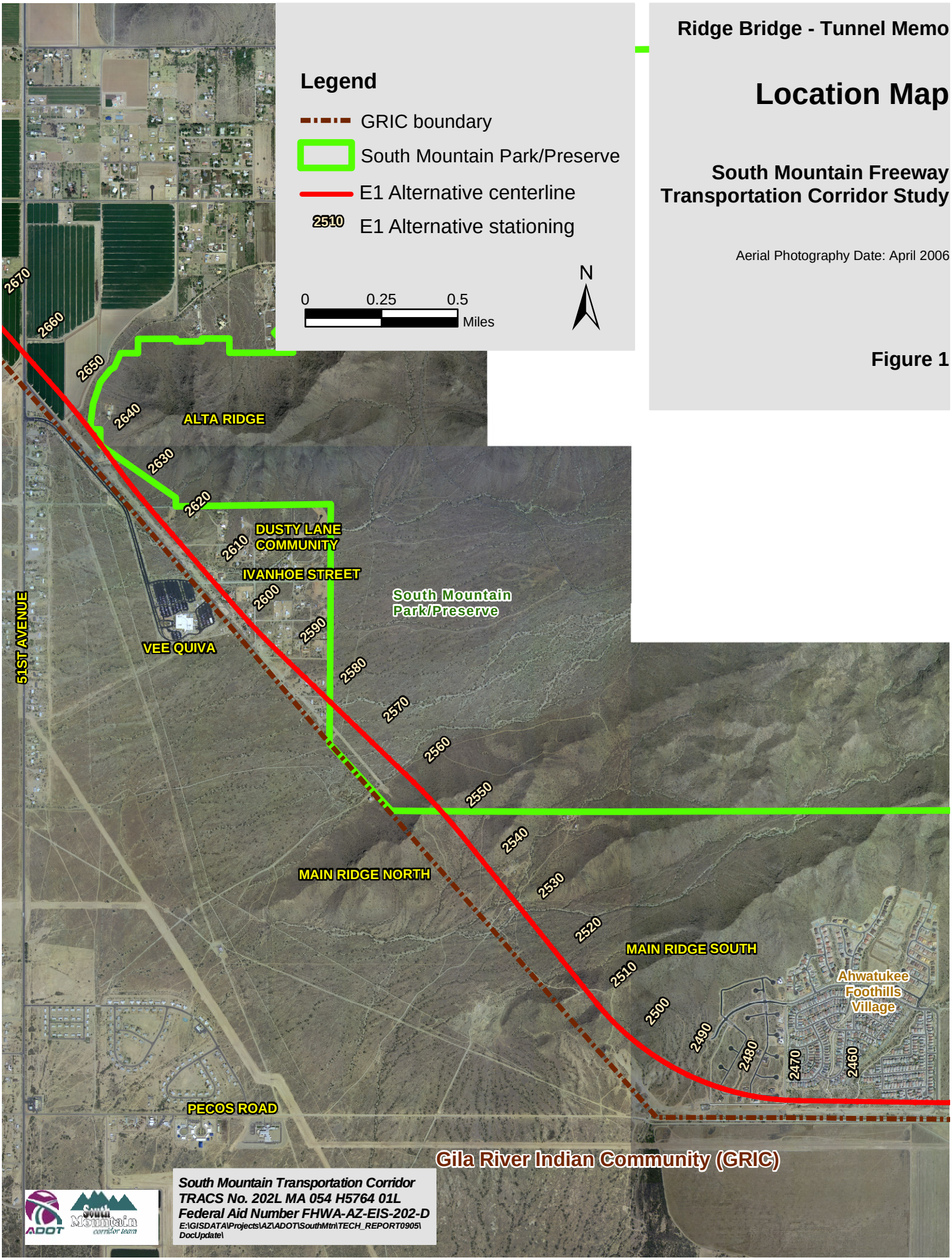
Ridge Bridge - Tunnel Memo

Location Map

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 1



Boring Method

Technical memos discussing the preliminary assessment of feasibility and cost for the boring method are included as an appendix to this document. Some of the major design items are listed below:

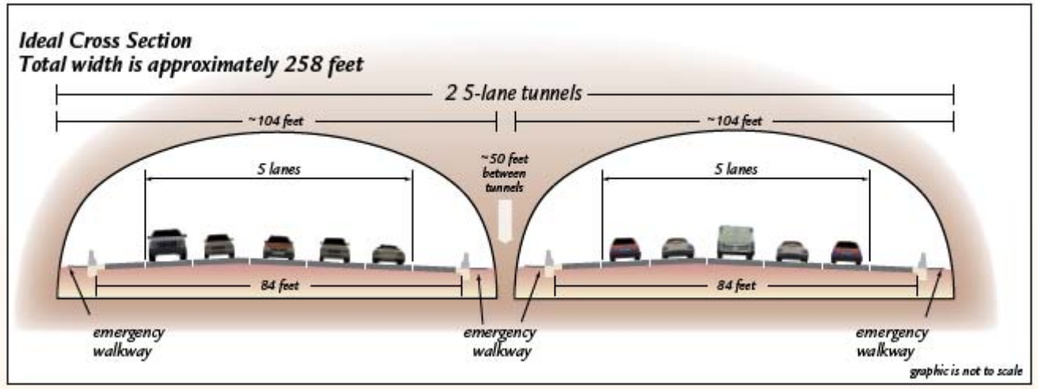
- The tunnel design would include five two-lane bores (each 44 feet wide) in order to accommodate the ultimate lane configuration of four general purpose lanes and one high-occupancy vehicle (HOV) lane in each direction. Two lane bores are a commonly accepted practice in the U.S., although some three lane bores do exist.
- Since each tunnel bore requires a bedrock pillar between itself and another tunnel bore of a width equal to the bore width, the total width of the tunnel section would be approximately 380 feet.
- Each tunnel would provide minimum vertical clearance of 16 feet and a minimum of 40 feet of rock mass above the crown where the bore daylights resulting in a total profile grade depth of 56 feet.
- Other safety issues required for tunnels include traffic control, fire detection systems, ventilation systems, exhaust systems, drainage systems, maintenance crossovers between tunnel bores, fire doors, an emergency response plan, and full-time operational personnel.
- Tunnel scarring could result at the portals as shown in the photo of the US 60 Queen Creek Tunnel. However, without detailed geotechnical information, it is not possible to estimate the extent of the scarring.

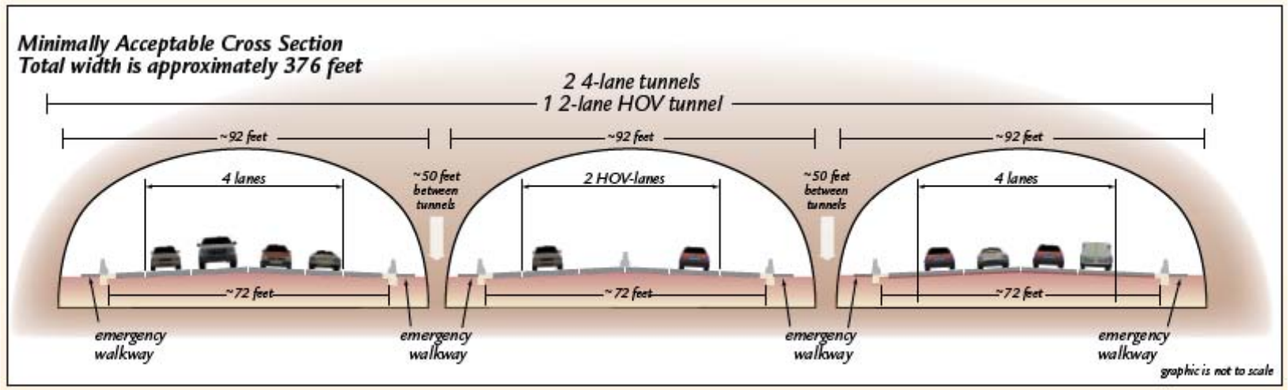
US 60 Queen Creek Tunnel: approximately 50' wide, carries 4-lanes of traffic, scarring to the ridge for the construction of the portal.

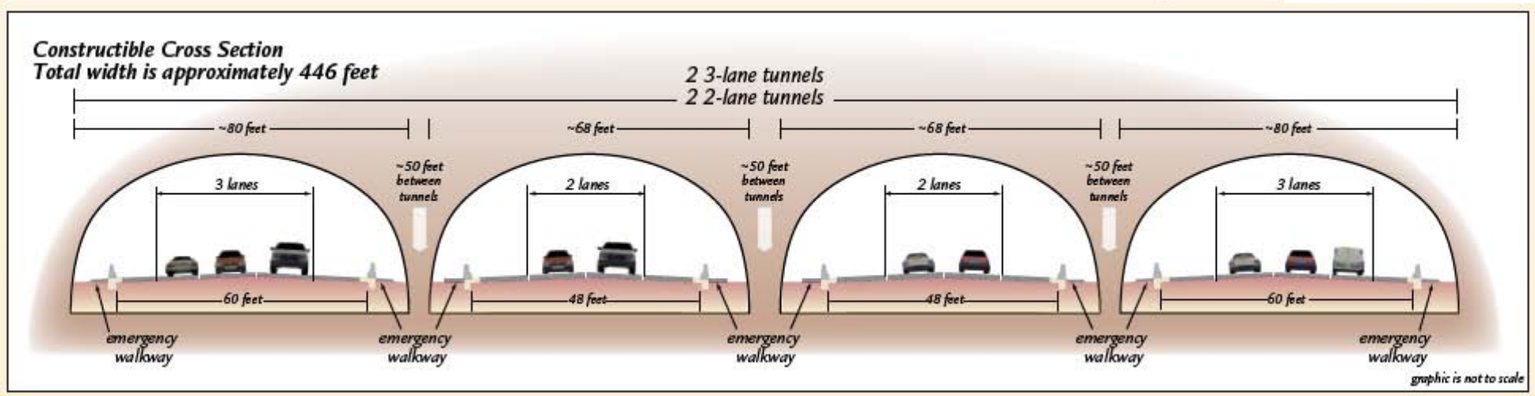
SEM/NATM

- SEM/NATM often is applied to larger tunnels where considerations of practicality and face stability require that staged excavation be performed.
- Preliminary analysis of this approach yielded a significant construction cost savings over the boring approach. The costs included mechanical and electrical requirements, including lighting, fire detection systems, ventilation systems, exhaust systems and other safety features.
- For purposes of preliminary feasibility analysis, assumed tunnel dimensions (accomplished using staged excavation) of width 66 feet and height 34 feet. These tunnel dimensions reflected an assumption of 3 general purpose lanes in a single tunnel. For the ultimate build-out of 10 lanes, this approach would require two 3-lane tunnels and two 2-lane tunnels as shown in Figure 2.
- While larger tunnel excavations may be possible, there are no known examples of larger freeway tunnel excavations within the U.S.

Tunnel Cross Sections







Tunnel Cross Sections
Ridge Bridge – Tunnel Memo

Figure 2

Bridge versus Embankment
For the Medium and High Profile options, consideration was given to the economic and engineering feasibility of embankment versus bridge structure. As an alignment profile rises above the existing ground, it requires more embankment material to gain elevation, which results in a wider footprint. Additionally, there comes a point with the cost of the embankment material becomes more expensive than the cost of bridge structures. In coordination with ADOT Valley Project Management and ADOT District Maintenance, it was determined that approximately 40 feet is the height at which the embankment/bridge structure transition would need to occur on this project.

Roadway Grade
The maximum grade based on ADOT Roadway Design Guidelines for a freeway facility is three percent. This constraint will dictate how far in advance of the ridges the freeway must start its incline and decline.

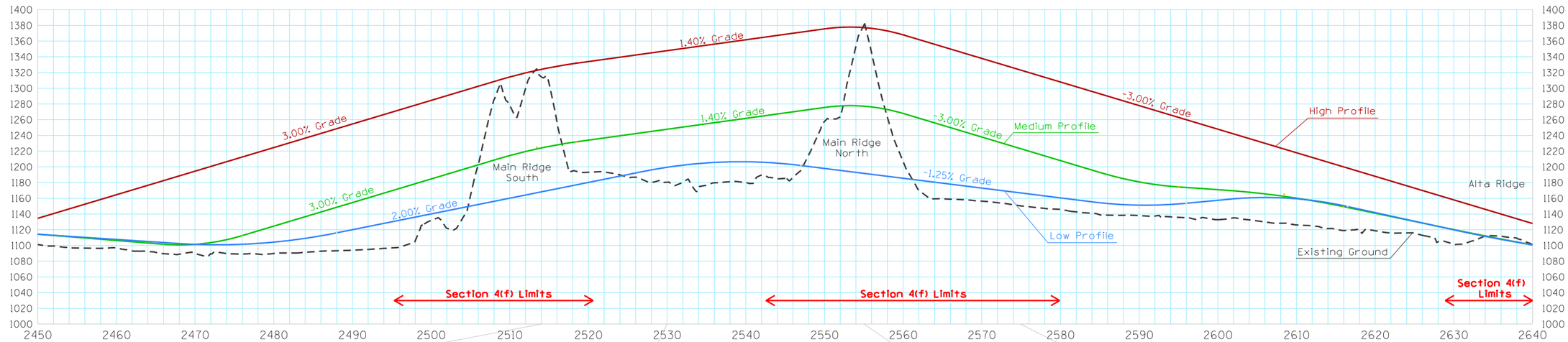
PROFILE OPTIONS
When designing options for passage from one side of the mountain ridges to the other, consideration was given to the following approaches:

- ***Underground Profile*** - Tunneling under the mountain ridges entirely, from the northwestern side of Main Ridge North to the southeastern side of Main Ridge South. For safety and tunnel stability, the top of the tunnel must have 40 feet of soil above it at the portal. As such, at the northwestern side of Main Ridge North and the southeastern side of Main Ridge South, the profile for this option has the top of the tunnel 40 feet below existing ground per the design criteria. The remainder of the profile is developed maintaining the 40 feet of cover and per the design criteria.
- ***Low Profile*** - Low profile is essentially on existing ground except where elevated at specific locations to allow passage of drainage, wildlife crossing, and pedestrian access. The profile for this option was developed using the design criteria.
- ***Medium Profile*** - Elevated to pass through approximately the mid-height of each of the ridge lines. This profile option is essentially on existing ground until it begins to rise to pass through the mid-height of each of the ridges. As the elevation of the roadway above existing ground approaches 40 feet, the roadway transitions from embankment onto bridge structures per the design criteria. The alignment remains on bridge structures following the profile design criteria between the ridges, before beginning its descent on the other side. When the alignment is approximately 40 feet above the existing ground, it transitions from bridge structures to embankment and continues down to existing ground per the design criteria.
- ***High Profile*** - Elevated to pass over the top of each of the ridges. This profile option begins on existing ground and rises to pass over the top of both ridge lines per the design criteria. As the elevation of the alignment becomes approximately 40 feet above the existing ground, it transitions from embankment to bridge structures. It remains on bridge structures until it passes over both ridges and transitions back down toward existing ground. When it is approximately 40 feet above existing ground, it transitions from bridge structures to embankment and continues on down to existing ground per the design criteria.

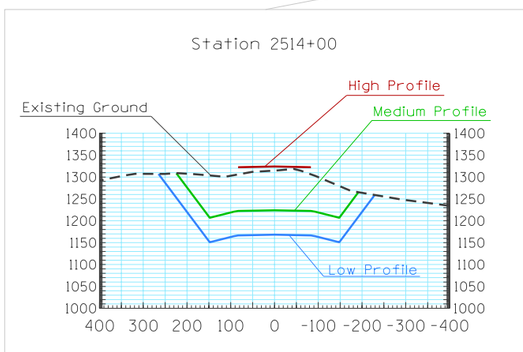
Figure 3 shows the profiles for the Low, Medium and High Profile options. Figure 4 shows the profiles for the Underground, Low and Medium Profile options.

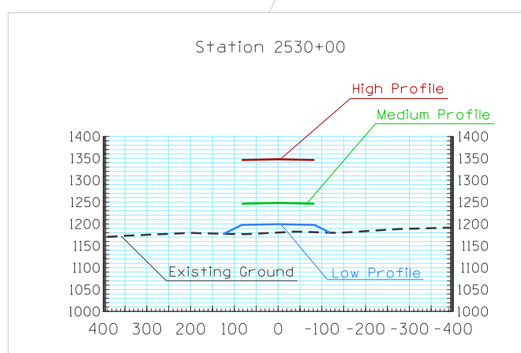
DESIGN OPTIONS
For the Low and Medium Profile options, as the alignment passes through the ridge lines, it can either pass through in an open cut section or tunnel section. The open cut or tunnel sections are considered design options. They are based on the design criteria previously discussed. Concept drawings of each design option are presented in Figure 5.

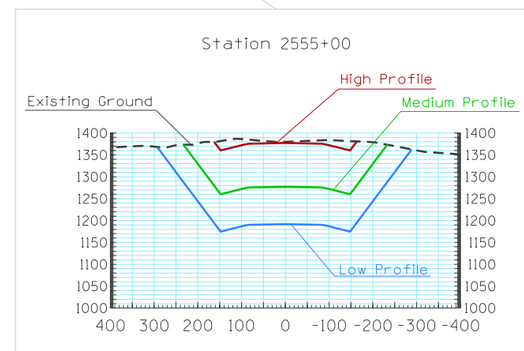
Open Cut Profiles

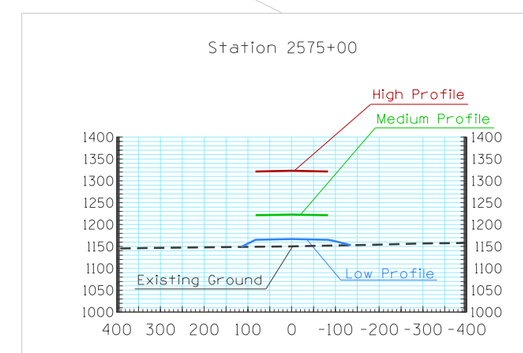


Open Cut Cross-sections





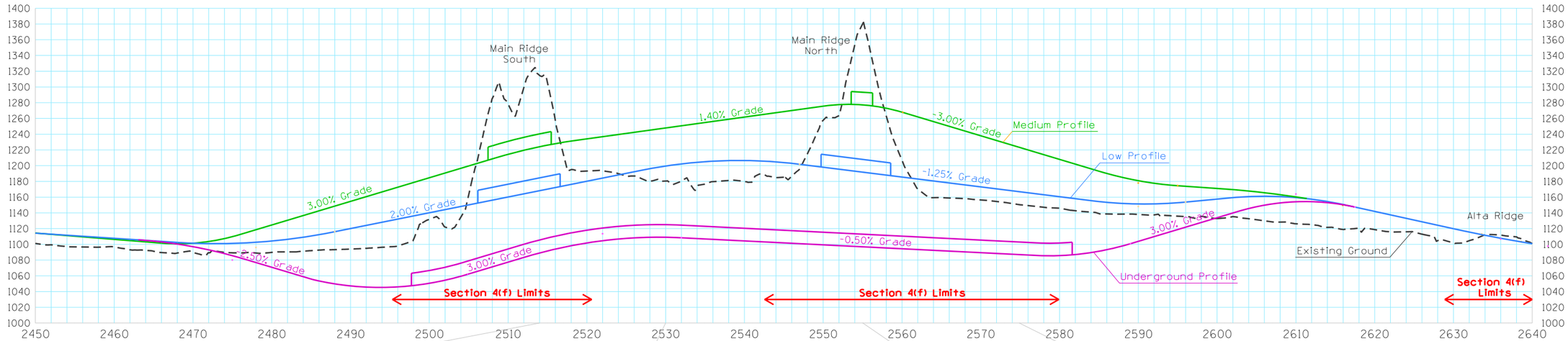




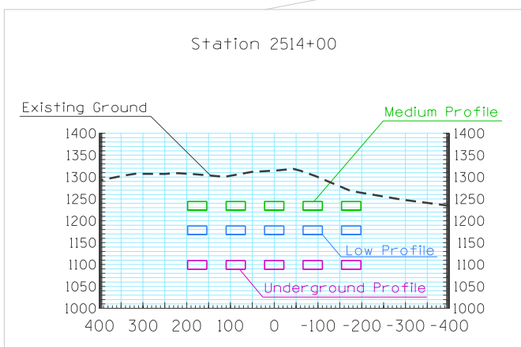
Open Cut Profiles and Cross–sections
Ridge Bridge – Tunnel Memo
E1 Alternative – Station 2450+00 to Station 2640+00

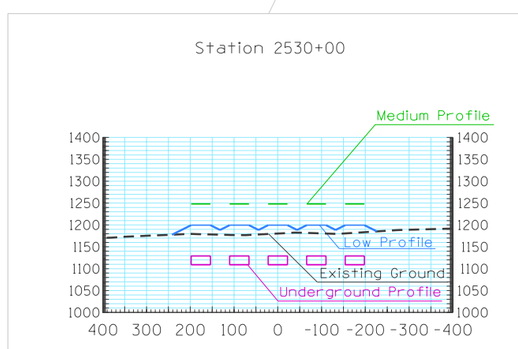
Figure 3

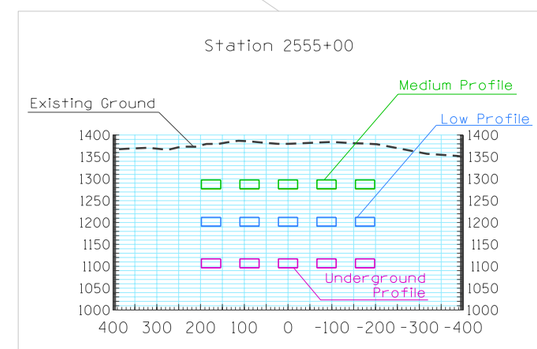
Tunnel Profiles

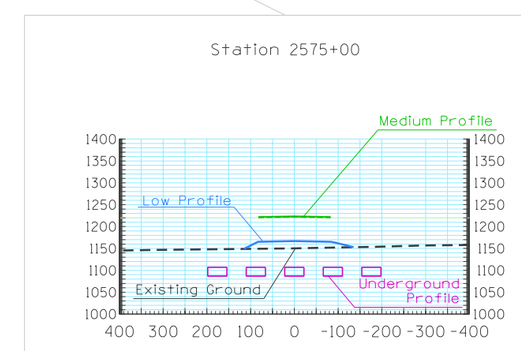


Tunnel Cross-sections





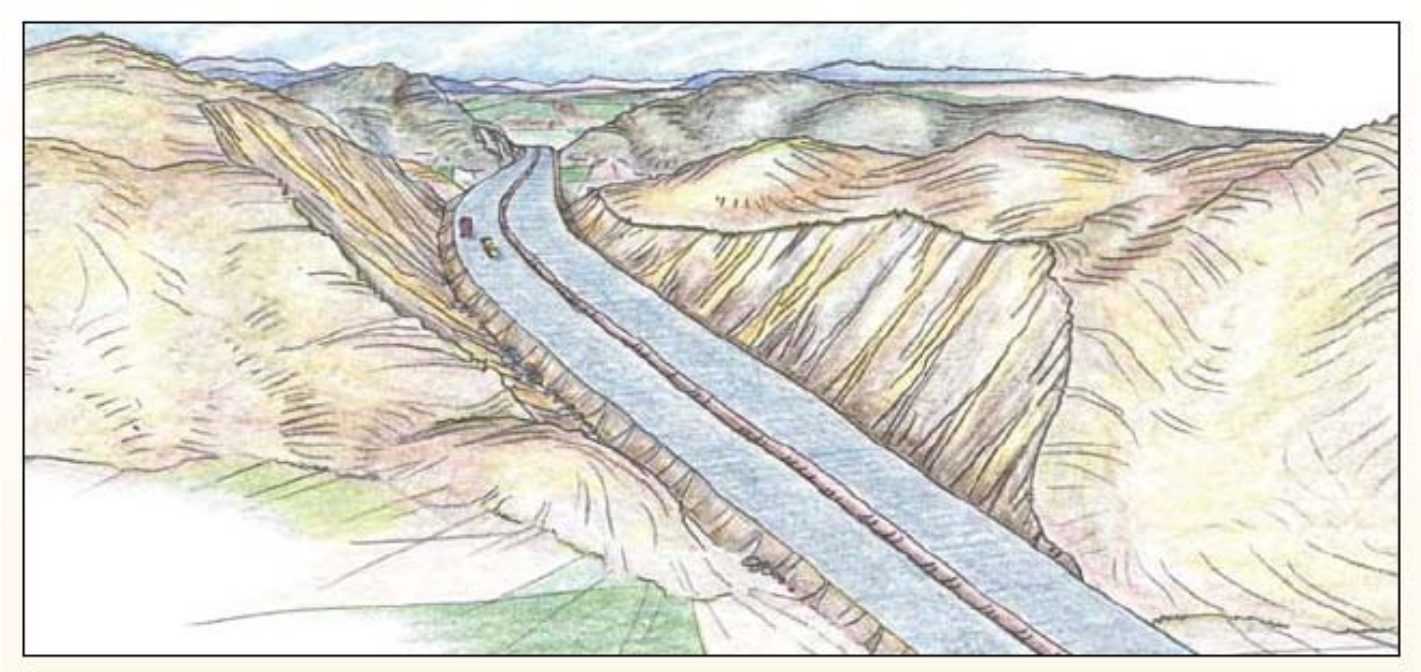




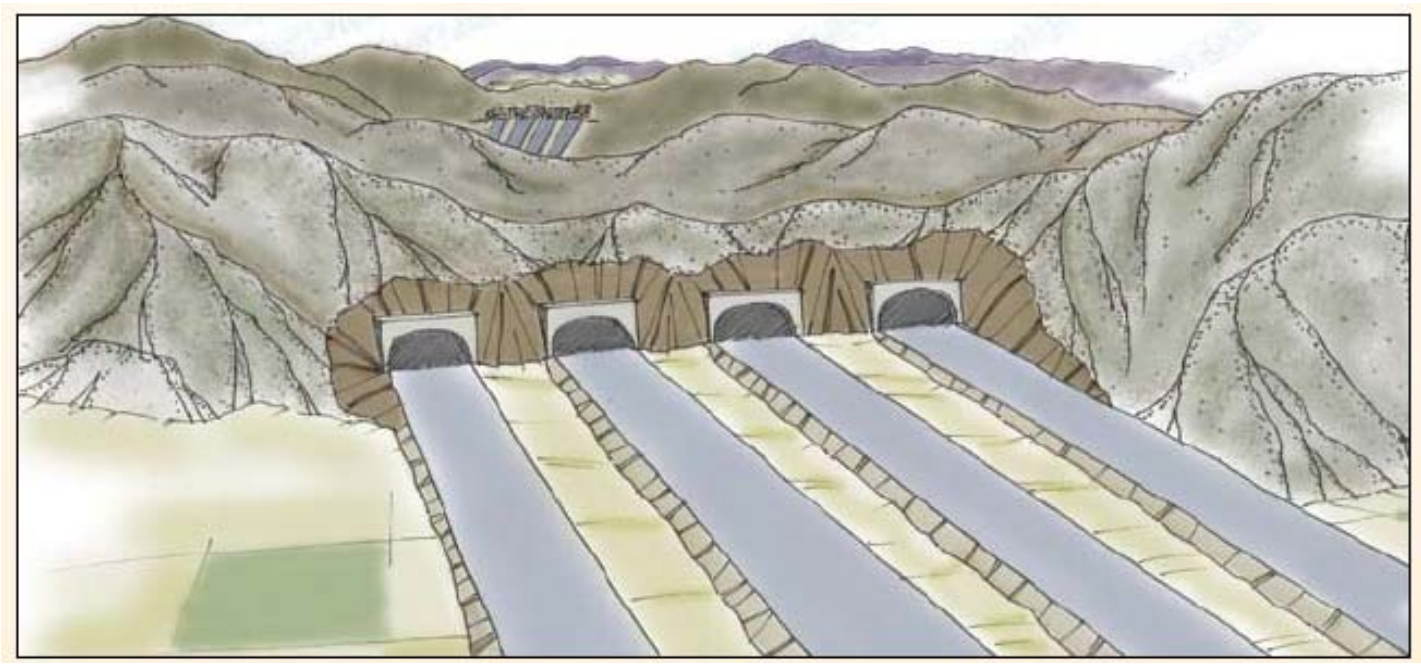
Tunnel Profiles and Cross–sections
Ridge Bridge – Tunnel Memo
E1 Alternative – Station 2450+00 to Station 2640+00

Figure 4

Open Cut Design Option – Artist Sketch



Tunnel Design Option – Artist Sketch



ADOT South Mountain corridor team	**Open Cut and Tunnel Artist Sketches** **Ridge Bridge – Tunnel Memo**	**Figure 5**

UNDERGROUND PROFILE

This option would tunnel under the mountain ridges entirely, from the northwestern side of Main Ridge North to the southeastern side of Main Ridge South. The profile and specific cross sections are shown in Figure 4. The horizontal location of the option is shown in Figure 6.

Potential Impacts and/or Benefits

Potential affects to habitat, wildlife connectivity, Section 4(f), visual, safety, hazardous material transport and homeland security were investigated.

Habitat

Habitat is maintained within the limits of the tunnels, except in areas of potential ventilation shafts and maintenance facilities.

Wildlife Connectivity

Wildlife connectivity is maintained within the limits of the tunnels, but not at the portal approaches. As the alignment approaches the portals, it is between 55 and 60 feet below existing ground. Within these areas, there is no wildlife connectivity.

Section 4(f)

While this option best reduces potential impacts to the Section 4(f) properties, it does not avoid them entirely. This is due to potential ventilation shafts, maintenance facilities and access roadways. Also, the Community has stated that tunneling under the mountain ridges would not mitigate harm to the TCP's associated with the mountains.

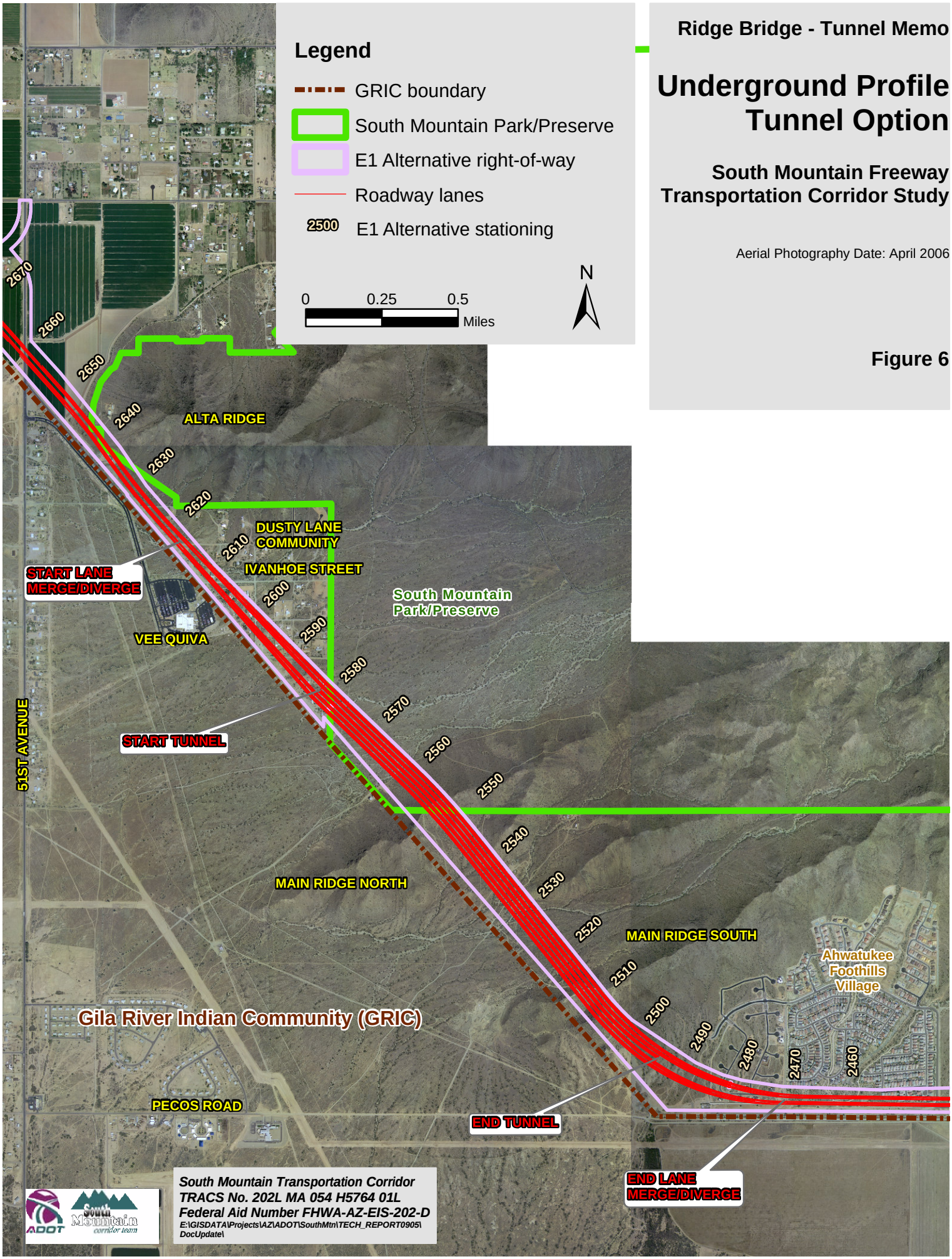
Visual

The Underground Profile would remove the freeway from view in the vicinity of the mountain ridges with the exception of the portals. However, the potential exists for scarring to the ridges to result from construction of the portals. These disturbed areas could have slope treatment applied as well as vegetation to better blend with the surrounding areas. Also, ventilation locations, maintenance facilities, and access roads would be required and could impact the visual setting of the ridges.

Safety

Efforts have been made to analyze different tunnel options in response to requests from the public, elected officials and city staff. The tunnel configurations presented earlier in this document, for both the boring method and SEM/NATM, required multiple tunnels to accommodate the ultimate build-out of 10 lanes. In the case of the boring method, research indicated that reasonable accommodations could be made for 2 lanes in a bore. Larger bores to accommodate more lanes are not a commonly accepted practice within the U.S. For the SEM/NATM method, research indicated that in theory wide excavations are possible, within the U.S., however, the largest excavations were less than 70 feet in width.

Discussions with ADOT and FHWA resulted in concurrence that due to safety concerns for the traveling public, the tunnels must accommodate a minimum of 4 lanes in each tunnel and preferably 5 lanes. With less than 5 lanes of traffic in a tunnel, directional traffic would diverge into separate tunnels, which is a safety concern at freeway speeds. As shown in Figure 2, accommodation of 4 lanes of traffic would require a tunnel width of 92 feet (includes 12 foot lanes, 12 foot shoulders, barriers, and pedestrian walkways on both sides) and 5 lanes would require a tunnel width of 104 feet (same as 4 lane tunnel with the addition of a 12 foot HOV lane).



Ridge Bridge - Tunnel Memo

Underground Profile Tunnel Option

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 6

Hazardous Material Transport
If a tunnel is selected, this portion of the South Mountain Freeway would prohibit use by vehicles carrying hazardous materials. These vehicles would need to use alternate routes, either I-17 through downtown Phoenix or surface streets on the Gila River Indian Community or within the City of Phoenix.

Homeland Security
Tunnels on a metropolitan freeway system are being recognized by the Department of Homeland Security as potential terrorist targets.

Detour Routing
In the case of tunnel maintenance, the facility could be closed for a weekend or more. Consideration would need to be given for maintenance of traffic.

Construction Cost Estimate
Following are construction cost estimates for the two methods of tunneling considered in the Underground Profile option, boring (Table 1) and SEM/NATM (Table 2). With these alternatives, additional drainage is needed to accommodate the flows interrupted by the depressed portal approaches and the below ground nature of the tunnel. This drainage is assumed to be accommodated by a pump station at each portal.

Table 1: Construction Cost for Underground Profile – Boring Method of Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	690,000	-	-
Excavation	Cubic yard	1,650,000	$7	$11,550,000
Borrow	Cubic yard	(960,000)	$5	-
Bridge	Square foot	0	$95	0
Pavement	Square yard	350,000	$40	$14,000,000
Tunnel	Linear Foot	8,400	$300,000	$2,520,000,000
Pump Stations	Each	2	$5,000,000	$10,000,000
TOTAL				**$2,555,550,000**

Table 2: Construction Cost for Underground Profile – SEM/NATM Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	690,000	-	-
Excavation	Cubic yard	1,650,000	$7	$11,550,000
Borrow	Cubic yard	(960,000)	$5	-
Bridge	Square foot	0	$95	0
Pavement	Square yard	350,000	$40	$14,000,000
Tunnel	Linear Foot	8,400	$132,000	$1,102,200,000
Pump Stations	Each	2	$5,000,000	$10,000,000
TOTAL				**$1,144,350,000**

With this profile option, there are additional long term operation and maintenance costs not experienced by non-tunnel options. These costs include:

- $1-1.5 million per year for maintenance of the tunnel facilities
- $0.5 million per year for rehab and repair of mechanical and electrical systems associated with the tunnel facilities

LOW PROFILE
This option maintains a low profile, essentially on existing ground except where elevated at specific locations to allow passage of drainage, wildlife crossing, and pedestrian access. The profile and specific cross sections are shown in Figure 3 (Open cut) and Figure 4 (Tunnel). The horizontal location of the option is shown in Figure 7.

Potential Impacts and/or Benefits
Potential affects to habitat, wildlife connectivity, Section 4(f), visual, safety, hazardous materials transport and homeland security was investigated. The results are indicated in the following and are defined by both the open cut and tunnel options for Low Profile.

Habitat
Open Cut – Habitat within the right-of-way footprint would be gone as a result of construction of the roadway embankment or removal of the ridges in open cut.

Tunnel - Habitat is maintained within the limits of the tunnels, except in areas of potential ventilation shafts and maintenance facilities.

Wildlife Connectivity
Open Cut – Wildlife connectivity is maintained in up to six areas through the use of bridge or large box culvert structures. In areas away from these facilities, wildlife connectivity is not maintained.

Tunnel - Wildlife connectivity is maintained within the limits of the tunnels.

Section 4(f)
Open Cut – The resources afforded protection under Section 4(f) are directly affected by construction of the roadway embankment or open cut sections.

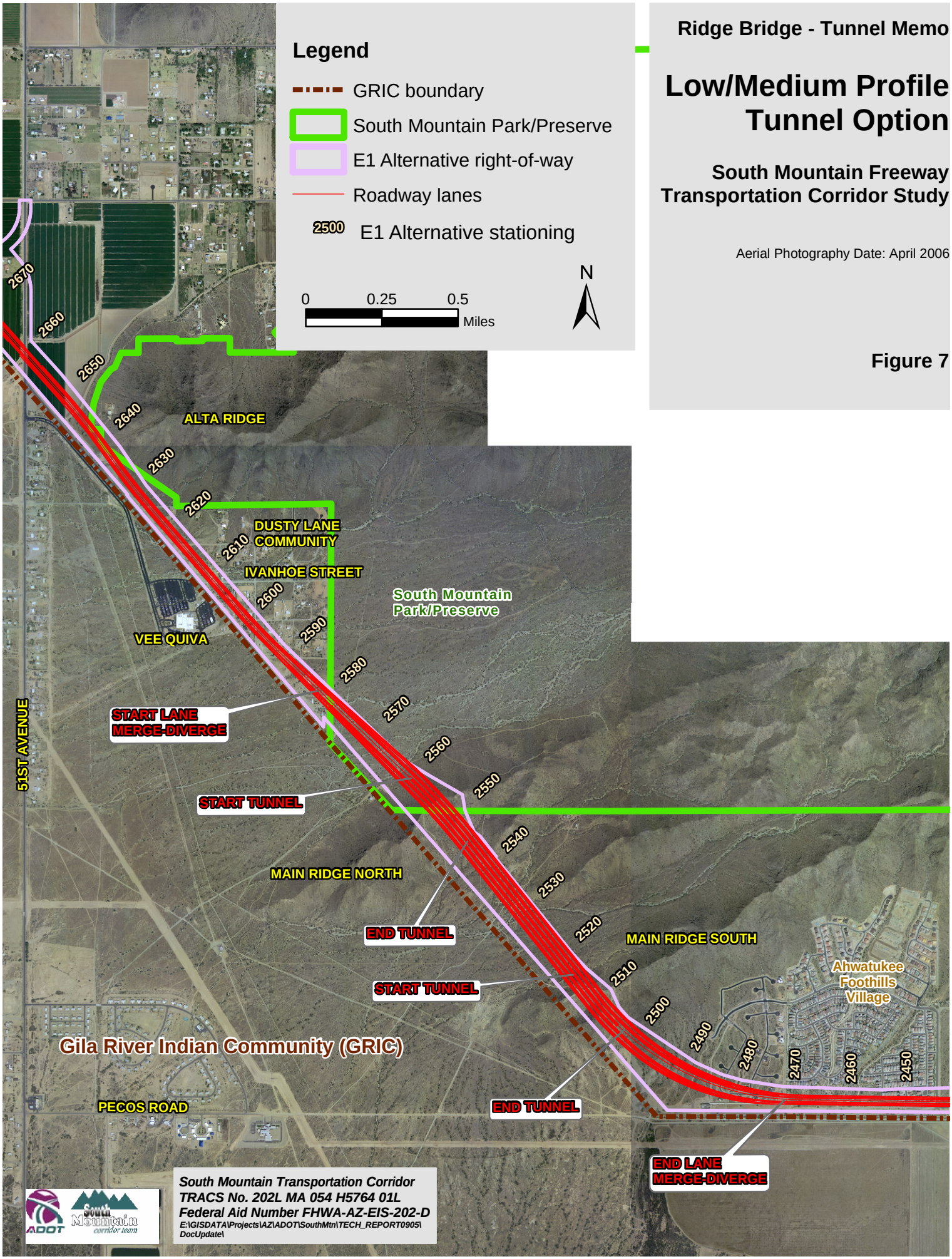
Tunnel – The resources afforded protection under Section 4(f) are directly affected by construction of the roadway embankment sections, as well as tunnel support facilities such as ventilation shafts, maintenance facilities and access roads. Also, the Community has stated that tunneling under the mountain ridges would not mitigate harm to the TCP's associated with the mountains.

Visual
Open Cut – Cut slopes could have slope treatment applied to better blend with the surrounding area. Vegetation would be used on all exposed surfaces. However, the open cut sections would disrupt the natural appearance of the existing ridges.

Tunnel – Vegetation would be used on all exposed roadway embankment surfaces. Potential scarring could result to the ridge faces as a result of portal construction. This scarring could have slope treatment applied to better blend with the surrounding area. Also, ventilation locations, maintenance facilities, and access roads would be required and could impact the visual setting of the ridges.

Safety
Open Cut – Rock fall containment facilities are provided for in the roadway cross section.

Tunnel - Efforts have been made to analyze different tunnel options in response to requests from the public, elected officials and city staff. The tunnel configurations presented earlier in this document, for both the boring method and SEM/NATM, required multiple tunnels to accommodate the ultimate build-out of 10 lanes. In the case of the boring method, research indicated that reasonable accommodations could be made for 2 lanes in a bore. Larger bores to accommodate more lanes are not a commonly accepted practice within the U.S. For the SEM/NATM method, research indicated



Ridge Bridge - Tunnel Memo

Low/Medium Profile Tunnel Option

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 7

that in theory wide excavations are possible, within the U.S., however, the largest excavations were less than 70 feet in width.

Discussions with ADOT and FHWA resulted in concurrence that due to safety concerns for the traveling public, the tunnels must accommodate a minimum of 4 lanes in each tunnel and preferably 5 lanes. With less than 5 lanes of traffic in a tunnel, directional traffic would diverge into separate tunnels, which is a safety concern at freeway speeds. As shown in Figure 2, accommodation of 4 lanes of traffic would require a tunnel width of 92 feet (includes 12 foot lanes, 12 foot shoulders, barriers, and pedestrian walkways on both sides) and 5 lanes would require a tunnel width of 104 feet (same as 4 lane tunnel with the addition of a 12 foot HOV lane).

Hazardous Materials Transport
Open Cut – There would be no restrictions on the transport of hazardous materials with the Open Cut option.

Tunnel – This portion of the South Mountain Freeway would prohibit use by vehicles carrying hazardous materials. These vehicles would need to use alternate routes, either I-17 through downtown Phoenix or surface streets on the Gila River Indian Community or within the City of Phoenix.

Homeland Security
Open Cut –There is no abnormally high risk to homeland security with the Open Cut option.

Tunnel - Tunnels on a metropolitan freeway system are being recognized by the Department of Homeland Security as potential terrorist targets.

Detour Routing
Tunnel - In the case of tunnel maintenance, the facility could be closed for a weekend or more. Consideration would need to be given for maintenance of traffic.

Construction Cost Estimate
Following are construction cost estimates for the open cut option (Table 3) and two methods of tunneling considered in the Low Profile option, boring (Table 4) and SEM/NATM (Table 5).

Table 3: Construction Cost for Low Profile – Open Cut
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	2,030,000	-	-
Excavation	Cubic yard	4,110,000	$7	$28,770,000
Borrow	Cubic yard	(2,080,000)	$5	-
Bridge	Square foot	0	$95	0
Pavement	Square yard	350,000	$40	$14,000,000
Tunnel	Linear Foot	0	$300,000	0
TOTAL				**$42,770,000**

Table 4: Construction Cost for Low Profile – Boring Method of Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	2,030,000	-	-
Excavation	Cubic yard	0	$7	-
Borrow	Cubic yard	2,030,000	$5	$10,150,000
Bridge	Square foot	0	$95	0
Pavement	Square yard	350,000	$40	$14,000,000
Tunnel	Linear Foot	1,930	$300,000	$579,000,000
TOTAL				**$603,150,000**

Table 5: Construction Cost for Low Profile – SEM/NATM Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	2,030,000	-	-
Excavation	Cubic yard	0	$7	-
Borrow	Cubic yard	2,030,000	$5	$10,150,000
Bridge	Square foot	0	$95	0
Pavement	Square yard	350,000	$40	$14,000,000
Tunnel	Linear Foot	1,930	$132,000	$254,760,000
TOTAL				**$278,910,000**

With the tunnel options, there are additional long term operation and maintenance costs not experienced by the non-tunnel option. These costs include:

- $1-1.5 million per year for maintenance of the tunnel facilities
- $0.5 million per year for rehab and repair of mechanical and electrical systems associated with the tunnel facilities

MEDIUM PROFILE
This option is elevated to pass through approximately the mid-height of each of the ridge lines. The profile and specific cross sections are shown in Figure 3 (Open cut) and Figure 4 (Tunnel). The horizontal location of the option is shown in Figure 7. The limits of the bridges necessary for this option are shown in Figure 8.

Potential Impacts and/or Benefits
Potential affects to habitat, wildlife connectivity, Section 4(f), visual, safety, hazardous materials transport and homeland security was investigated. The results are indicated in the following and are defined by both the open cut and tunnel options for Medium Profile.

Habitat
Open Cut – Habitat within the right-of-way footprint would be gone as a result of construction of the roadway embankment or removal of the ridges in open cut. However, post construction, habitat would return to the areas under the bridges.

Tunnel – Habitat within the right-of-way footprint for the portion of the alignment on embankment would be lost. Habitat is maintained within the limits of the tunnels, except in areas of potential ventilation shafts and maintenance facilities. Post construction, habitat would return to the areas under the bridges.

Wildlife Connectivity
Open Cut – Wildlife connectivity is maintained in the areas where bridge structures are used to approach the ridge crossings.

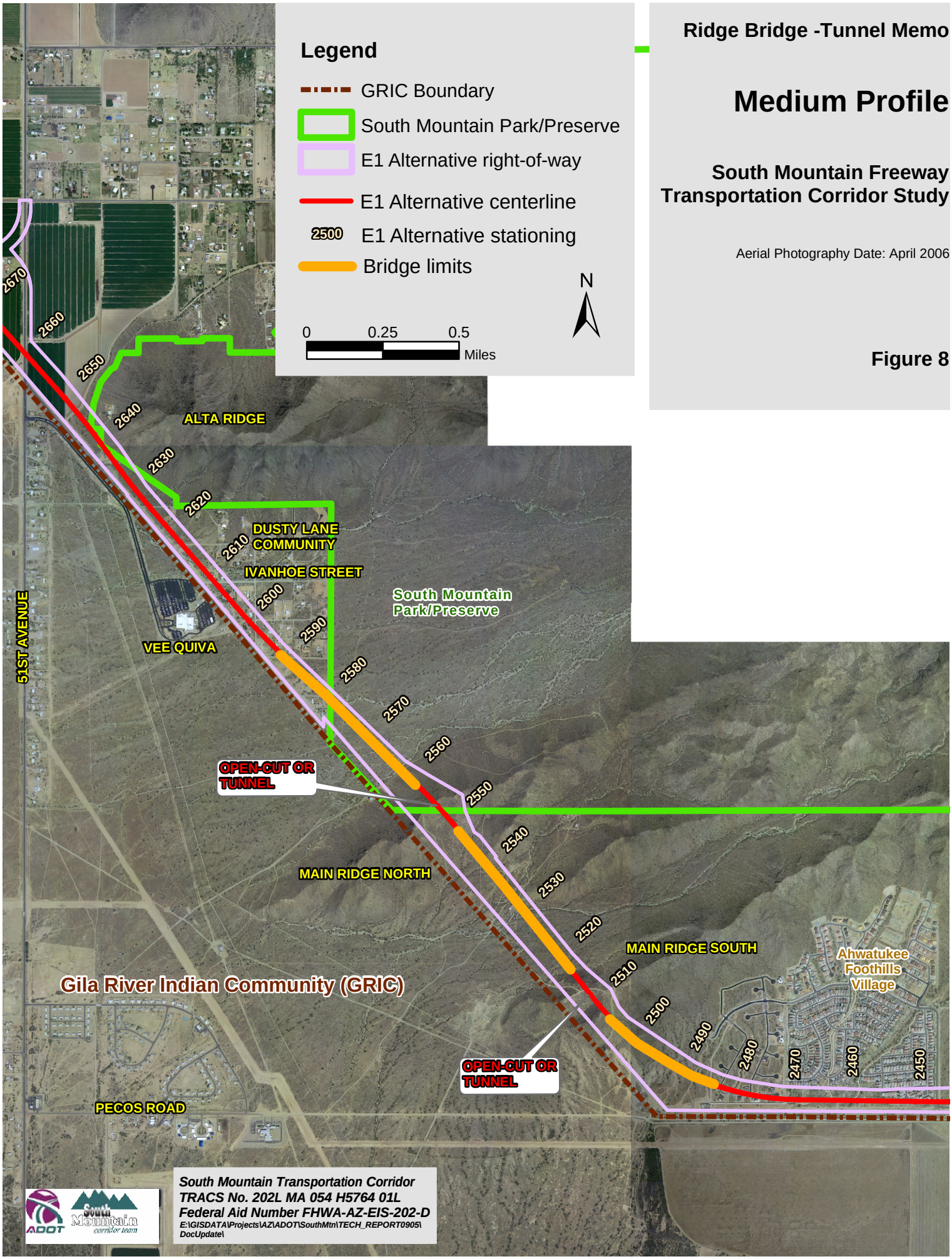
Tunnel - Wildlife connectivity is maintained within the limits of the tunnels and the bridge structures used to approach the portals.

Section 4(f)
Open Cut – The resources afforded protection under Section 4(f) are directly affected by construction of the roadway embankment or open cut sections. There would also be impacts from bridge pier locations.

Tunnel – The resources afforded protection under Section 4(f) are directly affected by construction of the roadway embankment sections and bridge piers, as well as tunnel support facilities such as ventilation shafts, maintenance facilities and access roads.

Visual
Open Cut – Cut slopes could have slope treatment applied to better blend with the surrounding area. Vegetation would be used on all exposed surfaces. However, the open cut sections would disrupt the natural appearance of the existing ridges. As the alignments passed out of the ridges in both the northwest and southeast, the freeway would be elevated approximately 20 to 40 feet above existing ground, fully visible to the residences in the Dusty Lane community, Ahwatukee Foothills Village, and Gila River Indian Community.

Tunnel – Vegetation would be used on all exposed roadway embankment surfaces. Potential scarring could result to the ridge faces as a result of portal construction. This scarring could have slope treatment applied to better blend with the surrounding area. As the alignments passed out of the ridges in both the northwest and southeast, the freeway would be elevated approximately 20 to 40 feet above existing ground, fully visible to the residences in the Dusty Lane community, Ahwatukee Foothills Village, and Gila River Indian Community.



Ridge Bridge -Tunnel Memo

Medium Profile

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 8

Safety
Open Cut – Rock fall containment facilities are provided for in the roadway cross section.

Tunnel - Efforts have been made to analyze different tunnel options in response to requests from the public, elected officials and city staff. The tunnel configurations presented earlier in this document, for both the boring method and SEM/NATM, required multiple tunnels to accommodate the ultimate build-out of 10 lanes. In the case of the boring method, research indicated that reasonable accommodations could be made for 2 lanes in a bore. Larger bores to accommodate more lanes are not a commonly accepted practice within the U.S. For the SEM/NATM method, research indicated that in theory wide excavations are possible, within the U.S., however, the largest excavations were less than 70 feet in width.

Discussions with ADOT and FHWA resulted in concurrence that due to safety concerns for the traveling public, the tunnels must accommodate a minimum of 4 lanes in each tunnel and preferably 5 lanes. With less than 5 lanes of traffic in a tunnel, directional traffic would diverge into separate tunnels which is a safety concern at freeway speeds. As shown in Figure 2, accommodation of 4 lanes of traffic would require a tunnel width of 92 feet (includes 12 foot lanes, 12 foot shoulders, barriers, and pedestrian walkways on both sides) and 5 lanes would require a tunnel width of 104 feet (same as 4 lane tunnel with the addition of a 12 foot HOV lane).

Hazardous Materials Transport
Open Cut – There would be no restrictions on the transport of hazardous materials with the Open Cut option.

Tunnel – This portion of the South Mountain Freeway would prohibit use by vehicles carrying hazardous materials. These vehicles would need to use alternate routes, either I-17 through downtown Phoenix or surface streets on the Gila River Indian Community or within the City of Phoenix.

Homeland Security
Open Cut –There is no abnormally high risk to homeland security with the Open Cut option.

Tunnel - Tunnels on a metropolitan freeway system are being recognized by the Department of Homeland Security as potential terrorist targets.

Detour Routing
Tunnel - In the case of tunnel maintenance, the facility could be closed for a weekend or more. Consideration would need to be given for maintenance of traffic.

Construction Cost Estimate
Following are construction cost estimates for the open cut option (Table 6) and two methods of tunneling considered in the Medium Profile option, boring (Table 7) and SEM/NATM (Table 8).

Table 6: Construction Cost for Medium Profile – Open Cut
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	1,450,000	-	-
Excavation	Cubic yard	1,070,000	$7	$7,490,000
Borrow	Cubic yard	380,000	$5	$1,900,000
Bridge	Square foot	1,394,400	$95	$132,468,000
Pavement	Square yard	200,000	$40	$8,000,000
Tunnel	Linear Foot	0	$300,000	0
TOTAL				**$149,858,000**

Table 7: Construction Cost for Medium Profile – Boring Method of Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	1,450,000	-	-
Excavation	Cubic yard	0	$7	0
Borrow	Cubic yard	1,450,000	$5	$7,250,000
Bridge	Square foot	1,394,400	$95	$132,468,000
Pavement	Square yard	200,000	$40	$8,000,000
Tunnel	Linear Foot	1,070	$300,000	$321,000,000
TOTAL				**$468,718,000**

Table 8: Construction Cost for Medium Profile – SEM/NATM Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	1,450,000	-	-
Excavation	Cubic yard	0	$7	0
Borrow	Cubic yard	1,450,000	$5	$7,250,000
Bridge	Square foot	1,394,400	$95	$132,468,000
Pavement	Square yard	200,000	$40	$8,000,000
Tunnel	Linear Foot	1,070	$132,000	$141,240,000
TOTAL				**$288,958,000**

With this tunnel options, there are additional long term operation and maintenance costs not experienced by the non-tunnel option. These costs include:

- $1-1.5 million per year for maintenance of the tunnel facilities
- $0.5 million per year for rehab and repair of mechanical and electrical systems associated with the tunnel facilities

HIGH PROFILE

This option is elevated to pass over the top of each of the ridges. The profile and specific cross sections are shown in Figure 3. The horizontal location of the option is shown in Figure 9.

Potential Impacts and/or Benefits
Potential affects to habitat, wildlife connectivity, Section 4(f), visual, safety, hazardous materials transport and homeland security was investigated. The results are indicated in the following and are defined by both the open cut and tunnel options for High Profile.

Habitat
Habitat within the right-of-way footprint would be gone as a result of construction of the roadway embankment. However, post construction, habitat would return to the areas under the bridges.

Wildlife Connectivity
Wildlife connectivity is maintained in the areas where bridge structures are used.

Section 4(f)
The resources afforded protection under Section 4(f) are directly affected by construction of the roadway embankment and bridge piers.

Visual
Vegetation would be used on all exposed surfaces. As the alignments passed over the ridges in both the northwest and southeast, the freeway would be elevated approximately 150 feet above existing ground, fully visible to the residences in the Dusty Lane community, Ahwatukee Foothills Village, and Gila River Indian Community. The profile would be elevated above existing ground from approximately 51st Avenue to 25th Avenue.

Safety
This profile results in bridge structures approximately 5 miles long. This increases the complexity of incident management.

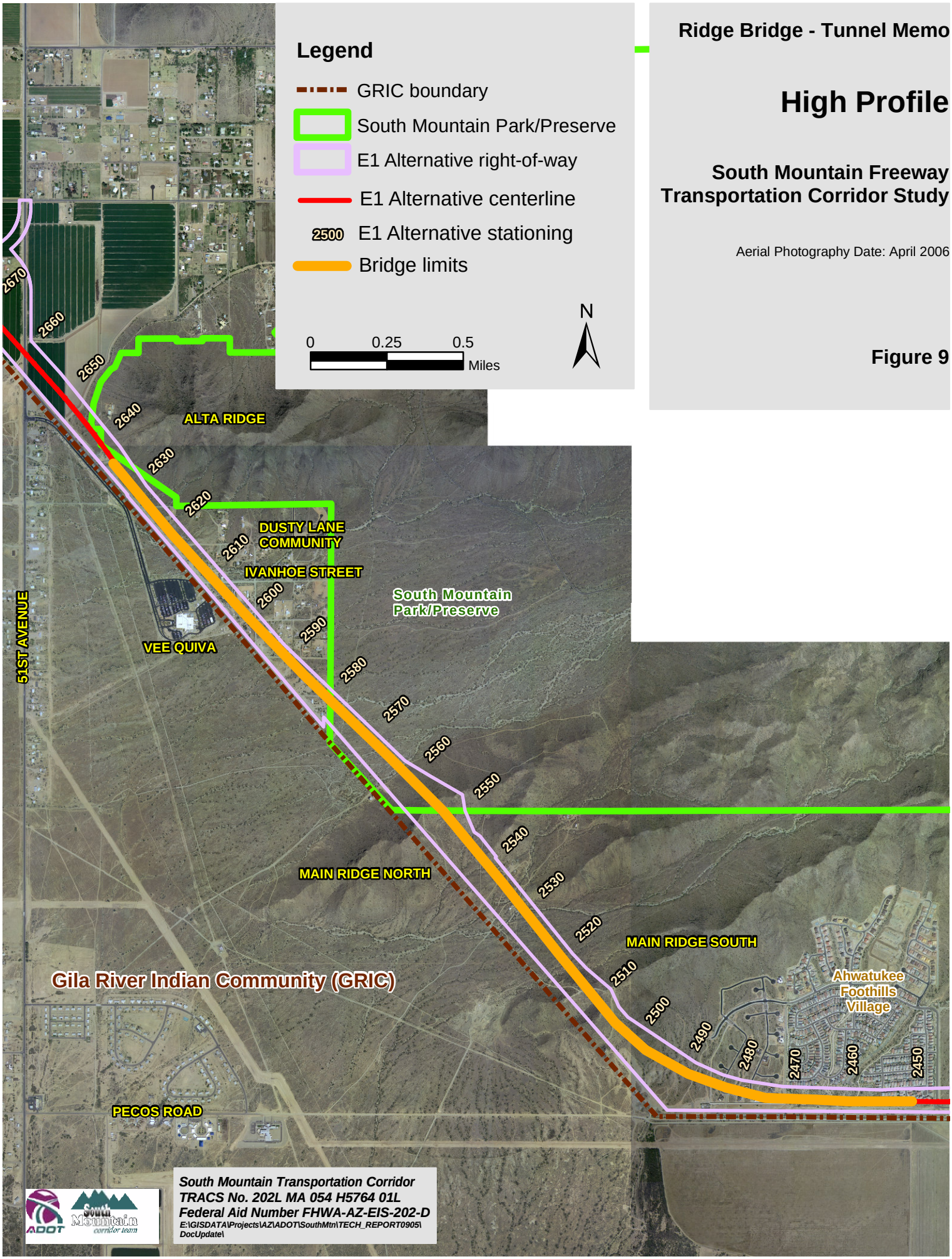
Hazardous Materials Transport
Consideration would be need to be given to transport of hazardous materials across the 5 mile long bridges, given that topography of the area would have spills flowing immediately onto the Gila River Indian Community, unless a drainage containment system is used.

Homeland Security
The potential exists that bridges of this length on a regional freeway system could be terrorist targets.

Construction Cost Estimate
Following is a construction cost estimates for the High Profile option (Table 9).

Table 9: Construction Cost for High Profile
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	3,260,000	-	-
Excavation	Cubic yard	4,000	$7	$28,000
Borrow	Cubic yard	3,256,000	$5	$16,280,000
Bridge	Square foot	3,071,000	$95	$291,745,000
Pavement	Square yard	10,000	$40	$400,000
TOTAL				**$308,453,000**



Ridge Bridge - Tunnel Memo

High Profile

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 9

CONCLUSIONS

A variety of options were investigated to minimize or eliminate impacts to the Section 4(f) properties as well as maintain drainage, wildlife connectivity, and habitat. Evaluation of these options results in a recommendation of the Low Profile (Open Cut) for continued study and elimination of the Underground Profile, Medium Profile (Open Cut and Tunnel), and High Profile. Table 10 details the reasons for this recommendation.

Table 10: Evaluation of Options

Profile Option	Design Option	Impact/Benefit Summary	Construction Cost	Study Status
Underground	***Tunnel***			
	Boring Method	▪ Reduced Section 4(f) affect ▪ Maintains habitat and wildlife connectivity of ridges ▪ Reduced visual impact ▪ Safety concerns splitting traffic ▪ Homeland security concerns	$2,555,550,000*	***Eliminated*** due to non-avoidance of Section 4(f) resources, traffic safety concerns and construction costs.
	SEM/NATM		$1,144,350,000*	***Eliminated*** due to non-avoidance of Section 4(f) resources, traffic safety concerns and construction costs.
Low	***Open Cut***	▪ Affect on Section 4(f) resources ▪ Visual impacts to ridges ▪ Loss of wildlife connectivity on ridges ▪ Maintain wildlife connectivity, drainage and access with structures	$42,770,000	***Further study*** in DEIS
	Tunnel			
	Boring Method	▪ Reduced Section 4(f) affect ▪ Maintains habitat and wildlife connectivity of ridges ▪ Reduced visual impact ▪ Safety concerns splitting traffic ▪ Homeland security concerns ▪ Does not mitigate TCP	$603,150,000*	***Eliminated*** due to non-avoidance of Section 4(f) resources, traffic safety concerns and construction costs.
	SEM/NATM		$278,910,000*	***Eliminated*** due to non-avoidance of Section 4(f) resources, traffic safety concerns and construction costs.

Table 10: Evaluation of Options Continued

Profile Option	Design Option	Impact/Benefit Summary	Construction Cost	Study Status
Medium	***Open Cut***	▪ Affect on Section 4(f) resources ▪ Visual impacts to ridges ▪ Loss of wildlife connectivity on ridges ▪ Maintain wildlife connectivity, drainage and access with structures	$149,858,000	***Eliminated*** due to non-avoidance of Section 4(f) resources, visual impacts and construction costs.
	Tunnel			
	Boring Method	▪ Reduced Section 4(f) affect ▪ Maintains habitat and wildlife connectivity of ridges	$468,718,000*	***Eliminated*** due to non-avoidance of Section 4(f) resources, traffic safety concerns and construction costs.
	SEM/NATM	▪ Reduced visual impact ▪ Safety concerns splitting traffic ▪ Homeland security concerns ▪ Does not mitigate TCP	$288,958,000*	***Eliminated*** due to non-avoidance of Section 4(f) resources, traffic safety concerns and construction costs.
High	**-**	▪ Reduced Section 4(f) affect ▪ Maintains habitat and wildlife connectivity on ridge slopes ▪ Increased visual impact ▪ Homeland security concerns	$308,453,000	***Eliminated*** due to non-avoidance of Section 4(f) resources, visual impact and construction costs.

* All tunnel options require $1.5 – 2.0 million in annual maintenance, repair and rehab costs.

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Memo

To:	South Mountain Project Team		
From:	Ben Spargo	Project:	South Mountain EIS & L/DCR
CC:	Project File		
Date:	December 18, 2009	Job No:	

RE: ADDENDUM TO:
Phoenix South Mountain Park/Preserve and Traditional Cultural Property Avoidance (Ridge Bridge – Tunnel) Analysis (2006)

INTRODUCTION

For the first time in the history of the ½ cent sales tax, the year-over-year revenue comparison declined between 2007 and 2008. The economic recession, which began in the fall of 2007, has significantly affected sales tax revenues through 2009. This has resulted in a major reduction to the projected total funding available for transportation projects in the MAG region. Compounding this issue is the fact that project costs have increased greatly when compared to the original estimates in the RTP.

In response, MAG and ADOT studied methods to reduce freeway project costs and balance the program. The general recommended changes included changes to the scope of projects (reduced lanes, value engineering) and deferral of projects beyond the funding horizon. Acknowledging community concerns regarding residential and business impacts and addressing declining revenues, two major changes were recommended for the South Mountain Freeway by the MAG Regional Council when it adopted the revised RTP including:

- reduce the proposed freeway to eight lanes (from the previous 10-lane concept) thereby reducing the right-of-way needed
- shift the Western Section alignment between Lower Buckeye Road and I-10 to connect at 59th Avenue (rather than 55th Avenue)

Due to the changes in the basic assumptions used in the original memo, this addendum has been developed to evaluate the impacts of the changes on the conclusions reached. Other notable items that have been incorporated into the analysis include:

- The previous 10-lane freeway was planned to be constructed in two phases. The first phase would have included 6 general purpose lanes and the second phase would have included an additional general purpose lane and an HOV lane. In the current plan, all of the lanes, including the HOV lane, will be constructed at the same time.
- Unit costs for some materials have increased, decreased, or remained the same during the time since the original memo. As a result, the cost estimates will be adjusted for the changes in scope as well as changes in the marketplace to reflect current practice.

DESIGN CRITERIA

The design criteria would be the same as previously reported.

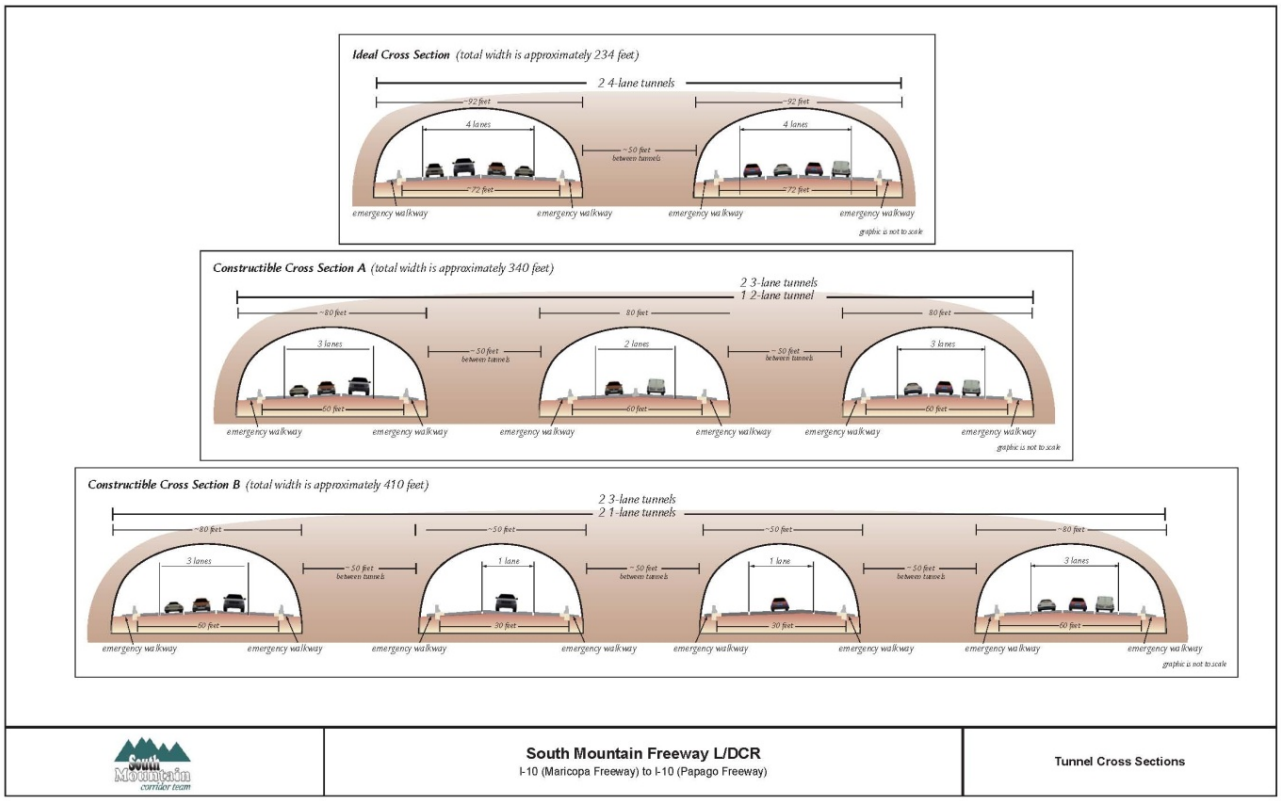
It is reiterated that the cost information presented in this memo only includes the major differentiating items for construction. The actual cost of the section for any of the options evaluated would increase

PROFILE OPTIONS

No Change

DESIGN OPTIONS

Due to the reduction in the number of lanes being constructed, additional tunnel configurations were developed. The ideal cross section would allow all of the travel lanes in one direction to be in a single tunnel. This would require a tunnel approximately 92 feet wide, which is believed to be greater than what is possible under current technology and rock conditions. There are two constructible options that would limit any one tunnel to 80 feet or less. Option A splits the HOV traffic in each direction into a third, center tunnel. Option B splits the HOV traffic in each direction into two individual tunnels. The cost estimate information presented in subsequent sections assumes Option A would be constructed.



UNDERGROUND PROFILE

This option would tunnel under the mountain ridges entirely, from the northwestern side of Main Ridge North to the southeastern side of Main Ridge South

Potential Impacts and/or Benefits
The potential impacts and benefits would be the same as previously reported.

Construction Cost Estimate
Following are construction cost estimates for the two methods of tunneling considered in the Underground Profile option, boring (Table 1) and SEM/NATM (Table 2).

The main changes to the cost estimates included reducing the pavement area for the reduction from 10 lanes to 8 lanes and reducing the tunnel unit cost to reflect a reduced number of tunnels required from four to three.

Table 1: Construction Cost for Underground Profile – Boring Method of Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	690,000	-	-
Excavation	Cubic yard	1,650,000	$7	$11,550,000
Borrow	Cubic yard	(960,000)	$5	-
Bridge	Square foot	0	$100	0
Pavement	Square yard	305,000	$40	$12,200,000
Tunnel	Linear Foot	8,400	$225,000	$1,890,000,000
Pump Stations	Each	2	$5,000,000	$10,000,000
TOTAL				**$1,923,750,000**

Table 2: Construction Cost for Underground Profile – SEM/NATM Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	690,000	-	-
Excavation	Cubic yard	1,650,000	$7	$11,550,000
Borrow	Cubic yard	(960,000)	$5	-
Bridge	Square foot	0	$95	0
Pavement	Square yard	305,000	$40	$12,200,000
Tunnel	Linear Foot	8,400	$100,000	$840,000,000
Pump Stations	Each	2	$5,000,000	$10,000,000
TOTAL				**$873,750,000**

LOW PROFILE

This option maintains a low profile, essentially on existing ground except where elevated at specific locations to allow passage of drainage, wildlife crossing, and pedestrian access.

Potential Impacts and/or Benefits
The potential impacts and benefits would be the same as previously reported.

Construction Cost Estimate
Following are construction cost estimates for the open cut option (Table 3) and two methods of tunneling considered in the Low Profile option, boring (Table 4) and SEM/NATM (Table 5).

The main changes to the cost estimates included reducing the pavement area for the reduction from 10 lanes to 8 lanes and reducing the tunnel unit cost to reflect a reduced number of tunnels required from four to three.

Table 3: Construction Cost for Low Profile – Open Cut
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	2,030,000	-	-
Excavation	Cubic yard	4,110,000	$7	$28,770,000
Borrow	Cubic yard	(2,080,000)	$5	-
Bridge	Square foot	0	$100	0
Pavement	Square yard	305,000	$40	$12,200,000
Tunnel	Linear Foot	0	$300,000	0
TOTAL				**$40,970,000**

Table 4: Construction Cost for Low Profile – Boring Method of Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	2,030,000	-	-
Excavation	Cubic yard	0	$7	-
Borrow	Cubic yard	2,030,000	$5	$10,150,000
Bridge	Square foot	0	$100	0
Pavement	Square yard	305,000	$40	$12,200,000
Tunnel	Linear Foot	1,930	$225,000	$434,250,000
TOTAL				**$456,600,000**

Table 5: Construction Cost for Low Profile – SEM/NATM Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	2,030,000	-	-
Excavation	Cubic yard	0	$7	-
Borrow	Cubic yard	2,030,000	$5	$10,150,000
Bridge	Square foot	0	$100	0
Pavement	Square yard	305,000	$40	$12,200,000
Tunnel	Linear Foot	1,930	$100,000	$193,000,000
TOTAL				**$215,350,000**

MEDIUM PROFILE

This option is elevated to pass through approximately the mid-height of each of the ridge lines.

Potential Impacts and/or Benefits
The potential impacts and benefits would be the same as previously reported.

Construction Cost Estimate
Following are construction cost estimates for the open cut option (Table 6) and two methods of tunneling considered in the Medium Profile option, boring (Table 7) and SEM/NATM (Table 8).

Table 6: Construction Cost for Medium Profile – Open Cut
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	1,450,000	-	-
Excavation	Cubic yard	1,070,000	$7	$7,490,000
Borrow	Cubic yard	380,000	$5	$1,900,000
Bridge	Square foot	1,115,000	$100	$111,500,000
Pavement	Square yard	160,000	$40	$6,400,000
Tunnel	Linear Foot	0	$225,000	0
TOTAL				**$127,290,000**

Table 7: Construction Cost for Medium Profile – Boring Method of Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	1,450,000	-	-
Excavation	Cubic yard	0	$7	0
Borrow	Cubic yard	1,450,000	$5	$7,250,000
Bridge	Square foot	1,115,000	$100	$111,500,000
Pavement	Square yard	160,000	$40	$6,400,000
Tunnel	Linear Foot	1,070	$225,000	$240,750,000
TOTAL				**$365,900,000**

Table 8: Construction Cost for Medium Profile – SEM/NATM Tunneling
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	1,450,000	-	-
Excavation	Cubic yard	0	$7	0
Borrow	Cubic yard	1,450,000	$5	$7,250,000
Bridge	Square foot	1,115,000	$100	$111,500,000
Pavement	Square yard	160,000	$40	$6,400,000
Tunnel	Linear Foot	1,070	$100,000	$107,000,000
TOTAL				**$232,150,000**

HIGH PROFILE

This option is elevated to pass over the top of each of the ridges.

Potential Impacts and/or Benefits

The potential impacts and benefits would be the same as previously reported.

Construction Cost Estimate

Following is a construction cost estimates for the High Profile option (Table 9).

Table 9: Construction Cost for High Profile
Station 2450+00 to Station 2640+00

ITEM	MEASURE	QUANTITY	UNIT COST	TOTAL
Embankment	Cubic yard	3,260,000	-	-
Excavation	Cubic yard	4,000	$7	$28,000
Borrow	Cubic yard	3,256,000	$5	$16,280,000
Bridge	Square foot	2,456,800	$125	$307,100,000
Pavement	Square yard	8,000	$40	$320,000
TOTAL				**$323,728,000**

CONCLUSIONS

The proposed changes to the lane configuration of the proposed freeway did not significantly change the potential impacts, benefits, or costs of the options evaluated in this document.

Table 10: Evaluation of Options

Profile Option	Design Option	Impact/Benefit Summary	Construction Cost	Study Status
Underground	***Tunnel***			
	Boring Method	No Change	**$1,923,750,000***	***Eliminated*** (No Change
	SEM/NATM		**$873,750,000***	***Eliminated*** (No Change
Low	***Open Cut***	No Change	**$40,970,000**	***Further study*** in DEIS (No Change)
	Tunnel			
	Boring Method	No Change	**$456,600,000***	***Eliminated*** (No Change
	SEM/NATM		**$215,350,000***	***Eliminated*** (No Change
Medium	***Open Cut***	No Change	**$127,290,000**	***Eliminated*** (No Change
	Tunnel			
	Boring Method	No Change	**$365,900,000***	***Eliminated*** (No Change)
	SEM/NATM		**$232,150,000***	***Eliminated*** (No Change)
High	**-**	No Change	**$323,728,000**	***Eliminated*** (No Change

* All tunnel options require $1.5 – 2.0 million in annual maintenance, repair and rehab costs.

SR 202L / SR 101L Direct Connection Alternatives Screening Report

In support of the **Technical Studies**
to the **Environmental Impact Statement**

South Mountain Transportation Corridor in Maricopa County, Arizona

Arizona Department of Transportation
Federal Highway Administration
in cooperation with
United States Army Corps of Engineers
United States Bureau of Indian Affairs

Version 1.0 / October 2003
ADOT TRACS No. 202L MA 054 H5764 01L
FHWA Federal Aid Project No. NH-202-D( )

Abstract: This document addresses the selection of alternatives to be carried forward into the draft EIS and L/DCR based on the three non-GRIC alternative options that tie directly into SR 101L developed as part of the EIS and L/DCR process.

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APPENDIX B – 99TH AVENUE ALTERNATIVES: DATA TABLES

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1	97th Avenue – Alternative 2 with Options 2A and 2B, Variations 1 and 2 Screening Data within the Refined Study Area
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*Additional tables are included in **Appendix A** for 97th Avenue alternatives and in **Appendix B** for 99th Avenue alternatives.

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INTRODUCTION

As part of the South Mountain Environmental Impact Statement (EIS) and Location/Design Concept Report (L/DCR) a total of nine non-Gila River Indian Community (GRIC) alternatives were developed. These alternatives were evaluated based on various environmental and design criteria, and the results presented in the Alternatives Screening Report (ADOT, 2003). Following the review of this report, the Project Team (ADOT, FHWA, COE, Consultant Team) concluded that Alternatives 5, 7 and 8 would be removed from further consideration at this time. The Project Team also recommended that Alternative 9 be reviewed in greater detail, particularly the use of high-speed reverse curves that make up the direct connection ramp movements. Following this review and the presentation of the findings to the Project Team, the conclusion was reached that Alternative 9 would be removed from further consideration at this time.

The South Mountain Transportation Corridor currently has three alternatives that remain as viable solutions to the transportation problems on the west side of the Study Area. Alternatives 1 and 6 remain as stand-alone alternatives that connect with Interstate 10 (I-10, Papago Freeway) in three-leg system interchanges. Alternatives 2, 3, and 4, which tie-in to I-10 at the existing system interchange of I-10 and State Route 101L (Loop 101, Agua Fria Freeway), are now being considered one alternative and two options, and thus have been renamed Alternative 2, and Options 2A and 2B, respectively, and will be referred to as such throughout.

Through Project Team meetings and meetings with representatives of the local municipalities, various revisions have been made to Alternative 2 and Options 2A and 2B to allow the ultimate alignment to provide the greatest service to the local area and region as a whole while minimizing impacts. As they were originally proposed, Alternative 2 and Options 2A and 2B all connected into the existing system interchange via a north-south stretch of freeway that would travel in the location of 97th Avenue. To minimize impacts and right-of-way takes, as well as ensure the constructability of the new system interchange, consideration was given to move the north-south portion to 99th Avenue.

To ensure that the alternative with the fewest impacts and greatest benefit is selected for the direct connection to I-10 and Loop 101, the Project Team analyzed the alternatives along 99th Avenue and 97th Avenue, including all variations that accompany these alignments.

All tables presented in this analysis will be based on the location of the alignments analyzed, 97th Avenue and 99th Avenue. This technical memorandum does not seek to provide a preferred alignment for the direct connection to I-10 / Loop 101. Rather it is intended to be used by the Project Team and affected parties to assist in choosing the Variation that best meets the needs of the project and the local municipalities and will be carried forward into the Draft Environmental Impact Statement (DEIS) with Alternatives 1 and 6 for detailed analysis.

REFINED STUDY AREA

The primary intent of this analysis is to determine the type and amount of impacts within the local municipalities while maintaining an alternative that provides a direct connection to I-10 /

Loop 101. Thus, for the purposes of this analysis, the refined study area (see **Figure 1**) has been defined as:

Northern Limit:	McDowell Road
Eastern Limit:	91st Avenue
Southern Limit:	Buckeye Road
Western Limit:	107th Avenue

The refined study area, which encompasses four square miles, includes the municipalities of Avondale and Tolleson, and as such, the data tables that follow in the analysis portion of this technical memorandum provide a breakdown of impacts by municipality.

Within the refined study area, Options 2A and 2B are identical, having the same alignment and identical impacts. As such, Options 2A and 2B will be presented jointly for each Variation along 97th and 99th Avenue. South of the refined study area, Options 2A and 2B do have different alignments and would have different impacts.

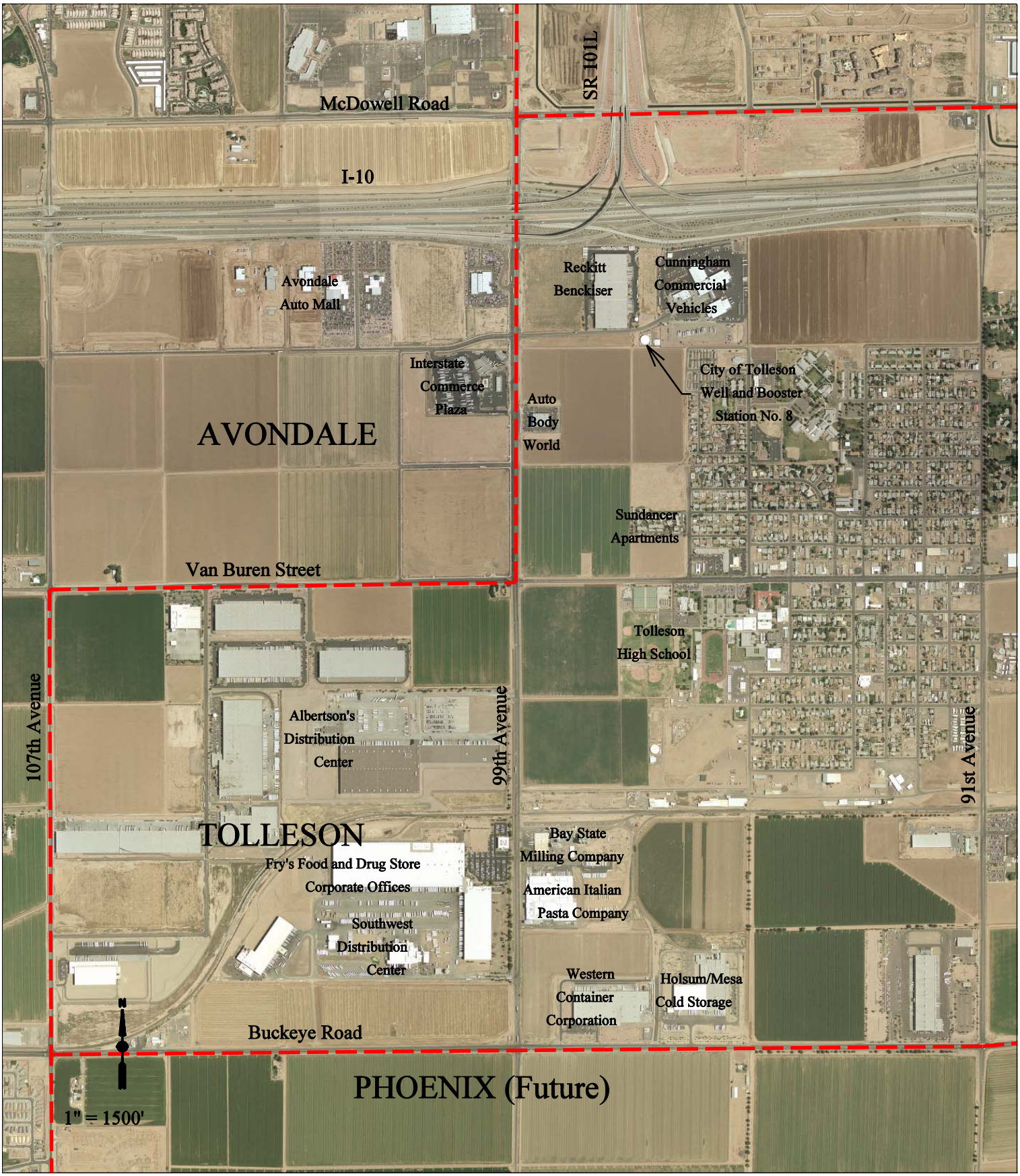
In addition, all Variations presented will have impacts along Loop 101 north of the refined study area. Impacts to Loop 101 could include widening of the mainline movement and reconfiguration of existing system interchange ramps. Another potential impact along Loop 101 occurs at the Thomas Road service interchange, where the mainline and ramp configurations associated with Variation 2 for all Alternatives and Options may require the removal or relocation of the Thomas Road service interchange. These impacts are not discussed in this report due to them being located outside the study area, resulting in little to no available data. However, where possible efforts were made to minimize potential impacts and maintain a feasible design.

DESCRIPTION OF ALTERNATIVES, OPTIONS AND VARIATIONS

As noted above, Alternatives 2, 3 and 4, as presented in the Alternatives Screening Report (ADOT, 2003), are no longer being considered stand-alone alternatives by the Project Team. Rather, the Project Team views these three alternatives as one alternative and two options, and thus has renamed them as such:

Previous Name *(Alternatives Screening Report and prior)*	**Refined Name** *(This analysis and forward)*
Alternative 2	Alternative 2
Alternative 3	Option 2A
Alternative 4	Option 2B

The Project Team determined this change in direction, from three stand-alone alternatives to three *options* of the same alternative, to be appropriate as all three have the same logical termini, serve the same general intent, serve primarily the same areas and are concurrent for more than 80 percent of their total lengths.



SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Refined Study Area

FIGURE 1

10/2003

As originally presented in the Alternatives Screening Report, these three alignments all connected into I-10 / Loop 101 along the location of where 97th Avenue would be (there is currently no arterial roadway along 97th Avenue). Through Project Team and Stakeholder meetings the idea was brought forward to shift these three alignments ¼ mile west to 99th Avenue (an arterial roadway does currently exist along 99th Avenue) between I-10 and Buckeye Road. As this shift could potentially minimize impacts to adjacent communities by utilizing existing rights-of-way, it was determined by the Project Team that this possibility should be considered in greater detail. This led to the inclusion of Alternative 2 and Options 2A and 2B along 99th Avenue as well as along 97th Avenue.

Through further discussion at Project Team meetings, as well as input from local stakeholders, it was determined that local access along 99th Avenue would need to be maintained when considering the Alternative and Options along 99th Avenue. In total, three Variations for each Alternative and Option were developed.

Variations 1 and 2 provide for frontage roads that would run parallel to 99th Avenue and the freeway mainline between I-10 and Lower Buckeye Road, depending on the location where the freeway mainline deviates from the 99th Avenue centerline. The frontage roads would be two-lane, one-way facilities that would provide access to adjacent properties. The primary difference between Variations 1 and 2 is the manner in which the system interchange between I-10, Loop 101 and State Route 202L (Loop 202, South Mountain Freeway) is treated.

Variation 1 assumes that the existing system interchange at I-10 / Loop 101 would remain largely as-is, with only minor reconstruction. The additional four ramps to the south needed with the inclusion of Loop 202 along with the freeway through movement would be configured in such a way as to minimize impacts and reconstruction of the existing system interchange. To accomplish this, the through movement in Variation 1 would be at the fourth and highest level of the interchange.

Variation 2 assumes that the existing system interchange at I-10 / Loop 101 would be removed and completely reconstructed. This variation would produce a system interchange that is more typical in appearance as well as function, and would have the through movement along Loop 101 and Loop 202 at the second level, with all directional ramps on levels three and four. To accommodate construction of the new system interchange while allowing the existing system interchange to remain open and usable by the public, Variation 2 requires that the new system interchange be offset to the west of the existing system interchange. This offset results in geometric changes to the freeway mainline centerline as well as ramp centerlines, but does not result in distinguishable differences in terms of traffic operations from Variation 1.

Unlike Variations 1 and 2, Variation 3 does not use frontage roads to maintain access to adjacent properties along 99th Avenue. Rather, Variation 3 provides for a viaduct cross-section of the freeway mainline over 99th Avenue. In other words, south of I-10 where the freeway mainline centerline is coincident with the centerline of 99th Avenue, the freeway would be elevated so as to allow 99th Avenue to proceed underneath the freeway. Variation 3 assumes that the existing system interchange will remain largely as-is, with only minor reconstruction.

Therefore, along 99th Avenue, Alternative 2 and Options 2A and 2B will all be analyzed with each of the three Variations discussed above. Along 97th Avenue, Alternative 2 and Options 2A and 2B will all be analyzed with Variations 1 and 2 only. Variation 3, which utilizes the viaduct cross-section, was not deemed applicable as no arterial roadway currently exists along 97th Avenue that would need to be maintained. Thus, the following set of Alternatives, Options and Variations will be considered in this analysis:

97th Avenue Alternatives (six alignments to be analyzed)

- Alternative 2
  - Variation 1 – Maintain existing system interchange.
  - Variation 2 – Reconstruct existing system interchange.
- Options 2A / 2B
  - Variation 1 – Maintain existing system interchange.
  - Variation 2 – Reconstruct existing system interchange.

99th Avenue Alternatives (nine alignments to be analyzed)

- Alternative 2
  - Variation 1 – Maintain existing system interchange.
  - Variation 2 – Reconstruct existing system interchange.
  - Variation 3 – Viaduct cross-section, maintain existing system interchange.
- Options 2A / 2B
  - Variation 1 – Maintain existing system interchange.
  - Variation 2 – Reconstruct existing system interchange.
  - Variation 3 – Viaduct cross-section, maintain existing system interchange.

Each of the 15 alignments is described in detail below. Figures 2 - 7, which follow the descriptions, illustrate the locations of the 15 alignments within the refined study area.

97TH AVENUE ALTERNATIVES

Alternative 2 – Variation 1

Within the refined study area, Alternative 2 – Variation 1 (see **Figure 2**) travels north along 97th Avenue and ties into the existing I-10 / Loop 101 system interchange. The existing system interchange would remain, and the four additional directional ramps and through movement structures would be designed to require only minor reconstruction. As no arterial roadway currently exists along 97th Avenue, frontage roads are not provided for in this alternative. South of Buckeye Road, Alternative 2 – Variation 1 follows the alignment of Technical Alternative 2 presented in the Alternatives Screening Report.

Alternative 2 – Variation 2

Similar to Variation 1, Alternative 2 – Variation 2 (see **Figure 2**) travels north along 97th Avenue and ties into the existing I-10 / Loop 101 system interchange. The existing interchange would be removed to allow for a more conventional fully directional system interchange to be constructed. The reconstructed system interchange would be in the same location as the existing system interchange. As no arterial roadway currently exists along 97th Avenue, frontage roads are not

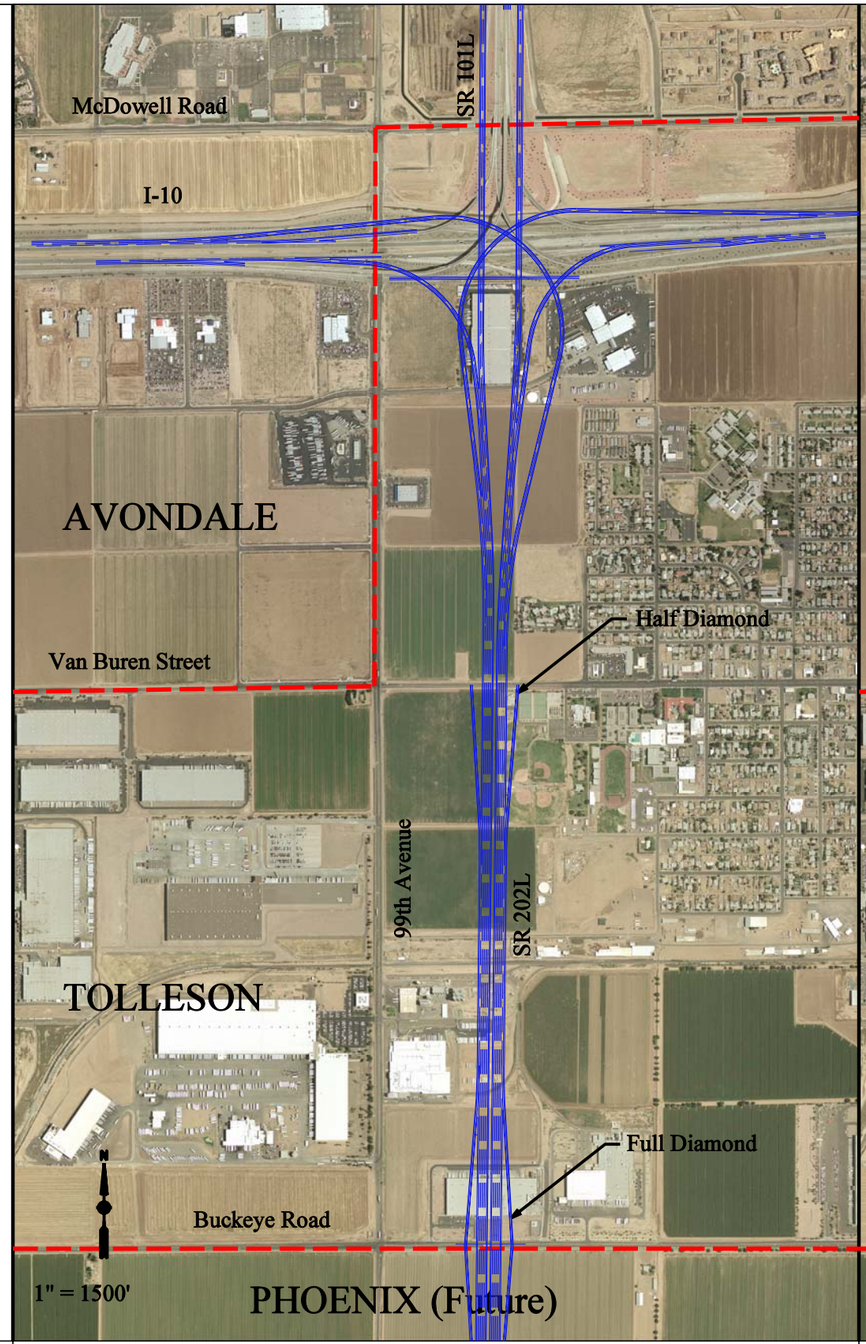
provided for in this alternative. South of Buckeye Road, Alternative 2 – Variation 2 follows the alignment of Technical Alternative 2 presented in the Alternatives Screening Report.

Options 2A / 2B – Variation 1

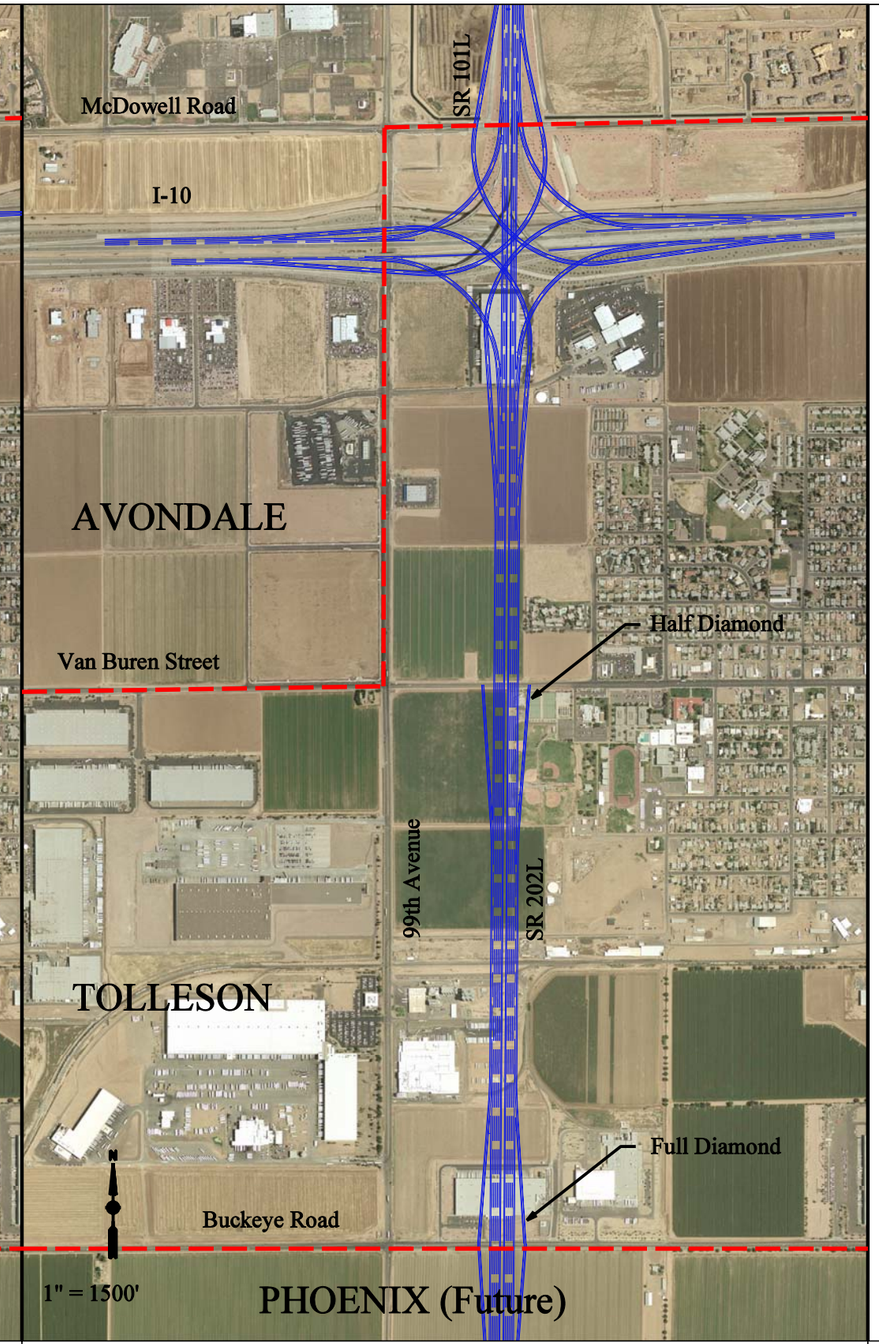
Within the refined study area, Options 2A / 2B – Variation 1 (see **Figures 3**) travels in a northwest direction until reaching 97th Avenue, where the alignment travels north and ties into the existing I-10 / Loop 101 system interchange. The existing system interchange would remain, and the four additional directional ramps and through movement structures would be designed to require only minor reconstruction. As no arterial roadway currently exists along 97th Avenue, frontage roads are not provided for in this option. South of Buckeye Road, Option 2A – Variation 1 follows the alignment of Technical Alternative 3 presented in the Alternatives Screening Report, while Option 2B – Variation 1 follows the alignment of Technical Alternative 4 in the Alternatives Screening Report.

Options 2A / 2B – Variation 2

Similar to Options 2A / 2B – Variation 1, Option 2A / 2B – Variation 2 (see **Figure 3**) travels in a northwest direction until reaching 97th Avenue, where the alignment travels north and ties into the existing I-10 / Loop 101 system interchange. The existing system interchange would be removed and reconstructed to allow for a more conventional fully directional system interchange to be constructed. The reconstructed system interchange would be in the same location as the existing system interchange. As no arterial roadway currently exists along 97th Avenue, frontage roads are not provided for in this Option. South of Buckeye Road, Option 2A – Variation 2 follows the alignment of Technical Alternative 3 presented in the Alternatives Screening Report, while Option 2B – Variation 2 follows the alignment of Technical Alternative 4 in the Alternatives Screening Report.



VARIATION 1
Freeway without Frontage Roads
Maintain Existing System Interchange



VARIATION 2
Freeway without Frontage Roads
Remove and Reconstruct System Interchagne

ADOT

South Mountain corridor team

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
97th Avenue - Alternative 2
Variations 1 and 2

FIGURE 2

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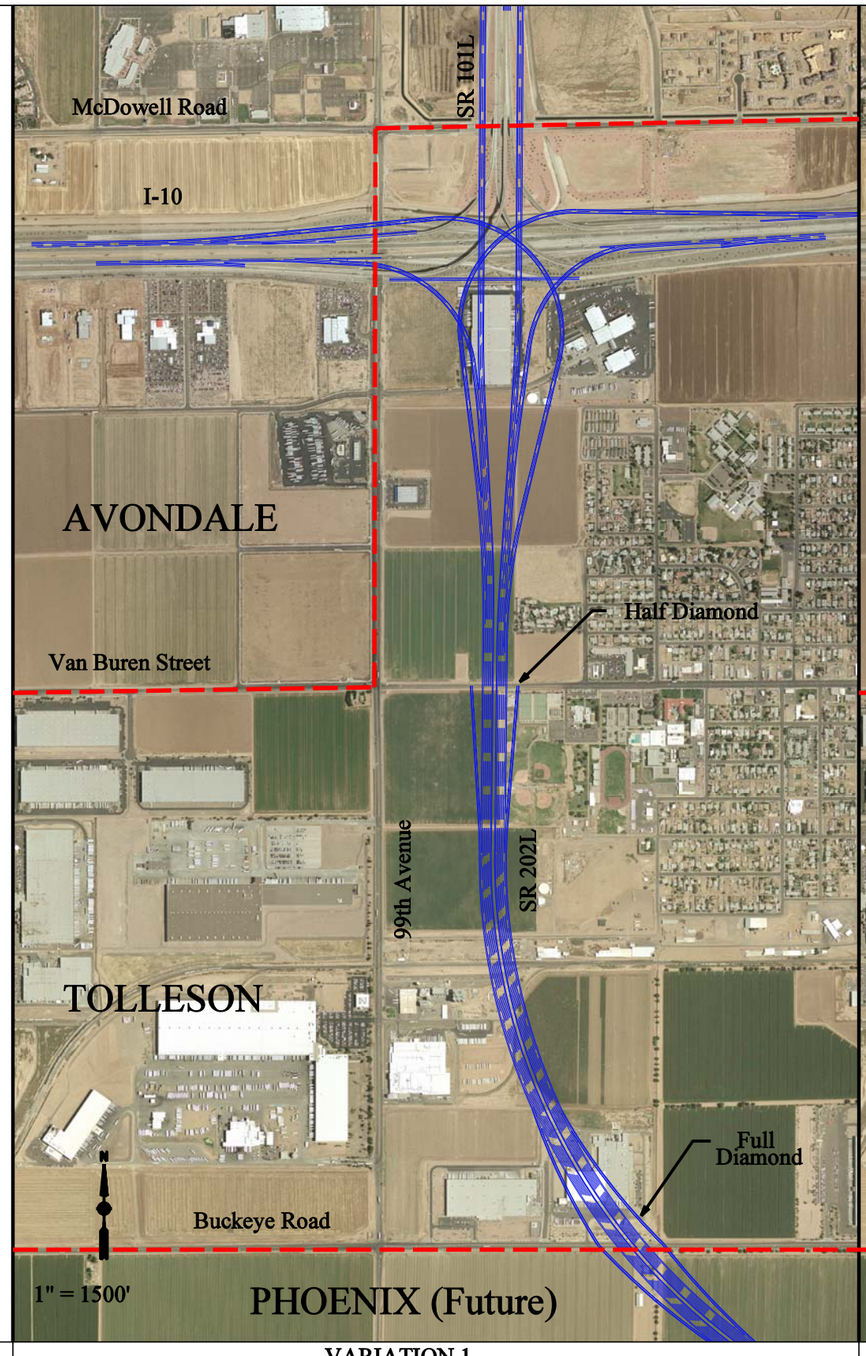
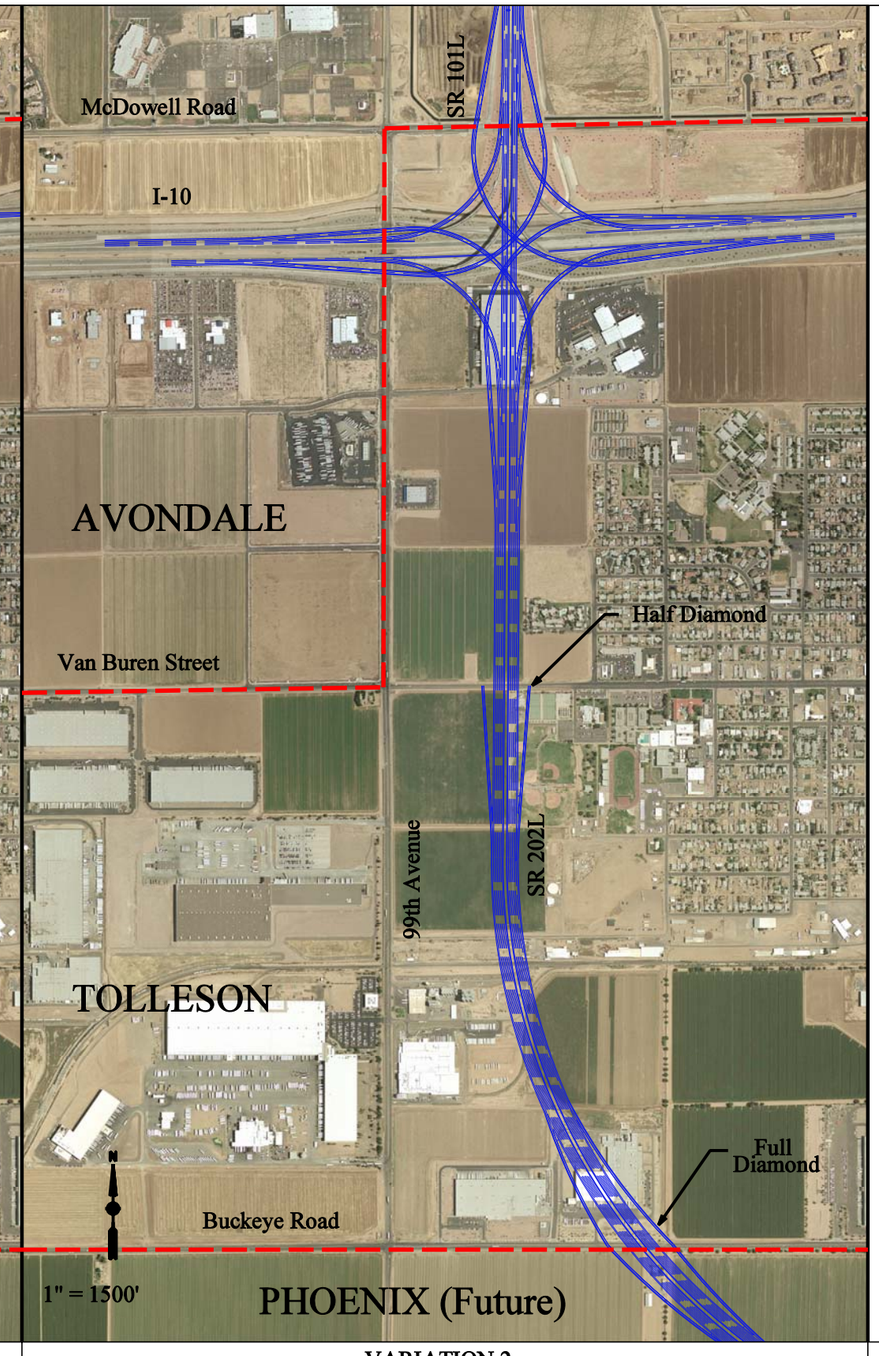


VARIATION 1
Freeway without Frontage Roads
Maintain Existing System Interchange



VARIATION 2
Freeway without Frontage Roads
Remove and Reconstruct System Interchange

ADOT
South Mountain corridor team

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
97th Avenue - Options 2A and 2B
Variations 1 and 2

FIGURE 3

OCTOBER 2003

99TH AVENUE ALTERNATIVES

Alternative 2 – Variation 1

Within the refined study area, Alternative 2 – Variation 1 (see **Figure 4**) travels north along 99th Avenue and ties into the existing I-10 / Loop 101 system interchange. The existing system interchange would remain, and the four additional directional ramps and the through movement structures would be designed to require only minimal reconstruction. Frontage roads would be provided parallel to the freeway mainline along 99th Avenue from approximately ½ mile south of Buckeye Road to I-10. South of Buckeye Road, Alternative 2 – Variation 1 shifts to the southeast and connects into 97th Avenue, where it then follows the alignment of Technical Alternative 2 presented in the Alternatives Screening Report.

Alternative 2 – Variation 2

Within the refined study area, Alternative 2 – Variation 2 (see **Figure 4**) travels north along 97th Avenue until just south of the Union Pacific Railroad (UPRR) tracks. The alignment then shifts to the northwest and connects with 99th Avenue just south of Van Buren Street. The mainline alignment then travels in a north-northeast direction and connects into I-10 just west of the existing I-10 / Loop 101 system interchange. The existing system interchange would be removed to allow for a more conventional fully directional system interchange to be constructed. The reconstructed system interchange would be offset to the west of the existing system interchange to allow traffic movements to continue while construction is underway. Frontage roads would be provided parallel to the freeway mainline along 99th Avenue from approximately ½ mile north of Buckeye Road (just north of the UPRR tracks) to I-10. South of Buckeye Road, Alternative 2 – Variation 2 continues south, where it then follows the alignment of Technical Alternative 2 presented in the Alternatives Screening Report.

Alternative 2 – Variation 3

Within the refined study area, Alternative 2 – Variation 3 (see **Figure 4**) behaves in the same manner as Alternative 2 – Variation 1. The only difference between these two alignments is the manner in which local access is maintained. Whereas Alternative 2 – Variation 1 utilized frontage roads, Alternative 2 – Variation 3 will utilize an elevated freeway section to create a viaduct, whereby 99th Avenue will remain in its current location, under the freeway. South of Buckeye Road, Alternative 2 – Variation 3 follows the alignment of Technical Alternative 2 presented in the Alternatives Screening Report.

Options 2A / 2B– Variation 1

Within the refined study area, Options 2A / 2B – Variation 1 (see **Figure 5**) travels north along 99th Avenue and ties into the existing I-10 / Loop 101 system interchange. The existing system interchange would remain, and the four additional directional ramps and the through movement structures would be designed to require only minimal reconstruction. Frontage roads would be provided parallel to the freeway mainline along 99th Avenue from approximately ½ mile south of Buckeye Road to I-10. South of Buckeye Road, Option 2A – Variation 1 shifts to the southeast and connects into the alignment of Technical Alternative 3 presented in the Alternatives

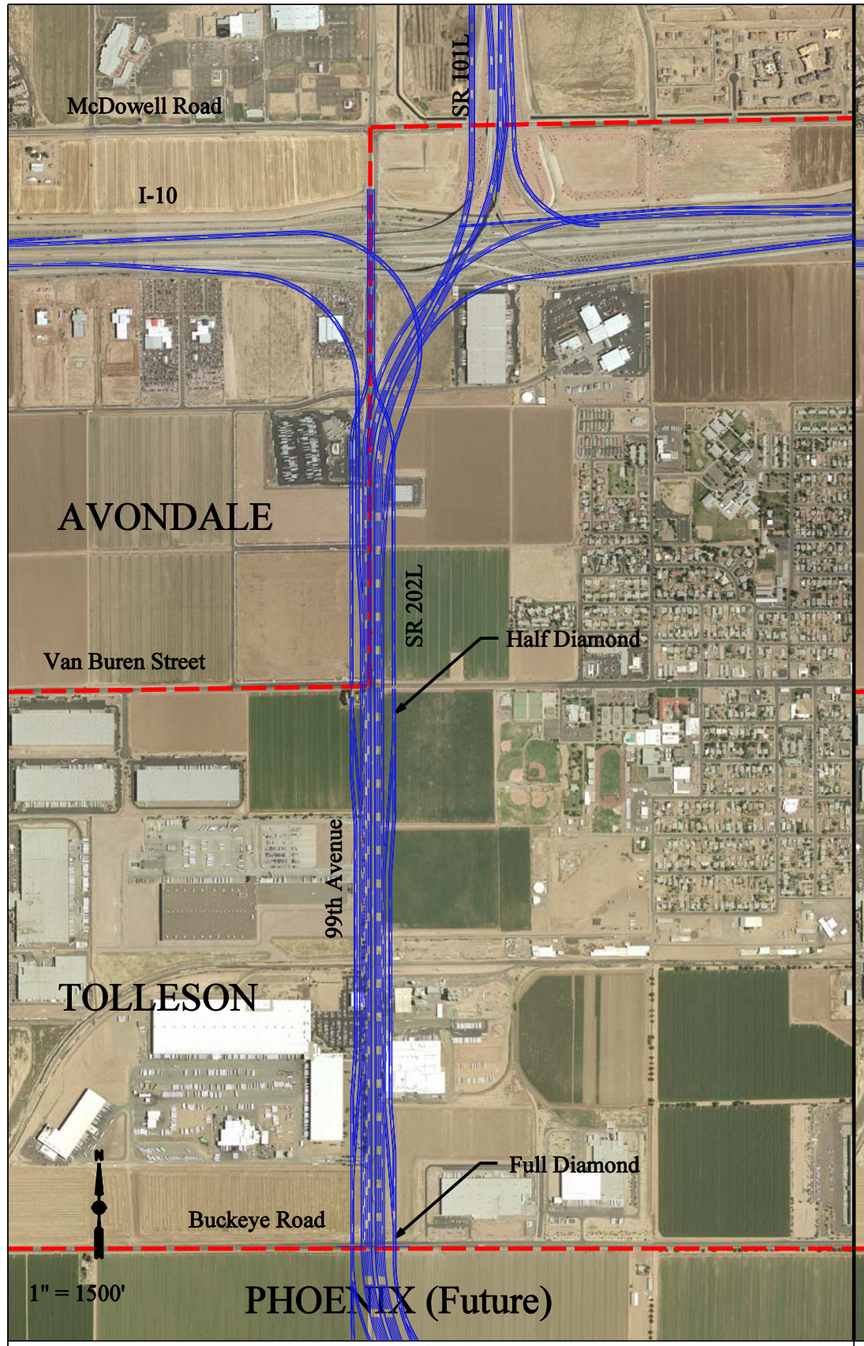
Screening Report, while Option 2B – Variation 1 follows the alignment of Technical Alternative 4 presented in the Alternatives Screening Report.

Options 2A / 2B – Variation 2

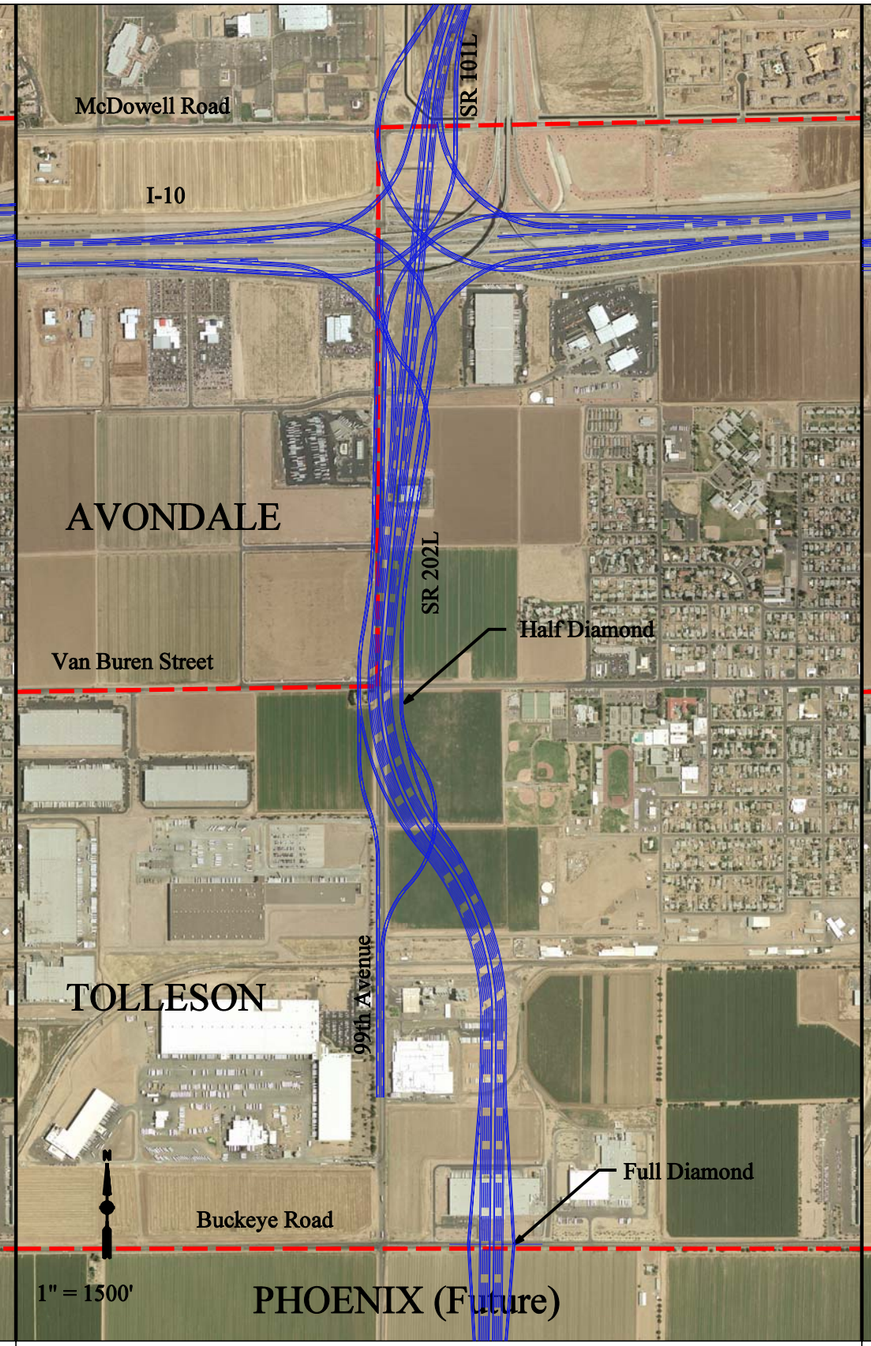
Within the refined study area, Options 2A / 2B – Variation 2 (see **Figure 5**) travels northwest, crossing the UPRR tracks and connects with 99th Avenue just south of Van Buren Street. The mainline alignment then travels in a north-northeast direction and connects into I-10 just west of the existing I-10 / Loop 101 system interchange. The existing system interchange would be removed to allow for a more conventional fully directional system interchange to be constructed. The reconstructed system interchange would be offset to the west of the existing system interchange to allow traffic movements to continue while construction is underway. Frontage roads would be provided parallel to the freeway mainline along 99th Avenue from approximately ½ mile north of Buckeye Road (just north of the UPRR tracks) to I-10. South of Buckeye Road, Option 2A – Variation 2 continues in a southeast direction, where it then follows the alignment of Technical Alternative 3 presented in the Alternatives Screening Report, while Option 2B – Variation 2 follows the alignment of Technical Alternative 4 presented in the Alternatives Screening Report.

Options 2A / 2B – Variation 3

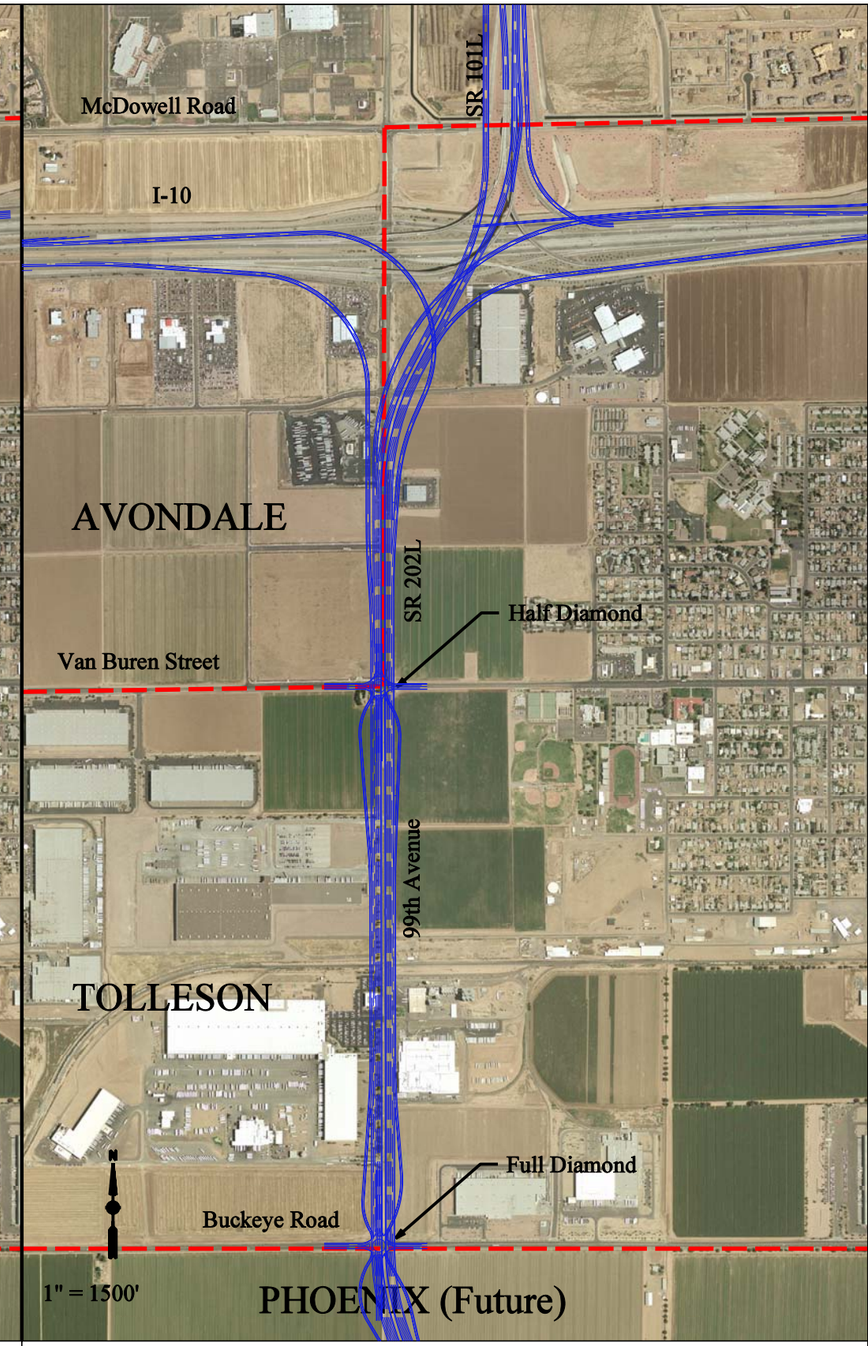
Within the refined study area, Options 2A / 2B – Variation 3 (see **Figure 5**) behaves in the same manner as Option 2A / 2B – Variation 1. The only difference between these alignments is the manner in which local access is maintained. Whereas Options 2A / 2B– Variation 1 utilized frontage roads, Options 2A / 2B – Variation 3 will utilize an elevated freeway section to create a viaduct, whereby 99th Avenue will remain in its current location, under the freeway. South of Buckeye Road, Option 2A – Variation 3 follows the alignment of Technical Alternative 3 presented in the Alternatives Screening Report, while Option 2B – Variation 3 follows the alignment of Technical Alternative 4 presented in the Alternatives Screening Report.



VARIATION 1
Freeway with Frontage Roads
Maintain Existing System Interchange



VARIATION 2
Freeway with Frontage Roads
Remove and Reconstruct System Interchange



VARIATION 3
Viaduct Freeway over 99th Avenue
Maintain Existing System Interchange

ADOT

South Mountain corridor team

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
99th Avenue - Alternative 2
Variations 1, 2 and 3

FIGURE 4

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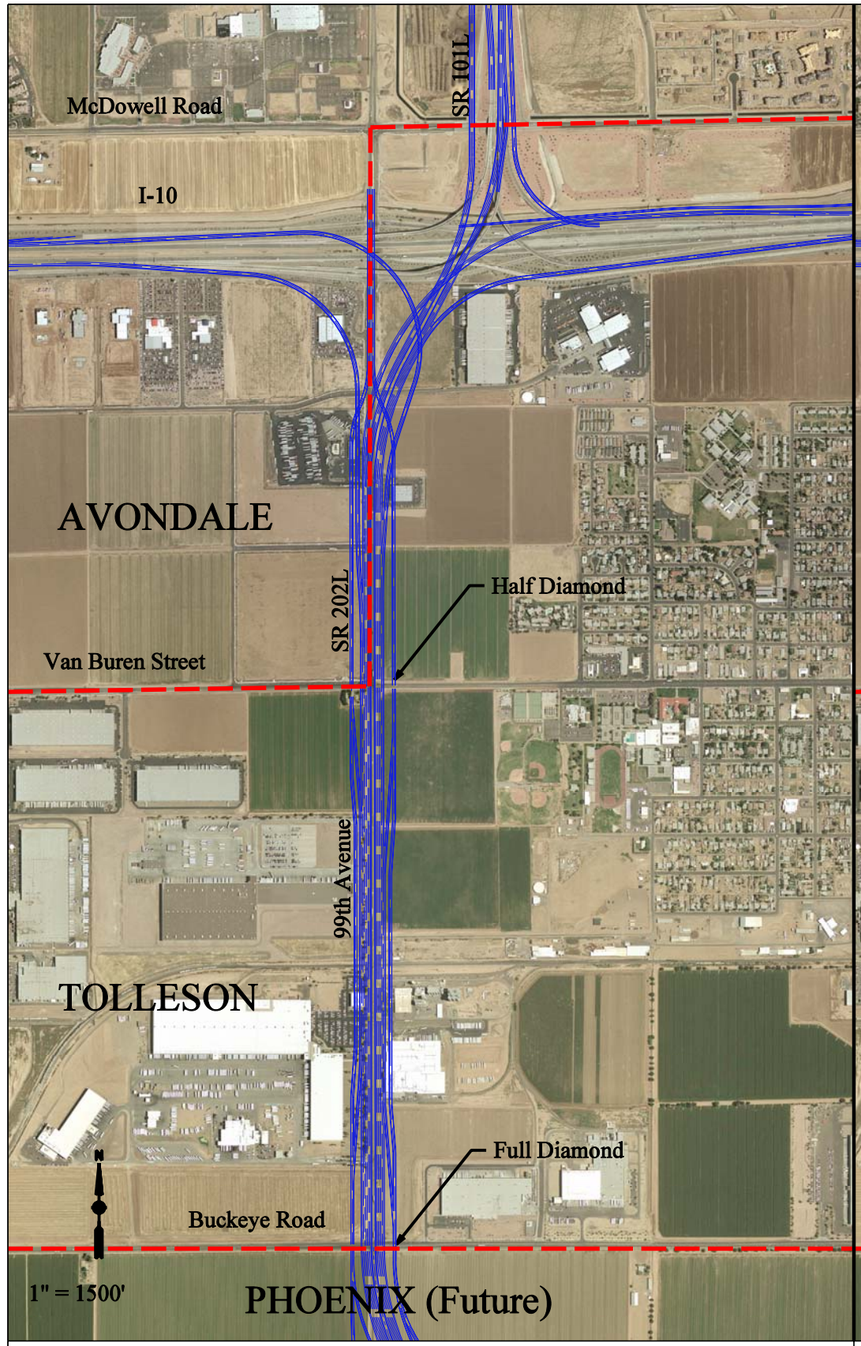
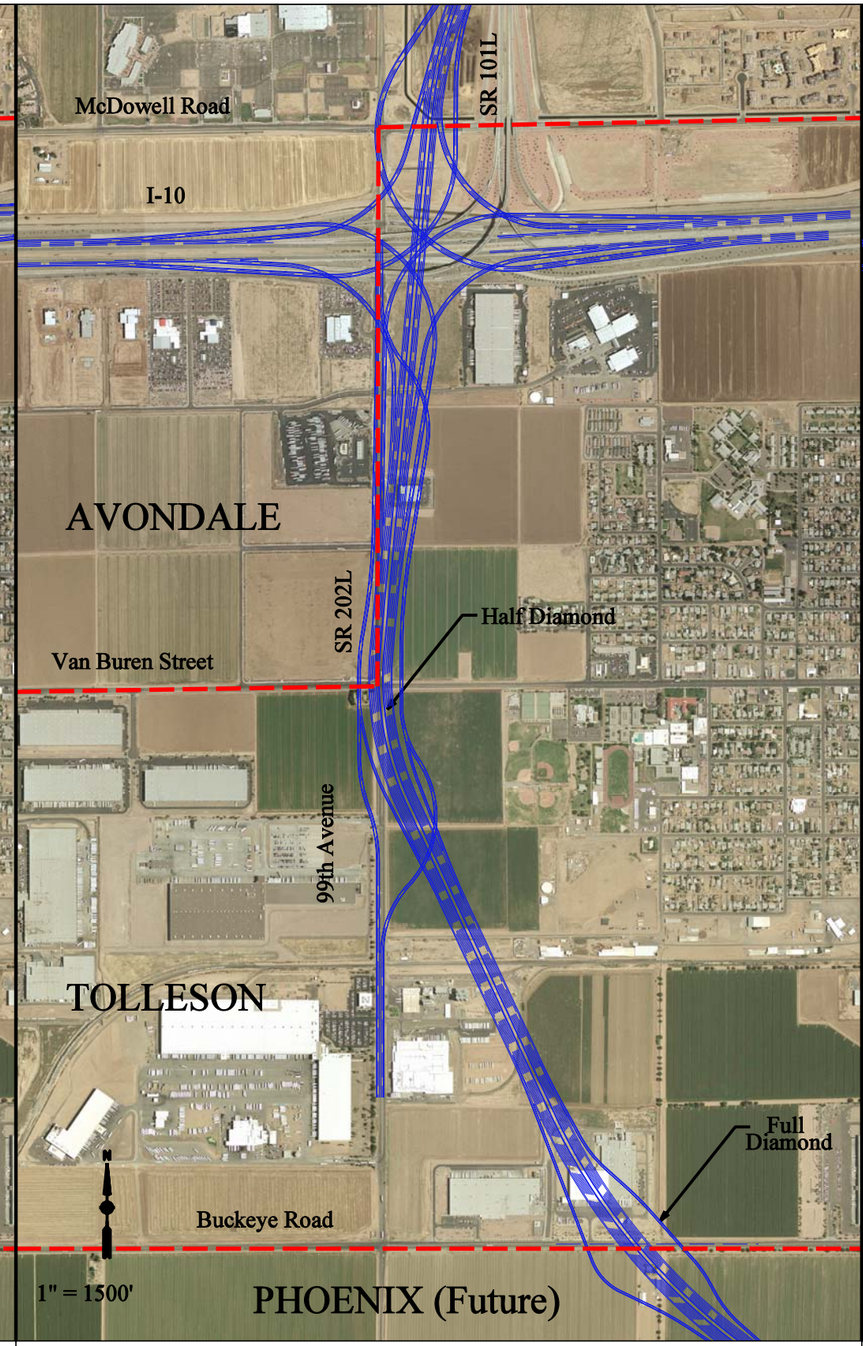
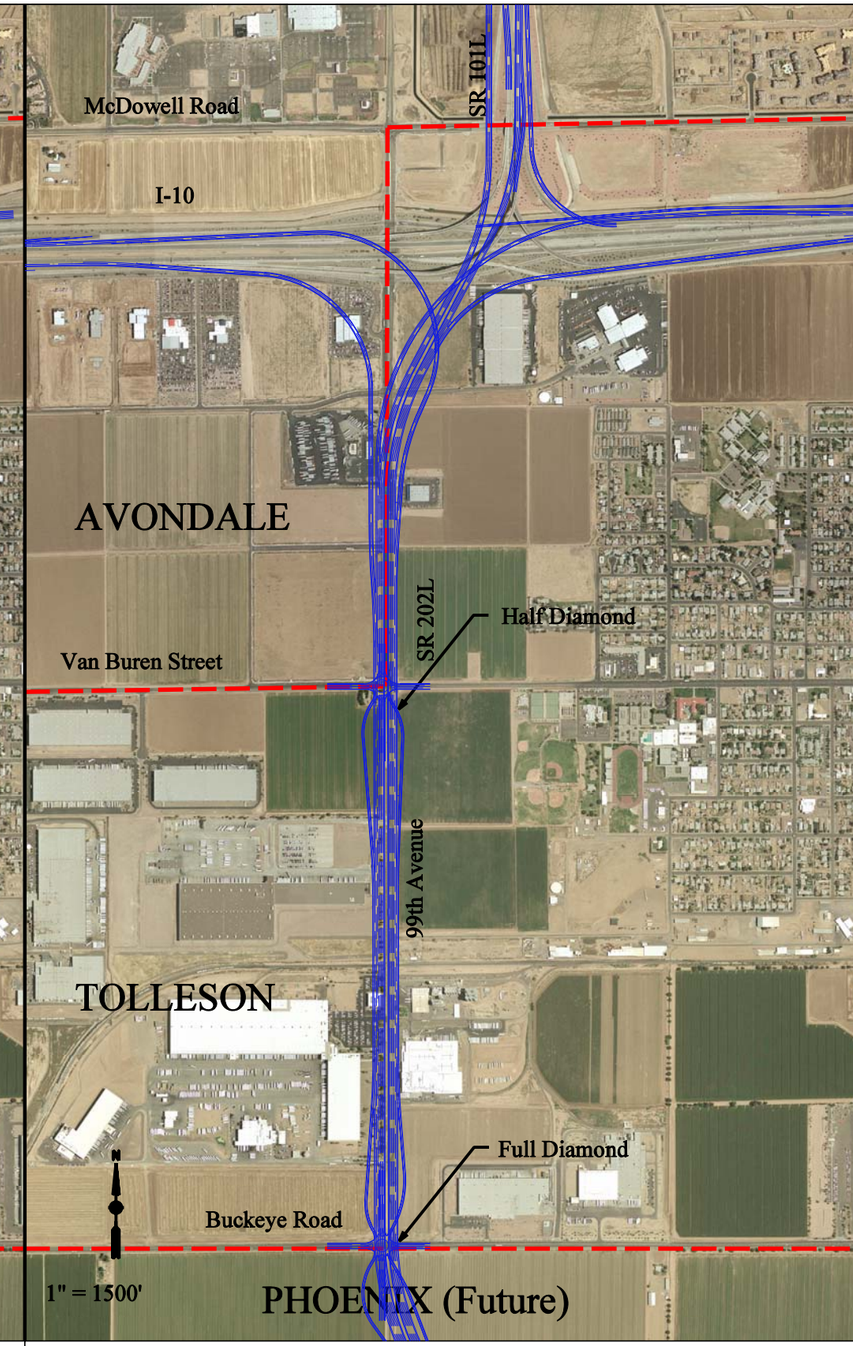


VARIATION 1
Freeway with Frontage Roads
Maintain Existing System Interchange



VARIATION 2
Freeway with Frontage Roads
Remove and Reconstruct System Interchange



VARIATION 3
Viaduct Freeway over 99th Avenue
Maintain Existing System Interchange

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SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
99th Avenue - Options 2A and 2B
Variations 1, 2 and 3

FIGURE 5

OCTOBER 2003

SUMMARY DATA

The 15 Alternatives, Options and Variations presented were run through Geographic Information Systems (GIS) and Computer Aided Drafting and Design (CADD) analyses to determine the impacts associated with each of the criteria presented below:

- Section 4(f)
- Cultural Sites
- Jurisdictional Waters
- Environmental Justice
- Threatened, Endangered and Sensitive Species
- Potentially Hazardous Sites
- General Plan Compatibility
- Prime and Unique Farmland
- Air Quality and Noise
- Impacted Facilities and Zoning
- Utilities
- Public Service Impacts
- Cumulative Impacts
- Public and Political Acceptability
- Compliance with Design Standards
- Traffic Operations
- Cost

Table 1 provides the summary data of the six alignments along 97th Avenue compared with criteria detailed in this technical memorandum.

Table 2 provides the summary data of the nine alignments along 99th Avenue compared with criteria detailed in this technical memorandum.

The remaining section discusses, in greater detail, the analysis and findings for each of the 15 alignments based on the criteria above.

South Mountain Transportation Corridor
97th Avenue - Alternative 2 with Options 2A and 2B, Variations 1 and 2 Screening Data within the Refined Study Area
Table 1

Summary Data of Alternatives, Options and Variations within the Refined Study Area									
Criteria	**Description**	**97th Avenue Alternatives**							
		Alternative 2				**Options 2A / 2B**			
		Variation 1		**Variation 2**		**Variation 1**		**Variation 2**	
		COA[1]	**COT[2]**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**
Section 4(f)	Resources Directly Used (number)	0	3	0	3	0	3	0	3
	Park and Recreation (acreage)	--	5.2	--	5.2	--	5.2	--	5.2
	Arizona State Museum (acreage)	--	3.4	--	4.6	--	3.5	--	4.7
Cultural Sites	Sites Directly Used (number)	0	3	0	3	0	3	0	3
	Total (acreage)	--	3.8	--	5.0	--	3.9	--	5.1
Jurisdictional Waters		No jurisdictional waters are known to exist within the refined study area.							
Environmental Justice		Environmental Justice concerns are the same for all Alternatives, Options and Variations within the refined study area.							
Sensitive Species		There are no known federally protected species or critical habitat within the refined study area.							
Potentially Hazardous Sites	High-Priority Sites (number)	0	0	0	0	0	0	0	0
	Mid-Priority Sites (number)	0	0	0	0	0	0	0	0
	Low-Priority Sites (number)	0	1	0	1	0	0	0	0
General Plan Compatibility	City of Avondale	None of the Alternatives, Options or Variations are presented in the City of Avondale General Plan.							
	City of Tolleson	None of the Alternatives, Options or Variations are presented in the City of Tolleson General Plan.							
Prime and Unique Farmland		No prime or unique farmlands are known to exist within the refined study area.							
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	40	0	15	0	40	0	40
	Non-Residential Sensitive Noise Receptors (units)	6	5	6	5	6	6	6	8
Impacted Facilities and Zoning	Existing Residential (units)	0	1	0	1	0	1	0	1
	Existing Non-Residential (units)	0	7	0	7	0	7	0	6
	Planned Residential (acreage)	--	14.6	--	14.7	--	14.6	--	14.7
	Planned Non-Residential (acreage)	--	52.6	--	43.6	--	55.1	--	47.5
Utilities	Gas	0	0	0	0	0	0	0	0
	Power	0	1	0	1	0	1	0	1
	Sewer	0	0	0	0	0	3	0	3
	Water	0	1	0	1	0	1	0	1
Public Service Impacts	Total (number)	0	1	0	1	0	1	0	1
Cumulative Impacts		Cumulative Impacts are anticipated to be similar for all Alternatives, Options and Variations within the refined study area.							

Summary Data of Alternatives, Options and Variations within the Refined Study Area (Continued)									
Criteria	**Description**	**97th Avenue Alternatives**							
		Alternative 2				**Options 2A / 2B**			
		Variation 1		**Variation 2**		**Variation 1**		**Variation 2**	
		COA	**COT**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**
Public and Political Acceptability	City of Avondale	The City of Avondale has not yet had the opportunity to comment on the Alternatives, Options and Variations within the refined study area.							
	City of Tolleson	The City of Tolleson has not yet had the opportunity to comment on the Alternatives, Options and Variations within the refined study area.							
Compliance with Design Standards		All Alternatives, Options and Variations are in compliance with state and Federal design standards.							
Traffic Operations		Traffic operations for all six Variations are anticipated to behave in a similar manner.							
Cost	Construction Costs	$150,000,000		$210,000,000		$150,000,000		$210,000,000	

[1] City of Avondale.
[2] City of Tolleson.

South Mountain Transportation Corridor
99th Avenue - Alternative 2 with Options 2A and 2B, Variations 1, 2 and 3 Screening Data within the Refined Study Area
Table 2

Summary Data of Alternatives, Options and Variations within the Refined Study Area													
Criteria	**Description**	**99th Avenue Alternatives**											
		Alternative 2						**Options 2A / 2B**					
		Variation 1		**Variation 2**		**Variation 3**		**Variation 1**		**Variation 2**		**Variation 3**	
		COA[1]	**COT[2]**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**
Section 4(f)	Resources Directly Used (number)	0	2	0	2	0	2	0	2	0	2	0	2
	Park and Recreation (acreage)	No Park and Recreation Section 4(f) locations were identified in connection with 99th Avenue Alternatives.											
	Arizona State Museum (acreage)	--	0.6	--	0.5	--	0.5	--	0.6	--	0.5	--	0.6
Cultural Sites	Sites Directly Used (number)	0	3	0	3	0	3	0	3	0	3	0	3
	Total (acreage)	--	1.7	--	0.7	--	0.7	--	1.7	--	0.7	--	0.7
Jurisdictional Waters		No Jurisdictional Waters are known to exist within the refined study area.											
Environmental Justice		Environmental Justice concerns are the same for all Alternatives, Options and Variations within the refined study area.											
Sensitive Species		There are no known federally protected species or critical habitat within the refined study area.											
Potentially Hazardous Sites	High-Priority Sites (number)	0	0	0	0	0	0	0	0	0	0	0	0
	Mid-Priority Sites (number)	0	0	0	0	0	0	0	0	0	0	0	1
	Low-Priority Sites (number)	0	1	0	1	0	0	0	1	0	0	0	0
General Plan Compatibility	City of Avondale	None of the Alternatives, Options or Variations are presented in the City of Avondale General Plan.											
	City of Tolleson	None of the Alternatives, Options or Variations are presented in the City of Tolleson General Plan.											
Prime and Unique Farmland		No prime or unique farmlands are known to exist within the refined study area.											
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	0	0	0	0	0	0	0	0	0	0	0
	Non-Residential Sensitive Noise Receptors (units)	5	2	8	8	5	7	5	4	7	7	5	7
Impacted Facilities and Zoning	Existing Residential (units)	0	1	0	1	0	1	0	1	0	1	0	1
	Existing Non-Residential (units)	4	7	4	6	4	7	4	7	4	6	4	7
	Planned Residential (acreage)	--	0.8	--	13.3	--	0.2	--	0.8	--	11.6	--	0.2
	Planned Non-Residential (acreage)	9.2	41.4	3.8	51.1	8.5	37.0	8.5	46.3	3.8	57.7	7.1	37.8
Utilities	Gas	0	1	0	1	0	1	0	1	0	1	0	1
	Power	0	1	0	1	0	1	0	1	0	1	0	1
	Sewer	0	0	0	0	0	3	0	0	0	3	0	0
	Water	2	2	2	2	2	2	2	2	2	2	2	2
Public Service Impacts		No public service impacts are known to exist within the refined study area in connection with any of the Alternatives, Option or Variations.											
Cumulative Impacts		Cumulative impacts are anticipated to be similar for all Alternatives, Options and Variations within the refined study area.											

Summary Data of Alternatives, Options and Variations within the Refined Study Area (Continued)													
Criteria	**Description**	**99th Avenue Alternatives**											
		Alternative 2						**Options 2A / 2B**					
		Variation 1		**Variation 2**		**Variation 3**		**Variation 1**		**Variation 2**		**Variation 3**	
		COA	**COT**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**	**COA**	**COT**
Public and Political Acceptability	City of Avondale	The City of Avondale has not yet had the opportunity to comment on the Alternatives, Options and Variations within the refined study area.											
	City of Tolleson	The City of Tolleson has not yet had the opportunity to comment on the Alternatives, Options and Variations within the refined study area.											
Compliance with Design Standards		All Alternatives, Options and Variations are in compliance with state and Federal design standards.											
Traffic Operations		Traffic operations for all nine Variations are anticipated to behave in a similar manner.											
Cost	Construction Costs	$150,000,000		$210,000,000		$350,000,000		$150,000,000		$210,000,000		$350,000,000	

[1] City of Avondale.
[2] City of Tolleson.

ENVIRONMENTAL AND DESIGN CRITERIA

Section 4(f)

The purpose of this screening exercise is to determine if there are feasible and prudent alternatives that avoid or have minimal impact on Section 4(f) resources.

97th Avenue Alternatives

Both Variation 1 and Variation 2 of Alternative 2 and Options 2A and 2B have Section 4(f) impacts associated with data provided by the Arizona State Museum (ASM) and Park and Recreation. For all Variations, the same three sites were impacted, an historic canal and roadway along with portions of the Tolleson High School campus.

Based on ASM designations, Variation 1 of Alternative 2 and Options 2A and 2B has fewer impacted acreage than Variation 2. Impacts to ASM sites for Variation 1 range from 3.4 to 3.5 acres, while these same impacts for Variation 2 range from 4.6 to 4.7 acres. For both Variation 1 and Variation 2, the largest impacts occurred to the historic canal, which accounted for 3.0 and 4.2 acres of impact respectively. All impacts associated with ASM designated sites occur in the City of Tolleson.

Based on Park and Recreation designations, Variation 1 and Variation 2 for Alternative 2 and Options 2A and 2B all impact the same site, and have the same impacted acreage of 5.2 acres. This acreage is part of the Tolleson High School campus, and is classified as a Section 6(f) property under the Land and Water Conservation Fund Act (LAWCON). As a Section 6(f) property, the Act prohibits the conversion of property acquired or developed with LAWCON grants to a non-recreational purpose without the approval of the Department of the Interior's National Park Service (FHWA, 1989). All impacts associated with the Park and Recreation designated site occur in the City of Tolleson.

Refer to **Tables A-1 and A-2** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives

All three Variations of Alternative 2 and Options 2A and 2B have Section 4(f) impacts associated with the data provided by the Arizona State Museum (ASM). For all Variations, the same two sites are impacted, an historic canal and an historic roadway.

Based on ASM designations, impacts to these sites range from 0.5 to 0.6 acres. All impacts associated with these ASM designated sites occur in the City of Tolleson.

No impacts were found to occur on any Park and Recreation designated sites in connection with alternatives along 99th Avenue.

Refer to **Table B-1** in **Appendix B** for a more detailed breakdown of the data.

Cultural Sites

The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on archaeological sites, which include historic and prehistoric sites.

97th Avenue Alternatives

Both Variation 1 and Variation 2 of Alternative 2 and Options 2A and 2B have cultural site impacts associated with data provided by the Arizona State Museum (ASM). For all Variations, the same three sites were impacted.

Based on ASM designations, Variation 1 of Alternative 2 and Options 2A and 2B has fewer impacts than Variation 2. Variation 1 impacts to ASM cultural sites range from 3.8 to 3.9 acres, while these same impacts for Variation 2 range from 5.0 to 5.1 acres. For both Variation 1 and Variation 2, the largest impacts occurred to the historic canal, which accounted for 3.0 and 4.2 acres of impact respectively. All impacts associated with ASM designated cultural sites occur in the City of Tolleson.

Refer to **Table A-3** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives

All three Variations of Alternative 2 and Options 2A and 2B have cultural site impacts associated with the data provided by the Arizona State Museum (ASM). For all Variations, the same three sites were impacted.

Based on ASM designations, Variation 2 of Alternative 2 and Options 2A and 2B along with Variation 3 of Alternative 2 and Options 2A and 2B have the fewest impacts to cultural sites, with an impacted acreage of 0.7 acres. The remaining Variations, Variation 1 of Alternative 2 and Options 2A and 2B have an impacted acreage of 1.7 acres. All impacts associated with ASM designated cultural sites occur in the City of Tolleson.

Refer to **Table B-2** in **Appendix B** for a more detailed breakdown of the data.

Potentially Hazardous Sites

Potentially hazardous sites have been classified in this level of analysis as high-priority, mid-priority and low-priority.

97th Avenue Alternatives

While potentially hazardous sites are known to exist within the refined study area, only one site is encountered with any of the Variations presented along 97th Avenue. The site, Building Products Co. (no Site ID number found) is listed as a “low-priority” site in the Mines database and is impacted in both Variation 1 and 2 of Alternative 2. No potentially hazardous sites were found in connection with Variation 1 or Variation 2 of Options 2A and 2B. All impacts associated with potentially hazardous sites occur in the City of Tolleson.

Refer to **Table A-4** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives

Three potentially hazardous sites were identified in connection with the Variations presented along 99th Avenue. Variation 3 of Options 2A and 2B both have one potentially hazardous site, Albertson's Distribution Center (Site ID 4856433), which is listed as a "mid-priority" site in the RCRA Transporter database. Variation 1 of Alternative 2 and Options 2A and 2B all have one potentially hazardous site, Shelly Farms (Site ID 66139764), which is listed as a "low-priority" site in the Spills database. Variation 2 of Alternative 2 has one potentially hazardous site, Building Products Co. (no Site ID number found), which is listed as a "low-priority" site in the Mines database. No potentially hazardous sites were found in connection with Variation 3 of Alternative 2 or Variation 2 of Options 2A and 2B. All impacts associated with potentially hazardous sites occur in the City of Tolleson.

Refer to **Table B-3** in **Appendix B** for a more detailed breakdown of the data.

Impacted Facilities and Zoning

The number of existing residences and businesses that would be impacted by each Variation and acreage of specific zoning for future residences and businesses was evaluated. The number of existing facilities impacted was recorded within the right-of-way, which varies for each of the Variations. To determine future displacements, the zoning sections of the land use plans were used. Dwellings per acre were determined as they were described in the plan.

97th Avenue Alternatives

All Variations presented along 97th Avenue will result in impacts to existing residential units. While the impacts to Sundancer Apartments do not remove any inhabitable structures, the western portion of the parking lot is encroached upon. In addition, every Variation will also result in impacts to existing non-residential units. Variation 2 of Options 2A and 2B has the fewest impacts to existing facilities with six, whereas Variation 1 of Alternative 2 and Options 2A and 2B, along with Variation 2 of Alternative 2 have the most with seven. The listing below indicates which facilities have land-based impacts and which facilities have functionality impacts for each Variation. Land-based impacts are impacts to properties with existing facilities where none of the improvements (buildings, storage and/or parking) are impacted. Functionality impacts are impacts to properties with existing facilities in which a portion or all of those facilities (building, storage, and/or parking) are impacted. All impacts associated with existing residential and non-residential units are located in the City of Tolleson.

Alternative 2 – Variation 1

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
Sundancer Apartments	-None-	Reckitt Benckiser
		Tolleson Well and Booster
		Cunningham Commercial Vehicles
		Tolleson High School
		Bay State Milling Company
		American Italian Pasta Company
		Western Container Corporation

Alternative 2 – Variation 2

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
Sundancer Apartments	Cunningham Commercial Vehicles	Reckitt Benckiser
	Tolleson Well and Booster	Tolleson High School
		Bay State Milling Company
		American Italian Pasta Company
		Western Container Corporation

Option 2A / 2B – Variation 1

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
Sundancer Apartments	-None-	Reckitt Benckiser
		Tolleson Well and Booster
		Cunningham Commercial Vehicles
		Tolleson High School
		Bay State Milling Company
		American Italian Pasta Company
		Holsum / Mesa Cold Storage

Option 2A / 2B – Variation 2

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
Sundancer Apartments	Cunningham Commercial Vehicles	Reckitt Benckiser
	Tolleson Well and Booster	Tolleson High School
		Bay State Milling Company
		Holsum / Mesa Cold Storage

Every Variation along 97th Avenue will require the acquisition of undeveloped land from within the City of Tolleson. Variation 2 of Alternative 2 has the least impacted acreage with a total of 58.3 acres. Variation 1 of Options 2A and 2B have the most impacted acreage with a total of 69.7 acres. All other Variations range between these two values. The average planned residential acreage take ranges between 14.6 and 14.7 acres. The average planned commercial acreage take ranges between 26.8 and 35.2 acres. Every Variation presented along 97th Avenue will require the acquisition of property from the Tolleson High School campus, ranging from 4.7 to 5.4 acres.

Refer to **Tables A-5 and A-6** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives

Every Variation presented along 99th Avenue will result in impacts to both existing residential and non-residential units. The lone residential unit, which is adjacent to agricultural lands located at 99th Avenue and Van Buren Street, is located in the City of Tolleson. In terms of non-residential units, Variation 2 of Alternative 2 and Options 2A and 2B has the fewest impacts with 10. Variations 1 and 3 of Alternative 2 and Options 2A and 2B has the most impacts on non-residential units with 11. The listing below indicates which facilities have land-based impacts and which facilities have functionality impacts for each Variation.

Alternative 2 – Variation 1

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
House	Avondale Auto Mall (1)[1]	Avondale Auto Mall (2)
		Reckitt Benckiser
		Interstate Commerce Plaza
		Auto Body Work
		Albertson's Distribution Center
		Bay State Milling Company
		American Italian Pasta Company
		Fry's Corporate Offices
		Southwest Distribution Center

Alternative 2 – Variation 2

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
House	Avondale Auto Mall (2)	Avondale Auto Mall (1)
	Interstate Commerce Plaza	Reckitt Benckiser
	Albertson's Distribution Center	Auto Body Work
		Bay State Milling Company
		American Italian Pasta Company
		Western Container Corporation

Alternative 2 – Variation 3

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
House	Avondale Auto Mall (1)	Avondale Auto Mall (2)
		Reckitt Benckiser
		Interstate Commerce Plaza
		Auto Body Work
		Albertson's Distribution Center
		Bay State Milling Company
		American Italian Pasta Company
		Fry's Corporate Offices
		Southwest Distribution Center

Option 2A / 2B – Variation 1

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
House	Avondale Auto Mall (1)	Avondale Auto Mall (2)
		Reckitt Benckiser
		Interstate Commerce Plaza
		Auto Body Work
		Albertson's Distribution Center
		Bay State Milling Company
		American Italian Pasta Company
		Fry's Corporate Offices
		Southwest Distribution Center

Option 2A /2B – Variation 2

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
House	Avondale Auto Mall (2)	Avondale Auto Mall (1)
	Interstate Commerce Plaza	Reckitt Benckiser
	Albertson's Distribution Center	Auto Body Work
		Bay State Milling Company
		American Italian Pasta Company
		Holsum / Mesa Cold Storage

Option 2A / 2B – Variation 3

Residential Impacts	Land-Based Non-Residential Impacts	Functionality Non-Residential Impacts
House	Avondale Auto Mall (1)	Avondale Auto Mall (2)
		Reckitt Benckiser
		Interstate Commerce Plaza
		Auto Body Work
		Albertson's Distribution Center
		Bay State Milling Company
		American Italian Pasta Company
		Fry's Corporate Offices
		Southwest Distribution Center

[1]Avondale Auto Mall (#) indicates that # number of parcels within the Avondale Auto Mall are impacted.

Similarly, every Variation along 99th Avenue will also require the acquisition of undeveloped land from both the City of Avondale and the City of Tolleson. Variation 3 of Alternative 2 and Options 2A and 2B has the least impacted acreage with a total of 45.7 acres (Alternative 2) and 45.1 acres (Options 2A and 2B). Variation 2 of Options 2A and 2B have the most impacted acreage with a total of 73.1 acres. No school acreage is required for any of the 99th Avenue Variations.
Refer to **Tables B-4 and B-5** in **Appendix B** for a more detailed breakdown of the data.

Air Quality and Noise

The number of sensitive noise receptors that are located within 500 feet of the middle of the outside lane of travel were documented. Analysis is based on the guidance of FHWA Document, FHWA-HI-00-046, June 1995 Highway Traffic Noise Analysis and Abatement Policy and Guidance. At this level of analysis, FHWA guidelines are being used. During detailed analysis, all alternatives carried forward will be analyzed using ADOT's Noise Policy. No residential or non-residential units that lie within the right-of-way, and thus would be relocated, are included in this analysis.

97th Avenue Alternatives

While all Variations along 97th Avenue have potentially sensitive noise receptors, Variation 2 of Alternative 2 has the fewest residential and non-residential impacts. Variation 2 of Alternative 2 had a total of 15 residential potentially sensitive noise receptors and 11 non-residential potentially sensitive noise receptors. All 15 residential units are located in the City of Tolleson, and are contained in the Sundancer apartment complex. Of the 11 non-residential units, six are located in the City of Avondale as part of the auto mall, and the other five, some of which include portions of the Tolleson High School campus, are located in the City of Tolleson.

All remaining Variations (Variation 1 of Alternative 2 and Options 2A and 2B, and Variation 2 of Options 2A and 2B) have the same residential impacts. For each, 40 residential units are impacted. Again, all 40 residential units (of which 15 are located in the Sundancer Apartment complex) are located in the City of Tolleson. The remaining Variations differ in the impacts to non-residential units, ranging from a low of 11 to a high of 14. Most of the impacts to the City of Avondale occur in the auto mall and some of the impacts to non-residential units in the City of Tolleson include portions of the Tolleson High School campus.

Refer to **Table A-7** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives
None of the Variations along 99th Avenue have any residential units that are considered potentially sensitive noise receptors. The number of non-residential potentially sensitive noise receptors ranges from a low of seven to a high of 16 units. For most Variations, the impacts to the City of Avondale and the City of Tolleson are similar. Variation 1 of Alternative 2 has the lowest number of non-residential units as potentially sensitive noise receptors, while Variation 2 of Alternative 2 has the most.

Refer to **Table B-6** in **Appendix B** for a more detailed breakdown of the data.

Utilities

The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on existing utilities, which include gas, power, sewer and water. All 15 alignments investigated along 97th and 99th Avenues will cross the Union Pacific Railroad (UPRR) located between Van Buren Street and Buckeye Road.

97th Avenue Alternatives
All Variations investigated along 97th Avenue have utility impacts within the City of Tolleson. Of the six Variations investigated, Variations 1 and 2 of Alternative 2 have the fewest number of impacts with two. For both Variations, the impacts were to power and water. The remaining Variations of Options 2A and 2B all have five utility impacts. These impacts include one power, three sewer and one water.

Refer to **Table A-8** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives
Similar to the 97th Avenue alignments, all nine Variations along 99th Avenue will have utility impacts, in both the City of Avondale and the City of Tolleson. For every Variation investigated along 99th Avenue, the same two utility impacts occur in the City of Avondale. For all Variations, two water impacts were identified. Within the City of Tolleson, Variations 1 and 2 of Alternative 2 and Variations 1 and 3 of Options 2A and 2B all have four utility impacts (also the fewest), including impacts to gas, power, and two water. Variation 3 of Alternative 2 and Variation 2 of Options 2A and 2B all have seven utility impacts (the most), including gas, power, three sewer and two water.

Refer to **Table B-7** in **Appendix B** for a more detailed breakdown of the data.

Public Service Impacts

The purpose of this screening exercise is to determine which alternatives avoid or have minimal impact on public services, which include police and fire services, schools and hospitals. Existing public service facilities were considered to be impacted if they fell within the same 500-foot area as the potentially sensitive noise receptors discussed in *Air Quality and Noise* (500 feet from the center of the outermost traveled lane). Planned and proposed facilities are not included.

97th Avenue Alternatives
The only public service impact identified within the refined study area that comes in contact with any of the Variations investigated was the Tolleson High School campus. Located at the intersection of Van Buren Street and 96th Avenue, the Tolleson High School campus is impacted by every Variation presented along 97th Avenue. No other public service impacts were identified.

Refer to **Table A-9** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives
No public service impacts are known to exist within the refined study area in connection with any of the Alternatives, Options or Variations presented along 99th Avenue, and thus no impacts with respect to this criterion are anticipated.

Cost

The purpose of this screening exercise is to determine the approximate construction cost for each of the 15 Variations investigated. The construction costs were determined by calculating costs for a typical 1-mile section, average service interchange, various types of system interchanges and structure plans. The typical values were then multiplied by the number of occurrences each Variation exhibited.

The values presented below represent construction costs only. Additional expenses from items such as land acquisition have not been included.

97th Avenue Alternatives
The two Variations presented along 97th Avenue differ in their construction costs as a result of the system interchange that is recommended along I-10. Whereas Variation 1 maintains a large portion of the existing system interchange, Variation 2 calls for the complete removal and reconstruction of the system interchange and thus costs on average $60,000,000 more. Variation 1 of Alternative 2 and Options 2A/2B has a construction cost of $150,000,000 while Variation 2 for these same alignments has a construction cost of $210,000,000.

Refer to **Table A-10** in **Appendix A** for a more detailed breakdown of the data.

99th Avenue Alternatives
Similar to the Variations presented along 97th Avenue, the Variations along 99th Avenue increase in cost from Variation 1 to Variation 3. Variation 1 of Alternative 2 and Options 2A/2B has a construction cost of $150,000,000. Variation 2 of Alternative 2 and Options 2A/2B has a construction cost of $210,000,000; the result of a completely reconstructed system interchange. And Variation 3 of Alternative 2 and Options 2A/2B has a construction cost of $350,000,000, over $220,000,000 of which is for the construction of a viaduct section of freeway between I-10 and Buckeye Road.

Refer to **Table B-8** in **Appendix B** for a more detailed breakdown of the data.

Jurisdictional Waters

There are no known jurisdictional waters within the refined study area, and thus no impacts with respect to this criterion are anticipated.

Environmental Justice

Executive Order 12898 (1994) was created to identify and address disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority and low-income populations.

Title VI of the Civil Rights Act of 1964 and related statutes assure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, national origin, age, sex, or disability (ADOT, 1997).

The western alternatives being studied along 97th Avenue and 99th Avenue, in order to provide a connection to the Loop 101, are located is the same geographical area with respect to census blocks and block groups. As such, there are no quantifiable effects of how the Alternatives, Options and Variations would be different in relation to Title VI and environmental justice populations.

One of the basic tenants of environmental justice is to ensure the meaningful involvement of all people during the project development process. ADOT has conducted several public involvement activities throughout the study. Three newsletters have been published since Fall 2001. Recognizing the large Hispanic population in the area, newsletters were made bilingual in order to reach both the English and Spanish speaking community members. In Fall 2001 a public open house was held at Fowler Elementary School to introduce community members and other interested parties to the project. Public meetings have also been held with various community groups including rotary clubs and developers. Most recently, a public open house was held on October 2, 2003 at Tolleson High School to present the current findings of the project. English and Spanish speaking members of the Project Team were on hand to address all concerns of the local community.

Since the beginning stages of the project monthly progress meetings have been held with key stakeholders including the City of Avondale, City of Chandler, City of Phoenix, City of Tolleson, Maricopa Department of Transportation, Federal Highways Administration, and the Gila River Indian Community. In addition to these monthly meetings one meeting was held with just City of Tolleson staff and mayor on March 18, 2003, one with just City of Avondale staff and mayor on March 17, 2003 and a joint meeting with the City of Tolleson and the City of Avondale on May 5, 2003 to get their input on alternatives being studied in their jurisdictions.

Threatened, Endangered and Sensitive Species

There are no known federally protected species or critical habitat within the refined study area, and thus no impacts with respect to this criterion are anticipated.

General Plan Compatibility

None of the Alternatives, Options or Variations presented along either 97th Avenue or 99th Avenue are included in the General Plans for the City of Avondale or the City of Tolleson.

Prime and Unique Farmland

There are no known prime or unique farmlands within the refined study area, and thus no impacts with respect to this criterion are anticipated.

Cumulative Impacts

The cumulative impacts for all Alternatives, Options and Variations are anticipated to be similar within the refined study area, and thus no unique impacts with respect to this criterion are anticipated.

Public and Political Acceptability

At this stage in their development, none of the 15 Alternatives, Options or Variations within the refined study area have been presented to either the City of Avondale or the City of Tolleson, and thus no political acceptability has as yet been determined.

Compliance with Design Standards

All 15 Alternatives, Options and Variations are in compliance with state and Federal design standards.

Traffic Operations

Traffic operations for all 15 alignments are anticipated to behave in a similar manner.

APPENDIX A – 97TH AVENUE ALTERNATIVES: DATA TABLES

Appendix A presents detailed data tables that were compiled from the Geographic Information Systems (GIS) and Computer Aided Drafting and Design (CADD) analyses that were run for the six alignments studied along 97th Avenue. Included in the following pages are tables for:

- Section 4(f) Site Locations Based on Arizona State Museum (ASM) Designations
- Section 4(f) Site Locations Based on Park and Recreation Designations
- Arizona State Museum (ASM) Cultural Sites
- Potentially Hazardous Sites
- Existing Units Displaced within Right-of-Way
- Future Zoning / Land Use Impacts Analysis
- Potentially Sensitive Noise Receptors
- Major Utility Locations
- Public Service Impacts
- Construction Costs

No tables are provided for the following criteria as there are either no impacts associated with these criteria within the refined study area in conjunction with any of the Alternatives, Options or Variations studied, or the impacts associated with these criteria are identical for all Alternatives, Options and Variations studied:

- Jurisdictional Waters
- Environmental Justice
- Sensitive Species
- Prime and Unique Farmlands
- Cumulative Impacts
- Public and Political Acceptability
- Traffic Operations

APPENDIX B – 99TH AVENUE ALTERNATIVES: DATA TABLES

Appendix B presents detailed data tables that were compiled from the Geographic Information Systems (GIS) and Computer Aided Drafting and Design (CADD) analyses that were run for the nine alignments studied along 99th Avenue. Included in the following pages are tables for:

- Section 4(f) Site Locations Based on Arizona State Museum (ASM) Designations
- Arizona State Museum (ASM) Cultural Sites
- Potentially Hazardous Sites
- Existing Units Displaced within Right-of-Way
- Future Zoning / Land Use Impacts Analysis
- Potentially Sensitive Noise Receptors
- Major Utility Locations
- Construction Costs

No tables are provided for the following criteria as there are either no impacts associated with these criteria within the refined study area in conjunction with any of the Alternatives, Options or Variations studied, or the impacts associated with these criteria are identical for all Alternatives, Options and Variations studied:

- Section 4(f) Site Locations Based on Park and Recreation Designations
- Public Service Impacts
- Jurisdictional Waters
- Environmental Justice
- Sensitive Species
- Prime and Unique Farmlands
- Cumulative Impacts
- Public and Political Acceptability
- Traffic Operations

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Memo

To:	South Mountain Project Team		
From:	Christopher Clary-Lemon	Project:	South Mountain EIS & L/DCR
CC:	Project File		
Date:	December 16, 2003 **(Conclusion added March 1, 2004)**	Job No:	

RE: SR 202L / SR 101L Direct Connection Alternatives along 99th Avenue and ¼ Mile East

INTRODUCTION

Following the submittal of the Alternatives Screening Report in February 2003, and the subsequent supplementary technical reports submitted in October and November 2003, the Project Team began to further investigate alternatives along 99th Avenue and ¼ mile east of 99th Avenue for a direct connection to SR 101L (Agua Fria Freeway). As presented in the Alternatives Screening Report, three of the nine originally proposed alternatives provide for a direct connection to SR 101L at I-10 (Papago Freeway) approximately ¼ mile east of 99th Avenue. Each of these three direct connection alternatives have passed the initial screening conducted in the Alternatives Screening Report.

Following multiple iterations of design concepts and impacts analysis along with several project team meetings, it was decided by the project team that the eight (8) alternatives along 99th Avenue and ¼ mile east of 99th Avenue presented in this technical memorandum be studied in greater detail. The eight alternatives presented below are centered on either 99th Avenue or ¼ mile east of 99th Avenue, and provide direct mainline connections to SR 101L and system interchange ramp connections to I-10.

REFINED STUDY AREA

As this analysis seeks to determine the impacts associated with a direct connection to SR 101L at I-10, the study area for this analysis has been refined to four square miles centered about Van Buren Street and 99th Avenue. As shown in **Figure 1**, the refined study area is bound by the following:

Northern Boundary:	McDowell Avenue
Southern Boundary:	Buckeye Road
Eastern Boundary:	91st Avenue
Western Boundary:	105th Avenue

Also included in **Figure 1** are the municipal boundaries for the City of Avondale, the City of Phoenix and the City of Tolleson as they exist within the proximity of the refined study area. Major facilities that could be impacted by any of the eight alternatives within this analysis are also identified in this figure.

For the purposes of this analysis, impacts outside the refined study area are not considered. Any of the eight alternatives investigated in this analysis can be tied into any of the three alternatives originally presented in the Alternatives Screening Report that connected into SR 101L.

ANALYSIS

To remain consistent with the analysis conducted in previous investigations as well as the analysis conducted in the Alternatives Screening Report, the same 17 design and environmental criteria that were used in previous analyses were investigated in this technical memorandum. To simplify the results of the analysis for each of the eight alternatives investigated, all information for each individual analysis is included on one page (See **Figure 3 through Figure 10**).

Each individual page includes four focus areas for the alternative, Geometry, Description, Impacts, and Notes.

Within the Geometry focus area, the freeway alternative investigated, along with all service and system interchange ramps, is shown in blue line work. Local roadway and frontage road improvements are shown in magenta line work, and municipal boundaries are shown in red line work. Also identified in this focus area is the 300-foot access control required to meet ADOT criteria along arterial routes with freeway access, shown in green. Estimated right-of-way is shown in yellow and approximates only new right-of-way (existing right-of-way is not shown) to be acquired.

Within the Description focus area a brief description of the alternative is given along with a reference to the type of typical section South Mountain Freeway (SR 202L) will take through the refined study area (See **Figure 2**). The description will include the minimum and maximum number of lanes in each direction as well as an estimated minimum and maximum right-of-way width (system interchange not included).

The Impacts focus area presents the impacts each alternative sustains within the refined study area. The summary table for each alternative presents the same five criteria. Compared with the Alternatives Screening Report summary tables, the following 12 criteria are omitted from the summary table as either no impacts are present for any of the alternatives within the refined study area or all alternatives have the same impacts with one another in the refined study area. Those criteria not listed in the summary tables include:

- Section 4(f) (No impacts)
- Cultural (No impacts)
- Jurisdictional Waters (No impacts)
- Environmental Justice (Same impacts)
- Sensitive Species (No impacts)
- General Plan Compatibility (Same impacts)
- Prime and Unique Farmland (No impacts)
- Cumulative Impacts (Same impacts)
- Public and Political Acceptability
- Public Service Impacts (No impacts)
- Compliance with Design Standards (No impacts)
- Traffic Operations (Same impacts)

Within the Notes focus area major features of each alternative along with impact highlights are presented.

CONCLUSION

On February 26, 2004, the Project Owners Team came together to review the information presented in this technical report. Also discussed was the information gathered at two meetings, one with the City of Tolleson on February 6, 2004 and the other with the City of Avondale on February 25, 2004, at which this technical report was discussed. The following people were in attendance at the February 26, 2004 meeting at ADOT:

- Floyd Roehrich (ADOT, PM)
- Steve Jimenez (ADOT)
- Dan Lance (ADOT)
- John Louis (ADOT)
- Thor Anderson (ADOT)
- Ken Davis (FHWA)
- Bill Vachon (FHWA)
- Dave Bender (AMEC)
- Amy Edwards (HDR, PM)
- Andrea Love (HDR)
- Ben Spargo (HDR)
- Chris Clary-Lemon (HDR)

The following conclusions were reached with respect to the eight (8) alternatives presented in this technical report:

Alternative A

Alternative A would be carried forward into the Draft Environmental Impact Statement (DEIS).

Alternative B

Alternative B would be removed from further consideration in the DEIS. The Project Owners Team supported a half diamond service interchange at Van Buren Street. As Alternative B does not provide for a half diamond service interchange at Van Buren Street, and Alternative A, which is almost identical to Alternative B, does provide a half diamond service interchange at Van Buren Street, Alternative B would be removed from further consideration.

Alternative C

Alternative C would be carried forward into the DEIS.

Alternative D

Alternative D would be removed from further consideration in the DEIS. Similar to Alternative B, Alternative D does not provide a half diamond service interchange at Van Buren Street. As Alternative C, which is almost identical to Alternative D, does provide a half diamond service interchange at Van Buren Street, Alternative D would be removed from further consideration.

Alternative E

Alternative E would be carried forward into the DEIS.

Alternative F

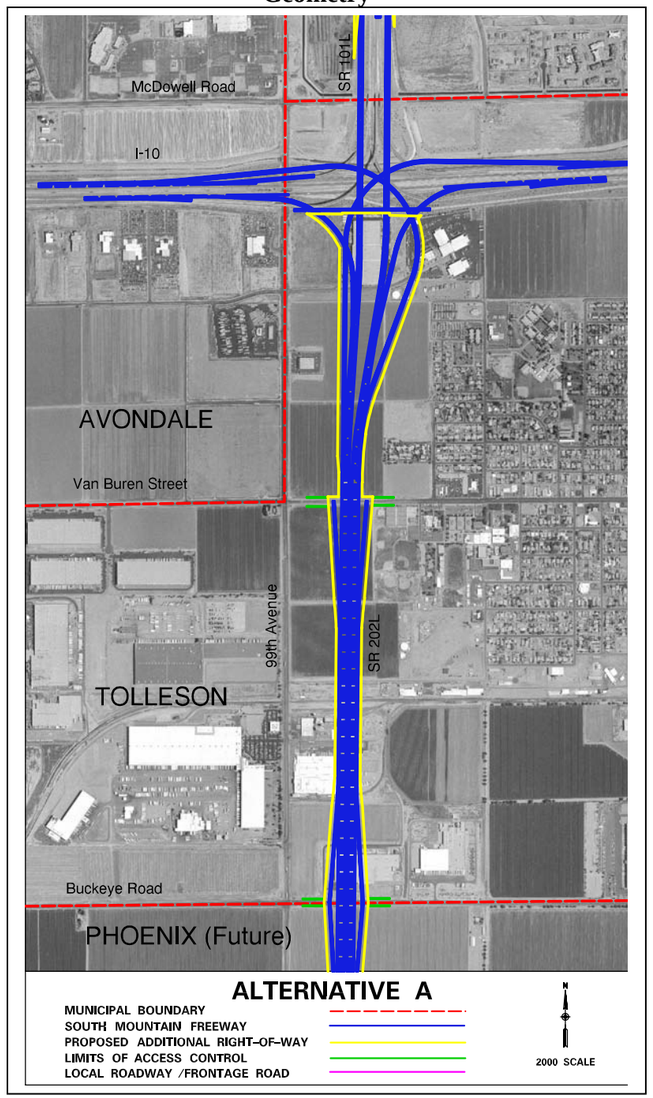
Alternative F would be carried forward into the DEIS.

Alternative G
Alternative G would be removed from further consideration in the DEIS. Alternative G is the only alternative presented that uses a viaduct cross-section (See **Figure 2**). While neither the City of Avondale nor the City of Tolleson favored this alternative, several other factors contributed to its removal.

First, one of the economic benefits of a freeway, that being commercial visibility from a highly traveled roadway, are lost in this alternative as the freeway mainline would be elevated some 20 – 25 feet above grade, thereby eliminating most adjacent development from the driver's line of sight. Additionally, both communities considered the elevated viaduct to be a visual barrier that would reduce the visual qualities of the adjacent land. Another disadvantage of the viaduct freeway presented in Alternative G would be the noise impacts. By elevating the freeway mainline between 20 – 25 feet above grade, the noise generated on the facility would travel a greater distance, making mitigation more necessary and potentially more complicated and costly. The final factor considered in the elimination of Alternative G from further consideration is the cost. The viaduct freeway was estimated to cost about $100M more per mile than an at-grade facility. For these reasons, the Project Owners Team believed Alternative G should be removed from further consideration.

Alternative H
Alternative H would be carried forward into the DEIS.

Geometry



Description

Alternative A travels in a north-south direction approximately ¼ mile east of 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road and a half diamond service interchange at Van Buren Street. This alternative seeks to maintain as much of the existing I-10 / SR 101L system interchange as possible. To accomplish this, the through movements are provided for on the fourth (top) level. Design options are being evaluated to potentially lower the mainline movements to the second or third level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway without Frontage Roads typical section (See **Figure 2**). The estimated right-of-way varies from 340 feet to 600 feet (system interchange not included).

Impacts

Summary Data for Alternative A			
Criteria	**Description**	**Municipality**	
		Avondale	**Tolleson**
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	0
	Low-Priority Sites (number)	0	0
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	14[1]
	Non-Residential Sensitive Noise Receptors (units)	0	4
Impacted Facilities and Zoning	Existing Residential (units)	0	0
	Existing Non-Residential (units)	0	7
	Planned Residential (acreage)	0	20.3
	Planned Non-Residential (acreage)	0	44.8
Utilities	Gas	0	1505’
	Sewer	0	0
	Water	0	680’
Cost	Construction Cost	$150,000,000	

[1]Includes seven apartment buildings in the Sundancer Apartment complex.

Notes

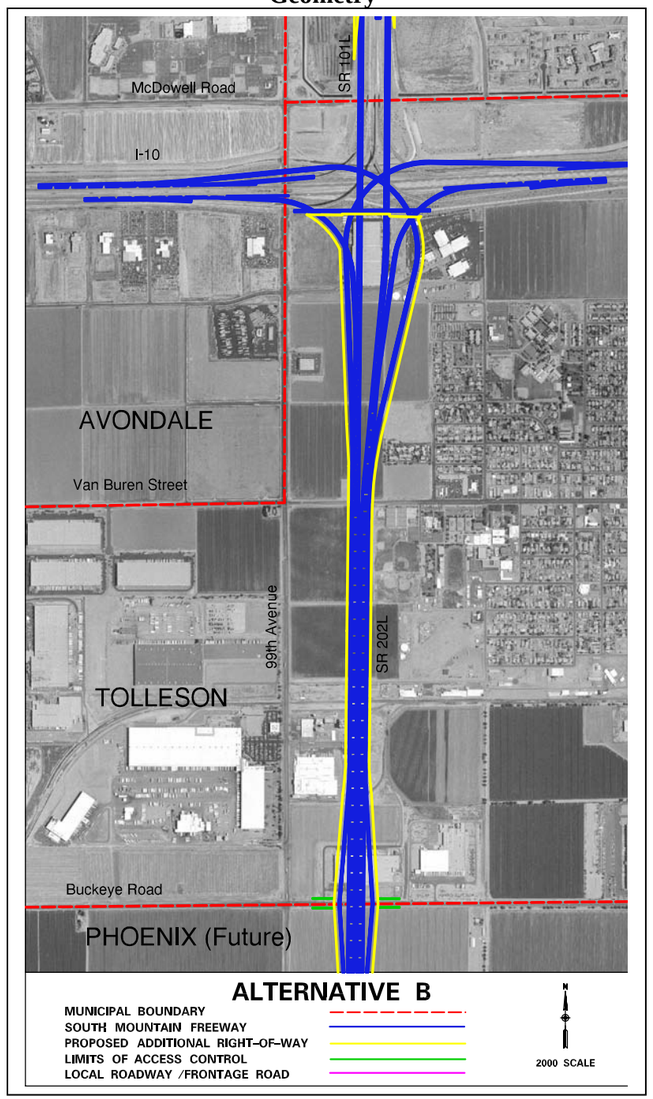
- Alternative A avoids impacts to Cowden Park adjacent to Tolleson High School.
- Provides for a half diamond service interchange at Van Buren Street.
- Direct impacts to existing non-residential facilities of Reckitt Benckiser, Cunningham Commercial Vehicles, City of Tolleson Well and Booster Station No. 8, facilities along UPRR tracks, Bay State Milling Company, American Italian Pasta Company, and Western Container Corporation.
- Library access along Van Buren Street limited to right-in / right-out only (within 300-foot access control criteria).
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative A

FIGURE 3

Geometry



Description

Alternative B travels in a north-south direction approximately ¼ mile east of 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road but no service interchange at Van Buren Street. This alternative seeks to maintain as much of the existing I-10 / SR 101L system interchange as possible. To accomplish this, the through movements are provided for on the fourth (top) level. Design options are being evaluated to potentially lower the mainline movements to the second or third level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway without Frontage Roads typical section (See **Figure 2**). The estimated right-of-way varies from 320 feet to 590 feet (system interchange not included).

Impacts

Summary Data for Alternative B			
Criteria	**Description**	**Municipality**	
		Avondale	**Tolleson**
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	0
	Low-Priority Sites (number)	0	1
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	27[1]
	Non-Residential Sensitive Noise Receptors (units)	0	6
Impacted Facilities and Zoning	Existing Residential (units)	0	0
	Existing Non-Residential (units)	0	7
	Planned Residential (acreage)	0	14.5
	Planned Non-Residential (acreage)	0	52.1
Utilities	Gas	0	1215’
	Sewer	0	0
	Water	0	630’
Cost	Construction Cost	$140,000,000	

[1]Includes 11 apartment buildings in the Sundancer Apartment complex.

Notes

- Alternative B avoids impacts to Cowden Park adjacent to Tolleson High School.
- No access from Loop 202 is provided at Van Buren Street.
- Direct impacts to existing non-residential facilities of Reckitt Benckiser, Cunningham Commercial Vehicles, City of Tolleson Well and Booster Station No. 8, facilities along UPRR tracks, Bay State Milling Company, American Italian Pasta Company, and Western Container Corporation.
- All existing library access is maintained along Van Buren Street.
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

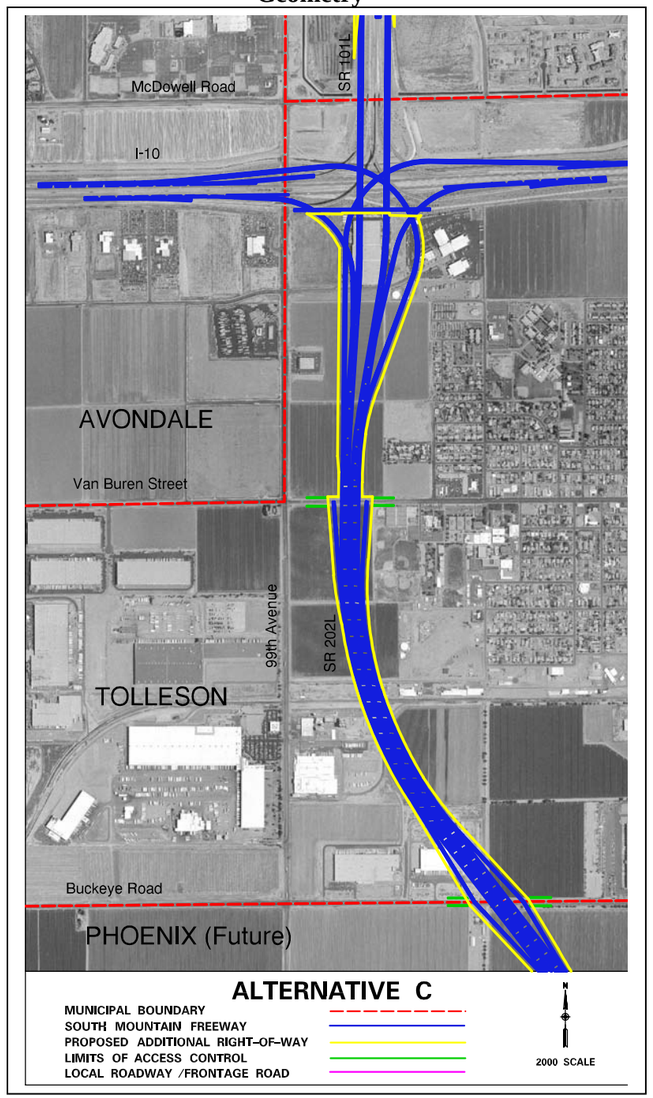
SOUTH MOUNTAIN TRANSPORTAION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative B

FIGURE 4

DRAFT

Geometry



Description

Alternative C travels in a northwest-southeast direction and then a north-south direction approximately ¼ mile east of 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road and a half diamond service interchange at Van Buren Street. This alternative seeks to maintain as much of the existing I-10 / SR 101L system interchange as possible. To accomplish this, the through movements are provided for on the fourth (top) level. Design options are being evaluated to potentially lower the mainline movements to the second or third level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway without Frontage Roads typical section (See **Figure 2**). The estimated right-of-way varies from 340 feet to 670 feet (system interchange not included).

Impacts

Summary Data for Alternative C			
Criteria	**Description**	**Municipality**	
		Avondale	**Tolleson**
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	0
	Low-Priority Sites (number)	0	0
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	15[1]
	Non-Residential Sensitive Noise Receptors (units)	0	6
Impacted Facilities and Zoning	Existing Residential (units)	0	0
	Existing Non-Residential (units)	0	6
	Planned Residential (acreage)	0	20.9
	Planned Non-Residential (acreage)	0	60.8
Utilities	Gas	0	1785’
	Sewer	0	2650’
	Water	0	2250’
Cost	Construction Cost	$150,000,000	

[1]Includes seven apartment buildings in the Sundancer Apartment complex.

Notes

- Alternative C avoids impacts to Cowden Park adjacent to Tolleson High School.
- Provides for a half diamond service interchange at Van Buren Street.
- Direct impacts to existing non-residential facilities of Reckitt Benckiser, Cunningham Commercial Vehicles, City of Tolleson Well and Booster Station No. 8, facilities along UPRR tracks, Bay State Milling Company, and Holsum / Mesa Cold Storage.
- Library access along Van Buren Street limited to right-in / right-out only (within 300-foot access control criteria).
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

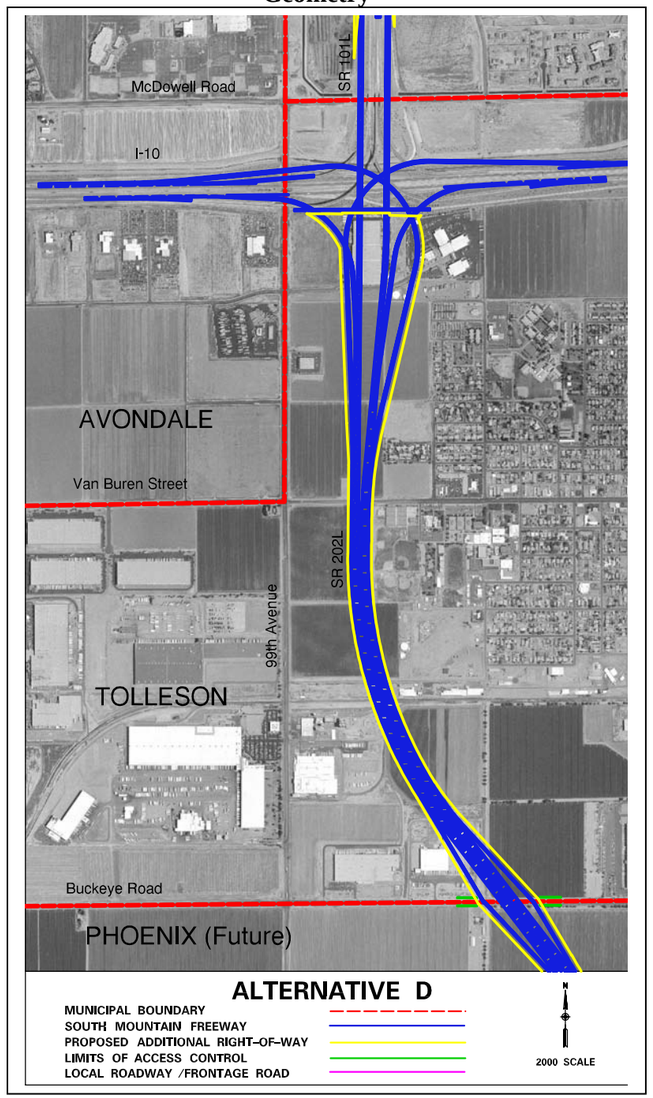
SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative C

FIGURE 5

DRAFT

Geometry



Description

Alternative D travels in a northwest-southeast direction and then a north-south direction approximately ¼ mile east of 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road but no service interchange at Van Buren Street. This alternative seeks to maintain as much of the existing I-10 / SR 101L system interchange as possible. To accomplish this, the through movements are provided for on the fourth (top) level. Design options are being evaluated to potentially lower the mainline movements to the second or third level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway without Frontage Roads typical section (See **Figure 2**). The estimated right-of-way varies from 320 feet to 670 feet (system interchange not included).

Impacts

Summary Data for Alternative D

Criteria	Description	Municipality	
		Avondale	Tolleson
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	0
	Low-Priority Sites (number)	0	0
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	40[1]
	Non-Residential Sensitive Noise Receptors (units)	0	7
Impacted Facilities and Zoning	Existing Residential (units)	0	0
	Existing Non-Residential (units)	0	6
	Planned Residential (acreage)	0	14.8
	Planned Non-Residential (acreage)	0	65.8
Utilities	Gas	0	1495’
	Sewer	0	2400’
	Water	0	2395’
Cost	Construction Cost	$140,000,000	

[1]Includes 15 apartment buildings in the Sundancer Apartment complex.

Notes

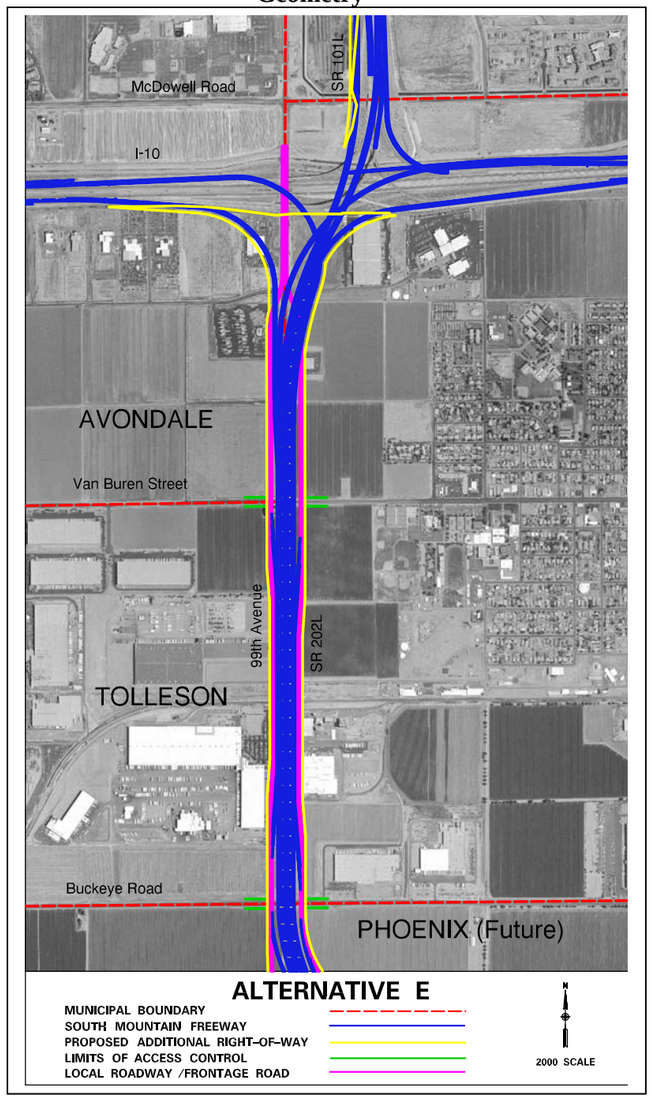
- Alternative D avoids impacts to Cowden Park adjacent to Tolleson High School.
- No access from Loop 202 is provided at Van Buren Street.
- Direct impacts to existing non-residential facilities of Reckitt Benckiser, Cunningham Commercial Vehicles, City of Tolleson Well and Booster Station No. 8, facilities along UPRR tracks, Bay State Milling Company, and Holsum / Mesa Cold Storage.
- All existing library access is maintained along Van Buren Street.
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative D

FIGURE 6

Geometry



Description

Alternative E travels in a north-south direction along 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road and a half diamond service interchange at Van Buren Street. Two-lane, one-way frontage roads are provided on both sides of the freeway, beginning ¼ mile south of I-10 and ending approximately ½ mile south of Buckeye Road. This alternative seeks to maintain as much of the existing I-10 / SR 101L system interchange as possible. To accomplish this, the through movements are provided for on the fourth (top) level. Design options are being evaluated to potentially lower the mainline movements to the second or third level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway with Frontage Roads typical section (See **Figure 2**). The estimated right-of-way varies from 440 feet to 510 feet (system interchange not included).

Impacts

Summary Data for Alternative E			
Criteria	**Description**	**Municipality**	
		Avondale	**Tolleson**
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	3
	Low-Priority Sites (number)	0	1
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	0
	Non-Residential Sensitive Noise Receptors (units)	0	3
Impacted Facilities and Zoning	Existing Residential (units)	0	1
	Existing Non-Residential (units)	3	7
	Planned Residential (acreage)	0	0
	Planned Non-Residential (acreage)	14.9	65.7
Utilities	Gas	255’	4440’
	Sewer	0	0
	Water	5230’	5820’
Cost	Construction Cost	$150,000,000	

Notes

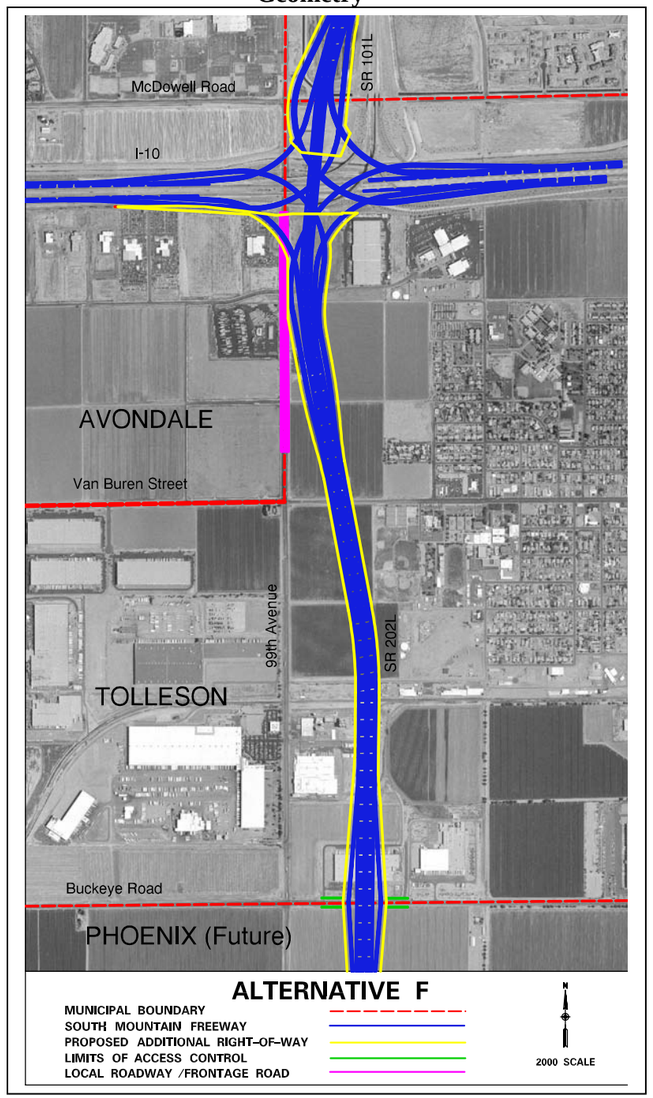
- Alternative E provides for a half diamond service interchange at Van Buren Street.
- Direct impacts to existing non-residential facilities of Avondale Auto Mall (two impacts), Reckitt Benckiser, Interstate Commerce Plaza, Auto Body World, Albertson’s Distribution Center, facilities along UPRR tracks, Fry’s Food and Drug Store Corporate Offices, Bay State Milling Company, and American Italian Pasta Company.
- Functionality of 99th Avenue shifted to one-way frontage roads on either side of the freeway.
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative E

FIGURE 7

Geometry



Description

Alternative F travels in primarily in a north-south direction between 99th Avenue and ¼ mile east of 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road but no service interchange at Van Buren Street. 99th Avenue is shown as a six lane arterial with a 16-foot median that maintains the existing roadway limits on the western side. This alternative seeks to maintain as much of the existing I-10 / SR 101L system interchange as possible. To accomplish this, the through movements are provided for on the fourth (top) level. Design options are being evaluated to potentially lower the mainline movements to the second or third level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway without Frontage Roads typical section (See **Figure 2**). The estimated right-of-way varies from 320 feet to 580 feet (system interchange not included).

Impacts

Summary Data for Alternative F			
Criteria	**Description**	**Municipality**	
		Avondale	**Tolleson**
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	0
	Low-Priority Sites (number)	0	1
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	0
	Non-Residential Sensitive Noise Receptors (units)	1	4
Impacted Facilities and Zoning	Existing Residential (units)	0	0
	Existing Non-Residential (units)	2	6
	Planned Residential (acreage)	0	15.0
	Planned Non-Residential (acreage)	1.1	57.1
Utilities	Gas	0	1200’
	Sewer	0	0
	Water	305’	630’
Cost	Construction Cost	$210,000,000	

Notes

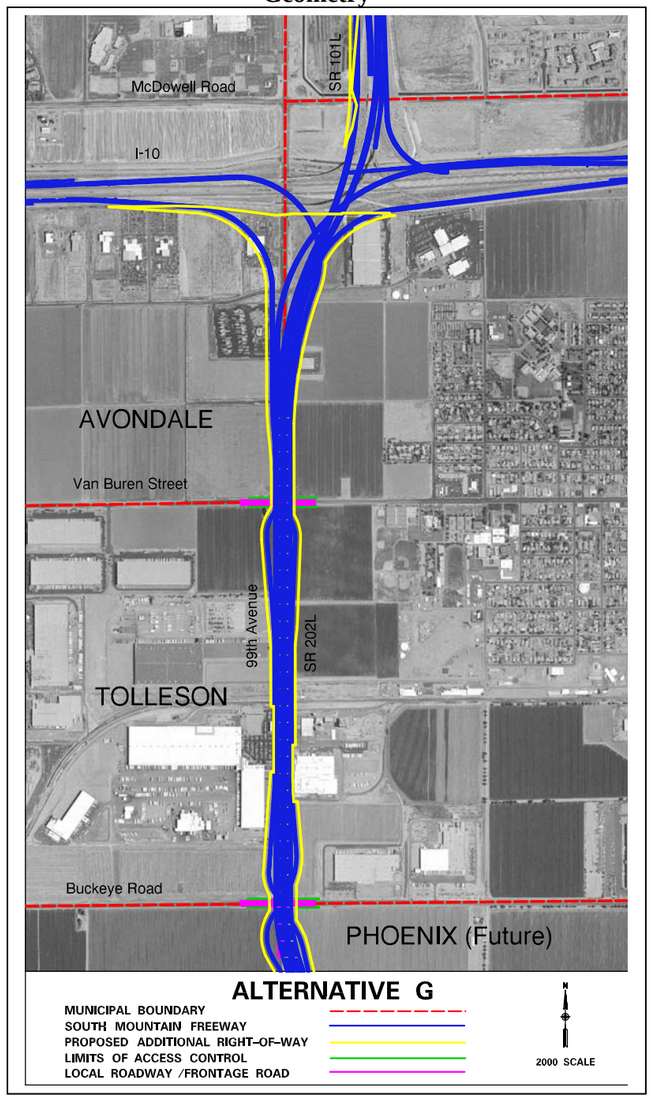
- Alternative F avoids impacts to Cowden Park adjacent to Tolleson High School.
- No access from Loop 202 is provided at Van Buren Street.
- Direct impacts to existing non-residential facilities of Avondale Auto Mall (two impacts), Reckitt Benckiser, Interstate Commerce Plaza, Auto Body World, facilities along UPRR tracks, Bay State Milling Company, American Italian Pasta Company, and Western Container Corporation.
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative F

FIGURE 8

Geometry



Description

Alternative G travels in a north-south direction along 99th Avenue. 99th Avenue would exist largely in it current location, with the freeway elevated at the second level above 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road and a half diamond service interchange at Van Buren Street. This alternative seeks to maintain as much of the existing I-10 / SR 101L system interchange as possible. To accomplish this, the through movements are provided for on the fourth (top) level. Design options are being evaluated to potentially lower the mainline movements to the second or third level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway on Viaduct typical section (See **Figure 2**). The estimated right-of-way varies from 260 feet to 520 feet (system interchange not included).

Impacts

Summary Data for Alternative G			
Criteria	**Description**	**Municipality**	
		Avondale	**Tolleson**
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	0
	Low-Priority Sites (number)	0	0
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	0
	Non-Residential Sensitive Noise Receptors (units)	0	5
Impacted Facilities and Zoning	Existing Residential (units)	0	1
	Existing Non-Residential (units)	3	7
	Planned Residential (acreage)	0	0
	Planned Non-Residential (acreage)	10.8	56.0
Utilities	Gas	160’	3955’
	Sewer	0	0
	Water	5230’	5625’
Cost	Construction Cost	$350,000,000	

Notes

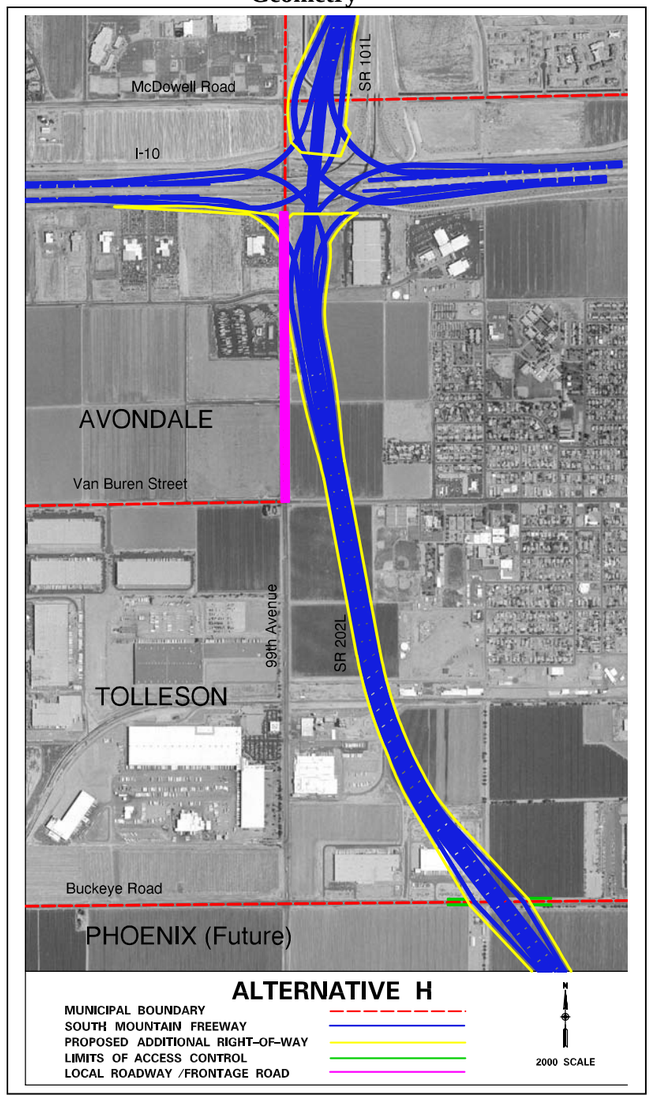
- Alternative G provides for a half diamond service interchange at Van Buren Street.
- The viaduct maintains 99th Avenue at ground level and the freeway on structure above.
- Direct impacts to existing non-residential facilities of Avondale Auto Mall (two impacts), Reckitt Benckiser, Interstate Commerce Plaza, Auto Body World, Albertson’s Distribution Center, facilities along UPRR tracks, Fry’s Food and Drug Store Corporate Offices, Bay State Milling Company, and American Italian Pasta Company.
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative G

FIGURE 9

Geometry



Description

Alternative H travels in a northwest-southeast direction between 99th Avenue and ¼ mile east of 99th Avenue. The alternative provides a full diamond service interchange at Buckeye Road but no service interchange at Van Buren Street. 99th Avenue is shown as a six lane arterial with a 16-foot median that maintains the existing roadway limits on the western side. This alternative seeks to remove and reconstruct the I-10 / SR 101L system interchange. Since the system interchange will be completely new, the through movements are provided for on the second level.

The total number of lanes in each direction, including auxiliary lanes, varies from three to seven utilizing a Freeway without Frontage Roads typical section (See **Figure 2**). The estimated right-of-way varies from 320 feet to 660 feet (system interchange not included).

Impacts

Summary Data for Alternative H			
Criteria	**Description**	**Municipality**	
		Avondale	**Tolleson**
Potentially Hazardous Sites	High-Priority Sites (number)	0	0
	Mid-Priority Sites (number)	0	0
	Low-Priority Sites (number)	0	0
Air Quality and Noise	Residential Sensitive Noise Receptors (units)	0	0
	Non-Residential Sensitive Noise Receptors (units)	1	6
Impacted Facilities and Zoning	Existing Residential (units)	0	0
	Existing Non-Residential (units)	2	5
	Planned Residential (acreage)	0	15.0
	Planned Non-Residential (acreage)	1.1	67.3
Utilities	Gas	0	1475’
	Sewer	0	2595’
	Water	300’	2200’
Cost	Construction Cost	$210,000,000	

Notes

- Alternative H does not provide access from Loop 202 to Van Buren Street.
- Includes complete reconstruction of system interchange at I-10.
- Direct impacts to existing non-residential facilities of Avondale Auto Mall (two impacts), Reckitt Benckiser, Auto Body World, facilities along UPRR tracks, Bay State Milling Company, and Holsum / Mesa Cold Storage.
- An historic highway is designated in the same location as Buckeye Road, and any improvements to Buckeye Road could have Section 4(f) and cultural impacts.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives

Alternative H

FIGURE 10

HDR | ONE COMPANY *Many Solutions*℠

Memo

To:	South Mountain Project Team		
From:	Ben Spargo	Project:	South Mountain EIS & L/DCR
CC:	Project File		
Date:	March 29, 2004	Job No:	

RE: Loop 202 / Loop 101 Direct Connection Alternatives
¼-Mile East of 99th Avenue – Mainline at 2nd Level – Reconstruction to Ramp S-W

INTRODUCTION

Following the submittal of the Alternatives Screening Report in February 2003, and the subsequent supplementary technical reports submitted in October and November 2003, the Project Team began to further investigate alternatives along 99th Avenue and ¼ mile east of 99th Avenue for a direct connection to Loop 101 (Agua Fria Freeway). In December 2003, the Project Team completed a technical report that described eight alternative connections. In each alternative, the Loop 202 mainline was assumed to travel over I-10 and the existing directional ramps at the 4th level. In addition to this analysis, the Project Team investigated options for direct connections with minimal reconstruction to the existing system interchange that would allow the Loop 202 mainline to travel over I-10 at the 2nd level.

The design presented below allows the Loop 202 mainline to remain at the 2nd level with complete reconstruction of only one of the four existing directional ramps (Ramp S-W). In addition to the direct connection to Loop 101, two options for retaining local access to McDowell Road and Thomas Road are discussed.

For the purpose of this analysis, the limits of the study are ¼-mile south of I-10 (southern boundary) and ¼-mile north of Thomas Road (northern boundary). The eastern boundary is 91st Avenue and the western boundary is 105th Avenue.

DESCRIPTION

In each alternative discussed in the December 2003 technical report, the northbound and southbound Loop 202 lanes split near Van Buren Street (separate horizontal and vertical alignments) and travel over I-10 and the system interchange to the east and west, respectively. For the design of this option, it was decided to control the northbound and southbound Loop 202 with one horizontal and vertical alignment through the interchange. Therefore, both directions of Loop 202 would cross to either the west or east of the existing system interchange.

The alternatives previously presented assumed that the Loop 202 mainline would cross I-10 at the 4th level due to conflicting directional ramps, including: Ramp S-E, Ramp S-W, and Ramp W-N, which are at the 2nd level and Ramp E-N, which is at the 3rd level. As part of this analysis, the ability to carry the Loop 202 mainline through the existing system interchange at the 2nd level was investigated. If the Loop 202 mainline were to cross I-10 at the 2nd level to the <u>east</u> of the existing system interchange, Ramp S-E would need to be reconstructed and raised to the 3rd level. Since the reconstructed Ramp S-E would then be in direct conflict with the existing Ramp E-N, which is already at the 3rd level, this option was removed from further consideration. If the Loop 202

mainline were to cross I-10 to the west of the existing interchange, Ramp S-W would need to be reconstructed and raised to the 3rd level. Since there were no immediately identifiable conflicts with this, it was carried forward as the option for this analysis.

ANALYSIS

The Loop 202 mainline profile, shown in **Figure 1,** is designed to travel over I-10 and under Ramp E-N and Ramp S-W (reconstructed) while providing clearance between each for a 6-foot structure depth and 17 feet of (16 feet required) vehicle clearance. While the profile for the mainline, along with other design sections, meets minimum clearance criteria, the clearance during construction may not meet minimum clearance criteria. A discussion on the impacts of construction false work on the proposed profiles can be found in the **Future Analysis** section of this report.

The Loop 202 mainline matches into the existing Loop 101 mainline ½-mile north of McDowell Road. For the design of this option, it was decided to provide the Loop 101 to Loop 202 connection on the interior lanes, consistent with Federal Highway Administration (FHWA) practices, while providing the Loop 101 to I-10 connections on the exterior lanes through the use of collector-distributor roadways (C-D). The C-D roads match into the directional ramps north of the existing structures over McDowell Road and enter and exit Loop 101 mainline at Thomas Road. The design of this option assumes the Loop 101 section at Thomas Road contain six general-purpose lanes in each direction. Improvements to Loop 101 north of Thomas Road will be discussed in the **Future Analysis** section of this report.

The southbound and northbound Loop 101 C-D roads (SB 101 CD and NB 101 CD) will be three lanes each, corresponding to the three lanes from their respective directional ramps. SB 101 CD is shown in **Figure 2a** and NB 101 CD is shown in **Figure 2b**. If SB 101 CD utilizes the existing structure over McDowell Road, the profile does not meet minimum design criteria for a 65 mph design speed. Due to this fact, a second profile, which would require a new structure, is also presented for SB 101 CD. A discussion on the benefits of the second option versus the cost of a new structure can be found in the **Future Analysis** section of this report. There are also two profiles shown for NB 101 CD, but these correspond to the different local access options presented in **Figure 4** and **Figure 5**.

The reconstructed Ramp S-W, shown in **Figure 3**, exits from SB 101 CD ¼-mile north of McDowell Road and enters at the existing Ramp S-W gore with I-10. The exit ramp gore is located within the limits of SB 101 CD's structure over Loop 202 mainline. The location of the exit gore is necessary to provide enough distance for Ramp S-W's profile to reach the 3rd level, based on grade and sight distance criteria, as it crosses over the Loop 202 mainline south of McDowell Road. The location is optimal because Ramp S-W exits SB 101 CD as SB 101 CD's profile is descending into a sag vertical curve and any movement of the exit to the south would reduce the distance and increase the change in height that Ramp S-W has to travel to reach the 3rd level.

The project team was directed to include a direct connection for the existing HOV lanes on I-10 to the future HOV lanes on Loop 101. The future HOV lanes on Loop 101 and the direct connection ramps are both included in the Regional Transportation Plan's 20-year freeway funding program. This directional ramp, shown in **Figure 4**, was designed to travel over all of the ramps and mainline lanes within the system interchange at the 4th level.

For all of the alternatives presented to date, it has been the Project Team's goal to provide equal or better local access than currently exists. For this design, the local access has been broken into two figures. **Figure 5** (Local Access A) shows an option for providing local access from the existing arterials (McDowell Road and Thomas Road) to SB 101 CD and NB 101 CD. **Figure 6** (Local Access B) shows an option for providing access from the existing arterials to the Loop 202/ Loop 101 mainline. The options are presented separately based on what is being accessed, but the final design may include any combination of the two options. After initial discussion with project team members, it was decided to investigate a local access option that provides all of the access options presented in Local Access A and Local Access B. Local Access C, shown in **Figure 7**, allows for the combination of the options discussed previously.

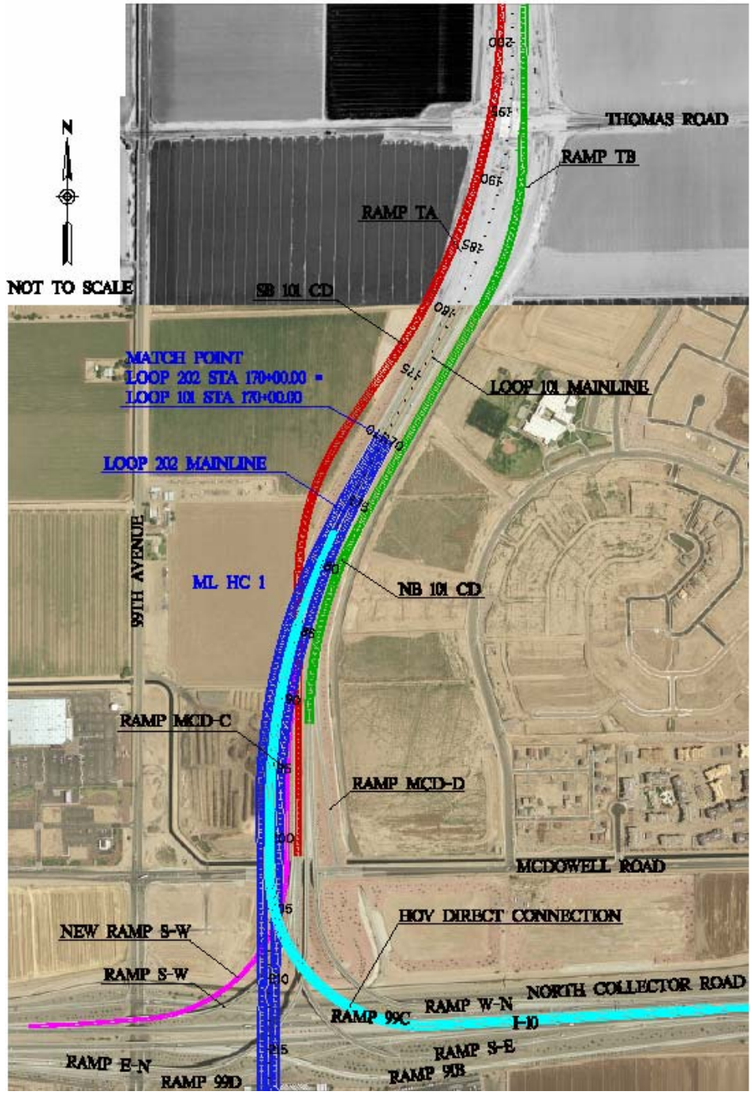
FUTURE ANALYSIS

The vertical profiles for all of the sections discussed were designed to accommodate the required vehicle clearance from the design criteria. It has been noted that during construction false work would possibly encroach on the minimum clearance in some sections. This analysis did not remove any viable options based on unacceptable vertical clearance due to construction false work.

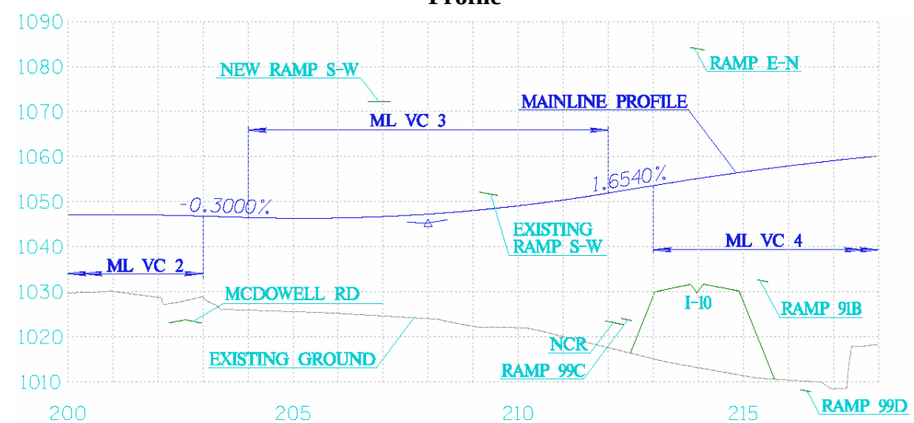
From the analysis of the options above it was found that future investigation of the total required improvements to Loop 101 for any direct connection alternative would be needed. The analysis assumed that the Loop 101 section at the departure of SB 101 CD and NB 101 CD would be six general-purpose lanes in each direction. The required improvements along I-10 to accommodate a new fully directional system interchange for Alternative 1 and Alternative 6 have been previously presented. The results showed that as many as 8 general-purpose lanes in each direction were required through some sections on I-10. No modeling or forecasting has been done along the Loop 101 including a direct connection with Loop 202. Verification of the assumptions for this analysis may be needed.

The two options for the profile of SB 101 CD depend on whether a new structure over McDowell Road is to be constructed. If the CD roads are designated as having a design speed of 65 mph, then the grades (>3.0 %) on SB 101 CD (existing McDowell Road structure) do not meet minimum design criteria. For this option, design exceptions or a lower designated design speed will be required. On the other hand, if a new structure is constructed, the grades can be flattened to meet minimum design criteria.

Plan View



Profile



Curve Tables

HORIZONTAL CURVE TABLE

MAINLINE	PI STATION	Δ	D	R (ft)	L (ft)	e ('/ft)	Ls (ft)
ML HC 1	186+59.76	28.39.30 L	1.15.00	4583.66	2292.68	0.036	150
*ML HC 2	232+04.28	2.22.41 R	0.20.00	17188.73	713.42	NC	-
*ML HC 3	240+84.15	2.11.35 L	0.20.00	17188.73	657.92	NC	-

VERTICAL CURVE TABLE

MAINLINE	PI STATION	G1	G2	L (ft)	SDs (ft)	**Provided Design Speed (mph)	Allowable Design Speed (mph)
*ML VC 1	182+00.00	-0.4041%	1.6200%	800	9400	>90	65
ML VC 2	195+00.00	1.6200%	-0.3000%	1600	1072	79	65
ML VC 3	208+00.00	-0.3000%	1.6540%	800	4686	>90	65
ML VC 4	223+00.00	1.6540%	-1.0386%	2000	992	75	65

*Not Shown
** Based on WinSDs, ADOT Roadway Design Section, 1996.

Description

Plan:

- This option allows the Loop 202 mainline to cross I-10 at the 2nd level with complete reconstruction of the directional Ramp S-W. Unlike previous alternatives, the northbound and southbound lanes of Loop 202 are controlled by the same horizontal and vertical alignment.
- Traveling southbound, the alignment begins by departing from the existing Loop 101 alignment ½-mile south of Thomas Road. Loop 202 travels under SB 101 CD (See **Figure 2a**) and then over McDowell Road to the west of the existing structures. Continuing, the through lanes travel under the reconstructed Ramp S-W (See **Figure 3**) and the existing Ramp E-N, while passing over I-10. The alignment ends by tying back into the alternatives as described in previous reports.

Profile:

- The profile shown travels from north of McDowell Road to I-10's south right-of-way limit.
- In all cases, vertical clearances assumed a 6-foot depth of structure and a 17-foot vehicle height, for a total of 23 feet.

Notes

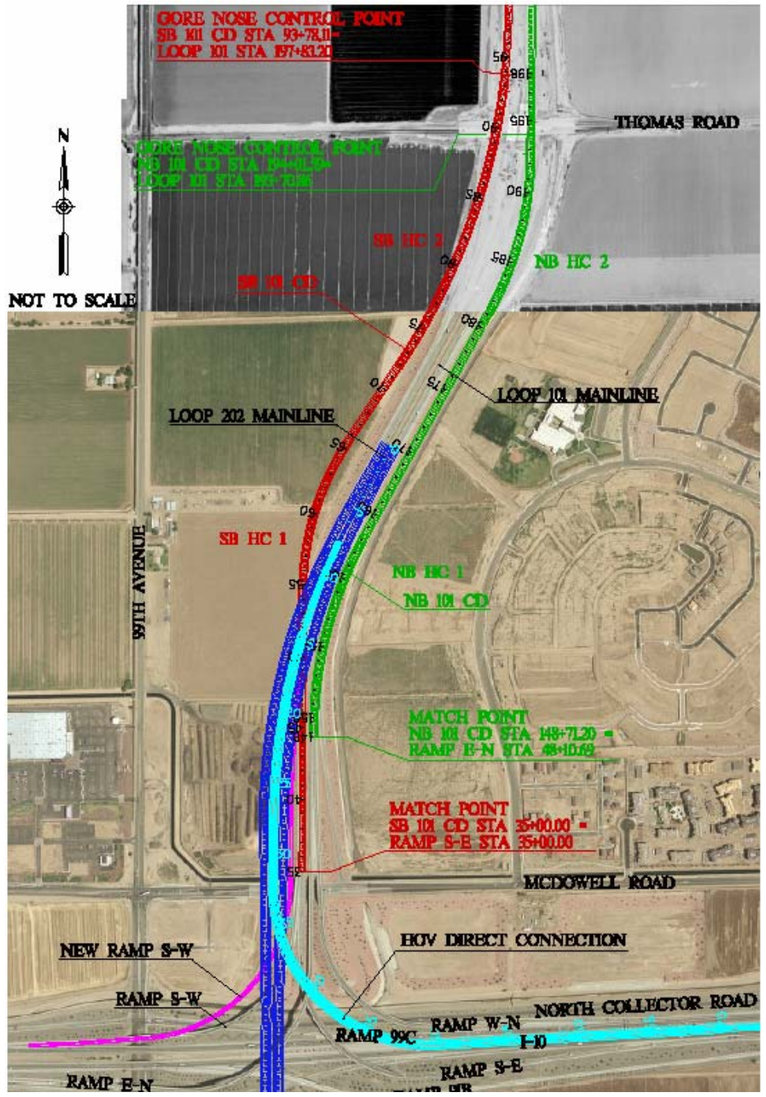
- New structures over McDowell Road and I-10 are required for the Loop 202 mainline.
- The Ramp E-N pier at station 28+71.25, which bisects the I-10 mainline, also bisects Loop 202 mainline.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
LOOP 202 MAINLINE

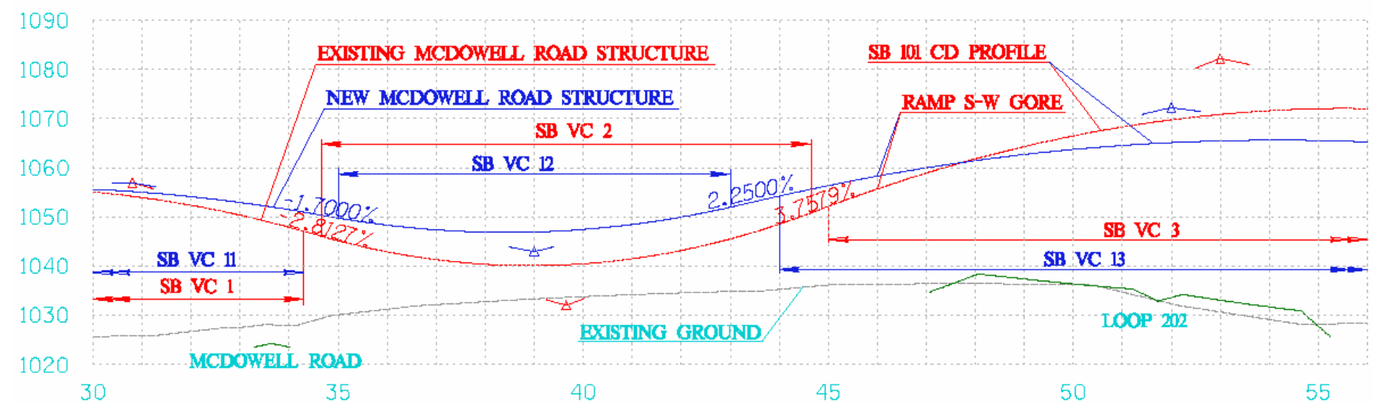
FIGURE 1

DRAFT

Plan View



SB 101 CD Profile



SB 101 CD Curve Tables

HORIZONTAL CURVE TABLE

SB 101 CD	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
SB HC 1	60+26.08	33.21.04 R	3.00.00	1909.86	1111.71	0.059	340
SB HC 2	85+66.21	33.30.57 L	1.15.00	4583.66	2684.26	0.036	150

VERTICAL CURVE TABLE

SB 101 CD (Exist McD)	PI STATION	G1	G2	L (ft)	SDs (ft)	**Provided Design Speed (mph)	Allowable Design Speed (mph)
SB VC 1	30+80.00	*0.2955%	-2.8127%	*700	547	55	65
SB VC 2	39+65.00	-2.8127%	3.7579%	1000	629	57	65
SB VC 3	53+00.00	3.7579%	-1.8982%	1600	585	55	65

SB 101 CD (New McD)	PI STATION	G1	G2	L (ft)	SDs (ft)	**Provided Design Speed (mph)	Allowable Design Speed (mph)
SB VC 11	30+80.00	*0.2955%	-1.7000%	800	730	65	65
SB VC 12	39+00.00	-1.7000%	2.2500%	800	809	67	65
SB VC 13	52+00.00	2.2500%	-1.3000%	1600	774	65	65

* Existing (Does not meet design criteria)
** Based on WinSDs, ADOT Roadway Design Section, 1996.

SB 101 CD Description

Plan:

- SB 101 CD includes one lane designated for Ramp S-W and two lanes designated for Ramp S-E.
- Traveling southbound, SB 101 CD departs from Loop 101 at Thomas Road and travels parallel to the mainline until ½-mile north of McDowell Road. The lanes bend to the south and travel over the mainline. SB 101 CD ties into the existing alignment for Ramp S-E at McDowell Road.

Profile:

- The limits of the profile shown are from existing Ramp S-E to the structure over Loop 202.
- There are two profiles presented; one utilizes the existing structure over McDowell Road (red), while the other assumes a new structure (blue).

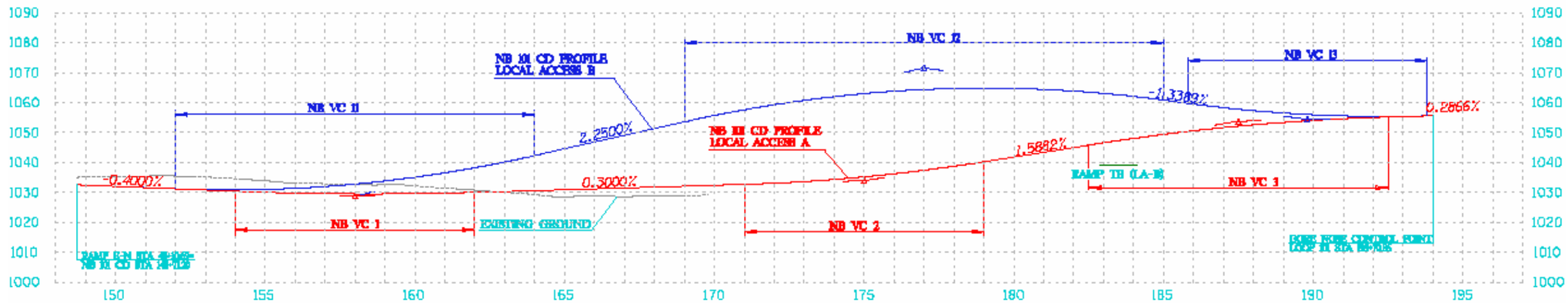
Notes

- Additional right-of-way is required.
- New structures over Thomas Road and Loop 202 are required for SB 101 CD.
- By using a new structure over McDowell Road, the vertical sight distance is increased and the vertical grades are decreased. This results in a more desirable design speed.
- The gore for Ramp S-W is 2.5 feet higher when the new structure profile is used. The reconstruction of Ramp S-W is discussed in **Figure 3**.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
SB 101 CD – NB 101 CD

FIGURE 2a

Profile



NB 101 CD Curve Tables

HORIZONTAL CURVE TABLE

NB 101 CD	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
NB HC 1	156+38.54	28.39.30 R	2.00.00	2864.79	1432.92	0.050	209
NB HC 2	187+08.60	28.49.23 L	2.30.00	2291.83	1152.92	0.056	234

VERTICAL CURVE TABLE

NB 101 CD (LA-A)	PI STATION	G1	G2	L (ft)	SDs (ft)	**Provided Design Speed (mph)	Allowable Design Speed (mph)
NB VC 1	158+00.00	-0.4000%	0.3000%	800	4111	>90	65
NB VC 2	175+00.00	0.3000%	1.5882%	800	2282	>90	65
NB VC 3	187+50.00	1.5882%	*0.2866%	1000	1010	77	65

NB 101 CD (LA -B)	PI STATION	G1	G2	L (ft)	SDs (ft)	**Provided Design Speed (mph)	Allowable Design Speed (mph)
NB VC 11	158+00.00	-0.4000%	2.2500%	1200	1989	>90	65
NB VC 12	175+00.00	2.2500%	-1.3389%	1600	770	65	65
NB VC 13	187+50.00	-1.3389%	*0.2866%	800	1830	>90	65

*Existing (Does not meet design criteria) - **Based on WinSDs, ADOT Roadway Design Section, 1996

NB 101 CD Description

Plan:

- NB 101 CD includes two lanes from Ramp W-N and one lane from Ramp E-N.
- As described traveling northbound, the NB 101 CD lanes depart from the existing alignment ¼-mile north of McDowell Road. The ramps run parallel to Loop 202/Loop 101 and tie-in at Thomas Road.

Profile:

- The profile shown is from the match point with Ramp E-N to the match point with Loop 101.
- The red profile corresponds to Local Access A (**See Figure 4**). This profile is very similar to the profile for Loop 101/Loop 202 mainline through this area.
- The blue profile corresponds to Local Access B (**See Figure 5**). In order to allow the New Ramp TB (LB-B) to travel under NB 101 CD, the profile needed to be raised.

Notes

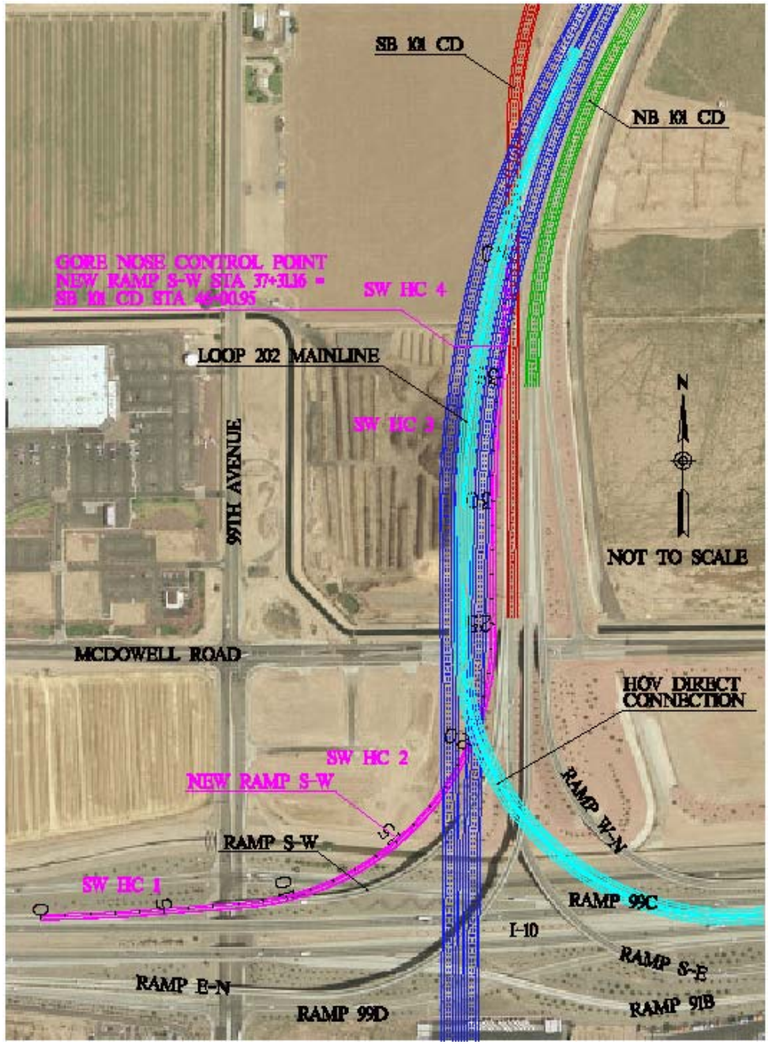
- A new structure over Thomas Road is required for both profiles.
- Additional right-of-way is required.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
NB 101 CD

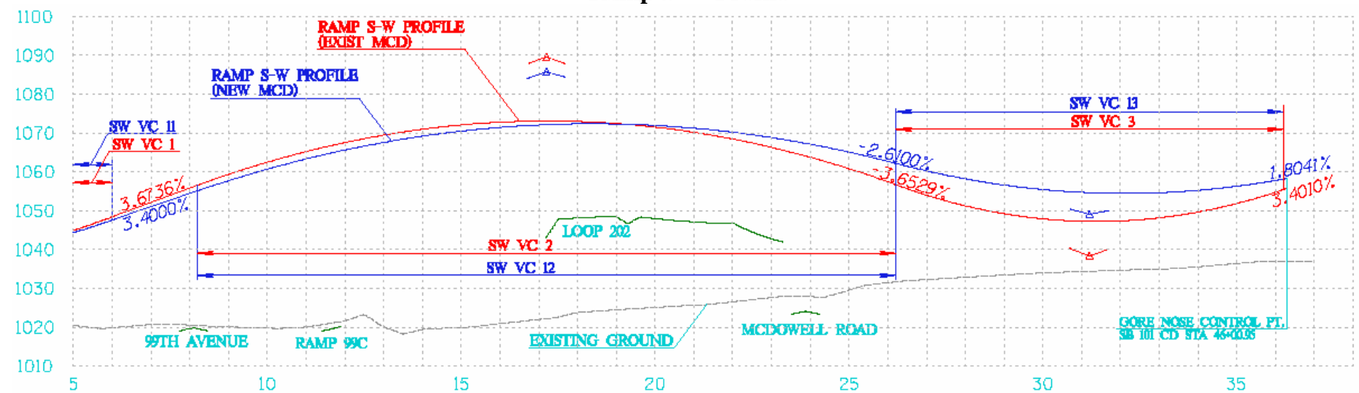
FIGURE 2b

DRAFT

Plan View



Ramp S-W Profile



Ramp S-W Curve Tables

HORIZONTAL CURVE TABLE

Ramp S-W	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
S-W HC 1	3+13.23	2.21.52 L	1.00.00	5729.58	236.45	0.027	72
S-W HC 2	18+24.07	85.14.42 L	5.15.00	1091.35	1623.72	0.057	181
S-W HC 3	32+31.52	5.00.00 R	1.00.00	5729.58	500.00	NC	-
S-W HC 4	38+62.78	5.00.00 L	1.00.00	5729.58	500.00	0.027	72

VERTICAL CURVE TABLE

Ramp S-W (**Exist McD**)	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
S-W VC 1	3+00.00	1.6587%	3.6736%	600	2683	>90	65
S-W VC 2	17+20.00	3.6736%	-3.6529%	1800	571	54	50
S-W VC 3	31+20.00	-3.6529%	3.4010%	1000	592	55	60

Ramp S-W (**New McD**)	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
S-W VC 1	3+00.00	1.6587%	3.4000%	600	1311	>90	60
S-W VC 2	17+20.00	3.4000%	-2.6100%	1800	631	57	50
S-W VC 3	31+20.00	-2.6100%	1.8041%	1000	894	70	60

* Based on WinSDs, ADOT Roadway Design Section, 1996.

Ramp S-W Description

Plan:

- Ramp S-W carries one lane of traffic from southbound Loop 101 to westbound I-10.
- The ramp departs from SB 101 CD as it travels over Loop 202. The ramp travels parallel to and midway between SB 101 CD and Loop 202 as it crosses over McDowell Road. Continuing, the ramp bends to the west and travels over Loop 202 and 99th Avenue before tying into the existing Ramp S-W/I-10 gore.

Profile:

- Ramp S-W needs to be raised to the 3rd level in order to allow Loop 202 to cross I-10 at the 2nd level.
- The limits of the profiles shown are from 99th Avenue to the gore nose control point with SB 101 CD.
- The two profiles correspond to the two options (new structure over McDowell Road or existing structure) for SB 101 CD.
- The "New McD" profile provides a more desirable design speed due to the flatter grades and the higher gore control point.

Notes

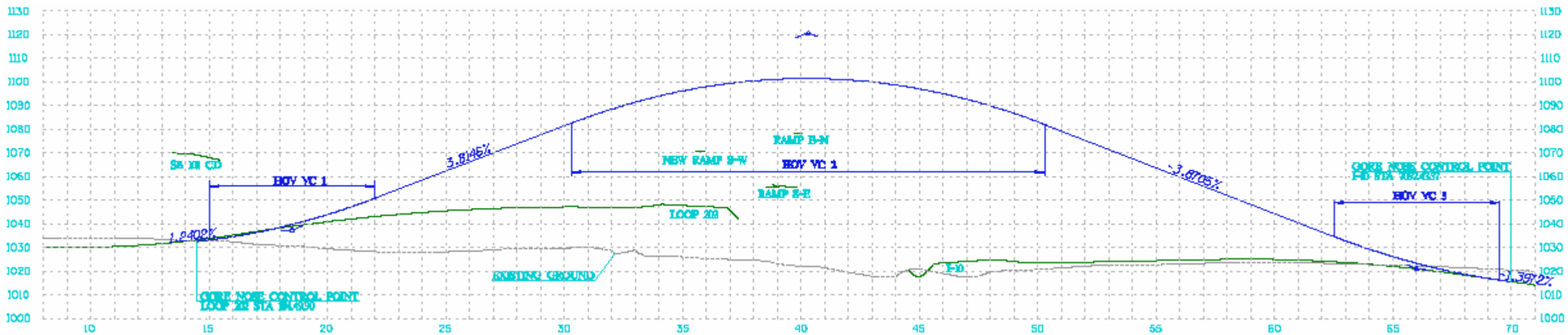
- The existing gore is relocated to allow the additional distance required to rise to the 3rd Level.
- The new ramp requires complete reconstruction including structures over McDowell Road, Loop 202, Ramp 99C/NCR, and 99th Avenue.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
RAMP S-W

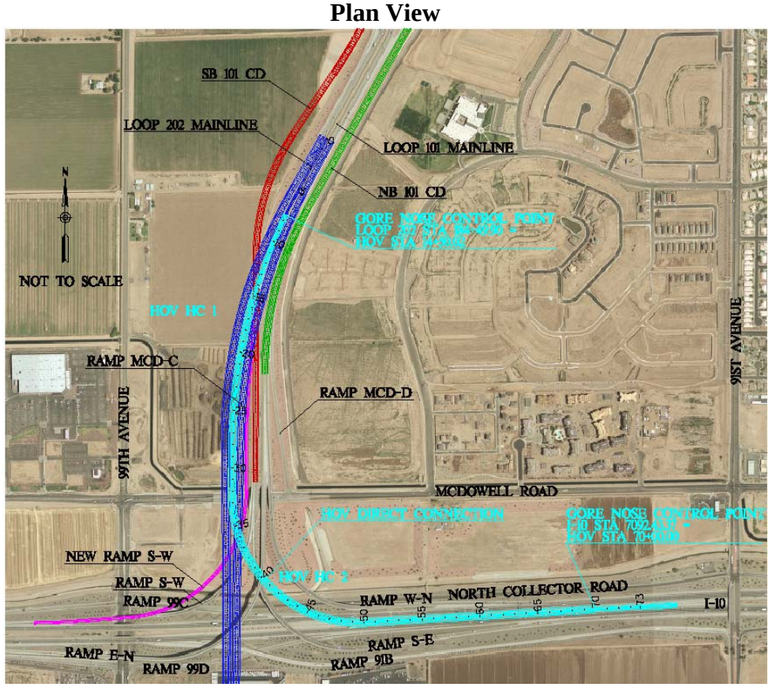
FIGURE 3

DRAFT

Profile



Plan View



Curve Tables

HORIZONTAL CURVE TABLE

HOV	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
HOV HC 1	16+59.76	28.37.26 L	1.15.00	4583.66	2289.91	0.032	86
HOV HC 2	43+97.36	93.38.38 L	5.15.00	1091.35	1783.70	0.057	181

VERTICAL CURVE TABLE

HOV	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
HOV VC 1	18+50.00	1.2402%	3.8146%	700	1336	84	60
HOV VC 2	40+30.00	3.8146%	-3.8705%	2000	588	55	50
HOV VC 3	66+00.00	-3.8705%	-1.3972%	700	1473	88	60

* Based on WinSDs, ADOT Roadway Design Section, 1996.

Description

Plan:

- HOV Direct connection ramps carry traffic from south to east and west to north.
- The typical section assumes a 12 foot lane with 10 foot and 6 foot shoulders for each directional ramp. In order to build the width for the shoulders, the mainline must bulge while the ramps are in the median.

Profile:

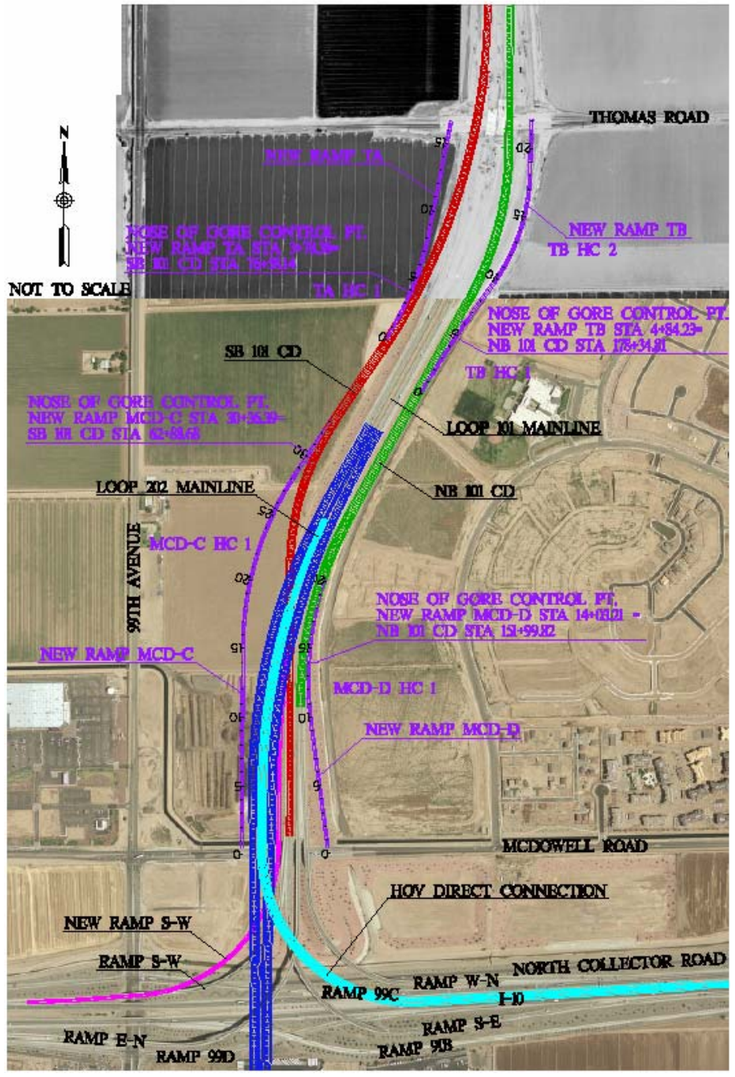
- The HOV ramps are designed to occupy the 4th Level of area through the system interchange.
- The ramps begin to ascend while within the median of the existing freeway. Once they have reached the required minimum clearance, they begin to curve and then descend in a similar fashion.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
HOV DIRECT CONNECTION

FIGURE 4

DRAFT

Plan View



Curve Tables

HORIZONTAL CURVE TABLE

RAMP TA	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
TA HC 1	4+35.13	21.30.02 L	2.30.00	2291.83	860.02	0.051	136

RAMP TB	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
TB HC 1	3+16.23	6.19.06 R	1.00.00	5729.58	631.83	0.027	72
TB HC 2	13+96.06	33.37.17 L	4.00.00	1432.40	840.54	0.052	124

RAMP McD-C	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
MCD-C HC 1	22+05.19	33.21.04 R	2.30.00	2291.83	1334.05	0.040	97

RAMP McD-D	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
MCD-D HC 1	14+98.38	26.19.37 R	2.30.00	2291.83	1053.08	0.051	136

VERTICAL CURVE TABLE

RAMP TA	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
TA VC 1	8+00.00	0.2197%	-2.1649%	800	668	62	60
TA VC 2	14+50.00	-2.1649%	1.5000%	400	487	50	50

RAMP TB	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
TB VC 1	11+00.00	1.4832%	-2.2159%	1200	657	60	60
TB VC 2	20+00.00	-2.2159%	1.5000%	400	480	50	50

RAMP McD-C	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
MCD-C VC 1	4+00.00	-2.0000%	3.9382%	750	536	55	50
MCD-C VC 2	20+00.00	3.9382%	-1.8982%	2000	675	59	60

RAMP McD-D	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
MCD-D VC 1	3+00.00	-2.0000%	2.2299%	500	507	52	50
MCD-D VC 2	9+75.00	2.2299%	-0.4800%	800	636	60	60

* Based on WinSDs, ADOT Roadway Design Section, 1996.

Description & Notes

Ramp TA:

- In this alternative, Ramp TA provides Thomas Road access to SB 101 CD, McDowell Road and eventually I-10.
- This alternative does not provide access to southbound Loop 202 from Ramp TA.
- Complete reconstruction of the existing ramp, including the intersection with Thomas Road, is required.
- The weaving distance between Ramp TA and Ramp McD-C is 1200 feet.
- Additional right-of-way is required.

Ramp TB:

- In this alternative, Ramp TB provides access to Thomas Road from NB 101 CD.
- Thomas Road is the first local access point for traffic going from I-10 to Loop 101.
- This alternative does not provide access to Thomas Road from the Loop 202/Loop 101 mainline.
- Complete reconstruction of the existing ramp, including the intersection with Thomas Road, is required.
- Additional right-of-way is required.

Ramp McD-C:

- In this alternative, Ramp McD-C provides SB 101 CD access to McDowell Road.
- The ramp terminal spacing between Ramp McD-C and New Ramp S-W is 1600'.
- Due to the Loop 202 lanes crossing McDowell Road to the west of the existing structures (See **Figure 1**), the intersection of Ramp McD-C and McDowell Road must be relocated to the west. The new intersection is 800'feet east of the intersection of 99th Avenue and McDowell Road.
- A new structure over the existing canal is required.
- Additional right-of-way is required for this ramp.

Ramp McD-D:

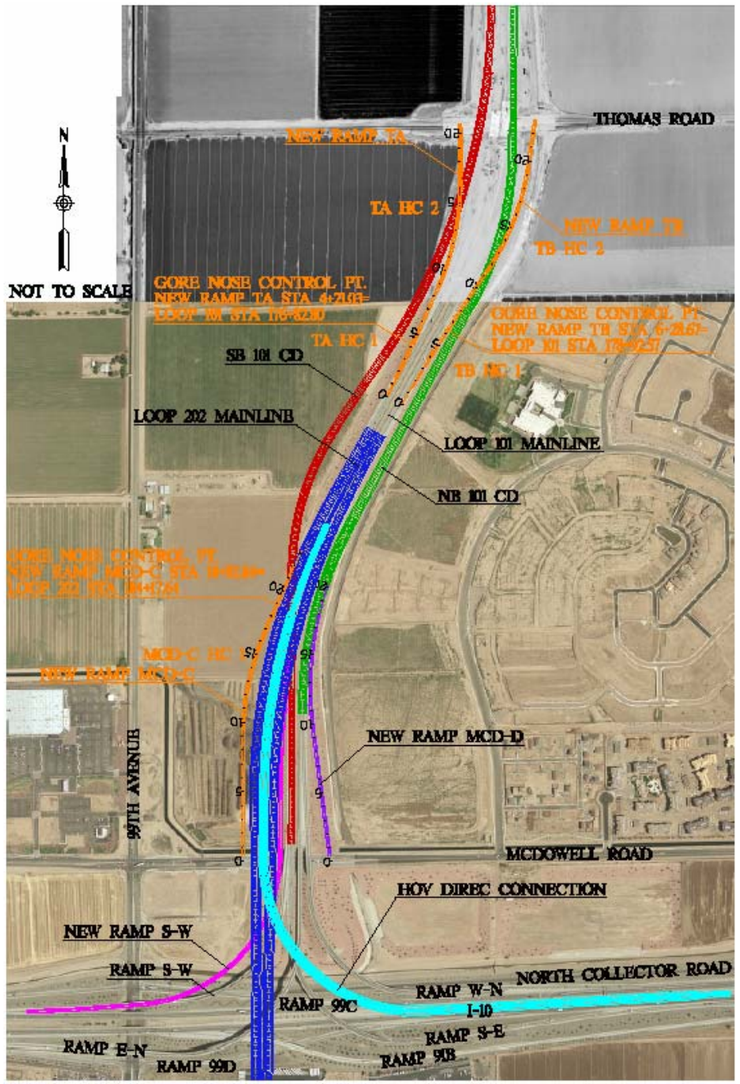
- In this alternative, Ramp McD-D provides McDowell Road access to NB 101 CD, Thomas Road and eventually Loop 101.
- Partial reconstruction of the existing ramp is required.
- The weaving distance between McD-D and Ramp TB is greater than 2000 feet.
- The new ramp can remain in existing right-of-way.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
LOCAL ACCESS A – SB 101 CD & NB 101 CD

FIGURE 5

DRAFT

Plan View



Curve Tables

HORIZONTAL CURVE TABLE

NEW RAMP TA	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
TA HC 1	2+50.16	5.00.00 L	1.00.00	5729.58	500.00	0.027	72
TA HC 2	12+67.04	24.20.37 L	3.00.00	1909.86	811.45	0.045	107

NEW RAMP TB	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
TB HC 1	3+16.23	6.19.06 R	1.00.00	5729.58	631.83	0.027	72
TB HC 2	13+96.06	33.37.17 L	4.00.00	1432.40	840.54	0.052	124

NEW RAMP McD-C	PI STATION	Δ	D	R (ft)	L (ft)	e_{max} ('/ft)	Ls (ft)
MCD-C HC 1	13+10.07	24.41.02 R	3.00.00	1909.86	822.79	0.045	107

VERTICAL CURVE TABLE

NEW RAMP TA	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
TA VC 1	8+40.00	0.5563%	-2.2138%	800	620	59	60
TA VC 2	14+90.00	-2.2138%	1.5000%	400	480	50	50

NEW RAMP TB	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
TB VC 1	11+00.00	1.4832%	-2.2159%	1200	657	60	60
TB VC 2	20+00.00	-2.2159%	1.5000%	400	480	50	50

NEW RAMP McD-C	PI STATION	G1	G2	L (ft)	SDs (ft)	*Provided Design Speed (mph)	Allowable Design Speed (mph)
MCD-C VC 1	2+20.00	-1.5000%	1.6695%	400	587	56	50
MCD-C VC 2	13+50.00	1.6695%	-1.1586%	1000	686	61	60

Description & Notes

Ramp TA:

- In this alternative, Ramp TA provides Thomas Road access to Mcdowell Road and soutbound Loop 202 mainline.
- This alternative does not provide access to the southbound Loop 101 to I-10 directional ramps.
- Complete reconstruction of the existing ramp, including the intersection with Thomas Road, is required.
- The weaving distance between Ramp TA and Ramp McD-C is 1700 feet.
- Additional right-of-way is required.
- An additional structure for SB 101 CD over Ramp TA is required.

Ramp TB:

- In this alternative, Ramp TB provides access to Thomas Road from northbound Loop 202/Loop 101 mainline.
- This alternative does not provide access to Thomas Road from the I-10 to northbound Loop 101 directional ramps.
- Complete reconstruction of the existing ramp, including the intersection with Thomas Road, is required.
- Additional right-of-way is required.
- An additional structure for NB 101 CD over Ramp TB is required.

Ramp McD-C:

- In this alternative, Ramp McD-C provides Loop 202/Loop 101 mainline access to McDowell Road.
- The gore for Ramp McD-C is located under the structure for SB 101 CD.
- Due to the Loop 202 lanes crossing McDowell Road to the west of the existing structures (See **Figure 1**), the intersection of Ramp McD-C and McDowell Road must be relocated to the west. The new intersection is 800 feet east of the intersection of 99th Avenue and McDowell Road
- A new structure over the existing canal is required.
- Additional right-of-way is required for this ramp.

Ramp McD-D:

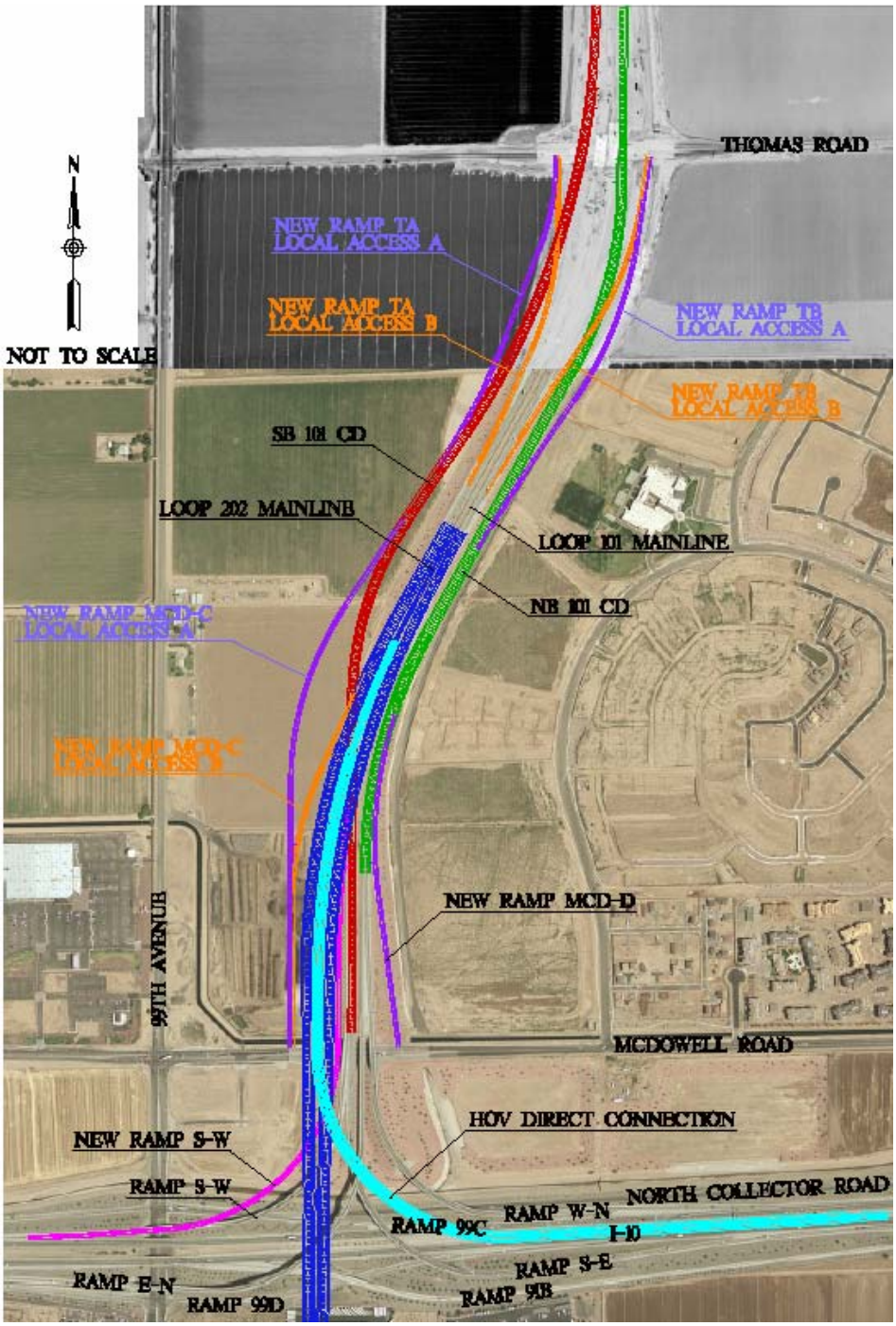
- There is no second alternative for Ramp McD-D, since Local Aceess A (See **Figure 4**) provides access to NB 101 CD, which provides access to northbound Loop 202/Loop 101 mainline.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
LOCAL ACCESS B – LOOP 202 MAINLINE

FIGURE 6

South Mountain Transportation Corridor
¼-Mile East of 99th Avenue – Mainline at 2nd Level – Reconstruction to Ramp S-W

Plan View



Description & Notes

Local Access C provides complete access to both Loop 101/Loop 202 mainline and the I-10/Loop 101 directional ramps. For all of the access points, the Local Access B ramp's horizontal and vertical alignments were kept constant and the Local Access A ramp's horizontal and vertical alignments were adjusted to tie into the Local Access B ramps at the arterial intersections.

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
Loop 101 Direct Connection Alternatives
LOCAL ACCESS C -
LOCAL ACCESS A + LOCAL ACCESS B

FIGURE 7

DRAFT

Traffic Report

In support of the
Environmental Impact Statement

South Mountain Transportation Corridor in Maricopa County, Arizona

Arizona Department of Transportation
Federal Highway Administration
in cooperation with
United States Army Corps of Engineers
United States Bureau of Indian Affairs

Version 7.0/January 2007
TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D

Abstract: This document assesses and describes the effects on traffic as a result of the construction and operation of the proposed South Mountain Freeway as adopted in the 2004 Regional Transportation Plan. Contents of this document will be presented in Chapter 3 of the South Mountain Transportation Corridor Environmental Impact Statement.

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LIST OF ACRONYMS AND ABBREVIATIONS

101L	Loop 101
202L	Loop 202
ADT	Average daily traffic
ADOT	Arizona Department of Transportation
C	Central
DCR	Design Concept Report
E	East
EA	Environmental Assessment
E1	E1 Alternative
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FR	Full Reconstruction
GP	General Purpose
GRIC	Gila River Indian Community
HOV	High Occupancy Vehicle
I-10	Interstate 10
LOS	Level of Service
MAG	Maricopa Association of Governments
MOE	Measure of Effectiveness
MP	Mile post
mph	miles per hour
M-VMT	Million Vehicle Miles Traveled
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act of 1969
PR	Partial Reconstruction
RFS	Regional Freeway System
ROW	right-of-way
RTP	Regional Transportation Plan
SEC	Seconds
SMPP	South Mountain Park/Preserve

SMTC	South Mountain Transportation Corridor
SOV	Single Occupant Vehicle
SR	State Route
TI	Traffic Interchange
TRA	Traffic Research and Analysis, Inc.
VMT	Vehicle Miles Traveled
vpd	Vehicles per day
vph	Vehicles per hour
W	West
W101	W101 Alternative
W101WFR	W101 Alternative, Western alignment, Full Reconstruction
W101WPR	W101 Alternative, Western alignment, Partial Reconstruction
W101CFR	W101 Alternative, Central alignment, Full Reconstruction
W101CPR	W101 Alternative, Central alignment, Partial Reconstruction
W101EFR	W101 Alternative, Eastern alignment, Full Reconstruction
W101EPR	W101 Alternative, Eastern alignment, Partial Reconstruction
W55	W55 Alternative
W71	W71 Alternative

GLOSSARY

affected environment Those elements of the project area that may be changed by the proposed alternatives. These changes might be positive or negative in nature.

capacity The maximum number of vehicles that a given section of roadway or traffic lane can accommodate.

CORSIM A traffic microsimulation package. For this project it was used to simulate arterial streets and intersections.

cumulative impact The impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can results from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7)

direct impact Changes that are caused by the action and occur at the same time and same place as the action.

Eastern Section The portion of the Study Area located east of 55th Avenue that corresponds to the Eastern Section alternative (E1).

EIS The project documentation prepared in accordance with the National Environment Policy Act when the project is anticipated to have a significant impact on the environment.

EMME-2 The transportation demand model software used by MAG

FHWA A branch of the US DOT responsible for administering the Federal-Aid Program. The program provides financial resources and technical assistance for constructing, preserving and improving the National Highway System along with other urban and rural roads.

gore The area between the freeways mainline and entrance/exit ramps.

impact A direct or indirect consequence of the construction or operation of a proposed alternative on the environment in the Study Area.

indirect impact Changes that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect impacts may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water, and other natural systems, including ecosystems.

mitigation An action taken to reduce or eliminate an adverse impact stemming from construction, operation, or maintenance of a proposed action alternative. Mitigation could reduce the magnitude and extent of an impact from a level of significance to a level of insignificance. Mitigation includes:

Avoiding the impact altogether by not taking a certain action or parts of an action.

Minimizing impacts by limiting the degree of magnitude of the action and its implementation.

Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

Reducing or eliminating the impact over time by preservation and maintenance

operations during the life of the action.

Compensating for the impact by replacing or providing substitute resources or environments. (40 CFR 1508.20).

Study Area The geographic area within which build alternative solutions to the problem are developed.

VISSIM A traffic microsimulation software package. For this project it was used to simulate the freeway mainline.

Western Section The portion of the Study Area located west of 55th Avenue that corresponds to the Western Section alternatives (W55, W71, and W101).

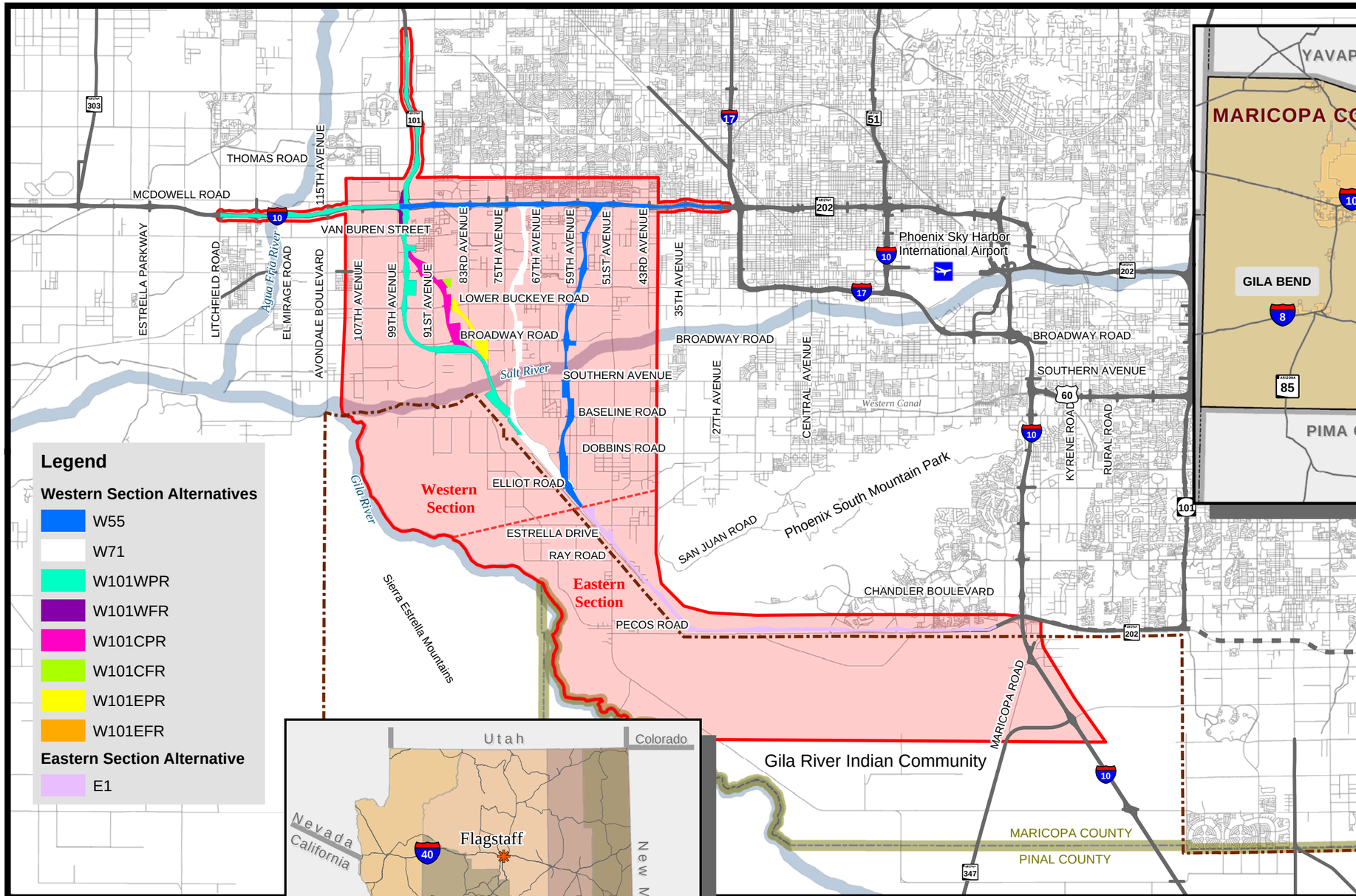
1. Project Description and Purpose and Need

PROJECT DESCRIPTION

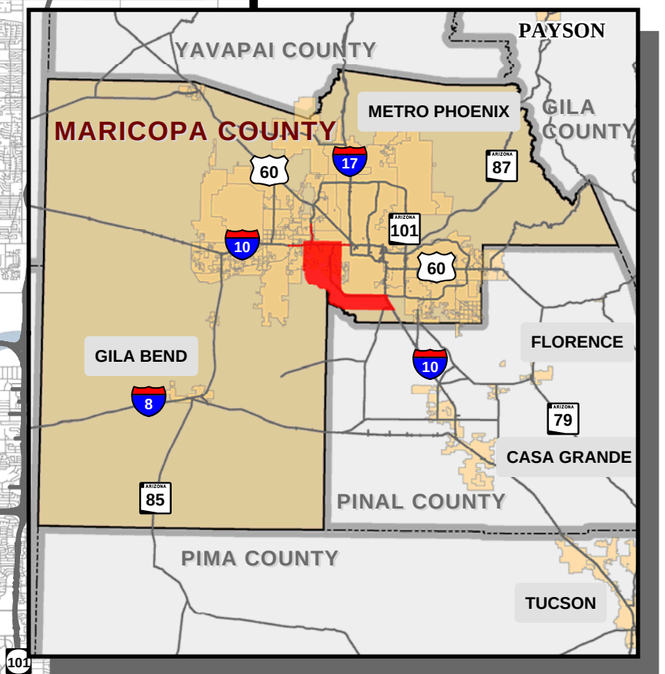
The Arizona Department of Transportation (ADOT) is studying the South Mountain Transportation Corridor (SMTC) in south Phoenix, Maricopa County, Arizona. The South Mountain Freeway corridor was adopted into the Maricopa Association of Governments (MAG) regional freeway system in 1985 as part of the MAG Freeway/Expressway Plan (MAG, 1985), at which time it was placed on the state highway system by the State Transportation Board. In 1988, ADOT prepared a Design Concept Report (DCR) and a State-Level Environmental Assessment for the project, identified at that time as the South Mountain Parkway (ADOT, 1988a, 1988b). As presented then, the project would connect Interstate 10 (I-10) (Maricopa

Freeway) south of Phoenix with I-10 (Papago Freeway) west of the city, following an east-west alignment along Pecos Road, through the western tip of the Phoenix South Mountain Park/Preserve (SMPP), then north to I-10 between 55th and 63rd avenues. Due to the time elapsed since those documents were approved and to secure eligibility for federal funding for a proposed project within this corridor, ADOT and the Federal Highway Administration (FHWA) are now preparing an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act. In November 2004, the MAG Regional Transportation Plan (RTP) was placed before Maricopa County voters who approved the tax funding the plan (MAG, 2003). The South Mountain Freeway was included in this plan.

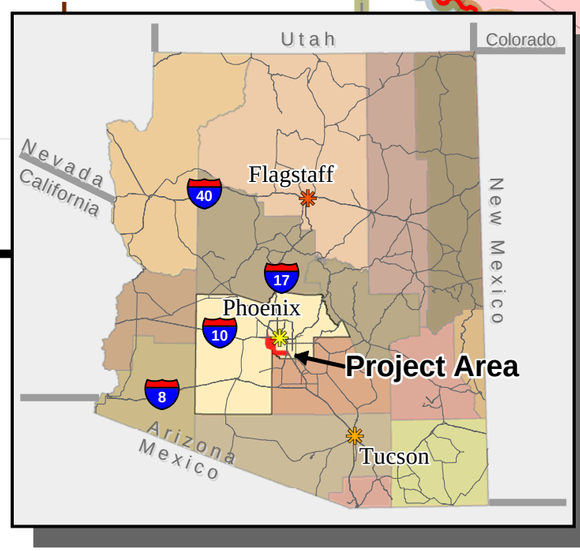
The project Study Area for the EIS includes more than 140 square miles and is divided into a Western Section and an Eastern Section at a location common to all action alternatives (Figure 1). The division between sections occurs just east of 59th Avenue and south of Elliot Road. Within the Western Section, three alternatives are being considered for detailed study. These are the W55, W71, and W101 alternatives. The W55 Alternative would connect to I-10 at 55th Avenue while the W71 Alternative would connect at 71st Avenue. The W101 Alternative would connect to I-10 at the existing State Route (SR) 101 or Loop 101 (101L) (Agua Fria Freeway)/I-10 system traffic interchange (TI) and has six associated options. The W101 Alternative options vary geographically among west (W), central (C), and east (E) and would vary geometrically based on a partial reconstruction (PR) or a full reconstruction (FR) of the system TI. A list of action alternatives and options can be found in Table 1.



PROJECT STUDY AREA AND ALTERNATIVES



LOCATION MAP



VICINITY MAP

Traffic Report

Project Study Area and Alternatives, Vicinity and Location Map

South Mountain Freeway Transportation Corridor Study

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D
E:\GISDATA\Projects\AZ\ADOT\SouthMtn\TECH_REPORT0905\Traffic\Regional_Traffic0905.mxd

Figure 1

Table 1. Action Alternatives and Options

Section	I-10 Connection	Alternative	Option- Buckeye Road to Broadway Road	Option- Loop 101/I-10 Connection - Reconstruction	Option Name
Western - W	55th Avenue	**W55**			
	71st Avenue	**W71**			
	101L	**W101**	West **- W**	Partial – **PR**	**W101WPR**
				Full – **FR**	**W101WFR**
			Central **- C**	Partial **- PR**	**W101CPR**
				Full **- FR**	**W101CFR**
			East **- E**	Partial **- PR**	**W101EPR**
				Full **- FR**	**W101EFR**
Eastern – E	Pecos Road	**E1**			
Note: = Not Applicable					

Improvements to I-10 (Papago Freeway) would occur for each Western Section alternative (W55, W71, and W101). Improvements to 101L would occur for each option associated with the W101 Alternative.

Within the Eastern Section of the Study Area, one action alternative (E1 Alternative) is being considered for detailed study. The E1 Alternative would begin east of 59th Avenue and would connect to I-10 (Maricopa Freeway) at the junction of the Pecos Road/I-10/SR-202 or Loop 202 (202L) (Santan Freeway) system TI.

All alternatives and options would lie outside the Gila River Indian Community (GRIC). Coordination regarding potential Eastern Section alternatives on GRIC land is ongoing; however, permission to study such alternatives has not yet been granted.

The No Action Alternative is being considered for the entire Study Area.

PURPOSE AND NEED

Between 2004 and 2030 the total vehicle miles traveled (vmt) in the entire MAG region are projected to more than double from 93 million to 197 million. The total traffic within the Study Area is projected to increase at roughly the same rate as the entire region. The Regional Transportation Plan (RTP) identified the South Mountain Freeway, as a piece of the overall plan, to help address the current and future congestion in this area. In order to illustrate the need for

the South Mountain Freeway, this section will outline the 2030 forecast traffic conditions for the area within the Study Area and the entire MAG region. The analysis will consider the effects on traffic operations with and without the South Mountain Freeway. A number of tools, including volumes, cut-lines, level of service (LOS), and travel time will be used to present the impacts.

Growth in the Region

The Phoenix metropolitan area will continue to grow over the next 25 years. The population is expected to double from 3.10 million in 2000 to 6.24 million in 2030. Figure 2 illustrates the socioeconomic growth projected to occur during this time period. Indicated on the graphic is the anticipated increase in residences, homes and jobs within specific geographic areas of the region. As shown, the areas directly serviced by the South Mountain Freeway will account for 55 percent of the population growth and 58 percent of the employment growth.

South Mountain Freeway Volumes

In 2030, the forecast traffic on South Mountain Freeway varies along the corridor between 130,000 and 180,000 vehicles per day (vpd). For comparison, the 2003 traffic on US 60 between Rural Road and McClintock Drive was 186,000 vpd and the 2003 traffic on I-17 between I-10 and Van Buren Street was 135,000 vpd. This demonstrates a high demand among motorists for a freeway in this area.

South Mountain Freeway Users

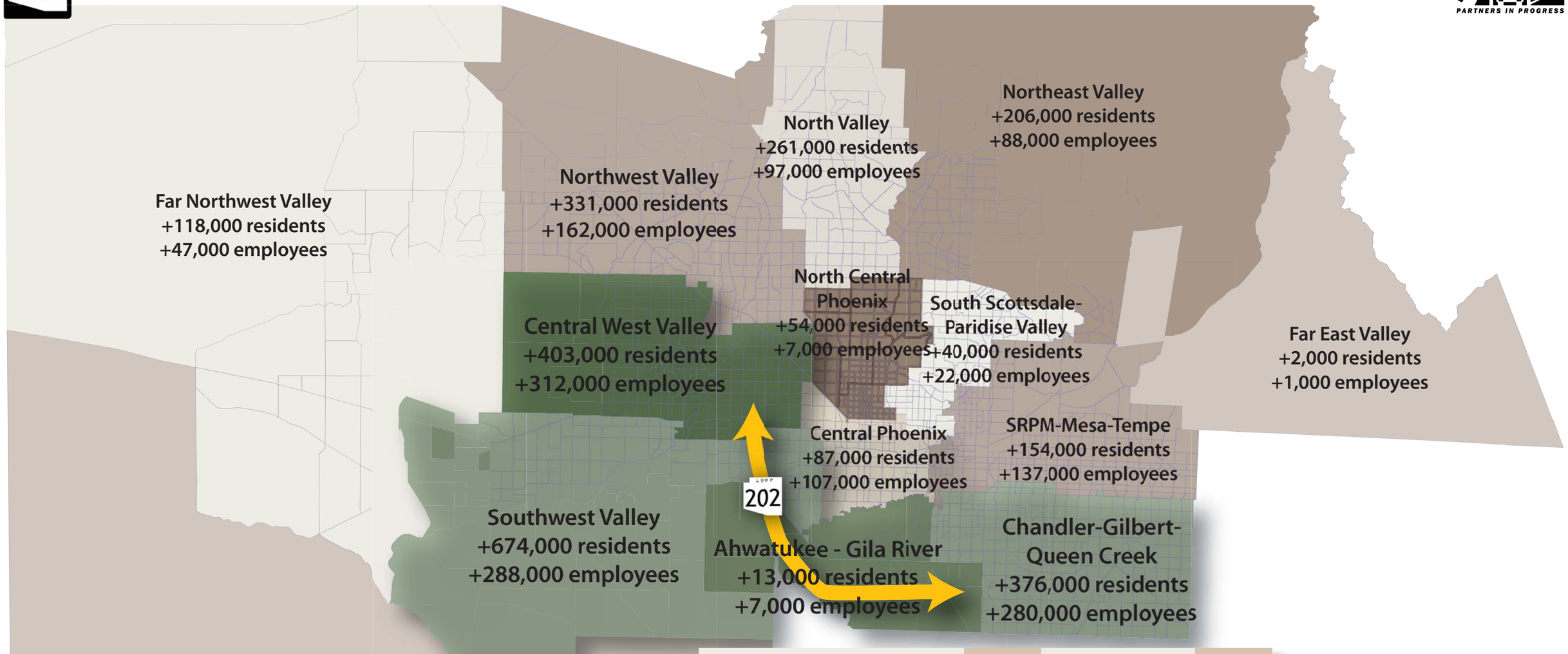
Figure 3 depicts where the users of South Mountain Freeway would be coming from or going to. This data was generated for a segment of the South Mountain Freeway just east of 51st Avenue. Over 75 percent of the freeway users at this point would be going to or from areas within Mesa, Tempe, Queen Creek, Gila River Indian Community, Chandler, Gilbert, Avondale, Glendale, Surprise, El Mirage, Goodyear, Buckeye, Tolleson, and the Laveen, Estrella, and Ahwatukee Villages of Phoenix.

Regional Freeway Volumes

The traffic projections vary with and without the South Mountain Freeway for freeway segments around the region. Six freeway locations are presented in Table 2 and are also shown in Figure 4. The largest difference in 2030 traffic is on I-10 between 48th Street and Broadway (also known as the Broadway Curve) with a reduction of 65,000 vpd between without South Mountain Freeway and with South Mountain Freeway.

South Mountain Freeway

2030 POPULATION AND EMPLOYMENT GROWTH IN THE SR-202L/SOUTH MOUNTAIN FREEWAY CORRIDOR



Activity Area	2005 Population	2030 Population	Population Growth	2005 Employment	2030 Employment	Employment Growth
Central West Valley	431,000	834,000	403,000	143,000	455,000	312,000
Southwest Valley	84,000	758,000	674,000	60,000	348,000	288,000
Chandler-Gilbert-Queen Creek	497,000	873,000	376,000	231,000	511,000	280,000
Ahwatukee-Gila River	82,000	95,000	13,000	25,000	32,000	7,000
Total for the SR-202L/South Mountain Freeway Actvity Areas	1,100,000	2,600,000	1,500,000	500,000	1,400,000	900,000
MARICOPA COUNTY	**3,500,000**	**6,100,000**	**2,600,000**	**1,600,000**	**3,300,000**	**1,700,000**
SR-202L/South Mountain Freeway Corridor Activity Areas Percentage	**32%**	**42%**	**55%**	**26%**	**41%**	**58%**

Figure 2
Page 1-5

FIGURE NOT TO SCALE
JANUARY 2006

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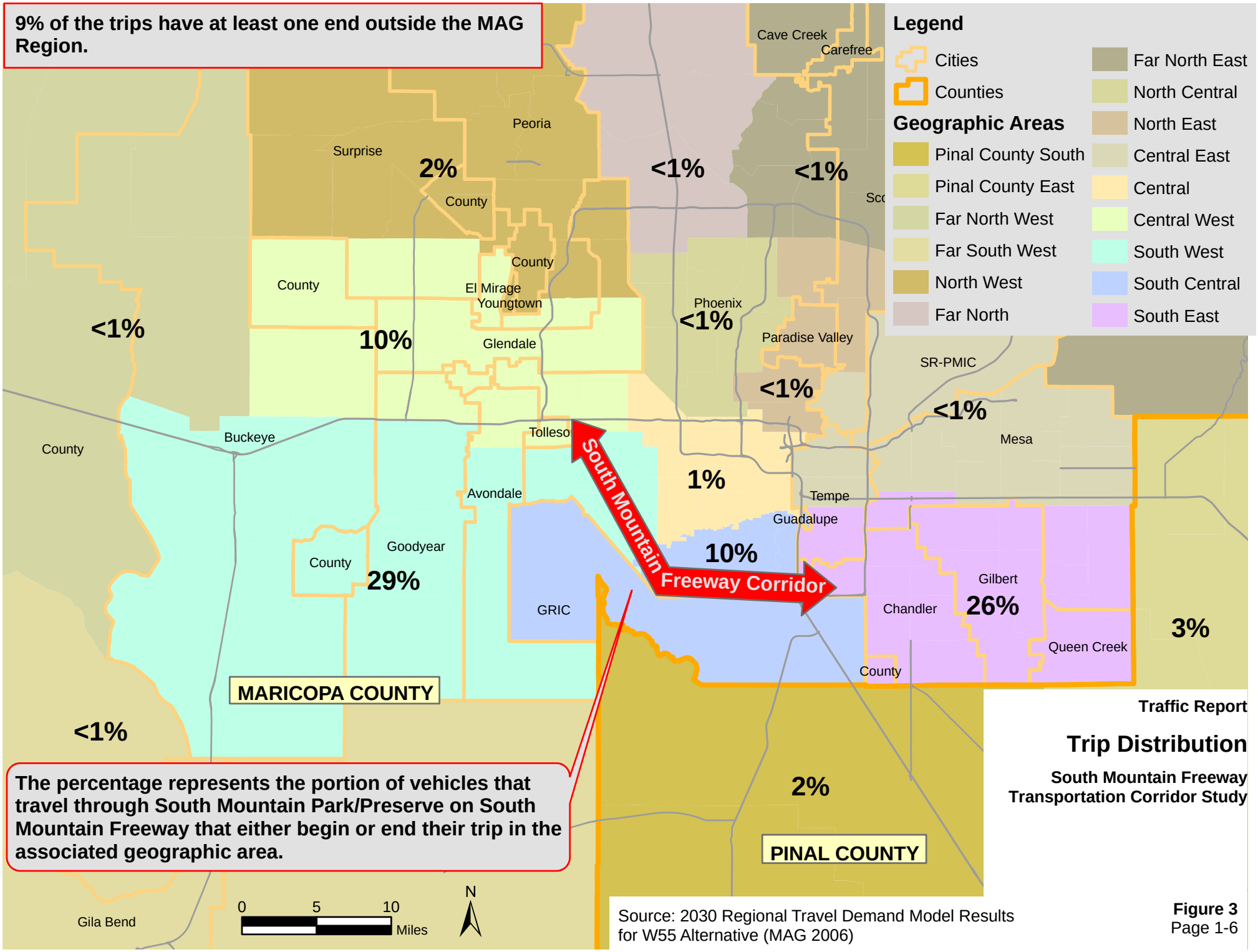


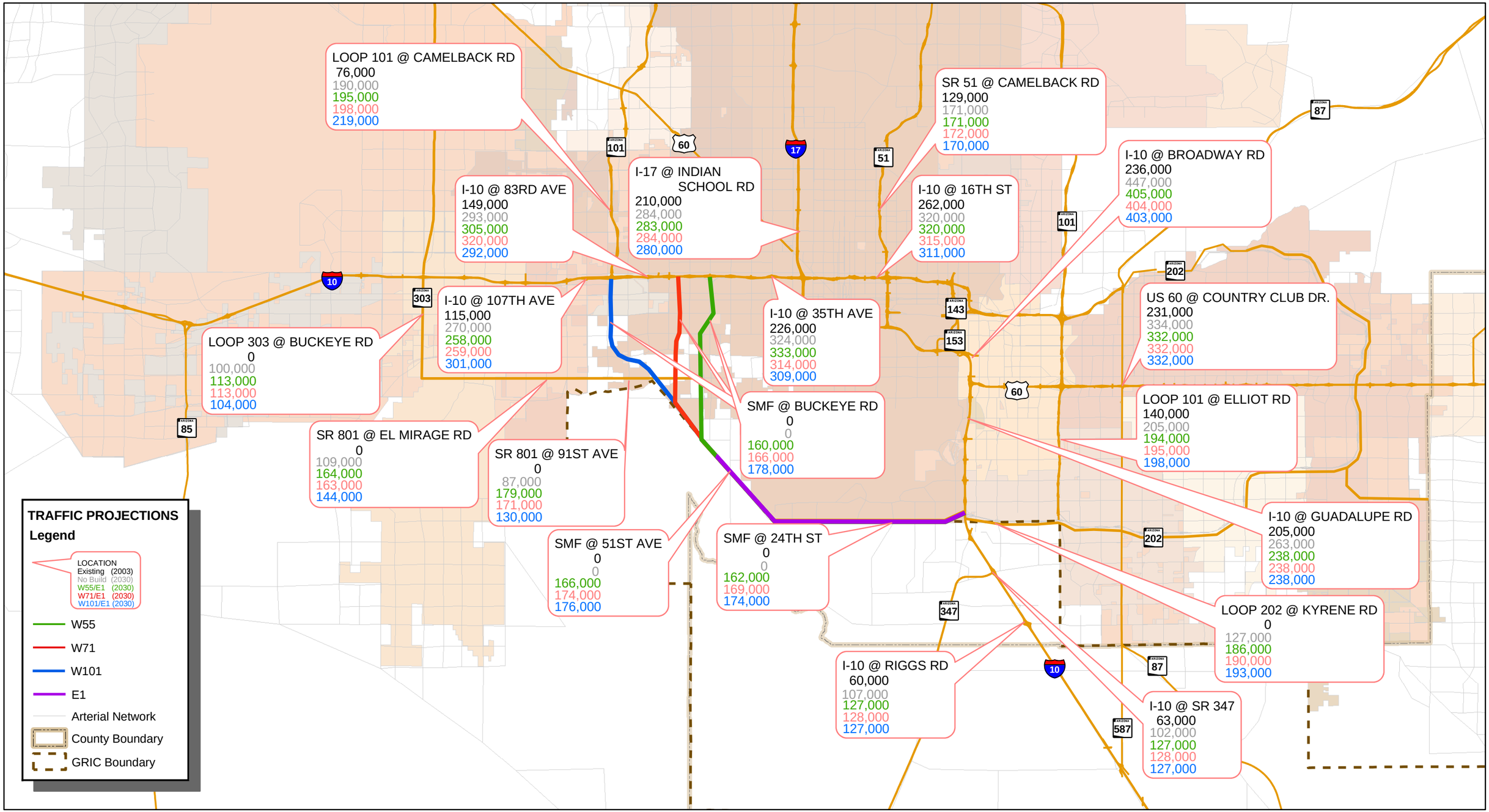
Traffic Report

Trip Distribution

South Mountain Freeway Transportation Corridor Study

Source: 2030 Regional Travel Demand Model Results for W55 Alternative (MAG 2006)

Figure 3
Page 1-6



Regional Freeway System
2003, 2030 No Action*, And 2030 Action Alternatives Traffic Volumes

Source: 2003 - MAG CERTIFIED TRAFFIC COUNTS
2030 - MAG TRANSPORTATION DEMAND MODEL

* Full Completion of Regional Transportation Plan Excluding South Mountain Freeway

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D E:\GISDATA\Projects\AZ\ADOT\SouthMtn\TECH_REPORT 0905\Traffic\traffic_middle_view_062105.mxd

Figure 4
Page 1-7

Table 2. Current Versus Projected Traffic Volumes on Selected Regional Freeway System (RFS) Segments

Segment	Vehicle Per Day, 2030		
	Without South Mountain Freeway	With South Mountain Freeway	Change
I-10, 83rd Avenue to 75th Avenue	293,000	305,000	+ 4 %
I-10, 48th Street to Broadway Road	447,000	405,000	- 9 %
I-10, 7th Street to 16th Street	320,000	320,000	No Change
I-10, Guadalupe Road to Elliot Road	263,000	238,000	- 10 %
I-17, Indian School Road to Camelback Road	284,000	283,000	No Change
101L, Guadalupe Road to Elliot Road	205,000	194,000	- 5 %

Travel Time

The travel time to and from specific locations were calculated using a traffic model that analyzes the volume results from the MAG run EMME/2 model based on the roadway type and LOS. The three trips listed in Table 3 were analyzed during the morning and afternoon peak periods.

Table 3. Travel Times in 2030

2030 Condition	Travel Time (minutes per vehicle)					
	51st Avenue and Elliot Road to I-10 and 7th Avenue		I-10 and Pecos Road to I-10 and Washington Street		I-10 and Pecos Road to I-10 and 101L	
	Morning – Laveen to Downton	Afternoon- Downtown to Laveen	Morning- Ahwatukee to Downtown	Afternoon- Downtown to Ahwatukee	Morning- East to West	Afternoon- West to East
With SMF[a]	25.8	28.7	32.2	34.2	40.5	49.9
Without SMF	27.9	33.5	40.7	46.2	50.0	65.9
Time Savings with SMF	2.1	4.8	8.5	12.0	9.5	16.0
% Time Savings with SMF	7.6%	14.4%	20.9%	26.0%	19.0%	24.2%

Notes:
a. SMF = South Mountain Freeway

The travel time savings indicated in Table 3 is per vehicle for specific trips. When travel time savings is evaluated for the region if South Mountain Freeway is built, a monetary savings can be attributed to it. With this approach, if South Mountain Freeway is built, the region would realize a savings of approximately $400 million per year each year after construction is complete.

Arterial Street Impacts

A cut-line analysis was conducted to help determine the impact of a South Mountain Freeway on the arterial street network. Three cut-lines, as shown in Figure 5, were defined as:

Cut-line 1: Along 41st Street from Pecos Road to Red Mountain Freeway

Cut-line 2: Along 47th Avenue from Estrella Drive to Interstate 10/Papago Freeway

Cut-line 3: Along the Salt River from 99th Avenue to SR 143/Hohokum Expressway

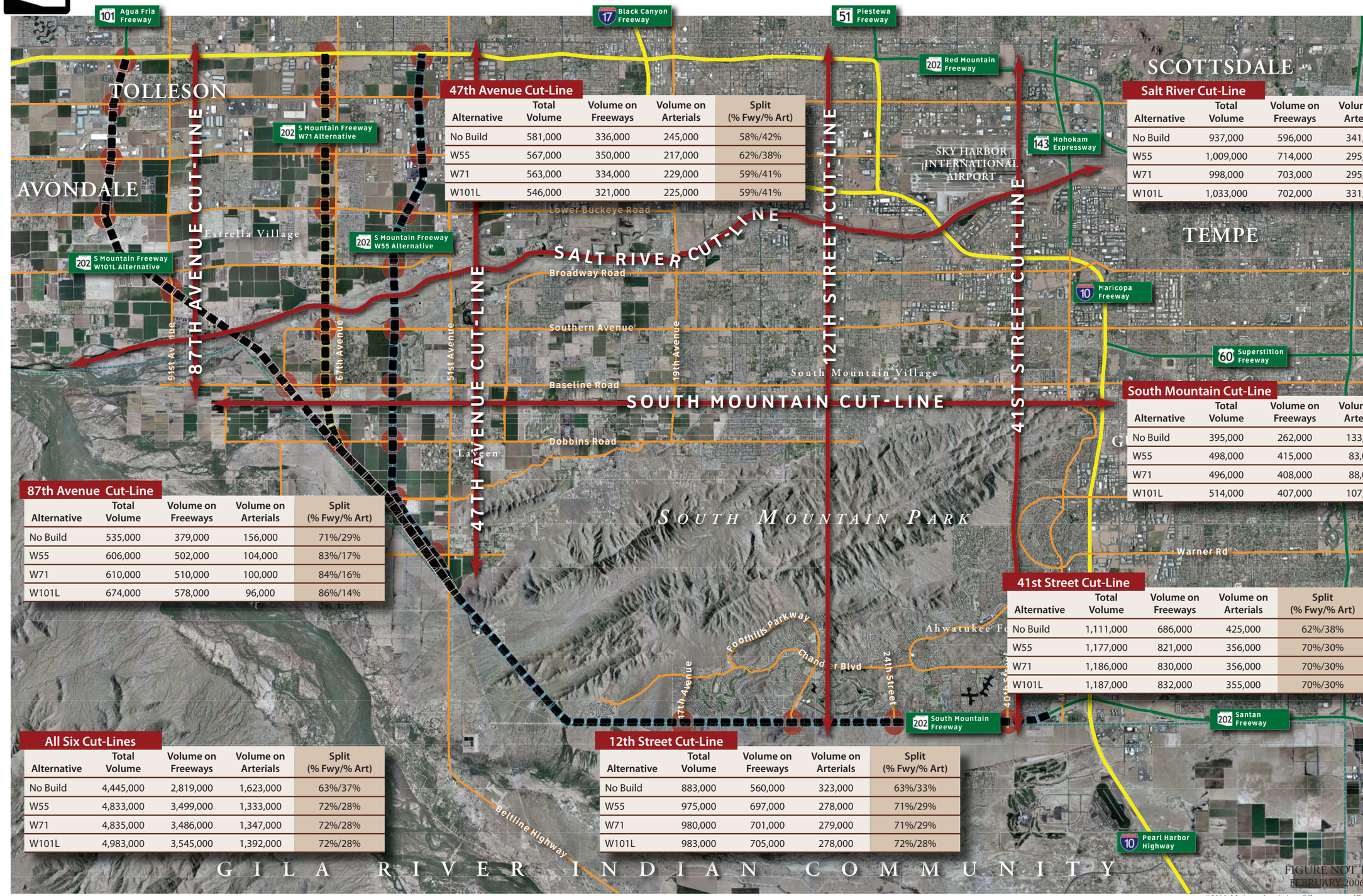
The results from the cut-line analysis are presented in Table 4. In general, there was lower demand for the arterial network with the South Mountain Freeway than without. The percent of the total traffic using arterial streets range from 27 percent to 38 percent and from 34 percent to 43 percent with and without South Mountain Freeway, respectively.

Table 4. Cut-line Comparison

Cut-line[1]	Total Volume	Volume on Freeways	Volume on Arterials	Split	
				% Freeway	% Arterial
Cut-line 1: Along 41st Street from Pecos Road to Red Mountain Freeway					
Without SMF[2]	1,111,000	686,000	425,000	62%	38%
With SMF	1,177,000	821,000	356,000	70%	30%
Cut-line 2: Along 47th Avenue from Estrella Drive to Interstate 10/Papago Freeway					
Without SMF	581,000	336,000	245,000	58%	42%
With SMF	567,000	350,000	217,000	62%	38%
Cut-line 3: Along the Salt River from 99th Avenue to SR 143/Hohokum Expressway					
Without SMF	937,000	596,000	341,000	64%	36%
With SMF	1,009,000	714,000	295,000	71%	29%

Notes:
1. For analysis purposes, with SMF values shown are for the W55 Alternative. There is no statistical difference between the alternatives.
2. SMF = South Mountain Freeway

South Mountain Freeway
2030 DAILY TRAVEL DEMAND CUT-LINE ANALYSIS IN THE CORRIDOR STUDY AREA



47th Avenue Cut-Line

Alternative	Total Volume	Volume on Freeways	Volume on Arterials	Split (% Fwy/% Art)
No Build	581,000	336,000	245,000	58%/42%
W55	567,000	350,000	217,000	62%/38%
W71	563,000	334,000	229,000	59%/41%
W101L	546,000	321,000	225,000	59%/41%

Salt River Cut-Line

Alternative	Total Volume	Volume on Freeways	Volume on Arterials	Split (% Fwy/% Art)
No Build	937,000	596,000	341,000	64%/36%
W55	1,009,000	714,000	295,000	71%/29%
W71	998,000	703,000	295,000	70%/30%
W101L	1,033,000	702,000	331,000	68%/32%

South Mountain Cut-Line

Alternative	Total Volume	Volume on Freeways	Volume on Arterials	Split (% Fwy/% Art)
No Build	395,000	262,000	133,000	66%/34%
W55	498,000	415,000	83,000	84%/17%
W71	496,000	408,000	88,000	82%/18%
W101L	514,000	407,000	107,000	79%/21%

87th Avenue Cut-Line

Alternative	Total Volume	Volume on Freeways	Volume on Arterials	Split (% Fwy/% Art)
No Build	535,000	379,000	156,000	71%/29%
W55	606,000	502,000	104,000	83%/17%
W71	610,000	510,000	100,000	84%/16%
W101L	674,000	578,000	96,000	86%/14%

41st Street Cut-Line

Alternative	Total Volume	Volume on Freeways	Volume on Arterials	Split (% Fwy/% Art)
No Build	1,111,000	686,000	425,000	62%/38%
W55	1,177,000	821,000	356,000	70%/30%
W71	1,186,000	830,000	356,000	70%/30%
W101L	1,187,000	832,000	355,000	70%/30%

All Six Cut-Lines

Alternative	Total Volume	Volume on Freeways	Volume on Arterials	Split (% Fwy/% Art)
No Build	4,445,000	2,819,000	1,623,000	63%/37%
W55	4,833,000	3,499,000	1,333,000	72%/28%
W71	4,835,000	3,486,000	1,347,000	72%/28%
W101L	4,983,000	3,545,000	1,392,000	72%/28%

12th Street Cut-Line

Alternative	Total Volume	Volume on Freeways	Volume on Arterials	Split (% Fwy/% Art)
No Build	883,000	560,000	323,000	63%/33%
W55	975,000	697,000	278,000	71%/29%
W71	980,000	701,000	279,000	71%/29%
W101L	983,000	705,000	278,000	72%/28%

Figure 5
Page 1-10

FIGURE NOT TO SCALE
FEBRUARY 2006 ANALYSIS

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Capacity Deficiency

Using a cut-line analysis approach, the capacity deficiency of the roadway network (operating at an acceptable LOS D) with and without South Mountain Freeway was determined. The capacity deficiency was calculated by comparing the total capacity and the total demand (projected 2030 volume) of all of the roadways that cross a cut-line. It is important to note, the traffic demand model already assumes a reduction in roadway demand based upon existing and planned improvements to transit, light rail, telecommuting, carpooling, and more.

For this project, a cut-line was used that cuts through the Study Area from the Phoenix Sky Harbor International Airport south into Ahwatukee Foothills. This cut-line would represent the east/west travel demand experienced within the Study Area. The result is that without a major regional roadway in the Study Area, the RTP planned roadway improvements would accommodate about 71 percent of the demand as projected in 2030. If additional funding becomes available, and more improvements can be made to transit, light rail, telecommuting, carpooling, and major arterial streets, a potential additional 13 percent of the 29 percent deficiency would be accommodated. Therefore, without a major freeway being constructed within the Study Area to provide east-west mobility, 16 percent of the drivers desiring to use the roadway network would be unable to do so. This equates to approximately 10 lanes of freeway needed beyond what has already been planned.

The same capacity deficiency analysis was performed for the cut-line with South Mountain Freeway constructed and found that the deficiency in projected capacity was 24 percent in 2030 (as compared to 29 percent). Therefore, South Mountain Freeway is projected to capture five percent of the average daily trips, leaving a remaining capacity deficiency of 11 percent.

Results of Purpose and Need Analysis

As the results of the traffic analyses show, there is a need for South Mountain Freeway for the following reasons:

- Travel within the MAG region is projected to double between 2004 and 2030.
- The majority of metropolitan-area freeways and arterials are projected to operate at LOS E or worse without South Mountain Freeway.
- South Mountain Freeway would reduce projected volumes on the remaining RFS and the local roadway network compared to the RFS and network without South Mountain Freeway.
- Without South Mountain Freeway, the RTP planned facility improvements would accommodate about 71 percent of the total demand (operating at an acceptable LOS D) that is projected in 2030.
- With South Mountain Freeway, the RTP planned facility improvements would accommodate about 76 percent of the total demand (operating at an acceptable LOS D) that is projected in 2030.

- Best-case non-freeway modal transportation improvements, including transit, Transportation Demand Management/Transportation System Management, roadway improvements (not including South Mountain Freeway), alone or cumulatively, are not enough to adequately address the projected 2030 capacity deficiencies.
- The length of travel time during peak periods would increase substantially between 2004 and 2030.
- The length of travel time during peak periods would be reduced in 2030 with South Mountain Freeway as compared to 2030 without South Mountain Freeway.

South Mountain Freeway Cross-Section

In accordance with the RTP adopted November 25, 2004, the South Mountain Freeway alternatives presented in this report assume an interim condition of three general purpose lanes in each direction resulting in the initial construction of a six-lane freeway facility. However, realizing that at some point, the freeway would likely be widened to four general purpose lanes and one high occupancy vehicle (HOV) lane in each direction (abbreviated as 4+1), the design concepts and right-of-way (ROW) 'footprints' allow for future construction of two additional lanes in each direction on the inside median when traffic volumes warrant. As such, the traffic analysis presented in this report assumes a total of five lanes in each direction along the mainline of the South Mountain Freeway, not including additional lanes necessary for lane balancing in the vicinity of system interchange connections near I-10 (Papago Freeway).

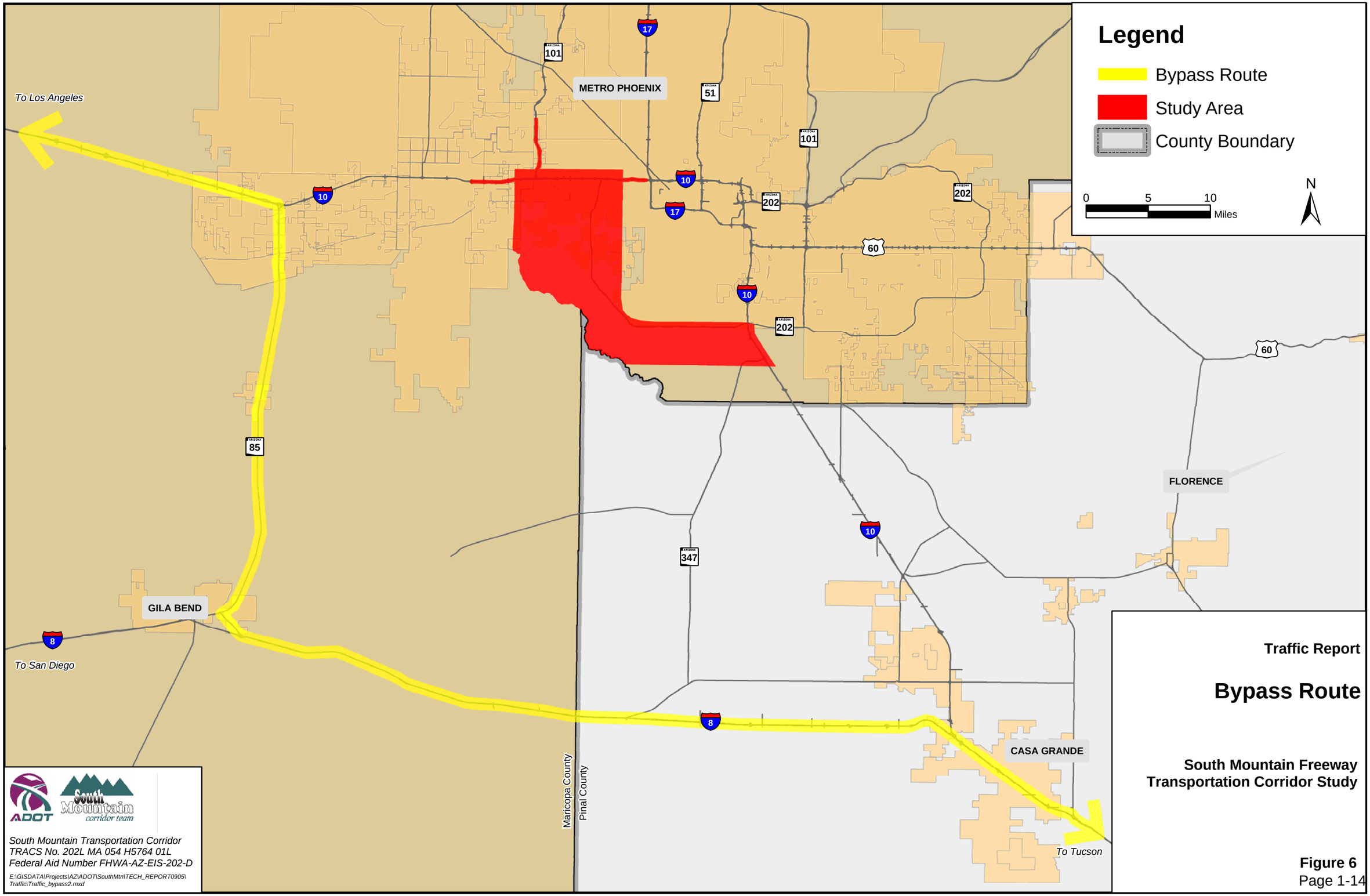
The feasibility of reversible lanes and HOV lanes along the proposed South Mountain Freeway was considered in the early stages of the development of alternatives. Because of the relatively even (55-45 percent) directional split of traffic, safety concerns and driver expectations, reversible lanes were eliminated from further consideration in this study. This elimination, however, does not preclude consideration of reversible lanes on future projects. HOV lanes restrict access to the lane during morning and afternoon peak periods to vehicles with two or more occupants. Facilities containing HOV lanes have become common in the Phoenix metropolitan area over the past several years and were included in the development of alternatives for this study. The cross-section for the proposed South Mountain Freeway includes a median wide enough to accommodate two additional lanes in each direction if and when traffic volumes warrant additional capacity. One of the two lanes has been identified for potential use as an HOV lane.

Downtown Phoenix Truck Bypass

While the proposed South Mountain Freeway would function as a continuation of the freeway loop system around downtown Phoenix, the South Mountain Freeway is not intended as a truck bypass. ADOT has an existing truck bypass of downtown Phoenix that utilizes SR 85 and Interstate 8 (I-8). The bypass route is identified in Figure 6. The existing truck bypass begins along I-10 approximately 32 miles west of downtown Phoenix, follows SR 85 for approximately

33 miles south and then connects to I-8. The truck bypass then follows I-8 approximately 63 miles east before reconnecting with I-10 approximately 56 miles south of downtown Phoenix. SR 85 is currently being reconstructed as a four-lane divided highway with limited access control. I-8 is a four-lane divided Interstate with full access control.

The MAG regional travel demand model forecasts approximately 10 percent truck traffic on the South Mountain Freeway in 2030. The forecast truck traffic is based on existing traffic studies and projected socioeconomic data. This percentage is similar to the current conditions on I-10 between 101L/Agua Fria Freeway and I-17 and on US 60/Superstition Freeway.



Traffic Report

Bypass Route

South Mountain Freeway Transportation Corridor Study

Figure 6

2. Existing Conditions

EXISTING TRAFFIC VOLUMES

The majority of the Study Area contains only arterial streets, with the exception of I-10 and a portion of 101L. As indicated in the "2003 Average Weekday Traffic Volume Map" published by MAG and shown in Figure 7, traffic volumes along arterial streets within the Study Area range from the low 1,000s to as much as 35,000 vpd. On the fringe of the Study Area, I-10 west of downtown Phoenix carries 149,000 to 174,000 vpd while I-10 south of downtown Phoenix carries around 99,000 vpd. The maximum traffic volume I-10 carried in 2003 was 262,000 vpd, which occurred between 7th Street and 16th Street in downtown Phoenix.

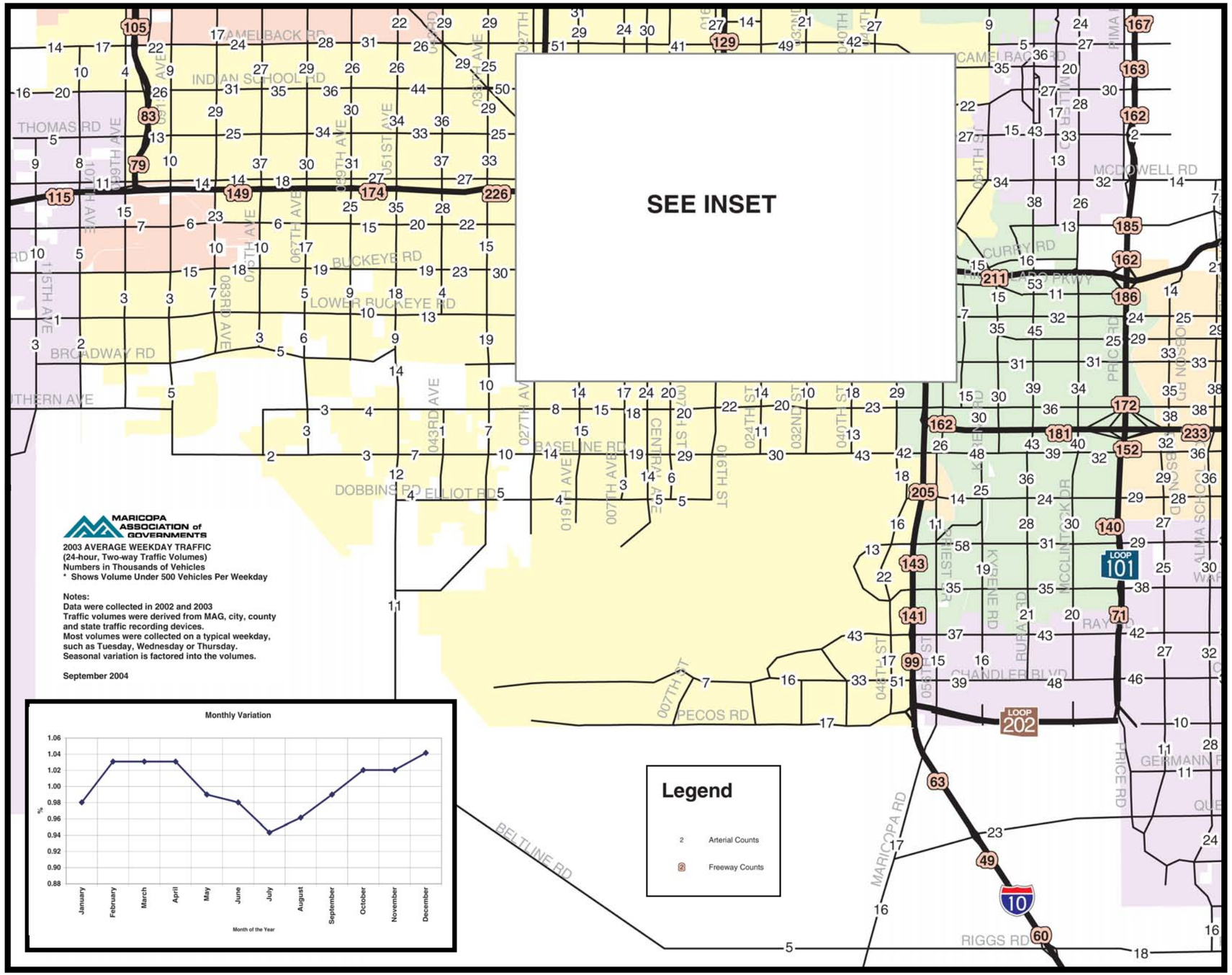
CRASH ANALYSIS SUMMARY

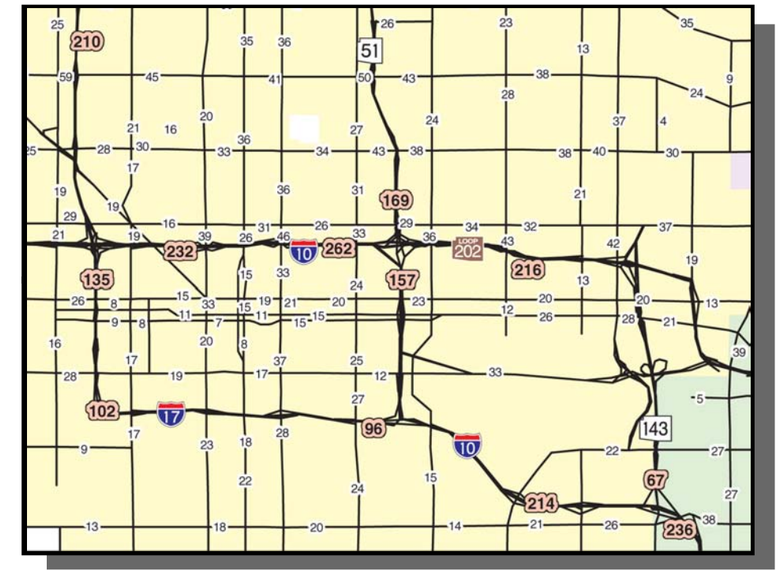
A crash analysis was conducted for the project to identify crash patterns and trends. The analysis Study Area extends along I-10 from 115th Avenue milepost (MP) 131 to 19th Avenue (MP 144) and along 101L from I-10 (MP 1) to Indian School Road (MP 5). Crash data within the analysis Study Area was obtained from ADOT from November 2001 until October 2004, representing the three most current years available.

A total of 4,424 crashes were documented between November 2001 and October 2004. Of the total crashes, 3,390 crashes (77 percent) occurred on freeway mainlines, while the remaining 1,034 crashes (23 percent) occurred on ramps. During this time period, approximately 199 crashes per mile occurred on the freeway mainline and 47 crashes per mile occurred on the ramps. On average, approximately 113 crashes per mile occurred on the freeway system within the analysis Study Area.

Of the 4,424 total crashes, 1,252 (28 percent) resulted in injuries (1,872 people injured). There were 15 fatal crashes (<1 percent) within the analysis Study Area, which resulted in the death of 16 people.

Table 5 summarizes the number and severity of crashes that occurred in the freeway system within the analysis Study Area.





Traffic Report

Maricopa Association of Governments 2003 Average Weekday Traffic Volume Map

South Mountain Freeway Transportation Corridor Study

South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D
E:...projects/AZ/ADOT/SouthMtn/TECH_REPORT0905/Juriswater/RegionalDesignData0905.mxd

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Figure 7

Table 5. Crash Number and Severity - Freeway System (November 2001 - October 2004)

Location	Crashes	Percent of Total	Length (Miles)	Crashes per Mile
Freeway Mainline	3,390[a] [1,379, 11][b]	77	17.0	199
Ramps	1,034 [493, 5]	23	22.2	47
Total	4,424 [1,872, 16]	100	39.2	113

Note:
a. number of crashes
b. [number of injuries, number of fatalities]

Freeway Mainline

Of the 3,390 crashes that were documented on the freeway mainline within the analysis Study Area, 3,222 crashes (95 percent) occurred on the 13-mile section of I-10, while the remaining 168 crashes (5 percent) occurred on the four-mile section of 101L. Between November 2001 and October 2004, approximately 248 crashes per mile occurred on the I-10 mainline and 42 crashes per mile occurred on the 101L mainline. The freeway mainline section with the most crashes per mile occurred on I-10 between MP 142 and MP 143 (just west of the junction of I-10 with I-17), with 452 crashes per mile.

Of the 3,390 total crashes that occurred on the freeway mainline, 936 (28 percent) resulted in injuries (1,379 people injured). There were 11 fatal crashes (<1 percent) on the freeway mainline, which resulted in the death of 11 people.

Table 6 summarizes the number and severity of crashes that occurred on the freeway mainline.

Table 6. Crash Number and Severity - Freeway Mainline (November 2001 - October 2004)

Location	Number of Crashes	Length (Miles)	Crashes per Mile
I-10 Mainline	3,222[a] [1,317, 10][b]	13	248
101L Mainline	168 [62, 1]	4	42
Total	3,390 [1,379, 11]	17	199

Note:
a. number of crashes
b. number of injuries, number of fatalities

The three most common collision manners that occurred on the freeway mainline (I-10 and 101L) were rear end (1,702 crashes, 50 percent), sideswipe-same direction (763 crashes, 23 percent), and single vehicle (748 crashes, 22 percent). Along I-10 within the analysis Study Area, the crashes that occurred most frequently were rear end (1,671 crashes, 52 percent); and along 101L, single vehicle (87 crashes, 52 percent).

Along I-10 just west of the junction with I-17 (the freeway mainline section with the most crashes per mile), the leading collision manner was rear end (56 percent). As a comparison, 50 percent of the total crashes on the freeway mainline within the analysis Study Area were rear end.

Table 7 identifies the number and percent of crashes by their collision manners that were documented on the freeway mainline.

Table 7. Crashes by Collision Manner - Freeway Mainline (November 2001 - October 2004) [1]

Collision Manner[2]	Freeway Mainline Total		I-10 Mainline		101L Mainline	
	Number of Crashes	Percent of Total	Number of Crashes	Percent of Total	Number of Crashes	Percent of Total
Single Vehicle	748	22	661	20	87	52
Sideswipe – same direction	763	23	731	23	32	19
Sideswipe – opposite direction	1	0	1	0	0	0
Angle	19	1	19	1	0	0
Rear-End	1,702	50	1,671	52	31	18
Head-On	1	0	1	0	0	0
Other	143	4	128	4	15	9
Non-Contact (not mc[3])	13	0	10	0	3	2
Total	3,390	100	3,222	100	168	100

Note:
3. Shaded numbers represent the collision manner that occurred most frequently.
4. Collision manners that did not occur during the analysis period have been omitted.
5. mc =motorcycle

Ramps

A total of 69 ramps with a total length of approximately 22.2 miles were included in the crash analysis. Of the 1,034 crashes that occurred on the ramps, 179 crashes (17 percent) occurred on the service interchange entrance ramps, 482 crashes (47 percent) occurred on the service interchange exit ramps, and 373 crashes (36 percent) occurred on the system interchange ramps.

Between November 2001 and October 2004 there were approximately 25 crashes per mile occurring on the service interchange entrance ramps, 61 crashes per mile on the service interchange exit ramps, and 53 crashes per mile on the system interchange ramps. The ramps with the most crashes per mile included I-10 westbound service interchange exit ramp to 75th Avenue and I-10 westbound service interchange exit ramp to 35th Avenue, both with approximately 216 crashes per mile.

Of the 1,034 total crashes that occurred on the ramps, 316 (31 percent) resulted in injuries (493 people injured). There were 4 fatal crashes (<1 percent) on the ramps which resulted in the death of 5 people.

Table 8 summarizes the number and severity of crashes that occurred on the ramps.

Table 8. Crash Number and Severity - Ramps (November 2001 – October 2004)

Location	Crashes	Percent of Total	Length (Miles)	Crashes per Mile
Service Interchange Entrance Ramps	179[a] [96, 0][b]	17	7.2	25
Service Interchange Exit Ramps	482 [237, 2]	47	7.9	61
System Interchange Ramps	373 [160, 3]	36	7.1	53
Total	1,034 [493, 5]	100	22.2	47

Note:
a. number of crashes
b. [number of injuries, number of fatalities]

The three most common collision manners that occurred on the ramps were rear end (552 crashes, 53 percent), single vehicle (303 crashes, 29 percent), and sideswipe-same direction (122 crashes, 12 percent). At service interchange entrance and exit ramps, the crashes that occurred most frequently were rear end (55 percent and 72 percent, respectively); at system interchange ramps, they were single vehicle (54 percent).

At the ramps with the most crashes per mile (I-10 westbound service interchange exit ramp to 75th Avenue and I-10 westbound service interchange exit ramp to 35th Avenue), the leading collision manner was rear end (84 percent and 82 percent, respectively). As a comparison, 53 percent of the total crashes on the ramps were rear end.

Table 9 identifies the number and percent of crashes by their collision manners that were documented on the ramps.

Table 9. Crashes by Collision Manner - Ramps (November 2001 – October 2004) [1]

Collision Manner[2]	Ramp Total		Service Interchange Entrance Ramps		Service Interchange Exit Ramps		System Interchange Ramps	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Single Vehicle	303	29	33	19	68	14	202	54
Sideswipe – Same Direction	122	12	36	20	36	7	50	13
Angle	21	2	2	1	19	4	0	0
Left Turn	7	1	5	3	2	1	0	0
Rear-End	552	53	99	55	347	72	106	29
Head-On	2	0	0	0	0	0	2	1
Backing	9	1	0	0	5	1	4	1
Other	18	2	4	2	5	1	9	2
Total	1,034	100	179	100	482	100	373	100

Note:
1. Shaded numbers represent the collision manner that occurred most frequently.
2. Collision manners that did not occur during the analysis period have been omitted.

3. South Mountain Freeway Alternatives

The driving force for the consideration of the South Mountain Freeway is to improve mobility within the region, primarily from the southeastern to southwestern portions of the Phoenix metropolitan area.

WESTERN SECTION ACTION ALTERNATIVES

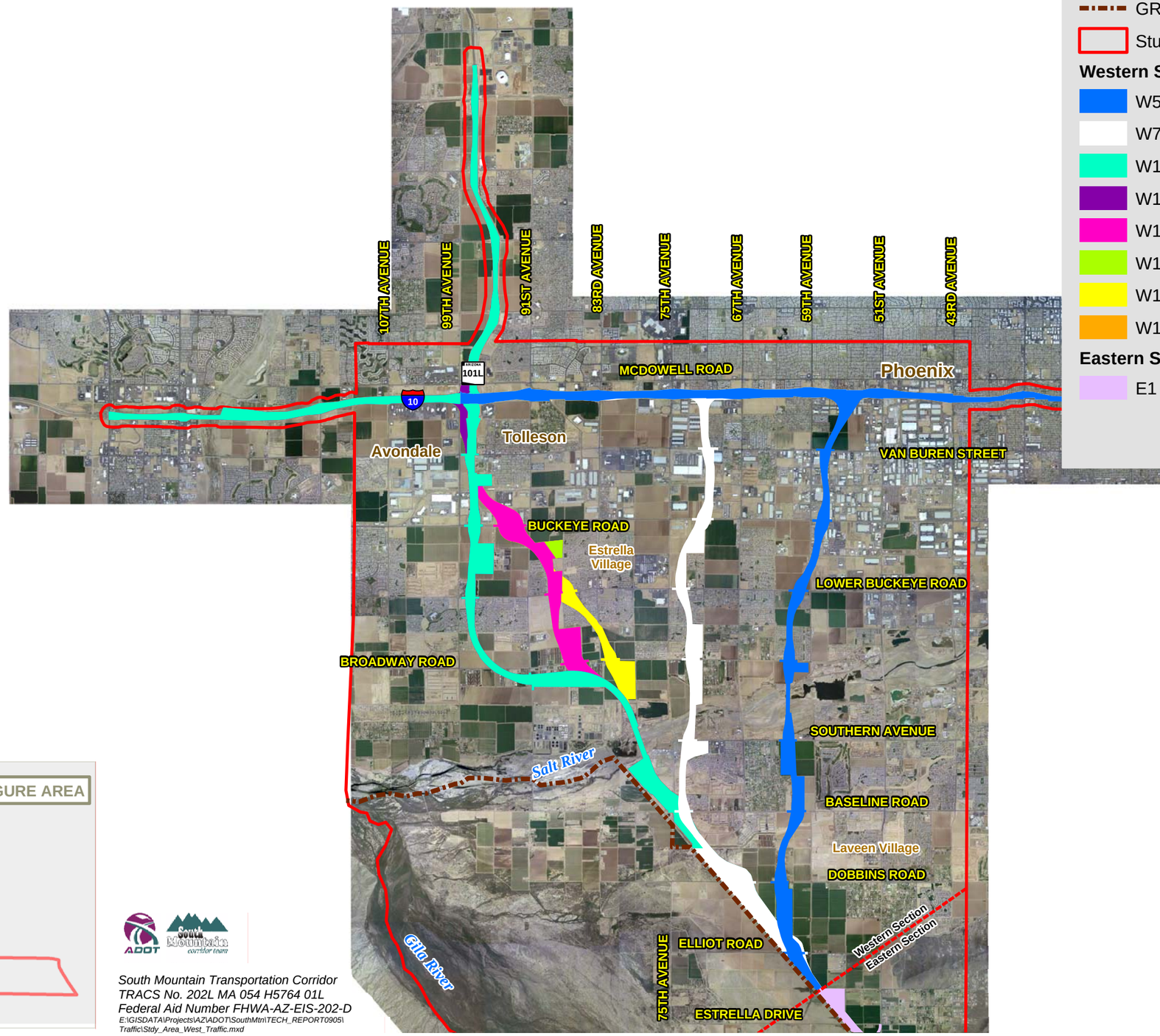
As indicated, there are three action alternatives and options being considered within the Western Section. These are the W55 Alternative, W71 Alternative, and the W101 Alternative with options. Each of the alternatives is shown on Figure 8 and discussed in greater detail below.

W55 Alternative

The W55 Alternative would begin with a three-leg system interchange along I-10 (Papago Freeway) approximately 3,000 feet east of 59th Avenue in the City of Phoenix. The freeway alignment would cross Van Buren Street, Buckeye Road and 59th Avenue heading in a south-southwest direction. Once across Lower Buckeye Road, the alignment would continue south approximately 1,600 feet west of 59th Avenue and would cross Broadway Road, the Salt River and Southern Avenue. The freeway alignment would shift to the east, south of Southern Avenue then proceed south and cross Baseline Road. South of Baseline Road, the alignment would curve to the west and cross Dobbins Road and Elliot Road approximately 2,300 feet west of 59th Avenue. Immediately south of Elliot Road, the alignment would proceed southeast immediately north of the GRIC boundary and crosses 59th Avenue.

W71 Alternative

The W71 Alternative would begin with a three-leg system interchange along I-10 (Papago Freeway) approximately 1,750 feet east of 75th Avenue in the City of Phoenix. The freeway alignment would proceed south for approximately 1,550 feet where it would negotiate a reverse curve to the southeast. This shift in direction would allow the alignment to “skirt” the existing industrial development south of Van Buren Street. After crossing Van Buren Street, the alignment would proceed due south and cross the Union Pacific Railroad. The alignment would negotiate another reverse curve to the southwest approximately 2,000 feet north of Buckeye Road. The alignment would cross Buckeye Road approximately 2,800 feet west of 67th Avenue. The alignment would cross Lower Buckeye Road approximately 900 feet east of 75th Avenue. After crossing Lower Buckeye Road, the alignment would continue south approximately 3,400 feet west of 67th Avenue and would cross Broadway Road, the Salt River, Southern Avenue and Baseline Road. At Baseline Road, the alignment would proceed southeast along the GRIC boundary crossing Dobbins and Elliot roads, Estrella Drive and 67th and 59th avenues.



Legend

- GRIC Boundary
- Study Area

Western Section Alternatives

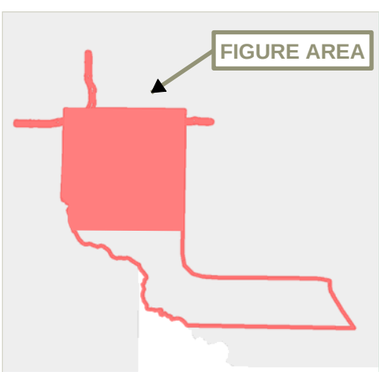
- W55
- W71
- W101WPR
- W101WFR
- W101CPR
- W101CFR
- W101EPR
- W101EFR

Eastern Section Alternative

- E1

N

0 6,000 12,000 Feet



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TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D
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Traffic Report

Alternatives - Western Section

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 8

W101 Alternative

The W101 Alternative would begin at the existing three-leg system interchange along I-10 (Papago Freeway) with 101L (Agua Fria Freeway), which is located approximately 1,150 feet east of 99th Avenue in the City of Tolleson. As part of the W101 Alternative, the existing system interchange would either be partially reconstructed to create a full system interchange with movements possible in all directions, or would be fully reconstructed to provide for all eight freeway-to-freeway movements. The W101 Alternative would provide a continuous freeway alignment between 202L (South Mountain Freeway) and 101L (Agua Fria Freeway). The three options for the W101 Alternative are discussed in the following.

W101W Option

South of I-10 (Papago Freeway), the W101W option would proceed due south, approximately 1,150 feet east of 99th Avenue and would cross Van Buren Street, Buckeye Road and Lower Buckeye Road. South of Lower Buckeye Road, the alignment would continue east-southeast where it would cross Broadway Road and 91st Avenue. Approximately half-way between 91st Avenue and 83rd Avenue, the alignment would head to the southeast and cross 83rd Avenue and the Salt River. South of the Salt River, the alignment would continue heading southeast just outside the GRIC boundary, where it would cross 75th Avenue; Baseline; Dobbins, and Elliot roads and 59th Avenue.

W101C Option

Similar to the W101W alignment option, the W101C alignment option would begin at the existing three-leg system interchange along I-10 (Papago Freeway) with 101L (Agua Fria Freeway) in the City of Tolleson.

The alignment would proceed due south from the existing system interchange approximately 1,150 feet east of 99th Avenue where it would cross Van Buren Street. The alignment would then turn to the southeast approximately 3,750 feet north of Buckeye Road and cross it in a southeasterly direction. Once across 91st Avenue and Lower Buckeye Road, the alignment would initiate a reverse curve that would bring the alignment back to a heading of due south approximately 1,350 feet east of 91st Avenue. Just north of Broadway Road, the alignment would shift to a southeasterly direction where it would cross Broadway Road, 83rd Avenue and the Salt River. Once over the Salt River, the alignment would follow that of the W101W option as discussed previously.

W101E Option

The W101E option is the third option for a direct connection to 101L (Agua Fria Freeway) at I-10 (Papago Freeway).

The W101E option would begin at the existing system interchange along I-10 (Papago Freeway) with 101L (Agua Fria Freeway) in the City of Tolleson. The alignment would proceed due south approximately 1,150 feet east of 99th Avenue, cross Van Buren Street, and then turn to the southeast approximately 3,750 feet north of Buckeye Road. The alignment would cross Buckeye Road, 91st Avenue, and Lower Buckeye Road in a southeasterly direction and then turn to the south-southeast just prior to 83rd Avenue. Continuing in a south-southeast direction, the W101E option would cross 83rd Avenue, Broadway Road, Southern Avenue and the Salt River. Once across the Salt River and north of Baseline Road, the alignment would proceed southeast just outside the GRIC boundary similar to the previous two options.

SOUTH MOUNTAIN FREEWAY/I-10 SYSTEM INTERCHANGE SCENARIOS

Scenarios for a system interchange have been developed at each of the three South Mountain Freeway alternative locations. Each of the scenarios has system and service interchange variations and configurations. Fourteen scenarios, including the No Action Alternative, (Scenario 1: without the construction of South Mountain Freeway), were included in the South Mountain traffic simulation analyses.

W55 Interchange Scenarios

The W55 Alternative would connect to I-10 in the vicinity of 55th Avenue utilizing a three-leg system interchange. The interchange would include two directional fly-over ramps that would cross over I-10 and two that would not cross over I-10. The three-leg system interchange would accommodate all possible movements between the South Mountain Freeway and I-10. There have not been any provisions included to upgrade the three-leg system interchange into a fully directional system interchange because the continuation of the South Mountain Freeway north of I-10 has not been planned. Each of the system interchange ramps would contain two lanes and have dedicated entrance and exit lanes. These additional lanes are included in the lane balancing along both I-10 and South Mountain Freeway.

In addition to the proposed new system interchange, existing service interchanges would need to be reconfigured to allow for required ramp spacing and weaving distances, to minimize disruption in driver expectation and to allow the new freeway to freeway ramps. The interchanges that would need to be reconfigured are located along I-10 at 67th, 59th, 51st and 43rd avenues. One option is to provide two sets of braided ramps between 59th and 51st avenues. Another option being considered is to provide a weaving section on the freeway mainline or on access roads.

Five scenarios were evaluated under the W55 Alternative, differing in the layout of the service ramps with local arterials of 59th and 51st avenues (Figure 9).

- Scenario 2: W55 Alternative with braided service interchange ramps between 59th and 51st avenues, and three miles of access roads north and south of I-10 between 67th and 43rd avenues.
- Scenario 3: W55 Alternative with braided service interchange ramps between 59th and 51st avenues, and two miles of access roads north and south of I-10 between 67th and 59th avenues and 51st and 43rd avenues.
- Scenario 4: W55 Alternative with service interchange ramp weave along the I-10 mainline between 59th and 51st avenues, with three miles of access roads north and south of I-10 between 67th and 43rd avenues.
- Scenario 5: W55 Alternative with service interchange ramp weave along the I-10 mainline between 59th and 51st avenues, and two miles of access roads north and south of I-10 between 67th and 59th avenues and 51st and 43rd avenues.
- Scenario 6: W55 Alternative with service interchange ramp weave on access roads between 59th and 51st avenues, with three miles of access roads north and south of I-10 between 67th and 43rd avenues.

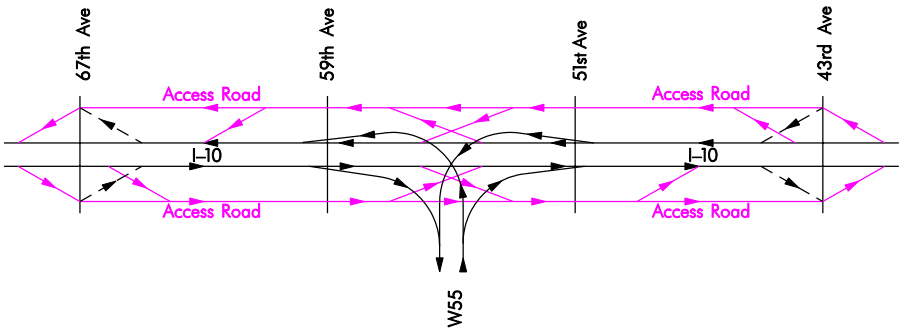
W71 Interchange Scenarios

The W71 Alternative would connect to I-10 in the vicinity of 71st Avenue utilizing a three-leg system interchange similar to the W55 Alternative. The interchanges that would need to be reconfigured with this alternative are located along I-10 at 83rd, 75th, 67th and 59th avenues. As in the W55 Alternative, one of the options being considered is to provide two sets of braided ramps. The braided ramps would be located between 75th and 67th avenues. The other option being considered is to provide a weaving section on the freeway mainline or on access roads.

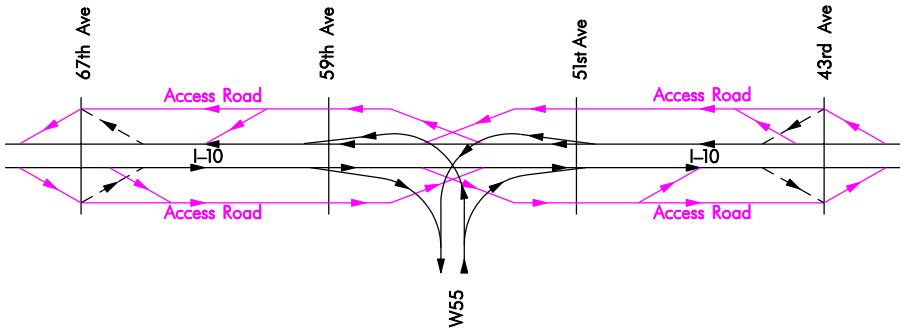
Three scenarios were evaluated under the W71 Alternative, differing in the layout of the service ramps with local arterials of 75th and 67th avenues (Figure 10).

- Scenario 7: W71 Alternative with braided service interchange ramps between 75th and 67th avenues, and two miles of access roads north and south of I-10 between 83rd and 75th avenues and 67th and 59th avenues.
- Scenario 8: W71 Alternative with service interchange ramp weave along the I-10 mainline between 75th and 67th avenues, and two miles of access roads north and south of I-10 between 83rd and 75th avenues and 67th and 59th avenues.
- Scenario 9: W71 Alternative with service interchange ramp weave on access roads between 75th and 67th avenues, with three miles of access roads north and south of I-10 between 83rd and 59th avenues.

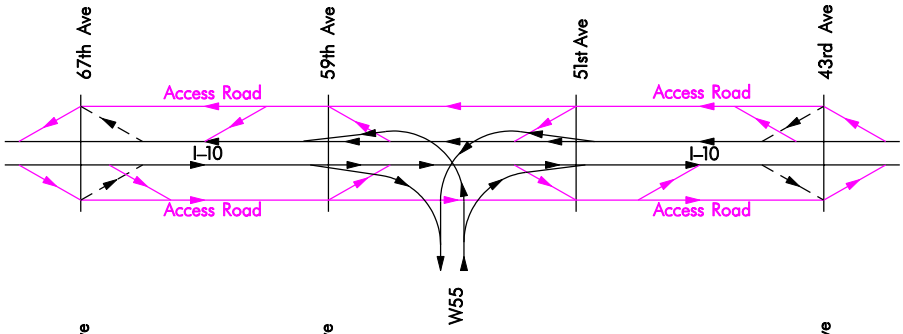
Scenario 2
Braided Ramps
(3 Miles of Access Roads)



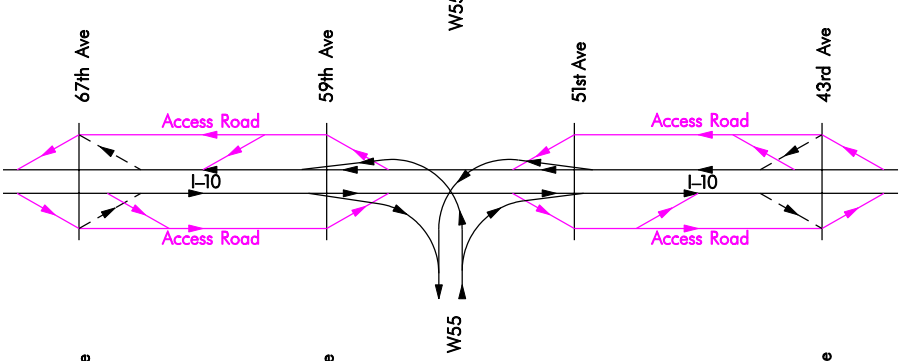
Scenario 3
Braided Ramps
(2 Miles of Access Roads)



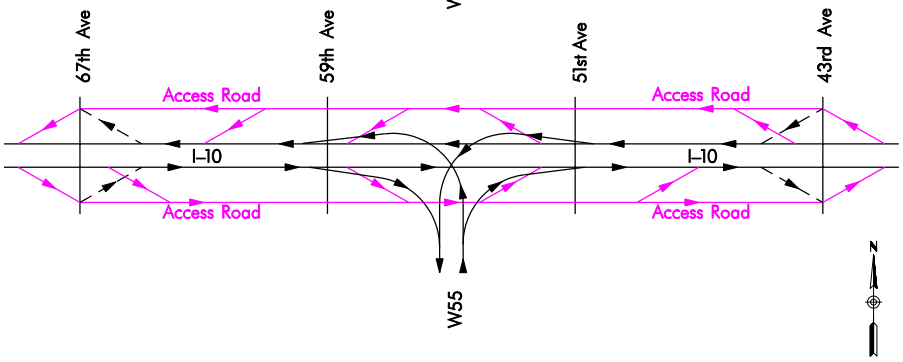
Scenario 4
Weave on Mainline
(3 Miles of Access Roads)



Scenario 5
Weave on Mainline
(2 Miles of Access Roads)



Scenario 6
Weave on Access Road
(3 Miles of Access Roads)



Dashed lines denote ramps to be removed

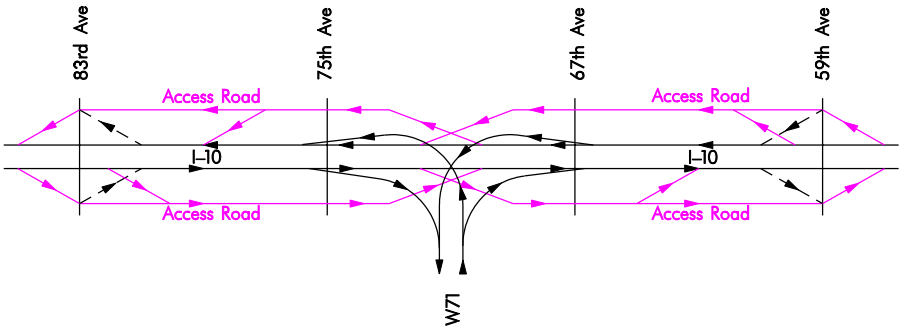
NOT TO SCALE

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
TRAFFIC REPORT

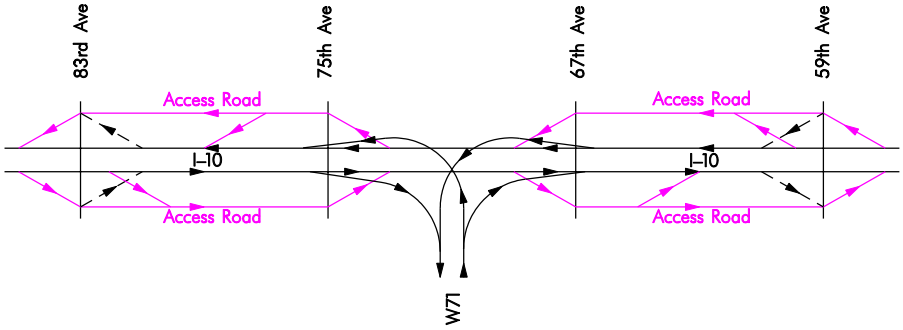
W55 INTERCHANGE SCENARIOS

Figure 9
Page 3–6

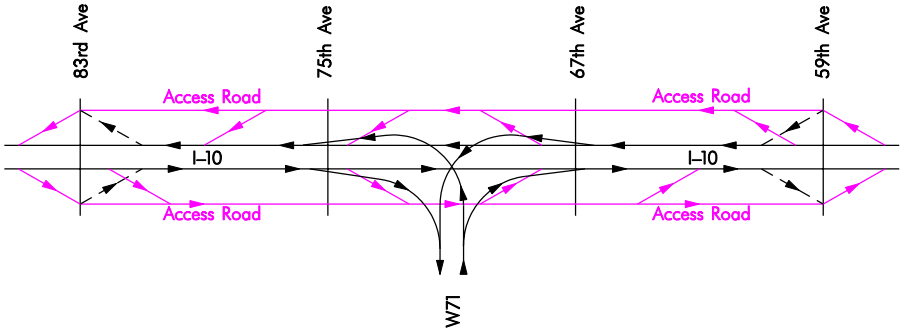
Scenario 7
Braided Ramps
(2 Miles of Access Roads)



Scenario 8
Weave on Mainline
(2 Miles of Access Roads)



Scenario 9
Weave on Access Road
(3 Miles of Access Roads)



Dashed lines denote ramps to be removed

NOT TO SCALE

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
TRAFFIC REPORT

W71 INTERCHANGE SCENARIOS

Figure 10
Page 3–7

W101 Interchange Scenarios

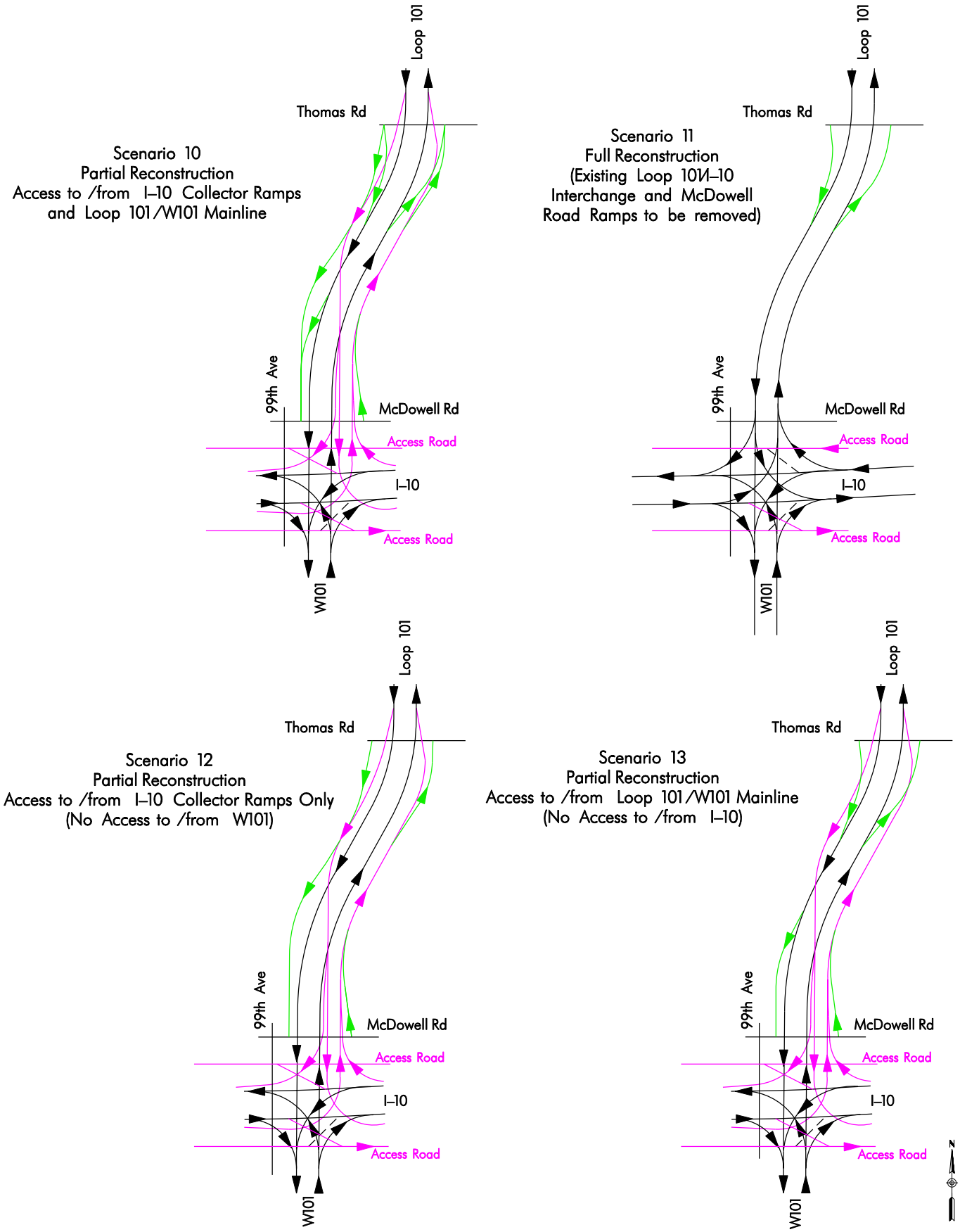
The W101 Alternative would connect to I-10 at the existing I-10/101L (Agua Fria Freeway) system interchange utilizing a fully directional system interchange. This fully directional system interchange would include four directional fly-over ramps that would cross over I-10 and four directional ramps that would not cross over I-10. The fully directional system interchange would accommodate all possible movements from the South Mountain Freeway, I-10, and 101L. Each of the four new ramps associated with the partial reconstruction would contain two lanes and have dedicated entrance and exit lanes. Each of the eight new ramps associated with the full reconstruction would contain two-lane ramps. Again, each ramp would have dedicated entrance and exit lanes. These additional lanes are included in the lane balancing along I-10, 101L, and South Mountain Freeway.

Five scenarios were evaluated under the W101 Alternative, differing in the layout of the service and system ramps (Figure 11).

- Scenario 10: W101W Alternative, partial reconstruction, with access along 101L (McDowell Road and Thomas Road) to both I-10 and South Mountain Freeway.
- Scenario 11: W101W Alternative, full reconstruction, with access along 101L (Thomas Road) to both I-10 and South Mountain Freeway.
- Scenario 12: W101W Alternative, along 99th Avenue with partial reconstruction, with access along 101L (McDowell Road and Thomas Road) to both I-10 and South Mountain Freeway. Differs from Scenario 10 south of Van Buren Street.
- Scenario 13: W101W Alternative, partial reconstruction, with access along 101L (McDowell Road and Thomas Road) to I-10 only.
- Scenario 14: W101W Alternative, partial reconstruction, with access along 101L (McDowell Road and Thomas Road) to 101L only.

EASTERN SECTION ALTERNATIVE

There is one action alternative being considered within the Eastern Section of the Study Area, the E1 Alternative. Should the GRIC grant permission to ADOT to study alternatives within their Community, additional action alternatives would be considered and analyzed in the Eastern Section. The one alternative is shown on Figure 12 and discussed in greater detail in the following.



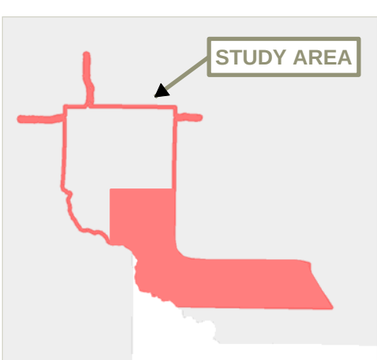
Dashed lines denote items to be removed

NOT TO SCALE

SOUTH MOUNTAIN TRANSPORTATION CORRIDOR
TRAFFIC REPORT

W101 INTERCHANGE SCENARIOS

Figure 11
Page 3–9



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D
E:\GISDATA\Projects\AZ\ADOT\SouthMtn\TECH_REPORT0905\Traffic\Stdy_Area_East_Traffic.mxd

Traffic Report

Alternatives - Eastern Section

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 12

E1 Alternative

The E1 Alternative would begin at the point common among all action alternatives, just east of 59th Avenue, and continue in a southeasterly direction parallel and adjacent to the GRIC boundary. In its southeasterly direction, the E1 Alternative would cross Estrella Drive and 51st Avenue before entering the Phoenix SMPP and turning easterly. In its easterly direction, the E1 Alternative would follow the Pecos Road alignment parallel and adjacent to (on the north side of) the GRIC boundary, and would cross 27th and 17th avenues, Desert Foothills Parkway, 24th, 32nd, 40th, and 48th streets. The E1 Alternative would then connect to the existing fully directional system interchange at I-10 (Maricopa Freeway)/202L/Pecos Road.

NO ACTION ALTERNATIVE

In addition to the action alternatives, the No Action Alternative is included for detailed study to consider impacts of not building a freeway to compare beneficial and adverse impacts with the action alternatives. The No Action Alternative would not extend the 202L freeway west of I-10 (Maricopa Freeway); however, it would include all other projects included in the RTP (MAG, 2003).

4. South Mountain Freeway Traffic Forecast

The following section summarizes the year 2030 forecast travel demand and operational performance of the South Mountain Freeway. Traffic counts for 2003 and forecasted 2030 action and No Action Alternatives are presented previously in Figure 4. The South Mountain Freeway would carry 149,000 vpd to 174,000 vpd at Buckeye Road in 2030, about the volume that 101L carries today near Elliot Road.

The basic travel demand description of each action alternative is shown in Tables 10 and 11 for the Western and Eastern Sections, respectively. The average daily traffic (ADT) and number of general purpose lanes between major arterials are provided. The HOV volume is not included in the totals presented. The action alternatives have approximately the same travel demand from Elliot Road in the Western Section to 51st Avenue in the Eastern Section. The higher volumes on the W71 and W101 alternatives east of 51st Avenue correspond to a higher demand (up to 11,000 vpd) to and from the east as compared to the W55 Alternative. The volumes become the same because a higher volume of traffic exit and enter the 51st Avenue interchange for the W71 and W101 alternatives. The differences north of Elliot Road to I-10 in the Western Section are caused by the traffic from SR 801 that enters and exits South Mountain Freeway north and south of Southern Avenue and the number of lanes required to build up for the system interchange with I-10 at the 101L interchange. The W101 Alternative would require 14 lanes (seven in each direction) as compared to eight lanes for the W55 and W71 alternatives (four in each direction) and therefore would be able to accommodate more traffic. The three additional lanes in each direction for the W101 Alternative provide for the through movement that is not necessary in the W55 and W71 alternatives.

To analyze the operational performance of the freeway, the afternoon peak hour LOS was calculated (within the MAG model) for each segment discussed in Tables 10 and 11 previously. The results of the analysis are presented in Tables 10 and 11. The peak direction in the afternoon is from I-10 in the Western Section to I-10 in the Eastern Section. In general, the minimum desirable LOS is D. If LOS D cannot be obtained then LOS E or F is acceptable for a short duration during the peak period of traffic. There are four segments with LOS E and F for the W55 Alternative and three segments with LOS E and F for the W71 and W101 alternatives. The results for the duration of LOS E and F are presented in Tables 10 and 11. For each of these segments, the duration the freeway experiences LOS E and F is less than one hour. Overall, in the Western Section, the W101 Alternative has the best LOS followed by the W71 Alternative and the W55 Alternative has the worst overall LOS. In the Eastern Section, the action alternatives have the same LOS for each section of freeway.

Table 10. Western Section: ADT (2030), Number of General Purpose Lanes, PM Peak Hour LOS (2030), Duration LOS E and F (2030)

Western Section Location			I-10 to Van Buren Street	Van Buren Street to Buckeye Road	Buckeye Road to Lower Buckeye Road	Lower Buckeye Road to Broadway Road	Broadway Road to Southern Avenue	Southern Avenue to Baseline Road	Baseline Road to Dobbins Road	Dobbins Road to Elliot Road	Elliot Road to Common Point*
Alternatives	W55/E1	ADT	127,000	149,000	136,000	132,000	147,000	182,000	172,000	152,000	143,000
		Lanes	8	8	8	8	8	8	8	8	8
		PM Peak LOS	C	D	D	D	D	E/F	E/F	D	D
		Duration LOS E/F (hours)	0	0	0	0	0	< 1	< 1	0	0
	W71/E1	ADT	125,000	152,000	142,000	134,000	135,000	178,000	165,000	145,000	146,000
		Lanes	8	8	8	8	8	8	8	8	8
		PM Peak LOS	C	D	D	D	D	E/F	D	D	D
		Duration LOS E/F (hours)	0	0	0	0	0	< 1	0	0	0
	W101/E1	ADT	164,000	174,000	154,000	136,000	139,000	185,000	164,000	142,000	143,000
		Lanes	14	14	12	10	8	8	8	8	8
		PM Peak LOS	B	C	C	C	C	E/F	D	D	D
		Duration LOS E/F (hours)	0	0	0	0	0	< 1	0	0	0

Table 11. Eastern Section: ADT (2030), Number of General Purpose Lanes, PM Peak Hour LOS (2030), Duration LOS E and F (2030)

Eastern Section Location			Common Point* to Estrella Drive	Estrella Drive to 51st Avenue	51st Avenue to 25th Avenue	25th Avenue to 17th Avenue	17th Avenue to Desert Foothills Parkway	Desert Foothills Parkway to	24th Street to 32nd Street	32nd Street to 40th Street	40th Street to I-10
Alternatives	W55/E1	ADT	143,000	143,000	160,000	159,000	158,000	153,000	157,000	160,000	173,000
		Lanes	8	8	8	8	8	8	8	8	10
		PM Peak LOS	D	D	E/F	E/F	D	D	D	D	D
		Duration LOS E/F (hours)	0	0	< 1	< 1	0	0	0	0	0
	W71/E1	ADT	146,000	146,000	167,000	166,000	165,000	160,000	164,000	167,000	180,000
		Lanes	8	8	8	8	8	8	8	8	10
		PM Peak LOS	D	D	E/F	E/F	D	D	D	D	D
		Duration LOS E/F (hours)	0	0	< 1	< 1	0	0	0	0	0
	W101/E1	ADT	143,000	143,000	170,000	168,000	168,000	163,000	167,000	169,000	184,000
		Lanes	8	8	8	8	8	8	8	8	10
		PM Peak LOS	D	D	E/F	E/F	D	D	D	D	D
		Duration LOS E/F (hours)	0	0	< 1	< 1	0	0	0	0	0

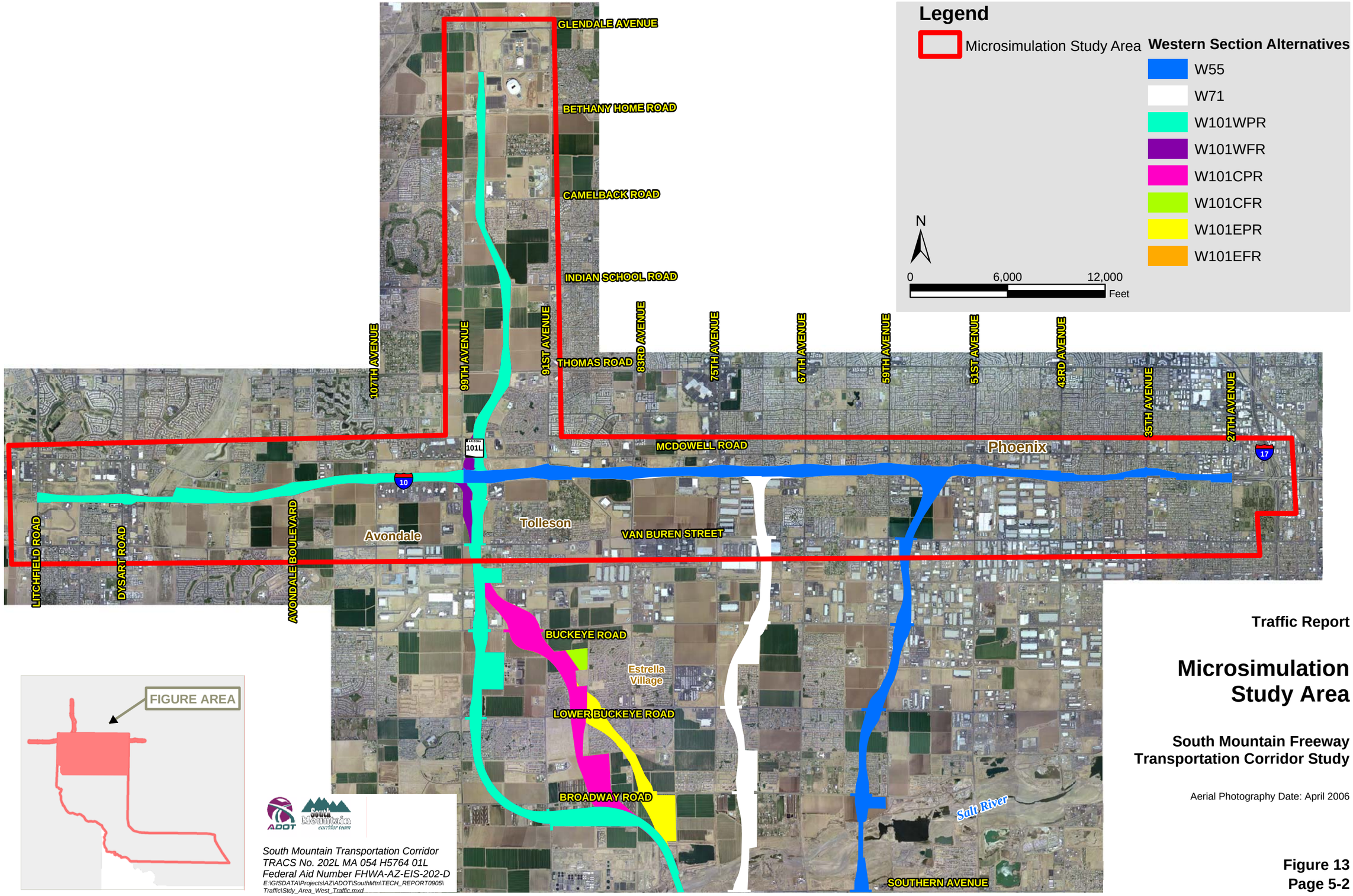
5. I-10 Freeway Analysis

Three locations for a system interchange with I-10 are being considered in the Western Section of the South Mountain Freeway corridor; W55, W71, and W101. Therefore, freeway operations on I-10 are considered a key component in the ultimate location decision. The microsimulation model VISSIM was used to evaluate traffic operations on I-10 and 101L and the microsimulation model CORSIM was used to evaluate traffic operations on the arterial streets crossing the freeways. The study area for the microsimulation analysis is presented in Figure 13. Both models are calibrated based upon existing traffic counts and the analysis is completed using year 2030 traffic forecasts. This section presents the results of the operations analyses.

Traffic counts used for the VISSIM and CORSIM calibrations were conducted by Traffic Research and Analysis Inc. (TRA) between November 2004 and January 2005 at various locations on the I-10 freeway mainline and at all signalized intersections within the Study Area. Midweek days (Tuesday, Wednesday, or Thursday) were used to avoid the unpredictability of weekend and Monday or Friday traffic conditions that could skew the results. No major incidents were reported during the days when traffic counts were conducted.

Counts were taken during the 6:00 to 9:00 A.M. and 3:00 to 6:00 P.M. time periods to cover the three-hour peak period traffic. This selection of time periods was based on peaking characteristics and free-flow freeway conditions that were derived from observations and traffic count data. This was done in an attempt to begin and end the traffic simulation in an uncongested state with a defined peak so that congestion would build and then dissipate over time. Other key traffic assumptions in the development of the simulation models were:

- Existing truck volumes were available from ADOT Permanent Traffic Recorders within the project Study Area. A truck percentage of eight percent was applied throughout the freeway corridors for existing morning and afternoon peak periods. The same percentage was applied to all future year scenarios.
- An HOV lane is provided along I-10 from 101L to I-17. Within the Study Area where an HOV lane is provided, an average of 12 percent of the total traffic traveled on the HOV lane.



Traffic Report

Microsimulation Study Area

South Mountain Freeway Transportation Corridor Study

Aerial Photography Date: April 2006

Figure 13
Page 5-2

6. Mainline Analysis – VISSIM

The freeway system in the Study Area includes approximately fifteen miles of I-10 from Litchfield Road to I-17 and five miles of 101L from I-10 to Glendale Avenue. This Study Area includes all freeway interchanges and adjacent major intersections along I-10 and 101L freeway corridors.

VISSIM MODEL DEVELOPMENT

The VISSIM model served as the primary analysis tool for the freeway operational analysis of the South Mountain Freeway/I-10 system interchange scenarios on the Western Section. Major data, assumptions and calibration techniques incorporated into the VISSIM model are discussed below.

Geometrics

Aerial photography was utilized to establish lane configurations, gore points, horizontal curvature, and locations of interchanges. Aerial photography was also used to identify the overpass or underpass of a crossroad or ramp in relationship to the freeway mainline in order to determine the upgrade or downgrade of the freeway mainline and ramp profiles. All information collected from aerial photography was verified during field survey.

Vehicle Type and Classification Data

Three basic vehicle types were included in the model: trucks, single occupant vehicles (SOVs), and HOVs. In the VISSIM simulation models, an HOV lane is closed to trucks and SOVs and open only to HOVs. General purpose (GP) lanes are open to all three types of vehicles.

Speed Curves

The default free-flow speed for the entire corridor, with separate speed profiles for system ramps and service ramps, was based on free-flow speed data collected with the use of a radar gun in the early spring of 2005 at representative locations within the Study Area. Table 12 shows free-flow speed distribution for eastbound I-10 at 79th Avenue.

Table 12. Free-Flow Speed Distribution on I-10 Freeway Mainline

Speed (mph)	Percentile of Traffic Below the Speed (%)
54	0
61	10
65	25
70	50
72	75
75	90
86	100

As shown in Table 12, the free-flow speed on freeway mainline ranged from 54 miles per hour (mph) to 86 mph, with a median speed of 70 mph.

Reduced speed areas on service ramps were determined based on existing design speed (generally up to 5 mph over the posted speed). Additional speed modifications were made on system ramps to simulate slow turning speeds (typically from 50 to 65 mph as compared with 70 mph on the freeway mainline).

Ramp Meters

Within the Study Area, westbound I-10 entrance ramps from 27th Avenue to 59th Avenue operate under ramp metering during P.M. peak period and eastbound I-10 entrance ramps from 83rd Avenue to 35th Avenue during A.M. peak period. Throughput rates were established as follows:

- 1-lane meter has a through capacity rate of 900 vehicles per hour (vph) (4-second cycle)
- 2-lane meter has a through capacity rate of 1500 vph (6-second cycle)

VISSIM MODEL CALIBRATION

The calibration process used for the VISSIM model followed FHWA guidelines for determining the acceptability of model results as compared to existing freeway operations. A synopsis of the calibration process follows, with emphasis placed on identifying the key points and major decisions and assumptions made in the refinement process.

Calibration Steps

The following steps were involved in the VISSIM model calibration:

ANIMATION CHECKING

Animation checking was used to check the geometric coding of the networks. Errors that were found in the checking process were corrected before the calibration runs were made. There are no reportable results from the animation checking process.

VISUAL CHECKING

Visual checking of the animation files was performed. Abnormal driving behaviors or irregular queuing within the freeway network were examined in order to identify the potential geometry coding errors.

VOLUME VALIDATION

Existing traffic flow maps, based on counts taken in winter 2004-2005, were developed. The traffic that traveled through the VISSIM models was then matched to the volumes in the existing flow maps. Data collection points were set up in the VISSIM simulation model at various locations along the freeway mainline to count the number of vehicles that passed through. The volumes that were measured in the VISSIM model were then compared with the existing flow maps.

TRAVEL SPEED CALIBRATION

Average travel speeds were measured along the freeway mainline within the Study Area. Data collection points were set up at the same locations to measure the average travel speeds in the VISSIM models. The two sets of average travel speeds were compared. Wherever discrepancy exists, the VISSIM model parameters were adjusted from their default values to match the empirical data.

Calibration Results

VOLUME VALIDATION

Table 13 compares the traffic volumes in the existing flow maps with the volumes that were measured in the VISSIM simulation model at the same locations. As shown in Table 13, the traffic volumes as measured in the VISSIM simulation model matched with the volumes in the existing flow maps, with a difference of no more than three percent. Since the existing flow maps were based on the existing traffic counts, the volumes in the VISSIM model represent the existing traffic conditions as measured in the field.

Table 13. Comparison of Traffic Volumes on Existing Traffic Flow Map with those in the VISSIM Model

Location	A.M. Peak Period (6:00 A.M. – 9:00 A.M.) (Number of Vehicles)			P.M. Peak Period (3:00 P.M. – 6:00 P.M.) (Number of Vehicles)		
	Flow Map	VISSIM Output	Percent Difference	Flow Map	VISSIM Output	Percent Difference
EB I-10 at Litchfield Road	9,190	9,190	0	8,550	8,560	0
WB I-10 at Litchfield Road	6,980	6,990	0	10,220	10,210	0
EB I-10 at 101L	11,390	11,320	-1	10,050	10,120	1
WB I-10 at 101L	8,110	8,230	1	13,210	13,210	0
EB I-10 at 43rd Avenue	26,480	26,540	0	21,490	21,670	1
WB I-10 at 43rd Avenue	17,580	17,580	0	29,070	29,020	0
NB 101L at Glendale Avenue	12,200	11,960	-2	16,090	15,870	-1
SB 101L at Glendale Avenue	15,360	14,920	-3	13,780	13,720	0

TRAVEL SPEED CALIBRATION

Table 14 compares the average travel speeds as measured in the field with those measured in the VISSIM simulation model at the same locations.

As shown in Table 14, the average travel speeds as measured in the VISSIM simulation model are consistent with those measured in the field, with a difference of no more than 10 percent at the locations above.

Table 14. Comparison of Average Travel Speeds Measured in the Field with those Measured in the VISSIM Model

Location	A.M. Peak Period (6:00 A.M. – 9:00 A.M.) (mph)			P.M. Peak Period (3:00 P.M. – 6:00 P.M.) (mph)		
	Traffic Count	VISSIM Output	Percent Difference	Traffic Count	VISSIM Output	Percent Difference
EB I-10 at Litchfield Road	60	64	7	64	64	0
WB I-10 at Litchfield Road	62	65	5	66	63	-5
EB I-10 at 101L	68	66	-3	73	67	-8
WB I-10 at 101L	70	66	-6	70	64	-9
EB I-10 at 43rd Avenue	43	42	-2	64	65	2
WB I-10 at 43rd Avenue	60	66	10	53	52	-2
NB 101L at Glendale Avenue	64	65	2	63	63	0
SB 101L at Glendale Avenue	69	65	-6	69	65	-6

FREEWAY SIMULATION RESULTS – YEAR 2030

In order to evaluate the differences among the South Mountain Freeway/I-10 system interchange scenarios, the delay per vehicle and the travel time were evaluated. Delay per vehicle accounts for every vehicle that enters the network, and accounts for all delay experienced while in the system. For this analysis, as described previously, the system includes approximately fifteen miles of I-10 from Litchfield Road to I-17 and five miles of 101L from I-10 to Glendale Avenue. This comparison is an excellent measure of effectiveness (MOE) when comparing system wide improvements for multiple alternatives. The travel time comparisons shown are the cumulative travel time for each direction on I-10 and on 101L. This was done to take into account that some alternatives have improved travel time on 101L, as opposed to just comparing the I-10 travel times. Table 15 compares the delay per vehicle on the freeway network and Table 16 compares the travel time along the freeway mainline for the future (2030) scenarios.

Table 15. Comparison and Ranking of Delay Per Vehicle for Future (2030) Alternative Scenarios

Scenario	Description	A.M. Peak Period			P.M. Peak Period		
		Delay Per Veh (sec)	Ratio to No Action	Rank	Delay Per Veh (sec)	Ratio to No Action	Rank
No Action							
Scenario 1	No Action	214	-	8	799	-	13
W55 Alternatives							
Scenario 2	W55_BRAID_3MILES	232	1.08	12	552	0.69	10
Scenario 3	W55_BRAID_2MILES	228	1.07	9	546	0.68	9
Scenario 4	W55_WEAVEML_3MILES	237	1.11	13	478	0.60	7
Scenario 5	W55_WEAVEML_2MILES	230	1.07	11	474	0.59	6
Scenario 6	W55_WEAVEACCESSRD	228	1.07	10	703	0.88	12
W71 Alternatives							
Scenario 7	W71_BRAID_2MILES	183	0.86	6	589	0.74	11
Scenario 8	W71_WEAVEML_2MILES	188	0.88	7	535	0.67	8
Scenario 9	W71_WEAVEACCESSRD	180	0.84	5	864	1.08	14
W101 Alternatives							
Scenario 10	W101WPR_ALLACCESS	109	0.51	3	381	0.48	2
Scenario 11	W101WFR	109	0.51	2	407	0.51	3
Scenario 12	W101WPR_I10ACCESS	346	1.62	14	419	0.52	4
Scenario 13	W101WPR_L101ACCESS	106	0.50	1	438	0.55	5

Table 16. Comparison and Ranking of Total Travel Time[1] for Future (2030) Alternative Scenarios

Scenario	Description	A.M. Peak Period			P.M. Peak Period		
		Travel Time (min)	Ratio to No Action	Rank	Travel Time (min)	Ratio to No Action	Rank
No Action							
Scenario 1	No Action	52.1	-	8	109.7	-	13
W55 Alternatives							
Scenario 2	W55_BRAID_3MILES	55.1	1.06	11	77.6	0.71	7
Scenario 3	W55_BRAID_2MILES	54.8	1.05	9	78.4	0.71	8
Scenario 4	W55_WEAVEML_3MILES	55.6	1.07	13	71.2	0.65	1
Scenario 5	W55_WEAVEML_2MILES	55.0	1.06	10	71.4	0.65	2
Scenario 6	W55_WEAVEACCESSRD	55.1	1.06	12	100.4	0.92	12
W71 Alternatives							
Scenario 7	W71_BRAID_2MILES	51.4	0.99	6	84.4	0.77	11
Scenario 8	W71_WEAVEML_2MILES	51.8	0.99	7	81.6	0.74	10
Scenario 9	W71_WEAVEACCESSRD	51.2	0.98	5	129.0	1.18	14
W101 Alternatives							
Scenario 10	W101WPR_ALLACCESS	44.8	0.86	3	71.5	0.65	3
Scenario 11	W101WFR	44.7	0.86	2	73.6	0.67	5
Scenario 12	W101WPR_I10ACCESS	63.5	1.22	14	75.8	0.69	6
Scenario 13	W101WPR_L101ACCESS	44.3	0.85	1	78.4	0.71	9

Note:
1. Total travel time includes the time spent traveling along I-10 and 101L within the project Study Area in both directions.

Alternative Comparison

This section begins to evaluate and describe the differences among I-10 operations associated with the No Action, W55, W71 and W101 alternatives based upon the VISSIM model results for delay per vehicle and total travel time. A summary of the discussion below along with recommendations are included in the conclusions presented in Section 9.

The delay per vehicle table (Table 15) shows that the system is more congested in the afternoon peak period than the morning peak period. Based on the best scenario from each alternative, the ranking in the morning peak period is W101, W71, No Action, and W55. In the afternoon peak period, the ranking is W101, W55, W71 and No Action. The major difference seen in the morning peak period is between alternatives. Still considering only the best scenario, the W101 Alternative results in much less delay when compared to the other three alternatives. The W101 Alternative delay is 59 percent, 50 percent, and 46 percent of the delay for the W71, No Action, and W55 alternatives, respectively. The next break in the alternatives is between the W71 Alternative and the W55 and No Action alternatives. The W71 Alternative delay is 84 percent and 79 percent of the delay for the No Action and W55 alternatives, respectively. The W55

Alternative results in seven percent more delay than the No Action Alternative. The W55 Alternative serves more traffic than the No Action Alternative in the morning peak period, but has a higher delay per vehicle. This is due to the higher demand (approximately 1000 vph) between 51st Avenue and I-17 in the eastbound direction along I-10. In the afternoon peak period, the difference between alternatives is less defined. When compared to the No Action Alternative, the best scenario from the W101, W55, and W71 alternatives result in 48 percent, 59 percent, and 67 percent of the delay in the afternoon peak period. Overall, the W101 Alternative results in the best traffic service along I-10 with respect to total delay per vehicle for both the morning and afternoon peak periods.

The total travel time comparison (Table 16) also shows that there is more congestion in the afternoon peak period. On average the travel times are 32 minutes longer than in the morning peak period. Based on the best scenario from each Alternative, the ranking in the morning peak period is W101, W71, No Action, and W55 and in the afternoon peak period the ranking is W55, W101, W71 and No Action. Still considering only the best scenario, in the morning peak period, the travel time for the W101 Alternative is lower when compared to the other three alternatives. The W101 Alternative travel time is 87 percent, 85 percent, and 81 percent of the travel time for the W71, No Action, and W55 alternatives, respectively. The travel time for the No Action, W55, and W71 alternatives differ by less than 10 percent. In the afternoon peak period, there is no difference between the best scenario from the W55 and W101 alternatives. Both result in a travel time that is 65 percent of the travel time for the No Build and 88 percent of the travel time for the W71 Alternative. The W71 Alternative results in lower travel times when compared to the No Action Alternative. Overall, the W101 Alternative results in the best traffic service along I-10 and 101L with respect to total travel time in the morning peak period, while in the afternoon peak period the W101 and W55 alternatives result in the best traffic service.

Local Access Scenario Comparison

In addition to evaluating the alternatives, the VISSIM model was also used to compare the effectiveness of different local access options. The descriptions of the local access options and their respective scenario number were presented in the South Mountain Freeway Alternatives (Chapter 2) of this report. The following sections will compare the options for the W55 and W71 alternatives together and the options for the W101 Alternative.

W55 AND W71 ALTERNATIVE

The delay per vehicle and travel time for the morning peak period and afternoon peak period are presented in Table 17 and Table 18, respectively for the scenarios representing the W55 and W71 Alternative. They are listed in order from lowest delay per vehicle to highest delay per vehicle.

Table 17. Comparison of Local Access Options for W55 and W71 Alternatives in A.M. Peak Period

Scenario	Description	A.M. Peak Period			
		Delay Per Veh (sec)	Ratio to No Action	Travel Time (min)	Ratio to No Action
W55 and W71 Alternatives					
Scenario 9	W71_WEAVEACCESSRD	180	0.84	51.2	0.98
Scenario 7	W71_BRAID_2MILES	183	0.86	51.4	0.99
Scenario 8	W71_WEAVEML_2MILES	188	0.88	51.8	0.99
Scenario 3	W55_BRAID_2MILES	228	1.07	54.8	1.05
Scenario 6	W55_WEAVEACCESSRD	228	1.07	55.1	1.06
Scenario 5	W55_WEAVEML_2MILES	230	1.07	55.0	1.06
Scenario 2	W55_BRAID_3MILES	232	1.08	55.1	1.06
Scenario 4	W55_WEAVEML_3MILES	237	1.11	55.6	1.07

The morning peak period results show almost no difference between the different local access options. The W71 Alternative scenarios are within eight seconds per vehicle of delay and less than one minute of travel time of each other. The W55 Alternative scenarios are within nine seconds per vehicle of delay and less than one minute of travel time of each other.

Table 18. Comparison of Local Access Options for W55 and W71 Alternatives in P.M. Peak Period

Scenario	Description	P.M. Peak Period			
		Delay Per Veh (sec)	Ratio to No Action	Travel Time (min)	Ratio to No Action
W55 and W71 Alternatives					
Scenario 5	W55_WEAVEML_2MILES	474	0.59	71.4	0.65
Scenario 4	W55_WEAVEML_3MILES	478	0.60	71.2	0.65
Scenario 8	W71_WEAVEML_2MILES	535	0.67	81.6	0.74
Scenario 3	W55_BRAID_2MILES	546	0.68	78.4	0.71
Scenario 2	W55_BRAID_3MILES	552	0.69	77.6	0.71
Scenario 7	W71_BRAID_2MILES	589	0.74	84.4	0.77
Scenario 6	W55_WEAVEACCESSRD	703	0.88	100.4	0.92
Scenario 9	W71_WEAVEACCESSRD	864	1.08	129	1.18

The results for the afternoon peak period better define the differences between the local access options. The scenarios with the weave on the mainline (Scenarios 5, 4 and 8) perform slightly better than the braided ramp (Scenarios 3, 2, and 7) and much better than the weave on the access road (Scenarios 6 and 9). The difference between the weave on mainline and braided ramp options is due to the location of the ramps in proximity with the upstream ramps. The weaving sections are shorter for the braided ramp options. For the weave on access road option, a combination of factors (short weaving section on the access road, overcapacity of the weaving

section lanes, and the close proximity of system and service ramp weaving) causes spillback onto I-10 and results in unfavorable operations. Within the individual access options, there is almost no difference among the scenarios with two miles of access roads (Scenarios 5 and 3) and those with three miles of access roads (Scenarios 4 and 2).

Based on the results above and discussions with ADOT and FHWA, the project team re-evaluated the three options to maximize the operations by making changes to the geometric layout. Modifications were made to the weave on access road and braided ramp options, but not the weave on the mainline option since there were no improvements possible. The changes are listed below:

- Modified W55 braid with 2 miles of access roads (Scenario 3) by maximizing the grades of the braided ramps in order to increase the weaving distance between the directional ramp exit movement and the braided ramp exit movement.
- Modified W55 weave on the access road (Scenario 6) by removing either the west pair of ramps, the east pair of ramps, or both sets of ramps.

Only the W55 Alternatives was modeled in the updated microsimulation. It is assumed that the results from the W55 Alternative would be applicable for the W71 Alternative since the operational trends were the same for each alternative in the initial microsimulation results.

The results of the secondary modeling are presented in Table 19. Only P.M. peak is presented since it showed the most differential during the initial run.

Table 19. Comparison of Local Access Options for W55 Alternative in P.M. Peak Period

Scenario	Description	P.M. Peak Period			
		Delay Per Veh (sec)	Ratio to No Action	Travel Time (min)	Ratio to No Action
W55 and W71 Alternatives					
Scenario 5	W55_WEAVEML_2MILES	474	0.59	71.4	0.65
Scenario 3 (MODIFIED)	W55_BRAID_2MILES	420	0.52	66	0.60
Scenario 6 (MODIFIED - West Ramps)	W55_WEAVEACCESSRD	530	0.66	74	0.67
Scenario 6 (MODIFIED - East Ramps)	W55_WEAVEACCESSRD	430	0.54	67	0.61
Scenario 6 (MODIFIED - No Ramps)	W55_WEAVEACCESSRD	460	0.57	69	0.63

By making the modifications discussed above, the ranking of local access options changed to braided ramps, east ramps only, no ramps, weave on mainline and west ramps only. Since the braided ramps have the best operations and provide more local access than any of the weave on access road options, it will be incorporated into the South Mountain Freeway design as the local access option along I-10 for the W55 and W71 alternatives.

W101 ALTERNATIVE

There are two comparisons being evaluated for the W101 Alternative. The first is a comparison of local access options for the partial reconstruction options. These are represented by Scenarios 10, 12, and 13. The delay per vehicle and travel time for the morning peak period and afternoon peak period are presented in Table 20 and Table 21, respectively. They are listed in order from lowest delay per vehicle to highest delay per vehicle.

Table 20. Comparison of Local Access Options for W101 Partial Reconstruction Alternative in A.M. Peak Period

Scenario	Description	A.M. Peak Period			
		Delay Per Veh (sec)	Ratio to No Action	Travel Time (min)	Ratio to No Action
W101 Alternatives					
Scenario 13	W101WPR_L101ACCESS	106	0.50	44.3	0.85
Scenario 10	W101WPR_ALLACCESS	109	0.51	44.8	0.86
Scenario 12	W101WPR_I10ACCESS	346	1.62	63.5	1.22

Table 21. Comparison of Local Access Options for W101 Partial Reconstruction Alternative in P.M. Peak Period

Scenario	Description	P.M. Peak Period			
		Delay Per Veh (sec)	Ratio to No Action	Travel Time (min)	Ratio to No Action
W101 Alternatives					
Scenario 10	W101WPR_ALLACCESS	381	0.48	71.5	0.65
Scenario 12	W101WPR_I10ACCESS	419	0.52	75.8	0.69
Scenario 13	W101WPR_L101ACCESS	438	0.55	78.4	0.71

The morning and afternoon peak periods produce mixed results for the three options evaluated for the partial reconstruction option. In the morning peak period, the I-10 access only option, Scenario 12, results in unfavorable traffic operations. The increased congestion is caused by a combination of factors (high demand for the 101L southbound to I-10 westbound and eastbound movements, a short weaving distance between the Thomas Road and McDowell Road ramps,

and overlapping system and service interchange ramp weaving within a short distance) that causes heavy queuing on southbound 101L, which spills back to the upstream ramps and weaving areas. In the afternoon peak period, all of the scenarios perform comparably, including the I-10 access only option.

The second evaluation identified differences from a traffic standpoint between the partial and full reconstruction options. This comparison is between Scenarios 10 and 11. The delay per vehicle and travel time for the morning peak period and afternoon peak period are presented in Table 22 and Table 23, respectively. They are listed in order from lowest delay per vehicle to highest delay per vehicle.

Table 22. Comparison of Partial and Full Reconstruction Options for W101 Alternative in A.M. Peak Period

Scenario	Description	A.M. Peak Period			
		Delay Per Veh (sec)	Ratio to No Action	Travel Time (min)	Ratio to No Action
W101 Alternatives					
Scenario 10	W101WPR_ALLACCESS	109	0.51	44.8	0.86
Scenario 11	W101WFR	109	0.51	44.7	0.86

Table 23. Comparison of Partial and Full Reconstruction Options for W101 Alternative in P.M. Peak Period

Scenario	Description	P.M. Peak Period			
		Delay Per Veh (sec)	Ratio to No Action	Travel Time (min)	Ratio to No Action
W101 Alternatives					
Scenario 10	W101WPR_ALLACCESS	381	0.48	71.5	0.65
Scenario 11	W101WFR	407	0.51	73.6	0.67

In both the morning and afternoon peak period there is almost no difference between the two options.

7. Intersection Analysis - SYNCHRO

For the arterial system analysis, typically four intersections per interchange, the ramp terminals and the two adjacent intersections, were selected. Intersections were analyzed using the combined results of two generally available software packages, CORSIM and SYNCHRO. Travel demand forecasts, used as input into the traffic analysis and simulation models, were developed using the existing EMME-2 model.

SYNCHRO/CORSIM MODEL DEVELOPMENT

SYNCHRO is a widely-used traffic analysis tool that is often used for localized intersection analyses, signal coordination, and traffic study work. It was used to evaluate ramp intersection operations. Adjacent street intersections were included within the network to account for the effect of platooning on the ramp terminal intersections that were evaluated.

Aerial photography was imported as the background to develop the basic SYNCHRO network. Field reconnaissance complimented the aerials when exact geometrics could not be determined. The phasing assumptions used in the various City agency models were used as the base whenever available. At several locations where no data was available, the HDR traffic team staff made site visits to record the signal phasing and determine the intersection operation for peak hour conditions for the base year model. The timing assumptions used in the various City agency models were also used as the base for the project whenever available.

CORSIM models were developed only in areas where spillback from ramp metering signals occurred within the VISSIM analysis. These CORSIM models were constructed from the aforementioned SYNCHRO models and then debugged and modified to include ramp metering in the appropriate locations. This analysis showed that in every case there was spillback from the ramp metering signal, the ramp terminal intersection would fail as well.

Intersection Analysis Summary

For each of the 14 scenarios considered in this analysis, an intersection capacity analysis was conducted that looked at the ramp terminal intersections along the I-10 corridor. Some of the ramp terminal intersections that had acceptable operations in SYNCHRO were reported to have failed due to the effect of ramp metering spilling back through the ramp terminal intersection.

As shown in Table 24, each of the action alternatives performs better than the No Action Alternative in the morning peak hour. The P.M. peak hour had results that varied among alternatives, and had no significant trends. The effects of ramp metering significantly increased the amount of failed intersections in the P.M. peak.

Table 24. Intersection Analysis Summary[1]

Scenario	Description	A.M. Peak Hour (7:00 – 8:00 A.M.) Number of Intersections		P.M. Peak Period (4:00 – 5:00 P.M.) Number of Intersections	
		Acceptable[2]	Failure[3]	Acceptable	Failure
No Action					
Scenario 1	No Action	30	6	28	8
W55 Alternatives					
Scenario 2	W55_BRAID_3MILES	34	2	30	6
Scenario 3	W55_BRAID_2MILES	34	2	27	9
Scenario 4	W55_WEAVEML_3MILES	34	2	26	10
Scenario 5	W55_WEAVEML_2MILES	34	2	27	9
Scenario 6	W55_WEAVEACCESSRD	34	2	26	10
W71 Alternatives					
Scenario 7	W71_BRAID_2MILES	33	3	29	7
Scenario 8	W71_WEAVEML_2MILES	33	3	29	7
Scenario 9	W71_WEAVEACCESSRD	33	3	30	6
W101 Alternatives					
Scenario 10	W101WPR_ALLACCESS	34	2	30	6
Scenario 11	W101WFR	30	6	28	8
Scenario 12	W101WPR_I10ACCESS	35	1	29	7
Scenario 13	W101WPR_L101ACCESS	35	1	29	7

Note:
1. Capacity Analysis Results based on Synchro 6.0 HCM Analysis
2. Acceptable LOS includes LOS A through D
3. Failure LOS includes LOS E and LOS F

As discussed above, the major cause of intersection failure is spillback from the ramp metering signals. The ramp meter locations that were found to cause spillback into adjacent intersections are listed in Table 25.

Table 25. Potential Queuing Locations Due to Ramp Metering

Alternative	Locations	
	A.M. Peak Period	P.M. Peak Period
No Action	McDowell Road NB[1], 115th Avenue EB[2]	Glendale Avenue SB[3], McDowell Road NB, Thomas Road NB, Indian School Road NB, 83rd Avenue WB[4]
W55	McDowell Road NB, 115th Avenue EB	Glendale Avenue SB, McDowell Road NB, Thomas Road NB, Indian School Road NB, 83rd Avenue WB, 75th Avenue EB, 59th Avenue EB, 51st Avenue EB, 35th Avenue WB
W71	McDowell Road NB, 115th Avenue EB, 67th Avenue WB	Glendale Avenue SB, McDowell Road NB, Thomas Road NB, 83rd Avenue WB, 75th Avenue EB, 43rd Avenue WB, 43rd Avenue EB
W101	115th Avenue EB	Glendale Avenue SB, Thomas Road SB, 115th Avenue EB, 83rd Avenue WB, 83rd Avenue EB, 75th Avenue EB, 43rd Avenue EB

Notes:
1. NB = northbound
2. EB = eastbound
3. SB = southbound
4. WB = westbound

8. HOV Direct Connections

As discussed previously, the ultimate configuration of the South Mountain Freeway is four general purpose lanes and one HOV lane in each direction. In the Western Section, the I-10 system interchange is designed to provide full mobility between the general purpose lanes on I-10 and the general purpose lanes on South Mountain Freeway. This section presents information related to the possibility of providing direct connection ramps for the HOV lanes between South Mountain Freeway and I-10 for each Western Section Alternative.

W55 AND W71 ALTERNATIVES

The W55 and W71 alternatives system interchange contains four general purpose directional ramps allowing traffic to travel from westbound to southbound, eastbound to southbound, northbound to westbound, and northbound to eastbound. In general, the ramps connect to the outside lanes of each freeway. The possibility exists to allow the same traffic movements for the HOV lanes. They would be connected through the median of each freeway. Due to this, the ramps would be grouped in pairs (westbound to southbound and northbound to eastbound; eastbound to southbound and northbound to westbound). The ramp pairs would be analyzed for traffic demand, right-of-way requirements, and constructability, individually and together.

W55 Alternative

The 2030 traffic projections for the W55 Alternative HOV direct connection ramps are presented in Table 26. The southern and eastern legs, which connect to the downtown area, are the heaviest movements with 9,000 vpd using the pair of ramps. The opposite movement has only 1,100 vpd. Initial review of the HOV ramps design concludes that no additional ROW is required. Review is ongoing as to the impacts to the arterial bridges adjacent to the system interchange and the constructability of the different ramp configuration.

Table 26. W55 Alternative HOV Connection Volumes

Interchange Connections	Ramp Movement	2030 HOV Ramp ADT
Southern and Eastern Legs	Ramp NB – EB	4,000
	Ramp WB – SB	5,000
Southern and Western Legs	Ramp NB – WB	1,000
	Ramp EB – SB	100

W71 Alternative

The 2030 traffic projections for the W71 Alternative HOV direct connection ramps are presented in Table 27. The connection legs are projected to have nearly the same traffic, with 6,700 vpd and 7,000 vpd on the southern and eastern legs and southern and western legs, respectively.

Initial review of the HOV ramps design concludes that no additional ROW is required. Review is ongoing as to the impacts to the arterial bridges adjacent to the system interchange and the constructability of the different ramp configurations.

Table 27. W71 Alternative HOV Connection Volumes

Interchange Connections	Ramp Movement	2030 HOV Ramp ADT
Southern and Eastern Legs	Ramp NB – EB	3,000
	Ramp WB – SB	3,700
Southern and Western Legs	Ramp NB – WB	3,500
	Ramp EB – SB	3,500

W101 ALTERNATIVE

The W101 Alternative system interchange contains eight general purpose directional ramps allowing traffic to travel from westbound to southbound, eastbound to southbound, westbound to northbound, eastbound to northbound, southbound to eastbound, southbound to westbound, northbound to westbound and northbound to eastbound. In general, the ramps connect to the outside lanes of each freeway. The possibility exists to allow the same traffic movements for the HOV lanes. They would be connected through the median of each freeway. Due to this, the ramps would be grouped in pairs (westbound to southbound and northbound to eastbound; eastbound to southbound and northbound to westbound; eastbound to northbound and southbound to westbound; westbound to northbound and southbound to eastbound). The ramp pairs will be analyzed for traffic demand, ROW requirements, and constructability, individually and in combinations.

The 2030 traffic projections for the W101 Alternative HOV direct connection ramps are presented in Table 28. The highest total traffic is projected for the northern and western leg connection (6,400 vpd). The next highest movement is the northern and eastern leg connection (5,000 vpd). Both of these legs connect I-10 and 101L. The ramps connecting I-10 and South Mountain Freeway have less demand (4,200 vpd on the southern and eastern legs and 2,900 vpd on the southern and western legs). Initial review of the HOV ramps design concludes that no additional ROW is required. Review is ongoing as to the constructability of the different ramp configurations.

Table 28. W101 Alternative HOV Connection Volumes

Interchange Connections	Ramp Movement	2030 HOV Ramp ADT
Southern and Eastern Legs	Ramp NB – EB	2,000
	Ramp WB – SB	2,200
Southern and Western Legs	Ramp NB – WB	1,600
	Ramp EB – SB	1,300
Northern and Western Legs	Ramp SB – WB	3,200
	Ramp EB – NB	3,200
Northern and Eastern Legs	Ramp SB – EB	3,000
	Ramp WB – NB	2,000

9. Conclusions

This chapter builds upon the observations and comparisons made in the Mainline Analysis Chapter, Intersection Analysis Chapter, and HOV Direct Connection Chapter of this report.

MAINLINE AND INTERSECTION ANALYSIS

A final disposition from strictly a traffic perspective and recommendations for improving the operations of each scenario is provided in Table 29.

Table 29. Traffic Analysis Recommendations

Scenario	Description	Recommendation
No Action Alternative; Scenario 1		The worst overall Alternative from a traffic standpoint.
W55 Alternative		Generally better than No Action, but not as good as W101 alternatives.
Scenario 2	W55_BRAID_3MILES	Removed from consideration since there is no improvement when compared to Scenario 3 (two miles of access roads).
Scenario 3	W55_BRAID_2MILES	Suitable for further consideration. With modifications to geometry becomes the best local access option.
Scenario 4	W55_WEAVEML_3MILES	Removed from consideration since there is no improvement when compared to Scenario 4 (two miles of access roads).
Scenario 5	W55_WEAVEML_2MILES	Removed from consideration since modified braided ramps and modified weave on access road options operate better.
Scenario 6	W55_WEAVEACCESSRD	Removed from consideration since modified options result in worse operations than modified braided ramps and reduce local access.
W71 Alternative		Generally better than No Action, but not as good as W101 Alternatives.
Scenario 7	W71_BRAID_2MILES	Suitable for further consideration. (See W55 discussion)
Scenario 8	W71_WEAVEML_2MILES	Removed from further consideration. (See W55 discussion)
Scenario 9	W71_WEAVEACCESSRD	Removed from further consideration. (See W55 discussion)
W101 Alternative		Best Alternative from a traffic standpoint.
Scenario 10	W101WPR_ALLACCESS	Suitable for further consideration. Best delay and travel time results overall.
Scenario 11	W101WFR	Suitable for further consideration. Include 2-lane ramps for southbound 101L to westbound I-10 ramp and eastbound I-10 to northbound 101L ramp. Slightly worse than partial reconstruction option (Scenario 10)
Scenario 12	W101WPR_I10ACCESS	Removed from consideration since operations worse than Scenario 10.
Scenario 13	W101WPR_L101ACCESS	Removed from consideration since operations worse than Scenario 10.

In conclusion, when comparing alternatives:

- The W101 Alternative performs better than the W55, W71 and No Action alternatives in the morning and afternoon peak periods.
- The W55, W71 and No Action alternatives perform nearly the same in the morning peak period, but not as well as the W101 Alternatives.
- The W55 and W71 alternatives perform better than the No Action Alternative in the afternoon peak period, but not as well as the W101 Alternatives.

When comparing local access options for the W55 and W71 alternatives:

- The modified braided ramp option performs better than the other options.
- The modified weave on access road options with east ramps or no ramps perform better than the weave on mainline option, but worse than the braided ramp options. The option with the west ramps performs the worst.
- There was no difference between the two miles of access road options and three miles of access road options, so the two miles option will be carried forward.

When comparing local access options for the W101 Alternative partial reconstruction option:

- The access to both I-10 and 101L option performed slightly better than the access to 101L only option.
- The access to both I-10 and 101L option should be carried forward as the local access option for the partial reconstruction option for the W101 Alternative.

When comparing the W101 Alternative partial reconstruction and full reconstruction:

- There is no difference from a traffic standpoint between the two options so both options will be carried forward.

HOV DIRECT CONNECTION ANALYSIS

Final recommendations are pending a full review of the impacts for each ramp configuration. Based on the traffic demand, an initial recommendation for each alternative follows:

W55 Alternative:

- Include southern to eastern legs connection in ultimate system interchange configuration.

W71 Alternative:

- Include both legs connection in ultimate system interchange configuration.

W101 Alternative:

- Include western to northern legs and eastern to northern legs connection in ultimate system interchange configuration.

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W101 Options Screening Memo

In support of the
Technical Studies to the
Environmental Impact Statement

South Mountain Transportation Corridor in Maricopa County, Arizona

Arizona Department of Transportation
Federal Highway Administration
in cooperation with
United States Army Corps of Engineers
United States Bureau of Indian Affairs

Version 1.0/January 2006
ADOT TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D

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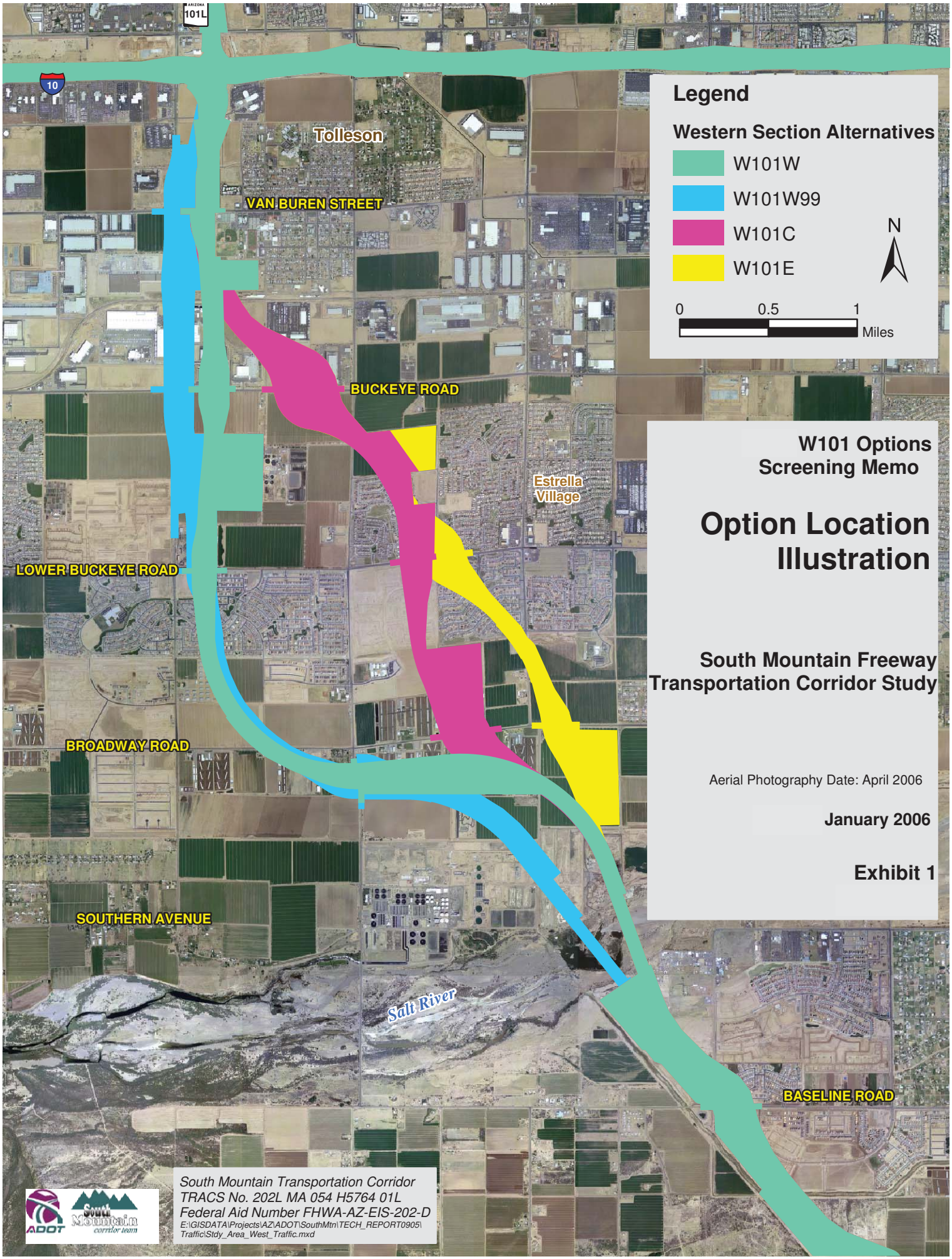
1. W101 Alternative Options Screening

Between Baseline Road and generally Van Buren Street, four alignment options are proposed for the W101 Alternative of the proposed South Mountain Freeway project. The options are the W99 Option (W101W99), the W Option (W101W), the C Option (W101C), and the E Option (W101E) (Exhibit 1 – Option Location Illustration).

The purposes of this technical memorandum are:

- to investigate the comparative performance of these options relative to cost, design, operational, and environmental factors;
- to determine if recommendations can be made to eliminate any of the options from detailed study based on the investigation and within the context of the National Environmental Policy Act (NEPA); and if such a recommendation can be made,
- to include the recommendation in this technical memorandum seeking project team concurrence of the recommendation.


101L
10
Tolleson
VAN BUREN STREET
BUCKEYE ROAD
Estrella Village
LOWER BUCKEYE ROAD
BROADWAY ROAD
SOUTHERN AVENUE
Salt River
BASELINE ROAD
Legend
Western Section Alternatives
W101W
W101W99
W101C
W101E
N
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Miles
W101 Options Screening Memo
Option Location Illustration
South Mountain Freeway Transportation Corridor Study
Aerial Photography Date: April 2006
January 2006
Exhibit 1
South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
Federal Aid Number FHWA-AZ-EIS-202-D
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ADOT
South Mountain corridor team

2. Summary of Findings and Recommendations

A multi-disciplinary exercise was undertaken to determine if for defensible reasons, any of the options of the W101 Alternative could be eliminated from further detailed study in the Draft Environmental Impact Statement. Details of the exercise are provided in the *Methodology* section below. The results of the exercise are presented in Exhibit 2 – W101 Option Scoring Matrix. First the team concluded that each of the options satisfied overall project purpose and need and therefore using purpose and need as a criterion was not beneficial to this exercise. Based on process and the results (as shown in Exhibit 2), the project team has decided that when considered together, the following reasons justify elimination of the W99 Option of the W101 Alternative for the following reasons:

- Traffic Operations - Undesirable horizontal curvature in close proximity to the South Mountain Freeway connection to I-10 would complicate driver decisions on the freeway (not a beneficial condition relative to driver expectancy).
- Local Arterial Access and Operations - The replacement of 99th Avenue with a pair of one-way frontage roads would contribute to a decrease in arterial street capacity which is an undesirable condition. The W99 Option would also result in two crossings of the Union Pacific Railroad lines – a very undesirable design condition.
- Right-of-Way (R/W) Impacts – While the W99 Option would displace about the same number of residences as the W Option (which would be expected) and up to 300 less residences than the C and E Options, it would displace a noticeably higher number of businesses (some with local and regional importance and high levels of capital investment) than the other options. Further the business displacements would affect a noticeably higher number of employees than the other options.
- Economic Impacts –The W99 Option would have the greatest impact resulting from reductions in property and sales tax revenues (this appears to be substantial to effects on the City of Tolleson).
- Preliminary Construction Costs – The W99 Option would be an estimated 18 percent higher in construction costs than the other highest cost option (E Option).

As a result of the decision, the W, C and E Options currently remain for detailed study in the DEIS. The project team is undertaking further study to determine if any of the remaining options should be eliminated from further detailed study in the DEIS. Two factors are of particular concern (as outlined in the *Assessment of Options* section of this memorandum) and they are: 1) the ability of the remaining options to optimize design of future connections to the South Mountain Freeway by SR 801 and Avenida Rio Salado; and 2) the comparative magnitude of impacts on residential and business relocations that would occur from the remaining three options.

Preliminary assessment illustrates the W Option performs better when compared to the C and E Options pertaining to operations and design, environmental impact, residential impact, and business impact (see *Assessment of Options* section of this memorandum for details). But it

would not perform as well relative to a future connection of the SR 801 or Avenida Rio Salado. However, because of its better performance in the categories noted above, a recommendation has been made to not eliminate from further study. Both C and E Options perform overall relatively the same as shown in Exhibit 2. However, when focusing on differentiators, preliminary assessment suggests the C Option would have the following benefits when compared to the E Option:

- substantially less residential displacements (a repeated major concern from the public as documented);
- more desirable geometry with respect to service traffic interchanges design;
- slightly lower preliminary cost estimates; and
- better opportunity for desirable design geometry for the future connections of the Avenida Rio Salado and SR 801 projects.

Based on these conclusions, an additional recommendation to eliminate the E Options from further detailed study has been made. This recommendation was presented to the project team on January 20, 2006. Based upon an assessment of how the information was organized relative to the recommendation, the project team directed HDR to restructure the memorandum to more succinctly present the information. The direction from the project team is reflected in this memorandum.

Exhibit 2. W101 Option Scoring Matrix

DESCRIPTION		WEIGHTING	OPTION								Comments
			W99		W		C		E		(See text for elaboration)
			Score[1]	Wt. Score	Score	Wt. Score	Score	Wt. Score	Score	Wt. Score	
Traffic Operations (Mainline):		1.0	3	3	5	5	4	4	4	4	All options would be similar in terms of projected traffic volumes and operations; creating numerous drivers' decision points is an undesirable condition; in this respect, observation of similar existing conditions suggest that the W Option would perform the best, followed by the E & C Options, and finally the W99 Option.
Design:		1.0	4	4	5	5	3	3	3	3	All options are anticipated to meet design standards; when viewed collectively in terms of horizontal and vertical design, the W Option would perform the best, followed by the W99 Option, and finally the C & E Options.
RFS Linkage:		0.8	3	2.4	3	2.4	4	3.2	5	4.0	SR 801 & Avenida Rio Salado are planned to connect to the South Mountain Freeway somewhere between Lower Buckeye Road and the Salt River; the E Option would appear to best accommodate the connections, followed by the C Option; the W and W99 Options are on the same alignment where the connection may occur and appear to be the least conducive.
Local Access:	**Footprint**	0.6	4		5		3		2		Six or seven service traffic interchanges would occur in the area of the alignment options; the ability to provide access between the freeway system and local arterial streets is important to the local officials, businesses, and residents. Local access is also important to minimize emergency response time for incident management on the freeway system and to residences and businesses. Based solely on interchange footprint size, the W Option would perform the best, followed by the W99 Option, C Option, and finally the E Option.
	Location		2		3		5		4		
	Avg. Total		3	1.8	4	2.4	4	2.4	3	1.8	
Local Arterial Operation:		0.7	1	0.7	3	2.1	4	2.8	3.5	2.5	Relating to arterial street intersection proximity and operation, the C Option would perform the best, followed by the E Option, and finally the W and W99 Options; additionally, the W99 Option would also result in two crossings of the Union Pacific Railroad lines – a very undesirable design condition.
Fatal Flaws:		Not Applicable - No Identified Fatal Flaws									
Environmental Impact[2]:		0.5		1.9	3.9	2.0	2.9	2.5	2.9	2.5	All options when considering key environmental factors together perform at a similar level. The C and E Options appear to perform slightly worse than the W and W99 Options; this is due primarily to anticipated greater mitigation requirements for noise mitigation for the C and E Options.
R/W Impacts[3]:		1.0	2.5	2.5	4.0	4.0	2.0	2.0	1.5	1.5	Residences: The C and E Options would result in the largest number of residential displacements (140 or more residences from the C option than options further west; approximately 300 or more residences from the E option than either of the W or W99 option). The W and W99 Options would have noticeably less residential displacements. Businesses: The W99 Option would have the greatest impact (10 businesses, 1,400 employees); W would have the least effect (3/4 businesses, 100 employees); C and E Options would have similar impact (5 to 6 businesses and approximately 900 employees). Other: The E Option would avoid impacts on expansion plans for the 91st Avenue Wastewater Treatment Plant; the W99, W, and C Options alignments would be adjusted to avoid impacts on the plant.
Economic Impacts[3]:		1.0	2.0	2.0	2.3	2.3	2.3	2.3	3.0	3.0	See Exhibit E4 for presentation of comparative analysis.
Preliminary Construction Costs:		0.8	2	1.6	3	2.4	3	2.4	3	2.4	Costs are based solely on conceptual level construction estimates; ranking does not include R/W acquisition and relocation costs; however, when anticipating acquisition and relocation costs, the W Option would likely be the least costly, followed by the W99 Option; the C and E Options would likely have the highest acquisition and relocation costs.
Acceptance:		0.8	1	.8	1	.8	1	.8	1	.8	Although some preference for one option over the others has been expressed, none of the jurisdictions have communicated support for any of the options.
Score (weighted):				20.7		28.4		25.7		25.5	
Score (unweighted):[4]			25.2		34.2		30.2		29.9		
Performance Ranking:[5]			1		4		3		2		

Notes:
1. Ranking: 5 = optimum performance, 1 = poor performance
2. See Exhibit 2 for scoring.
3. See Exhibit 3 for scoring.
4. Unweighted scores calculated to assess comparison of weighted vs. unweighted only. Total excludes footprints and location of local access as separate rankings; they are averaged.
5. Performance Ranking: 4 = highest; 1 = lowest

Western Section 101 Connection Alternatives: W99 = 99th Avenue Alignment Option; W = 101L Alignment Option; C = Central Alignment Option; E = Eastern Alignment Option
Wt. Rating = Weighted Rating

3. Methodology

Aerial photography (field verification), Geographic Information Systems (GIS) data input, and design data were used to create the basis for analysis. Screening criteria were established based on a premise to compare the options in a comprehensive manner (descriptions of criteria are presented below). Prior to screening, the criteria were compared against each other for the purposes of weighting each. Both the establishment and relative weighting of criteria were discussed and confirmed through consensus of the participants (participants identified below). This allowed each scoring item to be assigned a weighted adjustment to ensure higher priority issues were given a higher weighting when scoring options.

When scoring each alternative, the performance of each option was compared against each other alternative. This was done to determine which option best met project goals and objectives based solely on technical merits. As each alternative was reviewed and scored, the resultant value was confirmed by discussions and overall consensus of the participants.

HDR Engineering, Inc. (HDR) representatives Jack Allen (environmental), Ben Spargo (design and operations) and Chris Clary-Lemon (design and operations) served as primary analysts in the screening effort. Other HDR staff supported the effort when clarification was required. The approach, findings, recommendations, and resulting memorandum were reviewed by Amy Edwards, HDR Project Manager, prior to submittal to Arizona Department of Transportation (ADOT) and Federal Highway Administration (FHWA) for consideration. On January 20, 2006, ADOT, FHWA and HDR team members met and discussed the contents, conclusions, and recommendations of the initial draft of the memorandum. Based on the direction given at the meeting, the content was revised as reflected in this memorandum.

Using a weighted ranking system to consider comparative analysis has been successfully used by ADOT and FHWA for Regional Freeway System (RFS) projects in the recent past. On the SR202/US60 System-to-System Interchange project, this methodology was used to support the identification of alternatives to be studied in detail in the NEPA Environmental Assessment prepared for the project. To clarify, the weighted ranking exercise did not serve as the final analysis in making recommendations; more so, it was used as a tool to allow team members to assess information about the options to better articulate recommendations for the screening exercise.

4. Assessment of Options

The following criteria were established for screening purposes. Each individual criteria was assigned a weight ranging from 0.1 to 1.0 in importance level with 0.1 reflecting the lowest level of importance and 1.0 reflecting the highest level of importance. The weighting does not reflect a comparison of criteria, but instead is a weighting in importance to the overall project goals and objectives. Assigned weighting can be found in Exhibit 2 – Scoring Matrix.Traffic Operations

- Design
- RFS Linkage
- Local Access (to and from Freeway System)
- Local Arterial Operations
- Design and/or Environmental Fatal Flaws
- Environmental Impact Comparative Analysis
- R/W Impacts (residences, businesses, developable land)
- Economic Impacts
- Preliminary Construction Cost
- Acceptance

SCORING ITEMS WEIGHTING

Each option was ranked using a scale of 1 to 5. Five represented optimum performance against the criteria. One represented poor performance. The ranking was based on overall performance and in comparison of the performance of the other W101 options. Below are descriptions of criteria followed by an assessment of each option's performance relative to the criteria.

Traffic Operations [Weighting = 1.0]

CRITERIA

The W101 Alternative mainline must operate at an acceptable level of service (LOS) based on Design Year 2030 traffic volume projections.

The alignment option should provide sufficient capacity to provide an acceptable LOS allowing for minor variations in the design year traffic volume projections caused by unanticipated development or changes in regional travel patterns.

In the event all options are anticipated to perform at acceptable levels, comparison will be made relative to anticipated travel speeds and general preferences for operation.

In the event all options are anticipated to not perform at acceptable levels, comparison will be made relative to anticipated travel speeds and general preferences for operation.

ASSESSMENT

Traffic operations for all four options would be similar in terms of projected traffic volumes (both along I-10, Loop 101, and the South Mountain Freeway) as well as operations characteristics (directional distribution and LOS).

One area where the four options do differ that may have an impact on traffic operations is the geometry of the South Mountain Freeway itself. The system interchange that would connect the South Mountain Freeway to I-10 and Loop 101 would be a major decision point for motorists (driver expectancy) along the proposed freeway. These types of decision points have historically been associated with higher accident locations as the drivers' attention is refocused from driving to "other" decisions at hand (i.e., weaving traffic, lane selection, and merging/diverging ramps). Consequently, the potential for increased crashes would exist as drivers pay less attention to the driving moment, and more attention to where they need to be in 10 seconds, 30 seconds, 2 minutes, etc, from the moment.

The W Option presents the longest tangent section south of I-10; whereas the C and E Options introduce a horizontal curve approximately one mile south of I-10 (the longer tangent section also better orients the driver to a north-south alignment perpendicular to the east-west alignment of I-10). Although completely within the standards set forth in design criteria, this horizontal curve does introduce another decision prior to the system interchange, which could result in slower traffic movements. These slower movements could in turn result in a lower LOS (in reality as opposed to model land) as well as increased crashes. The W99 Option also introduces a horizontal curve south of I-10. While this curve is less pronounced, it is closer to the system interchange and actually contains ramp junctions on the curvilinear alignment.

In this respect, observation of similar existing conditions suggest that the W Option would perform the best, followed by the E Option, C Option, and finally the W99 Option (see Exhibit 2 for ranking results).

Design [Weighting = 1.0]

CRITERIA

The design must meet The American Association of State Highway and Transportation Officials (AASHTO) and ADOT design standards to optimize highway safety and operational characteristics.

The AASHTO design standards are mandatory for all elements. The ADOT geometric standards are mandatory, unless a formal design exception is obtained from the ADOT Roadway Group (not anticipated).

In the event all options are anticipated to meet design standards, a comparison will be made relative to minimum and desirable design features based on observed operations on other segments of the Regional Freeway System (RFS).

ASSESSMENT

All four options for the W101 Alternative meet both AASHTO and ADOT design standards. In some instances, “minimum” standards were used. Where possible, “desirable” standards were used.

There is no discernable difference between the four options based on the horizontal curve design. All horizontal curves in advance of the system interchange would exceed minimum standards, with the 4,583.66 feet (D = 1.15.00) as the minimum radius used.

Based on the vertical curve design of the four options considered, little difference is evident among the options. Where possible, all options attempt to lower to existing ground when not crossing features such as railroad tracks and arterial streets. In this respect, the W Option and the W99 Option appear to function better than the C and E Options. This is due to “double crossings” of arterial streets. The W and W99 Options would cross over Broadway Road and 91st Avenue in close proximity to one another, and thus, the vertical alignment would not approach existing ground. The same situation would occur for the C Option at Buckeye Road and 91st Avenue (this would also apply to the E Option at this location) and for the E Option at Broadway Road and 83rd Avenue.

When viewed collectively in terms of horizontal and vertical design, the W Option would perform the best, followed by the W99 Option, C Option, and finally the E Option (see Exhibit 2 for ranking results).

RFS Linkage [Weighting = 0.8]

CRITERIA

State Route (SR) 801 is planned to connect to the South Mountain Freeway somewhere between Lower Buckeye Road and the Salt River. As planned, it would connect to one of the four options considered in this memorandum. The alignment of the South Mountain Freeway should optimize the system-to-system interchange configuration that would result.

In the event all options are anticipated to optimize the interchange configuration, comparison will be made relative to undesirable and desirable design features based on observed operations on other system interchanges of the RFS.

ASSESSMENT

SR 801 is planned to connect to the South Mountain Freeway between Lower Buckeye Road and the Salt River. In this location, the four options to the W101 Alternative follow three different horizontal alignments, all of which would result in different system interchange configurations.

Based solely on horizontal curves and the desire to not directly affect the treatment plant located near Southern Avenue, the E Option would appear to best accommodate the connection, followed by the C Option. Both the W and W99 Options are on the same alignment where the connection may occur and appear to be the least conducive to accommodating the connection.

Local Access: [Weighting = 0.6]

CRITERIA

Six or seven service traffic interchanges would occur in the area of the alignment options. The ability to provide access between the freeway system and local arterial streets is important to the local officials, businesses, and residents. Local access is also important to minimize emergency response time for incident management on the freeway system and to residences and businesses.

The number of local access points should be maximized when technically, environmentally and economically feasible without negatively affecting the operational characteristics of the mainline. Desirable and undesirable local interchange design configurations are considered when comparing the options.

ASSESSMENT

In comparing local access between the four options, footprint size and proximity of adjacent intersections was considered.

In the design analysis of the W99 Option, the vertical/horizontal constraints of the mainline and frontage roads would not permit the inclusion of the half interchange at Van Buren Street (as would be the case for the other three options).

The two options with the most interchanges on tangent segments, and thus the smallest interchange footprint sizes, are the W and W99 Options (although the W99 Option would incorporate frontage roads and thus more R/W), followed by the C Option. The E Option would have the largest interchange footprints.

With respect to adjacent intersections in close proximity to interchange ramps, the W Option is in close proximity to four arterial intersections (Van Buren Street/99th Avenue, Buckeye Road/99th Avenue, Lower Buckeye Road/99th Avenue, and Broadway Road/91st Avenue). The C Option is in close proximity to two arterial intersections (Van Buren Street/99th Avenue and Buckeye Road/91st Avenue). The E Option is in close proximity to three arterial intersections

(Van Buren Street/99th Avenue, Buckeye Road/91st Avenue, and Broadway Road/83rd Avenue). The W99 Option is slightly different in this category as it lies directly on top of 99th Avenue (which would be reconstructed as one-way frontage roads). While these frontage roads could create their own conflicts, two arterial intersections are also in close proximity (Lower Buckeye Road/99th Avenue and Broadway Road/91st Avenue).

Based solely on interchange footprint size, the W Option would perform the best, followed by the W99 Option, C Option, and finally the E Option (see Exhibit 2 for ranking results).

Local Arterial Operation: [Weighting = 0.7]

CRITERIA

A primary purpose of the proposed project is to provide added capacity to the overall transportation system; including the local arterial network.

It is undesirable to eliminate arterial capacity. In the event all options are anticipated to not eliminate arterial capacity, a comparison will be made relative to undesirable and desirable design features on the arterial network that may result from the options.

ASSESSMENT

The arterial street network would function best when the freeway alignment and its interchange ramps do not affect the arterial street (by removing capacity) and/or the arterial street grid signalized intersections (indirectly).

Using the same information presented above related to arterial street intersection proximity, the C Option would perform the best, followed by the E Option, and finally the W and W99 Options (see Exhibit 2 for ranking results).

As the W99 Option eliminates the existing 99th Avenue and reconstructs it as a pair of one-way frontage roads, it is reasonable to expect a decrease in the capacity of this arterial street, and its appeal to adjoining property owners. In so doing, the W99 Option would also result in two crossings of the Union Pacific Railroad lines – a very undesirable design condition.

Design and Environmental Flaws [Weighting = N/A]

CRITERIA

An identified design and/or environmental fatal flaw will automatically eliminate an alternative from further consideration. Examples of fatal flaws would be if an alternative would directly impact a property protected under Section 4(f) of the Department of Transportation Act, or if certain design standards cannot be achieved. Weighting is not applicable under this criteria.

ASSESSMENT

A western portion of the Estrella District Complex (under construction) would be located within the W99 and W Options. As planned, the affected area of the complex would be a retention basin and trail, and would also serve as a grassy open space/play area. Similarly, the E Option would pass through a retention basin within a proposed City of Phoenix facility planned for the corner of 83rd Avenue and Elwood Road; the basin would also function as a public recreational facility. Relative to the park at 83rd Avenue and Elwood Road, the E Option could be adjusted to fully avoid the entire site, if warranted.

IMPORTANT NOTE

A determination has been made the Estrella District Complex is not afforded protection under Section 4(f) of the Department of Transportation Act. The complex when completed will include a myriad of city facilities including a fire station, police facilities, other government facilities and recreational amenities. Therefore, the complex in its entirety is determined to be a multiple use facility not afforded protection under Section 4(f) of the Department of Transportation Act.

Environmental Impact Comparative Analysis [Weighting = 0.5]

CRITERIA

This item addressed the impacts of the options on the environment and adjacent existing and planned development. Environmental factors considered include noise, air quality, visual, floodplains, farmlands, hazardous materials and environmental justice.

ASSESSMENT

All options when considering key environmental factors together perform at a similar level. The C and E Options appear to perform slightly worse than the W and W99 Options; this is due primarily to anticipated greater demand for noise mitigation for the C and E Options (see Exhibit 3 for ranking results).

Right-of-Way Impacts [Weighting = 1.0]

CRITERIA

The displacement and subsequent relocation of residences and businesses is an important criteria when considering alignment options. This criterion considered the number of residences (existing homes and platted lots) and the number of businesses (including number of employees)

that would be affected by the options. Additionally, when comparing options, the potential impacts (both in ability and in potential cost) of relocating certain businesses were taken into account.

ASSESSMENT

Residences: The C and E Options would result in the largest number of residential displacements (140 or more residences from the C option than options further west; approximately 300 or more residences from the E option than either of the W or W99 option). The W and W99 Options would have noticeably less residential displacements.

Businesses: The W99 Option would displace businesses including Fry's, Albertsons, Bay State Milling, and American Italian Pasta Company (AIPC) and an estimated 1,400 employees. The relocation of Bay State would likely have negative impacts on the local and regional economy and would be very expensive due to the high level of capital investment there.

The W Option would displace approximately 100 employees (includes Western Container).

The C and E Options would displace businesses including Rouseau Farming Co, Holsum Bakery, and Atrium Windows & Doors. Atrium is a major employer (approx. 450) and Holsum and Atrium have high levels of capital investment and would be very expensive to relocate. Major business interruptions would be expected with the relocation of Holsum. Approximately 900 employees would be affected by the C and E Options (the number varies slightly depending upon whether the I-10/101L traffic interchange is fully reconstructed or partially reconstructed).

Conclusion: As shown in the matrix, the W Option would, by far, perform the best when considering residential and business R/W impacts together (as described here). The C and E Options would be the poorest performers of the four options because of the impacts on both existing residences and businesses. While the W99 Option would have the least impact (by a slight margin) of residential R/W impacts, it would have the greatest degree of business relocation impact of the four options (see the Exhibit 4 for ranking results).

Economic Impacts [Weighting = 1.0]

CRITERIA

Economic impacts considered the projected reduction in property and sales tax to the cities of Phoenix, Tolleson, and Avondale on an annual basis over the course of the design period.

ASSESSMENT

When considered together, the W99 and W Options were the poorest performers while the E Option performed the best (primarily due to the most positive effect on the City of Phoenix (see the Exhibit 4 for ranking results). Fiscal impacts (property and sales tax revenues) would be

lower for the E Option than for the C or W options because with current land uses, there is less commercial property relative to the other options. There are approximately 22 acres of mining (aggregates) within the E Option that would not be affected by the other options (under future land uses, this mining land apparently would become developable and the difference would go away). The potential current fiscal impacts to Tolleson could account for as much as 10-20% of their current General Fund revenues.

Preliminary Construction Cost: [Weighting = 0.8]

CRITERIA

The alignment characteristics must be achieved in the most cost effective manner possible to obtain the necessary funding to implement the new facility.

ASSESSMENT

The preliminary construction costs for the four options between Van Buren Street and Southern Avenue (south bank of Salt River) are listed below in order of least to most:

Cost Estimate – Conceptual	
Option	Estimate in Millions of Dollars
C Option	$217
W Option	$227
E Option	$233
W99 Option	$274

The $16 million range among the C, W, and E Options represent less than 8 percent of the total cost. The major difference is the W99 Option which is over $40 million (about 18 percent) more than the highest other option. The unique configuration of the W99 Option also lends it to increased costs for utilities, drainage, and miscellaneous items that could not be foreseen at this level of design. The ranking does not consider R/W acquisition and relocation costs; however, when anticipating acquisition and relocation costs, the W Option would likely be the least costly, followed by the W99 Option; the C and E Options would likely have the highest acquisition and relocation costs.

Acceptance: [Weighting = 0.8]

CRITERIA

This item addresses the ability of the options to generate acceptance for implementation as it is currently understood. This issue is critical to the perception of ADOT's performance. Political influences can alter costs, schedule and public acceptability. Acceptance focuses on input received to date by the directly affected stakeholders of Tolleson, Avondale and Phoenix.

ASSESSMENT

Based upon current understanding, none of the three stakeholders support any of the W101 options. Reasoning for and degree of lack of support may vary. The City of Phoenix is opposed to any alternative or option other than the W55 Alternative; the City of Tolleson is opposed to any alignment (W101 Alternative) that would convert land within city jurisdiction to a non-taxable transportation use, as well as for other reasons. The City of Avondale has gone on record as not supporting the W101 Alternative. Therefore, the four options are equally determined to be poor performers under this criteria.

SCORING METHODOLOGY

The team reviewed each option based on each matrix scoring item. The resultant value of each item was determined by group discussion and overall consensus by the evaluation team. The composite alternative score is the sum of each alternative scoring item value multiplied by the weighting value. The final option scores and rankings are presented in Exhibits 2, 3, and 4. The scoring and rankings serve to support the discussion of the comparative analysis of the memorandum; the scoring and rankings are not supported by the context of this memorandum.

5. Recommendation

Before making any recommendations associated with W101 Options, it is first made clear through this memorandum that all W101 Options would support the overall project purpose and need. By so doing, for the purposes of this exercise, purpose and need is not a differentiator among the options and therefore, was not included in this screening process.

When reviewing Exhibit 2 – W101 Option Scoring Matrix, it is important to view the weighting, rankings and final scorings only as guidance when comparing the W101 Options. When making the following recommendations, the team generally considered the overall scoring communicated within the context of all criteria. From this information, the team then considered other factors, such as evolving themes associated with public input. As an example, the rapid development of residential communities in the area of the W101 Option and potential impacts on such development is reflected in the rankings under R/W Impacts; what is not reflected is the strong public message in opposition to the taking of homes and businesses in the area. Therefore, when considering this recommendation, the team attempted to take into account project-related aspects that could not necessarily be quantified in a scoring matrix.

Based on the above caveat, the W99 Option clearly performs the worst of the four options (the W Option the best) when taking into account all factors considered. Therefore, the project team will *eliminate the W99 Option from further detailed study*. *When considered together, the following reasons support this elimination*:

- Traffic Operations - Undesirable horizontal curvature in close proximity to the South Mountain Freeway connection to I-10 would complicate driver decisions on the freeway (not a beneficial condition relative to driver expectancy).
- Local Arterial Access and Operations - The replacement of 99th Avenue with a pair of one-way frontage roads would contribute to a decrease in arterial street capacity which is an undesirable condition. The W99 Option would also result in two crossings of the Union Pacific Railroad lines – a very undesirable design condition.
- Environmental Impact – Three high priority and nine medium priority sites would be within the R/W of W99 Option; a noticeably higher number of sites than the other options being considered. All other factors remain relatively equal.
- R/W Impacts – While the W99 Option would displace about the same number of residences as the W Option (which would be expected) and up to 300 less residences than the C and E Options, it would displace a noticeably higher number of businesses (some with local and regional importance and high levels of capital investment) than the other options. Further the business displacements would affect a noticeably higher number of employees than the other options.
- Economic Impacts –The W99 Option would have the greatest impact resulting from reductions in property and sales tax revenues (this appears to be substantial to effects on the City of Tolleson).

- Preliminary Construction Costs – The W99 Option would be an estimated 18 percent higher in construction costs than the other highest cost option (E Option).

ACTION #1

In comparing all W101 Options, the W101 Option study team has determined the W99 Option will be eliminated from further study in the EIS. Reasons are cited in the main text of the Recommendations section of this technical memorandum.

Based on the above considerations, the W101 Option study team recommends the W99 Option be eliminated from further study in the Environmental Impact Statement (EIS).

If the project team supports the recommendation to eliminate the W99 Option, the W, C, and E Options remain within the context of the detailed study in the EIS. As shown in Exhibit 2 of the three, the W Option has the highest scoring at 28.7 while the C and E Options scored lower at 24.7 and 24.8, respectively. Based solely on scoring, a conclusion could be reached to conclude the screening exercise with these three options. However, as noted in the opening paragraph of this section, other factors such as evolving themes that were not capably captured in the scoring matrix should be considered. An example of such a theme is the strong public message in opposition to the taking of homes and businesses should be factored into project-related decisions.

The table below illustrates the differences in residential and business displacements of the three remaining options.

Displacements[1] - W, C, and E Options					
	W Option	C Option	W vs. C Options	E Option	W vs. E Options
Residences[2]	228	368	The C Option would displace 140 more residences than the W Option	522	The E Option would displace 294 more residences than the W Option
Businesses					
Business[3]	3 or 4	6	The C Option would displace 2 to 3 more businesses than the W Option	5	The E Option would displace 1 to 2 more businesses than the W Option
Employees	100	900	The C Option would affect 800 more employees than the W Option	900	The E Option would affect 800 more employees than the W Option
Additional Comment: Both the C and E Options could displace three businesses having high capital investment levels and resulting costly relocation efforts. The W Option would not have such conditions occurring (see Exhibit 3).					

Displacements[1] - W, C, and E Options
Notes: 1. Effective date January 11, 2006 2. Residential displacements include existing residences and platted lots. 3. The 900 affected employees represents a midrange number dependent upon whether the I-10/101L traffic interchange is fully or partially reconstructed. W = West, C = Central, E = East

Among other factors to consider when comparing the three options, the W Option has more desirable operational and design features (with the possible exception of the future connection to SR 801 currently under study). From a preliminary cost perspective, there is a $30 million cost range among the three options – not enough to differentiate the options. From an environmental impact perspective, the W Option performs better primarily due to lesser noise mitigation associated with the W Option than with either the C or E Options. Based on this information as summarized in the table below, *the W Option performs better than the C and E Options.*

Performance Comparison - W, C, and E Options				
Differentiator Criteria	Options			Comment
	W	C	E	
Operation & Design	+	0	0	W Option has more desirable operational and design features (with the possible exception of the future connection to SR 801 currently under study)
Preliminary Cost	0	0	0	$30 million cost range among the three options
Environmental Impact	+	0	0	W Option would perform better primarily due to less noise mitigation
Residential Impact	+	0	-	W Option would affect 140 to 300 less residences
Business Impact	+	0	0	W Option would affect 1 – 3 less businesses and 800 less employees
Operation & Design	+	0	0	W Option has more desirable operational and design features (with the possible exception of the future connection to SR 801 currently under study)
Conclusion: Among differentiating criteria, the W Option has more favorable attributes than either the C or E Options				
Notes: W = West, C = Central, E = East + = better performance; - = worst performance in comparative analysis				

From this conclusion, a recommendation could be made to eliminate the C and E Options from further detailed study in the EIS. However, one additional factor should be weighed into the screening process before such a recommendation is made – RFS linkage. The RFS linkage is a screening criterion (see *Scoring Items Weighting* section of this memorandum); it focuses on the future connection of SR 801 to the South Mountain Freeway. Both C and E Options perform better than the W Option for this criterion.

Also important in this issue is the City of Phoenix's proposed Avenida Rio Salado project and its relationship to both the SR 801 and South Mountain Freeway projects. How both the Avenida Rio Salado and SR 801 projects interact with the South Mountain Freeway is still in the planning phases. Because the two projects' connections to the South Mountain Freeway project are an 'unknown' at this time, maintaining an alternative connection to just the W Option would be prudent. Therefore, eliminating both C and E Options although defensible, is not recommended; one or both options should be carried forward for detailed study at least until such time that the Avenida Rio Salado and SR 801 projects relationship with the South Mountain Freeway project are better established.

As such, since the C Option would outperform the E Option in the areas below, it is recommended that the E Option be eliminated from further detailed study and the C Option be carried forward with the W Option for detailed study in the EIS:

- ► substantially less residential displacements;
- ► more desirable geometry with respect to service traffic interchange design;
- ► slightly lower preliminary cost estimates; and
- ► better opportunity for desirable design geometry for the future connections of the Avenida Rio Salado and SR 801 projects.

Further carrying the C Option forward would maintain a viable W101 Alternative in the event the W Option was fatally flawed due to guidance established under Section 4(f) of the Department of Transportation Act.

ACTION #2 – NOT ACTED UPON AT THIS TIME

Because both the proposed Avenida Rio Salado and SR 801 projects are still in the planning phases, it is currently unknown as to how both projects may or would connect to the South Mountain Freeway. Therefore, it is recommended the C Option be carried forward in detailed study in the EIS (due to better performance than the E Option with respect to this criterion and others). This is a prudent recommendation in the event the W Option is determined to be fatally flawed; the C Option would maintain a viable W101 Alternative in the EIS.

Exhibit 3. Environmental Impact Comparative Matrix

ISSUE	MEASUREMENT (within Right-of-Way)	WEIGHT	W101 OPTION								COMMENT
			W99		W		C		E		
			Quant.	Wt. Rating	Quant.	Wt. Rating	Quant.	Wt. Rating	Quant.	Wt. Rating	
Hazardous Materials	# of high priority sites	.3	3	2(.3)=.6	0	5(.3)=1.5	0	4(.3)=1.2	0	4(.3)=1.2	Hazardous materials issues are not expected to be a discriminator for any of the L101 connection options.
	# of medium priority sites		9		0		2		2		
Prime Farmland	Acres	.2	499	1(.2)=.2	412	1(.2)=.2	457	1(.2)=.2	432	1(.2)=.2	Farmland impacts weighted low due to rapid conversion occurring because of non-transportation projects.
Noise Barrier	Cost ($ millions)	.7	$15.8	3(.7)=2.1	$17.0	3(.7)=1.4	$18.8	1(.7)=0.7	$19.3	1(.7)=0.7	Barrier costs are a good indicator of the number of affected receptors and barrier lengths.
Visual Quality	N/A	.3	Visual quality impacts anticipated to be relatively equal among options.								
100-Year Floodplain	Acres	.4	62	2(.4)=.8	61	2(.4)=.8	60	2(.4)=.8	62	2(.4)=.8	All options using proper design would minimize floodplain impacts and all options can create enhancement opportunities for the planned Rio Salado Oeste project.
Section 4(f) Resources	# of resources[1]	.8	None of the options would result in either a direct or constructive use of resources afforded protection under Section 4(f)								
Environmental Justice/ Title VI	Demographic concentrations	.7	The difference in affected minority blocks with displacements is not sufficient, given the difference in the number of displacements between the Options to justify differentiating between the Options. There is no difference in the number of affected census geographies with displacements for the other EJ communities (elderly, poverty, female head of household with own children).								
	TOTAL			3.7		3.9		2.9		2.9	

Notes:
1. Quantities reflect the identified number of resources afforded protection under Section 4(f) 'used' by proposed options.
Western Section 101 Connection Alternatives: W99 = 99th Avenue Alignment Option; W = 101L Alignment Option; C = Central Alignment Option; E = Eastern Alignment Option
Wt. Rating = Weighted Rating
Ranking: 5 = optimum performance, 1 = poor performance
FF = Fatal Flaw in Screening Criteria Process
Highlighted boxes constitute numbers not included in rating calculation

Exhibit 4. Displacement and Economic Comparative Matrix

ISSUE	MEASUREMENT (within Right-of-Way)	WEIGHT	W101 OPTION								COMMENT
			W99		W		C		E		
			Quant.	Rating	Quant.	Rating	Quant.	Rating	Quant.	Rating	
Displacements	# of residences (existing)	1.0	169	4(1.0)=4.0	175	4(1.0)=4.0	174	1.5(1.0)=1.5	199	1(1.0)=1.0	W99 & W: includes the police training facility.
	# of residences (platted lots)		53		53		194		323		C: police training facility
	# of businesses	1.0	10	1(1.0)=1.0	4/3	4(1.0)=4.0	6	2.5(1.0)=2.5	5	2(1.0)=2.0	W99: Would displace businesses including Fry's, Albertsons, Bay State Milling, and AICP. The relocation of Bay State would likely have negative impacts on the local and regional economy and would be very expensive due to the high level of capital investment there.
	# of employees[1]		1,400		100		900		900		W: Would displace less than 100 employees (includes Western Container). C: Would displace businesses including Rouseau Farming Co, Holsum Bakery, and Atrium Windows & Doors. Atrium is a major employer (approx. 450). Holsum and Atrium have high levels of capital investment and would be very expensive to relocate. Major business interruptions would be expected with the relocation of Holsum. E: Would displace businesses including Rouseau Farming, Holsum Bakery, and Atrium) – see C above regarding relocation difficulties.
	Average Total			2.5		4.0		2.0		1.5	
Economic Impacts (Reductions in property and sales tax revenues)	Phoenix (millions of $$$ per year)	1.0	$1.23	2	$1.23	2	$1.21	2	$0.25	4	
	Tolleson (millions of $$$ per year)		$1.02	1	$0.83-$0.89	3	$0.91-$0.98	3	$0.91-$0.98	3	
	Avondale (millions of $$$ per year)		$0.07	3	$0.02-$0.18	2	$0.02-$0.18	2	$0.02-$0.18	2	
	Economic Impact Average			2.0		2.3		2.3		3.0	

Notes:
1. Numbers represent midrange depending on whether the 101L/I-10 connection is through a partial reconstruction or a full reconstruction of the existing traffic interchange.
Western Section 101 Connection Alternatives: W99 = 99th Avenue Alignment Option; W = 101L Alignment Option; C = Central Alignment Option; E = Eastern Alignment Option
Wt. Rating = Weighted Rating
Ranking: 5 = optimum performance, 1 = poor performance
Highlighted boxes constitute numbers not included in rating calculation

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Memo

To:	South Mountain Project Team		
From:	Ben Spargo Amy Edwards	Project:	South Mountain EIS & L/DCR Contract No.: 01-50 TRACS No.: H 5764 01L
CC:	Project File		
Date:	May 1, 2006 ***Updated*** November 13, 2006	Job No:	00173-525-044

RE: E1 ALTERNATIVE – PROFILE VARIATIONS ALONG PECOS ROAD

INTRODUCTION

The E1 Alternative, currently the only build alternative being considered in the Eastern Section of the Study Area, would connect the existing I-10/SR-202L/Pecos Road system interchange in the east to one of the three action alternatives being considered in the Western Portion of the Study Area (W55, W71, or W101). As shown in Figure 1, the E1 Alternative alignment would travel west along Pecos Road (through the Ahwatukee Foothills Village), then diagonally through Phoenix South Mountain Park/Preserve (adjacent to the Gila River Indian Community (GRIC)), and connect to one of the Western Section alternatives near 59th Avenue (in Laveen Village). The profile for the E1 Alternative assumes an at-grade freeway facility that would become elevated to cross over major arterial streets such as 51st Avenue and 24th Street. At the request of the City of Phoenix, local residents, and the Ahwatukee Foothills Village representatives on the South Mountain Citizens Advisory Team (SMCAT), a profile option to depress the E1 Alternative along Pecos Road was investigated. The potential impacts of this profile option were identified and compared with the existing (at-grade) profile for the E1 Alternative along Pecos Road. This memo will begin by describing the base case designs and associated impacts for the At-grade/Elevated Option and the Depressed Option and then look at design options that could be made to each profile option. If an option costing more than the base case designs, ultimately becomes part of a preferred alternative, there would need to be MAG concurrence on the additional monies needed.

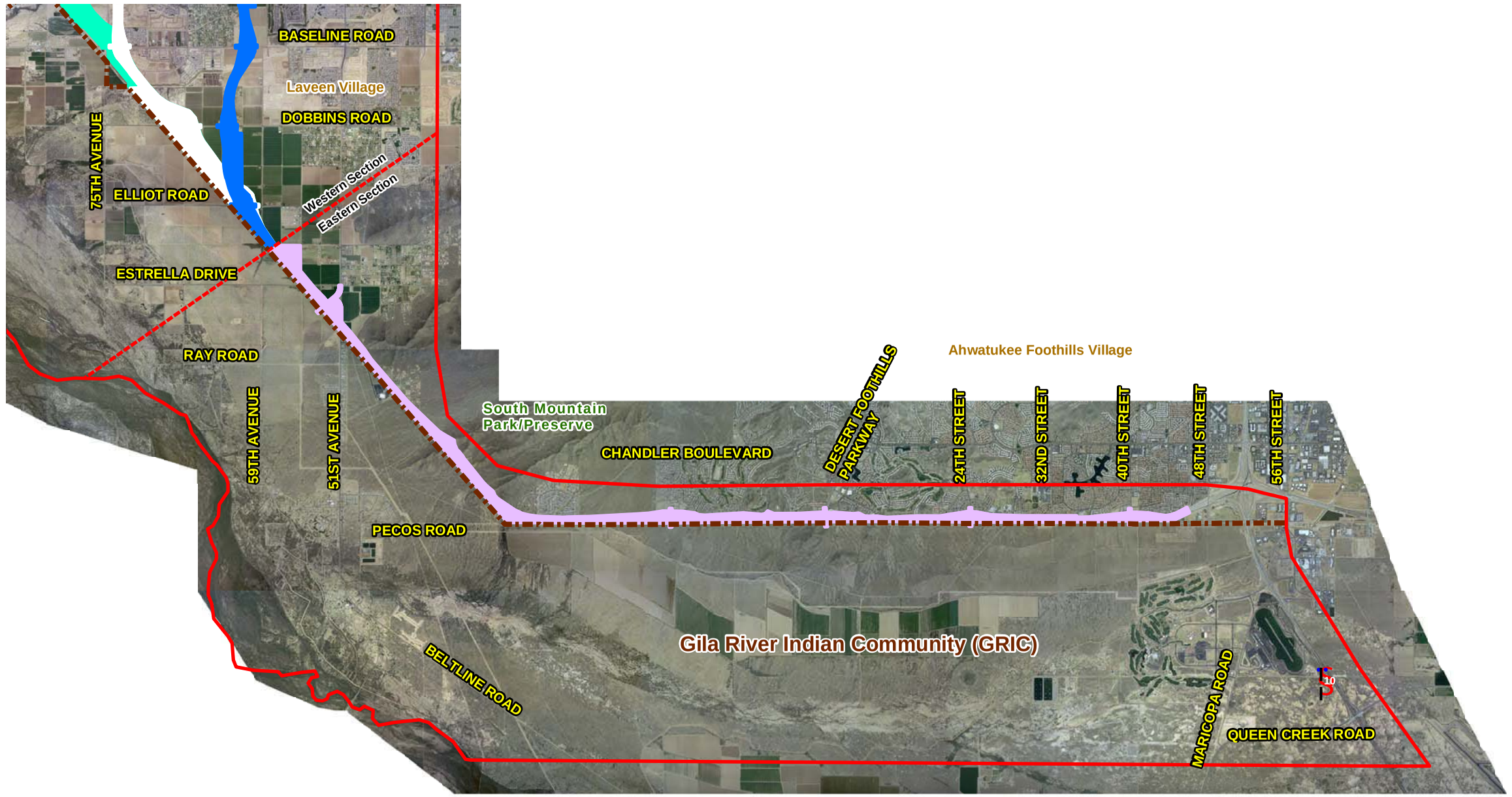
BASE CASE DESIGNS

The analysis begins by describing the base case designs and assumptions. The impacts associated with the footprint created by the design are also presented. The two profile options being analyzed are an at-grade/elevated profile and a depressed profile. The At-grade/Elevated Option, which has been used in previous impact analyses along Pecos Road, assumes the freeway profile would be as close to existing ground as possible except where it crosses major drainage features and major arterial streets. At these locations, the profile would rise above the existing ground by as much as 25 to 30 feet. The Depressed Option assumes the freeway profile along Pecos Road would be continuously below existing ground as much as 25 to 30 feet.

The right-of-way footprint for each profile option is determined by the roadway design, which generally includes the typical section, plan, profile, drainage and utilities. The assumptions for each portion of the roadway design are described in the following sections. A summary of the impacts, including environmental items, relocations, right-of-way cost, and construction cost are included as well.

At-grade/Elevated Option

Typical Section – The typical section for the At-grade/Elevated Option assumes an ultimate ten-lane freeway with typical cut and fill slopes. A parallel drainage channel is located north of the freeway lanes and the utilities are located north and south of the freeway lanes. All of these features are shown in Figure 2.



Legend

- GRIC boundary
- Study Area

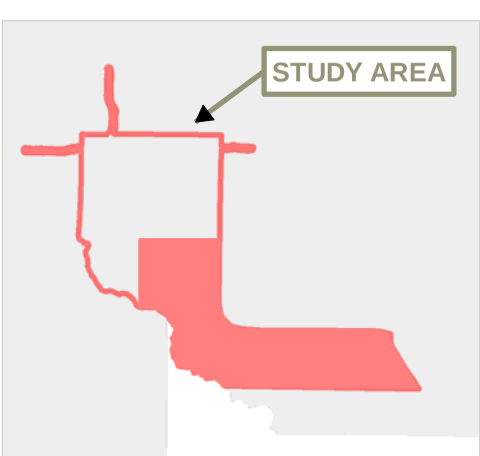
Western Section

- W55 Alternative
- W71 Alternative
- W101 Alternative

Eastern Section

- E1 Alternative

0 6,000 12,000 Feet



South Mountain Transportation Corridor
TRACS No. 202L MA 054 H5764 01L
FHWA Federal Project No. NH-202-D( )

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E1 Alternative -
Profile Variations along Pecos Road

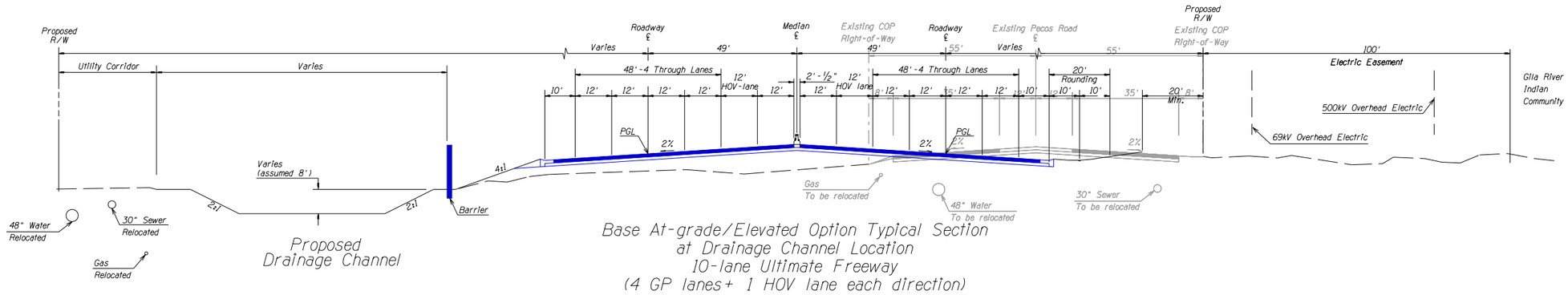
Alternatives - Eastern Section

South Mountain Freeway
Transportation Corridor Study

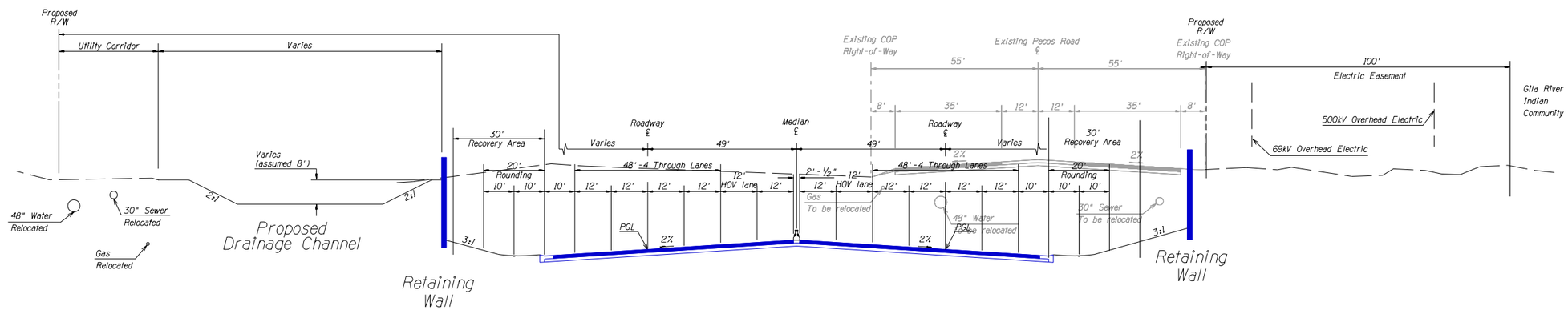
Aerial Photography Date: April 2006

November 2006

Figure 1



Base At-grade/Elevated Option Typical Section
at Drainage Channel Location
10-lane Ultimate Freeway
(4 GP lanes+ 1 HOV lane each direction)



Base Depressed Option Typical Section
at Drainage Channel Location
10-lane Ultimate Freeway
(4 GP lanes + 1 HOV lane each direction

South Mountain Transportation Corridor
E1 Alternative – Profile Variations along Pecos Road
Typical Section – Base At–grade/Elevated Option and Depressed Option

Figure 2

Plan and Profile – The centerline of the freeway generally parallels the GRIC boundary. It curves to the north near the major arterials to allow area for service traffic interchange ramps. The profile assumes the freeway would be as close to existing ground as possible except where it needed to cross major arterial streets. At these locations, the profile would rise above the existing ground by as much as 25 to 30 feet. The plan and profile are shown in Figure 3.

Drainage - For the At-grade/Elevated Option, the drainage design would collect off-site flow in a parallel channel corridor north of the freeway lanes and allow the water to flow under the freeway at existing crossing locations. Existing culverts and pipes would be replaced or extended as needed. Adequate channel width would be provided to ensure that the flow to the south of the freeway would not exceed existing conditions.

Utilities - There are currently water, sewer, and gas lines within the existing City of Phoenix right-of-way for Pecos Road. These utilities would need to be relocated to the north of the freeway lanes. Existing and proposed utilities are shown in the typical sections in Figure 2.

Impacts- The distinguishing impacts associated with the base design of the At-grade/Elevated Option are summarized in Table 1. (Note that the displacements and cost in the summary tables are for the entire length of the E1 Alternative and not just the portion that runs along Pecos Road. A representative impact of changes can be made by subtracting the base at-grade/elevated profile impacts from any subsequent option's impacts.) The right-of-way cost is based on the right-of-way estimate completed in March 2006 for every parcel within the E1 Alternative footprint. The construction cost is based on the estimate completed in November 2005 and assumes that there is no service traffic interchange at 32nd Street or 25th Avenue.

Table 1. Summary of Impacts for Base At-grade/Elevated Option

Impact Criteria		Total Impacts (Percent of Total)	
Displacements	Residential (number)	290	
	Business (number)	0	
Right-of-Way Cost (Millions)		$332	41%
Construction Cost (Millions)		$468	59%
Total Cost (Millions)		$800	

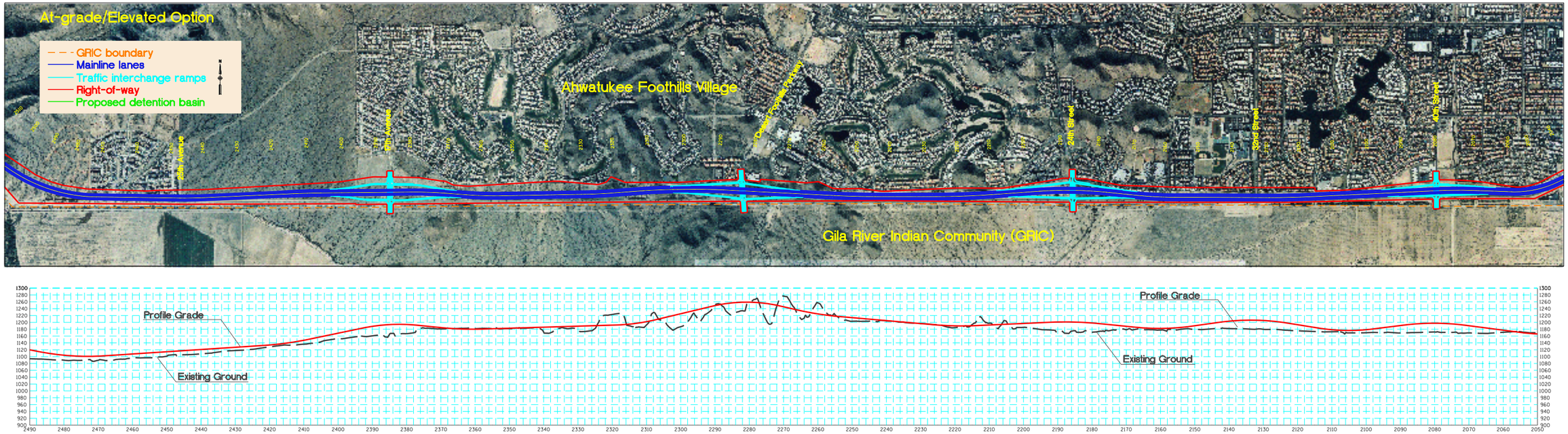
Depressed Option

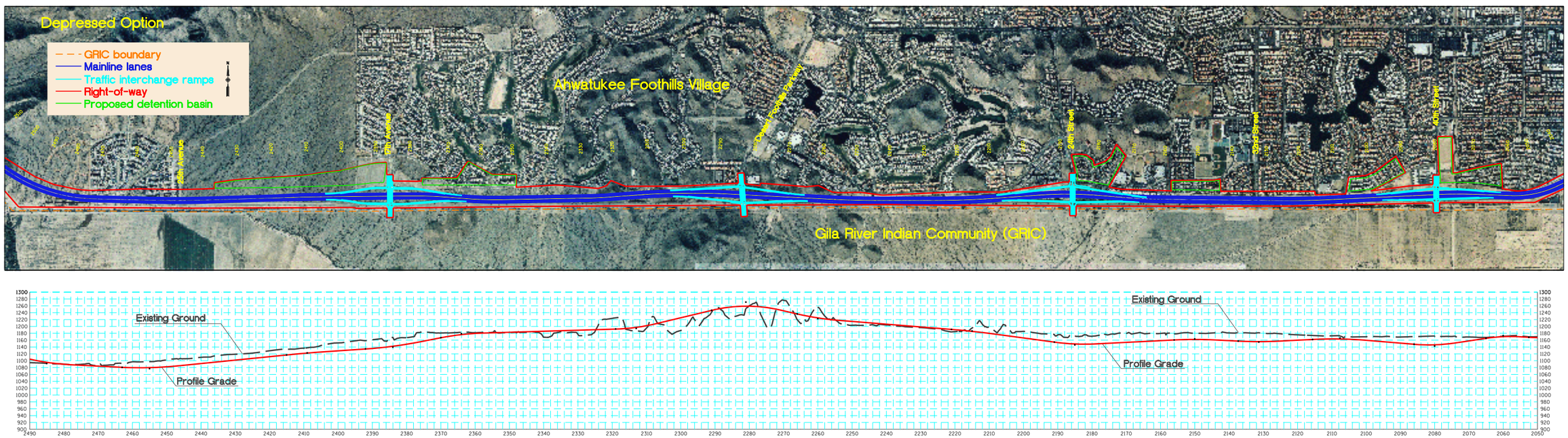
Typical Section – The typical section for the Depressed Option assumes an ultimate ten-lane freeway with typical cut and fill slopes. The drainage facilities are located north of the freeway lanes and the utilities are located north and south of the freeway lanes. All of these features are shown in Figure 2.

Plan and Profile - The centerline of the freeway generally parallels the GRIC boundary. It curves to the north near the major arterials to allow area for the service traffic interchange ramps. The profile assumes the freeway would be below existing ground as much as 25 to 30 feet. The plan and profile are shown in Figure 3.

Drainage - The base drainage plan for the Depressed Option includes detention basins near major outflow areas and a parallel channel corridor north of the freeway lanes. Pump stations would be located at each major detention basin and the flow of water would travel under the freeway lanes. A typical section depicting the drainage channel and detention basin are shown in Figure 2 and Figure 4, respectively.

Utilities - There are currently water, sewer, and gas lines within the existing City of Phoenix right-of-way for Pecos Road. These utilities would need to be relocated to the north of the freeway lanes. Existing and proposed utility locations are shown in the typical sections in Figure 2.





South Mountain Transportation Corridor

E1 Alternative – Profile Variations along Pecos Road

Plan & Profile – Base At–grade/Elevated Option and Depressed Option

Figure 3

Retaining Walls – Retaining walls may be used to the north and south of the freeway lanes in order to reduce the width required by the side slopes of the depressed profile. The determination of the location, height and length of the retaining walls would be made during design concept development. For this analysis, a ten-foot high wall on each side of the depressed section of freeway is assumed. Retaining walls are included in the typical sections found in Figure 2.

Impacts- The distinguishing impacts associated with the base design of the Depressed Option are summarized in Table 2. The comparison between the At-grade/Elevated Option and the Depressed Option shows that there are over 300 additional residential displacements anticipated. These displacements are based on the existing and planned homes that would reside within the boundary required for the detention basins. The additional right-of-way cost for this option was estimated by assuming a per acre cost of $2.6 million. This average cost comes from the estimate completed in March 2006 for the E1 Alternative. The construction cost includes additional costs for excavation of the depressed roadway and detention basins and the cost of pump stations. In total, the cost for the base Depressed Option is estimated to cost over $400 million more than the base At-grade/Elevated Option.

In addition to the displacement impacts, there is an additional 3 acres of Traditional Cultural Property (TCP) required to construct this alternative. TCPs are afforded protection under Section 4(f). To encroach upon more of these lands, there needs to be a clearly demonstrated benefit to the TCP. At this time, a benefit cannot be defined.

Table 2. Summary of Impacts for Base Depressed Option

Impact Criteria		Total Impacts		Change to Base At-grade/ Elevated Option	
		(Percent of Total)		Total	%-Increase
Displacements	Residential (number)	616		326	112%
	Business (number)	0		0	0%
Right-of-Way Cost (Millions)		$716	58%	$384	116%
Construction Cost (Millions)		$517	42%	$49	10%
Total Cost (Millions)		$1,233		$433	54%

The base Depressed Option design assumes the water flow would be pumped under the freeway. By placing pipes under the freeway a maintenance issue may arise if there is damage to the pipe infrastructure. An alternative to this option (Channels/Flumes) is discussed in the following section.

DESIGN OPTIONS

This section documents options for the profile and drainage portion of the roadway design. All of the options described are being investigated to reduce the impacts for the Depressed Option.

Wider Linear Channels

In addition to moving water, the possibility exists to use channels that are wide enough to act as detention basins as well. For this option, the extra right-of-way required would be linear and offset from the base At-grade/Elevated Option right-of-way footprint. Because there are schools located adjacent to the freeway between 40th Street and 32nd Street and 32nd Street and 24th Street that would be impacted by wider linear channels, they were eliminated as a modified drainage design option for the entire section. The detention basins west of Desert Foothills Parkway in the base depressed design, though, are generally wide and thin.

Underground Storage

The underground storage option includes the use of box culvert cells located under the freeway lanes to increase storage capacity for off-site and on-site water flow. The additional storage would reduce the size of the required detention basins and channels. This option would be used in combination with a system that moves the water from the north to south by pumping the water under the freeway lanes. A typical section depicting the interaction between the detention basin, pump station, and underground storage is illustrated in Figure 4. Pump stations are necessary to draw water out of the underground storage and drain it to the south.

The underground storage option is an iterative design based on the required storage volume. The required volume is covered by the sum of the detention basin and the box culvert volume. As the box culvert volume is increased by adding cells, the detention basin area required is reduced. (For example, if six 10' x 8' box culverts are used along the entire depressed area; the basin area required is reduced from 148 acres to 77 acres) To remove the need for detention basins, the extreme case of having seven to twenty 10' x 8' box culverts along the entire length of freeway would be required.

Impacts – In general, the cost of the box culverts is greater than the savings in right-of-way costs for the reduced detention basins. The summary of impacts shown in Table 3 assumes that six 10' x 8' box culverts are located under the freeway lanes for the entire length of depressed freeway. As mentioned above, the modified design results in 152 fewer residential displacements and therefore a reduction in right-of-way cost of $213 million. This savings is offset by the cost of the box culverts which increase the construction costs by $241 million for a net increase in cost of $28 million over the base Depressed Option design.

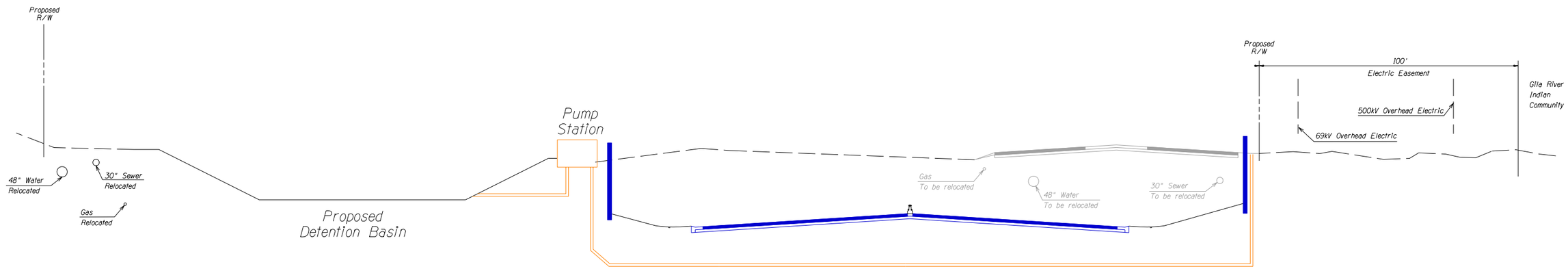
Table 3. Summary of Impacts for Underground Storage Modified Depressed Option Design

Impact Criteria		Total Impacts		Change to Base Depressed Option	
		(Percent of Total)		Total	%-Increase
Displacements	Residential (number)	464		-152	-25%
	Business (number)	0		0	0%
Right-of-Way Cost (Millions)		$503	40%	-$213	-30%
Construction Cost (Millions)		$758	60%	$241	47%
Total Cost (Millions)		$1,261		$28	2%

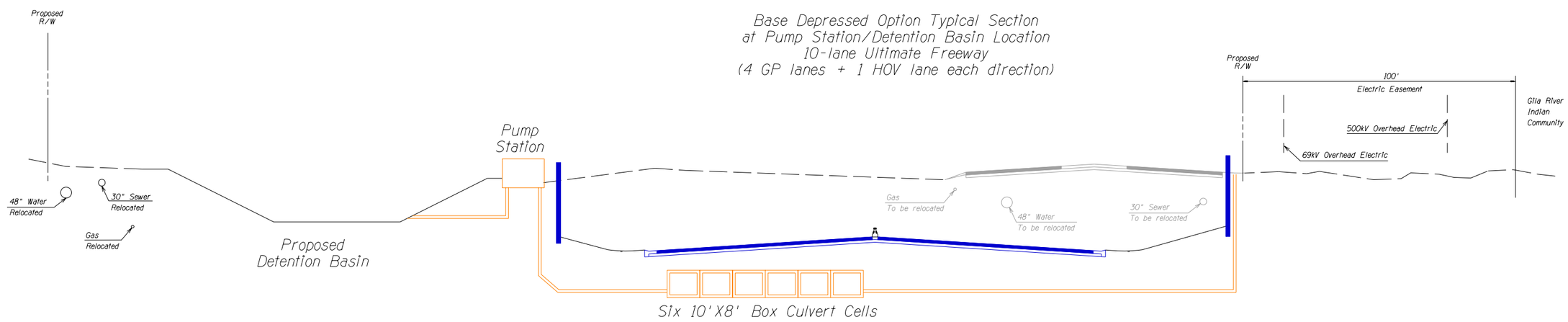
In addition to the impacts described above, maintenance and security issues associated with the underground box culverts would need to be addressed before they could be incorporated into the drainage plan. Due to the depth and length of the cells, it is difficult to access the facilities for cleaning and general maintenance. The enclosed areas are governed by "confined space" regulations and would require air tanks for any maintenance personnel accessing them. Provisions for allowing a bobcat type machine to access the cells would need to be incorporated into the design. Also, similar to the base design, it is difficult to remove standing water from the cells. Liability and security issues arise from the possibility of humans and wildlife accessing the culverts. The costs associated with these issues are not included in the totals presented.

Off-site Detention Basins

In addition to detention basins near the freeway, the amount of water crossing the freeway could be reduced by building new or improving existing off-site basins upstream (north) of the freeway. Improvement sites include but are not limited to existing golf courses, school fields, undeveloped land, and water features. The impacts associated with off-site detention basins were not considered in this analysis. Off-site detention basins will continue to be an option if found to be more suitable later in the design process.



Base Depressed Option Typical Section
at Pump Station/Detention Basin Location
10-lane Ultimate Freeway
(4 GP lanes + 1 HOV lane each direction)



Modified Depressed Option Typical Section
at Underground Storage Location
10-lane Ultimate Freeway
(4 GP lanes + 1 HOV lane each direction)

South Mountain Transportation Corridor
E1 Alternative – Profile Variations along Pecos Road
Typical Section – Base and Modified Depressed Option Designs

Figure 4

Channels/Flumes

Another option for passing the water across the freeway is to build channels, similar to an open culvert, or flumes, smaller pipes, to carry the water over the freeway. A typical section with a structure going over the freeway is shown in Figure 5. A channel would require a structure similar to a bridge at each crossing location. The profile of the freeway may need to be modified to allow for the required vertical clearance under the structures. The flumes would be located at each existing crossing location instead of at concentrated areas. As with the channel, the profile may need to be modified to allow for the required vertical clearance under the pipes. The impacts associated with the channels and flumes would be similar to the base Depressed Option. This option is included as an alternative to passing the water under the freeway, but is assumed to require the same amount of detention basin storage, pump stations, retaining walls, etc. as the base depressed profile design.

Rolling Profile with Detention Basins under Freeway

The rolling profile option in a sense is a third profile option in which the profile remains depressed under the major arterials, but then rises above ground at major drainage crossing locations to reduce the need for pump stations. By bringing the profile above ground at certain locations, the water flow could pass under the freeway without the use of a pump station. But, since there would only be concentrated flow crossings, the need for detention basins would not be reduced for this profile option.

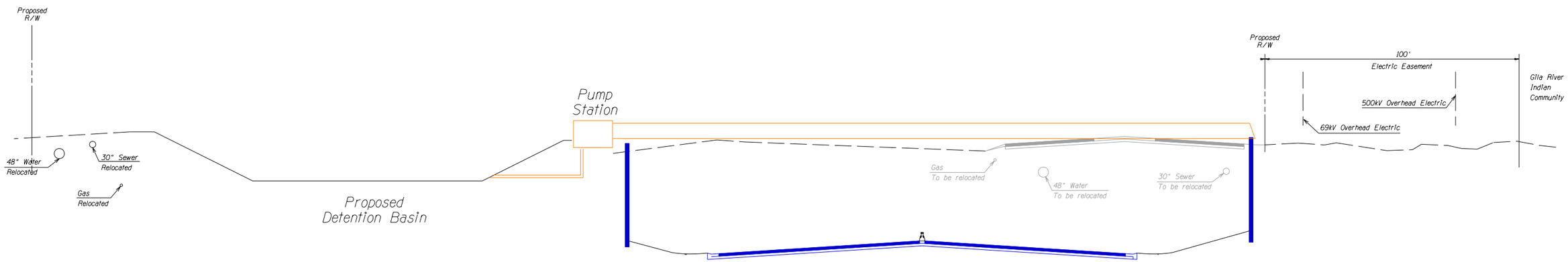
The impacts associated with this option were not included in this analysis because this profile option does not meet the original criteria of being depressed for entire stretches of freeway or reduce the size of the detention basins from the base depressed profile design. If the project team concludes that a rolling profile is more desirable than a depressed profile, further analysis of this option would be performed.

POWERLINE OPTIONS

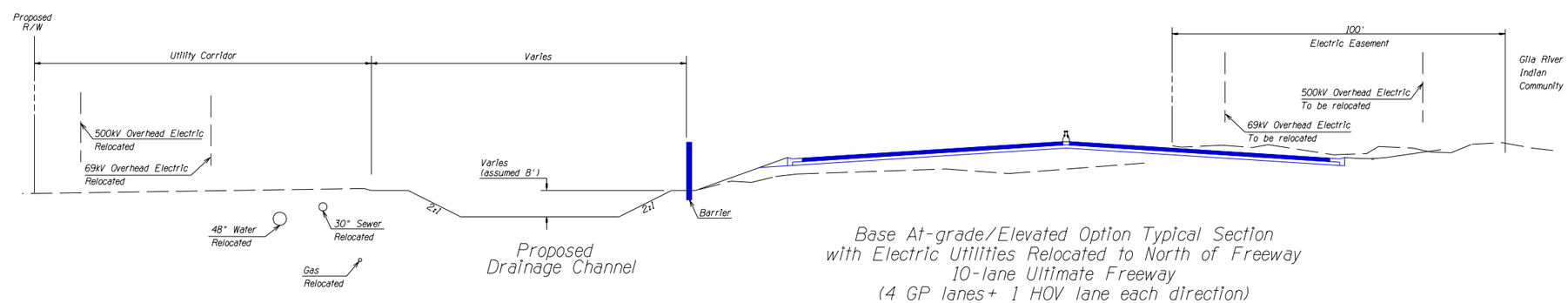
During Progress Team meetings, it was suggested that consideration be given to relocating the SRP power lines from their current location in the utility easement south of Pecos Road to north of Pecos Road. The intent of this relocation would be to construct the South Mountain Freeway on the existing utility easement, as close to the GRIC boundary as possible, and provide additional separation from the neighborhoods north of Pecos Road. Following are observations regarding this option:

- The powerline would cross over the South Mountain Freeway, from the south side of the freeway to the north side of the freeway, in the western portion of the Ahwatukee Foothills Village, west of 25th Avenue. The powerline would remain north of the freeway until approximately 32nd Street where it would transition to the south side.
- Relocation of the power lines would require acquisition of additional right-of-way for an utility easement to replace the existing easement. This would result in essentially the same right-of-way take. Figure 5 illustrates the typical section with the relocated powerline.
- Relocation of power lines of this nature (500 kV) are approximately $2,000,000 per mile, not including consideration of right-of-way and prior rights matters.
- Indications from the utility companies are that lines of this type would not be relocated under ground due to the ancillary equipment (cooling facilities, etc.) required.

Ultimately, it is recommended to leave the power lines above ground in the existing easement.



Modified Depressed Option Typical Section
at Overhead Channel/Flume Crossing Location
10-lane Ultimate Freeway
(4 GP lanes + 1 HOV lane each direction)



Base At-grade/Elevated Option Typical Section
with Electric Utilities Relocated to North of Freeway
10-lane Ultimate Freeway
(4 GP lanes+ 1 HOV lane each direction)

South Mountain Transportation Corridor
E1 Alternative – Profile Variations along Pecos Road
Typical Section – Modified Depressed Option Designs and Modified Utility Relocation

Figure 5

CONCLUSIONS

A summary of the displacements and associated costs of each design option including the percent increase when compared to the Base At-grade/Elevated Option are presented in Table 4.

Table 4. Summary of Impacts for E1 Alternative Design Options

Design Option	Displacements			
	Residential		Business	
	(number)	%-Increase	(number)	%-Increase
Base At-grade/ Elevated Option	290	NA	0	NA
Base Depressed Option	616	112%	0	0%
Modified Underground Storage	464	60%	0	0%
Modified Linear Basins	Incorporated into base detention basins where possible.			
Modified Channels/ Flumes	616	112%	0	0%
Modified Off-site Basins	Impacts not considered - Option considered for further analysis			
Modified Rolling Profile				

Design Option	Right-of-Way Cost		Construction Cost		Total Cost	
	(Millions)	%-Increase	(Millions)	%-Increase	(Millions)	%-Increase
Base At-grade/ Elevated Option	$332	NA	$478	NA	$800	NA
Base Depressed Option	$716	116%	$517	10%	$1,233	54%
Modified Underground Storage	$503	52%	$758	59%	$1,261	58%
Modified Linear Basins	Incorporated into base detention basins where possible.					
Modified Channels/ Flumes	$716	116%	$517	10%	$1,233	54%
Modified Off-site Basins	Impacts not considered - Option considered for further analysis					
Modified Rolling Profile						

Note:

%-Increase is to Base At-grade/ Elevated Option

It is recommended to eliminate the options shown in Table 5 for the reasons indicated:

Table 5. Summary of Impacts for E1 Alternative Design Options

Design Options	Reason for Elimination
Base Depressed Option	Eliminated due to impacts to residences (112% more than base At-grade/Elevated Option) and an additional 3 acres of TCP impact.
Modified Underground Storage	Eliminated due to impacts to residences (60% more than base At-grade/Elevated Option) and construction cost (56% more than base At-grade/Elevated Option).
Modified Linear Basins	Concept incorporated into all other design options as appropriate.
Modified Channels/ Flumes	Eliminated due to impacts to residences (112% more than base At-grade/Elevated Option).
Modified Off-site Basins	Potential exists to incorporate into 30% design. Potential affect would be the same among alternatives.
Modified Rolling Profile	

It is recommended that the Base At-grade/Elevated Option be carried forward for study in the DEIS. Included in this option is the potential for other entities to develop the linear drainage facilities as community activity areas.

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Memo

To:	South Mountain Project Team		
From:	Ben Spargo	Project:	South Mountain EIS & L/DCR
CC:	Project File		
Date:	March 13, 2008	Job No:	TRACS No.: H 5764 01L

RE: Profile Options along Pecos Road Section

Amended Below Existing Ground Option – Including Desert Foothills Parkway

The study team analyzed the impacts of varying the profile of the proposed freeway along the 7-mile-long Pecos Road section. The major impact of putting the freeway below existing ground would be that drainage basins and pump stations would be required to handle on- and off-site drainage. Land needed for basins and pump stations resulted in additional residential impacts and construction and right-of-way costs.

The table below summarizes the impacts of each option.

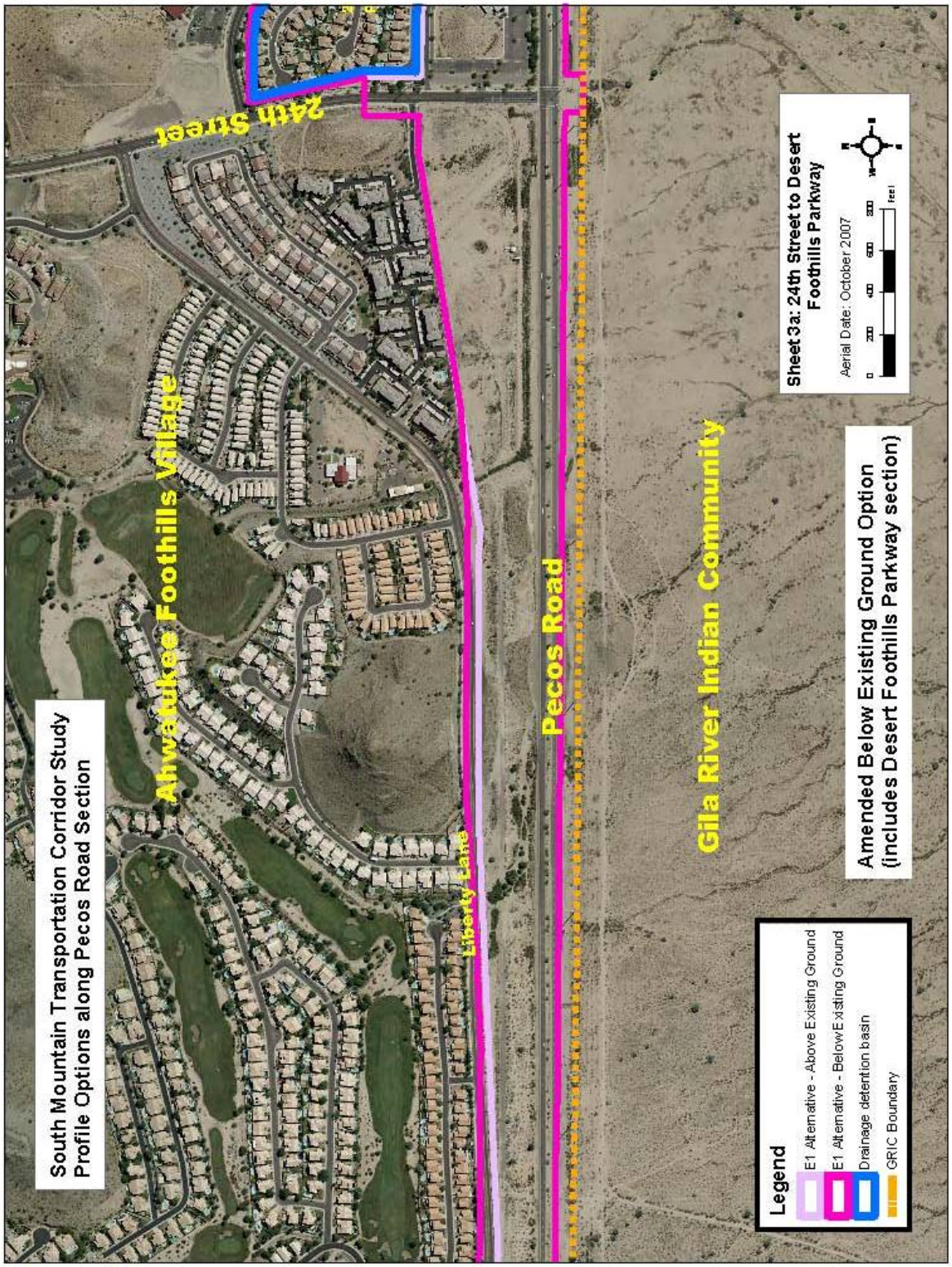
Issue	**Freeway Above Existing Ground Option**	**Freeway Below Existing Ground Option** (basic drainage plan)
Residential displacements	317	616
Total cost	**$810 million**	**$1.233 billion**

The results for the Freeway Below Existing Ground Option reflect having the profile built over Desert Foothills Parkway. Based on the initial analysis, the study team determined that keeping the freeway depressed under both Desert Foothills Parkway and the nearby foothills would result in disproportionately high impacts when compared to the remaining sections. Changes to the impacts as presented in the table would include:

- A new 20-acre basin located east of Desert Foothills Parkway would adversely affect approximately 60 residences.
- A basin west of Desert Foothills Parkway would need to be expanded by an additional 40 acres (i.e., from 20 to 60 acres), which would adversely affect approximately 130 additional residences.
- The centerline of the freeway would need to be shifted to the north approximately 20 feet to keep the cut slopes from crossing into the utility easement and across the GRIC boundary. The shift to the north would potentially impact local circulation on Liberty Lane between 24th Street and Desert Foothills Parkway. Retaining walls would potentially be needed to eliminate impacts to Liberty Lane.
- Based on the latest project cost estimating information, right-of-way along this section costs approximately $1.5 million per acre. Therefore, the additional right-of-way would cost over $100 million.
- Major construction items including the basins, pump stations, increased excavation, and retaining walls could cost in the range of $50 million.

The location of the new and expanded basins as well as of the overall right-of-way footprint is shown in the ammended Sheets 3a, 3b, and 3c.

The additional 190 residential impacts and $150 million for right-of-way and construction would represent approximately 40% and 30%, respectively, of the overall increase between the profile options. Remaining above existing ground through the foothills area may also reduce the need for blasting and other construction related impacts. For these reasons, the Amended Below Existing Ground Option – Including Desert Foothills Parkway was removed from the Freeway Below Existing Ground Option.



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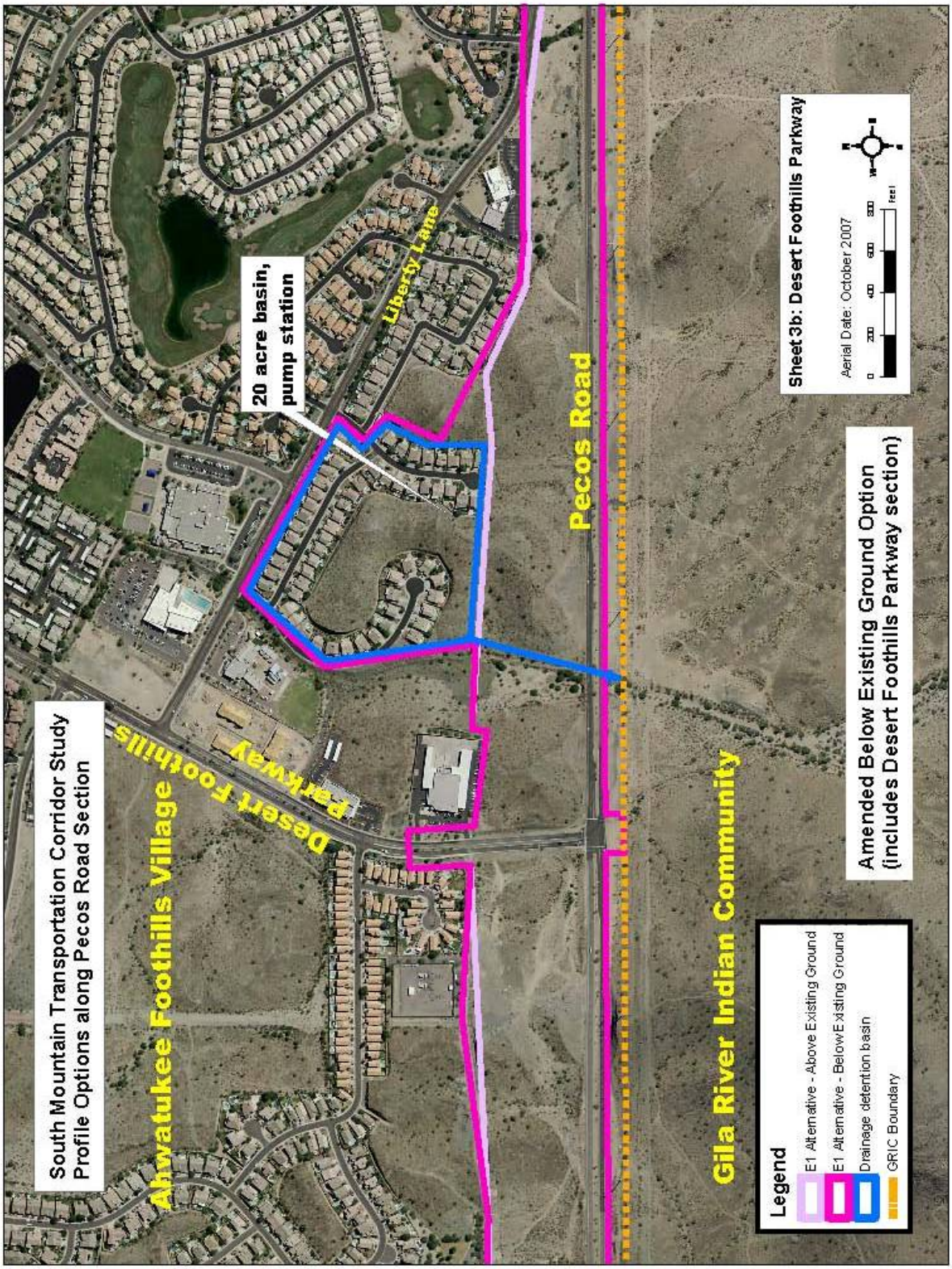

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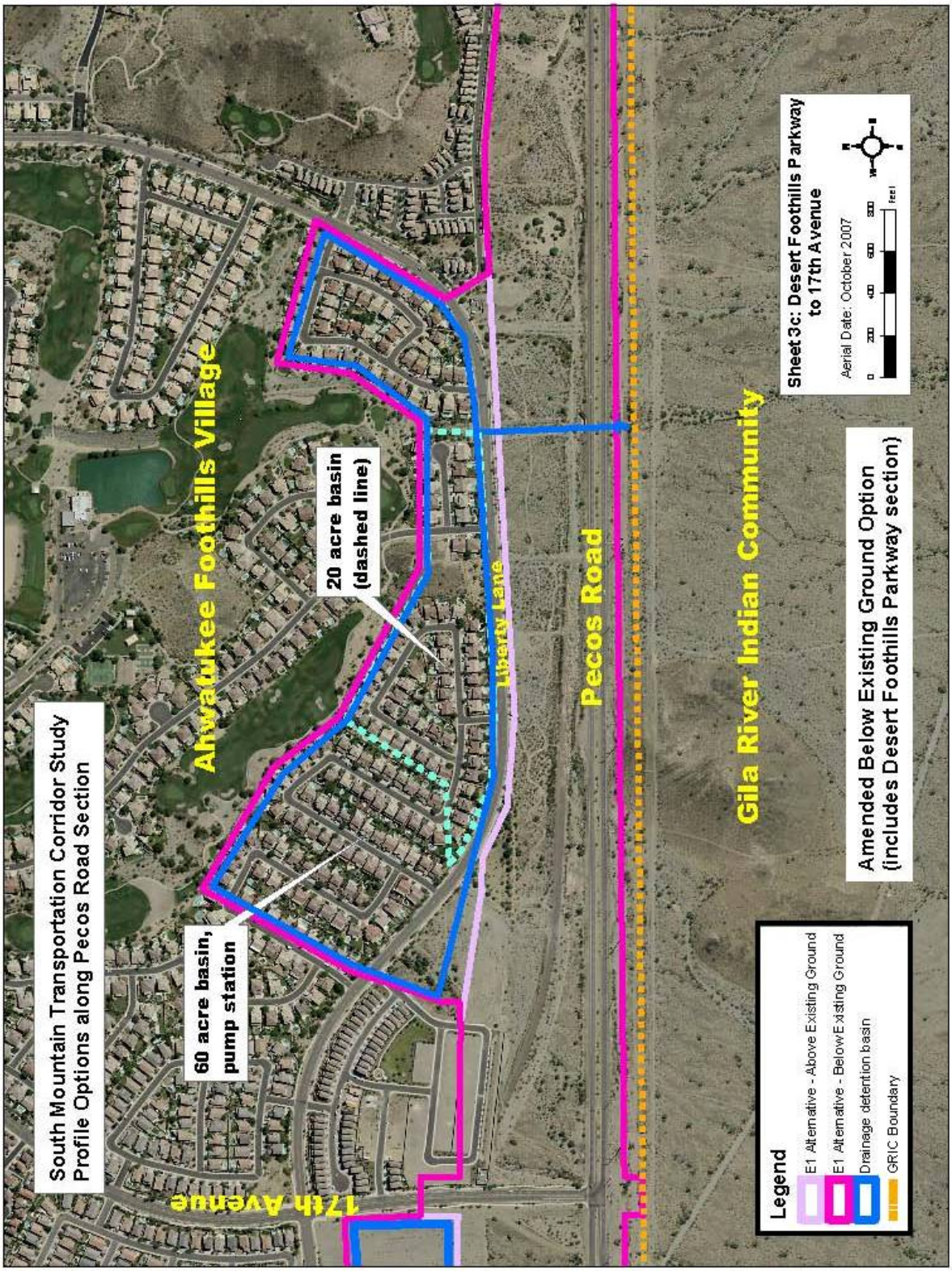

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Final Memorandum

To:	South Mountain Project Team		
From:	Amy Edwards	Project:	South Mountain EIS & L/DCR
CC:	Project File		
Date:	July 10, 2009; **Revised May 25, 2010**	Job No:	Contract Number: 01-50 Project Number: RAM-202-C200 TRACS Number: H 5764 01L

RE: W59 Alternative Environmental and Engineering Overview

INTRODUCTION

This memo was prepared in response to agency requests to provide an environmental and engineering overview of an alternative to connect the South Mountain Freeway to Interstate-10 (I-10) (Papago) at 59th Avenue (W59 Alternative). The results of this analysis will be two-fold. First, will be consideration of a connection at 59th Avenue and whether it provides benefits over the proposed connection at 55th Avenue, without resulting in an unreasonable change in impacts or cost. Second, the analysis will result in a more detailed design of the W55 Alternative than was previously undertaken. This more detailed approach may result in changes in the impacts and cost for the proposed alternative.

The W59 Alternative would maintain the W55 Alternative alignment south of Lower Buckeye Road, see Figure 1. North of Lower Buckeye Road, the W59 Alternative would remain parallel and adjacent to 59th Avenue. As shown in the figure, two options are being considered for the W59 Alternative, one west of 59th Avenue called the W59 Alternative (West) and one east of 59th Avenue called the W59 Alternative (East), between Lower Buckeye Road and Van Buren Street.

As part of the overview, engineering and environmental elements with the potential to differentiate between alternatives were analyzed. These elements are:

Engineering
- Typical sections
- Traffic interchanges (TIs)
- Interstate traffic operations
- Railroad
- Major utilities
- Petroleum facility (tank farm)
- Costs

Environmental
- Cultural resources
- Section 4(f) resources
- Hazardous material sites
- Acquisitions and relocations
- Environmental Justice issues

While not an exhaustive list of all potential impacts and analysis criteria, this list contains the key differentiators between alternatives. Additional elements that may need further review include the perception

of air quality impacts to local elementary schools, increased noise impacts to residential areas, potential unique business relocations, public perception, and traffic operations on I-10 and 59th Avenue.

The Engineering and Environmental sections of this overview document the individual elements of the W59 Alternative Options and summarize the W55 Alternative impacts. The W55 Alternative results are based on the technical report updates of early 2009, in support of the Draft Environmental Impact Statement. The technical report updates addressed an ultimate ten-lane freeway facility configuration. However, the analysis being presented in this technical memorandum is for an eight-lane freeway facility configuration. Therefore, the technical report data included in this document for the W55 Alternative have been reviewed and, as needed, adjusted to reflect the reduced right-of-way footprint.

For consistency in analysis of the engineering and environmental considerations in this technical memorandum, the limits of potential impacts reported will be the Salt River on the south, McDowell Road on the north, 63rd Avenue on the west, and 53rd Avenue on the east.

ENGINEERING

The engineering overview of the W59 Alternative Options evaluated the typical section, system TI, railroad coordination, major utilities, traffic control, constructability, and cost. Detailed graphics depicting the right-of-way footprints evaluated, including options for locations of the W59 Alternative and ramp terminal intersection spacing, are shown in the appendices listed below:

- Appendix A: W55 Alternative
- Appendix B: W59 Alternative (East) with 400’ ramp terminal intersection spacing
- Appendix C: W59 Alternative (West) with 400’ ramp terminal intersection spacing
- Appendix D: W59 Alternative (East) with 300’ ramp terminal intersection spacing
- Appendix E: W59 Alternative (West) with 300’ ramp terminal intersection spacing

Detailed discussion of the various engineering elements can be found in the following sections.

Typical Section

The typical section for the proposed South Mountain Freeway is three general purpose lanes and one high-occupancy-vehicle (HOV) lane in each direction, referred to as a 3+1 configuration. This section matches the proposed section in the *Regional Transportation Plan* (Figure 2). A barrier in the median separates the directional lanes. The HOV lane and median barrier would be constructed in conjunction with the general purpose lane construction. The right-of-way to be acquired with this typical section would restrict future widening. Three options are presented for the drainage channel located to the east of the proposed South Mountain Freeway: a trapezoidal channel, a reinforced concrete box channel, and a u-shaped channel.

For comparison purposes, Figure 2 also shows the previously proposed South Mountain typical section of four general purpose lanes and one HOV lane in each direction, referred to as a 4+1 configuration.

With the W59 Alternative, a portion of the South Mountain Freeway would use the existing 59th Avenue right-of-way, currently owned by the City of Phoenix. In this area, essentially located between Van Buren Street and the Roosevelt Irrigation District Canal, the existing 59th Avenue traffic would be carried on either side of the proposed freeway. Traffic southbound on 59th Avenue would be located on a frontage road on the western side of the South Mountain Freeway, and northbound traffic on 59th Avenue 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. For properties on the east side of 59th Avenue, this will require providing access across the drainage channel. The frontage roads and the freeway would be separated by

Figure 1: Alternatives and Options

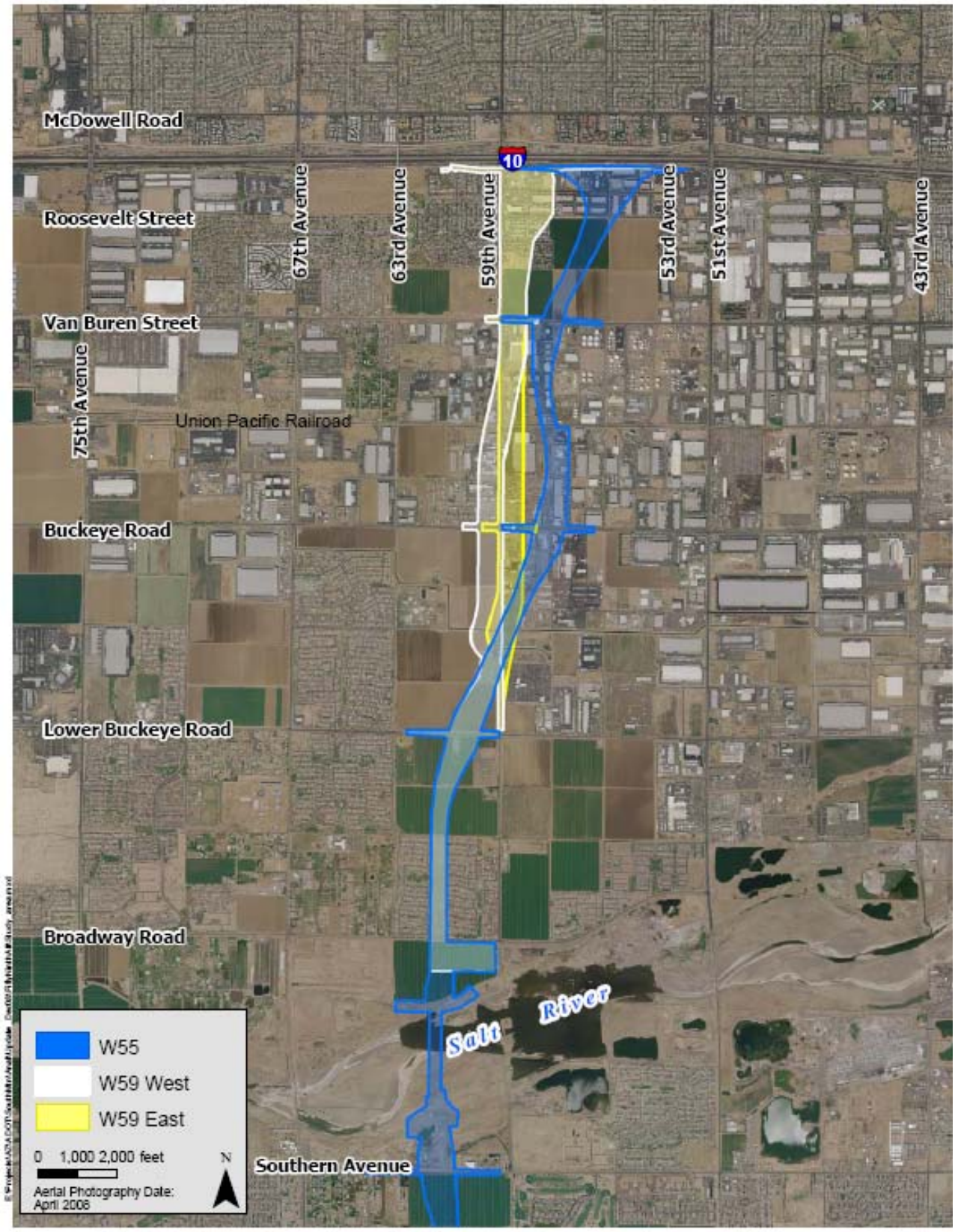

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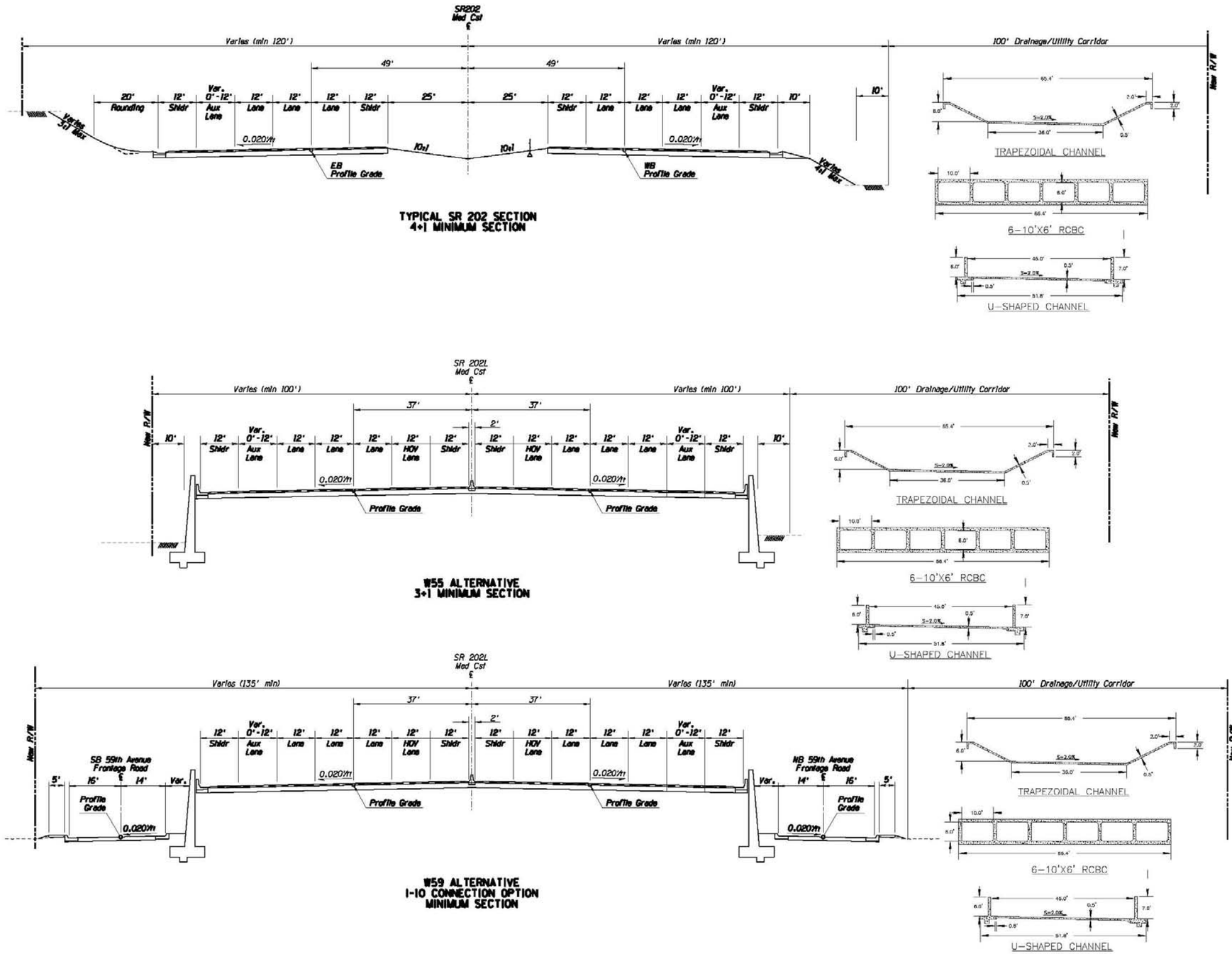
Figure 2: Typical Sections for Proposed South Mountain Freeway



walls, with slip ramps providing movement between the facilities, approximately every mile. As shown in Figure 2 and in the right-of-way footprint (appendices), the frontage roads are two lanes in each direction.

While Figure 2 depicts the desirable typical sections, it is important to note that the minimum right-of-way shown is rarely achieved. This is due to the close service TI spacing along the proposed South Mountain Freeway and use of the existing 59th Avenue infrastructure.

Traffic Interchanges
There are two types of TIs associated with I-10 (Papago), the system TI with the proposed South Mountain Freeway and the service TIs providing local access. Additionally, there are service TIs along the South Mountain Freeway facility.

Any alternative in this area would connect to I-10 (Papago) with a system TI. The following assumptions were made for the design of this connection:

- all directional ramp connections would be two lanes
- no direct HOV connection is provided to the median of I-10
- local access along I-10 includes connector roads and relocated service ramps
- ramps were configured to minimize structure length and skew

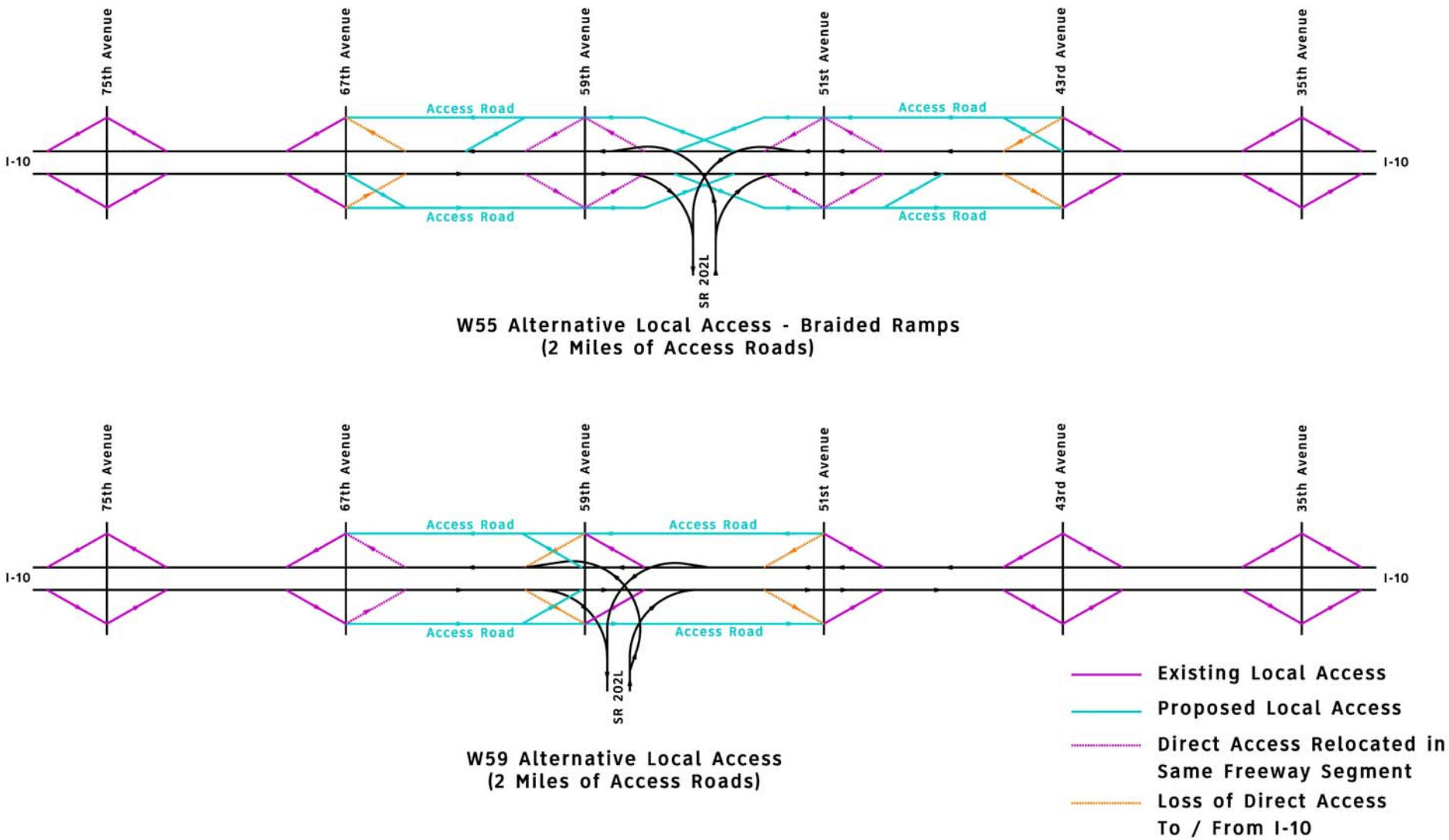
In developing and evaluating the system TI, the following observations were made:

- W55 Alternative and W59 Alternative Options would require the drainage channel north of I-10 to be relocated to a box culvert with no cost differential between the options
- W59 Alternative Options providing for vehicular access on 59th Avenue during construction would complicate maintenance of traffic
- W59 Alternative Options would have to avoid the pump station in the northwest quadrant of the system TI
- W55 Alternative and W59 Alternative Options would replace the bridge at 63rd Avenue (replace with similar structure would be $4.3 million, replace with pedestrian crossing only would be $0.8 million)
- W55 Alternative would replace the bridge at 51st Avenue
- W59 Alternative Options would have to acquire 22 homes in the neighborhood in the southwest quadrant of the system TI
- W59 Alternative Options would have to acquire 2 large apartment complexes just south of Roosevelt Street.

Connecting the proposed South Mountain Freeway to I-10 (Papago) would result in modifications to the existing service TIs. These potential modifications for local access are shown in Figure 3.

The W55 Alternative includes service traffic interchanges at Buckeye Road and Van Buren Street that would be in close proximity to the existing intersection with 59th Avenue. The final configuration would include three major signalized intersections (2 for the interchange ramp terminals and one for 59th Avenue) within a ¼-mile distance along Buckeye Road and Van Buren Street. The traffic operational analysis shows that the intersection with 59th Avenue would operate at LOS F during the evening with the 2030 traffic projections. The delay and congestion at the intersection would adversely affect the operations of the interchange signals. The W59 Alternative would incorporate 59th Avenue into the freeway cross section as a frontage road system. Therefore, there would be only two signals at each arterial and they would be coordinated to handle the 59th Avenue and ramp traffic. The traffic operational analysis of the W59 Alternative at Buckeye Road and Van Buren Street show that the two signals would operate at acceptable levels of service with the 2030 traffic projections.

Figure 3: I-10 (Papago) Local Access Modifications



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While evaluating the options for the W59 Alternative, efforts were made to minimize the potential right-of-way impacts at the proposed South Mountain Freeway service TIs. Both the W59 Alternative (West) and the W59 Alternative (East) service TIs were evaluated for ramp intersection spacing of the typical 400 foot and of a reduced 300 foot. The right-of-way footprints of these options are shown in the appendices. Following are the observations made of the 400 foot spacing versus 300 foot spacing options:

- 400 foot intersection spacing allows for more efficient traffic operations on the surface streets than 300 foot spacing
- 300 foot intersection spacing results in increased height and length of retaining walls over the 400 foot spacing
- 400 foot intersection spacing results in increased cross road pavement over the 300 foot spacing
- While the right-of-way needed for 300 foot intersection spacing would be less than the 400 foot spacing, the actual right-of-way take may be the same. This is dependent upon the economic viability of the remainder parcels.

Local Access South Mountain Freeway Frontage Roads

One of the infrastructure needs of the South Mountain Freeway is a drainage channel for capturing off-site drainage. Typically, this channel is located on the east side of the proposed freeway. With the W59 Alternative Options, this channel provides a unique design consideration. Access must be provided from the northbound frontage road to the properties on the east side of the proposed freeway. This would be done through a series of bridges. With the W59 Alternative (West), access across the drainage channel must be maintained to all the parcels along the east side of 59th Avenue. With the W59 Alternative (East), there would be fewer bridges required. This is a result of acquiring the existing parcels that front onto 59th Avenue for construction of the freeway, and only requiring access to be maintained to a few remaining parcels.

The W55 Alternative does not require access across the channel except at the major surface street crossings.

Interstate Traffic Operations

Traffic operations along I-10 (Papago) were analyzed for both the W59 Alternative and the W55 Alternative using traffic microsimulation software (VISSIM). The analysis area included I-10 (Papago) between Litchfield Park Road and 7th Avenue and portions of SR 101L (Agua Fria Freeway) and SR 202L (South Mountain Freeway). The only differences between the two models were the system TI location at I-10 (Papago) and the local access modifications adjacent to the system TI. Both alternatives have made the same assumptions regarding minimal improvements along I-10 (Papago) (two-lane exits include an option-lane, entrance ramps merge to one lane prior to entering I-10 (Papago)). The analysis presents operations for a 3-hour peak period in the morning (AM) and evening (PM) in 2030.

To evaluate the differences between the alternatives, the delay per vehicle and the travel time were calculated. Delay per vehicle accounts for every vehicle that enters the network, and accounts for all delay experienced while in the system. The travel time comparisons shown are the cumulative travel time for each direction on I-10 (Papago). The results for each alternative are presented in Table 1. Notable observations from the results include:

- During the AM peak period, the alternatives performed roughly the same. The W59 Alternative resulted in relatively small decreases in delay and travel time when compared to the W55 Alternative.
- During the PM peak period, the W59 Alternative resulted in a substantial improvement in delay and travel time when compared to the W55 Alternative.

Table 1: Microsimulation Results, W55 and W59 Alternatives, 2030

Alternative	Delay (seconds)	Travel Time (seconds)
W55 AM	43.9	98.2
W55 PM	79.1	145.7
W59 AM	42.5	95.8
W59 PM	37.9	90.9

In addition to the delay and travel time measures of effectiveness, level of service (LOS) maps for each hour of the AM and PM peak periods were developed and are presented in Appendix F. The LOS maps are shown for the freeway main line lanes as well as the ramp and crossroad intersections. Notable observations from the LOS maps include:

- The lane drop on the north-to-east ramp causes traffic to back up on SR 202L for both alternatives during both peak periods. Although this is an undesirable condition, it does meter traffic entering I-10 (Papago).
- Similar to the delay and travel time results, the W55 and W59 alternatives perform relatively the same during the AM peak period.
- During the AM peak period, the bottleneck created by I-17 in the eastbound direction backs traffic up onto the SR 202L North-to-East ramp as shown by the continuous LOS F conditions.
- During the AM peak period, the interchange signals at 67th and 59th avenues operate at LOS F during the third hour for both alternatives.
- During the second hour of the PM peak period for the W55 Alternative, I-10 (Papago) experiences severe congestion up to 43rd Avenue in the westbound direction. The interchange signals at 43rd, 35th, and 27th are all at LOS F. The LOS A conditions downstream of this location and on the SR 202L system ramps are due to the metering effect of the congestion and lack of access to the system.
- During the same time frame, the W59 Alternative also experiences congestion on westbound I-10 (Papago) up to 43rd Avenue. However, the adjacent interchanges are still operating at an acceptable LOS and although the metering of traffic improves operations downstream, the LOS C, D, and E conditions show that a substantial amount of traffic is still being served.
- Overall, during the PM peak period, the W59 Alternative performs as well or better than the W55 Alternative and is able to serve more vehicles.

Complex Construction Issues

The W55 Alternative requires a complex skewed bridge overpass as the result of the freeway simultaneously spanning 59th Avenue and the Roosevelt Irrigation District canal. Design concepts were developed that would accommodate these constraints. However, the construction would be more expensive than a traditional bridge overpass and would cause extensive disruption to local traffic along 59th Avenue. These complex design and construction methods would not be needed with the W59 Alternative.

Railroad Coordination

59th Avenue crosses the Union Pacific Railroad[a] in a single five-lane facility controlled by lights and gates. With a proposed reconfiguration of South Mountain Freeway on 59th Avenue, the freeway traffic would cross over the railroad on a grade separated structure. However, the 59th Avenue traffic would cross using two at-grade crossings: one crossing for the northbound frontage road and one for the southbound frontage road. Coordination with the Union Pacific Railroad would be required to determine the necessary design considerations and concerns.

[a] Throughout this document, the name Southern Pacific Railroad is used when addressing the historic nature of the rail line. The name Union Pacific Railroad is used when addressing issues about the current function of the rail facility.

Major Utilities
A review of utility as-built plans and a field survey were performed to document the presence of utilities in the area. The following are the results of the review:

- Buckeye Road – underground gas, water, sewer, and telecommunications and overhead electrical power lines
- Van Buren Street – underground gas, water, sewer, and telecommunications and overhead electrical power lines
- Union Pacific Railroad – underground gas and telecommunications
- Roosevelt Irrigation District Canal – underground telecommunications
- 59th Avenue – irrigation, underground gas, water, sewer, and telecommunications, and overhead electrical power lines

Each alternative would result in relocation of some utilities. However, the W59 Alternative Options may require the relocation of some utilities along 59th Avenue for approximately 3 miles. The utilities would be relocated to the frontage roads or channel right-of-way.

Traffic Control
Potential construction effects on maintenance of traffic were reviewed. Any connection to I-10 would result in temporary disruption of traffic on I-10 as well as the local access ramps. For a connection that follows 59th Avenue, either on the eastern or western side, there would be major disruption of traffic on 59th Avenue as well as the intersecting roads. During construction, 59th Avenue would experience temporary closures and detour routes would need to be provided.

Constructability
For the 59th Avenue alternatives, the proposed facility would use portions of the existing 59th Avenue infrastructure. This is a similar construction to that of the Price Freeway, where portions of existing facilities were used in the ultimate facility. This type of construction results in a number of issues, including complexities of traffic control, parallel utility relocation, and local access during construction.

Tank Farm
During 2006, ADOT held extensive meetings with business owners, the City of Phoenix, and the State of Arizona regarding the function of the petroleum facility located at 51st Avenue and Van Buren Street. This tank farm provides the majority of fuel for Sky Harbor Airport and is considered a potential terrorist target by the City of Phoenix and the State of Arizona. As a result of the stakeholder meetings, it was determined that the W55 Alternative is not precluded as a viable alternative if specific security measures were included in the construction. These measures included security barrier on the east side of the freeway and ramps to reduce the potential of vehicles deliberately exiting the freeway and to reduce visibility of the facility. Additionally, security cameras would be installed to monitor the security barrier and property line for intrusion. These precautions would not be necessary with the W59 Alternative.

Cost
Cost estimates for each of the alternatives addressed the components of construction and design as well as right-of-way. For complete details regarding the development of the cost estimates, refer to Appendix G.

The construction cost estimates were developed using the following information:

- South Mountain Freeway typical section of three general purpose lanes and one HOV lane
- construction of the HOV lane concurrent to the general purpose lane construction
- no provisions for future direct connection of the South Mountain Freeway HOV lanes with the I-10 (Papago) HOV lanes

- current ADOT bid tabulation sheets were used for construction unit prices

The right-of-way cost estimates were developed using the following information:

- 40% contingency was applied to the acquisition, relocation, and demolition costs
- W59 Alternative acquisition, relocation, and demolition costs were developed based on the 2006 appraisals performed on the W55 Alternative right-of-way (see Appendix F for more details)
- right-of-way cost estimates only include parcels not currently owned by ADOT
- Acquisition, relocation, and demolition costs ($63.2 million) were assumed for the apartment complexes affected by the W59 Alternative. There are no comparable properties affected by the W55 Alternative, however, efforts are on-going with ADOT Right-of-Way to provide a more detailed estimate of these costs.

For comparison purposes, Table 2 summarizes the construction, design, and right-of-way cost for the W55 Alternative in the 4+1 lane configuration with 400 foot ramp terminal spacing as presented in the Pre-Initial Location/Design Concept Report (L/DCR). Table 3 summarizes the construction, design, and right-of-way cost for the W55 Alternative and W59 Alternative Options with the 3+1 lane configuration, and either 400 foot or 300 foot ramp terminal spacing (see Appendix F for more details).

Table 2: W55 Alternative, 4+1 lane configuration, 400 foot ramp terminal spacing (Pre-Initial L/DCR)

Cost	W55Alternative
Construction and design	436.5
Right-of-way	286.0
TOTAL	722.5

Table 3: Costs ($ millions), 3+1 lane configuration, 400 foot and 300 foot ramp terminal spacing

	W55Alternative	W59 Alternative			
		West Option		East Option	
Cost	400 foot [a]	400 foot	300 foot [b]	400 foot	300 foot
Construction and design	388.8	393.9	416.4	386.9	409.4
Right-of-way	227.9	241.7	224.0	245.2	243.7
TOTAL	616.7	635.6	640.4	632.1	653.1

[a] 400 foot refers to the service TI ramp intersection spacing
[b] 300 foot refers to the service TI ramp intersection spacing

The W55 Alternative is the least expensive option studied. The W55 Alternative has a savings of $15.5 million over the W59 Alternative (East) with 400 foot ramp terminal intersection spacing and a savings of $18.9 million over the W59 Alternative (West) with 400 foot ramp terminal intersection spacing.

ENVIRONMENTAL

The environmental overview of the W59 Alternative Options evaluated the possible constraints associated with key potentially affected elements. These elements include cultural resources, Section 4(f) resources, hazardous material sites, acquisitions and relocations, and environmental justice issues. Figure 4 shows those elements of the environmental review that are considered constraints in the development of alternatives.

During the engineering analysis, several variations were studied for the W59 Alternatives Options, including ramp terminal spacing of 400 foot and 300 foot at the service TIs along the proposed South Mountain Freeway. These variations did not result in impact differences in the key environmental elements studies. As such, the environmental analysis will focus on the W55 Alternative, W59 Alternative (West), and W59 Alternative (East).

Cultural Resources

The cultural resources analysis was undertaken to identify known prehistoric and historic cultural resources that could be eligible for the National Register of Historic Places (National Register). A field survey was performed in June 2009 as well as a literature and database review.

Two prehistoric sites are in proximity to the alternatives. Pueblo del Alamo is a prehistoric Hohokam habitation site located along 59th Avenue south of the Roosevelt Canal. The site has been previously determined eligible for the National Register under Criterion D. Any adverse impacts to Pueblo del Alamo could be mitigated through archaeological excavations; therefore, it is not perceived as a constraint. Site NA15788 is a prehistoric artifact scatter adjacent to the W59 Alternative within the I-10 corridor. The site has likely been obliterated by the construction of I-10. Nevertheless, if any remaining portions were encountered and determined eligible for the National Register, the adverse effects would most likely be mitigated through archaeological excavations (standard procedures for Section 106 consultation with the State Historic Preservation Office who would provide a final ruling on treatment).

More than half of the area has not been investigated for archaeological resources. This area, including portions masked by development such as roads and parking lots, has potential for subsurface archaeological resources. It is assumed that any subsurface resources would likely be eligible under Criterion D.

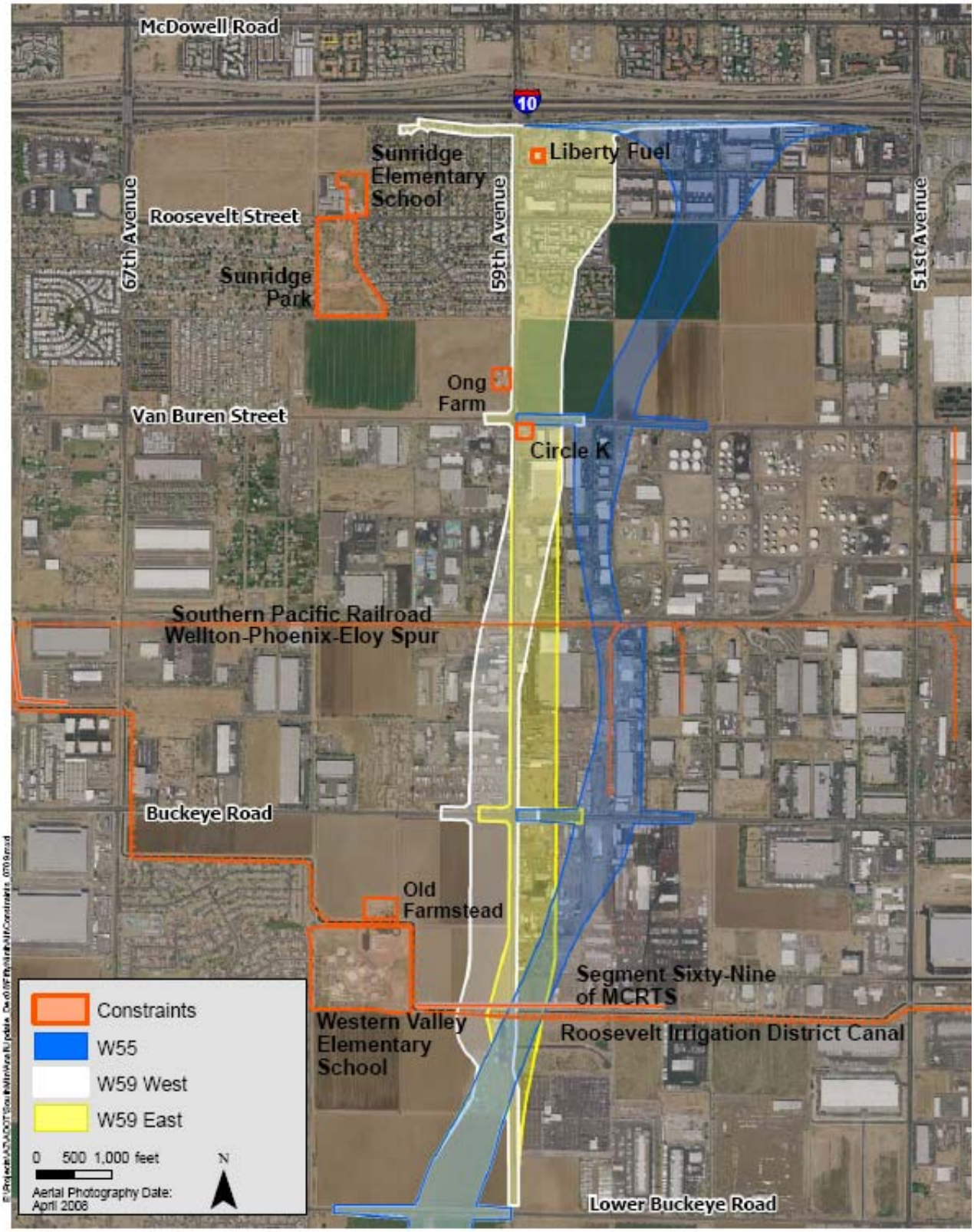
Three linear historic sites transect the area: the Wellton-Phoenix-Eloy spur of the Southern Pacific Railroad[b], the historic highway alignment of US 80, and the Roosevelt Irrigation Canal. The W59 Alternative crosses the Southern Pacific Railroad midway between Van Buren Street and Buckeye Road. The alternatives cross the Roosevelt Irrigation Canal 0.5 mile south of Buckeye Road. Both sites are eligible for the National Register under Criterion A for their important historical associations with the early development of the Salt River Valley and are shown in Figure 4.

The historic alignment of old US 80 is Buckeye Road in this area. The segment of old US 80 within the area no longer functions as a state highway and has been transformed from a rural two-lane highway into an urban thoroughfare. The site is eligible for the National Register under Criterion D and no longer retains integrity as a historic highway in the area.

Four properties in the area with historic buildings were previously evaluated for National Register eligibility: Mother's Restaurant at 5760 West Buckeye Road, Jarvis Marine Shop at 5800 West Buckeye Road, the Jackson Farmstead at 5727 Van Buren Street, and the Ong Farm at 410 North 59th Avenue. Of these four identified properties, only the Ong Farm is a constraint to the development of the alternative. The Ong Farm is located on the western side of 59th Avenue, north of Van Buren Street (Figure 2). The property was evaluated by the City of Phoenix as part of their Asian American Historic Property Study (Murray and Solliday 2007).

[b] Throughout this document, the name Southern Pacific Railroad is used when addressing the historic nature of the rail line. The name Union Pacific Railroad is used when addressing issues about the current function of the rail facility.

Figure 4: Environmental Constraints



MCRTS: Maricopa Regional Trails System

The Ong family still owns and occupies the property. The Ong Farm is eligible for listing on the National Register under Criterion A.

One farmstead (Old Farmstead), whose eligibility has not been assessed, is located on the north side of the Roosevelt Canal, southwest of 59th Avenue and Buckeye Road (Figure 4). This farmstead may be eligible or at least have buildings that could be individually eligible. However, the farmstead is already set amongst an encroaching urban setting and it is too far from 59th Avenue to be directly or indirectly affected.

As a result of the records check and field survey, the Ong Farm, Roosevelt Irrigation District Canal, and Southern Pacific Railroad were the only cultural resources constraints identified. However, there are engineering designs that may avoid impacts to these resources. Additional historic properties may exist in the area that could be identified only through a more comprehensive analysis.

Section 4(f) Resources

A field survey was performed to identify potential resources afforded protection under Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 U.S.C. § 303, as amended). Section 4(f) properties in the area include outdoor recreational amenities associated with schools, segments of the Maricopa County Regional Trails System (MCRTS), and historic properties. Historic properties eligible for inclusion on the National Register of Historic Places under Criteria A, B, or C are eligible for protection under Section 4(f). Cultural resources eligible under Criterion D are generally not considered Section 4(f) properties. The following Section 4(f) resources have been identified in the W59 Alternative area:

- Ong Farm
  - adjacent to the W59 Alternative Options, but direct impacts avoided
- Southern Pacific Railroad
  - W55 Alternative and W59 Alternative Options cross the railroad but direct impacts may be avoided
- Roosevelt Irrigation District Canal
  - W55 Alternative and W59 Alternative Options cross the canal but direct impacts may be avoided
- Western Valley Elementary School
  - located approximately 850 feet from the nearest alternative, W59 Alternative (West)
- Old Farmstead
  - located approximately 1,000 feet from the nearest alternative, W59 Alternative (West)
- Sunridge Elementary School
  - located approximately 720 feet from the nearest alternatives, W59 Alternative Options
- Sunridge Park
  - located approximately 1,280 feet from the nearest alternatives, W59 Alternative Options
- Segment Sixty-nine of the Maricopa County Regional Trails System (Segment Sixty-nine)
  - W55 Alternative and W59 Alternative Options cross the trail but direct impacts may be avoided

Each of these sites may be avoided by the W55 Alternative and W59 Alternative Options and therefore no direct use of the resources would occur. Additionally, qualitative assessment suggests no proximity impacts constituting a constructive use would occur from the alternatives.

Hazardous Material Sites

A field review and literature search of the area was performed to provide a preliminary identification of hazardous material sites. While low- and medium-risk sites exist within the area, they are not a differentiator between alternatives and are not reported on further in this document.

For the W59 Alternative Options, there are two high-risk sites identified: 1) Liberty Fuel located in the southeastern quadrant of the system TI of 59th Avenue and I-10; and 2) Circle K convenience store and fueling station located in the southeastern quadrant of 59th Avenue and Buckeye Road.

The W55 Alternative contains no high-risk hazardous material sites.

Acquisitions and Relocations

Acquisition and relocation data were acquired from multiple sources: review of aerial photography (April 2008), Maricopa County Assessor's data (January 2009), and a field review on June 24, 2009. The acquisitions and relocations would vary based on the location of the W59 Alternative Options. Table 4 summarizes the anticipated acquisition and relocation effects of the W59 Alternative Options.

Table 4: Acquisitions and Relocations Summary, W59 Alternative Options

	Alternative and Option		
Acquisition	**W55 Alternative**	**W59 Alternative (West)**	**W59 Alternative (East)**
Businesses	66	31	35
Single-family residences	1	22	22
Multifamily residences	0	2 complexes (~500 units)	2 complexes (~500 units)

Note: All acquisition and relocation impacts identified would occur north of Lower Buckeye Road. There are no impacts identified between the Salt River and Lower Buckeye Road.

Section 8 housing is provided at one of the apartment complexes. It is assumed comparable replacement housing is available in the area. This assumption is being verified at this time.

Environmental Justice Issues

Demographic data were acquired from the United States Census 2000 for the purpose of determining the presence of protected environmental justice populations. Data for minorities (African American, Native American, Asian, Pacific Islander, other race, two or more races, and Hispanic) and elderly persons (65 and older) were available at the census block level. Disabled, poverty, and female head of household population data were available at only the census block group level. Protected populations were determined within 0.5-mile buffer east and west of 59th Avenue; this area encompasses both W59 Alternative Options. In cases where a census block or census block group extends outside the 0.5-mile buffer, data for the entire census block or census block group were obtained. A given geographic unit was classified as having a protected population if its share of given socioeconomic or demographic group was 50 percent higher than that of the corresponding Maricopa County socioeconomic or demographic group.

The results of the demographic analysis are presented in Table 5. Although protected populations would be affected with any of the alternatives within the Western Section of the South Mountain Freeway Study Area, the impact would not be disproportionate or adversely high; therefore, no environmental justice impacts are anticipated.

Table 5: Demographic Analysis of Census Block Data for Environmental Justice Reporting

Alternative and Option		
W55 Alternative	W59 Alternative (West)	W59 Alternative (East)
• 79% of populated blocks have protected minority populations • 10% of populated blocks have protected elderly populations • 69% of block groups have protected poverty populations • 56% of block groups have protected female head of household populations • 0% of block groups have protected disabled populations	• 97% of populated blocks have protected minority populations • 0% of populated blocks have protected elderly populations • 50% of block groups have protected poverty populations • 25% of block groups have protected female head of household populations • 25% of block groups have protected disabled populations	• 97% of populated blocks have protected minority populations • 0% of populated blocks have protected elderly populations • 50% of block groups have protected poverty populations • 25% of block groups have protected female head of household populations • 25% of block groups have protected disabled populations

ANALYSIS SUMMARY

Table 6 summarizes the key environmental and engineering findings of the analysis of the W55 Alternative and W59 Alternative Options from I-10 (Papago) to the Salt River.

Table 6: Summary of Analysis, 3+1 Configuration

Issue	W55 Alternative	W59 Alternative			
		West Option		East Option	
	400 foot [a]	400 foot	300 foot [b]	400 foot	300 foot
Engineering					
Typical section	· three general purpose lanes · one HOV lane · concurrent construction of all general purpose and HOV lanes				
System TI	· two lane directional ramps · no HOV lane direct connection to median · I-10 local access maintained with connector roads and relocated service ramps				
Service TIs	· poor operations at Van Buren Street and Buckeye Road due to 3 major intersections within ¼-mile	· acceptable operations at Van Buren Street and Buckeye Road due to incorporating 59th Avenue into freeway section and reducing signals from three to two. · 400 foot options would improve operations by providing additional storage between the signals for vehicles turning left or travel through the interchange.			
Local Access to South Mountain Freeway Frontage Roads	· no frontage roads required	· use of frontage roads results in some out-of-direction travel · require construction of bridges to provide local access along northbound frontage road to adjacent properties			
Interstate traffic operations	· I-10 (Papago) would operate poorly during the AM and PM peak periods in 2030 · W55 and W59 alternatives would operate similarly during the AM peak period. · W59 Alternative operates better during the PM peak period as shown by lower delay and travel time within the microsimulation network.				
Railroad coordination	· coordination initiated · freeway spanning railroad right-of-way	· no coordination initiated · 59th Avenue crossing of railroad to be reconfigured to two separate crossings · freeway spanning railroad right-of-way			
Major utilities	· some affect to utilities crossing the freeway	· some affect to utilities crossing the freeway · relocation of utilities along 59th Avenue			
Traffic control	· disruption of traffic on I-10 and the service TI ramps	· disruption of traffic on I-10 and the service TI ramps · potential closure of 59th Avenue during construction			
Constructability	· complex bridge design and construction over 59th Avenue and RID canal	· complexities of traffic control along 59th Avenue and surface street crossings · parallel utility relocation · local access during construction			
Tank farm	· located acceptable distance from tank farm · requires reinforced walls and safety measures	· located acceptable distance from tank farm · would not require any special safety measures			
Costs ($ millions)					
Construction and design	388.8	393.9	416.4	386.9	409.4
Right-of-way	227.9	241.7	224.0	245.2	243.7
Total	616.7	635.6	640.4	632.1	653.1
Environmental					

Issue	W55 Alternative	W59 Alternative			
		West Option		East Option	
	400 foot [a]	400 foot	300 foot [b]	400 foot	300 foot
Cultural resources	· all cultural resources may be avoided				
Section 4(f)	· all Section 4(f) resources may be avoided				
Hazardous material sites (high-risk)	0	2		2	
Environmental justice issues	· no disproportionate impact				
Acquisitions and relocations					
Businesses	66	31		35	
Single-family residences	1	22		22	
Multi-family residences	0	2 complexes (~500 units)		2 complexes (~500 units)	

[a] 400 foot refers to the service TI ramp intersection spacing
[b] 300 foot refers to the service TI ramp intersection spacing

CONCLUSIONS

In the review of key environmental and engineering considerations for this section of the proposed South Mountain Freeway, ten elements differentiated among the alternatives and options:

- traffic operations on I-10 (Papago)
  - less delay and travel time with the W59 Alternative
- service TI operations
  - more optimal signal spacing and operational performance at Van Buren Street and Buckeye Road with the W59 Alternative
- high-risk hazardous materials sites
  - no high-risk site on W55 Alternative
  - two high-risk sites on W59 Alternative Options
- single-family and multifamily residential acquisitions and relocations
  - 1 single-family residence would be displaced and relocated on W55 Alternative
  - 22 single-family residences and 500 multifamily residences would be displaced and relocated on W59 Alternative Options
- business acquisitions and relocations
  - 66 businesses would be displaced and relocated on W55 Alternative
  - 31 to 35 would be displaced and relocated on W59 Alternative Options
- relocation of utilities
  - overhead electrical power lines relocated on W55 Alternative for 0.5 mile
  - irrigation, underground gas, water, sewer, and telecommunications, and overhead electrical power lines relocated on W59 Alternative Options for up to three miles
- construction impacts
  - 59th Avenue operational with W55 Alternative
  - construction complications due to the need to keep 59th Avenue operational
- traffic operations on surface streets
  - 300 foot ramp terminal intersection spacing adversely affects the queuing capability of traffic on the surface streets
  - separating the northbound and southbound traffic on 59th Avenue with the W59 Alternative Options results in some out of direction travel on the surface street
  - separating the northbound and southbound traffic on 59th Avenue with the W59 Alternative Options would increase safety as conflicts with left-turning vehicles would be removed
- tank farm proximity
  - W55 Alternative would require safety measures due to adjacency with tank farm properties
  - W59 Alternative Options would be farther removed from the tank farm and not require any extra safety measures
- costs
  - W55 Alternative has a savings of $15.5 million over the W59 Alternative (East) with 400 foot ramp terminal intersection spacing
  - W55 Alternative has a savings of $18.9 million over the W59 Alternative (West) with 400 foot ramp terminal intersection spacing

While not an exhaustive list of all potential impacts and analysis criteria, this list contains the key differentiators between alternatives. Additional elements that may need further review include the perception of air quality impacts to local elementary schools, increased noise impacts to residential areas, potential unique business relocations, public perception, and traffic operations on I-10 (Papago) and 59th Avenue.

Analysis of the W59 Alternative included application of the resulting design features to the proposed W55 Alternative. Design refinements of the W55 Alternative since the L/DCR analysis include:

- reduction in number of ultimate travel lanes
- addition of HOV lane in initial construction
- removal of allowance for future HOV direct connection to I-10 median
- use of retaining walls to minimize R/W takes
- more detailed cost analysis for utility relocation, traffic control, and drainage channel options

Analysis of these refinements resulted in a savings of $105.8 million for this portion of the W55 Alternative from the estimate of probable costs established for the L/DCR design.

Appendix A
W55 Alternative

3200 East Camelback Road
Suite 350
Phoenix, Arizona 85018
Phone (602) 522-7700
Fax (602) 522-7707
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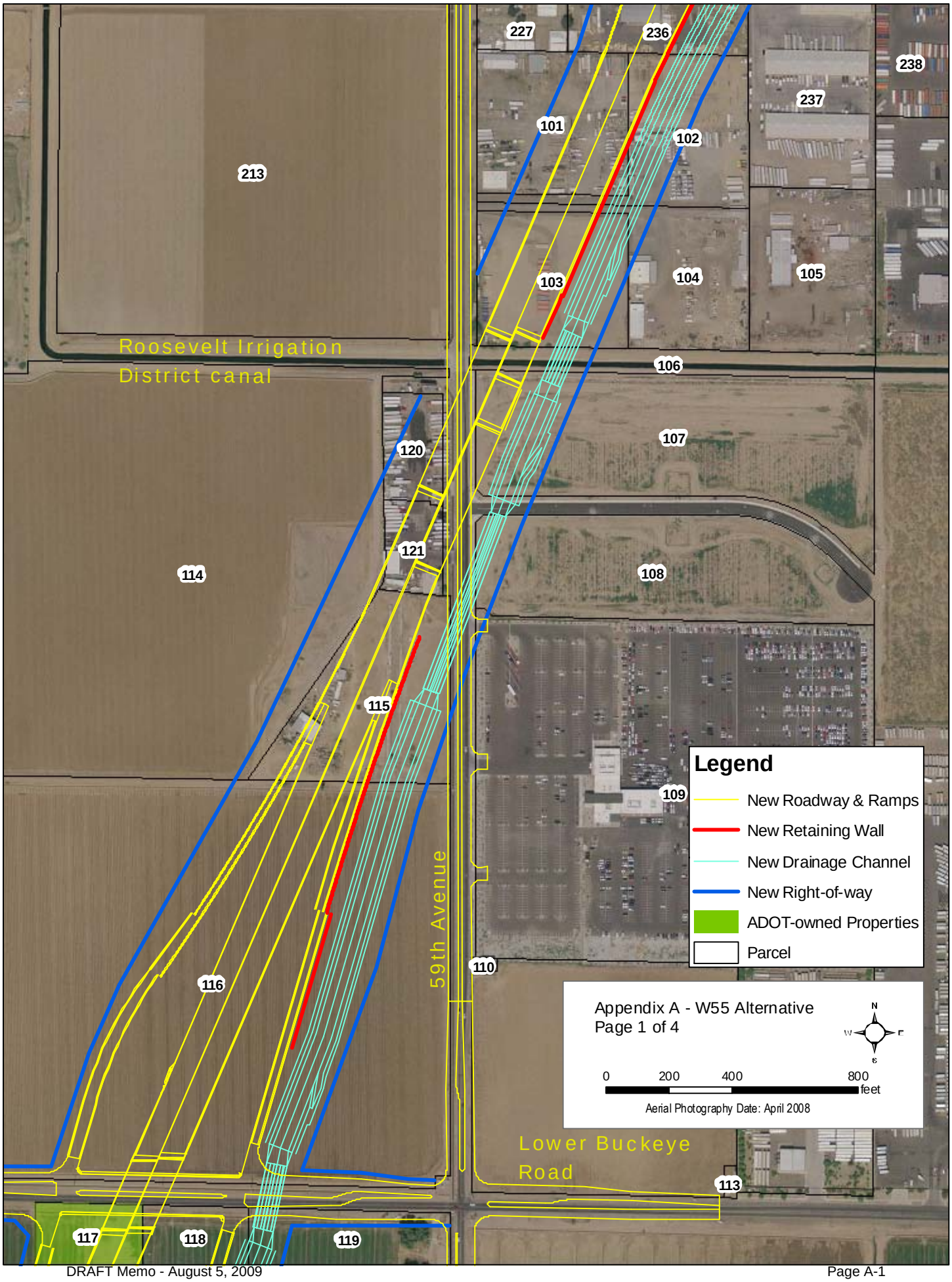
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Appendix A - W55 Alternative
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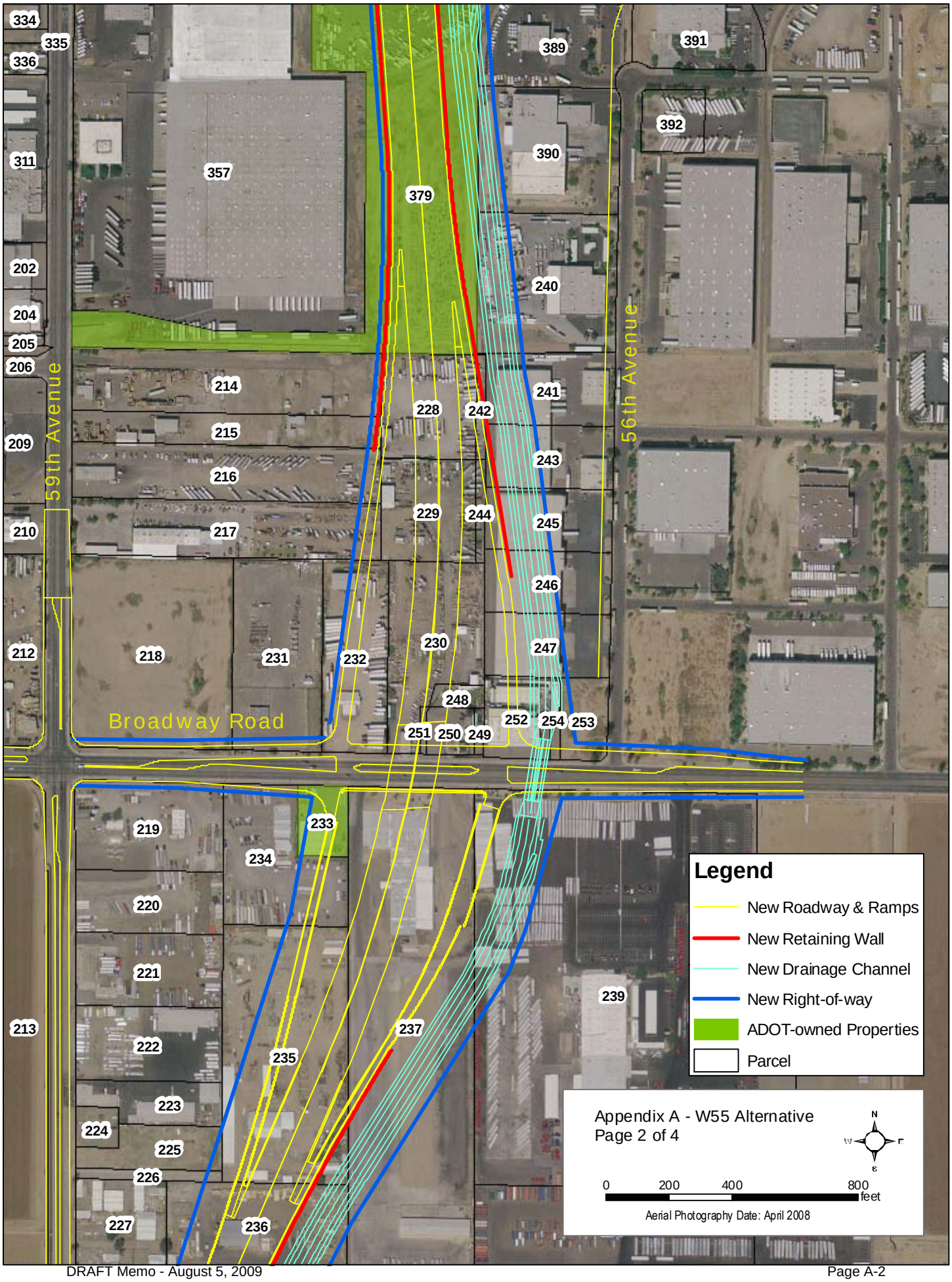
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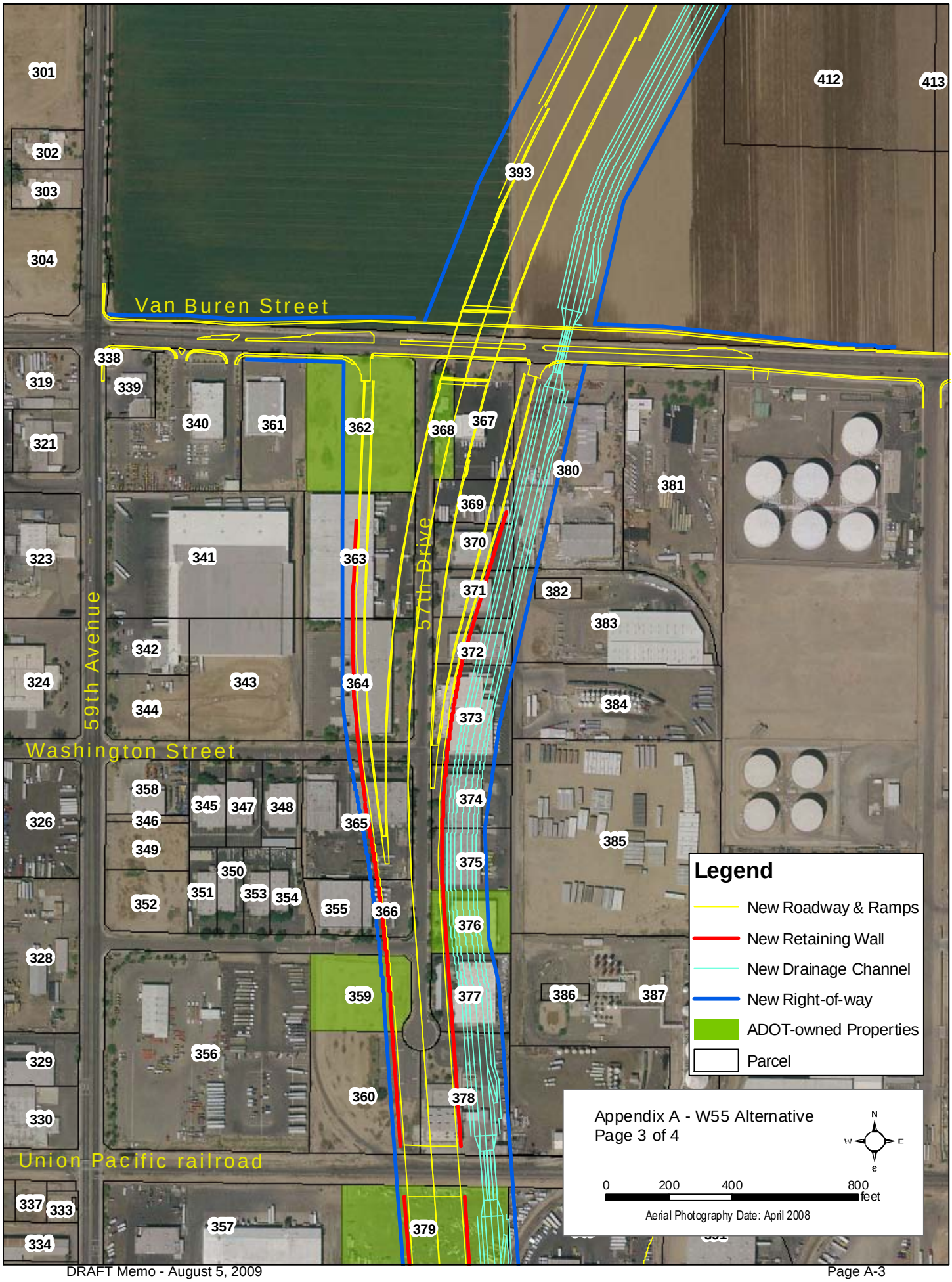
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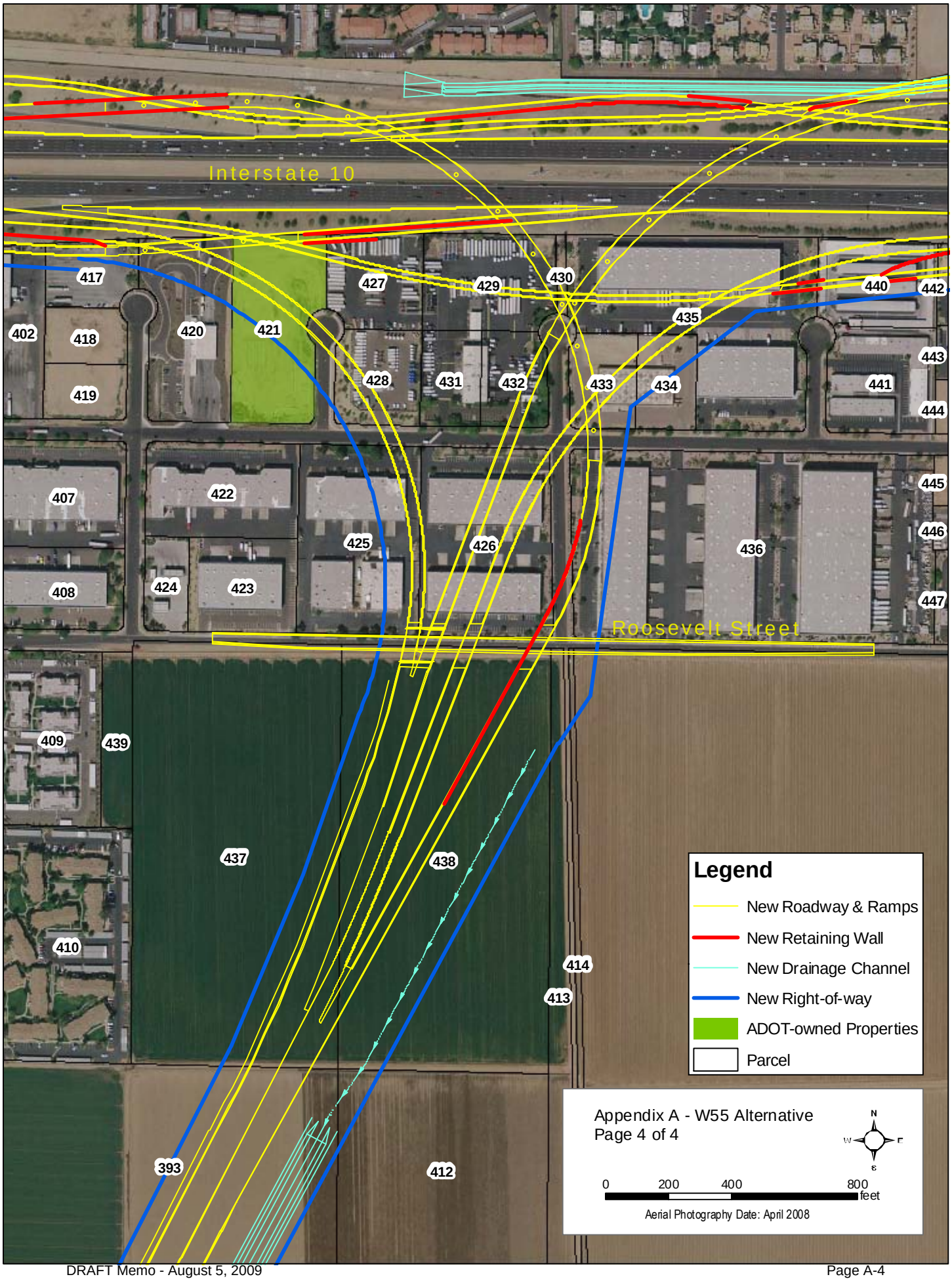
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Appendix A - W55 Alternative
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Appendix B
W59 Alternative (East) – 400' ramp terminal intersection spacing

3200 East Camelback Road
Suite 350
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Phone (602) 522-7700
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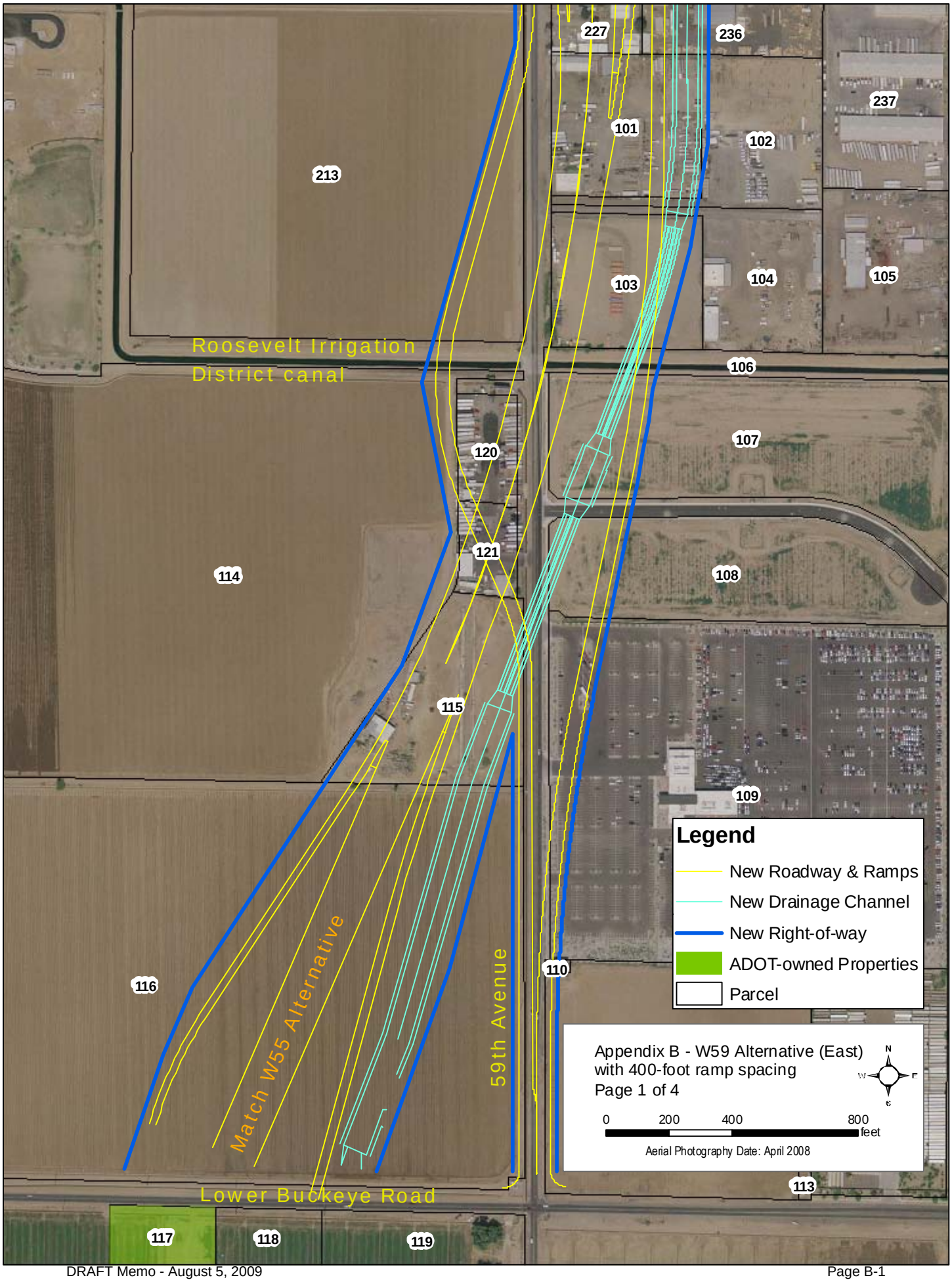
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Appendix B - W59 Alternative (East)
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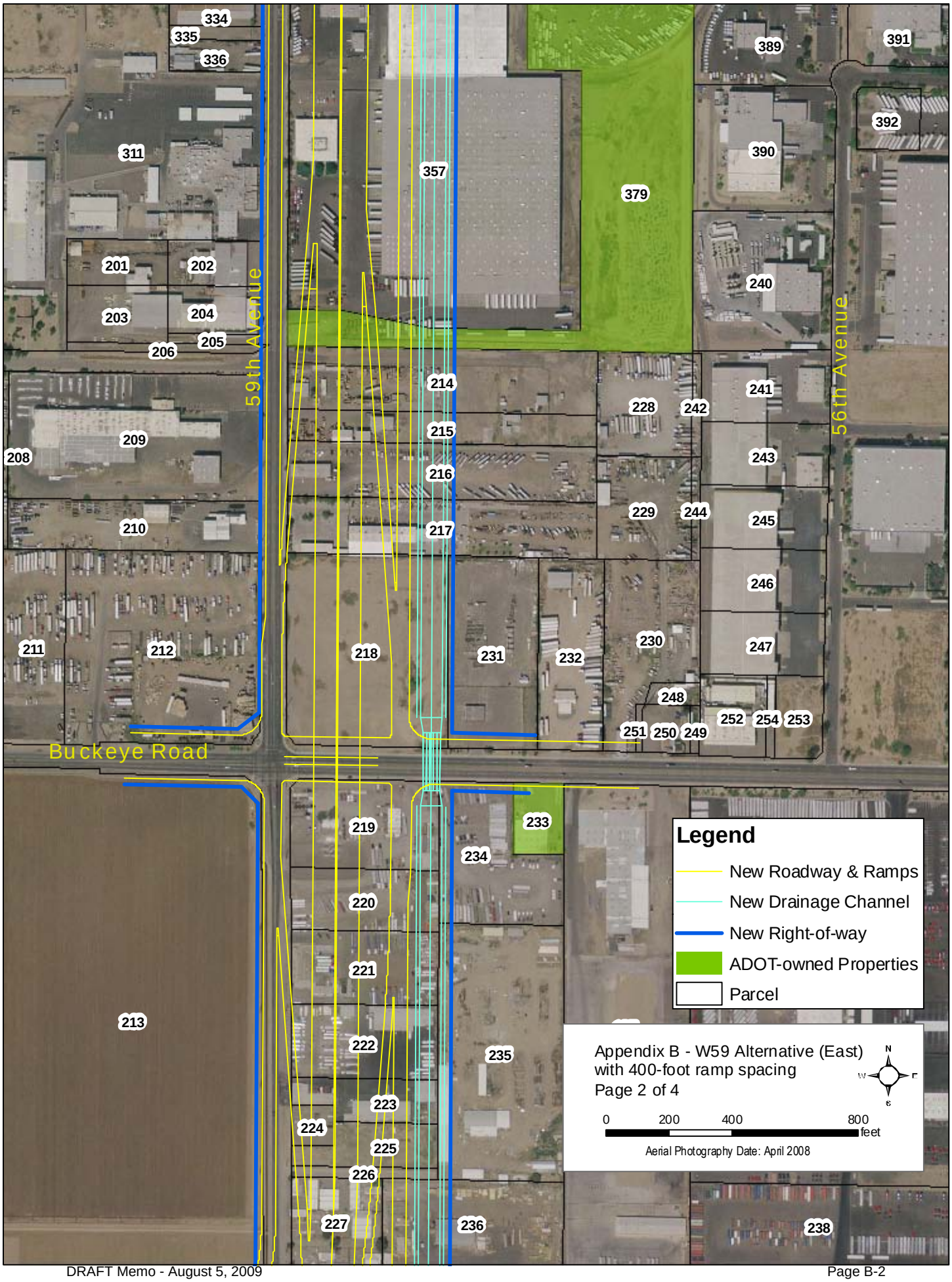
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Appendix B - W59 Alternative (East)
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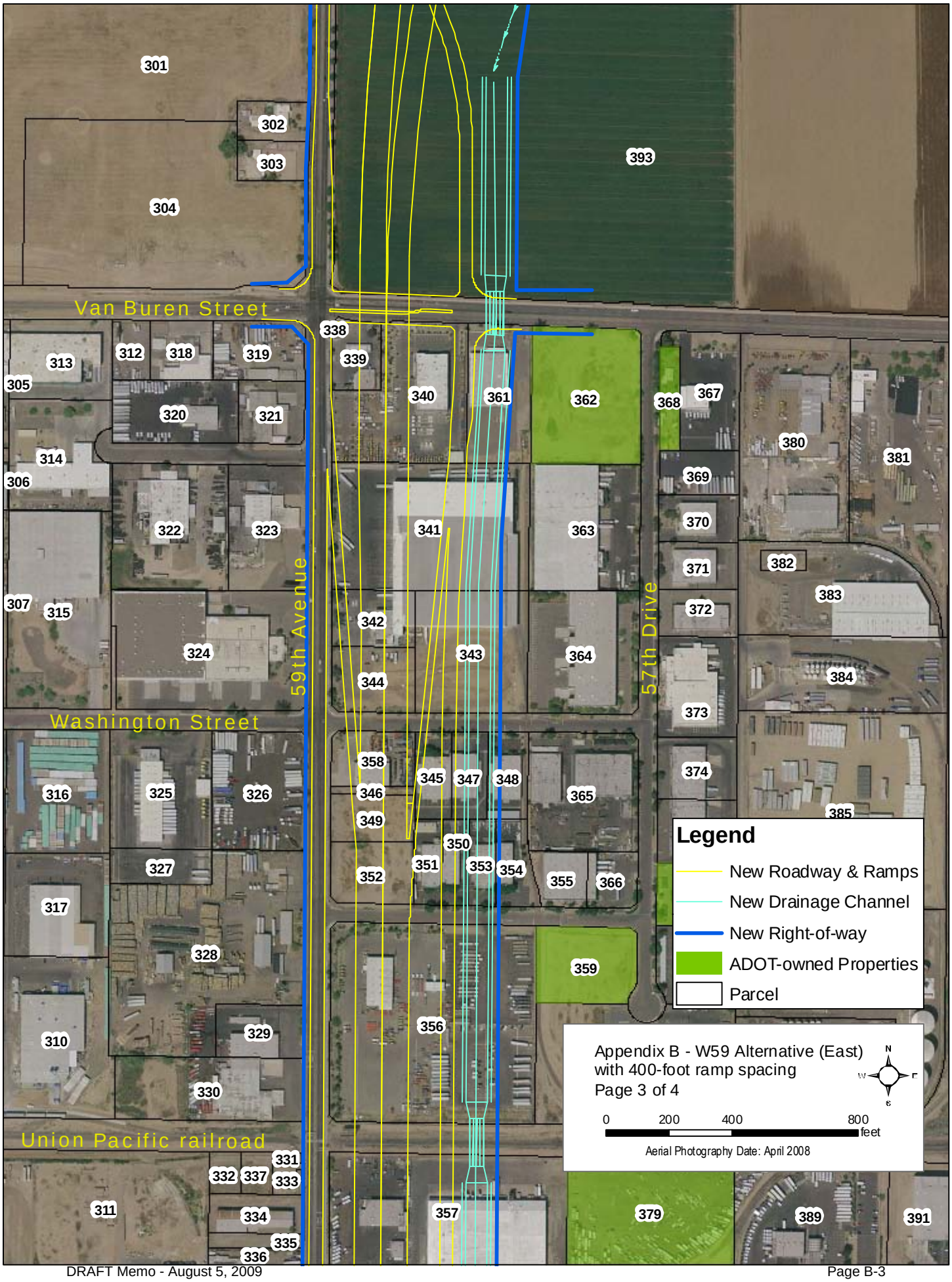
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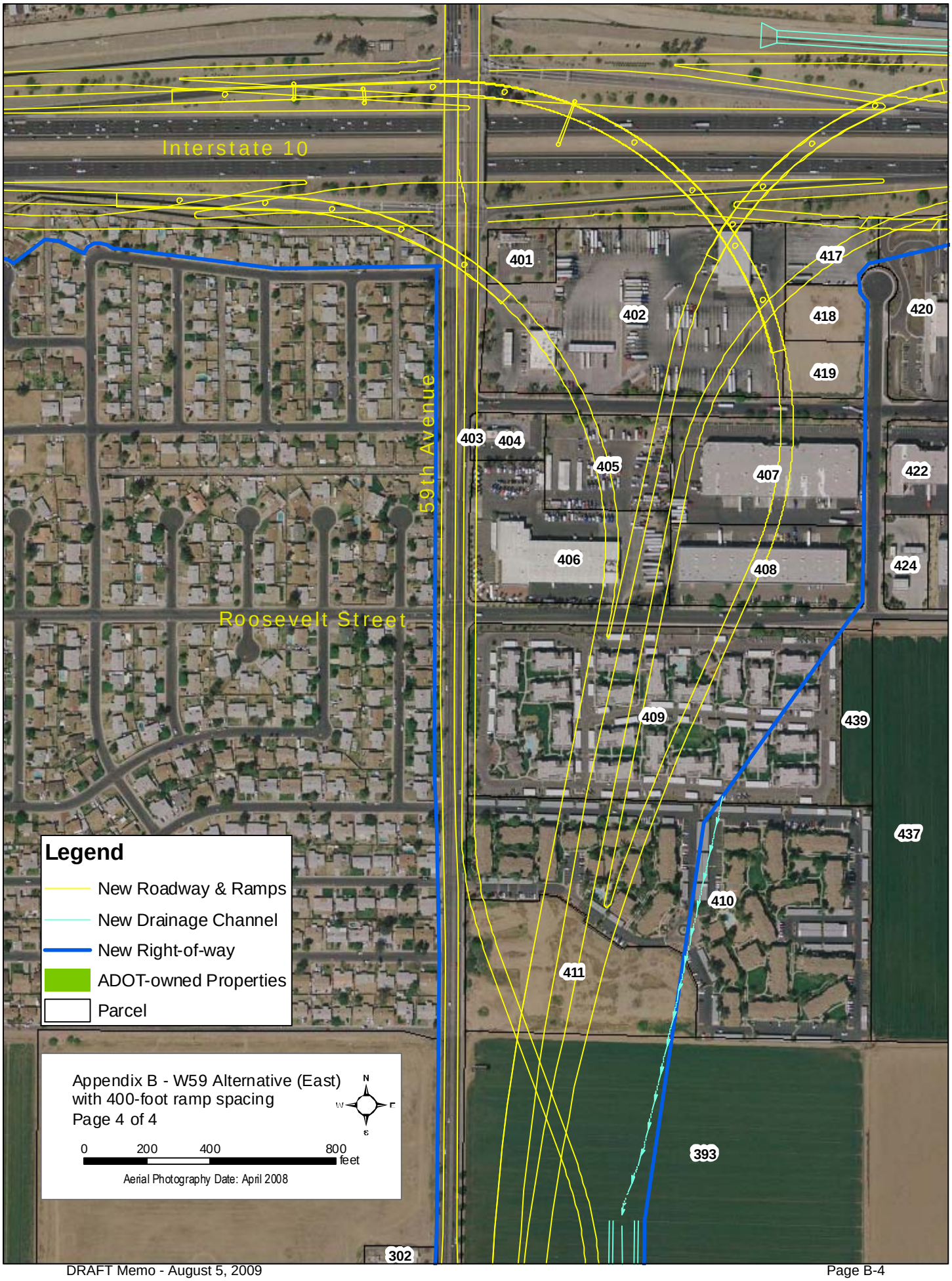
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Appendix C
W59 Alternative (West) – 400' ramp terminal intersection spacing

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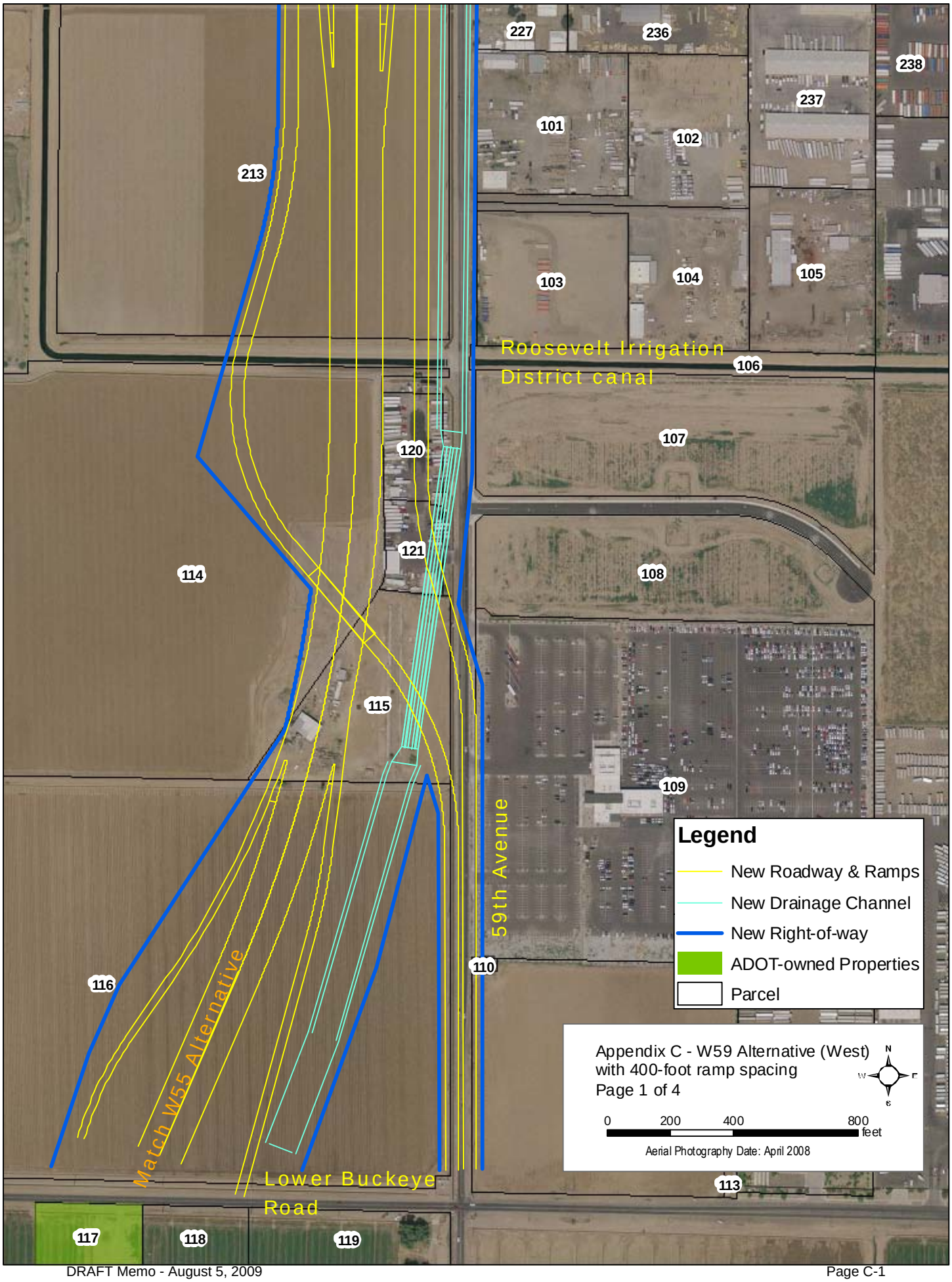
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Appendix C - W59 Alternative (West)
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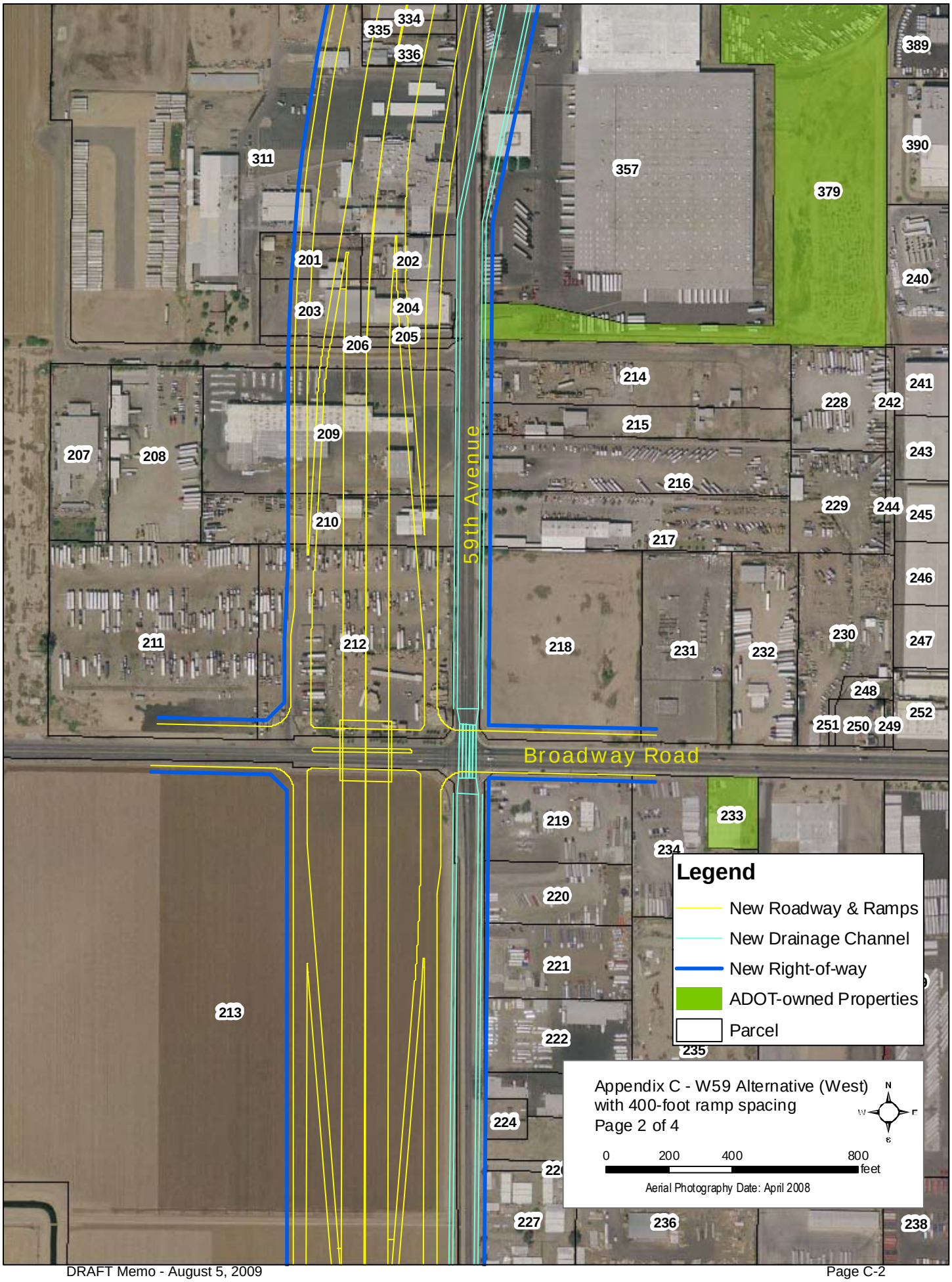
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Appendix C - W59 Alternative (West)
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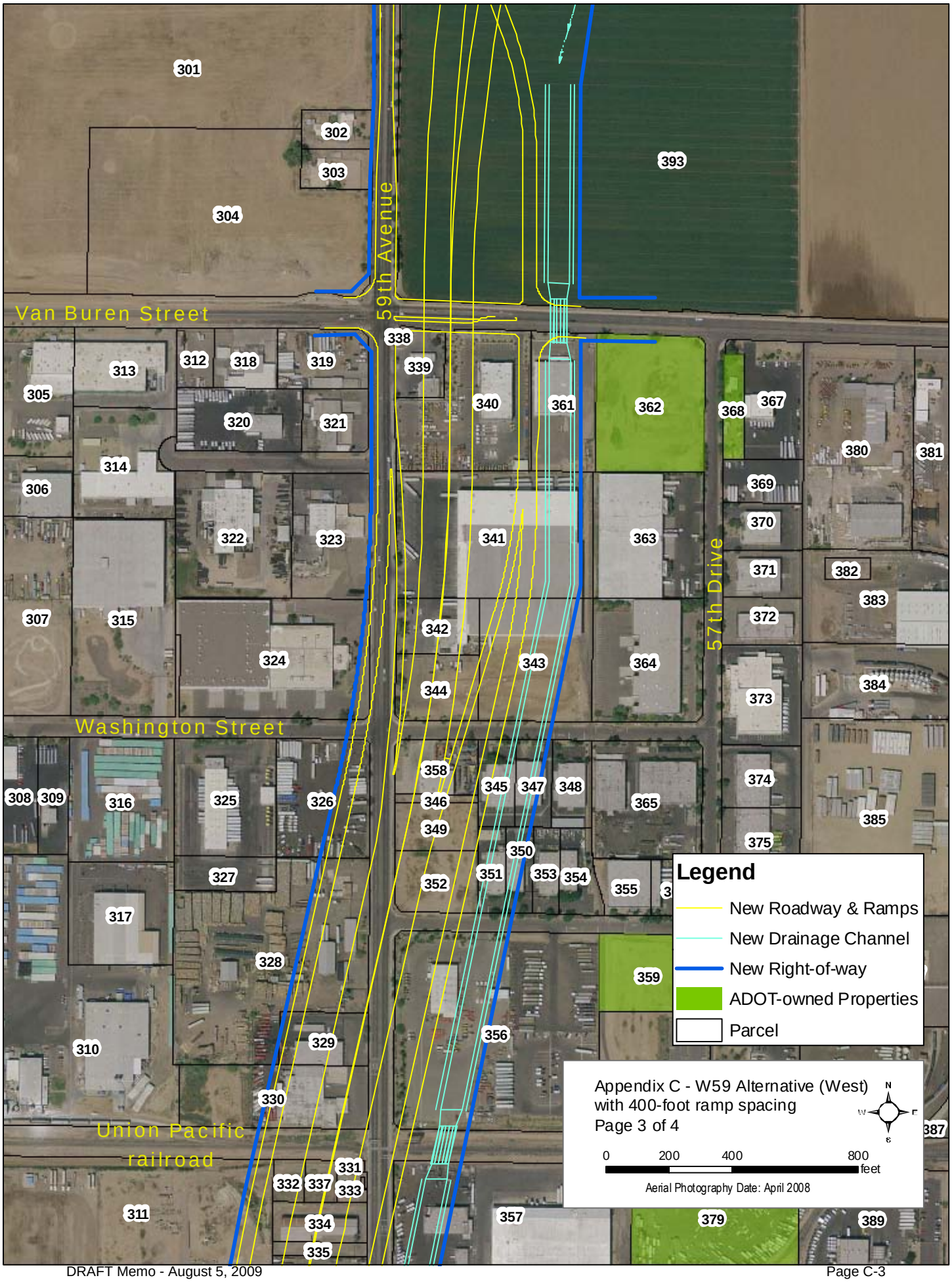
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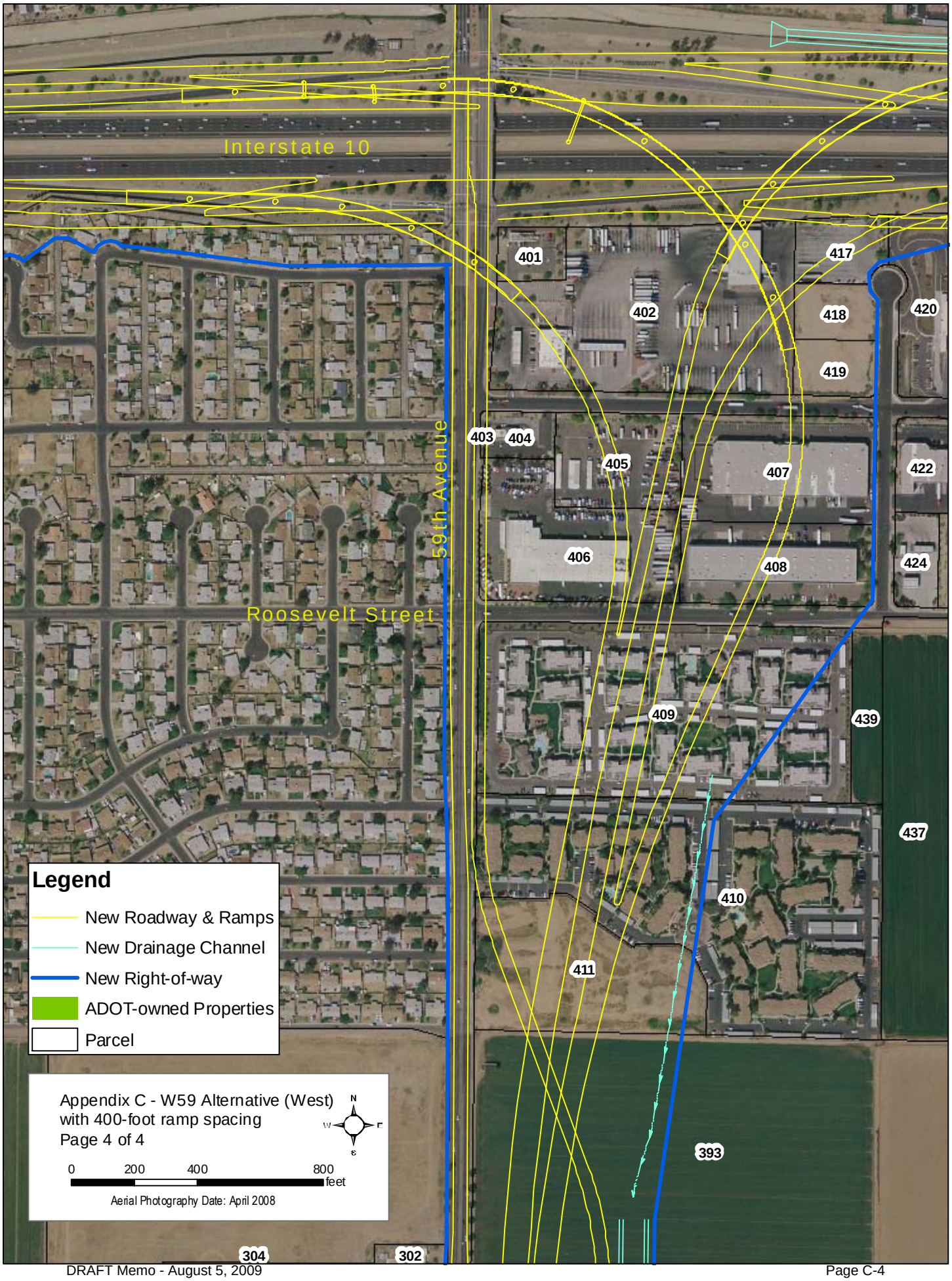
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Appendix D
W59 Alternative (East) – 300’ ramp terminal intersection spacing

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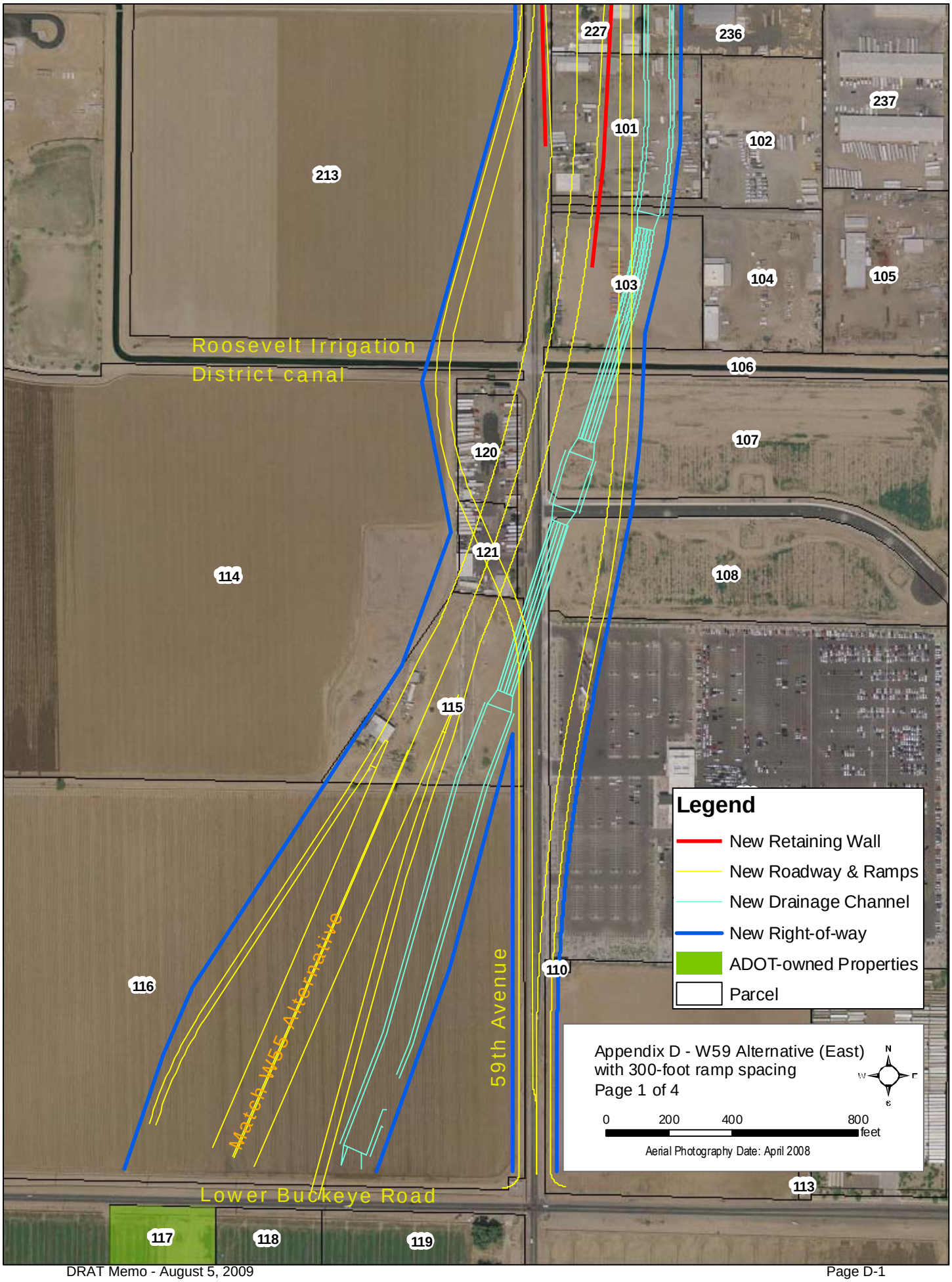
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New Right-of-way
ADOT-owned Properties
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with 300-foot ramp spacing
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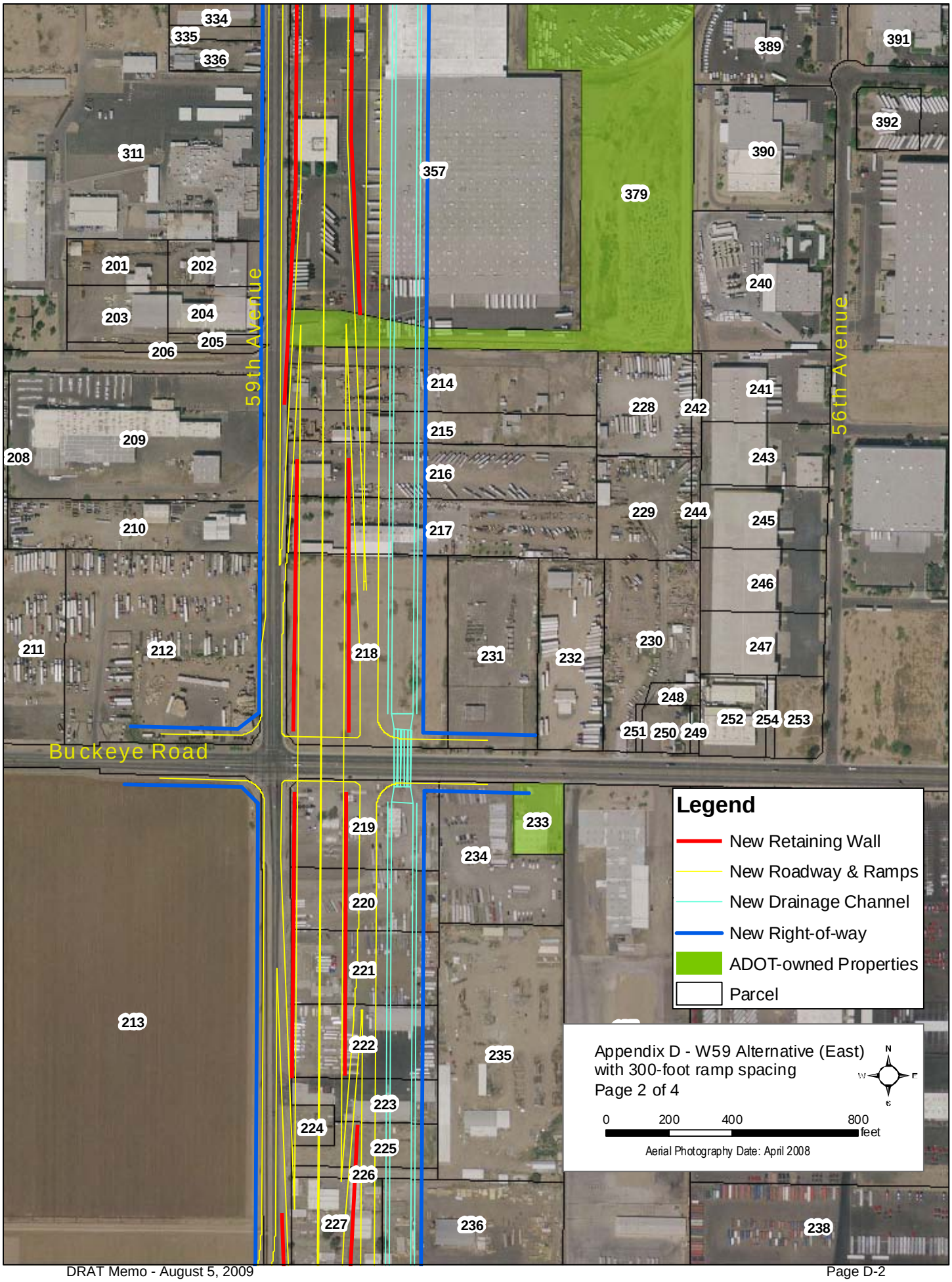
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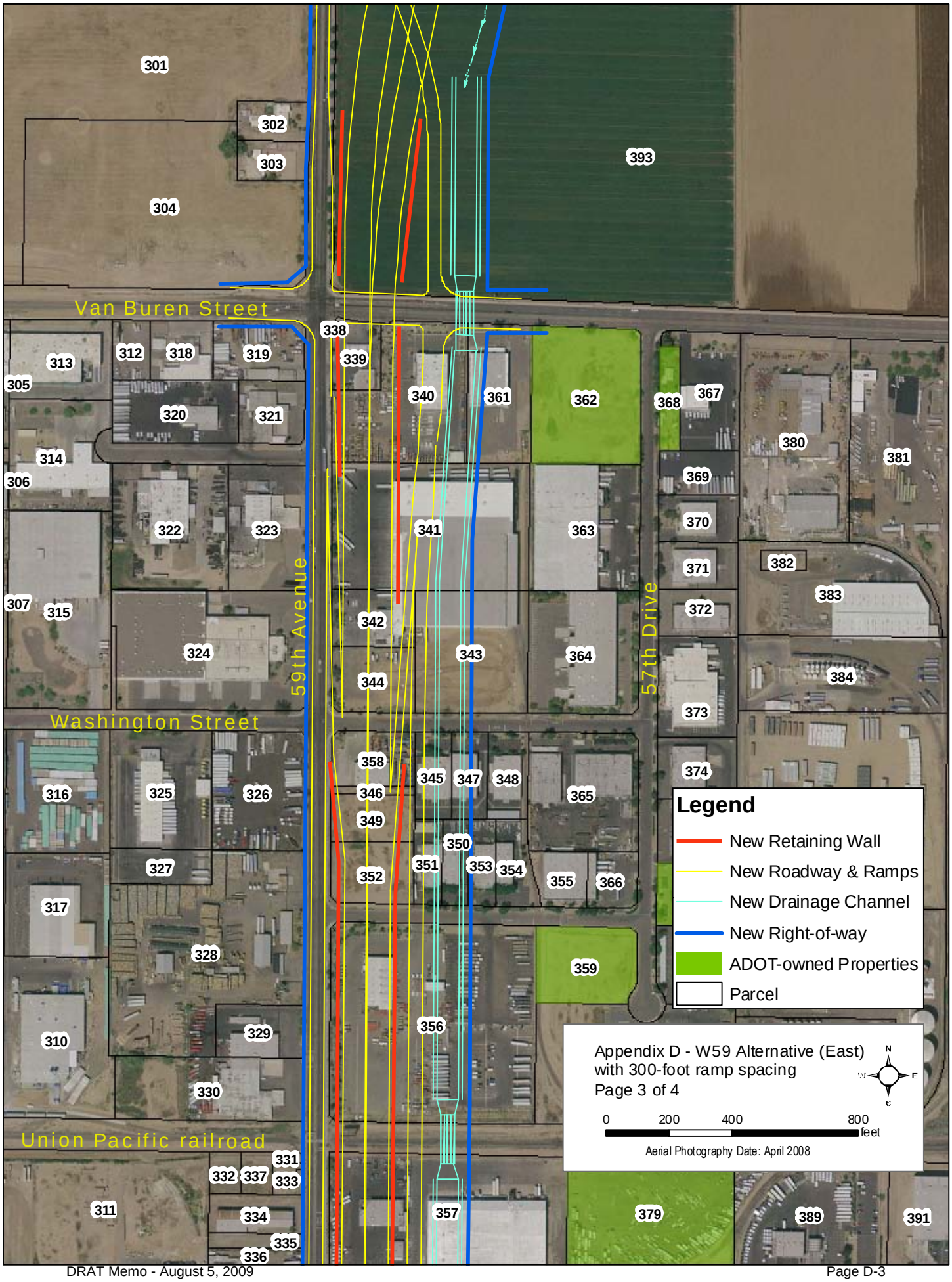
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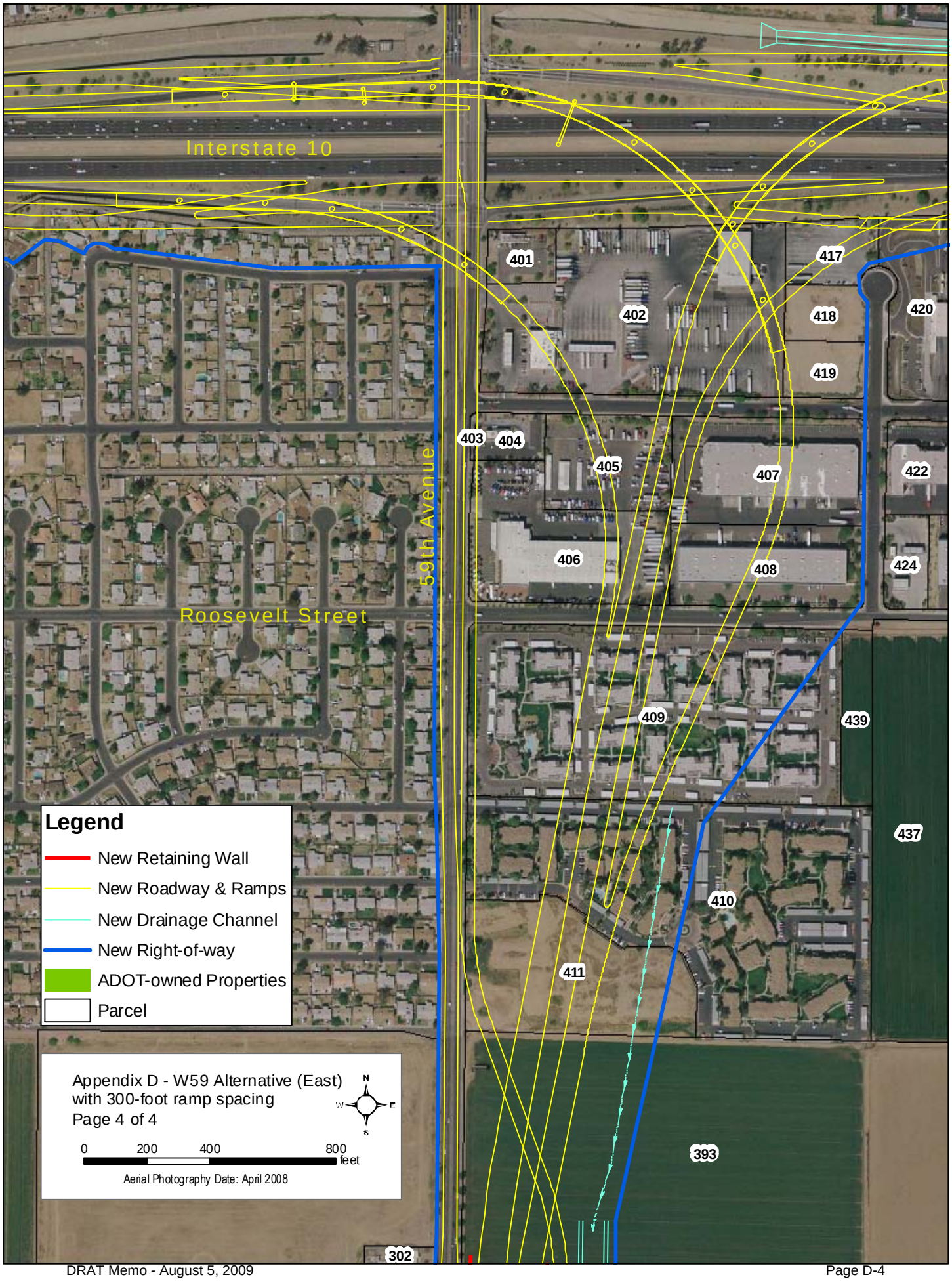
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Appendix E
W59 Alternative (West) – 300' ramp terminal intersection spacing

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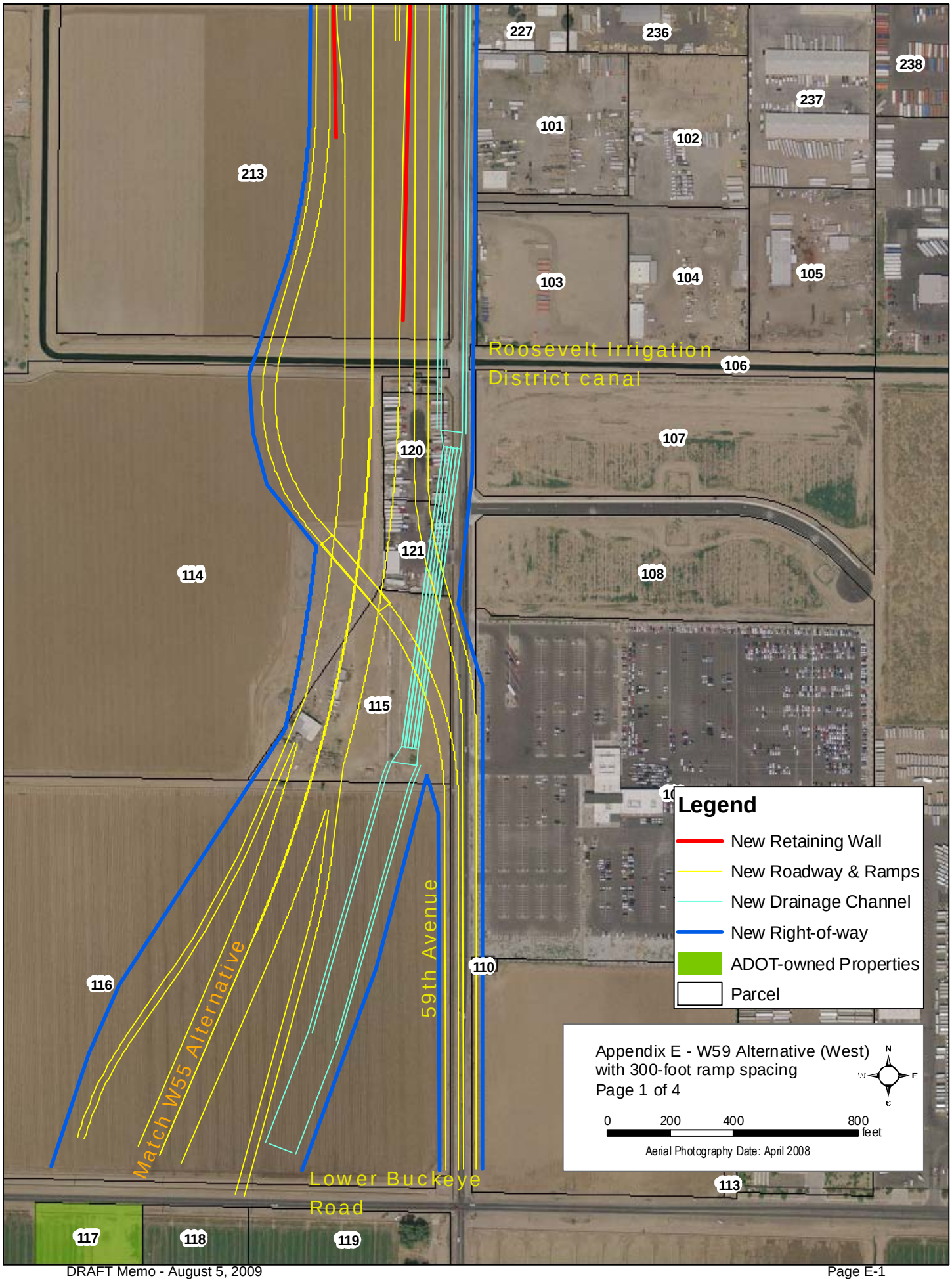
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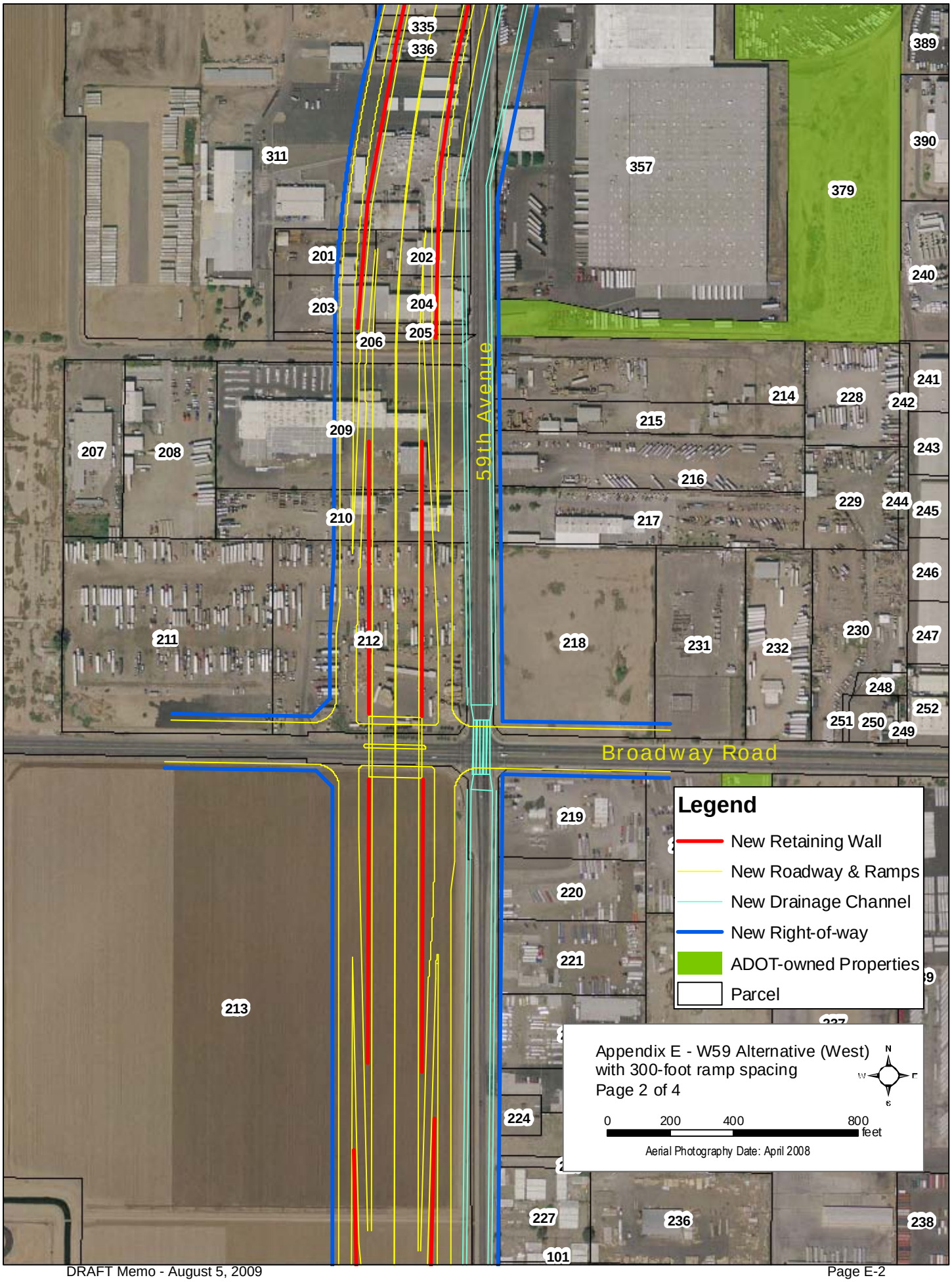
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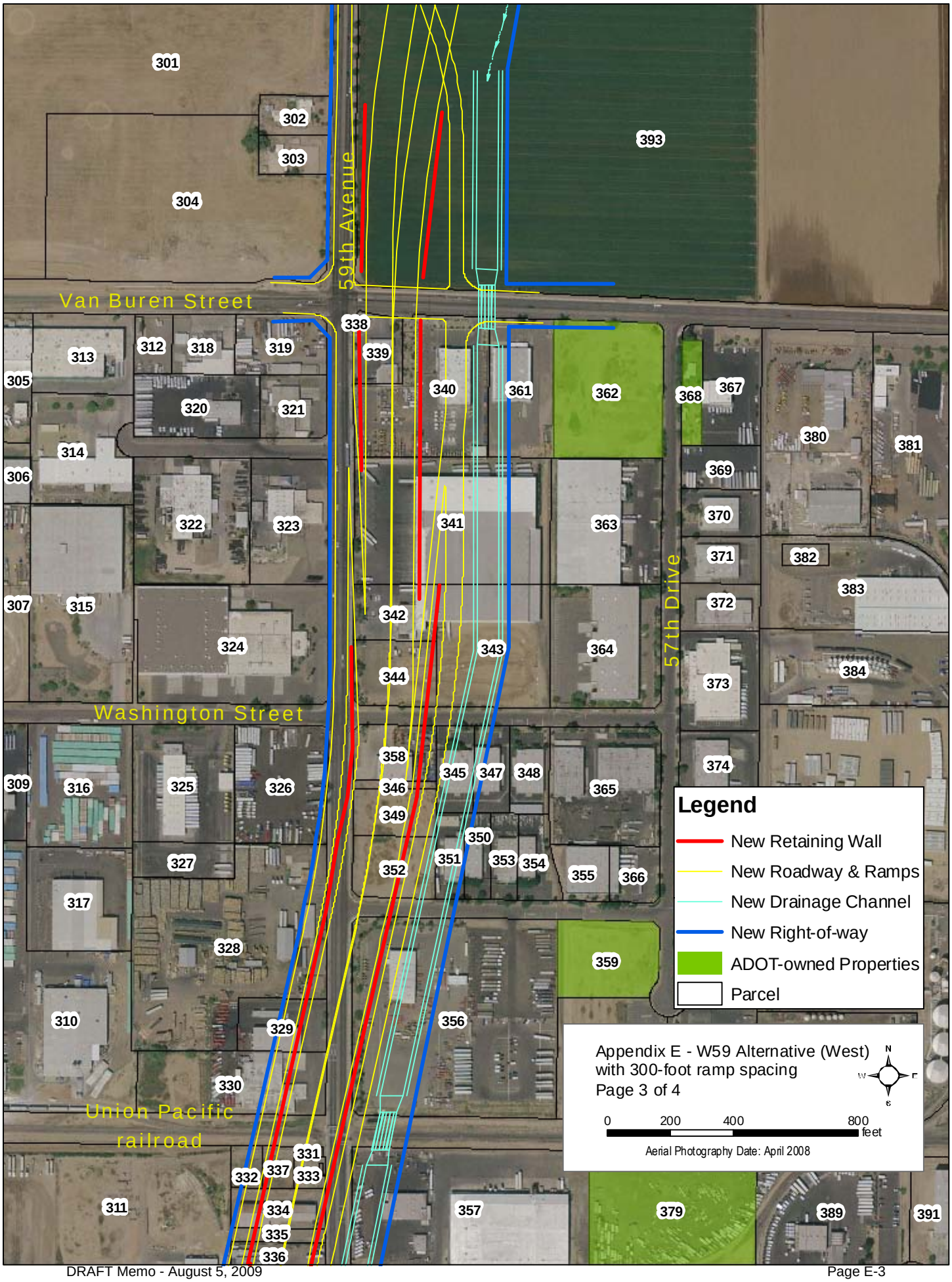
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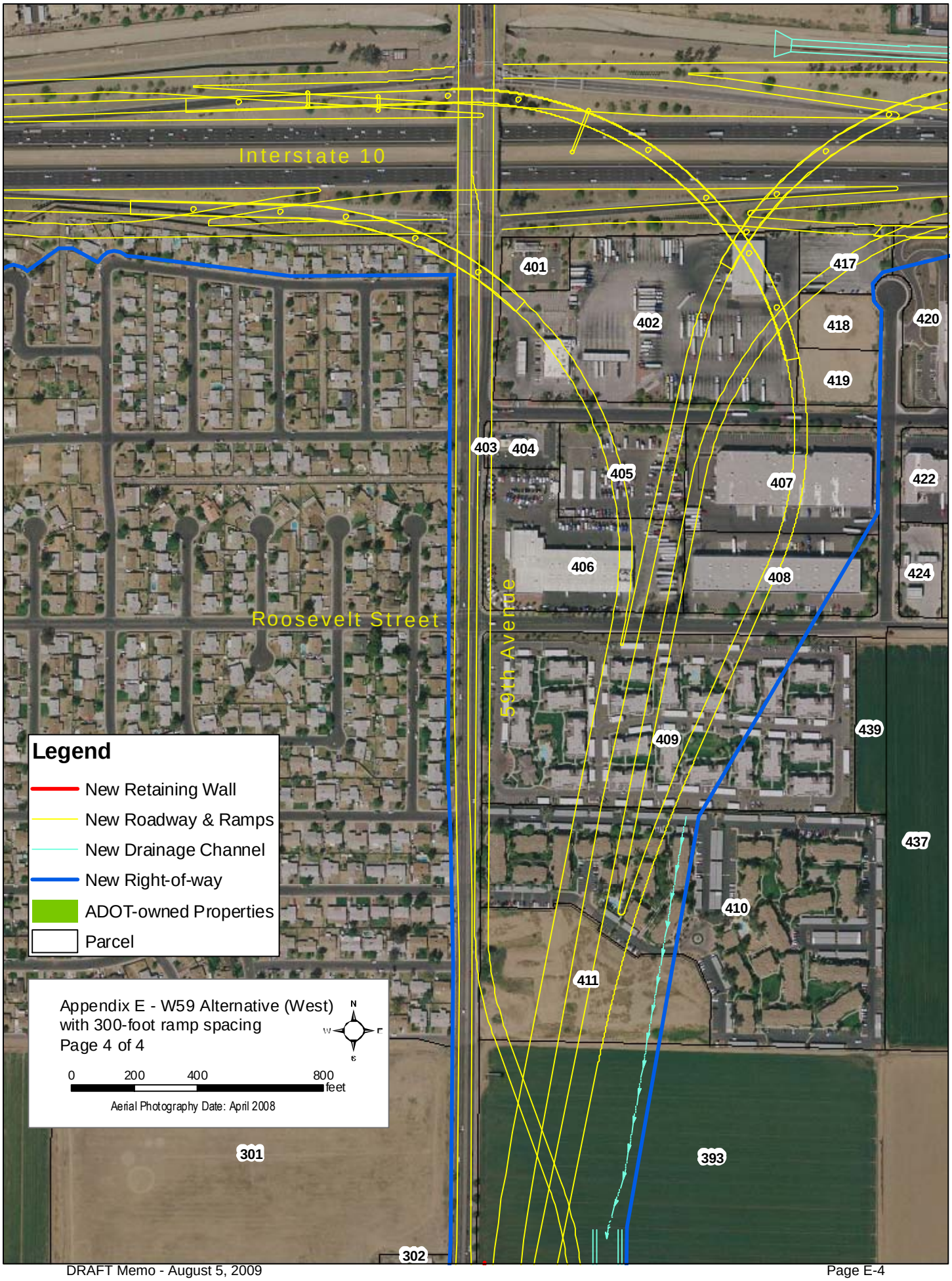
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Appendix F
Microsimulation LOS Maps

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W55 2030 AM Hour 1

11/22/2009

W55 2030 AM Hour 2

11/22/2009

W55 2030 AM Hour 3

11/22/2009

W55 2030 PM Hour 1

11/22/2009

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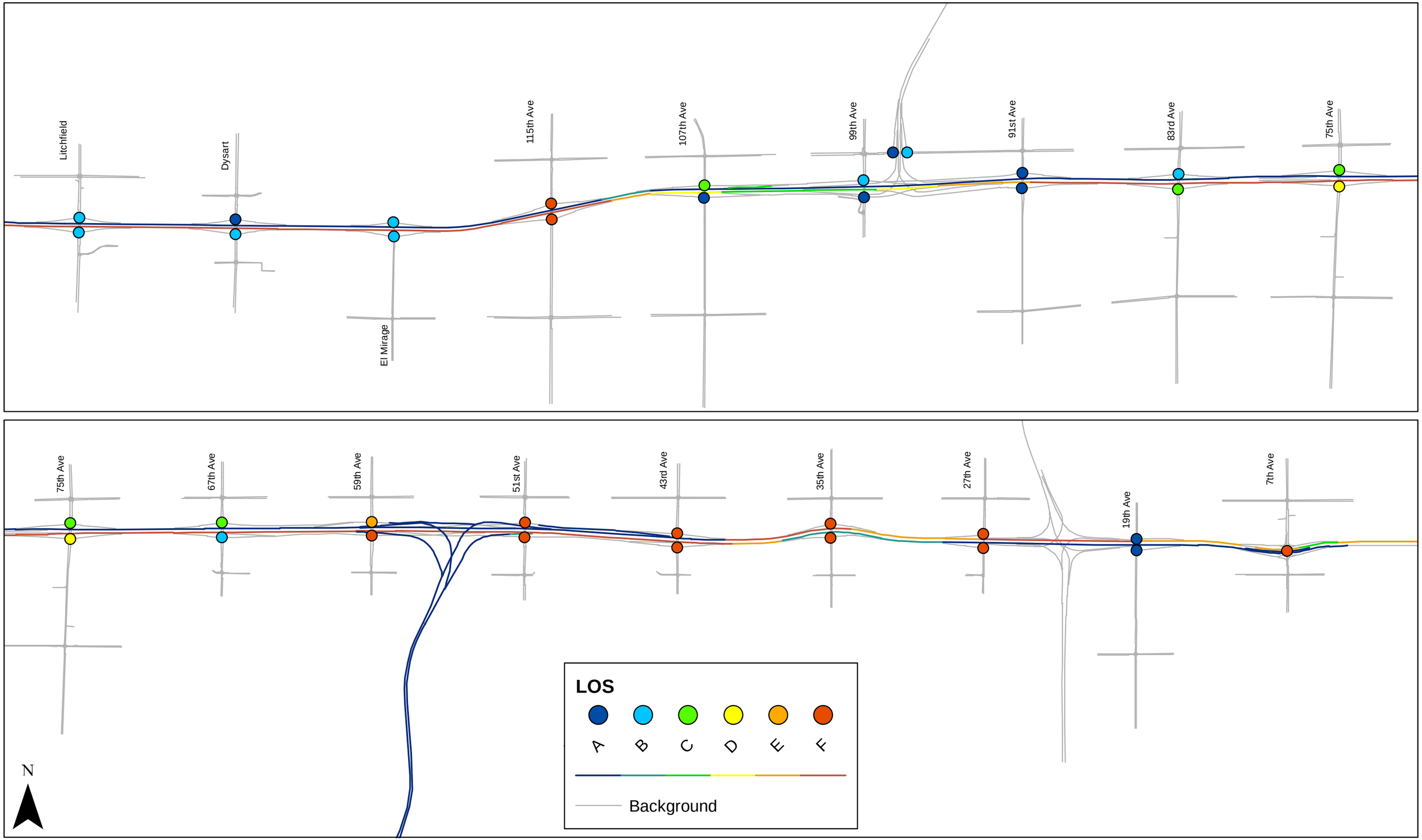

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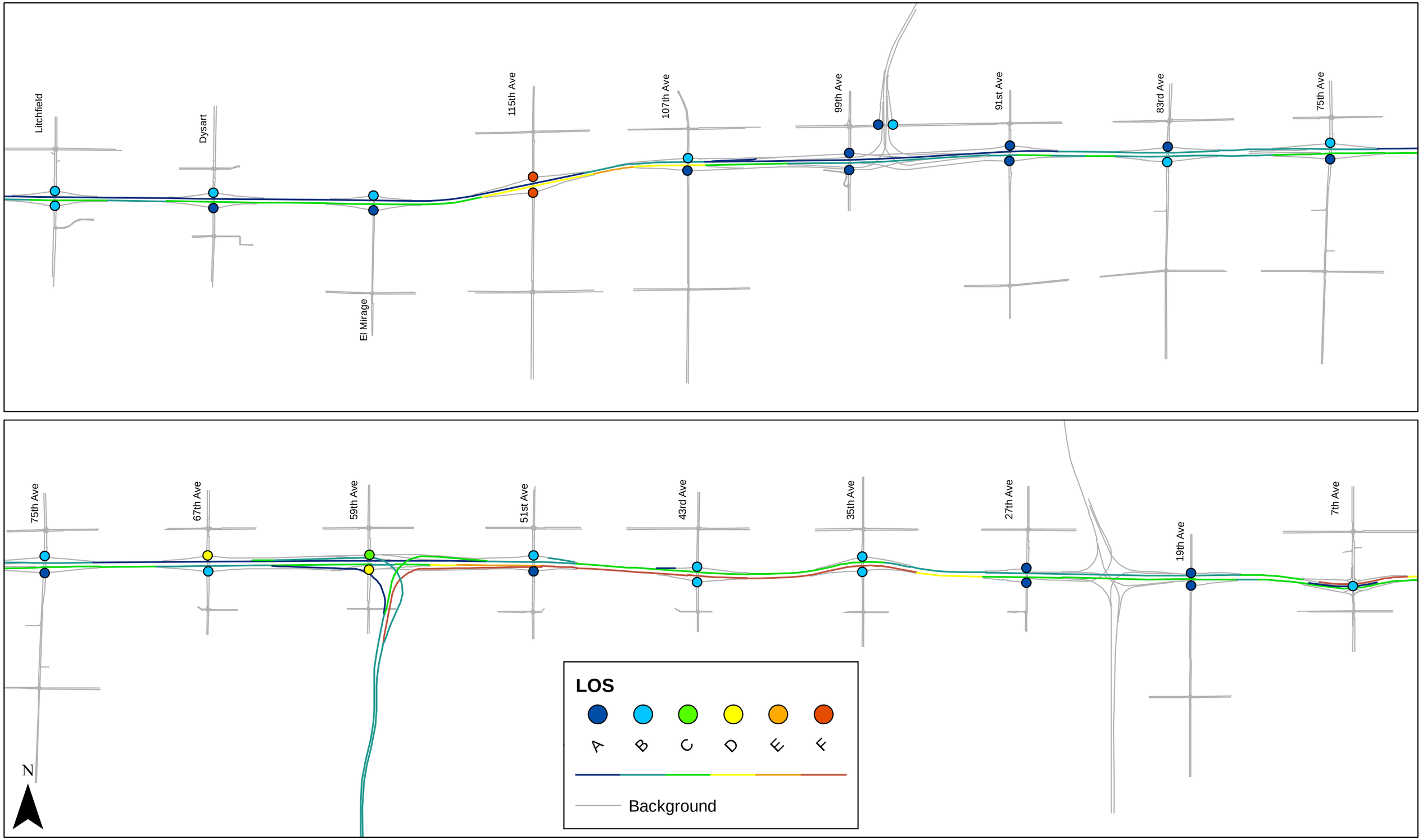
W59 2030 AM Hour 1



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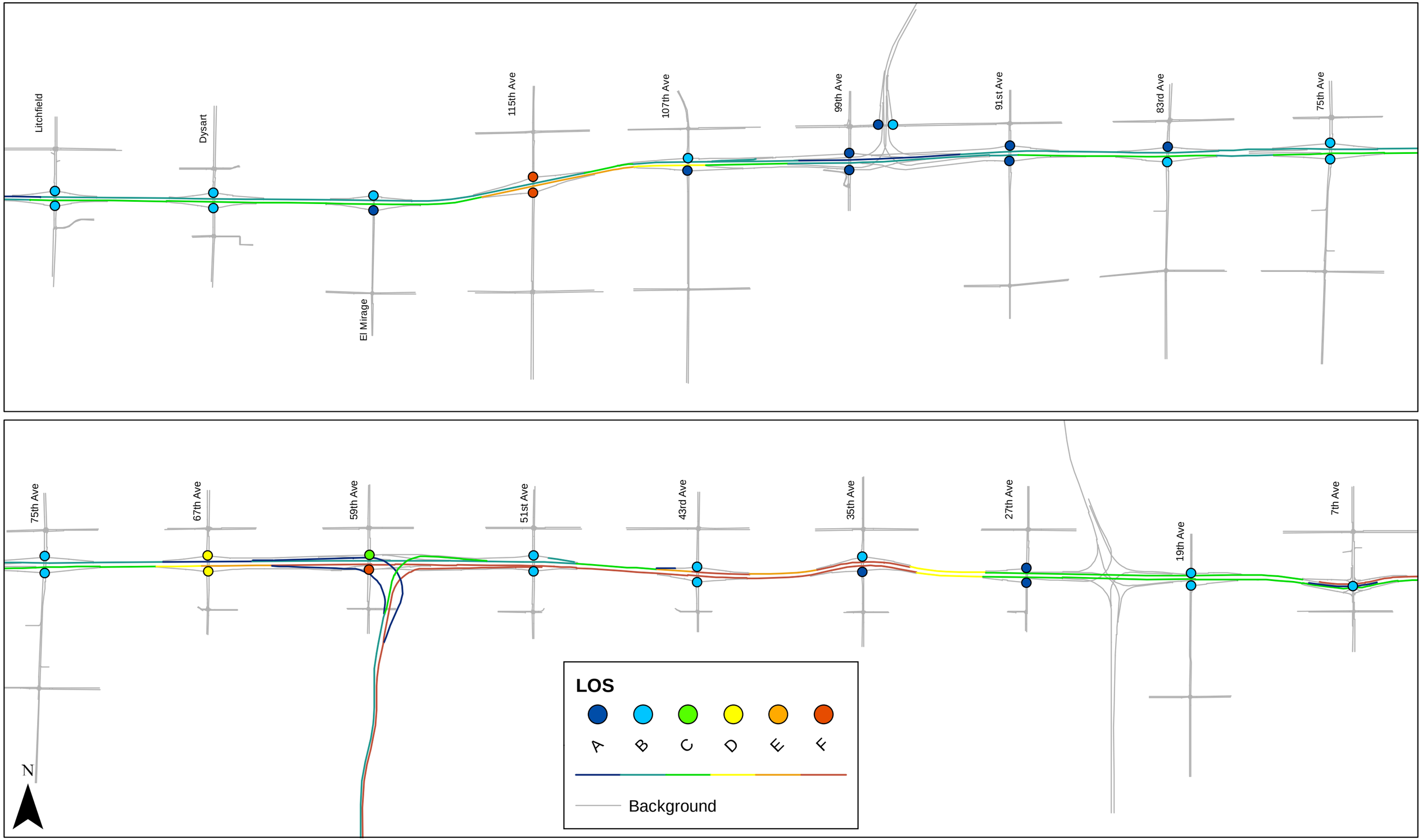
W59 2030 AM Hour 2



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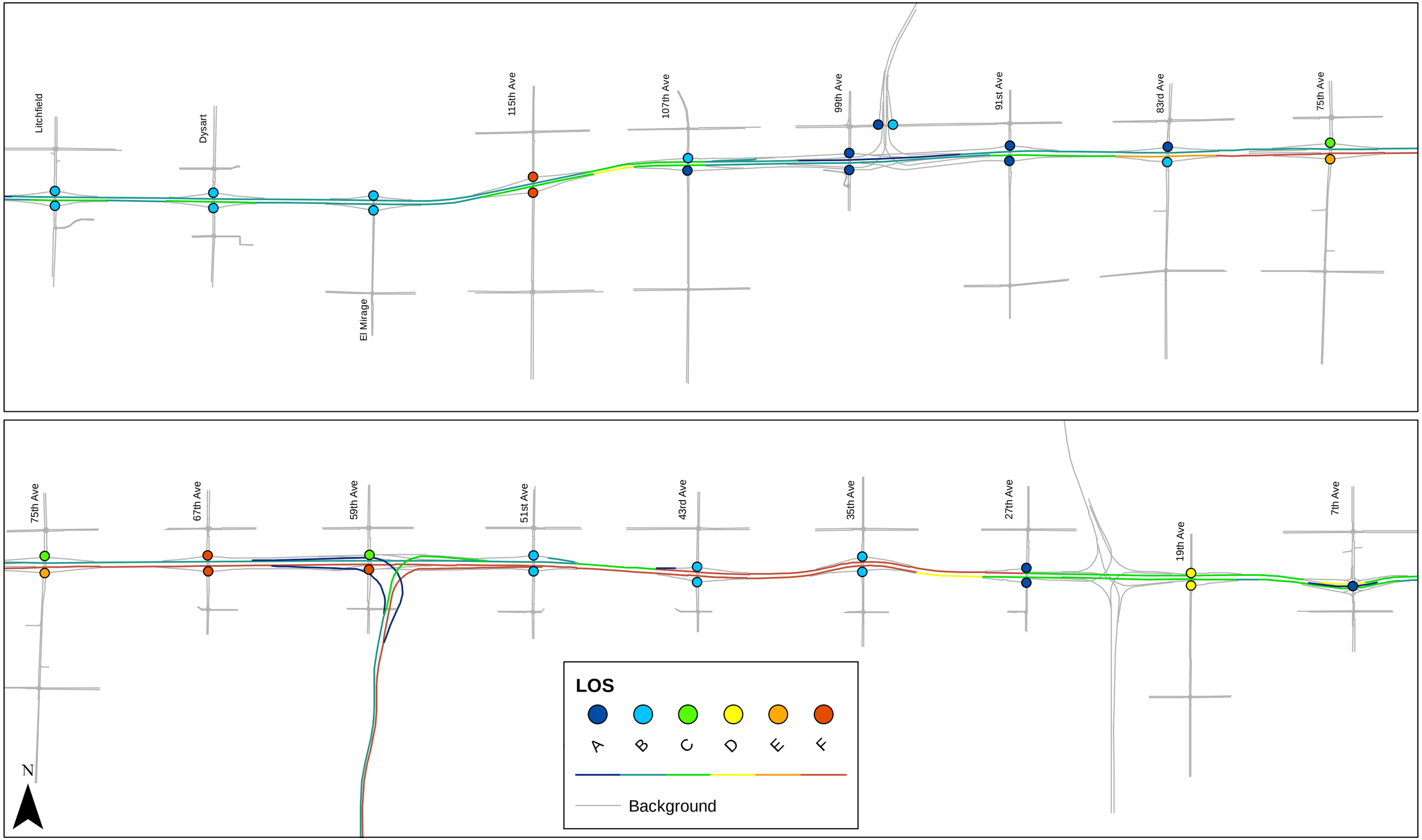
W59 2030 AM Hour 3



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W59 2030 PM Hour 1

11/22/2009

W59 2030 PM Hour 2

11/22/2009

W59 2030 PM Hour 3

11/22/2009

Appendix G
Cost Estimates

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Development of Cost Estimates

During April 2009, an initial analysis of total costs (construction, design, and right-of-way) was performed for the W55 Alternative and the W59 Alternative (East). At that time, it was assumed that the freeway would have an ultimate section of three general purpose lanes and one HOV lane in each direction, constructed concurrently, minimizing the right-of-way required. The results of the April analysis are shown in Table F-1. The costs include the system TI and South Mountain Freeway from I-10 (Papago) to the Salt River.

Table F-1: Costs ($ millions), April 2009

Cost	W55 Alternative	W59 Alternative (East)
Construction and design	470.7	426.2
Right-of-way	241.5	181.1
Total	712.2	607.3

The April analysis identified a cost savings of $104.9 million with the W59 Alternative (East). As part of the preparation of this technical memorandum, the costs for this segment of the proposed South Mountain Freeway were evaluated and further defined. The basis of revision incorporated the following items.

Construction Cost Unit Prices

The construction cost unit prices were evaluated using the latest ADOT construction bid tabulation sheets. Where appropriate, the assumed unit prices were adjusted in the construction cost estimates, including concrete, reinforced concrete box culverts, topsoil, retaining walls, and noise walls.

Footprint Requirements

The detailed design for the W59 Alternative Options revealed the need for a larger footprint than anticipated in April 2009. Some of the major items include:

- As discussed previously in this document, the design of the system interchange connection was more complicated than anticipated. As a result, the east-to-south ramp and south connector road would affect approximately 22 homes along the I-10 (Papago) right-of-way west of 59th Avenue and additional right-of-way would be required south of I-10 (Papago) and east of the system TI.
- To reduce construction costs for main line bridges over the frontage roads, the frontage roads were bowed out more on the northern and southern ends of the parallel facility to provide a less skewed crossing that could be constructed as a tunnel instead of a bridge. This increased the size of the required right-of-way footprint at the northern and southern ends of the segment.
- Between Van Buren Street and Buckeye Road, an off-site drainage channel would be needed east of the freeway. While options for the type of channel (u-shaped, trapezoidal, box culvert), exist all would require additional right-of-way and/or additional construction costs not initially accounted for in the estimate. Additional construction and maintenance costs to bury the channel in a box culvert under the freeway would likely outweigh costs of additional right-of-way for a trapezoidal channel next to the frontage road, especially because the majority of affected properties would require acquisition of the entire parcel with or without the channel.

Assumptions for W59 Alternative

As part of the April 2009 analysis, the right-of-way cost estimate for the W59 Alternative (East) was developed using an assumption of $750,000 per acre and a contingency of 50 percent. The specific function of each parcel was not analyzed and, as such, no specific accommodations for properties such as apartment complexes were assumed.

In the August 2009 analysis, the right-of-way cost estimate for this portion of the W59 Alternative Options was based on the Maricopa County Assessor full cash value estimates for 2008. Cost estimates for each property affected by the alignments were summed to arrive at a subtotal. The subtotal was multiplied by a factor[c] to account for market value adjustments, relocation cost, demolition cost, and contingency. The revised right-of-way estimate includes a contingency of 40 percent and relocation costs for the apartment complex residents (approximately 500 units).

Since the 2006 detailed right-of-way cost estimates for the W55 Alternative were compiled, ADOT has acquired several parcels between I-10 (Papago) and the Salt River. These parcels are shown on Figure F-1 for the area between I-10 (Papago) and the Union Pacific Railroad and Figure F-2 for the area between the Union Pacific Railroad and the Salt River. The right-of-way cost estimates for each of the alternatives takes this ADOT ownership into account.

Right-of-way Contingency

In the April 2009 analysis, the 3+1 typical section right-of-way cost estimate for the W55 Alternative for property between I-10 (Papago) and the Salt River was based on the 2006 acquisition, relocation, and demolition estimates completed for the entire South Mountain Freeway corridor. The estimates were reduced from the "Ultimate 4+1" estimates to account for a reduced right-of-way footprint throughout the corridor. The right-of-way estimate presented at that time included a 50 percent contingency.

For the August 2009 analysis, the right-of-way cost estimate for this portion of the W55 Alternative was reduced from the previous analysis to account for a reduction in the contingency factor from 50 percent to 40 percent.

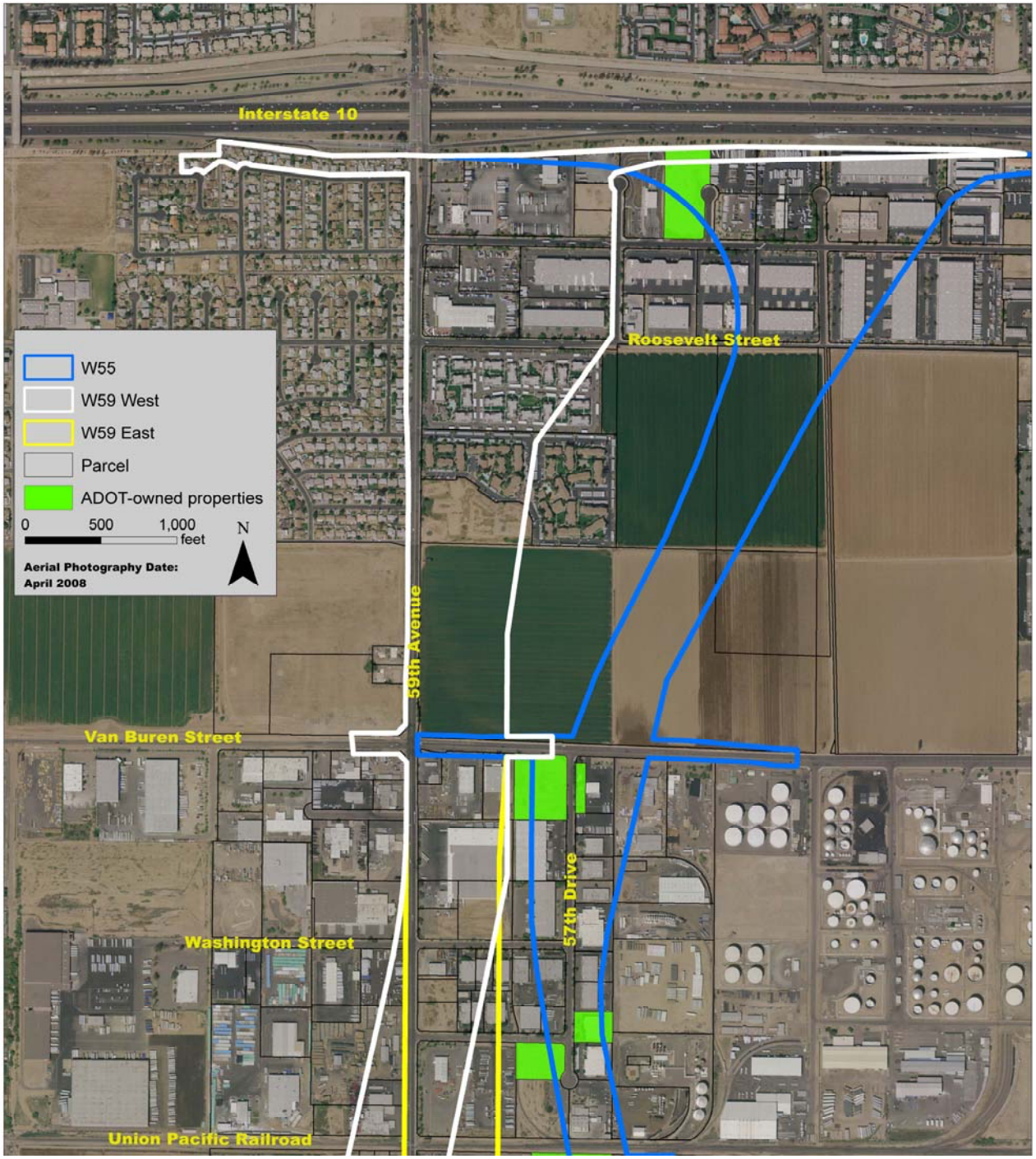
Current Cost Estimates

The summary right-of-way costs for each alternative are shown in Table F-2 through Table F-6. The detailed parcel list and associated cost for each alternative are shown in Table F-7 through Table F-11.

The detailed construction costs for each alternative are shown in Table F-12 through F-16.

[c] The factor was determined by taking the 2006 estimated cost for the W55 Alternative and comparing it with the total assessor's full cash value for the same parcels. The factor was determined to be 79 percent.

Figure F-1: ADOT-owned Parcels (I-10 (Papago) to the Union Pacific Railroad)



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Fax (602) 522-7707
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Figure F-2: ADOT-owned Parcels, Union Pacific Railroad to the Salt River

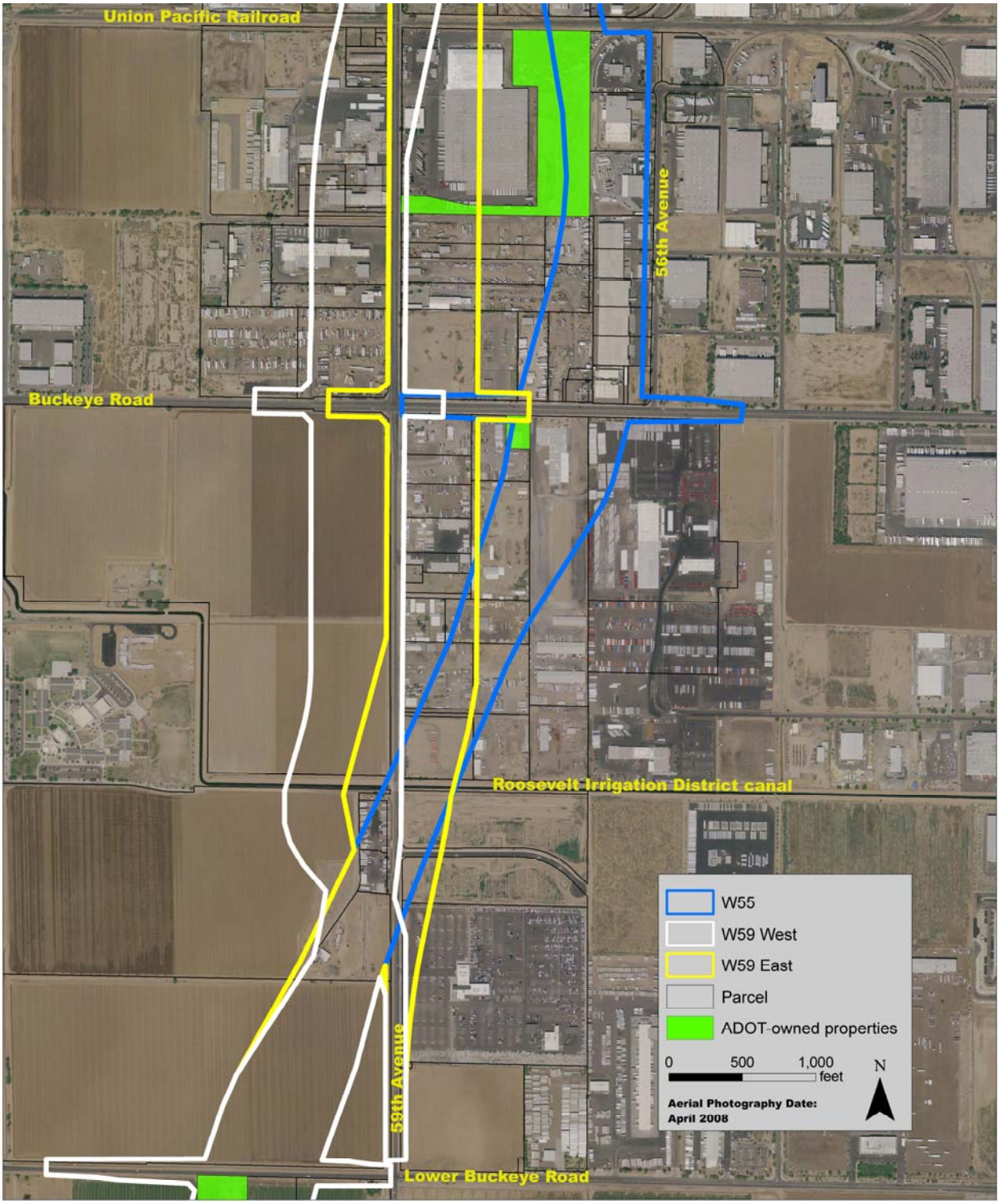

Table F-2: W55 Alternative right-of-way cost summary

Location	Maricopa County Assessor 2009 Total Full Cash Value (FCV)	Factor for Market Value, Relocation, Demolition, and Contingency		2006 Acquisition + Relocation + Demolition	40% Contingency	Total
Segment 8 - Salt River to Lower Buckeye Road	NA	NA		$28,000,000	$11,200,000	**$39,200,000**
Segment 8+9 - Lower Buckeye Road to I-10	$119,153,590	1.58		$134,788,249	$53,915,299	**$188,703,548**
TOTAL						**$227,903,548**

(See Table F-7 for list of properties)

Table F-3: W59 Alternative (West) right-of-way cost summary, 400 foot ramp terminal intersection spacing

Location	Maricopa County Assessor Total Full Cash Value (FCV)	FCV x Factor for Market Value, Relocation, Demolition, and Contingency		2006 Acquisition + Relocation + Demolition	40% Contingency	Total
Segment 8 - Salt River to Lower Buckeye Road	NA	NA		$28,000,000	$11,200,000	**$39,200,000**
Segment 8+9 - Lower Buckeye Road to I-10	$128,193,852.0	**$202,546,286**		NA	NA	**$202,546,286**
TOTAL						**$241,746,286**

(See Table F-8 for list of properties)

Table F-4: W59 Alternative (East) right-of-way cost summary, 400 foot ramp terminal intersection spacing

Location	Maricopa County Assessor Total Full Cash Value (FCV)	FCV x Factor for Market Value, Relocation, Demolition, and Contingency		2006 Acquisition + Relocation + Demolition	40% Contingency	Total
Segment 8 - Salt River to Lower Buckeye Road	NA	NA		$28,000,000	$11,200,000	**$39,200,000**
Segment 8+9 - Lower Buckeye Road to I-10	$130,390,239	**$206,016,578**		NA	NA	**$206,016,578**
TOTAL						**$245,216,578**

(See Table F-9 for list of properties)

Table F-5: W59 Alternative (West) right-of-way cost summary, 300 foot ramp terminal intersection spacing

Location	Maricopa County Assessor Total Full Cash Value (FCV)	FCV x Factor for Market Value, Relocation, Demolition, and Contingency		2006 Acquisition + Relocation + Demolition	40% Contingency	Total
Segment 8 - Salt River to Lower Buckeye Road	NA	NA		$28,000,000	$11,200,000	**$39,200,000**
Segment 8+9 - Lower Buckeye Road to I-10	$116,972,179.0	**$184,816,043**		NA	NA	**$184,816,043**
TOTAL						**$224,016,043**

(See Table F-10 for list of properties)

Table F-6: W59 Alternative (East) right-of-way cost summary, 300 foot ramp terminal intersection spacing

Location	Maricopa County Assessor Total Full Cash Value (FCV)	FCV x Factor for Market Value, Relocation, Demolition, and Contingency		2006 Acquisition + Relocation + Demolition	40% Contingency	Total
Segment 8 - Salt River to Lower Buckeye Road	NA	NA		$28,000,000	$11,200,000	**$39,200,000**
Segment 8+9 - Lower Buckeye Road to I-10	$129,434,865	**$204,507,087**		NA	NA	**$204,507,087**
TOTAL						**$243,707,087**

(See Table F-11 for list of properties)

Table F-7: W55 Alternative right-of-way cost details

	MARICOPA COUNTY ASSESSOR DATABASE										2006 RIGHT-OF-WAY ACQUISTION ESTIMATE					
MAP ID	APN	OWNER NAME	SITE ADDRESS	PROPERTY TYPE	LAND FULL CASH VALUE	IMPROVEMENT FULL CASH VALUE	TOTAL FULL CASH VALUE	LIMITED PROPERTY VALUE	BUILDING SIZE (SF)	AREA (SF)	AREA (ACRE)	TAKE TYPE	TAKE AREA (ACRE)	BUILDING SIZE (SF)	TOTAL COST	COMMENTS
101	10426004	HORNISH PROPERTIES LLC	1649 S 59TH AVE	COMMERCIAL	$643,000	$392,248.0	$1,035,248.0	$824,712.0	9,985	217,800	5.01	T	2.98	0	$811,443	Woody's Transportation (yard); Total Package Express (office, yard)
102	10426005B	JAMES L MASSEY LIVING TRUST		COMMERCIAL	$837,000	$10,975.0	$847,975.0	$504,030.0	1	199,723	4.58	T	2.96	0	$649,100	Kachina Steel Supply (yard)
103	10426005D	MORAN REAL ESTATE INVESTMENT LLC		COMMERCIAL	$573,800	$14,918.0	$588,718.0	$466,503.0	1	205,124	4.43	T	3.58	0	$737,934	DBA Construction (yard)
104	10426005C	RUMMEL ENTERPRISES LLC	1833 S 59TH AVE	COMMERCIAL	$783,500	$526,792.0	$1,310,292.0	$929,024.0	7,841	184,520	4.03	T	1.75	7840	$1,361,870	Rummel Construction (yard)
106	10426001	ROOSEVELT IRRIGATION DIST		COMMERCIAL	$520,000	$0.0	$520,000.0	$321,841.0	0	113,256	2.36	T	1.03	0	$441,110	Canal (AT&T UG FO; SRP OH Power)
107	10439009	BUCKEYE 59 LLC		VACANT	$1,380,443	$0.0	$1,380,443.0	$997,370.0	0	522,673	0.00	P	0.00	0	$0	vacant
108	10439008	BUCKEYE 59 LLC		VACANT	$1,046,405	$0.0	$1,046,405.0	$756,028.0	0	376,558	0.00	P	0.00	0	$0	vacant
114	10438002A	PROPERTY RESERVE ARIZONA LLC		AG	$112,333	$0.0	$112,333.0	$112,333.0	0	2,983,686	0.00	P	0.00	0	$0	
115	10438003A	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$7,774	$27,657.0	$35,431.0	$29,197.0	938	206,474	6.32	T	4.54	938	$751,041	
116	10438001	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$125,952	$0.0	$125,952.0	$125,952.0	0	3,345,408	77.72	P	25.08	0	$5,299,228	
120	10438003C	SHERWOOD WALTER L	2402 S 59TH AVE	COMMERCIAL	$394,000	$26,061.0	$420,061.0	$274,907.0	1	65,645	1.52	T	0.01	0	$64,609	
121	10438003D	SHERWOOD WALTER L	2402 S 59TH AVE	RESIDENTIAL	$75,500	$94,086.0	$169,586.0	$169,586.0	2,276	56,759	1.26	T	0.45	2274	$109,609	
228	10419006B	KIMMELL W L/EMILY/KAREN/FRIEH G CO-TR		COMMERCIAL	$385,000	$39,430.0	$424,430.0	$273,446.0	1,601	98,968	2.28	T	2.27	1600	$208,960	
229	10419006A	DBJ ENTERPRISES L L C	802 S 56TH AVE	COMMERCIAL	$397,000	$0.0	$397,000.0	$234,943.0	0	98,968	2.28	T	2.28	0	$293,262	
230	10419007C	H W JOHNSON INC		COMMERCIAL	$645,000	$33,281.0	$678,281.0	$444,393.0	2,561	145,273	3.29	T	3.18	2560	$554,601	
233	10426009	ARIZONA STATE DEPT OF TRANS		COMMERCIAL	$199,000	$587,329.0	$786,329.0	$602,716.0	10,000	35,981	0.83	T	0.83	10000	$0	actual cost $412,050 (1988)
234	10426008	MASSEY JAMES L/GLENDA D		COMMERCIAL	$697,500	$119,135.0	$816,635.0	$480,493.0	5,901	144,009	3.31	T	3.31	5900	$686,414	
235	10426003V	FLOYD NEILSEN & SONS		COMMERCIAL	$1,151,000	$269,772.0	$1,420,772.0	$912,670.0	16,641	332,014	7.69	T	7.69	17640	$1,683,145	Rodriguez Remodeling
236	10426003W	MORAN FAMILY INVESTMENTS LTD	1347 S 59TH AVE	COMMERCIAL	$736,000	$437,595.0	$1,173,595.0	$773,856.0	12,061	174,240	4.00	T	3.77	12060	$1,049,760	Moran Lumber
237	10426010	D F PROPERTIES INC	5707 W BUCKEYE RD	COMMERCIAL	$1,739,239	$3,634,938.0	$5,374,177.0	$4,729,276.0	179,321	791,137	18.17	T	8.16	179320	$12,259,791	
239	10426002Y	KNIGHT TRANSPORTATION INC		COMMERCIAL	$2,355,000	$4,350,489.0	$6,705,489.0	$6,414,921.0	0	1,158,061	0.00	P	3.27	0	$1,028,708	
240	10419058	L B I INVESTMENT ENTERPRISES LP	622 S 56TH AVE	COMMERCIAL	$730,500	$2,149,287.0	$2,879,787.0	$2,197,286.0	20,949	193,276	4.41	T	1.40	20948	$3,715,000	
241	10419015	SOUTH 56TH AVENUE LLC	802 S 56TH AVE	COMMERCIAL	$370,000	$0.0	$370,000.0	$256,263.0	0	96,635	2.17	T	0.58	40000	$2,194,672	
242	10419002N	KIMMELL W L		COMMERCIAL	$35,500	$0.0	$35,500.0	$22,329.0	0	9,009	0.19	t	0.19	0	$188,960	
243	10419014	SOUTH 56TH AVENUE LLC	810 S 56TH AVE	COMMERCIAL	$309,500	$3,281,158.0	$3,590,658.0	$3,322,021.0	78,941	80,864	1.86	T	0.50	40000	$2,205,772	
244	10419002M	D B J ENTERPRISES L L C		VACANT	$55,500	$0.0	$55,500.0	$34,324.0	0	9,009	0.19	T	0.19	0	$296,502	
245	10419013	DF PROPERTIES	816 S 56TH AVE	COMMERCIAL	$293,000	$0.0	$293,000.0	$193,250.0	0	80,210	1.84	T	0.49	40000	$2,700,752	
246	10419012	DF PROPERTIES	1002 S 56TH AVE	COMMERCIAL	$291,500	$3,953,827.0	$4,245,327.0	$3,421,550.0	117,994	79,917	1.82	T	0.48	40000	$2,700,752	
247	10419011	DF PROPERTIES	1010 S 56TH AVE	COMMERCIAL	$289,000	$0.0	$289,000.0	$190,844.0	0	79,224	1.81	T	0.47	40000	$2,700,752	
248	10419007D	COCHRAN FRANK		COMMERCIAL	$52,500	$0.0	$52,500.0	$36,030.0	0	9,503	0.24	T	0.24	0	$76,327	
249	10419002E	COCHRAN FRANK D		RESIDENTIAL	$22,500	$1,797.0	$24,297.0	$15,787.0	1	4,138	0.09	T	0.06	0	$76,327	
250	10419008B	COCHRAN FRANK		COMMERCIAL	$126,000	$24,118.0	$150,118.0	$113,268.0	1,368	22,795	0.52	T	0.36	2500	$208,827	
251	10419008C	H W JOHNSON INC		VACANT	$25,000	$0.0	$25,000.0	$16,741.0	0	3,080	0.07	T	0.05	0	$344,601	
252	10419002K	WALLACE THOMAS A/SHARON L		COMMERCIAL	$280,500	$458,281.0	$738,781.0	$646,408.0	15,035	55,452	1.26	T	0.48	15000	$1,320,450	
253	10419010	D F PROPERTIES INC	5602 W BUCKEYE RD	VACANT	$235,000	$0.0	$235,000.0	$147,001.0	0	39,419	0.00	P	0.00	0	$0	
254	10419002J	WALLACE THOMAS A/SHARON L		COMMERCIAL	$39,500	$0.0	$39,500.0	$28,272.0	0	7,884	0.00	P	0.00	0	$0	
359	10404007	ARIZONA DEPT OF TRANSPORTATION	210 S 57TH DR	VACANT	$347,000	$0.0	$347,000.0	$223,093.0	0	76,491	1.74	T	0.88	0	$0	actual cost $588,070 (2007)
360	10404006	YOUNG THOMAS C/BILLIE J TR	314 S 57TH DR	COMMERCIAL	$534,500	$47,047.0	$581,547.0	$394,840.0	1	133,294	3.04	T	1.30	0	$499,852	
362	10404512	ARIZONA DEPT OF TRANSPORTATION	5715 W VAN BUREN ST	COMMERCIAL	$738,000	$0.0	$738,000.0	$490,462.0	0	148,777	3.42	T	3.11	0	$0	actual cost $1,329,590 (2007)
363	10404017	HARRY ROSS INDUSTRIES	118 N 57TH DR	COMMERCIAL	$558,500	$2,846,036.0	$3,404,536.0	$3,057,036.0	80,223	140,350	3.27	T	2.88	80222	$7,671,270	
364	10404016	GOLDSTEIN RISA DEVRA/HARWICK RENEE S TR ETAL	18 N 57TH DR	COMMERCIAL	$546,000	$3,470,141.0	$4,016,141.0	$3,475,566.0	52,479	136,648	3.12	T	2.62	52478	$4,835,426	
365	10404008A	GOLDSTEIN RISA DEVRA TR/BETHANY TR/RISA DEVRA	5711 W WASHINGTON ST	COMMERCIAL	$444,641	$1,681,404.0	$2,126,045.0	$1,903,330.0	39,156	131,028	3.00	T	2.11	39155	$3,719,851	Mar-Bro Manufacturing; Shade-N-Net Awning
366	10404008C	29TH AVE ARIZONA PARTNERSHIP	5711 W WASHINGTON ST	COMMERCIAL	$132,000	$1,260,489.0	$1,392,489.0	$1,278,580.0	24,789	29,011	0.66	T	0.65	24788	$1,219,140	Bake Mark
367	10404031	D AND K INVESTMENTS	5701 W VAN BUREN ST	COMMERCIAL	$342,000	$568,939.0	$910,939.0	$668,706.0	4,901	71,656	1.69	T	1.69	4900	$475,000	
368	10404003	ARIZONA DEPT OF TRANSPORTATION	5727 W VAN BUREN ST	COMMERCIAL	$23,300	$93,200.0	$116,500.0	$102,087.0	981	21,780	0.51	T	0.50	0	$0	actual cost $240,000 (2008)
369	10404030	D AND K INVESTMENTS	133 S 57TH DR	COMMERCIAL	$166,500	$0.0	$166,500.0	$102,929.0	0	34,935	0.78	T	0.78	10000	$938,300	
370	10404029	AHERN JOHN M/DANI S TR	119 N 57TH DR	COMMERCIAL	$118,687	$507,213.0	$625,900.0	$625,900.0	11,381	37,767	0.87	T	0.86	11380	$1,110,600	
371	10404028	ZIMMERMAN PROPERTIES INC	107 N 57TH DR	COMMERCIAL	$185,000	$614,966.0	$799,966.0	$656,493.0	13,913	37,767	0.87	T	0.87	13912	$1,270,850	
372	10404027	C & W TARGET INVESTMENTS L C	27 N 57TH DR	COMMERCIAL	$185,000	$675,016.0	$860,016.0	$707,741.0	12,857	37,767	0.86	T	0.86	12856	$98,490	
373	10404046	JD PARTSMASTER LLC	15 N 57TH DR	COMMERCIAL	$297,495	$2,285,505.0	$2,583,000.0	$1,766,756.0	34,441	79,802	1.84	T	1.83	37400	$3,683,380	
374	10404024	JEWEL INVESTMENT CO	33 S 57TH DR	COMMERCIAL	$183,000	$0.0	$183,000.0	$133,076.0	0	50,355	1.15	T	1.07	18650	$1,743,830	
375	10404023	JEWEL INVESTMENT CO	109 S 57TH DR	COMMERCIAL	$183,000	$1,237,857.0	$1,420,857.0	$1,420,857.0	37,300	50,355	1.17	T	1.04	18650	$1,743,330	
376	10404022	AARDVARK PROPERTIES LLC	125 S 57TH DR	COMMERCIAL	$236,000	$953,168.0	$1,189,168.0	$976,132.0	19,450	50,355	1.16	T	1.03	19450	$0	pending ($1,340,000)
377	10404021	SHAPIRO EUGENE B/MARLENE R	211 S 57TH DR	COMMERCIAL	$280,000	$1,074,766.0	$1,354,766.0	$1,108,936.0	24,347	61,768	1.42	T	1.32	24346	$2,256,760	
378	10404005	MACHINED PRODUCTS INC	315 S 57TH DR	COMMERCIAL	$446,500	$1,518,138.0	$1,964,638.0	$1,588,016.0	20,013	107,593	2.47	T	2.46	10000	$997,800	
379	10419003B	ARIZONA STATE OF ADOT	445 S 59TH AVE	VACANT	$1,900,500	$0.0	$1,900,500.0	$1,189,769.0	0	603,220	13.80	P	10.71	0	$0	actual cost $3,738,800 (2009)
380	10404004F	JONES TROY D TR	5635 W VAN BUREN ST	COMMERCIAL	$968,000	$450,707.0	$1,418,707.0	$993,197.0	27,061	228,690	5.23	T	2.42	27060	$2,116,452	
389	10419020	GSF PHOENIX CORP	5524 W BUCHANAN ST	COMMERCIAL	$763,000	$556,684.0	$1,319,684.0	$1,015,261.0	7,123	199,288	4.61	T	0.75	7120	$702,890	
390	10419057	H J HEINZ COMPANY LP	610 S 56TH AVE	COMMERCIAL	$683,500	$3,435,971.0	$4,119,471.0	$3,694,263.0	56,180	178,596	4.09	T	1.10	60000	$5,613,055	
393	10328001G	SOUTHERN CROSS LLC	777 N 59TH AVE	AG	$108,960	$0.0	$108,960.0	$108,960.0	0	2,894,083	67.78	P	16.97	0	$1,918,684	
412	10328001H	SOUTHERN CROSS LLC	520 N 55TH AVE	AG	$16,400	$0.0	$16,400.0	$16,400.0	0	435,600	10.29	P	0.48	0	$54,270	vacant
417	10327011B	V A H LLC	1236 N 57TH AVE	COMMERCIAL	$380,000	$275,716.0	$655,716.0	$527,949.0	1	59,372	1.36	T	0.29	0	$122,953	
420	10327062A	BLUE BEACON INTERNATIONAL INC	1235 N 57TH AVE	COMMERCIAL	$856,000	$1,726,579.0	$2,582,579.0	$1,903,516.0	12,346	157,765	0.00	P	0.00	0	$1,335,772	
421	10327062B	ARIZONA DEPARTMENT OF TRANSPORTATION	5610 W LATHAM ST	VACANT	$874,500	$0.0	$874,500.0	$670,875.0	0	163,275	0.00	ADOT	0.00	0	$0	actual cost $3,026,000 (2007)
425	10327042A	SECURITY CAPITAL INDUSTRIAL TRUST	5536 W ROOSEVELT ST	COMMERCIAL	$786,286	$2,884,409.0	$3,670,695.0	$3,670,695.0	83,365	230,999	5.28	T	2.01	83634	$4,736,056	
426	10327056	EJM CORONADO I & II PROPERTIES LLC	5525 W LATHAM ST	COMMERCIAL	$1,213,000	$5,290,615.0	$6,503,615.0	$4,951,918.0	97,721	250,209	5.70	T	5.70	105300	$7,343,844	
427	10327017B	RYDER TRUCK RENTAL INC	1239 N 56TH AVE	COMMERCIAL	$407,500	$0.0	$407,500.0	$312,625.0	0	89,908	2.05	T	1.81	0	$644,726	
428	10327018	RYDER TRUCK RENTAL INC	5546 W LATHAM ST	COMMERCIAL	$414,000	$44,473.0	$458,473.0	$357,782.0	1	81,909	1.86	T	1.86	0	$644,726	
429	10327021B	RYDER TRUCK RENTAL INC	1236 N 55TH AVE	COMMERCIAL	$584,000	$0.0	$584,000.0	$448,250.0	0	128,894	2.96	T	2.64	0	$644,726	
430	10330003G	UNITED STATES OF AMERICA	1320 N 51ST AVE	COMMERCIAL	$64,500	$0.0	$64,500.0	$49,500.0	0	7,485	0.17	USA	0.15	0	$0	
431	10327019	RYDER TRUCK RENTAL INC	5526 W LATHAM ST	COMMERCIAL	$292,500	$0.0	$292,500.0	$224,625.0	0	57,950	1.32	T	1.32	0	$644,726	
432	10327020	RYDER TRUCK RENTAL INC	5502 W LATHAM ST	COMMERCIAL	$323,500	$1,159,009.0	$1,482,509.0	$1,154,539.0	14,161	64,054	1.47	T	1.46	14160	$644,726	
433	10327023	ACCESS ENTERPRISES LLC	5456 W LATHAM ST	COMMERCIAL	$285,000	$0.0	$285,000.0	$266,200.0	0	64,628	1.49	T	1.48	0	$984,450	
434	10327024	ACCESS ENTERPRISES LLC	5436 W LATHAM ST	COMMERCIAL	$255,000	$884,889.0	$1,139,889.0	$1,114,388.0	28,001	57,950	1.33	T	1.32	28000	$1,132,450	
435	10327061	AZE/M LAND HOLDINGS LLC	1202 N 54TH AVE	COMMERCIAL	$1,652,000	$5,792,734.0	$7,444,734.0	$5,469,497.0	125,140	349,565	8.03	T	7.51	136200	$7,962,030	
436	10327057	CORONADO COMMERCEPLEX II LLC	5446 W ROOSEVELT ST	COMMERCIAL	$1,752,127	$10,409,873.0	$12,162,000.0	$12,162,000.0	270,255	690,992	15.84	P	6.85	166400	$10,030,900	
437	10328002A	SOUTHERN CROSS LLC	520 N 55TH AVE	AG	$32,800	$0.0	$32,800.0	$32,800.0	0	871,200	20.54	P	4.45	0	$503,132	
438	10328002B	SOUTHERN CROSS LLC	5501 W ROOSEVELT ST	AG	$32,800	$0.0	$32,800.0	$32,800.0	0	871,200	20.59	P	15.34	0	$1,734,391	
440	10327027C	WEST VALLEY STORAGE SOLUTIONS L L C	1239 N 54TH AVE	COMMERCIAL	$603,000	$2,102,288.0	$2,705,288.0	$2,444,200.0	89,871	104,283	2.42	T	1.73	89870	$3,212,232	
442	10327028B	HBA HOLDINGS LLC	1242 N 53RD AVE	COMMERCIAL	$397,000	$1,874,383.0	$2,271,383.0	$2,169,925.0	27,906	62,814	1.47	T	0.26	27905	$3,050,000	
462	10327029B	PATEL SUBHASH R/HASUMATI S	1241 N 53RD AVE	COMMERCIAL	$343,000	$3,092,259.0	$3,435,259.0	$2,966,025.0	43,771	58,283	1.33	P	0.01	0	$26,900	

Table F-8: W59 Alternative (West) right-of-way cost details, 400 foot ramp terminal intersection spacing

	MARICOPA COUNTY ASSESSOR DATABASE										
MAP ID	APN	OWNER NAME	SITE ADDRESS	PROPERTY TYPE	LAND FULL CASH VALUE	IMPROVEMENT FULL CASH VALUE	TOTAL FULL CASH VALUE	LIMITED PROPERTY VALUE	BUILDING SIZE (SF)	AREA (SF)	COMMENTS
114	10438002A	PROPERTY RESERVE ARIZONA LLC		AG	$112,333	$0.0	$112,333.0	$112,333.0	0	2,983,686	
115	10438003A	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$7,774	$27,657.0	$35,431.0	$29,197.0	938	206,474	
116	10438001	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$125,952	$0.0	$125,952.0	$125,952.0	0	3,345,408	
120	10438003C	SHERWOOD WALTER L	2402 S 59TH AVE	COMMERCIAL	$394,000	$26,061.0	$420,061.0	$274,907.0	1	65,645	
121	10438003D	SHERWOOD WALTER L	2402 S 59TH AVE	RESIDENTIAL	$75,500	$94,086.0	$169,586.0	$169,586.0	2,276	56,759	
201	10418004M	COPPER STATE RUBBER OF ARIZONA INC	750 S 59TH AVE	COMMERCIAL	$198,500	$0.0	$198,500.0	$125,359.0	0	47,045	Copper State Rubber
202	10418008	RUBBER ENGINEERING OF ARIZ	740 S 59TH AVE	COMMERCIAL	$186,000	$0.0	$186,000.0	$117,507.0	0	44,083	Copper State Rubber
203	10418004L	COPPER STATE RUBBER OF ARIZONA INC	750 S 59TH AVE	COMMERCIAL	$247,000	$0.0	$247,000.0	$156,203.0	0	58,545	Copper State Rubber
204	10418009	COPPER STATE RUBBER OF ARIZONA	750 S 59TH AVE	COMMERCIAL	$188,500	$1,062,871.0	$1,251,371.0	$1,201,266.0	63,457	44,693	Copper State Rubber
205	10418010	RUBBER ENGINEERING OF ARIZ		COMMERCIAL	$40,000	$25,661.0	$65,661.0	$50,082.0	1	9,540	Copper State Rubber
206	10418003N	DOLPHIN INC	740 S 59TH AVE	COMMERCIAL	$55,500	$0.0	$55,500.0	$31,328.0	0	17,860	driveway
209	10418003C	JGZ PROPERTIES I LLC	802 S 59TH AVE	COMMERCIAL	$881,098	$1,252,902.0	$2,134,000.0	$1,688,225.0	72,746	323,869	Sun Valley Supply (drywall)
210	10418003G	COACH AND TRANSIT INC	842 S 59TH AVE	COMMERCIAL	$580,500	$355,789.0	$936,289.0	$737,600.0	8,383	127,979	unknown (industrial
212	10418003F	MIVAL LLC	5902 W BUCKEYE RD	COMMERCIAL	$1,832,500	$20,081.0	$1,852,581.0	$1,189,444.0	1	378,362	pallets
213	10427001B	PROPERTY RESERVE ARIZONA LLC	6103 W BUCKEYE RD	AG	$186,445	$106,550.0	$292,995.0	$292,995.0	5,632	4,952,174	vacant
311	10418006A	DOLPHIN INC	6002 W SHERMAN ST	COMMERCIAL	$2,848,000	$3,083,000.0	$5,931,000.0	$4,728,772.0	118,620	1,275,067	Dolphin Presicion Investment Casings; GCC Truck Driving School
324	10405009	CONAIR CORPORATION	2 N 59TH AVE	COMMERCIAL	$1,198,000	$4,092,673.0	$5,290,673.0	$4,262,861.0	124,865	266,761	Conair
326	10405005A	DOLPHIN INC	5939 W WASHINGTON ST	VACANT	$500,000	$0.0	$500,000.0	$326,557.0	0	111,078	trailer parking and storage
328	10405010B	DOLPHIN INC	250 S 59TH AVE	COMMERCIAL	$1,292,000	$286,141.0	$1,578,141.0	$1,063,739.0	9,776	326,395	IFCO Pallets
329	10405011	DOLPHIN INC	300 S 59TH AVE	COMMERCIAL	$206,500	$455,459.0	$661,959.0	$424,115.0	13,401	47,045	Smiley Crane Service; Spyder Crane Sales
330	10405001J	DOLPHIN INC	350 S 59TH AVE	COMMERCIAL	$526,000	$537,709.0	$1,063,709.0	$685,313.0	24,316	119,790	Smiley Crane Service; Spyder Crane Sales
331	10418004N	DOLPHIN INC		VACANT	$9,500	$0.0	$9,500.0	$5,490.0	0	3,102	vacant
332	10418004S	DOLPHIN INC		VACANT	$42,000	$0.0	$42,000.0	$31,125.0	0	13,504	vacant
333	10418004G	PHOENIX CITY OF	402 S 59TH AVE	COMMERCIAL	$67,000	$0.0	$67,000.0	$49,338.0	0	9,757	City of Phoenix Water Reservoir
334	10418004B	RANDAL ALLEN TR/DEMORE TIMOTHY A/DEBORA L	424 S 59TH AVE	COMMERCIAL	$208,500	$166,238.0	$374,738.0	$290,702.0	12,001	37,462	Muscle Match (car scraps)
335	10418004Q	RANDAL ALLEN TR/DEMORE TIMOTHY A/DEBORA L		VACANT	$88,000	$0.0	$88,000.0	$56,762.0	0	13,504	vacant
336	10418004V	DENIOS ROSEVILLE FARMERS MARKET & AUCTION INC	430 S 59TH AVE	COMMERCIAL	$173,000	$169,961.0	$342,961.0	$262,856.0	3,947	30,056	L & A Truck Repair
337	10418004H	DOLPHIN INC	410 S 59TH AVE	VACANT	$42,000	$0.0	$42,000.0	$25,926.0	0	13,504	vacant
338	10404002B	ROOSEVELT IRRIG DIST		COMMERCIAL	$11,000	$0.0	$11,000.0	$7,327.0	0	787	well site (se corner of Van Buren St and 59th Ave)
339	10404020	5879 VAN BUREN LLC	5879 W VAN BUREN ST	COMMERCIAL	$264,500	$228,789.0	$493,289.0	$440,855.0	3,008	33,454	Circle K
340	10404513	TORO GRANDE LLC	5825 W VAN BUREN ST	COMMERCIAL	$710,500	$1,738,909.0	$2,449,409.0	$1,793,892.0	20,749	157,861	Ross Equipment Rental
341	10404018	SJW LAND COMPANY	117 N 57TH DR	COMMERCIAL	$949,500	$7,800,915.0	$8,750,415.0	$8,025,497.0	180,172	250,165	Southwest Cold Storage
342	10404014	SJW LAND COMPANY	23 N 59TH AVE	COMMERCIAL	$181,500	$0.0	$181,500.0	$120,190.0	0	47,829	Southwest Cold Storage
343	10404015	SJW LAND COMPANY	5802 W WASHINGTON ST	COMMERCIAL	$531,500	$0.0	$531,500.0	$352,236.0	0	140,089	Southwest Cold Storage
344	10404013	SJW LAND COMPANY	1 N 59TH AVE	VACANT	$293,000	$0.0	$293,000.0	$183,852.0	0	55,539	Southwest Cold Storage
345	10404040	JEWEL INVESTMENT CO	5743 W WASHINGTON ST	COMMERCIAL	$85,798	$431,086.0	$516,884.0	$516,884.0	11,801	32,191	unknown (vactant building) West Gate Industrial Park
346	10404012A	ROVALA KARI/MARJA		VACANT	$49,000	$0.0	$49,000.0	$31,302.0	0	6,625	vacant (West Gate Industrial Park)
347	10404039	JEWEL INVESTMENT CO	5733 W WASHINGTON ST	COMMERCIAL	$83,575	$412,207.0	$495,782.0	$495,782.0	12,221	31,363	unknown (vactant building) West Gate Industrial Park
349	10404011	RMV PROPERTIES LLP	109 S 59TH AVE	VACANT	$222,500	$0.0	$222,500.0	$137,447.0	0	40,162	vacant (WGIP)
350	10404042	JEWEL INVESTMENT CO	5746 W JEFFERSON ST	COMMERCIAL	$60,717	$296,498.0	$357,215.0	$357,215.0	8,037	23,566	Veolia Environmental Services (WGIP)
351	10404041	JEWEL INVESTMENT CO	5752 W JEFFERSON ST	COMMERCIAL	$63,319	$331,164.0	$394,483.0	$394,483.0	8,337	24,611	Veolia Environmental Services (WGIP)
352	10404010	RMV PROPERTIES LLP	125 S 59TH AVE	VACANT	$279,500	$0.0	$279,500.0	$172,118.0	0	52,708	vacant (WGIP)
356	10404045	FIVE NINE NKW PROPERTIES LLC	249 S 59TH AVE	COMMERCIAL	$1,712,000	$1,236,817.0	$2,948,817.0	$2,062,767.0	10,549	411,468	Apache Equipment Rental
357	10419003A	BERENDO PROPERTY/HARRISON PROPERTIES LLC	435 S 59TH AVE	COMMERCIAL	$3,246,000	$9,824,275.0	$13,070,275.0	$11,446,600.0	576,302	1,030,280	multiple truck distribution companies
358	10404012B	JV RADFAM LLC	3 S 59TH AVE	COMMERCIAL	$211,080	$558,920.0	$770,000.0	$698,500.0	9,032	46,217	
393	10328001G	SOUTHERN CROSS LLC	777 N 59TH AVE	AG	$108,960	$0.0	$108,960.0	$108,960.0	0	2,894,083	
401	10327007E	WAFFLE HOUSE INC	1237 N 59TH AVE	COMMERCIAL	$381,000	$230,615.0	$611,615.0	$438,049.0	1,555	36,808	Waffle House
402	10327058	LIBERTY FUEL LLC	1201 N 59TH AVE	COMMERCIAL	$2,538,112	$3,325,131.0	$5,863,243.0	$4,266,725.0	33,976	417,784	Liberty Fuel Truck Stop (scale, truck wash)
403	10327054A	ARIZONA STATE OF DEPT OF TRANSPORTATION	1041 N 59TH AVE	COMMERCIAL	$19,500	$0.0	$19,500.0	$12,721.0	0	2,091	ADOT
404	10327054B	SCHLOSSER RONALD A/PAMELA R	1041 N 59TH AVE	COMMERCIAL	$290,500	$330,207.0	$620,707.0	$522,845.0	2,481	33,715	closed fast food
405	10327049	KENWORTH INLAND INC	5801 W LATHAM ST	COMMERCIAL	$708,000	$0.0	$708,000.0	$497,513.0	0	120,000	Kenworth Dealership
406	10327055	INLAND KENWORTH INC	1021 N 59TH AVE	COMMERCIAL	$1,328,000	$3,064,927.0	$4,392,927.0	$3,264,398.0	45,572	225,031	Kenworth Dealership
407	10327060	EASTGROUP PROPERTIES L P	5701 W LATHAM ST	COMMERCIAL	$1,009,000	$3,280,523.0	$4,289,523.0	$3,278,516.0	81,233	209,528	multiple offices (Exide Tech.; Alumco)
408	10327059	EASTGROUP PROPERTIES L P	5750 W ROOSEVELT ST	COMMERCIAL	$834,000	$2,327,972.0	$3,161,972.0	$2,672,648.0	58,521	160,217	multiple offices
409	10328004	LIBERTY COVE LLLP	801 N 59TH AVE	COMMERCIAL	$4,334,600	$17,338,600.0	$21,673,200.0	$20,807,765.0	287,757	654,649	Liberty Cove Apartments (2 stories, approximately 264 units)
410	10328003K	SOUTHWEST VILLAGE APARTMENTS L L C	777 N 59TH AVE	COMMERCIAL	$3,669,900	$14,679,700.0	$18,349,600.0	$14,784,482.0	280,722	712,511	Southwest Village Apartments (2 stories, approximately 300 units)
411	10328003J	SOUTHWEST VILLAGE APARTMENTS L L C		VACANT	$832,300	$0.0	$832,300.0	$599,789.0	0	252,212	vacant
417	10327011B	V A H LLC	1236 N 57TH AVE	COMMERCIAL	$380,000	$275,716.0	$655,716.0	$527,949.0	1	59,372	
418	10327010	LIBERTY FUEL LLC	1226 N 57TH AVE	VACANT	$285,000	$0.0	$285,000.0	$195,710.0	0	46,549	
419	10327009	LIBERTY FUEL LLC	1202 N 57TH AVE	VACANT	$289,500	$0.0	$289,500.0	$198,716.0	0	47,428	
420	10327062A	BLUE BEACON INTERNATIONAL INC	1235 N 57TH AVE	COMMERCIAL	$856,000	$1,726,579.0	$2,582,579.0	$1,903,516.0	12,346	157,765	
		22 homes along I-10 @ $130,000 each					$2,860,000.0				
		Additional contingency for apartment relocations					$5,000,000.0				

Table F-9: W59 Alternative (East) right-of-way cost details, 400 foot ramp terminal intersection spacing

	MARICOPA COUNTY ASSESSOR DATABASE										
MAP ID	APN	OWNER NAME	SITE ADDRESS	PROPERTY TYPE	LAND FULL CASH VALUE	IMPROVEMENT FULL CASH VALUE	TOTAL FULL CASH VALUE	LIMITED PROPERTY VALUE	BUILDING SIZE (SF)	AREA (SF)	COMMENTS
101	10426004	HORNISH PROPERTIES LLC	1649 S 59TH AVE	COMMERCIAL	$643,000	$392,248.0	$1,035,248.0	$824,712.0	9,985	217,800	Woody's Transportation (yard); Total Package Express (office, yard)
103	10426005D	MORAN REAL ESTATE INVESTMENT LLC		COMMERCIAL	$573,800	$14,918.0	$588,718.0	$466,503.0	1	205,124	DBA Construction (yard)
106	10426001	ROOSEVELT IRRIGATION DIST		COMMERCIAL	$520,000	$0.0	$520,000.0	$321,841.0	0	113,256	Canal (AT&T UG FO; SRP OH Power)
107	10439009	BUCKEYE 59 LLC		VACANT	$1,380,443	$0.0	$1,380,443.0	$997,370.0	0	522,673	vacant
108	10439008	BUCKEYE 59 LLC		VACANT	$1,046,405	$0.0	$1,046,405.0	$756,028.0	0	376,558	vacant
109	10439007	METRO AUTO AUCTION INC	2475 S 59TH AVE	COMMERCIAL	$3,122,605	$4,369,113.0	$7,491,718.0	$6,592,711.0	41,102	1,373,864	Arizona Auto Auction
114	10438002A	PROPERTY RESERVE ARIZONA LLC		AG	$112,333	$0.0	$112,333.0	$112,333.0	0	2,983,686	
115	10438003A	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$7,774	$27,657.0	$35,431.0	$29,197.0	938	206,474	
116	10438001	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$125,952	$0.0	$125,952.0	$125,952.0	0	3,345,408	
120	10438003C	SHERWOOD WALTER L	2402 S 59TH AVE	COMMERCIAL	$394,000	$26,061.0	$420,061.0	$274,907.0	1	65,645	
121	10438003D	SHERWOOD WALTER L	2402 S 59TH AVE	RESIDENTIAL	$75,500	$94,086.0	$169,586.0	$169,586.0	2,276	56,759	
213	10427001B	PROPERTY RESERVE ARIZONA LLC	6103 W BUCKEYE RD	AG	$186,445	$106,550.0	$292,995.0	$292,995.0	5,632	4,952,174	vacant
214	10419009B	RAM BULL LLC	811 S 59TH AVE	COMMERCIAL	$779,500	$46,099.0	$825,599.0	$547,336.0	3,719	196,020	Ace Pallets
215	10419009C	RAM BULL LLC	811 S 59TH AVE	COMMERCIAL	$386,000	$152,174.0	$538,174.0	$406,568.0	6,961	97,139	Ace Pallets
216	10419009E	KIMMELL W L/EMILY/KAREN/FRIEH G CO-TR	827 S 59TH AVE	COMMERCIAL	$704,500	$195,187.0	$899,687.0	$589,855.0	5,000	176,374	DRPT
217	10419009D	DBJ ENTERPRISES L L C	845 S 59TH AVE	COMMERCIAL	$707,500	$898,988.0	$1,606,488.0	$1,204,826.0	13,401	176,374	HWJ
218	10419004D	HEADLEY GEORGE VERNON/DENNIS KEVIN	5810 W BUCKEYE RD	VACANT	$1,551,500	$0.0	$1,551,500.0	$933,142.0	0	310,321	vacant
219	10426006A	MASSEY JAMES L/GLENDA D		COMMERCIAL	$635,000	$138,095.0	$773,095.0	$464,646.0	4,193	131,072	R Tek Diesel Repair
220	10426007C	MASSEY JAMES L/GLENDA D		COMMERCIAL	$451,000	$14,090.0	$465,090.0	$261,677.0	1	93,088	Massey Diesel Repair; Phoenix Fuel
221	10426003Y	MASSEY JAMES L/GLENDA D		COMMERCIAL	$429,000	$323,144.0	$752,144.0	$530,531.0	3,817	108,900	Massey Diesel Repair; Phoenix Fuel
222	10426003Z	JAMES L MASSEY LIVING TRUST	1417 S 59TH AVE	COMMERCIAL	$429,000	$148,160.0	$577,160.0	$386,559.0	6,716	108,900	Massey Diesel Repair; Phoenix Fuel
223	10426003U	JAMES L MASSEY LIVING TRUST	1417 S 59TH AVE	COMMERCIAL	$230,000	$366,255.0	$596,255.0	$485,960.0	18,283	58,327	Massey Diesel Repair; Phoenix Fuel
224	10426003G	MASSEY JAMES L/GLENDA D		COMMERCIAL	$68,500	$0.0	$68,500.0	$41,621.0	0	17,380	Massey Diesel Repair; Phoenix Fuel
225	10426003T	GENTRY IRA & SHIRLEY J		COMMERCIAL	$286,000	$9,747.0	$295,747.0	$210,091.0	1	55,626	vacant
226	10426003P	MORAN BARNEY		VACANT	$66,500	$0.0	$66,500.0	$38,405.0	0	15,812	Moran Lumber (driveway)
227	10426003Q	MCHENRY DAVID JOSEPH TR	1617 S 59TH AVE	COMMERCIAL	$417,000	$325,302.0	$742,302.0	$545,658.0	25,351	87,120	Bordrers Turf & Tractor (yard, office); Best-N-Arizona Trailer (yard)
236	10426003W	MORAN FAMILY INVESTMENTS LTD	1347 S 59TH AVE	COMMERCIAL	$736,000	$437,595.0	$1,173,595.0	$773,856.0	12,061	174,240	Moran Lumber
338	10404002B	ROOSEVELT IRRIG DIST		COMMERCIAL	$11,000	$0.0	$11,000.0	$7,327.0	0	787	well site (se corner of Van Buren St and 59th Ave)
339	10404020	5879 VAN BUREN LLC	5879 W VAN BUREN ST	COMMERCIAL	$264,500	$228,789.0	$493,289.0	$440,855.0	3,008	33,454	Circle K
340	10404513	TORO GRANDE LLC	5825 W VAN BUREN ST	COMMERCIAL	$710,500	$1,738,909.0	$2,449,409.0	$1,793,892.0	20,749	157,861	Ross Equipment Rental
341	10404018	SJW LAND COMPANY	117 N 57TH DR	COMMERCIAL	$949,500	$7,800,915.0	$8,750,415.0	$8,025,497.0	180,172	250,165	Southwest Cold Storage
342	10404014	SJW LAND COMPANY	23 N 59TH AVE	COMMERCIAL	$181,500	$0.0	$181,500.0	$120,190.0	0	47,829	Southwest Cold Storage
343	10404015	SJW LAND COMPANY	5802 W WASHINGTON ST	COMMERCIAL	$531,500	$0.0	$531,500.0	$352,236.0	0	140,089	Southwest Cold Storage
344	10404013	SJW LAND COMPANY	1 N 59TH AVE	VACANT	$293,000	$0.0	$293,000.0	$183,852.0	0	55,539	Southwest Cold Storage
345	10404040	JEWEL INVESTMENT CO	5743 W WASHINGTON ST	COMMERCIAL	$85,798	$431,086.0	$516,884.0	$516,884.0	11,801	32,191	unknown (vactant building) West Gate Industrial Park
346	10404012A	ROVALA KARI/MARJA		VACANT	$49,000	$0.0	$49,000.0	$31,302.0	0	6,625	vacant (West Gate Industrial Park)
347	10404039	JEWEL INVESTMENT CO	5733 W WASHINGTON ST	COMMERCIAL	$83,575	$412,207.0	$495,782.0	$495,782.0	12,221	31,363	unknown (vactant building) West Gate Industrial Park
348	10404038	JEWEL INVESTMENT CO	5723 W WASHINGTON ST	COMMERCIAL	$94,689	$463,045.0	$557,734.0	$557,734.0	15,241	35,501	Milan Glass Co (WGIP)
349	10404011	RMV PROPERTIES LLP	109 S 59TH AVE	VACANT	$222,500	$0.0	$222,500.0	$137,447.0	0	40,162	vacant (WGIP)
350	10404042	JEWEL INVESTMENT CO	5746 W JEFFERSON ST	COMMERCIAL	$60,717	$296,498.0	$357,215.0	$357,215.0	8,037	23,566	Veolia Environmental Services (WGIP)
351	10404041	JEWEL INVESTMENT CO	5752 W JEFFERSON ST	COMMERCIAL	$63,319	$331,164.0	$394,483.0	$394,483.0	8,337	24,611	Veolia Environmental Services (WGIP)
352	10404010	RMV PROPERTIES LLP	125 S 59TH AVE	VACANT	$279,500	$0.0	$279,500.0	$172,118.0	0	52,708	vacant (WGIP)
353	10404043	JEWEL INVESTMENT CO	5736 W JEFFERSON ST	COMMERCIAL	$60,717	$340,897.0	$401,614.0	$401,614.0	8,337	23,653	Veolia Environmental Services (WGIP)
354	10404044	JEWEL INVESTMENT CO	5726 W JEFFERSON ST	COMMERCIAL	$84,137	$313,503.0	$397,640.0	$397,640.0	8,037	32,626	Veolia Environmental Services (WGIP)
356	10404045	FIVE NINE NKW PROPERTIES LLC	249 S 59TH AVE	COMMERCIAL	$1,712,000	$1,236,817.0	$2,948,817.0	$2,062,767.0	10,549	411,468	Apache Equipment Rental
357	10419003A	BERENDO PROPERTY/HARRISON PROPERTIES LLC	435 S 59TH AVE	COMMERCIAL	$3,246,000	$9,824,275.0	$13,070,275.0	$11,446,600.0	576,302	1,030,280	multiple truck distribution companies
361	10404035	RMV PROPERTIES LLP	5801 W VAN BUREN ST	COMMERCIAL	$446,000	$1,087,614.0	$1,533,614.0	$1,173,416.0	20,097	90,692	empty building
393	10328001G	SOUTHERN CROSS LLC	777 N 59TH AVE	AG	$108,960	$0.0	$108,960.0	$108,960.0	0	2,894,083	
401	10327007E	WAFFLE HOUSE INC	1237 N 59TH AVE	COMMERCIAL	$381,000	$230,615.0	$611,615.0	$438,049.0	1,555	36,808	Waffle House
402	10327058	LIBERTY FUEL LLC	1201 N 59TH AVE	COMMERCIAL	$2,538,112	$3,325,131.0	$5,863,243.0	$4,266,725.0	33,976	417,784	Liberty Fuel Truck Stop (scale, truck wash)
403	10327054A	ARIZONA STATE OF DEPT OF TRANSPORTATION	1041 N 59TH AVE	COMMERCIAL	$19,500	$0.0	$19,500.0	$12,721.0	0	2,091	ADOT
404	10327054B	SCHLOSSER RONALD A/PAMELA R	1041 N 59TH AVE	COMMERCIAL	$290,500	$330,207.0	$620,707.0	$522,845.0	2,481	33,715	closed fast food
405	10327049	KENWORTH INLAND INC	5801 W LATHAM ST	COMMERCIAL	$708,000	$0.0	$708,000.0	$497,513.0	0	120,000	Kenworth Dealership
406	10327055	INLAND KENWORTH INC	1021 N 59TH AVE	COMMERCIAL	$1,328,000	$3,064,927.0	$4,392,927.0	$3,264,398.0	45,572	225,031	Kenworth Dealership
407	10327060	EASTGROUP PROPERTIES L P	5701 W LATHAM ST	COMMERCIAL	$1,009,000	$3,280,523.0	$4,289,523.0	$3,278,516.0	81,233	209,528	multiple offices (Exide Tech.; Alumco)
408	10327059	EASTGROUP PROPERTIES L P	5750 W ROOSEVELT ST	COMMERCIAL	$834,000	$2,327,972.0	$3,161,972.0	$2,672,648.0	58,521	160,217	multiple offices
409	10328004	LIBERTY COVE LLLP	801 N 59TH AVE	COMMERCIAL	$4,334,600	$17,338,600.0	$21,673,200.0	$20,807,765.0	287,757	654,649	Liberty Cove Apartments (2 stories, approximately 264 units)
410	10328003K	SOUTHWEST VILLAGE APARTMENTS L L C	777 N 59TH AVE	COMMERCIAL	$3,669,900	$14,679,700.0	$18,349,600.0	$14,784,482.0	280,722	712,511	Southwest Village Apartments (2 stories, approximately 300 units)
411	10328003J	SOUTHWEST VILLAGE APARTMENTS L L C		VACANT	$832,300	$0.0	$832,300.0	$599,789.0	0	252,212	vacant
417	10327011B	V A H LLC	1236 N 57TH AVE	COMMERCIAL	$380,000	$275,716.0	$655,716.0	$527,949.0	1	59,372	
418	10327010	LIBERTY FUEL LLC	1226 N 57TH AVE	VACANT	$285,000	$0.0	$285,000.0	$195,710.0	0	46,549	
419	10327009	LIBERTY FUEL LLC	1202 N 57TH AVE	VACANT	$289,500	$0.0	$289,500.0	$198,716.0	0	47,428	
420	10327062A	BLUE BEACON INTERNATIONAL INC	1235 N 57TH AVE	COMMERCIAL	$856,000	$1,726,579.0	$2,582,579.0	$1,903,516.0	12,346	157,765	
		22 homes along I-10 @ $130,000 each					$2,860,000.0				
		Additional contingency for apartment relocations					$5,000,000.0				

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Table F-10: W59 Alternative (West) right-of-way cost details, 300 foot ramp terminal intersection spacing

	MARICOPA COUNTY ASSESSOR DATABASE										
MAP ID	APN	OWNER NAME	SITE ADDRESS	PROPERTY TYPE	LAND FULL CASH VALUE	IMPROVEMENT FULL CASH VALUE	TOTAL FULL CASH VALUE	LIMITED PROPERTY VALUE	BUILDING SIZE (SF)	AREA (SF)	COMMENTS
114	10438002A	PROPERTY RESERVE ARIZONA LLC		AG	$112,333	$0.0	$112,333.0	$112,333.0	0	2,983,686	
115	10438003A	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$7,774	$27,657.0	$35,431.0	$29,197.0	938	206,474	
116	10438001	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$125,952	$0.0	$125,952.0	$125,952.0	0	3,345,408	
120	10438003C	SHERWOOD WALTER L	2402 S 59TH AVE	COMMERCIAL	$394,000	$26,061.0	$420,061.0	$274,907.0	1	65,645	
121	10438003D	SHERWOOD WALTER L	2402 S 59TH AVE	RESIDENTIAL	$75,500	$94,086.0	$169,586.0	$169,586.0	2,276	56,759	
201	10418004M	COPPER STATE RUBBER OF ARIZONA INC	750 S 59TH AVE	COMMERCIAL	$198,500	$0.0	$198,500.0	$125,359.0	0	47,045	Copper State Rubber
202	10418008	RUBBER ENGINEERING OF ARIZ	740 S 59TH AVE	COMMERCIAL	$186,000	$0.0	$186,000.0	$117,507.0	0	44,083	Copper State Rubber
203	10418004L	COPPER STATE RUBBER OF ARIZONA INC	750 S 59TH AVE	COMMERCIAL	$247,000	$0.0	$247,000.0	$156,203.0	0	58,545	Copper State Rubber
204	10418009	COPPER STATE RUBBER OF ARIZONA	750 S 59TH AVE	COMMERCIAL	$188,500	$1,062,871.0	$1,251,371.0	$1,201,266.0	63,457	44,693	Copper State Rubber
205	10418010	RUBBER ENGINEERING OF ARIZ		COMMERCIAL	$40,000	$25,661.0	$65,661.0	$50,082.0	1	9,540	Copper State Rubber
206	10418003N	DOLPHIN INC	740 S 59TH AVE	COMMERCIAL	$55,500	$0.0	$55,500.0	$31,328.0	0	17,860	driveway
209	10418003C	JGZ PROPERTIES I LLC	802 S 59TH AVE	COMMERCIAL	$881,098	$1,252,902.0	$2,134,000.0	$1,688,225.0	72,746	323,869	Sun Valley Supply (drywall)
210	10418003G	COACH AND TRANSIT INC	842 S 59TH AVE	COMMERCIAL	$580,500	$355,789.0	$936,289.0	$737,600.0	8,383	127,979	unknown (industrial
212	10418003F	MIVAL LLC	5902 W BUCKEYE RD	COMMERCIAL	$1,832,500	$20,081.0	$1,852,581.0	$1,189,444.0	1	378,362	pallets
213	10427001B	PROPERTY RESERVE ARIZONA LLC	6103 W BUCKEYE RD	AG	$186,445	$106,550.0	$292,995.0	$292,995.0	5,632	4,952,174	vacant
326	10405005A	DOLPHIN INC	5939 W WASHINGTON ST	VACANT	$500,000	$0.0	$500,000.0	$326,557.0	0	111,078	trailer parking and storage
328	10405010B	DOLPHIN INC	250 S 59TH AVE	COMMERCIAL	$1,292,000	$286,141.0	$1,578,141.0	$1,063,739.0	9,776	326,395	IFCO Pallets
329	10405011	DOLPHIN INC	300 S 59TH AVE	COMMERCIAL	$206,500	$455,459.0	$661,959.0	$424,115.0	13,401	47,045	Smiley Crane Service; Spyder Crane Sales
330	10405001J	DOLPHIN INC	350 S 59TH AVE	COMMERCIAL	$526,000	$537,709.0	$1,063,709.0	$685,313.0	24,316	119,790	Smiley Crane Service; Spyder Crane Sales
331	10418004N	DOLPHIN INC		VACANT	$9,500	$0.0	$9,500.0	$5,490.0	0	3,102	vacant
332	10418004S	DOLPHIN INC		VACANT	$42,000	$0.0	$42,000.0	$31,125.0	0	13,504	vacant
333	10418004G	PHOENIX CITY OF	402 S 59TH AVE	COMMERCIAL	$67,000	$0.0	$67,000.0	$49,338.0	0	9,757	City of Phoenix Water Reservoir
334	10418004B	RANDAL ALLEN TR/DEMORE TIMOTHY A/DEBORA L	424 S 59TH AVE	COMMERCIAL	$208,500	$166,238.0	$374,738.0	$290,702.0	12,001	37,462	Muscle Match (car scraps)
335	10418004Q	RANDAL ALLEN TR/DEMORE TIMOTHY A/DEBORA L		VACANT	$88,000	$0.0	$88,000.0	$56,762.0	0	13,504	vacant
336	10418004V	DENIOS ROSEVILLE FARMERS MARKET & AUCTION INC	430 S 59TH AVE	COMMERCIAL	$173,000	$169,961.0	$342,961.0	$262,856.0	3,947	30,056	L & A Truck Repair
337	10418004H	DOLPHIN INC	410 S 59TH AVE	VACANT	$42,000	$0.0	$42,000.0	$25,926.0	0	13,504	vacant
338	10404002B	ROOSEVELT IRRIG DIST		COMMERCIAL	$11,000	$0.0	$11,000.0	$7,327.0	0	787	well site (se corner of Van Buren St and 59th Ave)
339	10404020	5879 VAN BUREN LLC	5879 W VAN BUREN ST	COMMERCIAL	$264,500	$228,789.0	$493,289.0	$440,855.0	3,008	33,454	Circle K
340	10404513	TORO GRANDE LLC	5825 W VAN BUREN ST	COMMERCIAL	$710,500	$1,738,909.0	$2,449,409.0	$1,793,892.0	20,749	157,861	Ross Equipment Rental
341	10404018	SJW LAND COMPANY	117 N 57TH DR	COMMERCIAL	$949,500	$7,800,915.0	$8,750,415.0	$8,025,497.0	180,172	250,165	Southwest Cold Storage
342	10404014	SJW LAND COMPANY	23 N 59TH AVE	COMMERCIAL	$181,500	$0.0	$181,500.0	$120,190.0	0	47,829	Southwest Cold Storage
343	10404015	SJW LAND COMPANY	5802 W WASHINGTON ST	COMMERCIAL	$531,500	$0.0	$531,500.0	$352,236.0	0	140,089	Southwest Cold Storage
344	10404013	SJW LAND COMPANY	1 N 59TH AVE	VACANT	$293,000	$0.0	$293,000.0	$183,852.0	0	55,539	Southwest Cold Storage
345	10404040	JEWEL INVESTMENT CO	5743 W WASHINGTON ST	COMMERCIAL	$85,798	$431,086.0	$516,884.0	$516,884.0	11,801	32,191	unknown (vactant building) West Gate Industrial Park
346	10404012A	ROVALA KARI/MARJA		VACANT	$49,000	$0.0	$49,000.0	$31,302.0	0	6,625	vacant (West Gate Industrial Park)
347	10404039	JEWEL INVESTMENT CO	5733 W WASHINGTON ST	COMMERCIAL	$83,575	$412,207.0	$495,782.0	$495,782.0	12,221	31,363	unknown (vactant building) West Gate Industrial Park
349	10404011	RMV PROPERTIES LLP	109 S 59TH AVE	VACANT	$222,500	$0.0	$222,500.0	$137,447.0	0	40,162	vacant (WGIP)
350	10404042	JEWEL INVESTMENT CO	5746 W JEFFERSON ST	COMMERCIAL	$60,717	$296,498.0	$357,215.0	$357,215.0	8,037	23,566	Veolia Environmental Services (WGIP)
351	10404041	JEWEL INVESTMENT CO	5752 W JEFFERSON ST	COMMERCIAL	$63,319	$331,164.0	$394,483.0	$394,483.0	8,337	24,611	Veolia Environmental Services (WGIP)
352	10404010	RMV PROPERTIES LLP	125 S 59TH AVE	VACANT	$279,500	$0.0	$279,500.0	$172,118.0	0	52,708	vacant (WGIP)
356	10404045	FIVE NINE NKW PROPERTIES LLC	249 S 59TH AVE	COMMERCIAL	$1,712,000	$1,236,817.0	$2,948,817.0	$2,062,767.0	10,549	411,468	Apache Equipment Rental
357	10419003A	BERENDO PROPERTY/HARRISON PROPERTIES LLC	435 S 59TH AVE	COMMERCIAL	$3,246,000	$9,824,275.0	$13,070,275.0	$11,446,600.0	576,302	1,030,280	multiple truck distribution companies
358	10404012B	JV RADFAM LLC	3 S 59TH AVE	COMMERCIAL	$211,080	$558,920.0	$770,000.0	$698,500.0	9,032	46,217	
393	10328001G	SOUTHERN CROSS LLC	777 N 59TH AVE	AG	$108,960	$0.0	$108,960.0	$108,960.0	0	2,894,083	
401	10327007E	WAFFLE HOUSE INC	1237 N 59TH AVE	COMMERCIAL	$381,000	$230,615.0	$611,615.0	$438,049.0	1,555	36,808	Waffle House
402	10327058	LIBERTY FUEL LLC	1201 N 59TH AVE	COMMERCIAL	$2,538,112	$3,325,131.0	$5,863,243.0	$4,266,725.0	33,976	417,784	Liberty Fuel Truck Stop (scale, truck wash)
403	10327054A	ARIZONA STATE OF DEPT OF TRANSPORTATION	1041 N 59TH AVE	COMMERCIAL	$19,500	$0.0	$19,500.0	$12,721.0	0	2,091	ADOT
404	10327054B	SCHLOSSER RONALD A/PAMELA R	1041 N 59TH AVE	COMMERCIAL	$290,500	$330,207.0	$620,707.0	$522,845.0	2,481	33,715	closed fast food
405	10327049	KENWORTH INLAND INC	5801 W LATHAM ST	COMMERCIAL	$708,000	$0.0	$708,000.0	$497,513.0	0	120,000	Kenworth Dealership
406	10327055	INLAND KENWORTH INC	1021 N 59TH AVE	COMMERCIAL	$1,328,000	$3,064,927.0	$4,392,927.0	$3,264,398.0	45,572	225,031	Kenworth Dealership
407	10327060	EASTGROUP PROPERTIES L P	5701 W LATHAM ST	COMMERCIAL	$1,009,000	$3,280,523.0	$4,289,523.0	$3,278,516.0	81,233	209,528	multiple offices (Exide Tech.; Alumco)
408	10327059	EASTGROUP PROPERTIES L P	5750 W ROOSEVELT ST	COMMERCIAL	$834,000	$2,327,972.0	$3,161,972.0	$2,672,648.0	58,521	160,217	multiple offices
409	10328004	LIBERTY COVE LLLP	801 N 59TH AVE	COMMERCIAL	$4,334,600	$17,338,600.0	$21,673,200.0	$20,807,765.0	287,757	654,649	Liberty Cove Apartments (2 stories, approximately 264 units)
410	10328003K	SOUTHWEST VILLAGE APARTMENTS L L C	777 N 59TH AVE	COMMERCIAL	$3,669,900	$14,679,700.0	$18,349,600.0	$14,784,482.0	280,722	712,511	Southwest Village Apartments (2 stories, approximately 300 units)
411	10328003J	SOUTHWEST VILLAGE APARTMENTS L L C		VACANT	$832,300	$0.0	$832,300.0	$599,789.0	0	252,212	vacant
417	10327011B	V A H LLC	1236 N 57TH AVE	COMMERCIAL	$380,000	$275,716.0	$655,716.0	$527,949.0	1	59,372	
418	10327010	LIBERTY FUEL LLC	1226 N 57TH AVE	VACANT	$285,000	$0.0	$285,000.0	$195,710.0	0	46,549	
419	10327009	LIBERTY FUEL LLC	1202 N 57TH AVE	VACANT	$289,500	$0.0	$289,500.0	$198,716.0	0	47,428	
420	10327062A	BLUE BEACON INTERNATIONAL INC	1235 N 57TH AVE	COMMERCIAL	$856,000	$1,726,579.0	$2,582,579.0	$1,903,516.0	12,346	157,765	
		22 homes along I-10 @ $130,000 each					$2,860,000.0				
		Additional contingency for apartment relocations					$5,000,000.0				

Table F-11: W59 Alternative (East) right-of-way cost details, 300 foot ramp terminal intersection spacing

	MARICOPA COUNTY ASSESSOR DATABASE										
MAP ID	APN	OWNER NAME	SITE ADDRESS	PROPERTY TYPE	LAND FULL CASH VALUE	IMPROVEMENT FULL CASH VALUE	TOTAL FULL CASH VALUE	LIMITED PROPERTY VALUE	BUILDING SIZE (SF)	AREA (SF)	COMMENTS
101	10426004	HORNISH PROPERTIES LLC	1649 S 59TH AVE	COMMERCIAL	$643,000	$392,248.0	$1,035,248.0	$824,712.0	9,985	217,800	Woody's Transportation (yard); Total Package Express (office, yard)
103	10426005D	MORAN REAL ESTATE INVESTMENT LLC		COMMERCIAL	$573,800	$14,918.0	$588,718.0	$466,503.0	1	205,124	DBA Construction (yard)
106	10426001	ROOSEVELT IRRIGATION DIST		COMMERCIAL	$520,000	$0.0	$520,000.0	$321,841.0	0	113,256	Canal (AT&T UG FO; SRP OH Power)
107	10439009	BUCKEYE 59 LLC		VACANT	$1,380,443	$0.0	$1,380,443.0	$997,370.0	0	522,673	vacant
108	10439008	BUCKEYE 59 LLC		VACANT	$1,046,405	$0.0	$1,046,405.0	$756,028.0	0	376,558	vacant
109	10439007	METRO AUTO AUCTION INC	2475 S 59TH AVE	COMMERCIAL	$3,122,605	$4,369,113.0	$7,491,718.0	$6,592,711.0	41,102	1,373,864	Arizona Auto Auction
114	10438002A	PROPERTY RESERVE ARIZONA LLC		AG	$112,333	$0.0	$112,333.0	$112,333.0	0	2,983,686	
115	10438003A	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$7,774	$27,657.0	$35,431.0	$29,197.0	938	206,474	
116	10438001	PROPERTY RESERVE ARIZONA LLC	2402 S 59TH AVE	AG	$125,952	$0.0	$125,952.0	$125,952.0	0	3,345,408	
120	10438003C	SHERWOOD WALTER L	2402 S 59TH AVE	COMMERCIAL	$394,000	$26,061.0	$420,061.0	$274,907.0	1	65,645	
121	10438003D	SHERWOOD WALTER L	2402 S 59TH AVE	RESIDENTIAL	$75,500	$94,086.0	$169,586.0	$169,586.0	2,276	56,759	
213	10427001B	PROPERTY RESERVE ARIZONA LLC	6103 W BUCKEYE RD	AG	$186,445	$106,550.0	$292,995.0	$292,995.0	5,632	4,952,174	vacant
214	10419009B	RAM BULL LLC	811 S 59TH AVE	COMMERCIAL	$779,500	$46,099.0	$825,599.0	$547,336.0	3,719	196,020	Ace Pallets
215	10419009C	RAM BULL LLC	811 S 59TH AVE	COMMERCIAL	$386,000	$152,174.0	$538,174.0	$406,568.0	6,961	97,139	Ace Pallets
216	10419009E	KIMMELL W L/EMILY/KAREN/FRIEH G CO-TR	827 S 59TH AVE	COMMERCIAL	$704,500	$195,187.0	$899,687.0	$589,855.0	5,000	176,374	DRPT
217	10419009D	DBJ ENTERPRISES L L C	845 S 59TH AVE	COMMERCIAL	$707,500	$898,988.0	$1,606,488.0	$1,204,826.0	13,401	176,374	HWJ
218	10419004D	HEADLEY GEORGE VERNON/DENNIS KEVIN	5810 W BUCKEYE RD	VACANT	$1,551,500	$0.0	$1,551,500.0	$933,142.0	0	310,321	vacant
219	10426006A	MASSEY JAMES L/GLENDA D		COMMERCIAL	$635,000	$138,095.0	$773,095.0	$464,646.0	4,193	131,072	R Tek Diesel Repair
220	10426007C	MASSEY JAMES L/GLENDA D		COMMERCIAL	$451,000	$14,090.0	$465,090.0	$261,677.0	1	93,088	Massey Diesel Repair; Phoenix Fuel
221	10426003Y	MASSEY JAMES L/GLENDA D		COMMERCIAL	$429,000	$323,144.0	$752,144.0	$530,531.0	3,817	108,900	Massey Diesel Repair; Phoenix Fuel
222	10426003Z	JAMES L MASSEY LIVING TRUST	1417 S 59TH AVE	COMMERCIAL	$429,000	$148,160.0	$577,160.0	$386,559.0	6,716	108,900	Massey Diesel Repair; Phoenix Fuel
223	10426003U	JAMES L MASSEY LIVING TRUST	1417 S 59TH AVE	COMMERCIAL	$230,000	$366,255.0	$596,255.0	$485,960.0	18,283	58,327	Massey Diesel Repair; Phoenix Fuel
224	10426003G	MASSEY JAMES L/GLENDA D		COMMERCIAL	$68,500	$0.0	$68,500.0	$41,621.0	0	17,380	Massey Diesel Repair; Phoenix Fuel
225	10426003T	GENTRY IRA & SHIRLEY J		COMMERCIAL	$286,000	$9,747.0	$295,747.0	$210,091.0	1	55,626	vacant
226	10426003P	MORAN BARNEY		VACANT	$66,500	$0.0	$66,500.0	$38,405.0	0	15,812	Moran Lumber (driveway)
227	10426003Q	MCHENRY DAVID JOSEPH TR	1617 S 59TH AVE	COMMERCIAL	$417,000	$325,302.0	$742,302.0	$545,658.0	25,351	87,120	Bordrers Turf & Tractor (yard, office); Best-N-Arizona Trailer (yard)
236	10426003W	MORAN FAMILY INVESTMENTS LTD	1347 S 59TH AVE	COMMERCIAL	$736,000	$437,595.0	$1,173,595.0	$773,856.0	12,061	174,240	Moran Lumber
338	10404002B	ROOSEVELT IRRIG DIST		COMMERCIAL	$11,000	$0.0	$11,000.0	$7,327.0	0	787	well site (se corner of Van Buren St and 59th Ave)
339	10404020	5879 VAN BUREN LLC	5879 W VAN BUREN ST	COMMERCIAL	$264,500	$228,789.0	$493,289.0	$440,855.0	3,008	33,454	Circle K
340	10404513	TORO GRANDE LLC	5825 W VAN BUREN ST	COMMERCIAL	$710,500	$1,738,909.0	$2,449,409.0	$1,793,892.0	20,749	157,861	Ross Equipment Rental
341	10404018	SJW LAND COMPANY	117 N 57TH DR	COMMERCIAL	$949,500	$7,800,915.0	$8,750,415.0	$8,025,497.0	180,172	250,165	Southwest Cold Storage
342	10404014	SJW LAND COMPANY	23 N 59TH AVE	COMMERCIAL	$181,500	$0.0	$181,500.0	$120,190.0	0	47,829	Southwest Cold Storage
343	10404015	SJW LAND COMPANY	5802 W WASHINGTON ST	COMMERCIAL	$531,500	$0.0	$531,500.0	$352,236.0	0	140,089	Southwest Cold Storage
344	10404013	SJW LAND COMPANY	1 N 59TH AVE	VACANT	$293,000	$0.0	$293,000.0	$183,852.0	0	55,539	Southwest Cold Storage
345	10404040	JEWEL INVESTMENT CO	5743 W WASHINGTON ST	COMMERCIAL	$85,798	$431,086.0	$516,884.0	$516,884.0	11,801	32,191	unknown (vactant building) West Gate Industrial Park
346	10404012A	ROVALA KARI/MARJA		VACANT	$49,000	$0.0	$49,000.0	$31,302.0	0	6,625	vacant (West Gate Industrial Park)
347	10404039	JEWEL INVESTMENT CO	5733 W WASHINGTON ST	COMMERCIAL	$83,575	$412,207.0	$495,782.0	$495,782.0	12,221	31,363	unknown (vactant building) West Gate Industrial Park
349	10404011	RMV PROPERTIES LLP	109 S 59TH AVE	VACANT	$222,500	$0.0	$222,500.0	$137,447.0	0	40,162	vacant (WGIP)
350	10404042	JEWEL INVESTMENT CO	5746 W JEFFERSON ST	COMMERCIAL	$60,717	$296,498.0	$357,215.0	$357,215.0	8,037	23,566	Veolia Environmental Services (WGIP)
351	10404041	JEWEL INVESTMENT CO	5752 W JEFFERSON ST	COMMERCIAL	$63,319	$331,164.0	$394,483.0	$394,483.0	8,337	24,611	Veolia Environmental Services (WGIP)
352	10404010	RMV PROPERTIES LLP	125 S 59TH AVE	VACANT	$279,500	$0.0	$279,500.0	$172,118.0	0	52,708	vacant (WGIP)
353	10404043	JEWEL INVESTMENT CO	5736 W JEFFERSON ST	COMMERCIAL	$60,717	$340,897.0	$401,614.0	$401,614.0	8,337	23,653	Veolia Environmental Services (WGIP)
356	10404045	FIVE NINE NKW PROPERTIES LLC	249 S 59TH AVE	COMMERCIAL	$1,712,000	$1,236,817.0	$2,948,817.0	$2,062,767.0	10,549	411,468	Apache Equipment Rental
357	10419003A	BERENDO PROPERTY/HARRISON PROPERTIES LLC	435 S 59TH AVE	COMMERCIAL	$3,246,000	$9,824,275.0	$13,070,275.0	$11,446,600.0	576,302	1,030,280	multiple truck distribution companies
361	10404035	RMV PROPERTIES LLP	5801 W VAN BUREN ST	COMMERCIAL	$446,000	$1,087,614.0	$1,533,614.0	$1,173,416.0	20,097	90,692	empty building
393	10328001G	SOUTHERN CROSS LLC	777 N 59TH AVE	AG	$108,960	$0.0	$108,960.0	$108,960.0	0	2,894,083	
401	10327007E	WAFFLE HOUSE INC	1237 N 59TH AVE	COMMERCIAL	$381,000	$230,615.0	$611,615.0	$438,049.0	1,555	36,808	Waffle House
402	10327058	LIBERTY FUEL LLC	1201 N 59TH AVE	COMMERCIAL	$2,538,112	$3,325,131.0	$5,863,243.0	$4,266,725.0	33,976	417,784	Liberty Fuel Truck Stop (scale, truck wash)
403	10327054A	ARIZONA STATE OF DEPT OF TRANSPORTATION	1041 N 59TH AVE	COMMERCIAL	$19,500	$0.0	$19,500.0	$12,721.0	0	2,091	ADOT
404	10327054B	SCHLOSSER RONALD A/PAMELA R	1041 N 59TH AVE	COMMERCIAL	$290,500	$330,207.0	$620,707.0	$522,845.0	2,481	33,715	closed fast food
405	10327049	KENWORTH INLAND INC	5801 W LATHAM ST	COMMERCIAL	$708,000	$0.0	$708,000.0	$497,513.0	0	120,000	Kenworth Dealership
406	10327055	INLAND KENWORTH INC	1021 N 59TH AVE	COMMERCIAL	$1,328,000	$3,064,927.0	$4,392,927.0	$3,264,398.0	45,572	225,031	Kenworth Dealership
407	10327060	EASTGROUP PROPERTIES L P	5701 W LATHAM ST	COMMERCIAL	$1,009,000	$3,280,523.0	$4,289,523.0	$3,278,516.0	81,233	209,528	multiple offices (Exide Tech.; Alumco)
408	10327059	EASTGROUP PROPERTIES L P	5750 W ROOSEVELT ST	COMMERCIAL	$834,000	$2,327,972.0	$3,161,972.0	$2,672,648.0	58,521	160,217	multiple offices
409	10328004	LIBERTY COVE LLLP	801 N 59TH AVE	COMMERCIAL	$4,334,600	$17,338,600.0	$21,673,200.0	$20,807,765.0	287,757	654,649	Liberty Cove Apartments (2 stories, approximately 264 units)
410	10328003K	SOUTHWEST VILLAGE APARTMENTS L L C	777 N 59TH AVE	COMMERCIAL	$3,669,900	$14,679,700.0	$18,349,600.0	$14,784,482.0	280,722	712,511	Southwest Village Apartments (2 stories, approximately 300 units)
411	10328003J	SOUTHWEST VILLAGE APARTMENTS L L C		VACANT	$832,300	$0.0	$832,300.0	$599,789.0	0	252,212	vacant
417	10327011B	V A H LLC	1236 N 57TH AVE	COMMERCIAL	$380,000	$275,716.0	$655,716.0	$527,949.0	1	59,372	
418	10327010	LIBERTY FUEL LLC	1226 N 57TH AVE	VACANT	$285,000	$0.0	$285,000.0	$195,710.0	0	46,549	
419	10327009	LIBERTY FUEL LLC	1202 N 57TH AVE	VACANT	$289,500	$0.0	$289,500.0	$198,716.0	0	47,428	
420	10327062A	BLUE BEACON INTERNATIONAL INC	1235 N 57TH AVE	COMMERCIAL	$856,000	$1,726,579.0	$2,582,579.0	$1,903,516.0	12,346	157,765	
		22 homes along I-10 @ $130,000 each					$2,860,000.0				
		Additional contingency for apartment relocations					$5,000,000.0				

Table F-12: W55 Alternative construction cost details

ROUTE: SR 202L **PROJECT DESCRIPTION:** **Construct Roadway**

SEGMENT: Segments 8 & 9 (Broadway to I-10) **ESTIMATE SUMMARY LEVEL:** **Prop 300 Section 3+1**

LENGTH: 3.98 miles **TRACS NO.: 202L MA 054 H5764 01C** **DATE: 1-Aug-09**

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	1,254,000	1,254,000
	ROADWAY EXCAVATION	CU.YD.	1,689,044	3.00	5,067,132
	DRAINAGE EXCAVATION	CU.YD.	428,584	5.00	2,142,920
	BORROW	CU.YD.	3,767,843	7.00	26,374,901
	FURNISH WATER SUPPLY	MILE	4.61	30,000	138,300
	TOTAL ITEM 200				34,977,253
300 & 400	**BASE AND SURFACE TREATMENT**				
	CONCRETE PAVEMENT	SQ.YD.	625,112	45.86	28,669,930
	ASPHALT PAVEMENT	SQ.YD.	125,554	25.21	3,165,822
	TOTAL ITEM 300 & 400				31,835,752
500	**DRAINAGE**				
	ON-SITE DRAINAGE	MILE	9.61	835,533	8,029,471
	OFF-SITE DRAINAGE	MILE	9.61	2,558,349	24,585,730
	PUMP STATION	EACH			0
	OTHER:	L.SUM	1	88,900	88,900
	TOTAL ITEM 500				32,704,101
600	**STRUCTURES**				
	NUMBER OF STRUCTURES: 8	SQ.FT.	575,007	121.37	69,788,968
	OTHER:	EACH	0		0
	TOTAL ITEM 600				69,788,968
700	**TRAFFIC ENGINEERING**				
	TRAFFIC CONTROL	L.SUM	1	10,217,000	10,217,000
	SIGNING & PAVEMENT MARKING	MILE	9.61	598,850	5,754,950
	LIGHTING	MILE	4.61	976,280	4,500,650
	TRAFFIC SIGNAL	EACH	8	320,000	2,560,000
	FREEWAY MANAGEMENT SYSTEM	MILE	4.61	32,000	147,520
	TOTAL ITEM 700				23,180,120
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING	MILE	4.61	1,407,378	6,488,012
	TOPSOIL	CU.YD.	735,255	8.00	5,882,040
	EROSION CONTROL	MILE	4.61	15,000	69,150
	UTILITY RELOCATION	MILE	4.61	917,570	4,230,000
	TOTAL ITEM 800				16,669,202
900	**INCIDENTALS**				
	MOBILIZATION	L.SUM	1	18,282,000	18,282,000
	RETAINING WALLS	SQ.FT.	307,243	50.00	15,362,150
	SOUND WALLS	SQ.FT.	217,695	25.00	5,442,375
	ROADWAY APPURTENANCES	MILE	1.00	8,781,875	8,781,875
	CONTRACTOR QUALITY CONTROL	L.SUM	1	3,998,750	3,998,750
	CONSTRUCTION SURVEYING	L.SUM	1	4,570,000	4,570,000
	TOTAL ITEM 900				56,437,150
	SUBTOTAL A (ITEMS 200 THRU 900)				$265,593,000
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)				53,119,000
	SUBTOTAL B (SUBTOTAL A + UNIDENTIFIED ITEMS)				$318,712,000
	CONSTRUCTION ENGINEERING (9% OF SUBTOTAL B)				28,684,000
	TOTAL ESTIMATED CONSTRUCTION COST				**$347,396,000**
	OTHER PROJECT COSTS				
	DPS TRAFFIC CONTROL				$0
	PRIOR RIGHT UTILITY RELOCATIONS AND SERVICE AGREEMENTS				$0
	JOINT PROJECT AGREEMENT ITEMS				$0
	BID ITEM PRICE ESCALATION				$0
	CONTRACTOR INCENTIVES				$0
	SUBTOTAL OTHER PROJECT COSTS (*)				$0
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL B)				$15,936,000
	TOTAL ESTIMATED PROJECT COST (*)				**$363,332,000**

NOTE: These are construction costs only and do not include design.

Table F-13: W59 Alternative (West) construction cost details, 400 foot ramp terminal intersection spacing

ROUTE: SR 202L **PROJECT DESCRIPTION:** **Construct Roadway**

SEGMENT: Segments 8 & 9 (Broadway to I-10) **ESTIMATE SUMMARY LEVEL:** **Prop 300 Section 3+1**

LENGTH: 3.98 miles **TRACS NO.: 202L MA 054 H5764 01C** **DATE: 1-Aug-09**

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	1,254,000	1,254,000
	ROADWAY EXCAVATION	CU.YD.	1,689,044	3.00	5,067,132
	DRAINAGE EXCAVATION	CU.YD.	428,584	5.00	2,142,920
	BORROW	CU.YD.	3,767,843	7.00	26,374,901
	FURNISH WATER SUPPLY	MILE	4.61	30,000	138,300
	TOTAL ITEM 200				34,977,253
300 & 400	**BASE AND SURFACE TREATMENT**				
	CONCRETE PAVEMENT	SQ.YD.	625,112	45.86	28,669,930
	ASPHALT PAVEMENT	SQ.YD.	125,554	25.21	3,165,822
	TOTAL ITEM 300 & 400				31,835,752
500	**DRAINAGE**				
	ON-SITE DRAINAGE	MILE	9.61	835,533	8,029,471
	OFF-SITE DRAINAGE	MILE	9.61	3,858,099	37,076,330
	PUMP STATION	EACH			0
	OTHER:	L.SUM	1	88,900	88,900
	TOTAL ITEM 500				45,194,701
600	**STRUCTURES**				
	NUMBER OF STRUCTURES: 8	SQ.FT.	575,007	121.37	69,788,968
	OTHER:	EACH	0		0
	TOTAL ITEM 600				69,788,968
700	**TRAFFIC ENGINEERING**				
	TRAFFIC CONTROL	L.SUM	1	13,800,000	13,800,000
	SIGNING & PAVEMENT MARKING	MILE	9.61	598,850	5,754,950
	LIGHTING	MILE	4.61	976,280	4,500,650
	TRAFFIC SIGNAL	EACH	8	320,000	2,560,000
	FREEWAY MANAGEMENT SYSTEM	MILE	4.61	32,000	147,520
	TOTAL ITEM 700				26,763,120
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING	MILE	4.61	1,407,378	6,488,012
	TOPSOIL	CU.YD.	735,255	8.00	5,882,040
	EROSION CONTROL	MILE	4.61	15,000	69,150
	UTILITY RELOCATION	MILE	4.61	1,167,217	5,380,870
	TOTAL ITEM 800				17,820,072
900	**INCIDENTALS**				
	MOBILIZATION	L.SUM	1	19,300,000	19,300,000
	RETAINING WALLS	SQ.FT.	0	50.00	0
	SOUND WALLS	SQ.FT.	217,695	25.00	5,442,375
	ROADWAY APPURTENANCES	MILE	4.61	1,904,962	8,781,875
	CONTRACTOR QUALITY CONTROL	L.SUM	1	4,300,000	4,300,000
	CONSTRUCTION SURVEYING	L.SUM	1	4,900,000	4,900,000
	TOTAL ITEM 900				42,724,250
	SUBTOTAL A (ITEMS 200 THRU 900)				$269,104,000
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)				53,821,000
	SUBTOTAL B (SUBTOTAL A + UNIDENTIFIED ITEMS)				$322,925,000
	CONSTRUCTION ENGINEERING (9% OF SUBTOTAL B)				29,063,000
	TOTAL ESTIMATED CONSTRUCTION COST				**$351,988,000**
	OTHER PROJECT COSTS				
	DPS TRAFFIC CONTROL				$0
	PRIOR RIGHT UTILITY RELOCATIONS AND SERVICE AGREEMENTS				$0
	JOINT PROJECT AGREEMENT ITEMS				$0
	BID ITEM PRICE ESCALATION				$0
	CONTRACTOR INCENTIVES				$0
	SUBTOTAL OTHER PROJECT COSTS (*)				$0
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL B)				$16,146,000
	TOTAL ESTIMATED PROJECT COST (*)				**$368,134,000**

NOTE: These are construction costs only and do not include design.

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Table F-14: W59 Alternative (East) construction cost details, 400 foot ramp terminal intersection spacing

ROUTE: SR 202L **PROJECT DESCRIPTION: Construct Roadway**

SEGMENT: Segments 8 & 9 (Broadway to I-10) **ESTIMATE SUMMARY LEVEL: Prop 300 Section 3+1**

LENGTH: 3.98 miles **TRACS NO.: 202L MA 054 H5764 01C** **DATE: 1-Aug-09**

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	1,254,000	1,254,000
	ROADWAY EXCAVATION	CU.YD.	1,689,044	3.00	5,067,132
	DRAINAGE EXCAVATION	CU.YD.	428,584	5.00	2,142,920
	BORROW	CU.YD.	3,767,843	7.00	26,374,901
	FURNISH WATER SUPPLY	MILE	4.61	30,000	138,300
	TOTAL ITEM 200				34,977,253
300 & 400	**BASE AND SURFACE TREATMENT**				
	CONCRETE PAVEMENT	SQ.YD.	625,112	45.86	28,669,930
	ASPHALT PAVEMENT	SQ.YD.	125,554	25.21	3,165,822
	TOTAL ITEM 300 & 400				31,835,752
500	**DRAINAGE**				
	ON-SITE DRAINAGE	MILE	9.61	835,533	8,029,471
	OFF-SITE DRAINAGE	MILE	9.61	3,497,475	33,610,730
	PUMP STATION	EACH			0
	OTHER:	L.SUM	1	88,900	88,900
	TOTAL ITEM 500				41,729,101
600	**STRUCTURES**				
	NUMBER OF STRUCTURES: 8	SQ.FT.	575,007	121.37	69,788,968
	OTHER:	EACH	0		0
	TOTAL ITEM 600				69,788,968
700	**TRAFFIC ENGINEERING**				
	TRAFFIC CONTROL	L.SUM	1	13,600,000	13,600,000
	SIGNING & PAVEMENT MARKING	MILE	9.61	598,850	5,754,950
	LIGHTING	MILE	4.61	976,280	4,500,650
	TRAFFIC SIGNAL	EACH	8	320,000	2,560,000
	FREEWAY MANAGEMENT SYSTEM	MILE	4.61	32,000	147,520
	TOTAL ITEM 700				26,563,120
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING	MILE	4.61	1,407,378	6,488,012
	TOPSOIL	CU.YD.	735,255	8.00	5,882,040
	EROSION CONTROL	MILE	4.61	15,000	69,150
	UTILITY RELOCATION	MILE	4.61	1,036,443	4,778,000
	TOTAL ITEM 800				17,217,202
900	**INCIDENTALS**				
	MOBILIZATION	L.SUM	1	19,000,000	19,000,000
	RETAINING WALLS	SQ.FT.	0	50.00	0
	SOUND WALLS	SQ.FT.	217,695	25.00	5,442,375
	ROADWAY APPURTENANCES	MILE	4.61	1,904,962	8,781,875
	CONTRACTOR QUALITY CONTROL	L.SUM	1	4,200,000	4,200,000
	CONSTRUCTION SURVEYING	L.SUM	1	4,800,000	4,800,000
	TOTAL ITEM 900				42,224,250
	SUBTOTAL A (ITEMS 200 THRU 900)				$264,336,000
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)				52,867,000
	SUBTOTAL B (SUBTOTAL A + UNIDENTIFIED ITEMS)				$317,203,000
	CONSTRUCTION ENGINEERING (9% OF SUBTOTAL B)				28,548,000
	TOTAL ESTIMATED CONSTRUCTION COST				**$345,751,000**
	OTHER PROJECT COSTS				
	DPS TRAFFIC CONTROL				$0
	PRIOR RIGHT UTILITY RELOCATIONS AND SERVICE AGREEMENTS				$0
	JOINT PROJECT AGREEMENT ITEMS				$0
	BID ITEM PRICE ESCALATION				$0
	CONTRACTOR INCENTIVES				$0
	SUBTOTAL OTHER PROJECT COSTS (*)				$0
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL B)				$15,860,000
	TOTAL ESTIMATED PROJECT COST (*)				**$361,611,000**

NOTE: These are construction costs only and do not include design.

Table F-15: W59 Alternative (West) construction cost details, 300 foot ramp terminal intersection spacing

ROUTE: SR 202L **PROJECT DESCRIPTION:** **Construct Roadway**

SEGMENT: Segments 8 & 9 (Broadway to I-10) **ESTIMATE SUMMARY LEVEL:** **Prop 300 Section 3+1**

LENGTH: 3.98 miles **TRACS NO.: 202L MA 054 H5764 01C** **DATE: 1-Aug-09**

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	1,254,000	1,254,000
	ROADWAY EXCAVATION	CU.YD.	1,689,044	3.00	5,067,132
	DRAINAGE EXCAVATION	CU.YD.	428,584	5.00	2,142,920
	BORROW	CU.YD.	3,767,843	7.00	26,374,901
	FURNISH WATER SUPPLY	MILE	4.61	30,000	138,300
	TOTAL ITEM 200				34,977,253
300 & 400	**BASE AND SURFACE TREATMENT**				
	CONCRETE PAVEMENT	SQ.YD.	625,112	45.86	28,669,930
	ASPHALT PAVEMENT	SQ.YD.	125,554	25.21	3,165,822
	TOTAL ITEM 300 & 400				31,835,752
500	**DRAINAGE**				
	ON-SITE DRAINAGE	MILE	9.61	835,533	8,029,471
	OFF-SITE DRAINAGE	MILE	9.61	3,858,099	37,076,330
	PUMP STATION	EACH			0
	OTHER:	L.SUM	1	88,900	88,900
	TOTAL ITEM 500				45,194,701
600	**STRUCTURES**				
	NUMBER OF STRUCTURES: 8	SQ.FT.	575,007	121.37	69,788,968
	OTHER:	EACH	0		0
	TOTAL ITEM 600				69,788,968
700	**TRAFFIC ENGINEERING**				
	TRAFFIC CONTROL	L.SUM	1	13,800,000	13,800,000
	SIGNING & PAVEMENT MARKING	MILE	9.61	598,850	5,754,950
	LIGHTING	MILE	4.61	976,280	4,500,650
	TRAFFIC SIGNAL	EACH	8	320,000	2,560,000
	FREEWAY MANAGEMENT SYSTEM	MILE	4.61	32,000	147,520
	TOTAL ITEM 700				26,763,120
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING	MILE	4.61	1,407,378	6,488,012
	TOPSOIL	CU.YD.	735,255	8.00	5,882,040
	EROSION CONTROL	MILE	4.61	15,000	69,150
	UTILITY RELOCATION	MILE	4.61	1,167,217	5,380,870
	TOTAL ITEM 800				17,820,072
900	**INCIDENTALS**				
	MOBILIZATION	L.SUM	1	19,300,000	19,300,000
	RETAINING WALLS	SQ.FT.	307,243	50.00	15,362,150
	SOUND WALLS	SQ.FT.	217,695	25.00	5,442,375
	ROADWAY APPURTENANCES	MILE	1.00	8,781,875	8,781,875
	CONTRACTOR QUALITY CONTROL	L.SUM	1	4,300,000	4,300,000
	CONSTRUCTION SURVEYING	L.SUM	1	4,900,000	4,900,000
	TOTAL ITEM 900				58,086,400
	SUBTOTAL A (ITEMS 200 THRU 900)				$284,466,000
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)				56,893,000
	SUBTOTAL B (SUBTOTAL A + UNIDENTIFIED ITEMS)				$341,359,000
	CONSTRUCTION ENGINEERING (9% OF SUBTOTAL B)				30,722,000
	TOTAL ESTIMATED CONSTRUCTION COST				**$372,081,000**
	OTHER PROJECT COSTS				
	DPS TRAFFIC CONTROL				$0
	PRIOR RIGHT UTILITY RELOCATIONS AND SERVICE AGREEMENTS				$0
	JOINT PROJECT AGREEMENT ITEMS				$0
	BID ITEM PRICE ESCALATION				$0
	CONTRACTOR INCENTIVES				$0
	SUBTOTAL OTHER PROJECT COSTS (*)				$0
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL B)				$17,068,000
	TOTAL ESTIMATED PROJECT COST (*)				**$389,149,000**

NOTE: These are construction costs only and do not include design.

Table F-16: W59 Alternative (East) construction cost details, 300 foot ramp terminal intersection spacing

ROUTE: SR 202L **PROJECT DESCRIPTION:** Construct Roadway

SEGMENT: Segments 8 & 9 (Broadway to I-10) **ESTIMATE SUMMARY LEVEL:** Prop 300 Section 3+1

LENGTH: 3.98 miles **TRACS NO.:** 202L MA 054 H5764 01C **DATE:** 1-Aug-09

ITEM	MAJOR ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
200	**EARTHWORK**				
	CLEARING & REMOVALS	L.SUM	1	1,254,000	1,254,000
	ROADWAY EXCAVATION	CU.YD.	1,689,044	3.00	5,067,132
	DRAINAGE EXCAVATION	CU.YD.	428,584	5.00	2,142,920
	BORROW	CU.YD.	3,767,843	7.00	26,374,901
	FURNISH WATER SUPPLY	MILE	4.61	30,000	138,300
	TOTAL ITEM 200				34,977,253
300 & 400	**BASE AND SURFACE TREATMENT**				
	CONCRETE PAVEMENT	SQ.YD.	625,112	45.86	28,669,930
	ASPHALT PAVEMENT	SQ.YD.	125,554	25.21	3,165,822
	TOTAL ITEM 300 & 400				31,835,752
500	**DRAINAGE**				
	ON-SITE DRAINAGE	MILE	9.61	835,533	8,029,471
	OFF-SITE DRAINAGE	MILE	9.61	3,497,475	33,610,730
	PUMP STATION	EACH			0
	OTHER:	L.SUM	1	88,900	88,900
	TOTAL ITEM 500				41,729,101
600	**STRUCTURES**				
	NUMBER OF STRUCTURES: 8	SQ.FT.	575,007	121.37	69,788,968
	OTHER:	EACH	0		0
	TOTAL ITEM 600				69,788,968
700	**TRAFFIC ENGINEERING**				
	TRAFFIC CONTROL	L.SUM	1	13,600,000	13,600,000
	SIGNING & PAVEMENT MARKING	MILE	9.61	598,850	5,754,950
	LIGHTING	MILE	4.61	976,280	4,500,650
	TRAFFIC SIGNAL	EACH	8	320,000	2,560,000
	FREEWAY MANAGEMENT SYSTEM	MILE	4.61	32,000	147,520
	TOTAL ITEM 700				26,563,120
800	**ROADSIDE DEVELOPMENT**				
	LANDSCAPING	MILE	4.61	1,407,378	6,488,012
	TOPSOIL	CU.YD.	735,255	8.00	5,882,040
	EROSION CONTROL	MILE	4.61	15,000	69,150
	UTILITY RELOCATION	MILE	4.61	1,036,443	4,778,000
	TOTAL ITEM 800				17,217,202
900	**INCIDENTALS**				
	MOBILIZATION	L.SUM	1	19,000,000	19,000,000
	RETAINING WALLS	SQ.FT.	307,243	50.00	15,362,150
	SOUND WALLS	SQ.FT.	217,695	25.00	5,442,375
	ROADWAY APPURTENANCES	MILE	1.00	8,781,875	8,781,875
	CONTRACTOR QUALITY CONTROL	L.SUM	1	4,200,000	4,200,000
	CONSTRUCTION SURVEYING	L.SUM	1	4,800,000	4,800,000
	TOTAL ITEM 900				57,586,400
	SUBTOTAL A (ITEMS 200 THRU 900)				$279,698,000
	UNIDENTIFIED ITEMS (20% OF SUBTOTAL A)				55,940,000
	SUBTOTAL B (SUBTOTAL A + UNIDENTIFIED ITEMS)				$335,638,000
	CONSTRUCTION ENGINEERING (9% OF SUBTOTAL B)				30,207,000
	TOTAL ESTIMATED CONSTRUCTION COST				**$365,845,000**
	OTHER PROJECT COSTS				
	DPS TRAFFIC CONTROL				$0
	PRIOR RIGHT UTILITY RELOCATIONS AND SERVICE AGREEMENTS				$0
	JOINT PROJECT AGREEMENT ITEMS				$0
	BID ITEM PRICE ESCALATION				$0
	CONTRACTOR INCENTIVES				$0
	SUBTOTAL OTHER PROJECT COSTS (*)				$0
	CONSTRUCTION CONTINGENCIES (5% OF SUBTOTAL B)				$16,782,000
	TOTAL ESTIMATED PROJECT COST (*)				**$382,627,000**

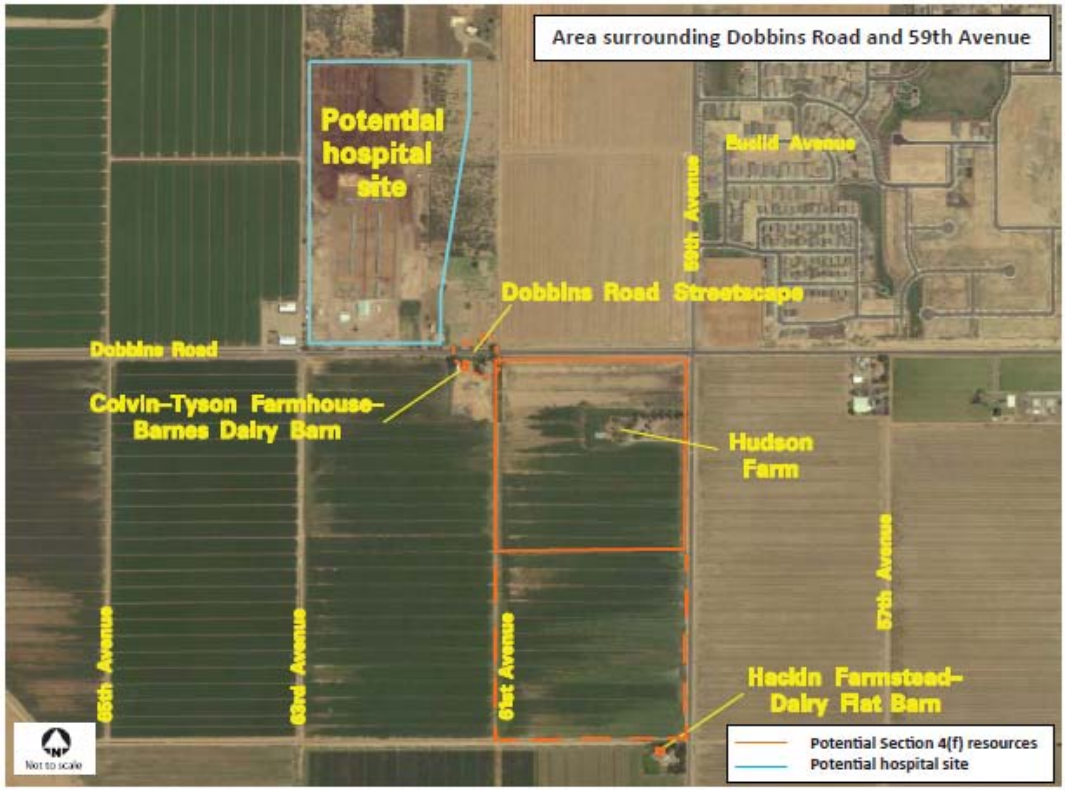
NOTE: These are construction costs only and do not include design.

61st Avenue Alignment
Section 4(f) Summary

Purpose

As the South Mountain Freeway passes through the area near 59th Avenue and Dobbins Road, there are a number of sensitive features that constrain alignment choices (see aerial below). There are four potential historic resources afforded protection under Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966 (orange outlined area). Also, the area surrounding Dobbins Road and 59th Avenue is identified in the City of Phoenix *General Plan* as the commercial core for the Laveen Village and there is a property zoned to allow for uses such as a hospital (blue outlined area). The local municipality has deemed the hospital an essential element of the village core.

This document presents the results of a reevaluation and exhaustive efforts to determine the potential to use the 61st Avenue Alignment (see Appendix C-1) of the South Mountain Freeway through this area.



Protection of Historic Properties

This section provides background information related to Section 106 of the National Historic Preservation Act (NHPA) and Section 4(f) of the U.S. Department of Transportation Act of 1966 and the interaction of each as it relates to the protection of historic properties.

SECTION 106

Historic property means any prehistoric or historic district, site, building, structure, or object included in,

or eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 Code of Federal Regulations [C.F.R.] § 800.16). For this study, the Federal Highway Administration (FHWA) is the lead agency responsible for compliance with the NHPA. Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation and other parties with a demonstrated interest a reasonable opportunity to comment on such undertakings. Section 106 compliance is implemented through the regulations for *Protection of Historic Properties* (36 C.F.R. § 800).

Eligibility

To be determined eligible for inclusion in the NRHP, properties must be generally at least 50 years old, meet at least one of four criteria of significance, and retain sufficient historic integrity to convey that significance. The four criteria of significance are:

- Criterion A – be associated with events that have made a significant contribution to the broad patterns of our history
- Criterion B – be associated with the lives of persons significant in our past
- Criterion C – embody the distinctive characteristics of a type, period, or method of construction; or represent the work of a master; or possess high artistic values; or represent a significant distinguishable entity whose components may lack individual distinction
- Criterion D – have yielded, or may be likely to yield, information important in prehistory or history

Integrity is assessed in terms of location, design, workmanship, materials, setting, feeling, and association. The significance of property may be at the local, state, or national level, depending on its historical associations. Typically, historic properties are at least 50 years of age, but more recent properties may be considered for listing if they are of exceptional significance.

Effects

If FHWA determines that there are historic properties which may be adversely affected by the undertaking, FHWA shall notify all consulting parties, invite their views on the effects, and assess adverse effects, if any, in accordance with 36 C.F.R. § 800.5.

An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the NRHP. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

Adverse effects on historic properties include, but are not limited to:

- Physical destruction of or damage to all or part of the property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary’s Standards for the Treatment of Historic Properties (36 C.F.R. part 68) and applicable guidelines;
- Removal of the property from its historic location;

- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;
- Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

If an adverse effect is found, FHWA shall consult with the SHPO and/or THPO and other consulting parties to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects on historic properties.

SECTION 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 states:

> The Secretary may approve a transportation program or project (other than any project for a park road or parkway under section 204 of title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if - (1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use. (49 United States Code [U.S.C] 303[c]).

If it is concluded that no prudent and feasible alternatives to avoid Section 4(f) resources exist, then FHWA may approve the alternative that causes the least overall harm in light of the statute's preservation purpose [23 C.F.R. § 774.3(c)].

Use

A "use" of a Section 4(f) resource, as defined in 23 C.F.R. § 774.17, occurs:

1) when land is permanently incorporated into a transportation facility (a direct use),
2) when there is a temporary occupancy of land that is adverse in terms of the statute's preservationist purpose (a direct use), as determined by the criteria in 23 C.F.R. § 774.13(d), or
3) when there is a constructive use of land as determined by the criteria in 23 C.F.R. § 774.15.

A constructive use of a Section 4(f) resource occurs when the transportation project does not incorporate land from the Section 4(f) resource, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features, or attributes of the resource are substantially diminished (23 C.F.R. § 774.15). For example, a constructive use can result when one or more of the following occur:

- The projected noise level attributable to the proposed action substantially interferes with the use and enjoyment of a noise-sensitive facility of a resource protected by Section 4(f). FHWA has defined this noise level as 67 dBA or higher.
- The proximity of the proposed action substantially impairs aesthetic features or attributes [such as blocking the view from a Section 4(f) property] of a resource protected by Section 4(f), where

such features or attributes are considered important contributing elements to the value of the resource. An example of such an effect would be locating a proposed transportation facility in such proximity that it obstructs or eliminates views that are considered part of an NRHP-eligible, architecturally significant, historical property's Section 4(f) eligibility. Another example would be locating a proposed transportation facility in such proximity that it detracts from the setting of a park or historic site which derives its value in substantial part because of its setting.

- The proposed action results in a restriction on access that substantially diminishes the utility of a significant publicly owned park, recreation area, or historic site.

If a direct or constructive use is found, avoidance alternatives must be considered. If there is no prudent and feasible avoidance alternative, measures to minimize harm to the resource would be developed in coordination with participating agencies and organizations.

De minimis

Section 6009(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) amended existing Section 4(f) legislation at Section 138 of Title 23 and Section 303 of Title 49, U.S.C, to simplify the processing and approval of projects that have only *de minimis* impacts on lands protected by Section 4(f). De minimis in this context refers to impacts that are negligible or minimal. This revision provides that once the USDOT determines that a transportation use of Section 4(f) property, after consideration of any impact avoidance, minimization, and mitigation or enhancement measures, results in a *de minimis* impact on that property, an analysis of avoidance alternatives is not required and the Section 4(f) evaluation process is complete.

As defined in 23 C.F.R. § 774.17, for historic sites, *de minimis* impact means that FHWA has determined, in accordance with 36 C.F.R. § 800, that no historic property is affected by the project or that the project will have "no adverse effect" on the historic property in question. FHWA can only make such a determination if SHPO has also determined that no historic property is affected by the project or that the project will have "no adverse effect" on the historic property in question.

SUMMARY

Section 106 of the NHPA is an integral part of the Section 4(f) process. Section 106 identifies the undertaking, identifies and evaluates significance of historic properties, determines project effect, and recommends eligibility of historic properties. Historic properties eligible for inclusion in the NRHP under Criteria A, B, or C are also afforded protection under Section 4(f) (with exceptions).

Additional information related to the interaction between the determination of an adverse effect through Section 106 and the determination of a use in Section 4(f) is presented in Appendix A.

Reevaluation of historic properties

To exhaust all efforts to reintroduce the 61st Avenue Alignment into the detailed study of the EIS process and because conditions had changed in the area of the 59th Avenue and Dobbins Road intersection, an independent review by a qualified-historian was performed to re-evaluate the eligibility determination of the historic properties in the Laveen area. An evaluation assessment document was prepared: *South Mountain Transportation Corridor Study: Evaluation of Four Historic Buildings and Districts, Maricopa County, Arizona, April 3, 2012*. The results of the reevaluation as well as the original evaluation, for comparison, are presented in the table below. Differences in the evaluations are in bold in the table.

Property name	Original evaluation (2005)	Reevaluation (2012)
Districts		
Hudson Farm	Eligible – Criterion A **~40-acre district**	Eligible – Criterion A **~80-acre district**
Hackin Farmstead/Dairy	Not Eligible	Not Eligible
Tyson Farmstead/Barnes Dairy	Not Eligible	Not Eligible
Dobbins Streetscape	**Eligible – Criterion A**	**Not Eligible**
Buildings		
Hudson Farm – Cement Stave Silos	Eligible – Criterion C	Eligible – Criterion C
Hackin Farmstead/Dairy – Dairy Flat Barn	Eligible – Criterion C	Eligible – Criterion C
Tyson Farmstead/Barnes Dairy – Head-to-Toe Barn	Eligible – Criterion C	Eligible – Criterion C

The reevaluation results were shared informally with staff from the SHPO on Friday, April 13, 2012. Official SHPO concurrence is pending. Informally, SHPO staff agreed with the new findings (Hudson Farm district should be 80 acres and Dobbins Road Streetscape should not be eligible). The reevaluation further supported the case that the Hudson Farm, Barnes Dairy Barn, and Hackin Dairy Flat Barn are significant historic resources.

Status of the 61st Avenue Alignment

On February 1, 2012, ADOT submitted a formal request to FHWA to consider relocating the alignment onto 61st Avenue (through the Hudson Farm property) based on a “least overall harm” interpretation, of the Section 4(f) statute. FHWA, after serious consideration of the interpretation, concluded the agency could not support the interpretation because it was an incorrect application of the regulation.

Because the historic property reevaluation resulted in a change in the physical lands determined eligible for the NRHP under Section 106 of the NHPA and in relation, afforded protection under Section 4(f), a reexamination of the situation occurred. First, the potential to apply the “de minimis” provisions of the Section 4(f) statute was discussed with FHWA. When applied to the 61st Avenue Alignment, FHWA communicated such application was not consistent with the provisions of the statute and consequently, the agency would not support a “de minimis” use determination.

As a result, examination of avoidance alternatives was necessarily undertaken.

Avoidance Alternatives

The purposes of this section are to:

- Identify and describe alternatives that would avoid the direct use of resources afforded protection under Section 4(f) in the area of Dobbins Road and 59th Avenue. The descriptions and evaluation of avoidance alternatives generally cover the 2-mile area from Elliot Road to Baseline Road.
- Present the advantages and disadvantages of each alternative presented to allow informed discussion as to the ability to satisfy the feasible and prudent thresholds as established under Section 4(f) guidance.

A matrix that summarizes the evaluation of alternatives is presented in Appendix B and an aerial view of each alternative is presented in Appendix C.

61ST AVENUE ALIGNMENT

Two options were evaluated along 61st Avenue to avoid impacts to the 80-acre Hudson Farm:

Tunnel

This option would avoid a direct use of the Hudson Farm by putting the freeway into a 2,600-foot-long tunnel under the entire 80-acre property (see Appendix C-2). Major considerations and impacts of this option include:

- The geology in the area includes undifferentiated Alluvium and Older Alluvium. Tunneling through the alluvium involves some inherent risks because any loss of ground or overexcavation in the tunnel can lead to ground movements, surface settlement, and possible damage to surface facilities. This may require specialized tunnel equipment to avoid such damage.
- Most of the tunneling would be below the groundwater table, which is between 9 and 40 feet in this area. This would require positive groundwater control to avoid loss of ground and surface settlement during construction. Specialized tunnel machines that are sealed to preclude groundwater inflows can be used. After construction is complete, pump stations would be required for groundwater and on-site drainage.
- Based on the area and soil conditions, the tunnel construction would most likely be accomplished using a cut-and-cover process. This would require a temporary Section 4(f) use but would allow the farm fields to be reestablished after construction.
- A tunnel would introduce concerns related to hazardous materials, ventilation, incident management, drainage (pump stations), long-term maintenance, and more.
- This option would only include a half-diamond traffic interchange serving traffic to and from the north at Dobbins Road.
- This option would displace five residential properties.
- The major items for a cut-and-cover tunnel would include the excavation for and construction of pavement, retaining walls, and roof structure. For a 2,600-foot long tunnel including safety features, ventilation, and pump station the total cost would be approximately $300 million.
- The study schedule would be delayed by 4 to 6 months to allow for additional studies along the new alignment.

Bridge

This option would avoid a direct use of the Hudson Farm by putting the freeway on a bridge that completely spans the entire 80-acre property (see Appendix C-3). Major considerations and impacts of this option include:

- The 2,600-foot-long bridge span would require an extravagant bridge type such as arch, cable-stay, or suspension so that no bridge piers or supports would be located within the Hudson Farm property. Similar span lengths in the U.S. are present on the Robert F. Kennedy Bridge in New York City and the St. Johns Bridge in Portland, Oregon. The recently completed Mike O'Callaghan-Pat Tillman Memorial Bridge at the Hoover Dam is 1,000 feet long.
- To provide the 2,600-foot-long span, a much longer overall bridge (likely with three total spans) would be required to allow for back anchorages and/or dead load balancing.
- The size and height of the bridge would result in a significant visual impact on the surrounding area including the Section 4(f) resources being avoided and would likely constitute a constructive use of the resource (for more information, see text regarding air rights and Section 4(f) in Appendix A).
- This option would only include a half-diamond traffic interchange serving traffic to and from the north at Dobbins Road.

- This option would displace five residential properties.
- The study schedule would be delayed by 4 to 6 months to allow for additional studies along the new alignment.
- Based on reviews of recently completed long-span bridges in the U.S., something similar in this location would cost $1,000 or more per square-foot or a total of approximately $600 million.

63RD AVENUE ALIGNMENT

This option would avoid direct use of the Hudson Farm by shifting the freeway alignment just west of the entire 80-acre property and just west of the Barnes Dairy Barn near the 63rd Avenue alignment (see Appendix C-4). Major considerations and impacts of this option include:

- This option was identified as the preferred avoidance alternative in 2005 and has been studied extensively. Updating the DEIS to incorporate the 63rd Avenue Alignment would take approximately 3 weeks.
- This option would directly impact the property zoned for uses such as a future hospital.
- This option would displace six residential properties; one more than the 61st Avenue Alignment.
- The total cost would be comparable to the 61st Avenue Alignment.
- The alternative was determined to be a feasible and prudent avoidance alternative as presented in versions of the Administrative DEIS as reviewed by ADOT and FHWA since 2005 (as referenced earlier in this memorandum).

62ND AVENUE ALIGNMENT

The 62nd Avenue Alignment would be located such that it passes between the Hudson Farm and the property zoned for a future hospital, directly west of the Barnes Dairy Barn (see Appendix C-9 for a close-up view of the typical freeway proximity to the Barnes Dairy Barn). The variations of this option are based on the freeway profile (elevated or semi-depressed) as it crosses Dobbins Road and the interchange type at Dobbins Road. The interchange options under consideration include a half interchange and a collapsed-diamond interchange. Major considerations and impacts of any of the options or variations to the options include:

- The study schedule would be delayed by 6 weeks to allow for additional studies along the new alignment. More detailed traffic operational analysis would need to be completed to support the assumption that these option would function at acceptable levels of service.
- Additional coordination with the City of Phoenix and surrounding community may be required due to change in alignment and freeway elevation (from semi-depressed to elevated) through the Laveen Village core.
- This alignment would displace six residential properties; one more than the 61st Avenue Alignment.

Half-diamond interchange with elevated freeway at Dobbins Road

This option would include a half-diamond interchange (to and from the north) connecting at Dobbins Road (see Appendix C-5). Major considerations and impacts of this option include:

- The implementation of a half-diamond interchange at Dobbins Road may not be acceptable to the City of Phoenix because this area is envisioned as the commercial core for the Laveen Village.
- Typically half-diamond interchanges are not desirable due to driver expectancy and other operational issues.

- Traffic going to or coming from the south would not be able to exit or enter the South Mountain Freeway at Dobbins Road. That traffic would be shifted to Elliot Road or Baseline Road.
- The current access to the Barnes Dairy Barn would remain the same because Dobbins Road would remain at its existing grade.
- The freeway would be elevated on a bridge structure as it passes just west of Barnes Dairy Barn.

Half-diamond interchange with semi-depressed freeway at Dobbins Road

This option would include a half-diamond interchange (to and from the north) connecting at Dobbins Road (see Appendix C-6). Major considerations and impacts of this option include:

- The implementation of a half-diamond interchange at Dobbins Road may not be acceptable to the City of Phoenix because this area is envisioned as the commercial core for the Laveen Village.
- Typically half-diamond interchanges are not desirable due to driver expectancy and other operational issues.
- Traffic going to or coming from the south would not be able to exit or enter the South Mountain Freeway at Dobbins Road. That traffic would be shifted to Elliot Road or Baseline Road.
- The current access to the Barnes Dairy Barn would be modified because Dobbins Road would be reconstructed (elevated) to go over the freeway.
- The freeway would be depressed approximately 15 feet as it passes just west of Barnes Dairy Barn. The construction of the freeway would require retaining walls near Barnes Dairy Barn to minimize excavation near the barn.

Collapsed diamond interchange with elevated freeway at Dobbins Road

This option would include a collapsed-diamond interchange connecting at Dobbins Road (see Appendix C-7). Traveling north, the exit ramp would cross under the freeway to the west side and then connect to Dobbins Road side-by-side to the southbound entrance ramp. Similarly, the southbound exit ramp would cross under the freeway to the east side and connect to Dobbins Road side-by-side to the northbound entrance ramp. Major considerations and impacts of this option include:

- Although this interchange design is used in the region, this would be the only location along the South Mountain Freeway.
- The overall cost would be approximately $10 million greater than the 61st Avenue Alignment due to the additional bridge structures over the northbound and southbound exit ramps.

Collapsed diamond interchange with semi-depressed freeway at Dobbins Road

This option would include a collapsed-diamond interchange connecting at Dobbins Road (see Appendix C-8). Traveling north, the exit ramp would cross over the freeway to the west side and then connect to Dobbins Road side-by-side to the southbound entrance ramp. Similarly, the southbound exit ramp would cross over the freeway to the east side and connect to Dobbins Road side-by-side to the northbound entrance ramp. Major considerations and impacts of this option include:

- The atypical design may not be conducive to the village core concept. Although this interchange design is used in the region, this would be the only location along the South Mountain Freeway.
- The current access to the Barnes Dairy Barn would be modified because Dobbins Road would be reconstructed (elevated) to go over the freeway.
- The freeway would be depressed approximately 15 feet as it passes just west of Barnes Dairy Barn. The construction of the freeway would require retaining walls near Barnes Dairy Barn to minimize excavation near the barn.
- The overall cost would be approximately $20 million greater than the 61st Avenue Alignment due to the additional ramp bridge structures over the freeway main line.

Appendix A – Excerpt from FHWA Section 4(f) Policy Paper

Federal Highway Administration
Office of Planning, Environment and Realty
Project Development and Environmental Review
March 1, 2005
Accessed from http://environment.fhwa.dot.gov/4f/4fpolicy.asp#1

Section 4(f) Applicability

3. Historic Sites

Question B: Does Section 4(f) apply when there is an adverse effect determination under the regulations implementing Section 106 of the National Historic Preservation Act (NHPA) (36 C.F.R. 800.5)?

Answer B: FHWA's determination of adverse effect under 36 C.F.R. 800.5 (www.achp.gov/work106.html) does not mean that Section 4(f) automatically applies, nor should it be presumed that the lack of an adverse effect finding (no historic properties adversely affected) means that Section 4(f) will not apply. When a project permanently incorporates land of an historic site, with or without an adverse affect, Section 4(f) applies. However, if a project does not physically take (permanently incorporate) historic property but causes an adverse effect, one must assess the proximity impacts of the project in terms of the potential for "constructive use" (see also Question 1 B). This analysis must determine if the proximity impact(s) will substantially impair the features or attributes that contribute to the National Register eligibility of the historic site or district. If there is no substantial impairment, notwithstanding an adverse effect determination, there is no constructive use and Section 4(f) requirements do not apply. Substantial impairment should be determined in consultation with the SHPO and/or THPO and thoroughly documented in the project record. The determination of Section 4(f) applicability is ultimately FHWA's decision.

As an example of a situation in which there is a Section 106 adverse effect but no Section 4(f) use, consider a transportation enhancement project where an abandoned National Register listed bus station will be rehabilitated. Rehabilitation for public use will require consistency with the American with Disabilities Act (ADA). The incorporation of ramps or an elevator will meet the definition of an adverse effect, however, there is no permanent incorporation of land into a transportation facility and all parties agree that the rehabilitation will not substantially impair the property. Therefore, Section 4(f) would not apply.

An example of a Section 4(f) use without a Section 106 adverse effect involves a project on existing alignment, which proposes minor improvements at an intersection. To widen the roadway sufficiently, a small amount of property from an adjacent Section 106 property will be acquired, but the significance of the Section 106 resource is such that the SHPO concurs in FHWA's determination of no adverse effect. However, the use of the property will permanently incorporate property of the historic site into a transportation facility and Section 4(f) will apply. This project situation may be evaluated using the Nationwide Section 4(f) Evaluation and Approval for Federally-Aided Highway Projects with Minor Involvements with Historic Sites, as long as the class of action is not an EIS.

19. Tunneling

Question: Is tunneling under a publicly owned public park, recreation area, wildlife or waterfowl refuge, or historic site subject to the requirements of Section 4(f)?

Answer: Section 4(f) would apply only if the tunneling:

- Disturbs any archaeological sites on or eligible for the National Register of Historic Places which warrant preservation in place, or
- Causes disruption which would permanently harm the purposes for which the park, recreation, wildlife or waterfowl refuge was established, or
- Substantially impairs the historic values of the historic site.

21. Air Rights

Question: Do the requirements of Section 4(f) apply to bridging over a publicly owned public park, recreation area, wildlife or waterfowl refuge, or historic site?

Answer: Section 4(f) will apply if piers or other appurtenances are physically located in the park, recreation area, wildlife and waterfowl refuge, or significant historic property. Where the bridge will span the 4(f) resource entirely, the proximity impacts of the bridge on the 4(f) resource should evaluated to determine if the placement of the bridge will result in a constructive use (see Question 1 B).

Appendix B – Alternative Evaluation Matrix

Alignment		61st Avenue Alignment (current alternative)	61st Avenue		63rd Avenue Alignment	62nd Avenue Alignment			
			Tunnel	Bridge		Half-diamond interchange		Collapsed diamond interchange	
						Elevated freeway	Semi-depressed freeway	Elevated freeway	Semi-depressed freeway
Crossing of Dobbins Road		semi-depressed underpass	tunnel under	bridge overpass	semi-depressed underpass	bridge overpass	semi-depressed;	bridge overpass	semi-depressed;
Dobbins Road interchange		Full access (diamond)	half; to and from the north	half; to and from the north	Full access (diamond)	half; to and from the north	half; to and from the north	Full access (collapsed diamond)	Full access (collapsed diamond)
Hudson Farm[a]	Section 106 effects	Adverse effects	No adverse effect	Adverse effect	No effect	No effect	No effect	No effect	No effect
	Section 4(f) use	Direct use of land, avoids house and other structures	Temporary direct use; no constructive use	No direct use; potential constructive use	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;
Barnes Dairy Barn[a]	Section 106 effects	No adverse effect	No adverse effect	No adverse effect	No adverse effect	No adverse effect	No adverse effect	No adverse effect	No adverse effect
	Section 4(f) use	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;
Hackin Farmstead[a]	Section 106 effects	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
	Section 4(f) use	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;	No direct or constructive use;
Impacts to land zoned for uses like a hospital		None	None	None	Acquisition of land (all 43 acres)	Acquisition of land (3 acres of 43 acres)	Acquisition of land (3 acres of 43 acres)	Acquisition of land (1 acre of 43 acres)	Acquisition of land (1 acre of 43 acres)
Residential displacements		5	5	5	6	6	6	6	6
Schedule impact		Not applicable	4-6 months	4-6 months	3 weeks	6 weeks	6 weeks	6 weeks	6 weeks
Cost		Base	Base + $300 million	Base + $600 million	Base	Base	Base	Base + $10 million	Base + $20 million
Viability		Low Cons: impacts a Section 4(f) resource	Low Cons: half access, cost	Low Cons: half access, cost; constructive use of Hudson Farm	Medium Pros: No Section 4(f) issues; full access; semi-depressed Cons: impacts land zoned for hospital	Low Pros: Avoids Hudson Farm; limited hospital impacts; Cons: half-access	Low Pros: Avoids Hudson Farm; limited hospital impacts; semi-depressed Cons: half-access; limits access to Barnes Dairy Barn	High Pros: Avoids Hudson Farm; limited hospital impacts; full access	Medium Pros: Avoids Hudson Farm; limited hospital impacts; full access; semi-depressed Cons: higher cost than other 62nd Avenue options; limits access to Barnes Dairy Barn
Notes: [a] All determinations of effect under Section 106 or use under Section 4(f) are preliminary and require further consultation with the SHPO and other parties.									