

# South Mountain Transportation Corridor Study



## Technical Memorandum Summary E1 Alternative Initial Screening Profile Options Along Pecos Road Section

### INTRODUCTION

#### *E1 Alternative Description*

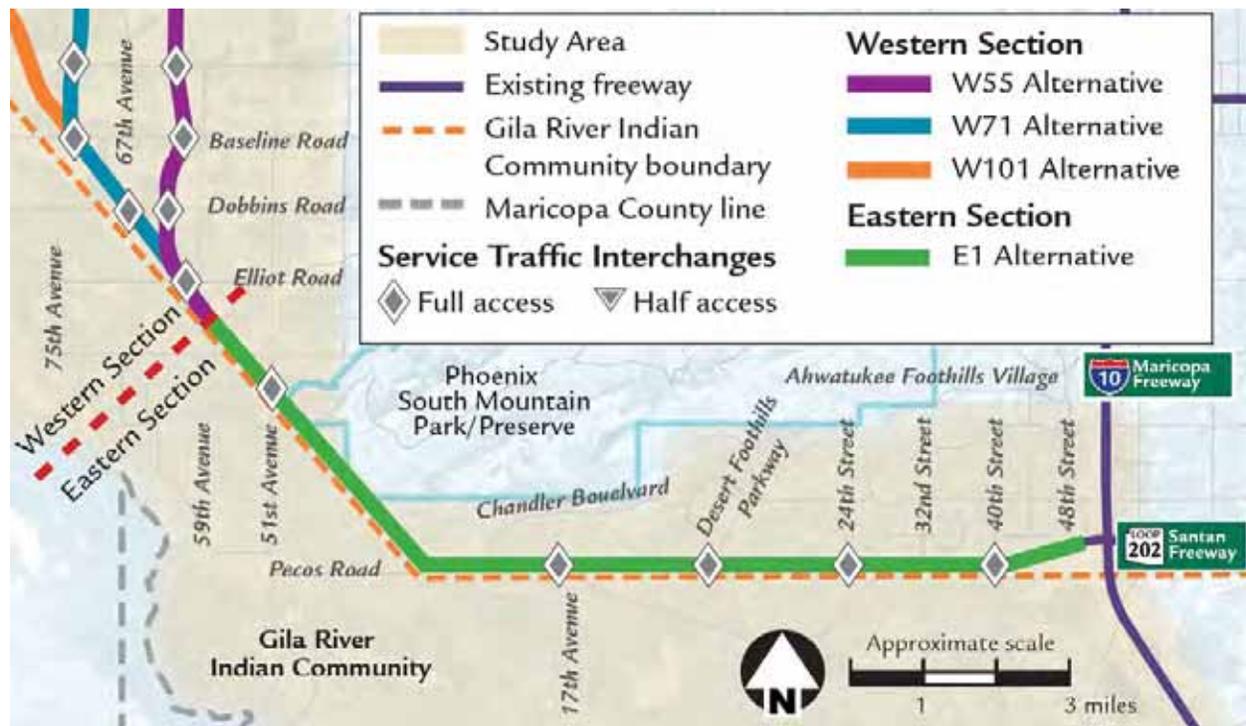
The E1 Alternative, shown in Figure 1, is currently the only action alternative being considered in the Eastern Section. In general, it would:

- connect the existing I-10/Loop 202/Pecos Road system traffic interchange in the east to the action alternatives in the Western Section.
- proceed west, replacing Pecos Road (through the southern edge of Ahwatukee Foothills Village), then diagonally through Phoenix South Mountain Park/Preserve (adjacent to the Gila River Indian Community).

#### *Memorandum Purpose*

Alternative profile designs for the E1 Alternative along the east-west portion of the alignment were studied to determine what impacts would result if the freeway were aboveground or went below ground. This technical memorandum summary presents existing conditions and the future conditions with the freeway aboveground or belowground. The evaluation presents impacts on the natural environment and adjacent residential areas, as well as presents preliminary cost estimates for each profile option.

**Figure 1. Proposed Alignment**



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### EXISTING CONDITIONS

#### *Description*

Currently, Pecos Road connects to I-10 and Loop 202 (Santan Freeway) on the east and continues west along the southern edge of Ahwatukee Foothills Village just north of the Gila River Indian Community boundary. Figure 2 displays the typical roadway-development context along Pecos Road. It is a 4-lane road with a divided, landscaped median. South of Pecos Road, there is a 100-foot major utility corridor that contains SRP overhead power lines. In most locations, there is undeveloped land between Pecos Road and the residential developments to the north.

Figure 2. Existing Conditions along Pecos Road



The undeveloped land is generally disturbed bare ground, varying in width. Almost all of the area north of the undeveloped land is fully developed with residential neighborhoods. The exception is between 17<sup>th</sup> Avenue and Chandler Boulevard, where the Arizona State Land Department owns a large undisturbed land parcel.

Pecos Road's profile generally follows the existing grade and has at-grade intersections with 40<sup>th</sup> Street, 32<sup>nd</sup> Street, 24<sup>th</sup> Street, Desert Foothills Parkway, 17<sup>th</sup> Avenue, and Chandler Boulevard. Between 24<sup>th</sup> Street and 17<sup>th</sup> Avenue, Pecos Road cuts through the South Mountains foothills.

#### *Design Elements*

##### Drainage

The City of Phoenix requires that major arterials be designed so that one 12-foot lane in each direction is free of runoff during a 2-year storm. The existing roadway uses the adjacent undeveloped land north of Pecos Road for retention and both drainage channels and natural washes to convey water to a series of culverts that carry the water under the roadway. In all, there are 35 culverts along Pecos Road in the following locations:

- 1 culvert is located between I-10 and 40<sup>th</sup> Street
- 1 culvert is located between 40<sup>th</sup> Street and 32<sup>nd</sup> Street
- 4 culverts are located between 32<sup>nd</sup> Street and 24<sup>th</sup> Street
- 5 culverts are located between 24<sup>th</sup> Street and Desert Foothills Parkway
- 9 culverts are located between Desert Foothills Parkway and 17<sup>th</sup> Avenue
- 15 culverts are located between 17<sup>th</sup> Avenue and Chandler Boulevard

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South of Pecos Road, there are spreader basins within the utility corridor that turn the concentrated flow coming from the culverts into sheet flow prior to the water crossing the Community boundary. The conversion to sheet flow is done to reduce the impact on Community land.

During heavy storms, water pools upstream of the major culverts, usually in fields or undeveloped land located along Pecos Road. The major constraint of the current system is the amount of water allowed to flow into the Community. Without additional water conveyance improvements on Community land, the flow from north of Pecos Road would not be allowed to increase.

### Transportation Use

Pecos Road serves as a major east-west arterial within the local grid system serving the southern portion of Ahwatukee Foothills Village. At the present time, it provides the lone access road to developments west of 17<sup>th</sup> Avenue.

## **FUTURE CONDITIONS: FREEWAY ABOVE EXISTING GROUND**

### *Description*

For the Freeway Above Existing Ground Option, the profile would be as close as possible to the existing grade except where it crosses major drainage structures and major arterial streets. At these locations, the profile would rise above the existing ground by as much as 30 feet.

To construct the freeway main line and service traffic interchanges, Pecos Road would be removed and all of the adjacent undeveloped land would be used. In some areas, the freeway would encroach on existing residential areas to the north. The freeway would not encroach on the existing utility corridor (relocation of the SRP overhead power line was reviewed and determined to not be prudent). The typical section includes the ultimate ten-lane freeway with standard cut and fill slopes and a parallel drainage channel located north of the freeway lanes.

### *Design Elements*

#### Drainage

For aboveground portions of freeways, ADOT requires that the freeway infrastructure be designed to convey a 50-year storm for runoff upstream of the freeway (off-site) and for a 10-year storm for runoff within the freeway right-of-way (on site).

For the Freeway Above Existing Ground Option, the drainage plan would collect off-site flow in a parallel drainage 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. Storm drain pipes would be used to collect on-site water and move it to the existing culverts and spreader basins south of the freeway.

#### Utilities

The existing City of Phoenix right-of-way for Pecos Road has water, sewer and gas lines. . These utilities, mostly located beneath the existing pavement, would need to be relocated north of the freeway lanes

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within the drainage channel corridor. This is a typical ADOT action that would be conducted to provide easier access to the utilities after the freeway were constructed.

### Transportation Use

During construction, where possible, methods would be used to limit the impact to the current access and circulation provided by Pecos Road. Once complete, the freeway would be connected to the street network by providing access points at major arterials (currently planned for at 40<sup>th</sup> Street, 24<sup>th</sup> Street, Desert Foothills Parkway, and 17<sup>th</sup> Avenue). Other arterials would be allowed either to pass under the freeway (32<sup>nd</sup> Street) or be cut off by the freeway (Chandler Boulevard).

### *Potential Impacts*

Distinguishing impacts associated with the Freeway Above Existing Ground Option are summarized in this section. The impacts presented would occur for the entire E1 Alternative, not just the portion that would run along Pecos Road.

### Displacements

The Freeway Above Existing Ground Option would potentially displace 317 residences, including existing single family, multifamily, and manufactured homes, as well as platted lots. The option would not displace any businesses.

### Cost

The Freeway Above Existing Ground Option (entire length, not just along Pecos Road) is estimated to cost \$810 million. The construction cost would be \$478 million, while the right-of-way cost would be \$332 million.

### Noise

Noise impacts would be mitigated based on FHWA's Noise Abatement Criteria and ADOT's Noise Abatement Policy. It is anticipated that noise barriers would be used along the Pecos Road section. The probable size and location of potential noise barriers would be evaluated during the EIS process.

## **FUTURE CONDITIONS: FREEWAY BELOW EXISTING GROUND**

### *Description*

For the Freeway Below Existing Ground Option, the profile would remain below the existing ground at a varying depth for almost the entire length between 40<sup>th</sup> Street and approximately 35<sup>th</sup> Avenue (west of Chandler Boulevard). Typical depths could be between 20 and 30 feet. Because of the South Mountains foothills located near Desert Foothills Parkway, the freeway would need to be above existing ground for approximately 1 mile to keep its cut slopes from crossing into the Gila River Indian Community. The freeway could remain below the existing ground through this area, but it would require the freeway to be shifted to the north adding a substantial number of additional impacts.

To construct the freeway main line and service interchanges, Pecos Road would be removed and all of the undeveloped land would be used. In some areas, the freeway would encroach on existing residential areas to the north. The freeway would not encroach on the existing utility corridor (relocation of the SRP

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overhead power line was reviewed and determined to not be prudent and feasible). The typical section includes the ultimate ten-lane freeway with standard cut and fill slopes.

### *Design Elements*

#### Retaining Walls

Retaining walls could be used north and south of the freeway lanes to reduce the width required by the side slopes of the freeway below existing grade.

#### Drainage

For a freeway belowground, ADOT requires that freeway infrastructure be designed to convey a 50-year storm for runoff upstream of the freeway and a 50-year storm for runoff within the freeway right-of-way. The requirements for on site water are increased for a freeway belowground because of an increased risk of flooding attributable to stormwater needing to be pumped out of the freeway belowground section.

To develop the design for the Freeway Below Existing Ground Option, the team started with what ADOT considers a typical drainage plan including detention basins near major outflow areas and a parallel channel corridor north of the freeway lanes. Up to six pump stations would be located along the corridor, one at each major detention basin, and the flow of water would travel under the freeway lanes. Similar systems have been successfully applied to I-10 (Papago Freeway) and Loop 202 (Santan Freeway). Detention basins are necessary because the amount of water to be conveyed would be greater for the Freeway Below Existing Ground Option and the number of crossings would be reduced, while the rate of water flow of the individual crossing must remain the same.

The location and size of the proposed detention basins are:

- 26-acre detention basin located north of the freeway and east of 40<sup>th</sup> Street
- 26-acre detention basin located north of the freeway between the 40<sup>th</sup> Street park and ride lot and Kyrene de Los Lagos Elementary School
- 10-acre detention basin located north of the freeway between 32<sup>nd</sup> Street and an existing channel
- 23-acre detention basin located north of the freeway just east of 24<sup>th</sup> Street
- 20-acre detention basin located north of the freeway between Desert Foothills Parkway and 17<sup>th</sup> Avenue adjacent to existing golf course outfall
- 38-acre detention basin located north of the freeway between 17<sup>th</sup> Avenue and Chandler Boulevard

After assessing the "typical" design and the impacts it might generate, the team looked at other design features, or options, to try to reduce impacts of a belowground condition. Such options included using wider linear channels instead of detention basins, using underground storage cells instead of detention basins, using detention basins located well upstream of the freeway instead of adjacent to the freeway, and using overhead channels and flumes instead of pumping under the freeway.

The use of wider linear channels instead of detention basins was eliminated from consideration because schools located adjacent to the freeway between 40<sup>th</sup> Street and 24<sup>th</sup> Street would be adversely affected by

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wider linear channels. As possible, the detention basins west of Desert Foothills Parkway would generally be long and narrow.

Incorporating underground storage cells resulted in a reduction of the size of the detention basins. It was not possible to totally eliminate the need for detention basins. Maintenance would be complicated because the depth and length of the cells would make it difficult to gain access to the facilities for cleaning and general maintenance, and the enclosed areas would be governed by “confined space” regulations requiring air tanks for any maintenance personnel entering the cells. Provisions for allowing a bobcat-type machine to enter the cells would need to be incorporated into the design. Liability and security issues would arise from the possibility of humans and wildlife entering the culverts. Reductions in the number and size of detention basins would reduce right-of-way cost and residential displacements. However, the construction and maintenance cost of the underground storage cells would be greater than savings from the reduced right-of-way. Additional cost, maintenance, and safety issues make this option undesirable.

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 would continue to be an option if found to be more suitable later in the design process.

Another option for passing runoff across the freeway would be to build channels (similar to an open canal) or flumes (multiple smaller pipes) to carry water over the freeway. A benefit of this system would be that maintenance would be much easier than a system that has the water going below the freeway. A channel would require a structure similar to a bridge at each crossing location. The freeway would need to be lower to allow for the required vertical clearance under structures. Flumes would be located at each existing crossing location instead of at concentrated areas. As with the channel, the freeway would need to be lower to allow for the required vertical clearance under the conveyance system. It is not anticipated that this option would reduce the size of the detention basins or remove the need for pump stations or retaining walls, and it would increase the depth of the freeway; therefore, this option was not carried forward for further study.

### Utilities

The existing City of Phoenix right-of-way for Pecos Road has water, sewer and gas lines. . These utilities, mostly located beneath the existing pavement, would need to be relocated north of the freeway lanes within the drainage channel corridor. This is a typical ADOT action that would be conducted to provide easier access to the utilities after the freeway were constructed.

### Transportation Use

During construction, where possible, methods would be used to limit the impact to the current access and circulation provided by Pecos Road. Once complete, the freeway would be connected to the street network by providing access points at major arterials (currently planned for at 40<sup>th</sup> Street, 24<sup>th</sup> Street, Desert Foothills Parkway, and 17<sup>th</sup> Avenue). Other arterials would be allowed either to pass over the freeway (32<sup>nd</sup> Street) or be cut off by the freeway (Chandler Boulevard).

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### *Potential Impacts*

Distinguishing impacts associated with the Freeway Below Existing Ground Option are summarized in the following section. The impacts presented would occur for the entire E1 Alternative, not just the portion that would run along Pecos Road.

### Displacements

The Freeway Below Existing Ground Option would potentially displace 616 residences (299 more than the Freeway Above Existing Ground Option), including existing single family, multifamily, and manufactured homes as well as platted lots. The option would not displace any businesses.

The use of underground storage cells would reduce the number of residential displacements to 491, approximately 125 fewer homes when compared with the impacts of the typical drainage plan for the Freeway Below Existing Ground Alternative.

### Cost

The Freeway Below Existing Ground Alternative (entire length, not just along Pecos Road) is estimated to cost \$1.233 billion, which is \$423 million more than the Freeway Above Existing Ground Alternative. The construction cost would be \$517 million, while the right-of-way cost would be \$716 million.

The use of underground storage cells would increase the total estimated cost to \$1.261 billion. The construction cost would increase to \$758 million, while the right-of-way cost would decrease to \$503 million. The maintenance cost would be in addition to the construction cost presented.

### Noise

Noise impacts would be mitigated based on FHWA's Noise Abatement Criteria and ADOT's Noise Abatement Policy. It is anticipated that noise barriers would be used along the Pecos Road section. The probable size and location of potential noise barriers would be evaluated during the EIS process. It can be expected that the size and location of the noise barriers would be similar to those for the Freeway Above Existing Ground Alternative.

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### SUMMARY AND CONCLUSION

Distinguishing impacts associated with the two profile options for the E1 Alternative along the Pecos Road section are summarized in Table 1.

<b>Issue</b>	<b>Freeway Above Existing Ground Option</b>	<b>Freeway Below Existing Ground Option</b>	<b>Notes and Comments</b>
Residential Displacements	317	616 with base drainage plan; 491 with underground storage cells	Up to 150 additional acres would be required for the freeway belowground, displacing between 174 and 299 additional residences.
Cost	\$810 million	\$1.233 billion with basic drainage plan; \$1.261 billion with underground storage cells	The pump stations, detention basins, and possible underground storage cells associated with the Freeway Below Existing Ground Option would result in additional maintenance cost for the life of the facility.
Noise	Noise barriers would be used to mitigate impacts	Noise barriers would be used to mitigate impacts	The noise mitigation would be similar in nature for both profile options.

The most common comment received from members of the public regarding the profile options along the Pecos Road section was that the belowground options would reduce noise and visual impacts. In examining the effectiveness of reducing impacts through depressing the freeway, ADOT would be required to spend an additional \$400 million for construction and right-of-way, displace an additional 300 residences, maintain additional pump stations and detention basins for the life of the freeway, and would still have noise-related impacts requiring mitigation. Noise barriers associated with either profile option would alter the views from Ahwatukee Foothills Village looking south. The Freeway Below Existing Ground Option would not result in the outcome that the public commenters anticipate and would result in substantially greater cost and displacements; therefore, the option was eliminated from further study.