

## 4. DESIGN CONCEPT ALTERNATIVES

### 4.1 Introduction

The improvement of US 93 requires construction of two additional lanes to provide needed capacity and to improve the safety and operation of the highway through the design year 2025. Major goals for the improvement as outlined in Chapter 1 include utilizing the existing roadway to the maximum extent possible and minimizing the need for new right-of-way.

Widening US 93 to a 4-lane divided highway facility within the existing corridor is consistent with the major goals. The existing corridor already provides a direct route between the intersection with SR 89 and the Santa Maria River through level to moderate rolling terrain. Property adjacent to the highway is undeveloped, except for the residential development north of SR 89 between MP 191.0 to 193.5. For most of the route, only some isolated ranch turnouts and a few public roads intersect the existing highway. Lastly, the Arizona State Land Department (ASLD) owns most of the property adjacent to the highway.

Investigation of alternatives outside of the existing highway corridor was considered during the scoping phase, however, as just noted, keeping the improvements within the existing US 93 corridor accomplished many project goals established by the project stakeholders. Since there were no compelling reasons to relocate the highway in a new corridor, and since there were successful alternatives identified that accomplished all of the project objectives, no new corridors on completely new alignments outside of the existing corridor were considered. Other factors that influenced this decision include:

- A new corridor would not make use of the existing roadway, requiring significantly more new right-of-way.
- The existing roadway’s vertical and horizontal alignments primarily meet current standards. Where current standards are not met, upgrading the existing roadway would be more economical than constructing a new alignment.
- Maintaining the existing roadway for one direction of travel will reduce impacts on adjacent property, retain access to existing drives and turnouts, and will minimize environmental impacts.
- Constructing only two new lanes for one direction of travel will cost much less than fully constructing two roadway sections.

### 4.2 Study Zones

In order to systematically describe and analyze improvement alternatives along US 93, the study route was subdivided into three study zones based on features or conditions unique to each zone. Designations and limits of the three study zones are shown in **Table 4-1, US 93 Study Zones** and **Figure 4-1, Study Zones**.

The design concept alternatives are identified by alpha numeric designations associated with the three study zones. Concept alternatives used varying typical sections, and were evaluated by implementing the improvements on either side of the existing roadway. For these variations, the alternatives were assigned the following identifying names:

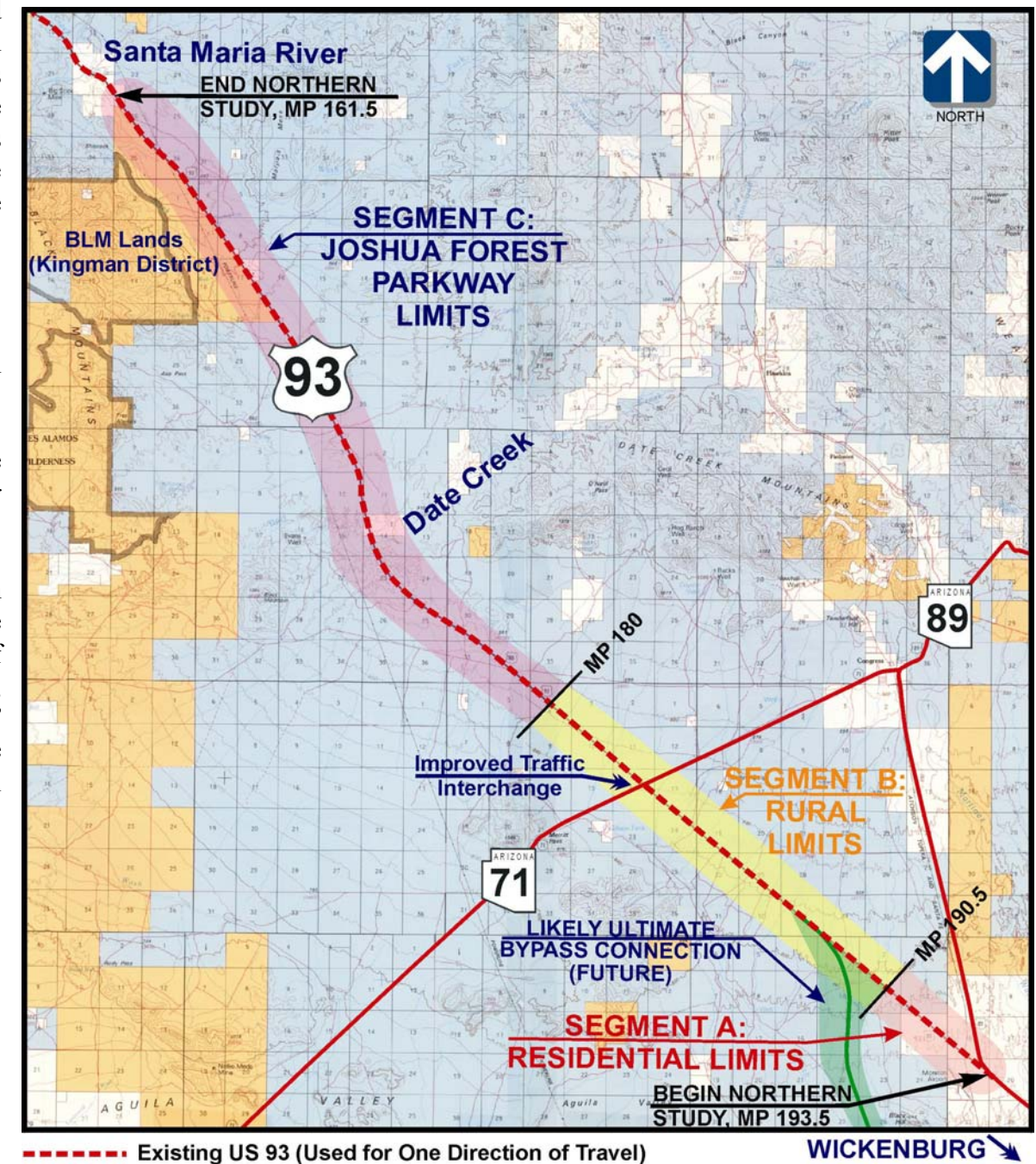
**Alternative A-1a**, where:

- A** The first capital letter identifies which Study Zone is being considered.
- 1** The first number corresponds to the type of typical section applied (either section 1, 2, or 3).
- a** The final letter corresponds to which side of the existing roadway the improvements were constructed. If they were improved on the west side, “a” was used. On the east side, “b” was used. If the improvements were constructed on both sides, no final suffix was provided.

**Table 4-1  
US 93 Study Zones**

Designation	Defining Characteristic	Milepost Location
A	Residential	193.5 – 190.5
B	Rural	190.5 – 180.0
C	Scenic	180.0 – 161.5

**Figure 4-1  
Study Zones**



### 4.3 Elimination of the Undivided Roadway Section– All Study Zones

A preliminary evaluation based on the project objectives established in Chapter 1 shows that widening the existing roadway and providing a paved median will not provide the desired improvement and should be dropped from further consideration:

- The narrow median does not provide an adequate recovery zone for out-of-control vehicles and would require a barrier to prevent crossover, head-on accidents.
- The rural character of the project area, with very little development, does not constrain the width of right-of-way to the existing width. Through much of the project the existing right-of-way width is adequate to allow construction of a divided highway without acquiring additional right-of-way. Through the portions of the project where additional right-of-way is required, the necessary widening of the right-of-way can be limited to just one side of the roadway. Costs of undeveloped, rural property for widened right-of-way will not be excessive and will not override the benefits of wider medians.
- Even through the residential area in Study Zone A, an undivided roadway section would be inconsistent to what the residents and the State desire south of the SR 89 intersection. From the future highway bypass to the north, through the SR 89 intersection area, and ultimately south to approximately Ricon Road, a divided roadway section is desired to provide some form of access control and retain the separation of opposing traffic.
- Traffic through the construction zones would be impacted significantly because widening construction would take place immediately adjacent to traffic. Separated roadways will ease construction, minimize traffic delays, and provide wider separation between traffic and construction forces, thereby making the divided roadway construction zone safer.
- The terrain is level to moderate rolling, which allows a wider roadway section without excessive increase in construction costs.
- An undivided roadway widening does not allow the flexibility to adjust the new roadway profile to help balance the project earthwork.
- Future expansion is not accommodated. Future widening would have to be done on the outside of the roadway rather than in the median, which would require reconstruction of intersections, frontage roads and drainage facilities.

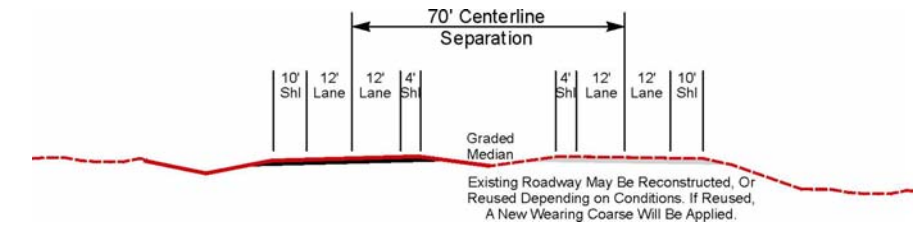
### 4.4 Alternative Typical Sections

The project study goals concur with what ADOT has been implementing across the State on major rural highways with heavy traffic volumes; a divided roadway section with two lanes in each direction is desirable when considering design, traffic, and construction benefits. This approach is also supported by the capacity information provided in Chapter 2, where the traffic projections, passing needs, and safety concerns all suggest that US 93 be widened to a 4-lane divided roadway section. The advantages to this type of roadway include:

- Providing a more natural appearance of a rural highway, especially through this scenic roadway corridor. Large medians retain the experience of driving one-way through the landscape with little concern for on-coming or even passing traffic. Undivided or narrow medians have the appearance of freeways and are not as pleasant for the driver or passenger to enjoy.
- Separation of opposing traffic for increased safety. Clear zones are maintained not only to the outside lanes, but to the inside as well.
- Independent alignments permit the new roadway section to be adjusted to best fit the landforms, thus minimizing earthwork and impacts on adjacent landscaping as well.
- Variation in the width of the separation between opposing roadways. This variation can result in desirable landscaping, scenic features, and unusual land forms being retained in the median by widening the separation. Conversely, impacts to adjacent private properties can be reduced through the residential developments by reducing the separation.
- Use of the existing roadway for one direction of travel, both during construction, and for the ultimate facility, reduces the construction costs.
- Building only one new roadway reduces the amount of R/W to purchase, and reduces the impacts to the environment as one side of the roadway remains untouched.

For these reasons, only divided roadway concepts were incorporated into the development of the design alternatives.

Three alternative typical sections were developed and considered for use in each of the three Study Zones. Descriptions and characteristics of each of the typical sections follow (See Appendix A for a larger size exhibit of all three typical sections):



#### Typical Section 1: Narrow Median (70-ft Centerline Separation)

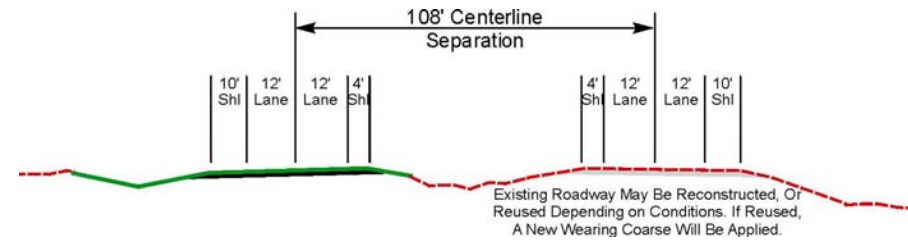
A 70-foot center-to-center separation of the roadway centerlines provides a 46-foot, graded median. This typical section is the minimum divided highway section to be used in rural areas (Section 304, ADOT Roadway Design Guidelines). This section should be used only where a wider separation has significant undesirable impacts.

##### Advantages of this section include:

- Requires the least amount of right-of-way for a divided highway.
- Results in the least impact on adjacent developed property for a divided highway.
- Provides adequate recovery area for out-of-control vehicles.
- Provides access control by separating opposing traffic and allowing access only at designated cross overs.
- Accommodates future expansion by providing room for added lanes in the median. If this should occur, it would require a median barrier to be installed between the two future lanes.

##### Disadvantages of this section include:

- Minimum opportunity for independent grades.
- No opportunity for retention of natural drainage features or vegetation in the median. The full width of the median is graded and has the appearance of a continuous ditch.
- Headlight glare from oncoming traffic is not screened as much as that provided by a wider median.
- Left turn bays are difficult to design. The roads are too close together to allow perpendicular storage of the turning vehicle in the median. As such, the opposing left turn bays are offset from each other, creating a large, paved median area, and no opportunities for trucks to make a U-Turn.



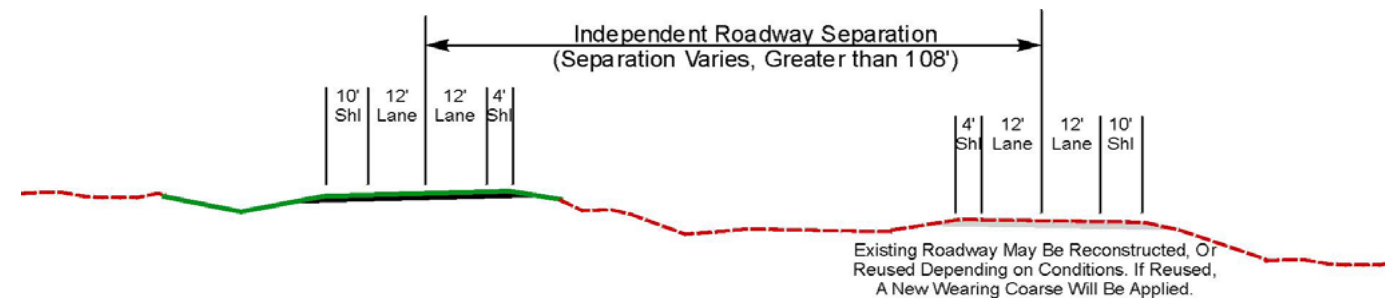
**Typical Section 2: Standard Divided Median (108-ft Centerline Separation).** A 108-foot center-to-center separation of the roadway centerlines provides an 84-foot median width. This typical section is designated by ADOT as the desirable, divided highway typical section to be used on rural roadways. This section is recommended where wider separation is feasible, and there is either existing or potential development likely adjacent to the highway.

**Advantages of this section include:**

- Provides a wide median recovery area for out-of-control vehicles.
- Accommodates future expansion without the need for median barrier.
- Allows a greater range of independent profile grades than a narrower median.
- Provides a landscape area in the median to improve aesthetics, especially on this project where the adjacent topography is not very abrupt and the profiles are rather flat.
- The impacts to the environment may actually be reduced from the narrow median as less ground disturbance may result if a natural median can be preserved.
- A standard left or inside turn bay can be provided adjacent to the inside lane, and still provide adequate storage in the median for a vehicle to stop in between the turn bays. With this design, even trucks can make a full turn.
- The wider median allows better flexibility with the drainage design than with a narrower median. Box culverts and pipes, for example, can open and daylight in the median with the roadways separated by this distance.

**Disadvantages of this section include:**

The only disadvantage with this typical section is that it requires more right-of-way than the minimum width, narrow typical section. However, in the rural, undeveloped areas that exist adjacent to the current highway, the additional new right-of-way that will be required is not considered significant, especially when the advantages of this section are compared to the narrow section.



**Typical Section 3: Variable Width, Divided Median (120-ft or more Centerline Separation).** With this typical section, the center-to-center separation of the roadway centerlines is so great that typically the two roadways are seen as completely independent roadways with a full, natural median located between them. This typical section is generally desired by many government land agencies through parks, forests, and scenic areas as to give the traveler the sense there is no opposing traffic, or any other obstructions for the other direction of travel. This section is recommended where wider separation is feasible, the cost for the R/W is not significant, and there is very little potential for development adjacent to the highway.

**Advantages of this section include:**

- Provides completely independent vertical and/or horizontal alignments to best fit the terrain. This results in savings in construction cost by providing a much better chance for a balanced earthwork design, and significantly reduced traffic control efforts.
- Independent alignments can be used to enhance aesthetic treatments such as improving views from the roadway or allowing natural vegetation to remain in the median. Existing features that would otherwise be in the way of the roadway can be avoided by simply going around them.
- Use of independent alignments will not significantly increase right-of-way cost or impact on adjacent property, especially if public agencies agree that there is a benefit to protecting the native vegetation and support providing the wider roadway easement or R/W.

**Disadvantages of this section include:**

The only disadvantage with this typical section is that it could result in significantly more right-of-way costs if the adjacent land is viewed as developable property. However, especially through the Joshua Forest Scenic Road, development is not likely adjacent to the current highway. Still, the land is managed by the ASLD, and the cost of the wider roadway section must be weighed against the benefits.

All of these typical sections meet the aforementioned goals for the improvement of US 93. The determination of which typical section is used will be based on an analysis of conditions throughout the length of the project.

## 4.5 Construction of Improvements to the East / West side of Existing US 93.

As discussed in Section 4.1, the existing roadway will be retained for one direction of travel. The determination of whether the new roadway should be constructed on the east or the west side of the existing roadway will depend on an analysis of conditions throughout the length of the project. Factors to be considered include the following:

- The best use of existing right-of-way.
- Minimize impact to existing improved properties adjacent to the highway, and those that could potentially be improved.
- Minimize environmental impacts.
- Minimize impacts on existing drainage facilities and natural drainage features, especially those that are parallel to the existing roadway and not necessary perpendicular to the roadway improvements.
- Enhancement of aesthetic treatment or preservation of natural features.
- Retaining the improvements on one side to avoid a construction/traffic control cross-over. Shifting the improvements from one side of the existing roadway to the other makes construction traffic control difficult; it could result in delays to the traffic and the contractor, and typically results in more difficult earthwork operations. If possible, these costs should be considered if the improvements shift from one side of US 93 to the other.

## 4.6 Study Zone A Alternatives

Study Zone A, MP 193.5 to MP 190.5, includes the SR 89 intersection, the Burlington Northern Santa Fe (B.N.S.F) Railroad crossing (known as the Matthie Railroad Overpass), the Vista Royale residential subdivision, other existing residential properties, and several county roads.

Terrain through Study Zone A is nearly level and there are no distinguishing natural features. Drainage channels adjacent to the existing corridor are minor and are similar on both sides of the existing highway. With most of the horizontal alignment located on the same tangent, the existing highway follows an excellent alignment.

### 4.6.1 Alternatives Identified – Study Zone A

Study Zone A begins at the intersection of US 93 and SR 89, two major highways that exist on the northern fringe of the Wickenburg developed area. There have been discussions with the ADOT Prescott District of potential development in this area that would necessitate the development of a full grade-separated traffic interchange for the intersection of these two major highways. However, development of such alternatives would require evaluation of improvements far south of this intersection, as well as improvements and possible relocations of SR 89 itself and realignment of many local roads. For the purposes of this study, it was concluded that any development in the area would keep US 93 on the same alignment as the existing highway section. None of the recommendations ultimately presented in this study will conflict with the future improvements as the crossing over the Matthie Railroad Overpass would be the same in any scenario. The Prescott District will initiate a separate design concept study to evaluate potential improvements to both the SR 89/US 93 intersection, and to continue the improvements to US 93 south from the intersection to the connection with the recently completed interim bypass improvements in Wickenburg that end just south of Rincon Road.

The following alternatives were identified to achieve the 4-lane divided roadway in Study Zone A:

**A-1a** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction on the west side of the existing roadway using a 46-foot median width.

**A-1b** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction on the east side of the existing roadway using a 46-foot median.

**A-2a** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction on the west side of the existing roadway using an 84-foot median width.

**A-2b** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction on the east side of the existing roadway using an 84-foot median width.

**A-3a** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction using a variable width median on the west side of the existing roadway, which allows development of independent alignments.

**A-3b** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction using a variable width median on the east side of the existing roadway, which allows development of independent alignments.

### 4.6.2 Alternatives Considered and Eliminated – Study Zone A

There are three factors through Study Zone A that influence the placement of the new 2-lane roadway on the west side of the existing roadway:

- Existing right-of-way is substantially wider on the west side of US 93 than on the east side (see **Table 4-2**). Construction of the new 2-lane roadway on the west side of US 93 will utilize the wider right-of-way and avoid having to acquire additional right-of-way.
- Existing residential development between MP 192.3 and MP 191.4 is located approximately 50-feet from the east right-of-way line and within 100-feet of the west right-of-way line. Construction of the new 2-lane roadway on the west side of US 93 will have less impact on the residential properties than construction on the east side.

- Through the residential development on the east side of US 93, there are several turnouts serving individual residences that create conflicts between turning traffic and through traffic. A frontage road will be considered to collect traffic from the multiple residential properties and connect them to US 93 at local road intersections. If the new 2-lane roadway were constructed on the east side of US 93, the right-of-way would have to be widened which would require acquisition of several properties including residences, to construct both the new US 93 roadway and the frontage road. Construction of the new 2-lane roadway on the west side of US 93 will reduce the amount of right-of-way required on the west side since only the frontage road will have to be constructed on that side.

Based on the above factors, it is proposed that the existing roadway will be used for the northbound roadway and a new 2-lane southbound roadway will be constructed on the west side of the existing roadway through Study Zone A. This will minimize impact on existing residential properties along the highway. Therefore, alternatives **A-1b**, **A-2b** and **A-3b** were eliminated from further consideration.

**Table 4-2**  
Existing Right-of-Way Width

US 93 Mile Post	West Side	East Side
MP 193.5 (Begin Project) to MP 193.25	200 ft.	100 ft.
MP 193.25 to MP 191.4	150 ft.	100 ft.
MP 191.4 to MP 183.2	250 ft.	150 ft.
MP 183.2 to MP 183.08	250 ft.	200 ft.
MP 183.08 to MP 182.8	Variable (SR 71 TI)	Variable (SR 71 TI)
MP182.8 to MP 179.2	200 ft.	200 ft.
MP 179.2 to MP 177.7	100 ft.	100 ft.
MP 177.7 to MP 174.0	200 ft.	200 ft.
MP 174.0 to MP 161.9	100 ft.	100 ft.
MP 161.9 to MP161.5	Varies 208 ft. min. to 335 ft. max.	
MP161.9 to MP 161.7		100 ft.
MP 161.7 to MP 161.5		Varies 150 ft. min. to 262 ft. max.

**A-2a** The existing right-of-way on the west side of US 93 through the majority of study zone A is 150-foot wide. Construction

of an 84-foot median width will require substantially more right-of-way than the narrower median proposed with Alternative A-1a, especially from the existing residential development that is located along both sides of US 93 from MP 192.3 to MP 191.4. With so much development occurring within this segment, and since this roadway will not be part of the ultimate US 93 highway when the Wickenburg Bypass is eventually constructed, it does not appear necessary to construct such a wide median and cause so many damages to the adjacent properties. Therefore alternative **A-2a** was eliminated from further consideration.

**A-3a** A variable width median can be justified where an independent alignment would be a better fit to the existing terrain resulting in savings in construction cost, or where scenic features can be preserved or enhanced by using independent alignments. Neither of those conditions exists in study zone A. Independent alignments would require additional right-of-way and would adversely impact existing residential properties. Therefore alternative **A-3a** was eliminated from further consideration.

## 4.7 Study Zone B Alternatives

Study Zone B (MP 190.5 to MP 180.0) includes the SR 71 traffic interchange. Nearly all of the property adjacent to the highway is managed by the ASLD.

Like Study Zone A, the terrain through Study Zone B is nearly level and there are no distinguishing natural features. The existing US 93 horizontal alignment throughout this study zone is a single tangent roadway. The vertical alignment is nearly flat, with a maximum gradient of 1.25%. Drainage channels are minor and are similar on both sides of the existing highway. All drainage flows are crossing the roadway from the north to the south, and are nearly perpendicular to the highway.

Throughout this study zone, the existing right-of-way is wider on the west side than the east side, up to the SR 71 traffic interchange (TI) located at MP 183.08 (see **Table 4-2**). The right-of-way is the same width on both sides of existing US 93 from the northerly side of the SR 71 TI at MP 182.8 to the end of Study Zone B at MP 180.0. While the R/W is symmetrical about the existing centerline north of the TI, the R/W fence on the east side of the existing roadway was constructed at a 100-ft offset.

There are no significantly developed areas on either side of US 93 through Study Zone B. There is private property and development at the TI on both the east and west sides of the highway.

### 4.7.1 Alternatives Identified – Study Zone B

**B-1a** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction on the west side of the existing roadway using a 46-foot median width.

**B-1b** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction on the east side of the existing roadway using a 46-foot median width.

**B-2a** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction on the west side of the existing roadway using an 84-foot median width.

**B-2b** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction on the east side of the existing roadway using an 84-foot median width.

**B-3a** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction using a variable width median on the west side of the existing roadway, which allows development of independent alignments.

**B-3b** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction using a variable width median on the east side of the existing roadway, which allows development of independent alignments.

### 4.7.2 Alternatives Considered and Eliminated – Study Zone B

The existing right-of-way continues to be wider on the west side of existing US 93 than on the east side through most of this study zone. There is virtually no development on either side of US 93 and the topography and vegetation through this study zone are similar on both sides of the existing road.

Since there are no factors that override the advantages of maximizing the use of existing right-of-way, it is proposed that the existing roadway will be used for the northbound roadway and a new 2-lane southbound roadway will be constructed on the west side of the existing roadway through study zone B. Therefore, alternatives **B-1b**, **B-2b** and **B-3b** were eliminated from further consideration.

**B-1a** The existing right-of-way width through Study Zone B is at least 200-feet wide on the west side of US 93 and there is virtually no development along the highway. Therefore, the rationale for using the minimum divided highway section allowed does not apply through Study Zone B. A wider median can be constructed within existing right-of-way throughout the study zone. Alternative **B-1a**, which provided a narrow, minimum median, was eliminated from further consideration.

**B-3a** A variable width median can be justified where an independent alignment would be a better fit to the existing terrain resulting in savings in construction cost, or where scenic features can be preserved or enhanced by using independent alignments. Neither of those conditions exist in study zone B since the terrain is essentially level and there are no scenic features that would be enhanced by independent alignments. Independent alignments that increase the median width beyond the 84-foot median provided in alternative B-2a would require additional right-of-way. Therefore alternative **B-3a** was eliminated from further consideration.

## 4.8 Study Zone C Alternatives

Study Zone C (MP 180.0 to MP 161.5) begins at the southern boundary of the Joshua Forest Scenic Road and continues northerly, tying into the existing 4-lane divided highway just south of the Santa Maria River. US 93 is designated as the Joshua Forest Scenic Road for the entire length of study zone C. Scenic setbacks of 500-ft on both sides of the existing roadway were established by Transportation Board Resolution from approximately MP 178 to the Santa Maria River.

Alamo Lake Road and Date Creek Ranch Road are major roadway intersections within Study Zone C. Several primitive roads that serve undeveloped areas on both sides of US 93 also intersect the highway, as well as turnouts to a few private property parcels. Most of them are gated turnouts.

The existing right-of-way continues to be symmetrical about the existing centerline from the beginning of Study Zone C to MP 161.9, however the width varies from 200-feet to 100-feet each side of the existing highway centerline. From MP 161.9 to the end of Study Zone C the right-of-way width varies to accommodate the existing 4-lane divided roadway (see **Table 4-2**).

US 93 crosses several drainage channels within Study Zone C, two of which are major bridged washes. US 93 crosses Date Creek at MP 174.2 and Big Jim Wash at MP 165.54. In addition to these perpendicular crossings, there are several minor washes that either parallel the existing highway for a short distance, or cross the ultimate R/W at a flat skew.

Terrain through Study Zone C is rolling, and is similar on both sides of US 93 from the beginning of the study zone to approximately MP 173. From MP 173 to the end of the project, the terrain is more severe on the west side of the roadway than the east. The existing highway follows an excellent alignment that fits the rolling terrain well through the entire section.

Two WAPA transmission lines cross over US 93 at MP 163.3. The WAPA structure nearest the east side of US 93 is for a 345 kv line (the Mead-Liberty line) and is designated as tower 162-3. The parallel line, located east of the Mead-Liberty line is a 500kV, Mead-Perkins line.

### 4.8.1 Alternatives Identified – Study Zone C

For this study zone, only the standard median width and varying median width sections were considered as there was no benefit of considering the narrow median within the Joshua Forest Scenic Road.

- C-2a.** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction on the west side of the existing roadway using an 84-foot wide median.
- C-2b.** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction on the east side of the existing roadway using an 84-foot wide median.
- C-3a.** Provide a divided highway using the existing roadway as 2-lanes northbound and constructing a new 2-lane roadway for the southbound direction on the west side of the existing roadway using a variable width median.
- C-3b.** Provide a divided highway using the existing roadway as 2-lanes southbound and constructing a new 2-lane roadway for the northbound direction on the east side of the existing roadway using a variable width median.
- C-3.** Provide a divided highway with a variable width median, using the existing 2-lane roadway for one direction of travel and constructing a new 2-lane roadway for the opposite direction of travel. The new 2-lane roadway would be on the west side of the existing roadway at the beginning of Study Zone C to match the roadway section used in Study Zone B. The new 2-lane roadway will shift from the west side of the existing roadway to the east side where the terrain changes from level to rolling. Through the remainder of zone C, the location of the new roadway will vary with respect to the existing roadway to best fit the terrain.

### 4.8.2 Alternatives Considered and Eliminated – Study Zone C

Both alternatives C-2a and C-2b include a constant 84-foot wide median. Within the scenic roadway limits, there are visual elements that should be enhanced from the view of the vehicle occupants, as well as significant vegetation that should be preserved with a varying width median. The constant width median limits the ability to enhance the scenic aspects of the area and would not allow the retention of an appreciable amount of vegetation in the median. Therefore neither of these alternatives is acceptable. Both alternative **C-2a** and **C-2b** were eliminated from further consideration.

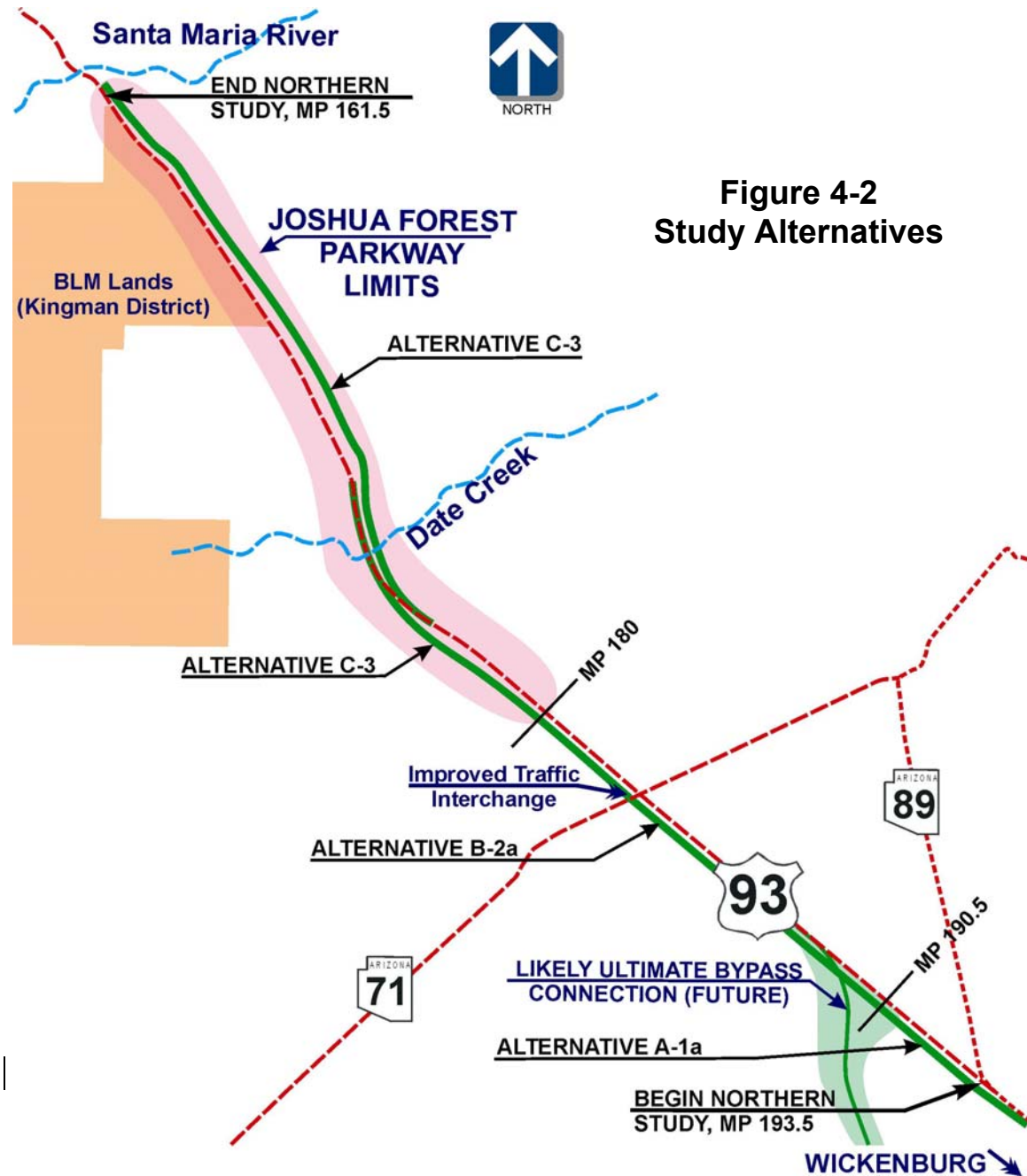
Alternatives C-3a and C-3b both maintain the new 2-lane roadway on one side of the existing 2-lane roadway through the length of the study zone; C-3a on the west side of the existing lanes, and C-3b on the east side of the existing lanes.

The existing right-of-way is symmetrical about the centerline of existing US 93 through the length of Study Zone C, so there is no advantage to maintaining the location of the new 2-lane roadway on one side or the other of the existing roadway.

Maintaining the location of the new 2-lane roadway on one side or the other of the existing roadway for the full length of Study Zone C, while desirable from a traffic control and constructability perspective, limits the ability of the new alignments to truly best fit the rolling terrain and to avoid the existing drainage features. The opportunities to enhance visual features and retain desirable vegetation through the length of Study Zone C are also limited if the new roadway is retained on one side of the existing roadway. Since alternative C-3 provides the needed flexibility in designing the new roadway, alternatives **C-3a** and **C-3b** were eliminated from further consideration.

## 4.9 Description of Alternatives

Each of the design concept alternatives shown in **Figure 4-2, Study Alternatives**, was developed in detail based on the project objectives outlined in Section 1.4.3 using the design controls stipulated in Section 5.2. A narrative description of each design concept alternative is presented below. Plan and profile sheets for the preferred alternatives are provided in Appendix D.



**Figure 4-2**  
**Study Alternatives**

### 4.9.1 Study Zone A Design Concept Alternative A-1a (MP 193.5 to MP 190.5) (Sta. 104+00 to Sta. 270+00)

Alternative A-1a begins at the Junction of US 93 and SR 89 and continues northerly along the existing US 93 alignment across the Matthe Railroad Overpass, ending just north (west) of existing residential development.

At the beginning of the project, existing US 93 is a divided 4-lane roadway with a 100-foot center-to-center roadway centerline separation. Immediately north of the SR 89 intersection, the existing southbound lane tapers into the northbound alignment and both northbound and southbound roadways taper from 2-lanes to 1-lane.

Alternative A-1a continues the divided roadway concept already developed at the intersection. The existing roadway will continue to be used for the northbound lanes. New southbound lanes will be constructed parallel to and west of the existing roadway. The roadway separation will be reduced from 100-feet to 70-feet to keep the new 2-lane roadway within the existing right-of-way. The transition from 100-feet to 70-feet will occur through the initial curve between the SR 89 intersection and the Matthe Railroad Overpass.

A new 2-lane B.N.S.F. overcrossing bridge will be constructed for the southbound lanes west of the existing bridge. The existing overpass will remain in place for the northbound roadway.

There are residential developments on both sides of US 93 beginning at approximately MP 192.3, just west of Moreton/Nine Irons Ranch Road. The residences on the east side are located quite close to the existing right-of-way line and have turnouts directly onto US 93. Vista Royale, a residential subdivision directly across US 93 on the west side, utilizes a single entrance for access to the highway. Through the residential developments to the end of Alternative A-1a, continuation of the 70-foot separation of the divided roadways is justified to

construct the new 2-lane roadway on the west side of the existing roadway within existing right-of-way.

Ultimately, all US 93 traffic will be relocated off of this section of road to use the ultimate Wickenburg Bypass that ties to existing US 93 near MP 191. However, it is expected that the bypass will not be constructed for 15-20 years. From the present time until the bypass is available, US 93 will continue to occupy the existing alignment between SR 89 and the future connection to the bypass alignment. Interim improvements to provide a 4-lane roadway on the existing US 93 alignment are necessary to provide a safe and efficient transportation facility until the ultimate bypass is completed. Partial access control will be included in improvements in Study Zone A. However, it is anticipated that the Wickenburg bypass will be complete by the time full access control is needed.

Partial access control will be achieved in this area by consolidating the many individual residence turnouts and county roads to use combined access crossovers at either end of this developed area, and one at the entrance to the Vista Royale subdivision. With the use of frontage roads on the east side, all access between MP 191.5 to 192.6 will be consolidated to better meet the requirements of providing partial access control in the area (See Chapter 7).

Detailed access would be implemented as follows:

- Retain the Quail Run intersection on the east side of US 93 at MP 192.6, and add a median crossover.
- A two-way frontage road will be constructed on the east side of US 93 from Quail Run (MP 192.6) to MP 191.5. Nine Irons Ranch Road and the eight existing residential turnouts will connect to the frontage road.
- The skewed intersection of US 93 and Moreton Road on the west side of US 93 at MP 192.4 will be realigned to provide a 90-degree right-in/right-out intersection, with no crossover.
- An at-grade intersection with median crossover will be constructed on the west side of US 93 at Caballero Drive (MP 192.1) to provide access to the Vista Royale subdivision.
- The gated emergency access to Vista Royale on the west side of US 93 at MP 191.5 will be realigned to a 90-degree turnout opposite the access to the frontage road on the east side of US 93. A median crossover will be provided.

North of MP 191.5, where currently there is no development, the roadway separation is maintained at the 70-ft centerline separation to maintain a uniform roadway appearance until the ultimate Wickenburg Bypass is constructed. When the bypass is finally developed, the current US 93 roadway is expected to be re-aligned beginning near MP 191, to curve towards the southwest and form an interchange with the new Bypass.

With the close proximity of the residences and the tight R/W restrictions, there is not much flexibility in the vertical design of the roadway. The profile is constrained by the existing road throughout in order to provide desirable crossover profiles and allow offsite drainage to pass through the corridor. While drainage and utilities must be adjusted to fit the new frontage roads, no major design issues exist that impact the alignment design.

**4.9.2 Study Zone B**  
**Design Concept Alternative B-2a**  
**(MP 190.5 to MP 180.0)**  
**(Sta. 270+00 to Sta. 620+00)**

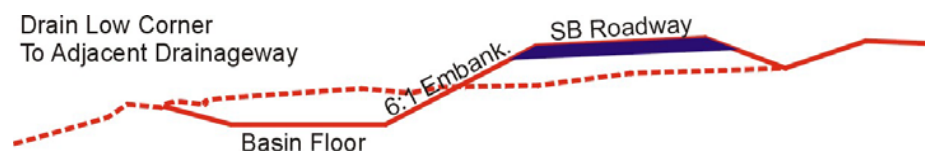
Alternative B-2a begins with a 70-foot separation between roadways, matching the improvements from Study Zone A. The roadway section will immediately transition to a wider, more desirable 108-foot separation, with the new 2-lane southbound roadway remaining on the west side of the existing roadway, to take full advantage of the existing R/W. The existing R/W on the west side of US 93 throughout this study zone will accommodate the wider median. The very fact that the existing roadway was located asymmetrically within the R/W and that there is ample room to build the improvements on the west side lends support to this roadway configuration.

The transition to the wider roadway will be accomplished using 0-degree, 15-minute reversing horizontal curves to complete the transition with little disruption to the driver. Aesthetically, the large radius curves and resulting shift in separation will also not be as noticeable to the passenger.

The 108-ft roadway separation will allow the new southbound roadway to be developed with an independent vertical profile. As most of the terrain is nearly flat, the only major vertical objective is to clear the many drainage culverts that cross under the existing roadway prism. The frequency of the culvert crossings, however, nearly forces the entire roadway embankment to be constructed on

embankment. Without any available excavated material, this could result in significant borrow costs for this segment of roadway.

To provide some embankment material, several added “basins” were excavated on the downstream (west) side of the new southbound roadway. These basins are large, shallow swales located between major drainage crossings that may provide enough embankment material to avoid hauling borrow for long distances. The basins will be designed as not to capture water, but to allow it to slowly gravity drain to an existing downstream drainageway. Seeding and relocating salvaged plants can mitigate the appearance of these basins. A cross section of this concept is shown in **Figure 4-3**.



**Figure 4-3: Embankment Excavation Basins**

The traffic interchange at the junction of US 93 and SR71 will be reconstructed to accommodate the 4-lane roadway on US 93, and to bring the interchange ramps to current standards. Initially, a new 2-lane overcrossing structure was considered for the new southbound lanes west of the existing bridge. The existing raised median will be removed from the existing bridge and the bridge rail will be brought to current standards. However, while this concept would be relatively easy to construct, it would require a significant amount of embankment material to raise southbound US 93 over SR 71. In addition, the existing vertical profile for the northbound roadway does not meet the proposed design speed. Therefore, it too would need to be reconstructed over SR 71. As there is very little excavation material available in this segment, most of this material would need to be hauled in as borrow.

An alternative to building US 93 over SR 71 is to reverse the grade-separation, and build SR 71 over US 93. With this concept, only 1/3 of the earthwork would be required to raise the minor cross highway over the US 93 mainline, reducing the construction costs considerably. Only one bridge structure, SR 71, would be necessary. The primary roadway would remain at grade, and have the greatest benefit of the vertical stopping sight distance. Lastly, the infield areas between the ramps and mainline could be depressed to form small retention basins to supply additional material for the mainline roadway embankment. The area does not experience significant rainfall, the soils are susceptible to percolation, and the water

captured by the basins could be used by the salvaged vegetation that can be planted within these areas to return the site to a more natural appearance.

Through the interchange area new right-of-way will be required along the four interchange ramps. The existing ramps do not provide adequate ingress and egress geometry for the higher speed roadway, and do not provide adequate intersection sight distance at the terminals with SR 71. The ramps proposed in the DCR concept plans have been established following the Roadway Design Guidelines, providing a maximum skew at the intersection with SR 71 of 10-degrees.

Full access control has been established through the interchange area on US 93. Access control along SR 71 will be modified to incorporate current requirements for access control at ramp terminals. Per the desires of ADOT’s Right-of-Way and Roadway Design Groups, access control will extend from the radius returns of the interchange to points at least 600-ft beyond the radius returns. This will require relocation of some of the existing access points into the properties adjacent to the interchange today.

North of the SR 71 interchange the terrain continues to be nearly level. The existing right-of-way width, unlike the right-of-way south of the TI, is now symmetrical about the existing roadway centerline, and 200-ft wide on both sides (see Table 4-2). The horizontal alignment of the existing roadway remains on a straight tangent from the SR 71 interchange to the end of Study Zone B at MP 180.0 and there are no significant differences between terrain or drainage features on either side of the highway. Therefore, there are no reasons to vary the alignment of the new 2-lane roadway from its location 108-feet west of the existing roadway within Study Zone B. The new 2-lane roadway can be constructed within existing right-of-way between the SR 71 interchange at approximately MP 182.8 and the end of Study Zone B at MP 180.0.

While there is adequate room to build the improvements within the existing right-of-way north of the TI, there is not as much flexibility in excavating additional material adjacent to the roadway to gain the material needed for the new roadway embankment section. The new profile will need to be designed to barely clear the drainage features to ensure there is adequate material to build the new embankment without significant borrow material being trucked in.

Minor access points through this segment of the project will be accommodated as described in Section 7.

### 4.9.3 Study Zone C

#### Design Concept Alternative C-3 (MP 180.0 to MP 161.5) (Sta. 620+00 to Sta. 1620+00)

Alternative C-3 begins as a continuation of the 108-foot centerline separation between roadways, with the existing roadway used for northbound travel and a new 2-lane southbound roadway constructed parallel to and on the west side of the existing roadway.

The beginning of this study zone corresponds with the southerly boundary of the Joshua Forest Scenic Road. As this scenic designation continues beyond the Santa Maria River, all of the improvements have been developed to protect this special highway designation.

The new 2-lane roadway on the west side of existing US 93 can be constructed within existing right-of-way between MP 180.0 and MP 179.2 where the existing right-of-way narrows to 100-feet on each side of the centerline of the existing roadway. Additional right-of-way will be required on the west side of the existing right-of-way for the new 2-lane roadway north of MP 179.2.

Alamo Road intersects US 93 on the west side at MP 178.6 and a primitive road intersects US 93 on the east side diagonally across from Alamo Road. Alamo Road will require minor realignment to provide a right angle intersection with the new US 93 roadway.

Following MP 178, the existing highway incorporates a gradual left turn. The new southbound roadway also incorporates a gradual 0-degree, 30-minute turn to the left, but also concurrently incorporates a transition to a wider roadway separation of 200-ft. This change was implemented to retain more native vegetation in the median as the density of Joshua trees increases.

Date Creek Ranch Road intersects US 93 on the east side at MP 177.4 and a primitive road intersects US 93 diagonally across from Date Creek Ranch Road. The primitive road on the west side of US 93 will require minor realignment to provide a single right angle intersection with the new US 93 roadway.

At approximately MP 176 the terrain gradually changes from nearly level to rolling. The natural vegetation continues to change with the density of Joshua Trees increasing along the roadway. Parallel to

and on either side of the existing roadway, existing drainage ravines appear that ultimately lead to Date Creek. Maintaining a constant centerline offset from the existing roadway would not allow the new southbound alignment to best fit the terrain. The southbound alignment, while similar to the existing northbound roadway, follows a ridge that exists between two drainage ravines, located approximately 200- to 300-feet west of the existing.

Date Creek, a major drainage channel, crosses the highway at approximately MP 174.2. The separation between the roadways will be increased to about 600-feet at MP 174, which allows both natural vegetation and the natural channel for Date Creek to be retained in the median. Another reason for the wider median is to build the new roadway on a single, continuous curve from MP 176 to 173, avoiding the “broken back” combination of smaller curves and a short tangent used on the existing roadway.

From approximately MP 173 northerly to the end of the project the terrain becomes more severe on the west side of existing US 93 than on the east side. Impacts on existing drainage channels are also reduced by constructing the new roadway on the east side of the existing roadway through this more severe terrain. Therefore, the alignment of the new roadway is shifted from the west side of the existing highway to the east side at approximately MP 173, which allows the vertical and horizontal alignment to better fit the terrain. This shift occurs such that the new southbound curve follows the foothills of the adjacent slopes west of the existing road to align with the existing highway near MP 173. At the section line near MP 173.25, the new northbound alignment departs from the existing alignment through a curve to be located parallel to and 200-ft east of the existing roadway. Making the shift at this location also avoids encroaching into private property and an air field located on the east side of the existing roadway south of MP 173.25.

Between MP 173 and MP 172, and generally up to MP 168, the northbound roadway alignment is similar to the existing, but the separation between roadways varies from a 200-ft minimum to 600-ft to retain large outcroppings of Joshua Trees and avoid natural drainage channels. Specifically at MP 172.5 and 169.7, the roadway was moved significantly to allow natural drainageways to remain in the median. The transitions were accomplished with large curves and gentle transitions to give the roadway a smooth appearance through the scenic roadway. The greater separation also shields the motorist from the opposing traffic, enhancing the driving experience through this reach of roadway.

From MP 168 northerly to MP 165, the separation between roadways is again reduced to 200-feet to minimize impact to the D.G. Ranch and crossings of both Hackberry Wash and Big Jim Wash. The 200-foot separation still retains natural vegetation in the median and allows the profiles to follow the landform through this area.

From MP 165.1 the separation between roadways again gradually increases to approximately 430-feet to align the new northbound roadway to pass between WAPA transmission towers near mid-span to avoid impacting the transmission line and maximize the clear distance between the roadway and towers on both sides of the roadway. Once past the WAPA towers, the separation between roadways reduces to 108-feet by MP 162.5.

As the improvements approach the Santa Maria River, a transition will be necessary to shift the improvements from the east side of the existing roadway, to the west side to match the recently completed roadway improvements beginning at MP 161.5. Transitions were investigated through the curves at MP 163 and at 161.5. The landform feature that helped make this selection was the drainage channel that crosses the existing roadway on a flat skew near MP 161.8. To best avoid this feature, the southbound transition from the existing 2-lane two-way roadway to the newly completed existing 2-lane, one-way roadway must occur between MP 161.5 and 161.9. This new transition would replace the reversing curves that currently transition the new southbound roadway to tie into the existing two-way roadway. Similarly, the new northbound roadway would parallel this new transition, keeping the two roadways 108-feet apart.

Access to three ranch properties along US 93 and to the network of primitive roads serving public and private land away from the highway will be accommodated initially and ultimately as described in Chapter 7, the Access Management Plan.

When full access control is implemented on US 93, a traffic interchange and access roads will be required to provide access between US 93 and both Alamo Road and Date Creek Ranch Road. The proposed location of the traffic interchange is MP 178.2. Other traffic interchanges and access roads are proposed at MP 171.2 and at MP 162.5 to provide access to the three ranch properties along US 93 and to the network of primitive roads serving public and private land away from the highway.

## 4.10 Evaluation of Alternatives

Each design concept alternatives developed was based upon the project objectives and evaluation factors described in Sections 1.4.3 and 1.4.4. The evaluation began first from a corridor perspective, considering if major shifts or changes to the existing corridor should be implemented. After concluding that the existing roadway was sufficient for use as one direction of travel, and that there was no reason to locate the roadway outside of the existing corridor, several alternatives were considered to make improvements adjacent to the existing roadway.

The alternatives were developed in a progressive manor. As changes or improvements to previous alternatives were considered, they were implemented to the preferred alternatives being developed. The merits or flaws of each alternative considered were identified within the alternative description. The evaluations of these concepts were discussed in Sections 4.3 through 4.9. All alternatives considered are summarized in **Table 4-3, Alternatives Development Summary**.

## 4.11 Conclusions

### 4.11.1 Discussion

US 93 from SR 89 to the Santa Maria River must be improved to meet the transportation needs of the State, the region, and the local residents as well. After starting with several feasible typical sections and with opportunities to build on either side of the existing roadway, three, well defined alternatives, matching the goals and objectives of the study process, have evolved as preferred alternatives. All that remains is to compare the advantages and impacts for the Build vs. No-Build Alternative, as there are no options that remain to compare within the three study zones.

- **No Build vs. Build Alternatives**

The No-Build Alternative involves no expenditure of funds and no apparent change to the environmental factors along US 93. However, the No-Build Alternative:

- Will require continuing expenditures to rehabilitate and maintain the existing, aging roadway;
- Will not reduce traffic congestion and the number of accidents along the corridor,

- Will not fulfill the goal of improving the capacity, safety, and traffic operational characteristics of the route.

Therefore, the No-Build Alternative is unacceptable.

**Conclusion: The No-Build Alternative is not recommended** and has been eliminated from consideration.

### 4.11.2 Public Opinion

In addition to the public scoping meeting held on June 3, 1999, a public information meeting was held at the Wickenburg Community Center from 6:00 to 8:00 p.m. on August 22, 2000. The meeting was advertised in the Wickenburg Sun and the Arizona Republic two weeks prior to the meeting. Three hundred forty-three people signed in at the meeting.

The meeting began with an explanation of the study process and how it had progressed since the public scoping meeting. The alternatives for widening US 93 from north of Wickenburg to the Santa Maria River were presented. It was explained that the existing roadway would be retained for one direction of travel and widening would occur to either side to provide a four-lane divided facility. Forms were made available at the meeting to allow the public to submit written comments.

Comments received regarding the project were generally in support of improving the roadway due to perceived unsafe conditions on the existing roadway. Concerns were expressed about visual impacts, impacts to businesses, avoiding wildlife and vegetation, improving the US 93/SR 89 and US 93/SR 71 junctions, accommodating new development, noise impacts, and maintaining access to adjacent properties. In addition, several people expressed opposition to the widening because they believed that the bypass southwest of Wickenburg should be the first priority for US 93 improvements in the Wickenburg vicinity.

**Table 4-3: Alternatives Development Summary**

Project Limits	Study Segments	Improvement Alternatives	Design Concept Alternatives	Preferred Alternative
Project Limits: MP 193.5 - 161.5 SR 89 to Santa Maria River	Segment A MP 193.5 - 190.5 SR 89 to north of Vista Royale	A-1a (carried forward) A-1b (eliminated) A-2a (eliminated) A-2b (eliminated) A-3a (eliminated) A-3b (eliminated)	A-1a MP 193.5 - 190.5 preferred	A-1a B-2a C-3
	Segment B MP 190.5 - 180.0 North of Vista Royale to Joshua Forest Scenic Road	B-1a (eliminated) B-1b (eliminated) B-2a (carried forward) B-2b (eliminated) B-3a (eliminated) B-3b (eliminated)	B-2a MP 190.5 - 180.0 preferred	
	Segment C MP 180.0 - 161.5 Joshua Forest Scenic Road to the Santa Maria River	C-1a (eliminated) C-1b (eliminated) C-2a (eliminated) C-2b (eliminated) C-3 (carried forward)	C-3 MP 180.0- 161.5 preferred	

### 4.11.3 Conclusions

Several alternatives have been developed and evaluated for improving US 93 from SR 89 to the Santa Maria River. These improvements will enhance the safety and traffic operational characteristics of the roadway, and will allow it to meet current and future traffic needs. In addition, implementation of these improvements will enhance the roadway appearance while protecting the scenic roadway designation it has already achieved.

In conclusion the following recommendations are made:

- Construct a four-lane divided roadway throughout the US 93 corridor.
- Retain the existing highway for one direction of travel.
- Provide a variable width median through the Joshua Tree National Parkway.
- Sequentially listed, construct the improvements as described by Alternatives A-1a, B-2a, and C-3.