



Prepared for:



205 South 17<sup>th</sup> Avenue  
Phoenix, Arizona 85007



# Initial Design Concept Report

October 2019



## Interstate 10: Junction Interstate 19 to Kolb Road

Tucson – Benson Highway

## State Route 210: Golf Links Road to I-10

Barraza – Aviation Parkway



Prepared by:



101 North 1st Avenue, Suite 2600  
Phoenix, Arizona 85003

Federal No.: 010-E(210)S

Project No.: 010 PM 260 H7825 01 L

Southcentral District – Pima County





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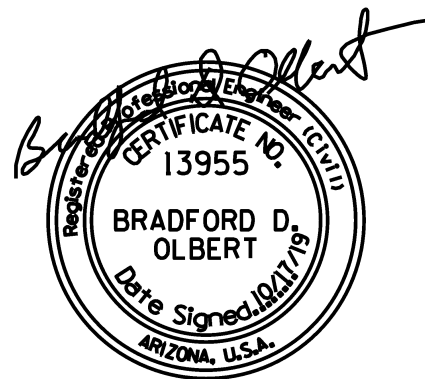
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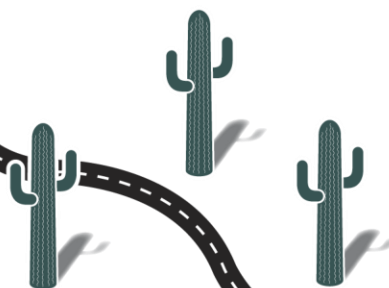


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## EXECUTIVE SUMMARY

### Introduction

The Arizona Department of Transportation (ADOT), the Federal Highway Administration (FHWA), the City of Tucson, and Pima County understood that a significant amount of future growth in population around the Tucson area would take place to the south and southeast of Tucson. Interstate 10 (I-10) cuts diagonally across this growth area and would be impacted by the future growth. East of the System Interchange with I-19, I-10 was constructed in the 1960's as a rural interstate highway with rural design criteria and typically with just two lanes of traffic in each direction. While a third lane in each direction from I-19 to west of Kino Parkway was added around 1990, the remainder of the I-10 corridor is virtually unchanged.

ADOT and FHWA commissioned the preparation of a two-phased study to define and evaluate future safety and capacity improvements to I-10 from the Junction with I-19 to the Junction with SR 83. The study also included the extension of the Barraza-Aviation Parkway (SR 210) from Golf Links Road to a connection with I-10 at a location to be determined.

The first phase of this study was a Feasibility Study (FS) and an Environmental Overview (EO). In summary, the FS and EO evaluated several alternatives for improving I-10 and for extending SR 210 to I-10. The subsequent Feasibility Study Update Report (February 2015) recommended three alternatives to be evaluated further as a part of the second phase of the study; the development of a Design Concept Study (DCR) and an Environmental Assessment (EA). Due to future construction funding limitations prior to the 2040 design year, the limits of the DCR were revised to end at Kolb Road, which is designated as a future north-south parkway and is a logical point of termini along I-10. The number of recommended alternatives to be evaluated further in the second phase of the study was also reduced to two after further review by the stakeholders.

The study area is located in the ADOT Southcentral District within the City of Tucson, the City of South Tucson and Pima County.

Portions of ADOT Project No. 010 PM 260 H7825 01L; Federal No. 010-E(210)S have been programmed in the Pima Association of Governments (PAG) Regional Transportation Highway Program for Fiscal Year (FY) 2020-2023. The following projects are programmed.

- TIP ID 39.13; A programmed amount of \$1,914,000 in FY 2021 using ASTP funds for Kino Parkway TI utility relocation and

\$4,000,000 using HURF26 funds for design. A programmed amount of \$2,086,000 in FY 2022 using ASTP funds for Design.

- TIP ID 74.07; A programmed amount of \$8,000,000 in FY 2022 using ASTP funds for the design of the Country Club Road TI.

I-10 is a full access controlled interstate freeway.

The functional classification of SR 210 is Urban Other Freeway. SR 210 is a divided multi-lane urban highway that parallels I-10 and is located approximately 1.75 miles northeast of I-10. SR 210 begins at Broadway Boulevard and ends just past South Palo Verde Road. From Broadway Boulevard through the intersection of Country Club Road, SR 210 has three-lanes in each direction. The roadway then narrows and continues with two-lanes in each direction to the end of SR 210. However, the roadway continues east and connects to Golf Links Road.

FHWA is serving as the lead federal agency and will provide input and oversight for the alternative's identification and evaluation process.

The following agencies were involved in developing the Feasibility Study, the Environmental Overview, the Design Concept Study and the Environmental Assessment: FHWA, Pima Association of Governments (PAG), Pima County, Pima County Sheriff's Department, Davis-Monthan Air Force Base (DMAFB), City of Tucson, City of South Tucson, US Customs & Border Protection (CBP), Sunnyside Unified School District, Tucson Airport Authority, Sun Tran, Arizona Game and Fish Department (AGFD), Arizona State Land Department (ASLD), the Regional Transportation Authority (RTA), the University of Arizona (UofA), and the Union Pacific Railroad (UPRR).

### Purpose and Need

The Interstate Highway System was intended to relieve congestion, improve safety, and enhance the economy by facilitating the movement of people and goods throughout the nation. Increasing traffic volumes on I-10 in the vicinity of Tucson, Arizona have contributed to reduced operational effectiveness, particularly the segment of I-10 between I-19 and Kolb Road.

The traffic modeling and analysis accomplished for the Feasibility Study demonstrated that north-south traffic demands through the project area are constrained by limitations on north-south arterial corridors. The UPRR switching yard located parallel to SR 210, north of I-10 prohibits any north-south arterials between Kino Parkway and Alvernon Way. The Davis-Monthan Air Force Base (AFB) prohibits any north-south arterials

between Alvernon Way and Kolb Road. Traffic along I-10 concentrates at certain TIs where major north-south arterials exist.

Expected future growth in the Tucson area will be to the south and southeast of the downtown area. Since I-10 cuts diagonally across this growth area, it is also expected that I-10 will be the primary travel corridor for this growth.

East of the System Interchange with I-19, I-10 was constructed in the 1960's as a rural interstate highway with rural design criteria and typically with just two lanes of traffic in each direction. Several of the TIs are partial cloverleaf type interchanges that have short ramp weave distances that adversely impact traffic operational efficiency, especially as traffic volumes increase over time. Some of the interchanges are spaced closer together than the recommended minimum of one mile, thus contributing to reduced operational efficiency.

In summary, the small number of north-south arterials, the diagonal alignment of I-10, and the projected growth pattern in Tucson contribute to an increase in local traffic using the Interstate Highway for short local trips. The numerous access points on I-10 and the old 1960's design present additional performance issues. These limitations further slow travel on the I-10 mainline and lead to more conflict between local and regional traffic. This is confirmed by the steady increase in crashes. Conflicting interaction between local and regional/interstate traffic has led to a reduction in the capacity of I-10 to accommodate through (regional) travel. Expected growth in both regional and local traffic on I-10 will further reduce the capacity of I-10.

SR 210 in the City of Tucson, Arizona, was built as an urban highway subsequent to the construction of I-10. SR 210 is approximately 3.4-miles long and is oriented in a northwest to southeast direction, extending southeast from West Broadway Boulevard at North 1st Avenue, with intersections at Kino Parkway, East 22nd Street, South Country Club Road, East 34th Street, Richie Road, and Dodge Boulevard, before terminating at Alvernon Way / Golf Links Road.

SR 210 is intended to provide motorists with an alternate route into Tucson's downtown business district from points east and south of downtown.

The use of SR 210 as a business spur is limited by the fact that motorists on westbound I-10 desiring to access downtown Tucson via SR 210 must currently use city arterials to get from I-10 to SR 210. The additional trips on the city arterials tend to exceed the capacity of the local roadway network, which causes motorists to stay on I-10. Commercial and



commuter traffic heading into downtown Tucson also use I-10 and add to peak hour congestion, causing increased volume and stress to the operation of the interstate highway. As is, the limited capacity and limited access for local trips prevents the existing roadway network in the study area from functioning as primarily intended.

Since I-10 runs parallel to SR 210 approximately 1.75 miles south of SR 210, connecting SR 210 and I-10 would facilitate the intended use of SR 210 as a business spur. It would provide westbound local traffic with an attractive alternative to using I-10 for accessing downtown Tucson and would allow the interstate route to better serve through-traffic.

For SR 210 traffic to increase to a level nearer capacity, local traffic currently using I-10 would require improved access via an extension of SR 210 to the south and east, likely connecting to I-10 somewhere between the existing Alvernon Way TI and the Rita Road TI south of DMAFB. This connection would allow SR 210 to become a viable alternative to I-10 for local traffic to and from the business, university and cultural districts in the downtown Tucson area.

The purpose of the proposed improvement to I-10 and the extension of SR 210 to a direct connection with I-10 is to address deficiencies in the interstate highway system and provide motorists with an alternate route into Tucson's downtown business district. The improvements to I-10 and the extension of SR 210 will provide satisfactory service levels on both I-10 and SR 210 through the 2040 design year.

## Traffic Data

An Initial Traffic Report and Addendum were prepared for the Feasibility Study and Update that identified and evaluated the design year 2040 transportation needs for I-10 from I-19 east to SR 90 in Cochise County, and for the extension of SR 210 to connect with I-10. It used 2045 forecasted regional growth from the Pima Association of Governments (PAG) to identify study area travel demand for the 2040 Design Year. The report and addendum are the basis for an accompanying traffic report that supplements this Initial DCR.

The Traffic Report assessed the existing and forecasted traffic demand, using the 2014 PAG Travel Demand Model, to evaluate the current and potential corridor alternative improvements to address transportation deficiencies, reduced mobility, and bottleneck locations. The adopted 2015 PAG Travel Demand Model was obtained and reviewed for the consistency of the traffic projections to verify that no significant changes occurred in the study area.

The study limits for the traffic operational analysis included I-10 from I-19 to MP 272.3 east of Kolb Road, and SR 210 from 34<sup>th</sup> Street to Alvernon Way. The study area included freeway mainline, ramps,

arterials, traffic interchange intersections, and intersections adjacent to the interchange that are directly affected by the interchange operations.

## Traffic Operational Analysis

An Initial Traffic Operational Analysis was conducted as part of the Feasibility Study and Update. An updated traffic operational analysis was conducted as part of the Design Concept Study. It evaluated the effectiveness of the existing roadway system and to evaluate the improvement alternatives developed to address future traffic volumes as projected by the 2040 PAG Travel Demand Model.

The regional traffic modeling provided a macroscopic analysis of the potential improvement alternatives and provided information on the general number of lanes and general concept of the interchanges for future conditions. The traffic operational analysis evaluated the peak hour traffic volumes obtained from the regional modeling efforts, at a 'microscopic level', to refine and ensure that the improvement alternatives are operationally feasible. This is an iterative process and takes into account existing and future roadway characteristics, traffic volumes, traffic control measures, and access spacing.

The methodology involved in the operational analysis included the following:

- 'Spot Checks' were conducted on mainline freeway segments and merge/diverge areas, for the proposed improvement alternatives, per the Highway Capacity Manual (HCM) using the Highway Capacity Software (HCS).
- The optimal configuration and operation of the traffic interchange intersections and adjacent arterial intersections were evaluated using the Synchro/Sim Traffic software.
- The AM and PM peak-hour operations of the roadway network system within the study area were modeled using the VISSIM microsimulation software and included:
  - I-10: mainline, merge/weave areas, ramps, ramp junctions with cross streets, traffic interchange intersections and adjacent intersections directly impacted by the interchange operations.
  - SR 210 (Barraza-Aviation Parkway): arterial, signalized and unsignalized intersections, and ramps.

Traffic operational analysis consisted of the VISSIM microsimulation model for the following four scenarios:

1. Year 2010: Existing

The existing roadway network within the study area was evaluated using traffic data collected in year 2010. The section of I-10 between I-19 and Kolb Road is considered urban in character.

2. Year 2040: No-Build  
The existing roadway network within the study area was evaluated with the projected year 2040 traffic volumes. Under this scenario there were no proposed improvements made to either I-10 or SR 210.

3. Year 2040: System I  
An improved roadway network (improvements to freeway/highway, ramps, and traffic interchange intersections) was evaluated with the projected year 2040 traffic volumes. In the System I roadway improvement alternative, SR 210 is extended as a freeway along the Alvernon Way alignment to connect to I-10 at a system interchange. The section of I-10 between I-19 and Kolb Road as well as SR 210 within the study area are considered urban in character.

4. Year 2040: System IV  
An improved roadway network (improvements to freeway/highway, ramps, and traffic interchange intersections) was evaluated with the projected year 2040 traffic volumes. In the System IV roadway improvement alternative, SR 210 is extended as a freeway along the Alvernon Way alignment to connect to I-10 at a system interchange. A collector-distributor roadway parallels I-10 in both directions between the I-10/SR 210 interchange and Kolb Road. The section of I-10 between I-19 and SR 83 as well as SR 210 within the study area are considered urban in character.

Per ADOT Roadway Design Guidelines, for I-10 and SR 210 mainline and ramp roadways, and for intersections of ramps and crossroads, LOS D is acceptable for urban conditions. The section of I-10 between I-19 and Kolb Road as well as SR 210 within the study area is considered urban in character for design year 2040.

## Results of Operational Analysis

The operational analysis showed that the 2040 No Build Alternative will operate at an LOS E or worse for the mainline and traffic interchanges. The analysis also showed that System Alternative I and System Alternative IV will operate with satisfactory service levels. I-10 will have LOS C or better in both directions through the limits of the project for both alternatives. The traffic interchanges for both System Alternatives will have LOS D or better through the limits of the project. See **Section 2** for more operational information.

## Alternatives Considered

Two alternatives have been identified to be carried forward for further study in the Design Concept Study.





- System Alternative I
- System Alternative IV

These two alternatives improve I-10 between the I-10/I-19 System Interchange and the Kolb Road TI and extend SR 210 from Golf Links Road along the Alvernon Way corridor to a connection with I-10 at the existing I-10/Alvernon Way TI. Both alternatives accommodate design year 2040 traffic at an acceptable level of service. Improvements to I-10 through the I-10/I-19 TI and to the north and west of the TI are not addressed in this study.

### I-10 from I-19 to SR 210 System TI and SR 210

The two alternatives are identical for two segments of the project; I-10 between I-19 and the I-10/SR 210 System TI at Alvernon Way and the entire extension of SR 210 south to the I-10/SR 210 System TI.

For the I-10 segment, both alternatives improve existing conditions by improving weaving distances where ramps enter/exit I-10, improve interchange spacing by replacing the Palo Verde Road TI with a new TI at Country Club Road, and provide braided ramps to address both ramp weaving distances and retain the Park Avenue TI despite short TI spacing to 6<sup>th</sup> Avenue and Kino Parkway TIs. Improvements to I-10 will begin at Milepost 260.79.

Auxiliary lanes are required between successive entrance and exit ramps along both the eastbound and westbound I-10 roadways. I-10 mainline lanes will vary as follows:

- I-19 to Kino Parkway - 4 mainline lanes in each direction.
- Kino Parkway to Alvernon Way- 3 mainline lanes in each direction.

The existing I-10 horizontal centerline will be retained. From west of Park Avenue to Alvernon Way, the existing open median will be enclosed with a concrete median barrier located at existing centerline, a wide inside paved shoulder and, as needed, a new traffic lane.

From I-19 to west of Kino Parkway, existing I-10 consists of PCCP. The intent of the design is to retain this pavement and widen as additional lanes are needed. Throughout the PCCP section, the existing I-10 vertical profile will be retained. East of the PCCP section, I-10 will have a new vertical profile, which will be designed to accommodate overpass structure replacements at traffic interchanges and the new structure over Country Club Road.

West of the horizontal curve over Park Avenue, the fourth lanes in each direction are added to the outside. Through the curve, the median is enclosed with a concrete median barrier and widening occurring both to the inside and outside. East of the curve, new lanes are added in the

median along with the new concrete median barrier and a wide paved shoulder that provides lateral space for a future additional general purpose lane.

East of Kino Parkway, Pima County has expressed an interest in expanding the Pima Sports Complex to the southerly side of I-10. It will require a grade-separated crossing under I-10 and a light-well grate in the median to provide natural light for the undercrossing. The actual location of the access road needs to be determined and will require future coordination with the County.

I-10 crosses over or under many cross streets and drainage channels via roadway structures. Given a combination of age, maintenance issues, existing vertical clearance issues, and changes in span lengths, most of these structures should be replaced. Structures can be widened at only four locations: 6th Avenue over I-10, I-10 over the UPRR east of 6th Avenue, I-10 over Park Avenue, and I-10 over Alvernon Way. Where I-10 crosses over existing drainage channels, care is needed to ensure that structure replacement does not adversely impact the capacity of the channel.

Each of the existing TIs will require improvements. Solutions typically involve enlarging the crossroads and ramp termini at the crossroads; providing additional through-lanes and turn lanes; modifications to eliminate successive loop ramps; and ‘braiding’ ramps to improve weaving distances and safety. A description of improvements for each existing and new TI is included in **Section 3.2.2.1** of this report. Improvements meet the capacity and operational requirements.

The areas adjacent to I-10 from I-19 to Alvernon Way are developed with commercial development along I-10. The existing I-10 ROW corridor is quite narrow and there is very little unused ROW between the existing outer edges of the roadways and the ROW lines. It will be necessary to widen the I-10 mainline roadways into the median to the extent feasible to reduce the impact to adjacent properties. Additional ROW will be required along I-10 where TIs and ramps are being modified.

The existing storm drain system between I-19 and Park Avenue will be retained with minor modifications to accommodate the extra pavement width. East of Park Avenue, the rural type drainage design will be converted to an urban type design with catch basins and an enclosed storm drain system. In areas where existing water ponds at slope toes, the storm drains will outlet into retention basins. Typically, they are located in the infields of traffic interchanges, but some may be needed between interchanges; requiring new right-of-way. In areas where water outlets into existing cross drainage structures, the storm drains will outlet into these structures. As needed to retain capacity in the cross drainages, the storm drains will outlet initially into detention basins.

For the SR 210 segment, both alternatives reconstruct the interchange at Golf Links Road to provide for the through movement of traffic on SR 210, reconstruct the bridge over the UPRR, provide a new TI at Ajo Way, and construct the new system interchange with I-10.

SR-210 mainline lanes will vary as follows:

- Richey Boulevard thru Golf Links TI - 2 mainline lanes in each direction.
- Golf Links TI to I-10 System TI- 4 mainline lanes in each direction.

At the I-10/SR 210 System Interchange, the two exterior lanes continue to connect with I-10 as system Ramps (South to East) SE and (West to North) WN, with each ramp having two lanes. Also, system Ramps (East to North) EN and (South to West) SW connect to I-10 to the west, with each ramp having one lane. The two interior lanes in each direction continue south as Alvernon Way. The Alvernon Way TI is designed with three lanes in each direction to match with the future Alvernon Way parkway to the south.

A description of improvements for SR 210 and each TI is included in **Section 3.2.2.2** of this report. Improvements meet the capacity and operational requirements.

The areas along the SR-210 corridor are developed with commercial and residential development. Typically, the corridor is adjacent to, crossing, or close to the UPRR. The existing SR-210/Alvernon Way ROW corridor south of the UPRR overpass is quite narrow and there is very little unused ROW between the existing outer edges of the roadways and the ROW lines. Additional ROW will be required for SR 210. Commercial businesses south of Aviation Parkway are within the limits of the new interchange with Golf Links Road and should be acquired. South of the UPRR overpass, new ROW is needed for the new Ajo Way TI, along Alvernon Way, and at Irvington Road to accommodate the new system interchange ramps.

SR 210 crosses over many cross streets and ramps. All will require new structures. A few existing structures can remain, including Alvernon Way over Aviation Parkway and northbound Golf Links over Aviation Parkway. The existing structure over the drainage channel just east of Palo Verde Road must be widened to the northeast to accommodate a third westbound SR 210 lane. North of Ajo Way, the existing structure over the UPRR has multiple spans over the two existing RR tracks. The UPRR expects to add tracks in the future and is requiring the reduction in the number of spans. The resulting longer spans will raise the SR 210 profile over the UPRR and require total structure replacement.

SR 210 pavement drainage will be addressed via an enclosed storm drain system that outlets to either retention basins or into existing crossing

drainage channels. Along Aviation Parkway, an existing storm drain system will be utilized to the maximum extent possible.

Regarding off-site drainage, there are three major crossings that convey storm water from east to west. The existing box culvert south of Aviation Parkway should be replaced with a lower skew angle. The existing box culvert just north of Ajo Way should be checked to determine if it will handle the additional SR 210 embankment dead load and should be lengthened under the TI ramps. The existing box culvert just north of Irvington Road should be extended to accommodate the wider SR 210 footprint and should be checked to determine if it will handle the additional SR 210 embankment dead load.

### I-10 from SR 210 System TI to Kolb Road

The two alternatives differ only within the segment of I-10 between the I-10/SR 210 System TI and the Kolb Road TI. Alternative I east of Alvernon Way has five mainline lanes in each direction that mixes regional and local traffic. Alternative IV east of Alvernon Way provides a collector-distributor system that separates local traffic (entering and exiting I-10) from I-10 mainline regional traffic.

Auxiliary lanes are required between successive entrance and exit ramps along both the eastbound and westbound I-10 roadways. I-10 mainline lanes will vary as follows:

- System Alternative I: Five mainline lanes in each direction.
- System Alternative IV: Three mainline lanes plus two CD lanes in each direction.

The Alvernon Way TI, the Valencia Road TI, the Craycroft Road TI, the Wilmot Road TI, and the Kolb Road TI will connect with I-10 mainline roadways for System Alternative I. For System Alternative IV, these TIs will connect with the I-10 CD roadways.

The existing I-10 horizontal centerline will be retained from Alvernon Way to just north of Valencia Road. To the east, the horizontal centerline will shift from existing to accommodate a wider roadway footprint than existing and avoid right-of-way takes from developed residential neighborhoods adjacent to I-10. Differences in typical sections for the two system alternatives will result in differing horizontal alignments between Valencia Road and Kolb Road. For both system alternatives east of Kolb Road, the centerline will be shifted to 60 feet left of existing to create space to retain the existing two-way frontage road and the improvements will be transitioned to match into the two existing lanes in each direction. Improvements to I-10 end at MP 272.30.

Between Valencia Road and Kolb Road, there are eastbound and westbound frontage roads. Typically, they serve few parcels, either

developed or undeveloped. The frontage roads between Craycroft Road and Kolb Road will be removed for both alternatives.

Between Valencia Road and Craycroft Road, the westbound frontage road will be retained for both system alternatives; primarily to provide access to adjacent parcels that have access strictly via the existing frontage road. The eastbound frontage road will be retained with System Alternative I. It will be removed with System Alternative IV. For System Alternative I, the two frontage roads are needed due to the short distance between the two interchanges. Traffic accessing Craycroft Road to/from Valencia Road will use the frontage roads instead of the west Craycroft Road ramps. This traffic will use the west Valencia Road ramps and must cross Valencia Road.

I-10 crosses over or under many cross streets and drainage channels via roadway structures. Given a combination of age, changes in structure width, and changes in horizontal alignment, these structures should be replaced. The Kolb Road structure over I-10 can be retained for System Alternative I only.

Each of the existing TIs will require improvements. Solutions typically involve retaining the interchange type; enlarging the crossroads and ramp termini at the crossroads; providing additional through-lanes and turn lanes; and modifications to tight diamond TIs to accommodate truck turning movements. The Kolb Road TI will be converted from a spread diamond type TI to a diverging diamond type TI that will accommodate the heavy turning and through movements on Kolb Road as it expands in the future to a parkway. A description of improvements for each existing TI is included in **Section 3.2.3** of this report. Improvements meet the capacity and operational requirements.

The areas adjacent to I-10 from Alvernon Way to Kolb Road are developed with commercial and residential development along I-10. The existing I-10 ROW corridor is quite narrow and there is very little unused ROW between the existing outer edges of the roadways and the ROW lines. It will be necessary to widen the I-10 mainline roadways into the median to the extent feasible to reduce the impact to adjacent properties. Additional ROW will be required along I-10 where TIs and ramps are being modified.

For both system alternatives, the rural type drainage design will be converted to an urban type design with catch basins and an enclosed storm drain system. In areas where existing water ponds at slope toes, the storm drains will outlet into retention basins. Typically, they are located in the infields of traffic interchanges, but some may be needed between interchanges; requiring new right-of-way. In areas where water outlets into existing cross drainage structures, the storm drains will outlet into

these structures. As needed to retain capacity in the cross drainages, the storm drains will outlet initially into detention basins.

### Evaluation of Alternatives

The following factors have been established for comparative evaluation of the improvement alternatives; System Alternatives I and IV.

- Safety Improvements
- Traffic Operations and LOS
- Access
- Right-of-Way
- Impacts to Utilities
- Earthwork
- Structures
- Drainage
- Environmental Impacts
- Displaced homes and businesses
- Constructability and Maintenance of Traffic
- Cost

A detailed evaluation of the two alternatives is included in **Section 3.3** of this report and is summarized below.

Alternatives I and IV are similar for much of the project length. They are identical for the section of I-10 between I-19 and Alvernon Way and for the entire length of the extension of SR 210. It is only within the Alvernon Way to Kolb Road section where there are differences between the two alternatives. Alternative I combines regional and local traffic within five mainline lanes in each direction, plus auxiliary lanes between successive entrance and exit ramps. Alternative IV keeps regional and local traffic separate by having three mainline lanes and two CD lanes in each direction separated by a concrete barrier. Auxiliary lanes between successive entrance and exit ramps merge with the CDs. The result is that Alternative IV has a wider footprint than Alternative I. While this impacts some evaluation factors differently, many other evaluation factors are identical or very similar.

For most of the evaluation factors, Alternative I and IV are either the same or the differences are slight. Significant differences in factors are:

- Right-of-Way

Alternative	Parcels Impacted	New R/W (Acres)
I	179	160.63
IV	190	175.32
- Earthwork

System Alternative I Borrow =	3,396,800 Cu Yd
System Alternative IV Borrow =	3,834,400 Cu Yd



- Structures  
Between Alvernon Way and Kolb Road, Alternative IV has a wider roadway footprint than Alternative I, thus requiring wider I-10 structures over the cross streets and drainage channels.
- Drainage  
Between Alvernon Way and Kolb Road, Alternative IV has longer cross culverts due to the wider roadway footprint. Also, Alternative IV has more catch basins and lateral pipes for collecting pavement runoff along the concrete barrier that separates mainline from the CD roadways.
- Cost  
System Alternative I Total Cost = \$1,165,317,000  
System Alternative IV Total Cost = \$1,255,095,000

Based on the evaluation of alternatives, Alternative I was selected as the Recommended Alternative for the following reasons:

- Alternative I provides a slightly higher level of service than Alternative IV but at a cost that is \$90,000,000 less than Alternative IV.
- Alternative I has less of an impact on adjacent property owners, with less land taken and fewer properties affected. Alternative I fits well within the existing right-of-way.
- Alternative I provides better access to commercial properties between Alvernon Way and Kolb Road.
- Both alternatives provide excellent safety improvements, better spacing between traffic interchanges with reduced congestion and high levels of service.
- Environmental concerns are nearly identical between the two alternatives. Alternative IV relocates a short stretch (approximately 250') of the Rodeo Wash trail. Alternative I has no impact on the trail.

## Draft Environmental Assessment

The Draft Environmental Assessment is briefly summarized in **Section 8.1**. Environmental concerns are nearly identical between the two alternatives. The entire Draft Environmental Assessment is a stand-alone report prepared by EcoPlan dated October 2019.



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## TABLE OF CONTENTS

EXECUTIVE SUMMARY	i		24		46
TABLE OF CONTENTS	vii				
1. INTRODUCTION	1	3. DESIGN CONCEPT ALTERNATIVES	24	5. ACCESS MANAGEMENT PLAN	46
1.1 Forward	1	3.1 Introduction	24	5.1 Introduction	46
1.2 Project Objectives	2	3.1.1 General Modifications to Existing I-10	24	5.2 General Access Control Criteria	46
1.2.1 Scoping Process	2	3.1.2 Extension of SR 210	26	5.3 Access Control Along Crossroads	46
1.2.2 Feasibility Study	4	3.2 Description of Alternatives	29		
1.2.3 Feasibility Study Update	5	3.2.1 No-Build Alternative	29	6. ITEMIZED COST ESTIMATES	52
1.2.4 Design Concept Study	5	3.2.2 General Requirements - All Alternatives	29		
1.3 Purpose and Need for the Project	6	3.2.2.1 I-10 (I-19 to SR 210)	29	7. IMPLEMENTATION PLAN	55
1.3.1 Purpose and Need for Improvement of I-10	6	3.2.2.2 SR 210 Extension	31	7.1 Introduction	55
1.3.2 Purpose and Need for Extension of SR 210 to a Connection with I-10	7	3.2.3 System Alternative I	31	7.2 Project Descriptions	56
1.4 Description of the Project	7	3.2.4 System Alternative IV	33	Country Club Rd TI (MP 263.25 to MP 264.66)	57
1.4.1 Project Limits	7	3.3 Evaluation of Alternatives	36	Kino Parkway TI (MP 262.25 to MP 263.25)	58
1.4.2 History of the Project Route	7	3.3.1 Alternative Evaluation Factors	36	Park Avenue TI (MP 260.89 to MP 262.25)	59
1.4.3 Proposed Improvements	7	3.3.2 Evaluation of Alternatives	36	6th Avenue TI (MP 261.0)	59
1.5 Characteristics of the I-10 and SR 210 Corridors	8	3.3.3 Evaluation Matrix	37	I-10 (Alvernon Way to Valencia Road) (MP 264.66 to MP 266.82)	60
1.5.1 Characteristics of the I-10 Corridor	8	3.4 Evaluation of Alternatives	37	I-10 (I-19 to Kino Parkway) (MP 260.79 to MP 262.25)	61
1.5.2 Characteristics of the SR 210 Corridor	9	4. MAJOR FEATURES	40	SR 210 Construction Projects	61
2. TRAFFIC AND CRASH DATA	10	4.1 Introduction	40	SR 210 (Palo Verde Rd to Ajo Way) Stage I Project (MP 4.56 to 6.16)	62
2.1 Forward	10	4.2 Major Design Features	40	SR 210 (Palo Verde Rd to Ajo Way) Stage II Project (MP 4.56 to MP 6.16)	63
2.2 Traffic Operational Analysis	10	4.2.1 Design Controls	40	SR 210 (Ajo Way to I-10) (MP 6.16 to MP 7.31)	64
2.3.1 Methodology	10	4.2.2 Access Control	41	I-10 (Valencia Road TI) (MP 266.82 to MP 267.69)	65
2.3.2 Operational Analysis	10	4.2.3 Horizontal and Vertical Alignments	41	I-10 (Craycroft Road TI) (MP 267.69 to MP 268.83)	66
2.3.3 Results of Updated Operational Analysis	11	4.2.4 Right-of-Way	41	I-10 (Wilmot Road TI) (MP 268.83 to MP 269.93)	67
2.3 Crash Data	20	4.2.5 Drainage	41	I-10 (Kolb Road TI) (MP 269.93 to MP 272.27)	68
		4.2.6 Section 401 and 404 Permits	41		
		4.2.7 Floodplain Considerations	41	8. ENVIRONMENTAL SUMMARY AND PUBLIC INVOLVEMENT	69
		4.2.8 Geology	42		
		4.2.9 Earthwork	42		
		4.2.10 Traffic Design	42		
		4.2.11 Preliminary Pavement Design	43		
		4.2.12 Transit	43		
		4.2.13 Utilities and Rail Facilities	43		
		4.2.14 Design Exceptions	44		





**LIST OF FIGURES**

Figure 1.1 Project Location Map ..... 1  
 Figure 1.2 Vicinity Map..... 3  
 Figure 1.3 Existing and Future Mainline Lanes & LOS Summary ..... 6  
 Figure 2.1 I-10 Existing Conditions 2010 – Mainline Lanes & LOS Summary ..... 13  
 Figure 2.2 I-10 No Build Alternative 2040 – Mainline Lanes & LOS Summary ..... 14  
 Figure 2.3 I-10 System Alternative I – 2040 Build – Mainline Lanes & LOS Summary..... 15  
 Figure 2.4 I-10 System Alternative IV – 2040 Build – Mainline Lanes & LOS Summary ..... 16  
 Figure 2.5 Crash Locations ..... 21  
 Figure 2.6 Crash Density ..... 22  
 Figure 3.1 I-10 Overview..... 25  
 Figure 3.2 SR 210 Overview..... 28  
 Figure 5.1 6<sup>th</sup> Avenue TI..... 47  
 Figure 5.2 Park Avenue TI..... 47  
 Figure 5.3 Kino Parkway TI..... 48  
 Figure 5.4 Country Club Road TI..... 48  
 Figure 5.5 Alvernon Way TI..... 49  
 Figure 5.6 Valencia Road TI..... 49  
 Figure 5.7 Craycroft Road TI..... 50  
 Figure 5.8 Wilmot Road TI..... 50  
 Figure 5.9 Kolb Road TI..... 51  
 Figure 7.1 Implementation Plan..... 56  
 Figure 7.2 Country Club TI..... 57  
 Figure 7.3 Kino Parkway TI..... 58  
 Figure 7.4 Park Avenue TI..... 59  
 Figure 7.5 I-10 (Alvernon Way to Valencia Rd) TI..... 60  
 Figure 7.6 I-10 (I-19 to Kino Parkway) TI ..... 61  
 Figure 7.7 SR 210 (Palo Verde to Ajo Way) Stage I Project..... 62  
 Figure 7.8 SR 210 (Palo Verde to Ajo Way) Stage II Project ..... 63  
 Figure 7.9 SR 210 (Ajo Way to I-10) ..... 64  
 Figure 7.10 Valencia Road TI..... 65  
 Figure 7.11 Craycroft Road TI..... 66  
 Figure 7.12 Wilmot Road TI..... 67  
 Figure 7.13 Kolb Road TI..... 68

**LIST OF TABLES**

Table 1.1 5-Year Crash Summary (July 2011-June 2016)..... 6  
 Table 1.2 Previous Projects Within the I-10 Study Area ..... 8  
 Table 1.3 Existing I-10 Structures..... 9  
 Table 1.4 Previous Projects within the SR 210 Study Area..... 9  
 Table 1.5 Existing Structures - SR 210 Study Area..... 9  
 Table 2.1 I-10 Ramps LOS Summary Table..... 17  
 Table 2.2 SR 210 Ramps LOS Summary Table..... 18  
 Table 2.3 I-10 Intersection LOS Summary Table ..... 19  
 Table 2.4 SR 210 Intersection LOS Summary Table..... 19  
 Table 2.5 Summary of Crashes (July 2011-June 2016) ..... 20  
 Table 2.6 Severity of Crashes (July 2011-June 2016) ..... 20  
 Table 2.7 I-10 Mainline 5-Year Crash Summary..... 20  
 Table 2.8 SR 210 Mainline 5-Year Crash Summary ..... 23  
 Table 2.9 Alvernon Way/Golf Links Mainline 5-Year Crash Summary..... 23  
 Table 3.1 Mainline LOS..... 36  
 Table 3.2 Right-of-Way Impacts..... 37  
 Table 3.3 Evaluation Matrix..... 38  
 Table 4.1 Utility and Railroad Contacts..... 45  
 Table 6.1 Total Estimated Cost..... 52  
 Table 6.2 System Alternative I Estimated Cost ..... 53  
 Table 6.3 System Alternative IV Estimated Cost ..... 54  
 Table 7.1 Project Order of Construction ..... 55

**APPENDICES**

APPENDIX A EXISTING CONDITIONS..... 71  
 APPENDIX B INITIAL TRAFFIC REPORT FIGURES..... 89  
 APPENDIX C SYSTEM ALTERNATIVE I PLAN SHEETS..... 123  
 APPENDIX D SYSTEM ALTERNATIVE I TYPICAL SECTIONS..... 141  
 APPENDIX E SYSTEM ALTERNATIVE I DRAINAGE PLANS .. 187  
 APPENDIX F SYSTEM ALTERNATIVE I PROFILES SHEETS ... 205  
 APPENDIX G SYSTEM ALTERNATIVE I GEOMETRICS ..... 253  
 APPENDIX H SYSTEM ALTERNATIVE I BARRIER SUMMARY ..... 287  
 APPENDIX I SYSTEM ALTERNATIVE IV PLAN SHEETS ..... 295  
 APPENDIX J SYSTEM ALTERNATIVE IV TYPICAL SECTIONS ..... 313  
 APPENDIX K SYSTEM ALTERNATIVE IV DRAINAGE PLANS ..... 361  
 APPENDIX L SYSTEM ALTERNATIVE IV PROFILES SHEETS ..... 379  
 APPENDIX M SYSTEM ALTERNATIVE IV GEOMETRICS ..... 427  
 APPENDIX N SYSTEM ALTERNATIVE IV BARRIER SUMMARY ..... 459  
 APPENDIX O CRAYCROFT ROAD ACCESS ..... 467  
 APPENDIX P FREEWAY MANAGEMENT SYSTEM & SIGNAGE ..... 481  
 APPENDIX Q MEETING NOTES..... 553  
 APPENDIX R 100 ACRE WOOD BIKE PARK MEMO ..... 607



# 1. INTRODUCTION

## 1.1 Forward

The Arizona Department of Transportation (ADOT), the Federal Highway Administration (FHWA), the City of Tucson, and Pima County understood that a significant amount of future growth in population around the Tucson area would take place to the south and southeast of Tucson. Interstate 10 (I-10) cuts diagonally across this growth area and would be impacted by the future growth. East of the System Interchange with I-19, I-10 was constructed in the 1960's as a rural interstate highway with rural design criteria and typically with just two lanes of traffic in each direction. While a third lane in each direction from I-19 to west of Kino Parkway was added around 1990, the remainder of the I-10 corridor is virtually unchanged.

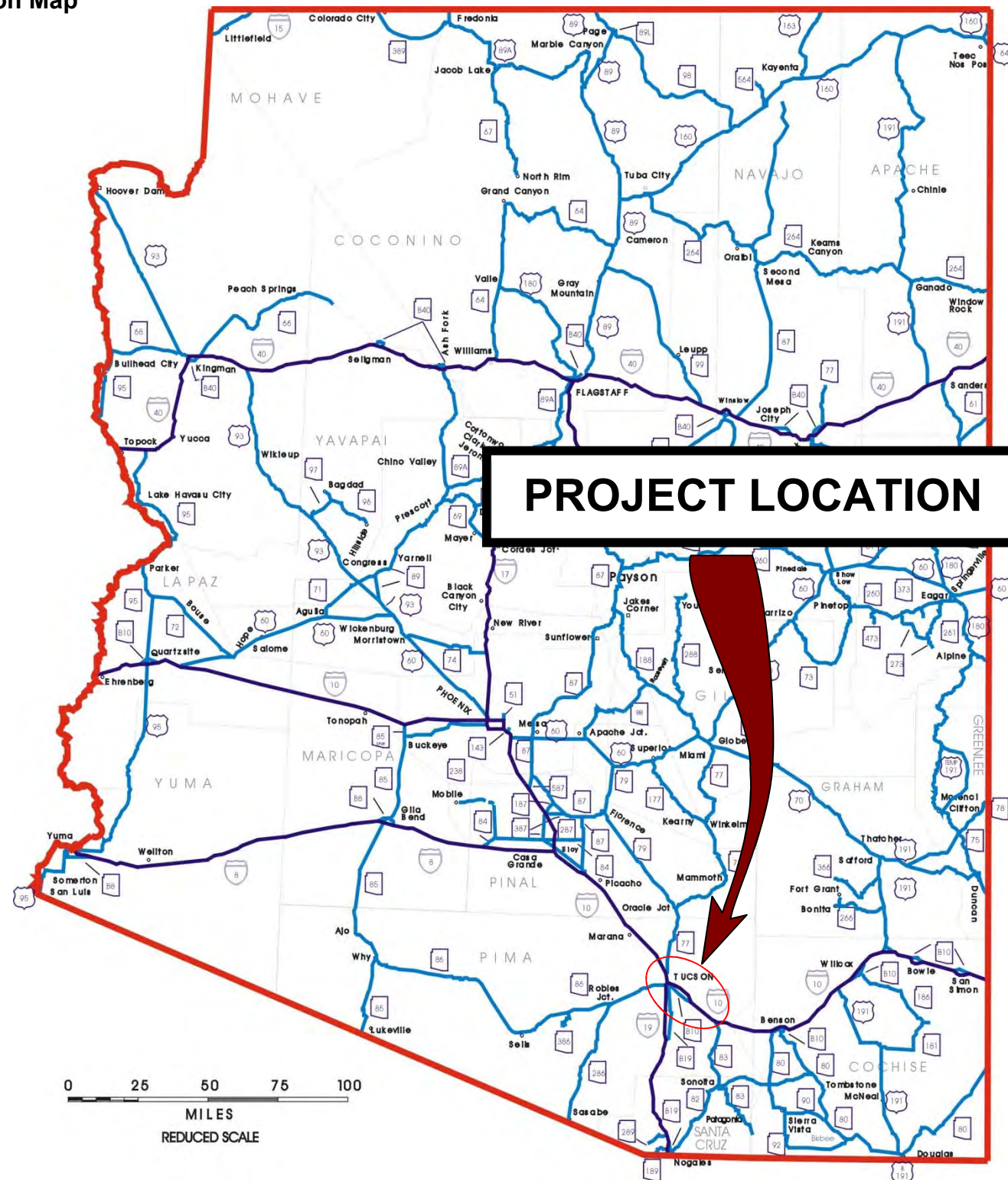
ADOT and FHWA commissioned the preparation of a two-phased study to define and evaluate future safety and capacity improvements to I-10 from the Junction with I-19 to the Junction with SR 83. The study also included the extension of the Barraza-Aviation Parkway (SR 210) from Golf Links Road to a connection with I-10 at a location to be determined.

The first phase of this study was a Feasibility Study (FS) and an Environmental Overview (EO). In summary, the FS and EO evaluated several alternatives for improving I-10 and for extending SR 210 to I-10. The subsequent Feasibility Study Update Report (February 2015) recommended three alternatives to be evaluated further as a part of the second phase of the study; the development of a Design Concept Study (DCR) and an Environmental Assessment (EA). Due to future construction funding limitations prior to the 2040 design year, the limits of the DCR were revised to end at Kolb Road, which is designated as a future north-south parkway and is a logical point of termini along I-10. The number of recommended alternatives to be evaluated further in the second phase of the study was also reduced to two after further review by the stakeholders.

**Figure 1.1 Project Location Map** shows the location of the study area for both I-10 and SR 210 in the State of Arizona. The study area is located in the ADOT Southcentral District within the City of Tucson, the City of South Tucson and Pima County.

Portions of ADOT Project No. 010 PM 260 H7825 01L; Federal No. 010-E(210)S have been programmed in the Pima Association of Governments (PAG) Regional Transportation Highway Program for Fiscal Year (FY) 2019-2023. The following projects are programmed.

Figure 1.1 Project Location Map







- TIP ID 39.13; A programmed amount of \$1,914,000 in FY 2021 using ASTP funds for Kino Parkway TI utility relocation and \$4,000,000 using HURF26 funds for design. A programmed amount of \$2,086,000 in FY 2022 using ASTP funds for Design.
- TIP ID 74.07; A programmed amount of \$8,000,000 in FY 2022 using ASTP funds for the design of the Country Club Road TI.

I-10 is a full access-controlled interstate freeway.

The functional classification of SR 210 is Urban Other Freeway. SR 210 is a divided multi-lane urban highway that parallels I-10 and is located approximately 1.75 miles northeast of I-10. SR 210 begins at Broadway Boulevard and ends just past South Palo Verde Road. From Broadway Boulevard through the intersection of Country Club Road, SR 210 has three-lanes in each direction. The roadway then narrows and continues with two-lanes in each direction to the end of SR 210. However, the road continues east and connects to Golf Links Road.

FHWA is serving as the lead federal agency and will provide input and oversight for the alternatives identification and evaluation process.

The following agencies were involved in developing the Feasibility Study, the Environmental Overview, the Design Concept Study and the Environmental Assessment: FHWA, Pima Association of Governments (PAG), Pima County, Pima County Sheriff's Department, Davis-Monthan Air Force Base (DMAFB), City of Tucson, City of South Tucson, US Customs & Border Protection (CBP), Sunnyside Unified School District, Tucson Airport Authority, Sun Tran, Arizona Game and Fish Department (AGFD), Arizona State Land Department (ASLD), the Regional Transportation Authority (RTA), the University of Arizona (UofA), and the Union Pacific Railroad (UPRR).

## 1.2 Project Objectives

The primary objective of this project is to develop a Design Concept Study (DCR) that will be used as a long-range master plan that will guide future decisions and design parameters regarding the improvements to I-10 between I-19 and Kolb Road and for the extension of SR 210 from Golf Links Road to a connection with I-10. **Figure 1.2 Project Vicinity Map** shows the DCR limits. The Recommended Alternative will address the project's objectives and purpose.

The improvements will be based on optimizing traffic operations for the Design Year 2040. Development of Design Year traffic projections are to be in accordance with approved regional and local Transportation Planning Traffic Modeling from PAG. As needed, slight adjustments will be made to account for any localized anomalies within the model results. The goal is to identify the capacity requirements along I-10 and SR 210

and identify the number of traffic lanes and any auxiliary lanes needed to meet minimum Level of Service requirements set by ADOT.

Another objective of this project is to identify and evaluate alternative routes for the extension of SR 210 from Golf Links Road southerly to a connection with I-10. This process was performed during development of the Feasibility Study and the Environmental Overview. As input for the DCR, the Feasibility Study recommended three alternatives for further evaluation.

### 1.2.1 Scoping Process

Throughout both phases of the study, the project stakeholders and the public have provided valuable input in the form of issues, concerns, and opportunities (ICO's) that pertain to I-10 and SR 210 within the study limits for further evaluation. These are listed below.

#### Roadway/Design ICOs

The following roadway design ICO's that involve the safe and efficient flow of traffic are:

- Expected future growth in the Tucson area will be to the south and southeast of the downtown area. Since I-10 cuts diagonally across this growth area, it is also expected that it will be the primary travel corridor for this growth. This will result in congestion and undesirable conditions, especially with a high percentage of regional and truck traffic also using the corridor. Identify and incorporate roadway improvements to meet transportation needs for the foreseeable future.
- The section of I-10 between I-19 and Craycroft Road exhibits congestion and undesirable conditions due to short weaving distances on many ramps. These short weaves are caused by the old 1960's design with loop ramps and traffic interchange spacing less than the standard of one mile. Identify and incorporate modifications to interchange spacing and/or ramp designs to improve traffic flow and safety, which will reduce crashes.
- Currently, much of the traffic to/from downtown Tucson uses the segment of I-10 between Kino Parkway and Alvernon Way instead of using the combination of Alvernon Way and the Barraza-Aviation Parkway. As traffic growth continues over time, this section of I-10 will develop capacity and operational issues. To resolve these issues, SR 210 should be extended southerly to a connection with I-10. Identify and evaluate alternative alignments for the extension of SR 210 to I-10.
- Currently, the primary traffic movement within the Barraza-Aviation/Alvernon Way/Golf Links interchange is between Barraza-Aviation Parkway and Golf Links Road. With the extension of SR 210

to the south, the primary movement through the interchange changes to through traffic on SR 210. Therefore, the interchange must be reconfigured to provide for 'route continuity' of SR 210, yet retain all other movements, especially those with Golf Links Road.

- The I-10/Alvernon Way TI does not provide access to westbound I-10 due to the close proximity to the Palo Verde Rd TI. Identify and incorporate modifications to provide this important movement.
  - Most of the existing I-10 bridges over the cross streets are old and will probably need replacing. Replacements should accommodate future cross street capacity requirements. Identify and incorporate cross street lane requirements under I-10 that will accommodate future cross street traffic growth.
  - Currently on 6th Avenue at the I-10 interchange, there are heavy left turn volumes (northbound 6th Avenue to westbound Ramp B and southbound 6th Avenue to eastbound Ramp D). Identify and incorporate additional left turn lanes on 6th Avenue.
  - The City of Tucson is proposing to provide north-south transit via a Streetcar facility that will cross I-10 somewhere within a corridor that extends between I-19 and Kino Parkway. Therefore, coordination is needed to identify the Streetcar route and evaluate impacts to the I-10 and cross street designs.
  - Currently, there is a designated bicycle route through the Barraza Aviation/Golf Links interchange and along Contractor's Way that provides connectivity between the Barraza Aviation Parkway and Alvernon Way in the vicinity of I-10. This route will likely be impacted by the extension of SR 210. Identify and incorporate a new bicycle and pedestrian route that will safely convey bicycle and pedestrian traffic along the SR 210 corridor.
  - Coordinate with the development team for the Sonoran Corridor.
- The following roadway design ICO's that involve providing or retaining safe access to properties and businesses are:
- Provide left turn access control along interchange cross streets in accordance with the current ADOT Access Control criteria and coordinate with local agencies to resolve any localized issues.



Figure 1.2 Vicinity Map





- Along I-10 between Valencia Road and Kolb Road, an existing frontage road system provides access to some parcels that have frontage along ADOT right-of-way. However, these frontage roads often are along undeveloped parcels and convey small traffic volumes. It may be applicable to eliminate the frontage road system and utilize the recovered right-of-way for additional general purpose lanes for mainline I-10. Identify and evaluate the impacts of removing the frontage road system and resolve access issues associated with frontage removal.
- An initial evaluation of interchange spacing and ramp weaving indicates a potential need to modify westbound ramps in the vicinity of Park Avenue. This would impact the westbound frontage road between Park Avenue and 6th Avenue by ‘detaching’ it from Park Avenue. A concern of the City of South Tucson is that this would disrupt the status quo of traffic flow in the area. Identify, evaluate, and incorporate a design change that re-establishes westbound traffic flow between Park Avenue and 6th Avenue.
- The Los Niños Elementary School, located on the east side of Alvernon Way south of I-10 currently has access issues associated with the flow (arrival and departure) of school buses and private vehicles at the front of the school. It is important that any design improvements to Alvernon Way south of the interchange with I-10 do not exacerbate the current situation.
- State Lands has an undeveloped parcel located in the southwest quadrant of I-10 and Kolb Road. State Lands has expressed a need for design improvements to Kolb Road south of the interchange to provide a point of access to this parcel.
- The existing intersection of Alvernon Way and Irvington Road is close to I-10. If the connection of SR 210 to I-10 occurs at the existing I-10/Alvernon Way TI, then ADOT design criteria dictates that direct access (via interchange ramps) between SR 210 and Irvington Road cannot be accommodated. This would impact access between the Tucson Electric Power Company (TEP) and westbound SR 210; redirecting traffic up Contractor’s Way to Ajo Way and then onto westbound SR 210. In the event of a rail incident that blocks the at-grade UPRR crossing of Ajo Way just west of Contractor’s way, TEP emergency vehicles would suffer a blockage of needed access. TEP has asked that emergency access be provided. Identify and incorporate emergency access into SR 210 improvements.

The following roadway design ICO’s that involve drainage design are:

- In the section of I-10 between I-19 and Park Avenue, the existing pavement drainage is collected in a storm drain system. Modify the

existing storm drain system to accommodate more pavement drainage area. Retain the existing storm drain outlets.

- Along I-10 east of Park Avenue, existing pavement drainage flows into existing drainage channels. The existing rural type pavement drainage system should be converted to an urban type drainage system with a combination of storm drain systems and some open channels that outlet into existing drainage channels. These channels cannot be enlarged downstream from the outlets. Therefore, it is important to regulate pavement drainage flows into these channels so as to not overwhelm them. Identify and incorporate drainage design facilities, such as detention basins to regulate drainage flows into these channels.

Additional roadway design ICO’s are:

- There are several developed residential subdivisions that are adjacent to I-10 right-of-way. It is important to avoid acquiring new right-of-way from these subdivisions. Identify and incorporate shifts in the I-10 centerline alignment to avoid acquiring new right-of-way from these subdivisions while still providing sufficient right-of-way width to support the I-10 typical section.
- Along the SR 210 corridor between Ajo Way and Irvington Road, it would be advantageous to acquire new right-of-way from only one side. Identify and incorporate shifts in the SR 210 alignment to accommodate this condition.
- Reduce impacts to existing major utilities. Identify and incorporate adjustments in alignments to avoid impacts to major utilities. For example, adjust the vertical profile of Alvernon Way just north of I-10 to provide adequate vertical clearance under the existing overhead transmission power lines that extend west out of the TEP plant.

### Environmental ICOs

The following environmental ICO’s were identified:

- Identify, evaluate and avoid environmental impacts. If environmental impacts cannot be avoided, identify and incorporate mitigation measures.
- Eliminate or reduce impacts to the Littletown area.
- Eliminate or reduce impacts to Davis-Monthan AFB.
- Widening I-10 and extending SR 210 to handle more traffic will increase traffic noise. Identify reasonable and feasible noise mitigation measures per the ADOT Noise Abatement Requirements (ADOT, 2017).
- Identify, evaluate and avoid nearby historic building structures and mitigate impacts if any.

- Identify, evaluate and avoid nearby cultural resources and mitigate impacts if present.
- Identify, evaluate and avoid nearby parks, trails and recreational areas. Mitigate impacts if present.

The ICOs identified above will be addressed by the study and will be used to evaluate alternatives.

### **1.2.2 Feasibility Study**

A project study team, in cooperation with participating agencies, initiated a study of the feasibility of improving I-10 from the I-19 traffic interchange (TI) (MP 260.2) easterly through the SR 83 TI (MP 282.0) and extending SR 210 from its current easterly end at Golf Links Road to an interchange connection with I-10 at a location to be determined. The study team also prepared an Environmental Overview that helped identify environmental impacts from the evaluated improvements and alternatives.

All improvements to I-10 and the extension of SR 210 to I-10 are to accommodate design year 2040 traffic. A traffic study was prepared that used 2040 traffic volume projections from PAG and identified the number of traffic lanes needed on I-10 and SR 210 to provide an adequate Level of Service (LOS) as per ADOT criteria. The traffic study also evaluated ‘no-build’ scenarios with design year volumes. This identified which existing ramps do not provide an adequate LOS for the design year and require modification. Each ramp modification was tested to ensure that it provided an adequate LOS.

The traffic study also evaluated several alternatives for the extension of SR 210 and the system interchanges where they connect to I-10. In summary, simultaneous design development and LOS evaluation resulted in alternatives that adequately provide traffic capacity for the 2040 design year and an adequate LOS.

The Feasibility Study presented various alternatives for accomplishing the necessary improvements and evaluated each alternative with recommendations for alternatives to be retained and carried forward for further study.

During development of the Feasibility Report, improvement alternatives I, II and IIIc were identified and evaluated for the extension of SR 210 to several connection locations with I-10.

- Alternative I extends SR 210 along the Alvernon Way corridor to I-10.
- Alternative II extends SR 210 along the western edge of Davis-Monthan AFB and then south along the Swann Road alignment to I-10 just north of Valencia Road.





- Alternative IIIc extends SR 210 along the entire western edge of Davis-Monthan AFB to connect with I-10 at the existing Wilmot Road TI.

The alternatives included improvements to I-10 interchanges and system interchanges where SR 210 connects to I-10. The Feasibility Study was completed in October 2012 and submitted for review. It recommended that three alternatives (I, II and IIIc) move forward into the DCR phase of the study.

### **1.2.3 Feasibility Study Update**

After the Feasibility Report was submitted, the traffic study was redone, significantly reducing the expected growth rate in the Tucson metropolitan area due to the downturn in the economy. In summary, the 2040 projected traffic volumes reduced, but not enough to result in the reduction in general purpose lanes on either I-10 or SR 210. Therefore, the alternatives remain unchanged so that they should accommodate traffic at an acceptable LOS beyond the 2040 design year.

In addition, a third alternative was added for evaluation. Regarding the extension of SR 210, Alternative IV is similar to Alternative I. The difference between these two alternatives is in their configuration along I-10 between the system interchange with SR 210 and Kolb Road.

Alternative I has five general purpose lanes in each direction. Alternative IV has three general purpose lanes in each direction and adjacent collector-distributors (CD's) in each direction.

The Feasibility Report Update for I-10; Jct. I-19 to SR 83 & SR 210; Golf Links Road to I-10 was initiated in January of 2014 and the Final Feasibility Study Update was issued in February of 2015. It recommended three alternatives (I, II & IV) to carry forward into the DCR phase of the study.

During preparations for Phase II (preparation of the DCR and the EA), stakeholder concerns related to taking property from Davis-Monthan AFB for Alternative II were discussed with FHWA, ADOT, the City of Tucson and Pima County. The proposed route for Alternative II could pose additional risk to the security of the AFB and require a number of additional business relocations that would not occur for Alternatives I and IV. Subsequently, Alternative II was eliminated from further consideration.

### **1.2.4 Design Concept Study**

Phase II of the study is the development of both the DCR and the EA. The DCR refines the designs of Alternatives I and IV to a level that allows for finite comparisons and evaluations of the two alternatives. The EA identifies environmental impacts of the two alternatives and any environmental mitigation measures needed.

### 1.3 Purpose and Need for the Project

#### 1.3.1 Purpose and Need for Improvement of I-10

The Interstate Highway System was intended to relieve congestion, improve safety, and enhance the economy by facilitating the movement of people and goods throughout the nation. Increasing traffic volumes on I-10 in the vicinity of Tucson, Arizona have contributed to reduced operational effectiveness, particularly the segment of I-10 between I-19 and Kolb Road.

The traffic modeling and analysis accomplished for the Feasibility Study demonstrated that north-south traffic demands through the project area are constrained by limitations on north-south arterial corridors. The UPRR switching yard located parallel to SR 210, north of I-10 prohibits any north-south arterials between Kino Parkway and Alvernon Way. The Davis-Monthan Air Force Base (AFB) prohibits any north-south arterials between Alvernon Way and Kolb Road. Traffic along I-10 concentrates at certain TIs where major north-south arterials exist.

Expected future growth in the Tucson area will be to the south and southeast of the downtown area. Since I-10 cuts diagonally across this growth area, it is also expected that it will be the primary travel corridor for this growth.

East of the System Interchange with I-19, I-10 was constructed in the 1960's as a rural interstate highway with rural design criteria and typically with just two lanes of traffic in each direction. Several of the TIs are partial cloverleaf type interchanges that have short ramp weave distances that adversely impact traffic operational efficiency, especially as traffic volumes increase over time. Some of the interchanges are spaced closer together than the recommended minimum of one mile, thus contributing to reduced operational efficiency.

Crash data analysis accomplished for the Feasibility Study and updated for the DCR demonstrated that annual crash rates within the study area have been increasing. Some of these crashes may be attributed to the old 1960's design of I-10 and the interchanges.

**Table 1.1 5-Year Crash Summary (July 2011-June 2016)**

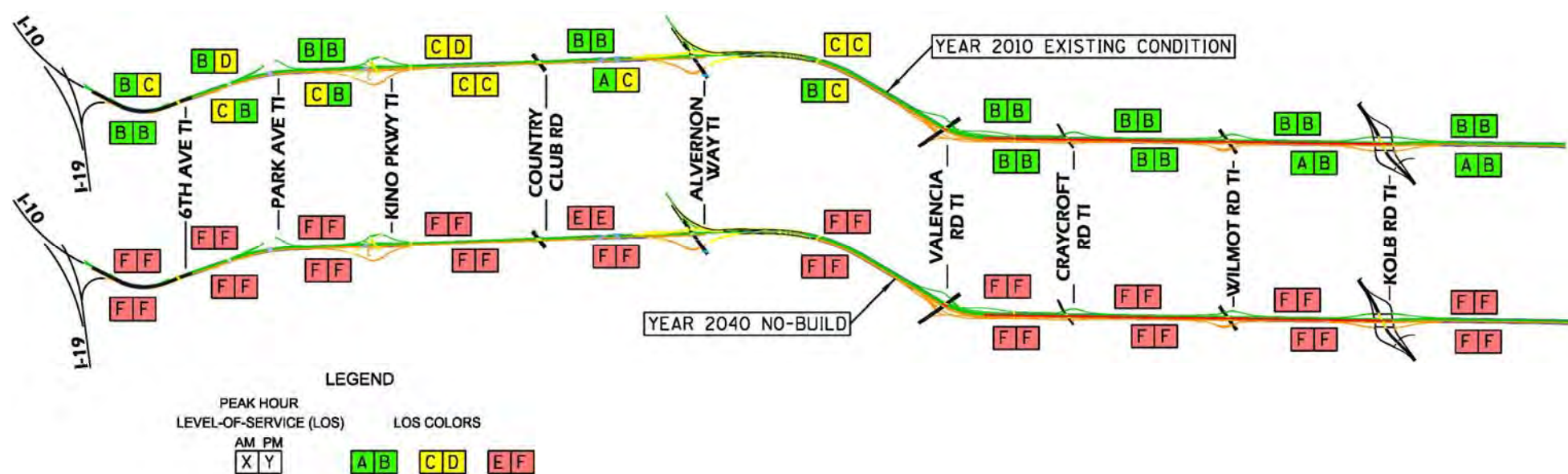
Year	Total Crashes
July 2011 – June 2012	335
July 2012 – June 2013	372
July 2013 – June 2014	393
July 2014 – June 2015	470
July 2015 – June 2016	486
<b>Total</b>	<b>2,056</b>

In summary, the small number of north-south arterials, the diagonal alignment of I-10, and the projected growth pattern in Tucson contribute to an increase in local traffic using the Interstate Highway for short local trips. The numerous access points on I-10 and the old 1960's design present additional performance issues. These limitations further slow travel on the I-10 mainline and lead to more conflict between local and regional traffic. This is confirmed by the steady increase in crashes. Conflicting interaction between local and regional/interstate traffic has led to a reduction in the capacity of I 10 to accommodate through (regional) travel. Expected growth in both regional and local traffic on I-10 will further reduce the capacity of I-10.

Analysis of 2010 traffic shows that I-10 in the study area operates at level of service (LOS) D or better in the AM and PM peak hours except for isolated areas where AM or PM peak hour LOS is less than LOS D, as discussed in the Feasibility Report Update. See **Figure 1.3**.

In the future, increasing traffic volumes on this segment of I-10 originating from anticipated growth to the south and east of downtown Tucson, as well as growing demands on I-10 as an interstate facility, will lead to capacity and access restrictions on and along the interstate. Poor operational performance for local, regional, and interstate traffic will result from operations on this portion of I-10 declining to LOS D then to LOS F by 2040. The decline to LOS F will show the roadway is failing to function as intended with forced flow and extensive delays. See **Figure 1.3**.

**Figure 1.3 Existing and Future Mainline Lanes & LOS Summary**





The combination of demand exceeding capacity and poor access along I-10 will restrict and compromise the primary functions of the roadway network in the study area. This will contribute to a growing degradation of the primary purpose and operational characteristics of I-10 as originally designed and compromise the purposes of the overall roadway network in the study area.

The purpose of the proposed improvements to I-10 is to address deficiencies in the Interstate highway system through the study area and ultimately develop improvements that will provide satisfactory service levels on the Interstate highway through the 2040 design year.

### 1.3.2 Purpose and Need for Extension of SR 210 to a Connection with I-10

SR 210 in the City of Tucson, Arizona, was built as an urban highway subsequent to the construction of I-10. SR 210 is approximately 3.4-miles long and is oriented in a northwest to southeast direction, extending southeast from West Broadway Boulevard at North 1st Avenue, with intersections at Kino Parkway, East 22nd Street, South Country Club Road, East 34th Street, Richie Road, and Dodge Boulevard, before terminating at Alvernon Way / Golf Links Road.

Much of SR 210 was constructed adjacent to the Union Pacific Railroad (UPRR); they share a number of grade separations from the City's street network. This proximity to the railroad minimizes the number of cross streets and access points to SR 210, which is advantageous to the use of SR 210 as an urban parkway. However, the presence of the UPRR switch yard serves as a barrier to north-south city arterials, which has a negative effect on traffic that is destined to and from North Tucson. Much of the north-south traffic that is blocked by the UPRR remains on I-10 to access major north-south arterials to reach their destinations.

SR 210 is intended to provide motorists with an alternate route into Tucson's downtown business district from points east and south of downtown.

The use of SR 210 as a business spur is limited by the fact that motorists on westbound I-10 desiring to access downtown Tucson via SR 210 must currently use city arterials to get from I-10 to SR 210. The additional trips on the city arterials tend to exceed the capacity of the local roadway network, which causes motorists to stay on I-10. Commercial and commuter traffic heading into downtown Tucson also use I-10 and add to peak hour congestion, causing increased volume and stress to the operation of the interstate highway. As is, the limited capacity and limited access for local trips prevents the existing roadway network in the study area from functioning as primarily intended.

Since I-10 runs parallel to SR 210 approximately 1.75 miles south of SR 210, connecting SR 210 and I-10 would facilitate the intended use of SR 210 as a business spur. It would provide westbound local traffic with an attractive alternative to using I-10 for accessing downtown Tucson and would allow the interstate route to better serve through-traffic.

For SR 210 traffic to increase to a level nearer capacity, local traffic currently using I-10 would require improved access via an extension of SR 210 to the south and east, likely connecting to I-10 somewhere between the existing Alvernon Way TI and the Rita Road TI south of DMAFB. This connection would allow SR 210 to become a viable alternative to I-10 for local traffic to and from the business, university and cultural districts in the downtown Tucson area.

The purpose of extending SR 210 to an interchange with I-10 is to provide traffic originating east and south of downtown Tucson an alternative route to access the city center. Improved operational performance for local, regional, and interstate traffic would result from better utilization of SR 210 and improved operations on I-10.

## 1.4 Description of the Project

### 1.4.1 Project Limits

**Figure 1.2 Project Vicinity Map** shows the limits of the DCR study, beginning to the east of the I-19 TI (MP 260.79) and extending easterly through the Kolb Road TI (MP 272.30). The study also extends SR 210 from its current easterly end at Golf Links Road to I-10 with a system interchange connection at Alvernon Way (I-10 MP 265.04). See Appendix A for Existing Conditions along the I-10 and SR 210 corridors.

### 1.4.2 History of the Project Route

I-10 within the project limits was constructed in the 1960's with two 12-foot lanes, two-foot inside shoulders, and 10-foot outside shoulders in each direction. An open median typically separates the eastbound and westbound roadways. At the time, the I-10 corridor was designed as a rural interstate highway with rural highway criteria and rural drainage facilities. Some of the traffic interchanges were Pima County projects within Pima County acquired right-of-way.

While a third lane in each direction from I-19 to west of Kino Parkway was added around 1990, the remainder of the I-10 corridor is virtually unchanged; with several partial cloverleaf type interchanges remaining.

For SR 210, the Barraza-Aviation Parkway was designed and constructed between Broadway Boulevard and Golf Links Road in the 1980's and 1990's. The parkway parallels the UPRR facilities and connects downtown Tucson with Golf Links Road, south Alvernon Way, and south Palo Verde Road by way of Richie Boulevard. It typically has two lanes

in each direction with a raised median. Connections with major local streets are via signalized intersections.

### 1.4.3 Proposed Improvements

Modifications are needed to improve the safety and capacity to I-10 within the project limits and to extend SR 210 to a connection with I-10.

- The purpose of the study is to: Identify the scope of work and design concept for safety and capacity improvements for Design Year 2040 to both the eastbound and westbound roadways of I-10 and for the extension of SR 210 to a connection with I-10.
- Additional right-of-way (R/W) will be required for the addition of general purposes lanes, adding parallel drainage facilities, and for reconfiguring several traffic interchanges along the I-10 corridor. Additional R/W will be required along the SR 210/Alvernon Way corridor for additional general purpose lanes, for the reconfiguration of the interchange with Golf Links Road, and for new traffic interchange ramps at Ajo Way.
- Convert the rural type drainage facilities to an urban type design with a combination of storm drains and drainage channels to either existing drainage facilities or to new drainage basins.
- Coordinate with local utilities to identify and evaluate any major utilities that could potentially be impacted by the preferred improvements.
- Coordinate with ADOT and local agencies to establish left turn access control along interchange cross streets in accordance with current ADOT policy.
- Coordinate with ADOT and local agencies to establish cross street typical sections to meet both current and future capacity needs. The goal is to identify cross street width impacts on overpass structure span lengths and impacts to freeway profiles.
- Coordinate with ADOT and local agencies to identify and evaluate any potential transit features that could be affected by the preferred improvements.
- Develop an Implementation Plan that identifies a potential chronological order of construction projects.
- Prepare an environmental document (Environmental Assessment) to identify and evaluate any potential environmental features that could be affected by the preferred improvements.

## 1.5 Characteristics of the I-10 and SR 210 Corridors

### 1.5.1 Characteristics of the I-10 Corridor

The Design Concept Study area begins to the east of the limits of the I-10/I-19 System Interchange at MP 260.79 and extends eastward approximately 5 miles to I-10 MP 272.3, east of the I-10/Kolb Road TI. See **Figure 1-2 Vicinity Map**.

The Union Pacific Railroad approaches I-10 from the north along the east side of Alvernon Way. The railroad turns and continues southeast approximately 250-feet north of I-10 for a short distance. The railroad and I-10 then separate and continue south-east about three-quarters of a mile apart.

At the beginning of the project, I-10 turns from a north-south direction to an east-west direction as the corridor proceeds to the east. Just east of Park Avenue, I-10 turns to the southeast. From Park Avenue to the end of the project I-10 is oriented on a northwest to southeast diagonal that intersects the city street grid at approximately a 45-degree angle.

From the beginning of the project at I-19 to Kino Parkway, I-10 has three lanes eastbound and three lanes westbound with 10-foot inside and outside shoulders. From Kino Parkway to the end of the project east of Kolb Road, I-10 has two eastbound lanes and two westbound lanes with 10-foot outside shoulders and 4-foot inside shoulders.

I-10 has a variable width median running through the project area. From the beginning of the project through 6th Avenue the median width is 32-feet, with a concrete barrier located in the center of the median. Through the horizontal curve east of 6th Avenue the median narrows to 26-feet. The 26-foot median continues to Park Avenue, where the median transitions to 60-foot wide and the concrete barrier ends. The 60-foot wide median continues to Kino Parkway, where the width of the median transitions to 84-foot wide. The 84-foot wide median continues to Valencia Road. The median width narrows to 68-foot wide through the horizontal curve on I-10 at Valencia Road. The 68-foot wide median continues through Houghton Road to approximately MP 277.4.

The existing cross-slope of the I-10 roadway in tangent sections as shown on as-built plans is:

Beginning of Project @ MP 260.2 to MP 267.5: roadway cross-slope is -0.01ft/ft from median to shoulder.

MP 267.5 to End of Project @ MP 270.6: roadway cross-slope is -0.015ft/ft from median to shoulder.

TIs are located at major cross streets including from west to east: 6th Avenue, Park Avenue, Kino Parkway, Palo Verde Road, Alvernon Way, Valencia Road, Craycroft Road, Wilmot Road, and Kolb Road.

The Design Speed on I-10 through the project limits is 65 mph in accordance with the ADOT RDG for urban/fringe urban Controlled Access Highways.

The speed limit on I-10 is 55 mph from I-19 through the Kino Parkway TI where the speed limit increases to 65 mph through Kolb Road TI. The speed limit then increases to 75 mph east of the study area.

#### Previous I-10 Projects

Based upon available data at ADOT Engineering Records, the following I-10 projects have been completed within the Study Area.

**Table 1.2 Previous Projects Within the I-10 Study Area**

Project No.	Begin MP	End MP	Const. Date	Description
UI-141(4)	259.8	261.2	1955	2-24' PCC + 10'AC
IR 10-5(54)	260	262.4	1989	I-19 – Park Ave. Remove & Replace Exist. EB, WB & Structures
NH 10-5(71)	260	262		I-19 – Park Ave. Landscape & Irrigation
ARRA 010-D(206)A	260.2	267.2		I-19 – Valencia Rd. FMS
I-10-5(32)	260.7	261.5	1965	6th Ave. TI Ramps, Vet OP & Fr. Rd.
F 002-4(1)	261.2	261.5	1958	Veterans OP and Approaches MBS
I-10-4-927	260.4	-	1976	Jct. I-19 TI Groove Ramps
IM 10-5(77)P	260.5	268.8	2001	Jct. I-19 – Craycroft Rd. Signing
I-10-5(16)	261.4	264	1964	Vet OP – Hughes Access Rd. GD
I-10-5(28)	261.4	268.3	1967	Vet OP – Valencia Rd. BC PCC
I-10 -5(42)	261.4	267.5	1983	Lighting & Safety
ACIR-10-5(58)	262	267	1988	Park Ave. – Valencia Rd. Pavement Rehab
I-10-5-910	262.4	-	1976	Ajo Way OP (EB) Bridge Repair
N-900-0-543	262.6, 268.1		1999	Kino & Craycroft TIs Minor Improvements
I-10-5(30)	262.7	263	1966	Campbell Rd TI GD/Str

**Table 1.2 Previous Projects Within the I-10 Study Area**

Project No.	Begin MP	End MP	Const. Date	Description
I-10-5(17)	264	267.5	1965	Hughes Access Rd. – East GD
010 E NFA	264.1	264.9	2008	Palo Verde TI Construct TI Lighting
IR 10-5(55)	265	-	1984	Alvernon Way (Valencia-Irvington Rd) GD
IR 10-5(61)	265	265.4	1986	Alvernon Way OP
BP-IR-10-5(57) & BP-F 084-1(9)	267	-	1983	Kolb Rd. (I-10 – Valencia Rd.) New TI
I-10-5(56)	267.1	267.5	1986	I-10 @ Valencia Rd. New TI
I-10-5(5) & F 002-4(6)	267.5	272.8	1958	1-36' AC (EB)
I-10-5(12)	267.5	272.8	1958	GD/AC (WB)
IR-10-5(62)	267.5	272	1990	Valencia – Rita Rd. Remove, Recycle, AC Overlay
IR-I-10-5(40)	267.53	281.2	1978	Valencia Rd. – Mtn. View TI Resurface
IR-10-5(30)	268	-	1986	I-10 Access Ramps (Kino Blvd/Ajo Way) Mod. TI, GD/AC Pave
NHPP-010-E(219)T	267.81	268.36	2017	Remove and replace Craycroft Road Bridge decks (STR # 594 & #595)
IM-010-E(010)A	268.0	350.0	2016	I-10 Sign Rehabilitation Project
NH-010-E(214)T	268.0	268.3	2016	I-10 Craycroft Road TI signals

#### Existing I-10 Right-of-Way

The existing right-of-way (ROW) width of I-10 varies through the length of the project. At each TI the right-of-way increases substantially, depending on the configuration of the TI. The ROW is also increased to accommodate frontage roads. The following ROW mainline widths provide a general overview of the ROW corridor. However, it will be necessary to refer directly to the ADOT ROW plans for detailed information.

- From the I-19 TI to the 6th Avenue TI – Mainline ROW width is 200-feet.
- From the Park Avenue TI to the Valencia Road TI – Mainline ROW width is 300-feet.
- From the Valencia Road TI to the Kolb Road TI – Mainline ROW width is 280-feet.



- From the Kolb Road TI to the Rita Road TI – Mainline ROW width varies from 300-feet to 400-feet.

**Existing I-10 Structures**

The following existing structures are located along I-10 within the study area:

**Table 1.3 Existing I-10 Structures**

Milepost	Structure No.	Structure Name	Spans/Str. Length	Br. Rdwy. Width
260.37	2599	12th Ave. Connector Br.	1/95	55.2'
260.55	2194	10th Avenue OP	4/310'	147.3'
260.99	2195	6th Ave. TI UP	2/209'	82'
261.41	2164	Frontage Road. UPRR OP WB	3/167'	40'
261.41	2196	Loop Road. UPRR PB EB FR	3/167'	40'
261.41	2197	Veterans UPRR OP	3/168'	125.8'
261.72	2162	Park Ave. TI OP EB	4/251'	72.5'
261.72	2163	Park Ave. TI OP WB	4/248'	72'
262.38	2012	Ramp K3 Over Ajo Way	2/176'	26'
262.44	1107	Ajo Way OP EB	4/261'	38'
262.44	1108	Ajo Way OP WB	4/261'	38'
262.53	1162	Kino Pkwy TI UP NB	7/504'	49'
262.53	1163	Kino Pkwy TI UP SB	6/461'	38'
262.82	1109	Diversion Channel Br EB	1/90'	64'
262.82	1110	Diversion Channel Br WB	1/90'	50'
263.82	1111	Country Club OP EB	3/150'	38'
263.82	1112	Country Club OP WB	3/150'	38'
264.27	1217	Irvington Road. OP EB	4/261'	42'
264.27	1218	Irvington Road. OP WB	4/261'	42'
264.37	1219	Palo Verde TI OP EB	4/195'	42'
264.37	1220	Palo Verde TI OP WB	4/195'	42'
265.02	2018	Alvernon Way TI OP EB	2/215'	60'
265.02	2019	Alvernon Way TIOPWB	2/215'	60'
265.80	5555	Julian Wash RCB	6Brl/74'	-
266.00	1223	Drexel Road. OP EB	3/141'	38'
266.00	1224	Drexel Road. OP WB	3/141'	38'
267.10	1225	Valencia Road. TI OP EB	4/183'	38'

**Table 1.3 Existing I-10 Structures**

Milepost	Structure No.	Structure Name	Spans/Str. Length	Br. Rdwy. Width
267.10	1226	Valencia Road. TI OP WB	4/183'	38'
267.65	1044	Earp Wash Trib Br EB	4/96'	48.8'
267.65	1045	Earp Wash Trib Br WB	4/96'	48.8'
267.65	1052	Earp Wash Trib Br FR Br	4/96'	24'
267.65	6814	Earp Trib RCB/EB FR	3Brl/32'	-
268.08	594	Craycroft TI OP EB	4/177'	38.2'
268.08	595	Craycroft TI OP WB	4/177'	38.2'
269.36	596	Wilmot Road TI OP EB	4/177'	38'
269.36	597	Wilmot Road. TI OP WB	4/177'	38'
270.58	1823	Kolb Road TI UP	2/280'	76.2'

**1.5.2 Characteristics of the SR 210 Corridor**

The study area begins at the east end of SR 210 near Golf Links Road and Alvernon Way. The north-west end of the Davis-Monthan AFB is located just east of the end of SR 210. Alignments to extend SR 210 south-east to connect with I-10 will be identified east from Alvernon Way. The northern limits of the study area will be the southern boundary of Davis-Monthan AFB. Alignments to extend SR 210 will have to turn to the south to avoid Davis-Monthan AFB.

Property through the study area for extending SR 210 is primarily industrial and commercial along Alvernon Way from Golf Links Road south to I-10. South of I-10 along Alvernon Way the property is primarily residential with some undeveloped commercial land. The Los Niños Elementary School is located to the east of Alvernon Way south of the Julian Wash.

**Previous SR 210 Projects**

Based upon available data at ADOT Engineering Records and Pima County, the following projects have been completed within the project limits.

**Table 1.4 Previous Projects within the SR 210 Study Area**

Project No.	Begin MP	End MP	Const. Date	Description
M-824-9-522	2.4	4.5	1995	Grade, Drain, Pave, Structures SR 210
AZ-IMX-505-4(4)	4.5	--	1985	Grade, Drain, Pave, Structures Golf Links Road

IXD-508-4(5) & IXM-508-4(5)	-	-	1984	Grade, Drain, Pave, Structures Golf Links Road and Alvernon Way
IXD-508-4(4)	-	-		Grade, Drain, Pave, Structures

**Existing SR 210 Right-of-Way and Access Control**

Existing Right-of Way (ROW) for SR 210 is shown on the ADOT Right of Way Plan for the Aviation Corridor Highway; Park Avenue – Palo Verde Road, SR 210; Project No. AZP-824-9-704. The northern ROW line and the southern ROW line and access control line is shown on this set of plans.

The north access control line is defined on the Results of Survey; Aviation Corridor Highway; 6th Avenue – Palo Verde Road; Project No. 210 PM 001 H0888 01R, Federal No. N 810-601-PM(1). Access control is broken at 22nd Street, 34th Street and Richie Boulevard.

The southern ROW and Access Control line is a common line with the northern UPRR Right-of-Way line.

East of Palo Verde Road all existing ROW is Tucson City Street Right-of-Way.

**Existing SR 210 Structures**

The following existing structures are located along SR 210 within the study area.

**Table 1.5 Existing Structures - SR 210 Study Area**

Roadway	Struct. No.	Structure Name	Spans/Str. Length	Br. Rdwy. Width
Golf Links Rd.	9815	Aviation Hwy. Ramp OP	3/250	72'
Alvernon Way	9809	Aviation Hwy. UP Br.	1/86	76'
Alvernon Way	9811	Alvernon NB FR. OP	3/146	100'
Alvernon Way	9813	Alvernon UPRR & SB FR OP	5/417	100'
Alvernon Way	-	RCBC (north of Ajo Way)	4/32	205'
Alvernon Way	-	RCBC (north of Irvington Road)	4/40	156'
Alvernon Way	8733	Small Wash RCB	3/30	80

## 2. TRAFFIC AND CRASH DATA

### 2.1. Forward

A separate traffic report was prepared to supplement this study that provides more details into the traffic analysis. The traffic report assessed the existing and forecasted traffic demand, using the 2014 PAG Travel Demand Model, to evaluate the current and potential corridor alternative improvements to address transportation deficiencies, reduced mobility, and bottleneck locations. The adopted 2015 PAG Travel Demand Model was obtained and reviewed for the consistency of the traffic projections to verify that no significant changes occurred in the study area. This section will summarize the evaluation and major findings of the report. **Appendix B. Initial Traffic Report Figures** contains the figures of traffic volumes and Level of Service (LOS) for all the analysis scenarios.

### 2.2. Traffic Operational Analysis

A Traffic Operational Analysis was conducted to evaluate the effectiveness of the existing roadway system and to evaluate the improvement alternatives developed to address future traffic volumes as projected by the 2040 PAG Travel Demand Model.

The study limits for the traffic operational analysis included I-10 from I-19 to MP 272.3 east of Kolb Road, and SR 210 from 34<sup>th</sup> Street to Alvernon Way. The study area included freeway mainline, ramps, arterials, traffic interchange intersections, and intersections adjacent to the interchange that are directly affected by the interchange operations.

#### 2.3.1 Methodology

The regional traffic modeling provided a macroscopic analysis of the potential improvement alternatives and provided information on the general number of lanes and general concept of the interchanges for future conditions. The traffic operational analysis evaluated the peak hour traffic volumes obtained from the regional modeling efforts, at a ‘microscopic level’, to refine and ensure that the improvement alternatives are operationally feasible. This is an iterative process and takes into account existing and future roadway characteristics, traffic volumes, traffic control measures, and access spacing.

The methodology involved in the operational analysis included the following:

- ‘Spot Checks’ were conducted on mainline freeway segments and merge/diverge areas, for the proposed improvement alternatives, per the Highway Capacity Manual (HCM) using the Highway Capacity Software (HCS).

- The optimal configuration and operation of the traffic interchange intersections and adjacent arterial intersections were evaluated using the Synchro/SimTraffic software.
- The AM and PM peak-hour operations of the roadway network system within the study area were modeled using the VISSIM microsimulation software and included:
  - I-10: mainline, merge/weave areas, ramps, ramp junctions with cross streets, traffic interchange intersections and adjacent intersections directly impacted by the interchange operations.
  - SR 210 (Barraza-Aviation Parkway): arterial, signalized and unsignalized intersections, and ramps.

VISSIM is a microscopic time step and behavior-based simulation model developed to model urban traffic and public transit operations. The program can analyze traffic and transit operations under constraints such as lane configuration, traffic composition, traffic signals, transit stops, etc. This makes it a useful tool for the evaluation of various alternatives based on transportation engineering and planning measures of effectiveness. The measures of effectiveness (MOE’s) obtained from the VISSIM microsimulation model include delay, speed, volume/ density, queues, etc. These are then translated into a level-of-service (LOS) description by facility type, based on the 2010 Highway Capacity Manual definitions. Level-of-service is a qualitative measure of the operational efficiency or effectiveness of a roadway. Six levels of service are defined and are designated by letters ranging from A through F, with LOS A representing the best range of operating conditions and LOS F representing the worst. The specific terms in which each level of service is defined vary with the type of facility involved. Per ADOT Roadway Design Guidelines, for mainline I-10 and SR 210, LOS D is the design criteria for urban conditions while LOS B is the design criteria for rural conditions.

#### 2.3.2 Operational Analysis

A traffic operational analysis was conducted as part of the Feasibility Study Update which consisted of the VISSIM microsimulation model for the following five scenarios:

1. Year 2010: Existing
  - The existing roadway network within the study area was evaluated using traffic data collected in year 2010. The section of I-10 between I-19 and Houghton is considered urban in character, and the section of I-10 between Houghton and SR 83 is considered rural in character. SR 210 within the study area is considered urban in character.

2. Year 2040: No-Build
  - The existing roadway network within the study area was evaluated with the projected year 2040 traffic volumes. Under this scenario there were no proposed improvements made to either I-10 or SR 210. The section of I-10 between I-19 and SR 83 as well as SR 210 within the study area are considered urban in character.
3. Year 2040: System I
  - An improved roadway network (improvements to freeway/highway, ramps, and traffic interchange intersections) was evaluated with the projected year 2040 traffic volumes. In the System I roadway improvement alternative, SR 210 is extended as a freeway along the Alvernon Way alignment to connect to I-10 at a system interchange. The section of I-10 between I-19 and SR 83 as well as SR 210 within the study area are considered urban in character.
4. Year 2040: System II
  - An improved roadway network (improvements to freeway/highway, ramps, and traffic interchange intersections) was evaluated with the projected year 2040 traffic volumes. In the System II roadway improvement alternative, the freeway connection from I-10 to SR 210 begins just west of Valencia Road and continues parallel to the Davis-Monthan Air Force Base (AFB) before tying into the existing SR 210. The section of I-10 between I-19 and SR 83 as well as SR 210 within the study area are considered urban in character.
5. Year 2040: System IV
  - An improved roadway network (improvements to freeway/highway, ramps, and traffic interchange intersections) was evaluated with the projected year 2040 traffic volumes. In the System IV roadway improvement alternative, SR 210 is extended as a freeway along the Alvernon Way alignment to connect to I-10 at a system interchange. A collector-distributor roadway parallels I-10 in both directions between the I-10/SR 210 interchange and Kolb Road. The section of I-10 between I-19 and SR 83 as well as SR 210 within the study area are considered urban in character.

An updated traffic operational analysis was conducted as part of the Design Concept Study which consisted of the VISSIM microsimulation model for the following two scenarios:

1. Year 2040: System I
  - A refined roadway network (improvements to freeway/highway, ramps, and traffic interchange intersections) was evaluated with the projected year 2040 traffic volumes. In the System I roadway improvement alternative, SR 210 is extended as a freeway along the



Alvernon Way alignment to connect to I-10 at a system interchange. The section of I-10 between I-19 and Kolb Road as well as SR 210 within the study area are considered urban in character.

2. Year 2040: System IV

A refined roadway network (improvements to freeway/highway, ramps, and traffic interchange intersections) was evaluated with the projected year 2040 traffic volumes. In the System IV roadway improvement alternative, SR 210 is extended as a freeway along the Alvernon Way alignment to connect to I-10 at a system interchange. A collector-distributor roadway parallels I-10 in both directions between the I-10/SR 210 interchange and Kolb Road. The section of I-10 between I-19 and Kolb Road as well as SR 210 within the study area are considered urban in character.

**2.3.3 Results of Updated Operational Analysis**

The following figures summarize the results of the I-10 Mainline Operational Analysis:

**Year 2010 – Existing Conditions**

**I-10 Mainline:**

For more details, refer to **Figure 2.1: I-10 No-Build Alternative 2010 – Mainline Lanes & LOS Summary** on page 13.

- For the section of I-10 between I-19 and Kolb Road, the LOS is D or better in both the AM and PM peak hour.

**I-10 Ramps:**

For more details, refer to **Table 2.1 I-10 Ramps LOS Summary** on page 17.

- For the section of I-10 between I-19 and Kolb Road, the LOS is D or better in both the AM and PM peak hour, except:
  - I-10 EB Off-ramp to Kino Parkway NB operates at LOS E in the AM peak hour due to queuing backups at the stop control.

**Intersections:**

For more details, refer to **Table 2.3 I-10 Intersection LOS Summary** and **Table 2.4 SR 210 Intersection LOS Summary** on page 19.

- For the section of I-10 between I-19 and Kolb Road, all the intersections in the vicinity of the project operate at LOS D or better during the AM and PM peak hour, except:
  - I-10 WB ramp and Valencia Road intersection operates at LOS E during the AM peak hour.

- For the section of SR 210 between Broadway Boulevard and Alvernon Way, all the intersections operate at LOS C or better during the AM and PM peak hour.

**Year 2040 – No Build**

**I-10 Mainline:**

For more details, please refer to **Figure 2.2: I-10 No-Build Alternative 2040 – Mainline Lanes & LOS Summary** on page 14.

- For the section of I-10 between I-19 and Kolb Road, the LOS is E or worse in both the AM and PM peak hour.

**I-10 Ramps:**

For more details, please refer to **Table 2.1 I-10 Ramps LOS Summary** on page 17.

- For the section of I-10 between I-19 and Kolb Road, the LOS is E or worse in both the AM and PM peak hour, except:
  - I-10 WB off-ramp to I-19 operates at LOS D in the AM peak hour and LOS F in the PM peak hour.
  - I-10 EB off-ramp to 6<sup>th</sup> Avenue operates at LOS C in the AM peak hour and LOS B in the PM peak hour.
  - I-10 EB on-ramp from 6<sup>th</sup> Avenue operates at LOS D in the AM peak hour.
  - I-10 WB on-ramp from 6<sup>th</sup> Avenue operates at LOS C in the AM peak hour and LOS D in the PM peak hour.
  - I-10 WB off-ramp to 6<sup>th</sup> Avenue operates at LOS B in both the AM and PM peak hour.
  - I-10 EB off-ramp to Park Avenue operates at LOS D in the AM peak hour.
  - I-10 WB on-ramp from northbound Park Avenue operates at LOS C in the AM and at LOS D in the PM peak hour.
  - I-10 WB off-ramp to Park Avenue operates at LOS D in the AM peak hour.
  - I-10 EB on-ramp from northbound Kino Parkway operates at LOS A in both the AM and PM peak hour.
  - I-10 WB on-ramp from Kino Parkway operates at LOS B in the AM peak hour and LOS D in the PM peak hour.
  - I-10 WB on-ramp from Ajo Way operates at LOS D in the AM peak hour and LOS C in the PM peak hour.

- I-10 WB off-ramp to Ajo Way operates at LOS C in the PM peak hour.
- I-10 WB on-ramp from Irvington Road operates at LOS A in the AM peak hour and LOS B in the PM peak hour.
- I-10 WB off-ramp to Irvington Road operates at LOS C in the AM peak hour and LOS B in the PM peak hour.
- I-10 EB off-ramp to Alvernon Way operates at LOS A in both the AM and PM peak hour.
- I-10 WB off-ramp to Alvernon Way operates at LOS B in both the AM and PM peak hour.
- I-10 WB on-ramp from Valencia Road operates at LOS C in both the AM and PM peak hours.
- I-10 EB off-ramp to Craycroft Road operates at LOS C in the AM peak hour.
- I-10 WB on-ramp from Craycroft Road operates at LOS C in the PM peak hour.
- I-10 WB on-ramp from Wilmot Road operates at LOS C in both the AM and PM peak hour.
- I-10 WB off-ramp to Wilmot Road operates at LOS C in the PM peak hour.
- I-10 EB off-ramp to Kolb Road operates at LOS C in the PM peak hour.
- I-10 WB on-ramp from Kolb Road operates at LOS A in both the AM and PM peak hour.

**Intersections:**

For more details, please refer to **Table 2.3 I-10 Intersection LOS Summary** and **Table 2.4 SR 210 Intersection LOS Summary** on page 19.

- For the section of I-10 between I-19 and Kolb Road, all the intersections in the vicinity of the project operate at LOS E or worse during the AM and PM peak hour, except:
  - Palo Verde Road and Irvington Road operates at LOS D in both the AM and PM peak hour.
  - Hotel Drive and Irvington Road operates at LOS D in both the AM and PM peak hour.
  - Alvernon Way and Irvington Road operates at LOS D in the AM peak hour.



- I-10 EB ramp and Alvernon Way operates at LOS B in the AM peak hour.
- For the section of SR 210 between 34th Street and Alvernon Way, all the intersections operate at LOS E or worse during the AM and PM peak hour, except:
  - SR 210 and 34<sup>th</sup> Street operates at LOS A in both the AM and PM peak hour.
  - Palo Verde Road and the Frontage Road operates at LOS A in both the AM and PM peak hour.
  - Palo Verde Road and 37<sup>th</sup> Street operates at LOS A in both the AM and PM peak hour.
  - SR 210 and Alvernon Way operates at LOS C in both the AM and PM peak hour.

#### **Year 2040 – System Alternative I Improvements**

##### **I-10 Mainline:**

For more details, refer to **Figure 2.3 I-10 System Alternative I – 2040 Build - Mainline Lanes & LOS Summary** on page 15.

- For the section of I-10 between I-19 and Kolb Road, the LOS is C or better in both the AM and PM peak hour.

##### **SR 210 Mainline:**

For more details, please refer to **Figure 2.3: I-10 System I Alternative – 2040 Build - Mainline Lanes & LOS Summary** on page 15.

- For the section of SR 210 between 34th Street and the I-10/SR 210 system interchange, the LOS is C or better in both the AM and PM peak hour.

##### **I-10 Ramps:**

For more details, please refer to **Table 2.1 I-10 Ramps LOS Summary** on page 17.

- For the section of I-10 between I-19 and Kolb Road, the LOS is D or better in both the AM and PM peak hour.

##### **SR 210-Ramps:**

For more details, refer to **Table 2.2 SR 210 Ramps LOS Summary Table** on page 18.

- For the section of SR 210 between Golf Links Road and the I-10/SR 210 system interchange, the LOS is D or better in both the AM and PM peak hour.

##### **Intersections:**

For more details, refer to **Table 2.3 I-10 Intersection LOS Summary** and **Table 2.4 SR 210 Intersection LOS Summary** on page 19.

- For the section of I-10 between I-19 and Kolb Road, all the intersections in the vicinity of the project operate at LOS D or better during the AM and PM peak hour.
- For the section of SR 210 between 34<sup>th</sup> Street and the I-10/SR 210 system interchange, all the intersections operate at LOS C or better during the AM and PM peak hour.

#### **Year 2040 – System Alternative IV Improvements**

##### **I-10 Mainline:**

For more details, please refer to **Figure 2.4: I-10 System IV Alternative – 2040 Build - Mainline Lanes & LOS Summary** on page 16.

- For the section of I-10 between I-19 and Kolb Road, the LOS is D or better in both the AM and PM peak hour.
- For the CD roadway between the I-10/SR 210 system interchange and Kolb Road, the LOS is C or better in both the AM and PM peak hour.

##### **SR 210 Mainline:**

For more details, please refer to **Figure 2.4: I-10 System IV Alternative – 2040 Build - Mainline Lanes & LOS Summary** on page 16.

- For the section of SR 210 between 34th Street and the I-10/SR 210 system interchange, the LOS is C or better in both the AM and PM peak hour.

##### **I-10 Ramps:**

For more details, please refer to **Table 2.1: I-10 Ramps LOS Summary** on page 17.

- For the section of I-10 between I-19 and Kolb Road, the LOS is D or better in both the AM and PM peak hour.

##### **SR 210 Ramps:**

For more details, please refer to **Table 2.2: SR 210 Ramps LOS Summary** on page 18.

- For the section of SR 210 between Golf Links Road and the I-10/SR 210 system interchange, the LOS is D or better in both the AM and PM peak hour.

##### **Intersections:**

For more details, please refer to **Table 2.3: I-10 Intersection LOS Summary** and **Table 2.4 SR 210 Intersection LOS Summary** on page 19.

- For the section of I-10 between I-19 and Kolb Road, all the intersections in the vicinity of the project operate at LOS D or better during the AM and PM peak hour.
- For the section of SR 210 between 34th Street and the I-10/SR 210 system interchange all the intersections operate at LOS C or better during the AM and PM peak hour.



Figure 2.1 I-10 Existing Conditions 2010 – Mainline Lanes & LOS Summary

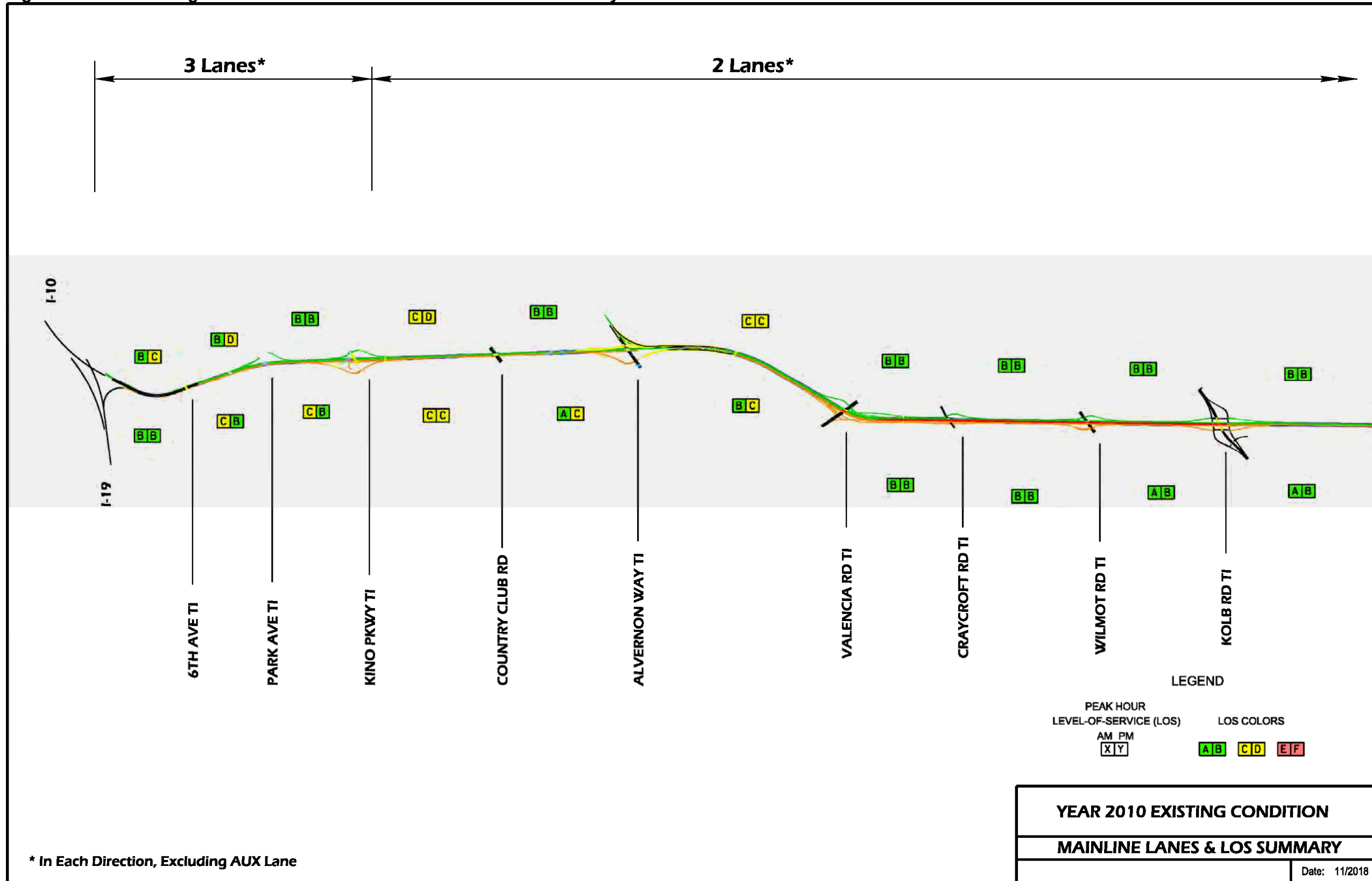


Figure 2.2 I-10 No Build Alternative 2040 – Mainline Lanes & LOS Summary

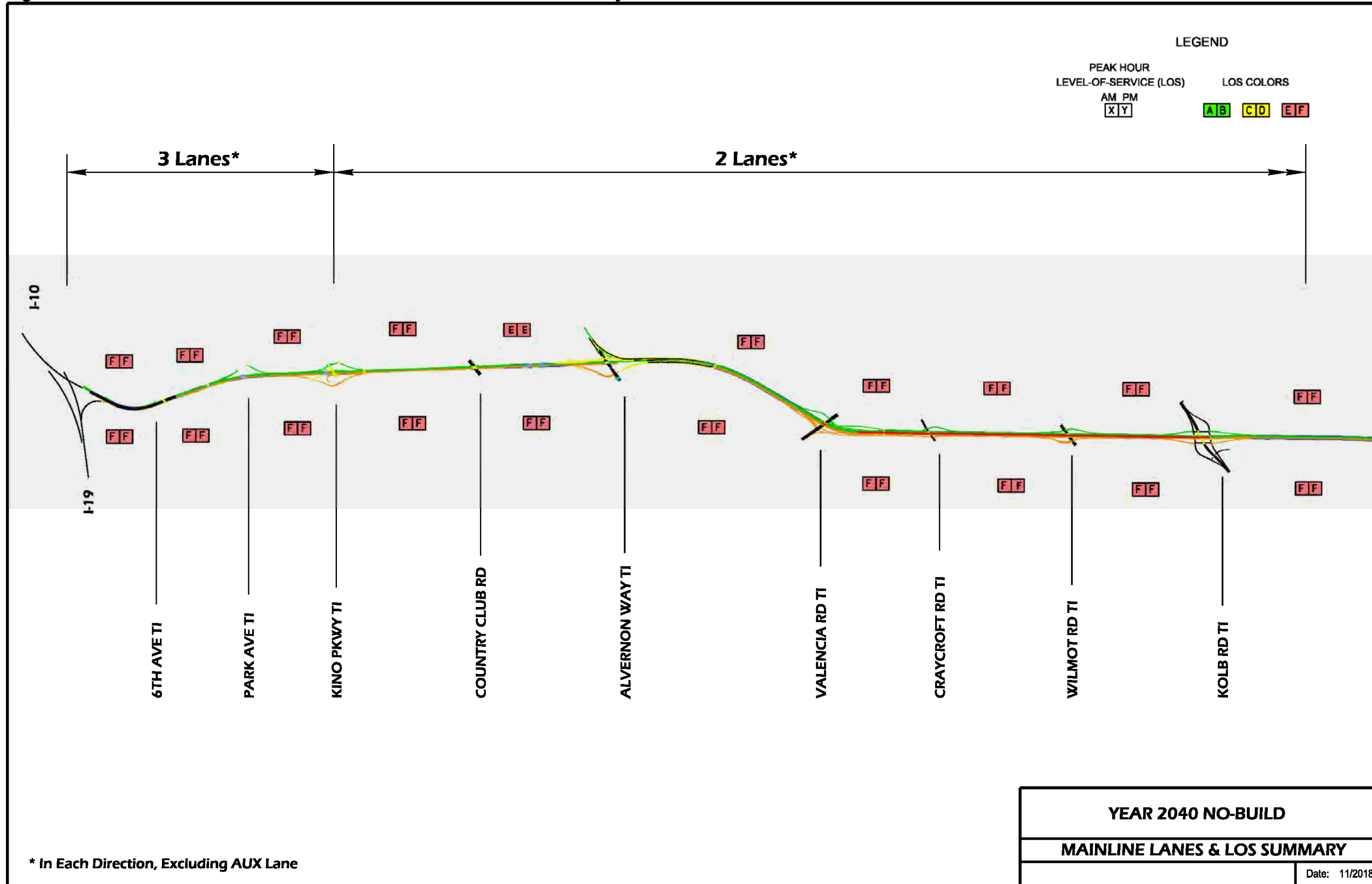




Figure 2.3 I-10 System Alternative I – 2040 Build – Mainline Lanes & LOS Summary

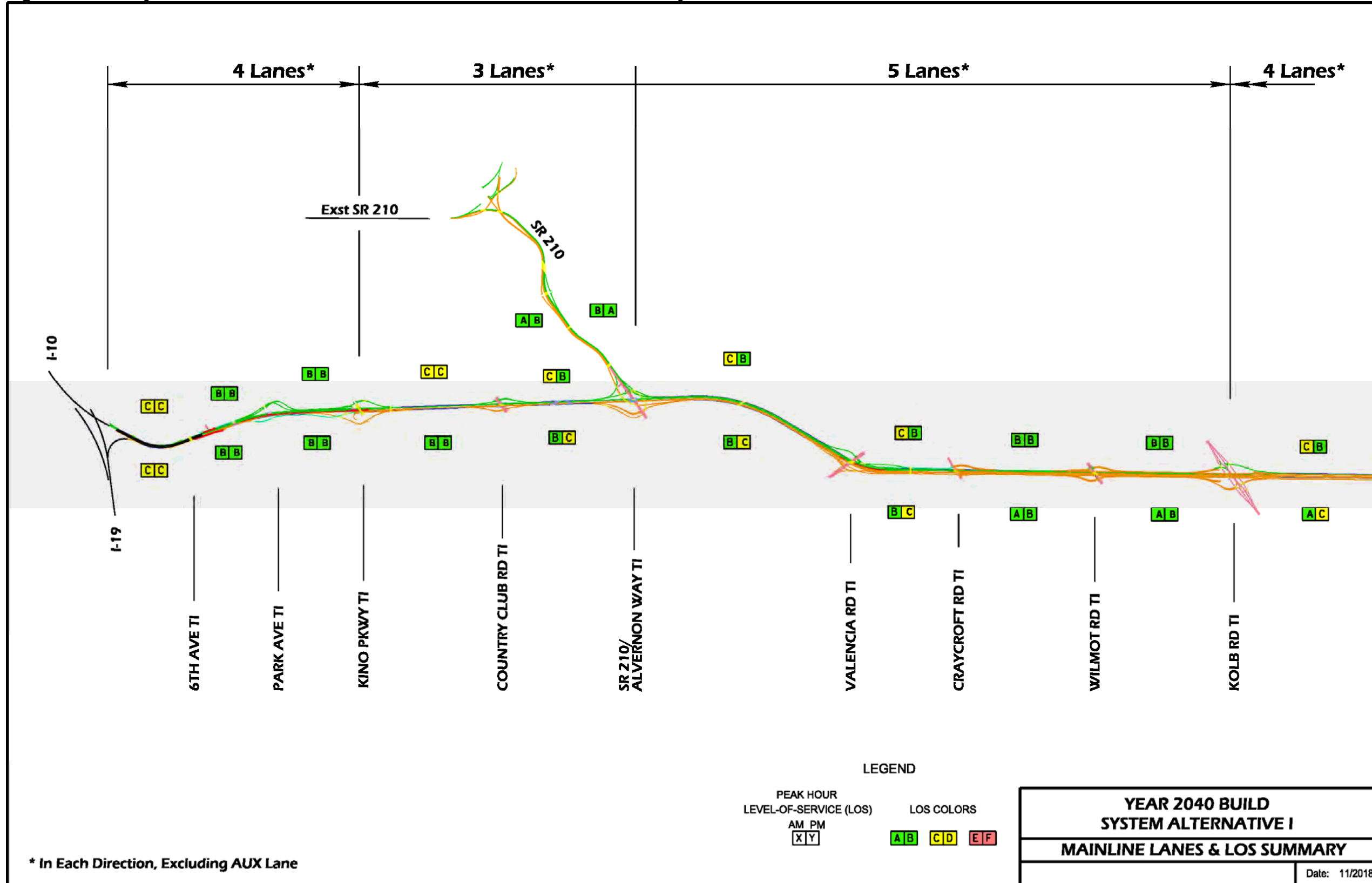


Figure 2.4 I-10 System Alternative IV – 2040 Build – Mainline Lanes & LOS Summary

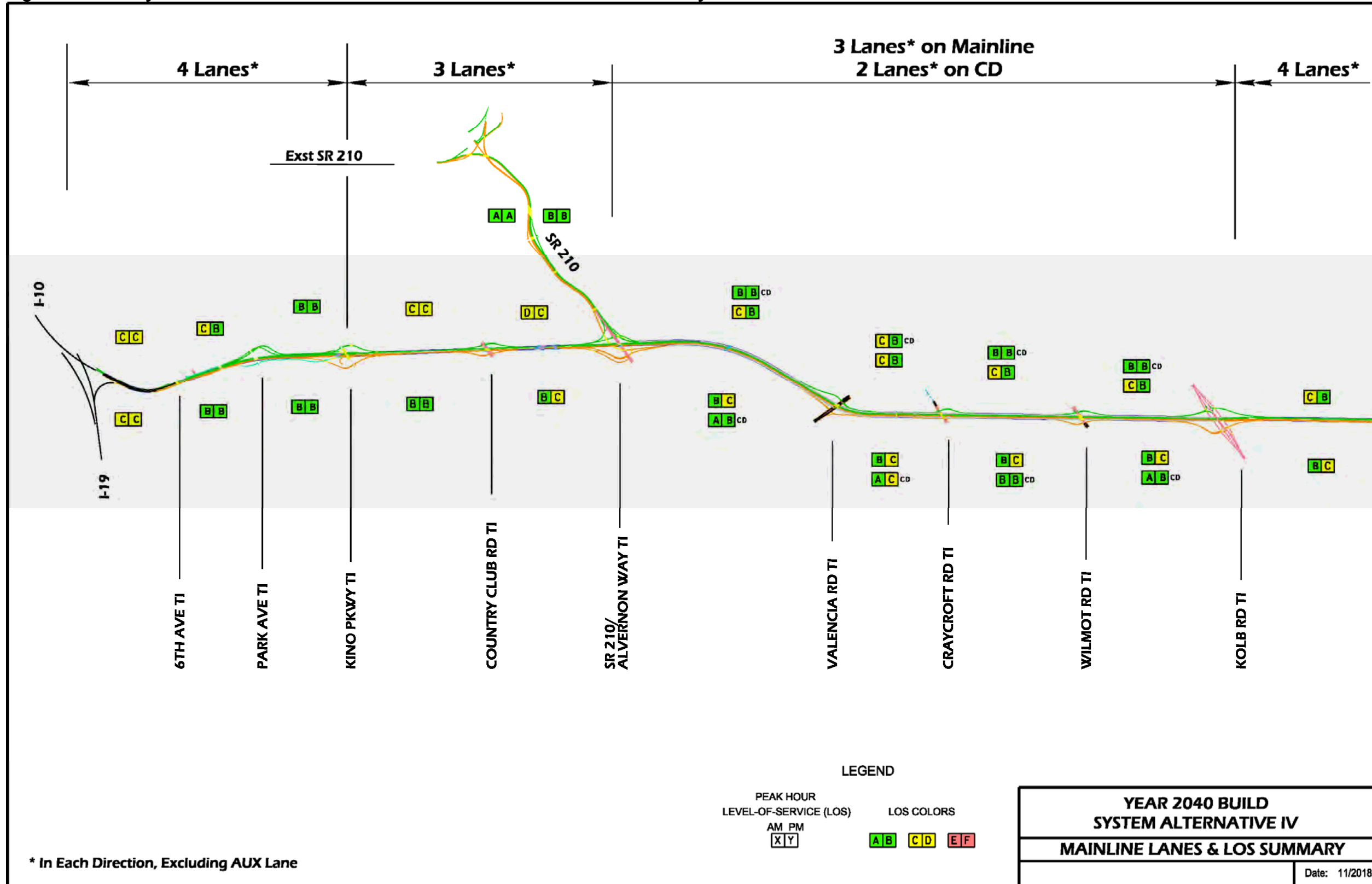




Table 2.1 I-10 Ramps LOS Summary Table

Traffic Interchange (TI)	Ramp Name	Operational Analysis Scenarios							
		2010 – Existing LOS		2040 – No Build LOS		2040 - System I LOS		2040 - System IV LOS	
		AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr
I-10 & I-19 System	I-10 WB to I-19 SB Ramp	A	C	D	F	C	D	C	D
	I-19 NB to I-10 EB Ramp	C	B	F	F	C	B	C	C
6 <sup>th</sup> Ave.	WB Off-Ramp	A	A	B	B	B	B	B	B
	WB On-Ramp	A	B	C	D	B	B	B	B
	EB Off-Ramp	B	A	C	B	B	B	B	B
	EB On-Ramp	A	A	D	F	A	B	B	B
Park Ave.	WB Off-Ramp	A	A	D	E	B	C	C	C
	WB On-Ramp	A	B	C	D	B	C	B	C
	EB Off-Ramp	B	A	D	F	B	B	B	B
	EB On-Ramp	A	A	F	F	A	A	A	A
Kino Pkwy.	EB Off-Ramp to SB Kino Pkwy.	B	A	F	F	(2)	(2)	(2)	(2)
	EB Off-Ramp to NB Kino Pkwy.	E	A	F	F	(2)	(2)	(2)	(2)
	EB On-Ramp from SB Kino Pkwy.	A	A	F	F	B	C	B	C
	EB On-Ramp from NB Kino Pkwy.	A	A	A	A	(2)	(2)	(2)	(2)
	WB Off-Ramp	(1)	(1)	(1)	(1)	C	B	C	B
	WB On-Ramp	B	B	B	D	B	C	B	C
	EB Off-Ramp	(1)	(1)	(1)	(1)	B	B	B	B
	EB On-Ramp	(1)	(1)	(1)	(1)	A	A	A	A
Ajo Way	WB Off-Ramp	B	A	F	C	(2)	(2)	(2)	(2)
	WB On-Ramp	A	C	D	C	(2)	(2)	(2)	(2)
Country Club Rd.	WB Off-Ramp	(1)	(1)	(1)	(1)	B	B	C	C
	WB On-Ramp	(1)	(1)	(1)	(1)	C	D	C	C
	EB Off-Ramp	(1)	(1)	(1)	(1)	C	B	C	B
	EB On-Ramp	(1)	(1)	(1)	(1)	B	B	B	B
Palo Verde Rd.	EB Off-Ramp to SB Palo Verde Rd.	A	A	F	F	(2)	(2)	(2)	(2)
	EB Off-Ramp to NB Palo Verde Rd.	B	A	F	F	(2)	(2)	(2)	(2)
	EB On-Ramp from SB Palo Verde Rd.	A	D	F	F	(2)	(2)	(2)	(2)
	WB On-Ramp from SB Palo Verde Rd.	A	B	F	F	(2)	(2)	(2)	(2)
Irvington Rd.	WB Off-Ramp	A	A	C	B	(2)	(2)	(2)	(2)
	WB On-Ramp	B	D	A	B	(2)	(2)	(2)	(2)
Alvernon Way	WB Off-Ramp	B	A	B	B	A	A	A	A
	WB On-Ramp	(1)	(1)	(1)	(1)	A	B	B	B
	EB Off-Ramp	A	A	A	A	A	A	A	B
	EB On-Ramp	A	B	E	F	A	B	A	A

Notes: (1) Currently not a ramp.

(2) Not a future ramp.

**Table 2.1 (Continued) I-10 Ramps LOS Summary Table**

Traffic Interchange (TI)	Ramp Name	Operational Analysis Scenarios							
		2010 – Existing LOS		2040 – No Build LOS		2040 - System I LOS		2040 - System IV LOS	
		AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr
I-10 & SR 210 System	I-10 WB to SR 210 NB	(1)	(1)	(1)	(1)	B	A	B	A
	I-10 EB to SR 210 NB	(1)	(1)	(1)	(1)	A	A	B	A
	SR 210 SB to I-10 EB	(1)	(1)	(1)	(1)	A	B	A	B
	SR 210 SB to I-10 WB	(1)	(1)	(1)	(1)	A	A	A	A
Valencia Rd.	WB Off-Ramp	B	A	F	F	C	B	B	B
	WB On-Ramp	B	A	C	C	D	D	B	B
	EB Off-Ramp	A	B	F	F	C	D	B	B
	EB On-Ramp	A	A	F	F	B	C	B	C
Craycroft Rd	WB Off-Ramp	A	A	F	F	B	A	A	A
	WB On-Ramp	A	A	F	C	(2)	(2)	(2)	(2)
	EB Off-Ramp	A	A	C	F	(2)	(2)	(2)	(2)
	EB On-Ramp	A	A	F	F	A	B	A	B
Wilmot Rd	WB Off-Ramp	A	A	F	C	A	A	A	A
	WB On-Ramp	A	A	C	C	C	C	D	C
	EB Off-Ramp	A	A	F	F	B	C	B	C
	EB On-Ramp	A	A	E	E	A	A	A	B
Kolb Rd.	WB Off-Ramp	A	A	F	F	B	B	B	B
	WB On-Ramp	A	A	A	A	B	B	C	B
	EB Off-Ramp	A	A	F	C	A	B	B	C
	EB On-Ramp	A	A	F	F	A	B	A	B

Notes: (1) Currently not a ramp.  
(2) Not a future ramp.

**Table 2.2 SR 210 Ramps LOS Summary Table**

Traffic Interchange (TI)	Ramp Name	Operational Analysis Scenarios							
		2010 – Existing LOS		2040 – No Build LOS		2040 - System I LOS		2040 - System IV LOS	
		AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr
Ajo Way	NB Off-Ramp	(1)	(1)	(1)	(1)	A	A	A	A
	NB On-Ramp	(1)	(1)	(1)	(1)	B	C	B	C
	SB Off-Ramp	(1)	(1)	(1)	(1)	B	A	B	B
	SB On-Ramp	(1)	(1)	(1)	(1)	B	D	B	D
Golf Links Rd.	NB Off-Ramp	(1)	(1)	(1)	(1)	B	B	B	B
	SB On-Ramp	(1)	(1)	(1)	(1)	A	B	A	B
Alvernon Way	NB Off-Ramp	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
	SB On-Ramp	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)

Notes: (1) Currently not a ramp.  
(2) Not a future ramp.



**Table 2.3 I-10 Intersection LOS Summary Table**

Traffic Interchange (TI)	Ramp Name	Operational Analysis Scenarios							
		2010 – Existing LOS		2040 – No Build LOS		2040 - System I LOS		2040 - System IV LOS	
		AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr
6th Ave.	I-10 WB Ramps & 6th Ave.	B	B	F	F	B	D	B	D
	I-10 EB Ramps & 6th Ave.	A	B	F	F	B	B	B	B
Park Ave.	I-10 WB Ramps & Park Ave.	B	A	F	F	B	C	B	C
	I-10 EB Ramps & Park Ave.	A	A	E	F	B	B	B	C
Kino Pkwy.	Kino Pkwy. & Ajo Connector	C	B	F	F	C	C	C	C
	I-10 WB Ramps & Kino Pkwy.	(1)	(1)	(1)	(1)	B	C	C	C
	I-10 EB Ramps & Kino Pkwy.	(1)	(1)	(1)	(1)	B	B	B	B
	Ajo Connector & Ajo Way	D	C	F	F	B	B	B	B
Country Club Rd.	I-10 WB Ramps & Country Club Rd.	(1)	(1)	(1)	(1)	B	C	C	C
	I-10 EB Ramps & Country Club Rd.	(1)	(1)	(1)	(1)	B	B	B	B
Palo Verde Rd.	Palo Verde Rd & Irvington Rd.	C	C	D	D	C	C	C	C
	I-10 EB Ramp & Palo Verde Rd.	(1)	(1)	(1)	(1)	A	A	A	A
	Hotel Dr. & Irvington Rd.	B	C	D	D	(2)	(2)	(2)	(2)
Alvernon Way	I-10 WB Ramps & Alvernon Way	(1)	(1)	(1)	(1)	B	B	B	B
	I-10 EB Ramps & Alvernon Way	B	B	B	E	B	B	B	B
Valencia Rd.	I-10 EB Ramps & Valencia Rd.	B	C	F	F	B	C	B	C
	I -10 WB Ramps & Valencia Rd.	E	B	F	F	B	C	B	C
Craycroft Rd.	I-10 EB Ramps & Craycroft Rd.	A	A	F	F	B	C	B	C
	I-10 WB Ramps & Craycroft Rd.	A	A	F	F	B	B	B	B
Wilmot Rd.	I-10 WB Ramps & Wilmot Rd.	A	A	F	F	B	B	B	B
	I-10 EB Ramps & Wilmot Rd.	A	B	F	F	B	B	B	B
Kolb Rd.	I-10 WB Ramps & Kolb Rd.	A	A	F	F	B	B	B	B
	I-10 EB Ramps & Kolb Rd.	A	A	F	F	A	A	A	A

Notes: (1) Currently not a ramp.  
 (2) Not a future ramp.

**Table 2.4 SR 210 Intersection LOS Summary Table**

Traffic Interchange (TI)	Ramp Name	Operational Analysis Scenarios							
		2010 – Existing LOS		2040 – No Build LOS		2040 - System I LOS		2040 - System IV LOS	
		AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr	AM Peak Hr	PM Peak Hr
Ajo Way	SR 210 SB Ramps & Ajo Way	(1)	(1)	(1)	(1)	C	C	C	C
	SR 210 NB Ramps & Ajo Way	(1)	(1)	(1)	(1)	B	B	C	B
N/A	SR 210 & Alvernon Way	C	B	C	C	B	B	B	B
N/A	Alvernon Way & 37th St.	(1)	(1)	(1)	(1)	B	B	A	A
N/A	Palo Verde Rd. & 37th St.	B	B	A	A	B	C	B	B
N/A	Palo Verde Rd. & Frontage Rd.	B	B	A	A	B	B	B	AB
N/A	SR 210 & Richey Blvd.	B	B	F	F	A	A	A	A
N/A	SR 210 & 34th St.	A	A	A	A	B	B	B	B

Notes: (1) Currently not a ramp. (2) Not a future ramp.

### 2.3. Crash Data

Historic crash data for the 5-year period from July 2011 to June 2016 was obtained from ADOT’s Accident Location Identification Surveillance System (ALISS) database for the study corridors within the extent of the DCR:

- I-10: I-19 to MP 271 east of Kolb Road
- SR 210: Broadway Road to Alvernon Way
- Alvernon Way/Golf Links Road: SR 210 to I-10 and Alvernon Way TI.

#### Crash Summary

The number of crashes per year for the mainline and all other roads including ramps, frontage roads, and cross-streets between and within 250 feet of ramp junctions along the corridors are summarized in **Table 2.5 Summary of Crashes**. A year was measured from July 1<sup>st</sup> of one year to June 30<sup>th</sup> of the following year. A total of the 2,056 crashes occurred during the 5-year period on the study corridors; the number of incidents, primarily on the I-10 mainline, increased each year.

**Table 2.5 Summary of Crashes (July 2011-June 2016)**

Year <sup>1</sup>	I-10		SR 210		Alvernon Way		Total
	Mainline	Other Roads <sup>2</sup>	Mainline	Other Roads <sup>2</sup>	Mainline	Other Roads <sup>2</sup>	
July 2011-June 2012	122	123	21	23	29	17	335
July 2012-June 2013	147	143	16	13	35	18	372
July 2013-June 2014	164	145	12	17	37	18	393
July 2014-June 2015	239	140	14	22	39	16	470
July 2015-June 2016	254	132	18	27	39	16	486
<b>Total</b>	<b>926</b>	<b>683</b>	<b>81</b>	<b>102</b>	<b>179</b>	<b>85</b>	<b>2,056</b>

**Notes:** <sup>1</sup> A year is measured from July 1 of one year to June 30 of the following year.

<sup>2</sup> Includes ramps, frontage roads, and cross streets between ramp junctions.

More than half of the total crashes during the 5-year period resulted in property damage only and no injuries were reported. An estimated 24 crashes were fatal during the 5-year period; 15 crashes occurred along the I-10 corridor. **Table 2.6 Severity of Crashes** details the severity of the crashes along the study corridors.

**Table 2.6 Severity of Crashes (July 2011-June 2016)**

Severity	I-10		SR 210		Alvernon Way		Total
	Mainline	Other Roads <sup>1</sup>	Mainline	Other Roads <sup>1</sup>	Mainline	Other Roads <sup>1</sup>	
Fatal	8	7	1	3	3	2	24
Incapacitating Injury	15	19	10	6	3	2	55
Non-incapacitating Injury	89	80	24	27	22	13	255
Possible Injury	123	128	11	17	33	13	325
Property Damage Only	691	449	35	49	118	55	1,397
<b>Total</b>	<b>926</b>	<b>683</b>	<b>81</b>	<b>102</b>	<b>179</b>	<b>85</b>	<b>2,056</b>

**Notes:** <sup>1</sup> Includes ramps, frontage roads, and cross streets between ramp junctions.

**Figure 2.5 Crash Locations** visually displays the location of all crashes including the fatal and incapacitating crashes for the mainlines and all other roads such ramps, frontage roads, and cross streets between and within 250 feet of ramps junctions along the corridors. **Figure 2.6 Crash Density** displays the overall density of the crashes as well as the fatal crashes by mode.

#### I-10 Mainline: I-19 to MP 271 east of Kolb Road

A total of 926 crashes occurred on the I-10 mainline; most of the crashes were rear end collisions, sideswipe (same direction) collisions or single vehicle crashes that occurred during the day under clear weather conditions. Crashes were typically cited as speed too fast for conditions, unknown, or no improper driving. Of the crashes cited as unknown and no improper driving, nearly a third occurred at night.

**Table 2.7 I-10 Mainline 5-Year Crash Summary** details the crashes by segment for the mainline. Segments were divided as follows: Segment 1: I-19 to Valencia Road and Segment 2: Valencia to MP 271. A total of 450 crashes occurred in the eastbound direction and 476 in the westbound direction.

- Most of the crashes, 334 in both directions, are in Segment 1.
- No fatal crashes were reported in the eastbound direction.
- In the westbound direction, 8 fatal crashes occurred with 6 crashes in Segment 1 and 2 crashes in Segment 2. Crashes were predominantly cited as speed too fast for conditions and other.

- The highest number of reported incidents for each direction is between Kino Parkway and Palo Verde Road in Segment 1: 112 eastbound crashes and 111 westbound with 4 fatal crashes. At least 2 fatal crashes were pedestrian related collisions that occurred at night.

**Table 2.7 I-10 Mainline 5-Year Crash Summary**

Segment		EB		WB	
Beginning TI <sup>1</sup> or MP	Ending TI <sup>1</sup> or MP	All Crash Types	Fatal Crashes	All Crash Types	Fatal Crashes
<b>Segment 1<sup>3</sup></b>					
I-19 <sup>2</sup>	6th Ave	24	0	11	0
6th Ave	Park Ave	33	0	32	0
Park Ave	Kino Pkwy	73	0	54	0
Kino Pkwy	Palo Verde Rd	112	0	111	4
Palo Verde Rd	Alvernon Way	30	0	68	1
Alvernon Way	Valencia Rd	62	0	58	1
<b>Segment 2<sup>3</sup></b>					
Valencia Rd	Craycroft Rd	38	0	57	1
Craycroft Rd	Wilmot Rd	35	0	47	1
Wilmot Rd	Kolb Rd	31	0	30	0
Kolb Rd	MP 271	12	0	8	0
<b>TOTAL Segment 1</b>		334	0	334	6
<b>TOTAL Segment 2</b>		116	0	142	2
<b>TOTAL - ALL SEGMENTS</b>		<b>450</b>	<b>0</b>	<b>476</b>	<b>8</b>

**Notes:** <sup>1</sup> From/to crossroad overpass or underpass, unless otherwise noted.

<sup>2</sup> From the east most ramp eastward (does not include the area within the TI).

<sup>3</sup> I-10 Segments are divided as follows:

- Segment 1, I-10, 6th Avenue to Alvernon Way is urban in character.
- Segment 2, I-10, from Alvernon Way to Kolb Road is urban fringe in character.

#### SR 210 Mainline: Broadway Boulevard to Alvernon Way

An estimated 81 crashes occurred on SR 210 mainline; crashes were primarily single vehicle crashes or rear end collisions that occurred during the day under clear weather conditions. Mainline crashes were generally cited as speed too fast for conditions, unknown, and other.



Figure 2.5 Crash Locations



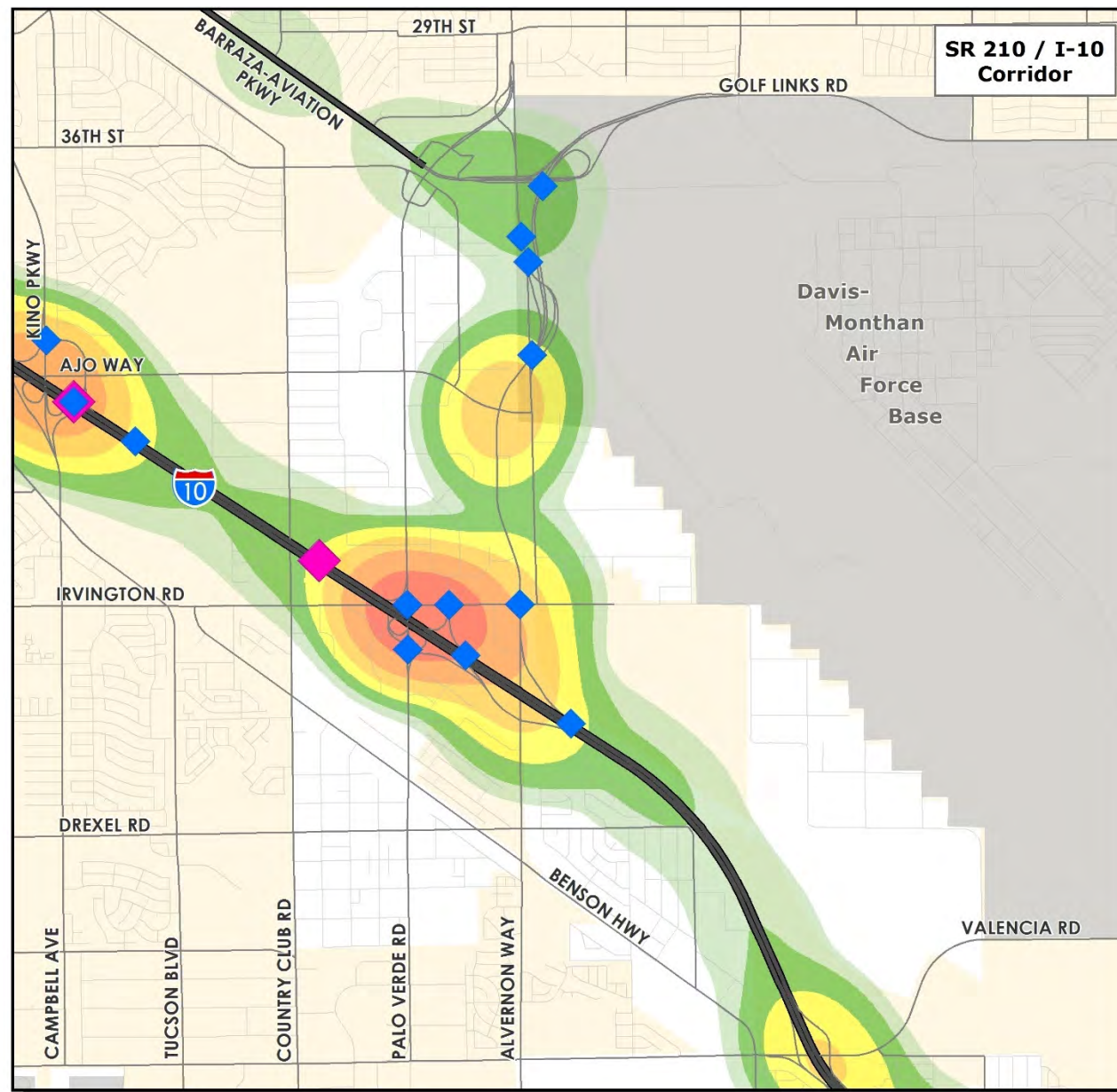
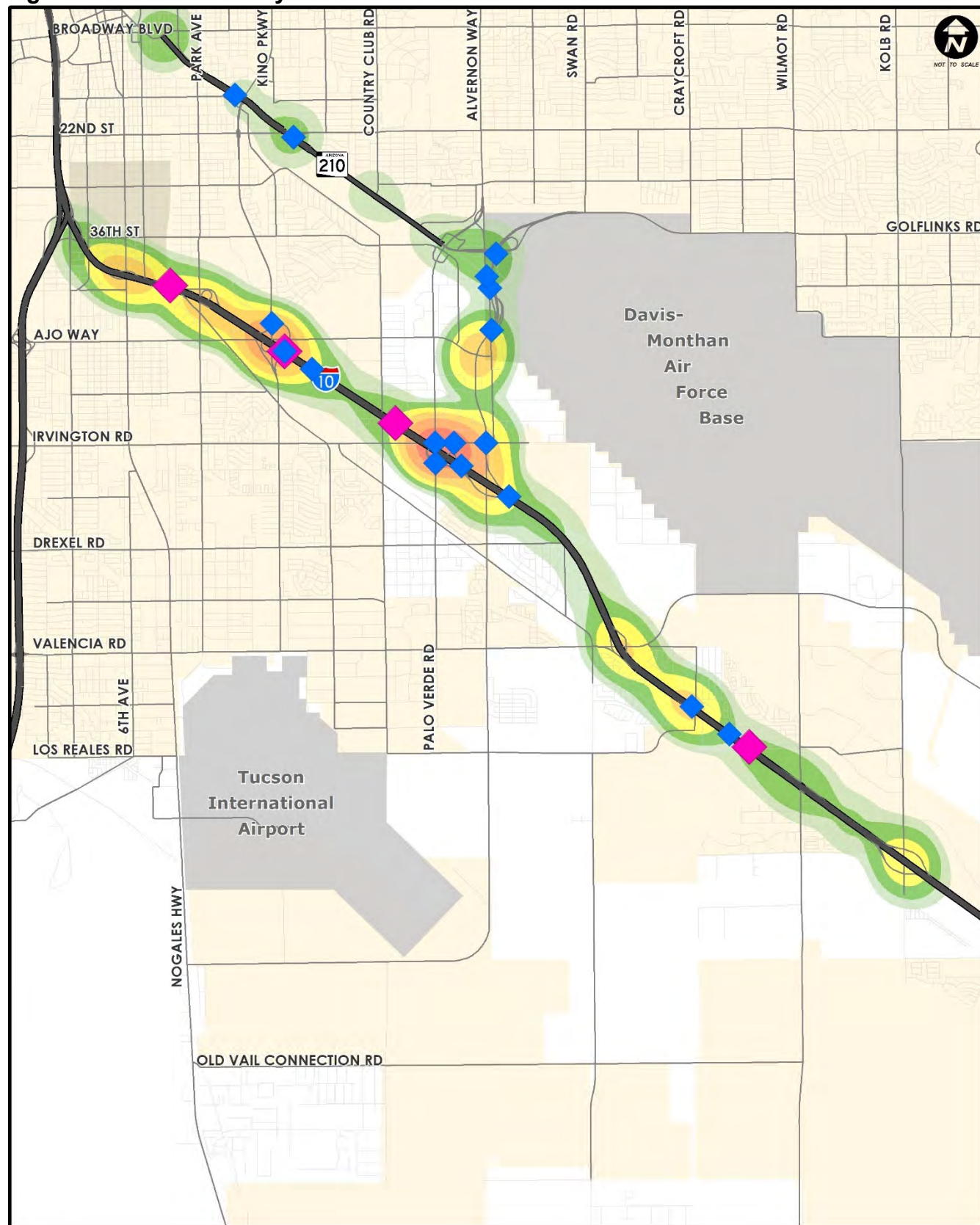
**JACOBS** FHWA PAG

**CRASH LOCATIONS (July 2011 - June 2016)**

- ◆ Fatal Crashes
- ◆ Incapacitating Injury Crash
- Property Damage Only, Non-Incapacitating or Possible Injury
- Interstate/State Routes
- Other Major Streets
- Local Streets



Figure 2.6 Crash Density



**CRASH DENSITY (July 2011 - June 2016)**

<p><b>Crash Density</b></p> <p>High Low</p>	<p><b>Fatal Crashes</b></p> <ul style="list-style-type: none"> <li><span style="color: blue;">◆</span> Auto Related</li> <li><span style="color: magenta;">◆</span> Pedestrian Related</li> </ul>	<ul style="list-style-type: none"> <li><span style="border-bottom: 2px solid black; width: 20px; display: inline-block;"></span> Interstate/State Routes</li> <li><span style="border-bottom: 1px solid gray; width: 20px; display: inline-block;"></span> Other Major Streets</li> <li><span style="border-bottom: 1px dashed gray; width: 20px; display: inline-block;"></span> Local Streets</li> </ul>
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**Table 2.8 SR 210 Mainline 5-Year Crash Summary** details the crashes by segment for the mainline. Crashes were nearly equal in each direction; 41 crashes occurred in the eastbound direction and 40 crashes in the westbound direction.

- The highest number of reported incidents for each direction is between 22nd Street and Country Club Drive: 13 eastbound and 11 westbound.
- No fatal crashes were reported in the westbound direction.
- In the eastbound direction, 1 fatal crash occurred between Broadway Boulevard and Kino Parkway. The crash was cited as speed too fast for condition.
- The sections from Dodge Boulevard to the end of SR 210 had a combined total of 12 crashes in the eastbound direction and 15 in the westbound direction.

**Table 2.8 SR 210 Mainline 5-Year Crash Summary**

Segment		EB		WB	
Beginning Crossroad <sup>1</sup>	Ending Crossroad <sup>1</sup>	All Crash Types	Fatal Crashes	All Crash Types	Fatal Crashes
Broadway Blvd	Kino Pkwy	7	1	7	0
Kino Pkwy	22nd St	2	0	3	0
22nd St	Country Club Dr	13	0	11	0
Country Club Dr	34th St	4	0	2	0
34th St	Richey Blvd	0	0	2	0
Richey Blvd	Dodge Blvd	3	0	1	0
Dodge Blvd	Alvernon Way	8	0	8	0
Alvernon Way	End of SR 210	4	0	6	0
<b>TOTAL - ALL SEGMENTS</b>		<b>41</b>	<b>1</b>	<b>40</b>	<b>0</b>

**Notes:** <sup>1</sup> From/to crossroad overpass or underpass, unless otherwise noted.

**Alvernon Way/Golf Links Road Mainline: Aviation Parkway to I-10 and Alvernon Way TI**

A total of 264 crashes occurred on the mainline from Aviation Parkway to I-10 WB off ramp at Alvernon Way TI. Most of the crashes were rear end collisions, left turn collisions or sideswipe (same direction) collisions that occurred during the day under clear weather conditions. Crashes were

generally cited as speed too fast for conditions, inattention or distraction, or unknown.

**Table 2.9 Alvernon Way/Golf Links Road Mainline 5-Year Crash Summary** details the crashes by segment for the mainline. Crashes were nearly equal in each direction; 89 crashes occurred in the northbound direction and 90 crashes in the southbound direction.

- The highest number of reported incidents for the northbound direction is from Ajo Way to Irvington Road with 42 crashes.
- In the southbound direction the sections from Golf Links Road to Irvington Rd have an estimated 37 and 35 crashes respectively.
- No fatal crashes were reported in the northbound direction.
- A total of 3 fatal crashes occurred in the southbound direction; 2 along Golf Links Road mainline from Aviation Parkway to Alvernon Way and 1 crash along Alvernon Way mainline from Aviation Parkway to Golf Links Road. Crashes were primarily cited as speed too fast for condition and exceeded lawful speed.

**Table 2.9 Alvernon Way/Golf Links Mainline 5-Year Crash Summary**

Segment		NB		SB	
Beginning Crossroad <sup>1</sup>	Ending Crossroad <sup>1</sup>	All Crash Types	Fatal Crashes	All Crash Types	Fatal Crashes
Aviation Pkwy <sup>2</sup>	Alvernon Way	15	0	10	2
Aviation Pkwy <sup>3</sup>	Golf Links Rd	9	0	5	1
Golf Links Rd	Ajo Way	8	0	37	0
Ajo Way	Irvington Rd	42	0	35	0
Irvington Rd	I-10 and Alvernon Way TI	15	0	3	0
<b>TOTAL - ALL SEGMENTS</b>		<b>89</b>	<b>0</b>	<b>90</b>	<b>3</b>

**Notes:** <sup>1</sup> From/to crossroad overpass or underpass, unless otherwise noted.

<sup>2</sup> Golf Links Road mainline from Aviation Parkway to Alvernon Way.

<sup>3</sup> Alvernon Way mainline from Aviation Parkway to Golf Links Road

### 3. DESIGN CONCEPT ALTERNATIVES

#### 3.1 Introduction

The Feasibility Study Update Report that was completed in October of 2014 evaluated the I-10 corridor between I-19 and SR 83 and evaluated the extension of SR 210 to several potential connections with I-10. It is the basis of further evaluation within this Design Concept Study.

The Feasibility Study evaluated several ‘no-build’ scenarios and determined that improvements to I-10 and the extension of SR 210 to a connection with I-10 are required to provide improved mobility and an acceptable level of service on both highways for the 2040 design year.

Evaluated alternatives for I-10 improvements occur within the existing I-10 study corridor. They include improving existing conditions, such as; short weaving distances (especially regarding successive loop ramps), TIs spaced closer than the desirable one mile spacing, and short driver decision-making distances. Improvements also include modifying TI configurations and mainline roadways to improve traffic operations and safety and to reduce new right-of-way requirements. The primary improvement is the addition of general purpose lanes and auxiliary lanes to increase traffic capacity and improve the level of service.

Evaluated alternatives for the extension of SR 210 involved several different connection points with I-10 and subsequently different routes for SR 210. During development of the Feasibility Study Update, System Alternative II that routed SR 210 along the southwest edge of Davis-Monthan Air Force Base to a connection with I-10 north of Valencia Road was eliminated due to environmental impact concerns. In summary, all SR 210 alternatives with alignments east of the Alvernon Way corridor were eliminated due mostly to environmental impacts and impacts to Davis-Monthan AFB.

Two alternatives have been identified to be carried forward for further study in the Design Concept Study. See **Figure 3.1 Overview**.

- System Alternative I
- System Alternative IV

These two alternatives improve I-10 between the I-10/I-19 System Interchange and the Kolb Road TI and extend SR 210 from Golf Links Road along the Alvernon Way corridor to a connection with I-10 at the existing I-10/Alvernon Way TI. Both alternatives accommodate design year 2040 traffic at an acceptable level of service. Improvements to I-10 through the I-10/I-19 TI and to the north and west of the TI are not addressed in this study.

The two alternatives are identical for two segments of the project; I-10 between I-19 and the I-10/SR 210 System TI at Alvernon Way and the entire extension of SR 210 south to the I-10/SR 210 System TI.

For the I-10 segment, both alternatives improve existing conditions by improving weaving distances where ramps enter/exit I-10, improve interchange spacing by replacing the Palo Verde Road TI with a new TI at Country Club Road, and provide braided ramps to address both ramp weaving distances and retain the Park Avenue TI despite short TI spacing to 6<sup>th</sup> Avenue and Kino Parkway TIs. For the SR 210 segment, both alternatives reconstruct the interchange at Golf Links Road to provide for the through movement of traffic on SR 210, reconstruct the bridge over the UPRR, provide a new TI at Ajo Way, and construct the new system interchange with I-10.

The two alternatives differ only within the segment of I-10 between the I-10/SR 210 System TI and the Kolb Road TI. Alternative I east of Alvernon Way has five mainline lanes in each direction that mixes regional and local traffic. Alternative IV east of Alvernon Way provides a collector-distributor system that separates local traffic (entering and exiting I-10) from I-10 mainline regional traffic.

##### 3.1.1 General Modifications to Existing I-10

Modifications to existing I-10 from I-19 to Kolb Road are required to provide an acceptable LOS for design year 2040 and to resolve interchange spacing and ramp weaving issues. The modifications include improvements to both the I-10 mainline roadway and to the existing I-10 TIs within the project limits.

The modifications to existing I-10 will be similar for both System Alternative I and System Alternative IV with the following exceptions between the SR 210 System Interchange and the Kolb Road TI:

- The number of mainline I-10 lanes will be different. System Alternative I will have five mainline lanes in each direction. System Alternative IV will have three mainline I-10 lanes and CD roadways parallel to the eastbound and westbound I-10 mainline roadways.
- The Alvernon Way TI, the Valencia Road TI, the Craycroft Road TI, the Wilmot Road TI, and the Kolb Road TI will connect with the I-10 CD roadways.
- Shifts in I-10 horizontal alignments will be needed to reduce right-of-way takes from adjacent residential subdivisions. Differences in typical sections for the two alternatives will result in differing horizontal alignments.

##### Evaluation Process for Existing I-10 Mainline and TIs

Using the 2040 PAG Forecast Traffic Volumes for peak hour traffic volumes and ‘Synchro’ micro-modeling software, traffic capacity problems at TIs were identified wherever levels of service are low using the existing crossroad and ramp configurations. Solutions were then identified and tested by re-running the micro-model with the proposed solution coded into the software. This iterative process was repeated until an adequate solution was produced.

All initial ‘Synchro’ micro-modeling runs, and solutions involved a default of a standard diamond type TI. If micro-modeling indicated that a diamond type TI will not adequately function, other TI types were tested. **Sections 3.2.2 thru 3.2.4** describe each TI and required improvements.

##### I-10 Capacity

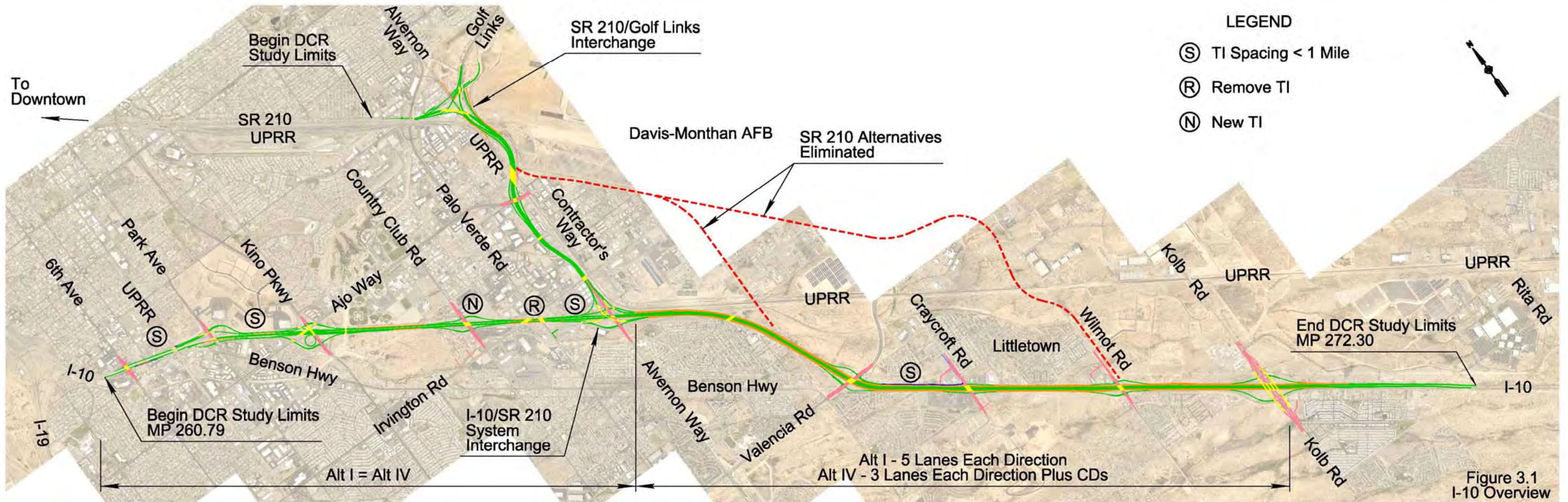
Traffic demand on I-10 is relatively the same for both alternatives. This means that traffic volumes and the number of mainline I-10 lanes west of the SR 210 System Interchange are similar for both alternatives. East of the SR 210 System Interchange, the configurations of the mainline roadways and ramp connections between the I-10 mainline and crossroads at traffic interchanges are different for System Alternative IV because of the introduction of the CD lanes. Auxiliary lanes are required between successive entrance and exit ramps along both the eastbound and westbound I-10 roadways in addition to the mainline through lanes or CD lanes. I-10 mainline lanes will vary as follows:

- From the I-19 interchange easterly to the Kino Parkway interchange I-10 will have four mainline lanes in each direction.
- From the Kino Parkway interchange easterly to the I-10/SR 210 System Interchange at Alvernon Way, I-10 will have three mainline lanes in each direction.
- Between the System Interchange at Alvernon Way and the Kolb Road interchange, I-10 will have the following number of mainline lanes in each direction for the alternatives under consideration:
  - System Alternative I: Five mainline lanes in each direction.
  - System Alternative IV: Three mainline lanes plus two CD lanes in each direction.

I-10 will have LOS C or better in both directions through the limits of the project for both alternatives.



Figure 3.1 I-10 Overview





The western project limits of this study are at the I-10/I-19 System Interchange. Initial traffic evaluations suggested the potential need for improvements to extend into the interchange. Later traffic evaluations during the FS Update, with the adjusted traffic model numbers, indicated that improvements will not extend into the interchange. The eastbound entrance ramp from northbound I-19 becomes the 4th eastbound general purpose lane on I-10 and will require the reconstruction of the gore of the eastbound exit ramp to 6th Avenue. The 4th westbound general purpose lane on I-10 is dropped prior to the gore with the westbound entrance ramp from 6th Avenue.

### **I-10 Right-of-Way**

The areas adjacent to I-10 from I-19 to Kolb Road are developed with both commercial and residential development along I-10. The existing I-10 ROW corridor is quite narrow and there is very little unused ROW between the existing outer edges of the roadways and the ROW lines.

Input from Stakeholders indicated a desire to widen the existing roadways to the outside where feasible. However, preliminary layout of additional lanes for the I-10 mainline roadway and the reconfiguration of TI ramps indicates that within the limits discussed above, it will be necessary to widen the I-10 mainline roadways into the median to the extent feasible to reduce the impact to adjacent properties that would occur if all widening is done to the outside of the existing roadways.

Additional ROW will be required along I-10 where TIs and ramps are being modified.

### **I-10 Median**

At the west end of the project, existing I-10 has a closed median with Portland Cement Concrete Pavement (PCCP) and a concrete median barrier located at median centerline. Through the horizontal curve over Park Avenue, the existing median changes from the closed median to an open median that separates the eastbound and westbound roadways. The open median continues throughout the remainder of the project.

Because of the need to minimize the impact on adjacent developed areas, it is necessary to extend the closed median from Park Avenue east to Kolb Road.

### **I-10 TI Spacing**

In urban conditions, TIs should nominally be one mile apart. This provides distance to develop adequate weaving distances associated with auxiliary lanes that normally occur between successive entrance and exit ramps. Since I-10 cuts angularly across the local street grid system with major arterials on one mile spacing, the distances between TIs are nominally more than one mile apart; typically, 1.4 miles. However, the

location of some existing TIs results in distances between TIs of less than one mile.

- Park Avenue TI is approximately 0.7 miles from both 6th Avenue TI and Kino Parkway TI.
- Craycroft Road TI is approximately 0.85 miles from the Valencia Road TI.
- Palo Verde Road TI is approximately 0.6 miles from the Alvernon Way TI.

Elimination of the Park Avenue and Craycroft Road TIs is not practical, as they provide needed access to local businesses and governmental services. Therefore, reconfiguration of TI ramps is needed to maintain access, yet maximize weaving distances and safety for the traveling public. See **Section 3.2.2.1** for the Park Avenue TI ramp modifications. See **Sections 3.2.3 and 3.2.4** for the Craycroft Road TI modifications.

The Palo Verde Road TI can be removed, and a new TI at Country Club Road is needed and will be added. Country Club Road is located approximately 1.2 miles from Kino Boulevard TI and Alvernon Way TI. All other TIs within the project limits meet or exceed the minimum one-mile spacing criteria.

A Change of Access Report will be prepared that details traffic operations and address FHWA policy requirements for new or revised access points to the interstate system.

### **Cross Streets Between TIs**

Pima County had advised during the Feasibility Study that consideration should be given to extending half-mile minor arterial or major collector streets across I-10 between I-10 TIs to improve the connectivity of neighborhoods across I-10 and to relieve the traffic volume of arterial streets at the TIs. A review of the local street system indicates that potential intermediate streets either don't currently exist or are unlikely to be developed in the future. The substitution of Country Club Rd TI for the Palo Verde Rd TI addresses this issue. Pima County has expressed an interest in expanding the Pima Sports Complex to the southerly side of I-10 and will participate in developing access under I-10 between Kino Parkway and Country Club Road by extending Forgeus Avenue to the south. The actual location of the access road needs to be determined and will require future coordination with the County.

### **I-10 Drainage**

At the west end of the project, from I-19 to Park Avenue, existing I-10 pavement drainage is addressed via an enclosed storm drain system. East of Park Avenue to the east end of the project, I-10 pavement drainage consists of a rural type design that typically has embankment curbs and

downdrains at the outer pavement edges. In many areas, water sheet-flows off the pavement. Open medians are drained via median catch basins and outlet culverts. All pavement drainage collects at embankment slope toes and typically ponds there. Occasionally, storm water is conveyed along the slope toes to outlet into cross drainage structures, typically man-made channels.

For both alternatives, the existing storm drain system between I-19 and Park Avenue will be retained with minor modifications to accommodate the extra pavement width. East of Park Avenue, the rural type drainage design will be converted to an urban type design with catch basins and an enclosed storm drain system. In areas where existing water ponds at slope toes, the storm drains will outlet into retention basins. Typically, they are located in the infields of traffic interchanges, but some may be needed between interchanges; requiring new right-of-way. In areas where water outlets into existing cross drainage structures, the storm drains will outlet into these structures. As needed to retain capacity in the cross drainages, the storm drains will outlet initially into detention basins.

### **I-10 Structures**

I-10 crosses over or under many cross streets and drainage channels via roadway structures. Given a combination of age, maintenance issues, existing vertical clearance issues, and changes in span lengths, most of these structures should be replaced. Structures can be widened at only four locations: 6th Avenue over I-10, I-10 over the UPRR east of 6th Avenue, I-10 over Park Avenue, and I-10 over Alvernon Way. Where I-10 crosses over existing drainage channels, care is needed to ensure that structure replacement does not adversely impact the capacity of the channel.

### **3.1.2 Extension of SR 210**

Typically, traffic from the southeast part of Tucson accesses downtown Tucson via westbound I-10 to either Alvernon Way or Kino Parkway and then northerly towards downtown. The primary route is I-10 to Kino Parkway. This adds local traffic to the regional traffic already on I-10, adversely affecting traffic operations and safety. To decrease the local traffic on I-10, SR 210 is to be extended southerly to connect with I-10.

From the Feasibility Study Update, alternative routes for SR 210 to different connection points along I-10 were developed and evaluated. All of the alternatives with connection points east of Alvernon Way passed along the edge of Davis-Monthan AFB and required right-of-way from businesses that have environmental issues. Because of these issues and concerns about security to the AFB, all of these alternatives were eliminated from further study. The remaining alternative follows the Alvernon Way alignment to I-10. North of Palo Verde Road, existing SR 210 (Barraza-Aviation Parkway) is an access-controlled facility with traffic signals at major street intersections. South of the Palo Verde Road





undercrossing, SR 210 remains an access-controlled facility, but without at-grade intersections.

### **Evaluation Process for SR 210**

Using the 2040 PAG Forecast Traffic Volumes for peak hour traffic volumes and ‘Synchro’ micro-modeling software, traffic capacity issues on proposed SR 210 and at TIs were identified. Solutions were then identified and tested by re-running the micro-model with the proposed solution coded into the software. This iterative process was repeated until an adequate solution was produced.

Once the 2040 Build scenario was validated, it was presented to the project stakeholders. Stakeholder comments that impact the design solution were addressed by developing revised solutions and checking them through the micro-modeling process. The resulting combined solution was checked using VISSIM regional micro-modeling software. This identified levels of service and numbers of lanes for mainline SR 210, ramps, crossroads, and turn lanes.

### **SR 210 Capacity**

The results of traffic modeling indicated that in 2040 two lanes will be required in each direction on SR 210 between Richey Boulevard and the southerly ramps to/from Golf Links Road. In addition, two lanes will be required in each direction to/from Golf Links Road to SR 210. From Golf Links Road ramps south to the System Interchange with I-10, four lanes will be required in each direction.

At the I-10/SR 210 System Interchange, the two exterior lanes continue to connect with I-10 as system Ramps (South to East) SE and (West to North) WN, with each ramp having two lanes. Also, system Ramps (East to North) EN and (South to West) SW connect to I-10 to the west, with each ramp having one lane. The two interior lanes in each direction continue south as Alvernon Way.

SR 210 mainline between Richey Boulevard and the I-10/SR 210 system interchange at Alvernon Way will have LOS B or better, both AM and PM in 2040.

The SR 210 ramps between Golf Links Road and the I-10/SR 210 system interchange will have LOS B or better for the AM in 2040 and LOS D or better for the PM in 2040. The Golf Links Road ramps to SR 210 will have LOS B or better, both AM and PM in 2040.

### **SR 210 Right-of-Way**

Along the SR 210 corridor and the Golf Links interchange between Palo Verde Road and the UPRR overpass just north of Ajo Way, the corridor is adjacent to the UPRR on the west side and City of Tucson property or

Davis-Monthan AFB on the east side. The area along Aviation Parkway, which connects SR 210 directly to Golf Links Road, is developed with commercial businesses. The area along the Alvernon Way alignment south of the UPRR overpass is developed with commercial developments. Near Irvington Road, the east side of Alvernon Way is against the UPRR. The existing SR 210/Alvernon Way ROW corridor south of the UPRR overpass is quite narrow and there is very little unused ROW between the existing outer edges of the roadways and the ROW lines.

Additional ROW will be required for SR 210. Commercial businesses south of Aviation Parkway are within the limits of the new interchange with Golf Links Road and should be acquired. South of the UPRR overpass, new ROW is needed for the new Ajo Way TI, along Alvernon Way, and at Irvington Road to accommodate the new system interchange ramps.

### **SR 210 Interchanges**

There will be three interchanges along the extension of SR 210.

First is the SR 210/Golf Links interchange. The existing interchange will be reconfigured for the extension of SR 210. To accommodate SR 210 route continuity through the interchange, southbound Golf Links Road to eastbound SR 210 must be split out from existing Golf Links as a ramp. This increases the total roadway footprint of the interchange. Approximately 1/3 mile south of Aviation Parkway, the ROW corridor is restricted by the UPRR to the west and Davis-Monthan AFB to the east. To accommodate the wider footprint, existing Contractor’s Way between Ajo Way and Aviation Parkway must be removed. That traffic can be shifted onto the SR 210 corridor.

Second is the new diamond type interchange at Ajo Way, which replaces the existing at-grade signalized intersection.

Third is the system interchange with I-10.

### **SR 210 Drainage**

SR 210 pavement drainage will be addressed via an enclosed storm drain system that outlets to either retention basins or into existing crossing drainage channels.

Within the SR 210/Golf Links interchange, existing Aviation Parkway pavement drainage is addressed via an enclosed storm drain system that outlets into a concrete lined drainage channel that parallels Palo Verde Road. To the maximum extent possible, this storm drain system will be utilized for draining new east-west ramps in close proximity to Aviation Parkway. For the remainder of the interchange, pavement drainage will be collected in retention basins located in the infields of the interchange.

DMAFB requested the retention basins in this area be drained by bleed off pipes or dry wells to eliminate ponding. Ponded water could attract birds that could be a hazard to their jet planes.

Regarding off-site drainage, there are three major crossings. The first is located approximately 1/3 mile south of Aviation Parkway. It conveys storm waters from Davis-Monthan AFB under two roadways and consists of two 3-cell concrete box culverts with high skew angles. Due to age and increased embankment dead load, they should be replaced with new box culverts at a lower skew angle to reduce culvert length.

The second is located just north of Ajo Way and it conveys storm waters from the western edge of the AFB to the west under existing Alvernon Way. It will be extended under the new Ajo Way interchange ramps. It should be checked to determine if the existing culvert will handle the additional SR 210 embankment dead load. This culvert will receive SR 210 and ramp pavement drainage between the UPRR overpass and Ajo Way.

The third is located approximately 1/4 mile north of Irvington Road and it conveys storm waters from east of Contractor’s Way to the west under Alvernon Way. It will be extended to accommodate the wider SR 210 footprint and should be checked to determine if the existing culvert will handle the additional SR 210 embankment dead load.

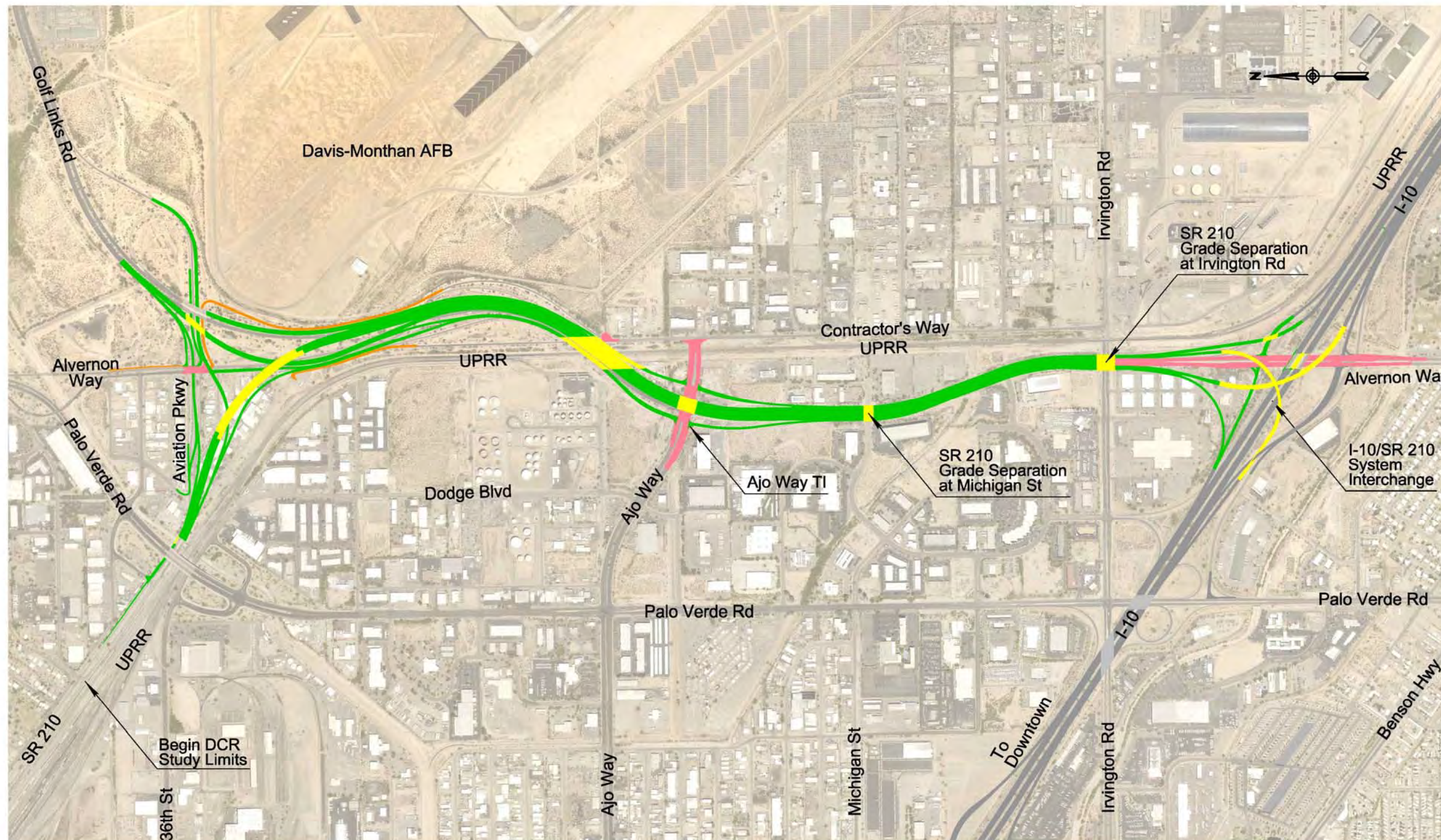
### **SR 210 Structures**

SR 210 crosses over many cross streets and ramps. All will require new structures. A few existing structures can remain, including Alvernon Way over Aviation Parkway and northbound Golf Links over Aviation Parkway. The existing structure over the drainage channel just east of Palo Verde Road must be widened to the northeast to accommodate a third westbound SR 210 lane.

North of Ajo Way, the existing structure over the UPRR has multiple spans over the two existing RR tracks. The UPRR expects to add tracks in the future and is requiring the reduction in the number of spans. The resulting longer spans will raise the SR 210 profile over the UPRR and require total structure replacement.



Figure 3.2 SR 210 Overview





## 3.2 Description of Alternatives

### 3.2.1 No-Build Alternative

The No-Build Alternative is provided for comparison purposes. It provides no improvements to the capacity, safety, and operational features of the existing roadways and involves only maintenance costs and no apparent change to the environmental conditions of the I-10 and SR 210 corridors. The No-Build Alternative (existing conditions) is shown in **Appendix A**.

The No-Build Alternative does not address the deficient operational and safety issues along I-10 between I-19 and Alvernon Way, the interchange spacing issues along I-10 or the need to accommodate for the future growth to the south and southeast of the Tucson area. Therefore, the **No-Build Alternative was eliminated from further consideration**.

### 3.2.2 General Requirements - All Alternatives

General Requirements will apply to both Alternatives I and IV and involve improvements to I-10 between I-19 and System Interchange with SR 210 and the entire extension of SR 210 to I-10. While there are some I-10 design features east of the I-10/SR 210 System Interchange that are the same for both alternatives, they will be addressed in the text for each alternative. See **Appendices C, D, I and J** for plan views and typical sections of the proposed improvements – System Alternative I and IV.

#### 3.2.2.1 I-10 (I-19 to SR 210)

##### I-10 Mainline Improvements

From I-19 to Alvernon Way, one additional I-10 mainline travel lane and auxiliary lanes between successive entrance and exit ramps will be needed to achieve an adequate level of service for the design year 2040. For both alternatives, the required lanes in each direction are:

- I-19 to Kino Parkway – 4 lanes (each direction)
- Kino Parkway to Alvernon Way – 3 lanes (each direction)

The existing I-10 horizontal centerline will be retained. From west of Park Avenue to Alvernon Way, the existing open median will be enclosed with a concrete median barrier located at existing centerline, a wide inside paved shoulder and, as needed, a new traffic lane.

From I-19 to west of Kino Parkway, existing I-10 consists of PCCP. The intent of the design is to retain this pavement and widen as additional lanes are needed. Throughout the PCCP section, the existing I-10 vertical profile will be retained. East of the PCCP section, I-10 will have a new vertical profile, which will be designed to accommodate overpass

structure replacements at traffic interchanges and the new structure over Country Club Road.

West of the horizontal curve over Park Avenue, the fourth lanes in each direction are added to the outside. Through the curve, the median is enclosed with a concrete median barrier and widening occurring both to the inside and outside. East of the curve, new lanes are added in the median along with the new concrete median barrier and a wide paved shoulder that provides lateral space for a future additional general purpose lane.

East of Kino Parkway, Pima County has expressed an interest in expanding the Pima Sports Complex to the southerly side of I-10. It will require a grade-separated crossing under I-10 and a light-well grate in the median to provide natural light for the undercrossing. The actual location of the access road needs to be determined and will require future coordination with the County.

For both alternatives, the existing storm drain system between I-19 and Park Avenue will be retained with minor modifications to accommodate the extra pavement width. East of Park Avenue, the rural type drainage design will be converted to an urban type design with catch basins and an enclosed storm drain system. In areas where existing water ponds at slope toes, the storm drains will outlet into retention basins. Typically, they are located in the infields of traffic interchanges, but some may be needed between interchanges; requiring new right-of-way. In areas where water outlets into existing cross drainage structures, the storm drains will outlet into these structures. As needed to retain capacity in the cross drainages, the storm drains will outlet initially into detention basins.

##### I-10 TI Modifications

Each of the existing TIs within the project limits was evaluated from a capacity and safety standpoint to determine needed improvements. The evaluation process involved:

- Using the projected 2040 peak hour traffic volumes and micro-modeling software to identify problem areas or movements that have unacceptable levels of service.
- Identifying solutions.
- Testing solutions by re-running the micro-model with the proposed solutions coded into the software.
- Repeating the iterative process until adequate solutions were produced.

Solutions typically involved enlarging the crossroads and ramp termini at the crossroads; providing additional through-lanes and turn-lanes to accommodate the higher traffic demand.

- The existing TIs are typically diamond type TIs.
- Where right-of-way is limited, tight diamond TIs are used. The tight diamond TIs can remain but adjusted to accommodate truck turns.
- There are three partial cloverleaf TIs that will be modified to eliminate successive loop ramps. The successive loop ramps provide inadequate weaving distances, limiting capacity and create safety issues.

The existing TIs have been tested for capacity as diamond TIs with approximately 600 feet between the ramp termini, unless conditions dictated a different spacing. The 600 feet is the suggested distance between ramp for a standard diamond interchange as per the ADOT Roadway Design Guidelines. Where diamond TIs cannot provide the needed capacity, modifications were made to develop the capacity.

A description of improvements for each existing and new TI west of the Valencia Road TI is included below. Improvements meet the capacity and operational requirements.

##### I-10 / 6<sup>th</sup> Avenue TI (MP 260.99)

The existing diamond type TI has four ramps that provide full access between I-10 and 6<sup>th</sup> Avenue. I-10 is fully depressed and passes under 6<sup>th</sup> Avenue. Phase II traffic modeling evaluations have determined that the TI functions adequately but will require an additional left turn lane in each direction on the crossroad. See plan sheets 1 and 2 of 2040 Improvements - System Alternatives I and IV in **Appendices C, D, I and J**. Existing TI issues and improvements include:

- In the vicinity of the eastbound exit ramp to 6th Avenue, the auxiliary lane is extended easterly to create the 4th eastbound general purpose lane. This will require relocating the exit gore.
- The eastbound entrance ramp from 6th Avenue combines with the eastbound exit ramp from I-10 to Park Avenue via a weave on the frontage road. The combined ramp is impacted only by the outside widening of eastbound I-10.
- The existing westbound exit ramp from I-10 to 6th Avenue combines with the existing entrance loop ramp from Park Avenue to westbound I-10 via a short weave along mainline I-10. The Park Avenue loop ramp will be replaced with a conventional diamond ramp that will conflict with the existing westbound exit ramp. Therefore, the ramp exit will be relocated to the east side of Park Avenue with grade separated crossings over Park Avenue and the new westbound entrance ramp from Park Avenue. The exit ramp will then tie into the existing westbound frontage road to 6th Avenue.

- The existing westbound entrance ramp from 6th Avenue is not impacted.
- 6th Avenue across I-10 has two through lanes and single left turn lanes in each direction between the ramp termini. An additional left turn lane is needed in each direction to provide adequate turning traffic capacity. This will require widening the existing bridge; yet minimum vertical clearance over I-10 can be maintained. The outside pedestrian fencing has artistic enhancements that should be incorporated into the bridge widening.

The existing ‘U-turn’ ramp located near the UPRR crossing under I-10 connects the eastbound and westbound frontage roads and improves access. Discussions with local stakeholders indicated a need to retain this ramp. The vertical clearance under the I-10 bridge does not meet current design criteria therefore a design exception will be needed.

#### **I-10 / Park Avenue TI (MP 261.72)**

The existing partial cloverleaf TI has four ramps that provide full access between I-10 and Park Avenue. Existing TI conditions include:

- The weave along I-10 between the westbound loop entrance ramp and the exit ramp to 6th Avenue is too short.
- The eastbound exit ramp intersects Park Avenue approximately 600 feet south of I-10 with a signalized intersection and becomes the west end of Benson Highway. This intersection is too far away from the interchange.
- Benson Highway crosses Park Avenue at a 45 degree skew angle. Therefore, left turns onto northbound Park Avenue are a sharp 135 degrees, which is not desirable and impacts turning capacity.
- At I-10, Park Avenue has three through lanes and a single left turn lane in each direction. The outside northbound lane becomes the loop ramp. To the north, the curb line is continued for three lanes to the intersection with the westbound ramps, but the outside lane is striped for non-usage.

Modifications to the Park Avenue TI were identified and evaluated through the iterative process described previously. See plan sheet 2 of 2040 Improvements – System Alternatives I and IV in **Appendix C, D, I and J**. The modifications are:

- The loop ramp from Park Avenue to westbound I-10 will be replaced with a diamond entrance ramp from Park Avenue to westbound I-10. This converts the partial cloverleaf TI to a diamond type TI.
- The Park Avenue westbound exit ramp must be relocated to the east to avoid conflicts with the westbound exit ramp to 6th Avenue and the

new westbound entrance ramp from Kino Parkway. The exit ramp to Park Avenue is relocated just inside the existing north right-of-way for I-10 to east of Kino Parkway and it ‘braids’ under Kino Parkway and the Kino entrance ramp to avoid weaving and improve safety.

- With the relocation of the westbound ramps (6th Avenue exit and Park Avenue entrance), access from Park Avenue to the westbound frontage road is eliminated. To restore this access, a connection ramp is needed between the westbound entrance ramp from Park Avenue and the westbound 6th Avenue exit ramp.
- The eastbound exit ramp from I-10 to Park Avenue currently connects to the eastbound frontage road and then to the Benson Highway. That connection will remain, and an additional connection will be extended from the frontage road to Park Avenue. This removes traffic from the skewed intersection with Benson Highway and improves traffic operations and safety.

Park Avenue will have 3-through lanes and single left-turn lanes in each direction. Existing Park Avenue has adequate width for this configuration.

#### **I-10 / Kino Parkway TI (MP 262.53)**

Kino Parkway is one of four continuous major north-south arterials/parkways from south of I-10 into central and north Tucson that does not encounter a physical obstacle, such as the UPRR switching yard and Davis-Monthan AFB. As such, the I-10/Kino Parkway TI is a major intermediate destination for traffic from the south and southeast part of the Tucson Metropolitan area to access downtown Tucson. The existing partial cloverleaf TI provides access between I-10, Kino Parkway, and Ajo Way. Existing TI conditions include:

- Through traffic on all three roadways are grade-separated.
- Majority of access to and from I-10 is through TI ramps.
- The Ajo Way Connector between Kino Parkway and Ajo Way in the northeast quadrant provides access to and from westbound I-10 and Kino Parkway. This requires all Kino/westbound I-10 traffic to travel through the at-grade intersection with Ajo Way. While this intersection provides access to Ajo Way, it reduces traffic capacity for traffic from westbound I-10 to downtown Tucson via northbound Kino Parkway.
- The westbound entrance ramp to I-10 serves only southbound Kino Parkway traffic. Northbound Kino Parkway traffic headed to westbound I-10 must use the Ajo Way Connector described above and then use the westbound entrance ramp from Ajo Way. This requires traffic to travel through the intersection at Ajo Way.

- Access between southbound Kino Parkway and eastbound I-10 uses a loop ramp in the southwest quadrant. Access between eastbound I-10 and northbound Kino Parkway uses a loop ramp in the southeast quadrant. The two loop ramps have a short weave distance, which is undesirable.

A diamond TI was evaluated through the iterative process described above. See plan sheet 3 of 2040 Improvements – System Alternatives I and IV in **Appendices C, D, I and J**. The improvements are:

- A new ramp from westbound I-10 to Kino Parkway is provided. It is grade-separated over Ajo Way, bypassing the at-grade intersection with Ajo Way and improving traffic operations and safety.
  - This new ramp allows for the removal of the two westbound ramps with I-10.
  - The westbound access to and from Ajo Way is relocated to a new TI at Country Club Road.
- A new westbound entrance from Kino Parkway to I-10 will directly serve both southbound and northbound Kino Parkway traffic.
- The eastbound I-10 exit loop ramp is removed and replaced with a new I-10 exit ramp west of Kino Parkway.
  - The eastbound exit ramp weaves with the new eastbound entrance ramp from Park Avenue.
  - The ramp terminus is located as far north as possible along Kino Parkway to increase the weave distance down to the left turn lanes onto Benson Highway.
- The southbound Kino Parkway to eastbound I-10 loop ramp was originally removed as a part of the effort to remove all loop ramps. However, the traffic simulations indicated that the heavy southbound left turn demand from Kino Parkway to eastbound I-10, along with the heavy northbound through traffic demand on Kino Parkway, causes the intersection of Kino Parkway and the I-10 eastbound entrance and exit ramps to fail.
 

Therefore, a loop ramp is used to remove the southbound left-turn traffic from the ramp terminal intersection. The existing loop ramp will be modified to operate more safely. The loop ramp will merge with the diamond ramp. The ramp merge onto eastbound I-10 will be moved to the east to provide adequate length.

Kino Parkway will have three lanes in each direction. Dual left turn lanes will be used for the northbound Kino Parkway to westbound I-10 movement.



Traffic modeling evaluations determined that the TI will function adequately as a diamond TI with the loop ramp. The modeling also indicated that both TI intersections operate at a satisfactory LOS for all conditions. The modeling evaluations indicated that both intersections will operate at LOS C or better for 2040 AM and PM peak hours

#### **I-10 / Country Club Road TI (MP 263.82)**

A new diamond TI will be located at Country Club Road to replace the existing Palo Verde Road TI. See plan sheet 4 of 2040 Improvements – System Alternatives I and IV in **Appendices C, D, I and J**. Design criteria for skew angles of ramps at the crossroad will impact both the spacing between ramp termini and ramp alignments.

Traffic modeling evaluations determined that the diamond TI will function adequately, by providing three lanes and dual left turn lanes in each direction on the crossroad with external storage needed for the left turn lanes. The modeling evaluations also indicate that both intersections will operate at LOS B for 2040 AM and PM peak hours.

#### **I-10 / Palo Verde Road TI (MP 264.37)**

The existing TI at the junction of I-10 and Palo Verde Road will be removed. The proposed TI at I-10 and Country Club Road will provide access for traffic that currently uses the Palo Verde TI. See plan sheet 5 of 2040 Improvements – System Alternatives I and IV in **Appendices C, D, I and J**.

The existing eastbound frontage road on the south side of I-10 will remain. The intersection of the frontage road and Palo Verde Road will be modified to a “T” intersection to provide access from both northbound and southbound Palo Verde Road.

#### **I-10 / Alvernon Way TI (MP 265.02)**

Alvernon Way is one of four continuous major north-south arterials/parkways from south of I-10 into central and north Tucson that does not encounter a physical obstacle, such as the UPRR switching yard and Davis-Monthan AFB. The I-10/Alvernon Way TI is a major connector for traffic from the south and southeast part of the Tucson Metropolitan area to access central and downtown Tucson.

Alvernon Way is the location for the SR 210 to I-10 System Interchange. The Service TI discussed here will be integrated with the System Interchange. See plan sheet 5 and 6 of 2040 Improvements – System Alternatives I and IV in **Appendices C, D, I and J**.

The existing partial diamond TI has three ramps; restricting full access between I-10 and Alvernon Way. There is no existing entrance ramp from

Alvernon Way to westbound I-10. The existing westbound exit ramp from I-10 does not provide access to southbound Alvernon Way.

The initial evaluation involved retaining the existing TI, with the following changes:

- To complete the diamond TI, the westbound I-10 exit ramp to Palo Verde Road is eliminated and a new westbound entrance ramp from Alvernon Way is added
- The westbound exit ramp will be reconfigured to provide access to southbound Alvernon Way.
- The eastbound exit ramp will be reconfigured to improve the angle at the intersection with Alvernon Way.

The diamond TI ramps serve to provide access for the minor movements between I-10 and Alvernon Way south of I-10.

Traffic modeling evaluations determined that the TI will function adequately as a diamond TI with three lanes in each direction plus left turn lanes on the crossroad. The modeling evaluations also indicate that both intersections will operate at LOS C or better for 2040 AM and PM peak hours, but external storage for left turns is needed. While existing curb locations do not support the external storage, there is sufficient distance between the center bridge pier and the abutments to accommodate the additional lanes. Additional study should be done during final design to determine the final need for the external storage while providing an adequate LOS.

#### **3.2.2.2 SR 210 Extension**

SR 210 will be extended southerly along the Alvernon Way alignment from Golf Links Road to a new System Interchange at I-10. The System Interchange provides direct ramp access between I-10 and mainline SR 210 and overlays the diamond TI discussed above. See **Figure 3.2 SR 210 Extension**.

SR 210 improvements include:

- Extend SR 210 south along the Alvernon Way alignment to I-10.
- Reconstruct the existing Barraza-Aviation/Alvernon Way/Golf Links interchange to provide route continuity for SR 210 while providing all traffic movements to the greatest extent possible.
- Close Contractor’s Way between Golf Links Road and Ajo Way. Provide alternative access along SR 210 via appropriate ramps at Ajo Way and Alvernon Way in the vicinity of Golf Links Road.
- Provide a diamond interchange with SR 210 and Ajo Way.

- Provide SR 210 overpass structures over E. Michigan Street and E Irvington Road.
- Provide a system interchange that will be integrated with the diamond interchange movements at the junction of Alvernon Way and I-10.
- Replace the Alvernon Way structure over the UPRR with a structure with longer span lengths as per discussions with the UPRR. The UPRR expects to add tracks in the future and is requiring the reduction in the number of spans. The resulting longer spans will raise the SR 210 profile over the UPRR and require total structure replacement.
- Provide gated maintenance access for ADOT, Tucson Electric Power (TEP) and Tucson Water along the SR 210 corridor by using the abandoned southbound portion of Contractor’s Way north of Ajo Way.
- Provide gated maintenance access for ADOT and TEP vehicles between Ajo Way and Golf Links Road along the eastern edge of the SR 210 corridor. It will use a portion of the abandoned northbound Contractor’s Way.
- Additional right-of-way will be required for SR 210, the SR 210/Golf Links interchange, the SR 210/Ajo Way interchange and the I-10/SR 210 system interchange.
- Shift the SR 210 alignment south of Ajo Way to minimize new right-of-way takes from both sides of the Alvernon Way corridor. The goal is to take new right-of-way from just one side of the Alvernon Way corridor through a given section.

The extension of SR 210 typically has an elevated profile, with overpass structures over: Golf Links TI directional ramps, the UPRR, Ajo Way, Michigan Street, and Irvington Road. South of Irvington Road, the profile drops to closely match the existing Alvernon Way profile as it passes under the existing east-west overhead power transmission lines coming from the TEP plant located in the northeast quadrant of the I-10/Alvernon Way TI. By maintaining the Alvernon Way profile under I-10, the intent is to retain adequate vertical clearance under I-10 to avoid the need for structure replacement due to vertical clearance.

#### **3.2.3 System Alternative I**

System Alternative I includes the General Requirements addressed above in **Section 3.2.2** and the improvements to I-10 between the I-10/SR 210 System Interchange at Alvernon Way and the Kolb Road TI. See **Appendix C and D** for plan views and typical sections of the proposed improvements.

### I-10 Mainline Improvements

From Alvernon Way to Kolb Road, additional I-10 mainline travel lanes and auxiliary lanes between successive entrance and exit ramps will be needed to achieve an adequate level of service for the design year 2040. For System Alternative I, five lanes in each direction plus auxiliary lanes are needed and will provide an LOS C or better in both directions for 2040 AM and PM peak hours. I-10 will have a closed median with a new concrete median barrier and a wide paved shoulder that provides lateral space for a future additional general purpose lane.

The existing I-10 horizontal centerline will be retained from Alvernon Way to just north of Valencia Road. To the east, the horizontal centerline will shift from existing to accommodate a wider roadway footprint than existing and avoid right-of-way takes from developed residential neighborhoods adjacent to I-10. East of Kolb Road, the centerline will be shifted to 60 feet left of existing to create space to retain the existing two-way frontage road. East of the east Kolb Road ramps, the five mainline lanes in each direction will be transitioned to match the existing two lanes in each direction.

Between Valencia Road and Kolb Road, there are eastbound and westbound frontage roads. Typically, they serve few parcels, either developed or undeveloped. Between Craycroft Road and Kolb Road, the frontage roads will be removed to make room for the I-10 roadway footprint and utility corridors. Between Valencia Road and Craycroft Road, the distance between the TIs is 0.85 miles. Back-to-back diamond TIs with auxiliary lanes adjacent to five mainline lanes will not function adequately. Therefore, the easterly Valencia Road ramps will be retained and the westerly Craycroft Road ramps will be eliminated. The ramp traffic will be shifted onto the retained/reconstructed frontage roads. This will require that the westerly Valencia ramps will also serve traffic to/from Craycroft Road and that Craycroft ramp traffic must cross Valencia Road. Also, along the westbound frontage road, there are a few access driveways near Craycroft Road and several undeveloped parcels to the west that have access only to the frontage road. Retaining the westbound frontage road preserves access to these parcels and avoids total parcel ROW takes, including the Triple T truck stop.

Between Wilmot Road and Kolb Road adjacent to the westbound frontage road, there are a few access driveways for utility facilities. It is intended to relocate these access points to the local street system identified in the La Estancia de Tucson future development. An evaluation has determined that access to these properties can be achieved and that the westbound frontage road can be removed.

East of Alvernon Way, the rural type drainage design will be converted to an urban type design with catch basins and an enclosed storm drain

system. In areas where existing water ponds at slope toes, the storm drains will outlet into retention basins. Typically, they are located in the infields of traffic interchanges, but some may be needed between interchanges; requiring new right-of-way. In areas where water outlets into existing cross drainage structures, the storm drains will outlet into these structures. As needed to retain capacity in the cross drainages, the storm drains will outlet initially into detention basins.

### I-10 TI Modifications

Each of the existing TIs east of Alvernon Way was evaluated from a capacity and safety standpoint to determine needed improvements. The evaluation process was the same used for I-10 west of Alvernon Way.

Solutions typically involved enlarging the crossroads and ramp termini at the crossroads; providing additional through-lanes and turn-lanes to accommodate the higher traffic demand.

- The existing TIs are typically diamond type TIs.
- Where right-of-way is limited, tight diamond TIs are used. The tight diamond TIs can remain but adjusted to accommodate truck turns.
- The Kolb Road TI will experience heavy left turn demand during the AM peak hour. Traffic evaluations during the Feasibility Study indicated that a diamond interchange will not adequately operate. A diverging diamond interchange is recommended.

A description of improvements for each existing TI between Alvernon Way and Kolb Road is included below. Improvements meet the capacity and operational requirements.

### I-10 / SR 210 – System Alternative I Interchange (MP 265.02)

At the I-10/SR 210 System Interchange, I-10 and SR 210 traffic merge via four system interchange ramps. See sheet 5 of 2040 Improvements - System Interchange I in **Appendix C**. The System Interchange overlays the diamond type service interchange that provides access between I-10 and Alvernon Way south of I-10. The horizontal geometry of the directional ramps accommodates both system alternatives and the I-10/Alvernon Way service TI ramps.

The System Interchange provides direct access between SR 210 and I-10 via four directional ramps (S-E, W-N, S-W, and E-N). Directional Ramps S-E and W-N have two lanes each to accommodate the heaviest traffic volume demand between SR 210 and I-10 to the east. Directional Ramps S-W and E-N have one lane each to accommodate the lesser traffic demand between SR 210 and I-10 to the west.

Portions of the new system interchange are located within the existing Julian Wash 100-year floodplain. The Los Niños Elementary School and Los Niños Park are located south of Julian Wash on the east side of Alvernon Way. The existing Julian Wash box culvert under I-10 is adequate to convey the 100-year storm flow. See the environmental assessment regarding noise impacts to the Los Niños Elementary School and Los Niños Park. Future increases in traffic volumes along Alvernon Way south of I-10 will affect the ability of school buses to leave the school property in the morning and afternoon. The Sunnyside Unified School District requested a signal be installed to provide a traffic break for the busses to exit the property.

### I-10 / Drexel Road (MP 266.00)

The existing bridge overpass at Drexel Road has no ramps to I-10. See sheet 6 of 2040 Improvements - System Interchange I in **Appendix C**. Drexel Road will be widened to provide three lanes, shoulders, sidewalks and a 12-foot wide multi-use path associated with the Julian Wash Linear Park. The increase in width of Drexel Road will require the replacement of the existing I-10 bridge.

### I-10 / Valencia Road TI (MP 267.10)

The existing diamond TI has four ramps that provide full access between I-10 and Valencia Road. See sheet 7 of 2040 Improvements - System Interchange I in **Appendix C**. The horizontal alignment of I-10 east of Valencia Road is shifted to avoid the residential subdivisions and commercial businesses adjacent to the eastbound frontage road. This will shift the I-10 centerline and bridges alignments within the TI.

As addressed above, the eastbound and westbound frontage roads will tie into the east Valencia ramps and traffic to/from Craycroft Road will cross Valencia Road and use the west Valencia ramps.

Traffic modeling evaluations determined that a diamond TI will function adequately by reconstructing Valencia Road to provide three through lanes and dual left turn lanes in each direction. The increase in the width of Valencia Road and the shifting of I-10 to the east of the current Valencia Road crossing will require the replacement of the existing I-10 bridges.

### I-10 / Craycroft Road TI (MP 268.08)

The existing tight diamond type TI has four ramps that provide full access between I-10 and Craycroft Road. See sheet 8 of 2040 Improvements – System Alternative I in **Appendix C**. There are commercial properties in all four quadrants of the TI, including the Triple T Truck Stop in the northwest quadrant, the Pilot Travel Center and Freightliner of Arizona in the northeast quadrant, Greater AZ Auto Auctions in the southwest



quadrant and Cornwell Truck Repair in the southeast quadrant. The four-span I-10 overpass structures accommodate one through lane in each direction on the crossroad and single left turn lanes.

As addressed above, the eastbound and westbound frontage roads will tie into the east Valencia ramps and traffic to/from Craycroft Road will cross Valencia Road and use the west Valencia ramps.

Traffic modeling evaluations determined that the existing tight diamond TI functions adequately, by providing two lanes and single left turn lanes in each direction on Craycroft Road. The increase in crossroad width will require the replacement of the existing I-10 bridges.

Additional evaluations determined that the tight diamond configuration will meet truck turning radii, required left turn storage and other elements. This will minimize the roadway footprint and right-of-way acquisitions from the developed properties.

After the Feasibility Study Update, two trucking oriented businesses were constructed in the northeast quadrant of the interchange (Pilot and Freightliner). The access point (Travel Plaza Way) onto Craycroft Road for these two businesses is located approximately 250 feet north of the northern ramp returns, which is in conflict with current ADOT cross street access control criteria. By 2040 Travel Plaza Way will operate at LOS F under existing conditions during peak hours. Future improvements to Craycroft Road include constructing a raised median extending north 660' to a new tee intersection with a 3-lane two-way connector roadway to the west connecting Craycroft Road to the westbound frontage road. Truck traffic will use the Craycroft connector road to access I-10 at the Valencia Road TI. See sheet 8 of 2040 Improvements – System Alternative I in **Appendix C**.

#### **I-10 / Wilmot Road TI (MP 269.36)**

The existing tight diamond type TI has four ramps that provide full access between I-10 and Wilmot Road. See sheet 9 of 2040 Improvements – System Alternative I in **Appendix C**. There are commercial properties in two of the four quadrants of the TI, including Chevron and Travel Inn in the northwest quadrant. The two-span I-10 overpass structure only accommodates two lanes in each direction on the crossroad.

There are existing eastbound and westbound frontage roads between Craycroft Road and Wilmot Road. They provide access to only two developed parcels, both on the westbound frontage road near Wilmot Road. Both frontage roads will be removed. Access to the Chevron gas station can be restricted to Wilmot Road. Alternative access for Travel Inn will be developed via a connector road to Wilmot Road. The break in the center median for Travel Inn should be located beyond the limit of ADOT left turn access control criteria.

Traffic modeling evaluations determined that the existing tight diamond TI functions adequately, by providing two lanes in each direction on Wilmot Road with a single left turn lane for the south to east movement and a double left turn lane for the north to west movement. The increase crossroad width will require the replacement of the existing I-10 bridges. All ramps will be realigned to improve the skew angles at the crossroad.

#### **I-10 / Kolb Road TI (MP 270.58)**

The existing spread diamond type TI has four ramps that provide full access between I-10 and Kolb Road. See sheet 10 of 2040 Improvements – System Alternative I in **Appendix C**. There are commercial properties in the southeast quadrant of the interchange. The Bureau of Land Management (BLM) owns the parcel in the southwest quadrant of the interchange.

The PAG identified improvements to Kolb Road as a needed but unfunded improvement south of I-10. The improvement would extend Kolb Road to the south of I-10 and tie it into Wilmot Road. Kolb Road will then be identified as a Parkway and will be one of four continuous major north-south arterials/parkways from south of I-10 into central and north Tucson that does not encounter a physical obstacle, such as the UPRR switching yard and Davis-Monthan AFB. The I-10/Kolb Road TI is a major connector for traffic from the southeast part of the Tucson Metropolitan area to access downtown Tucson via I-10 and north Tucson via Kolb Road. The major traffic movements at the TI are shown in **Appendix B**.

The combination of heavy through volumes on Kolb Road and heavy opposing turn volumes will create significant operational problems. Initial traffic modeling evaluations were performed with different types of TIs; diamond, single point urban (SPUI), and diverging diamond. None of these resolved the operational problems; particularly due to the projected heavy through volumes on Kolb Road. Finally, a diverging diamond TI with separate roadways for through traffic was developed and evaluated. It will function with a LOS of B or better for 2040 AM and PM peak hours.

With this configuration, existing Kolb Road including the existing structure over I-10 is used as the diverging portion of the interchange with signalized intersections where traffic shifts directions. Standard diamond type ramps tie to the diverging diamond. The northbound and southbound Kolb Road mainline roadways carry only through traffic. Thus, all turning movements are confined to the diverging diamond and do not interfere with through movements. I-10 remains at ground level. The Kolb Road mainline roadways are two levels above I-10 and the diverging diamond roadway is one level above I-10.

The diverging diamond roadway and the Kolb Road mainline roadways merge at the north end of the interchange just south of Science Park Drive, a significant east-west arterial. To provide for right turns from the center roadway to eastbound Science Park Drive, a connector road is needed, which will pass under northbound mainline Kolb Road in a box structure. It will end at Science Park Drive as a right turn lane.

East of Kolb Road, a two-way frontage road serves properties along the south side of I-10. The west end of the frontage road intersects Kolb Road approximately 300-ft. south of the existing ramp intersection. The frontage road parallels I-10 and ends approximately 7,000-ft. (1.3 miles) east of Kolb Road.

The diverging diamond roadway and the Kolb Road mainline roadways merge at the south end of the interchange. This restricts access to Wall Street, which is the access to Trails West Active Adult Community. To provide access, a new connector road to the frontage road is needed. It will partially utilize an existing street easement.

To retain the two-way frontage road and avoid new right-of-way, I-10 is shifted to the north. This also allows for the retention of the frontage road access point onto Kolb Road. However, due to the new interchange configuration, a new south connector is required to provide full access to/from the frontage road. The connector intersects with the center roadway but passes under the northbound and southbound Kolb Road mainline roadways via two-lane box structures. The connector will be extended westerly to provide access to the BLM property.

#### **3.2.4 System Alternative IV**

System Alternative IV includes the General Requirements addressed above in **Section 3.2.2** and the improvements to I-10 between the I-10/SR 210 System Interchange at Alvernon Way and the Kolb Road TI. See **Appendix I** for plan views and typical sections of the proposed improvements.

#### **I-10 Mainline Improvements**

From Alvernon Way to Kolb Road, additional I-10 mainline travel lanes and auxiliary lanes between successive entrance and exit ramps will be needed to achieve an adequate level of service for the design year 2040. For System Alternative IV, three mainline lanes in each direction will address the regional traffic demands. I-10 will have a closed median with a new concrete median barrier and a wide paved shoulder that provides lateral space for a future additional general purpose lane. Local traffic will be addressed via eastbound and westbound collector-distributors (CD) adjacent to the mainline lanes. A concrete barrier will separate mainline from each CD. Each CD will have a wide inside paved shoulder that provides lateral space for a future additional traffic lane. Auxiliary lanes

between successive entrance and exit ramps will be provided and they will connect to the CD roadways. The CD roadways will terminate within the eastern limits of the Kolb Road TI. The eastbound CD will taper into eastbound I-10. The westbound CD will separate from westbound I-10 and become the westbound ramp to SR 210. The I-10 mainline and the CD roadways will have LOS C or better in both directions for 2040 AM and PM peak hours.

The existing I-10 horizontal centerline will be retained from Alvernon Way to just north of Valencia Road. To the east, the horizontal centerline will shift from existing to accommodate a wider roadway footprint than existing and avoid right-of-way takes from developed residential neighborhoods adjacent to I-10. East of Kolb Road, the centerline will be shifted to 60 feet left of existing to create space to retain the existing two-way frontage road. East of the east Kolb Road ramps after merging mainlines and CDs, the merged lanes will be transitioned to match the existing two lanes in each direction.

Between Valencia Road and Kolb Road, there are eastbound and westbound frontage roads. Typically, they serve few parcels, either developed or undeveloped, and will be removed to make room for the I-10 roadway footprint and utility corridors. While the distance from Valencia Road to Craycroft Road is less than the desirable one-mile spacing, back-to-back diamond TIs with auxiliary lanes will function adequately as they will merge with lesser traffic on the CDs instead of the higher traffic on a five-lane mainline for Alternative I.

Along the westbound frontage road, there are a few access driveways near Craycroft Road and several undeveloped parcels to the west that have access only to the frontage road. Therefore, the westbound frontage road should be retained to preserve access to these parcels and avoid total parcel ROW takes, including the Triple T truck stop. The eastbound frontage road can be removed.

Between Wilmot Road and Kolb Road adjacent to the westbound frontage road, there are a few access driveways for utility facilities. It is intended to relocate these access points to the local street system identified in the La Estancia de Tucson future development. An evaluation has determined that access to these properties can be achieved and that the westbound frontage road can be removed.

Along the eastbound CD located west of Wilmot Road, a ramp will be provided to allow vehicles on eastbound I-10 to enter the CD. This ramp allows eastbound I-10 mainline traffic to exit at Kolb Road. Along the westbound CD located west of Kolb Road, a ramp will be provided to allow vehicles on the CD to enter westbound I-10. This ramp allows westbound traffic from Kolb Road (via the westbound CD) to enter I-10 mainline without having to travel the entire length of the CD.

At strategic points along each CD, special moveable gates will be provided in the median barriers that separate mainline from the CDs. These gates create emergency access between mainline I-10 and the CDs for first responders and enforcement vehicles. During non-emergency conditions, the gates will be closed to provide continuous physical separation between mainline and the CDs. During emergency conditions, first responders will open the gates to provide access for their vehicles. As needed, the gates can be used to route vehicles away from crash/emergency sites.

East of Alvernon Way, the rural type drainage design will be converted to an urban type design with catch basins and an enclosed storm drain system. In areas where existing water ponds at slope toes, the storm drains will outlet into retention basins. Typically, they are in the infields of traffic interchanges, but some may be needed between interchanges; requiring new right-of-way. In areas where water outlets into existing cross drainage structures, the storm drains will outlet into these structures. As needed to retain capacity in the cross drainages, the storm drains will outlet initially into detention basins.

#### **I-10 TI Modifications**

Each of the existing TIs east of Alvernon Way was evaluated from a capacity and safety standpoint to determine needed improvements. The evaluation process was the same used for I-10 west of Alvernon Way. Solutions typically involved enlarging the crossroads and ramp termini at the crossroads; providing additional through-lanes and turn-lanes to accommodate the higher traffic demand.

- The existing TIs are typically diamond type TIs.
- Where right-of-way is limited, tight diamond TIs are used. The tight diamond TIs can remain but adjusted to accommodate truck turns.
- The Kolb Road TI will experience heavy left turn demand during the AM peak hour. Traffic evaluations during the Feasibility Study indicated that a diamond interchange will not adequately operate. A diverging diamond interchange is recommended.
- Due to the wider overall roadway footprint for Alternative IV, the distance between the ramp termini is larger than for Alternative I.
- Traffic interchanges will provide access between the CD roadways and major cross streets.

A description of improvements for each existing TI between Alvernon Way and Kolb Road is included below. Improvements meet the capacity and operational requirements.

#### **I-10/SR 210 – System Alternative I Interchange (MP 265.02)**

At the I-10/SR 210 System Interchange, I-10 and SR 210 traffic merge via four system interchange ramps. See sheet 5 of 2040 Improvements - System Interchange IV in **Appendix I**. The System Interchange overlays the diamond type service interchange that provides access between I-10 and Alvernon Way south of I-10. The horizontal geometry of the directional ramps accommodates both system alternatives and the I-10/Alvernon Way service TI ramps.

The System Interchange provides direct access between SR 210 and I-10 via four directional ramps (S-E, W-N, S-W, and E-N). Directional Ramps S-E and W-N have two lanes each and connect directly to the CD roadways to the east. Ramp S-E becomes the eastbound CD. A ramp will be provided to allow vehicles on eastbound I-10 to exit I-10 and enter the eastbound CD roadway. The westbound CD becomes Ramp W-N. A ramp will be provided to allow vehicles on the westbound CD roadway to exit the CD roadway and enter westbound I-10. Directional Ramps S-W and E-N have one lane each to accommodate the lesser traffic demand between SR 210 and I-10 to the west.

Portions of the new system interchange are located within the existing Julian Wash 100-year floodplain. Los Niños Elementary School and Los Niños Park are located south of Julian Wash on the east side of Alvernon Way. The existing Julian Wash box culvert under I-10 is adequate to convey the 100-year storm flow. See the environmental assessment regarding noise impacts to the Los Niños Elementary School and Los Niños Park. Future increases in traffic volumes along Alvernon Way south of I-10 will affect the ability of school buses to leave the school property in the morning and afternoon. The Sunnyside Unified School District requested a traffic signal be installed to provide a traffic break for the busses to exit the property.

#### **I-10 / Drexel Road (MP 266.00)**

The existing bridge overpass at Drexel Road has no ramps to I-10. See sheet 6 of 2040 Improvements - System Interchange I in **Appendix I**. Drexel Road will be widened to provide three lanes, shoulders, sidewalks and a 12-foot wide multi-use path associated with the Julian Wash Linear Park. The increase in width of Drexel Road will require the replacement of the existing I-10 bridge.

#### **I-10 / Valencia Road TI (MP 267.10)**

The existing diamond TI has four ramps that provide full access between I-10 and Valencia Road. See sheet 7 of 2040 Improvements - System Interchange IV in **Appendix I**. The horizontal alignment of I-10 east of Valencia Road is shifted to avoid the residential subdivisions and



commercial businesses adjacent to the eastbound frontage road. This will shift the I-10 centerline and bridges alignments within the TI.

As addressed above, the westbound frontage road will tie into the Valencia westbound exit ramp and traffic from Craycroft Road will cross Valencia Road and use the Valencia westbound entrance ramp.

Traffic modeling evaluations determined that a diamond TI will function adequately by reconstructing Valencia Road to provide three through lanes and dual left turn lanes in each direction. The increased width of Valencia Road and the shifting of I-10 east of Valencia Road will require the replacement of the existing I-10 bridges.

#### **I-10 / Craycroft Road TI (MP 268.08)**

The existing tight diamond type TI has four ramps that provide full access between I-10 and Craycroft Road. See sheet 8 of 2040 Improvements - System Alternative IV in **Appendix I**. There are commercial properties in all four quadrants of the TI, including the Triple T Truck Stop in the northwest quadrant, Pilot Travel Center and Freightliner of Arizona in the northeast quadrant, Greater AZ Auto Auctions in the southwest quadrant and Cornwell Truck Repair in the southeast quadrant. The four-span I-10 overpass structures accommodate one through lane in each direction on the crossroad and single left turn lanes.

As addressed above, the westbound frontage road will tie into the Valencia westbound exit ramp and traffic from Craycroft Road will cross Valencia Road and use the Valencia westbound entrance ramp.

Traffic modeling evaluations determined that the existing tight diamond TI functions adequately, by providing two lanes and single left turn lanes in each direction on Craycroft Road. The increase in crossroad width will require the replacement of the existing I-10 bridges.

Additional evaluations determined that the tight diamond configuration will meet truck turning radii, required left turn storage and other elements. This will minimize the roadway footprint and right-of-way acquisitions from the developed properties.

After the Feasibility Study Update, two trucking oriented businesses were constructed in the northeast quadrant of the interchange (Pilot and Freightliner). The access point onto Craycroft Road for these two businesses is located approximately 300 feet north of the northern ramp returns, which conflicts with current ADOT cross street access control criteria. By 2040 Travel Plaza Way will operate at LOS F under existing conditions during peak hours. Future improvements to Craycroft Road include constructing a raised median extending north 660' to a new tee intersection with a 3-lane two-way connector roadway to the west connecting Craycroft Road to the westbound frontage road. Truck traffic will use the Craycroft connector road to access I-10 at the Valencia Road

TI. See sheet 8 of 2040 Improvements – System Alternative IV in **Appendix I**.

#### **I-10 / Wilmot Road TI (MP 269.36)**

The existing tight diamond type TI has four ramps that provide full access between I-10 and Wilmot Road. See sheet 9 of 2040 Improvements – System Alternative IV in **Appendix I**. There are commercial properties in two of the four quadrants of the TI, including Chevron and Travel Inn in the northwest quadrant. The four-span I-10 overpass structure only accommodates two lanes in each direction on the crossroad.

There are existing eastbound and westbound frontage roads between Craycroft Road and Wilmot Road. They provide access to only two developed parcels, both on the westbound frontage road near Wilmot Road. Both frontage roads will be removed. Access to the Chevron gas station can be restricted to Wilmot Road. Alternative access for Travel Inn will be developed via a connector road to Wilmot Road. The break in the center median for Travel Inn should be beyond the limit of ADOT left turn access control criteria.

Traffic modeling evaluations determined that the existing tight diamond TI functions adequately, by providing two lanes in each direction on Wilmot Road with a single left turn lane for the south to east movement and a double left turn lane for the north to west movement. The increase in crossroad width will require the replacement of the existing I-10 bridges. All ramps will be realigned to improve the skew angles at the crossroad.

#### **I-10/Kolb Road TI (MP 270.58)**

The existing spread diamond type TI has four ramps that provide full access between I-10 and Kolb Road. See sheet 10 of 2040 Improvements – System Alternative IV in **Appendix I**. There are commercial properties in the southeast quadrant of the interchange. The Bureau of Land Management (BLM) owns the parcel in the southwest quadrant of the interchange.

The PAG identified improvements to Kolb Road as a needed but unfunded improvement south of I-10. The improvement would extend Kolb Road to the south of I-10 and tie it into Wilmot Road. Kolb Road will then be identified as a Parkway and will be one of four continuous major north-south arterials/parkways from south of I-10 into central and north Tucson that does not encounter a physical obstacle, such as the UPRR switching yard and Davis-Monthan AFB. The I-10/Kolb Road TI is a major connector for traffic from the southeast part of the Tucson Metropolitan area to access downtown Tucson via I-10 and north Tucson via Kolb Road. The major traffic movements at the TI are shown in **Appendix B**.

The combination of heavy through volumes on Kolb Road and heavy opposing turn volumes will create significant operational problems. Initial traffic modeling evaluations were performed with different types of TIs; diamond, single point urban (SPUI), and diverging diamond. None of these resolved the operational problems; particularly due to the projected heavy through volumes on Kolb Road. Finally, a diverging diamond TI with separate roadways for through traffic was developed and evaluated. It will function with a LOS of B or better for 2040 AM and PM peak hours.

With this configuration, existing Kolb Road and the existing bridge structure over I-10 are replaced with new approach roadways and two new bridges for the diverging portion of the interchange. Signalized intersections are used where traffic shifts directions. Standard diamond type ramps tie to the diverging diamond. The northbound and southbound Kolb Road mainline roadways carry only through traffic. Thus, all turning movements are confined to the diverging diamond and do not interfere with through movements. I-10 remains at ground level. The Kolb Road mainline roadways are two levels above I-10 and the diverging diamond roadways are one level above I-10.

The diverging diamond roadway and the Kolb Road mainline roadways merge at the north end of the interchange just south of Science Park Drive, a significant east-west arterial. To provide for right turns from the center roadway to eastbound Science Park Drive, a connector road is needed, which will pass under northbound mainline Kolb Road in a box structure. It will end at Science Park Drive as a right turn lane.

East of Kolb Road, a two-way frontage road serves properties along the south side of I-10. The west end of the frontage road intersects Kolb Road approximately 300-ft. south of the existing ramp intersection. The frontage road parallels I-10 and ends approximately 7,000-ft. (1.3 miles) east of Kolb Road.

The diverging diamond roadway and the Kolb Road mainline roadways merge at the south end of the interchange. This restricts access to Wall Street, which is the access to Trails West Active Adult Community. To provide access, a new connector road to the frontage road is needed. It will partially utilize an existing street easement.

To retain the two-way frontage road and avoid new right-of-way, I-10 is shifted to the north. This also allows for the retention of the frontage road access point onto Kolb Road. However, due to the new interchange configuration, a new south connector is required to provide full access to/from the frontage road. The connector intersects with the center roadway but passes under the northbound and southbound Kolb Road mainline roadways via two-lane box structures. The connector will be extended westerly to provide access to the BLM property.

### 3.3 Evaluation of Alternatives

#### 3.3.1 Alternative Evaluation Factors

The following factors have been established for comparative evaluation of the improvement alternatives; System Alternatives I and IV.

- Safety Improvements
- Traffic Operations and LOS
- Access
- Right-of-Way
- Impacts to Utilities
- Earthwork
- Structures
- Drainage
- Environmental Impacts
- Displaced homes and businesses
- Constructability and Maintenance of Traffic
- Cost

#### 3.3.2 Evaluation of Alternatives

Alternatives I and IV are similar for much of the project length. They are identical for the section of I-10 between I-19 and Alvernon Way and for the entire length of the extension of SR 210. It is only within the Alvernon Way to Kolb Road section where there are differences between the two alternatives. Alternative I combines regional and local traffic within five mainline lanes in each direction, plus auxiliary lanes between successive entrance and exit ramps. Alternative IV keeps regional and local traffic separate by having three mainline lanes and two CD lanes in each direction separated by a concrete barrier. Auxiliary lanes between successive entrance and exit ramps merge with the CDs. The result is that Alternative IV has a wider footprint than Alternative I. While this impacts some evaluation factors differently, many other evaluation factors are identical or very similar. Both alternatives have been evaluated against the evaluation factors listed in Section 3.3.1 above.

##### Safety Improvements

Both alternatives reconstruct I-10 and existing interchanges to improve existing conditions, such as short weaving distances (particularly

successive loop ramps), TIs spaced closer than the desirable one-mile spacing, and short driver decision-making distances. Existing Palo Verde Road TI is removed and replaced with a new interchange to Country Club Road.

Between Alvernon Way and Kolb Road, Alternative IV separates local and ramp weaving traffic from the regional traffic on the mainline lanes, thus potentially improving safety over Alternative I.

Both alternatives provide pedestrian and bicycle connectivity along the SR 210 corridor and across I-10.

##### Traffic Operations and LOS

For I-10 between I-19 and Alvernon Way and the extension of SR 210, both alternatives have similar improvements to traffic operations. The LOS differs in one location on westbound I-10 between Country Club Road and Alvernon Way. For Alternative IV, the weaving action between the mainline and the collector-distributor lowers the LOS in the AM peak period. See **Table 3.1** Mainline LOS below.

For I-10 between Alvernon Way and Kolb Road, improvements to traffic operations and LOS are similar. The LOS differs in one location on eastbound I-10 between Kolb Road and Rita Road. For Alternative IV, the weaving action between the mainline and the collector-distributor lowers the LOS in the AM peak period. See **Table 3.1** Mainline LOS below.

**Table 3.1 Mainline LOS**

Interstate 10	System Alternative I	System Alternative IV
I-19 to 6 <sup>th</sup> Ave	WB – (C/C) EB – (C/C)	WB – (C/C) EB – (C/C)
6 <sup>th</sup> Ave to Park Ave	WB – (B/B) EB – (B/B)	WB – (C/B) EB – (B/B)
Park Ave to Kino Parkway	WB – (B/B) EB – (B/B)	WB – (B/B) EB – (B/B)
Kino Parkway to Country Club Rd	WB – (C/C) EB – (B/B)	WB – (C/C) EB – (B/B)
Country Club Rd to Alvernon Way	WB – (C/B) EB – (B/C)	WB – (D/C) EB – (B/C)
Alvernon Way to Valencia Rd	WB – (C/B) EB – (B/C)	WB – (B/B) CD, (C/B) Main Line EB – (A/B) CD, (B/C) Main Line

Valencia Rd to Craycroft Rd	WB – (C/B) EB – (B/C)	WB – (C/B) CD, (C/B) Main Line EB – (A/C) CD, (B/C) Main Line
Craycroft Rd to Wilmot Rd	WB – (B/B) EB – (A/B)	WB – (B/B) CD, (C/B) Main Line EB – (B/B) CD, (B/C) Main Line
Wilmot Rd to Kolb Rd	WB – (B/B) EB – (A/B)	WB – (B/B) CD, (C/B) Main Line EB – (A/B) CD, (B/C) Main Line
Kolb Rd to Rita Rd	WB – (C/B) EB – (A/C)	WB – (C/B) EB – (B/C)
<b>State Route 210</b>		
Golf Links Rd to I-10	WB – (B/A) EB – (A/B)	WB – (B/B) EB – (A/A)

WB – westbound, EB – eastbound,  
(B/A) – Peak Hour LOS (AM/PM), CD - Collector-Distributor

##### Access

For I-10 between I-19 and Alvernon Way and the extension of SR 210, both alternatives provide identical access to I-10 and SR 210 via the same traffic interchanges. Restrictions to left turns along interchange cross streets, based on current ADOT criteria, are identical for both alternatives for the entire project. Both alternatives provide the same pedestrian and bicycle access throughout the project limits.

The differences in access between the two alternatives occur between Alvernon Way and Kolb Road. While both alternatives provide access at the same traffic interchanges, the difference is that the ramp traffic merges with I-10 mainline traffic for Alternative I and merges with CD traffic for Alternative IV. The concrete barriers that separate mainline traffic from CD traffic for Alternative IV slightly change how directly the access is.

##### Right-of-Way

Right-of-way requirements are the same for both alternatives for I-10 between I-19 and Alvernon Way and for SR 210. As shown in **Table 3.2 Right-of-Way Impacts**, the differences in right-of-way between the two alternatives occur between Alvernon Way and Kolb Road. Since Alternative IV has a wider corridor footprint than Alternative I, the right-of-way required for Alternative IV is more than for Alternative I.





**Table 3.2 Right-of-Way Impacts**

Alternative	Parcels Impacted	New R/W (Acres)
I	179	160.63
IV	190	175.32

**Environmental Impacts**

While the right-of-way requirements and parcels affected for Alternative IV are slightly higher than for Alternative I, the impacts to the environment are virtually the same for air, noise, cultural, biological, hazardous materials and historic structures. For social impacts Alternative I is slightly better than Alternative IV. Alternative IV relocates a short stretch of the Rodeo Wash trail (approximately 250’). Alternative I has no impact on the trail.

**Constructability and Maintenance of Traffic**

Since both alternatives are identical west and north of the I-10/SR 210 System Interchange and nearly identical east of the system interchange, constructability and maintenance will be virtually the same.

**Cost**

Between Alvernon Way and Kolb Road, Alternative IV has a higher cost than Alternative I, due to a wider footprint. This increases the quantities for Borrow (for embankment), PCCP (for additional shoulders), concrete barriers (between mainline and the CDs), structures (for the wider I-10 footprint), and right-of-way. All of the above items will also increase due to the use of the two special ramps between the CDs and I-10 mainline and the special gates in the median barriers for first responder access.

System Alternative I Total Cost = \$1,165,317,000

System Alternative IV Total Cost = \$1,255,095,000

**Impacts to Utilities**

For the entire project limits, both alternatives impact utilities identically.

**Earthwork**

For I-10 between I-19 and Alvernon Way and the extension of SR 210, both alternatives have the same design and the same need for roadway embankment borrow. Between Alvernon Way and Kolb Road, Alternative IV has a wider roadway footprint than Alternative I, thus requiring more roadway embankment borrow.

System Alternative I Borrow = 3,396,800 Cu Yd

System Alternative IV Borrow = 3,834,400 Cu Yd

For both alternatives, the borrow quantity needs over the 20± years of the construction window will be substantial.

**Structures**

For I-10 between I-19 and Alvernon Way and the extension of SR 210, both alternatives have the same design and the same need for both new structures and widening existing structures. Between Alvernon Way and Kolb Road, Alternative IV has a wider roadway footprint than Alternative I, thus requiring wider I-10 structures over the cross streets and drainage channels.

**Drainage**

For the entire project limits, both alternatives require pavement and off-site drainage facilities that are virtually identical. For Alternative IV section between Alvernon Way and Kolb Road, the cross-culvert lengths are longer due to the wider roadway prism, but culvert sizing is the same. This section of Alternative IV has more catch basins for collecting pavement runoff because the barrier separating the mainline express lanes from the collector-distributor lanes blocks the runoff thus more catch basins are needed. A few additional storm drain laterals are needed to pick up the storm flow collected by the additional catch basins.

**3.3.3 Evaluation Matrix**

Advantages and disadvantages of the alternatives are tabulated in the following evaluation matrix. See Table 3.3. The purpose of this matrix is to present a side-by-side comparison of the alternatives, evaluated against the foregoing criteria.

**3.4 Evaluation of Alternatives**

Based on the evaluation of alternatives, Alternative I was selected as the Recommended Alternative for the following reasons:

- Alternative I provides a slightly higher level of service than Alternative IV but at a cost that is \$90,000,000 less than Alternative IV.
- Alternative I has less of an impact on adjacent property owners, with less land taken and fewer properties affected. Alternative I fits well within the existing right-of-way.
- Alternative I provides better access to commercial properties between Alvernon Way and Kolb Road.
- Both alternatives provide excellent safety improvements, better spacing between traffic interchanges with reduced congestion and high levels of service.
- Environmental concerns are nearly identical between the two alternatives. Alternative IV relocates a short stretch (approximately 250’) of the Rodeo Wash trail. Alternative I has no impact on the trail.

Table 3.3 Evaluation Matrix

Design Evaluation Factor	System Alternative I	System Alternative IV	Comments
<p><b>Safety Improvements</b></p>	<p>Alternative I reconstructs I-10 and existing interchanges to improve existing conditions, such as short weaving distances, TIs spaced closer than the desirable one-mile spacing, and short driver decision-making distances. Existing Palo Verde Road TI is removed and replaced with a new interchange to Country Club Road.</p>	<p>Alternative IV reconstructs I-10 and existing interchanges to improve existing conditions, such as short weaving distances, TIs spaced closer than the desirable one-mile spacing, and short driver decision-making distances. Existing Palo Verde Road TI is removed and replaced with a new interchange to Country Club Road. Between Alvernon Way and Kolb Road, Alternative IV separates local and ramp weaving traffic from the regional traffic on the mainline lanes, thus potentially improving safety over Alternative I. Emergency Access Gates will be provided at half mile intervals along the barrier wall between the mainline and the collector-distributor lanes in both directions.</p>	<p>Separating mainline regional traffic from local and ramp weaving traffic is an improvement to safety for the stretch between Alvernon Way and Kolb Road for Alternative IV. Emergency Access Gates provided at intervals will allow access by emergency vehicles and a means to remove vehicles confined by the mainline barrier walls.</p>
<p><b>Transportation Performance</b>            WB – westbound            EB – eastbound            (B/A) – Peak Hour LOS (AM/PM)            CD - Collector-Distributor</p>	<p><b>I-10, I-19 to Alvernon Way (2040)</b>            I-19 to 6th Ave: WB – (C/C), EB – (C/C)            6th Ave to Park Ave: WB – (B/B), EB – (B/B)            Park Ave to Kino Pkwy: WB – (B/B), EB – (B/B)            Kino Pkwy to Country Club Rd: WB – (C/C), EB – (B/B)            Country Club Rd to Alvernon Way: WB – (C/C), EB – (B/B)</p> <p><b>I-10, Alvernon Way to Kolb Road (2040)</b>            Alvernon Way to Valencia Rd: WB – (C/B), EB – (B/C)            Valencia Rd to Craycroft Rd: WB – (C/B), EB – (B/C)            Craycroft Rd to Wilmot Rd: WB – (B/B), EB – (A/B)            Wilmot Rd to Kolb Rd: WB – (B/B), EB – (A/B)            Kolb Rd to Rita Rd: WB – (C/B), EB – (A/C)</p> <p><b>State Route 210 (2040)</b>            Golf Links Rd to I-10: WB – (B/A), EB – (A/B)</p>	<p><b>I-10, I-19 to Alvernon Way (2040)</b>            I-19 to 6th Ave: WB – (C/C), EB – (C/C)            6th Ave to Park Ave: WB – (C/B), EB – (B/B)            Park Ave to Kino Pkwy: WB – (B/B), EB – (B/B)            Kino Pkwy to Country Club Rd: WB – (C/C), EB – (B/B)            Country Club Rd to Alvernon Way: WB – (D/C), EB – (B/C)</p> <p><b>I-10, Alvernon Way to Kolb Road (2040)</b>            Alvernon Way to Valencia Rd: WB – (B/B) CD, (C/B) Mainline            EB – (A/B) CD, (B/C) Mainline            Valencia Rd to Craycroft Rd: WB – (C/B) CD, (C/B) Mainline            EB – (A/C) CD, (B/C) Mainline            Craycroft Rd to Wilmot Rd: WB – (B/B) CD, (C/B) Mainline            EB – (B/B) CD, (B/C) Mainline            Wilmot Rd to Kolb Rd: WB – (B/B) CD, (C/B) Mainline            EB – (A/B) CD, (B/C) Mainline            Kolb Rd to Rita Rd: WB – (C/B), EB – (B/C)</p> <p><b>State Route 210 (2040)</b>            Golf Links Rd to I-10: WB – (B/B), EB – (A/A)</p>	<p>High levels-of-service are provided by both system alternatives. System Alternative IV Westbound LOS between Country Club Road and Alvernon Way (at the west end of the CD) decreases more than System Alternative I. Decrease is minor but due to CD traffic weaving with mainline traffic. System Alternative IV Eastbound LOS between Kolb Road and Rita Road (at the east end of the CD) decreases more than System Alternative I. Decrease is minor but due to CD traffic weaving with mainline traffic. The mainline lanes for Alternative I operate at a slightly higher LOS between Craycroft Road and Kolb Road than Alternative IV.</p>
<p><b>Land Impacts</b></p>	<p>Number of Parcels affected = 179            Right-of-Way takes (acres) = 160.63</p>	<p>Number of Parcels affected = 190            Right-of-Way takes (acres) = 175.32</p>	<p>System Alternative I takes 9.1% less property and affects 6.1% fewer parcels than System Alternative IV.</p>
<p><b>Mobility</b></p>	<p>Mainline lanes provide a high level-of-service throughout the project. Traffic speeds are very good. Mobility around Davis Monthan AFB is greatly improved with the extension of SR210 along the Alvernon Way alignment.</p>	<p>Mainline lanes provide a high level-of-service throughout the project. Alternative IV provides an opportunity to separate regional passenger and truck traffic from commuter traffic. Traffic speeds for the mainline lanes between Alvernon Way and Kolb Road will be higher than Alternative I. Mobility around Davis Monthan AFB is greatly improved with the extension of SR210 along the Alvernon Way alignment.</p>	<p>Alternative IV provides an opportunity to separate regional passenger and truck traffic from local commuter traffic. Approximately 60% of regional traffic does not stop in Tucson. Mobility for both alternatives is excellent.</p>



Table 3.3 Evaluation Matrix (continued)

Design Evaluation Factor	System Alternative I	System Alternative IV	Comments
<b>Access</b>	Access to local arterial streets is excellent. Traffic interchanges have been widened with more lanes to provide more capacity for turning movements. Access to the downtown area is greatly improved maximizing the use of the existing SR 210 corridor. Access control requirements restricting left-turn movements near traffic interchanges will affect a number of properties.	Access to local arterial streets is excellent. Traffic interchanges have been widened with more lanes to provide more capacity for turning movements. Access to the downtown area is greatly improved maximizing the use of the existing SR 210 corridor. The barrier between the CD lanes and mainline lanes for System Alternative IV will have an effect on direct access to residential and commercial properties between Alvernon Way and Kolb Road. Traffic on the mainline lanes will not have access to traffic interchanges at Valencia Road, Craycroft Road, and Wilmot Road. This may have an impact on local businesses. Access control requirements restricting left-turn movements near traffic interchanges will affect a number of properties.	Both alternatives provide greatly improved access along the I-10 and SR 210 corridors. Alternative I provides better access than Alternative IV. Access control requirements restricting left-turn movements near traffic interchanges are the same for both alternatives.
<b>Right-of-Way</b>	Right-of-Way required is 160.63 acres.	Right-of-Way required is 175.32 acres.	Alternative IV requires more land than Alternative I.
<b>Social Impacts</b>	Residences taken = 5 (2 near CC, 3 near Golf Links Road). Commercial Lots affected with structures taken = 28 Parcels affected = 179 No effect on the Rodeo Wash Trail.	Residences taken = 5 (2 near CC, 3 near Golf Links Road). Commercial Lots affected with structures taken = 28 Parcels affected = 190 Right of Way take requires a short stretch of Rodeo Wash trail to be relocated.	While there is no difference in the number of residences taken and the number of commercial lot affected between alternatives, the number of parcels affected by Alternative IV is more than Alternative I. Alternative IV relocates a short stretch of the Rodeo Wash trail. Alternative I has no impact on the trail.
<b>Environmental Impacts</b>	Improvements to the I-10 and SR 210 corridors follow existing alignment minimizing the impacts to air, noise, cultural resources, biological, hazardous materials and historic structures.	Improvements to the I-10 and SR 210 corridors follow existing alignment minimizing the impacts to air, noise, cultural resources, biological, hazardous materials and historic structures.	The environmental impacts caused by both alternatives is virtually the same.
<b>Constructability and Maintenance of Traffic</b>	Constructability and Maintenance of Traffic is the same as System Alternative IV.	Constructability and Maintenance of Traffic is the same as System Alternative I.	Constructability and Maintenance of Traffic is the same for both System Alternatives.
<b>Financial Performance (Cost)</b>	Construction Cost = \$510,563,000 Miscellaneous = \$226,185,000 Engineering and Contingency = \$178,769,000 Right-of-Way = \$74,669,000 Utility Relocation = \$69,000,000 Indirect Cost Allocation (ICAP) = \$106,131,000 Total Cost for Alt I = <b>\$1,165,317,000</b>	Construction Cost = \$553,489,000 Miscellaneous = \$245,200,000 Engineering and Contingency = \$194,001,000 Right-of-Way = \$79,098,000 Utility Relocation = \$69,000,000 Indirect Cost Allocation (ICAP) = \$114,307,000 Total Cost for Alt IV = <b>\$1,255,095,000</b>	System Alternative I is 7.2% less costly than System Alternative IV.
<b>Impacts to Utilities</b>	Impacts to Utilities is the same as System Alternative IV.	Impacts to Utilities is the same as System Alternative I.	Impacts to Utilities is the same for both System Alternatives.
<b>Earthwork</b>	System Alternative I requires 3,396,800 cubic yards of borrow for the project.	System Alternative IV requires 3,834,400 cubic yards of borrow for the project.	System Alternative IV requires 437,600 cubic yards of borrow more than System Alternative I. That is 12.9% more than System Alternative I.

## 4. MAJOR FEATURES

### 4.1. Introduction

This section describes the major design features used to develop and evaluate alternatives to meet current and future traffic needs and enhance safety and traffic operational features of I-10 and SR 210 including traffic interchanges and frontage roads.

The I-10/SR 210 improvement alternatives meet the design requirements in the ADOT Roadway Design Guidelines and the 2004 AASHTO Policy on Geometric Design of Highways and Streets. The improvements to I-10 satisfy requirements for interstate highways as contained in the AASHTO Policy on Design Standards Interstate System.

### 4.2. Major Design Features

#### 4.2.1 Design Controls

The following design controls were used for both I-10 and SR 210 in the development of the alternatives:

- Design Year: 2040
- Design Speed
  - I-10 and SR 210 Mainline (Urban): 65 mph
  - I-10 and SR 210 Ramps – Service Interchange:
    - Main Body of Ramp: 50 mph
    - Parallel Exit Ramp: 60 mph
    - Parallel Entrance Ramp: 55 mph
    - Ramp at Crossroad: 35 mph
  - I-10 and SR 210 Ramps – System Interchange:
    - Main Body of Ramp: 55 mph
    - First Curve at Entrance: 55 mph
    - First Curve at Exit: 65 mph
  - I-10 and SR 210 Ramps (At Crossroads): 35 mph
  - Crossroads through Interchange: 40 mph
    - If the design speed of a crossroad outside the limits of an interchange is greater than 40 mph the higher design speed will be carried through the interchange.
    - (Crossroads classified as Parkways may have 50 mph design speed.)
- Typical Sections:
  - I-10 Mainline, I-10 Collector-Distributor Roadway and SR 210 Mainline:
    - Lane width: 12-foot
    - Shoulder width:

- 2 lanes in each direction:
  - Outside shoulder: 10-foot
  - Inside shoulder: 4-foot
- 3 or more lanes in each direction:
  - Outside shoulder: 12-foot\*
  - Inside shoulder: 12-foot \*
  - \*Truck traffic DDHV is projected to exceed 250.
- Number of Through Lanes – I-10:
  - From I-19 to Kino Parkway:
    - Eastbound: 4-lanes
    - Westbound: 4-lanes
  - From Kino Parkway to SR 210 connection to I-10:
    - Eastbound: 3-lanes
    - Westbound: 3-lanes
  - From SR 210 connection to Kolb Road
    - System Alternative I:
      - Eastbound: 5-lanes
      - Westbound: 5-lanes
    - System Alternative IV:
      - Eastbound: 3 mainline lanes + 2 CD lanes
      - Westbound: 3 mainline lanes + 2 CD lanes
- Through Lanes for SR 210 with System Alternative I and System Alternative IV:
  - Through the main body of SR 210 with System Alternative I and System Alternative IV, the number of lanes will vary from 2-lanes in each direction to 4-lanes in each direction.
  - (Note: Number of through lanes for SR 210 with System Alternatives I and IV includes lanes for both Alvernon Way local traffic and SR 210 traffic.)
- Interchange Ramps (I-10 and SR 210):
  - All ramps shall be parallel type ramps. Two lane entrance ramps at service interchanges will have dual-lane metering of traffic onto the mainline.
  - 1-Lane Directional Ramps:
    - Lane width: 12-foot
    - Left shoulder: 6-foot
    - Right shoulder: 10-foot
  - 2-Lane Directional Ramps:
    - Lane width: 12-foot
    - Left shoulder: 4-foot

- Right shoulder: 8-foot
- 1-Lane and 2-Lane Ramps:
  - Lane width: 12-foot
  - Left shoulder: 2-foot
  - Right shoulder: 8-foot
- Interchange Crossroads:
  - Crossroads will have raised curbs with 2-foot setback from the outside lane edge.
  - Crossroads will have raised medians with 2-foot setback to the median curb from the lane edge. Number of through lanes will vary per agreement with local agency having jurisdiction. Median width of crossroads within the ADOT R/W will be in accordance with RDG Chapter 500.
  - Lane width: 12-foot
- Slope Criteria:
  - I-10 and SR 210:
    - Use ADOT RDG Figure 306.4B.
  - Interchange Ramps:
    - Use ADOT RDG Figure 504.4A.
- Roadway Cross-slope:
  - Roadway Cross-slope of tangent sections of new or reconstructed roadways shall be 0.02'/'
- Maximum Gradient (Urban):
  - I-10 and SR 210 Mainline: 3%
  - Interchange Ramps: Use ADOT RDG Section 504.1.
  - Interchange Crossroads adjacent to ramp termini: 3%
- Maximum Superelevation:
  - I-10 and SR 210 Mainline (RDG Section 202): 0.06 ft/ft
  - Interchange Ramps (RDG Section 504.3): 0.06 ft/ft (Ramp curves should not have spirals, per RDG Section 504.2)
- Maximum Degree of Curve:
  - I-10 and SR 210 Mainline (RDG Table 202.3B): 3° 27'
  - I-10 and SR 210 Interchange Ramps (RDG Table 202.3B)
    - Circular curves will be used for ramp alignment.
    - Service Interchange:
      - Main Body of Ramp: 6° 53'
      - Parallel Exit Ramp: 4° 18'
      - Parallel Entrance Ramp: 5° 24'
    - System Interchange:



Body of Ramp:	5° 24'
First Curve at Entrance	5° 24'
First Curve at Exit	3° 27'

#### 4.2.2 Access Control

I-10 is an Interstate Freeway with full control of access along the mainline roadways and through the full extent of all interchange ramps.

Existing SR 210 is a partial access controlled Parkway with access breaks at major signalized intersections.

The extension of SR 210 is an Urban Access Controlled Freeway with full control of access along the mainline roadways and through the full extent of all interchange ramps.

- The limits of access control managed by ADOT at interchange crossroads will be in accordance with Section 506 of the ADOT RDG.
- Access control along interchange crossroads beyond the requirements of Section 506 of the RDG will be implemented by agreements with the local agencies having jurisdiction over the crossroad. See **Section 5 - Access Management** for access control concepts at interchange crossroads.

#### 4.2.3 Horizontal and Vertical Alignments

All elements of the I-10 and SR 210 improvements will comply with the ADOT RDG and the AASHTO guidelines.

The existing horizontal alignment of the I-10 eastbound and westbound mainlines will be retained from I-19 to within ¼ mile north of Valencia Road. From ¼ mile north of Valencia Road to east of Kolb Road, the horizontal alignment of I-10 will be shifted to efficiently use the existing I-10 right-of-way corridor and to eliminate or reduce new right-of-way takes from developed parcels/subdivisions along the I-10 corridor.

The existing vertical alignment of I-10 will be retained from I-19 to within 1/3 mile west of Kino Parkway and at the I-10 bridge over Alvernon Way. For the remainder of I-10, it will be necessary to modify the vertical alignment to accommodate vertical clearance requirements for new or widened structures and to reconstruct the existing pavement. Additional through lanes will be added throughout the project and traffic interchanges will be modified.

The sections of existing I-10 that are to be retained horizontally and vertically have been reviewed and meet current AASHTO design criteria.

#### 4.2.4 Right-of-Way

The existing ROW for I-10, including ROW for TI ramps and for Frontage Roads will be used. It will be necessary to acquire additional

ROW, especially where interchanges are being extensively revised. The extent of new ROW has been identified for both alternatives. New ROW for System Alternative I will impact 179 parcels and require approximately 161 acres. New ROW for System Alternative IV will impact 190 parcels and require approximately 175 acres.

ROW required for revisions to the existing ROW corridor will be in conformance with requirements of the ADOT RDG and AASHTO.

The minimum right-of-way width for the extension of SR 210 will be 10-feet beyond the catch line of the mainline or ramp roadway in accordance with Figure 306.4B of the ADOT RDG. South of the Ajo Way interchange, the SR 210 right-of-way width and impacts to developed parcels is minimized by the use of retaining walls.

#### 4.2.5 Drainage

Several major watercourse crossings that exist within the study segment of I-10 and the extension of SR 210 are listed below. The bridges and box culverts need to be lengthened or widened to accommodate the wider roadway prisms and storm flows.

1. Diversion Channel, EB (MP 262.82): single 85' span bridge.
2. Diversion Channel, WB (MP 262.82): single 85' span bridge.
3. Julian Wash (MP 265.80): 6 barrel, 74' total span Reinforced Concrete Box Culvert (RCBC).
4. Earp Wash Tributary, WB Frontage Road (MP 267.65): four 25' span bridge.
5. Earp Wash Tributary, EB (MP 267.65): four 25' span bridge.
6. Earp Wash Tributary, WB (MP 267.65): four 25' span bridge.
7. Earp Wash Tributary, EB Frontage Road (MP 267.65): three 10' span bridge.
8. Julian Wash, Treat Avenue (north of Irvington Rd): New 6-barrel 10'x10' RCBC.
9. Julian Wash, Country Club Road (north of Irvington Rd): 6-barrel 10'x10' RCBC.
10. Drainage Channel, Alvernon Way (SR 210 mid-way between Golf Links Rd and UPRR): 3-barrel RCBC.
11. Drainage Channel, Alvernon Way (SR 210 just north of Ajo Way): 4-barrel RCBC.
12. Drainage Channel, Alvernon Way (SR 210 mid-way between Michigan St and Irvington Rd): 4-barrel RCBC.

13. Drainage Channel, Craycroft Rd (near Travel Plaza Way just north of I-10): New 2-barrel 6'x8' RCBC.

Numerous smaller drainage crossing facilities existing along the study area. The adequacy of the culverts has been addressed in the Drainage Report prepared by J2, dated January 2019.

#### 4.2.6 Section 401 and 404 Permits

Impacts to floodplains, water quality, or the sole source aquifer would not be expected to have a major role in determining I-10 or SR 210 improvements.

Any widening of the I-10 mainline and new interchange ramps on the north side of I-10 between Kino Parkway and Craycroft Road may encroach on the 100-to-500-year Julian Wash floodplain. Drainage analysis during design would be needed to determine the degree of impacts. Primarily, impacts could be expected at Country Club Road (new TI), and Alvernon Way (expanded TI under System Alternative I and System Alternative IV). A jurisdictional delineation should be conducted during final design to identify all Waters in the study area.

Julian Wash and several unnamed washes cross SR 210 in the study area and may be regulated by the Corps.

Section 404 of the Clean Water Act regulates the placement of fill or dredged material into Waters of the United States (Waters). The U. S. Army Corps of Engineers (Corps) has regulatory jurisdiction of Waters. A Section 401 Water Quality Certification, which is administered by the Arizona Department of Environmental Quality, is required for any action subject to Section 404; however, most projects that fall under a Nationwide Permit are conditionally certified under Section 401.

Coordination with the EPA during design would need to occur relative to sole source aquifer impacts. This study area is within the Upper Santa Cruz & Avra Basin Sole Source Aquifer designated area.

ADOT Environmental Planning shall apply for all permits required.

#### 4.2.7 Floodplain Considerations

Research of known flood hazard areas or local flooding problem areas along or near existing I-10, and along or near the proposed extension of SR 210 within the study limits included review of the most recent Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMS), and discussions with City of Tucson and Pima County personnel.

Offsite drainage affecting the segment of I-10 from I-19 to SR 83 is characterized by washes flowing roughly parallel to I-10, from east-southeast towards the west-northwest. Inspection of FEMA FIRMS in the

study area shows that several Special Flood Hazard Areas (SFHAS) exist adjacent to I-10 along this corridor to include the following locations:

1. East of Kino Parkway: Zone A, Tucson Diversion Channel crossing of I-1.0
2. West of Palo Verde Road, Zone A, unnamed flooding area south of I-10.
3. South of Valencia Road: Zone A, "1% Annual Chance Flood Discharge Contained in Culvert."

Within the SR 210 study area there is one FEMA SFHA; Julian Wash (FEMA Zone X) south of Valencia Road and north of the UPRR tracks. Discussions with City of Tucson and Pinal County personnel revealed that they had no knowledge of additional local flooding problems within the I-10 and SR 210 extension study corridors.

#### 4.2.8 Geology

The I-10 and SR 210 extension study corridors are located within the Basin and Range physiographic province, and are characterized as broad alluvial filled basins bounded by steeply dipping faults and fault-block mountains. The corridor within the limits of this project is within the Tucson Area (Upper Santa Cruz basin), which is a structural basin filled with alluvium and bounded by mountains.

The Upper Santa Cruz basin has a broad and gently sloping valley floor, generally trending north to northwest. Elevations in the basin range from about 2,490-feet in downtown Tucson to about 3,500-feet at the east edge of the basin near SR 83.

Geologic hazards along the I-10 study corridor include land subsidence and earth fissures, soil shrink and swell potential, floods and earthquakes.

- Land subsidence and earth fissures are associated with the draw-down of groundwater from the alluvial aquifers.
- Soil shrink and swell is a potential hazard in areas of the alluvial fan where sediment has been deposited from flood and mud flow events.
- Flood hazards may exist in low lying portions of the alignment near the stream channels. The I-10 alignment within the study area tends to parallel stream channels instead of crossing the channels. Flood hazards are therefore reduced to low lying portions of the alignment adjacent to the stream channels.
- Earthquake and seismic activity has been a low risk hazard in the Santa Cruz basin area. The Seismicity Map of the State of Arizona contains two events within 50 miles of the I-10/SR 210 study area. The intensity was such that damage to manmade structures would not be great.

Additional geotechnical information is available in the Materials Investigation Report for the I-10 Corridor Study, Junction I-19 to Pima/Cochise County Line prepared for ADOT.

#### 4.2.9 Earthwork

Most of existing I-10 within the study area is constructed on earthwork embankments. Modifications to the I-10 mainline roadway, ramps and frontage roads will require importing fill material.

The extension of SR 210 under System Alternative I or System Alternative IV will be at-grade or above grade through the length of the extension to the connection with I-10. Borrow will be required.

Initial roadway modeling for the entire project identified the need for borrow to construct roadway embankments. System Alternative I will require approximately 3.4 million cubic yards of borrow. System Alternative IV will require approximately 3.8 million cubic yards of borrow. Borrow requirements will be spread out over a 20+ year period.

#### 4.2.10 Traffic Design

##### I-10

The existing service interchange at Palo Verde Road will be removed and replaced with a new service interchange at Country Club Road to improve spacing of traffic interchanges and improve connections to the local street system.

All other I-10 service interchanges within the project limits will be modified as described in **Section 3**, Alternatives Considered.

A system interchange with the SR 210 Extension will be developed at Alvernon Way.

##### SR 210 Extension

The existing SR 210/Alvernon Way/Golf Links Road connection consists of a split interchange between Golf Links Road and Alvernon Way plus a diamond interchange between SR 210 and Alvernon Way.

System Alternative I and System Alternative IV will reconfigure the combined Golf Links/Alvernon Way interchange to extend SR 210 to a system interchange with I-10 at Alvernon Way. The interchange between SR 210 and Golf Links Road/Alvernon Way will be reconfigured with interchange connections with SR 210, Golf Links Road and Alvernon Way as shown in **Appendix C and I**.

A diamond interchange will connect Ajo Way with extended SR 210.

Due to the close proximity to the system interchange with I-10, access between SR 210 and Irvington Road will not be provided.

#### Signing and Pavement Marking

The project guide signing concept has been prepared for the I-10 and the SR-210 corridors within the project limits and any other impacted signing approaching the study corridor. The guide sign concept has been prepared for both the Alternatives I and IV to address the project improvements described in **Section 3**. The objective of the guide sign concept is to provide a clear and consistent advance guide signing and exit signage for each of the service and system interchanges for both the alternatives.

The preliminary project guide sign concept for each alternative is shown in plan sheets included in **Appendix P**. The guide sign concept has been prepared in accordance with the FHWA's *Manual of Uniform Traffic Control Devices (MUTCD)*, 2009 Edition, the *Arizona's Supplement to MUTCD*, 2009 Edition and ADOT's *Traffic Guidelines and Policies, TGP 300, Signs*. All the signs included in the guide sign concept shall conform to meet ADOT's retro-reflectivity standards and will not require any sign lighting for installation. The final location and the size of the sign structures will be determined during the final design of the project and the final designer must consider the conflicts associated with the installation of other infrastructure such as bridges, drainage features, noise/retaining walls, bridge structures, utilities, and other appurtenances.

The project improvements identified in **Section 3** show some major changes to the I-10 and SR 210 corridors within the project limits for the service/system interchanges. The existing signs and the sign structures are no longer applicable or are past the design life associated with the sign structures, hence all existing signs and sign structures will be removed and salvaged.

The pavement marking plans correspond with the new lane configurations for the mainline, auxiliary lanes, cross streets/local streets, and the service/system interchange ramps and ramp terminal intersections. The pavement marking plans have been developed to comply with ADOT's *Signing and Pavement Marking Standard Drawings*, May 2015.

#### Traffic Signals

The project improvements identified in **Section 3** for Alternatives I and IV will require modification to existing traffic signals or construction of new traffic signals at the impacted service traffic interchanges. The impacts of the project improvements on the traffic signals will need to be evaluated further during the final design for the project.

#### Lighting

High-mast lighting exists along I-10 from I-19 to S. Park Avenue and side-mount lighting for all the merge / diverge areas within the rest of the project limits. The existing lighting on the project corridor is High Pressure Sodium (HPS) fixtures on high mast or side mount poles.



A Lighting Assumptions memorandum has been prepared and submitted to ADOT. Any comments from ADOT have been incorporated to the memo and into the DCR. The complete Lighting Assumptions Memorandum is included in **Appendix P** and a summary is provided below:

#### **Lighting Assumptions**

1. LED luminaires will be used throughout the project limits.
2. Pole foundations, poles, mast arms, and junction boxes will comply with ADOT standard details.
3. The Light Loss Factor (LLF) for all LED lighting is 0.8.
4. RP-8-00 luminaire standard for freeway class B
  - Average Illuminance of 0.6 (cd/m<sup>2</sup>)
  - Avg/Min Illum Ratio of 4:1
  - Minimum Illuminance of 0.2

#### **Lighting Options**

Upon review of the two roadway system alternatives, two separate lighting options were created for each alternative. It is to be noted that all lighting options described below use American Electric Luminaire with 10-foot mast arms atop 30ft type G poles, for all ramps.

##### System Alternative I Lighting Option 1

In this option, American Electric Luminaires are mounted with 20-foot mast arms atop 40-foot type H poles on opposite sides of roadway in a staggered formation along the shoulders.

##### System Alternative I Lighting Option 2

In this option, Holophane high mast luminaires are mounted with twin luminaires atop 50-foot type U poles along the median.

##### System Alternative IV Lighting Option 1

In System Alternative IV Option 1, American Electric Luminaires are mounted with 20-foot mast arms atop 40-foot type H poles on opposite sides of roadway in a staggered formation along the shoulders, except for the roadway section with the collector distributor. For the roadway section with the collector distributor, American Electric Luminaires are mounted with 20 ft mast arms atop 40 ft H poles on opposite sides of roadway along the shoulders and Holophane high mast luminaires mounted with twin luminaires atop 50-foot type U poles along the median, in a staggered formation.

##### System Alternative IV Lighting Option 2

In System Alternative IV Option 2, on I-10, Holophane High Mast luminaires are mounted on the outer medians (between the mainline and

the collector-distributor road for each direction) with twin luminaire brackets atop 50-foot type U poles. On SR210, Holophane high mast luminaires are mounted with twin luminaire brackets atop 69 ft type U poles along the Median.

#### **Lighting Analysis**

Analysis to determine the layout of the luminaires was conducted by determining cross sectional lengths of the roadways lane configurations. *AGi32-17.5* software was utilized to determine spacing of the luminaires along the project limits for each system alternative. See the Lighting Assumptions Memo in **Appendix P** for analysis results tables and preliminary costs.

#### **Intelligent Transportation Systems (ITS)**

The existing Intelligent Transportation Systems (ITS) facilities includes Closed-Circuit Television (CCTV) cameras, Dynamic Message Signs (DMS), fiber optic trunk line conduit systems, pull boxes, and system detectors placed along the I-10 corridor between I-19 and Valencia Road. All the existing ITS devices are interconnected with fiber optic cables in the three 3-inch trunk line conduits back to the ADOT's Traffic Operations Center. The project improvements will impact the locations of several ITS devices/conduits and pull boxes. The existing ITS infrastructure such as the trunk line conduits, CCTV cameras and the detection systems do not meet the requirements identified in ADOT's *Intelligent Transportation Systems (ITS) Design Guide*, March 2018 for urban freeway facilities. Hence, all existing ITS infrastructure will be removed/salvaged/abandoned and new ITS infrastructure will be constructed along with the project improvements.

All new ITS infrastructure for Alternative I or Alternative IV will be compliant with ADOT's *ITS Design Guide*, March 2018 and will include all the field devices, cabinets, mainline and ramp detection systems, CCTV cameras, DMS, three 3-inch conduits on both sides of the freeway system, pull boxes, ITS load centers, and a provision for wrong-way detection systems.

The existing ITS system along I-10 from I-19 to Valencia Road will remain operational through construction until the permanent ITS devices are in place. All the proposed ITS infrastructure should be evaluated during the final design to determine any potential conflicts with other project infrastructure. The final designer shall coordinate with ADOT's Systems Technology group for design compliance reviews, and with the City of Tucson, the City of South Tucson and Pima County for any potential fiber optic connections to their infrastructure adjacent to the project limits.

The preliminary ITS design plans for each alternative is shown in plan sheets included in **Appendix P**.

#### **4.2.11 Preliminary Pavement Design**

Preliminary pavement design has been coordinated with the ADOT Pavement Design Section and the results are included in the Preliminary Geotechnical Evaluation report, dated January 19, 2017.

#### **4.2.12 Transit**

A report titled Transit Design Considerations for I-10 and State Route 210, dated July 2011, has been prepared (See **Appendix O**). The following future transit plans are identified in the report:

- The Regional Transportation Authority's (RTA) 20-year plan includes:
  - Express bus service between new park-and-ride lots at Wentworth Road (Old Vail Road) and Houghton Road, and downtown Tucson via I-10.
- PAG 2040 Regional Transit Plan (RTP) includes new express bus and Bus Rapid Transit (BRT) services that would operate along I-10 and across the corridor:
  - BRT along I-10 between Wentworth Road and downtown Tucson. Plans for this service are conceptual in nature.
  - BRT between southeast Tucson and downtown. This service could potentially use I-10 and SR 210.
  - New express bus services are proposed for the Kolb Road and Valencia Road corridors.
- PAG high capacity transit system plan includes both express bus and BRT on I-10.
  - Express bus along I-10 between the community of Vail, near Rita Road, and downtown Tucson. This service could also use SR 210.
  - BRT along I-10 between the community of Vail, near Rita Road and downtown Tucson. This service could also use SR 210.

#### **4.2.13 Utilities and Rail Facilities**

**Table 4.1** lists Utility and Railroad contacts.

- Union Pacific Railroad (UPRR):
  - I-10 crosses the UPRR Nogales Subdivision tracks at MP 261.41.
  - The UPRR is located to the east of Alvernon Way and approaches I-10 from the north and turns to the east just north of I-10. The I-10 right-of-way line is parallel to and 42-feet south of the UPRR right-of-way line from approximate MP 265.25 to MP 265.55. I-10 then turns to the southeast and separates from the UPRR by approximately three-quarters of a mile.



- The extension of SR 210 with System Alternative I and System Alternative IV crosses over the UPRR south of the Alvernon/Golf Links Road TI.

#### **4.2.14 Design Exceptions**

No design exceptions are anticipated for the I-10 or SR 210 improvements.



**Table 4.1 Utility and Railroad Contacts**

Agency	Utility Type	Contact Name	Contact Information
American Telephone and Telegraph (AT&T)	Coaxial, Fiber	Joseph Forkert Forkert Engineering & Surveying, Inc.	(714) 963-7964 joef@forkertengineering.com
City of Tucson DOT - Traffic Eng	Street Lights, Traffic Signals	Luis Murrieta	(520) 791-3251
City of Tucson DOT - Streets & Traffic Maintenance Division	Irrigation	Paul Rosenboom	(520)837-6796 Paul.Rosenboom@tucson.az.gov
City of Tucson Facility Design and Maintenance	Electric, Gas, Sewer, Water	Carlos Carazo	(520) 837-6334
City of Tucson Inet Fiber	Fiber	Theo Christenson	520-791-3121 theo.christenson@tucsonaz.gov
Cox Communications	CATV, Fiber	Jeff Krause	(520) 867-7526 Jeff.Krause@cox.com
Century Link	Coaxial, Fiber	Leann Kysar Robert Jones	(520) 838-3043 Leann.Kysar@CenturyLink.com Robert.Jones@centurylink.com
El Paso Natural Gas	Gas	Kelly Sims	(520) 663-4223 Kelley_Sims@kindermorgan.com
Kinder Morgan Energy	Petroleum	Mark Sabeti	(714) 560-4770 mark_sabeti@kindermorgan.com
Level 3 Communications	Fiber	Alan Smith	alan.smith@level3.com
MCI	Fiber	John Bachelder	investigations@verizon.com
Pima County Traffic Engineering	Traffic Signals	Tim Scott	(520) 724-5887 Tim.Scott@pima.gov
Pima County Wastewater Management	Sewer	Bob Machen	(520) 724-9405
Ray Water Company	Water	Rhonda Rosenbaum	(520) 623-2366 raywaterco@gmail.com
Southwest Gas	Gas	Robert Daniels	(520) 794-6166 TUCSWGFranchiseGroup@swgas.com
Sprint Communications Company	Coaxial, Fiber	Colin Sword	(602) 430-3615 colin.sword@sprint.com
Tucson Electric Power	Electric	Jason Saline Environmental Land Use Planner Renee Darling Senior Environmental & Land Use Planner	(520) 396-2767 JSaline@tep.com (520) 884-3642 rdarling@tep.com
Tucson Water	Recaimed Water, Water	Edward Lopez	(520) 837-2125 edward.lopez@tucsonaz.gov
Voyager Water Company	Water	Keith Dojaquez	(520) 624-1460 ext 102 kdojaquez@southwesternutility.com
Zapco Energy Tactics Corp	Methane Gas	Phil Priebe	(815) 671-3576 ppriebe21@msn.com
Union Pacific Railroad	Railroad	Alex Popovici	Contact Sayeed Hani, ADOT Utilities and Railroad Engineering Liaison 520-712-7555

## 5 ACCESS MANAGEMENT PLAN

### 5.1 Introduction

The project improvements identified in the proposed alternatives will require reconstruction of crossroads at each traffic interchange. At each crossroad, access control will be established to meet both current design criteria and yet be customized to meet the specific access needs for the existing development along each crossroad.

Adequate access control is essential to the safe and efficient operation of traffic interchanges. Access control limits should be practicable to help minimize queue spillback, stop-and-go travel, heavy weaving volumes, and poor signal progression. Access control involves the restriction of left and right turns within close proximity to the interchange intersections with the ramps. For example, if left turns are allowed too close to the interchange, left turn traffic will adversely impact traffic operations on the cross street and at the interchange. Access control also involves restrictions on the location of the nearest signalized intersections. For example, if a signalized intersection is too close to the interchange intersection, poor signal progression may be the result.

However, access control must be customized to meet the specific development conditions for each crossroad. Development of access control along each crossroad will require coordination between ADOT and local jurisdictional stakeholders.

### 5.2 General Access Control Criteria

At each crossroad, access control will be established in accordance with the access control guidelines in Section 506 of the current ADOT Roadway Design Guidelines (RDG).

Partially, the guidelines establish that a raised median island that restricts left turns will extend a minimum of 660' beyond the interchange ramp intersections. Also, the guidelines state that the desirable distance to the nearest signalized intersection should be at least 2,640 feet (1/2 mile) from any ramp intersection unless existing conditions dictate otherwise, or unless an operational analysis can justify a closer intersection.

Section 506 of the RDG recognizes that it may be difficult to obtain minimum access control distances along crossroad that are already have existing development. The goal is to assess current conditions and determine the practicality of obtaining desirable access control and signalized intersection distances and develop specific access control that meets both the goals of the RDG and the needs of the existing developments along each crossroad.

### 5.3 Access Control Along Crossroads

An access management plan has been developed for each crossroad. **Figures 5.1 through 5.9** illustrate the access management plan for each crossroad. Each access management plan shows existing and proposed signalized intersections, limits of raised median islands, and distances to the nearest signalized intersection from the ramp intersections. Special features at certain crossroads are outlined below.

6th Avenue (See **Figure 5.1**) is already fully developed commercially with signalized intersections close to the interchange signalized intersections. Limits of raised median island match the existing medians.

Park Avenue (See **Figure 5.2**) and Kino Parkway (See **Figure 5.3**) already have existing signalized intersections close to the interchange. Limits of raised median island match the existing medians. South of the Kino Parkway interchange two future median breaks will provide left-turn access into the South Kino Sports Park.

Country Club Road (See **Figure 5.4**) is currently not fully developed and access management can be established. South of the interchange is the existing signalized intersection with Irvington Road. The raised median should be extended to the intersection. North of the interchange, the goal is to establish the first signalized intersection at Milber Street. However, widening of Country Club north of Michigan Street may be needed and may require a traffic signal at Michigan Street.

Alvernon Way (See **Figure 5.5**) has raised median islands between Irvington and Drexel Roads. North of the interchange, Alvernon Way transitions into SR 210 with full access control. South of the interchange, Alvernon Way has an existing median break at Concord Stravenue. Limits of raised the median island will match the existing medians. A new traffic signal proposed at Concord Stravenue will improve access to the Los Niños Elementary School. The signal will provide a break in traffic and a safer egress for school buses leaving the school.

Valencia Road (See **Figure 5.6**) is already fully developed with signalized intersections close to the interchange signalized intersections. Limits of raised median island match the existing medians. Access to the Jack In The Box will be right in/right out for eastbound Valencia Road. Otherwise, the limits of raised median island will match the existing medians.

Craycroft Road (See **Figure 5.7**) serves three commercial trucking facilities, all located on the north side of the interchange. Currently, there are heavy volumes of left turning trucks in close proximity to the north interchange ramp intersection. The recommended access management

plan requires special treatment to restrict these heavy left turn volumes, including a new connector road to the westbound frontage road. Also, see **Appendix L**.

Wilmot Road (See **Figure 5.8**) is not fully developed and access management can be established. South of the interchange, the nearest signalized intersection will be located at Garden Stone Road, which is also the end of the extension of Los Reales Road. Left turn access to the Shell Station from northbound Wilmot will be shifted to Los Reales Road Extension. North of the interchange, the goal is to establish the first signalized intersection at existing Los Reales Road. With the removal of the existing westbound frontage road, access to the Travel Inn, located a block west of Wilmot, will be impacted. Resolution of their access could be resolved with either a total right-of-way take or by providing access directly to Wilmot via a new connector road. If the solution is the later, then a break in the median island will be needed at the connector road. A traffic signal is not anticipated at this location.

Kolb Road (See **Figure 5.9**) is proposed to be a Diverging Diamond Interchange. It will have full access control between Science Park Drive on the north and Explorer Boulevard on the south. The northbound and southbound through movement are separate from the ramp turning movements. Because the movements are separate, full access is allowed for the frontage road east of Kolb Road south of the DDI. Medians beyond the ramp TI intersections will be a combination of open medians where the roadways are widely spaced and raised medians where the roadways are close together. A break in the median will be provided at the East Frontage Road, where the roadways are widely spaced and there is room in the median for storage. The entrance to the Trails West Active Adult Community will be relocated to this intersection via a new connector. Stop control will be used for the East Frontage Road.



Figure 5.1 6th Avenue TI

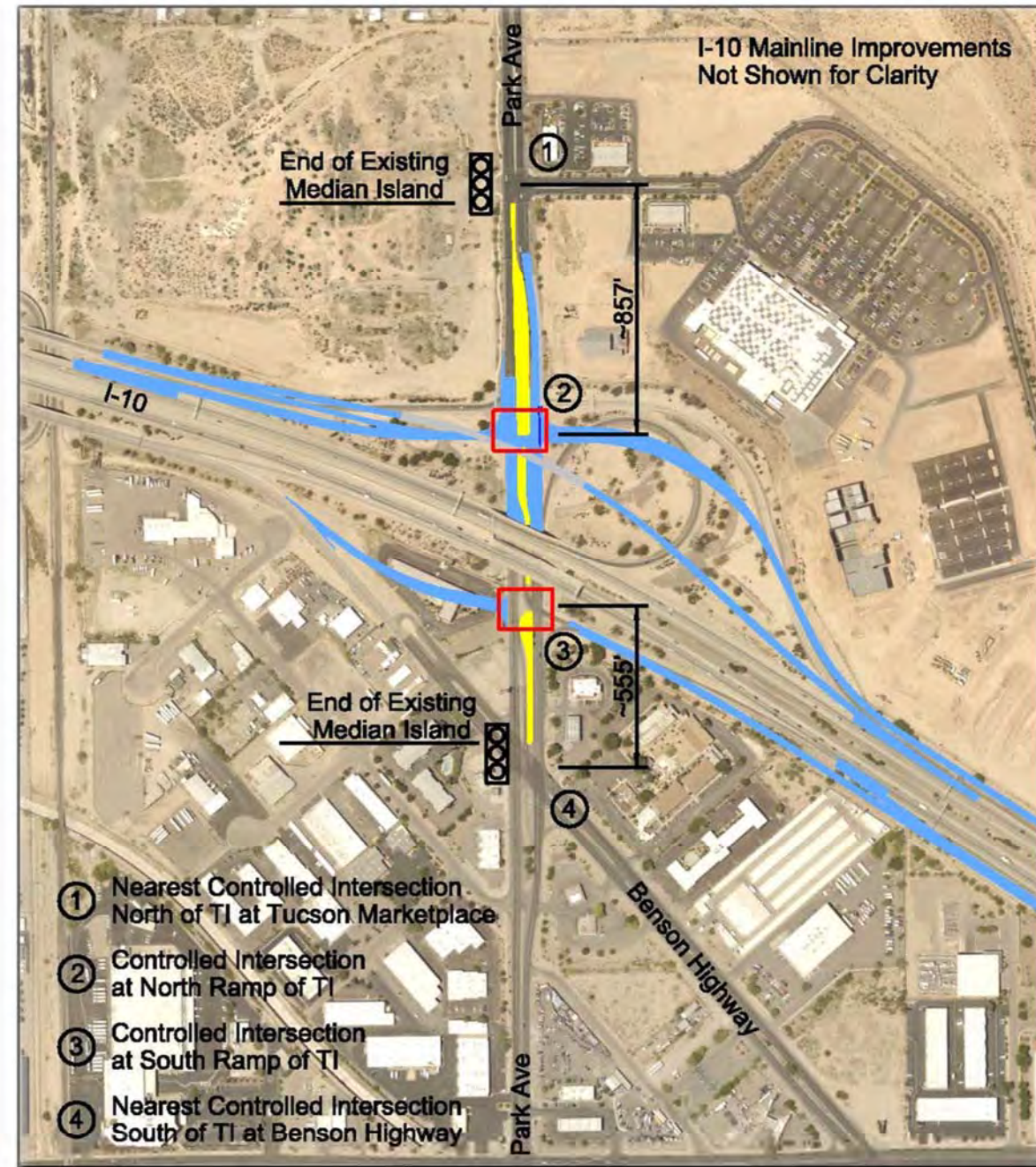


- Future Controlled Intersection (Signal, Stop, or Roundabout)
- Existing Traffic Signal
- Raised Median



FIGURE 5.1  
6th Avenue TI

Figure 5.2 Park Avenue TI



- Future Controlled Intersection (Signal, Stop, or Roundabout)
- Existing Traffic Signal
- Raised Median



FIGURE 5.2  
Park Avenue TI



Figure 5.3 Kino Parkway TI



Figure 5.4 Country Club Road TI

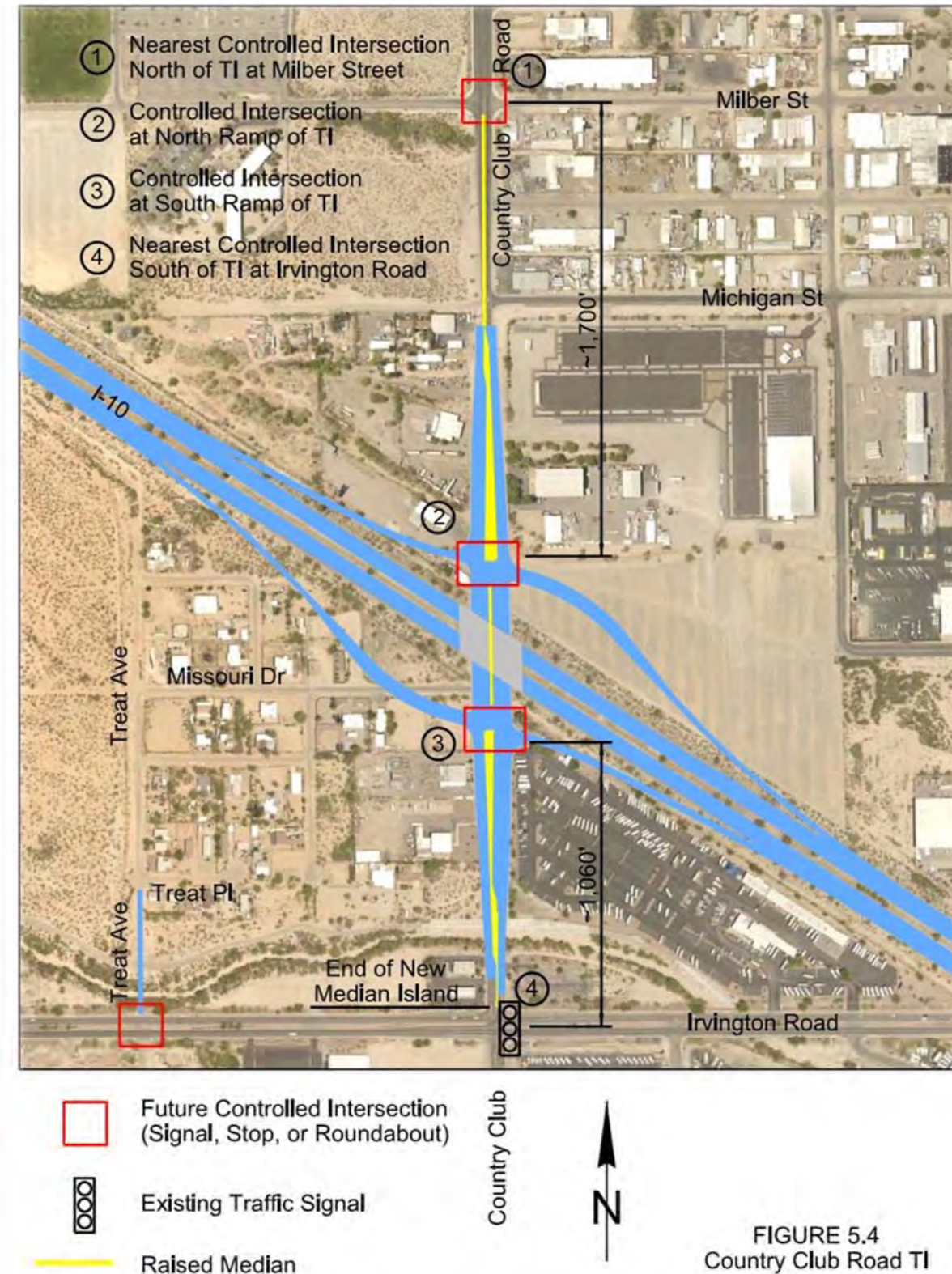
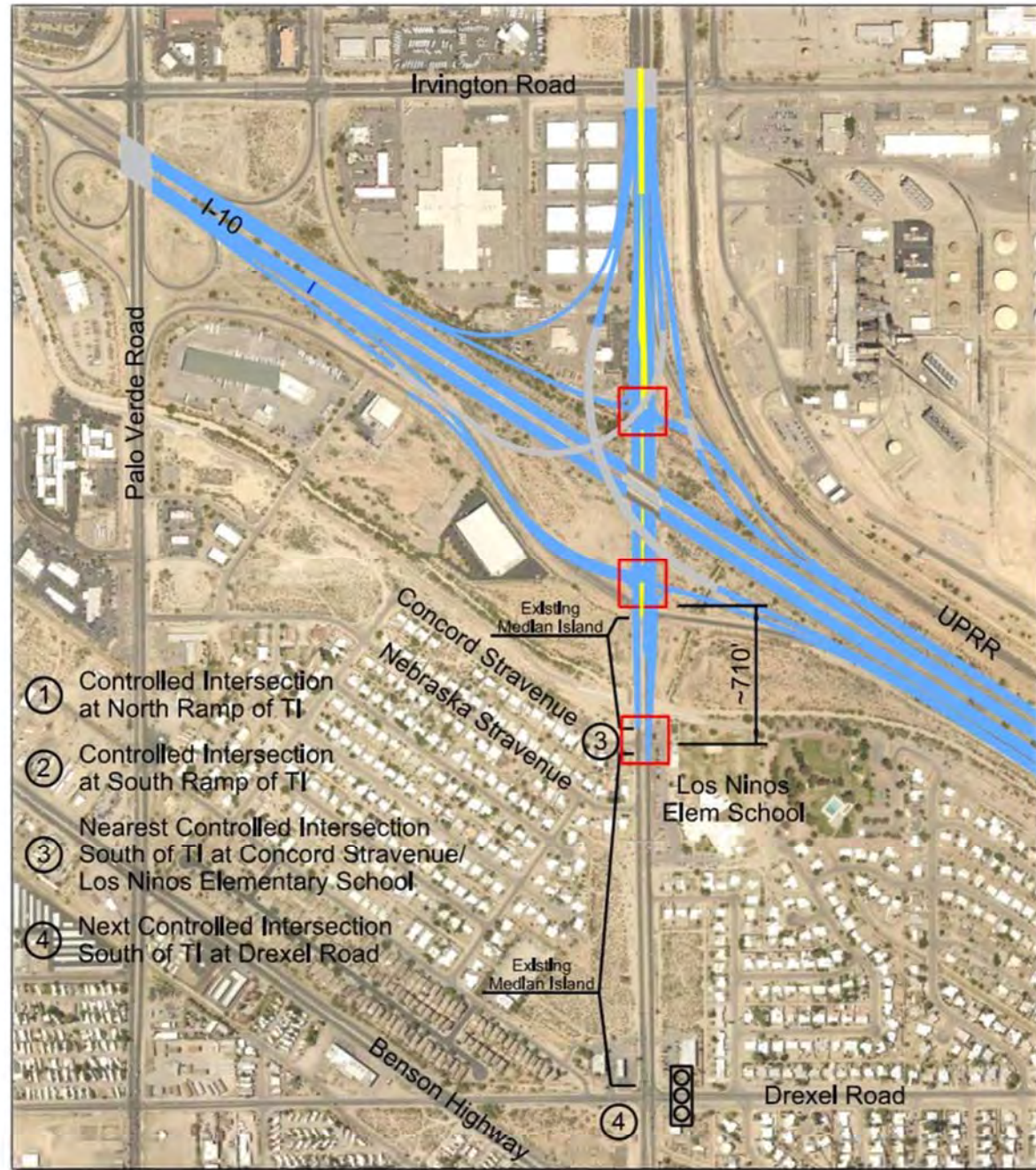




Figure 5.5 Alvernon Way TI



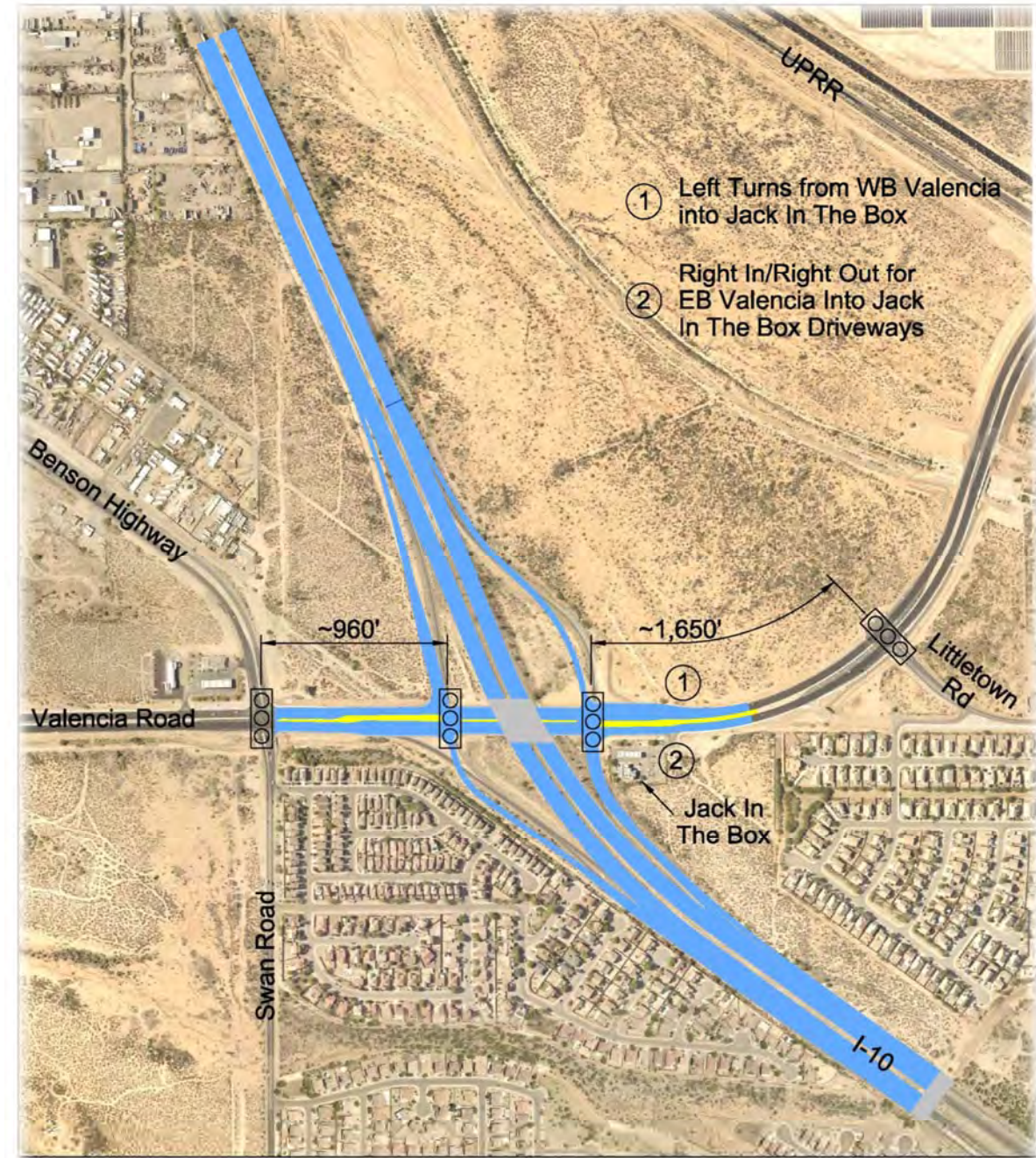
- ① Controlled Intersection at North Ramp of TI
- ② Controlled Intersection at South Ramp of TI
- ③ Nearest Controlled Intersection South of TI at Concord Stravenue/ Los Ninos Elementary School
- ④ Next Controlled Intersection South of TI at Drexel Road

- Future Controlled Intersection (Signal, Stop, or Roundabout)
- Existing Traffic Signal
- Raised Median



FIGURE 5.5 Alvernon Way TI

Figure 5.6 Valencia Road TI



- ① Left Turns from WB Valencia into Jack In The Box
- ② Right In/Right Out for EB Valencia Into Jack In The Box Driveways

- Future Controlled Intersection (Signal, Stop, or Roundabout)
- Existing Traffic Signal
- Raised Median



FIGURE 5.6 Valencia Road TI



Figure 5.7 Craycroft Road TI



- Future Controlled Intersection (Signal, Stop, or Roundabout)
- Existing Traffic Signal
- Raised Median



FIGURE 5.7 Craycroft Road TI

Figure 5.8 Wilmot Road TI



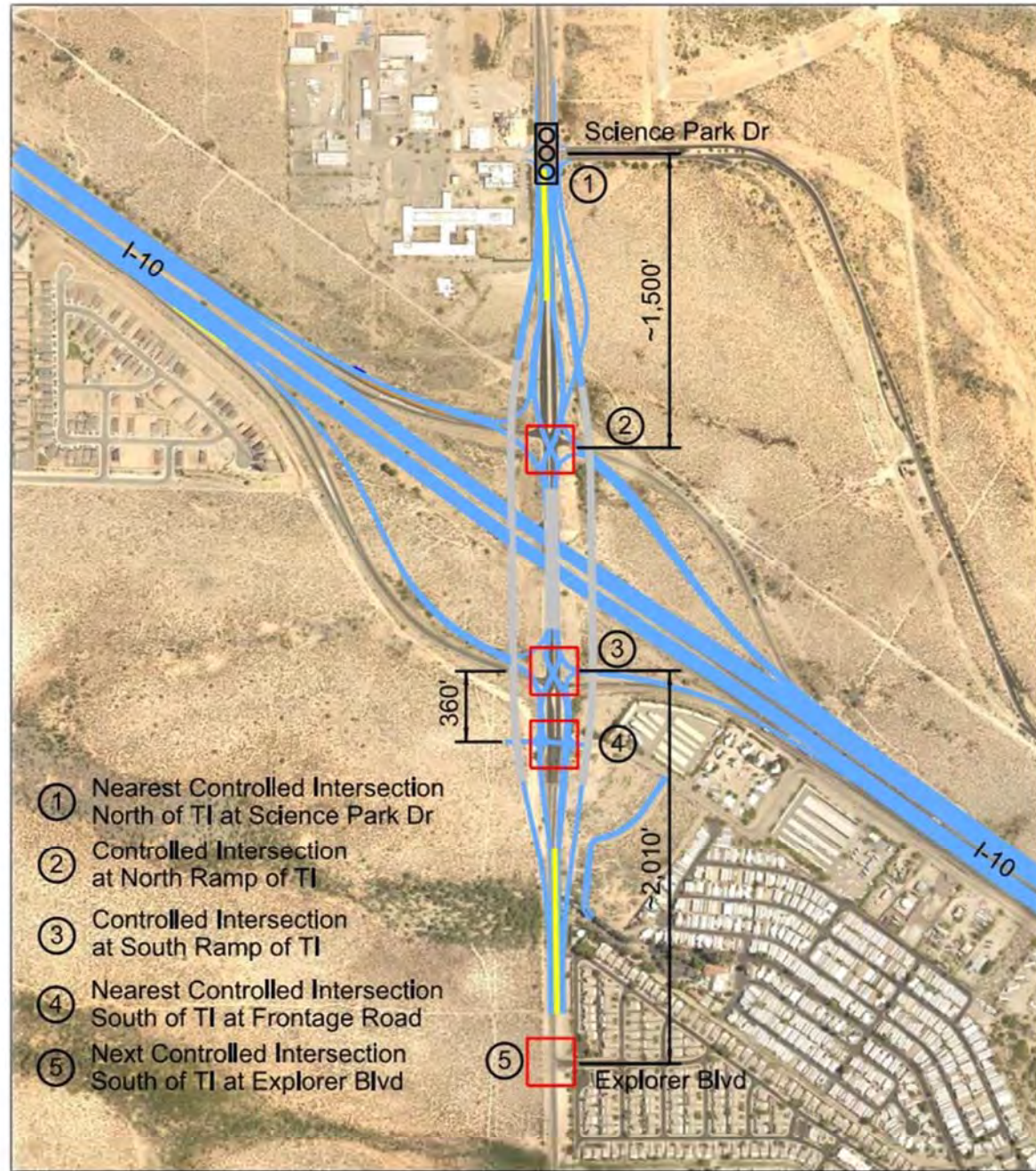
- Future Controlled Intersection (Signal, Stop, or Roundabout)
- Existing Traffic Signal
- Raised Median



FIGURE 5.8 Wilmot Road TI



Figure 5.9 Kolb Road TI



□ Future Controlled Intersection (Signal, Stop, or Roundabout)

⓪ Existing Traffic Signal

— Raised Median

Kolb Road



FIGURE 5.9  
Kolb Road TI

## 6 ITEMIZED COST ESTIMATES

Preliminary cost estimates based on conceptual plans have been prepared for System Alternative I and System Alternative IV. The estimates are based on data available at the Feasibility Study level of development.

- The estimate items and the basis for the estimated cost of each item for I-10 and SR 210 improvements are summarized below.
- Removals – based on estimated quantities of various removals and estimated unit costs
- Earthwork (Roadway Excavation and Borrow) – based on estimated quantities and estimate unit cost
- Pavements – based on estimated quantities of various pavement structural sections and curbs for mainline, shoulders, and crossroads, and sidewalks and ramps for crossroads using estimated unit costs
- Barriers – based on estimated quantities of various concrete barrier types and using estimated unit costs
- Bridges – based on estimated square foot area for bridge widening and new bridges and using estimated unit cost per square foot, removal of existing structures is included in replacement of existing bridges cost
- Retaining Walls – based on estimated areas of exposed wall face and estimated unit cost
- Drainage (Pavement) – based on estimated quantities for excavation, pipe, catch basins, inlets, riprap, channel lining, and miscellaneous items per linear mile
- Traffic – based on estimated costs for traffic signals per intersection, signs, pavement marking, lighting and FMS per centerline mile, and wrong way driver warning system per interchange
- Environmental Mitigation (Noise Walls) – based on estimated quantities of noise walls needed per initial noise study and estimated unit cost
- Landscaping – based on estimated cost per mile for similar project
- Right-of-Way – based initial right-of-way requirements for each alternative and using estimated per square foot unit costs from ADOT initial investigation
- Utility Relocations – based on estimated costs for each service at the service interchanges
- Indirect Cost Allocation (ICAP) – based on a percentage of 10.02%

### Total Estimated Cost

The total estimated costs for System Alternative I and IV are listed in **Table 6.1 Total Estimated Cost**. A more detailed breakdown of the costs associated with System Alternatives I and IV has been provided on the following pages.

**Table 6.1 Total Estimated Cost**

Item	Alternative I	Alternative IV
Removals	\$8,493,895	\$8,698,645
Earthwork	\$57,285,300	\$64,065,300
Pavements	\$123,580,600	\$138,060,400
Barriers	\$14,348,500	\$19,372,000
Bridges	\$181,233,161	\$194,866,386
Retaining Walls	\$52,837,500	\$51,982,500
Drainage	\$17,925,500	\$18,750,500
Traffic	\$31,380,000	\$34,215,000
Environmental Mitigation	\$12,228,000	\$12,228,000
Landscaping	\$11,250,000	\$11,250,000
<b>Subtotal</b>	<b>\$510,563,000</b>	<b>\$553,489,000</b>
Miscellaneous	\$226,185,000	\$245,200,000
Engineering & Contingencies	\$178,769,000	\$194,001,000
Right-of-Way	\$74,669,000	\$79,098,000
Utility Relocations	\$69,000,000	\$69,000,000
Indirect Costs (CAP)	\$106,131,000	\$114,307,000
<b>Grand Total</b>	<b>\$1,165,317,000</b>	<b>\$1,255,095,000</b>





Table 6.2 System Alternative I Estimated Cost

ESTIMATE OF PROBABLE COST - SYSTEM ALTERNATIVE I

Item Description	Unit	Quantity	Unit Price	Amount
<b>Removals</b>				
Remove Structures and Obstructions	L.Sum	1	\$1,687,775	\$1,687,775
Asphaltic Concrete Pavement Removal	Sq.Yd.	904,900	\$3.00	\$2,714,700
Portland Cement Concrete Pavement Removal	Sq.Yd.	53,000	\$10.00	\$530,000
Curb and Gutter Removal	L.Ft.	125,100	\$5.00	\$625,500
Barrier Removal	L.Ft.	9,500	\$20.00	\$190,000
Bridge Structure Removals	L.Sum	1	\$365,820.00	\$365,820
Traffic Removals	L.Sum	1	\$2,211,000.00	\$2,211,000
Lighting Removals	L.Sum	1	\$169,100.00	\$169,100
<b>Earthwork</b>				
Roadway Excavation	Cu.Yd.	703,700	\$9.00	\$6,333,300
Borrow	Cu.Yd.	3,396,800	\$15.00	\$50,952,000
<b>Roadway Items</b>				
Portland Cement Concrete Pavement	Sq.Yd.	1,298,500	\$70.00	\$90,895,000
Asphaltic Concrete Pavement	Ton	166,600	\$80.00	\$13,328,000
Aggregate Base	Cu.Yd.	214,100	\$45.00	\$9,634,500
Load Transfer Dowel Assembly	Each	29,500	\$100.00	\$2,950,000
Concrete Curb and Gutter	L.Ft.	283,500	\$20.00	\$5,670,000
Concrete Sidewalk	Sq.Ft.	123,300	\$7.00	\$863,100
Concrete Sidewalk Ramp	Each	80	\$3,000.00	\$240,000
Concrete Half Barrier	L.Ft.	116,300	\$70.00	\$8,141,000
Concrete Retaining Barrier	L.Ft.	2,800	\$200.00	\$560,000
Concrete Variable Height Median Barrier	L.Ft.	17,100	\$90.00	\$1,539,000
Concrete Median Barrier	L.Ft.	43,600	\$80.00	\$3,488,000
Moment Slab	L.Sum	1	\$53,000.00	\$53,000
End Terminal Treatments	L.Sum	1	620,500	\$620,500
<b>Bridge Structures and Retaining Walls</b>				
Widening of Existing Bridges	L.Sum	1	\$8,089,563.00	\$8,089,563
Replacement of Existing Bridges	L.Sum	1	\$77,550,396.00	\$77,550,396
Modify Existing Bridges	L.Sum	1	\$53,000.00	\$53,000
New Bridges	L.Sum	1	\$95,487,202.00	\$95,487,202
Retaining Walls	Sq.Ft.	704,500	\$75.00	\$52,837,500
<b>Drainage Improvements</b>				
On-Site Drainage Improvements	L.Sum	1	\$11,140,000.00	\$11,140,000
New Reinforced Concrete Box Culverts	L.Sum	1	\$6,785,500.00	\$6,785,500
<b>Traffic Improvements</b>				
Traffic Signals	L.Sum	1	\$6,000,000.00	\$6,000,000
Signing	L.Sum	1	\$7,960,000.00	\$7,960,000
Pavement Marking	L.Sum	1	\$1,030,000.00	\$1,030,000
Lighting	L.Sum	1	\$6,700,000.00	\$6,700,000
<b>Freeway Management Systems</b>				
FMS	L.Sum	1	\$8,790,000.00	\$8,790,000
Wrong Way Driver Warning System	Each	18	\$50,000.00	\$900,000
<b>Environmental Mitigation</b>				
Noise Walls	L.Sum	1	\$12,228,000.00	\$12,228,000
<b>Landscaping</b>				
Landscaping and Irrigation	Mile	15	\$750,000.00	\$11,250,000
<b>Item Total:</b>				<b>\$510,563,000</b>

ESTIMATE OF PROBABLE COST - SYSTEM ALTERNATIVE I

Item Description	Unit	Quantity	Unit Price	Amount
<b>Project Wide</b>				
Maintenance and Protection of Traffic	Cost	8%		\$40,846,000
Dust and Water Palliative	Cost	0.75%		\$3,830,000
Quality Control	Cost	1.00%		\$5,106,000
Construction Surveying	Cost	1.5%		\$7,659,000
Erosion Control	Cost	1.0%		\$5,106,000
Mobilization	Cost	8%		\$40,846,000
<b>Project Wide Subtotal:</b>				<b>\$103,393,000</b>
Unidentified Items (20% of Item Total and Project Wide Subtotal)	Cost	20%		\$122,792,000
<b>Project Wide Total:</b>				<b>\$226,185,000</b>
<b>Other Costs</b>				
Construction Engineering	Cost	8%		\$58,940,000
Construction Contingencies	Cost	5%		\$38,838,000
PCCP Quality Incentive	Sq.Yd.	1,298,500	\$1.50	\$1,948,000
Engineering Design (Includes Predesign, Surveying and Geotechnical)	Cost	11%		\$81,043,000
Utility Relocation	L.Sum	1	\$69,000,000.00	\$69,000,000
Right-of-Way	L.Sum	1	\$74,669,000.00	\$74,669,000
<b>Other Cost Total:</b>				<b>\$322,438,000</b>
<b>Summary</b>				
<b>Item Total</b>				<b>\$510,563,000</b>
<b>Project Wide Total</b>				<b>\$226,185,000</b>
<b>Other Cost Total</b>				<b>\$322,438,000</b>
<b>Subtotal Project Cost</b>				<b>\$1,059,186,000</b>
<b>Indirect Cost Allocation (ICAP) (10.02%)</b>				<b>\$106,131,000</b>
<b>Total Project Cost</b>				<b>\$1,165,317,000</b>



Table 6.3 System Alternative IV Estimated Cost

ESTIMATE OF PROBABLE COST - SYSTEM ALTERNATIVE IV

Item Description	Unit	Quantity	Unit Price	Amount
<b>Removals</b>				
Remove Structures and Obstructions	L.Sum	1	\$1,687,775	\$1,687,775
Asphaltic Concrete Pavement Removal	Sq.Yd.	904,900	\$3.00	\$2,714,700
Portland Cement Concrete Pavement Removal	Sq.Yd.	53,000	\$10.00	\$530,000
Curb and Gutter Removal	L.Ft.	125,100	\$5.00	\$625,500
Barrier Removal	L.Ft.	9,500	\$20.00	\$190,000
Bridge Structure Removals	L.Sum	1	\$365,820.00	\$365,820
Traffic Removals	L.Sum	1	\$2,415,750.00	\$2,415,750
Lighting Removals	L.Sum	1	\$169,100.00	\$169,100
<b>Earthwork</b>				
Roadway Excavation	Cu.Yd.	727,700	\$9.00	\$6,549,300
Borrow	Cu.Yd.	3,834,400	\$15.00	\$57,516,000
<b>Roadway Items</b>				
Portland Cement Concrete Pavement	Sq.Yd.	1,542,600	\$70.00	\$107,982,000
Asphaltic Concrete Pavement	Ton	132,400	\$80.00	\$10,592,000
Aggregate Base	Cu.Yd.	236,400	\$45.00	\$10,638,000
Load Transfer Dowel Assembly	Each	20,700	\$100.00	\$2,070,000
Concrete Curb and Gutter	L.Ft.	283,800	\$20.00	\$5,676,000
Concrete Sidewalk	Sq.Ft.	123,200	\$7.00	\$862,400
Concrete Sidewalk Ramp	Each	80	\$3,000.00	\$240,000
Concrete Half Barrier	L.Ft.	117,100	\$70.00	\$8,197,000
Concrete Retaining Barrier	L.Ft.	2,700	\$200.00	\$540,000
Concrete Variable Height Median Barrier	L.Ft.	16,800	\$90.00	\$1,512,000
Concrete Median Barrier	L.Ft.	99,500	\$80.00	\$7,960,000
Emergency Access Gates	Each	20	\$25,000.00	\$500,000
Moment Slab	L.Sum	1	\$52,882.00	\$52,882
End Terminal Treatments	L.Sum	1	\$663,000	\$663,000
<b>Bridge Structures and Retaining Walls</b>				
Widening of Existing Bridges	L.Sum	1	\$8,089,563.00	\$8,089,563
Replacement of Existing Bridges	L.Sum	1	\$84,256,965.00	\$84,256,965
Modify Existing Bridges	L.Sum	1	\$52,882.00	\$52,882
New Bridges	L.Sum	1	\$102,414,094.00	\$102,414,094
Retaining Walls	Sq.Ft.	693,100	\$75.00	\$51,982,500
<b>Drainage Improvements</b>				
On-Site Drainage Improvements	L.Sum	1	\$11,965,000.00	\$11,965,000
New Reinforced Concrete Box Culverts	L.Sum	1	\$6,785,500.00	\$6,785,500
<b>Traffic Improvements</b>				
Traffic Signals	L.Sum	1	\$6,000,000.00	\$6,000,000
Signing	L.Sum	1	\$9,270,000.00	\$9,270,000
Pavement Marking	L.Sum	1	\$1,085,000.00	\$1,085,000
Lighting	L.Sum	1	\$7,510,000.00	\$7,510,000
<b>Freeway Management Systems</b>				
FMS	L.Sum	1	\$9,450,000.00	\$9,450,000
Wrong Way Driver Warning System	Each	18	\$50,000.00	\$900,000
<b>Environmental Mitigation</b>				
Noise Walls	L.Sum	1	\$12,228,000.00	\$12,228,000
<b>Landscaping</b>				
Landscaping and Irrigation	Mile	15	\$750,000.00	\$11,250,000
<b>Item Total:</b>				<b>\$553,489,000</b>

ESTIMATE OF PROBABLE COST - SYSTEM ALTERNATIVE IV

Item Description	Unit	Quantity	Unit Price	Amount
<b>Project Wide</b>				
Maintenance and Protection of Traffic	Cost	8%		\$44,280,000
Dust and Water Palliative	Cost	0.75%		\$4,152,000
Quality Control	Cost	1.00%		\$5,535,000
Construction Surveying	Cost	1.5%		\$8,303,000
Erosion Control	Cost	1.0%		\$5,535,000
Mobilization	Cost	8%		\$44,280,000
<b>Project Wide Subtotal:</b>				<b>\$112,085,000</b>
Unidentified Items (20% of Item Total and Project Wide Subtotal)	Cost	20%		\$133,115,000
<b>Project Wide Total:</b>				<b>\$245,200,000</b>
<b>Other Costs</b>				
Construction Engineering	Cost	8%		\$63,896,000
Construction Contingencies	Cost	5%		\$39,935,000
PCCP Quality Incentive	Sq.Yd.	1,542,600	\$1.50	\$2,314,000
Engineering Design (Includes Predesign, Surveying and Geotechnical)	Cost	11%		\$87,856,000
Utility Relocation	L.Sum	1	\$69,000,000.00	\$69,000,000
Right-of-Way	L.Sum	1	\$79,098,000.00	\$79,098,000
<b>Other Cost Total:</b>				<b>\$342,099,000</b>
<b>Summary</b>				
<b>Item Total</b>				<b>\$553,489,000</b>
<b>Project Wide Total</b>				<b>\$245,200,000</b>
<b>Other Cost Total</b>				<b>\$342,099,000</b>
<b>Subtotal Project Cost</b>				<b>\$1,140,788,000</b>
<b>Indirect Cost Allocation (ICAP) (10.02%)</b>				<b>\$114,307,000</b>
<b>Total Project Cost</b>				<b>\$1,255,095,000</b>



## 7 IMPLEMENTATION PLAN

### 7.1 Introduction

The project improvements identified in the Recommended Alternative are expected to be constructed over the next 20 years or more. Each I-10 project reconstructs I-10, including any additional lanes needed to accommodate the design year 2040 traffic demand and reconstructs any interchange within the project limits. Each project will include tapers needed to match to existing roadways. It is recommended that construction projects be prioritized by need, either to address traffic operational issues (such as reconfiguring or eliminating partial cloverleaf traffic interchanges), extend SR 210 to I-10, and to enlarge I-10 east of Alvernon Way to accommodate additional traffic from the extension of SR 210.

As a result, **Table 7.1** is a list of proposed construction projects; listed in proposed chronological order. Also, **Figure 7.1** shows an overall view of the projects. Projects 14 thru 18 are not shown for clarity. Projects 1 thru 3 and 5 thru 13 have figures provided below in **Section 7.2**. Each figure shows project limits and detours.

**Table 7.1 Project Order of Construction**

No.	Location	Description
1	Country Club Rd TI	Construct new TI and I-10 to 3 GP lanes in each direction
2	Kino Parkway TI	Reconstruct TI and I-10 to 3 GP lanes in each direction
3	Park Avenue TI	Reconstruct TI
4	6th Avenue TI	Widen crossroad and bridge over I-10
5	I-10 (Alvernon Way to Valencia Road)	Reconstruct I-10 to 3 GP lanes in each direction
6	I-10 (I-19 to Kino Parkway)	Widen I-10
7	SR 210 (Palo Verde Rd to Ajo Way) Stage 1	Construct Golf Links TI
8	SR 210 (Palo Verde Rd to Ajo Way) Stage 2	Construct new SR 210
9	SR 210 (Ajo Way to I-10)	Construct new SR 210
10	I-10 (Valencia Road TI)	Reconstruct TI and I-10 to 3 GP lanes in each direction
11	I-10 (Craycroft Road TI)	Reconstruct TI and I-10 to 3 GP lanes in each direction
12	I-10 (Wilmot Road TI)	Reconstruct TI and I-10 to 3 GP lanes in each direction

**Table 7.1 Project Order of Construction**

No.	Location	Description
13	I-10 (Kolb Road TI)	Reconstruct TI and I-10 to 3 GP lanes in each direction
14	I-10 (Alvernon Way to Craycroft Rd)	Add one GP lane in each direction into the median
15	I-10 (Craycroft Rd to Kolb Rd)	Add one GP lane in each direction into the median
16	Kolb Road TI	Construct the Kolb Rd express lanes
17	I-10 (Alvernon Way to Craycroft Rd)	Add one GP lane in each direction into the median
18	I-10 (Craycroft Rd to Kolb Rd)	Add one GP lane in each direction into the median

The first six projects reconstruct I-10 between I-19 and Valencia Road to improve traffic flow and simplify traffic movements. Construction of the new Country Club Rd TI allows for the removal of the Palo Verde Rd TI, which improves interchange spacing and allows for the construction of a westbound entrance ramp from the Alvernon Way service TI. Early construction of Country Club Rd TI assists in providing additional detour routes during the Kino Parkway TI reconstruction. It is closer in proximity than Palo Verde and will provide better traffic operations. While not changing interchange spacing, the Kino Parkway TI, Park Avenue TI, and I-19 to Kino Parkway projects reconfigure interchange ramps to improve access and traffic flow. The 6th Avenue TI project widens 6th Avenue to add dual left turn lanes between the interchange ramps to improve traffic flow at the interchange and along 6th Avenue. The fifth project reconstructs I-10 between Alvernon Way and Valencia Road. It constructs the new system interchange ramps between I-10 and SR 210 and adds lanes to I-10 to the east to accommodate the additional traffic related to the extension of SR 210.

The next three projects involve the extension of SR 210 southerly from Palo Verde to I-10. The first project constructs the interchange with Golf Links Road to provide continuous access between Golf Links Road with Barraza Aviation Parkway to the northwest and with Alvernon Way (new SR 210) to the south. The final two projects construct SR 210 mainline and two ramps at the Ajo Way interchange.

The next four projects involve the reconstruction of I-10 at each of the four interchanges east of the I-10/SR 210 system interchange. Each project constructs a minimum of three I-10 mainline lanes in each direction; leaving an open median for future addition of general purpose

lanes. Each project also reconstructs the crossroad and the interchange ramps.

Four of the final five projects involve the addition of I-10 general purpose lanes in the median. Depending on funding availability and project size, these projects can be grouped differently from what is shown above. The timing of these projects will be based on traffic needs as traffic volumes on I-10 increase over time.

Project #16 is the addition of the Kolb Road express lanes at the Kolb Road TI. The timing of this project will be based on the traffic needs and operational characteristics of the new DDI interchange at Kolb Road and how it handles through traffic on Kolb Road.

Construction sequencing and maintenance of traffic for the I-10 projects east of Alvernon Way may involve temporarily shifting traffic into the median to provide space for constructing the needed I-10 lanes. If there is sufficient funding, it may be prudent to include permanent paving in the median for shifting I-10 traffic. Further analysis is needed to determine any need to add at least some of the permanent pavement.

#### Maintenance of Traffic and Detours

Each project will require phased construction that will allow for maintenance of traffic during construction. This applies to construction along I-10 and SR 210, along crossroads, and for ramp replacement.

Between I-19 and Park Avenue, I-10 will be widened to the outside; typically only requiring shoulder closures. East of Park Avenue, I-10 will typically be widened to the inside during a first construction phase. Traffic will then be shifted to the new pavement in the median and the outside lanes will be constructed during a second construction phase. As needed, ramps will be closed and traffic routed via detours using local streets. Where the local street system does not support detours, construction will be performed via phased, half-width construction to keep traffic moving.

Detours will be needed to safely convey traffic around construction sites. **Section 7.2 Project Descriptions** describes specific construction phasing and detours on existing streets needed for each proposed project. Major detours are detours that need to be in place for prolonged periods of time. Minor detours are detours that are needed for short periods of time; e.g. a ramp closure or a weekend closure for bridge construction.

## 7.2 Project Descriptions

The first thirteen projects are discussed below in detail, including:

- Project Need
- Project Features
- Construction Phasing
- Construction Detours

The milepost limits shown are approximate and should be established during final design. However, the limits shown are based on an initial determination of the end of mainline reconstruction that includes allowing an adequate distance for tapers between the end of widened I-10 and the next encountered roadway width restriction, such as an existing structure.

Figure 7.1 Implementation Plan

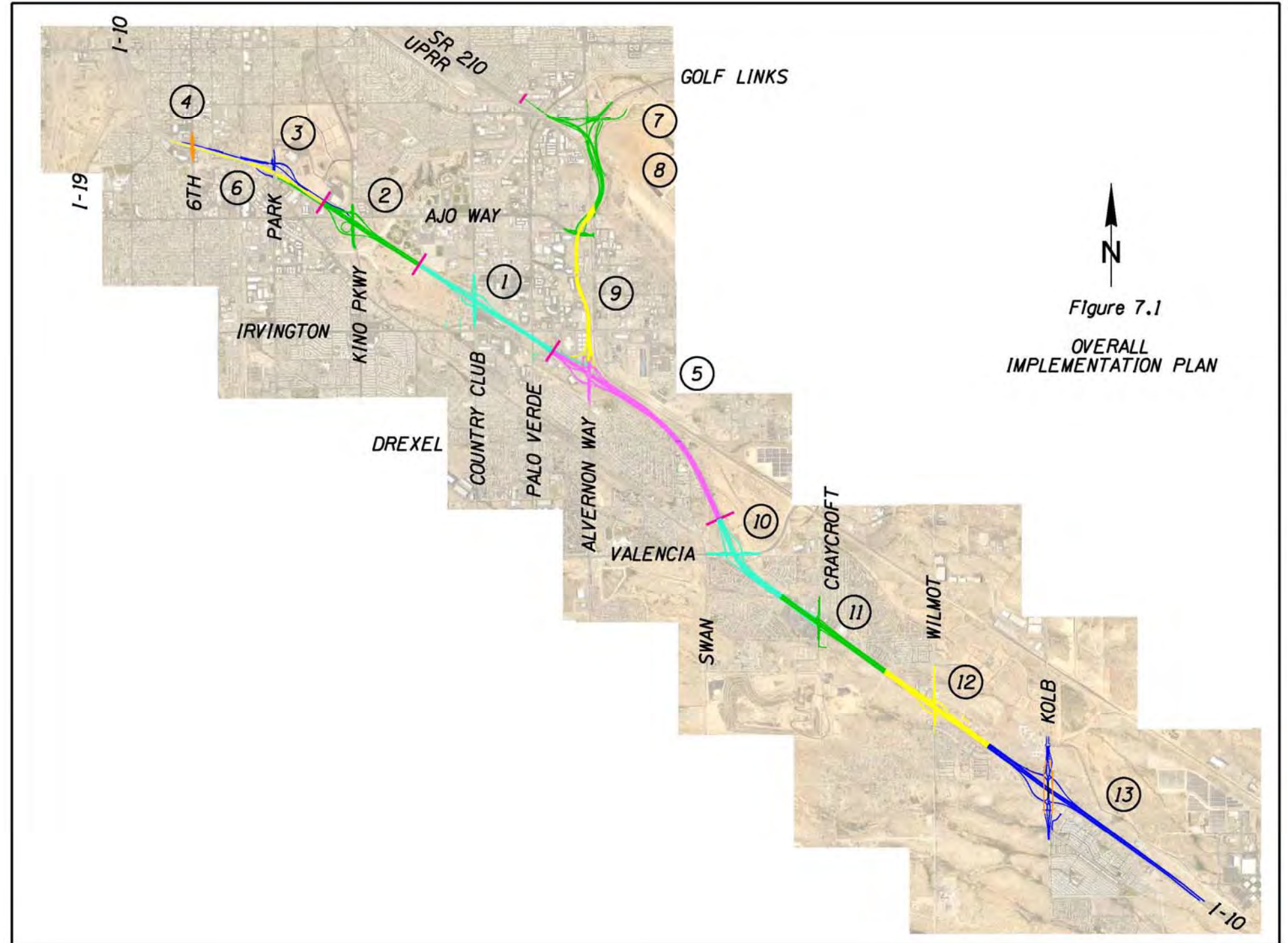


Figure 7.1  
OVERALL  
IMPLEMENTATION PLAN



**Country Club Rd TI (MP 263.25 to MP 264.66)**

**Project Need**

The distance between the Palo Verde Rd TI and the Alvernon Way TI does not meet current interchange spacing criteria and the weaving issues between the two interchanges are undesirable. Also, the Palo Verde Rd TI is a partial cloverleaf with weaving and decision-making issues that impact traffic operations and safety. To resolve these issues, Palo Verde Rd TI will be removed and replaced with a new diamond traffic interchange at Country Club Road. Once the new interchange is constructed, the Palo Verde Rd TI will be removed and a new westbound entrance ramp from Alvernon Way will be constructed to improve access to I-10 from Alvernon Way. See **Figure 7.2**.

**Project Features**

I-10 is reconstructed with three general purpose lanes in each direction and replaces I-10 overpass structures at Country Club Road, Irvington Road and Palo Verde Road. Due to the need for new structures, the I-10 profile will be higher than the existing profile. The project replaces the existing grade separation at Country Club Road with a new diamond TI and reconstructed/widened crossroad. The new TI requires the relocation of access to the residential subdivision in the southwest quadrant of the interchange. The access will be relocated to an extension of Treat Avenue south across Julian Wash to Irvington Road. Pima County is expanding the Kino Sports Complex which includes the Forgeus Avenue undercrossing of I-10. See **Figure 7.2** for the location.

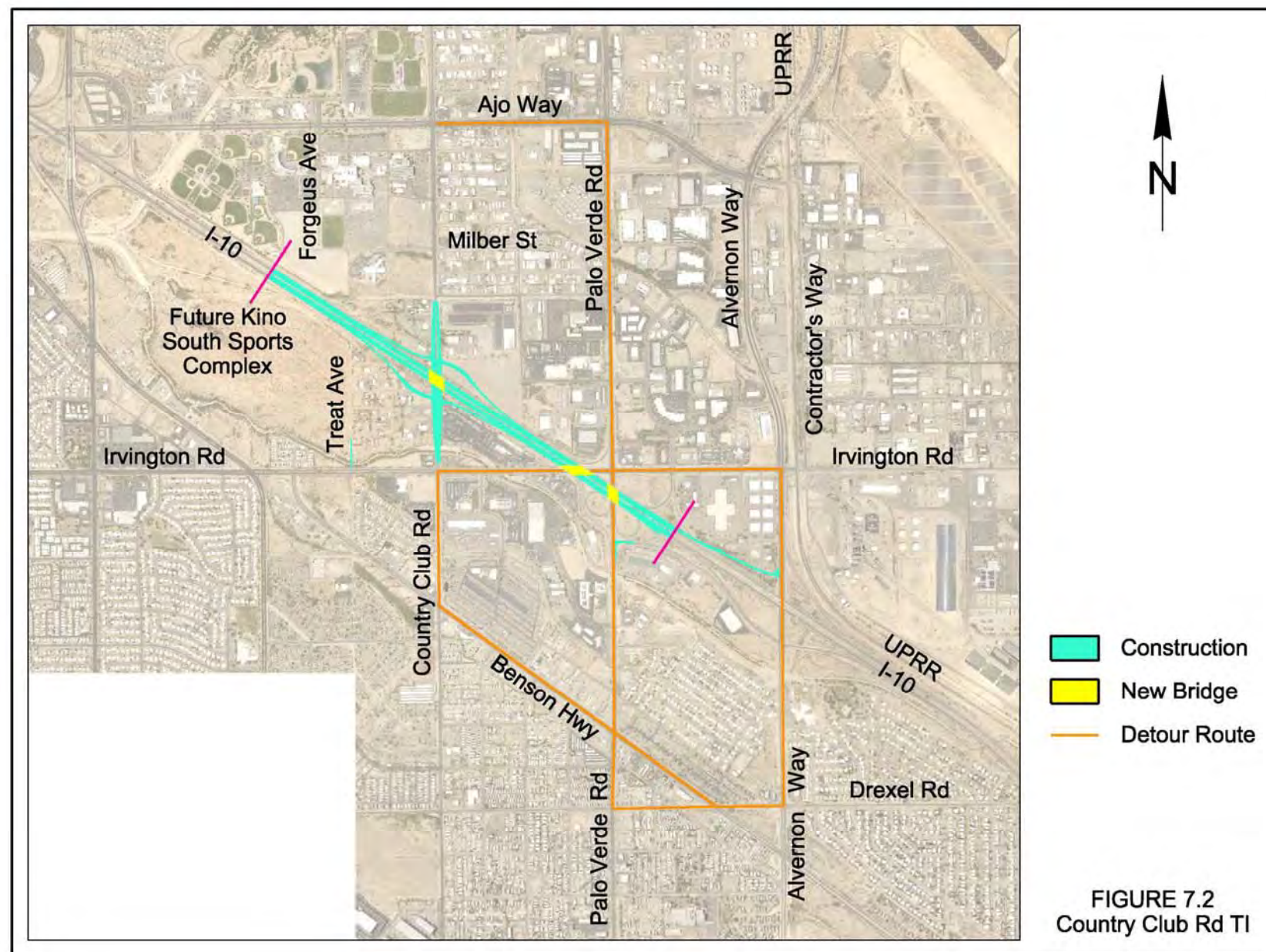
Country Club Road may be widened to five lanes north of the TI to Milber Street. The added capacity on Country Club Road will help with the detour traffic for the Kino Parkway TI construction project and the later SR 210 construction projects. If desired, the Country Club widening could be delayed until the SR 210 projects.

**Construction Phasing**

Reconstruction of I-10 and the construction of the new overpass structures will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. Due to profile differentials at the Palo Verde TI ramps, care is needed with phasing development to avoid ramp reconstruction prior to their removal in a later phase. New I-10 overpass structures will be full width across I-10, allowing for temporarily shifting traffic into the median.

Ordinarily, construction on Country Club Road would be performed in stages to keep it open to traffic. However, since there aren't any existing ramps and traffic demand on Country Club Road is low, the contractor may opt to keep Country Club open to local traffic only and closed to

**Figure 7.2 Country Club TI**



through traffic. This would allow for crossroad reconstruction and new ramp construction to occur in a single phase. At each end of the project, tapers will be needed. The project termini should be developed to provide adequate space for the tapers before reaching existing I-10 overpasses at Ajo Way and Alvernon Way.

**Construction Detours**

Reconstruction of I-10 will not require detours, just shifts in traffic within the I-10 corridor. See **Figure 7.2** to view the following detours.

- If Country Club Road is constructed in one phase, crossroad traffic will be detoured to Palo Verde Rd.
- For I-10 structure replacement over Irvington Road and Palo Verde Road, crossroad traffic will require detours for temporary closures of the crossroads for bridge demolition and superstructure construction. Both detours will be between Country Club and Alvernon Way. For Irvington Road, traffic will be detoured to Drexel and Benson Hwy. For Palo Verde Road, traffic will be detoured to Drexel.



### Kino Parkway TI (MP 262.25 to MP 263.25)

Figure 7.3 Kino Parkway TI

#### Project Need

Existing Kino Parkway TI is a partial cloverleaf with weaving and decision-making issues that impact traffic operations and safety. Some interchange access must traverse through the two signalized intersections, which impacts traffic flow and safety. To resolve these issues, Kino Parkway TI will be reconstructed as a diamond traffic interchange. See **Figure 7.3**.

#### Project Features

I-10 is reconstructed with three general purpose lanes in each direction and replaces I-10 overpass structures at Ajo Way and Tucson Diversion Channel and replaces the Kino Parkway structure over I-10. Due to the need for new structures, the I-10 profile will be higher than the existing profile. The west end of the project is located near the east end of the existing PCCP on I-10; where the new I-10 profile begins.

The southbound Kino to eastbound I-10 loop ramp is needed and will be reconstructed to meet current design criteria. The southbound left turn volumes at the south ramp termini are restricted due to the heavy traffic on northbound Kino. The project constructs two new eastbound ramps to resolve weaving issues along eastbound I-10 between Park Avenue and Kino Parkway.

#### Construction Phasing

Reconstruction of I-10 and the construction of the new overpass structures will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The overpass structures will be full width across I-10, allowing for temporarily shifting traffic into the median. At the west end of the project, tapers will be needed.

I-10 structure replacement over the Tucson Diversion Channel will be performed using the same phased construction for mainline I-10 reconstruction. Channel improvements for pedestrian, bicycle and maintenance access related to the expansion of the Kino Sports Park will be designed and paid by others. See **Figure 7.3** for the channel location. For I-10 structure replacement over Ajo way, crossroad traffic will be maintained.

Reconstruction of Kino Parkway will be performed via half-width construction phasing.

#### Construction Detours

Reconstruction of I-10 will not require detours, just shifts in traffic within the I-10 corridor. See **Figure 7.3** to view the following detours.

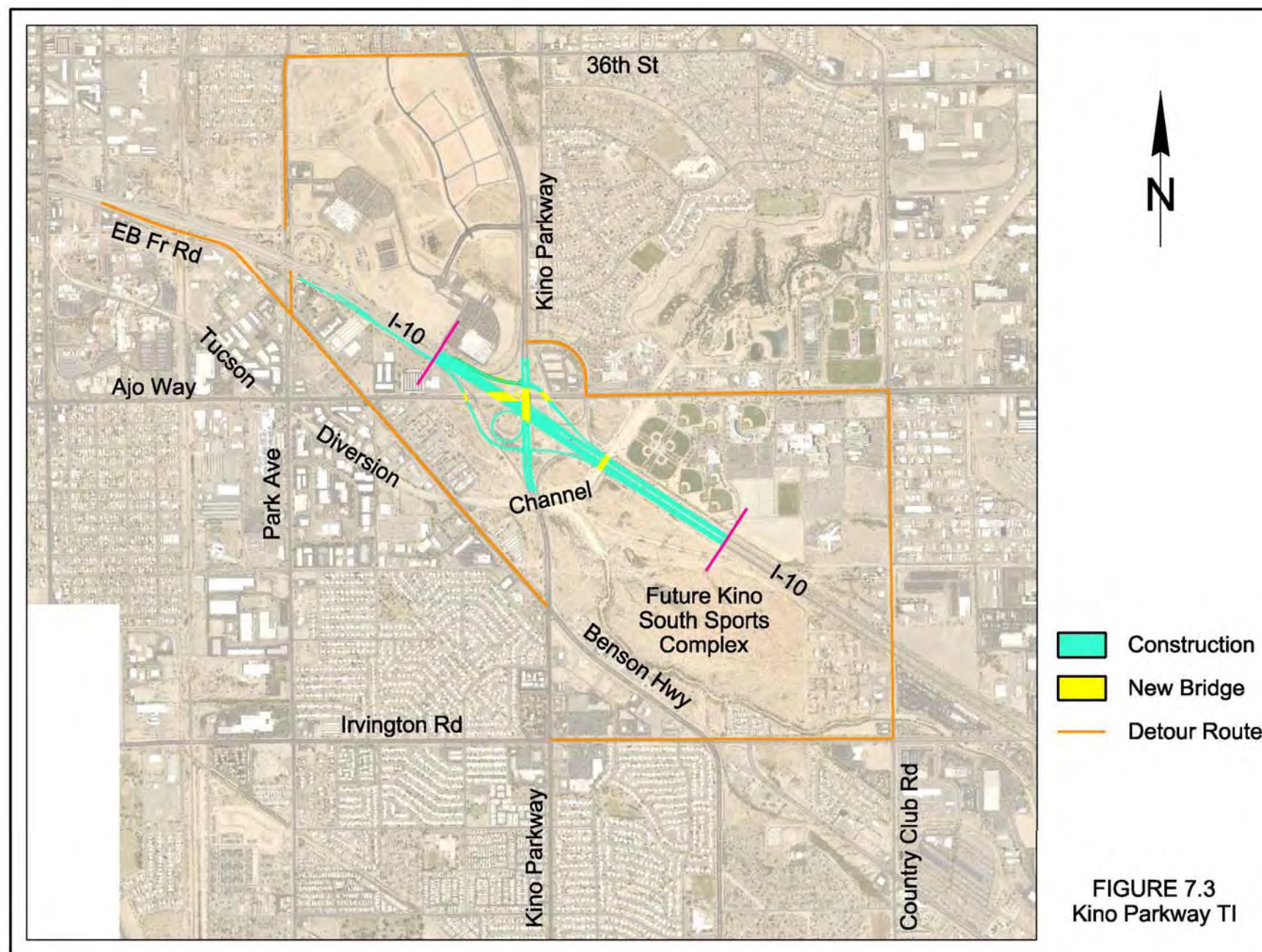


FIGURE 7.3  
Kino Parkway TI

- Kino Parkway overpass replacement will require a temporary crossroad detour with traffic detoured to Country Club Road.
- Ramp construction will require temporary ramp closures and detours.



**Park Avenue TI (MP 260.89 to MP 262.25)**

**Project Need**

Existing Park Avenue TI is a partial cloverleaf with weaving and decision-making issues that impact traffic operations and safety. The distances from the Park Avenue TI to the 6th Avenue and Kino Parkway TIs do not meet current interchange spacing criteria and the weaving issues between the three interchanges are undesirable. To resolve these issues, Park Avenue TI ramps will be reconstructed with new configurations. See **Figure 7.4**

**Project Features**

All reconstruction along the I-10 corridor regards ramp reconstruction. The westbound loop entrance ramp is replaced with a traditional diamond ramp. However, the new ramp conflicts with the existing westbound exit ramp to the frontage road and 6th Avenue. It will be replaced with a new exit ramp that exits I-10 east of Park Avenue and crosses over Park Avenue via a flyover. However, the new ramp conflicts with the existing westbound exit ramp to Park Avenue. It will be replaced with a new exit ramp that exits I-10 near Kino Parkway and crosses under the westbound entrance ramp from Kino Parkway.

The existing eastbound exit ramp to Park Avenue becomes Benson Highway with a high skew angle with Park Avenue. While retaining the connection to Benson Highway, a new ramp connects more directly to Park Avenue. Due to new westbound ramp reconfigurations, the north half of Park Avenue is reconstructed.

**Construction Phasing**

The westbound ramps must be constructed in a specific order to simplify construction phasing and maintenance of traffic. The existing westbound exit ramp to the frontage road is closed and reconstructed before addressing the westbound loop entrance ramp. Since there is little reconstruction on Park Avenue, traffic will be maintained during construction via half-width phased construction.

**Construction Detours**

See **Figure 7.4** to view the following detours.

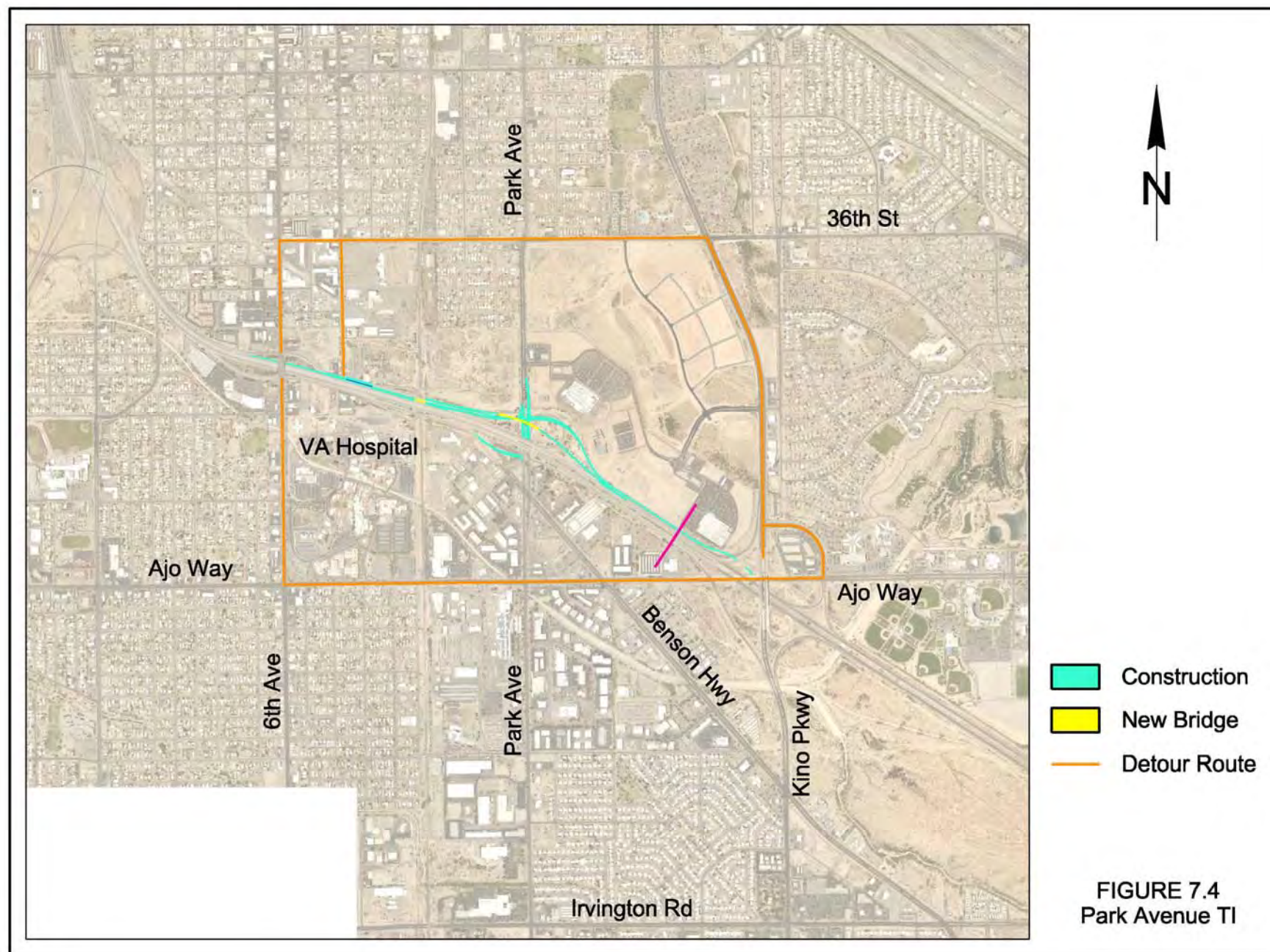
- Ramp construction will require temporary ramp closures and detours.

**6th Avenue TI (MP 261.0)**

**Project Need**

Existing 6th Avenue has single left turn lanes on the bridge over I-10. Currently, the interchange has left turn capacity issues due to high

**Figure 7.4 Park Avenue TI**



through traffic volumes on 6th Avenue. To resolve these issues, dual left turn lanes in each direction are needed. This requires the widening of the 6th Avenue structure and approaches. The 6th Avenue TI is the main access point to I-10 for the Veterans Administration (VA) Hospital located just south of I-10. See **Figure 7.4** for the location of the VA hospital.

**Project Features and Construction**

All reconstruction involves 6th Avenue only. Existing special pedestrian fencing will be relocated. Traffic on 6th Avenue will be maintained during construction. No impacts to ramps. No detours required.



**I-10 (Alvernon Way to Valencia Road) (MP 264.66 to MP 266.82)**

**Project Need**

The first three projects address operational issues associated with the original 1960s design and widens I-10 to three lanes in each direction. With the widening of I-10 and the removal of the Palo Verde Rd TI, traffic demand to use the I-10/Alvernon Way TI and I-10 east of the interchange will increase. To meet the demand, I-10 will be widened to three lanes in each direction and the service interchange with Alvernon Way will be reconstructed. Also, with the extension of SR 210 to I-10 in the future, the system interchange ramps tie into I-10. To avoid future maintenance of traffic issues, the portions of the ramps near I-10 (tapers and structures over I-10) should be constructed with this project. See **Figure 7.5**.

**Project Features**

I-10 is reconstructed with three general purpose lanes in each direction and replaces I-10 overpass structures at Drexel Road. Construction will be to the outside; leaving an open median for the addition of lanes in the future with subsequent projects. The existing I-10 structure over Alvernon Way is widened into the median. Alvernon Way and three of the service TI ramps are reconstructed. The westbound entrance ramp was already constructed with the Country Club Road TI project. Portions of the I-10/SR 210 system interchange ramps are constructed.

The north ramps at Valencia Road are reconstructed to connect to the widened I-10. The location of these ramp gores marks the north ends of the I-10 mainline pavement tapers.

**Construction Phasing**

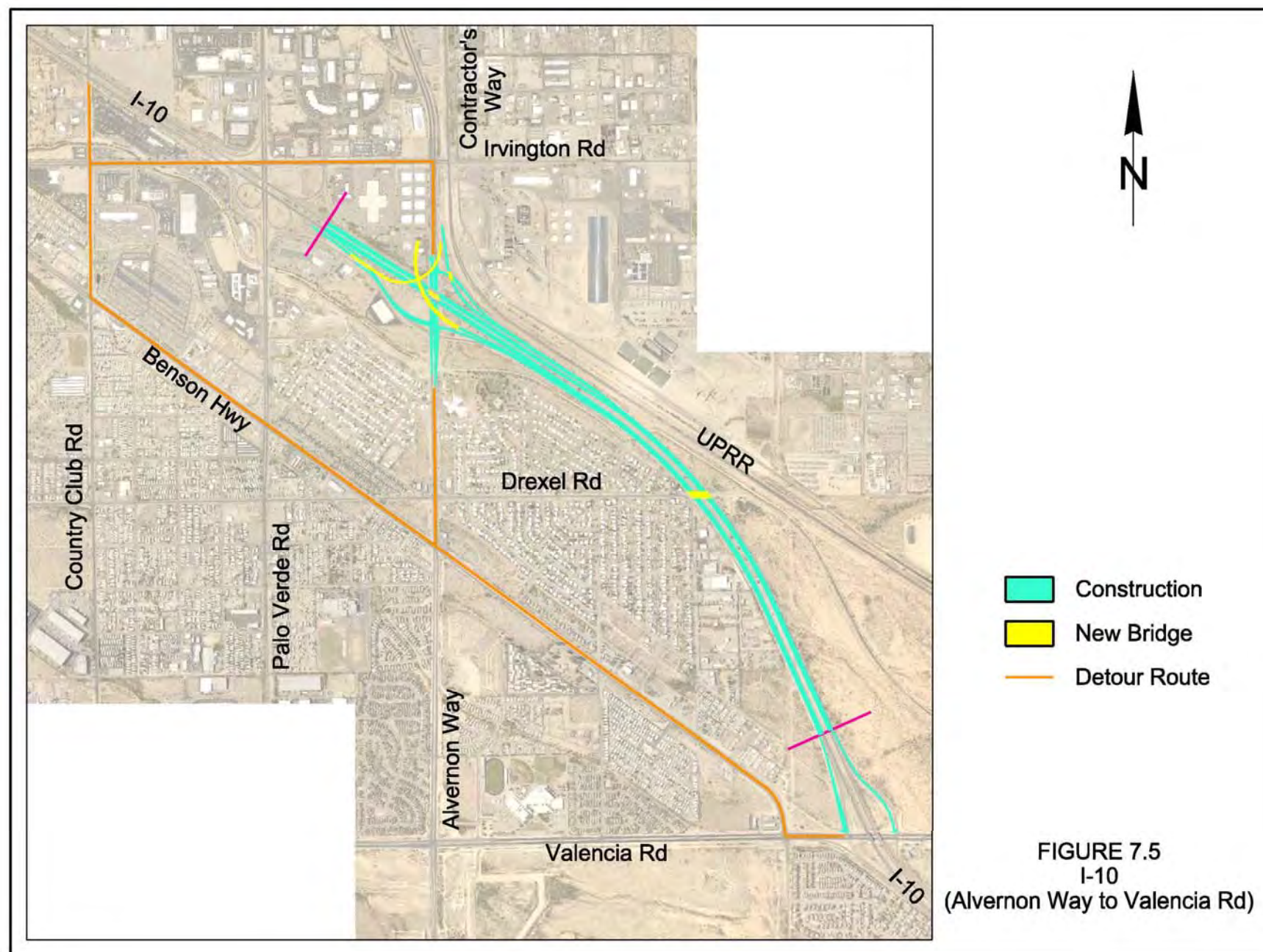
Reconstruction of I-10 and the construction of the new overpass structures at Drexel will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The overpass structures will be full width across I-10, allowing for temporarily shifting traffic into the median. At the east end of the project, tapers will be needed. I-10 structure replacement over Drexel Road will be performed using the same phased construction for mainline I-10 reconstruction. Reconstruction of Alvernon Way will be performed via half-width construction phasing.

**Construction Detours**

See **Figure 7.5** to view the following ramp closures and detours.

- EB exit to Alvernon Way- Exit at Country Club, then south to Irvington or Benson Hwy, then east to Alvernon.

**Figure 7.5 I-10 (Alvernon Way to Valencia Rd) TI**



**FIGURE 7.5**  
I-10  
(Alvernon Way to Valencia Rd)

- EB entrance from Alvernon- East on Benson Hwy to Valencia, then east to I-10.
- WB exit to Alvernon Way- Exit at Valencia, then west on Valencia and Benson Hwy to Alvernon.
- WB entrance from Alvernon- West on Benson Hwy or Irvington to Country Club, then north to I-10.
- EB exit to Valencia- Exit at Alvernon Way, then south to Benson Hwy to Valencia, then east to I-10.
- WB entrance from Valencia- West on Valencia and Benson Hwy to Alvernon, then north to I-10.



**I-10 (I-19 to Kino Parkway) (MP 260.79 to MP 262.25)**

**Project Need**

This project completes improvements to the I-10 corridor between I-19 and Valencia Road. See **Figure 7.6**.

**Project Features**

The fourth general purpose lane is added to the outside of eastbound I-10 between I-19 and the UPRR Spur. East of the UPRR Spur, the fourth general purpose lanes in each direction are added into the median. The existing I-10 structures over the UPRR Spur and Park Avenue are widened into the median.

For this project, I-10 is widened without replacement of the existing PCCP. However, the retention of the PCCP versus pavement replacement or rehabilitation should be determined by ADOT Materials.

**Construction Phasing**

Widening of I-10 and the overpass structures at the UPRR Spur and Park Avenue will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The overpass structures will be full width across I-10.

Traffic on I-10 will be maintained during construction, including widening to the outside and construction in the median.

**Construction Detours**

See **Figure 7.6** to view the following ramp closures and detours.

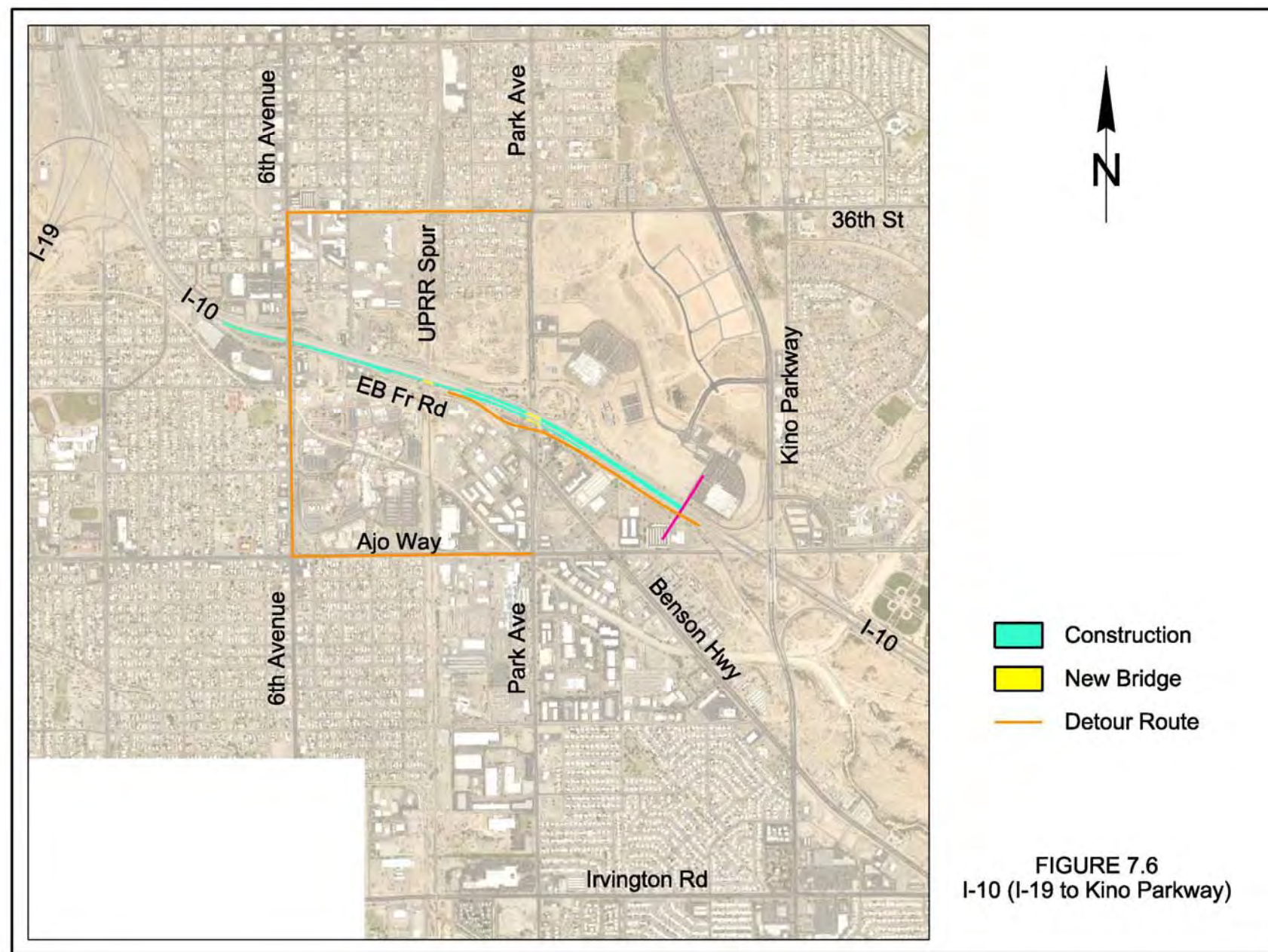
- EB exit ramp to Park Ave- Exit at 6th Avenue, then either north to 36th St or south to Ajo Way.
- EB entrance ramp from frontage road- Stay on the frontage road to Park, then onto the EB entrance ramp.

**SR 210 Construction Projects**

**Project Identification**

Construction of SR 210 between Palo Verde and I-10 is probably too large, dollar-wise, to be performed as a single project. It is logical to split the construction into two projects, with the split being at Ajo Way. However, the northern-most project, with its interchange with Golf Links Road, is much larger, dollar-wise, than the southern project. Therefore, it is reasonable to assume that splitting the northern project (Palo Verde to Ajo Way) into two projects is desirable. They will be designated as Stage I and Stage II projects.

**Figure 7.6 I-10 (I-19 to Kino Parkway) TI**



**FIGURE 7.6**  
I-10 (I-19 to Kino Parkway)

A review of existing traffic patterns indicates the need to preserve the north-south movement of traffic between Golf Links Road and Alvernon Way south of the interchange. While SB/WB Golf Links traffic can be detoured to Ajo Way via Palo Verde Road, it would be difficult to detour northbound Alvernon traffic up to NB/EB Golf Links, as there isn't a logical detour route. Therefore, a construction sequence and maintenance of traffic plan must maintain this connection with at least two lanes in each direction. Since much of new SR 210 is in conflict

with existing Alvernon Way between Golf Links Road and Ajo Way, existing Alvernon Way will be preserved. Therefore, the first project will construct the main interchange ramps that connect to Golf Links

Road and also construct the outer lanes of SR 210; preserving the interior corridor for the bulk of SR 210. The second project then constructs mainline SR 210 between Palo Verde Road and Ajo Way.



### SR 210 (Palo Verde Rd to Ajo Way) Stage I Project (MP 4.56 to 6.16)

#### Project Need

This project begins the extension of SR 210 to I-10. From the Feasibility Study Update, the extension of SR 210 to I-10 is needed to accommodate the increase in traffic demand for the design year 2040. See **Figure 7.7**.

#### Project Features

This project constructs the major ramps of the SR 210/Golf Links interchange, including; EB SR 210 to EB Golf Links, WB Golf Links to WB SR 210, WB Golf Links to EB SR 210 and WB SR 210 to EB Golf Links. The project replaces the existing structure over the UPRR with a structure with longer spans that allow for future UPRR tracks. The northern two diamond type ramps at Ajo Way are also constructed. The Aviation Bikeway is realigned along Alvernon Way to the 37th Street corridor.

#### Construction Phasing

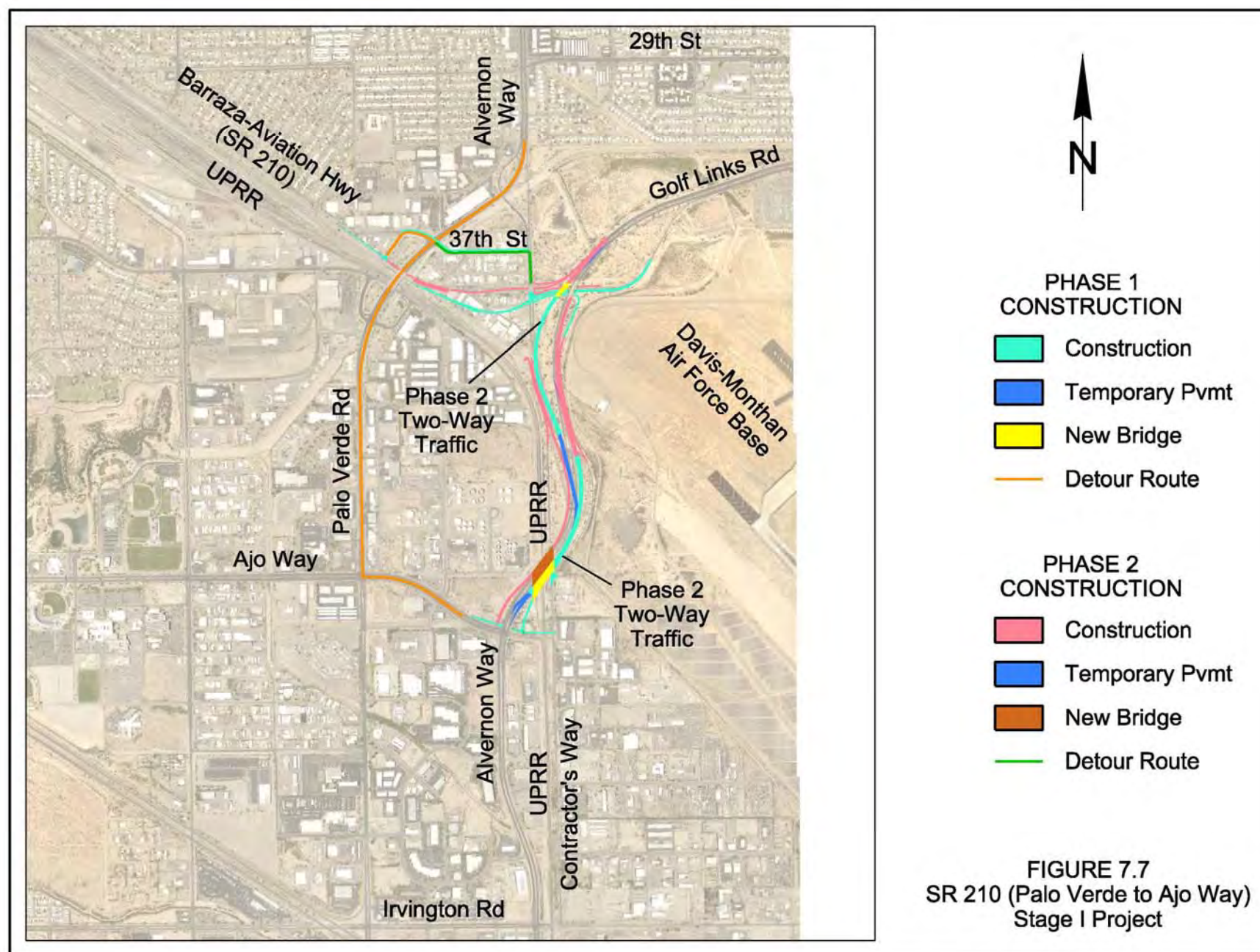
Construction will require phased construction, as shown in **Figure 7.7**. Prior to the first phase, Contractor's Way is closed between Golf Links Parkway on the north end and north of Ajo Way on the south end. Traffic is shifted to existing Alvernon Way. In the first phase, the following new roadways are constructed:

- South end WB SR 210 outer lanes, east half of the bridge over UPRR, WB entrance ramp from Ajo Way.
- North end of new WB Golf Links to EB SR 210 and WB exit ramp from Golf Links Road to Alvernon Way.
- New EB SR 210 ramp to EB Golf Links.
- New outer lane of SR 210 northwest from Palo Verde Road.
- Three temporary connectors for shifting traffic onto the new roadways at the end of the phase.

In the second phase, the following new roadways are constructed:

- New WB SR 210 ramp to EB Golf Links.
- New WB Golf Links ramp to WB SR 210.
- South end of Ajo Way Ramp A/EB exit ramp to Ajo Way.
- West half of the new bridge over UPRR.

Figure 7.7 SR 210 (Palo Verde to Ajo Way) Stage I Project



#### Construction Detours

See **Figure 7.7** to view the following ramp closures and detours.

- Alvernon Way and Contractor's Way traffic will be detoured over to Palo Verde Road for the entire project.

During phase two, WB Golf Links to WB SR 210 traffic will be detoured via the new WB exit ramp to Alvernon Way and 37th Street.

- Northbound and southbound traffic on Alvernon Way (north of the project) that wants to access I-10 may want to utilize the Country Club Road TI via a combination of Palo Verde, Ajo Way, and Country Club Road. To accommodate this traffic, Country Club Road will need to be widened to a five-lane roadway from I-10 to Milber Street. This widening could be accelerated to be included in the first project; Country Club Road TI.



### SR 210 (Palo Verde Rd to Ajo Way) Stage II Project (MP 4.56 to MP 6.16)

#### Project Need

This project is the second of three projects to extend SR 210 to I-10. From the Feasibility Study Update, the extension of SR 210 to I-10 is needed to accommodate the increase in traffic demand for the design year 2040. See Figure 7.8.

#### Project Features

This project constructs the remainder of SR 210 and remaining ramps between Palo Verde Road and Ajo Way. It also reconstructs Ajo Way and constructs the major portion of the southerly Ajo Way ramps. Temporary connectors for the shifting of traffic and at the south ends of the new southerly Ajo Way ramps to connect to existing Alvernon Way.

#### Construction Phasing

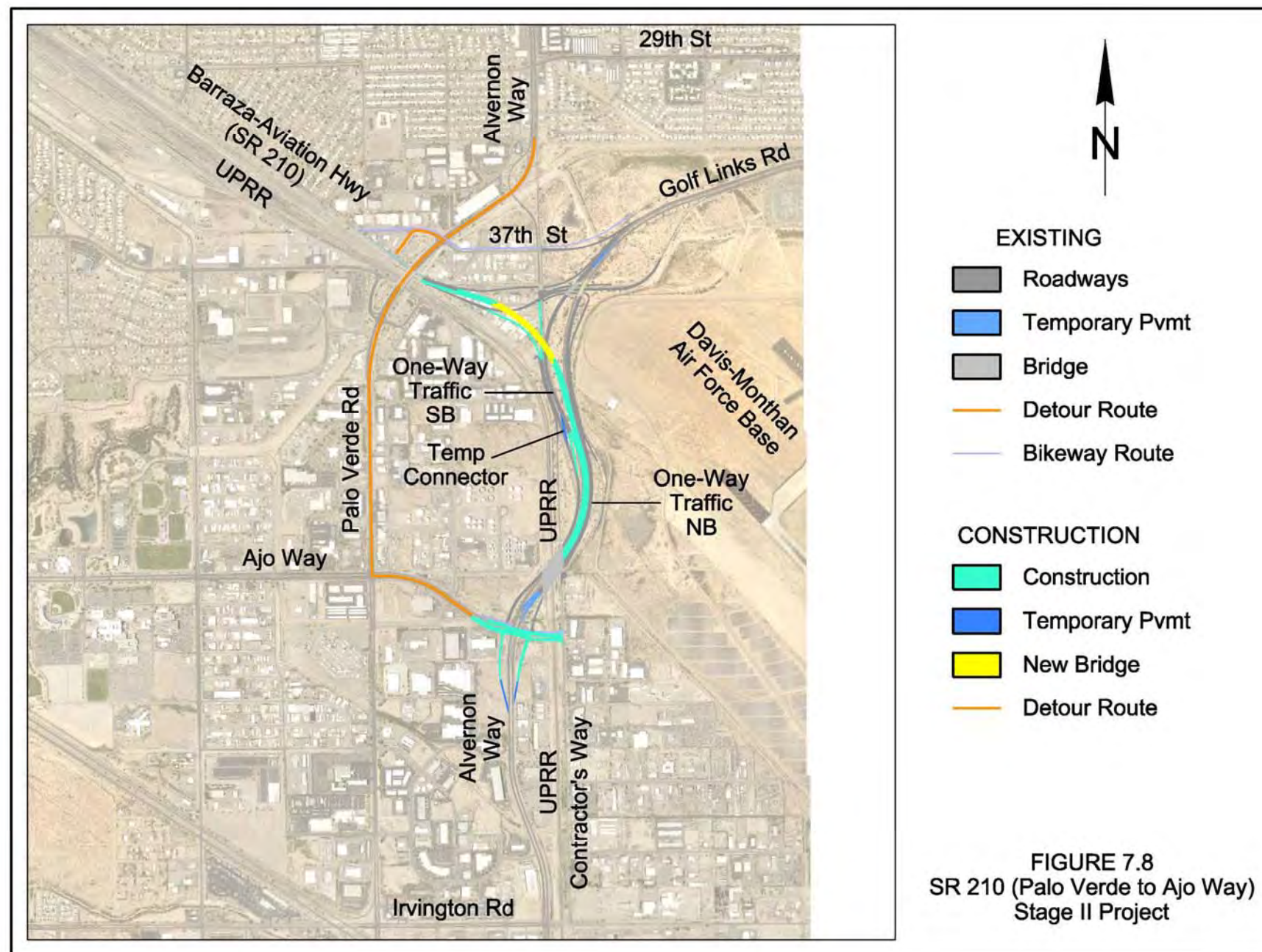
This project essentially has only one phase, as shown in Figure 7.8. The earliest construction activity constructs a temporary connector that allows the traffic that connects to/from Golf Links Road to be split; creating an open area in between. This area is for construction of SR 210. When all is complete, traffic travels on the outside portions of SR 210 and using the Ajo Way ramps to cross Ajo Way.

#### Construction Detours

See Figure 7.8 to view the following ramp closures and detours.

- Alvernon Way and Contractor's Way traffic (north of Ajo Way) will be detoured over to Palo Verde Road for the entire project.
- Northbound and southbound traffic on Alvernon Way (north of the project) that wants to access I-10 may want to utilize the Country Club Road TI via a combination of Palo Verde, Ajo Way, and Country Club Road. To accommodate this traffic, Country Club Road will need to be widened to a five-lane roadway from I-10 to Milber Street. This widening could be accelerated to be included in the first project; Country Club Road TI.

Figure 7.8 SR 210 (Palo Verde to Ajo Way) Stage II Project





**SR 210 (Ajo Way to I-10) (MP 6.16 to MP 7.31)**

**Figure 7.9 SR 210 (Ajo Way to I-10)**

**Project Need**

This project is the third of three projects to extend SR 210 to I-10. From the Feasibility Study Update, the extension of SR 210 to I-10 is needed to accommodate the increase in traffic demand for the design year 2040. See **Figure 7.9**.

**Project Features**

This project constructs SR 210 between the bridge over the UPRR and the system interchange at I-10. This includes the northern portions of the I-10/SR 210 system interchange ramps; matching into the portions of these ramps constructed in the I-10 (Alvernon Way to Valencia Road) project.

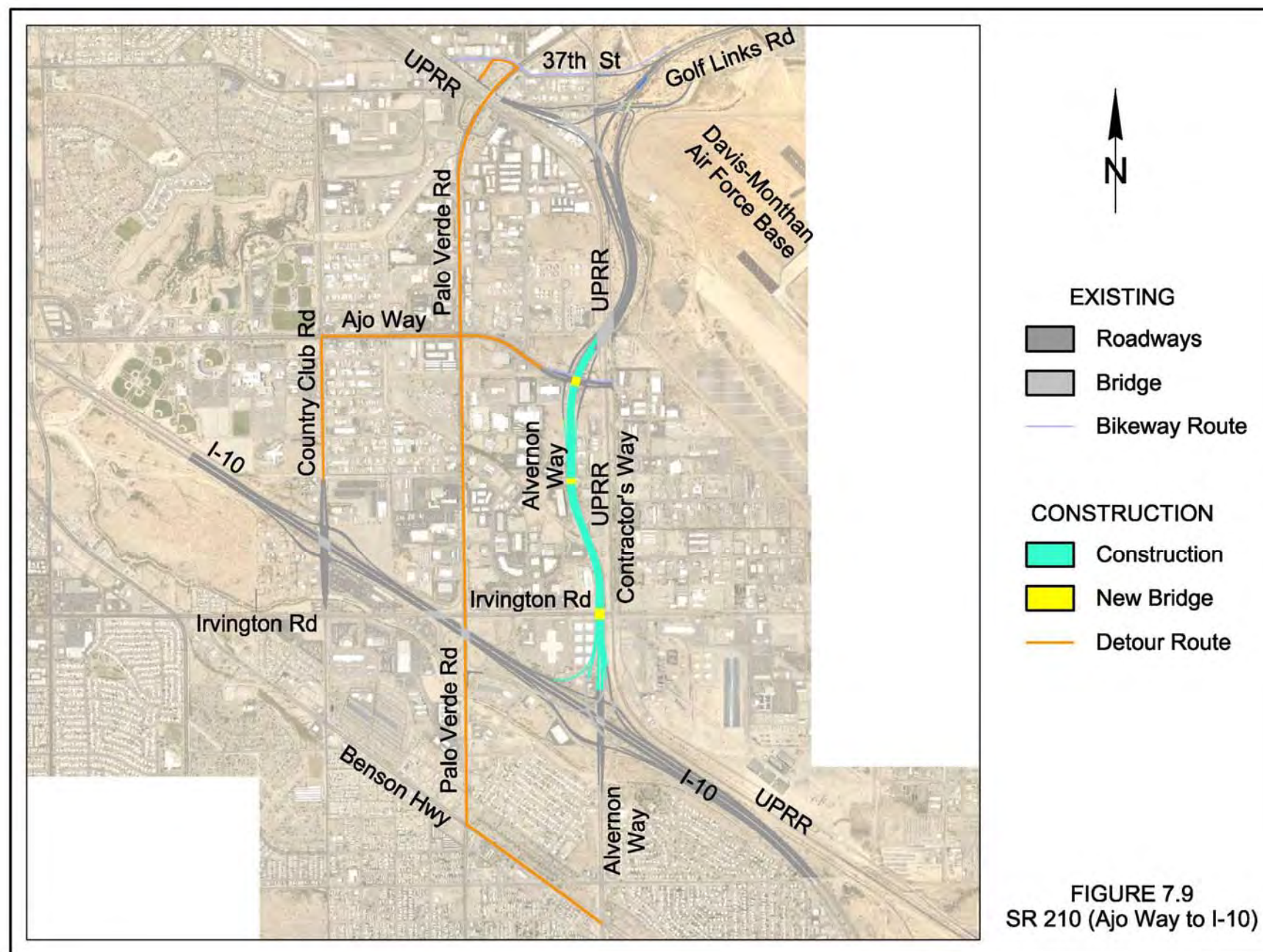
**Construction Phasing**

This project essentially has only one phase, as shown in **Figure 7.9**.

**Construction Detours**

See **Figure 7.9** to view the following ramp closures and detours.

- Alvernon Way and SR 210 traffic will be detoured over to Palo Verde Road for the entire project.
- Northbound and southbound traffic on Alvernon Way (north of the project) that wants to access I-10 may want to utilize the Country Club Road TI via a combination of Palo Verde, Ajo Way, and Country Club Road. To accommodate this traffic, Country Club Road will need to be widened to a five-lane roadway from I-10 to Milber Street. This widening could be accelerated to be included in the first project; Country Club Road TI.





**I-10 (Valencia Road TI) (MP 266.82 to MP 267.69)**

**Project Need**

This project is the first project to be constructed after the extension of SR 210 to I-10 at the system interchange at Alvernon Way. It is needed to accommodate the increase in traffic demand generated by the extension of SR 210. See **Figure 7.10**.

**Project Features**

I-10 is reconstructed with three general purpose lanes in each direction and replaces I-10 overpass structures at Valencia Road and a drainage channel. Due to the need for new structures, the I-10 profile will be higher than the existing profile. The project leaves an open median for future addition of general purpose lanes. It also reconstructs the crossroad and the interchange ramps.

This project includes the construction of a westbound frontage road between Craycroft Road and Valencia Road. It provides access to parcels along the north right-of-way of I-10. For System Alternative I, this project also constructs an eastbound long ramp between Valencia Road and Craycroft Road.

**Construction Phasing**

Reconstruction of I-10 and the construction of the new overpass structures will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The overpass structures will be full width across I-10, allowing for temporarily shifting traffic into the median. At the east end of the project, tapers will be needed.

The first phase constructs temporary pavements in the median during construction of the median portions of the bridges over Valencia Road and the drainage channel. Subsequent phases will construct the remainder of the new improvements.

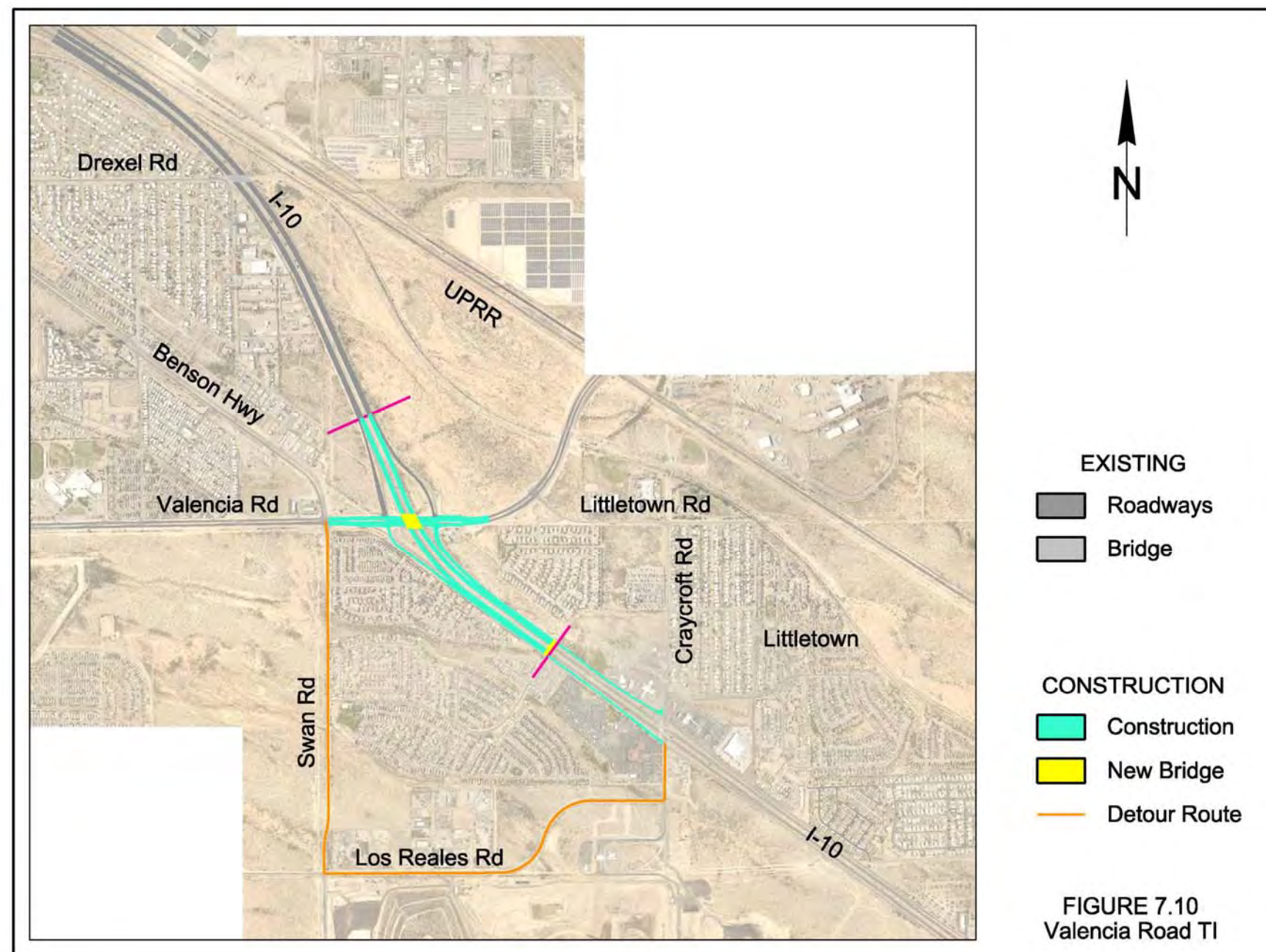
I-10 structure replacement over Valencia Road and the drainage channel will be performed using the same phased construction for mainline I-10 reconstruction. Reconstruction of Valencia Road will be performed via half-width construction phasing.

**Construction Detours**

Reconstruction of I-10 will not require detours, just shifts in traffic within the I-10 corridor. See **Figure 7.10** to view the following ramp closures and detours.

Reconstruction of ramps will require temporary detours during construction and will route traffic between Valencia Road and Craycroft

**Figure 7.10 Valencia Road TI**



Road via a combination of Swan Road and Los Reales Road. The goal is to NOT allow a detour north along Craycroft Road and through the Littletown neighborhood.



**I-10 (Craycroft Road TI) (MP 267.69 to MP 268.83)**

Figure 7.11 Craycroft Road TI

**Project Need**

This project is the second project to be constructed after the extension of SR 210 to I-10 at the system interchange at Alvernon Way. It is needed to accommodate the increase in traffic demand generated by the extension of SR 210. See Figure 7.11.

**Project Features**

I-10 is reconstructed with three general purpose lanes in each direction and replaces I-10 overpass structures at Craycroft Road. Due to the need for new structures, the I-10 profile will be higher than the existing profile. The project leaves an open median for future addition of general purpose lanes. It also reconstructs the crossroad and the interchange ramps.

**Construction Phasing**

Reconstruction of I-10 and the construction of the new overpass structures will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The overpass structures will be full width across I-10, allowing for temporarily shifting traffic into the median. At the east end of the project, tapers will be needed.

The first phase constructs temporary pavements in the median during construction of the median portions of the bridges over Craycroft Road. Subsequent phases will construct the remainder of the new improvements.

I-10 structure replacement over Craycroft Road will be performed using the same phased construction for mainline I-10 reconstruction.

Reconstruction of Craycroft Road will be performed via half-width construction phasing.

**Construction Detours**

Reconstruction of I-10 will not require detours, just shifts in traffic within the I-10 corridor.

A detour for Craycroft Road will not be required. Craycroft Road is isolated from other major streets, especially south of I-10. There are not any viable detour routes via the local street system. While construction of the east ramps would normally require temporary closures with detours, the lack of detour routes via local streets dictates that these ramps must be reconstructed under traffic via phased construction techniques. See Figure 7.11.

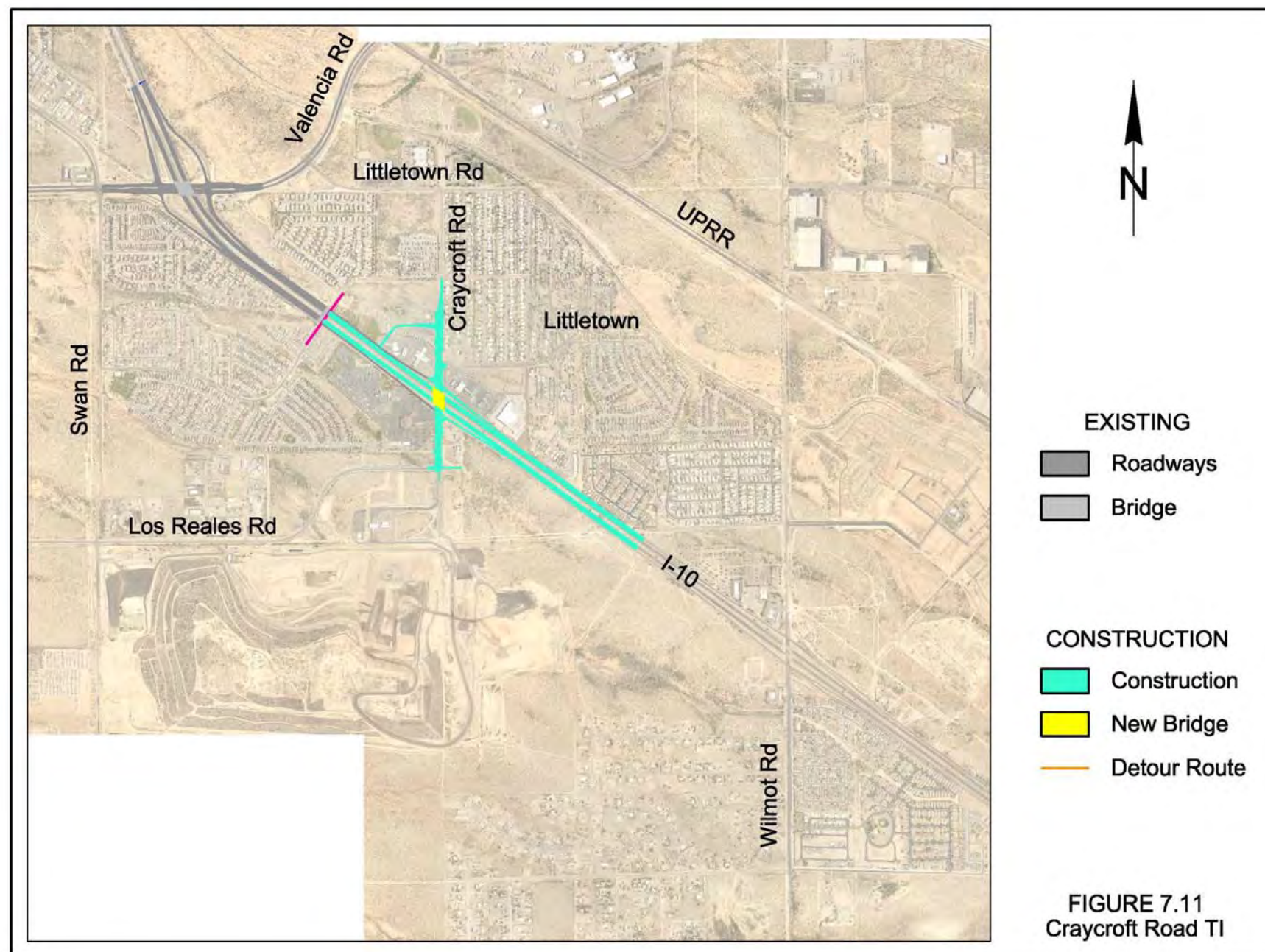


FIGURE 7.11  
Craycroft Road TI



**I-10 (Wilmot Road TI) (MP 268.83 to MP 269.93)**

**Project Need**

This project is the third project to be constructed after the extension of SR 210 to I-10 at the system interchange at Alvernon Way. It is needed to accommodate the increase in traffic demand generated by the extension of SR 210. See **Figure 7.12**.

**Project Features**

I-10 is reconstructed with three general purpose lanes in each direction and replaces I-10 overpass structures at Wilmot Road. Due to the need for new structures, the I-10 profile will be higher than the existing profile. The project leaves an open median for future addition of general purpose lanes. It also reconstructs the crossroad and the interchange ramps.

**Construction Phasing**

Reconstruction of I-10 and the construction of the new overpass structures will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The overpass structures will be full width across I-10, allowing for temporarily shifting traffic into the median. At the east end of the project, tapers will be needed.

The first phase constructs temporary pavements in the median during construction of the median portions of the bridges over Wilmot Road. Subsequent phases will construct the remainder of the new improvements.

I-10 structure replacement over Wilmot Road will be performed using the same phased construction for mainline I-10 reconstruction.

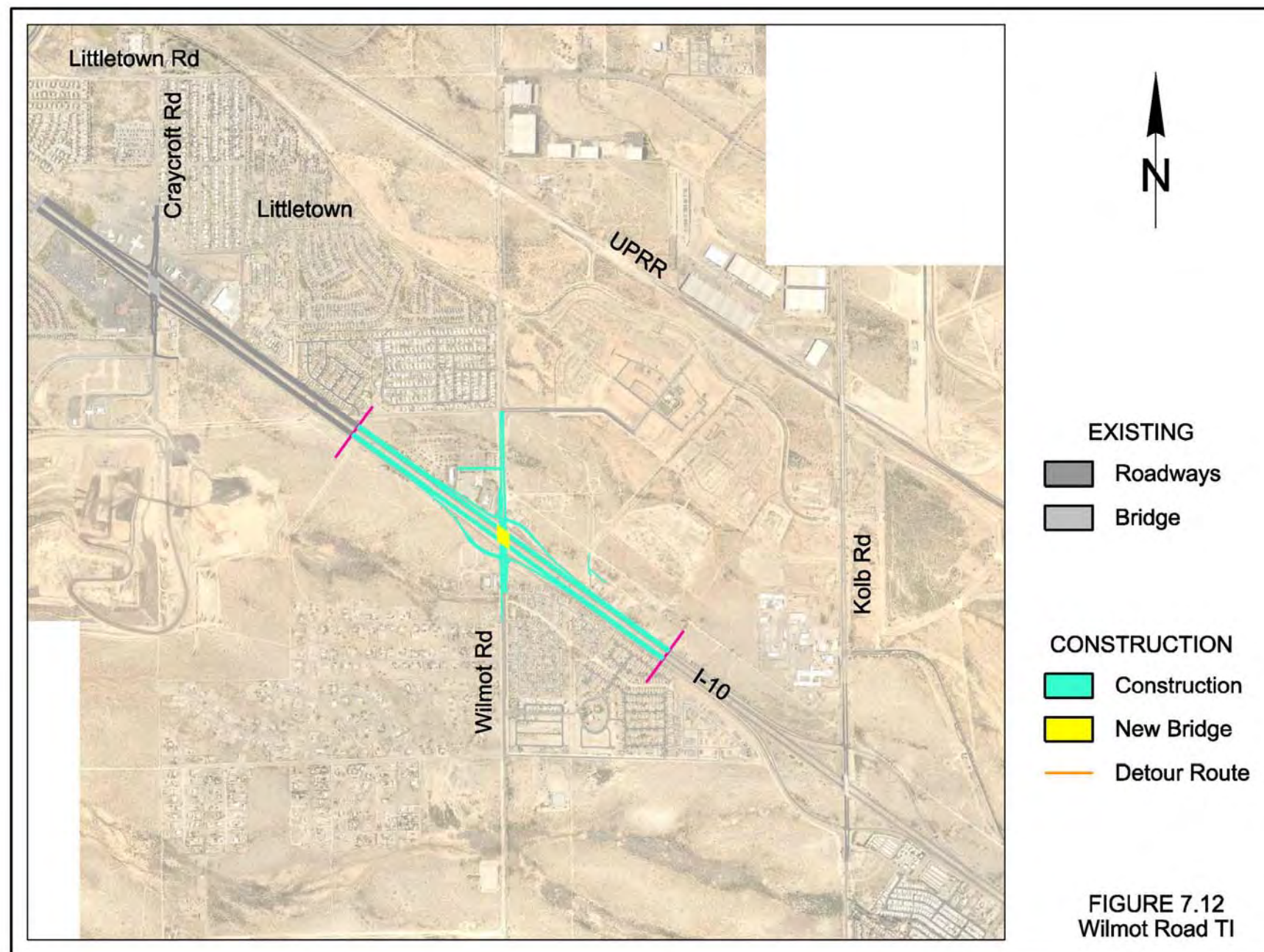
Reconstruction of Wilmot Road will be performed via half-width construction phasing.

**Construction Detours**

Reconstruction of I-10 will not require detours, just shifts in traffic within the I-10 corridor.

A detour for Wilmot Road will not be required. Wilmot Road is isolated from other major streets, especially south of I-10. There are not any viable detour routes via the local street system. While construction of the east ramps would normally require temporary closures with detours, the lack of detour routes via local streets dictates that these ramps must be reconstructed under traffic via phased construction techniques. See **Figure 7.12**.

**Figure 7.12 Wilmot Road TI**



**FIGURE 7.12**  
Wilmot Road TI



**I-10 (Kolb Road TI) (MP 269.93 to MP 272.30)**

**Figure 7.13 Kolb Road TI**

**Project Need**

This project is the third project to be constructed after the extension of SR 210 to I-10 at the system interchange at Alvernon Way. It is needed to accommodate the increase in traffic demand generated by the extension of SR 210. See **Figure 7.13**.

**Project Features**

I-10 is reconstructed with three general purpose lanes in each direction with tapers down to match existing pavement widths and number of lanes east of Kolb Road. The project leaves an open median for future addition of general purpose lanes. It also reconstructs the Kolb Road interchange; replacing the diamond type interchange with a Diverging Diamond Interchange (DDI). The center portion of the DDI utilizes the existing crossroad structure over I-10 for System Alternative I. For System Alternative IV, the existing structure is replaced with a pair of structures for the interior portion of the DDI.

**Construction Phasing**

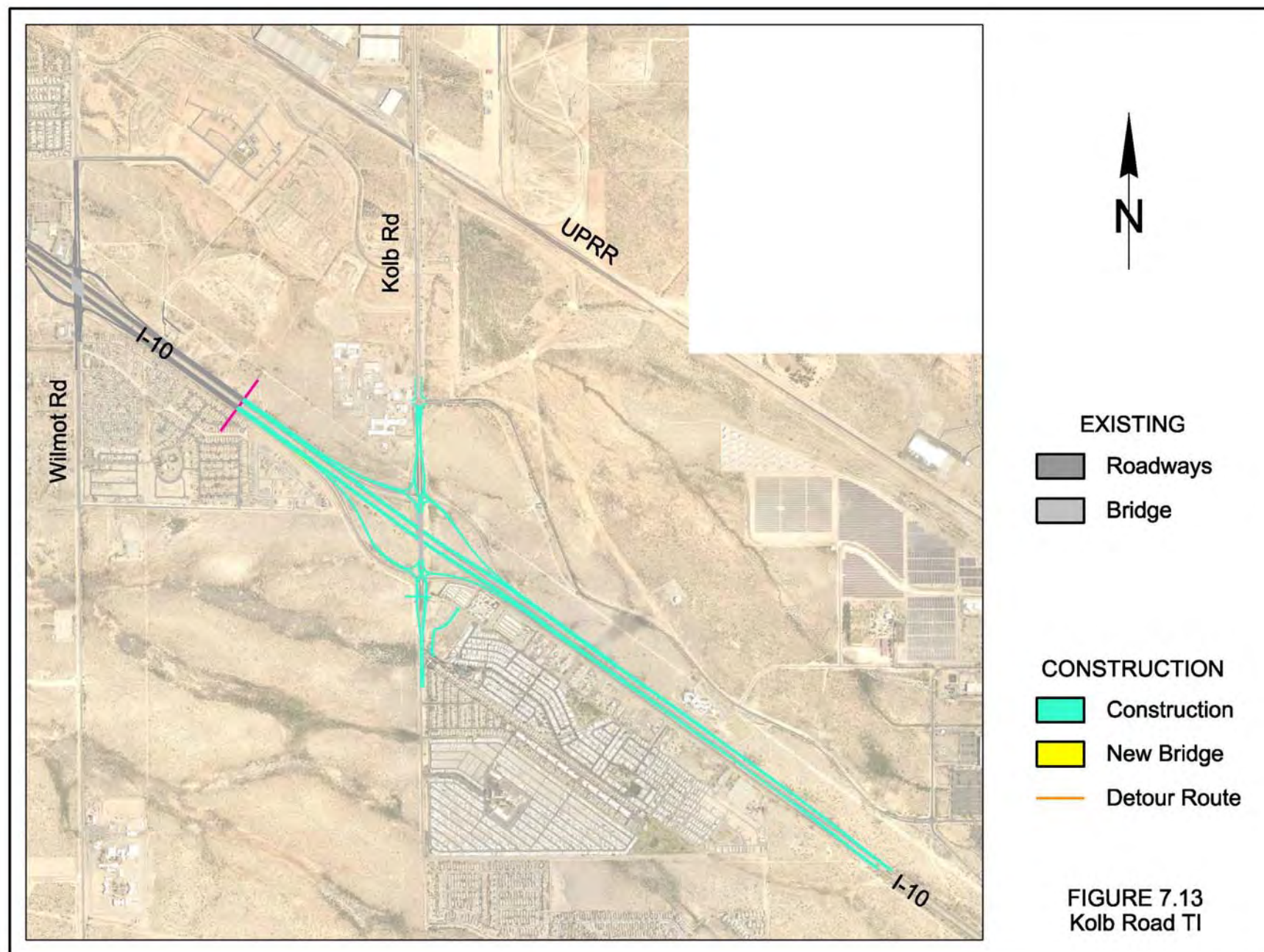
Reconstruction of I-10 will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The first phase constructs temporary pavements in the median. Subsequent phases will construct the remainder of the new improvements.

Reconstruction of Kolb Road will be performed via half-width construction phasing.

**Construction Detours**

Reconstruction of I-10 will not require detours, just shifts in traffic within the I-10 corridor.

A detour for Kolb Road will not be required. Kolb Road is isolated from other major streets, especially south of I-10. There are not any viable detour routes via the local street system. While construction of the east ramps would normally require temporary closures with detours, the lack of detour routes via local streets dictates that these ramps must be reconstructed under traffic via phased construction techniques. See **Figure 7.13**.





## 8 ENVIRONMENTAL SUMMARY AND PUBLIC INVOLVEMENT

### 8.1 Environmental Summary

The Draft Environmental Assessment (EA) evaluates the alternatives being considered for this project. The Draft EA is a separate stand-alone document that is summarized in the following paragraphs. Separate reports were prepared to evaluate impacts from noise, air quality, cultural resources, hazardous materials, biological, and 4(f) resources due to freeway widening or TI reconstruction. These reports are included as appendices to the Draft EA.

#### I-10 (Junction I-19 to Kolb Road)

The evaluation of the socioeconomic environment, physical and natural resources, cultural resources, and regulatory requirements conducted for I-10 indicates the proposed improvements from I-19 to Kolb Road have no fatal flaws. The proposed improvements are located largely in or near the existing I-10 ROW. Impacts could occur with the TI connections to I-10 and SR 210; however, those impacts are moderate, with residential displacements unlikely, few business displacements, and limited impact on cultural resources.

The evaluation of the socioeconomic environment, physical and natural resources, cultural resources, and regulatory requirements conducted for I-10 from I-19 to Alvernon Way indicates the proposed improvements for Alternatives I & IV are the same.

The evaluation conducted for I-10 from Alvernon Way through Kolb Road indicated minor differences for noise, air quality, cultural resources, hazardous materials, biological, and 4(f) resources. Impacts due to land acquisition, parcels affected, and businesses affected were greater for Alternative IV than for Alternative I.

#### SR 210 (Golf Links Road to I-10)

The evaluation of the socioeconomic environment, physical and natural resources, cultural resources, and regulatory requirements conducted for SR 210 indicates the extension from Golf Links Road to a connection with I-10 has some substantive environmental issues.

The System IV alternative follows the same alignment as System I along the Alvernon Way corridor.

The issues related to the System I and IV alternatives, while notable with regard to economic impacts, would not be considered a fatal flaw resulting in a recommendation to not extend SR 210.

The greatest impacts to the SR 210 study corridor would be in the form of potential business displacements and changes in access for the System

I and System IV alternatives. A single residential parcel containing three homes in the midst of industrial zoning could be displaced by both alternatives. System alternatives I and IV could require relocation of approximately 15 to 20 businesses and access changes to several others. Additionally, the system alternatives also encroach on a portion of DMAFB property.

The evaluation of the socioeconomic environment, physical and natural resources, cultural resources, and regulatory requirements conducted for SR 210 indicates the proposed improvements for Alternatives I & IV are the same.

### 8.2 Agency/Stakeholder Coordination

The I-10, I-19 to Kolb Road and SR 210, Golf Links Road to I-10 project was split into two Phases. Phase I included the development of a Feasibility Study and an Environmental Overview. Phase II involves the preparation of a Design Concept Report and Environmental Assessment. Coordination with stakeholder agencies and team progress meetings were jointly held throughout the two phases. Below is a summary of the Agency/Stakeholder coordination effort to date.

#### Agency/Stakeholder Coordination

The Phase I project kickoff meeting was held on July 21, 2010, at the City of Tucson Fire Central Station. Participants included representatives from:

- FHWA
- ADOT
- PAG
- Pima County Department of Transportation
- Cochise County Highway and Flood Control Departments
- City of South Tucson

The meetings were chaired by the ADOT Project Manager and Jacobs Engineering Group Inc. Agenda items were varied for each meeting, with a focus on soliciting input from the stakeholders. Presentations to the stakeholders provided data and graphics depicting existing conditions, LOS, operational issues, traffic modeling/forecasts, alternatives development, and environmental resource issues. Early discussions included the potential to enlarge the SR 210 study corridor farther west. The corridor was shifted west to Palo Verde Road. Preliminary traffic analysis indicated that connection locations west of Alvernon Way would not generate substantive traffic relief on I-10; therefore, no alternatives using Palo Verde Road were developed. The preliminary traffic analysis

also indicated that connection locations east of Wilmot Road would not generate substantive traffic relief on I-10; therefore, no alternatives east of Wilmot Road were developed.

Several stakeholder-focused discussions supplemented the progress meetings, including:

- Sun Tran – August 22, 2010
- Utility Companies – September 27, 2010
- AGFD – November 11, 2010
- UPRR – March 9, 2011
- PAG – April 6, 2011, April 7, 2014, and October 15, 2014 (presentation to Transportation Planning Committee)
- DMAFB, PAG, and Pima County DOT – March 14, 2012 (Discussion of System IIIa, IIIb and IIIc alternatives)

A reevaluation of the traffic study was needed due to a reduction in the 2040 population projection from 2.0 million to 1.4 million for the Tucson metro area. Further evaluation of System Alternative IIIc and the introduction of System Alternative IV resulted in an update to the Feasibility Study beginning January 2014. Additional stakeholder-focused discussions supplemented the progress meetings, including meetings with:

- Pima County DOT – January 14 and 21, 2014 and July 30, 2014
- City of Tucson – March 6, 2014
- PAG – October 15, 2014 (presentation to Transportation Planning Committee)

Progress meetings resumed in 2014 including the above-mentioned participants plus the following participant agencies:

- City of Tucson
- Sun Tran
- DMAFB
- U.S. Customs and Border Protection
- UPRR

Feasibility Study materials were made available on the project website at [www.jacobsaz.com](http://www.jacobsaz.com). Phase I meeting notes can be found in **Appendix I** of the Feasibility Report Update. The Feasibility Report Update is available on ADOT's website.

An Agency Kickoff/Scoping meeting was held December 1, 2016 for Phase II to bring new attendees from participating agencies up to speed regarding the project and changes made since the distribution of the

Feasibility Report Update. The eastern limit of the project was shifted to the west to Kolb Road to reduce construction funding needs for the project. With the eastern limit change, ADOT believed they could realistically construct the overall project by the 2040 design year. A collective decision was made by ADOT, FHWA, Pima County and the City of Tucson to discontinue Alternative II from further study. Strong opposition from the US Customs and Border Protection, high potential for hazardous material discovery and cleanup, potential for unexploded ordinance being present along the alignment and high costs to relocate several commercial businesses were a few reasons given to discontinue development of the alternative.

Progress meetings with agencies and stakeholders were resumed in December 2017 for Phase II. Several stakeholder-focused discussions supplemented the progress meetings, including:

- UPRR – June 27, 2017
- City of South Tucson - March 16, 2017
- Sunnyside Unified School District – March 16, 2017
- ADOT Traffic Group – May 15, 2017
- Pima County Administration – May 16, 2017
- Tucson Electric Power – May 16, 2017
- ADOT Right-of-Way Group – August 8, 2017
- City of Tucson/Pima County – October 30, 2017
- City of South Tucson – March 29, 2018
- Tucson Aviation Authority – June 11, 2018
- City of Tucson – July 20, 2018
- Pima County – December 12, 2018
- Davis Monthan AFB – February 4, 2019

Development changes at the I-10/Craycroft Road TI after the Feasibility Report was updated changed the traffic volumes and traffic flow patterns. Discussions about the situation was presented to the project stakeholders. Meetings were held April 12, 2018 with local business owners, the Sunnyside Unified School District, Pima County Natural Resources, Parks and Recreation, FHWA and ADOT to determine an access control solution for the TI. Additional meetings with ADOT, FHWA, Pima County and the City of Tucson were held. Several concepts were developed and a consensus on the concept to move forward with in Phase II was reached with the project stakeholders.

A meeting held February 4, 2019 with Davis Monthan AFB personnel revealed the base was providing 100 acres of land to the City of Tucson for a new park called “100 Acre Wood Bike Park”. The new park is located in the northwest part of the base east of Alvernon Way and north or Golf Links Road. The park was in the final stages of approval. A

memorandum was written to define the situation and recommend adjustments to the SR 210 / Golf Links Road TI. The westbound off-ramp from Golf Links Road to Alvernon Way needed to be relocated to the south to avoid taking right-of-way from the park. The existing Barraza-Aviation Bikeway will remain in its current location. See **Appendix R** for more information.

Phase II DCR Study materials and other documents are available on the ADOT website at [www.azdot.gov](http://www.azdot.gov) for review. Meeting notes can be found in **Appendix Q** of this report.

### 8.3 Public Involvement

Public Involvement for the Phase I feasibility study was initiated with a Public Information Meeting held October 6, 2011 at the Holiday Inn Hotel and Suites, 4550 S. Palo Verde Road, Tucson, AZ. The format of the meeting was an open house with an informational video. System Alternatives I, II were displayed for public view.

Approximately seventy people attended the meeting. The following public agencies were represented at the meeting: FHWA, ADOT, Pima County, PAG, RTA, DMAFB, City of Tucson. Two news stations covered the meeting: Fox News 11 and KVOA News 4.

Public Involvement for the Phase II design concept study was initiated with a Public Scoping Meeting held on February 15, 2017 at the El Pueblo Regional Center located at 1010 W. Irvington Road, Tucson, AZ. The public scoping meeting was conducted in an open house format, including an approximate 30-minute presentation on study background, status, proposed alternatives, and next steps. During the open house portions of the meetings (before and after the presentation), study team members were available to talk with attendees and answer their questions. System Alternatives I and IV were displayed for the public to view and comment on. Seventy-two persons signed in at the meeting. The following public agencies were represented at the meeting: FHWA, ADOT, Pima County, PAG, RTA, and the City of Tucson.

Two public information meetings were held on November 28, 2018 at the Billy Lane Lauffer Middle School – located at 5385 E Littletown Rd. Tucson, AZ and on November 29, 2018 at the Apollo Middle School, located at 265 W. Nebraska St., Tucson, AZ. Both public information meetings were conducted in an open house format, including an approximate 30-minute presentation on study background, status, proposed alternatives, and next steps. During the open house portions of the meetings (before and after the presentation), study team members were available to talk with attendees and answer their questions. System Alternatives I and IV were displayed for the public to view and comment

on. Approximately 35 persons attended each meeting. The following public agencies were represented at the meetings: FHWA, ADOT, Pima County, PAG, and the City of Tucson.

Two subsequent teleconference meetings were held with local business owners that missed the public meetings. Materials presented at the public information meeting was shared at both meetings. The first teleconference was held January 24<sup>th</sup>, 2019 with the owner of the Silver Saddle Stakehouse. The property is located east of 6<sup>th</sup> Avenue along the I-10 eastbound frontage road. The second teleconference was held June 27<sup>th</sup>, 2019 with the owners of the G&LW Tucson Gem Show located at the northeast corner of Country Club Road and I-10. Both property owners desired information on any impacts to their properties and the timing of future construction projects. Email and mailing information were provided by the owners and they requested information on any future public meetings.

The Initial Design Concept Report and Draft Environmental Assessment have been distributed for public review. Both reports are available on the ADOT project website, [azdot.gov/i10sr210study](http://azdot.gov/i10sr210study). In addition, the reports can be viewed at the following locations:

- Littletown Community Center, 6465 S. Craycroft Road, Tucson, AZ 85756
- Joel D. Valdez Main Library, 101 N. Stone Avenue, Tucson, AZ 85701
- Sam Lena-South Tucson Public Library, 1607 S. 6th Avenue, Tucson, AZ 85713

A public hearing on the I-10/SR 210 study is scheduled for Wednesday, November 20<sup>th</sup>, 2019 from 5:30 to 7:30 p.m. at Billy L. Lauffer Middle School, 5385 E. Littletown Road in Tucson.