State Route (SR) 30: SR 303L to SR 202L

Location/Design Concept Report

Maricopa County, Arizona

Federal Aid Project No. NH-801-B(ARG)

ADOT Project No. 801 MA 000 H6876 01L

Prepared for:

Arizona Department of Transportation

Project Management Group

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EXPIRES 3/31/2023

April 2020

ADOT
Infrastructure Delivery and Operations

PROJECT DETERMINATION FORM

Project Number	County and ADOT District	Project Name and Highway	Final Project Assessment Date
801 MA 000 H6876 01L	Maricopa	SR303L to SR202L South Mountain, Phase I	April 2020
NH-801-B(ARG)	Central District	SR 30	

Project Description:	System Expansion - New Freeway

Existing Program	
Yes	No
X	

Program Year	Programmed Budget
2020-24	$412,572,144
	PA Construction Cost Estimate
	$1,667,000,000

Operating Partnership Category					
S	F	T	D	Z	N/A
		X			

Public Hearing: In the Highway Development Process, at least one public hearing or the opportunity for a hearing will be offered for any project that:

X	Requires a significant amount of new right-of-way:
X	Substantially changes the layout or function of connecting roadway or the facility being improved;
X	Has a significant adverse impact on abutting real property;

X	Otherwise has a significant social, economic, environmental or other effect
	Is controversial on environmental grounds;
X	Or has significant floodplain encroachment
	None of the above conditions apply

Recommends:

Yes:	No:	
	x	Public Forum
	x	Offer a combined Location / Design Hearing
	x	Offer Separate Location/Design Hearing
	x	Hold a Design Public Hearing

Environmental Category		
Class 1	Class II	Class III
		X

Concur:

DocuSigned by: Reed Henry 4/27/2020
Reed Henry — Deputy State Roadway Engineer — Date

DocuSigned by: Paul O'Brien 4/27/2020
Paul O'Brien — Manager, Environmental Planning — Date

DocuSigned by: Troy Sieglitz 4/20/2020
Troy Siegllitz — Project Manager, Project Management Group — Date

DocuSigned by: David Eberhart 4/27/2020
David Eberhart — Bridge Group Manager — Date

Approved:

DocuSigned by: Michael DenBleyker 4/28/2020
Michael DenBleyker — State Roadway Engineer — Date

DocuSigned by: Randy Everett 4/27/2020
Randy Everett — Sr. Division Administrator, Central District — Date

Comments:

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Executive Summary

This Location/Design Concept Report (L/DCR) describes the development and evaluation process for the proposed State Route (SR) 30 (formerly known as both SR 801 and the I-10 Reliever) between SR 303L (Loop 303) on the west and SR 202L (Loop 202, South Mountain Freeway) on the east in Maricopa County, Arizona. This document is supported by four other documents developed during this multiyear study, including the corridor Alternatives Selection Report (ASR), the SR 30/SR 202L Traffic Interchange (TI) Selection Report (ISR), the Environmental Assessment (EA), and the Traffic Report. All four of these reports document the evaluation efforts during the development and screening of the numerous alternatives studied, and selection of the Recommended Build Alternative (RBA) and Recommended Alternative (RA), which led to identification of the Selected Alternative.

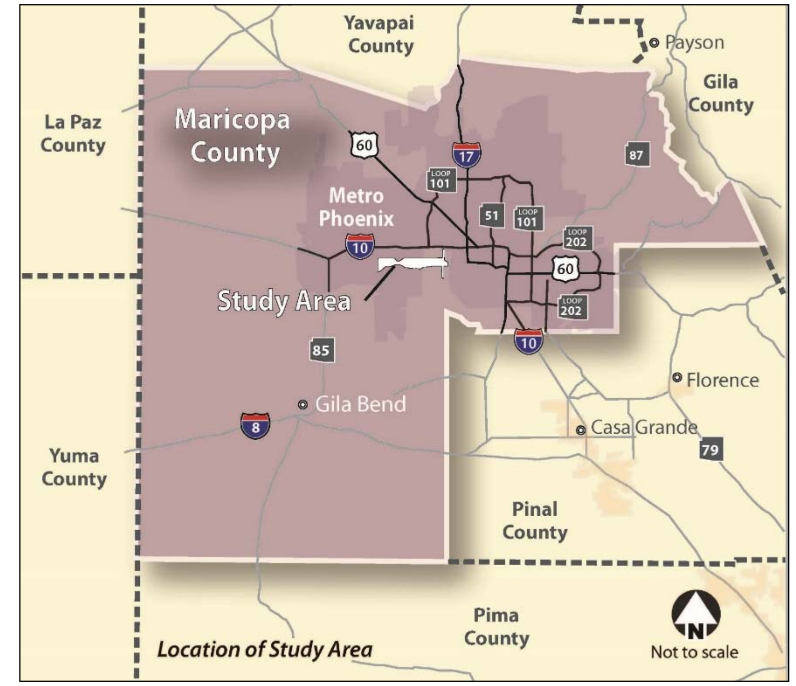
The Arizona Department of Transportation (ADOT) project number for this study is 801 MA 000 H6876 01L and the Federal-aid project number is NH-801-B(ARG). The project is located in ADOT's Central Construction and Maintenance District.

Project Location

The SR 30 study area encompasses approximately 25,600 acres and is located in southwestern Maricopa County (Figures ES-1 and ES-2). The study area crosses the cities of Goodyear, Avondale, and Phoenix, and unincorporated Maricopa County. The study area's original western boundary was Jackrabbit Trail (see next paragraph on the revised western boundary) and extends east to 51st Avenue. The northern boundary is Lower Buckeye Road and the southern boundary is delineated by the Salt River. The boundary does extend farther north and south along the SR 202L corridor between Buckeye Road and Dobbins Road to encompass the new SR 30/SR 202L TI ramp runouts. Existing land uses are predominantly agricultural, which includes dairy operations, and vacant land, interspersed with residential and commercial properties (including sand and gravel operations). This proposed new facility will be roughly parallel to, and approximately 5 miles south of, Interstate 10 (I-10, Papago Freeway).

Figure ES-1. Study area location in state

Figure ES-2. Study area vicinity



With regard to the western boundary, because the SR 303L, I-10 to SR 30, EA and L/DCR study was underway at the same time as this study, and because the SR 30/SR 303L TI is part of both projects, it did not make sense for both studies to define and evaluate this system TI location. Consequently, in 2017, ADOT and the Federal Highway Administration agreed to develop a match line that crosses SR 30 immediately west of Sarival Avenue. Everything defined and affected along SR 30 west of this Sarival Avenue match line is being addressed in the SR 303L study. Prior to 2017, the SR 30 documents did consider much of this area west of Sarival Avenue. These older documents will not be updated, so any references to the SR 30 project elements west of Sarival Avenue predate the 2017 decision and will be perpetuated so as not to lose that study history. This will be particularly noticeable in the ASR and the Traffic Report.

Historical Context of the Project

In November 2003, the Maricopa Association of Governments (MAG) developed the comprehensive, performance-based, multimodal *Regional Transportation Plan* (RTP), covering the period through 2026. In November 2004, the voters of Maricopa County approved Proposition 400, allowing for a 20-year extension of the ½-cent sales tax to fund the proposed improvements in the RTP; SR 30 is one of the new freeways identified in the RTP.

The Regional Public Transportation Authority, MAG, and ADOT worked together to develop the RTP. The recommended improvements are consistent with regional freeway, high-occupancy vehicle (HOV), and transit system studies. At the time of this L/DCR publication, the RTP program has funded the acquisition of the ultimate freeway right-of-way (ROW) and the relocation of some long-lead time utilities for the SR 30 corridor; however, construction of the freeway has been deferred several years pending a new corridor funding mechanism beyond 2025.

Project Purpose and Scope

This project is needed based on regional transportation demand; socioeconomic factors including population, housing, and employment growth; and existing and projected transportation system capacity deficiencies. Even with the "Great Recession" between 2007 and 2009, it is projected that Maricopa County's population, employment, and housing will increase approximately 50 percent between 2010 and 2035. The area served by the proposed freeway would experience a significant portion of that total growth (MAG 2013a). Additionally, the total vehicle miles traveled is projected to increase faster than the socioeconomic factors (MAG 2013b).

The population growth, economic development, and employment patterns have resulted in increased traffic congestion on the existing regional freeway system and arterial streets. The existing regional transportation system operates at poor levels of service during the peak morning and evening commute periods. Even with the planned improvements from the RTP, the system's operations would be under stress. The 2030 peak-hour travel demand is projected to exceed the capacity of a built-out I-10 facility, resulting in the need for an alternate route. Furthermore, no high-capacity transportation facility exists, other than I-10, in this part of the Valley. As a result, when I-10 is closed to clear an incident (as it has been in the past), traffic backups can occur for many miles and last many hours, resulting in lost time for the motoring public and adverse impacts on air quality. Without a major reliever for I-10 in the study area, the region will suffer even greater congestion, travel delays, and limited options for moving people and goods safely through this important Phoenix metropolitan region corridor.

The purpose of the proposed SR 30 facility is to ease traffic congestion in western Maricopa County by increasing the east-to-west freeway capacity in the region with a supplemental transportation link to I-10. The facility would further optimize system operations and the effectiveness of individual network components that are important to the overall regional transportation network operation. The proposed freeway would reduce the duration of congested conditions on I-10, improve travel times throughout the region, and attract trips from the arterial street network. The project would also support the plans, policies, and growth objectives of jurisdictions in the region, including the Town of Buckeye, City of Goodyear, City of Avondale, City of Phoenix, and Maricopa County. In addition, the project would support the plans for other regional facilities, such as planned flood control infrastructure and river restoration projects in the Salt and Gila Rivers.

The proposed freeway has been identified as a needed element in regional transportation planning efforts. The need today is greater than it has ever been.

Program Years and Programmed Costs

The MAG RTP Freeway Program 20-year plan calls for the development of the SR 30 (SR 303L to SR 202L) corridor to start in FY 2018, beginning with ROW acquisition and advance utility relocations. At this time, construction of the 3+0 full freeway section is included in the 20-year plan, but it is not fully funded. Funding exists only for the acquisition of the full freeway ROW and some long lead time advance utility relocations. The 3+0 freeway would be built in later years but is not specifically programmed in a fiscal year, so it is indicated as only FY 2026+. It is important to note that this program changes regularly and thus could change at any time, but at the time of the publication of this document, the current program for this corridor is shown in Table ES-1.

Table ES-1. SR 30 (SR 303L to SR 202L) MAG Program schedule and funding (as of September 2019)

Segment	Design schedule	Design funding	ROW acquisition and utility relocation schedule	ROW and utility relocation funding	Construction schedule	Construction funding
SR 303L to SR 202L Predesign and Environmental	FY 2017	$3,000,000	—	—	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2018	$60,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2020	$67,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2021	$67,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2022	$51,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2023	$134,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	FY 2024	$1,000,000	FY 2024	$155,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	—	—	FY 2025	$4,000,000
SR 303L to SR 202L freeway construction (3 general purpose lanes each direction) (unfunded)	FY 2026+	$170,000,000	—	—	FY 2026+	$1,700,000,000
Total	—	**$174,000,000**	—	**$534,000,000**	—	**$1,704,000,000**

Note: FY = fiscal year, ROW = right-of-way

Coordination with Other Projects

The study team regularly communicates with representatives of adjacent projects that could directly affect or be directly affected by the proposed freeway. These projects include, but are not limited to:

- SR 202L, South Mountain Freeway Project (ADOT)
- SR 303L, I-10 to SR 30 (ADOT)
- SR 30, SR 202L to I-17, Scoping Study and Planning and Environmental Linkages (MAG)
- I-10 and SR 30, Hassayampa Valley Roadway Framework Study (MAG)
- Durango Regional Conveyance Channel (Flood Control District of Maricopa County)
- local street and utility improvement projects from Phoenix, Avondale, Goodyear, and the Maricopa County Department of Transportation, including water treatment plant expansions
- local school district improvements
- private and quasi-public utility company projects
- numerous private developments in and along the corridor

A discussion of potential intergovernmental agreements can be found in Section 4.18 of this document.

Corridor Description

The proposed new facility would be roughly parallel to and approximately 5 miles south of I-10. SR 30 would begin at its western terminus with the system TI between the future SR 303L and SR 30. From this point, it would travel in an easterly direction for approximately 12.8 miles (from Sarival Avenue to SR 202L) before reaching its eastern terminus at the system TI with the future SR 202L. As this document is being prepared, SR 202L is under construction through a design-build contract. Coordination has occurred with the SR 202L team to integrate the SR 30/SR 202L TI design into the project that they are constructing.

Alternatives Studied in Detail

The process undertaken to develop a range of alternatives, screen those alternatives using a multidisciplinary set of criteria, and identify alternatives to be studied is documented in detail in the ASR and is continued in this document. At each step in the process, alternatives were screened against multiple criteria, including the ability to meet the purpose and need, cost effectiveness, minimization of environmental impacts, operational and design characteristics, constructability, and public and agency acceptability. Alternatives were either eliminated from further study or carried forward to the next level of evaluation.

During the screening process, it was determined that alignments would need to pass through two "pinch points," so it was deemed beneficial to break the study area into three sections: Segment 1 (eastern), Segment 2 (central), and Segment 3 (western). Initially, a total of eleven subsections were analyzed. The ASR recommended dropping seven subsections and carrying forward four subsections for further analyses. Of the subsections carried forward, one was in the eastern section, two were in the central section, and one was in the western section. These four subsections resulted in two complete corridor alignments called the North and South Alternatives.

After completing the ASR, and during the detailed engineering study of these two alternatives, two more alignments emerged that would meet the needs and visions of the local municipal governments' updated general plans. The two options introduced during this phase were called the Center and Hybrid Alternatives. This L/DCR has studied these four alternatives in depth. The four alternatives are presented in Figure ES-3. Following are the noteworthy elements of the four alternatives:

- The SR 30 corridor was divided into three segments: Segment 1 is between SR 303L and Bullard Avenue; Segment 2 is between Bullard and 91st Avenues; and Segment 3 is between 91st Avenue and SR 202L.
- In Segments 1 and 3, the corridor alignment is the same for the four alternatives. In Segment 2, all four alternatives have different alignments.
- The Segment 2 alignments of the four alternatives differ as follows:
  - The North Alternative runs parallel to, and about one-quarter mile south of, Broadway Road.
  - The South Alternative parallels the northern bank of the Gila River.
  - The Center Alternative closely follows the half-mile section between Broadway Road and Southern Avenue.
  - The Hybrid Alternative is same as the Center Alternative between Avondale Boulevard and 91st Avenue but deviates toward the south at Avondale Boulevard, following the Southern Avenue alignment between Dysart Road and Avondale Boulevard.

At the SR 30/SR 202L TI, numerous interchange alternatives were developed, combining different solutions for interchange shapes, stack order, and local access solutions along SR 202L. This study is documented in detail in the ISR document prepared in 2010. The ISR concluded with two interchange alternatives being carried into this L/DCR for further study—both with an assumed SR 202L corridor design. This L/DCR screened both of these to a single alternative. However, in 2017, with SR 202L under construction with a slightly different design, updates to the TI configuration were needed to reflect the new SR 202L layout. This effort is documented in an ISR Addendum, defined in Chapter 8 of the ISR.

The design of each corridor and interchange alternative was developed to a common level of detail sufficient to determine that construction was feasible, to allow analysts to meaningfully assess and compare impacts that would result from the alternatives, and to allow for decisions to be made about the preference of each alternative.

Identification of the Selected Alternative

For several engineering, environmental, and financial reasons, the North, Central, and South Alternatives were recommended to be dropped from further consideration, and the Hybrid Alternative was recommended to be carried forward as the RBA. Furthermore, one of the SR 30/SR 202L interchange alternatives was also dropped from the ISR findings, resulting in one SR 30 Build Alternative from SR 303L to SR 202L. This RBA, along with the No-Build Alternative, was presented at a public information meeting in November 2017. Feedback received from that meeting, coupled with findings from a detailed engineering and environmental assessment, led to the decision to select the RBA as the RA. The RA decision was presented at the public hearing held in May 2019 and was available for public comment during the public comment period. After the public hearing, the RA was identified as the Selected Alternative to be carried forward for final design and construction.

Design Elements

The proposed ultimate roadway typical section would accommodate a barrier-divided, 10-lane (4 general purpose lanes + 1 HOV lane in each direction) section with 12-foot-wide travel lanes and 12-foot-wide shoulders. Entrance and exit ramps would be designed using a parallel-type configuration coupled with auxiliary lanes between TIs approximately 1 mile apart. The entire section would be paved with Portland cement concrete pavement and overlaid with asphalt rubber friction course.

Because funding is limited, it is possible that this corridor would be built in phases, similar to other corridors in the Valley such as SR 303L. Figure 6-1 in Chapter 6.0 depicts one possible example of these construction phases. However, it must be noted that program funding does and will change to accommodate budgetary constraints and available funding sources, and this would likely affect how this corridor's construction would be phased.

Also in the RTP, but currently unfunded, would be the initial phase of the full freeway construction. This phase would construct the outermost six lanes (three in each direction, or 3+0), auxiliary lanes, and the outside shoulders of the ultimate typical section. An interim 12-foot-wide asphaltic concrete inside shoulder would also be included. The interim median would be a 50-foot-wide open-graded median with cable barriers.

The initial freeway typical section would accommodate a future (unfunded) widening project that would fill in the open median with one additional general purpose lane and one HOV lane in each direction (bringing it to a 4+1 section). A concrete median barrier would separate the directions of travel. The freeway would cross over the existing major crossroads, leaving the arterial streets at grade.

It is expected that even in a 4+1 configuration, SR 30 would fill up with traffic by or before 2040. To accommodate this excess demand, a 50-foot future transit corridor is also being planned in the SR 30 corridor. This corridor would predominantly be along, and inside, the SR 30 south ROW line, but would have to transition into the median of SR 30 as it passes through the system TIs at SR 303L and SR 202L. While the transit technology or mode to be applied in this corridor are not defined in this study, the transit corridor has been established to accommodate all known transit modes, including intercity high speed rail, to keep future options open. This future transit project is not currently in the RTP.

Each arterial crossroad was evaluated on a case-by-case basis to determine the need for an interchange. Figure ES-4 shows the locations of the proposed full access and half access interchanges along the freeway. Diamond-type interchanges were assumed at all locations because they are common in the area, are cost-effective, and provide an adequate level of service for the projected traffic conditions.

The freeway main line would mostly feature an "at-grade" profile with the freeway crossing over the crossroads. Because of the elevated profile at the crossroads, overhead power line relocations would be required at some locations.

SR 30 would bridge over all of the major mile arterials and the water crossings in the corridor, including the Agua Fria River, Bullard Wash, and irrigation canals/ditches. In addition, bridges would be required for new roadways over the Salt River associated with the SR 30/SR 202L system TI.

Off-site drainage would be collected and conveyed by a channel located on the north side of the freeway alignment. Detention basins would be integrated into the drainage channel design. Drainage outfalls to the Salt, Gila, and Agua Fria Rivers would be coordinated with the Flood Control District of Maricopa County (and the Cities, as applicable) to be consistent with the District's and U.S. Army Corps of Engineers' watercourse master plans and area drainage master plans.

The SR 30 study area contains many noteworthy and significant utility facilities including:

- facilities belonging to four major power companies, including several high-voltage overhead transmission power lines ranging in size from 69 to 500 kilovolts
- two electrical substations
- three wastewater treatment plants (WWTPs), including the City of Phoenix's 91st Avenue WWTP, the Avondale WWTP, and the Goodyear WWTP
- a large-diameter Arizona Public Service pipeline, beginning at the 91st Avenue WWTP and ending at the Palo Verde Nuclear Generating Station, which is the plant's sole source of cooling water

Figure ES-3. Four alternatives studied in detail

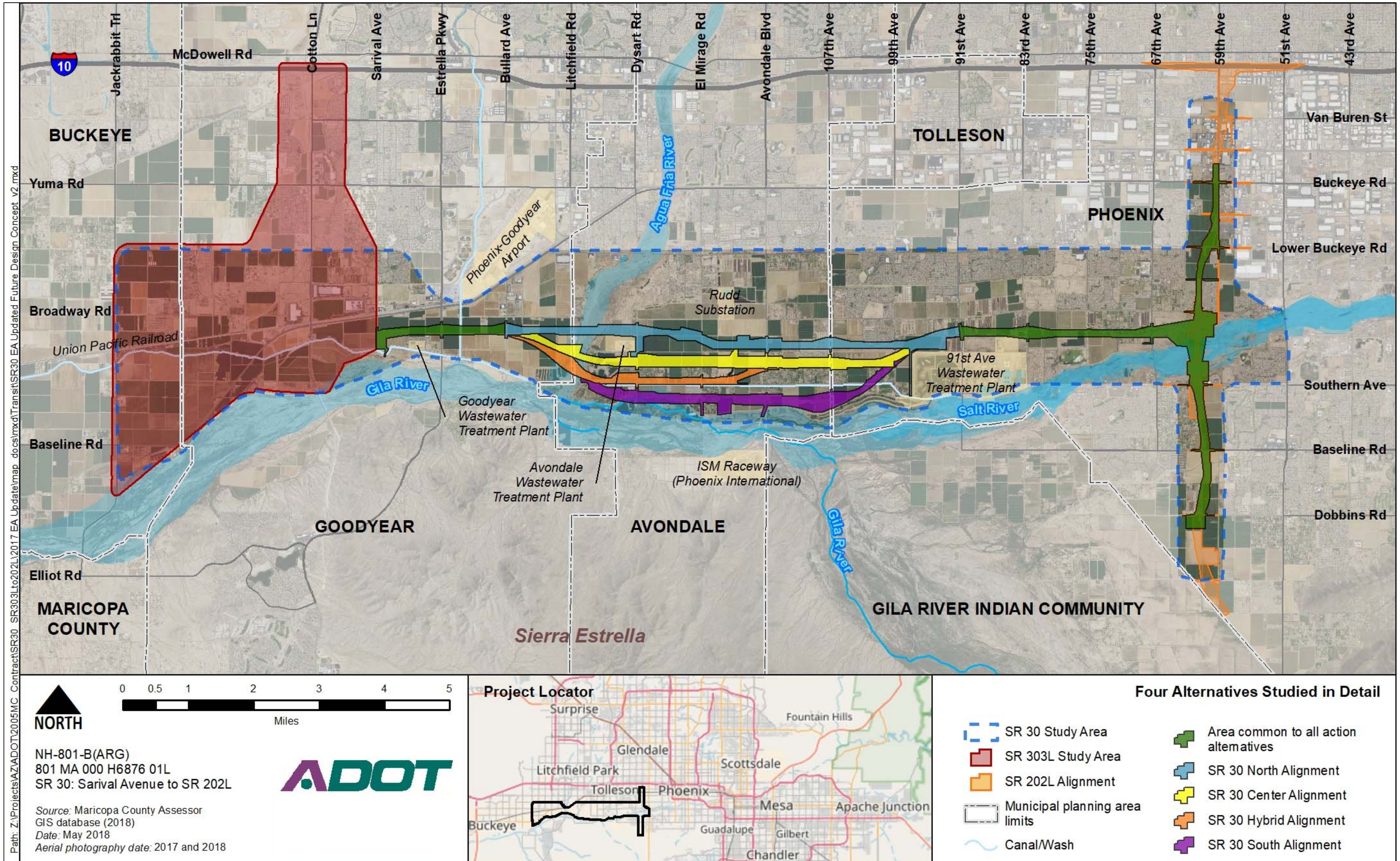
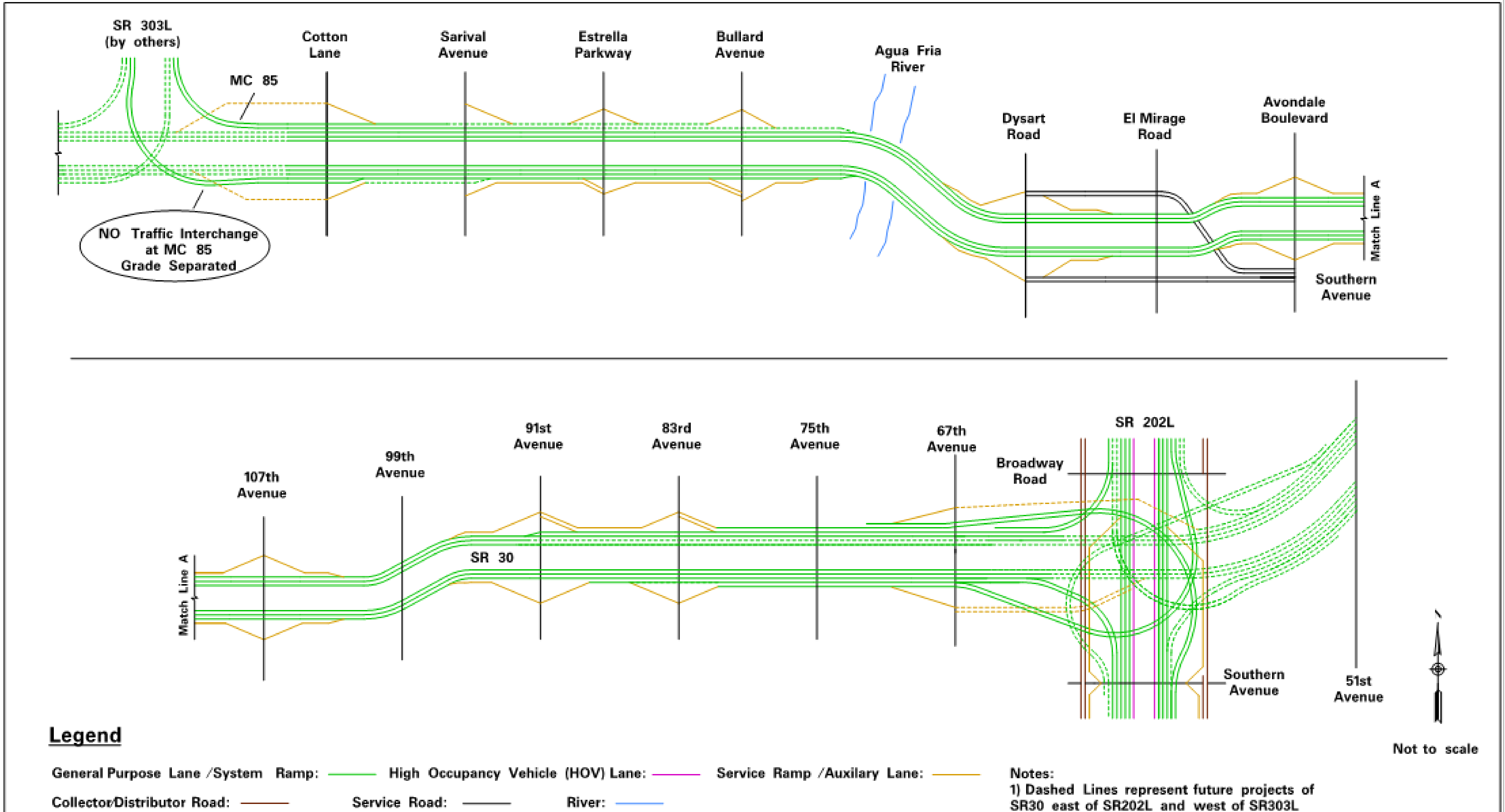


Figure ES-4. Proposed full access and half access interchanges



1.0 Introduction

This Location/Design Concept Report (L/DCR) describes the development and evaluation process for the proposed State Route (SR) 30 (formerly known as both SR 801 and the I-10 Reliever) between SR 303L (Loop 303) on the west and SR 202L (Loop 202, South Mountain Freeway) on the east in Maricopa County, Arizona. This document is supported by four other documents developed during this multiyear study, including the corridor Alternatives Selection Report (ASR), the SR 30/SR 202L Traffic Interchange (TI) Selection Report (ISR), the Environmental Assessment (EA), and the Traffic Report. All four of these reports document the evaluation efforts during the development and screening of the numerous alternatives studied, and selection of the Recommended Build Alternative (RBA) and Recommended Alternative (RA), which led to identification of the Selected Alternative. This proposed new facility will be roughly parallel to, and approximately 5 miles south of, Interstate 10 (I-10).

The Arizona Department of Transportation (ADOT) has followed the EA process for the proposed freeway. The EA process (1) satisfies ADOT's National Environmental Policy Act (NEPA) environmental analysis requirements; (2) compares the social, economic, and environmental impacts that may result from implementation of the proposed action—construction and operation of a major transportation facility; and (3) identifies measures to avoid, reduce, or otherwise mitigate adverse impacts.

This L/DCR has been developed in support of the EA process. It describes the development, evaluation, and recommendations for the alternatives studied.

The study area for the project is located in ADOT's Central Construction and Maintenance Districts in Maricopa County in south central Arizona, west of downtown Phoenix. Project location and project vicinity maps are displayed in Figures ES-1 and ES-2 in the Executive Summary. The study area encompasses portions of the planning areas of the Cities of Phoenix, Avondale, and Goodyear, and of Maricopa County.

The logical termini for the proposed freeway are:

- On the east, SR 202L, currently under construction, will be a major traffic generator serving regional and interstate travel. The SR 30 project would terminate at the system TI connecting SR 30 and SR 202L.
- On the west, the future SR 303L will be a major link serving regional and interstate travel. The SR 30 project would terminate at the system TI connecting SR 30 and SR 303L. The SR 303L, I-10 to SR 30, project documentation (L/DCR and EA) are addressing the actual SR 30/SR 303L interchange. The interface point between the two studies is at Sarival Avenue.

The purpose of this new facility is to help reduce traffic congestion on the existing I-10, which is a heavily traveled interstate linking the cities of Los Angeles and Phoenix. This document identifies several potential freeway corridors in the study area and existing constraints that may affect these potential corridors.

The current *Regional Transportation Plan* (RTP), approved by the Maricopa Association of Governments (MAG) in November 2003, has tracked rapid and sustained growth in Maricopa County over the past four decades, and foresees continued growth over the next two decades. Residential and commercial growth on the fringes of the urbanized area, as well as infill development, is contributing to increased urban density of the entire region.

1.1 Foreword

SR 30 was originally included in MAG transportation planning documents, including the current adopted MAG RTP (MAG 2003). The 2003 RTP is a comprehensive regional, multimodal plan addressing needs for all transportation modes and for planned transportation improvements in the MAG region through fiscal year (FY) 2026.

The voter approved ½-cent sales tax that was established in 1985 was extended in November 2004 to continue funding RTP transportation needs in Maricopa County for an additional 20 years, to 2025. The funds generated by this ½-cent sales tax are administered by MAG as part of the RTP. Some of the funds generated from this sales tax will be used to improve I-10 in the West Valley. However, even with the planned widening and reconstruction projects, I-10 will experience heavy congestion because of the projected rapid growth of the West Valley communities of Avondale, Goodyear, and Buckeye, and the increased traffic flow between Phoenix and Los Angeles. In addition to relieving commuter congestion, SR 30 would provide a route for truck traffic that serves the industrial and warehouse facilities that are between the I-10 and SR 30 freeway corridors. The expected congestion on I-10 necessitates the construction of a parallel reliever route to I-10. To serve this demand, SR 30 would be located approximately 5 miles south, and parallel to, I-10 between the existing SR 85 and Interstate 17 (I-17), along the north side of the Salt and Gila Rivers.

In 2009, MAG and ADOT began the process of making a substantial update to the freeway program of the RTP (the transit and arterial programs were subjected to similar reviews). The update became necessary as declining sales tax revenues caused by the Great Recession that occurred between 2007 and 2009 were combined with rising project costs for the freeway program. The *RTP 2010 Update* (MAG 2010) presents the updated financial situation. The original, 2003 RTP budget (projected revenue) and project cost estimates were balanced at approximately $9.4 billion. Since that time, the cost opinions increased to approximately $16.0 billion, with $2.7 billion obligated or spent through 2009. With declining revenues and softer revenue projections, it was anticipated that only $6.6 billion in additional revenue would be collected through the end of the RTP (2026) to fund the remaining $13.3 billion in projects. That left a program deficit of approximately $6.7 billion.

MAG held meetings throughout 2009 to discuss the options for balancing the freeway program. In developing the recommended scenario, MAG considered numerous options including removing projects, reprioritizing projects, scaling projects back, and deferring projects outside of the funding horizon. The recommended changes were presented at a public hearing on October 13, 2009, and were adopted by the MAG Regional Council later that month. The recommended scenario maintains the core elements and priorities of the RTP and balances the budget by deferring a number of projects to an "unfunded" status outside of the plan's funding horizon. The SR 30 project was one of the projects that was deferred to unfunded status at that time.

By 2016, the RTP freeway program was showing signs of improved health, indicating a surplus of over $1 billion in the program. MAG undertook another rebalancing effort in 2016 and 2017 that refunded some of the 2009 projects that had been shifted to unfunded status. SR 30 between SR 303L and SR 202L was included in this rebalancing to fund the full right-of-way (ROW) acquisition costs and to construct a Phase 1 roadway in the corridor. This Phase 1 roadway would have been an at-grade four-lane arterial-style roadway with at-grade signalized intersections at the major mile crossings. However, the Phase 1 roadway is no longer planned for implementation. At the time of this L/DCR publication, the RTP program has funded the acquisition of the ultimate freeway ROW and the relocation of some long-lead time utilities for the SR 30 corridor; however, construction of the freeway has been deferred several years pending a new corridor funding mechanism beyond 2025.

1.2 Purpose and Need for the Project

Over the past 40 years, Phoenix-area population, housing, and employment experienced some of the fastest growth in the nation. From the early 1950s to the mid-1990s, Maricopa County's population grew by more than 500 percent (see Figure 1-1), while the U.S. population as a whole grew by approximately 70 percent. Rates of population, employment, and housing growth experienced since the 1950s are projected to continue through 2040. Despite stagnant growth during the Great Recession of 2008 to 2009, Maricopa County continues to be one of the most rapidly growing counties in the United States. Between 2000 and 2017, its population increased by 35.5 percent, to 4,164,474 (MAG 2017). Regional growth in population, employment, and housing generates regional mobility needs. Since World War II, the Phoenix metropolitan area has experienced (except for during the recession) steady and, at times, very rapid growth in these socioeconomic indicators. Throughout this growth period, the rate of increase in vehicle miles traveled (VMT) has outpaced the rates of growth of these socioeconomic measures.

MAG projects that Maricopa County population in households will increase by another 42 percent to 5,902,635 between 2017 and 2040. Employment is projected to increase by 40 percent to 2,476,057 between 2017 and 2040. In the SR 30 study area, MAG projects even higher growth rates, with population in households projected to more than double to 96,500 between 2017 and 2040, while employment is projected to more than triple to 27,500.

Most people in the growing work force will continue to commute to jobs outside the study area. Not all residents would be in the work force, but those employed outside the study area would increase travel demand substantially above and beyond that of those currently employed in the agricultural sector or the area's emerging manufacturing and commercial sectors.

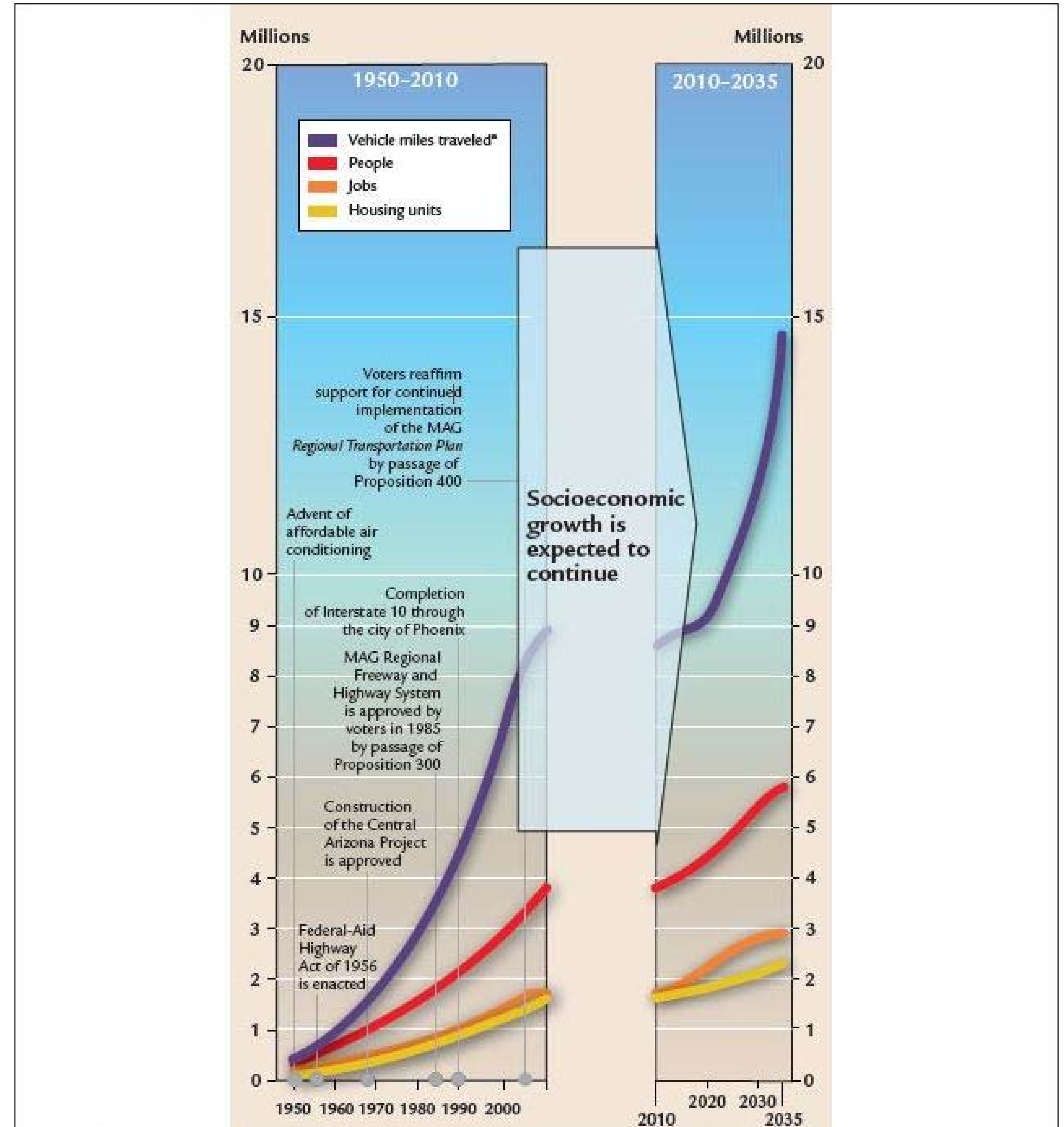
To summarize, rates of population, housing, and employment growth experienced since the 1950s are projected to continue through 2040. As has been the case in the past, VMT are projected to meet or exceed the three socioeconomic trends.

This growth continues to drive the need for public infrastructure (for example, transportation systems). MAG's 1985 *Long-Range Transportation Plan* (LRTP), which included the planned 232-mile Regional Freeway System, was a direct response to the growth occurring in the region (MAG 1985). The multimodal 2003 RTP serves as the "next generation" of the LRTP.

At the beginning of the study process, the need for a reliever freeway in the study area was examined and documented in the *Draft Purpose and Need Report* (December 2006) and the *Traffic Report* (September 2012 with June 2018 Addendum). The evaluation revealed that a major transportation facility is needed; the need is based on:

- Socioeconomic factors
  - Population, housing, and employment in the study area are projected to increase by between 100 and 200 percent between 2017 and 2040, increasing travel demand.
  - Growth in VMT is projected to meet or exceed the growth of these socioeconomic factors and to further burden the already overtaxed regional transportation system.
- Transportation capacity
  - The 2017 road network can serve approximately 60 percent of the total 2017 demand while operating at level of service (LOS) D.
  - Even with planned RTP improvements, the 2040 road network would be able to serve only 70 percent of the total demand while operating at LOS D.

Figure 1-1. Historical and projected growth



[a] vehicle miles traveled reduced to one-tenth of their actual values to facilitate comparison of growth rates on the same axis

Sources: US Census 1950-2010, MAG 2013a and 2013b, extrapolated analysis

- Transportation demand
    - Between 2017 and 2040, total daily VMT in the entire MAG region is projected to increase from 102 million to 158 million. Daily VMT in the study area is projected to grow at a similar rate as the MAG region.
    - Average daily traffic (ADT) volumes on freeways and arterial streets is projected to increase substantially in and adjacent to the study area between 2017 and 2040.
    - Without a new major transportation facility in the study area, the volume of traffic on local arterial streets would increase at a greater rate than would the volume on freeways. Therefore, a desired outcome of the RTP—to redistribute traffic appropriately based on travel needs—would not be achieved in the study area and its immediate surroundings without this project.
- Quality of traffic operations
    - During the morning and evening commutes in 2018, the region's freeways were noticeably congested and operated poorly.
    - Even with the RTP-planned improvements, congestion conditions in 2040 will be substantially worse than in 2018, but will be far worse without SR 30.
    - The increased travel demand on the arterial streets will result in major congestion, with almost all major signalized intersections operating at LOS E or F.

Considering the above factors, the proposed action is a needed element of the transportation network in the MAG region.

The purpose of providing an additional east-to-west transportation facility south of I-10 is to enable the regional freeway system to function as planned and, by so doing, to relieve congestion that future inter- and intraregional traffic would experience on arterial streets and shift that traffic to the more efficient regional freeway system. Efficient use of the regional freeway system as designed by transportation professionals for the whole MAG region depends on implementing SR 202L (the South Mountain Freeway) and addressing the capacity deficiency for east-to-west travel demand west of this section of SR 202L that cannot be accommodated in 2035 and beyond by relying on a sole linkage to what will be an increasingly congested I-10. The higher goals of the proposed action are to efficiently meet subregional and regional mobility needs and study area accessibility needs, and provide the linkages that will optimize the RTP infrastructure already in place and that envisioned, and approved, by voters. Creating a new transportation facility that can provide the added capacity would complement land use plans and growth objectives of regional and local governments.

1.3 Description of the Project

This segment of the proposed SR 30 would begin at its western terminus with the system TI between the future SR 303L and the proposed SR 30. From this point, SR 30 would travel in an easterly direction for approximately 12.8 miles (from Sarival Avenue to SR 202L) before reaching its eastern terminus at a system TI with SR 202L.

The proposed ultimate roadway typical section would accommodate a barrier divided, 10-lane (4+1) section with 12-foot-wide travel lanes and 12-foot-wide shoulders. Entrance and exit ramps would be designed using a parallel-type configuration coupled with auxiliary lanes between TIs approximately 1 mile apart. The entire section would be paved with Portland cement concrete pavement (PCCP) and overlaid with asphalt rubber friction course. Detailed typical sections can be viewed in Appendix A, and the plans are in Appendix B.

Because funding is limited, it is possible that this corridor would be built in phases, similar to other corridors in the Valley such as SR 303L. Figure 6-1 in Chapter 6.0 depicts one possible example of these construction phases. However, it must be noted that program funding does and will change to accommodate budgetary constraints and available funding sources, and this would likely affect how this corridor's construction would be phased.

At the time of this publication, the RTP has fully funded the ROW acquisition for the full freeway. Also in the approved RTP, but currently unfunded, would be the initial phase of the full freeway construction. This phase would construct the outermost six lanes (three in each direction, or 3+0), auxiliary lanes, and the outside shoulder of the ultimate typical section. An interim 8-foot-wide asphaltic concrete inside shoulder would also be included. The interim median would be a 50-foot-wide open-graded median with cable barriers.

At the time of this L/DCR publication, the RTP program has funded the acquisition of the ultimate freeway ROW and the relocation of some long-lead time utilities for the SR 30 corridor; however, construction of the freeway has been deferred several years pending a new corridor funding mechanism beyond 2025.

The initial 3+0 freeway construction roadway typical section would accommodate a future (unfunded) widening project that would fill in the open median with one additional general purpose lane and one high-occupancy vehicle (HOV) lane in each direction (bringing it to a 4+1 section). A concrete median barrier would separate the directions of travel. The freeway would cross over the existing major crossroads, leaving the arterial streets at grade.

It is expected that even in a 4+1 configuration, SR 30 would fill up with traffic by or before 2040. To accommodate this excess demand, a 50-foot future transit corridor is also being planned in the SR 30 corridor. This corridor would predominantly be along, and inside, the SR 30 south ROW line, but would have to transition into the median of SR 30 as it passes through the system interchanges at SR 303L and SR 202L. While the transit technology or modes to be applied in this corridor are not defined in this study, the transit corridor has been established to accommodate all known transit modes, including intercity high speed rail, to keep future options open. This future transit construction is not currently in the RTP.

Each arterial crossroad was evaluated on a case-by-case basis to determine the need for an interchange. Figure ES-4 in the Executive Summary shows the locations of the proposed full access and half access interchanges along the freeway. Diamond-type interchanges, as depicted in the ADOT *Roadway Design Guide* (RDG) Figure 502.1, were developed at all locations because they are common in the area, are cost-effective, and provide adequate LOS for the projected traffic conditions.

The freeway main line would mostly feature an "at-grade" profile, with the freeway crossing over the crossroads. Because of the elevated profile at the crossroads, overhead power line relocations would be required at some locations.

SR 30 would bridge over all of the major mile arterials and the water crossings in the corridor, including the Agua Fria River, Bullard Wash, and irrigation canals/ditches. In addition, additional bridges would be required for roadway and Salt River crossings at the SR 30/SR 202L system TI.

Off-site drainage would be collected and conveyed by a channel located on the north side of the freeway alignment. Detention basins would be integrated into the drainage channel design. Drainage outfalls to the Salt, Gila, and Agua Fria Rivers would be coordinated with the Flood Control District of Maricopa County (FCDMC) (and the Cities, as applicable) to be consistent with the District's watercourse master plans and area drainage master plans.

1.4 Characteristics of the Corridor

The SR 30 study area encompasses approximately 25,600 acres and is located in southwest Maricopa County. The study area crosses the cities of Goodyear, Avondale, and Phoenix, and unincorporated Maricopa County. The existing land use is predominantly agricultural, which includes dairy operations, and vacant, with some residential and commercial properties (including sand and gravel operations) interspersed. Specific land uses were identified by site characteristics through aerial imagery, field verification, and zoning data. Undeveloped land parcels are scattered throughout the study area. Many of the larger vacant parcels have residential subdivisions planned and/or platted. Table 1-1 summarizes the existing land use (in acres) of the study area, by jurisdiction.

Table 1-1. Existing land use (2018)

	Goodyear		Avondale		Phoenix		Study Area	
Existing land use	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Agricultural	4,622	66	3,138	47	4,192	35	11,952	47
Commercial	10	<1	14	<1	591	5	615	2
Industrial	400	6	447	7	579	5	1,426	5
Open space/Water	326	5	1,206	18	960	8	2,492	10
Public/Quasi-public	58	1	109	2	1,029	9	1,196	5
Residential (single family)	757	11	1,371	20	3,572	30	5,700	22
Vacant	853	12	456	7	899	8	2,208	9
Total	**7,026**	**100**	**6,741**	**100**	**11,822**	**100**	**25,589**	**100**

Several land uses encompassing large areas in the study area are worth noting:

- Three wastewater treatment plants (WWTPs) are in the study area—the Avondale WWTP, the Goodyear WWTP, and Phoenix's 91st Avenue WWTP. All three plants have expansion plans, and the boundaries used for this study reflect the maximum growth boundary for each site.
- Associated with the 91st Avenue WWTP is the Tres Rios wetlands project adjacent to and in the Gila and Salt Rivers.
- Numerous high-voltage overhead transmission power line corridors exist in the study area. Arizona Public Service (APS), Salt River Project (SRP), Tucson Electric Power (TEP), and the Western Area Power Administration (WAPA) own transmission facilities ranging from 69 to 500 kilovolts (kV).
- The Rudd Power Substation is located at El Mirage Road and Broadway Road.
- The Union Pacific Railroad (UPRR) cuts diagonally across the west end of the study area. Numerous sensitive utilities were found inside the UPRR ROW, including fiber optic lines and petroleum pipelines.
- The Phoenix-Goodyear Airport is located just north of the study area near Estrella Parkway. Airspace issues under the runway flight path near Estrella Parkway will need to be coordinated through the project development process.
- The Agua Fria River bisects the study area between Litchfield Road and Dysart Road.
- Several sand and gravel operations are located along the north bank of the Gila River and along both sides of the Agua Fria River.
- Several dairies operate along Broadway Road, but are slowly being relocated out of the study area as development displaces the dairy and agricultural land uses.
- The Lakin Cattle Company owns a large tract of land in the central portion of the study area in Avondale. This property is currently being planned as a large, master-planned development.
- ISM Raceway (formerly known as the Phoenix International Raceway, or PIR) is located just outside the study area on the south side of the Gila River at Avondale Boulevard (115th Avenue). While not technically in the study area, ISM Raceway is important because it draws a high volume of traffic through the study area during major events several times a year.
- North-to-south traffic on arterial streets throughout the study area is somewhat limited because few crossings exist at the Salt and Gila Rivers, which make up the study area's southern boundary. Currently, bridge crossings are located at 51st Avenue, Avondale Boulevard, Bullard Avenue, Estrella Parkway, and Cotton Lane. Low-flow crossings exist at 67th Avenue, 91st Avenue, and El Mirage Road.
- East-to-west traffic on arterial streets throughout the study area is constrained by the Agua Fria River, the UPRR tracks, and the Phoenix-Goodyear Airport. Buckeye Road (Maricopa County [MC] 85) is the only bridge crossing over the Agua Fria River, and Lower Buckeye Road is the only low-flow crossing.
- The Buckeye Water Conservation and Drainage District (BWCDD), SRP, and the St. Johns Irrigation District have irrigation facilities that cross the study area.
- Bullard Wash, a regional flood control facility, crosses the study area from north-to-south about 0.25 mile east of Estrella Parkway.
- APS owns a 104- to 114-inch-diameter reclaimed water pipeline that begins at the 91st Avenue WWTP and ends at the Palo Verde Nuclear Generating Station (PVNGS). This pipeline roughly follows the Roeser Road alignment from the WWTP until it intersects with the Buckeye Canal. At that point, the pipeline parallels the northern edge of the canal to the PVNGS. It is worth noting that this is the only pipeline that carries cooling water to the PVNGS.

Future land use of the study area was determined by reviewing MAG's future land use database and the general plans of the municipalities in the study area (Table 1-2). The MAG database considers both types and densities of developments that are anticipated to occur.

Table 1-2. Anticipated future land use for 2040

Land use	Approximate number of acres	Percentage of study area
Commercial	938	3
Industrial	4,167	15
Mixed use	1,606	7
Open space/Water	3,014	11
Public/Quasi-Public	1,271	4
Residential	14,593	60
Total:	**25,589**	**100.0**

A comparison of Tables 1-1 and 1-2 shows that a major change in land use is anticipated in the study area over the next 20+ years. Approximately 60 percent of the future land use is projected to be residential, as opposed to 22 percent of the current land use. Perhaps the most notable change will occur in the agricultural land use category. Currently, approximately 47 percent of the study area consists of agricultural land. In the future, the agricultural component is expected to virtually disappear as the land is developed for other uses. The study area contains

53 planned developments covering approximately 11,000 acres. These projects are in various stages of development, from planning to active construction.

It is anticipated that north-to-south traffic patterns on arterial streets throughout the study area will change over time as local jurisdictions enhance the roadway network by replacing the existing low-flow crossings of the Gila and Salt Rivers with bridge crossings. Some possible locations where this could occur are at 67th Avenue, 75th Avenue, El Mirage Road, and Dysart Road. A Salt River bridge crossing at 91st Avenue could also occur, but would be dependent on the Gila River Indian Community. It is also likely that existing bridge crossings could be widened to enhance capacity. Estrella Parkway and Avondale Boulevard are examples of where such a widening might occur.

In addition, east-to-west traffic patterns on arterial streets throughout the study area could also be enhanced over time by the local jurisdictions by replacing the existing low-flow crossing of the Agua Fria River at Lower Buckeye Road with a bridge crossing. In addition, a new Agua Fria River crossing could be added on the Broadway Road alignment. It is also likely that the existing bridge crossing at Buckeye Road (MC 85) could be widened to enhance capacity. Also worth noting is Maricopa County's plan to transform MC 85 into an "intelligent" high-capacity corridor. A corridor study for MC 85 by the Maricopa County Department of Transportation documents this concept.

All of the WWTPs in the study area have expansion plans to keep up with growth in the area. These facilities are considered critical and unmovable. As a result, the SR 30 study collected the build-out expansion boundaries from the three WWTP owners and used these boundaries as fixed constraints for the development of SR 30 alternatives. Active expansion plans are ongoing with the Goodyear WWTP and coordination has been ongoing between the SR 30 study team and Goodyear to make that expansion compatible with the SR 30 corridor.

Two significant regional flood control facilities are planned in the study area. West of the Agua Fria River, the White Tanks/SR 303L Area Drainage Master Plan (ADMP) includes a SR 303L outfall channel that runs north-to-south along the west edge of Cotton Lane, ultimately discharging into the Gila River. As of the writing of this document, this project's construction was recently completed. East of the Agua Fria River, the Durango ADMP calls for the construction of the Durango Regional Conveyance Channel (DRCC) and two detention basins. A Sunland Channel is also planned that would connect into the DRCC. Based on the Selected Alternative, only the Sunland Channel would be altered by SR 30. The scopes of the DRCC and Sunland Channel projects are currently being reevaluated by FCDMC and the City of Avondale, so continued coordination will be necessary to keep these flood control projects compatible with the proposed SR 30 improvements.

With the disappearance of agricultural land from the study area over time, the existing irrigation delivery systems serving this land would become obsolete. However, because of State of Arizona water rights laws, most of these systems would have to remain intact even though they may not serve a future function. In addition, some irrigation facilities may be considered historic and would, therefore, have to be preserved. This issue will need to be addressed in more detail and on a case-by-case basis as the proposed project is designed.

Sand and gravel operations are currently located along the banks of the rivers in the study area and new facilities are planned in two areas. The first facility is located in the area surrounding the confluence of the Gila and Agua Fria Rivers. The second facility is located in the area along the Salt River between 83rd Avenue and 43rd Avenue. If affected, these businesses could represent considerable cost and technical challenges, such as additional environmental mitigation/cleanup, drainage obstructions, 100+-foot-deep holes in the freeway corridor, and excessive settlement resulting from uncompacted backfills placed by the operators.

The Phoenix-Goodyear Airport has published a draft master plan document that calls for expanding the airport with a second, parallel, runway. Additionally, UPRR is currently evaluating adding a second track in its railway corridor that crosses the study area. In addition, MAG considered a commuter rail system that would use these tracks. The activities of each of these entities are not anticipated to have a material effect on the proposed SR 30.

Early in the study process, a study area was delineated to define the scope of the analysis. This study area, which was defined primarily through observation, is shown in Figure ES-3 in the Executive Summary. Because the proposed SR 30 freeway is meant to parallel the existing I-10 facility, it was decided that the two facilities should be separated by at least 3 miles in order for SR 30 to effectively supplement I-10 operations and vice versa. Consequently, the northern boundary of the study area was set at Lower Buckeye Road. The exception to this northern boundary occurs at the Phoenix-Goodyear Airport, where the northern boundary of the study area matches the southern limits of the airport in order to avoid affecting the airport.

The southern boundary was defined as the northern banks of the Gila and Salt Rivers, approximately 2 to 2.5 miles south of the northern boundary. The western boundary was initially set at the expected location of the SR 30/SR 303L system TI, but after coordinating with the SR 303L study team, has been pulled back to Sarival Avenue to ensure no overlap in project limits between the two studies. The eastern boundary was to be located at the SR 30/SR 202L interchange. While the study area was being defined, five locations were being considered for SR 202L. Consequently, the eastern boundary was set at 51st Avenue to encompass the easternmost SR 202L alignment.

Once the study area was defined and agreed to by ADOT and the local jurisdictions, a baseline environmental analysis and major infrastructure search was conducted in the study area. The findings were plotted on a map that illustrated major obstacles the freeway would have to avoid and/or overcome. Items included:

- potential historical sites, features, and districts
- hazardous material sites
- known and potential Section 4(f) sites
- areas with a higher percentage of low-income and higher percentage of minority populations
- existing and planned Phoenix-Goodyear Airport protected airspace
- WWTP sites with future expansion boundaries
- electrical substations
- existing and planned major utilities, such as high-voltage overhead power lines, large-diameter or significant pipelines, and significant fiber optic facilities
- existing and planned flood control features
- significant existing quasi-public and private irrigation facilities
- floodway and floodplain delineations for the Gila, Salt, and Agua Fria Rivers

Once these elements were mapped, 1,000-foot corridors were developed to avoid or minimize the impacts on these features. These original 1,000-foot corridors are discussed in Chapter 3.0. Later, these corridors were modified as the study evolved and additional constraints or route opportunities were discovered.

1.5 Agency and Public Scoping and Involvement

The SR 30, SR 303L to SR 202L, study began in the summer of 2005. Over the course of the last 14 years, the study team has had regular involvement with the agencies involved in the corridor, including the Federal Highway Administration (FHWA), MAG, the Cities, the County, utilities, and regulatory agencies, as applicable, during the study process. This agency coordination effort was kicked off with an agency scoping meeting in September 2005. Furthermore, monthly progress meetings were held during periods of the 14-year study duration when the study was active. FHWA, MAG, the Cities, and the County have been involved in these meetings and the meeting documentation distribution for constant coordination. Additionally, numerous one-on-one meetings with these agencies occurred to address and resolve specific issues as the study progressed.

Likewise, the public outreach effort began with a public scoping meeting in September 2005 to discuss the study objectives and to share the study area. This effort was followed up with a public information meeting in March 2006, where broad corridors were defined for the next level of analysis. In November 2006, a newsletter was mailed to every property owner in the study area to share with them that the study corridors had been expanded slightly in a few areas. In March 2007, another public information meeting was held to share the results of the corridor analysis and that the list of corridors had been narrowed to just two—the North and the South Alternatives.

However, between 2008 and 2011, the SR 30 study went on hold because of the lack of funding for the project, triggered in large part by the Great Recession. MAG rebalanced the RTP and placed SR 30 into unfunded status. Between 2011 and 2014, after the study had been restarted, two new alternatives (the Center and the Hybrid) had been defined in addition to the North and the South Alternatives that had been presented during the March 2007 public meeting. Because of the additional corridors, and the time that had elapsed since the last public information meeting, another public information meeting was held in January 2015 to share all four alternatives.

After reviewing the corridor evaluation information and considering the public and agency feedback received during the January 2015 meeting, ADOT, FHWA, and MAG agreed to select the Hybrid Alternative as the RBA in August 2017. In November 2017, the last public information meeting was held to present this decision to the public. While attendance at the events prior to November 2017 was relatively small, attendance at the November 2017 was substantial, with 300 to 400 in attendance.

The RBA was the sole Build Alternative being considered after the November 2017 meeting, and was evaluated against the No-Build Alternative in this document and the EA. After careful consideration of the feedback received and the results of the detailed analysis, ADOT selected the RBA as the RA. The RA was presented in the Draft EA and the Initial L/DCR and was offered for public review during a comment period surrounding the final public hearing, held on May 11, 2019, at the La Joya Community High School in Avondale. The RA has been chosen as the Selected Alternative, to be carried forward for final design and construction.

2.0 Traffic and Crash Data

This chapter presents the abstract traffic operational analysis of the SR 30 RBA, which consists of the main line and service and system TIs. The detailed travel demand and traffic operational analysis of the SR 30 freeway corridor was presented in the technical document *State Route (SR 30), SR 303L to SR 202L, Traffic Report Addendum* (May 2018), which is a precursor to this L/DCR. The RBA later became the RA, which was presented to the public at a hearing held in May 2019, and the RA was identified as the Selected Alternative. This chapter discusses the RBA because it was the build alternative under consideration during the traffic analysis.

Because SR 30 does not exist today, a no-build traffic analysis was not performed for the corridor, but the Traffic Report does include network measures (cut-line analysis, etc.) of the no-build condition versus the build condition for reference.

2.1 SR 30 Recommended Build Alternative

The RBA is the Hybrid Alternative identified in the *State Route (SR 30), SR 303L to SR 202L Final Traffic Report* (April 2013). The RBA was selected by ADOT, FHWA, and MAG in August 2017. The proposed freeway would run east-to-west, parallel to and south of, I-10, for about 12.8 miles (from Sarival Avenue to SR 202L). The western terminus of the SR 30 freeway would be located at the proposed SR 303L, near Citrus Road. The eastern terminus would be located at the proposed SR 202L, near 51st Avenue. For this project, the SR 30 terminus on the west has been moved east from its original western terminus at MC 85, at Jackrabbit Trail, to Sarival Avenue. The eastern terminus remains the same, at 51st Avenue in the area of SR 202L. The study area is in ADOT's Central Construction and Maintenance District. The RBA closely follows the half-mile section between Broadway Road and Southern Avenue between Avondale Boulevard and 91st Avenue. It deviates southward at Avondale Boulevard following the Southern Avenue alignment between Dysart Road and Avondale Boulevard. Figure 2-1 shows the SR 30 project location and vicinity.

The proposed SR 30 freeway would initially be a six-lane facility with a 50-foot-wide median with cable barrier. This median would accommodate another general purpose lane and one HOV lane in each direction in the future. When built out, it would have 12-foot-wide lanes with 12-foot-wide shoulders on both sides and a median concrete barrier. The service TIs would be located at a minimum of 1-mile spacing, along with 12-foot-wide auxiliary lanes where warranted. The freeway would cross over the existing major crossroads, leaving the arterial streets at grade.

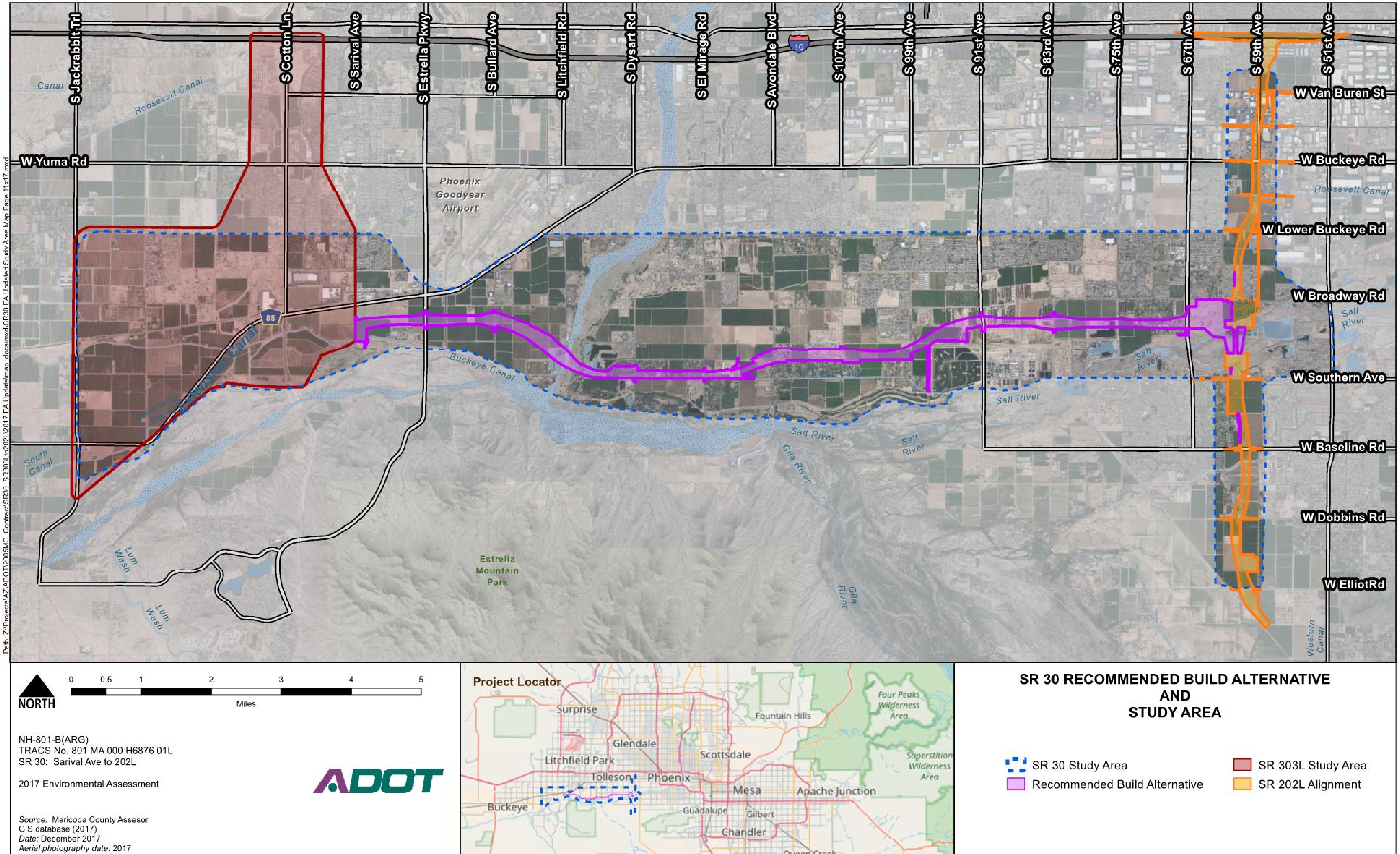
2.1.1 SR 30 Service Traffic Interchanges

Ten service TIs are proposed for the RBA. These interchanges were assumed to be full compact diamond interchange (CDI) types with the exception of Sarival and 67th Avenues, where a half-CDI type interchange was evaluated. From west to east, the TI locations are: Cotton Lane, Sarival Avenue, Estrella Parkway, Bullard Avenue, Dysart Road, Avondale Boulevard, 107th Avenue, 91st Avenue, 83rd Avenue, and 67th Avenue.

2.1.2 SR 30 and SR 202L System Traffic Interchange

The proposed system TI between SR 30 and SR 202L is located in Phoenix between Broadway Road and Southern Avenue, along the proposed SR 202L over the Salt River. The proposed SR 30 freeway would connect to the proposed SR 202L as a three-legged system TI (north, south, and west legs) during initial construction. An eastern leg is planned as SR 30 extends east in the future and is accommodated into the TI design. The October 2017 MAG conformity model runs for 2035 opening year and 2040 design year traffic projections include the eastern leg for accurate traffic routing and projections (refer to the *SR 801/SR 202L Interchange Selection Report* and Addendum for more information on this configuration).

Figure 2-1. SR 30 Recommended Build Alternative



2.2 Crash Analysis

Since SR 30 is a proposed project, there are no crashes to analyze.

2.3 Traffic Analysis

2.3.1 Development of Traffic Volumes

The travel demand models for the SR 30 freeway corridor study were provided by MAG based on 2025, 2035, and 2040 socioeconomic data, the RBA alignment, and planned roadway network improvements during that period. The October 2017 MAG conformity model runs were used for the traffic analysis. The 2035 travel demand models formed the basis for an opening year traffic analysis, while the 2040 travel demand model was used to provide an understanding of how travel demand would change beyond 2035.

It is assumed that the proposed SR 30 freeway would open to traffic around 2035. Freeway and signalized intersection traffic analysis methodologies as described in the Transportation Research Board's *Highway Capacity Manual* (HCM) (2010) were used to evaluate the operational performance of the proposed SR 30 freeway and the system and service TIs along SR 30.

2.3.2 Main Line Highway Capacity Software Analysis

The freeway traffic operational analysis, as described in the HCM, introduces the LOS concept. It is a letter grading system, from A to F, which defines the traffic operations in a qualitative manner based on traffic flow and other roadway characteristics. LOS A depicts free-flow conditions with little or no delay and with free-flow speeds, while LOS F represents the worst condition, with unacceptable congestion, long queues, and delays. LOS A, B, and C are considered to be acceptable and free-flow speeds are maintained. Congestion becomes more noticeable at LOS D, with reduced speeds and freedom to maneuver. Most agencies aim for LOS D to balance mobility and economics. LOS E occurs when demand has reached the capacity of the facility and maneuverability within the traffic stream is extremely limited. Figure 2-2 illustrates the LOS A to F concept based on flow condition.

The freeway main line operational analysis, based on HCM methodology, splits the freeway into three segments:

- Weaving segment: Weaving segments are formed when an auxiliary lane is used to connect adjacent on- and off-ramps spaced less than 1.5 miles apart. A lane change is required for all the traffic that is either joining or leaving the freeway main line.
- Ramp junction: The ramp junction (or merge and diverge) analysis is used in locations where a ramp enters or exits a freeway main line and is not coupled with a weaving area.
- Basic freeway segment: The basic freeway segments are all other segments that are outside of the weaving or ramp junction influence areas. This generally occurs between the successive off- and on-ramps. The basic freeway segment analysis is also used to analyze the body of the system TI ramps.

Table 2-1 presents the HCM LOS criteria for freeway segments based on the lane density ranges for each. The freeway operations analysis—which includes basic segments, weaving segments, and exit and entry ramps—is performed using the Highway Capacity Software (HCS+ version 5.4), which uses the methodology defined in the HCM.

Figure 2-2. Level of service


Level of Service A


Level of Service B


Level of Service C


Level of Service D


Level of Service E


Level of Service F

Table 2-1. *Highway Capacity Manual* level of service criteria for freeway segments

Level of service	Density range (passenger car/mile/lane)		
	Freeway segment type		
	Basic	Weaving	Merge and diverge
A	≤11	≤10	≤10
B	11–18	10–20	10–20
C	18–26	20–28	20–28
D	26–35	28–35	28–35
E	35–45	35–43	>35
F	>45	>43	Demand exceeds capacity

Source: Transportation Research Board, *Highway Capacity Manual*, 2010

2.4 SR 30 Freeway Main Line Analysis

The freeway main line analysis evaluated the traffic operational performance of the freeway and ramp junctions based on the proposed lane configuration and projected traffic volumes. The main line analysis was conducted using HCS+ Version 6.1, using methodologies from the 2010 HCM, as described in Section 2.3.2. Because HCS provides localized analysis, it should be noted that poor operations at a downstream segment can affect the operations at an upstream segment (resulting from the shockwave effect), and these are not addressed with the HCS analysis.

Figure 2-3 presents the general main line configuration of the SR 30 freeway RBA.

Figures 2-4 and 2-5 show the 2035 morning (AM) and evening (PM) peak hour HCS analysis results for the RBA. Tables 2-2 and 2-3 summarize the 2035 HCS results for each labeled segment.

2.4.1 2035 Morning Peak Hour

SR 30 eastbound represents the morning peak hour direction. Important observations from the freeway main line analysis are:

- Under 2035 traffic conditions, the HCS analysis shows that four eastbound freeway segments would operate at LOS C or better, three segments would operate at LOS D, four segments would operate at LOS E, and 15 segments would operate at LOS F.
- The westbound SR 30 RBA would operate at LOS C or better under 2035 traffic conditions.

2.4.2 2035 Evening Peak Hour

In the westbound direction with 2035 PM peak hour traffic conditions, the HCS analysis shows that seven segments of the SR 30 RBA would operate at LOS C or better. Seven segments would operate at LOS D, and six segments would operate at LOS E. Seven segments are forecast to have LOS F operations.

2.4.3 2040 Morning Peak Hour

- Two freeway segments would operate at LOS C or better; four segments would operate at LOS D.
- Four freeway segments would operate at LOS E; 16 segments would operate at LOS F.

2.4.4 2040 Evening Peak Hour

In the westbound direction with 2040 PM peak hour traffic conditions, five segments of the SR 30 RBA would operate at LOS C or better. Five segments would operate at LOS D, and two segments would operate at LOS E. Fourteen segments are forecast to have LOS F operations.

Figures 2-6 and 2-7 show the 2040 AM and PM peak hour HCS analysis results for the RBA. Tables 2-4 and 2-5 summarize the 2040 HCS results for each labeled segment.

Detailed information of the main line analysis was provided in the *Final Traffic Report Addendum* (May 2018).

Figure 2-3. SR 30 initial construction

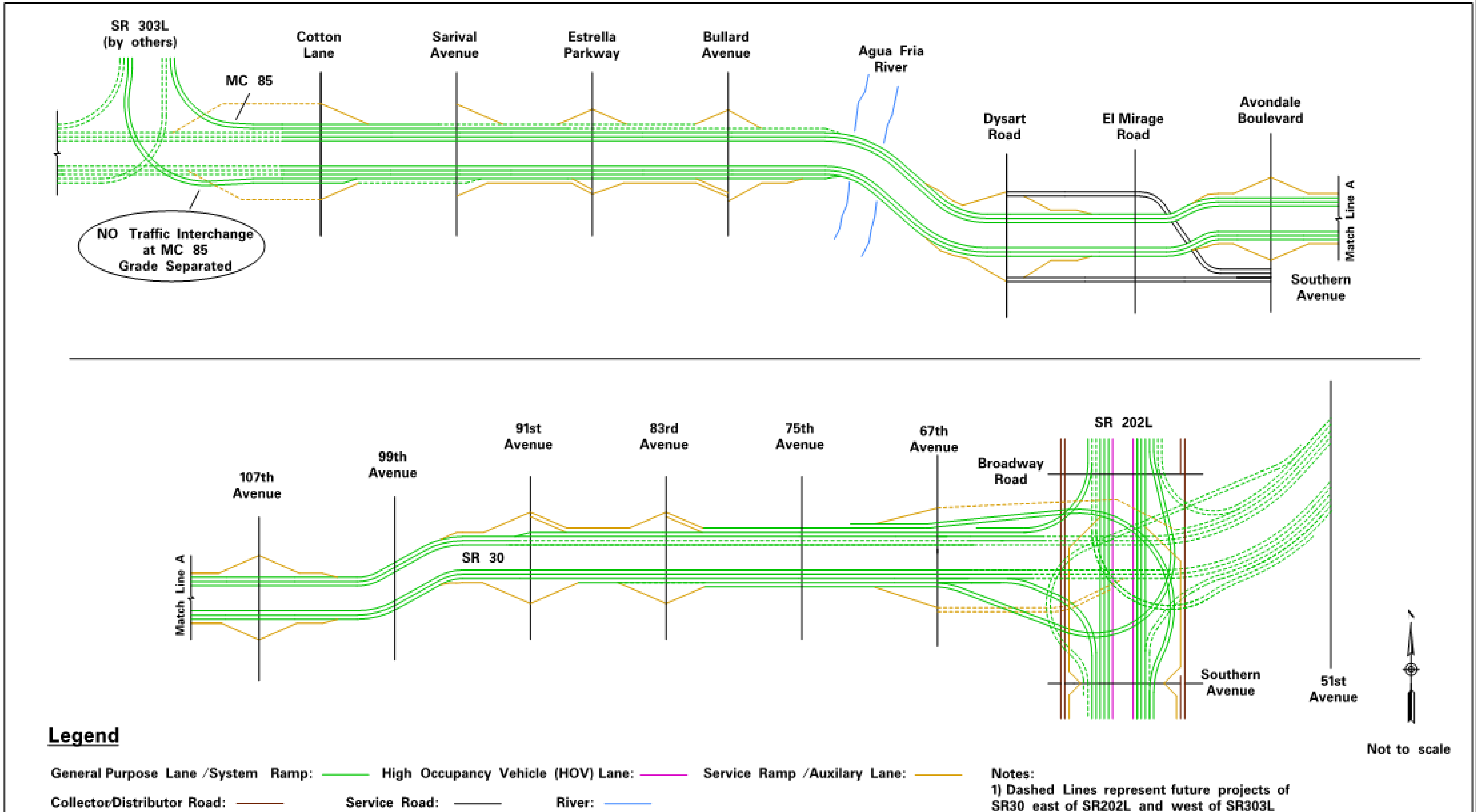


Figure 2-4. SR 30 Recommended Build Alternative AM peak hour HCS level of service (2035)

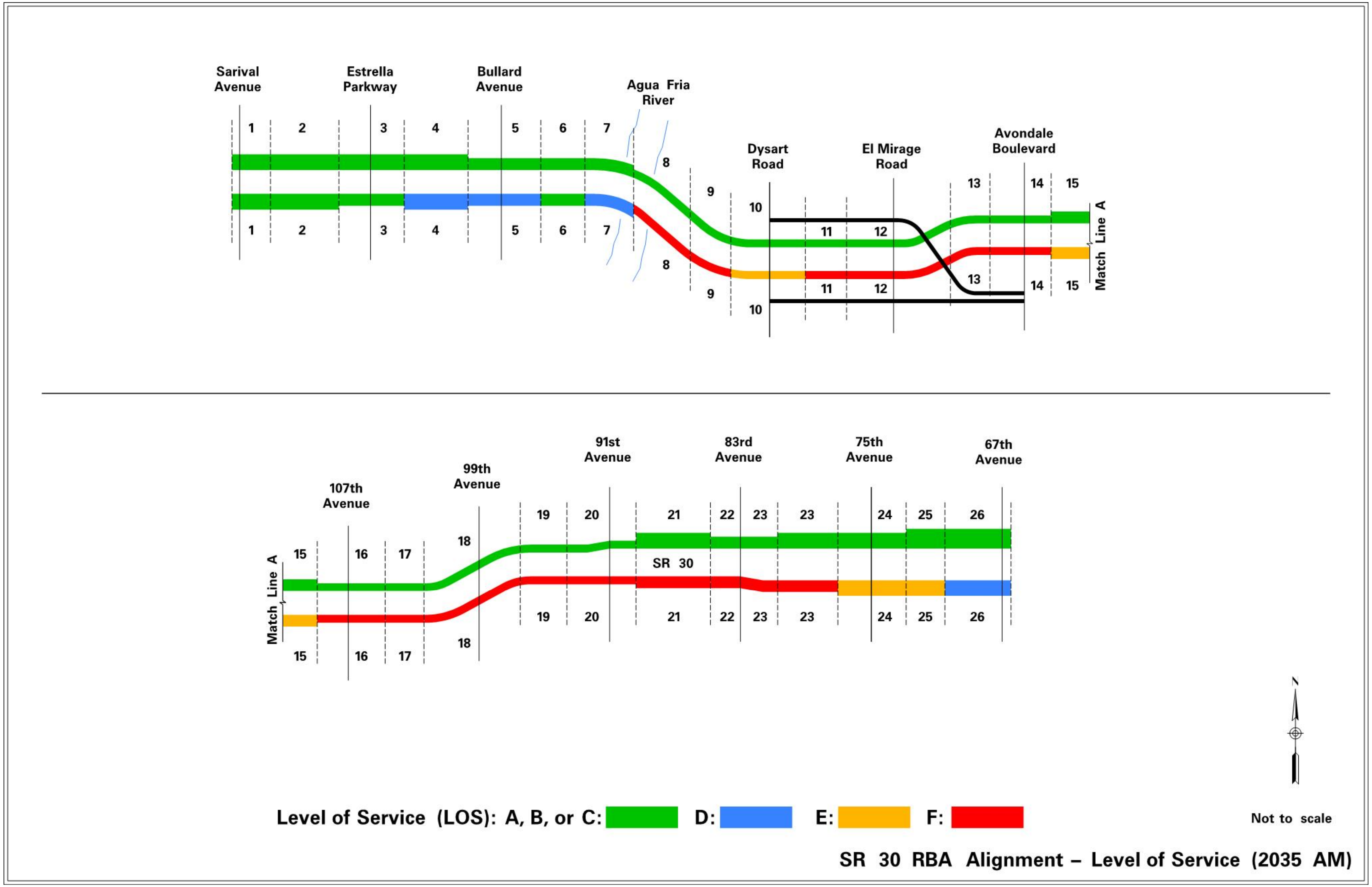


Figure 2-5. SR 30 Recommended Build Alternative PM peak hour HCS level of service (2035)

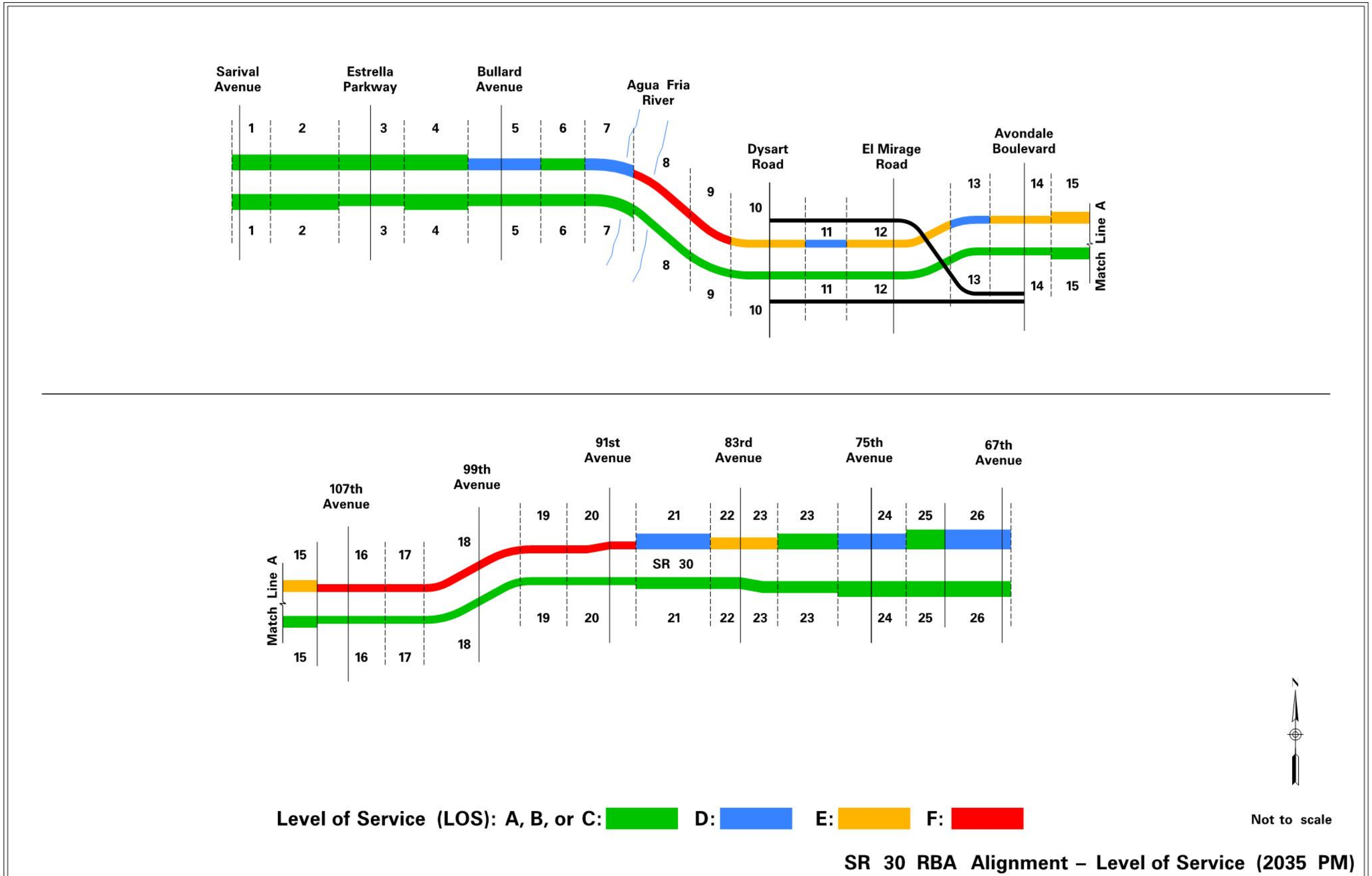


Table 2-2. SR 30 Recommended Build Alternative main line HCS analysis, eastbound direction (2035)

Section ID	Section	Freeway segment type	Time period	HCS LOS	Number of lanes	Main line volume	Weaving lanes	Peak hour volume	On ramp volume	Off ramp volume	Volume FF	Volume RF	Volume FR	Volume RR	Weave length
1	Main Line: At Sarival Avenue	Basic	AM	B	5	5,025									
			PM	A		2,025									
2	Between Estrella Parkway and Sarival Avenue	Weave	AM	C	5	5,675	5	5,675	650	50	4,975	650	50	0	2,200
			PM	A		2,400		2,400	400	100	1,900	400	100	0	
3	Main Line: At Estrella Parkway	Basic	AM	C	4	5,650									
			PM	A		2,300									
4	Between Bullard Avenue and Estrella Parkway	Weave	AM	D	5	6,625	5	6,625	1,000	400	5,225	1,000	400	0	2,100
			PM	B		3,050		3,050	750	100	2,200	750	100	0	
5	Main Line: At Bullard Avenue	Basic	AM	D	4	6,250									
			PM	B		2,950									
6	On Ramp: Bullard Avenue	Merge	AM	C	4	6,250			400						
			PM	A		2,950			50						
7	Main Line: West of Agua Fria River	Basic	AM	D	4	6,625									
			PM	B		2,975									
8	Main Line: East of Agua Fria River	Basic	AM	F	3	6,625									
			PM	B		2,975									
9	Off Ramp: Dysart Road	Diverge	AM	F	3	6,625				350					
			PM	B		2,975				75					
10	Main Line: At Dysart Road	Basic	AM	E	3	6,300									
			PM	B		2,925									
11	On Ramp: Dysart Road	Merge	AM	F	3	6,300			200						
			PM	B		2,925			200						
12	Main Line: El Mirage Road	Basic	AM	F	3	6,475									
			PM	B		3,125									
13	Off ramp: Avondale Boulevard	Diverge	AM	F	3	6,475				25					
			PM	B		3,125				75					
14	Main Line: At Avondale Boulevard	Basic	AM	F	3	6,475									
			PM	B		3,050									
15	Between 107th Avenue and Avondale Boulevard	Weave	AM	E	4	7,425	4	7,425	975	75	6,375	975	75	0	1,620
			PM	B		3,525		3,525	500	150	2,875	500	150	0	
a16	Main Line: At 107th Avenue	Basic	AM	F	3	7,350									
			PM	C		3,375									
17	On Ramp: 107th Avenue	Merge	AM	F	3	7,350			625						
			PM	B		3,375			300						
18	Main Line: At 99th Avenue	Basic	AM	F	3	7,950									
			PM	C		3,675									
19	Off Ramp: 91st Avenue	Diverge	AM	F	3	7,950				275					
			PM	C		3,675				175					
20	Main Line: At 91st Avenue	Basic	AM	F	3	7,700									
			PM	C		3,525									
21	Between 83rd Avenue and 91st Avenue	Weave	AM	F	4	8,650	4	8,650	975	125	7,550	975	125	0	2,055
			PM	B		4,100		4,100	600	125	3,375	600	125	0	
22	Main Line: At 83rd Avenue	Basic	AM	F	4	8,525									
			PM	B		4,000									
23	On Ramp: At 83rd Avenue	Merge	AM	F	4	8,525			900						
			PM	B		4,000			475						
24	Main Line: At 75th Avenue	Basic	AM	E	5	9,425									
			PM	B		4,450									
25	Off Ramp: At 67th Avenue	Diverge	AM	E	5	9,425				825					
			PM	C		4,450				500					
26	Main Line: West of 67th Avenue	Basic	AM	D	5	8,625									
			PM	B		3,950									

Table 2-3. SR 30 Recommended Build Alternative main line HCS analysis, westbound direction (2035)

Section ID	Section	Freeway segment type	Time period	HCS LOS	Number of lanes	Main line volume	Weaving lanes	Peak hour volume	On ramp volume	Off ramp volume	Volume FF	Volume RF	Volume FR	Volume RR	Weave length
1	Main Line: At Sarival Avenue	Basic	AM	A	5	825									
			PM	B		4,825									
2	Between Estrella Parkway and Sarival Avenue	Weave	AM	A	5	1,200	5	1,200	75	375	750	75	375	0	2,225
			PM	C		5,600		5,600	50	775	4,775	50	775	0	
3	Main Line: At Estrella Parkway	Basic	AM	A	5	1,125									
			PM	C		5,550									
4	Between Bullard Avenue and Estrella Parkway	Weave	AM	A	5	1,650	5	1,650	100	525	1,025	100	525	0	2,085
			PM	C		6,475		6,475	450	925	5,100	450	925	0	
5	Main Line: At Bullard Avenue	Basic	AM	A	4	1,550									
			PM	D		6,025									
6	Off Ramp: Bullard Avenue	Diverge	AM	A	4	1,575				25					
			PM	C		6,450				425					
7	Main Line: West of Agua Fria River	Basic	AM	A	4	1,575									
			PM	D		6,450									
8	Main Line: East of Agua Fria River	Basic	AM	A	3	1,575									
			PM	F		6,450									
9	On Ramp: Dysart Road	Merge	AM	A	3	1,550			50						
			PM	F		6,075			400						
10	Main Line: At Dysart Road	Basic	AM	A	3	1,550									
			PM	E		6,075									
11	Off Ramp: Dysart Road	Diverge	AM	A	3	1,700				150					
			PM	D		6,325				275					
12	Main Line: El Mirage Road	Basic	AM	A	3	1,700									
			PM	E		6,325									
13	On ramp: Avondale Boulevard	Merge	AM	A	3	1,625			75						
			PM	D		6,300			50						
14	Main Line: At Avondale Boulevard	Basic	AM	A	3	1,625									
			PM	E		6,300									
15	Between 107th Avenue and Avondale Boulevard	Weave	AM	A	4	1,975	4	1,975	150	375	1,450	150	375	0	1,675
			PM	E		7,200		7,200	100	900	6,200	100	900	0	
16	Main Line: At 107th Avenue	Basic	AM	A	3	1,850									
			PM	F		7,100									
17	Off Ramp: 107th Avenue	Diverge	AM	B	3	2,025				200					
			PM	F		7,600				500					
18	Main Line: At 99th Avenue	Basic	AM	B	3	2,025									
			PM	F		7,600									
19	On Ramp: 91st Avenue	Merge	AM	A	3	1,925			125						
			PM	F		7,350			250						
20	Main Line: West of 91st Avenue	Basic	AM	A	3	1,925									
			PM	F		7,350									
21	Between 83rd Avenue and 91st Avenue	Weave	AM	A	5	2,375	5	2,325	75	475	1,775	75	475	0	2,220
			PM	D		8,400		8,400	175	1,050	7,175	175	1,050	0	
22	Main Line: At 83rd Avenue	Basic	AM	A	4	2,325									
			PM	E		8,225									
23	Off Ramp: 83rd Avenue	Major Diverge	AM	A	5	2,625				325					
			PM	B		8,900				675					
24	Main Line: At 75th Avenue	Basic	AM	A	5	2,625									
			PM	D		8,900									
25	On Ramp: At 67th Avenue	Merge	AM	A	6	2,350			275						
			PM	C		8,225			675						
26	Main Line: West of 67th Avenue	Basic	AM	A	6	2,350									
			PM	D		8,225									

Figure 2-6. SR 30 Recommended Build Alternative AM peak hour HCS level of service (2040)

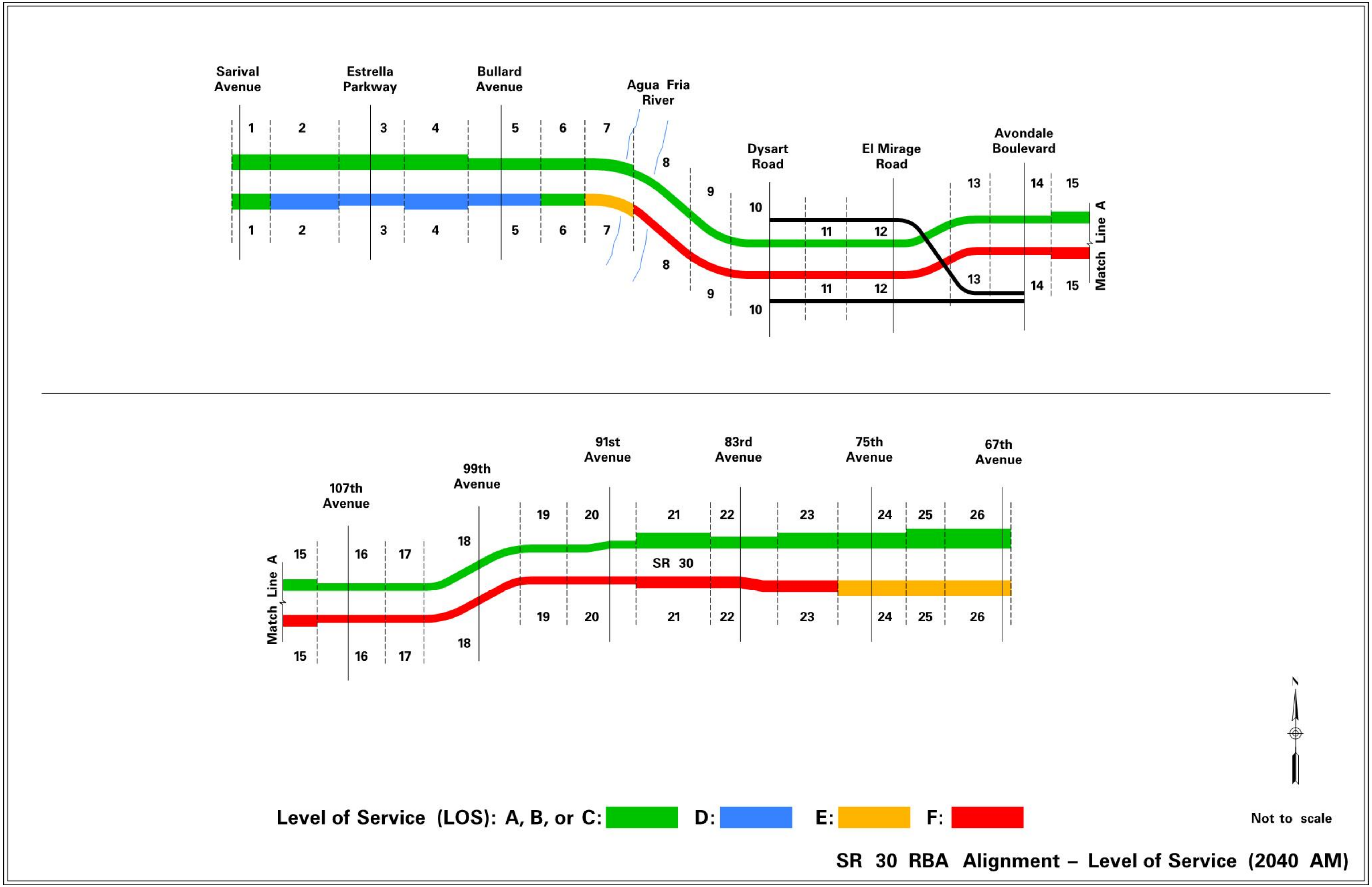


Figure 2-7. SR 30 Recommended Build Alternative PM peak hour HCS level of service (2040)

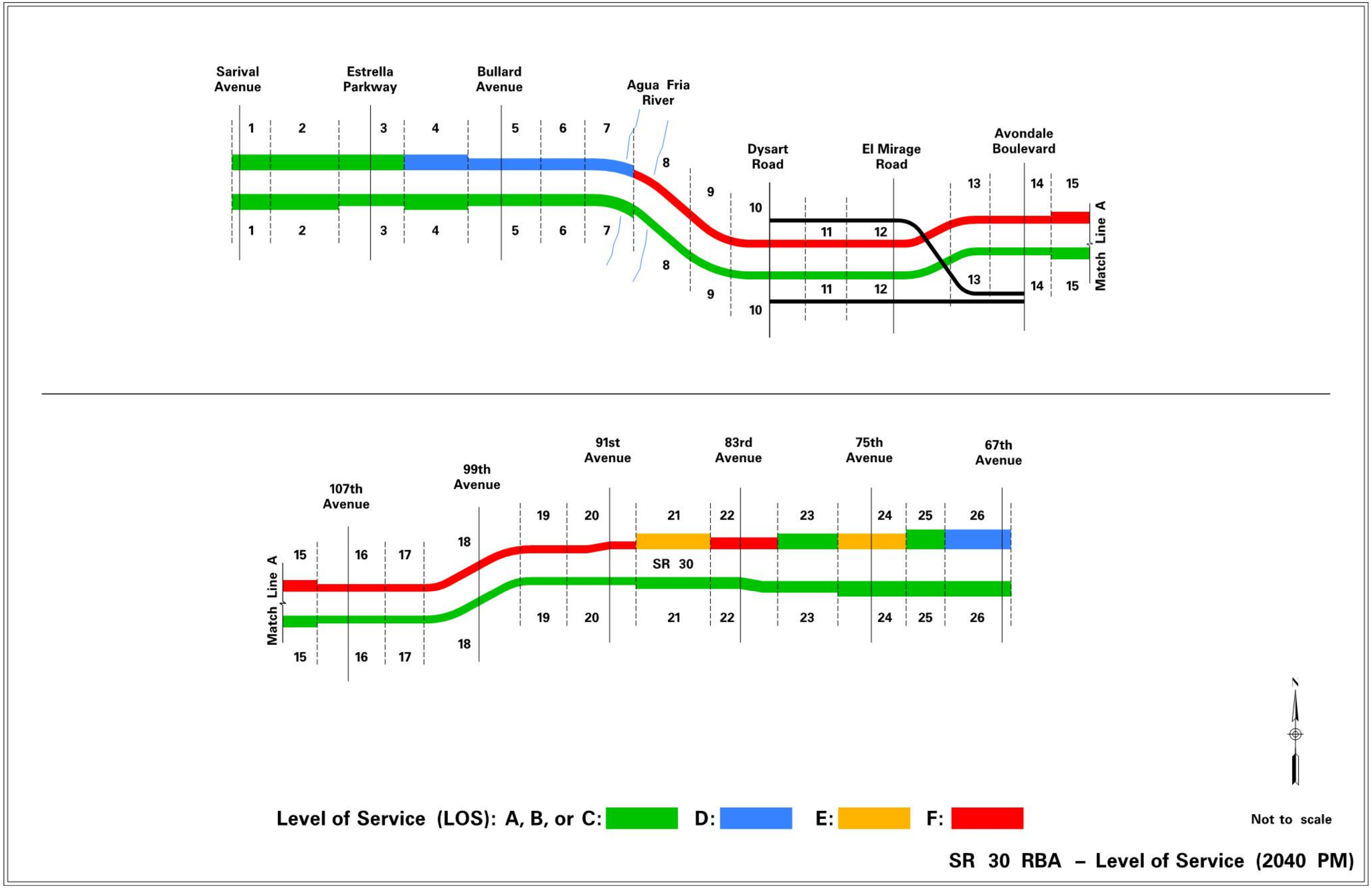


Table 2-4. SR 30 Recommended Build Alternative main line analysis, eastbound direction (2040)

Section ID	Section	Freeway segment type	Time period	HCS LOS	Number of lanes	Main line volume	Weaving lanes	Peak hour volume	On ramp volume	Off ramp volume	Volume FF	Volume RF	Volume FR	Volume RR	Weave length
1	Main Line: At Sarival Avenue	Basic	AM	C	5	6,375									
			PM	A		2,400									
2	Between Estrella Parkway and Sarival Avenue	Weave	AM	D	5	7,050	5	7,050	700	50	6,300	700	50	0	2,200
			PM	B		2,875		2,875	500	125	2,250	500	125	0	
3	Main Line: At Estrella Parkway	Basic	AM	D	4	7,025									
			PM	B		2,750									
4	Between Bullard Avenue and Estrella Parkway	Weave	AM	D	5	7,900	5	7,900	900	650	6,350	900	650	0	2,100
			PM	B		3,550		3,550	800	150	2,600	800	150	0	
5	Main Line: At Bullard Avenue	Basic	AM	D	4	7,275									
			PM	B		3,400									
6	On Ramp: Bullard Avenue	Merge	AM	C	4	7,275			375						
			PM	B		3,400			125						
7	Main Line: West of Agua Fria River	Basic	AM	E	4	7,625									
			PM	B		3,500									
8	Main Line: East of Agua Fria River	Basic	AM	F	3	7,625									
			PM	C		3,500									
9	Off Ramp: Dysart Road	Diverge	AM	F	3	7,625				550					
			PM	C		3,500				100					
10	Main Line: At Dysart Road	Basic	AM	F	3	7,075									
			PM	C		3,425									
11	On Ramp: Dysart Road	Merge	AM	F	3	7,075			300						
			PM	B		3,425			220						
12	Main Line: El Mirage Road	Basic	AM	F	3	7,375									
			PM	C		3,625									
13	Off ramp: Avondale Boulevard	Diverge	AM	F	3	7,375				25					
			PM	C		3,625				75					
14	Main Line: At Avondale Boulevard	Basic	AM	F	3	7,350									
			PM	C		3,550									
15	Between 107th Avenue and Avondale Boulevard	Weave	AM	F	4	8,400	4	8,400	1,075	75	7,250	1,075	75	0	1,620
			PM	C		4,125		4,125	575	200	3,350	575	200	0	
16	Main Line: At 107th Avenue	Basic	AM	F	3	8,350									
			PM	C		3,950									
17	On Ramp: 107th Avenue	Merge	AM	F	3	8,350			700						
			PM	C		3,950			325						
18	Main Line: At 99th Avenue	Basic	AM	F	3	9,050									
			PM	C		4,250									
19	Off Ramp: 91st Avenue	Diverge	AM	F	3	9,050				425					
			PM	C		4,250				200					
20	Main Line: At 91st Avenue	Basic	AM	F	3	8,650									
			PM	C		4,075									
21	Between 83rd Avenue and 91st Avenue	Weave	AM	F	4	9,650	4	9,650	1,025	50	8,575	1,025	50	0	2,055
			PM	C		4,625		4,625	575	125	3,925	575	125	0	
22	Main Line: At 83rd Avenue	Basic	AM	F	4	9,625									
			PM	C		4,525									
23	On Ramp: At 83rd Avenue	Merge	AM	F	4	9,625			1,000						
			PM	B		4,525			475						
24	Main Line: At 75th Avenue	Basic	AM	E	5	10,625									
			PM	B		4,975									
25	Off Ramp: At 67th Avenue	Diverge	AM	E	5	10,625				825					
			PM	C		4,975				525					
26	Main Line: West of 67th Avenue	Basic	AM	E	5	9,800									
			PM	B		4,475									

Table 2-5. SR 30 Recommended Build Alternative main line analysis, westbound direction (2040)

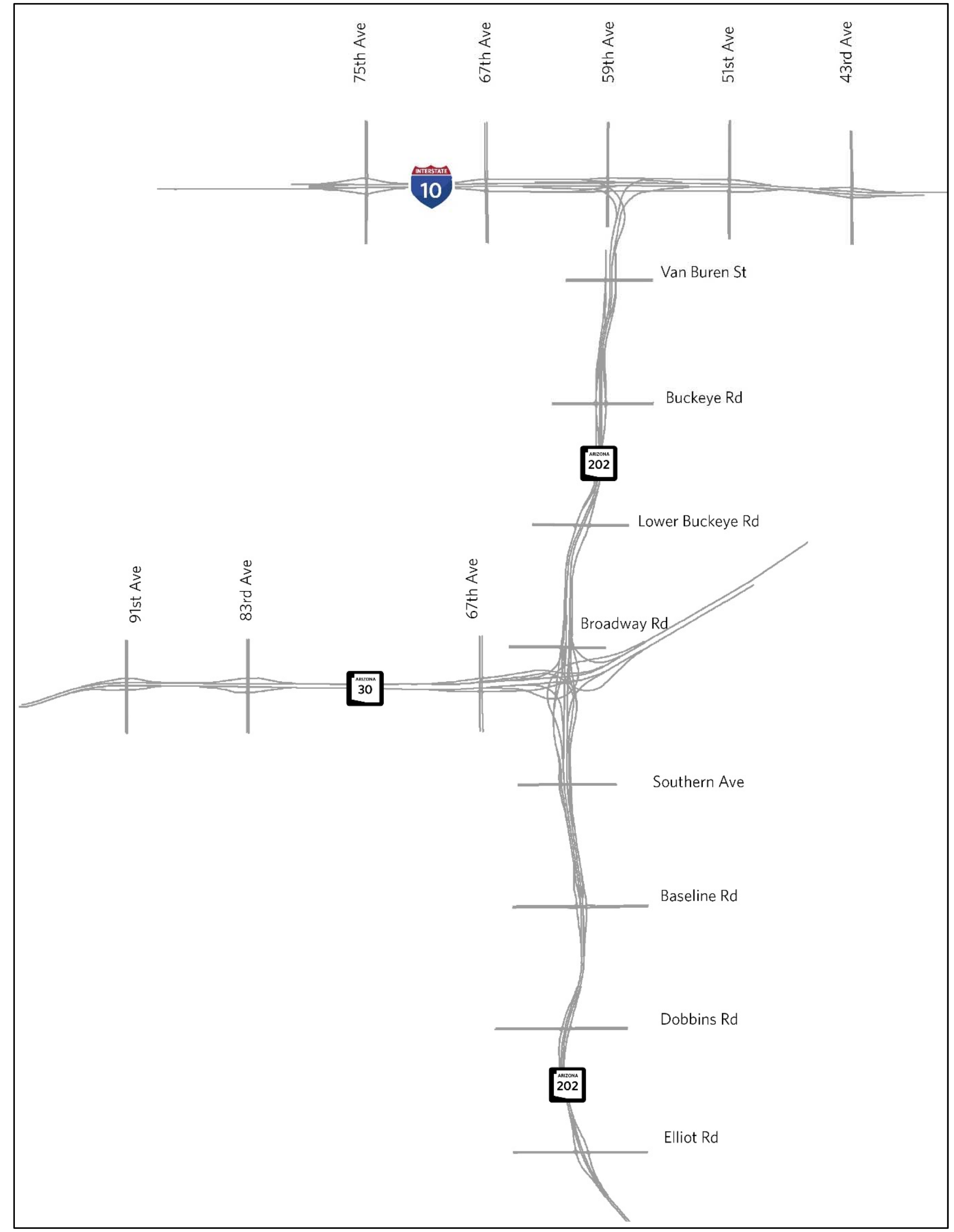
Section ID	Section	Freeway segment type	Time period	HCS LOS	Number of lanes	Main line volume	Weaving lanes	Peak hour volume	On ramp volume	Off ramp volume	Volume FF	Volume RF	Volume FR	Volume RR	Weave length
1	Main Line: At Sarival Avenue	Basic	AM	A	5	1,200									
			PM	C		6,050									
2	Between Estrella Parkway and Sarival Avenue	Weave	AM	A	5	1,550	5	1,550	100	375	1,075	100	375	0	2,225
			PM	C		6,825		6,825	75	800	5,950	75	800	0	
3	Main Line: At Estrella Parkway	Basic	AM	A	5	1,450									
			PM	C		6,775									
4	Between Bullard Avenue and Estrella Parkway	Weave	AM	A	5	2,050	5	2,050	125	600	1,325	125	600	0	2,085
			PM	D		7,625		7,625	650	875	6,100	650	875	0	
5	Main Line: At Bullard Avenue	Basic	AM	A	4	1,950									
			PM	D		7,000									
6	Off Ramp: Bullard Avenue	Diverge	AM	A	4	1,975				50					
			PM	D		7,300				300					
7	Main Line: West of Agua Fria River	Basic	AM	A	4	1,975									
			PM	D		7,300									
8	Main Line: East of Agua Fria River	Basic	AM	B	3	1,975									
			PM	F		7,300									
9	On Ramp: Dysart Road	Merge	AM	A	3	1,900			75						
			PM	F		6,775			525						
10	Main Line: At Dysart Road	Basic	AM	A	3	1,900									
			PM	F		6,775									
11	Off Ramp: Dysart Road	Diverge	AM	B	3	2,050				175					
			PM	F		7,125				350					
12	Main Line: El Mirage Road	Basic	AM	B	3	2,050									
			PM	F		7,125									
13	On ramp: Avondale Boulevard	Merge	AM	A	3	1,975			75						
			PM	F		7,100			25						
14	Main Line: At Avondale Boulevard	Basic	AM	B	3	1,975									
			PM	F		7,100									
15	Between 107th Avenue and Avondale Boulevard	Weave	AM	B	4	2,400	4	2,400	175	425	1,800	175	425	0	1,675
			PM	F		8,075		8,075	100	975	7,000	100	975	0	
16	Main Line: At 107th Avenue	Basic	AM	B	3	2,225									
			PM	F		7,975									
17	Off Ramp: 107th Avenue	Diverge	AM	B	3	2,425				200					
			PM	F		8,575				625					
18	Main Line: At 99th Avenue	Basic	AM	B	3	2,425									
			PM	F		8,575									
19	On Ramp: 91st Avenue	Merge	AM	B	3	2,300			125						
			PM	F		8,225			375						
20	Main Line: West of 91st Avenue	Basic	AM	B	3	2,300									
			PM	F		8,225									
21	Between 83rd Avenue and 91st Avenue	Weave	AM	A	5	2,750	5	2,750	75	450	2,225	75	450	0	2,220
			PM	E		9,325		9,325	100	1,125	8,100	100	1,125	0	
22	Main Line: At 83rd Avenue	Basic	AM	B	4	2,675									
			PM	F		9,225									
23	Off Ramp: 83rd Avenue	Major Diverge	AM	A	5	3,000				325					
			PM	B		10,025				800					
24	Main Line: At 75th Avenue	Basic	AM	A	5	3,000									
			PM	E		10,025									
25	On Ramp: At 67th Avenue	Merge	AM	A	6	2,675			325						
			PM	C		9,225			800						
26	Main Line: West of 67th Avenue	Basic	AM	A	6	2,675									
			PM	D		9,225									

2.5 SR 30/SR 202L System Traffic Interchange Analyses

This section discusses the traffic operational analysis at the SR 30 and SR 202L system TI conducted using traffic micro simulation analysis. VISSIM micro simulation software version 9.00-11, developed by PTV AG, was used to analyze the traffic operations in opening year 2035 and future 2040 for the system TI RBA. Figure 2-8 shows the study area modeled in VISSIM. Notable observations from the micro simulation analysis conducted for the AM and PM peak hour periods include:

- The overall projected operations on SR 30 and SR 202L near the SR 30/SR 202L system TI are acceptable, with LOS D or better for the opening year 2035 and future year 2040 AM peak hour periods. SR 30 eastbound west of 83rd Avenue, however, is operating at LOS F. The over-capacity conditions west of 83rd Avenue create a bottleneck that reduces the volume of traffic able to reach SR 202L.
- The overall projected operations on SR 30 and SR 202L near the SR 30/SR 202L system TI are failing, with LOS F for the opening year 2035 and future year 2040 PM peak hour periods. Westbound SR 30 breaks down between the SR 202L system TI and 83rd Avenue, causing congestion and queue spillback that extends to the east and south of the system TI. By the second hour of the simulation, northbound SR 202L is operating at LOS F from SR 30 to south of Elliot Road. This congestion is the result of over-capacity conditions west of 83rd Avenue.
- Congested conditions are observed on I-10 in the eastbound direction in the AM peak hour period, with LOS F for the opening year 2035 and future year 2040 scenarios. I-10 eastbound is operating at LOS E or better west of the system TI during the PM peak hour period, but congestion on northbound SR 202L in the PM peak hour period creates a bottleneck that reduces the volume of traffic able to reach I-10.
- In general, the operational performance near the SR 30/SR 202L system TI is better in the AM peak hour period than in the PM peak hour period, but the over-capacity conditions on eastbound SR 30 west of 83rd Avenue in the AM peak hour period limit the amount of traffic that is able to reach the system TI.

Figure 2-8. SR 30/SR 202L system traffic interchange – VISSIM model study area network



2.6 SR 30 Service Traffic Interchange Analysis

The service TI analysis was performed using the Synchro simulation analysis package (Version 9.1, Build Series 909, Revision 20) developed by Trafficware, Inc. Synchro is a widely used traffic analysis tool that evaluates intersection delays and congestion based on procedures similar to those described in the 2010 HCM. It is often used for localized intersection analyses, signal coordination, and traffic study work. It was used to evaluate the ramp intersection performance. Major adjacent street intersections were included in the Synchro network to account for the effect of queues spilling back to the ramp terminal intersections.

Basic inputs to Synchro include traffic volumes, lane geometry, signal control, and signal timing and phasing. Synchro was used to optimize the signal cycle length and phasing during the analysis.

HCM evaluates the LOS of individual lane groups and of the entire signalized intersection based on the control delay. It states that:

> Control delay is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base condition.
>
> Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group.

Table 2-6 presents the HCM LOS grade and associated range of intersection control delay for signalized and unsignalized intersections.

Table 2-6. *Highway Capacity Manual* level of service criteria for signalized and unsignalized intersections

Level of service	Average control delay (seconds per vehicle)	
	Signalized	Unsignalized
A	≤10	≤10
B	10–20	10–15
C	20–35	15–25
D	35–55	25–35
E	55–80	35–50
F	>80	>50

Source: Transportation Research Board, *Highway Capacity Manual*, 2010

The service TI lane configuration, geometry, and type for the SR 30 RBA are based on the *State Route (SR 30), SR 303L to SR 202L Final Traffic Report* (April 2013), and with signal timing optimized for the RBA 2035 and 2040 traffic forecasts. The Cotton Lane interchange was not analyzed in this update.

Ten service TIs are proposed for the RBA. These interchanges were assumed to be full CDI types with the exception of Sarival and 67th Avenues, where a half-CDI type interchange was evaluated. From west to east, the TI locations are: Sarival Avenue, Estrella Parkway, Bullard Avenue, Dysart Road, Avondale Boulevard, 107th Avenue, 91st Avenue, 83rd Avenue, and 67th Avenue.

2.6.1 Synchro Analysis Results

The SR 30 corridor is envisioned to be open to the public around 2035. The arterial lane configurations and traffic forecasts used in this report may change as Cities update their general plans and MAG updates its population and employment growth projections. This analysis should be reevaluated during the final design phase of the project based on updated travel forecasts. Detailed information of the Synchro analysis was provided in *State Route (SR 30), SR 303L to SR 202L Final Traffic Report Addendum* (May 2018). The LOS results from the Synchro analysis for the RBA service TIs are presented in Table 2-7. All of the service TIs would operate at an acceptable LOS D or better.

Table 2-7. SR 30 Recommended Build Alternative AM and PM peak hour Synchro analysis level of service (2035 and 2040)

Arterial street	Signal	LOS			
		SR 30 RBA 2035		SR 30 RBA 2040	
		AM peak hour	PM peak hour	AM peak hour	PM peak hour
Sarival Avenue[a]	North	A	B	A	B
	South	A	A	A	A
Estrella Parkway	North	B	B	B	B
	South	B	B	B	C
Bullard Avenue	North	B	B	B	C
	South	B	C	B	C
Dysart Road	North	B	B	B	C
	South	C	C	C	C
Avondale Boulevard	North	B	B	B	B
	South	B	B	B	B
107th Avenue	North	A	B	A	B
	South	A	A	A	B
91st Avenue	North	B	C	B	C
	South	C	C	B	B
83rd Avenue	North	B	C	B	C
	South	B	B	B	B
67th Avenue	North	B	C	B	C
	South	B	B	B	C

[a] stop controlled intersection

2.6.2 Turning Movement Storage Length

This analysis used the minimum storage lengths proposed in the *State Route (SR 30), SR 303L to SR 202L Final Traffic Report* (April 2013) for the crossroad and ramp turning lanes. These proposed minimum storage lengths are presented in Table 2-8.

Table 2-8. Turn lane minimum storage lengths (feet)

Turn lane	Sarival Avenue	Estrella Parkway	Bullard Avenue	Dysart Road	El Mirage Road	Avondale Boulevard	107th Avenue	91st Avenue	83rd Avenue	67th Avenue
North intersection										
Eastbound left	300	300	300	300	300	300	300	300	300	300
Eastbound right	250	250	250	250	250	250	250	250	250	250
Westbound left	350	300	300	300	300	350	350	350	350	300
Westbound right	250	350	350	250	250	350	250	350	250	250
Northbound left	300	300	450	300	300	300	450	300	300	300
Northbound right	250	250	250	250	250	250	250	250	250	250
Southbound left	300	300	300	300	300	300	300	300	300	300
Southbound right	250	250	250	250	250	250	250	250	250	250
South intersection										
Eastbound left	300	350	300	300	300	300	300	350	350	350
Eastbound right	250	350	350	250	250	350	350	350	250	250
Westbound left	300	300	300	300	300	300	300	300	300	300
Westbound right	250	250	250	250	250	250	250	250	250	250
Northbound left	300	300	300	300	300	300	300	300	300	300
Northbound right	250	250	250	250	250	250	250	250	250	250
Southbound left	300	300	300	300	300	300	300	300	300	300
Southbound right	250	250	250	250	250	250	250	250	250	250

Note: Minimum 250- and 350-feet storage length for right and left turns, respectively. The locations where more than minimum storage is required are in red text.

3.0 Location Analysis and Design Concept Alternatives

3.1 Introduction

This chapter of the L/DCR documents the design alternatives that were considered and evaluated for the new SR 30 freeway (formerly known as both SR 801 and the I-10 Reliever) between the future SR 303L on the west and SR 202L on the east. This new, fully access controlled freeway will be located roughly 5 miles south of, and roughly parallel to, the existing I-10.

The ASR, prepared in support of this study, documented the location analysis criteria and evaluation process used to determine the wide range of alternatives that were studied and which alternatives were carried forward for further evaluation in this L/DCR.

3.2 Design Concept Alternatives Considered and Eliminated

This section of SR 30 (SR 303L to SR 202L) has been subdivided into three segments for the purpose of this study, as shown in Figure 3-1.

- Segment 1 extends from SR 303L to 0.5 mile east of Estrella Parkway.
- Segment 2 begins at the east end of Segment 1 and ends 0.5 mile east of 91st Avenue.
- Segment 3 begins at the east end of Segment 2 and extends to SR 202L.

Multiple options were developed for each of the three corridor segments. Segment 1 had two different subsections, Segment 2 had nine different subsections, and Segment 3 had two different subsections. Figure 3-2 shows all the subsections that were considered as part of this corridor effort. The ASR screened out many of these alternatives. This L/DCR document screened out the remaining options. The following is a brief description of each eliminated alternative (detailed information about each alternative can be found in the ASR).

3.2.1 Subsections Dropped by Alternatives Selection Report

Subsection 1A (Eliminated): This subsection is approximately 1.8 miles long and extends from roughly the Cotton Lane/Elwood Road intersection on the west to about 1,500 feet south of MC 85 on Estrella Parkway on the east. This northwest-to-southeast alignment is completely elevated and crosses over Sarival Avenue, UPRR, MC 85, and Estrella Parkway.

Subsection 1A was eliminated because of the technical challenges associated with crossing UPRR and MC 85, and the lack of jurisdictional support. Also, no feasible SR 30/SR 303L interchange connection exists using the 1A layout.

Subsection 2A-1 (Eliminated): This subsection is approximately 8.1 miles long and extends from Estrella Parkway, approximately 1,900 feet south of MC 85, to 91st Avenue, approximately 1,000 feet south of Broadway Road. This alignment is almost a straight east-to-west line.

Subsection 2A-1 is very similar to subsection 2A-2; however, Subsection 2A-2 facilitates better land use, so subsection 2A-1 was eliminated.

Subsection 2B-1 (Eliminated): This subsection is approximately 8.2 miles long and extends from Estrella Parkway, approximately 1,500 feet south of MC 85, to 91st Avenue, approximately 1,000 feet south of Broadway Road. This alignment is almost a straight east-to-west line. This alignment moves south, closer to Southern Avenue, between Bullard Avenue and Avondale Boulevard.

Subsection 2B-1 is similar to subsection 2A-2 and does not offer any advantage over subsection 2A-2. It had no jurisdictional support and would require several high-voltage overhead transmission power line relocations. Therefore, subsection 2B-1 was eliminated.

Subsection 2B-2 (Eliminated): This subsection is also approximately 8.2 miles long and extends from Estrella Parkway, approximately 1,500 south of MC 85, to 91st Avenue, approximately 1,000 feet south of Broadway Road. This alignment is almost a straight east-to-west line. This alignment pushes north from subsection 2B-1 to avoid some of the high-voltage overhead transmission power lines.

Subsection 2B-2 is similar to subsection 2A-2 and does not offer any advantage over subsection 2A-2. It had no jurisdictional support, and it affects the APS 114-inch pipeline in the bottom of the Agua Fria River. Therefore, subsection 2B-2 was eliminated.

Subsection 2C-1 (Eliminated): This subsection is approximately 8.5 miles long and extends from Estrella Parkway, approximately 1,500 south of MC 85, to 91st Avenue, approximately 1,000 feet south of Broadway Road. This alignment pushes south, closer to Southern Avenue, between Estrella Parkway and Dysart Road. From here, the alignment crosses Southern Avenue and is closer to the northern bank of the Gila River between Dysart Road and 107th Avenue.

Subsection 2C-1 was eliminated because of extensive encasement of the APS PVNGS pipeline, relocation of four major high-voltage transmission power lines, and the realignment of Southern Avenue near 107th Avenue.

Subsection 2C-2 (Eliminated): This subsection is approximately 8.6 miles long and extends from Estrella Parkway, approximately 1,500 south of MC 85, to 91st Avenue, approximately 1,000 feet south of Broadway Road. This layout is similar to subsection 2C-1 except near the beginning, between Estrella Parkway and Dysart Road, where this alignment is north of subsection 2C-1. This alignment would require an arterial street modification at 107th Avenue to achieve a more desirable skew at the interchange.

Subsection 2C-2 was eliminated because of possible impacts on wetlands and on numerous prehistoric sites.

Subsection 3A (Eliminated): This subsection is approximately 3.3 miles long and begins approximately 1,000 feet south of the 91st Avenue/Broadway Road intersection on the west and ends near the intersection of 61st Avenue and Broadway Road. This alignment is elevated because of the number and size of various utilities (many of which are gravity systems) and the shallow groundwater depth in this area.

Subsection 3A is far less desirable than subsection 3B because of undesirable geometry, more environmental impacts, and no local jurisdiction support; therefore, subsection 3A was eliminated.

Figure 3-1. SR 30 corridors and section limits

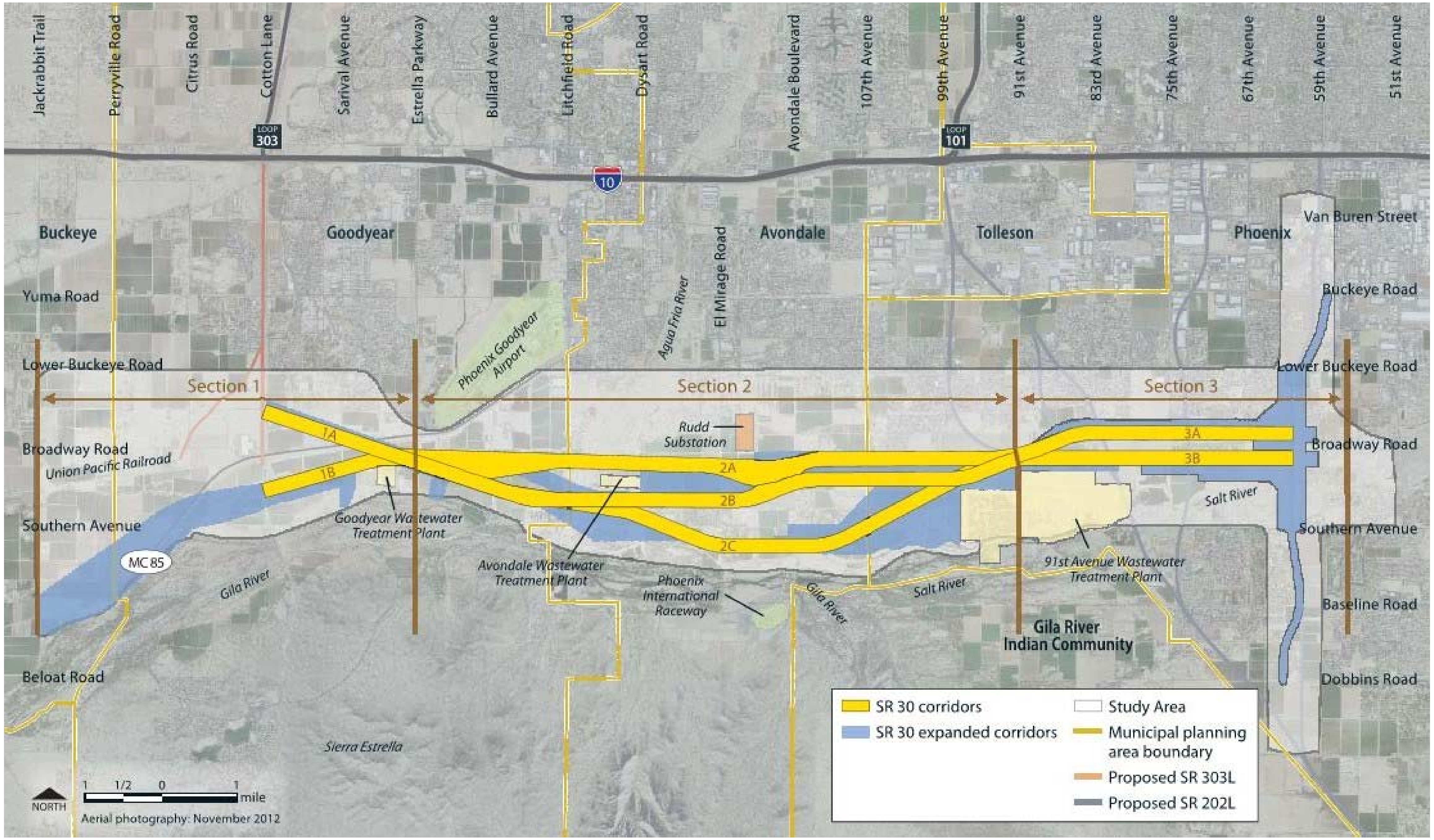
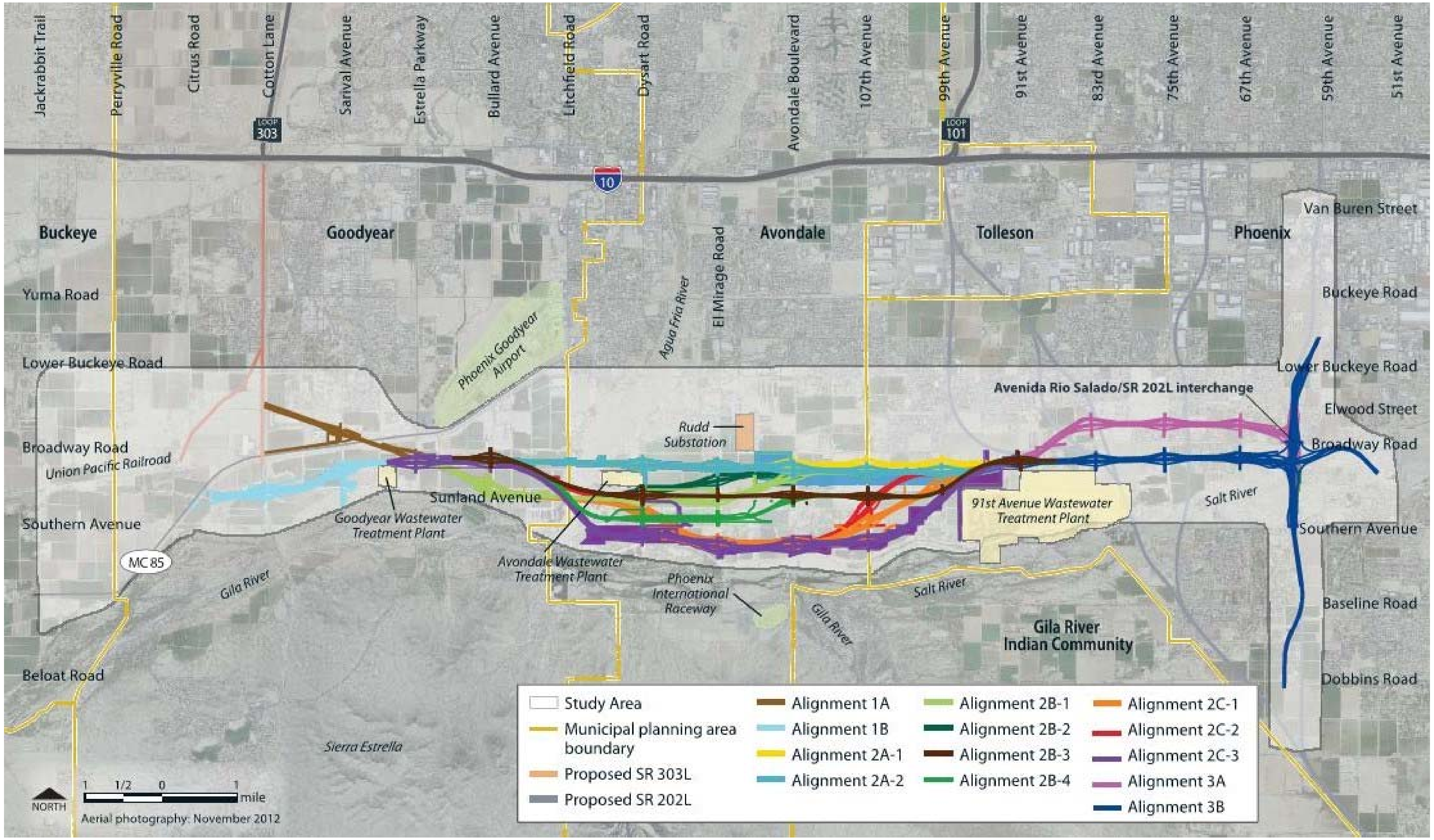


Figure 3-2. SR 30 subsections considered in the *Final Alternatives Selection Report* and this L/DCR



3.2.2 Subsections Carried Forward by Alternatives Selection Report

As a result of the evaluation process documented in the ASR, the following four subsections and the No-Build Alternative were carried forward for further study in the L/DCR and EA.

Subsection 1B (Carried Forward): This subsection is approximately 2.8 miles long and extends from roughly MC 85 on the west to about 1,500 feet south of MC 85 on Sarival Avenue on the east.

Subsection 1B is considered technically superior to Subsection 1A; therefore, Subsection 1B is recommended for further study and represents the only build alternative in Section 1 to be studied.

Subsection 2A-2 (Carried Forward): This subsection is approximately 8.1 miles long. It is almost identical to Subsection 2A-1, but differs between Avondale Boulevard and 91st Avenue where the alignment drops south about 500 feet before transitioning back north. This subsection extends from Estrella Parkway, approximately 1,900 feet south of MC 85, to 91st Avenue, approximately 1,000 feet south of Broadway Road. This subsection was developed in response to feedback from FHWA regarding Subsection 2A-1 and shifts south to stay next to the power line corridor east of El Mirage Road.

Since Subsection 2A-2 facilitates better land use, it was recommended for further study. This option is referred to as the North Alternative.

Subsection 2C-3 (Carried Forward): This subsection is approximately 8.7 miles long and extends from Estrella Parkway, approximately 1,500 south of MC 85, to 91st Avenue, approximately 1,000 feet south of Broadway Road. This subsection was developed in response to feedback from the City of Avondale regarding concerns about the other Section 2 options. This subsection improves certain aspects of the other 2C layouts, such as avoiding the DRCC Basin No. 1.

Subsection 2C-3 had full jurisdictional support at the completion of the ASR document, but ranked lower in other categories. However, the study team felt it was premature to eliminate this subsection and recommended it for further study. This option is referred to as the South Alternative.

Subsection 3B (Carried Forward): This subsection is approximately 3.3 miles long and begins approximately 1,000 feet south of the 91st Avenue/Broadway Road intersection on the west and ends approximately 1,000 feet south of the 61st Avenue and Broadway Road intersection. This alignment is elevated because of the number and size of various utilities (many of which are gravity systems) and the shallow groundwater depth in this area.

Subsection 3B has local jurisdictional support, has more desirable engineering traits, and generally has less impact on the environment. Therefore, this alternative was recommended for further study.

The evaluation matrix containing more details about all subsections can be found in the ASR.

The four subsections carried forward from the ASR were combined to create two complete build alignments:

- 1B, 2A-2, 3B = North Alternative
- 1B, 2C-3, 3B = South Alternative

The ASR, therefore, recommended that the North Alternative, the South Alternative, and the No-Build Alternative be carried forward to this L/DCR for further study.

SR 30/SR 202L System Traffic Interchange: Similar analyses were conducted on the SR 30/SR 202L system TI alternatives and are documented in the ISR. The following is a brief description of the report findings (the detailed information can be found in the ISR).

The system interchange selection process used for the SR 30/SR 202L system TI used three tiers of evaluation, with input from the study team at each level of development. Tier 1 focused on the interchange shape and stack order. Tier 2 focused on the local access points in the influence area of the system TI. Tier 3 integrated the Tier 1 and Tier 2 findings and developed new hybrid concepts with the goal of developing configurations that combined the best of all the interchange attributes evaluated.

Based on the evaluation of the 9 Tier 1 concepts, 13 Tier 2 concepts, and 6 Tier 3 concepts, Concept G1a-2A is the concept recommended to be carried forward from the ISR. This design is recommended because it provides the design most consistent with the site constraints, maximizes the future expansion opportunities with the least impact on existing traffic, handles the anticipated travel demand, has support from all the project stakeholders, and minimizes the environmental impacts. In 2018, an addendum was issued to this report to reflect a revised geometric layout that altered the stack sequence and ramp geometry to reflect the actual SR 202L design, and to account for SR 30 as a full freeway extension east of SR 202L.

Figure 3-3 shows the build-out configuration of this interchange, including the potential fourth leg (east side) and three potential HOV connector ramps, depending on the future need. Appendices B and D of this document define this proposed and future interchange concept in detail.

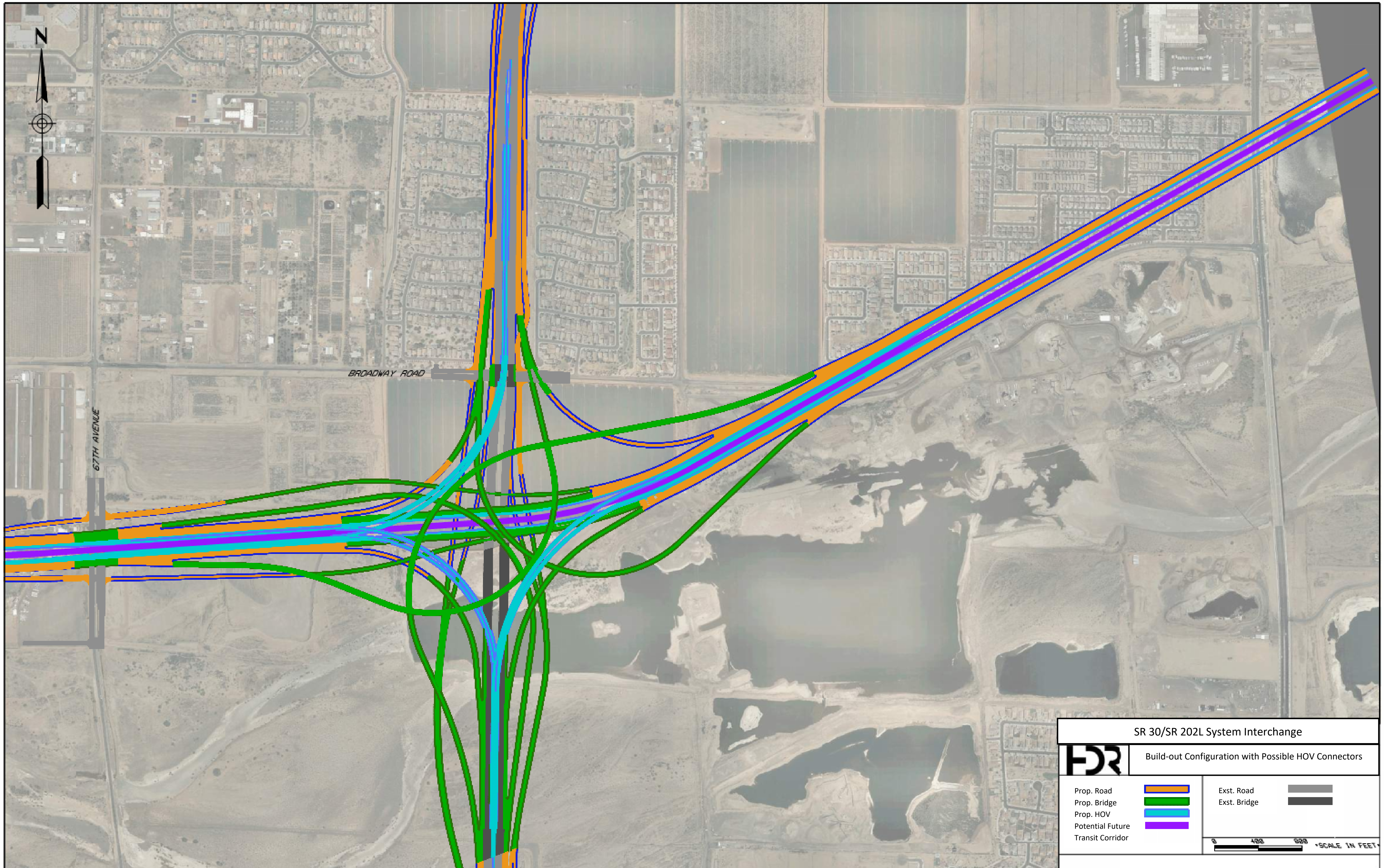
3.3 Design Concept Alternatives Studied in Detail

After completing the evaluation and identifying two build alternatives to carry forward for further analysis, the study team examined new economic data from the City of Avondale. The study team examined the effects of the proposed freeway on the City's tax revenues (property and sales tax receipts) and also analyzed the fiscal and economic impacts on Avondale resulting from the two build alternatives and the No-Build Alternative.

The additional economic studies, along with the City of Avondale's firm opposition to implementing the North Alternative, prompted the study team to explore other alignments lying between the two already identified build alternatives that could reduce environmental and economic impacts while still being acceptable to the public. Two additional build alternatives were identified in Section 2: the Center and Hybrid.

- The North Alternative runs parallel to, and just south of, Broadway Road. See Appendix C for details.
- The South Alternative parallels the northern bank of the Gila River. See Appendix C for details.
- The Center Alternative closely follows the half-mile section between Broadway Road and Southern Avenue and is shown in Figure 3-2 as Alignment 2B-3. See Appendix C for details.
- The Hybrid Alternative is same as the Center Alternative between Avondale Boulevard and 91st Avenue but deviates toward the south at Avondale Boulevard, following the Southern Avenue alignment between Dysart Road and Avondale Boulevard. This is shown in Figure 3-2 as Alignment 2B-4 and can be seen in detail in Appendix B (as the Selected Alternative).

Figure 3-3. SR 30/SR 202L TI build-out configuration with potential HOV connectors



3.4 Drainage Considerations during Alternatives Screening

3.4.1 Existing Conditions

Because the proposed SR 30 freeway is near the Salt and Gila Rivers, it became apparent early on that any of the SR 30 freeway alternatives would provide a significant barrier to off-site storm flows reaching the rivers. This became a substantial engineering challenge to overcome with all of the four alternatives being studied in detail. As a result, a detailed drainage study was undertaken as part of this alternatives screening effort to adequately evaluate the drainage needs and footprint requirements of each alternative.

Stormwater runoff generally flows from northeast to southwest in the study area, with the ultimate outfall being the Gila, Salt, or Agua Fria Rivers. The existing land use in the region is primarily agricultural, with fields that have been laser leveled. Delivery and tailwater ditches provide irrigation water to the properties. As a result of the current land use, overland flow is the predominant flow condition.

Existing drainage and flood control features were identified through field visits, as-built plans, and drainage reports on file with FCDMC, City of Phoenix, City of Avondale, and City of Goodyear. Notable existing features include:

- The Agua Fria River flows to the south through the study area and outfalls into the Gila River at approximately Litchfield Road.
- The Salt River bounds the study area on the south and flows to the west. It outfalls into the Gila River.
- The Gila River bounds the study area on the southwest and flows to the west.
- The Bullard Wash outfall channel lies between Estrella Parkway and Bullard Avenue. This wash has been channelized, is armored, and drains south to the Gila River from north of the Phoenix-Goodyear Airport.
- The SR 303L outfall channel is a recently built channel associated with the future SR 303L freeway and located just west of Cotton Lane. It is discussed in the SR 303L Corridor/White Tanks ADMP and in the SR 303L Final L/DCR.
- Floodplains exist along the Gila River, Salt River, Agua Fria River, and Bullard Wash outfall channel.
- The Tres Rios project, including the Tres Rios Levee, is located along the Salt and Gila Rivers between 91st Avenue and the Agua Fria River confluence.

Irrigation canals divide drainage areas into smaller areas. Consequently, it is important to identify their functions and locations:

- The SRP Buckeye Feeder Canal runs through the study area between 55th Avenue and the Agua Fria River. This canal supplies irrigation water to properties in the area and conveys tailwater to the Gila River.
- The BWCCD canal flows from the Agua Fria River to Cotton Lane and continues west out of the SR 30 study area. This canal is a surface flow diversion and conveys groundwater and tailwater to the west.
- The St. Johns Irrigation District Canal flows between 55th Avenue and the Agua Fria River on the south side of Southern Avenue.
- In the study area, several secondary irrigation supply and return flow ditches (lined and earthen) exist along the sides of many major roads.

Major storm drains, retention basins, and an effluent line were found in the study area, and include:

- A City of Avondale large-diameter storm drain exists in the northern portion of the study area between Dysart Road and Litchfield Road. This storm drain discharges to the Agua Fria River north of Broadway Road.
- An existing effluent line runs from the City of Phoenix 91st Avenue WWTP to the PVNGS. This pipe is generally located along Roeser Road and the BWCDD canal, and has a limited maintenance outage schedule.
- The City of Phoenix owns a large-diameter storm drain, varying in size from 66 to 96 inches, along 75th Avenue, which outfalls into the Salt River. This storm drain is designed for 10-year flows and drains a basin at the corner of 75th Avenue and Van Buren Street. Additionally, street drainage east of 75th Avenue flows into this pipe by storm drain laterals sized for a 2-year storm.
- Scattered localized drainage basins have been constructed for the developed area's on-site storage requirements of a 100-year, 2-hour storm, according to the Maricopa County standard.

3.4.2 Existing Models and Studies

Several studies have been performed in the project area, as described below:

- SR 303L/White Tanks ADMP Update area hydrologic analysis in Maricopa County, Arizona, September 2009, by HDR for FCDMC. The ADMP Update updated the hydrologic models completed by URS Corporation in June 2004. This is a joint project between FCDMC and ADOT. The new models accounted for development that has occurred in this region since the completion of the original ADMP and used the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rainfall data. The report discusses on- and off-site drainage for the realigned I-10 main line through the system interchange. A HEC-1 model was created for the existing conditions and for the proposed drainage improvements. The updated analysis was used to update the conceptual design plans for proposed regional and roadway basins and channels along SR 303L and I-10.
- Final L/DCR for SR 303L, I-10 to US 60, December 2005, by URS Corporation for the Maricopa County Department of Transportation. The DCR closely follows the concepts depicted in the ADMP for the SR303L/White Tanks. The Final SR 303L DCR proposes an ultimate design for the realignment of I-10 that includes a normal crown typical section, curb and gutter, a complete roadway storm drain system, and a regional drainage system that follows the SR 303L alignment. The proposed regional drainage system continues to the south along the SR 303L alignment with an ultimate outfall at the Gila River. This DCR is used as the basis for HDR's drainage design through the study area along Cotton Lane.
- Durango ADMP, September 2005, by Dibble and Associates for FCDMC. This ADMP determined conceptual designs to reduce flooding in the area between the Agua Fria River and 47th Avenue. Several channels, basins, and a storm drain were proposed. A HEC-1 model was created for the existing conditions and for the proposed drainage improvements.
- Draft Candidate Assessment Report DRCC, December 2005, by Aspen Consulting Engineers for FCDMC. This report updated the drainage master plan described above and advanced the design of the DRCC and the Sunland Channel. The updated plan for DRCC removed the channel in Phoenix, relocated the 91st Avenue Basin to 99th Avenue, and placed box culverts under 91st Avenue, 99th Avenue, and 107th Avenue to connect existing retention basins. The HEC-1 model was updated for the proposed drainage improvements. Conceptual design plans were created for the proposed regional basins and channels.
- Sun Valley ADMP, by J. E. Fuller for FCDMC. This ADMP is being developed to ensure responsible floodplain management and to coordinate flood control infrastructure improvements in conjunction with new development

projects. The Sun Valley ADMP covers approximately 183 square miles, which includes the Town of Buckeye and portions of unincorporated Maricopa County.

- Agua Fria Watercourse Master Plan, November 2001, by Kimley-Horn and Associates for FCDMC. The HEC-1 model for the Agua Fria River was obtained from FCDMC. This model was originally prepared and adopted as part of the Agua Fria River Watercourse Master Plan by FCDMC in 2001.
- El Rio Watercourse Master Plan Overview Report, March 2006, by Stantec Consulting, Inc., for FCDMC. This study proposed levees and channel improvements for the Gila River from the Agua Fria River west to MC 85. With these planned improvements, portions of the SR 30 study area would be removed from the floodplain.

3.4.3 Proposed Drainage Improvements by Others

Proposed drainage improvements have been identified in the study area. This information was collected through meetings and from plans and drainage reports on file with FCDMC, City of Phoenix, City of Goodyear, and City of Avondale. The following drainage features are proposed in the study area:

- DRCC (FCDMC) – This proposed channel conveys flows generally from east to west between 107th Avenue and the Agua Fria River.
- Sunland Channel (FCDMC) – Flood control channel and box running east to west from 99th Avenue to Avondale Boulevard. The channel outlet is at the DRCC.
- SR 202L South Mountain Freeway Drainage (ADOT) – Freeway drainage has been investigated for the SR 202L. A channel and several basins are proposed for the new roadway and are currently under construction.
- El Rio Watercourse Master Plan (FCDMC) – This study proposed levees and channel improvements for the Gila River from the Agua Fria River west to MC 85.
- Tres Rios (City of Phoenix and U.S. Army Corps of Engineers [USACE]) – Levees and channel improvements along the Salt and Gila Rivers are proposed and under construction between 105th Avenue and the Agua Fria River.
- Localized drainage basins for developing areas to retain on-site storage requirements in accordance with the Maricopa County standard for the 100-year, 2-hour storm. The City of Goodyear on-site storage requirements is 100-year, 2-hour storm, according to it Engineering Design Standards and Policies Manual.

3.4.4 Drainage Design Criteria

The drainage evaluation for the SR 30 alignment selection was based on ADOT design criteria, mostly provided in Chapter 600 of the ADOT RDG. Notable items include:

- As presented in Table 603.2A, for cross drainage structures, such as culverts, the design storm frequency should be based on ADOT's roadway drainage classification. As a new urban access-controlled freeway, the proposed road meets Drainage Class 1. Accordingly, the design storm is the 50-year storm, unless other factors control, such as structures affected by Federal Emergency Management Agency (FEMA) regulations (which typically would be the 100-year storm).
- As presented in Table 603.2B, pavement surface drainage and associated drainage systems would be designed for a 10-year storm frequency. For depressed road locations, roads with ponded depth (ignoring any drainage system) in excess of 30 inches, the pavement drainage system would be designed for the 50-year storm frequency. Because of shallow groundwater conditions, no depressed roadway locations are anticipated on this project.
- Storm drain systems would be designed such that the hydraulic grade line is a minimum of 6 inches below the top of inlet.
- As generally reflected in Table 603.2C, during the 10-year storm, flow spread on roads with one travel lane per direction shall not expand beyond the edge of the travel lane. Flow spread on roads with more than one travel lane per direction shall not expand beyond half the width of one travel lane. Refer to Table 603.2C for spread criteria on ramps and other applications.
- Allowable ponding depth on highways shall not exceed the curb height for a 10-year storm frequency.
- Ditches that are parallel to the road and that convey road drainage should be designed for the 10-year storm frequency. Detention basins and channels that intercept off-site flows should be designed for the applicable design storm for crossing structures in accordance with ADOT's roadway drainage classification. The 100-year storm frequency should also be checked to avoid adverse impacts on properties adjacent to the freeway ROW.
- Considerations should be given to FEMA and local jurisdiction regulations for floodplain development.
- Detention/retention basin side slopes are to be a minimum 6:1.
- Regional concrete-lined channel side sloes are to be 2:1.

3.4.5 Off-site Design

The proposed freeway alignments were overlaid onto the HEC-1 schematics (White Tanks ADMP west of the Agua Fria River and Durango ADMP east of the Agua Fria River) indicating subbasin layouts and the flow routings for the existing scenarios in the associated models. The HEC-1 model was modified to more accurately represent the area with the constructed freeway. These modifications included basin boundaries, routes, diverts and combination points, and the addition of channel routes, culverts, and detention and first-flush basins for the subbasin affected. The channel design was based primarily on the existing HEC-1 and the local topographic information. Updating land use and routing for the area affecting the freeway may be necessary during final design.

A HEC-River Analysis System (RAS) analysis was prepared to model the channel size and culvert sizes in the channel. The proposed design assumes that the channel would be placed along with culverts to cross under crossroads. All models assume the Tres Rios project and the South Mountain Freeway are constructed and in place. The North Alternative is modeled with the DRCC in place. The South Alternative was assessed with the DRCC and Sunland Channel in place, and a secondary model was developed without the flood control features. All land use and soils for basins affected by the proposed alignments were updated using the latest mapping from MAG. The current regional models were updated with the latest NOAA satellite precipitation data and NOAA 14, and a peak runoff comparison of the available models was reviewed. The Green and Ampt Infiltration Method and the S-Graph were used to determine rainfall losses and unit hydrograph, respectively. All hydrology east of the Agua Fria River is based on the existing conditions in Durango ADMP. All hydrology west of the Agua Fria River is based on the SR 303L/White Tanks ADMP Update. The alternative alignments deviate from one another from Bullard Avenue to 91st Avenue, approximately 4.5 miles. In these regions, separate analyses and off-site systems were developed for each alignment.

For each alternative, the existing ground topographic information was reviewed to determine the high points, low points, and longitudinal slopes of the existing terrain along the upstream side of the proposed alignment alternatives. Off-site flow would be intercepted and conveyed in channels along the ROW. Taking into account utility crossings, major arterial street crossings, groundwater depth, and other constraints, flow directions and outfall locations were determined. Basin and off-site channel footprints were placed in regions considered to be the most cost-effective and fit within the proposed ROW limits of the project. Investigation of the water surface profiles along with existing terrain profile allowed for channel costs to be reduced by optimizing the channel footprint.

The SR 30 off-site drainage systems are split into four regional systems:

- Region 1 – MC 85 to Bullard Wash
- Region 2 – Bullard Wash to the Agua Fria River
- Region 3 – Agua Fria River to 99th Avenue
- Region 4 – 99th Avenue to SR 202L system TI

Appendix E contains the 100-year, 24-hour (west of the Agua Fria River) and 100-year, 6-hour (east of the Agua Fria River) peak flows at the associated crossings along the alignment alternatives.

3.4.6 Regional Off-site Systems

Region 1 – MC 85 to Bullard Wash

From MC 85 to Bullard Wash, all alternatives share the same freeway alignment, and thus the same general drainage design. In this region, off-site flow generally runs from north to south toward the Gila River. The proposed SR 30 freeway crosses in an east-to-west direction, and new channels and culverts will be needed along the northern side of the freeway to intercept the off-site runoff approaching from the north. Under the proposed scenario, the off-site channels will have two outfall locations to the Gila River.

The first alternative outfall location is the Loop 303 outfall channel. Off-site flows approaching the proposed freeway from the north are collected via open channel starting at the Buckeye Irrigation Canal (BIC) and routed west, ultimately outfalling into the Loop 303 outfall channel. Coordination between FCDMC and ADOT will be required.

Off-site flows west of the Loop 303 outfall channel are minimal and will be treated for first flush and routed south via pipe culvert, maintaining existing drainage patterns.

The proposed SR 30 freeway fill slopes cross over two channels: the Loop 303 outfall channel and the BIC wasteway. Box culverts will be used to convey flows under the proposed freeway to the south and southwest, respectively.

The second outfall location is a proposed retention basin east of Sarival Avenue. The proposed basin will be located on the south side of SR 30. Flows west of Bullard Wash to Sarival Avenue will be captured in an open channel. Flows will be conveyed south under the proposed freeway to the Sarival retention basin via a box culvert. Off-site flows west of Sarival Avenue to the BIC will be captured by a shallow basin and routed to the south and east via pipe culverts to the Sarival retention basin. The Sarival retention basin is sized to capture the 100-year, 24-hour storm. Off-site flows will be pumped post-storm via a submersible pump station and drained south to the Gila River. Because of horizontal constraints at the pump station, it is necessary to pass flow over the BIC and the PVNGS 96-inch water line. This configuration helps minimize pump station cost as opposed to the in-line pump station used to route flows during storms.

Region 2 – Bullard Wash to Agua Fria River

South/Center/Hybrid Alternatives

From Bullard Wash to the Agua Fria River, the South, Center, and Hybrid Alternatives share the same freeway alignment, and thus the same general drainage design. In the Bullard Wash to the Agua Fria River region, off-site flow generally runs from north to south into either the Gila River or Bullard Wash. The proposed SR 30 freeway crosses in an east-to-west direction, then dips south (northwest-to-southeast direction) east of Bullard Avenue to the Agua Fria River. New channels and culverts are needed along the northern side of the freeway to intercept the off-site runoff approaching from the north. Under the proposed scenario, the off-site channels will have two outfall locations to the Gila River.

The first outfall location is Bullard Wash. Bullard Wash is aligned in a north-to-south direction. Off-site flows approaching SR 30 are intercepted from 0.25 mile west of Litchfield Road and routed west to Bullard Wash. Near Bullard Wash, flows are routed south in a box culvert to minimize the tailwater effects of Bullard Wash flow on the SR 30 channel and to maintain freeboard.

The second outfall location is a spreader basin extending from east of Litchfield Road to the proposed Agua Fria River bridge abutment. Off-site flows from the north are intercepted and conveyed south via pipe culverts. A spreader basin will be used on the south side of the freeway to maintain existing flow patterns to the south. According to the FEMA Flood Insurance Rate Maps (FIRMs), this area lies in the 100-year flood plain.

Based on data collected in the *Agua Fria Watercourse Master Plan Sediment Trend Analysis Final Report* dated November 2001, a preliminary scour depth was developed for the bridge crossing. Both local and general scour calculations assess the stability of the structure in the Agua Fria River environment. The scour depth is estimated to be 18 feet.

North Alternative

In the Bullard Wash to Agua Fria River region, off-site flow generally runs from north to south. Runoff drains to the either the Gila River or Bullard Wash. The proposed SR 30 freeway crosses in an east-to-west direction. New channels and culverts will be needed along the northern side of the freeway to intercept off-site drainage approaching from the north. Under the proposed scenario, the off-site channels will have two outfall locations to the Gila River.

The first outfall location is Bullard Wash. Bullard Wash has a north-to-south alignment. Off-site flows are intercepted from 0.25 mile west of Litchfield Road and routed west to Bullard Wash. Near Bullard Wash, flows are routed south via a box culvert to minimize the tailwater effects on the SR 30 channel and to maintain freeboard.

The second outfall location is a spreader basin east of Litchfield Road to the proposed bridge abutment. Off-site flows from the north are intercepted and conveyed south via pipe culverts. A spreader basin will be used on the south side of the freeway to maintain existing flow patterns to the south. According to the FEMA FIRMs, this area is in the 100-year floodplain.

Region 3 – Agua Fria River to 99th Avenue

North Alternative

Agua Fria River to Avondale Boulevard (115th Avenue)

East of the Agua Fria River, the North Alternative traverses between Broadway Road and Southern Avenue. The alignment is bisected by the DRCC channel at 117th Avenue. Model development used the flood control feature with controlled outfalls along the east and west banks. Portions of the alignment are in FEMA-mapped floodplain; refer to Section 4.8, *Floodplain Considerations*, for further details.

West of Dysart Road, captured drainage conveys to a basin along the northern ROW limits and is metered out to the Agua Fria River. The outfall would be equipped with a flap gate to control backwater effects from the Agua Fria River. West of the proposed DRCC alignment, developing drainage continues to concentrate from the northeast to the southwest. Drainage developing east of El Mirage Road concentrates along the roadway and drains to the south. A small channel will capture the concentrated flows and discharge it into the DRCC channel along 117th Avenue.

Drainage west of El Mirage Road is captured along the northern ROW limits to be conveyed underneath the proposed alignment and metered into DRCC Basin No. 1, after water quality treatment.

Avondale Boulevard (115th Avenue) to 99th Avenue

From Avondale Boulevard to 99th Avenue, the general trend of off-site flows continues from the northeast to the southwest. A concrete lined off-site channel will intercept off-site flows along the northern ROW. The stormwater will ultimately be discharged into the DRCC alignment running from north to south. The Buckeye Feeder Canal (BFC), paralleling Avondale Boulevard along its eastern ROW, would be retrofitted with a bypass system in order to accommodate the SR 30/Avondale Boulevard TI. A potential siphon contingency cost was included in the overall cost assessment for the BFC relocation efforts.

Center Alternative

Agua Fria River to 99th Avenue

The proposed SR 30 Center Alternative crosses east-to-west from Dysart Road to 99th Avenue and is located approximately 0.25 mile north of Southern Avenue. The proposed freeway in this region is in a localized sag in the terrain, with off-site flows approaching the freeway from the north and south, requiring drainage channels for both sides.

In this region, there are two FCDMC channels: the DRCC and Sunland Channel. These channels are anticipated to be built before the construction of SR 30. Therefore, the FCDMC channels are considered to be an existing condition. The proposed freeway will affect the DRCC and Sunland Channel.

The DRCC channel conveys flows from 75th Avenue to the DRCC outfall basin (west of Dysart Road). The DRCC alignment is in an east-to-west direction from 75th Avenue to 0.5 mile west of El Mirage Road, where the channel alignment shifts to a north-to-south alignment. Flows are conveyed directly south to the Sunland Channel (0.25 mile north of Southern Avenue). At this confluence point, flows are conveyed west to the DRCC Basin (west of Dysart Road). The Sunland Channel begins at 99th Avenue and conveys flows directly west to the DRCC channel.

The proposed SR 30 channel along the northern ROW will convey flows from the DRCC from 0.5 mile east of El Mirage Road to Dysart Road and will outlet to the DRCC Basin. The channel configuration is proposed to be an earthen channel with cement-stabilized alluvium banks. Off-site flows east of the DRCC will be intercepted via a concrete channel from 99th Avenue to 0.5 mile west of El Mirage Road and outlet into the northern ROW channel. The proposed off-site channel along the northern side of the freeway and east of 99th Avenue is shallow and earth-lined because of several existing sewer lines and the PVNGS 96-inch water line. Box culverts will be required at Dysart Road, El Mirage Road, and Avondale Boulevard.

The southern ROW channel will replace the Sunland Channel and will intercept flows approaching from the south (Southern Avenue to the proposed freeway). The channel collects off-site flows from 99th Avenue to Dysart Road and outfalls into the DRCC Basin. Box culverts will be required at Dysart Road, El Mirage Road, and Avondale Boulevard.

Hybrid Alternative

El Mirage Road to Avondale Boulevard (115th Avenue)

East of the Agua Fria River, the Hybrid Alternative parallels Southern Avenue from Dysart Road to approximately 1,400 feet east of El Mirage Road. The alignment then heads northeast to join the Center Alternative at Avondale Boulevard. While the Hybrid Alternative removes the levee relocation associated with the South Alternative, portions of it are still in FEMA-mapped floodplains. Analysis of the impacts on the floodplain would need to be developed at final design. Refer to Section 4.8, *Floodplain Considerations*, for further details.

Between Dysart Road and Avondale Boulevard, the Hybrid Alternative is located on a localized crest. The crest is located along Southern Avenue until approximately 0.3 mile west of El Mirage Road. Other than a small area around Avondale Boulevard (115th Avenue), there would be no need for an off-site system along this portion of the alignment. All on-site drainage would be collected in two large-diameter trunk lines paralleling the alignment. The small quantity of off-site drainage collected will be conveyed into the southern trunk line and discharged along with the on-site system.

Avondale Boulevard (115th Avenue) to 99th Avenue

From Avondale Boulevard to 99th Avenue, the Hybrid Alternative parallels the Center Alternative. As with the Center Alternative, off-site collection systems will be needed north and south of the alignment. The southern channel will parallel the Sunland Channel alignment, but the Hybrid Alternative system will deviate from the Center Alternative concept to use the DRCC collector canal paralleling 117th Avenue. Discharge from the southern channel will be conveyed underneath the alignment to join the northern channel. Flows will be discharged into the DRCC main channel at its existing tie into the Sunland Channel system. The BFC will be diverted through an 8×4 reinforced concrete box to a small open channel with a potential siphon underneath the main line off-site channel. An open channeled system will provide maintenance access to both portions of the BFC diversions. The BFC at Avondale Boulevard would be relocated at the SR 30/Avondale Boulevard TI. A potential siphon contingency cost was included into the overall cost assessment for the BFC relocation efforts.

The system integration of the SR 30 Hybrid Alternative off-site system and the DRCC existing features would require coordinated efforts between final design consultants and FCDMC. Currently, an alternative alignment has been proposed for the north to south leg on 117th Avenue. While the alignment would shift to the west approximately 1,200 feet, its overall capacity and function would not change. Therefore, cost implications associated with the possible update are minimal and the cost would be covered by contingencies in the estimate.

South Alternative

Agua Fria River to 99th Avenue

East of the Agua Fria River, the South Alternative traverses east to west between the DRCC/Sunland Channel system and the Tres Rios levee. Outfalls for the alignment use the existing drainage features in the region and reduce the overall footprint of the project. Because of geometric constraints, the alignment would require relocating approximately 2.2 miles of the Tres Rios levee system west of El Mirage Road to the Agua Fria River. The levee would be realigned 1,470 feet south of its currently planned alignment. A preconstruction and design model of the Tres Rios levee system was obtained, and the proposed relocation of the levee was modeled. Additional information is provided in the next few paragraphs. A majority of the alignment is also in the FEMA-mapped floodplains for the region. Refer to the *Tres Rios Levee Impacts* section below and Section 4.8, *Floodplain Considerations*, for details.

From Dysart Road to Avondale Boulevard, drainage south of the DRCC/Sunland Channel alignment generally flows from northeast to southwest. However, from Dysart Road to El Mirage Road, there is a localized ridgeline following the St. Johns Irrigation District Canal that splits flows to north and south directions along Southern Avenue.

Off-site drainage from Dysart Road to El Mirage Road is captured by concrete-lined trapezoidal channels running parallel to the alignment along the northern ROW. Flows are discharged into a basin and treated for first flush before being discharged underneath the realigned Tres Rios levee. The outfall will require a flap gate to prevent tailwater conditions along the Gila River from surcharging the off-site system during larger storms.

The El Mirage Road to 99th Avenue off-site systems convey discharge to detention basins located between the South Alternative and the Tres Rios levee. Basins are sized to accommodate off-site discharge for the 100-year, 6-hour storm along with first-flush volumes for water quality purposes. The basins outfall to existing Tres Rios drainage facilities, including the Tres Rios 115th Avenue collector channel and two existing outfalls located at El Mirage Road and Avondale Boulevard (115th Avenue). Both outfall structures contain five 5×3 reinforced concrete box culverts with flap gates. If the Salt River is flowing at 100-year levels, it will cause the flap gates at the existing outfall to close and, therefore, no stormwater would be conveyed. To ensure the system will hold while the storm passes, the basins in the region have been designed with retention capacity for off-site and first flush volumes of the 10-year, 6-hour storm.

Tres Rios Levee Impacts

The proposed SR 30 South Alternative crosses just south of Southern Avenue and curves to the northwest shortly after El Mirage Road. This alternative lies in the floodplain of the Gila and Agua Fria Rivers. Because of geometric constraints, the alignment would require relocating approximately 2.2 miles of the Tres Rios levee system west of El Mirage Road to the Agua Fria River. The levee would be realigned 1,470 feet south of its currently planned alignment. The levee starts at the proposed freeway bridge abutment (over the Agua Fria River) and will tie into El Mirage Road. East of El Mirage Road, the existing Tres Rios levee runs from El Mirage Road (approximately 0.5 mile south of Southern Avenue) to the 91st Avenue WWTP.

FCDMC has referred team members to use West Consultants' *Tres Rios Pre Construction Engineering & Design* study as the base hydraulic model. This is the best available model at this time. As a result, the *Tres Rios Pre Construction Engineering & Design* HEC-RAS model was used as the base model for this project. A proposed model and an existing conditions model were created to evaluate the impact of the Tres Rios levee.

The SR 30 South Alternative's impact on the hydraulic analysis showed there was minimal rise in the water surface; typically, the water surface change is less than 0.10 feet. The highest water surface change was 0.4 feet just upstream of Dysart Road. Upstream of Avondale Boulevard, there was no rise in the water surface. The proposed levee height will be set to meet the 3-foot FEMA freeboard requirement. Both the north and south banks were checked for the 3-foot freeboard requirement for levees. There are no impacts on the floodplain/floodway along the south side of the Gila River. The existing south bank protection ranges from 5 feet to 15 feet above the 100-year water surface. At the north bank, the existing Tres Rios levee maintains the required 3 feet of freeboard with a few exceptions, most notably downstream of Avondale Boulevard, where the freeboard is only 2.2 feet. If the South Alternative is selected, the future designer will have to verify the existing condition once the official hydraulic model and as-built plans become available.

Region 4 – 99th Avenue to SR 202L TI

From 67th Avenue to 99th Avenue, all alignment alternatives share the same freeway alignment and thus the same general drainage design. The proposed SR 30 alignment is about 0.25 mile south of, and parallel to, Broadway Road. Runoff developing in Region 4 generally flows from the northeast to the southwest; however, all flows developing east of 59th Avenue will be intercepted by the SR 202L off-site system. The SR 202L intercepted flows will be conveyed along the east side of SR 202L freeway and ultimately discharged into the Salt River.

The SR 30 system will use trapezoidal concrete-lined channels and reinforced concrete box culverts to convey discharge along the northern ROW of the alignment. The culvert crossing from 67th Avenue to 91st Avenue will need to avoid large existing utilities. These utilities include:

- 67th Avenue – a 67th Avenue storm drain and a 54-inch water line
- 75th Avenue – a 36-inch irrigation line, 24-inch sanitary sewer, and the 75th Avenue storm drain
- 83rd Avenue – two 72-inch sanitary sewer lines
- 87th Avenue – two 84-inch sanitary sewer lines
- 91st Avenue – two 30-inch sanitary sewer lines

Potholes were gathered for the listed utilities to verify their nature, size, and vertical location. Data indicate the culverts from 83rd to 91st Avenues will have to be developed in a siphon condition to avoid the large sanitary sewer lines. A contingency cost has been included for siphons in the estimate of probable costs at each of these major conflict points. The channel width upstream of the siphon may need to be widened and a small pump used to clear the culvert from any standing water after storms. The existing irrigation channel along 75th Avenue will need to be retrofitted for siphon conditions to pass underneath the freeway alignment.

The collected discharge will be conveyed to a large detention facility south of the alignment and north of the 91st Avenue WWTP campus. The collected discharge would be metered to an outfall channel that runs parallel to the western border of the Tres Rios regulating wetlands and ultimately discharged into the Salt River. This outfall channel has been titled the 97th Avenue outfall channel. This outfall channel will have to cross under the Tres Rios wetlands channel and levee system, likely in a siphon condition, before it enters the Salt River. This outfall will require further coordination with the City of Phoenix and FCDMC to ensure proper hydraulic operations and permitting.

In addition to hydraulic operations, the system integration of the SR 30 97th Avenue outfall and the Tres Rios levee will require coordinated efforts between final design consultants and USACE. Water quality and system maintenance would be extensive to ensure the system remains operational and meets regulatory standards for FEMA and local jurisdictions. The proximity of the 97th Avenue outfall channel to the Tres Rios wetlands would require water quality clearance. Furthermore, a maintenance plan will have to be enacted to assure siphon condition culverts are maintained and operated correctly. Debris, if allowed to accumulate in the siphon condition culvert, can adversely affect the hydraulic performance of the facility. Damage to the roadways, upstream properties, and even the Tres Rios facilities, could result from debris obstructing the flow into the culvert. Coordination with operation and maintenance crews for debris removal would be necessary to ensure the siphons work properly.

The SR 30/SR 202L system TI will require retrofitting embankment protection features along the north and south banks of the Salt River. Extending the bank rail protection in the east and west directions along the south bank will accommodate the system ramps. The SR 202L outfall along the northern embankment will remain in place. However, the existing protection will be extended to the west to protect the additional ramp configurations. The final construction documents and reports generated for the SR 202L project indicate that the scour depth being used at the Salt River crossing is between 28 and 32 feet, depending on location.

3.4.7 On-site Drainage Design

An elevated urban freeway section with curb and gutter was assumed for the on-site drainage analysis. The road cross section is proposed with normal crown geometry, except in areas of superelevation, allowing runoff to flow toward the outside curb. Catch basins and storm drain systems would be used to collect drainage flows.

ADOT Standard C-15.91, C-15.92, and C-15.80 catch basins are used to intercept the flows along the main line. Runoff collected in the catch basins would be conveyed in storm drains. First flush volumes are included in the overall basin size. The basins are sized to treat the first one-half-inch of runoff from pavement in ADOT's ROW. The design of the on-site storm water collection system was determined using ADOT's Best Management Practices. However, these can and frequently do change and should be reevaluated during the final design.

The following describes site-specific considerations:

- For the alternative alignments being considered, the proposed bridges over the Agua Fria and Salt Rivers would have a high point near the center of the bridge to split the drainage area so that runoff would drain in both directions toward the bridge abutments. The deck drainage would be routed through first flush basins or other treatment facilities prior to discharge to the associated rivers near the ends of the bridge. Drainage inlets in the bridge deck connected with hanging storm drain pipes under the bridge would be used to keep spread in acceptable limits, and would be used only as required.
- Between Avondale Boulevard (115th Avenue) and the Agua Fria River, two large trunk lines paralleling the alignment are required to collect the on-site drainage. The trunk lines range in size from 36 to 48 inches. The lines combine west of Dysart Road into a single 60-inch line that discharges to a basin east of the existing BFC for first flush treatment. Vertical constraints would require a pump station to pass flow over the BFC to the DRCC Basin No. 1. The pump would be developed as a post-storm submersible pump. This configuration helps minimize pump station cost as opposed to the in-line pump station used to route flows during storms.

3.5 Structures Considerations during Alternatives Screening

Similar to the drainage discussion in Section 3.4, the bridge structures were evaluated in detail for all four of the alternatives being considered. For organizational purposes, this section of the report is divided into the three sections defined in Figure 3-1. All sections cross a number of existing roads, irrigation canals, and major waterways, and pass through agricultural land, urban developments, and desert terrain. Section 1 contains six bridge sites. Section 2 has four alignments—North, Center, Hybrid, and South. The North Alternative contains 15 bridge sites; the Center Alternative contains 15 bridges sites; the Hybrid Alternative contains 20 bridge sites; and the South Alternative contains 18 bridge sites. The final section, Section 3, has three SR 30 main line bridge sites and two interchange configurations for connecting to the proposed SR 202L. All of the arterial street structures are classified as overpass structures.

A preliminary bridge type was assumed for all overpass structures based on the span-to-depth ratios; constructability considerations, such as the use of false work or local traffic detouring; and minimizing impacts on the roadway profile grade. Some sites have unique characteristics that required additional evaluation of the bridge type. Examples of the special needs include construction in waterways, construction over historic irrigation canals, and construction over active roadways. Overpass structures with similar site characteristics are presented in general discussion. Sites that required additional investigation are discussed individually following the general discussion.

Some retaining walls and sound walls would be required along the proposed freeway. The retaining walls are used along the freeway to constrain the ROW required and at bridge structures that require full-height abutments. Sound walls are proposed along certain sections of the freeway to mitigate noise-related impacts from the operation of the freeway. While quantified in the final evaluation, the walls on the project are fairly minimal and were studied in detail during the alternatives screening process.

3.5.1 General Discussion of Overpass Structures

The outside-to-outside width of the proposed ultimate freeway section is typically 170 feet. Bridge structures matching the freeway typical section would include two superstructures with 6-inch minimum of separation centered on the construction centerline. Each superstructure would typically have four 12-foot travel lanes, a 12-foot HOV lane, a 12-foot outside shoulder, a 12-foot inside shoulder, and a 1-foot-5-inch-wide, 32-inch-high F-shaped barrier at each shoulder, for a total superstructure width of 86 feet 10 inches. Some bridge structure widths would vary as a result of auxiliary lanes or pavement tapers.

The majority of the overpass structures along the main line would span existing or proposed roads. The bridge span lengths were determined based on the ultimate typical section for each road, according to the local Cities or governing agencies. Side slopes of 2:1 were projected from the edge of sidewalk to the face of the bridge abutment to establish the bridge span lengths. Embankments perpendicular to the wingwalls would be sloped at 3:1, while the embankments in front of the abutments would be sloped at 2:1. Slope paving would be required on embankment slopes steeper than 3:1. A minimum vertical clearance of 16.5 feet has been maintained. At these sites, two-span structure were evaluated. Skews noted in the plans are approximate and should be refined during the final design effort.

One superstructure type that could meet most of the site considerations for the overpass structures is a cast-in-place, post-tensioned (CIP PT) concrete box girder. This structure type can accommodate a variety of span lengths while maintaining a suitable span-to-depth ratio. CIP PT structures are typically used for spans ranging from 100 feet to over 250 feet, with span-to-depth ratios between 1-to-20.5 and 1-to-25. These span-to-depth ratios give the appearance of a slender superstructure that is aesthetically attractive. This structure type has historically been an economical alternative for overpasses, and is commonly used in the Phoenix metropolitan area. Because many of the overpass sites have few, if any, site constraints, a CIP PT concrete box girder could be constructed on falsework or soffit fill. Traffic on an existing road would be temporarily diverted for the soffit fill construction method, or restricted if built on falsework.

There are many sites where the required span length and available vertical clearance based on the current roadway profile grade can accommodate a precast girder superstructure option. A more detailed analysis would be conducted during final design to determine the best structure type for the overpasses based on cost, constructability, future widening constructability, and other considerations.

3.5.2 Substructure Assumptions

For the majority of the overpass structures, stub abutments on drilled shafts in fill slopes were assumed. If site constraints or stub abutments were unsuitable, full height abutments on spread footings with retaining walls were assumed. For bridges on full height abutments, appropriate cost adjustments were applied. The piers were assumed to be columns on drilled shafts.

3.5.3 Cost Assumptions

For planning purposes, the preliminary cost assumed for a CIP PT box girder structure was $118 (2018 $) per square foot. The preliminary cost assumed for an American Association of State Highway and Transportation Officials (AASHTO) precast girder structure was also $118 (2018 $) per square foot. Each bridge site was then evaluated for site-specific considerations such as potential full height abutments, long span lengths that would require steel bridge options, tall flyover bridges, utility conflicts, bridge widenings, straddle bents, drainage conflicts, scour, and other site constraints. After this evaluation, the appropriate cost adjustments were applied with specific bridge costs increasing to up to $300 (2018 $) per square foot. The cost for anchor slabs, approach slabs, and wing walls were included in the bridge square-foot cost.

3.5.4 Specific Site Considerations

The following sections describe the location and proposed conditions of specific bridge sites. Also, as appropriate, any known constructability or traffic control issues are discussed. If a specific bridge is not listed, no special or extraordinary issues are known to exist for that location, and would typically be covered in the *General Discussion of Overpass Structures* section above.

3.5.5 Section 1

Sarival Avenue Overpass

Location

SR 30 would cross over Sarival Avenue approximately 1,500 feet south of the intersection of Broadway Road and Sarival Avenue at approximately a 19-degree skew.

Proposed Conditions

The Sarival Avenue bridges will be two-span, Type IV AASHTO girder structures that carry SR 30 eastbound and westbound over Sarival Avenue. The bridges will be constructed in fill. Span 1 will be approximately 85'-8" while span 2 will be approximately 64'-4", measured from centerline of abutment to centerline of pier along the profile grade line, for a total bridge length of approximately 155'-10" from backwall to backwall. The eastbound roadway will consist of five 12-foot travel lanes, a 12-foot inside shoulder, and a 12-foot outside shoulder. The westbound roadway will consist of four 12-foot travel lanes, a 12-foot inside shoulder, and a 12-foot outside shoulder. The roadways will be separated by a 47'-2" open median that is reserved for future widening. The bridge substructure will be parallel to the centerline of Sarival Avenue and, therefore, skewed at approximately 19 degrees right of perpendicular to the bridge reference chord. Utilities along Sarival Avenue include an overhead power line that may need to be raised to provide adequate vertical clearance. An irrigation trench may need to be relocated or piped in order to construct the roadway.

The moderate skew increases the length of the substructure and the size of the approach slabs. Therefore, the costs for these items are greater than those for otherwise comparable bridges. The relatively short spans reduce the deck area of the bridges and increase their total unit cost.

Constructability and Traffic Control

The overhead power lines may present a potential conflict with the crane that is used to set the girders. No traffic control measures are necessary during construction of the overpass since there is no existing traffic on Sarival Avenue at this location.

Bullard Wash Bridge

Location

SR 30 will cross over Bullard Wash approximately 1,000 feet south of Broadway Road at an approximately 0.5-degree skew, which may be able to be reduced to zero during final design in coordination with FCDMC.

Proposed Conditions

The Bullard Wash bridges will be two-span, Type VI Modified AASHTO girder structures that carry SR 30 eastbound and westbound over Bullard Wash. The bridges will be constructed in fill. Both spans will be 125'-0" from centerline of abutment to centerline of pier for a total bridge length of 255'-6" from backwall to backwall. The eastbound roadway at the bridge will taper from 111'-8" at the west abutment to 95'-2" at the east abutment, while the westbound roadway will taper from 107'-2" at the west abutment to 95'-2" at the east abutment. The eastbound roadway will be striped for three 12-foot travel lanes, one variable width auxiliary lane, a variable width gore, and a variable width outside shoulder. The westbound roadway will be striped for three 12-foot through lanes, a 12-foot auxiliary lane, a variable width gore, and a variable width shoulder. The center 35'-2" of roadway in each direction will be striped for additional lanes in the future. The bridge substructure will be approximately parallel to the flow of Bullard Wash and, therefore, skewed at approximately 0.5 degrees right of perpendicular to the SR 30 centerline. Utilities along Bullard Wash include an irrigation trench that may need to be relocated or piped for construction. Lighting conduit will be provided in the concrete bridge barrier.

Constructability and Traffic Control

A portion of the riprap gabions that line Bullard Wash will need to be removed to construct the pier and to allow access for construction equipment around the site. The riprap gabions will need to be reconstructed. An allowance for riprap removal and reconstruction is included in the cost of these bridges. There is no need for traffic control because the bridges are not being constructed over an active roadway.

3.5.6 Section 2 – Center Alternative

Bullard Avenue

Location

SR 30 will cross over Bullard Avenue approximately 1,000 feet south of the intersection of Broadway Road and Bullard Avenue at approximately a 3-degree skew.

Proposed Conditions

The Bullard Avenue bridges will be two-span, Type V AASHTO girder structures that carry SR 30 eastbound and westbound over Bullard Avenue. The bridges will be constructed in fill. Span 1 will be 90'-1", while span 2 will be 102'-2" measured from centerline of abutment to centerline of pier along the profile grade line for a total bridge length of 197'-9" from backwall to backwall. The eastbound and westbound roadways will each consist of the typical roadway section. The roadways will be separated by a 47'-2" open median that is reserved for future widening. Utilities along Bullard Avenue include a water main, an underground telephone line, an overhead power line, and an overhead telephone line that may need to be raised to provide adequate vertical clearance. Irrigation ditches on each side of Bullard Avenue will be piped to reconstruct the roadway.

Constructability and Traffic Control

The overhead power and telephone lines may present a potential conflict with the crane that is used to set the girders. Construction activity over Bullard Avenue, such as setting girders and deck forms, and placing concrete for the deck, will require temporary roadway closures.

Agua Fria River and DRCC Basin No. 1 Crossing (including Dysart Road Ramps A and B)

Location

The proposed SR 30 Center Alternative would cross over the Agua Fria River, the adjacent gravel pits, and Dysart Road in this area. The Agua Fria River is a north-to-south flowing river and converges with the Gila River approximately 3,000 feet south of this alignment. It is a jurisdictional water and is overseen by USACE. Based on recently completed projects in the vicinity, scour depth in the river channel is assumed to be 20 feet. In the area of the crossing, mining operations have occurred on the west and east sides of the river for many years. On the west side of the river, there is potentially a gravel excavation pit in the floodway that has been refilled. It is assumed that this pit was 20 feet in depth. A major active gravel mining operation is in this proposed freeway alignment on the east side of the river. The depth of this pit is assumed to be 100 feet, which is the maximum depth allowed by the permit issued for the gravel excavation. It is anticipated that this approximately 3,600-foot-long gravel pit will be the future DRCC Basin No. 1 and serve as part of this corridor’s drainage system.

The future DRCC Basin No. 1 limits are the Agua Fria River east bank on the west and Dysart Road on the east. Because of the close proximity of the river, the basin, and Dysart Road, it is proposed that the Agua Fria River crossing be two continuous bridge structures (westbound and eastbound), including an entrance ramp structure (Dysart Road Ramp A) and an exit ramp structure (Dysart Road Ramp B), carrying this alignment over the river, the DRCC Basin, and Dysart Road. While abutments could have been placed on the east bank of the river to separate the river crossing from the basin crossing, this would have resulted in full height abutments near each other. By replacing these abutments with single pier, potential compaction issues can be eliminated and construction costs reduced by building only one substructure. A bridge over 6,000 feet long is required to span over these three design features.

Although the floodplain of the Agua Fria River is very wide near the proposed freeway alignment, the proposed bridges span over the 100-year floodway while limiting water surface elevation increase to less than 1 foot. Bank protection will be required at the west abutment.

There is a concrete-encased, 96-inch APS effluent water line located diagonally across the river channel on the west side under the proposed SR 30 bridge. This utility cannot be relocated or disturbed. Based on as-builts, it is assumed that this utility is located approximately 20 feet below the existing riverbed. Two bridge piers in the river area are anticipated to consist of a straddle bent type structure to provide approximately 20 feet of horizontal clearance from this water line.

Proposed Conditions

Bridge Geometry

The two main line bridge structures (eastbound and westbound) will parallel each other. The proposed horizontal alignment in the main line bridge limits begins on a horizontal curve with a 2 percent superelevation and transitions into a tangent section with a normal crown (2 percent) at approximately 1,500 feet west of the Dysart Road construction centerline. The cross slope of each bridge would be at full superelevation and would transition to normal crown. Over the length of each bridge, the proposed vertical alignment begins at a 2,000-foot crest vertical curve at the west abutment of the bridge, progresses through an 800-foot crest vertical curve, a 600-foot vertical tangent segment with 0.44 percent grade, an 800-foot vertical sag curve, and a 1,000-foot crest curve.

The Agua Fria River crossing would consist of two main line bridges with a 47'-2" open median. This opening is reserved for future widening. Each superstructure would carry three 12-foot travel lanes, a 12-foot outside shoulder, and a 12-foot inside shoulder for a clear roadway width of 60 feet. The superstructure width in each direction would include a 1-foot-5-inch-wide, 32-inch-high F-shaped barrier at the edge of each side for a total bridge width of 62 feet 10 inches.

Dysart Ramps A and B extend approximately 2,100 feet and 700 feet onto the eastbound and westbound main line bridges, respectively. A portion of the main line bridges would be flared, affecting six eastbound spans and four westbound spans, to accommodate ramp tapers. The ramps would become individual bridges starting at a common pier with the main line bridge.

Dysart Ramp A consists of two 12-foot travel lanes, a 4-foot outside shoulder, and a 4-foot inside shoulder for a clear road width of 32 feet. The superstructure width in each direction would include a 1-foot-5-inch-wide, 32-inch-high F-shaped barrier at the edge of each side for a total bridge width of 34 feet 10 inches.

Dysart Ramp B consists of one 12-foot travel lane, a 4-foot outside shoulder, and a 10-foot inside shoulder for a clear road width of 26 feet. The superstructure width in each direction would include a 1-foot-5-inch-wide, 32-inch-high F-shaped barrier at the edge of each side for a total bridge width of 28 feet 10 inches.

Bridge Superstructure

A number of superstructure types could be used for the Agua Fria River bridges. Many of these systems, however, would require shoring or falsework in the river and the DRCC Basin. This would present a substantial risk for constructing the segment over the river in case of an unexpected flood. The risk and cost would also be high for building the segment over the basin because of constructability and feasibility concerns of the 100-foot deep water condition. While the structural requirements, aesthetics, economic feasibility, construction considerations, and long-term serviceability of feasible systems would be fully reviewed during the bridge type selection phase of the design process, the traditional solution for similar river crossings throughout the region has been the precast, prestressed concrete girder.

Because of the extensive lengths of the proposed bridges, the unique site conditions, and the potential major cost savings associated with different superstructure systems, several feasible superstructure types other than the traditional precast concrete girder were considered during this study. A preliminary cost comparison between the steel plate girder and the precast, prestressed concrete girder system indicates that although the steel girder system provides small savings at the construction stage, the precast, prestressed concrete girder system provides a significant maintenance saving over the life of the bridge. Therefore, the precast girder system is used for this study's cost estimate, which results in a total bridge length of 6,635 feet 9 3/8 inch, with a total of 48 spans for the main line bridges. Dysart Ramps A and B bridges would have a total bridge length of 1,402'-6", with 10 spans, and 1,544'-6", with 11 spans, respectively.

Bridge Substructure

The proposed alignment crosses over three major design features. Similar substructure units with some variation are proposed at each design feature to satisfy its specific constraints while maintaining consistency with other structures in the alignment from economic and aesthetic considerations. Abutments of the proposed main line and ramp bridges would be stub abutments supported on drilled shafts, which are typical throughout the alignment. Larger diameter drilled shafts are anticipated at the ramp abutments because of extensive shaft length through a fill condition.

The main line bridge piers in the Agua Fria River are proposed to be at approximately 10-degree skew. These pier units would consist of round columns on large diameter drilled shafts with a pier cap alignment placed parallel to the floodway flow to minimize impacts on river hydraulics. Based on recent construction projects with similar conditions, the shafts were assumed to be 7 feet in diameter except at the straddle bents, where an 8-foot diameter will be used. Pier layout transitions from a 10-degree skew to perpendicular to the SR 30 construction centerline as the bridge continues beyond the river.

Approximately half of the piers for the proposed main line bridge and all the piers for the ramp structures would fall in the future DRCC Basin No. 1. Because of the potential ultimate condition of the DRCC Basin, including approximately 100-foot-deep ponded water that could exist at the time of bridge foundation construction, it is assumed that in addition to the drilled shaft length, the pier column would be approximately 120 feet long. To address the unique situation of constructing a very tall bridge substructure and supporting foundation in such deep water, a feasible pier system in the basin would consist of a conventional pier cap supported by constant 10-foot diameter shafts/columns with a watertight permanent casing as the form work. It is understood that this is a costly foundation system. If basin site conditions during final design indicate a substantially lower water level, a more economical foundation will be investigated. Geotechnical investigations will need to occur at gravel pit areas to verify their depth and evaluate potential foundation constructability issues because of man-made uncompacted fill material and debris.

The pier at the Dysart Road construction centerline would consist of blade piers with a 7-foot-diameter shaft, which is consistent with the other crossroad structures along this alignment.

Bridge Drainage

Based on the preliminary drainage design, a deck drain system will generally not be required along the bridge. However, it is proposed to provide a deck drain for each bridge at the pier between the Agua Fria River east bank and the future basin to convey drainage from the river crossing segment route to the ground. This will prevent hazardous spill in the river segment from merging to the basin segment. The bridge segment over the basin is assumed to drain directly into the DRCC Basin through a slotted drain at face of barrier. Catch basins will also be provided at each abutment.

Constructability and Traffic Control

The bridge site can be accessed using the proposed SR 30 freeway corridor from either Broadway Road or Southern Avenue. Access to the river channel would be necessary during construction of the river segment; therefore, appropriate environmental permits (see Section 4.7, *Sections 401 and 404 of the Clean Water Act*, for further details) would be required.

While the river bridge is anticipated to be constructed in a dry riverbed (as it is 95 percent of the time), the basin segment is assumed to be constructed over 100-foot-deep water. Typically, constructing bridge foundations in water can be achieved by dewatering, constructing a coffer dam, and building a causeway or using a floating modular barge system, depending on the size of the water body, depth of the water, and the bridge location relative to nearest access during construction. Based on the basin's size (approximately 138 acres), anticipated potential environmental impact, feasibility, constructability, and cost, a modular floating barge system is assumed for bridge construction in the basin area. If information at the final design stage indicates a significantly lower water depth, other, more conventional, approaches can be investigated.

There is an overhead power line in the limits of span 48; this may present a potential conflict with the crane that is used to set the girders and needs to be closely coordinated with the utility company.

3.5.7 Section 2 – Hybrid Alternative

Bullard Avenue

Location

SR 30 will cross over Bullard Avenue approximately 1,000 feet south of the intersection of Broadway Road and Bullard Avenue at approximately a 3-degree skew.

Proposed Conditions

The Bullard Avenue bridges will be two-span, Type V AASHTO girder structures that carry SR 30 eastbound and westbound over Bullard Avenue. The bridges will be constructed in fill. Span 1 will be 90'-1" while span 2 will be 102'-2", measured from centerline of abutment to centerline of pier along the profile grade line, for a total bridge length of 197'-9" from backwall to backwall. The eastbound and westbound roadways will each consist of the typical roadway section. The roadways will be separated by a 47'-2" open median that is reserved for future widening. Utilities along Bullard Avenue include a water main, an underground telephone line, an overhead power line, and an overhead telephone line that may need to be raised to provide adequate vertical clearance. Irrigation ditches on each side of Bullard Avenue will be piped to reconstruct the roadway.

Constructability and Traffic Control

The overhead power and telephone lines may present a potential conflict with the crane that is used to set the girders. Construction activity over the Bullard Avenue, such as setting girders and deck forms, and placing concrete for the deck, will require temporary roadway closures.

Agua Fria River Bridge Crossing

Location

The proposed SR 30 freeway alignment would cross over the Agua Fria River and adjacent gravel pits in this area. The Agua Fria River is a north-to-south flowing river and converges with the Salt and Gila Rivers approximately 2,800 feet south of this alignment. It is a jurisdictional water and is overseen by USACE. Based on recently completed projects in the vicinity, scour depths in the river channel are assumed to be 20 feet. In the area of the crossing, mining operations have occurred on the west and east sides of the river for many years. On the west side of the river, the alignment spans an active gravel excavation pit in the floodway that is assumed to be 20 feet in depth. On the east side of the river, the alignment spans the southeast corner of the same active gravel mining operation that will become the DRCC Basin No. 1 that the Center Alternative crosses over. Since the SR 30 bridge is only located near the edge of this basin, the depth near its construction will be much less than 100 feet.

The future DRCC Basin No. 1 limits are the Agua Fria River east bank on the west and Dysart Road on the east. Because of the close proximity of the river and the basin, it is proposed that the Agua Fria River crossing be two continuous bridge structures carrying eastbound and westbound alignments across the river and the basin. While abutments could have been placed on the east bank of the river to separate the river crossing from the basin crossing, this would have resulted in full height abutments near each other. By replacing these abutments with a single pier, potential compaction issues can be eliminated and construction costs reduced by building only one substructure. A bridge over 4,035 feet long is required to span over these two design features.

Although the floodplain of the Agua Fria River is very wide near the proposed freeway alignment, the proposed bridges span over the 100-year floodway while limiting the water surface elevation increase to less than 1 foot. Bank protection will be required at the west abutment.

There is a concrete-encased, 96-inch APS effluent water line located diagonally across the river channel on the west side under the proposed SR 30 bridge. This utility cannot be relocated or disturbed. Based on as-builts, it is assumed that this utility is located approximately 20 feet below the existing riverbed. Two bridge piers in the river area are anticipated to consist of a straddle bent type structure to provide approximately 20 feet of horizontal clearance from this water line.

Proposed Conditions

Bridge Geometry

The two bridge structures (eastbound and westbound) will parallel each other. The proposed horizontal alignment in the bridge limits begins on a horizontal reverse curve with a 2.3 percent superelevation that transitions over to 4.5 percent superelevation the other direction at approximately midpoint of the bridge. Over the length of each bridge, the proposed vertical alignment begins at a 2,500-foot crest vertical curve at the west abutment and progresses through a vertical tangent segment with about a 1 percent grade.

The Agua Fria River crossing would consist of two bridges with a 47'-2" open median. This opening is reserved for future widening. Each superstructure would carry three 12-foot travel lanes, a 12-foot outside shoulder, and a 12-foot inside shoulder for a clear roadway width of 60 feet. The superstructure width in each direction would include a

1-foot-5-inch-wide, 32-inch-high F-shaped barrier at the edge of each side for a total bridge width of 62 feet 10 inches.

Bridge Superstructure

Several superstructure types could be used for the Agua Fria River bridges. Many of these systems, however, would require shoring or falsework in the river and the basin. This would present a substantial risk for constructing the segment over the river in the case of an unexpected flood. The risk and cost would also be high for building the section over the DRCC Basin because of constructability concerns. While the structural requirements, aesthetics, economic feasibility, construction considerations, and long-term serviceability of feasible systems would be fully reviewed during the bridge type selection phase of the design process, the traditional solution for similar river crossings throughout the region has been the precast, prestressed concrete girder. Therefore, the precast girder system is proposed for this bridge, which results in a total bridge length of 4,035 feet with 31 spans.

Bridge Substructure

The proposed alignment crosses over two major design features. Similar substructure units with some variation are proposed at each design feature to satisfy its specific constraints while maintaining consistency with other structures in the alignment from economic and aesthetic considerations. Abutments of the proposed bridges would be stub abutments supported on drilled shafts, which are typical throughout the alignment. The east abutments of the proposed bridges will be supported on a significant amount of fill on the southern edge of the DRCC Basin.

The bridge piers in the Agua Fria River are proposed to be at varying skew angles to the SR 30 construction centerline. These pier units would consist of round columns on larger diameter drilled shafts with a pier cap placed parallel to the floodway skew to minimize impacts on river hydraulics. Based on recent construction projects with similar conditions, the shafts were assumed to be 7 feet in diameter except at the straddle bents, where an 8-foot diameter will be used. Pier layout transitions from skew to perpendicular to the SR 30 construction centerline as the bridge continues beyond the river.

Three pier lines from each of the proposed bridges would fall along the edges of the future DRCC Basin No. 1. Because of the potential ultimate condition of the DRCC Basin, including approximately 100-foot-deep ponded water that could exist at the time of bridge foundation construction, it is assumed that in addition to the drilled shaft length, the pier column would be approximately 120 feet long. To address the unique situation of constructing a very tall bridge substructure and supporting foundation in such deep water, a feasible pier system in the basin would consist of a conventional pier cap supported by constant 10-foot-diameter shafts/columns with a watertight permanent casing as the form work. It is understood that this is a costly foundation system. If basin site conditions during final design indicate a substantially lower water level, a more economical foundation will be investigated. Geotechnical investigations will need to occur at gravel pit areas to verify their depth and evaluate potential foundation constructability issues because of man-made uncompacted fill material and debris.

Bridge Drainage

Based on the preliminary drainage design, a deck drain system will not be required along the bridge. Catch basins at each abutment would collect runoff and convey it off the proposed structure.

Constructability and Traffic Control

The bridge site can be accessed using the proposed SR 30 freeway corridor from either Broadway Road or Southern Avenue. Access to the river channel would be necessary during construction of the bridge; therefore, appropriate environmental permits (see Section 4.7, *Sections 401 and 404 of the Clean Water Act*) would be required.

While a majority of the bridge is anticipated to be constructed in a dry riverbed (as it is 95 percent of the time), a small section of the bridge is assumed to be constructed near 100-foot-deep water at the DRCC Basin. Typically, constructing bridge foundations in water can be achieved by dewatering, constructing a coffer dam, and building a causeway or using a floating modular barge system, depending on the size of the water body, depth of the water, and the bridge location relative to nearest access during construction. Because this alignment's bridge only skirts the edge of this basin, conventional ground-based equipment is assumed for this construction. If information at the final design stage indicates a significantly different condition than that described here, other approaches can be investigated.

Buckeye Feeder Canal

Location

The proposed SR 30 Center Alternative would cross over the BFC just east of the Agua Fria River. At this location, the proposed freeway bridges would span the entire canal, existing maintenance roads, and the new Dysart Road driveway approximately 200 feet east of the canal. At the freeway crossing, the 15-foot-wide maintenance road on either side of the canal must be maintained. The bridge must provide 16.5 feet of vertical clearance over the canal maintenance roads and the Dysart Road driveway.

Proposed Conditions

The proposed alignment crosses the BFC and the Dysart Road driveway at approximately 58- and 50-degree skew angles, respectively. To minimize construction and long-term maintenance issues, the proposed bridge substructures would have a maximum of 45-degree skew. For this study, it is assumed that pier line immediately adjacent to the canal and falsework over the canal will not be allowed by SRP.

Precast girder, CIP box girder, and steel plate girder structures were evaluated at this location based on their inherent advantages and disadvantages:

- A precast girder can be erected quickly with minimal impacts on the canal. However, its span length is limited to approximately 135 feet, which would require piers located adjacent to the canal. This system would also require a straddle bent type pier structure over the canal and the driveway, limiting the vertical clearance to less than 16'-6".
- A CIP PT concrete box girder is an economical option in the Phoenix metropolitan area for large skew and long span bridges similar to this situation. A two-span structure could easily span all the design features without placing a pier adjacent to the canal. However, this superstructure type would require falsework to span over the canal. It could be difficult to maintain access to the Roosevelt Irrigation District maintenance road during construction.
- A steel plate girder superstructure has higher costs but can accommodate the long span without the need for falsework. Therefore, the steel plate girder appears to be the best option for this location and is the assumed bridge type for this study. This results in a two-span structure with a total bridge length of 372 feet for westbound and 420 feet for eastbound.

While the east abutment would be a stub abutment, a full height abutment is proposed at the west abutment to reduce span length and minimize superstructure cost. Both abutments would be supported on drilled shafts. The pier would consist of a rectangular column with 7-foot-diameter shaft.

Constructability and Traffic Control

The bridge site can be accessed using the proposed SR 30 freeway corridor from Southern Avenue and the existing maintenance road. There is no existing utility other than the canal itself in the limits of the proposed structure.

3.5.8 Section 2 – South Alternative

Bullard Avenue

Location

SR 30 will cross over Bullard Avenue approximately 1,000 feet south of the intersection of Broadway Road and Bullard Avenue at approximately a 3-degree skew.

Proposed Conditions

The Bullard Avenue bridges will be two-span, Type V AASHTO girder structures that carry SR 30 eastbound and westbound over Bullard Avenue. The bridges will be constructed in fill. Span 1 will be 90'-1" while span 2 will be 102'-2", measured from centerline of abutment to centerline of pier along the profile grade line, for a total bridge length of 197'-9" from backwall to backwall. The eastbound and westbound roadways will each consist of the typical roadway section. The roadways will be separated by a 47'-2" open median, which is reserved for future widening. Utilities along Bullard Avenue include a water main, an underground telephone line, an overhead power line, and an overhead telephone line that may need to be raised to provide adequate vertical clearance. Irrigation ditches on each side of Bullard Avenue will be piped to reconstruct the roadway.

Constructability and Traffic Control

The overhead power and telephone lines may present a potential conflict with the crane that is used to set the girders. Construction activity over Bullard Avenue, such as setting girders and deck forms and placing concrete for the deck, will require temporary roadway closures.

Agua Fria River Crossing

Location

The proposed SR 30 freeway would cross over the Agua Fria River. The Agua Fria River is a north-to-south flowing river and converges with the Gila River just south of the SR 30 South Alternative. It is a jurisdictional water and is overseen by USACE. In the area of the crossing, the Agua Fria River has been subject to gravel mining operations for many decades. A major gravel mining operation is located just north (upstream) of this proposed SR 30 freeway South Alternative on the east side of the river. Mining operations have occurred on the east and west sides of the river for many years. Some of the excavation pits have been filled in and geotechnical investigations will need to occur at locations where the bridge abutments are located on the banks of the river. Scour depths in the river channel are assumed to be 20 feet. This scour depth is subject to change based on gravel mining activities that are currently taking place.

There is a concrete-encased, 96-inch APS effluent water line located diagonally across the river channel on the west side under the proposed SR 30 bridge. This utility cannot be relocated or disturbed. Based on as-builts, it is assumed that this utility is located approximately 20 feet below the existing riverbed. Two bridge piers in the river area are anticipated to consist of a straddle bent type structure to provide approximately 20 feet of horizontal clearance from this water line.

Proposed Conditions

Bridge Geometry

The proposed horizontal alignment within the reach of the Agua Fria River is at approximately an 11-degree skew, and the two bridge structures (eastbound and westbound) would parallel each other. The cross slope of each bridge would be at normal crown (2 percent) except in areas of superelevation. Over the length of the bridge, the proposed vertical alignment begins on a 3 percent tangent, progresses through a 2,000-foot crest vertical curve, and then ends on a 1.25 percent tangent.

While the floodplain of the Agua Fria River is very wide near the proposed SR 30 freeway South Alternative, a 3,125-foot structure could be used to span the 100-year storm frequency floodway and limit water surface elevation increase in the floodplain to the designated floodway elevation with channel improvements. Bank protection would need to be constructed at each abutment.

The Agua Fria River crossing would consist of two bridges with a 47'-2" open median. This opening is reserved for future widening. Each superstructure would carry three 12-foot travel lanes, a 12-foot outside shoulder, and a 12-foot inside shoulder for a clear roadway width of 60 feet. The superstructure width in each direction would include a 1-foot-5-inch-wide, 44-inch-high F-shaped barrier at the edge of each side for a total bridge width of 62 feet 10 inches. It should be noted that the study team debated the appropriate barrier height for the Agua Fria River bridges, and the team settled on the 44-inch barrier, but final design efforts may reduce this to 32 inches if design preferences change.

Bridge Superstructure

A number of structure types could be used for the Agua Fria River bridge. Many of these systems, however, would require shoring or falsework in the river, which would present a substantial risk in the case of an unexpected flood. While the structural requirements, aesthetics, economic feasibility, construction considerations, and long-term serviceability of these systems would be fully reviewed during the bridge type selection phase of the design process, the traditional solution for similar river crossings throughout the region has been the precast, prestressed concrete girder. The total bridge length would be 3,125 feet, with a total of 24 spans. For this length of structure, deck drains would be required to collect drainage and convey it off the proposed structure.

Bridge Substructure

Similar substructure units compared to the rest of the corridor are expected with this bridge to maintain consistency with other structures in the alignment for economic and aesthetic considerations. Abutments of the proposed bridges would be stub abutments supported on drilled shafts, which are typical throughout the alignment.

The bridge piers in the Agua Fria River feature are proposed to be at approximately an 11-degree skew to the SR 30 construction centerline. These pier units would consist of round columns on larger diameter drilled shafts with a pier cap placed parallel to the floodway skew to minimize impacts on river hydraulics. Based on recent construction projects with similar conditions, the shafts were assumed to be 7 feet in diameter except at the straddle bents, where an 8-foot diameter will be used. Pier layout transitions from skew to perpendicular to the SR 30 construction centerline as the bridge continues beyond the river.

Bridge Drainage

Based on the preliminary drainage design, a deck drain system will not be required along the bridge. Catch basins at each abutment would collect runoff and convey it off the proposed structure.

Constructability and Traffic Control

The bridge site can be accessed using the proposed SR 30 freeway corridor from either Broadway Road or Southern Avenue. Access to the river channel would be necessary during construction; therefore, appropriate environmental permits would be required (see Section 4.7, *Sections 401 and 404 of the Clean Water Act*).

It is anticipated that this bridge will be constructed in a dry riverbed (as it is 95 percent of the time). Construction work windows should avoid the wet seasons.

Buckeye Feeder Canal

Location

The proposed SR 30 South Alternative would cross over the BFC just east of the Agua Fria River. At this location, the proposed freeway bridges would span the entire canal and existing maintenance roads. At the freeway crossing, the 15-foot-wide maintenance road on either side of the canal must be maintained. The bridge must provide 16.5 feet of vertical clearance over the canal maintenance. The bride would be at approximately a 26-degree skew. This can be achieved with a single span CIP box girder structure.

Proposed Conditions

Precast girder and CIP box girder structures were evaluated at this location based on their inherent advantages and disadvantages. A precast girder can be erected quickly with minimal impacts on the canal. However, it is limited in span length to approximately 135 feet, which would require a pier and full height abutments. A CIP box girder can easily span the canal with a single span using full height abutments, thus reducing substructure cost. However, it may be difficult to span the canal with falsework during construction.

There are overhead power lines near the proposed abutment 1. Telephone and irrigations lines cross near abutment 2.

3.5.9 Section 3

While subtle difference exist with the bridge layouts between the two SR 30/SR 202L system TI configurations, these differences are not substantial. As a result, only the recommended TI configuration was studied in detail, consistent with the SR 30/SR 202L system TI design documented in the ISR Addendum (Chapter 8).

SR 30/SR 202L Ramp EN

Location

Ramp EN is a directional ramp that carries two traffic lanes from eastbound SR 30 to northbound SR 202L. This ramp is located on level 5 of the system interchange. The major features of this bridge are that it crosses the SR 202L main line at level 1, SR 30 at level 2, Ramp WS at level 3, and Ramps NW and SE at level 4.

Proposed Conditions

Ramp EN is an overpass structure with 37 spans that will be fully elevated over the features mentioned above. The proposed Ramp EN bridge typical section includes two 12-foot travel lanes, a 6-foot inside shoulder, and a 10-foot outside shoulder. The ramp will have a 44-inch-high, F-shaped concrete barrier on each side. The total out-to-out width is 43'-2". Near the north end of the bridge, Ramp EN merges with Ramp WN, adding two more lanes to the bridge, resulting in a bridge with four traffic lanes on spans 35, 36, and 37. Ramp EN’s horizontal alignment is on multiple tangents and horizontal curves. In addition, the vertical profile of the ramp in the bridge limits is on multiple tangents and vertical curves.

A preliminary layout of the bridge indicates a structure length of 5,225 feet is required. Key areas for pier placement and span optimization include crossing Ramps NW and SW, spanning over the SR 202L main line, and finally spanning over SR 30.

For the purpose of this study, an AASHTO Type Super VI Girder bridge was considered for the entire structure with the exception of span 37, which is 200 feet in length and will need to be either a CIP PT box girder or a steel plate girder bridge. The rest of the span lengths vary from 94 to 160 feet. Substructure units consists of stub-type abutments supported on single row 60-inch-diameter drilled shafts. Piers consist of 15-foot × 6-foot rectangular columns with transition caps supported on two 108-inch-diameter drilled shafts. Cantilevered type wing walls and retaining walls will be used for protecting embankments at the south abutment, and mechanically stabilized earth walls will be used for embankment protection at the north abutment.

Constructability and Traffic Control

Casing for drilled shafts may be needed, considering the possibility of a shallow groundwater table near the Salt River.

No long-term detour will be required for construction activities. A temporary closure of features crossed will be required while setting girders and placing deck forms, and during the deck concrete pours. All full closures can be accommodated during nights and weekends.

SR 30/SR 202L Ramp WN

Location

Ramp WN is a directional ramp that carries two traffic lanes over Broadway Road from SR 30 westbound to SR 202L northbound and is located on the east side of SR 202L. While technically not part of the west half of the interchange, the interrelationship of this bridge to the Ramp EN bridge makes constructing this short bridge feasible with the west half of the system TI.

Proposed Conditions

The structure will consist of a two-span bridge. The spans are 143'-3" and 143'-8". The total bridge length is 289'-7". The ramp’s roadway configuration will consist of two 12-foot travel lanes, a 6-foot inside shoulder, and a 10-foot outside shoulder. The total out-to-out width of the bridge, including the 44-inch-high, F-shaped barrier, is 43'-2". The bridge is on a horizontal curve and the bridge’s vertical profile is on a crest vertical curve.

For the purpose of the study, an AASHTO Type Super VI Girder Bridge was considered. The pier will consist of one 8-foot × 5-foot rectangular column with a transition cap supported on one 108-inch-diameter drilled shaft. The south abutment is a stub-type supported by a single row of 60-inch-diameter drilled shafts. Cantilevered type wing walls will be used for protecting the embankment at the abutment. The north end of the bridge ends at pier 2 and is where the Ramp WN merges with Ramp EN. Pier 2 consists of three 8-foot × 5-foot rectangular columns with a transition cap each supported on 108-inch-diameter drilled shaft.

Constructability and Traffic Control

Casing for drilled shafts may be needed considering the possibility of a shallow groundwater table near the Salt River.

Access for bridge construction can occur from Broadway Road. No long-term detour is required for construction activities. A temporary closure of Broadway Road may be required during the setting of the girders, placing of deck forms, and pouring of the deck concrete. All full closures can be accommodated during nights and weekends.

SR 30/SR 202L Ramp NW

Location

Ramp NW is a directional ramp that carries two traffic lanes from northbound SR 202L to westbound SR 30. This ramp is located on level 4 of the system interchange. The major features of this bridge are that is crosses the SR 202L main line at level 1, SR 30 at level 2, and Ramp WS at level 3.

Proposed Conditions

The Ramp NW flyover bridge will be a 33-span structure that will be fully elevated over the features mentioned above. The proposed Ramp NW bridge typical section includes two 12-foot travel lanes, a 6-foot inside shoulder, and a 10-foot outside shoulder. The ramp will have a 44-inch-high, F-shaped concrete traffic barrier on each side. The total out-to-out width is 43'-2". Near the south end of the bridge, Ramp EN merges into the SR 202L main line and the last three spans of the ramp are widening the existing SR 202L bridge over the Salt River. Ramp NW's horizontal alignment is on multiple tangents and horizontal curves. The vertical profile of the ramp in the bridge is on multiple tangents and vertical curves.

A preliminary layout of the bridge indicates a structure length of 5,222 feet is required. On dry land, the pier locations and span configurations are directly related to the geometry of the ramp and the features it crosses. Over the Salt River, however, the placement of the piers was dictated by the existing SR 202L bridge span configuration. Pier locations were determined by extending the centerline of existing piers of the adjacent SR 202L main line bridge over the Salt River to minimize impacts on the flow of the river. Since the Ramp NW alignment is on multiple tangents and horizontal curves and not parallel to the main line bridge, different span lengths along the bridge were required. Span length over the entire Ramp NW will range between 94 and 184 feet.

For the purpose of the study, an AASHTO Type Super VI Girder was considered for the first 12 spans, which are all above dry land. For the portion spanning the Salt River, a steel plate girder was considered. The steel plate girder type of superstructure was selected for its capability to span the required distance without the use of falsework in the riverbed. The final three spans of the structure are a widening of the SR 202L main line bridge over the Salt River. Those three spans will range in length between 173 and 178 feet. It is a common practice to match the existing superstructure type when widening an existing bridge; therefore, for these spans, a Bulb T girder will be considered for the widening. During the final design phase, use of the Bulb T girders throughout this structure over the river should be evaluated because they may be more economical and/or more aesthetically pleasing.

Substructure units consist of stub-type abutments supported on single row 60-inch-diameter drilled shafts. The existing SR 202L bridges over the Salt River use semi-integral abutments, so that should be matched for the widened portion of this bridge. For the spans that lie outside the Salt River channel, the piers consists of one 8-foot × 5-foot rectangular column with a transition cap supported on one 108-inch-diameter drilled shaft. For spans that lie in the Salt River channel, pier units consist of two 60-inch-diameter circular columns, with each being supported on 72-inch-diameter drilled shafts. Cantilevered type wing walls and retaining walls will used for embankment protection at the abutments, and the existing scour protection will be perpetuated.

Special Conditions that Influence the Costs

The adjacent sand and gravel mining operation will significantly affect the design of the proposed bridge structure. There are existing pits upstream and downstream. The pits will increase the cost of the bridge foundation because the shaft lengths will have to be lengthened to accommodate these impacts. Sand and gravel pits located downstream of the structure may "head cut" upstream. Sand and gravel pits located upstream of the structure will collect sediment and increase the sediment transport rate through the structure. Long-term degradation from these sand and gravel operations is anticipated to be approximately 20 feet. The estimates for drilled shafts length are increased by 20 feet for long-term degradation and by 32 feet for local pier scour and contraction scour, for a total of 52 feet to accommodate these riverbed conditions.

Constructability and Traffic Control

Casing for drilled shafts may be needed in the riverbed considering the possibility of a shallow groundwater table.

Access for bridge construction can occur from the riverbed. Temporary construction easements (TCEs) may be required along the south and north banks of river to provide access to the riverbed. The construction equipment can access the river to construct the substructure elements. No conventional falsework is required.

No long-term detour will be required for construction activities. A temporary closure of the features crossed by the ramp will be required during setting of the girders, placing of deck forms, and pouring of the deck concrete. All full closures can be accommodated during nights and weekends.

SR 30/SR 202L Ramp ES

Location

Ramp ES is a directional ramp that carries two traffic lanes from eastbound SR 30 to southbound SR 202L. This ramp is a level 2 ramp in the system interchange. Ramp ES crosses over the proposed SR 202L southbound frontage road bridge over the Salt River.

Proposed Conditions

Ramp ES is an 18-span overpass structure that is fully elevated as it crosses the proposed SR 202L southbound frontage road bridge. The proposed Ramp ES bridge typical section includes two 12-foot travel lanes, a 6-foot inside shoulder, and a 10-foot outside shoulder. There will be 44-inch-high, F-shaped concrete bridge barriers on each side of the bridge. The total out-to-out width is 43'-2". At span 9, the ramp joins the southbound SR 202L and transitions into a 13'-5" widening of the existing southbound SR 202L bridge. The 44-inch-high barrier is maintained on the outside edge of the widening. At pier 16, the bridge will widen to 58'-3" to accommodate a future WS ramp that will also merge with the southbound SR 202L bridge. This additional widening south of pier 16 is proposed as part of this project so that the SR 202L bridge abutment widening and associated abutment protection is altered only once.

The preliminary layout of the bridge results in a structure length of 2,857 feet. Piers have been located to accommodate crossing over the frontage road and to perpetuate the pier alignments in the Salt River of the existing SR 202L bridge.

For the purpose of this study, AASHTO Type Super VI Girders have been considered for spans 1 thru 6. At span 7, the bridge starts to parallel SR 202L and the span lengths start to match the existing SR 202L southbound bridge where the girders transition to Bulb T girders, matching the girder type of the existing SR 202L bridge. At span 9, Ramp ES becomes a widening of the SR 202L bridge. Since common practice is to match the existing structure type, the Bulb T will continue as the girder type for the remaining spans 9 thru 18. The proposed substructure consists of a semi-integral stub-abutment (to match the existing SR 202L bridge) on a single row of 60-inch-drilled shafts. Piers will consist of pier caps on two 60-inch-diameter circular columns, with each column being supported by a 72-inch-diameter drilled shaft foundation. Cantilevered wing walls will be used at the abutments for embankment protection, and the existing scour protection will be perpetuated.

Special Conditions that Influence the Costs

The adjacent sand and gravel mining operation will significantly affect the design of the proposed bridge structure. There are existing pits upstream and downstream. The pits will increase the cost of the bridge foundation. Sand and gravel pits located upstream of the structure will collect sediment and increase the sediment transport rate under the structure. Long-term degradation from these sand and gravel operations is anticipated to be approximately 20 feet. The estimates for drilled shaft length are increased by 20 feet for long-term degradation and 32 feet for local pier scour and contraction scour, for a total of 52 feet.

Constructability and Traffic Control

Casing for drilled shafts may be needed considering the possibility of a shallow groundwater table near the Salt River.

Access for bridge construction can occur from the riverbed. TCEs may be needed along the south and north banks of the Salt River to provide construction access to the riverbed to construct the substructure elements. Because of the structure type, no falsework supported in the river is required.

No long-term detours are required for constructing this ramp. Depending on construction phasing, temporary closures of roadways crossed that may be active at the time of construction will be required to set girders, install deck forms, and during the deck concrete pours. These closures can be accomplished during the nights and weekends.

SR 30/SR 202L Ramp SW

Location

Ramp SW is a multi-lane directional ramp that carries traffic from southbound SR 202L to westbound SR 30. This ramp is a level 2 ramp of the system interchange. Ramp SW crosses over Broadway Road and the proposed SR 202L southbound frontage road.

Proposed Conditions

Ramp SW is a seven-span overpass structure that is fully elevated as it crosses Broadway Road, and the proposed SR 202L southbound frontage road. The proposed Ramp SW bridge typical section at abutment 1 includes three 12-foot travel lanes, a 6-foot inside shoulder, and a 10-foot outside shoulder with a total out-to-out width of 55'-2". The bridge flares from abutment 1 to pier 4 to accommodate four traffic lanes—two for a future Ramp SE and two continuing lanes for this Ramp SW, giving a total out-to-out width of 99'-2". From pier 4 to abutment 2, the typical section includes two 12-foot travel lanes, a 6-foot inside shoulder, and a 10-foot outside shoulder. The total out-to-out width is 43'-2". There will be 44-inch-high, F-shaped concrete bridge barriers on each side of the bridge.

The preliminary layout of the bridge results in a structure length of 1,020 feet. Piers have been located to accommodate Broadway Road and the proposed SR 202L southbound frontage road. At pier 5, the frontage road passes under Ramp SW at a high skew angle, so a straddle bent pier is proposed at this location.

For the purpose of the study, a CIP PT box girder is proposed for the entire length of the bridge. The spans vary from 115 to 170 feet. The proposed substructure consists of stub-abutments on a single row of 60-inch-diameter drilled shafts. The proposed pier configuration for piers 1 thru 4 are two 8-foot × 5-foot rectangular columns supported on a 108-inch-diameter drilled shaft. As previously discussed, because of the high skew of the frontage road crossing that passes under Ramp SW, a straddle bent will be needed for pier 5. For pier 6, a single 8-foot × 5-foot rectangular column supported on a 108-inch-diameter drilled shaft is recommended. Cantilevered wing walls will be used at the abutments for embankment protection.

Constructability and Traffic Control

Casing for drilled shafts may be needed considering the possibility of a shallow groundwater table near the Salt River.

No long-term detours are required for constructing this ramp. Temporary closures of Broadway Road will be required to erect and remove falsework for the CIP PT box girder and to place concrete. These closures can be accomplished during the nights and weekends.

SR 30/SR 202L SB Frontage Road over the Salt River

Location

The southbound frontage road over the Salt River bridge is a combination of an entrance and exit ramp that spans the Salt River and is located west of SR 202L. The ramp carries three traffic lanes—two lanes from Broadway Road that enter the southbound SR 202L main line south of Southern Avenue and one lane of southbound traffic from SR 202L that exits at Southern Avenue. The bridge begins 590 feet south of Southern Avenue and continues north to a distance of 320 feet north of Ramp EN.

Proposed Conditions

The southbound frontage road over the Salt River bridge will consist of 29 spans. The south 12 spans are over dry land and the remaining spans are over Salt River floodway limits. The south 12 spans of the ramp will have a roadway configuration that consists of two 12-foot travel lanes, a 10-foot outside shoulder, and a 6-foot inside shoulder. The total out-to-out width, including the 34-inch-high, F-shaped barrier, is 42'-10". Spans 13 to 27 will have three 12-foot travel lanes, a 10-foot outside shoulder, and a 6-foot inside shoulder. The total out-to-out width, including the 44-inch-high, F-shaped barrier, is 55'-2". Spans 28 and 29 vary in width as the bridge starts to widen to accommodate the gore area. The ramp's alignment is on multiple tangents and horizontal curves. The vertical profile is elevated to provide a minimum of 3 feet of freeboard above the 100-year water surface elevation of the Salt River.

Placement of the piers in the Salt River floodway was dictated by the existing SR 202L main line bridge span configuration. Pier locations were determined by extending the centerline of the existing piers of the adjacent SR 202L main line bridge. Since the ramp alignment is on multiple tangents and horizontal curves, and not parallel to the main line bridge, variable span lengths along the bridge were required.

For the purpose of the study, an AASHTO Type Super VI Girder was considered for the portion of the bridge on dry land where bridge spans will range from 132 to 140 feet. For the portion of the bridge spanning the Salt River, steel plate girder was considered. A steel plate girder type of superstructure was selected for its capability to span the required distance without the use of falsework in the riverbed. The spans in this stretch will range between 111 and 181 feet. The total bridge length will be 4,388 feet. The abutments are stub-type and are supported on a single row of 60-inch-diamter drilled shafts. For spans 1 through 12, which lie outside the Salt River channel, the piers consists of one 8-foot × 5-foot rectangular column with a transition cap supported on one 108-inch-diameter drilled shaft. For spans that lie in the Salt River channel, pier units consist of two 60-inch-diameter circular columns, with each being supported on 72-inch-diameter drilled shafts. Cantilevered type wing walls and retaining walls will be used for the embankment protection at the abutments.

Special Conditions that Influence the Costs

The adjacent sand and gravel mining operation will significantly affect the design of the proposed bridge structure. There are existing pits upstream and downstream. The pits will increase the cost of the bridge foundation. Sand and gravel pits located downstream of the structure may "head cut" upstream. Sand and gravel pits located upstream of the structure will collect sediment and increase the sediment transport rate through the structure. Long-term degradation from these sand and gravel operations is anticipated to be approximately 20 feet. The estimates for drilled shafts length are increased by 20 feet for long-term degradation and 32 feet for local pier scour and contraction scour, for a total of 52 feet to accommodate these riverbed conditions.

Constructability and Traffic Control

Casing for drilled shafts may be needed in the riverbed considering the possibility of a shallow groundwater table.

Access for bridge construction can occur from the riverbed. TCEs may be required along the south and north banks of the river to provide access to the riverbed. The construction equipment can access the river to construct the substructure elements. No conventional falsework is required.

No traffic control is anticipated for this bridge construction.

SR 30/SR 202L Baseline-Frontage NB Ramp

Location

The Baseline-Frontage NB Ramp is a branch of the northbound frontage road. It is located on the east side of SR 202L over the Salt River. It carries one traffic lane in the northbound direction that will merge into northbound SR 202L just north of SR 30.

Proposed Conditions

The structure will consist of a two-span bridge. The spans are 152 and 101 feet. The total bridge length is 256 feet. The ramp's roadway configuration will consist of one 12-foot travel lane, a 6-foot inside shoulder, and a 10-foot outside shoulder. The total out-to-out width of the bridge, including the 44-inch-high, F-shaped barrier, is 31'-2". The ramp is on a tangent horizontal alignment. The vertical profile is on a tangent and is elevated to provide a minimum of 3 feet of freeboard above the 100-year water surface elevation.

For the purpose of the study, an AASHTO Type Super VI Girder bridge was considered. Pier units will consist of two 60-inch-diameter circular columns, each supported on 72-inch-diameter drilled shafts, and located on the same alignment as the piers for the existing SR 202L main line bridge. At the south end of the bridge is pier 1, which is where the ramp splits off from the northbound frontage road. The north abutment is a stub-type supported by a single row of 60-inch-diameter drilled shafts. Cantilevered type wing walls will be used for embankment protection at the abutments. Bank protection will be provided to protect the abutment against scour and degradation.

Constructability and Traffic Control

Casing for drilled shafts may be needed in the riverbed considering the possibility of a shallow groundwater table.

Access for bridge construction can occur from the riverbed. TCEs may be required along the north bank of the river to provide access to the riverbed. The construction equipment can access the river to construct the substructure elements. No conventional falsework is required.

Traffic control is not required, since there is no existing road or other features at this location.

SR 30/SR 202L NB Frontage Road over Southern Avenue

Location

The northbound frontage road bridge over Southern Avenue is an exit ramp that crosses over Southern Avenue and is located on the east side of SR 202L. The ramp branches off from the northbound SR 202L main line and carries two traffic lanes from SR 202L to Broadway Road. The overpass structure begins 400 feet south of Southern Avenue and continues north to a distance of 400 feet north of Southern Avenue.

Proposed Conditions

The overpass will be a five-span structure that will be fully elevated over Southern Avenue. The roadway configuration will consist of two 12-foot travel lanes, a 6-foot inside shoulder, a 10-foot outside shoulder, and 34-inch-high, F-shaped barriers at the outside edge, for an out-to-out width of 42'-10". The ramp's horizontal alignment is on a horizontal curve for the first span, then on a tangent for the remainder of the bridge. The profile is on a crest vertical curve throughout the bridge.

For the purpose of the study, an AASHTO Type Super VI Girder bridge was considered. The structure will consist of four equal spans of 153 feet and one 160-foot-long-span for a total bridge length of 778 feet. The abutments are stub-type and are supported by a single row of 60-inch-diameter drilled shafts. All piers will consist of one 8-foot × 5-foot rectangular column with a transition cap supported on 108-inch-diameter drilled shafts. Cantilevered type wing walls and retaining walls will be used for the embankment protection at abutments.

Constructability and Traffic Control

No long-term detour will be required for construction activities. A temporary closure of Southern Avenue will be required during setting of the girders, placing of deck forms, and pouring of the deck concrete. All full closures can be accommodated during nights and weekends. An existing overhead power line on Southern Avenue may need to be relocated, if necessary, for constructing the overpass. However, this may be addressed with the construction of SR 202L.

SR 30/SR 202L NB Frontage Road over the Salt River

Location

The northbound frontage road bridge over the Salt River is a combination of an entrance and exit ramp that spans over the Salt River and is located east of SR 202L. The combined ramp carries two lanes of traffic. The first is northbound traffic from Southern Avenue that enters the SR 202L main line north of SR 30; the second lane is northbound traffic from SR 202L that exits near Broadway Road. The overpass structure begins 1,300 feet north of Southern Avenue and continues north to a distance of 190 feet south of the eastbound SR 30.

Proposed Conditions

This bridge will be a 17-span structure that will span the floodway limits of Salt River. The ramp's roadway configuration over the majority of its length will consist of two 12-foot travel lanes, a 6-foot inside shoulder, and a 10-foot outside shoulder. The total out-to-out width of the bridge, including the 44-inch-high, F-shaped barrier, is 43'-2". At the south end of the ramp, the roadway width will vary from 64'-11" to 43'-2" over the first three spans. For spans 13, 14, and 15, the roadway width will vary from 43'-2" to 79'-4". At pier 15, the ramp splits and the roadway over the final two spans (spans 16 and17) will consist of one 12-foot travel lane, a 6-foot inside shoulder, and one 10-foot outside shoulder. This bridge is located on multiple tangents and horizontal curves. The vertical profile is elevated to provide a minimum of 3 feet of freeboard above the 100-year water surface elevation of the Salt River.

Placement of the piers was dictated by the existing SR 202L main line bridge span configuration. Pier locations were determined by extending the centerline of the existing piers of the adjacent SR 202L main line bridge. Since the ramp alignment is on multiple tangents and horizontal curves, and is not parallel to the main line bridge, different span lengths along the bridge were required. The spans will range from 105 to 193 feet for a total bridge length of 2,907 feet.

For the purpose of the study, a steel plate girder was considered. The steel plate girder superstructure was selected for its capability to span the required distance without the use of falsework in the riverbed. The abutments are stub-type supported by a single row of 60-inch-diameter drilled shafts. Pier units will consist of two 60-inch-diameter circular columns, each supported on 72-inch-diameter drilled shaft. Cantilevered type wing walls and retaining walls will be used for the protection of embankment at the abutments.

Special Conditions that Influence the Costs

The adjacent sand and gravel mining operation will significantly affect the design of the proposed bridge substructure. There are existing pits upstream and downstream. The pits will increase the cost of the bridge foundation. Sand and gravel pits located downstream of the structure may “head cut” upstream. Sand and gravel pits located upstream of the structure will collect sediment and increase the sediment transport rate through the structure. Long-term degradation from these sand and gravel operations is anticipated to be approximately 20 feet. The estimates for drilled shafts lengths are increased by 20 feet for long-term degradation and 32 feet for local pier scour and contraction scour, for a total of 52 feet to accommodate these riverbed conditions.

Constructability and Traffic Control

Casing for drilled shafts may be needed in the riverbed considering the possibility of a shallow groundwater table.

Access for bridge construction can occur from the riverbed. TCEs may be required along the south and north banks of the river to provide access to the riverbed. The construction equipment can access the river to construct the substructure elements. No conventional falsework is required.

Traffic control is not required, since there is no existing road or other features at this location.

SR 202L Bridge Widenings Associated with the SR 30/SR 202L TI

The following bridges on the SR 202L will need to be widened to accommodate the SR 30/SR 202L interchange ramps and frontage roads:

- Baseline Road, northbound and southbound (two span)
- Southern Avenue, northbound and southbound (single span)
- Broadway Road, southbound (single span)
- Lower Buckeye Road, northbound and southbound (single span)
- Roosevelt Irrigation Canal, northbound (single span)
- Buckeye Road, northbound (single span)

For these bridge locations, the typical practice of matching the existing superstructure and substructure will be followed.

Baseline Road Northbound and Southbound Bridges

For this location, the northbound SR 202L bridge widening over Baseline Road will be 14'-0", and the southbound SR 202L bridge widening will be 26'-0". The bridge barriers will be a 32-inch-high, F-shaped concrete bridge barrier.

Southern Avenue Northbound and Southbound Bridges

For this location, the northbound SR 202L bridge widening over Southern Avenue will be 25' and the southbound SR 202L bridge widening will be 37'-5". The bridge barriers will be a 32-inch-high, F-shaped concrete bridge barrier.

Broadway Road Southbound Bridge

For this location, only the southbound SR 202L bridge will be widened, with the widening varying from 17'-4" to 31'-3". The bridge barrier will be a 32-inch-high, F-shaped concrete bridge barrier.

Lower Buckeye Road Northbound and Southbound Bridges

For this location, the northbound SR 202L bridge widening over Lower Buckeye Road will be 25'-5" and the southbound SR 202L bridge widening will be 13'-5". The bridge barriers will be a 32-inch-high, F-shaped concrete bridge barrier.

Roosevelt Irrigation Canal Southbound Bridge

For this location, only the southbound SR 202L bridge over the Roosevelt Irrigation Canal will be widened, with the widening being 13'-5". The bridge barrier will be a 32-inch-high, F-shaped concrete bridge barrier.

Buckeye Road Southbound Bridge

For this location, only the southbound SR 202L bridge over Buckeye Road will be widened, with the widening being 13'-5". The bridge barrier will be a 32-inch-high, F-shaped concrete bridge barrier.

Constructability and Traffic Control

No long-term detours are required for constructing these widenings. Temporary closures of the crossroads will be required to erect or remove falsework and to place girders and deck forms, and during concrete pours that occur over traffic. These closures can be accomplished during the nights and weekends.

3.6 Utilities

There are a number of utilities in the SR 30 study area, some of which may require relocation or adjustments prior to construction. All utility companies were contacted and utility as-builts and system quad-maps were collected when available. Major utilities were mapped from this information and can be seen on the plans in Appendices B and C. The final utility design shall be in accordance with the current version of the ADOT *Policy for Accommodating Utilities on Highway Rights-of-Way* at the time the project is designed for construction. The following sections present contact information and potential utility conflicts by owner. The types, sizes, and locations of utilities are based on:

- as-built plans, maps, and drawings
- visual observations from site visits, aerial mapping, and photographs
- discussions with utility company representatives
- written feedback from utility company representatives

Many of the utilities in the SR 30 can be categorized as minor because they will be relatively inexpensive or easy to relocate or modify, if necessary. These utilities include water lines less than 24 inches in diameter, distribution and small transmission power lines 69 kV and lower, localized storm drain networks, and local communication facilities including telephone, cable television, and natural gas distribution pipelines. All of these types of facilities exist in the SR 30 study area.

Major utilities were identified and evaluated on a case-by-case basis. For the purpose of this study, major utilities include 230 kV and higher overhead transmission power lines, sanitary sewer pipelines and lift stations, regional storm drain pipes, channels and culverts, water pipes larger than 24 inches in diameter, national communications facilities (primarily, fiber-optic routes), natural gas lines, and large irrigation district-owned facilities such as canals and culverts.

The SR 30 study area contains many noteworthy utility facilities including:

- facilities belonging to four major power companies, including several high-voltage overhead transmission power lines ranging in size from 69 kV to 500 kV
- two electrical substations
- three WWTPs, including the City of Phoenix's 91st Avenue WWTP, the Avondale WWTP, and the Goodyear WWTP
- a large-diameter pipeline, beginning at the 91st Avenue WWTP and ending at the PVNGS, that is the plant's sole source of cooling water

3.6.1 Section 3 Utilities (SR 30/SR 202L TI)

The SR 30/SR 202L TI addition to the SR 202L freeway will require widening along the SR 202L freeway north and south of the Salt River crossing to accommodate the system ramp lane runouts. As this L/DCR report was written, the SR 202L project was under construction as a design-build contract. Utility relocations were ongoing or under design for that project, so it was not feasible to develop a complete list of all the utilities. However, project coordination continues between this SR 30 study and the design of SR 202L with the objective that the SR 202L project is relocating all utilities in a manner that will avoid being affected by the known future SR 30 improvements. As such, significant utility impacts are not anticipated along SR 202L. As final design of the SR 30 corridor begins, however, this will need to be reexamined to ensure nothing has changed, and to mitigate any new conflicts that may arise because of design refinements or new utilities being added later.

3.6.2 Design Considerations

All utilities in the SR 30 study area were considered during the design process. Avoidance of utility conflicts, especially the major utilities, was preferred when designing the freeway facilities. Elevating the freeway profile minimized the number of conflicts with at-grade utilities. When avoidance could not be implemented, adjustments such as encasing or relocating were required.

The SR 30 corridor has numerous high-voltage overhead power lines crossing through the study area. The study team met with SRP and APS to identify preliminary potential impacts with major transmission lines. If impacts cannot be avoided, overhead power lines would require either height relocation or horizontal relocation. Relocation is the preferred conflict resolution method because of safety concerns and the high expense of heightening. Conflicts would need to be evaluated on a case-by-case basis to ensure that the safest and most practical method is implemented. Should relocations be chosen, then new ROW or easements would need to be acquired by ADOT for the new power line alignment. The widths of these new strips should be the same as the widths that the power companies currently hold. With that being said, several of the alternatives avoided major overhead power line relocations.

The study team also met with PVNGS staff to discuss potential impacts on a 96- to 114-inch Portland cement concrete water line that runs from the City of Phoenix's 91st Avenue WWTP to the PVNGS. The pipeline is the sole source of cooling water for the plant. Therefore, losing the pipeline would mean shutting down the plant and blacking out a significant part of the southwestern United States. When possible, avoiding the pipeline was the preferred method. APS strongly opposes the options that would necessitate pipeline relocation. In locations where conflict occurs, encasement is the preferred method. APS would perform all design and construction activities for pipeline encasements. The latest coordination with PVNGS staff in early 2018 indicated that encasement costs would be in the range of $14,000 per linear foot, would need to be encased from ROW to ROW across the SR 30 corridor, and it could take several dry up periods to build long segments.

The study team also coordinated with the City of Phoenix to inform it that the conceptual plans would not affect its sewer infrastructure for the 91st Avenue WWTP. Discussion with the utility companies will continue throughout the design process, with plans for any relocations and/or adjustments finalized during the later stages of design.

Details of the meetings and discussions the study team had with the representatives from PVNGS and the utility companies are summarized in the ASR.

3.6.3 Section 1 Utilities

Table 3-1 provides the location of utilities in Section 1.

Table 3-1. Locations of Section 1 utilities

Utilities	Type/Size	Direction	Crossroad/Region	Adjustment/Relocation
APS	96” effluent water line	east-to-west	MC 85	No conflict
WAPA	4-230 kV overhead power lines	east-to-west	MC 85	No conflict
Private; SRP	Irrigation; 12 kV overhead power line	east-to-west	MC 85 to Cotton Lane	Pipe irrigation; relocate overhead power
BWCDD; private; City of Goodyear; SRP	Irrigation ditch; private irrigation pipe, storm drain pipe, 12 kV overhead power line	north-to-south	Cotton Lane	Pipe BWCDD irrigation; abandon private irrigation; relocate overhead power
Private	Irrigation	northeast-to-southwest	Cotton Lane to Buckeye Irrigation Canal	Pipe irrigation
SRP; CenturyLink	12 kV overhead power line; telephone line	northwest-to-southeast	Buckeye Irrigation Canal	Relocate overhead power and telephone line
BWCDD	Irrigation ditch	northwest-to-southeast	Buckeye Irrigation Canal	No conflict
APS	114” effluent water line	northeast-to-southwest	Buckeye Irrigation Canal	Encase pipe line
Private	Irrigation	northeast-to-southwest	Buckeye Irrigation Canal to Sarival Avenue	Abandon irrigation
SWG	8” high pressure gas line	east-to-west	East of Buckeye Irrigation Canal	Relocate gas line
SRP; private	12 and 69 kV overhead power lines; irrigation ditch	north-to-south	Sarival Avenue	Relocate overhead power; pipe private irrigation
City of Goodyear	24” VCP sewer line	north-to-south	East of Sarival Avenue	Encase sewer line
City of Goodyear	30” VCP sewer line	north-to-south	East of Sarival Avenue	Encase sewer line
City of Goodyear	36” concrete sewer line	north-to-south	East of Sarival Avenue	Encase sewer line
Private	Irrigation ditches	east-to-west	Sarival Avenue to west of Estrella Parkway	Relocate irrigation

Notes: APS = Arizona Public Service; BWCDD = Buckeye Water Conservation and Drainage District; SRP = Salt River Project; SWG = Southwest Gas; VCP = vitrified clay pipe; WAPA = Western Area Power Administration

3.6.4 Section 2 – North Alternative Utilities

Table 3-2 provides the location of utilities in Section 2, with the North Alternative.

Table 3-2. Locations of Section 2 – North Alternative utilities

Utilities	Type/Size	Direction	Crossroad/Region	Adjustment/Relocation
City of Goodyear; private	16” ACP water Line; irrigation ditch	north-to-south	Estrella Parkway	Relocate water line; pipe irrigation
		east-to-west	Estrella Parkway to Bullard Avenue	No conflict
Private; CenturyLink; City of Goodyear	Irrigation ditches; telephone lines; 12” DIP water line	north-to-south	Bullard Avenue	Misc. utility relocations/adjustments
SRP; CenturyLink; private	12 kV overhead power line; telephone line; irrigation ditches	east-to-west	Bullard Avenue to Dysart Road	Relocate overhead power and telephone line; pipe irrigation ditches
TEP	345 kV overhead power line	northeast-to-southwest	Agua Fria River	No conflict
SRP	4-230 kV overhead power lines	east-to-west	Dysart Road	No conflict
SRP	500 kV overhead power line	east-to-west	Dysart Road	No conflict
APS	114" effluent water line	east-to-west	Dysart Road	No conflict
City of Avondale	48" RS sewer line	north-to-south	Dysart Road	No conflict
City of Avondale	24" reclaimed water line	north-to-south	Dysart Road	No conflict
Private ; SRP	Irrigation ditch ; overhead power lines	north-to-south	Dysart Road	Misc. utility relocations/adjustments
Private	Irrigation ditch	east-to-west	Dysart Road to El Mirage Road	Pipe irrigation
SRP	3-230 kV overhead power lines	east-to-west/north-to-south	West of El Mirage Road	Relocate overhead power lines
SRP	2-230 kV overhead power lines	east-to-west/north-to-south	West of El Mirage Road	Relocate overhead power lines
City of Avondale	36" sewer line	north-to-south/east-to-west	West of El Mirage Road	No conflict
Private; CenturyLink	Irrigation ditch; telephone line	north-to-south	El Mirage Road	Misc. utility relocations/adjustments
		east-to-west	El Mirage Road to Avondale Boulevard (115th Avenue)	No conflict
APS	114" effluent water line	east-to-west	Avondale Boulevard (115th Avenue)	Encase water line
City of Avondale	36" sewer line	north-to-south	Avondale Boulevard (115th Avenue)	No conflict
Private; SRP; CenturyLink	Irrigation ditches; overhead power lines; telephone lines	north-to-south	Avondale Boulevard (115th Avenue)	Misc. utility relocations/adjustments
El Paso Natural Gas	20” natural gas line	northwest-to-southeast	East of Avondale Boulevard (115th Avenue) on ramp	Relocate gas line
Private; SRP	Irrigation ditches; 12 kV overhead power lines	east-to-west	Avondale Boulevard (115th Avenue) to 107th Avenue	Relocate irrigation and overhead power lines
APS	114" effluent water line	east-to-west	107th Avenue	No conflict
SRP; Cox; CenturyLink	12 and 69 kV overhead power lines; television line; telephone lines	north-to-south	107th Avenue	Misc. utility relocations/adjustments
Private; City of Phoenix; SWG; CenturyLink; Cox; SRP	Irrigation ditches; 8" and 12" DIP water lines; 2" PE gas lines; telephone lines; television lines; 12 kV overhead power lines	east-to-west	107th Avenue to 99th Avenue	Misc. utility relocations/adjustments
City of Phoenix	24” RGRCP storm drain	north-to-south	West of 99th Avenue	Abandon storm drain
City of Phoenix	3-8” DIP sewer lines	north-to-south	West of 99th Avenue	No conflict
City of Phoenix	16” DIP water line	east-to-west	West of 99th Avenue	No conflict
SRP; CenturyLink; City of Phoenix; private	12 kV overhead power line; telephone line; 8" DIP water line; irrigation ditches	north-to-south	99th Avenue	Misc. utility relocations/adjustments
Private	Irrigation ditches	east-to-west	99th to 91st Avenue	Pipe irrigation

Notes: ACP = asbestos cement pipe; APS = Arizona Public Service; DIP = ductile iron pipe; RGRCP = rubber gasket reinforced concrete pipe; SRP = Salt River Project; SWG = Southwest Gas; TEP = Tucson Electric Power

3.6.5 Section 2 – Center Alternative Utilities

Table 3-3 provides the location of utilities in Section 2, with the Center Alternative.

Table 3-3. Locations of Section 2 – Center Alternative utilities

Utilities	Type/Size	Direction	Crossroad/Region	Adjustment/Relocation
City of Goodyear; private	16" ACP water line; irrigation ditch	north-to-south	Estrella Parkway	Relocate water line; pipe irrigation
		east-to-west	Estrella Parkway to Bullard Avenue	No conflict
Private; CenturyLink; City of Goodyear	Irrigation ditches, telephone lines; 12" DIP water line	north-to-south	Bullard Avenue	Misc. utility relocations/adjustments
Private	Irrigation ditches	north-to-south	Bullard Avenue to Dysart Road	Pipe irrigation
WAPA; TEP; APS; SRP	4- 230 kV overhead power lines; 345 kV overhead power lines; fiber optic line; 500 kV overhead power lines	east-to-west	East of Bullard Avenue	Potential power line adjustments
APS	96" effluent water line	east-to-west	Agua Fria River	No conflict
SRP; City of Avondale; private	12 kV overhead power lines; 4" water line; irrigation ditches	north-to-south	Dysart Road	Misc. utility relocations/adjustments
		east-to-west	Dysart Road to El Mirage Road	No conflict
SRP; CenturyLink	12 kV overhead power lines; telephone line	north-to-south	El Mirage Road	Misc. utility relocations/adjustments
SRP; private	12 kV overhead power lines; irrigation ditches	east-to-west	El Mirage Road to Avondale Boulevard (115th Avenue)	Relocate overhead power; pipe irrigation
CenturyLink; SRP; RWC	Telephone lines; irrigation lines; 12 kV overhead power lines; 4" and 8" water lines	north-to-south	Avondale Boulevard (115th Avenue)	Misc. utility relocations/adjustments
El Paso Natural Gas	20" gas line	northwest-to-southeast	East of Avondale Boulevard (115th Avenue)	Relocate gas line
SRP; CenturyLink	irrigation ditches; telephone lines	east-to-west	Avondale Boulevard (115th Avenue) to 107th Avenue	Misc. utility relocations/adjustments
Cox; SRP; RWC; CenturyLink	Television line; irrigation ditches; 8" water line; telephone line; 12 kV overhead power lines	north-to-south	107th Avenue	Misc. utility relocations/adjustments
		east-to-west	107th Avenue to 99th Avenue	No conflict
SRP; City of Phoenix; CenturyLink	Irrigation ditches; 12 kV overhead power lines; 8" water line; telephone line	north-to-south	99th Avenue	Misc. utility relocations/adjustments
SRP	2-500 kV overhead power lines	east-to-west	East of 99th Avenue	No conflict
APS	114" effluent water line	east-to-west	East of 99th Avenue	Encase water line
Private	Irrigation ditches	east-to-west	99th to 91st Avenue	Pipe irrigation

Notes: ACP = asbestos cement pipe; APS = Arizona Public Service; DIP = ductile iron pipe; RWC = Regional Wireless Cooperative; SRP = Salt River Project; TEP = Tucson Electric Power; WAPA = Western Area Power Administration

3.6.6 Section 2 – Hybrid Alternative Utilities

Table 3-4 provides the location of utilities in Section 2, with the Hybrid Alternative.

Table 3-4. Locations of Section 2 – Hybrid Alternative utilities

Utilities	Type/Size	Direction	Crossroad/Region	Adjustment/Relocation
City of Goodyear; private	16" ACP water line; irrigation ditch	north-to-south	Estrella Parkway	Relocate water line; pipe irrigation
		east-to-west	Estrella Parkway to Bullard Avenue	No conflict
Private; CenturyLink; City of Goodyear	Irrigation ditches, telephone lines; 12" DIP water line	north-to-south	Bullard Avenue	Misc. utility relocations/adjustments
CenturyLink; Private; SRP	Telephone line; irrigation ditches; 12 kV overhead power lines	north-to-south	Bullard Avenue to Dysart Road	Misc. utility relocations/adjustments
WAPA; TEP; APS; SRP	4-230 kV overhead power lines; 345 kV overhead power lines; fiber optic line; 500 kV overhead power line	east-to-west	East of Bullard Avenue	Potential power line adjustments
APS	96" effluent water line	east-to-west	Agua Fria River	No conflict
SRP; CenturyLink; private; City of Avondale	12 kV overhead power lines; telephone lines; 4" PVC water lines	north-to-south	Dysart Road	Misc. utility relocations/adjustments
SRP; CenturyLink; City of Avondale; private; RWC	12 kV overhead power lines; telephone lines; 4" PVC water lines; irrigation ditches; 6" water line	east-to-west	Dysart Road to El Mirage Road	Misc. utility relocations/adjustments
Private; CenturyLink; RWC	Irrigation ditches; telephone lines; 4" PVC water line	north-to-south	El Mirage Road	Misc. utility relocations/adjustments
SRP; private	12 kV overhead power lines; irrigation ditches	east-to-west	El Mirage Road to Avondale Boulevard (115th Avenue)	Relocate overhead power; pipe irrigation
CenturyLink; SRP; RWC	Telephone lines; irrigation lines; 12 kV overhead power lines; 4" and 8" water lines	north-to-south	Avondale Boulevard (115th Avenue)	Misc. utility relocations/adjustments
El Paso Natural Gas	20” gas line	northwest-to-southeast	East of Avondale Boulevard (115th Avenue)	Relocate gas line
SRP; CenturyLink	Irrigation ditch; telephone lines	east-to-west	Avondale Boulevard (115th Avenue) to 107th Avenue	Misc. utility relocations/adjustments
Cox; SRP; RWC; CenturyLink	Television line; irrigation ditch; 8" water line; telephone line; 12 kV overhead power lines	north-to-south	107th Avenue	Misc. utility relocations/adjustments
		east-to-west	107th Avenue to 99th Avenue	No conflict
SRP; City of Phoenix; CenturyLink	Irrigation ditches; 12kV overhead power lines; 8” water line; telephone line	north-to-south	99th Avenue	Misc. utility relocations/adjustments
SRP	2-500 kV overhead power lines	east-to-west	East of 99th Avenue	No conflict
APS	114" effluent water line	east-to-west	East of 99th Avenue	Encase water line
Private	Irrigation ditches	east-to-west	99th to 91st Avenue	Pipe irrigation

Notes: ACP = asbestos cement pipe; APS = Arizona Public Service; DIP = ductile iron pipe; PVC = polyvinyl chloride; RWC = Regional Wireless Cooperative; SRP = Salt River Project; TEP = Tucson Electric Power; WAPA = Western Area Power Administration

3.6.7 Section 2 – South Alternative Utilities

Table 3-5 provides the location of utilities in Section 2, with the South Alternative.

Table 3-5. Locations of Section 2 – South Alternative utilities

Utilities	Type/Size	Direction	Crossroad/Region	Adjustment/Relocation
City of Goodyear; private	16" ACP water line; irrigation ditch	north-to-south	Estrella Parkway	Relocate water line; pipe irrigation
		east-to-west	Estrella Parkway to Bullard Avenue	No conflict
Private; CenturyLink; City of Goodyear	Irrigation ditches, telephone lines; 12" DIP water line	north-to-south	Bullard Avenue	Misc. utility relocations/adjustments
CenturyLink; private; SRP	Irrigation ditches; 12 kV overhead power lines	north-to-south	Bullard Avenue to Dysart Road	Misc. utility relocations/adjustments
WAPA; TEP; Level 3 Communications; SRP	4-230 kV overhead power lines; 345 kV overhead power lines; fiber optic line; 500 kV overhead power line	east-to-west	East of Bullard Avenue	Potential power line adjustments
APS	96" effluent water line	east-to-west	Agua Fria River	No conflict
		north-to-south	Dysart Road	No conflict
Private; RWC	Irrigation ditches	east-to-west	Dysart Road to El Mirage Road	Pipe irrigation
		north-to-south	El Mirage Road	No conflict
SRP; CenturyLink; RWC; private	12 kV overhead power lines; telephone lines; 4" PVC water line; irrigation ditches	east-to-west	El Mirage Road to Avondale Boulevard (115th Avenue)	Misc. utility relocations/adjustments
CenturyLink; SRP	Telephone lines; 12 kV overhead power lines	north-to-south	Avondale Boulevard (115th Avenue)	Misc. utility relocations/adjustments
SRP; CenturyLink; private	12 kV overhead power line; telephone line; irrigation ditches	east-to-west	Avondale Boulevard (115th Avenue) to 107th Avenue	Misc. utility relocations/adjustments
CenturyLink; SRP	Telephone line; 12 kV overhead power line	north-to-south	107th Avenue	Misc. utility relocations/adjustments
El Paso Natural Gas	20" natural gas line	northeast-to-southwest	East of 107th Avenue	Relocate gas line
SRP; CenturyLink; private; City of Phoenix	12 kV overhead power lines; telephone lines; 2" steel	east-to-west	107th Avenue to 99th Avenue	Misc. utility relocations/adjustments
SRP; City of Phoenix; private; CenturyLink	Overhead power lines; 8" water line; irrigation ditch; telephone line	north-to-south	99th Avenue	Misc. utility relocations/adjustments
SRP	2-500 kV overhead power lines	east-to-west	East of 99th Avenue	No conflict
APS	114" effluent water line	east-to-west	East of 99th Avenue	Encase water line
Private	Irrigation ditches	east-to-west	99th to 91st Avenue	Pipe irrigation

Notes: ACP = asbestos cement pipe; APS = Arizona Public Service; DIP = ductile iron pipe; PVC = polyvinyl chloride; RWC = Regional Wireless Cooperative; SRP = Salt River Project; TEP = Tucson Electric Power; WAPA = Western Area Power Administration

3.6.8 Section 3 Utilities (91st Avenue to 67th Avenue)

Table 3-6 provides the location of utilities in Section 3.

Table 3-6. Locations of Section 3 utilities (91st Avenue to 67th Avenue)

Utilities	Type/Size	Direction	Crossroad/Region	Adjustment/Relocation
CenturyLink; City of Phoenix; SRP	Telephone lines; 8" and 12" CIP water lines; irrigation ditches; 12 and 69 kV overhead power lines	north-to-south	91st Avenue	Misc. utility relocations/adjustments
City of Tolleson	30" CIP sewer line	north-to-south	91st Avenue	Encase sewer line
SRP; City of Phoenix; CenturyLink	Irrigation ditches; telephone lines; 8" DIP water line; 12 kV overhead power lines;	east-to-west	91st Avenue to 83rd Avenue	Misc. utility relocations/adjustments
City of Phoenix	86" RCP sewer line	east-to-west	87th Avenue	Encase sewer line
SRP; Cox; CenturyLink; private	12 and 69 kV overhead power lines; television line; telephones lines; irrigation ditches	north-to-south	83rd Avenue	Misc. utility relocations/adjustments
City of Phoenix	2-84" RCP sewer lines	north-to-south	83rd Avenue	Encase sewer line
Private; SRP	Irrigation ditches	east-to-west	83rd Avenue to 75th Avenue	Pipe irrigation
City of Phoenix; SRP; CenturyLink	8" DIP storm drain; 12 kV overhead power line; 36" RGRCP irrigation line; telephone line	north-to-south	75th Avenue	Misc. utility relocations/adjustments
City of Phoenix	3-24" DIP force main sewer line; 1-12" DIP sewer line	north-to-south	75th Avenue	Encase sewer lines
FCDMC	96" storm drain	north-to-south	75th Avenue	No conflict
SRP; CenturyLink; City of Phoenix; private	12 kV overhead power lines; telephone lines; 6" and 8" DIP water lines; 48" CIP irrigation; irrigation ditches	east-to-west	75th Avenue to 67th Avenue	Misc. utility relocations/adjustments
Private; CenturyLink	Irrigation ditch; telephone line	north-to-south	67th Avenue	Misc. utility relocations/adjustments
FCDMC	96" storm drain	north-to-south	67th Avenue	No conflict

Notes: CIP = cast-in-place; DIP = ductile iron pipe; FCDMC = Flood Control District of Maricopa County; PVC = polyvinyl chloride; RCP = reinforced concrete pipe; RGRCP = rubber gasket reinforced concrete pipe; SRP = Salt River Project

3.7 Evaluation of Alternatives and Recommendations

Four build alternatives—North, Center, South, and Hybrid—and the No-Build Alternative have been considered for the proposed SR 30 corridor. Refer to Appendices B and C for detailed layouts of each of these alternatives. Section 3.7.1 and Table 3-7 summarize the results of this evaluation. In addition, two SR 30/SR 202L system TI configurations were evaluated and are discussed in Section 3.7.2.

Generally, the evaluation of the four alternatives revealed only subtle differences between them, although in some cases, those subtle differences made the critical difference in selecting the RBA. Based on the evaluation, one build alternative was recommended as the RBA—the Hybrid Alternative, combined with alternative 3B-2 for the SR 30/SR 202L system TI.

The justification for the RBA selection is discussed below. The RBA was chosen as the RA and presented to the public during a hearing held in May 2019. The RA was identified as the Selected Alternative, which will be carried forward for final design and construction.

3.7.1 SR 30 Alternative Alignments

After more than 10 years of study, ADOT believes that four alternatives considered (North, Center, Hybrid, and South) represent a reasonable range of alternatives responsive to the project's purpose and need. All four alternatives have been rigorously evaluated using a comprehensive screening process with 24 technical (environmental and engineering) criteria, 8 cost and ROW criteria, and 7 agency and public support criteria.

After carefully considering the evaluation results, ADOT decided to select the Hybrid Alternative as the RBA based on the following justification:

1. The North Alternative would affect a Section 4(f) future high school site. Because the three other alignment options being considered are avoidance alternatives, the North Alternative cannot be considered further pursuant to 23 Code of Federal Regulations 774.3. In addition, the North Alternative would require the complete acquisition of an existing elementary school, and while that school is not a Section 4(f) resource (does not allow for walk-on public access to its recreational facilities), ADOT has elected to avoid this acquisition and associated community impact since other alternatives exist to avoid it.
2. The South Alternative would essentially become the northern edge of the Gila River. The Gila River ecosystem is unique and among the most sensitive in the study area. The South Alternative would affect this ecosystem the most. Section 408 permitted levees would be required and would introduce a high level of engineering complexity and risk to ADOT in terms of liability for the surrounding community and the potential damage to the freeway infrastructure. The freeway drainage systems would also present expensive and complex retention and outfall challenges behind and through the levee. For these reasons, ADOT has elected to eliminate the South Alternative from further consideration.
3. The Center Alternative is nearly identical to the Hybrid Alternative, except for the 2.5-mile section between the Agua Fria River and Avondale Boulevard (115th Avenue). In this 2.5-mile section, two primary differences between the Center and Hybrid Alternatives exist: the DRCC Basin and the freeway drainage infrastructure requirements. The DRCC Basin is an active sand and gravel mine that is permitted to a 100-foot depth, with approximately 80 feet of that depth below groundwater. Once the DRCC Basin site is mined out, the resulting pit will be repurposed into a regional flood control basin. Constructing a bridge over an 80-foot-deep lake being recharged constantly with groundwater is a major technical challenge that would add an estimated $250 million to the Center Alternative's cost. In addition, between Dysart Road and Avondale Boulevard, the Center Alternative is aligned over a natural drainage trough in the terrain. This means that large drainage infrastructure would be needed on both sides of the freeway to intercept off-site flows and convey them to the DRCC Basin. This additional drainage infrastructure would require additional ROW, added construction costs, and long-term maintenance efforts. For these reasons, ADOT has elected to drop the Center Alternative from further consideration.

   When comparing the Hybrid Alternative with the Center Alternative, the Hybrid Alternative would avoid constructing the long DRCC Basin bridge (replacing it instead with a much shorter bridge that would span only a corner of the DRCC Basin). In addition, the Hybrid Alternative's alignment along Southern Avenue follows a natural ridge line in the terrain, meaning that little to no off-site drainage infrastructure would be needed between Dysart Road and Avondale Boulevard.
4. The Hybrid Alternative is also the only alternative consistent with the City of Avondale *General Plan 2030*, updated on August 28, 2012 (reference page 17). The area between the Agua Fria River and Avondale Boulevard falls in the City of Avondale planning boundary, and this represents the limits where the Hybrid and Center Alternatives are different. ADOT acknowledges that the Hybrid Alternative would affect more homes than the other alternatives considered; however, considering all factors, the Hybrid Alternative is the most reasonable and practicable build alternative that meets the project's purpose and need.

3.7.2 SR 30/SR 202L System Traffic Interchange

Two SR 30/SR 202L system TI alternatives were developed and presented in the ISR. The differences between the two designs are very subtle and limited to how local access along SR 202L is addressed. From an environmental perspective, both interchanges have the same footprint requirements, height requirements, and operational characteristics. From the engineering perspective, there are a few minor distinctions. Alternative 3B-1 uses a less desirable triple exit/triple entry ramp configuration that is more difficult to sign, ultimately leading to driver confusion (which could indirectly affect capacity and safety). In addition, alternative 3B-1 costs $13 million more than 3B-2.

Alternative 3B-2 uses a more desirable double exit/double entry ramp design, making it easier for the drivers to understand the signs. Alternative 3B-2 is also less expensive. As a result, the recommendation is to drop alternative 3B-1 from further consideration because of the higher cost and the undesirable signing requirements, and to carry forward 3B-2 as the preferred SR 30/SR 202L system TI alternative.

It is worth noting that the Addendum produced for the ISR in 2018 (Chapter 8 of that document) redesigned this interchange to reflect the actual SR 202L design that is being built. However, the design intent of Alternative 3B-2 was preserved in that redesign so that this recommendation would not be altered. The details of this configuration can be found in Appendix B (as the Selected Alternative).

3.7.3 Selection of the Recommended Alternative

In November 2017, the RBA and the No-Build Alternative were presented to the public during a public information meeting and through the study website, with an opportunity to comment during the associated 30-day public comment period. After carefully considering the findings from the multiyear screening process that evaluated 24 environmental and engineering criteria, 8 cost and ROW criteria, and the public and agency feedback received, ADOT recommended the RBA as the RA over the No-Build Alternative, with the following justification:

- Only the Build Alternative satisfies the objectives of the adopted RTP, which seeks to develop an efficient regional transportation system for the whole region, and which was approved by the voters of Maricopa County in 2004 through Proposition 400.
- Only the Build Alternative is consistent with the voter-approved land use plans and economic and residential growth objectives of the Cities of Phoenix, Avondale, and Goodyear, and of Maricopa County.
- Only the Build Alternative will accommodate the projected travel demand in the study area, which is expected to increase substantially as existing agricultural land transitions to residential, commercial, warehouse and distribution, and light industrial uses.
- Only the Build Alternative provides route redundancy and congestion relief for I-10 and other east-west arterials in the area. These facilities will only continue to operationally degrade over the next couple of decades as growth in the Southwest Valley occurs, even after they are widened to their maximum capacity.
- Opposition to the Build Alternative has been minimal, given the project’s magnitude and regional significance.

While ADOT acknowledges that the Build Alternative is estimated to cost nearly $1.7 billion, will have some minor environmental impacts that will require mitigation, and will require the unfortunate acquisition and relocation of 130 homes and 13 businesses, the public benefits gained from selecting the Build Alternative outweigh these factors.

3.7.4 Identification of the Selected Alternative

The RA was presented at the public hearing held in May 2019 and was available for public comment during the public comment period. Based on the results of the engineering and environmental studies for the SR 30 project and the comments received from the public hearing, ADOT has approved the RA as the Selected Alternative, which will be carried forward for final design and construction.

Table 3-7. Alternatives evaluation summary matrix (Sarival Avenue to SR 202L)

Alignment criterion	North (12.71 miles)	Center (12.86 miles)	Hybrid (13.02 miles)	South (13.37 miles)
Environmental				
Floodplain Zone A, AE, and AH Impacts (acres pre-Tres Rios levee) Note: Floodplain extent is anticipated to change after the Tres Rios levee floodplain remapping effort is completed and released by USACE.	662 (originally 566)	802 (originally 707)	786 (originally 691)	959 (originally 864)
Section 408 levee reconstruction permitting	No	No	No	Yes
Jurisdictional waters impacts (acres)	64.5	59.5	63.4	60.2
Wetland impacts	None	None	None	None
Water resource impacts	59 wells, Buckeye and Extension Canal crossings, SRP Buckeye Feeder Canal crossing	52 wells, Buckeye and Extension Canal crossings, SRP Buckeye Feeder Canal crossing	47 wells, Buckeye and Extension Canal crossings, and SRP Buckeye Feeder Canal crossing	51 wells, Buckeye and Extension Canal crossings, and historic St. John's Canal crossings
Relative noise impacts (existing conditions)	Medium – 51 of 75 receivers exceed ADOT criterion. Eight of nine potential noise barriers exceed ADOT policy for cost/benefited receiver. One potential noise barrier meets policy.	High – 75 of 89 receivers exceed ADOT criterion. All 12 potential noise barriers exceed ADOT policy for cost/benefited receiver.	High – 108 of 130 receivers exceed ADOT criterion. All 18 potential noise barriers exceed ADOT policy for cost/benefited receiver.	High – 69 of 109 receivers exceed ADOT criterion. All 14 potential noise barriers exceed ADOT policy for cost/benefited receiver.
Air quality impacts	Conformance compliant	Conformance compliant	Conformance compliant	Conformance compliant
Visual quality rating	Most substantial change in Visual Character (although impact is not adverse) because of introduction of strong linear features into an otherwise open agricultural landscape; would fragment landscape and distract from the strong agricultural character. Low change in visual quality arises from small changes attributable to crossing water-filled quarries, encroaching urbanization, fragmentation of unified landscapes, and introduction of incongruous elements.	Notable change in Visual Character. Low change in visual quality arises from small changes attributable to crossing water-filled quarries, encroaching urbanization, fragmentation of unified landscapes, and introduction of incongruous elements.	Notable change in Visual Character. Low change in visual quality arises from small changes attributable to crossing water-filled quarries, encroaching urbanization, fragmentation of unified landscapes, and introduction of incongruous elements.	Notable change in Visual Character. Low change in visual quality arises from small changes attributable to crossing water-filled quarries, encroaching urbanization, fragmentation of unified landscapes, and introduction of incongruous elements.
Potentially affected hazardous material sites (medium- and high-risk locations only)	4	2	1	0
Environmental justice issues (disabled, age 65 and older, female head of household, minority, and poverty)	No disproportionately high adverse impacts	No disproportionately high adverse impacts	No disproportionately high adverse impacts	No disproportionately high adverse impacts
Biological (Endangered Species Act) resources impacts	Low	Low	Low-medium; proposed critical habitat for the western yellow-billed cuckoo occurs in a small sliver of the Hybrid Alternative, although the habitat in this sliver possesses only marginal elements of western yellow-billed cuckoo habitat.	Proposed critical habitat for the western yellow-billed cuckoo occurs in small portions of the South Alternative and borders much of this alignment along the Gila and Salt River floodway. Construction of the South Alternative would remove a small amount of proposed critical habitat for the cuckoo.
Planned development impacts (acres)	13	12	12	10
Cultural resources impacts (AzSITE prehistoric sites)	13 archaeological sites NRHP-eligible under Criterion D; 4 in-use historic canals NRHP-eligible under Criteria A and/or C; 1 in-use historic road NRHP-eligible under Criterion D	12 archaeological sites NRHP-eligible under Criterion D; 4 in-use historic canals NRHP-eligible under Criteria A and/or C; 1 in-use historic road NRHP-eligible under Criterion D	13 archaeological sites NRHP-eligible under Criterion D; 4 in-use historic canals NRHP-eligible under Criteria A and/or C; 1 in-use historic road NRHP-eligible under Criterion D	10 archaeological sites NRHP-eligible under Criterion D; 4 in-use historic canals NRHP-eligible under Criteria A and/or C; 1 in-use historic road NRHP-eligible under Criterion D

Alignment criterion	North	Center	Hybrid	South
Traditional cultural property (TCP) impacts	1 TCP NRHP-eligible under Criterion A	1 TCP NRHP-eligible	1 TCP NRHP-eligible	1 TCP NRHP-eligible
Cultural resources impacts (historic architecture)	No direct or indirect impacts	No direct or indirect impacts	No direct or indirect impacts	No direct or indirect impacts
Section 4(f) resource impacts	Direct impact of 31 acres of the future Tolleson Union High School. Crosses the Buckeye, South Extension, and Roosevelt Canals and related facilities (no direct or indirect use of these linear facilities).	Crosses the Buckeye, South Extension, and Roosevelt Canals and related facilities (no direct or indirect impacts).	Crosses the Buckeye, South Extension, and Roosevelt Canals and related facilities (no direct or indirect impacts).	Crosses the Buckeye, South Extension, and Roosevelt Canals and related facilities. Crosses the St. Johns Irrigation Ditch twice. No direct or indirect impacts.
Engineering				
Geometric design	Desirable, relatively straight.	Desirable level design, but with some moderate curvature.	Desirable level design, but with some curvature approaching the high limits.	Desirable level design, but with some curvature approaching the high limits.
Drainage implications	Shortest river crossing, therefore, only minor floodplain impacts at Agua Fria River. Crosses the DRCC and uses it as an outfall, but intercepts DRCC flows so freeway drainage channel becomes a regional flood control facility. Drainage channels are required along north side for entire length. Some drainage channel siphons may be required between 91st Avenue and 83rd Avenue. Lowest overall drainage cost alternative.	Longest river crossing with floodplain impacts mostly limited to the west bank of the Agua Fria River. Bridge deck drainage will be challenging. Alignment coincides with the DRCC alignment, allowing for the shared use (and possible cost sharing) of this facility for drainage. However, because the DRCC facility and this alignment is located in a natural valley, off-site channels along both sides of the freeway are necessary, increasing cost, complexity, and maintenance for both systems. Some drainage channel siphons may be required between 91st Avenue and 83rd Avenue. Most overall drainage construction and maintenance cost alternative.	Long river crossing with floodplain impacts mostly limited to the west bank of the Agua Fria River. Bridge deck drainage will be challenging. Between the Agua Fria River and Avondale Boulevard, the alignment follows Southern Avenue, which is a natural ridge line in the terrain. Only on-site drainage conveyance (pipes) is needed in this reach since off-site flows do not exist. This decreases the footprint and maintenance requirements. Between Avondale Boulevard and 99th Avenue, the alignment coincides with the DRCC alignment (and the Center Alternative), allowing for the shared use (and possible cost sharing) of this facility for drainage. However, because the DRCC facility is located in a natural valley, off-site channels along both sides of the freeway are necessary in this reach, slightly increasing cost, complexity, and maintenance. Some drainage channel siphons may be required between 91st Avenue and 83rd Avenue.	Long river crossing with substantial floodplain impacts on both banks of the Agua Fria River. Bridge deck drainage will be challenging. Will be located immediately upstream of Tres Rios levee (and requiring its extension to the west of the existing levee further into the river's floodway). This alignment will affect most of the current basins behind the Tres Rios levee, requiring basin volume replacement and expansion using very shallow and large basin footprints to accommodate the new freeway. Some drainage channel siphons may be required between 91st Avenue and 83rd Avenue. Generally, drainage outfalls and water quality for this alignment will be extremely challenging being so close to the Gila River.
Number of pump stations	1	1	2	1
Traffic operations	Efficient and balanced TI traffic utilization. Highest traffic attraction from arterials from both sides of the freeway.	Efficient and balanced TI traffic utilization. Highest traffic attraction from arterials from both sides of the freeway.	Efficient and balanced TI traffic utilization. Traffic attraction from arterials is nearly as good as the north and central options.	Less efficient and unbalanced TI traffic utilization. Lowest traffic attraction from arterials, primarily because there is no land use south of the alignment and the use of some "dead end" interchanges.
ISM Raceway special event traffic considerations	Alignment is about 1.5 miles from ISM Raceway. ISM Raceway traffic would inundate the local arterial system between the freeway and ISM Raceway.	Alignment is about 1.25 miles from ISM Raceway. ISM Raceway traffic would inundate the local arterial system between the freeway and ISM Raceway.	Alignment is 0.75 to 1 mile from ISM Raceway. ISM Raceway traffic would heavily use Southern Avenue and the frontage road system along the freeway to access the freeway at up to three locations. Most evenly distributes the traffic to SR 30 to/from ISM Raceway while minimizing arterial impacts.	Alignment is about 0.5 mile from ISM Raceway. ISM Raceway traffic would largely avoid the arterial network north of SR 30 (except perhaps Southern Avenue) but would concentrate at Avondale Boulevard. Without frontage roads to the adjacent interchanges, El Mirage Road would be underused.

Alignment criterion	North	Center	Hybrid	South
Major utility impacts	Two 230 kV and several 69 kV OHP relocations, including work near Rudd Substation. 1 APS pipeline encasement. 20-inch gas line relocation. Buckeye Feeder Canal relocation. Other sewer pipeline encasements.	Possible multiple high voltage (230, 345, 500 kV) height adjustments. Several 69 kV OHP relocations. 1 APS pipeline encasement. 20-inch gas line relocation. Buckeye Feeder Canal relocation. Other sewer pipeline encasements.	Possible multiple high voltage (230, 345, 500 kV) height adjustments. Several 69 kV OHP relocations. 1 APS pipeline encasement. 20-inch gas line relocation. Buckeye Feeder Canal relocation. Other sewer pipeline encasements.	Possible multiple high voltage (230, 345, 500 kV) height adjustments. Several 69 kV OHP relocations. 1 APS pipeline encasement. 20-inch gas line relocation. Other sewer pipeline encasements.
Other engineering challenges	None	A structure is needed to cross through the DRCC Basin No. 1. Structure is costly (~$250 million), but also technically challenging as the basin will be 100 feet deep and full of water.	A structure is potentially needed to cross a corner of the DRCC Basin No. 1. Structure is assumed, but may be able to fill the corner of the basin instead if feasible.	Tres Rios levee relocation required and could be difficult to permit under the new Section 408 federal levee requirements. In addition, sand and gravel sites south of Southern Avenue could be developed by the time freeway arrives, greatly increasing cost and design complexity.
Cost and ROW				
Construction cost (includes design)	$1.239 billion	$1.684 billion	$1.369 billion	$1.355 billion
ROW cost (acquisitions and relocations)	$334 million	$312 million	$316 million	$324 million
Total cost (construction and ROW)	$1.573 billion	$1.996 billion	$1.684 billion	$1.678 billion
Gross ROW acreage	1,530	1,599	1,612	1,663
Residential displacements (existing)	72	90	130	107
Dairy, sand and gravel, other business impacts	10	11	13	15
Potential for future sand and gravel operation impacts	Low	Low	Low	Very high
Planned/Existing school impacts	2 planned, 1 existing	0	0	0
Agency and public support				
City of Phoenix	Supports Recommended Build Alternative with requirements – all build alternatives satisfy Phoenix's requirements			
City of Avondale	No	No	Yes	No
City of Goodyear			Supports Avondale's preference	
City of Buckeye			Supports Avondale's preference	
City of Tolleson			Supports Avondale's preference	
Maricopa County			Supports Avondale's preference	
Public support (results from approximately 60 comments from public meeting input as of 2/11/15). Approx. 20 percent of respondents chose No-Build, and 80 percent chose a Build option.	50%	6%	11%	13%

Notes: DRCC = Durango Regional Conveyance Channel; NRHP = National Register of Historic Places; OHP = overhead power; SRP = Salt River Project; TCP = traditional cultural property; TI = traffic interchange

4.0 Major Design Features

The study and design of the proposed SR 30 freeway in the study area has been ongoing for over 14 years. In that time, numerous changes to the alignment, vertical profile, cross section, interchange locations, and other design concepts have been made. The changes and evaluation of concepts have been documented in the ASR, the ISR, the *SR 303L, I-10 to SR 30 Location/Design Concept Report*, and the previous chapter of this report, and all informed the selection process that ultimately led to the selection of the RA documented in this chapter. The RA was identified as the Selected Alternative, which will be carried forward for final design and construction.

4.1 Introduction

The proposed freeway construction of SR 30 would initially include three general purpose lanes with auxiliary lanes in each direction and a wide median. The travel lanes and inside and outside shoulders would all be 12 feet wide and paved with PCCP. The PCCP would be overlaid with an asphalt-rubber/asphaltic-concrete friction course. Entrance and exit ramps would generally use a parallel-type configuration coupled with auxiliary lanes between service TIs, as warranted. The wide median would eventually be used for an additional 12-foot general purpose lane and a 12-foot HOV lane, centered along a median barrier.

Auxiliary lanes would be designed in accordance with the *Interim Auxiliary Lane Design Guidelines* (ADOT 1996). Auxiliary lanes would be provided between successive service TIs within 1.5 miles of each other. Parallel drop and add lanes would be provided between interchanges separated by more than 1.5 miles. Table 4-1 presents the auxiliary lane application between each service TI along the proposed freeway.

Table 4-1. Auxiliary lane application

Location	Spacing (miles)	Application
Sarival Avenue to Estrella Parkway	1.0	Auxiliary lanes
Estrella Parkway to Bullard Avenue	1.0	Auxiliary lanes
Bullard Avenue to Dysart Road	2.0–2.5	Parallel add- and drop-lanes
Dysart Road to 115th Avenue	2.0	Parallel add- and drop-lanes
115th Avenue to 107th Avenue	1.0	Auxiliary lanes
107th Avenue to 91st Avenue	2.0–2.5	Parallel add- and drop-lanes
91st Avenue to 83rd Avenue	1.0	Auxiliary lanes
83rd Avenue to 67th Avenue	2.0	Refer to Appendix B – integrated into the SR 30/SR 202L system TI ramp runouts

The use of parallel drop- and add-lanes at spacing greater than 1.5 miles is consistent with the ADOT RDG and supported by the main line traffic analysis presented in Chapter 2.0. Providing an auxiliary lane for the full length between service TIs would increase the construction cost (extra pavement, wider bridges, etc.) and increase the ROW footprint. For these reasons, the proposed design only includes the auxiliary lane application as presented in Table 4-1.

4.2 Design Controls

The design criteria were developed in accordance with the ADOT RDG and Standard Drawings (all with current revisions and updates), as well the AASHTO *A Policy on Geometric Design of Highways and Streets* (AASHTO 2011a) (Green Book) and *Roadside Design Guide* (AASHTO 2011b, with 2015 errata). The notable design criteria for the associated road types are presented in Tables 4-2 to 4-6.

Table 4-2. Design controls for SR 30 freeway main line

Item description	Proposed six-lane freeway
Typical section	see Appendix A
Design year	2040
Design vehicle	WB-67
Design speed	65 mph (minimum)
Superelevation	0.06 feet/feet (maximum)
Minimum vertical curve	800 feet
Maximum horizontal angle break	0º 45’ 00”
Maximum gradient	3% (level terrain); 4% (rolling terrain); 5% (mountainous terrain)
Horizontal curve	1º 45' 00" (maximum degree of curvature based on horizontal sight distance criteria as restricted by median barrier and 3% downgrade) Minimum length = 975 feet (15 times the design speed; see RDG Section 203.5) (Spiral transitions are not used.)
Half road width (including shoulders, excluding auxiliary lanes)	60 feet
Lane width	12 feet
Median shoulder width	12 feet
Outside shoulder width	12 feet (no additional shy distance added)
Recovery area	ADOT RDG Section 303.2
Cross slope	0.02 feet/feet
Pavement design life	20 years
Barrier type	Outside: concrete (per ADOT C-Standards) Median: Use of median cable barrier to be evaluated by ADOT for 3+0 freeway condition
Curb and gutter type	ADOT Standard C-05.10 (Type B or C)
Access control	Full
Right-of-way	Minimum: 10 feet from outside toe of slope Desirable: 20 feet from outside toe of slope
Tapers	50 to 1 to drop main line lanes added by on-ramp lane (RDG Figure 504.8A) Design speed : 1 to drop main line lane or shoulder 25 : 1 to add lane or shoulder
Utilities	*Policy for Accommodating Utilities on Highway Rights-of-Way* (ADOT Latest Edition)
Lighting	Full outside lighting

Table 4-3. Design controls for directional ramps

Item description	Directional ramp
Design year	2040
Design vehicle	WB-67
Design speed	55 mph (main body); 65 mph (at main line exit)
Superelevation	0.06 feet/feet (maximum)
Maximum gradient	4% upgrade; 5% downgrade
Horizontal curve	5º 24' (maximum degree of curvature)
Road width	36 feet (2 lane); 1 lane directional ramps not permitted; shy distance applies to 2 lane ramp
Lane width	12 feet (except as noted in Section 7.1 of this document)
Barrier type	Concrete per ADOT Construction Standards
Curb and gutter type	ADOT Standard C-05.10, Type B or C

Table 4-4. Design controls for entrance and exit ramps

Item description	Entrance ramp	Exit ramp
Design year	2040	2040
Design vehicle	WB-67	WB-67
Design speed	55 mph (gore area) 50 mph (ramp body) 35 mph (intersection)	60 mph (gore area) 50 mph (ramp body) 35 mph (intersection)
Superelevation	0.06 feet/feet (maximum)	0.06 feet/feet (maximum)
Maximum gradient	4% upgrade/5% downgrade	4% upgrade; 5% downgrade
Horizontal curve	Max D_c at gore area is controlled by minimum superelevation breakover criteria of 2 percent (ADOT RDG Section 504.3) Max D_c for 50 mph and 35 mph design speed are 6º 53' and 18º 19', respectively Length = 500 feet minimum for Δ = 5°; increase length by 100 feet for each 1 º decrease in Δ	5º 24' (maximum degree of curvature)
Road width	28 feet (ramp body, excluding shy distance)	Varies at intersection 22 feet (gore and ramp body, excluding shy distance) 34 feet for dual lane exit ramp
Lane width	12 feet (except as noted in Section 7.1 of this document)	12 feet (except as noted in Section 7.1 of this document)
Recovery area	ADOT RDG Section 303.2	Concrete per ADOT Construction Standards
Barrier type	Concrete per ADOT Construction Standards	ADOT Standard C-05.10, Type B or C
Curb and gutter type	ADOT Standard C-05.10, Type B or C	

Table 4-5. Design controls for major arterial streets

Item description	Major arterial street
Crossroad typical section	City of Phoenix Detail No. P1010 Section B City of Goodyear G-3120 and G-3122 City of Avondale Major Arterial Section
Design year	2040
Design vehicle	WB-50
Design speed	50 mph (45 mph at interchanges)
Road width	Varies by jurisdiction
Number of through lanes	4 or 6 lanes depending on city's General Plan
Number of left-turn lanes at interchange	Based on traffic analysis
Number of right-turn lanes prior to interchange	1 lane
Bike lane	Varies by jurisdiction
Sidewalk	5 feet
Pavement design life	20 years
Drainage (pavement)	10 years
Right-of-way	Varies
Lane width	Varies by jurisdiction and type
Clear zone width	1.5 feet from face of curb minimum, 6 feet desirable
Road foreslope	3:1
Median	14 feet (4 feet minimum within interchange)
Curb and gutter type	MAG Standard Detail 220 (ADOT Standard C-05.10, Type D within access control)

Table 4-6. Design controls for Southern Avenue frontage roads

Item description	Frontage road
Crossroad typical section	City of Avondale Major Collector Half Section (The proposed one-way frontage roads on the project are solely in the City of Avondale's planning area and would likely be owned and maintained by Avondale similar to other frontage roads in the valley. As a result, it is assumed that the frontage roads will be two 12-foot travel lanes in each direction, possibly with a 4-foot bike lane on the right, and no shoulders, bounded by curb and gutter on each side—the same as the City of Avondale Major Collector section.)
Design year	2040
Design vehicle	WB-50
Design speed	50 mph
Road width	28-feet (curb to curb) each direction
Number of through lanes	2 lanes in each one-way direction
Bike lane	4-foot each direction possible
Sidewalk	5 feet
Pavement design life	20 years
Drainage (pavement)	10 years
Clear Zone Width	1.5 feet from face of curb minimum, 6 feet desirable
Access control	Yes – between crossroad and ramp-frontage road gore No – between ramp-frontage road gores. Right-in/Right-out access will be permitted.
Drainage (pavement)	10 years, with minimum grades per Avondale's requirements

4.3 Horizontal and Vertical Alignments

The plans in Appendix B include detailed horizontal and vertical alignment tables for the SR 30 freeway main line, ramps, and crossroads for the Selected Alternative.

4.4 Access

4.4.1 System Traffic Interchanges

A system TI between SR 30 and SR 303L is planned on the west end of the study limits, located somewhere in the general vicinity of Cotton Lane and SR 30. This system TI is being located, designed, and documented as part of the SR 303L; I-10 to SR 30 L/DCR and EA and, as such, will not be repeated here.

A system TI between SR 30 and SR 202L is included with this study's Selected Alternative, and has been designed in a manner consistent with the findings of the ISR. A key design feature of this proposed TI is its phased implementation. This interchange has been designed assuming that in its ultimate configuration, it would be a full four-legged system interchange with two-lane directional ramps in all directions, because the MAG Regional Freeway Plan includes extending SR 30 from SR 202L over to and connecting with I-17 at some point in the future. In addition, a future east-to-west transit corridor has been preserved through the center of the interchange to accommodate future travel demand in the corridor that cannot be met by the freeway itself. Finally, the interchange design has built in the flexibility to build any one of three possible direct HOV ramps (the north-east/west-south ramp, the north-west/east-south ramp, or the south-west/east-north ramp), since it is not clear at this time which movement will have the highest HOV travel demand in the future. Because of these future phased options, it is envisioned that the first phase will be just the west half of the system TI, followed by the east half at a later date. The direct HOV ramps and/or the transit elements would also likely be built in subsequent phases after the full system TI is complete.

Details of the SR 30/SR 202L system TI design can be found in Appendix B, with supplemental information for future expansion phases of this interchange being found in Appendix D.

4.4.2 Service Traffic Interchanges

Nine diamond service TIs are proposed along SR 30. The majority of the service TIs would provide full access. Half access to the east would be provided at Sarival Avenue because of its close proximity to the proposed system interchange at SR 303L. Similarly, half access to the west would be provided at 67th Avenue because of its close proximity to the SR 202L system interchange with SR 30 at the eastern terminus of the project. However, at 67th Avenue, provisions have been made in the design of the SR 30/SR 202L system TI to provide the east half of the 67th Avenue TI with braided diamond ramps embedded in the system TI at such time that SR 30 may extend east of SR 202L.

The design controls for the entrance and exit ramps are presented in Table 4-4. In accordance with the ADOT RDG, entrance ramps would have two lanes that begin to taper to one lane after the back of main line and ramp gore to provide for ramp metering, if necessary.

Table 4-7 shows the proposed stationing of interchanges and grade separations.

Table 4-7. Interchange and grade separation locations – Selected Alternative

SR 30 Station	Facility crossed	Freeway crossing	Description
1357+65.43	Sarival Avenue	Overpass	Half-service TI
1410+36.31	Estrella Parkway	Overpass	Service TI
1462+64.78	Bullard Avenue	Overpass	Service TI
1557+73.49	Dysart Road driveway	Overpass	Grade separation
1581+40.66	Dysart Road	Overpass	Service TI
1633+85.55	El Mirage Road	Overpass	Grade separation
1657+15.96	WB frontage road	Overpass	Grade separation
1688+84.35	Avondale Boulevard	Overpass	Service TI
1741+01.61	107th Avenue	Overpass	Service TI
1793+41.86	99th Avenue	Overpass	Grade separation
1852+28.24	91st Avenue	Overpass	Service TI
1922+44.81	83rd Avenue	Overpass	Service TI
WB 25+55.83, EB 5+49.65	75th Avenue	Overpass	Grade separation
WB 77+78.20, EB 57+67.32	67th Avenue	Overpass	Half-service TI, expandable to full TI

4.4.3 Streets and Intersections

This section describes the recommended design concept for improving the arterial cross roads through the corridor (Table 4-8). The improvements are based on growth and traffic projections for FY 2040. However, Dysart Road and Avondale Boulevard have widths based on anticipated peak traffic generated by events at the ISM Raceway (formerly PIR).

Table 4-8. Arterial standards table

Street	Northbound						Raised island (feet)	Southbound					
	Sidewalk width (feet)[a]	Curb and gutter width (feet)	Right shoulder (feet)	Approaching right-turn lanes	Through lanes	Left-turn lanes		Left-turn lanes	Through lanes	Approaching right-turn lanes	Right shoulder (feet)	Curb and gutter width (feet)	Sidewalk width (feet)[a]
City of Goodyear													
Sarival Avenue (1)	8	2.708	5	None	1@12'	None	8	2@12'	None	None	5	2.708	8
Estrella Parkway (1)	8	2.708	5	2@12'	3@12'	2@12'	8	2@12'	3@12'	None	5	2.708	8
Bullard Avenue (2N, 2C, 2S, 2SSH)	8	2.708	5	2@12'	2@12'	2@12'	Varies	2@12'	2@12'	1	5	2.708	8
City of Avondale													
Dysart Road (2N, 2C, 2SSH, 2S)	8	2.708	5	1@12'	3@12'	2@12'	Varies	2@12'	3@12'	None	5	2.708	8
El Mirage Road (2N, 2C)	6	2	5	None	2@12'	None	16	None	2@12'	None	5	2	6
El Mirage Road (2SSH)	8	2.708	5	None	2@12'	2@12'	8	2@12'	2@12'	None	5	2.708	8
El Mirage Road (2S)	6	2	5	None	2@12'	None	Varies	1@12'	2@12'	None	5	2	6
Avondale Boulevard (2S)	8	2.708	5	1@12'	3@12'	2@12'	Varies	1@12'	3@12'	None	5	2.708	8
Avondale Boulevard (2N, 2C, 2SSH)	8	2.708	5	1@12'	3@12'	2@12'	8	2@12'	3@12'	None	5	2.708	8
107th Avenue (2N, 2C, 2SSH)	8	2.708	5	None	2@12'	1@12'	8	1@12'	2@12'	None	5	2.708	8
107th Avenue (2S)	8	2.708	5	None	2@12'	1@12'	Varies	2@12'	None	1@12'	5	2.708	8
City of Phoenix													
Southern Avenue (2S)	6	2	5	None	2@12'	None	None	None	2@12'	None	5	2	6
99th Avenue (2N, 2C, 2SSH, 2S)	6	2	6	None	2@12'	None	None	None	2@12'	None	6	2	6
91st Avenue (2N, 2C, 2SSH, 2S)	6	2.708	5	None	3@12'	1@12'	Varies	2@12'	3@12'	None	5	2.708	6
83rd Avenue (3A, 3B)	6	2.708	5	None	2@12'	1@12'	Varies	1@12'	2@12'	None	5	2.708	6
75th Avenue (3A, 3B)	6	2	6	None	2@12'	None	None	None	2@12'	None	6	2	6
67th Avenue (3A, 3B)	6	2.708	5	None	3@12'	2@12'	Varies	None	3@12'	1@12'	5	2.708	6

[a] All sidewalks are 5 feet wide between ramp terminals.

City of Goodyear Existing Conditions

The City of Goodyear arterial existing conditions between Sarival Avenue and the Agua Fria River are as follows: Bullard Avenue is presently a two-lane paved road and Estrella Boulevard is a four-lane paved road, both without curbs or sidewalks. Sarival Avenue exists only as a graded maintenance road for the power line and irrigation facilities.

City of Goodyear Proposed Improvements

Between Sarival Avenue and the Agua Fria River, Goodyear will have three local interchanges, with SR 30 being grade-separated over the arterials. Estrella Parkway will be constructed as a six-lane arterial having dual northbound and southbound left-turn lanes through the interchanges. It also requires dual northbound right-turn lanes. An 8-foot island will separate the turn lanes and contain the center piers for the bridges. A 6-foot sidewalk on the west side and 8-foot pathway on the east side will be needed.

Sarival Avenue will have a unique configuration, with no roadway continuing south of the interchange. It will have only a dual southbound left-turn lane and a single northbound through lane under the bridge because Sarival Avenue is not planned to have continuity south of SR 30. The lanes will be separated by an 8-foot island for the bridge piers. Only a 6-foot sidewalk on the west side is planned. It is only a half diamond with ramps to the east.

Bullard Avenue will be constructed as a four-lane arterial with dual northbound and southbound left turn lanes, dual northbound right-turn lanes, and a single southbound right-turn lane for all alternatives.

Bypass detours will be needed while the bridges are constructed at Estrella Parkway and Bullard Avenue.

City of Avondale Existing Conditions

Avondale's major arterial roadways (Dysart Road, El Mirage Road, Avondale Boulevard, and 107th Avenue) that intersect the proposed freeway will need to be upgraded and widened. Dysart Road, El Mirage Road, and 107th Avenue are all two-lane paved roads. Avondale Boulevard is currently a four-lane paved roadway without curb and gutter or sidewalks. Dysart Road currently dead-ends south of Southern Avenue.

City of Avondale Proposed Improvements

The proposed SR 30 will traverse Avondale, crossing over all four major arterials and constructing full service TIs at Dysart Road, Avondale Boulevard, and 107th Avenue. El Mirage Road, however, will only be a grade-separated crossing, but with frontage road access to the Dysart Road TI.

Dysart Road and Avondale Boulevard will be constructed as six-lane arterials having dual left-turn lanes in both directions and a northbound right-turn lane. 107th Avenue will be a four-lane arterial with one left-turn lane in each direction. These three roadways will have an 8-foot island, a 6-foot sidewalk on the west side, and an 8-foot pathway on the east side.

The Selected Alternative uses new one-way frontage roads starting from the east side diamond ramps at Dysart Road and continuing east about 1.75 miles through El Mirage Road and tying into the existing Southern Avenue. The westbound frontage road also has a street leaving it to access properties along the BFC. The frontage roads will be 28 feet wide and have right- and left-turn lanes at intersections.

Avondale Boulevard is the only location where a bypass detour is expected to be required. Two lanes will be provided during construction of the structures.

City of Phoenix Existing Conditions

The five arterial roadways crossed in the City of Phoenix include 99th, 91st, 83rd, 75th, and 67th Avenues. Four presently exist as only two-lane asphalt roadways without curbs or sidewalks, the lone exception being 83rd Avenue, which is not a through street at this time. The City's 91st Avenue WWTP is directly south of this area, east of 91st Avenue.

City of Phoenix Proposed Improvements

The five arterial roadways crossed in the City of Phoenix are planned to include full interchanges at 91st Avenue and 83rd Avenue. A half-diamond interchange at 67th Avenue is planned (because of proximity of the east half of the proposed SR 202L system TI), with expansion options as a full TI when the east half of the system TI is built. Grade separations are proposed at 99th and 75th Avenues. In all cases, the freeway will pass over the at-grade arterial roadway.

91st Avenue will be on a new alignment roughly paralleling, and to the west of, two existing sanitary sewer lines in the street that feed the 91st Avenue WWTP. It will include six through lanes with a single northbound left and dual southbound left-turn lanes. 83rd Avenue will be four lanes with a left-turn lane in each direction, also aligned to miss two sanitary sewer lines. 67th Avenue will be constructed 15 feet east of the section line with six through lanes, a northbound left turn, and dual southbound right-turn lanes. This 15-foot alignment shift avoids affecting an existing 96-inch storm drain with the new bridge pier foundations. 99th and 75th Avenues will each be a four-lane roadway divided by a 14-foot island containing the center piers for the bridges.

It is expected that bypass detours will be constructed for 91st and 67th Avenues to avoid soffit loading on the large existing utilities along those streets.

4.5 Right-of-way

New ROW will be required for the Selected Alternative. Approximately 236 parcels are affected with a total acquisition area of 1,235 acres between Sarival Avenue and SR 202L. Utility easements may also be required, but are expected to be minimal and will depend on the actual utility relocation designs negotiated with the utility companies during the final design phase. In addition, TCEs may be required, but are also expected to be minimal and will depend on construction methods and maintenance of traffic requirements.

4.6 Drainage

Because the drainage elements associated with the SR 30 corridor are substantial and played a role in the alternative selection process, a detailed analysis of the required drainage infrastructure was undertaken for all four of the alternatives studied in detail. A summary of this analysis can be found in Section 3.4 of this document. Because the Hybrid Alternative has become the Selected Alternative, the discussion for its drainage elements can be found in Section 3.4 and will not be repeated here.

4.7 Sections 401 and 404 of the Clean Water Act

USACE administers Section 404 of the Clean Water Act (CWA), which regulates the discharge of dredged or fill material into the United States (jurisdictional waters), including wetlands. USACE regulates jurisdictional waters through permitting using nationwide and individual permits.

Types of waters that are regulated include wetlands, ephemeral washes, perennial streams, springs, riverbeds, and special aquatic sites. Functional values are a key component of the waters of the U.S. determination and the associated permitting and mitigation.

The proposed SR 30 freeway would require the placement of structures such as bridge substructures into jurisdictional waters leading to the discharge of dredged or fill material into the Salt River and Agua Fria River. There would be potential temporary impact area associated with constructing the SR 30/SR 202L system TI and the Agua Fria River crossing.

The proposed 97th Avenue outfall channel along the western border of the Tres Rios facilities is directly upstream of the Tres Rios overbank wetlands. Discharged water would require monitoring and regulation for water quality.

It is anticipated that an individual permit would be required for the SR 30 project. ADOT is committed to integrating NEPA and Section 404 of the CWA in the transportation planning, decision making, and implementation process. When avoidance of waters of the U.S. is not practicable, minimization of impacts would be achieved, and unavoidable impacts would be mitigated to the extent possible. The permitting process for Section 404 requires CWA Section 401 certification. This certification is regulated by the Arizona Department of Environmental Quality (ADEQ) for waters of the U.S., except on tribal land. Preliminary jurisdictional delineations have been performed and were approved by USACE in 2019, and the necessary permits will be obtained during final design.

ADOT would prepare a water quality certification application in accordance with Section 401 of the CWA as part of the Section 404 permitting process. The application would be submitted for review and approval by ADEQ. The steps outlined below would be taken by ADOT to satisfy provisions of the Section 401(b)(1) of the CWA in accordance with Section 404 (USACE 2005):

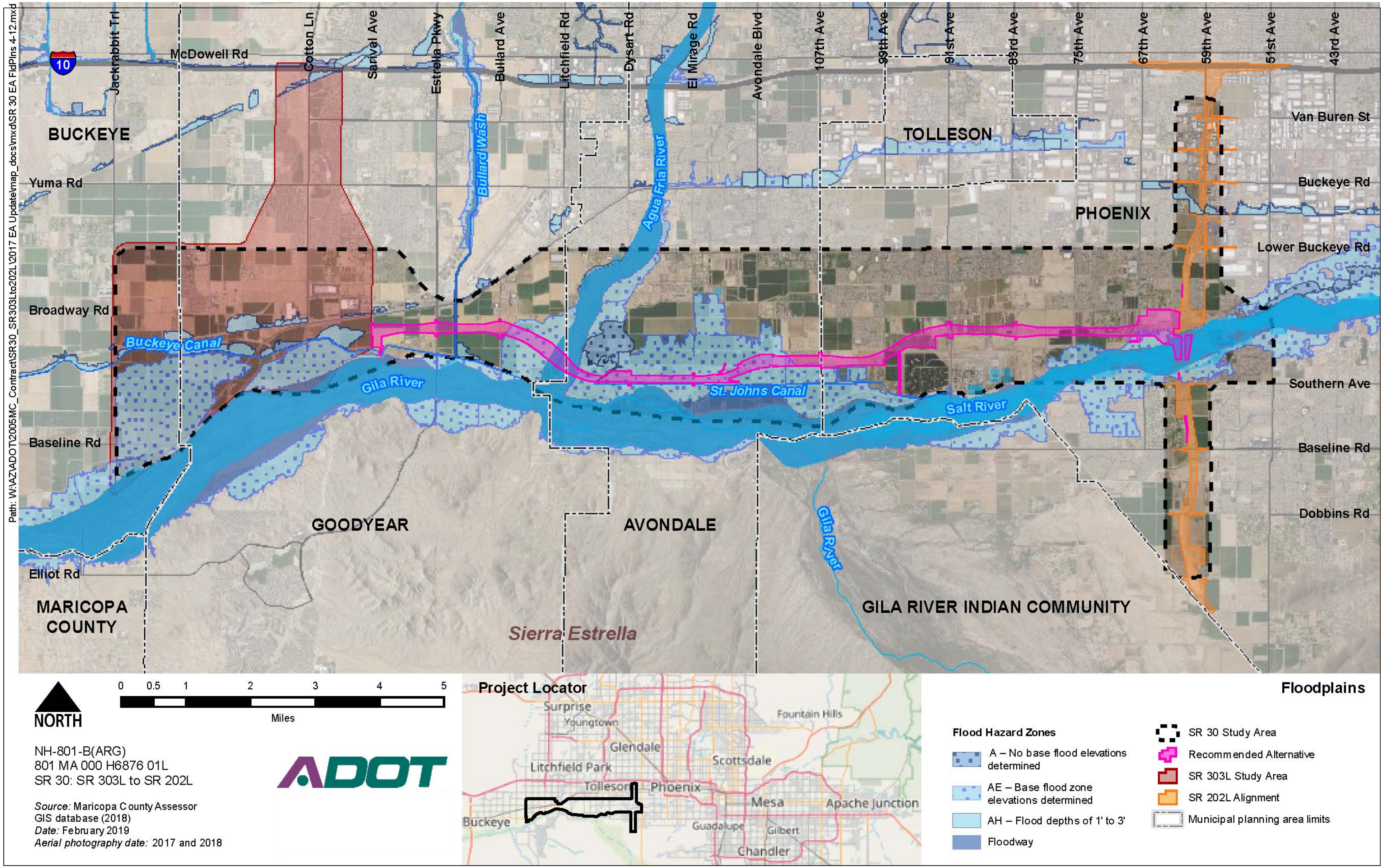
- minimize impacts by limiting the degree or magnitude of the freeway and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts
- rectify impacts by repairing, rehabilitating, or restoring the affected environment
- reduce impacts over time through preservation and maintenance operations during the life of the freeway
- compensate for impacts by replacing, enhancing, or providing substitute resources or environments
- monitor impacts and take appropriate corrective measures

4.8 Floodplain Considerations

All projects in a FEMA regulatory floodway must undergo an encroachment review to determine their effect on flood flows and to ensure that they do not cause problems.

A review of the FEMA FIRMs indicates portions of the proposed SR 30 alignment would affect the 100-year floodplain (see Figure 4-1).

Figure 4-1. SR 30 floodplain and floodway impacts



Impacts on floodplains typically occur when the topography of the project area is substantially modified by either placement or removal of material in the floodplain. The proposed SR 30 build alignment would be developed on a fill condition and is above the effective floodplain elevation but will reduce the overall conveyance capacity of the existing floodplain. Impacts in the effective floodway are primarily because of the proposed bridges over the Agua Fria River and the bridges crossing the Salt River, associated with the SR 30/SR 202L system TI. At the Agua Fria River crossings, impacts on the floodway/floodplain were reduced by extending the bridges west, which increased the overall conveyance in the floodway.

It is important to note that the current regulatory maps do not include the existing Tres Rios project. Currently, the Tres Rios project is in the Letter of Map Revision process at FEMA and is expected to substantially reduce the floodplain footprint in the Avondale portion of the project. If future SR 30 design activities reveal that the proposed freeway has a significant impact on the floodplains, then a separate Conditional Letter of Map Revision will be developed to address floodplain impacts and flood mitigation procedures. However, it is not anticipated that this will be the case. In fact, the minimal floodplain impacts that exist with the proposed SR 30 alignment should be reduced over time as FEMA remapping efforts catch up to current conditions. Furthermore, SR 30 is not expected to either enlarge or reduce the FEMA floodplain in the corridor.

The integration of the SR 30 off-site system and the existing and planned regional flood control elements in the region would require extensive coordination. Regional parties and their associated interests would include:

- USACE and City of Phoenix – Tres Rios levee and wetlands
- FEMA and local jurisdictions – river floodplain development and management
- FCDMC – DRCC, Sunland Channel, and Loop 303 outfall channel
- ADOT – operation and maintenance of proposed facilities

4.9 Earthwork

The proposed freeway (including the main line, system and service TIs, drainage channels, and basins) was modeled to determine earthwork quantities. A summary of the earthwork quantities, broken down by major segments within the Selected Alternative, is shown in Table 4-9.

Although the freeway is above ground throughout the corridor, a large amount of material is produced. The major sources of this material are the off-site drainage channels, drainage basins, and the assumed overexcavation depth of 3 feet under the roadway prism.

The rolling elevated main line profile results in a fairly consistent need for embankment along the freeway corridor of approximately 1,000,000 cubic yards per mile. Assuming that the majority of the 5,000,000 cubic yards of excavated material from the project site can be reused for embankment, the project will still require imported borrow in the amount of approximately 9,700,000 cubic yards between Sarival Avenue and SR 202L. A specific borrow source has not been identified, but given the large number of sand and gravel sources along the rivers around project site, it is not expected that this borrow would have to be transported from large distances.

Table 4-9. Earthwork quantity summary for the Selected Alternative

Location	Length (miles)	Total excavation (roadway/overexcavation/ drainage) (cubic yards)	Net in–place borrow (–) or waste (+) (cubic yards)
Sarival to Estrella Parkway	1.00	380,000	–870,000
Estrella Parkway to Dysart Road	3.31	820,000	–2,010,000
Dysart Road to Avondale Boulevard	1.94	630,000	–1,220,000
Avondale Boulevard to 97th Avenue	2.23	630,000	–1,050,000
97th Avenue to 67th Avenue	3.84	1,340,000	–2,340,000
67th Avenue to SR 202L	0.70	1,250,000	–2,170,000
Total	**13.02**	**5,050,000**	**–9,660,000**

4.10 Construction Phasing and Traffic Control

Because this is a brand-new transportation corridor, no major constraints would substantially affect construction phasing along the corridor. However, some minor constraints would have to be coordinated during final design and construction that could affect certain areas of the corridor. Some examples of these constraints are:

- utility relocations, modifications, and encasements
- irrigation and utility dry-up periods
- wet weather windows in the Agua Fria and Salt Rivers
- flood control coordination
- special event work restrictions (such as ISM Raceway events)
- interim end-of-freeway conditions

Traffic control would be required at some of the existing crossroads, as noted in Section 4.4.3. In addition, the SR 30/SR 202L system TI construction would require some complex traffic control along SR 202L for the overhead flyover construction and the main line widening for the ramp runouts. In addition, several of the crossroads along SR 202L would need traffic control because of overhead bridge widening and ramp gore reconstructions; however, these impacts are expected to be minimal and of short duration.

4.11 Traffic Design

The following sections describe the proposed concepts for guide signs, pavement marking, traffic signals, lighting, freeway management system (FMS), and vehicle counting system elements. The traffic design concepts were developed based on the guidelines presented in the following documents:

- *Manual on Uniform Traffic Control Devices* (MUTCD) (FHWA 2009)
- Arizona Supplement to the MUTCD (ADOT 2009)
- ADOT Traffic Signals and Lighting Standard Drawings (ADOT 2015, with updates)
- ADOT Signing and Marking Standard Drawings (ADOT 2014, with updates)
- ADOT ITS Design Guide (current edition)
- ADOT Traffic Engineering TGP (ADOT 2011, with updates)

The traffic design detail would continue to be refined through final design. Coordination would continue with adjacent projects, such as the SR 303L corridor, to address sign locations, light locations, and conduit installation.

4.11.1 Signing

Guide Signs

The proposed freeway would require extensive guide signing to be installed along the corridor. The guide signs would be mounted on overhead cantilever sign structures located on the outside of the freeway lanes, overhead tubular frame structures spanning all the freeway lanes in one direction, or median sign structures (one- or two-sided) mounted in conjunction with the median barrier wall. Guide signs used for this project would include:

- guide signs within 2 miles of the approaches to the system TIs and service TI sequence signs, listing the next three service TIs, with mileages
- sequential exit ramp guide signs for system TI ramps and service TI ramps, including appropriate E11-1 ("EXIT down arrow ONLY") and E11-1a ("EXIT ONLY") panels

A guide sign concept plan is included in the project plans in Appendix B. Final sign locations would be determined during final design based on the locations of utilities, drainage elements, right side barrier, and other features.

Each freeway interchange would also have several overhead guide signs on the crossroad approaches to the freeway, including signs for the freeway route number with cardinal directions and destination cities, and for lane assignments at on-ramp approaches.

Other Signs

The appropriate regulatory, warning, and other ground-mounted guide sign locations would be determined during final design for the main line freeway, on- and off-ramps, and on interchange crossroads within approximately 500 feet of the freeway.

Pavement Marking

The conceptual pavement marking plan for delineating the freeway main line general purpose, on- and off-ramps, and crossroad lanes is included in the project plans in Appendix B. At approaches to system TIs, there would be advance in-lane pavement markings identifying lanes connecting via directional ramps to another freeway.

4.11.2 Traffic Signals

New traffic signals would be installed at the service TI ramp and crossroad intersections. All the service interchange crossroads are maintained by the respective local agency (Cities). The traffic signal design would meet ADOT standards and be coordinated with the adjacent signals. The final signal design, including ownership and maintenance responsibilities, would be determined during final design and documented in intergovernmental agreements (IGAs).

4.11.3 Lighting

The lighting design concept would provide for a uniform lighting design that adheres to all ADOT lighting standards. The desired lighting illumination level and uniformity ratio that conforms to ADOT standards would be addressed during final design.

Freeway Main Line and Ramp Lighting

Uniform lighting levels for the initial freeway construction (3+0 configuration) would be achieved with standard pole fixtures located along the outside of the main line on 45-foot-high I-poles with a 400-watt lamp on each pole. The poles would be spaced at intervals to achieve desired lighting levels. At the time of ultimate 4+1 construction, the freeway lighting will be reevaluated and shifted to standard pole fixtures located along the median barrier wall on 70-foot-high T-poles with two 400-watt lamps on each pole.

The main line freeway mostly goes through agricultural land. The possibility of reduced or no lighting in this section would be evaluated. However, critical underground conduit crossings would be installed for future use. The current absence of power drops through this area may also limit lighting design options. Locations where power drops are required would be determined during final design.

Main line lighting at service TIs would be supplemented with added lights on the entrance and exit ramps, or 100-foot-high multi-light mast lights located in the infields between the freeway main line and the ramps.

Over the long bridge over the Agua Fria River, critical conduit and pole foundations would be included in the structure design, even if only for future use.

The main line lighting at the system TI at SR 202L would require installing multi-light high mast poles to provide adequate lighting for the various flyover ramps. Lighting along the SR 202L main line in and near the proposed system TI will be in place, but limited areas may require lighting design modification to accommodate the SR 202L widening.

As applicable, the lighting design would evaluate the possibility of orienting and directing lighting to avoid spillover and nuisance lighting into adjacent residential areas and the Phoenix-Goodyear Airport, as required.

Guide Sign Lighting

No guide signs lighting is anticipated for this project. Sign sheeting material would be specified during final design in accordance with the latest ADOT design guidance.

Bridge Underdeck Lighting

The majority of the bridges located along the proposed freeway would be overpasses crossing over the arterial streets. Because they would be closed structures, crossroad underdeck lighting would need to be provided. The bridge underdeck lighting would be determined during final design. Maintenance and annual electrical costs of underdeck lighting of cross streets passing under the freeway is a local agency responsibility and will require IGAs to be established during final design.

Freeway Management System

The location of the FMS trunkline conduit, pull boxes, detectors, ramp meters, and other elements would be determined during final design. The full implementation of some elements of FMS, such as node buildings, dynamic message signs, and closed-circuit television, may occur at a later date after the initial freeway construction. Dynamic message sign locations will be coordinated during the final design phase of the project and will be integrated into the overall guide sign strategy. Because of the construction challenges and added cost implications to include a dynamic message sign on the long Agua Fria River bridge structure, no dynamic message signs would be proposed along the bridge. All critical underground elements, including pull boxes, would be constructed with the proposed freeway. At waterway crossings, conduit and pull box facilities will be incorporated into the bridge superstructure design of those crossings.

Vehicle Counting System

ADOT's Multimodal Planning Division requires the installation of Type C loops and pull boxes for traffic counter systems on all main line lanes, entrance and exit ramps, and frontage roads. In addition, Type S loops and other related equipment for speed and vehicle classification systems would be located at specified locations. While eventual integration with the FMS is planned, these vehicle counting systems would be initially installed on a stand-alone basis.

4.12 Utilities, Railroad, and Irrigation Systems

Because the utilities and irrigation system elements associated with the SR 30 corridor are substantial and played a role in the alternative selection process, a detailed analysis of the existing utility infrastructure was undertaken for all four of the alternatives studied in detail. A summary of this analysis can be found in Section 3.6 of this document. Because the Hybrid Alternative was identified as the Selected Alternative, the discussion for its utility elements can be found in Section 3.6 and will not be repeated here.

4.13 Freeway Landscaping, Irrigation, and Aesthetics

SR 30 is envisioned as a full urban freeway and, as such, will include freeway landscaping, irrigation, and aesthetic elements consistent with other freeways in the region that were not enhanced with local enhancement funding. Design details will be developed as the corridor proceeds into final design. For the purposes of this conceptual document, the cost estimates and programming amounts include standard landscaping, irrigation, and aesthetic costs on a per-mile basis.

4.14 Structures

Because the structures associated with the SR 30 corridor are substantial and played a role in the alternative selection process, a detailed analysis of the new structural requirements was undertaken for all four of the alternatives studied in detail. A summary of this analysis can be found in Section 3.5 of this document. Because the Hybrid Alternative was identified as the Selected Alternative, the discussion for its structural elements can be found in Section 3.5 and will not be repeated here.

4.14.1 Geotechnical

Regional Geology

The study area is situated in the West Salt River Valley (WSRV) sub-basin, which encompasses the western portion of the greater Phoenix metropolitan area and includes Phoenix, Glendale, Peoria, Avondale, Goodyear, Litchfield Park, and Tolleson. The WSRV sub-basin is bounded to the north by the Hedgepeth Hills and the Hieroglyphic Mountains; to the east by the Phoenix Mountains, Papago Buttes, and Union Hills; to the south by the South Mountains and the Sierra Estrella; and to the west by the White Tank Mountains. The sub-basin boundary extends downstream of the confluence of the Salt and Gila Rivers in the vicinity of Buckeye, north/northwest of the northern end of the Sierra Estrella and south/southeast of the southern end of the White Tank Mountains. The WSRV sub-basin is characterized by a broad and gently sloping alluvial plain underlain by up to several thousand feet of alluvium, and is bisected by several streams, including the Salt and Gila Rivers, Agua Fria River, New River, and Skunk Creek.

Bedrock is not exposed in the study area. The nearest occurrence of exposed bedrock is outside the study area, south of the Gila River, between the alignments of 107th Avenue and Avondale Boulevard (115th Avenue). Exposed bedrock comprising the base of the Sierra Estrella exists 1 to 1.5 miles south of the study area, beginning approximately at the alignment of Avondale Boulevard and extending to the western end of the study area. East of 99th Avenue, exposed bedrock of the South Mountains is located about 2 miles to more than 5 miles south of the study area.

According to published geologic maps, surficial deposits along the SR 30 alternatives consist of several broad categories of Quaternary-age alluvium, including alluvium in channels and low terraces of small drainages, young alluvial fans, and broad terraces of major drainages; active and recently active channel deposits in major axial drainages; and undifferentiated alluvium (Demsey 1989).

Available Geotechnical Data

Previous geotechnical subsurface data was obtained for locations that may be representative of the study area, including:

- Salt River crossing near 51st Avenue (SRP 1993)
- Agua Fria River crossing between Dysart Road and Litchfield Road (SHB 1985)
- Broadway Road east of El Mirage Road (SRP 2001)
- Broadway Road from El Mirage Road to 59th Avenue (SHB 1973)
- Cotton Lane at and north of the Gila River (Baker 2006)
- *Drilled Shaft Load Test Report, South Mountain Freeway* (SR 202L) (HDR 2016)
- *Final Geotechnical Investigation Report, SR 202L, Segment C2 Salt River Bridges and Abutment and Wing Walls* (AMEC 2017a)
- *Final Geotechnical Investigation Report, SR 202L, Segment D1 RID Canal Bridges* (AMEC 2017b)
- *Final Geotechnical Investigation Report, SR 202L, Segment C2 Salt River, Laveen Area Conveyance Channel* (AMEC 2017c)
- *Final Geotechnical Investigation Report, SR 202L, Segment C2 Roadways* (AMEC 2017d)
- *Final Geotechnical Investigation Report, SR 202L, Segment C2 Bridge 370 Lower Buckeye Road* (Connect 202 Partners/WSP 2017a)
- *Final Geotechnical Investigation Report, SR 202L, Segment D1 Roadways* (Connect 202 Partners/WSP 2017b)

Geotechnical data from the referenced reports indicate that relatively coarse-grained alluvium exists at and in major drainages including the Salt, Gila, and Agua Fria Rivers. At the Salt and Gila Rivers, encountered alluvial deposits consist of dense to very dense silt, sand, gravel, and cobbles ("SGC soils") in various mixtures including sands (Unified Soil Classification System classifications SP and SW), silty sands (SM), silty gravels (GM), gravelly sands (SP), sandy gravels (GP, GP-GM, and GC-GM), and sand, gravel, and cobbles (GP). On the north side of the Gila River at Cotton Lane, a 30- to 35-foot thick layer of stiff to hard, low to high plasticity silty to sandy clay (CL-CH) is encountered, beginning about 60 to 65 feet below ground surface (bgs), underlain by more coarse-grained alluvium as described. At the Agua Fria River, encountered alluvial deposits consist of SGC soils including sands (SP and SW), gravels (GP and GW), silty sands (SM and SW/SM), clayey sands (SC-GC), and sand, gravel, and cobbles (GP) that are loose to medium dense at the surface/near surface, to dense to very dense at depth.

Away from the major drainages, relatively fine-grained alluvial deposits (terrace deposits) are encountered from the ground surface to about 15 to 25 feet bgs. These soils include stratified, soft to hard sandy and silty clays of low to high plasticity (CL and CH) and soft to moderately firm clayey sands and silty sands (SC and SM) underlain by coarser grained sands (SP and SW) and gravels (GP and GW). Occasional lenses of moderately firm to firm, low plasticity to non-plastic silt and sandy silt (ML) separate the overlying clays and clayey/silty sands from the underlying coarser grained alluvium. Below about 20 to 25 feet bgs, dense to very dense, coarse-grained alluvium (SGC soils as previously described for the Salt and Gila River areas) is encountered. In some locations along and in the Salt River active channel in the vicinity of 59th Avenue/SR 202L, fill soils consisting of sand and gravel associated with historical sand and gravel mining operations were encountered.

For SRP's investigation at Broadway Road east of El Mirage Road, soil liquefaction was considered by SRP to be a possibility in the project area because of the presence of non-cohesive, non-plastic soils (sands and silty sands) and relatively shallow groundwater conditions (SRP 2001).

Grain size analyses were performed on representative surface samples of channel deposits in the Salt River and Agua Fria River at and in the vicinity of the planned SR 30 and SR 202L crossings. This sampling and testing includes recent field transect sampling and analysis by HDR, and previous work by others, to estimate the median grain size (D50) values for scour analysis. Based on the recent grain size data and data from previous studies, values of D50 of 57 mm and 0.43 mm are recommended for preliminary scour analysis for the crossings of the Salt River and Agua Fria River, respectively. These values are based on limited data and should only be used for preliminary calculations. More detailed discussion of results of the sampling and testing are presented in the "Grain Size Analysis of Channel Deposits, Salt River and Agua Fria River Crossings" memorandum (HDR 2011).

Groundwater

Depth to groundwater in the study area ranges from near-surface at portions in and adjacent to active channels of the Salt and Gila Rivers, to greater than 100 feet bgs with increasing distance away from these active channels (ADOT 2006). The potential for encountering groundwater would require consideration when planning depressed segments of roadway excavations, and excavations for deep foundations (drilled shafts), depending on proximity of the excavations to major drainage channels, and the frequency, duration, and volume of flow events.

Geologic Constraints

Land subsidence and associated earth fissures are documented in the region of the study area. Based on currently available information, ground subsidence comprising the West Valley Land Subsidence Feature is currently occurring in the study area (ADWR 2018). Documented earth fissures are located north of I-10, well north of the study area (AZGS 2018).

Near surface loose to very loose sandy soils, and SGC soils at depth will be encountered during construction of certain project elements. Where encountered, temporary stabilization of excavations, such as for deep foundations (drilled shafts), would be necessary in these soils

Isolated soil strata below the groundwater table may be susceptible to liquefaction in response to earthquake events that may occur in the study area. The extent, depth, and properties of these soils would require delineation and evaluation during subsurface geotechnical investigation for design.

Zones of surficial soils that may possess moderate to high potential for shrink and swell, and for collapse upon wetting (including compressible and expansive soils, and hydro-collapsible soils) were identified in the study area, based on available geotechnical subsurface data and surface soil mapping (USDA-NRCS 2002). The extent, depth, and properties of these soils would require delineation and characterization relative to their suitability for use as roadway subgrade and for support of embankments, structures, channels and drainage structures, and other elements.

4.14.2 Hazardous Materials

Soil or groundwater affected by hazardous materials, on a large scale, are not known to currently exist in the study area. Based on the Draft Initial Site Assessment, several large groundwater contamination plumes were found in the region, all located outside of the study area to the north (ADOT 2011). Were any of these plumes to migrate into the study area, or the limits of the study area to expand to include any portion of these plumes, potential for encountering groundwater affected by hazardous materials would require consideration when planning for geotechnical investigations and construction of depressed segments of roadway and excavations for deep foundations (drilled shafts). Early hazardous materials assessment like that completed to date for the study area did not identify specific localized areas that may have soil and groundwater contamination. Locations of geotechnical borings may be affected by contaminated areas of soil or groundwater, which are not discovered until a specific corridor is selected, and a corridor-specific hazardous materials assessment is performed.

4.14.3 Summary

The study area is situated on a broad, gently sloping alluvial plain in the WSRV sub-basin, and is underlain by up to several thousand feet of alluvium. Bedrock is not exposed in the study area. Surface and near-surface soils in the study area consist of alluvial deposits on alluvial fan surfaces, terraces adjacent to small and major drainages, and in drainage channels, and consist of mixtures of sand, silt, clay, gravel, and cobbles. These soils range from loose to very loose at the ground surface, to dense to very dense at depth, and generally become coarser with increasing depth below the ground surface. Excavations for roadways, foundations, and other elements would encounter the coarse grained soil deposits. Temporary stabilization of excavations, such as for deep foundations (drilled shafts), would be necessary in these soils.

Depth to groundwater in the study area ranges from near-surface in active channels, to greater than 100 feet bgs. The potential for encountering groundwater would require consideration when planning depressed segments of roadway excavations and excavations for deep foundations (drilled shafts), depending on proximity of the excavations to major drainage channels and the occurrence of flow events. Isolated soil strata susceptible to liquefaction in response to earthquake events (non-cohesive fine sands and silts below the groundwater table) may exist in the study area and would require delineation and evaluation during design. Zones of surficial soils that may possess moderate to high potential for shrink and swell, and hydro-collapse, were identified in the study area and would require delineation and characterization relative to their suitability for use as roadway subgrade and for support of embankments, structures, and other elements.

4.15 Preliminary Pavement Design

No pavement designs were developed as part of this L/DCR. However, for the purposes of computing quantities, the following pavement sections were assumed for the corridor based on other typical pavement sections for recently constructed freeways in the Phoenix area:

- SR 30 main line: 13 inches of PCCP over 4 inches of aggregate base (all main line is either at grade or elevated)
- SR 30 ramps, collector-distributor roads, and crossroads within access control: 10 inches of PCCP over 4 inches of aggregate base
- Crossroads outside of access control and frontage roads: 6 inches of asphaltic concrete pavement over 9 inches of aggregate base.

4.16 Habitat Connectivity

Linear transportation facilities such as the proposed SR 30 freeway can fragment wildlife habitat and act as a barrier to wildlife movement. Such fragmentation can prevent wildlife from gaining access to required resources and isolate populations from each other, resulting in reduced genetic diversity that can undermine a population's long-term viability. Impacts on wildlife movement generally increase with increasing roadway width. Other features associated with freeways, such as ROW fencing, can contribute to this barrier effect. Roadways have also been shown to suppress populations of some wildlife species occurring near roads; this is likely attributable to road kill incidents.

Except for the Agua Fria River floodway, most of the land in the study area and to the north, east, and west has been converted to agricultural uses or has been otherwise developed. This condition generally limits wildlife to birds and smaller species of mammals, reptiles, and amphibians. Because the study area is projected to be built out by 2030, little wildlife habitat is likely to remain in the study area at the time of the proposed freeway's construction, currently scheduled for after 2026.

Habitat for a variety of wildlife species, large and small, occurs south of the study area along the Gila and Salt Rivers, in Estrella Mountain Regional Park, and on Gila River Indian Community land. Some of these species can move great distances and may need to move through the study area to reach suitable habitat farther north. The most likely corridor for north-to-south movement through the study area would be the naturally vegetated Agua Fria River floodway. Because of existing development north of the study area, the nearest large expanses of natural desert habitat are more than 22 miles north of the Gila River, near the southern end of the Hieroglyphic Mountains. East-to-west movement in the area would likely occur along the naturally vegetated Gila and Salt Rivers south of the study area.

In 2006, the Arizona Wildlife Linkages Workgroup completed *Arizona's Wildlife Linkages Assessment* (2006), which is an initial effort to identify potential linkage zones important to Arizona's wildlife and natural ecosystems. The Gila and Salt Rivers, downstream of their confluence, are identified as the "Gila/Salt River Corridor Granite Reef Dam" potential linkage zone across habitat blocks. No other linkage zone has been identified in the study area.

Larger wildlife occurring south of the study area includes desert bighorn sheep, mule deer, mountain lion, and javelina. Because of the lack of habitat in the study area for larger species, substantial movement of these species into the study area from land to the south is unlikely. Medium-sized species such as coyote and bobcat may travel into the study area from the south; these species are known to frequent developed land near the urban-wildland interface.

Smaller species such as rodents, lizards, snakes, and amphibians are unlikely to move into the study area from the south because of their small home ranges, lack of suitable habitat in the study area, or because the Gila and Salt Rivers may form an impassible barrier for some of these species.

Avian species, while highly mobile because of their ability to fly, are constrained by habitat requirements. Some species can meet foraging requirements in human-dominated landscapes like agricultural fields and residential developments and, as a result, they migrate through developed areas regardless of the presence or absence of wildlife corridors. Others require more natural habitat and are more constrained during migration to naturally vegetated corridors such as the Agua Fria, Gila, and Salt Rivers' floodways.

4.17 Multimodal Considerations

Bicycle and Pedestrian Considerations: Bicycle and pedestrian facilities in the corridor generally fall into two categories**—**those that fall on the arterial roadways and those that have dedicated trails or paths. The intent of the SR 30 corridor is to perpetuate and/or accommodate all existing and planned bicycle and pedestrian facilities that cross the corridor.

Along the arterials, each City's ultimate planned cross section (according to the Cities' general plans and roadway classification maps) is accommodated at each crossing. If the City's section includes space for sidewalks, paths, or bike lanes, that space is perpetuated through the planned freeway crossing.

Existing and planned trails and pathways also cross the SR 30 corridor. Many of these follow or are planned to follow other existing features such as canals, washes, rivers, and powerlines. Since SR 30 must cross each of these elements, it is the intent that the existing or planned trails and pathways that would cross SR 30 would also be spanned to preserve the continuity of the trail or pathway. Additional coordination will be needed during final design with the local agencies on how to accommodate all the bicycle and pedestrian facilities crossing the corridor.

It should be noted that no trail or pathway is included in and along the SR 30 corridor.

Bus Routes: Six bus routes currently serve the SR 30 corridor and include routes on Buckeye Road, Lower Buckeye Road, 59th Avenue, 67th Avenue, 75th Avenue, and Baseline Road. The City of Phoenix Dial-a-Ride and the Southwest Valley Americans with Disabilities Act Service provide the paratransit options in the study area. According to the MAG 2040 RTP, no transit improvements (including bus routes, regional super grid buses, regional express network buses, and light-rail transit/high-capacity transit) are planned in the SR 30 study area. However, some minor transit improvements are planned in the study area with the City of Phoenix Transportation 2050 (T2050) initiative. These improvements are, however, subject to change as the T2050 program timing and definition become more defined.

Future Transit Corridor: As noted in earlier sections of this report, the SR 30 freeway corridor is expected to be at or over capacity well before the 2040 design horizon. With a capped 4+1 freeway footprint, there is recognition that the SR 30 corridor will require a next generation high-capacity mode of transportation to serve this unmet travel demand. In addition, with the proliferation of high speed rail corridors around the country, it is not hard to imagine that a high speed rail corridor between southern California and the Phoenix area could be built someday. Geography limits the options where this type of facility could be feasibly built. The SR 30 corridor is the most likely route. In response, a 50-foot wide future transit corridor is being preserved in the proposed SR 30 ROW using geometry sufficient to accommodate all known current modes of transit, including the most restrictive high speed rail option. This future transit corridor will generally follow the south ROW except at the system interchanges with SR 303L and SR 202L, where the corridor will transition into the median of SR 30 to pass through them.

This document does not attempt to define the transit mode or the technology to be used in this future transit corridor. At the speed at which technology changes, any attempt to do so with today's knowledge would almost certainly be wrong in the future. It is also unclear when or if this transit corridor would be built, because it is not funded. However, the travel demand need will clearly exist, so it is imperative that this study make this provisions in the design so that future generations can respond to this demand in a cost-effective manner.

4.18 Design Exceptions

Refer to Chapter 7.0 of this document for more information on design exceptions.

4.19 Intergovernmental Agreements

Because of the complexity and length of this project, it is likely that at least three IGAs will be needed to complete this project. These three IGAs will deal with financial and maintenance agreements between ADOT and the Cities of Phoenix, Avondale, and Goodyear. Additional IGAs may be needed between ADOT and the Maricopa County Department of Transportation and FCDMC.

5.0 Itemized Cost Estimate

A detailed itemized construction cost estimate was prepared for each of the four build alternatives considered, based on 2018 dollars. In addition, a detailed parcel-by-parcel ROW cost estimate was prepared for each alternative in 2011 for use in the comparative cost analysis. After the selection of the RBA, the RBA ROW cost estimate was updated in 2018 and, based on this update, was proportionately allocated to the other three build alternatives for this estimate's update. Section 5.1 shows the MAG program in Table 5-1 that was updated after the public hearing in September 2019. It also provides the cost estimate for the RA developed in April 2019 and shared during the public hearing in May 2019. Section 5.2 provides the updated cost estimate for the Selected Alternative developed in December 2019 in collaboration with ADOT's Management Consultant just prior to the publication of this document. Future maintenance costs are discussed in Section 5.3. Section 5.4 provides the cost estimates for the three build alternatives that were not advanced (North, Center, and South).

5.1 Programming and Cost Estimate of the Recommended Alternative

The MAG RTP Freeway Program 20-year plan calls for the development of the SR 30 (SR 303L to SR 202L) corridor to start in FY 2018, beginning with ROW acquisition and advance utility relocations. At this time, construction of the 3+0 full freeway section is included in the 20-year plan, but it is not fully funded. Funding exists only for the acquisition of the full freeway ROW and some long lead time advance utility relocations. The 3+0 freeway would be built in later years but is not specifically programmed in a fiscal year, so it is indicated as only FY 2026+. It is important to note that this program changes regularly and thus could change at any time, but at the time of the publication of this document, the current program for this corridor is shown in Table 5-1.

Table 5-1. SR 30 (SR 303L to SR 202L) MAG Program schedule and funding (as of September 2019)

Segment	Design schedule	Design funding	ROW acquisition and utility relocation schedule	ROW and utility relocation funding	Construction schedule	Construction funding
SR 303L to SR 202L Predesign and Environmental	FY 2017	$3,000,000	—	—	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2018	$60,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2020	$67,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2021	$67,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2022	$51,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	FY 2023	$134,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	FY 2024	$1,000,000	FY 2024	$155,000,000	—	—
SR 303L to SR 202L ultimate freeway ROW and advance utility relocations (funded)	—	—	—	—	FY 2025	$4,000,000
SR 303L to SR 202L freeway construction (3 general purpose lanes each direction) (unfunded)	FY 2026+	$170,000,000	—	—	FY 2026+	$1,700,000,000
Total	—	**$174,000,000**	—	**$534,000,000**	—	**$1,704,000,000**

Notes: FY = fiscal year, ROW = right-of-way

The estimated project cost of the SR 30 RA (Hybrid Alternative) from Sarival Avenue to SR 202L in 2018 dollars, which was shared with the public during the public hearing, is summarized in Table 5-2.

Table 5-2. SR 30 (Sarival Avenue to SR 202L) RA (Hybrid Alternative) estimated project cost

Segment	Length (miles)	Construction cost (2018 $)	ROW cost (2018 $)	Design cost (2018 $)	Total project cost (2018 $)
Sarival to Estrella Parkway 3+0 Freeway[a]	1.00	67,250,000	24,250,000	4,150,000	95,650,000
Estrella Parkway to Dysart Road 3+0 Freeway	3.31	309,030,000	80,200,000	18,810,000	408,040,000
Dysart Road to Avondale Boulevard 3+0 Freeway	1.94	111,970,000	47,000,000	6,900,000	165,850,000
Avondale Boulevard to 97th Avenue 3+0 Freeway	2.23	125,260,000	54,000,000	7,660,000	186,930,000
97th Avenue to 67th Avenue 3+0 Freeway	3.84	243,390,000	93,100,000	14,100,000	350,580,000
67th Avenue to SR 202L System TI	0.7	433,020,000	17,000,000	27,120,000	477,140,000
Total	**13.02**	**$1,289,920,000**	**$315,550,000**	**$78,710,000**	**$1,684,180,000**

Notes: ROW = right-of-way, SR = State Route, TI = traffic interchange
[a] SR 303L to Sarival limits cost covered in the SR 303L; SR 30 to I-10 DCR and EA.

5.2 Cost Estimate of the Selected Alternative

An updated cost estimate for the Selected Alternative (previously indicated as the Recommended Alternative) was developed in December 2019 in collaboration with ADOT's Management Consultant using 2019 dollars just prior to the publication of this document.

The 2019 detailed cost estimate of the Selected Alternative can be found in Appendix F.

5.3 Estimate of Future Maintenance Costs

The projected annual maintenance cost for SR 30 was calculated to provide future budgeting guidance for ADOT's Phoenix Maintenance District. The calculation included an average pavement width of 156 feet (includes travel lanes, shoulders, and auxiliary lanes) for a 3+0 configuration, a total project length of 13.02 miles (from Sarival Avenue to SR 202L), and a current annual maintenance cost per lane-mile of $17,400. Combining these factors and inflating to a projected opening year of 2030 results in an annual maintenance cost of approximately $3 million.

5.4 Detailed Cost Estimates of Other Alternatives Considered

Project cost estimates were also developed for the North, Center, and South Alternatives to an equal level of development for comparison purposes, all based on 2018 dollars. Summaries of these alternative costs are listed in following sections.

5.4.1 North Alternative Cost Estimate

The estimated project cost of the SR 30 North Alternative from Sarival Avenue to SR 202L is summarized in Table 5-3.

Table 5-3. SR 30 (Sarival Avenue to SR 202L) North Alternative estimated project cost

Segment	Length (miles)	Construction cost (2018 $)	ROW cost (2018 $)	Design cost (2018 $)	Total project cost (2018 $)
Sarival to Estrella Parkway 3+0 Freeway[a]	1.00	67,250,000	24,250,000	4,150,000	95,650,000
Estrella Parkway to Dysart Road 3+0 Freeway	3.06	208,970,000	74,150,000	12,910,000	296,030,000
Dysart Road to Avondale Boulevard 3+0 Freeway	1.94	97,720,000	47,000,000	5,720,000	150,440,000
Avondale Boulevard to 97th Avenue 3+0 Freeway	2.22	128,030,000	80,000,000	7,710,000	215,730,000
97th Avenue to 67th Avenue 3+0 Freeway	3.79	232,130,000	91,800,000	14,550,000	338,480,000
67th Avenue to SR 202L System TI	0.7	433,020,000	17,000,000	27,120,000	477,140,000
Total	**12.71**	**$1,167,120,000**	**$334,200,000**	**$72,160,000**	**$1,573,470,000**

Notes: ROW = right-of-way, SR = State Route, TI = traffic interchange
[a] SR 303L to Sarival limits cost covered in the SR 303L; SR 30 to I-10 DCR and EA.

5.4.2 Center Alternative Cost Estimate

The estimated project cost of the SR 30 Center Alternative from Sarival Avenue to SR 202L is summarized in Table 5-4.

Table 5-4. SR 30 (Sarival Avenue to SR 202L) Center Alternative estimated project cost

Segment	Length (miles)	Construction cost (2018 $)	ROW cost (2018 $)	Design cost (2018 $)	Total project cost (2018 $)
Sarival to Estrella Parkway 3+0 Freeway[a]	1.00	67,250,000	24,250,000	4,150,000	95,650,000
Estrella Parkway to Dysart Road 3+0 Freeway	3.15	579,770,000	76,300,000	37,070,000	711,140,000
Dysart Road to Avondale Boulevard 3+0 Freeway	1.94	119,080,000	47,000,000	7,340,000	173,420,000
Avondale Boulevard to 97th Avenue 3+0 Freeway	2.23	126,480,000	54,000,000	7,740,000	188,220,000
97th Avenue to 67th Avenue 3+0 Freeway	3.84	242,930,000	91,100,000	14,060,000	350,090,000
67th Avenue to SR 202L (SMF) System TI	0.7	433,020,000	17,000,000	27,120,000	477,140,000
Total	**12.86**	**$1,586,540,000**	**$311,650,000**	**$97,480,000**	**$1,995,660,000**

Notes: ROW = right-of-way, SR = State Route, TI = traffic interchange
[a] SR 303L to Sarival limits cost covered in the SR 303L; SR 30 to I-10 DCR and EA.

5.4.3 South Alternative Cost Estimate

The estimated project cost of the SR 30 South Alternative from Sarival Avenue to SR 202L is summarized in Table 5-5.

Table 5-5. SR 30 (Sarival Avenue to SR 202L) South Alternative estimated project cost

Segment	Length (miles)	Construction cost (2018 $)	ROW cost (2018 $)	Design cost (2018 $)	Total project cost (2018 $)
Sarival to Estrella Parkway 3+0 Freeway[a]	1.00	67,250,000	24,250,000	4,150,000	95,650,000
Estrella Parkway to Dysart Road 3+0 Freeway	3.40	284,870,000	82,400,000	17,300,000	384,570,000
Dysart Road to Avondale Boulevard 3+0 Freeway	1.94	118,310,000	47,000,000	7,290,000	172,600,000
Avondale Boulevard to 97th Avenue 3+0 Freeway	2.49	133,970,000	60,300,000	8,210,000	202,480,000
97th Avenue to 67th Avenue 3+0 Freeway	3.84	239,230,000	93,000,000	13,830,000	346,060,000
67th Avenue to SR 202L (SMF) System TI	0.7	433,020,000	17,000,000	27,120,000	477,140,000
Total	**13.37**	**$1,276,650,000**	**$323,950,000**	**$77,900,000**	**$1,678,490,000**

Notes: ROW = right-of-way, SR = State Route, TI = traffic interchange
[a] SR 303L to Sarival limits cost covered in the SR 303L; SR 30 to I-10 DCR and EA.

6.0 Implementation Plan

The proposed construction implementation of the SR 30 corridor is from the east to the west. This is primarily because the anticipated traffic volumes on SR 30 are 30 to 40 percent higher on the east end as compared with the west end. This implementation approach is akin to constructing a drainage facility from downstream to upstream.

As mentioned in the segment descriptions under traffic and drainage considerations, the four westernmost segments could be opened to traffic independent of each other. However, some or all could be combined to share a common open-to-traffic date, if practicable.

By contrast, the two easternmost segments are operationally linked. Because the drainage outfall is shared for these two projects, and because the SR 30/SR 202L system TI segment (as described above) does not include a logical end-of-freeway condition at 67th Avenue, these two projects must open to traffic at the same time. However, because the system TI's combined design and construction schedule would likely last at least 1 year longer because of the complexity, the system TI segment should be started 1 year before the 97th Avenue to 67th Avenue segment begins.

The proposed programming segments (along with their interdependencies) are as follows from west to east:

- SR 303L to Estrella Parkway (independent utility and construction)
- Estrella Parkway to Dysart Road (independent utility and construction)
- Dysart Road to Avondale Boulevard (independent utility and construction)
- Avondale Boulevard to 97th Avenue (independent utility and construction)
- 97th Avenue to 67th Avenue (independent construction, but must open to traffic when 67th Avenue to SR 202L segment complete)
- 67th Avenue to SR 202L (independent construction, but must open to traffic when 97th Avenue to 67th Avenue segment complete)

SR 30 would also likely be built in cross-sectional phases similar to other Valley freeways. Figure 6-1 illustrates one potential implementation. Note that a four-lane "Phase 1" roadway was initially proposed and is kept as part of this project documentation for message consistency, but is no longer planned for implementation, as was shared during the public hearing.

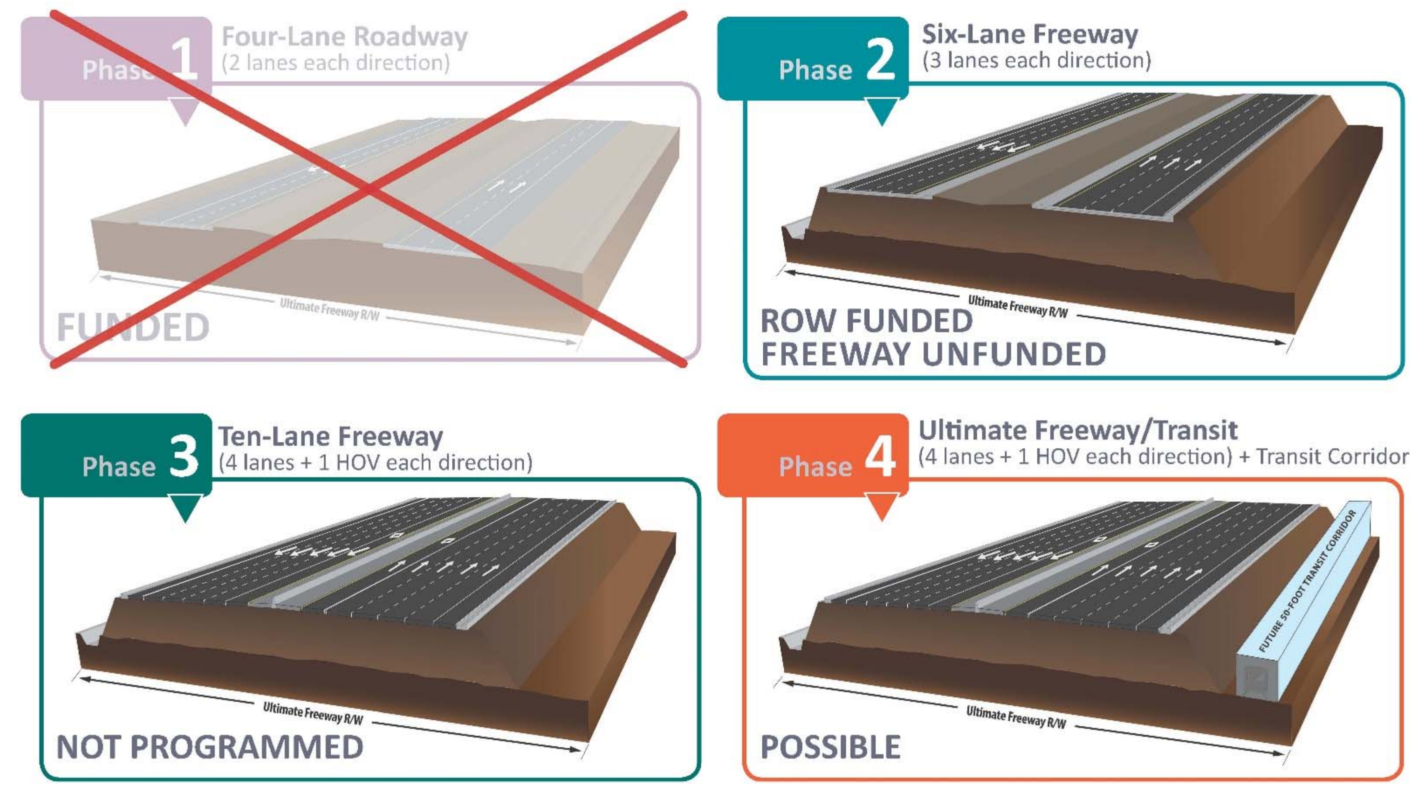
The second phase of implementation would occur using a 3+0 cross section (three general purpose lanes in each direction) with a wide median. This phase would be the actual freeway construction, complete with bridges, interchanges, ramps, and storm drain systems.

The third phase of implementation would widen the 3+0 section to a 4+1 section (four general purpose lanes and one HOV lane in each direction) in the median of SR 30 when travel demand warrants it, and when funding is available.

The fourth and final phase of construction would be to construct the transit corridor being preserved inside the SR 30 ROW, as was discussed in Section 4.16 of this document, should future conditions warrant it.

It must be noted that program funding does and will continue to change to accommodate budgetary constraints and available funding sources, and this will likely affect how this corridor's construction would be phased. As a result, the information presented here is subject to change over time.

Figure 6-1. SR 30 cross section implementation



7.0 AASHTO Controlling Design Criteria and Design Exceptions

The Selected Alternative would build a new freeway using AASHTO or better Controlling Design Criteria as defined in Section 4.2 of this document.

7.1 AASHTO Non-Conforming Geometric Design Elements

This is a new facility being designed to AASTHO standards, so AASHTO design exceptions are not anticipated. However, at the time of this document's final preparation, ADOT and the FHWA were debating the interpretation of Tables 3-27 and 3-28 from the 2018 version of AASHTO's *A Policy on Geometric Design of Highways and Streets*, otherwise known as the Green Book. A possible outcome of that debate is that an FHWA design exception may be required for the ramp's travel way widths. The final design effort will need to verify if this is required.

7.2 AASHTO Design Exceptions

No AASHTO design exceptions would be necessary for the new freeway identified in this study's Selected Alternative, except as possibly noted in Section 7.1 above

7.3 ADOT RDG Non-Conforming Geometric Design Elements

This is a new facility being designed to ADOT standards, so ADOT design exceptions are not anticipated.

7.4 ADOT Design Exceptions

No ADOT design exceptions would be necessary for the new freeway identified in this study's Selected Alternative.

8.0 Social, Economic, and Environmental Concerns and Mitigations

An EA, along with supporting technical reports, has been prepared for this project as part of the preliminary design and engineering process for the proposed SR 30 freeway action and in accordance with NEPA, Council on Environmental Quality regulations, and the environmental guidelines published by FHWA.

The EA identified and evaluated potential impacts on the social, economic, natural, and cultural environment that could result from construction of the proposed SR 30 freeway. Also contained in the EA are mitigation measures to be incorporated into the project final design and construction documents. The mitigation measures listed in the EA are not subject to modification without prior written approval of ADOT.

The Draft EA was available for review by the public, agencies, local elected and government officials, community organizations, and other interested stakeholders. Pertinent comments received on the Draft EA were reflected in the EA. The EA, L/DCR, and other studies conducted for the proposed SR 30 freeway are posted to the SR 30 website where they may be viewed by the public:

https://www.azdot.gov/planning/transportation-studies/state-route-30

In addition, SR 30 has been identified a key sustainable transportation corridor. The design and environmental processes are undergoing an FHWA INVEST (Infrastructure Voluntary Evaluation Sustainability Tool) evaluation. The tool consists of voluntary sustainability best practices, called criteria, which cover the full lifecycle of transportation services, including system planning, project planning, design, and construction, and continuing through operations and maintenance. ADOT's Sustainable Transportation Program attempts to quantify, balance, and communicate sustainability benefits and trade-offs. INVEST helps ADOT identify, prioritize, and communicate balanced choices. With INVEST, users can balance the economic, social, and environmental factors that define sustainability; identify and share sustainability best practices; and provide decision-makers with the information they need by systematically monitoring criteria that affect a project's sustainability performance over time.

ADOT has determined that the proposed action would not result in a significant impact to the environment. As a result, a finding of no significant impact (FONSI) was approved by ADOT on November 6, 2019. The FONSI allows the right-of-way of the Selected Alternative to be cleared from an environmental standpoint, and the proposed SR 30 action will move forward to the next level of design and engineering.

The following resources or areas of impact were evaluated in the SR 30 EA:

- land ownership, jurisdiction, and land use
- social and economic considerations
- cultural resources
- Section 4(f) resources
- Section 6(f) resources
- air quality
- noise
- utilities
- visual resources
- drainage and floodplains
- Section 404 and 401 of the CWA and National Pollutant Discharge Elimination System
- biological resources
- hazardous materials
- material sources and waste materials
- secondary impacts
- cumulative impacts

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